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Symposium Remarks

On April 20, 2018, the Connecticut Journal of International Law hosted its annual Symposium at the University of Connecticut School of Law. Our symposium, entitled "Paris, Policy, and the Grid" focused on the intentional, national, and regional impacts of the Paris Agreement on energy policy, grid stability, and renewable energy production. Three panels of distinguished international scholars and environmental lawyers discussed the United States' withdrawal from the Paris Agreement, compared national energy policies of China, Germany, Canada, and the United States, as well as the resilience of the electrical grid in the United States.

What follows are the prepared remarks of Ángel Oquendo, an international scholar on worldwide comparative law, and the transcribed keynote address from Manuel Pulgar-Vidal, leader of the World Wildlife Fund's Global Climate and Energy Practice.

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Fifty Shades of Green: From Individual to Planetary Environmental Rights*

*Ángel R. Oquendo***

> I've tried to express the terrible human passions with the red and the green. . .Everywhere it's a battle and an antithesis of the most different greens and reds. . .[1]

The 2015 Paris Agreement within the United Nations Framework Convention on Climate Change can boast, at the very least, an impressive consensus on climatological rhetoric.[2] It will thereby contribute, certainly, neither to achieving its global objectives on temperature[3] nor to redressing any of the resulting "loss and damage"[4] but possibly to continuing the worldwide dialogue on the environment and environmental entitlements.[5] This paper will dissect and categorize the latter. It will conclude that the Parisian framers essentially kept the conversation going, nationally and internationally encouraging the Establishment, the judiciary, and civil society to resume the conceptual and practical advancement on point, as well as beyond.

Individualized rights are the most basic element in this categorical scheme. They support claims that one person asserts against someone else. For instance, *P* may, under usual circumstances, rightfully insist on indemnification, on the basis of individual entitlements, when she endures personal injury as a consequence of *D*'s ecological negligence or maliciousness.

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* *Cf.* E. L. JAMES (Erika Mitchell), FIFTY SHADES OF GREY (2011).

** George J. and Helen M. England Professor of Law, University of Connecticut; CAPES Visiting Professor from Abroad, Federal and State Universities of Rio de Janeiro; DAAD Visiting Professor, Free University of Berlin. Ph.D., M.A. (Philosophy), A.B. (Economics and Philosophy), Harvard University; J.D., Yale Law School. I presented this paper during the luncheon, as my own ruminations while the audience digested, at the annual symposium of the Connecticut Journal of International Law on *Paris, Policy, and The Grid: The Future of Transnational Energy Policy*. Beyond the organizers of and the participants at the event, I would like to thank Emily Byrnes, Chris Hyde, and Claudia Schubert for their invaluable contributions to the development of the outlined ideas. I have myself undertaken the translation of the quoted non-English-language materials and vouch for its accuracy.

[1] VAN GOGH MUSEUM, VINCENT VAN GOGH: THE LETTERS, LETTER (676) FROM VINCENT VAN GOGH TO THEO VAN GOGH. ARLES, SATURDAY, 8 SEPTEMBER 1888, available at http://vangoghletters.org/vg/letters/let676/letter.html.

[2] *See* Paris Agreement to the United Nations Framework Convention on Climate Change, Dec. 12, 2015, 27 U.N.T.S. 7.d [hereinafter "Paris Agreement"].

[3] *See id.* art. 2(1)(a) ("This Agreement . . . aims to strengthen the global response to the threat of climate change. . . by: Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels. . . .").

[4] *See id.* art. 8(1) ("Parties recognize the importance of averting, minimizing and addressing loss and damage associated with the adverse effects of climate change. . . .").

[5] The discussion will use the words 'right' and 'entitlement' mostly interchangeably.

P may allege a breach of her landowner rights. Alternatively, she may aver an encroachment upon her environmental rights, particularly if her property forgoes none of its market value, salubriousness, or beauty. In the nomenclature of Judy Thomson, such entitlements would qualify as "cluster rights" to the extent that they cluster or encompass other interrelated ones.[6]

Two or more parties may sometimes combine their respective individual assertions in a single action, if they can show sufficient legal or factual commonality to warrant the combination.[7] The rights in question do not thereby lose their individualized character. For example, *P1* and *P2* may institute their complaints and vindicate their entitlements together, whenever *D* injures both of them at once through her negligent or malicious conduct.[8] They should receive compensation commensurate with what they are individually entitled to.

As the number of right-holders increases, the denomination 'aggregated individual rights' becomes appropriate. Still, the numerous entitlements generally remain individual and amenable to apportionment. For instance, when a substantial set of proprietors sues *D* for encroaching upon their rights, each one of them usually has a claim that corresponds to the detriment that she has experienced.[9]

Such individually held entitlements, which allow decoupling despite their commingling, stand out in sharp relief against societal rights, which are basically indivisible and concern society as a unit, or a sizeable community. This ampler category includes generalized entitlements that have attained national or international recognition, such as the right to an ecologically wholesome subsistence.[10] These particular entitlements have developed more recently than individual rights.[11] Furthermore, they often operate as positive rights, which compel the government (or private parties) positively to engage in, rather than negatively to refrain from, certain actions.[12]

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[6] JUDITH JARVIS THOMSON, THE REALM OF RIGHTS 55 (1990) ("Let us call rights that contain other rights 'cluster-rights'.).

[7] *See, e.g.*, FED. R. CIV. P. 20(a)(1) ("Persons may join in one action as plaintiffs if: (A) they assert any right to relief jointly, severally, or in the alternative with respect to or arising out of the same transaction, occurrence, or series of transactions or occurrences; and (B) any question of law or fact common to all plaintiffs will arise in the action.").

[8] *See, e.g.*, United States v. Olson, 546 U.S. 43, 45 (2005) ("In this case, two injured mine workers (and a spouse) have sued the United States claiming that the negligence of federal mine inspectors helped bring about a serious accident at an Arizona mine.").

[9] *See, e.g.*, Baatz v. Columbia Gas Transmission, LLC, 814 F.3d 785, 788 (6th Cir. 2016) ("On December 21, 2012, a group of landowners brought a class action against Columbia in the Southern District of Ohio for [storing natural gas nearby].").

[10] *See, e.g.*, AFRICAN CHARTER ON HUMAN AND PEOPLES' RIGHTS (Banjul Charter) art. 24 (1981) ("Right to a General Satisfactory Environment"), adopted June 27, 1981, O.A.U. Doc. CAB/LEG/67/3 rev. 5, 21 I.L.M. 58 [hereinafter AFRICAN CHARTER].

[11] *See, e.g.*, ÁNGEL R. OQUENDO, LATIN AMERICAN LAW 382 (2017) ("Since the attainment of independence in the nineteenth century, constitutions in Latin America have guaranteed negative rights. . . . Latin American nations have been incorporating positive rights into their constitutional charters since the beginning of the twentieth century.").

[12] *See, e.g.*, Org. of Am. States (OAS), Additional Protocol to the American Convention on Human Rights in the Area of Economic, Social, and Cultural Rights, "Protocol of San Salvador," art. 11, Nov. 17, 1988, O.A.S. T.S. No. 69, 1144 U.N.T.S. 123 ("The States Parties shall promote the protection, preservation, and improvement of the environment."); *see also* AFRICAN CHARTER, *supra* note 10, art. 16(2) ("State Parties to the present Charter shall take the necessary measures to protect the health of their people and to ensure that they receive medical attention when they are sick.").

Rights that belong indivisibly to several persons have, most likely, existed in all legal systems and at all times. When two individuals own a tract of land, for example, they normally possess a relatively undividable right with respect to it. Likewise, entitlements that pertain to society at large have had an extremely extended history. The Roman *actio popularis*, for instance, enabled ordinary citizens to uphold the entitlements of the entire citizenry.[13] The novelty of the contemporary action of this sort consists in its general, as opposed to sporadic, availability, in its widespread deployment, and in its focus on modern concerns, such as the environment.[14] The U.S. citizen suit and the civil-law action on so-called "diffuse" interests provide cases in point.[15]

For purposes of illustration, one may think of a privately-run enterprise that neglects ecological regulations and compromises the environmental welfare of the immediate vicinity. The neighbors who, as a result, undergo individualized injuries might join their claims and jointly demand satisfaction. In addition to this joinder of individual assertions, the surrounding neighborhood might seek to enforce its right to an ecologically sound space and request a judicial order commanding the entrepreneurs to abide by the relevant rules.

In societal litigation, the entitlement at stake transcends any personal entitlement that the neighboring residents might enjoy. Indeed, it cannot be apportioned (or divided) among them in a straightforward fashion. An injunction issued against the responsible authorities, in defense of this right, benefits the group but no person in particular.

In fact, an infringement would occur even if none of the properties had environmentally depreciated, so to speak. After all, the population, as a totality, has itself suffered a separate harm—beyond that that its constituents have individually borne—due to the overall diminution in quality of life. The individual entitlements relate to but also distinctly differ from their collective counterpart.

While both types of rights can be vindicated "collectively," there are two elemental dissimilarities between aggregated-individual and societal entitlements. First, the former are readily divisible, whereas the latter are not. Second, the two kinds of rights diverge in their range of application: typically, grouped individual entitlements concern a circumscribed, though potentially vast, number of persons, while societal entitlements pertain to the polity in its entirety.

In light of their divisibility, such aggregable individual rights permit individualized or collectivized enforcement; either by the interested parties themselves or through a representative, respectively. In contradistinction, societal entitlements necessitate joint vindication by means of representation. The members of the broader society could not enforce their "part" because the right would withstand no easy partition. The person representing them must vindicate the entitlement in the name of the collectivity, which constitutes the real party in interest.

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[13] *See* DIG. 47.23.1-8 ("De popularibus actionibus").

[14] *See, e.g.*., Ángel R. Oquendo, *Justice for All: Certifying Global Class Actions*, 16 WASH. U. GLOBAL STUD. L. REV. 71, 114-15 (2017) ("In the nineteenth century, . . . Latin American Civil Codes . . . codified . . . popular actions . . . for very specific purposes. . . . ") ("Since the 1990s, Latin America . . . has embraced . . . wide-ranging public-law actions for the enforcement of diffuse rights.").

[15] *See id.*, at 121 (Diffuse-rights "suits bear a resemblance to . . . citizen suits . . . in that they turn on a genuinely collective assertion."); *see generally* OQUENDO, *supra* note 11, at 857-929.

The state performs a primordial part in the enforcement of these meta-individual entitlements.[16] It accordingly upholds rights that stand in opposition to its own contractual, proprietary, or pecuniary rights.[17] For example, the authorities may stake, on the one hand, 'publicly' a claim against a manufacturing company for poisoning a popular recreational park and, on the other hand, 'privately' an assertion for damages against the business when it negligently contaminates a governmental plot. In the first case, the government enforces entitlements that belong to the populace as a whole. In the second, it vindicates entitlements that it holds in its own right as a juridical entity.

Consequently, the state predominates in this enforcement effort. Nevertheless, scores of jurisdictions in the Western Hemisphere have started empowering individuals and organizations to take on a comparable representative role.[18] In the United States, people have long prosecuted class actions and, more lately, citizen suits.[19] In Continental Europe and Latin America, the expression "diffuse rights" has emerged along with this empowerment to distinguish these from other entitlements that a person may enforce, namely, personal rights.[20]

At this juncture, the analysis could climb up a step in the spectrum of generality. It could contemplate entitlements that pertain not to a nation but to all of humanity, against which someone might perpetrate ecological outrages, as well as crimes. Such a humanitarian right would similarly present itself as monolithic and positive and contrast with an agglomeration of individualized entitlements. It would call for vindication by a public or private party in transnational tribunals, or in their domestic counterparts with universal jurisdiction. This option could come in handy when international or national regimes either disregard or openly defy such a right.[21]

The Inter-American Court of Human Rights has lately begun pondering along these lines. It has embraced ecology entitlements that stretch beyond nationally defined boundaries with the following formulations: "In order to respect and guarantee the rights to life and to integrity of any person within their jurisdiction, states have

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[16] *See, e.g.,* Alaska Sport Fishing Ass'n v. Exxon Corp., 34 F.3d 769, 773 (9th Cir. 1994) (*per curiam*) ("State governments may act in their *parens patriae* capacity as representatives for all their citizens in a suit to recover damages for injury to a sovereign interest. . . . There is a presumption that the state will adequately represent the position of its citizens.").

[17] *See, e.g.,* Alfred L. Snapp & Son, Inc., v. Puerto Rico ex rel. Barez, 458 U.S. 592, 602 (1982) ("Quasi-sovereign interests stand apart. . : they are not sovereign interests, proprietary interests, or private interests pursued by the State as a nominal party. They consist of a set of interests that the State has in the wellbeing of its populace.").

[18] *See generally* Oquendo, *supra* note 14, at 113 (In the last three decades, Latin American "diffuse-rights suits [and, since the 1960s and 1970s, respectively,] Rule 23(b)(2) actions and citizen suits [in the United States] have developed dramatically. . . . They usually entitle any person, without a showing of individual injury, to litigate on behalf of society as a whole or a certain community for injunctive relief and frequently damages, in order to enforce diffuse or societal entitlements, such as those pertaining to the environment or collective cultural goods.").

[19] *See id.*

[20] *See id.*; *see generally* OQUENDO, *supra* note 11, at 857-929.

[21] *See, e.g.*, Michael D. Shear, *Trump Abandoning Global Climate Accord*, N.Y. TIMES, June 2, 2017, § A, at 1 ("Mr. Trump's decision to abandon the agreement for environmental action signed by 195 nations is a remarkable rebuke to heads of state, climate activists, corporate executives and members of the president's own staff, who all failed to change his mind with an intense, last-minute lobbying blitz.").

an obligation to prevent extensive environmental injury within and without their territory,"[22] as well as "to cooperate with each other in good faith to secure the environment against significant harm."[23]

The greenhouse effect in itself seems to push in this very direction. It obviously has ramifications and roots that cross politically demarcated frontiers. Nonetheless, one might feel reluctant to embark upon a rights-based response.[24] One might prefer instead to respond by way of policies.

By and large, environmental conservation may appear to fit this bill insofar at it comes across as teleological, gradational, relative to a specific group, and requiring balancing against competing goals.[25] In this sense, however, it does not distinguish itself from the generation of employment, the preservation of health, or the achievement of self-determination and may equally admit an alternative approach resting on deontological, principled rights, internationally as well as nationally.[26] Engagement in this domain might thereby gain in prominence and visibility. Moreover, it would ultimately unfold on the basis of principles and adjudicative enforcement, rather than values and governmental discretion.[27]

On first impression, the Paris Agreement itself appears to focus principally on policy, a notion mentioned repeatedly throughout its text.[28] Of course, it also refers to seemingly collateral impacts on a plethora of entitlements. In "*[a]cknowledging* that climate change is a common concern of humankind," the treaty specifically commits the "Parties . . . , when taking action to address [this phenomenon, to] respect, promote and consider their respective obligations on human rights, the right to health, the rights of indigenous peoples, local communities, migrants, children, per-

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[22] Environment and Human Rights (Arts. 4.1, 5.1, 1.1, and 2 American Convention on Human Rights), Advisory Opinion OC-23/17, Inter-Am. Ct. H.R., ¶ 5 ("Con el propósito de respetar y garantizar los derechos a la vida e integridad de las personas bajo su jurisdicción, los Estados tienen la obligación de prevenir daños ambientales significativos, dentro o fuera de su territorio. . . .") (hereinafter Environment and Human Rights Opinion, Inter-Am. Ct. H.R.).

[23] *Id.* ¶ 7 (". . . cooperar, de buena fe, para la protección contra daños transfronterizos significativos al medio ambiente . . .").

[24] Bernard Williams, Human Rights: The Challenge of Relativism, Lecture at the Raymond & Beverly Sackler Distinguished Lecture Series 2 (Apr. 23, 1997) (on file with the author) ("Declarations of human rights standardly proclaim [so-called positive] rights . . . , but there is a problem with them. . . . The problem is: against whom is this [kind of] right held? Who violates it if it is not observed? . . . I think that it may be unfortunate that [these] declarations . . . have, though for understandable reasons, included supposed rights of this kind.").

[25] *See generally* Ángel R. Oquendo, *The Politicization of Human Rights in the Inter-American System and Beyond*, 50 N.Y.U. J. INT'L L. & POL. 1, 35-36 (2017) (As opposed to rights, policies, according to Jürgen Habermas, are "teleologically structured," "designate[] specific actions . . . as recommendable to some degree or another," have a culturally "narrow range of application," and "may . . . clash or compete with one another and necessitate a relative ranking.") (citing JÜRGEN HABERMAS, FAKTIZITÄT UND GELTUNG: BEITRÄGE ZUR DISKURSTHEORIE DES RECHTS UND DES DEMOKRATISCHEN RECHTSSTAATS 311 (1992)).

[26] *See generally id.* at 38. ("On. . . positive entitlements, [t]he government does not have a vague and wide-ranging obligation. . . . Instead, it must . . . demonstrate an earnest engagement on the right.").

[27] *See generally id.* at 44, 72. ("[A] right essentially embodies a principle or a norm. . . . When public officials flout the principle underlying a given entitlement, they should almost ineludibly endure reproof and sanction.") ("At any rate, a court should strictly scrutinize and, thereupon, severely sanction the authorities if they trample upon the principle underlying a particular entitlement.").

[28] *See* Paris Agreement, *supra* note 2, arts. 5(2), 7(5), 7(7)(a), 9, 9(d), 11(4).

sons with disabilities and people in vulnerable situations and the right to development, as well as gender equality, empowerment of women and intergenerational equity."[29]

Upon deeper inspection, the accord actually seems to be insinuating an ecological entitlement that intricately intertwines with all of these rights. At base, it might be intimating such intertwinement. In the passage quoted earlier, the Inter-American judges themselves analogously interconnected other entitlements, perhaps mirroring the petition lodged before them and minding the want of an explicit commitment on the environment in the American Convention. They further affirmed that "environmental damage can affect, beyond the right to a wholesome environment . . . , all human rights, [whose] full enjoyment . . . rides on a propitious environment,"[30] and elaborated on this interconnection:

> The human right to a wholesome environment has been understood as possessing both individual and collective connotations. In its collective dimension, it amounts to a boon to future, as well as present, generations. This right has an individual dimension to boot, since its violation can have direct or indirect repercussions on people due to its connection with other rights, such as the rights to health, to personal integrality, and to life.[31]

The examined entitlement surely branches out into others as it applies individually; yet, collectively too. The collectivity may, as much as its membership, face an impingement upon its sanitary, vital, and other rights.

All the same, someone might object to the instrumentalization of this right. More precisely, she might repudiate the apparent subordination of the latter, if not to other entitlements, then to human beings more broadly. Such an anthropocentric viewpoint would indeed entail shielding natural treasures solely to the degree that they profit men and women.

In 1972, Justice William Douglas memorably proposed an iconoclastic take while dissenting in *Sierra Club v. Morton*.[32] "Inanimate objects," he recalled, "are sometimes parties in litigation."[33] Douglas stressed that "the problem is to make certain that [they] have spokesmen before they are destroyed."[34] He cautioned that the "'public interest' has so many differing shades of meaning as to be quite meaningless

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[29] *Id.* pmbl.

[30] *See* Environment and Human Rights Opinion, Inter-Am. Ct. H.R., *supra* note 22, ¶ 64 ("Ahora bien, además del derecho a un medio ambiente sano, como se mencionó previamente, los daños ambientales pueden afectar todos los derechos humanos, en el sentido de que el pleno disfrute de todos los derechos humanos depende de un medio propicio.").

[31] *See id.*, ¶ 59 ("El derecho humano a un medio ambiente sano se ha entendido como un derecho con connotaciones tanto individuales como colectivas. En su dimensión colectiva, el derecho a un medio ambiente sano constituye un interés universal, que se debe tanto a las generaciones presentes y futuras. Ahora bien, el derecho al medio ambiente sano también tiene una dimensión individual, en la medida en que su vulneración puede tener repercusiones directas o indirectas sobre las personas debido a su conexidad con otros derechos, tales como el derecho a la salud, la integridad personal o la vida, entre otros.").

[32] 405 U.S. 727, 741 (1972) (Douglas, J., dissenting).

[33] *Id.* at 742.

[34] *Id.* at 745.

on the environmental front."[35] Douglas proclaimed: "The voice of the inanimate object, therefore, should not be stilled."[36] Talking about the United States and with a trace of anthropocentricity despite himself, he urged that "before . . . priceless bits of Americana (such as a valley, an alpine meadow, a river, or a lake) are forever lost or are so transformed as to be reduced to the eventual rubble of our urban environment, the voice of the existing beneficiaries of these environmental wonders should be heard."[37] These words evoke a substantive as well as procedural right for the environment itself.

Over three decades later, Ecuador's 2008 Constitution, which (like its 2009 Bolivian counterpart) opens with a celebration of "nature, Pachamama [or the Andean aboriginal goddess], of which we are part and which is vital to our existence,"[38] enshrines such an entitlement in its Article 71: "Nature or Pachamama, where life reproduces and realizes itself, has a right to an integral respect of her existence and to the maintenance and regeneration of her vital cycles, her structure, and her evolutionary functions and processes."[39] The immediately ensuing provision differentiates this entitlement from those held by humans, whether individually or collectively, to environmental assets: "Nature has a right to restoration, which shall take place independently of the obligation of the state and natural or juridical persons to indemnify individuals or collectivities that depend on the affected natural systems."[40]

In 2015, the country's foremost constitutional adjudicators explained that "the rights of nature—Pachamama—constitute one of the major innovations of the Ecuadorian Constitution in force, along with the recognition of nature itself as a subject of rights, in contrast to the traditional paradigm, which deems it a property object and a mere source of natural resources."[41] They observed a tendency toward "a biocentric relation between nature and society, inasmuch as [the constitutional charter conceives of] nature as a living being and a giver of life and grounds the respect owed it by human beings on an appreciation of it as an owner of rights, beyond its utility for people."[42] Despite lacking clear textual cover in its own Constitution, the

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[35] *Id.*

[36] *Id.* at 749.

[37] *Id.* at 750.

[38] CONST. pmbl. (Ecuador) (2008) ("Celebrando a la naturaleza, la Pacha Mama, de la que somos parte y que es vital para nuestra existencia"). *Cf.* CONST. pmbl. (Bol.) (2009) ("Obeying the command of our peoples, with the strength of our Pachamama and with thanks to God, we found Bolivia anew.") ("Cumpliendo el mandato de nuestros pueblos, con la fortaleza de nuestra Pachamama y gracias a Dios, refundamos Bolivia.").

[39] CONST. art. 71 (Ecuador) (2008) ("La naturaleza o Pacha Mama, donde se reproduce y realiza la vida, tiene derecho a que se respete integralmente su existencia y el mantenimiento y regeneración de sus ciclos vitales, estructura, funciones y procesos evolutivos.").

[40] *Id.* art. 72 ("La naturaleza tiene derecho a la restauración. Esta restauración será independiente de la obligación que tienen el Estado y las personas naturales o jurídicas de Indemnizar a los individuos y colectivos que dependan de los sistemas naturales afectados.").

[41] Corte Constitucional [Ct. Const.] del Ecuador, July 9, 2015, Sentencia No. 218-15-SEP-CC 9 ("En este sentido, es preciso señalar que los derechos de la naturaleza —pacha mama— constituyen una de las mayores novedades de la Constitución ecuatoriana vigente, al reconocer a la naturaleza como sujeto de derechos, al contrario del paradigma tradicional que la considera como objeto de propiedad y mera fuente de recursos naturales.").

[42] *Id.* at 10 ("Ahora bien, es evidente que las Constitución ecuatoriana tiende a una perspectiva biocéntrica de relación 'naturaleza-sociedad' en la medida en que reconoce a la naturaleza como ser vivo y

Colombian Constitutional Court has correspondingly assumed an "*eco-centric* perspective" in order to accomplish "greater justice for nature" and espouse "biocultural rights."[43] It has mandated the accomplishment of "justice for nature . . . beyond the human realm" and the acceptance of the natural universe as "a subject of rights."[44]

Bolivia's own Law 71 of 2010 pursues an identical aim in an even more pantheistic spirit.[45] It consecrates "the rights of Mother Earth, along with the obligations and duties of the . . . state and society to assure respect for those rights."[46] The statute spells out the terms of interaction of these entitlements with others. First: "Society's interest, in the context of Mother Earth's rights, shall prevail in all areas of human activity and over any acquired right."[47] Secondly: "All Bolivians, as members of the community of beings that make up Mother Earth, shall exercise [her] rights . . . compatibly with their own individual and collective rights."[48] Finally: "The exercise of individual rights shall be limited by that of collective rights within the life systems of Mother Earth. Any conflict shall be resolved so as not to alter irreversibly the functionality of these systemic units."[49]

Comparably, the High Court of Uttarakhand at Nainital in India declared last year in *Miglani v. State of Uttarakhand*: "Rivers and Lakes have intrinsic right not to be polluted."[50] It specified that: "Rivers, Forests, Lakes, Water Bodies, Air, Glaciers and Springs have a right to exist, persist, maintain, sustain and regenerate their own vital ecology system."[51] Thereupon, the justices enunciated: "We must recognize and bestow the Constitutional legal rights to the 'Mother Earth.'"[52]

Lastly, New Zealand's government freshly acceded to Maori demands for concession of juridical status to a river and a natural reserve in the North Island.[53] Likewise, a 2017 "suit . . . filed. . . in Federal District Court in Colorado . . . name[d] the

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como dadora de vida y por tanto, fundamenta el respeto que le deben los seres humanos en su valoración como ente titular de derechos más allá de su utilidad para las personas.").

[43] Ct. Const. de Colombia ¶ 9.30 (p. 138) ("Así las cosas, se trata entonces de establecer un instrumento jurídico que ofrezca a la naturaleza y a sus relaciones con el ser humano una mayor justicia desde el reconocimiento colectivo de nuestra especie como lo sugieren los derechos bioculturales.").

[44] *Id.* at ¶ 9.31 (p. 138). ("En otras palabras, la justicia con la naturaleza debe ser aplicada más allá del escenario humano y debe permitir que la naturaleza pueda ser sujeto de derechos.).

[45] L. 71 (Bol.) (2010).

[46] *Id.* art. 1 ("La presente Ley tiene por objeto reconocer los derechos de la Madre Tierra, así como las obligaciones y deberes del Estado Plurinacional y de la sociedad para garantizar el respeto de estos derechos.").

[47] *Id.* art. 2(2) ("El interés de la sociedad, en el marco de los derechos de la Madre Tierra, prevalece. . . en toda actividad humana y por sobre cualquier derecho adquirido.").

[48] *Id.* art. 6 ("Todas las bolivianas y bolivianos, al formar parte de la comunidad de seres que componen la Madre Tierra, ejercen los derechos establecidos en la presente Ley, de forma compatible con sus derechos individuales y colectivos.").

[49] *Id.* ("El ejercicio de los derechos individuales está. . . limitado. . . por el ejercicio de los derechos colectivos en los sistemas de vida de la Madre Tierra, cualquier conflicto entre derechos debe resolverse de manera que no se afecte irreversiblemente la funcionalidad de los sistemas de vida.").

[50] Miglani v. State of Uttarakhand, March 30, 2017, Writ Petition (PIL) No.140 61 (2017).

[51] *Id.*

[52] *Id.*

[53] Julie Turkewitz, *Plaintiff in Federal Lawsuit Over a Violation of Rights Is the Colorado River*, N.Y. TIMES, Sept. 27, 2017, § A, at 14; ("In New Zealand, officials declared in March that a river used by the Maori tribe of Whanganui in the North Island to be a legal person that can sue if it is harmed."); Bryant Rousseau, *In New Zealand, Rivers and Parks Are People, Too (Legally, at Least)*, N.Y. TIMES, July 14, 2016, § A, at 11 ("In New Zealand, [a] former national park has been granted personhood, and a

river ecosystem as the plaintiff . . . and s[ought] to hold the state . . . liable for violating the river's 'right to exist, flourish, regenerate, be restored, and naturally evolve.'"[54] Even so, the lawyer of record eventually withdrew the complaint "following a warning from the Colorado Attorney General's Office that it would seek reimbursement of legal costs. . . ."[55]

The most authoritative institution in the Inter-American human-rights edifice has discerned these trends.[56] It has commented on them too:

> This Court considers it key to underscore that the right to a wholesome environment, as an autonomous right and unlike others, protects environmental components, such as forests, rivers, seas, and so forth, as juridical interests in themselves, even in the absence of certainty or self-evidence as to any risk to individual persons. Nature and the environment demand safeguard not only because of their usefulness to human beings or of how their degradation might impact people's other rights, such as to health, life, or personal integrality, but also because of their significance for other living organisms, which share the planet and deserve to be safeguarded in themselves as well.[57]

The philosophical tree that, unbeknownst to anyone, collapses in the middle of the forest turns not merely into a reality for everyone but additionally into a possessor of rights.[58]

The Parisian pact itself in "*[n]oting* the importance of ensuring the integrity of all ecosystems, including oceans, and the protection of biodiversity," invokes this standpoint. It highlights that these natural forms find acknowledgement in "some cultures as Mother Earth" and, in the same breath, calls attention to "the concept of 'climate justice'" in conjunction with the endeavor "to address climate change."[59]

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river system is expected to receive the same soon. The unusual designations . . . came out of agreements between New Zealand's government and Maori groups.").

[54] Julie Turkewitz, *Plaintiff in Federal Lawsuit Over a Violation of Rights Is the Colorado River*, N.Y. TIMES, Sept. 27, 2017, § A, at 14.

[55] Julia Cardi, *River of Challenges*, LAW WEEK COLO., (Dec. 12, 2017), http://lawweekcolorado.com/2017/12/river-of-challenges/.

[56] *See* Environment and Human Rights Opinion, Inter-Am. Ct. H.R., *supra* note 22, ¶ 62 ("En este sentido, la Corte advierte una tendencia a reconocer personería jurídica y, por ende, derechos a la naturaleza no solo en sentencias judiciales sino incluso en ordenamientos constitucionales.").

[57] *Id.* ("Esta Corte considera importante resaltar que el derecho al medio ambiente sano como derecho autónomo, a diferencia de otros derechos, protege los componentes del medioambiente, tales como bosques, ríos, mares y otros, como intereses jurídicos en sí mismos, aún en ausencia de certeza o evidencia sobre el riesgo a las personas individuales. Se trata de proteger la naturaleza y el medio ambiente no solamente por su conexidad con una utilidad para el ser humano o por los efectos que su degradación podría causar en otros derechos de las personas, como la salud, la vida o la integridad personal, sino por su importancia para los demás organismos vivos con quienes se comparte el planeta, también merecedores de protección en sí mismos.").

[58] *Cf.* GEORGE BERKELEY, A TREATISE CONCERNING THE PRINCIPLES OF HUMAN KNOWLEDGE ¶¶ 23, 45 (1710) ("[T]here is nothing easier than for me to imagine trees, for instance, in a park . . . and nobody by to perceive them.") ("The objects of sense exist only when they are perceived; the trees therefore are in the garden . . . no longer than while there is somebody by to perceive them.").

[59] Paris Agreement, *supra* note 2, pmbl.

Hence, the drafters signaled the path from humanitarian to planetary entitlements. They may have been thus implicitly inviting vindication by the authorities, associations, or individuals; in and out of court; and on various levels: individually, aggregately, societally, humanitarianly, and planetarily.

Nominal claimants could proceed not as outsiders but as constituents, as well as in representation, of the environment or planet. Inevitably, they would have to carry the habitually imposed adjective and material burdens. The alleged violators would, in turn, retain every opportunity to defend themselves extrajudicially as well as judicially, whether procedurally or substantively. At the end of the day, the two opposing sides might be able to solve the controversy sensibly, either by negotiating on their own or with the intervention of a trier, an arbitrator, or a mediator. They would run into all of the prospects and challenges of trans-individual dispute-resolution, like any of their counterparts on the verge or in the midst of a class action or citizen suit would.

In sum, this piece catalogued environmental rights in the wake of the Paris Agreement on greenhouse-gas emissions. It traced the gradation and progression along the notional scale: from individual to planetary entitlements. By endorsing this expansion, as well as by drumming up almost unanimous enthusiasm for the core cause, the signatories may have scored their biggest, albeit relatively modest,[60] success. Most definitely, they will need, nationally as well as internationally, considerable prodding by the third sector with the support of the bench to make any additional headway.[61]

[60] *Cf.* Stephen Kim Park, *Investors as Regulators: Green Bonds and the Governance Challenges of the Sustainable Finance Revolution*, 54 STAN. J. INT'L L. 1, 2 (2018) ("The traditional paradigm of a single comprehensive treaty-based regime, constituted and funded by governments, is arguably defunct.").

[61] UNITED NATIONS, CIVIL SOCIETY, http://www.un.org/en/sections/resources-different-audiences/civil-society/ (last visited April 28, 2018) ("Civil society is the 'third sector' of society, along with government and business. It comprises civil society organizations and non-governmental organizations.").


UNIVERSITY OF CONNECTICUT
1881

PARIS, POLICY & THE GRID: THE FUTURE OF TRANSNATIONAL ENERGY POLICY
KEYNOTE ADDRESS

Manuel Pulgar-Vidal[*]**:** Thank you, thank you so much. I feel more than honored to be part of this important seminar. And I feel like back in home, in the school of law, as I used to lecture a lot in environmental law, mining and environment and natural resources, just before I moved to Berlin, it was unfortunately, as I am traveling too much, I have left temporarily the lectures. But I feel not only honored but happy to be with lot of students and to try to address what is the title of this seminar, "Paris, Policies and The Grid". Also, I have to challenge you for sure to make your lunch more enjoyable and to talk after really strong panelists and speakers during all the morning, I really enjoyed it. Congratulations for all these comparison in between Germany, Canada, China, Connecticut, among some other places.

So I came to here with four main topics. After the morning, I have more than 20. So what I will try, it is to make some statements, to go through each one of them to try not only to address this topic, but also to try to give some things that could be discussed later during your lectures when we talk about policies, law, energy, climate, among some others.

Let me start by saying the climate debate, it is a political one with strong economic roots and economic consequences. The energy debate it is an economic one with strong political roots and political consequences. What I am trying to say it is that not necessarily there is a coincidence in between the climate and the energy. And I will talk later about the concept of energy security and how much the concept of energy security it is making us or not making us able to address the climate problems through the energy sector. But let me say in relation to the climate debate, and why it is important to recognize that it is a political process. Because since the beginning, since 1987 or '88 in which the IPCC was created, we have gotten a lot. And one of our reflection when we think about law, and international law, it is how dutiful it has been that the UNFCCC, so the climate change convention, it is a framework convention, so that left us enough flexibility to complement it through protocols as in case of Kyoto, and/or now with the Paris Agreement.

And when you think about the climate change convention and compare it

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[*] Leader of the World Wildlife Fund's Global Climate and Energy Practice

with for example, the biodiversity one, it is clear that we have gotten more through the climate than through the CBD. And let me say I am Peruvian, from a place of tropical forest, one of the most bio-diverse countries of the world, and I remember, because I'm involved in environmental topics in 1986, when Peru was preparing the Peruvian position to Rio '92, it was a document of 20 pages, 18 pages was about biodiversity and two paragraphs about climate. In a time in which we thought that this climate it is a northern problem. And it is amazing how much things has changed since that time until now, in which everybody recognizes that climate it is a main threat, let's review the World Economic Forum report, in which climate it is in the top of the priorities when we talk about risk and how close the biodiversity convention was really close to passed away. And it was fortunately through Aichi targets and that kind of mechanism, the ICABC, Kuala Lumpur, framework among some others that we have given to the CBD some new life.

And also it is important recognizing these political processes, when we talk about Paris, that it was Kevin who raised this idea of China and the U.S statement in 2014 that for sure helped a lot the Paris Agreement, but it was, for sure before of that, it was in Copenhagen when five countries or six, I don't remember exactly, signed this out of the multilateral process this Copenhagen accord. So for sure Copenhagen was a full failure, but the Copenhagen accord was the only way to recover the process. Also it was the first time ever then China and the U.S started to talk about climate. So Copenhagen deserves more recognition. We do need to recognize that the green climate plan, in some way the NDCs and all this political will that we got in Paris started in Copenhagen. So every step counts, and every step make it possible to get an agreement as we got it in Paris. And in this political process after Copenhagen, and Cancún in which the process was recovered. And after that, by Durban in which the new platform was launched with a clear timeframe to end in 2015 with an agreement, we got it, but there are no next milestone, and that is not good for the process. And it is not I am trying to bring a new deal, a new agreement or a new treaty, but what we do need, it is to explain to the world that our next big milestone, it could be 2020, 2030, because 2050 is too far away.

How can we identify milestone to move it, the process in a really strong way? And let me say that I'm raising this idea. I used to be a politician, minister for the environment. And for sure, the politicians are used to moving with milestones. The politicians are used to seeing what's next, not how to implement the former, because it is the way in which they can legitimate their own mandate. What it is happening with the new leadership of China or France among some others, that it is clearly that they are testing things by saying, "Make the planet great again," or by saying, "Let's invite the scientists from the US to France." It is testing. The new leaders are testing how to move their agenda forward in a strong way. What it could be? It is something that we're going to discuss later. So it is a political process that meets political outcome and the point it is how much the energy could be, that political outcome in relation to climate, and let me take some more minutes to come back to this one.

Second statement. Climate fortunately has already left the walls of the COP venues. We used to have climate inside the walls of the COPs. So the COPs used to be the place in which the government took decisions. Fortunately, that

changed in 2014 with the Lima-Paris Action Agenda. And the Lima-Paris Action Agenda, it was a mechanism that we had not thought how useful and how strong it could be. And fortunately, we are still in initiative here in the States in which through all these businessmen, actors, academia, civil society among some others, started to phrase this political threat when the US administration announced that they would or will withdraw from the Paris Agreement. And for the students, sometimes you do need to take the risk of launching a process, and the process could get traction. When we started with the Lima-Paris Action Agenda, we had not thought how powerful it could be, and that is good.

And I'm used to saying to my friends because some months ago, October I think it was, the world celebrate the 500th anniversary of Martin Luther for the reform. Now I am used to saying Martin Luther had never thought how much he could change the world by hammering 95 complaints in the front doors of a church. And that is for you students. That is the way to move things; some clarity, some intuition, some ability to politically smell the scenario and to see the context. And this is important for the next step to implement the Paris Agreement. That it is really important.

So what I'm trying to say it is that currently, and that is why this panel, the last panel was really important, what we do need to think it is, when we talk about climate, the big picture includes the formal global process, and when I talk about the formal global process, it is UNFCCC, that Kigali Amendment that it is part of the Montreal protocol, the Aviation, the CORSIA as part of the ICAO, the IMO, the maritime, the decision that they have just taken among some others. That is the formal in which Kevin is used to being very active parts until now.

But it is not the only one, because also we have the non-formal global, in which all the initiative around the normative accords, the friends of the champion, and all that kind of activities are becoming really important. As for example, the next California Summit in September organized by Governor Brown, that could be seen as that good and strong push forward of the role of the normative person in the climate debate. But it is not only about the global. It is the same in the domestic. So the point it is how much we can push that domestic agenda in the formal level and... In the domestic level formal and in the non-formal one.

And that moved me to some things. Governance. In one of the panel, I think it was Timmons, he talked about the governance. And when we think about governance in the global process, it is clear that the UNFCCC joint system agency, governance it is probably the most strong than the other convention. It is strange why the UNFCCC it is just under the secretary general, and why the secretariat of the CBD it is under UNIP. Why the world decided to have all these kind of different governance, some weakest than the other, and how can we strengthen the governance of the UN system. But it is exactly the same in the domestic level. So the people who is used to being part of the climate debate, it is not the same that it is used to being part of the energy debate.

I have a assisted to three times of the IRENA Assembly, and most of the people, 80% of the people who are used to being in the IRENA, thee International Renewable Energy Agency that is also part of the UN, 80% are people who is not used to being in the UNFCCC process, and there is a big divorce in-between. So how can we bring it more together, the energy governance with the climate

governance? It is possible or it is not possible. That move me to my third reflection. Sorry. And in relation to the governance, it is interesting something that also has been raised by somebody in the panel. The United States used to have a strong mechanism to build confidence. That major economy forum... Dr. Stern used to convene as chief negotiator of the US, the Major Economy Forum in-between every COP, as a way to got confidence to move the process towards the Paris Agreement, and she did it.

But after that announcement of the US to withdraw of the Paris Agreement, somebody else has taken that leadership, fortunately, the EU, Canada, China, among some others. So, how can we give to this room for debate, and to build trust and confidence, enough strong ability to continue moving to the next step? So, we do need to continue moving that governance room, because it is not enough strong to do that. But the governance, it is a killer. That move me to my third reflection.

Legally binding or non-legally binding, probably something that you have discussed more than once during the discussion for the Paris Agreement. So what does it mean, this legally binding? And also this is related to this new initiative to move that new Global Pact for the Environment. How useful it could be to have the Global Pact for the Environment as a new mechanism to move, as it was with the Rio Declaration, the work toward a new paradigm shift, and how much this new Global Pact for the Environment should be legally binding?

And, let me say that there are some trade off in the legally binding when we talk about the US. If it had been legally binding, probably it would have been more difficult to have the US administration taking a decision. But on the other hand, everybody knows that it had been very difficult to have a legally binding being approved by the Congress. So now, what we have it is a non-legally binding that it has been announced from the US that they are going to withdraw, but on the other hand, the next administration... Finally, the administration formalized that decision in 2019, that entered into force in 2020. The next administration could do the opposite. So, it is interesting.

So, how much we do need to have legally binding instrument or not? Mostly, when we think about the Rio Declaration, all of the principles of the Rio Declaration were part of a non-legally binding instrument. And most of them has been already adopted in constitutions, in laws, in judicial resolutions, among some others.

So, the legally binding or non-legally binding, it is probably something that the lawyers are used to discussing, but we do need to include in this reflection, the political approach. So, it is not something that it is just a law or a legal issue, it is more political. As for example, and let me come back to the Global Pact for the Environment, we do need to have a global pact to qualify the Rio Declaration from '92? In my point of view, no. Don't make any sense to qualify principles that has already gotten 25 years, 30 years, 90... That is why I am a lawyer, I'm really bad at math.

But 25 years after, we don't need to qualify principles. And the principle has been already adopted by the legislation. But my point, and I hope that you as students could help the process, my point it is, is the Global Pact for the Environment has already gotten traction. France has gotten the support of 50

countries in the UN General Assembly in September of the last year. We can take advantage of that. For what? To try to see if we can develop new principles, and different principles that could move the world toward something different. And I am referring, for example, could we develop a principle for clean energy? Or could we develop a principle for sustainable cities? Or could we develop a principle for just transition? And that is something that it is missing in this discussion. When we talk about coal phaseout and fossil fuel phaseout and clean energy, nobody talk about just transition, and that is something that I hope I can have some minutes to discuss it.

So my point it is, could we lawyers... And no lawyer's perfect. It is not just an issue of lawyer. Could we think new principles as used to be in the beginning of Rio '92, to move the world toward something different? I think so. But we do need to take the time to sit and to try and to write and to discuss, and probably Timon, we can do it, or with the people of UConn Law, we can do it. But we do need to help the process to avoid to have something that it could be really useless to qualify the oldest principle, to try and to think on the next. So, that is my third statement.

My fourth statement, it is how much what we have learned in Paris, to go to Paris, it could be useful for the next? And let me say some things, four element or five element about Paris. Paris was possible because some element that we had gotten before. First element, the role of science, and how important it is, the IPCC as a mechanism, that it is scientific-based but political-based. Because remember, it is an intergovernmental panel. So, the members of the panel are members of the government. But on the other hand, it is scientifically strong.

So, when the IPCC released the fifth Synthesis Report for policy makers of climate change, and defined all these models of what it could happen if we continue with our business-as-usual behavior, things started to change. And it is interesting because for the oldest, probably you remember that the IPCC that had been created before of Rio, was the strong support of the Climate Change Convention. But after the convention was adopted in '92, in the meantime, there was a big divorce in between decision-making and political decision-making and science. That, fortunately, we have already record, and now we are waiting for the next IPCC report, that it is going to be around 1.5 for this year in land and ocean and the cryosphere for the next year.

And I am going to talk about what it could mean, the 1.5. It is still possible, it is feasible. What role it could play in the geoengineering, the solar radiation management and all this kind of thing that are very sensitive in the environmental debate.

So science, first element; second element, political will, and it is through caring. The statement of China, US to a statement really France, China and Brazil, France I think it was, gave to the process and a strong support because made it possible to fill that things were possible and we got the Paris Agreement. The political support, it is something that we do need to have for the future. And now for sure, it is mostly China, France, and India. That is the support that we do need for the next step until have the US coming back. I remember your Canadian, when I heard the first time, I met Catherine McKenna, the current minister for the environment of Canada, it was in the pre-COP inn France. And it was just after Canada had a strong position against climate. And I remember the first speech of

Catherine in the pre-COP and with Canada is back. And the people were emotional, responded to Canada coming back to the process and now it's leading the process. I hope that the US can do it soon, really soon.

The point it is political will, it is really, really important. But the third, it is financial pledges, because financial support to this process, it is key also to create a good balance in-between developing and developed countries, and also because it is under discussion, very sensitive topics as those endowments that it is for many, something that everybody, many are trying to avoid to discuss, but all these things on how can we really get something strong with no financial support, it is part of the discussion.

And before Paris, what we got, it is a strong financial pledge to deal with this 100-billion pledge for the world by 2020 an annual 100-billion money. But everybody knows that is not enough. But fortunately, the OEC report of 2015, that report showed that there are more money that it is currently under the climate change, not only public, but private. And it is important to keeping this idea of the financial flows as a way to continue moving the process forward.

But the last element, let me say that for me, probably the most important, it is the mechanism to build trust in between 197 countries. And what was that mechanism? In the beginning, the INDC. Many people are used to blame the INDC as a tool that it is not enough to address climate change and it is true. But everybody knows that we had developed that mechanism by knowing that it would be not enough. But the reason of the mechanist, it was to create confidence, to say to all the world, "Okay, I am going to leave you with the opportunity with no rules, with no any other way to put your plates on the table. No rules, no ways of enforcing it, no ways of following, but we want to know what it is the best effort that you can do."

Remember, especially the young people, the only way to get consensus with among 200 countries, it is by creating a mechanism of trust and confidence. There are no alternatives. Because if you try to impose a top-down process, you are going to fail as it was Copenhagen. That is why through the INDC, the world got enough trust to move the process forward. But what is the next with the INDC? That is something that I am going to talk about.

But for today, what we do need, it is to make countries fulfill with what they had pledged in their own NDC, that in most of cases are around energy, but not in every case. Let me put the example of Peru. What is the main source of emission of our country with tropical forest? Land use change and deforestation, that is the main source. It is not energy. For developed, it is energy. The point is, how can we balance our energy effort with some other effort that are related to some other kind of threats as it is the land use?

So that move me to my fifth element. That it was a discussion between Timmons and Kevin. It is the Paris Agreement enough strong? For me, yes, it is. And why? Because it is a smart agreement. Yeah, for sure. If you compare Kyoto with Paris, many people who are not in the process are used to asking, but there are no numbers. There is no period of commitment. There are not baseline a year. So why it is good? Because first, it has included a clear threshold, and that is important, well below two or making effort to get 1.5. And that means a lot. To have that threshold means a lot. If you think in some other topics, water, ocean,

amongst some other, what is a threshold? There are not. Part of that difficulty of water, of getting a strong international global agenda, it is a nobody knows how to manage the water, that it is an issue of access, of rights, and quality and quantity.

So what is the threshold for water? On climate it's clear, we have the two degrees, well below two degrees, 1.5. How far away we are, or how on track we are? What seems it's going to happen is it that the IPCC who report it is going to say us, that it is still feasible, but to not overshoot, some things could happen and we do need to discuss. I've seen that we do need to be open to discuss openly geoengineering, solar radiation management. It is not that I am pushing that, but we do need to know how we are going to manage that kind of things. Because that things are going to emerge just after the release of the IPCC report in October of this year. So it is better to be prepared than to wait and be surprised. So that is one point. So the threshold, it is clear, and everybody knows that we are, until now, moving the raise of temperature to almost three degrees or 2.8, and everybody knows the consequences that that could bring to the world.

And also, that is moving this strong initiative as the mission 2020. So to have the 2020 as a time to peak emissions and cities are working in peak emission by 2020, many cities are working in electric vehicles by 2020 or 2023, so many sectors are moving the agenda toward a strong 2020. Why? Because of the threshold. Because you know how to count. But unfortunately, that it is not the same with adaptation, because adaptation has not include clearly ways to be measured. And that is something that I'm going to address later. Clear threshold, good. Two main objectives: Mitigation and adaptation. So mitigation means a carbon-neutral economy, that it is probably difficult to understand by the common audience, but everybody knows what we are seeking by half of the century: A carbon-neutral economy. And that is why lot of effort of having 100% renewable energy by 2050... Could you correct me Kevin or Timothy, if you know... For example, by the CVF, the most vulnerable countries, they have defined 100% renewable energy, I don't remember if by 2050 or 2030.

Okay, who knows. But it is part of this idea of getting a carbon-neutral economy. What does it mean for the energy sector to have these countries defining, almost 50 countries of the world, the most vulnerable, defining a 100% renewable energy target by 2050? Yes, I suppose that it's 2050. What does it mean, not for Germany, not for Canada, not for the U S, but to the developing? How can we help? How can we work with them? Because we are in a time in which what it is happening, it is the opposite, that Great Mekong, the African countries are receiving investment from Japan, among some others, for coal facilities, in a time in which we are defining or trying to define a coal phase-out process. So how can we address the problem of coal, it is something important. So two main objectives, but the NDC as the main mechanism to make the Paris Agreement gradually enforceable. That is why I say the Paris Agreement, it is good.

Why? Because after this Talanoa dialogue, and I'm sure that you know what it is the Talanoa dialogue, it is the dialogue that the world is having this year to end with the COP 24 by answering three questions: What you have gotten, where are you planning to be, and how are you planning to get there? So the world it is stock taking by answering these three very simple questions, it is trying to define how much we have gotten and how we can improve the system. Because this is

related to the second part of what it is, the main outcome of the COP 24, the rules or the guidelines for the implementation of the Paris Agreement. And that guideline for sure are going to be related to ways to track, ways to measure and ways to make it gradually enforceable. So what it is important, it is to help countries not only to achieve what we had gotten with the INDC, but to enhance NDC. Because by 2020, what the world is expecting, it is to start to have new NDCs. So what does it mean if a country decides not to improve, not to enhance the NDC? What does it mean in this new real economy?

That it is something that also I want to talk with you. Are we in a new climate economy or not yet? The energy is part of this new climate economy. Also there is an initiative that it is going to raise a report in some month, a new climate economy. Are we really a new climate economy in the sense of energy or not? It is something that we do need to answer. And for sure the last three elements, capacity building, technology transfer and fines; that three key elements to support all of this. So it is an strong mechanism? It is. That move me to my sixth statement. How... Am I on time? Okay. I love the mic note, yeah. The energy security concept. It was, and that is a lot related to your money, it was three or four months ago... No, it was last year really, that I went to Brussels to discuss this energy security. And it is interesting that energy security, it is a concept that it is moving decisions, but that does not include climate considerations. Let me put the example of your money; most of the environmental decisions and also governance of your money has been related to nuclear.

For example, they created these, how it is called, Ministry for the Environment and Nuclear Safety, that is the name, just after Chernobyl, and they decided to phase out nuclear just after Fukushima. The nuclear, it is related to political decisions in country as important as Germany. The energy security concept, that means in the most simple way, the most affordable source of energy for a functioning economy does not include climate consideration, because the countries are taking decisions based in two elements: Prices, and remember the crisis of oil in 1973 that made the world move a lot of new decision, and crisis. So prices and crisis, but not climate. How much we can include climate as a consideration of energy security, to have countries taking more coherent decision or more cohesive decision in-between. That it is a case of Europe. France that had defined phase-out of nuclear, has already postponed it. Why? Because the French decision didn't move the others. That is why the French are saying, "I am not going to take this decision alone, if the others are not planning to do the same, because I'm going to be less competitive".

So the point it is, how can we help the concept of energy security mostly when we are talking about gas that it is coming from former Soviet countries, from the Eastern Europe, amongst some other? How can we work more strongly in bringing climate consideration into the energy security thing? That moved me to some element of the energy new economy. It is clear that transformation... It is happening. The cost is falling. The solar investment are growing. Local jobs also are growing. But there are two element that I want to go deeply in by last two or three minutes. We don't need to balance clean energy with energy efficiency and access to energy, because when we think on what it is happening in the Great Mekong, let's think on Myanmar, you know that the coverage of electricity is 37%.

And for sure, everything, anything that could means to grow that coverage, despite that it is coal or some others, no, it's going to be immediately acceptable. So how can we guaranty mechanism of access to energy, universal access to energy? Because there are more than one billion people in the world with no electricity, and there are more than two billion people that are cooking in a very, very damaging ways.

So how can we assure, by using technology, by using subsidy, by using some other mechanism, universal access to energy? And let's explore, and let me say that I am not an expert on this topic, but I am sure that the Kigali Amendment has brought to us a huge opportunity to work in energy efficiency, that it is a topic through appliances for sure, because it is related to HFCs. So how can we help? So that Kigali Amendment, all these energy package, it is something really important. And let me say some last things. First, we don't need to connect the dots. And this is my seventh statement. How much the energy and climate, it is also related to the SDGs. And how much by working with SDGs, we can really make it our strength in the system on energies or sustainable energy in relation to policies. Let me make my last two comments. First one, it is the CORSIA thing. It is interesting that the CORSIA, so the aviation, what it is trying, it is to offset aviation emissions. Also, they are planning to include more biofuels in all the mix, in all the blend of the fuel.

But what it is happening, that the offsetting system are not enough strong to assure a sustainable offsetting of the aviation emissions. Why? Because now the forests are seeking not to be a thing, but to be part of the solutions. So, the forest sector don't want to be just part of market, because that it means that it is just a tool and not part of the solution. That is why what we are going to discuss in the California Summit through the land stewardship, it is something challenging because what we do need, it is to integrate land, forest and food, are the three main elements that the many people are saying that it is 1/3 of the solution. And it could be 1/3 of the solution. So how can we use the mechanism of land in that situation? Last idea: Green bonds. It is something that we have not talk about, green bonds. France has a insurance bonds some months ago, and have created an evaluation council, that it is dealing to assure that the investment of the green bond are going to an environmental purpose. And it is interesting.

The first project that it is going to be evaluate, it is about subsidies for energy efficiency and house holding. It is related to energy. So the green bonds and how to assure or to secure good investment, it is something important. And just transition, that is something that we do need to address. We are going to have a difficult COP in COP 24, because Katowice is a coal region with the Polish that used to have these coal summit in the COP 19 that created a lot of resistance. So how are we going to deal with the coal phaseout with a coal country, by working for a just transition with the unions, by bringing also ways, by working a sustainable city, for a strong regeneration of cities. Let me put an example that it is not related to coal. China is organizing the next winter games, Olympic winter games in 2022, and the main facilities are going to be based in a former steel facility of Shougang. And what they are planning as a regeneration plan of that place, that I don't remember the name, it is something strong. So, how can we bring some other ways to regenerate countries that are mostly dependent of coal?

It is something that we will need to face. So sorry, I see that I took... I have taken some more time, but I hope, mostly to the students that this has brought to us new ways of thinking and to see the big, big picture of this debate. Thank you very much.

Yuliya Shamailova: If anyone has any questions, please raise your hand and one student will be in the front and the other in the back.

Audience Member: How big a deal is Africa in the future? Thank you.

Manuel Pulgar-Vidal: No, thank you. Yeah. Look, let me start by saying that what it is happening in Africa, it is interesting in sense of political decision. The African Union, it is a strong block of negotiation that it is really committed to the climate things. What it is not happening in Latin America, Latin America it has shown to be strongly divided, and it has not taken the advantage of this kind of agreement and the benefit of this kind of agreement. But in Africa, fortunately, what it is happening, it is that the Africans are working together toward secure energy access, and on the other hand, clean energy. Secondly, the CVF, it is mostly Africans countries. The Climate Vulnerable Forum, it is a group of 50 countries, that has defined this 100% renewable energy as a target. I don't remember now what is the timeframe, but it is mostly African countries.

Now, it is sharing by Marshall Island, it used to be shared by Ethiopia. No, but mostly the African countries. Sir, I think to answer your question that what it is happening, it is that most of these new investment in coal, that it is happening a lot of pressure, are happening because of bilateral banks, not multilateral. And it is interesting how much the multilateral has already started to take decision related to fossil fuels. Look the World Bank, that took the decision in the One Planet Summit in Paris, to say that by 2019 they are not going to support more money for exploration, or oil exploration. Or what it is happening with the pension funds of Norway, that have... Took out the money from fossil fuels and coal and all that kind of facilities. So, it is mostly Japan I know, but I don't have the evidence, no, but I know that Germany and there are certain countries that are supporting those kind of investments.

So, the point it is, how can we secure to Africa, to developing countries, universal access to energy when there is a lot of pressure for those kind of investment, by having them moving as a block? That is the challenge. I don't have a clear answer to do that, but I hope that through the CVF, through these summits that are related to California, to the UN Secretary General, we can continue taking decisions and engaging more the country. My point to finally answer your question it is, how can we make to don't leave anyone behind? Because what it is currently happening, it is that the big trend it is mostly in the developed. I went to the COP 23 in which I had a panel with the mayor of Oslo, and the mayor Monrovia in Liberia. And it was terrible to listen, the mayor of Oslo talking about "No fossil fuels vehicles in the city," and the mayor of Monrovia, Liberia saying "Look, what we are facing, it is vicious tuberculosis, storms, and that kind of thing."

So, the point it is how Oslo can bring Monrovia to make it into some, I hope, more sustainable way of working. So, that is the point with Africa, how can

we through this summit, that fortunately has identified healthy energy in the top priority, we can bring more developing countries. Because the main element, it's going to be the NDCs. The main element it is to have them fulfilling or achieving and also enhancing the NDC, in which we do need to help them. But to have a strong NDCs also, we do need to work in the enabling condition; governance mechanism to measure, financial support, and that kind of thing to make each one of the African countries or developing countries stronger.

Timothy Fisher[**]**:** So, thank you very much, we appreciate it. If you'll join me in thanking our speaker.

[**] Dean, University of Connecticut School of Law


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REWIRED INFRASTRUCTURE POST-PARIS

Steven Ferrey[*]

Abstract

The Trump Administration announced in 2017 that it is withdrawing the U.S. from the international Paris Agreement regarding climate change which went into full effect in 2016. More than half the states sued the EPA when it promulgated the Clean Power Plan (CPP) to reduce power sector carbon emissions by 32 percent by 2030; thereafter, the Supreme Court stayed enforcement of the regulation, pending eventual review on the merits. The Trump Administration began efforts to repeal the Obama Administration CPP which was designed to satisfy the U.S. Paris Agreement commitments to curb CO_2 emissions from burning coal to generate electric power.

The CPP remains in protracted limbo, although even before, in 2017, the U.S. Department of Energy forecast that even the CCP was not demanding enough for the U.S. to achieve its Paris Agreement commitment to reduce CO_2 emissions twenty-six to twenty-eight percent by 2025. This article examines recent data which suggests that the U.S. currently is on track under business-as-usual to reduce CO_2 emissions twenty-seven to thirty-five percent below baseline 2005 levels by 2030, even reaching the 2032 CPP-required levels of CO_2 reduction a full decade in advance, without assistance of the CPP now enjoined by the courts.

This article examines how this is possible under economic forces, what is happening to coal, the traditional work-horse of the electric power sector, and the ascendance of renewable energy alternatives. This article then pivots to look at the new dimension of land-use requirements to produce and transmit wind power from where it is most available to population centers.

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We showcase several instances where single state opposition to siting new power lines, exercising state police power, frustrates the development and deployment of additional renewable energy sought to be transmitted through the state.

The exclusively state and local control over transmission and distribution power line siting varies in each state. This article peels the legal onion to distinguish whether this critical authority is controlled in each of the 50 states either by local land-use laws or is preempted by state law. There is no federal authority over transmission facility siting, despite the increasingly interstate nature of power transmission. The article concludes by analyzing the degree to which renewable energy can maintain reliability in the power grid.

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I. U.S. DOMESTIC AND INTERNATIONAL 'STEP BACK' ON CLIMATE CHANGE AND THE U.S. POWER GRID?

All critical modern infrastructure is at risk and significant economic value can be lost, without access to reliable power.[1] There are sixteen critical infrastructure sectors in the United States, including communications, emergency services, energy, food and agriculture, health care and public health, transportation, and water and wastewater sectors.[2] All sixteen of these critical infrastructure sectors depend on electric power for a stable power supply in order to function.[3] With a delivered value of approximately $390 billion in the U.S. annually,[4] exceeding the total amount of corporate income taxes collected in the U.S.,[5] electricity is critical. Yet, because of the types of electricity we use, there are now atmospheric concentrations of greenhouse gases at levels that have not been seen for almost a million years.[6]

What are the intermediate- and long-term effects of the Trump Administration's step-back from the Obama Administration's Clean Power Plan? Or the Trump Administration's intended withdrawal from the international Paris Agreement of 2015 which took the next international step, after the Kyoto Protocol, to limit the international emissions of Greenhouse Gases (GHGs)? The parties to the Paris Agreement agreed to hold "the increase in the global average temperature to well below 2°C above pre-industrial levels" and to "pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change."[7]

Current EPA Secretary Pruitt criticized inequity in the Paris Agreement: "China and India got away, the largest producers of CO_2 internationally, got away scot-free. They didn't have to take steps until 2030. We've penalized ourselves through lost jobs while China and India didn't take steps to address the issue

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[1] U.S. DEP'T OF ENERGY, QUADRENNIAL ENERGY REVIEW, TRANSFORMING THE NATION'S ELECTRICITY SYSTEM: THE SECOND INSTALLMENT OF THE QER 1-7 (Jan. 2017) (hereinafter "QER").

[2] U.S. DEP'T OF HOMELAND SECURITY, CRITICAL INFRASTRUCTURE SECTORS, https://www.dhs.gov/critical-infrastructure-sectors (last visited Dec. 21, 2017).

[3] *Id.*

[4] *See* PUB. POL'Y INST. OF NEW YORK STATE, INC., AVERAGE RETAIL PRICE OF ELECTRICITY TO ULTIMATE CUSTOMERS BY END-USE SECTOR, BY STATE, YEAR-TO-DATE THROUGH FEBRUARY 2011 AND 2010, http://ppinys.org/reports/jtf/2011/employ/average-retail-price-of-electricity2010-11.htm.

[5] TAX POLICY CENTER, HISTORICAL AMOUNT OF REVENUE BY SOURCE, http://www.taxpolicycenter.org/taxfacts/displayafact.cfm?Docid=203.

[6] INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS 11 (2013) (highest levels of GHGs for at least 800,000 years).

[7] Adoption of the Paris Agreement (decision 1/CP.21), art. 2.1(a), Dec. 12, 2015, *in* United Nations Framework Convention on Climate Change, Conference of the Parties, (2015), U.N. Doc. FCCC/CP/2015/L.9/Rev.1.

internationally."[8] When speaking at the CPAC convention in February, President Trump subsequently characterized the Paris Agreement, as "totally disastrous, job-killing, wealth-knocking-out."[9] The Trump Administration pull-back leaves the U.S. as the only major nation in the world not continuing with the Paris Agreement and international climate commitments. However, economic forces are proving more determinative than law. We examine first what the Trump Administration has altered, and second, the state of power and carbon.

A. *Prior Legal Climate Commitments Repealed*

Electric power production is the major source of CO_2 and carbon emissions of all sectors of the economy in the U.S. Addressing this, there is a significant difference in legal policy between the Obama and Trump administrations. Initiatives during the Obama administration focused on decreasing the use of coal resources for U.S. power production and their carbon emissions to the atmosphere. Obama Administration policies in this regard included joining the 2015 Paris Agreement on climate[10] and restricting CO_2 power plant emissions through the Clean Power Plan (CPP) focused on coal-fired power plants.

The Paris Agreement was agreed by the requisite number of countries by October 2016 and entered into force in November 2016.[11] However, a country cannot turn on a dime and withdraw from the Paris agreement once having agreed to it. There is a four-year window to execute such a withdrawal. The Paris Agreement provides:[12]

> "1. At any time after three years from the date on which this Agreement has entered into force for a Party, that Party may withdraw from this Agreement by giving written notification to the Depositary.
>
> 2. Any such withdrawal shall take effect upon expiry of one year from the date of receipt by the Depositary of the notification of withdrawal, or on such later date as may be specified in the notification of withdrawal.
>
> 3. Any Party that withdraws from the Convention shall be considered as also having withdrawn from this Agreement."

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[8] *See* Martin Pengelly, *Trump to Sign Executive Order Undoing Obama's Clean Power Plan*, GUARDIAN, (Mar. 26, 2017), https://www.theguardian.com/environment/2017/mar/26/trump-executive-order-clean-power-plan-coal-plants.

[9] *See* Hanna Northey, *Trump Slams 'Totally Disastrous' Paris Pact, Touts Coal*, GREENWIRE (Feb. 23, 2018), https://www.eenews.net/greenwire/2018/02/23/stories/1060074641.

[10] *See* UNITED NATIONS, LIST OF PARTIES THAT SIGNED THE PARIS AGREEMENT ON 22 APRIL, http://www.un.org/sustainabledevelopment/blog/2016/04/parisagreementsingatures/.

[11] 194 UNFCCC member nations signed the treaty, and 141 of them have ratified it.

[12] Paris Agreement art. 28, Apr. 22, 2016, I-54113 (U.N.T.S. volume number not yet assigned).

Neither the Kyoto Protocol nor the Paris Agreement have any enforcement mechanisms for countries which fail to comply with their terms.

The United States' enactment of the CPP was one of the first major global initiatives to curb domestic greenhouse gas emissions. The Obama Administration CPP was designed to meet the Kyoto Protocol and Paris Agreement pledges for GHG reductions. However, the CPP was preliminarily enjoined by the Supreme Court during the Obama Administration, in *West Virginia v. EPA.*[13]

The change in Presidential administrations brought with it a fundamental change in the executive branch approach to the power sector in the U.S. economy. In March 2017, the Trump Administration issued Executive Order 13783 ordering the EPA to eliminate the CPP. By doing so, EPA changed the value attributed to **CO_2** emissions savings.[1415] Additionally, Executive Order 13371, issued in January 2017, directed agencies to eliminate two existing regulations for every one new regulation issued.[16] In November 2017, the Administration announced repeal of the CPP.[17] Finally, in the last days of 2017, EPA issued an Advance Notice of Proposed Rulemaking to Replace the Clean Power Plan.**[18]**

The CPP exclusively targeted fossil fuel electricity production for reductions of carbon.[19] The CPP was designed to achieve a required thirty-two percent reduction of annual CO_2 emissions from new and existing power plants,[20] compared to the

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[13] West Virginia v. EPA, 136 S. Ct. 1000 (2016).

[14] Repeal of Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 82 Fed. Reg. 48,035 (Oct. 16, 2017) (to be codified at 40 C.F.R. pt. 60). "This approach shifts the focus to the domestic (rather than global) social cost of carbon, and employs both 3 percent and 7 percent discount rates." *Id.*

[15] *Presidential Executive Order on Promoting Energy Independence and Economic Growth*, THE WHITE HOUSE, OFFICE OF PRESS SECRETARY (Mar. 28 2017) *available at* https://www.whitehouse.gov/the-press-office/2017/03/28/presidential-executive-order-promoting-energy-independence-and-economi-1.

[16] *Presidential Executive Order on Reducing Regulation and Controlling Regulatory Costs*, THE WHITE HOUSE (Jan. 30, 2017), https://www.whitehouse.gov/presidential-actions/presidential-executive-order-reducing-regulation-controlling-regulatory-costs/. Executive Order 13771 directs that no agency may issue a new rule unless the agency offsets the costs of the new rule by rescinding at least two existing ones. *See id*.

[17] Repeal of Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 82 Fed. Reg. 51787 (Nov. 8, 2017) (to be codified at 40 C.F.R. pt. 60).

[18] *Electric Utility Generating Units: Repealing the Clean Power Plan: Proposal*, ENVTL. PROT. AGENCY (Dec. 28, 2017), https://www.epa.gov/stationary-sources-air-pollution/electric-utility-generating-units-repealing-clean-power-plan-0 (last updated Feb. 27, 2018). (To utilize the best system of emission reduction (BSER) at or to an existing power plant, at the source-specific level, based on a physical or operational change to a building, structure, facility, or installation at that source).

[19] 80 Fed. Reg. 64661–*65120, RIN 2060–AR33* (Oct. 23, 2015).

[20] *Fact Sheet: Clean Power Plan Overview*, ENVTL. PROT. AGENCY (Jan. 19, 2017), https://19january2017snapshot.epa.gov/cleanpowerplan/fact-sheet-overview-clean-power-plan_.html. Between the rule's promulgation in 2014 and final rule issuance in 2015, the EPA delayed implementation; Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64,662 (Oct. 23, 2015) (to be codified at 40 C.F.R. pt. 60). This included more time for state compliance with a two-year delay for states filing required plans from 2016 to 2018, and a two-year delay in the first year of required CO_2 reductions, from 2020 to 2022; *Id*. at 64,669. The EPA's final regulation indicates that the goal of this rule is to substitute gas for coal in the generation of

2005 carbon emission power generation baseline by 2030.[21] In certain states, this would require up to a 50 percent reduction in the carbon intensity of existing electric power generation.[22] EPA received two-and-a-half million comments in response to the proposed CPP regulation under which each state would have been required to develop standards of performance to limit CO_2 emissions from existing fossil-fuel-fired generating facilities.[23] The final CPP rule eliminated energy efficiency as one of four originally specified compliance building blocks to reduce CO_2 emission, retaining the building blocks of improvement of coal-fired power facility heat rates, substitution of natural gas for coal-fired electric generation facility operation, and construction of more renewable energy to comply with reduction requirements.[24]

Once the CPP was proposed but not yet promulgated, more than half the states sued EPA,[25] and twenty-seven states sued the EPA after promulgation of the final CPP rule to block or overturn it.[26] As well, the current Administration began a still-ongoing regulatory repeal of the CPP by changing the underlying math originally used to justify the rule. Additionally, the Trump Administration declared that the CPP was not permissible because the Clean Air Act requires individual source regulation, rather than regulation "beyond the fence line" away from the regulated fossil-fuel-fired power plant called for by the CPP. Such instances of "beyond the fence line regulation" include dispatching and ramping up gas-fired power plants in lieu of coal-fired power plants and shifting generation to wind and solar plants. The Administration also changed the evaluation of the value of "co-benefits", as opposed to direct benefits, associated with carbon emission reduction and shifted the focus from counting international benefits to solely assessing domestic benefits.

Originally, the Obama Administration EPA had forecast CPP benefits of $14-34 billion annually,[27] with CPP costs at $5.1-8.4 billion per year. If "co-benefits"

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electricity; Id. at 64,665. The EPA increased how much CO_2 emissions will have to be brought down from the 2005 baseline BY 2030 from the 30 percent proposed to 32 percent in the final rule. *Id.*

[21] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64,662 (Oct. 23, 2015) (to be codified at 40 C.F.R. pt. 60); *see also* Juliet Eilperin & Steven Mufson, *EPA Proposes Cutting Carbon Dioxide Emissions From Coal Plants 30% by 2030*, WASH. POST (June 2, 2014), https://www.washingtonpost.com/national/health-science/epa-to-propose-cutting-carbon-dioxide-emissions-from-coal-plants-30percent-by-2030/2014/06/01/f5055d94-e9a8-11e3-9f5c-9075d5508f0a_story.html.

[22] Paul DeCotis, *What the Clean Power Plan Means for You & How to Tackle Building a Compliance Strategy,* ENERGY BIZ (Nov. 7, 2014), http://www.energybiz.com/article/14/11/what-clean-power-plan-means-you-how-tackle-building-compliance-strategy.

[23] Regulatory Impact Analysis for the Proposed Standards of Performance for Greenhouse Has Emission for New Stationary Sources: Electric Utility Generating Units, ENVTL. PROT. AGENCY, at 1-1 (Sept. 2013), http://www2.epa.gov/sites/production/files/2013-09/documents/20130920proposalria.pdf.

[24] *Id*.

[25] *Id*. at 45.

[26] In re Murray Energy Corp., 788 F.3d 330, 333 (D.C. Cir. 2015).

[27] Ted Gayer, *The Social Costs of Carbon*, BROOKINGS (Feb. 28, 2017), available at https://www.brookings.edu/testimonies/the-social-costs-of-carbon/; James E. McCarthy, *EPA Regulation of Greenhouse Gases: Congressional Responses and Options*, CONG. RES. SERV. 7-5700 (Feb. 5, 2015).

and international benefits were added, benefits increased to $32-54 billion per year.[28]

In contrast, the Trump Administration declared that repeal of the CPP is estimated to save $33 billion in avoided compliance costs by 2030.[29] The net benefits forecast in the CPP turned negative once the current Administration no longer counted (1) benefits occurring outside the United States (reducing the prior Obama Administration estimate of $20 billion in international benefits to $3 billion of domestic benefits), and (2) indirect "co-benefits" unrelated to CO_2, with CO_2 being the only chemical that the CPP addresses.[30] Less than one-tenth of one percent of the estimated benefits of the CPP are from carbon reduction; more than ninety-nine percent of the benefits are "co-benefits" from estimated reduction of other criteria pollutants not regulated by the CPP.[31]

The Supreme Court became involved in the enforcement of the CPP regulation very early, granting a stay of enforcement of the CPP on February 9, 2016, less than three weeks after parties applied for the stay and before any court had evaluated the Plan on its merits.[32] The Court's order granting the stay applied directly to EPA's CPP rule, rather than to a lower court judicial decision on appeal to the Court as it does in all other matters. No party in the matter was able to point to any previous case in which the Supreme Court had stayed an agency rule before any court had reviewed it on its merits. After being reversed by the Supreme Court issued the stay, the D.C. Circuit found that the stay not only relieved EPA of its enforcement obligation, but also relieved EPA of its statutory duty to regulate carbon for the indefinite future.[33] Internationally, when Syria joined the Paris Climate Accord in

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[28] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64,662 (Oct. 23, 2015) (to be codified at 40 C.F.R. pt. 60); *see also* James McCarthy & Claudia Copeland, EPA Regulations: Too Much, Too Little, or On Track?, CONG. RES. SERV. 7-5700 at 13 (Dec. 30, 2016). Other reporters reported EPA's calculated benefits as $14-34 billion per year; Nathan Hultman, *Trump's Executive Order on Energy Independence*, BROOKINGS (Mar. 28, 2017), available at https://www.brookings.edu/blog/planetpolicy/2017/03/28/trumps-executive-order-on-energy-independence/. In essence, the EPA set the BSER as different for each state. BSER is set considering cost. The cost and possibilities for each state would be different depending on its electric generating technology mix, and estimated time until retirement of each. Traditionally, the BSER was set as the same for each emitting technology or source.

[29] *EPA Takes Another Step To Advance President Trump's America First Strategy, Proposes Repeal Of "Clean Power Plan,"* ENVTL. PROT. AGENCY (Oct. 10 2017), available at https://www.epa.gov/newsreleases/epa-takes-another-step-advance-president-trumps-america-first-strategy-proposes-repeal.

[30] *See* Ted Gayer,*The Social Costs of Carbon*, Brookings (Feb. 28, 2017), available at https://www.brookings.edu/testimonies/the-social-costs-of-carbon/. Instead of considering global climate benefits, the Trump administration EPA now only shows domestic benefits.

[31] *See* McCarthy & Copeland, *supra* note 29. The direct CPP direct benefits of mercury reductions were $4-6 million, which increased one-thousand fold when indirect co-benefits were added to make total benefits of CPP equal to $37-90 billion.

[32] West Virginia v. ENVTL. PROT. AGENCY, 136 S.Ct. 1000 (2016); *see* Jonathan Adler, *Supreme Court put the Brakes on the EPA's Clean Power Plan*, THE WASH. POST (Feb. 9 2016), available at https://www.washingtonpost.com/news/volokh-conspiracy/wp/2016/02/09/supreme-court-puts-the-brakes-on-the-epas-clean-power-plan/?utm_term=.dd512a870f71.

[33] West Virginia v. ENVTL. PROT. AGENCY, Case No. 15-1363, Order (Aug. 8, 2017).

2017, the United States became the only significant nation to have not joined or remained in the Paris Agreement.[34]

B. *Is What Is Past, Prologue?*

Withdrawing from the Paris Agreement and similarly pulling back from the already-stayed CPP, both of which were directed at significantly repressing power sector carbon emissions, would seem to foreshadow that the U.S. would not come close to the Paris Agreement carbon emission reductions pledged by major nations. The CPP was designed as the primary U.S. mechanism for this compliance,[35] targeted to reduce electricity sector power emissions by thirty-two percent between 2022 and 2030. The United States submitted to the United Nations Framework Convention on Climate Change (UNFCCC) an intended nationally determined contribution (INDC) of 17 percent U.S. reductions below 2005 levels by 2020 and twenty-six and twenty-eight percent reductions by 2025. According to the most recent U.S. Department of Energy "World Energy Outlook" "[e]ven with the CPP, the United States does not meet its NDC targets based on reductions projected from compliance with the CPP alone . . ."[36]

This projection is that the CPP requirements alone, would not satisfy the Obama Administration pledge for U.S. carbon reductions. However, under one estimate, significant reductions appear to be occurring without the CPP, even though it is still four years before the CPP would have required any of its reductions to be implemented.[37] The Rhodium Group estimated that United States electricity emissions are currently on track to fall twenty-seven to thirty-five percent below baseline 2005 levels by 2030, even with the CPP regulation repealed by the Trump Administration or otherwise enjoined by the courts.[38] The midpoint of this range is approximately the thirty-two percent reduction that the Clean Power Plan would require by 2032.[39] This estimated reduction is also in the general range of the U.S. Paris Agreement INDC pledge of twenty-six to twenty-eight percent carbon reductions below 2005 levels by 2025, if approximately one percent of this projected reduction is discounted from each year before the CPP 2032 deadline.

Let's put this in historical perspective. The CPP is not responsible for any CO_2 reductions occurring during the Obama Administration, since it was not promulgated until 2015 and required none of its initial levels of reductions until

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[34] Brady Dennis, *As Syria Embraces Paris Climate Deal, it's the United States Against the World*, WASH. POST, (Nov. 7, 2017) https://www.washingtonpost.com/news/energy-environment/wp/2017/11/07/as-syria-embraces-paris-climate-deal-its-the-united-states-against-the-world/?utm_term=.1722485dda54.

[35] The CPP regulatory preamble links the CPP to international obligations to reduce emissions and indicates that the CPP is an attempt to meet many of these obligations.

[36] *International Energy Outlook 2017*, U.S. Energy Information Administration (Sept. 14, 2017), https://www.eia.gov/outlooks/ieo/exec_summ.php.

[37] John Larsen & Whitney Herndon, *What the CPP Would Have Done*, RHODIUM GROUP (Oct. 9, 2017), available at http://rhg.com/notes/what-the-cpp-would-have-done.

[38] *Id.*

[39] *Id.*

2022, and in the interim, was stayed by the Supreme Court and is now the object of repeal by the current Administration. This repeal will take significant time, as the Trump Administration re-opened the repeal rule comment period for an additional three months through late April 2018.[40] When the final CPP rule was released by EPA in 2015, its calculations were predicated on 2014 energy sector projections.[41] The U.S. Department of Energy, Energy Information Administration (EIA), in its Annual Energy Outlook (AEO) released that year, projected CO_2 emissions to decrease by only eight percent below 2005 levels by 2030.[42] The Rhodium analysis, by comparison, places the U.S. on track to achieve a thirty-two percent reduction from 2005 CO_2 levels without a federal CPP, in the range of twenty-seven to thirty-five percent reductions below 2005 levels.[43]

The Rhodium analysis projects that the U.S. could achieve the 2032 CPP-required levels of CO_2 reduction from power plants a full decade in advance under the business-as-usual scenario.[44] The U.S. could achieve the CPP 2032 carbon reduction goal by 2020 and maintain this level to 2032.[45] The country may be on course based on recent data. Power-sector carbon emissions are today twenty-eight percent below 2005 levels, which simultaneously means the U.S. will satisfy its 2030 Paris Agreement commitment, now being only four percent away from the Clean Power Plan's thirty-two percent reduction required by 2030.[46] Despite the stay of the CPP, by the time the U.S. was only one year of fourteen years into the 2030 carbon reduction deadline, it had achieved more than eighty-five percent of the power sector reductions which would have been required under the CPP

Based on these forecasts, the power sector-carbon reduction objective could be achieved by basic economic forces, notwithstanding the current stay and intended repeal of the CPP. Under this analysis, it is possible that the U.S. will achieve the CPP requirements and the Paris Agreement international targets a decade in advance without the CPP as law. How is this achieved and what are the impacts on the power sector and the use of renewable energy? Next, we examine the forces accomplishing this.

C. *The Descending Reliance on Coal for Power*

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[40] *See* News Release, Envtl. Prot. Agency, EPA Schedules Three Listening Sessions on Proposed Repeal of Clean Power Plan (Jan. 11, 2018) https://www.epa.gov/newsreleases/epa-schedules-three-listening-sessions-proposed-repeal-clean-power-plan.

[41] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 80 Fed. Reg. 64,662 (Oct. 23, 2015) (to be codified at 40 C.F.R. pt. 60).

[42] *Id. See* Figure 1. The CPP was projected to reduce power sector CO_2 emissions 32% below 2005 levels by 2030.

[43] *Id.*

[44] *Id.*

[45] *Id.*

[46] *2018 Factbook, Sustainable Energy in America*, Bus. Council for Sustainable Energy (2018), http://www.bcse.org/wp-content/uploads/2018-Sustainable-Energy-in-America-Factbook_Executive-Summary.pdf.

The Obama Administration expressly declared that its CPP and Mercury and Air Toxics (MATs) regulations were designed to frustrate ongoing and future use of coal in the United States for electric power generation. However, the Supreme Court reversed and remanded a significant Obama Administration regulation restricting coal emissions of hazardous air pollutants because EPA ignored the costs of the regulation in exercising executive branch regulatory discretion.[47]

The United States electric system has traditionally used coal-fired resources as its principal prime-mover power generation technology since the first harnessing of electricity.[48] The dominance of coal use in the U.S. has been in steep decline in recent years: coal for power generation has been rapidly decreasing in the most recent decade, and now supplies barely thirty-percent of U.S. electric power, with its share continuing to decrease.[49] A decade ago, in 2007, coal supplied half of all power generation, and has declined in its share by forty-percent since then.[50]

NERC's analysis of the CPP which was designed to limit carbon dioxide emissions from the power sector, finds the rule would help drive investment in ten to twenty gigawatts of new wind and solar generation by 2030, while coal power would decline by up to twenty seven gigawatts during that period.[51] U.S. coal-fired generating capacity is projected to decrease to 262 gigawatts in 2040, which would constitute a fifteen percent decrease, according to the U.S. Energy Information Agency.[52] The U.S. Department of Energy forecasts that there will be a significant increase in U.S. natural gas usage with a corresponding significant decrease in coal use in the next 25 years.[53]

D. *Renewable Energy Ascent*

While natural gas gets much credit for displacing more carbon-intensive methods for power generation, renewable energy and energy efficiency were the primary source of the 4.2% decrease in power sector carbon emissions achieved in

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[47] Michigan v. EPA, 135 S. Ct. 2699, 2706 (2015).

[48] *See* JAMES G. SPEIGHT, THE CHEMISTRY AND TECHNOLOGY OF COAL, 13 (3d ed., 2013).

[49] *See* Wendy Koch, *EPA Seeks 30% Cut in Power Plant Carbon Emissions by 2030*, USA TODAY (June, 3, 2014), http://www.usatoday.com/story/money/business/2014/06/02/epa-proposes-sharp-cuts-power-plant-emissions/9859913/.

[50] Mario Parker & Naureen Malik, *Coal Confronting Bigger Threat than Obama's Rules for Clean Air, Bloomberg Energy & Climate Report* (June 10, 2015), http://www.stltoday.com/business/local/coal-confronting-bigger-threat-than-obama-s-clean-air-rules/article_c39c876e-7658-5e32-b944-9808f7194613.html; *see also* 105 BLOOMBERG ENERGY & CLIMATE REP. (June 2, 2015).

[51] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 79 Fed. Reg. 117 (proposed Jun.18, 2014) (Not enacted); *see also* Andrew Childers, *Clean Power Plan Driving Renewables, Limiting Coal: Report*, BNA: ENVIRONMENT REP. (May 20, 2016), https://www.bloomberglaw.com.

[52] Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, 79 Fed. Reg. 117 (proposed Jun.18, 2014) (to be codified at 40 C.F.R. pt. 60).

[53] U.S. ENERGY INFO. ADMIN., *Today in Energy: Fossil fuels still dominate U.S. energy consumption despite recent market share decline*
(July 1, 2016), https://www.eia.gov/todayinenergy/detail.cfm?id=26912.

2017.[54] Renewable electric energy and natural gas-powered generation have been quickly supplanting coal generation over the last five years in the U.S. The cost of wind power has dropped to be competitive with the price of some more traditional fossil fuel resources for electricity generation.[55] Wind, along with natural gas, has dominated new sources of electrical energy capacity deployed in the most recent decade.[56] In 2012, wind energy was the most installed new U.S. electricity generation source, at forty-three percent of all new electric generation.[57] Wind energy provided 4.5% of total U.S. power supplies in 2013.[58]

Since 2009, U.S. solar generation has increased by two-thousand percent.[59] The cost to install photovoltaic (PV) solar panels has fallen dramatically by about sixty percent, with PV module prices decreasing from ~$1.90 per watt in 2009 to $0.36 per watt in 2017.[60] Solar power inverter prices have also declined by more than 60% from $0.60-$1.00+ per watt in 2005 to under $0.20 per watt in 2013.[61] This has permitted the solar photovoltaic market to grow at an average rate of more than 40% each year since 2000.[62] Solar energy was predicted to be competitive in cost with retail electricity prices in forty-seven U.S. states by 2016 under current federal and state subsidies.[63]

The success of the solar industry is augmented by federal and state tax credits, falling installation prices,[64] and the proliferation of net metering programs in 41

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[54] BLOOMBERG NEW ENERGY FINANCE, *2018 Factbook, Sustainable Energy in America*, http://www.bcse.org/wp-content/uploads/2018-Sustainable-Energy-in-America-Factbook_Executive-Summary.pdf.

[55] Tara Patel, *Fossil Fuels Losing Cost Advantage Over Solar, Wind, IEA Says*, BLOOMBERG (Aug. 31, 2015), http://www.bloomberg.com/news/articles/2015-08-31/solar-wind-power-costs-drop-as-fossil-fuels-increase-iea-says.

[56] DEP'T OF ENERGY, ENERGY DEPT. REPORTS: U.S. WIND ENERGY PRODUCTION AND MANUFACTURING REACHES RECORD HIGHS (2013), http://energy.gov/articles/energy-dept-reports-us-wind-energy-production-and-manufacturing-reaches-record-highs.

[57] *Id*.

[58] *Id*.

[59] *Id*.

[60] Wilson Rickerson, *Residential Prosumers-Drivers and Policy Options*, IEA-RETD 9 (June 2014) (relying on Jade Jones, *Regional PV Module Pricing Dynamics: What You Need to Know*, PV News 32 (12), 1, 9–10 (2013)).

[61] *Id.* (relying on Ian Clover, *IHS Cuts Global Inverter Market Forecast in Face of Dramatic Price Drops*, PV MAG. (Oct. 16, 2013)); *see also* Navigant Consulting Inc., *A Review of PV Inverter Technology Cost and Performance Projections*, NREL/SR-620-38771, Nat'l Renewable Energy Laboratory (2006).

[62] Peter Kind, *Disruptive Challenges: Financial Implications and Strategic Responses to a Changing Retail Electric Business*, EDISON ELEC. INST. 1 (Jan. 2013), http://www.ourenergypolicy.org/wp-content/uploads/2013/09/disruptivechallenges-1.pdf.

[63] Ari Natter, *Solar Energy to Reach 'Grid Parity' in Nearly All States by 2016, Deutsche Bank Predicts*, BNA (Oct. 27, 2015). This is based on the assumption that the cost of solar systems will decline by about 20% more, from less than $3 per watt installed to less than $2.50 per watt installed, resulting in a net price from 9-14 cents/Kwh, and lowered financing cost for solar projects. The average cost of residential electricity in the U.S. in 2013 was 12.12 cents/Kwh, and was 8.95 cents/Kwh in 2004.

[64] *See Solar Industry Growing at a Record Pace*, SOLAR ENERGY INDUSTRIES ASS'N, http://www.seia.org/research-resources/solar-industry-data (last visited Jan. 9, 2018).

states.[65] Solar electric energy is now cost-competitive with traditional fossil fuels due to substantial subsidies,[66] and will expand in use in the next decade.[67] Wind power is forecast by the U.S. Department of Energy to be cheaper than electricity produced from natural gas by 2025, even without a continuing federal production tax credit incentive.[68] In 2015, there was a multi-year extension and phase-down of the renewable Production Tax Credit (PTC), which was previously scheduled to expire at the end of 2014 and is typically used by wind power projects and the Investment Tax Credit (ITC), which typically is used by solar power projects. Before Congress extended these programs, the PTC had expired at the end tax of 2014 and the ITC was set to drop to a credit of ten percent of project costs at the end of 2016.[69]

At the end of 2015, the PTC was extended and phased out by 2020 while the ITC thirty percent tax credit declines to 10% in 2021 and continues.[70] However, without the tax credits extended, coal is replaced by natural gas combined cycle (NGCC) units as the least-cost option; solar and wind power assume the dominant role through 2021, adding almost 300 TWHs of generation in lieu of NGCC generation, and continue to be the technology of choice.[71] This dominance of new renewable energy in lieu of natural gas and coal, reduce U.S. carbon emissions.

Because of these economic factors, the role of renewable energy in the power sector will expand dramatically with or without the CPP and with or without joinder of the U.S. in the Paris Agreement. Wind is the most significant new power generation source added each year.[72] Renewable energy is expected to claim almost two-thirds of the spending on new power plants over the next quarter century, dwarfing spending on fossil fuels, as solar energy moves into a dominant position for new power generation technology for consumers.[73]

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[65] *See State Net Metering Policies*, NAT'L CONF. OF ST. LEGIS. (Nov. 3, 2016), http://www.ncsl.org/research/energy/net-metering-policy-overview-and-state-legislative-updates.aspx; Sean Paul, *The Solar Industry in a Period of Transition*, GEO. PUB. POL. REV., (Nov. 15, 2016) http://gppreview.com/2016/11/15/solar-industry-period-transition/.

[66] INT'L RENEWABLE ENERGY AGENCY, RENEWABLE POWER GENERATION COSTS IN REMAP 2030, https://www.irena.org/remap/REmap-FactSheet-7-Cost%20Competitive.pdf.

[67] *Solar Industry Data: Solar Industry Growing at a Record Pace*, SOLAR ENERGY INDUS. ASS'N, https://www.seia.org/solar-industry-data.

[68] *See* Christopher Martin and Justin Doom*, Wind Power Without U.S. Subsidy to Become Cheaper Than Gas*, BNA ENERGY & CLIMATE REP. (Mar. 12, 2015), http://www.bloomberglaw.com.

[69] John Larson and Whitney Herndon, *Renewable Tax Extenders: The Bridge to the Clean Power Plan*, RHODIUM GRP., LLC, (Jan. 27, 2016), http://rhg.com/notes/renewable-tax-extenders-the-bridge-to-the-clean-power-plan.

[70] STEVEN FERREY, LAW OF INDEPENDENT POWER §§ 3:59.10 & 3:59.40 (Thomas-Reuters, 44th ed. 2017).

[71] John Larson & Whitney Herndon, *Renewable Tax Extenders: The Bridge to the Clean Power Plan*, RHODIUM GROUP (Jan. 27, 2016), https://rhg.com/research/renewable-tax-extenders-the-bridge-to-the-clean-power-plan/.

[72] Roy L. Hales, *2/3 of New U.S. Electricity Capacity Was From Wind In October*, CLEANTECHNICA (Nov. 24, 2014), https://cleantechnica.com/2014/11/24/two-thirds-of-us-installations-were-from-the-wind-sector/.

[73] Ehren Goossens, *Renewable Energy Expected to Draw Bulk of Spending for New Power Plants*, BLOOMBERG ENV'T REP. (June 23, 2015).

II. KEY SPATIAL CHALLENGES FOR THE DOMINANT RENEWABLE TECHNOLOGIES

Because renewable power is less dense than fossil fuels, it requires more land, which triggers more legal issues. The U.S. Department of Energy recently explained the scale of the central electric grid in the United States:

> Today, the U.S. transmission and distribution system is a vast physical complex of interlocked machines and wires, with a correspondingly complex set of institutions overseeing and guiding it through policies, statutes, and regulations. The U.S. grid delivers approximately 3,857 terawatt-hours [or trillion watt-hours] of electrical energy from electric power generators to 159 million residential, commercial, and industrial customers. This is accomplished via 19,000 individual generators at about 7,000 operational power plants in the United States with a nameplate generation capacity of at least one megawatt (MW). These generators send electricity over 642,000 miles of high-voltage transmission lines and 6.3 million miles of distribution lines. Together with its electric generation component, the grid is sometimes referred to as the world's largest machine; in 2000, the National Academy of Engineering named electrification as the greatest engineering achievement of the 20th century.[74]

A. *The Transmission Challenge for Wind*

For wind, the key issue is getting electric power from where the wind blows the strongest to where power consumers reside. The two factors do not overlap in many places. Wind power in the high-wind areas of the U.S. great plains needs to be transported to the major cities of the Midwest, and other wind power areas of the Rocky Mountain states needs to be transported to population centers in California. Transmission also is necessary to move Canadian hydropower to New England. These challenges are occurring in real time. At the end of January 2018, from among four dozen applicants in a competitive procurement, Massachusetts chose the Northern Pass project to move hydropower south from Canada through New Hampshire. Less than a week later, the New Hampshire Site Evaluation Committee rejected the application to construct new transmission capacity to carry the power south.[75] When New Hampshire did not change its position to not site additional electric transmission infrastructure across its state to serve the population centers of

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[74] U.S. DEP'T OF ENERGY, QUADRENNIAL ENERGY REV.: FIRST INSTALLMENT 3-4 (2015), https://www.energy.gov/sites/prod/files/2015/08/f25/QER%20Chapter%20III%20Electricity%20April%202015.pdf.

[75] Annie Ropeik, *Site Evaluation Committee Casts Unanimous Vote Against Northern Pass Project*, NEW HAMPSHIRE PUB. RADIO (Feb. 1, 2018), http://nhpr.org/post/site-evaluation-committee-casts-unanimous-vote-against-northern-pass-project#stream/0.

Massachusetts and Connecticut, Massachusetts withdrew from this significant renewable power option. Unless the position of a single state changes, there is no ability to construct new transmission facilities in it.

The power generation sector is the most significant source of carbon dioxide emissions in the United States; more than 99 percent of anthropogenic greenhouse gas emissions result from fossil fuel use.[76] The transmission and distribution of electricity over long distances to end users results in significant energy losses and inefficiencies.[77] Therefore, energy policies which reduce fuel use and enable generation closer to consumer loads is a priority.[78]

The high-voltage transmission network was recognized as the most important engineering accomplishment of the 20th century.[79] New transmission to strengthen the grid and for renewable power deployment could cost $100 billion.[80] The Joint Coordinated System Plan, on behalf of several power pools and independent system operators, predicted that a five percent wind generation component achieved by 2024 could require the construction of roughly 10,000 miles of additional high-voltage transmission lines at an estimated cost $50 billion to deliver that power. A more aggressive twenty percent wind penetration target for wind power could require the construction of 15,000 miles of additional high-voltage transmission lines at a cost of approximately $80 billion in order to deliver the power from more remote locations to consumers.[81]

Wind power deployment has increased substantially.[82] In 2012, wind energy was the most deployed new U.S. electricity generation capacity, contributing forty-two percent of all new electric generation.[83] In 2015, more than half of new generating capacity was wind energy.[84] It was expected to increase to 14,000 MW by 2020.[85]

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[76] U.S. DEP'T OF ENERGY, QUADRENNIAL ENERGY REVIEW: SECOND INSTALLMENT 3-5 (2017), https://www.energy.gov/sites/prod/files/2017/02/f34/Chapter%20III--Building%20a%20Clean%20Electricity%20Future.pdf.

[77] *Id*. at 3-8.

[78] *Id*.

[79] Mason Willrich, *Energy Transmission Policy for America: Enabling a Smart Grid, End-to-End* 5 (MIT-IPC-Energy Innovation Working Paper 09-003, 2009).

[80] *See* Nuel Navarrete, *U.S. grid needs $100 billion for renewable energy capability,* ECOSEED: BRIDGING ENV'T & ECO. (Oct. 15, 2010) http://www.ecoseed.org/en/business-article-list/article/1-business/8218-u-s-grid-needs-$-100-billion-for-renewable-energy-capability.

[81] Matthew L. Wald, Richard Perez-Pena, & Neela Banerjee, *THE BLACKOUT: WHAT WENT WRONG; Experts Asking Why Problems Spread So Far*, N.Y. TIMES, at A1 (Aug. 16, 2003) (examining cause of 2003 blackout across the northeastern United States).

[82] Ernest Moniz, *America's Wind Industry Reaches Record Highs*, U.S. DEP'T OF ENERGY (Aug. 6, 2013), https://www.energy.gov/articles/americas-wind-industry-reaches-record-highs.

[83] *Id*.

[84] *See* Scheduled 2015 capacity additions mostly wind and natural gas; retirements mostly coal, U.S. ENERGY INFO. ADMIN. (Mar. 10, 2015), https://www.eia.gov/todayinenergy/detail.php?id=20292.

[85] Michael Dotten, *Integrating Wind Energy into Power Planning: Lessons from the Pacific Northwest*, MARTEN LAW (July 21, 2011), http://www.martenlaw.com/newsletter/20110721-wind-energy-power-planning.

The distribution of electricity from source to consumers requires a vast, physically interconnected grid.[86] At the state level, every state has a regulatory authority to establish retail rates and distribution reliability standards.[87] On a regional scale, in the United States there are five separate grids through which electricity is transmitted, for the Eastern United States, for the Western United States, for a large part of Texas, for Hawaii, and for Alaska.[88] See Figure 1. There are limited power transactions between these major regional grids. This U.S. transmission grid system operates at fifteen different voltage levels.[89]

Figure 1: United States Transmission Grids[90]

[86] U.S. DEP'T OF ENERGY, QUADRENNIAL ENERGY REVIEW: SECOND INSTALLMENT S-16 (2017), https://www.energy.gov/sites/prod/files/2017/01/f34/Transforming%20the%20Nation's%20Electricity%20System--Summary%20for%20Policymakers.pdf.

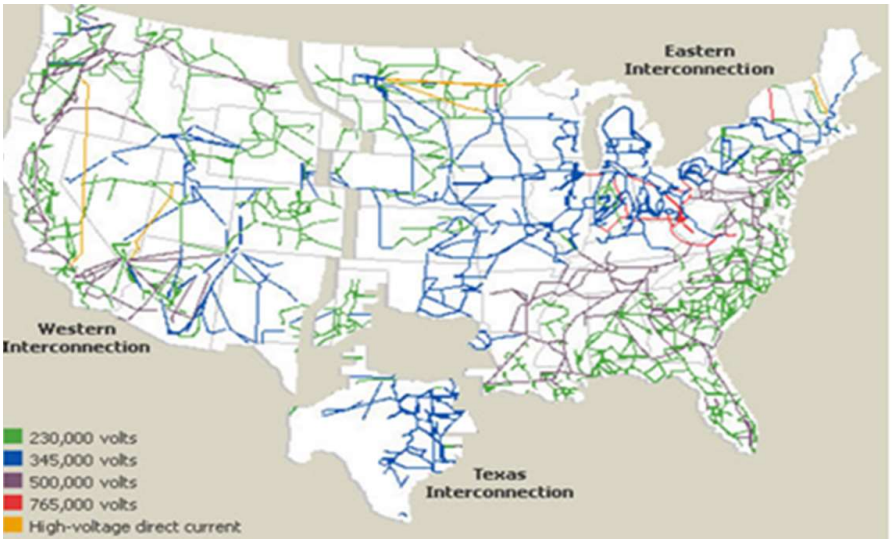
[87] *Regulatory Commissions*, NAT'L ASS'N. REG. UTIL. COMMISIONERS, https://www.naruc.org/about-naruc/regulatory-commissions/ (last visited Jan. 20, 2018).

[88] *Id*. at 3, Fig. 2.

Learn More About Interconnections, U.S. DEP'T ENERGY, https://www.energy.gov/oe/services/electricity-policy-coordination-and-implementation/transmission-planning/recovery-act-0 (last visited Feb. 11, 2018). Note that the term "interconnection" is used here to refer to alternating current power grids.

[89] Craig Cano, *Efficiency Should be Viewed as Key Part of Entire Delivery System, Wellinghoff says*, ELECTRIC UTIL. WEEK, at 18-19 (Dec. 13, 2010).

[90] *United States Transmission Grid*, GENI, https://www.geni.org/globalenergy/library/national_energy_grid/united-states-of-america/americannationalelectricitygrid.shtml (last visited June 30, 2018).



Regulatory authority over electric infrastructure is spread over levels of government. The federal government exercises exclusive authority pursuant to the Federal Power Act over wholesale power transactions in electricity and over power transmission lines pursuant to the Federal Power Act, but can exercise no authority over siting the infrastructure of power generation facilities or the transmission and distribution lines. The federal government, through the Federal Energy Regulatory Commission (FERC), exercises exclusive legal authority over financial wholesale and interstate transactions in electric power,[91] pursuant to Sections 205 and 206 of the Federal Power Act,[92] as upheld by the Supreme Court.[93] FERC has exclusive jurisdiction over the "transmission of electric energy in interstate commerce" and over "all facilities for such transmission or sale of electric energy."[94] The Supreme Court repeatedly has held that Congress meant to draw a "bright line," easily ascertained and not requiring case-by-case analysis, between state and federal jurisdiction,[95] and where there is federal authority, it preempts state regulation pursuant to the Constitution's Supremacy Clause.[96]

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[91] 16 U.S.C. §§ 824 (d-e) (2015).

[92] *Id*.

[93] Pub. Util. Dist. No. 1 v. FERC, 471 F.3d 1053, 1058 (9th Cir. 2006).

[94] 16 U.S.C. § 4(b) (repealed 2014); Connecticut Light and Power Co., 70 FERC P61, 012 (1995); Central Vermont Pub. Serv. Corp., 84 FERC P61,194 (1998); Niagara Mohawk Power Corp., 100 FERC P61, 019 (2002); Entergy Servs., Inc., 120 FERC P61, 020 (2007); Aquila Merch. Services., Inc., 125 FERC P61, 175 (2008).

[95] Fed. Power Comm/n v. Southern California Edison Co., 376 U.S. 205, 215–16 (1964).

[96] New England Power Co. v. New Hampshire, 455 U.S. 331 (1982) (violation of Supremacy Clause, Federal Power Act, and the Dormant Commerce Clause of the U.S. Constitution); s*ee also* Montana-Dakota Co. v. Pub. Serv. Comm'n, 341 U.S. 246, 251 (1951); Nantahala Power & Light Co. v. Thornburg, 476 U.S. 953 (1986); Mississippi Power & Light Co. v. Mississippi ex rel. Moore, 487 U.S. 354 (1988); Entergy Louisiana, Inc. v. Louisiana Pub. Serv. Comm'n*,* 539 U.S. 39 (2003).

Techniques that integrate large amounts of variable generation into the power system [97] include faster generator dispatch and scheduling,[98] and larger load balancing areas.[99] In its Order 764, the FERC required every transmission customer to be afforded the ability to adjust its transmission schedule at 15-minute intervals to reflect changing intermittent wind conditions.[100] FERC Order 764 requires that interconnecting DG generators pay for any incremental generation required, subject to reimbursement for generators who later interconnect to the increased transmission capacity. This promotes competition by supporting intermittent independent wind and solar technologies.

However, FERC does not regulate the construction of transmission facilities themselves, only economic tariffs for transactions moving power over them.[101] Local government exclusively exercises police power over all electric facility land-use and siting authority.[102] About half of the U.S. states also add a state level regulation of power facility siting, which varies in states as to whether it preempts local police power for siting. Distribution of power, as opposed to the transmission of power,[103] is regulated by the states exclusively.[104]

The federal government attempted to exert authority over the siting of the necessary transmission hardware that traditionally is within state and local authority. Section 216 of the Energy Policy Act of 2005 directs the U.S. Department of Energy to study transmission congestion in consultation with the states and designate certain transmission-constrained areas as national interest electric transmission corridors (NIETCs).[105] Section 216 grants FERC the authority

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[97] *See* M. Milligan & B. Kirby, *Impact of Balancing Areas Size, Obligation Sharing, and Ramping Capability on Wind Integration* 38-39 (Nat'l Renewable Energy Lab., Conference Paper No. NREL/CP-500-41809, 2007), http://www.nrel.gov/docs/fy07osti/41809.pdf.

[98] ENERNEX CORP., AVISTA CORPORATION WIND INTEGRATION STUDY (2007), http://www.uwig.org/avistawindintegrationstudy.pdf (sub-hourly scheduling would greatly reduce variable energy resources integration costs and faster (sub-hourly) power system dispatch and scheduling would allow system operators to more quickly and efficiently respond to power system output variations, reducing wind integration costs with sub-hourly dispatch intervals).

[99] Praveen Kathpal, *Increased Grid Flexibility from Energy Storage Technologies*, FERC DOCKET NO. AD09-4-000, 2009) (variable energy integration costs are greatly reduced if wind resources are geographically diverse).

[100] Integration of Variable Energy Res., 139 FERC P61, 246 (2012).

[101] *See* Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities, 76 Fed. Reg. 49,842 (Aug. 11, 2011) **(**requiring nondiscriminatory access by all parties to transmission infrastructure).

[102] *About FERC, What FERC Does Not Do*, FEDERAL REGULATORY ENERGY COMMISSION, (updated June 24, 2014) (limit of jurisdictional authority), available at http://www.ferc.gov/about/ferc-does.asp.

[103] Ferrey, *supra* note 71; STEVEN FERREY, ENVIRONMENTAL LAW: EXAMPLES & EXPLANATION 586 (Wolters Kluwer 7th ed. 2016); STEVEN FERREY, THE NEW RULES 23-24, 46-47 (Pennwell 2001).

[104] Public Utility District No. 1 v. FERC, 471 F.3d 1053, 1058 (9th Cir. 2006); Order No. 1000, *Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities*, 136 F.E.R.C. ¶ 61,051, 76 Fed. Reg. 49,842 (2011); FERREY, ENVIRONMENTAL LAW, *supra* note 103, at 586.

[105] Energy Policy Act of 2005 § 216, 16 U.S.C. §§ 824p et seq. (2011).

to issue permits to construct transmission facilities in these NIETCs under certain limited circumstances.[106]

However, a federal appellate court in 2009 blocked FERC from acting to "backstop" and grant a federal permit under Section 216 for a new transmission line, when the state had failed for twelve months to act on the permit.[107] As long as the state took some action, including a denial of the permit, FERC's Section 216 authority to intercede was not triggered. In 2011, the Ninth Circuit ruled that the U.S. Department of Energy (DOE) failed to properly consult with affected states in preparing the Congestion Study required by Section 216, and further ruled that the DOE failed to consider the environmental effects of designating NIETCs under the National Environmental Policy Act for corridors in mid-Atlantic and Southwestern states.[108] These opinions eliminated any effective attempted federal authority over traditional state decisions to site electric transmission lines.

Energy facility siting is jurisdictionally vested in the states rather than federally. Some of the states[109] divest this siting authority to localities. What has occurred in the past two decades in about 25% of the states is deregulation of retail sale of power in the states, as well as a dramatic increase in incentives for, and deployment of, renewable energy. Starting in 1997 in Massachusetts, Rhode Island, and then spreading to 13 states in total (see Figure 2), competition and partial deregulation of retail power was adopted in approximately one-quarter of the states. Several states have taken their regulated utilities out of the business of generating power, in favor of purchasing it wholesale in the states' new deregulated market.[110] In a significant number of these 13 deregulated states, this resulted in the regulated monopoly utilities selling their generation units to independent power companies which now operate in wholesale markets to sell that power back to retail utilities and competitors.[111]

Figure 2: State Utility Deregulation[112]

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[106] FERC issued Order No. 689 in 2006, creating a multi-year process for obtaining a federal permit to construct transmission within a NIETC. 71 Fed. Reg. 69,440 (Dec. 1, 2006).

[107] Piedmont Envt'l Council v. FERC, 558 F.3d 304 (4th Cir. 2009).

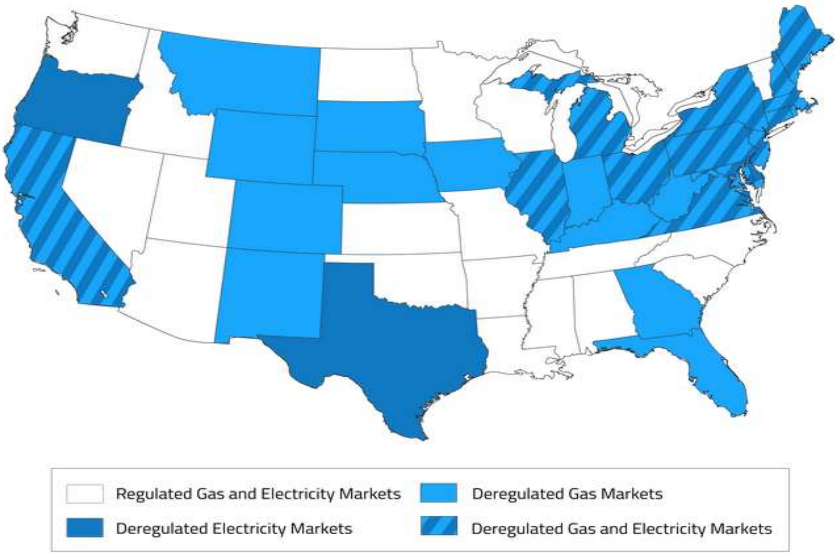
[108] Cal. Wilderness Coalition v. U.S. Dept. of Energy, 631 F.3d 1072 (9th Cir. 2011).

[109] *See infra* at Section IV.

[110] FERREY, THE NEW RULES, *supra* note 103 at 238-39.

[111] ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, THE CHANGING STRUCTURE OF THE ELECTRIC POWER INDUSTRY 2000: AN UPDATE 106 (2000).

[112] *Map of Deregulated Energy States and Markets*, ELECTRICCHOICE, https://www.electricchoice.com/map-deregulated-energy-markets/ (last visited June 30, 2018).



The majority of new generation facilities are now constructed each year by "merchant" (unregulated) companies, rather than by regulated utilities.[113] And this trend is expected to continue with more distributed generation, including solar rooftop facilities, continuing to proliferate.[114] With an increase of independent power projects (IPPs) and an increase in renewable energy facilities now dominating new power facilities, this raises an interesting legal question about how such independent wind projects, for example, obtain transmission rights to move their power from remote sites to population centers. The conventional regulated retail utilities have access to state siting powers not yet necessarily available to IPPs. And states and localities differently exercise their siting authority for both generation facilities and lines to move their power.

Solar and wind facilities capture a less dense form of power than fossil fuels, and therefore require much more land to generate an equivalent amount of power.

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[113] "In the 1970s, vertically integrated utility companies (investor-owned, municipal, or cooperative) controlled over 95 percent of the electric generation in the United States. . . . by 2004 electric utilities owned less than 60 percent of electric generating capacity. Increasingly, decisions affecting retail customers and electricity rates are split among federal, state, and new private, regional entities." ELECTRIC ENERGY MARKET COMPETITION TASK FORCE, REPORT TO CONGRESS ON COMPETITION IN WHOLESALE AND RETAIL MARKETS FOR ELECTRIC ENERGY 10 (2007); Steven Ferrey, *Sale of Electricity*, *in* THE LAW OF CLEAN ENERGY: EFFICIENCY AND RENEWABLES 217-218 (Michael B. Gerrard ed., American Bar Association Press 2011); *see also Wind Energy Facts at a Glance*, AM. WIND ENERGY ASS'N, www.awea.org/Resources/Content.aspx?ItemNumber=5059; *Scheduled 2015 capacity additions mostly wind and natural gas; retirements mostly coal,* U.S. ENERGY INFO. ADMIN., www.eia.gov/todayinenergy/detail.cfm?id=20292 (Mar. 20, 2015).

[114] *U.S. Solar Market Insight*, SOLAR ENERGY INDUS. ASS'N, http://www.seia.org/research-resources/us-solar-market-insight (Dec. 14, 2017).

Concentrating solar collectors require ten times as much land area, and wind turbines require up to 70 times as much land area, as does a typical fossil-fuel-fired power plant.[115] This is because solar technology is less efficient in generating electricity[116] through a centralized turbine technology than concentrated fossil-fuel technologies.[117] More renewable energy in America involves more land, subject to local police power regulation.

B. *Siting Authority*

What is required to site many smaller renewable energy facilities which require much more land than conventional power generation per unit of power produced? In 12 of the 28 states which have elected to exercise state power facility siting authority, only public utilities are required obtain a siting license or certificate before beginning construction on a generation facility.[118] Independent or "merchant" power generation facilities, which for several successive years have dominated new facility construction in the U.S., are not covered in these 12 of the 28 states exercising siting authority prior to construction. In these 12 states, IPPs must only satisfy local land-use and zoning authorities for construction permission. Local communities traditionally exercised their police power to regulate siting of any land uses.[119]

1. The Scope of State Regulation

Every state that has investor-owned public utilities to regulate through its public utilities commission (PUC).[120] PUCs exercise different authority under disparate state law in different states:[121]

- Whether states exercise any authority over power facility siting
- Whether such authority applies only to projects over a certain minimum size

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[115] Robert Glennon & Andrew Reeves, *Solar Energy's Cloudy Future*, 1 ARIZ. J. ENVTL. L. & POL'Y 93, 104 (2010).

[116] *Id*. at 127 (quoting Electric Power Annual 2008, showing less than 20% efficiency of installed solar capacity).

[117] *Id*. at 101.

[118] *Compare* IND. CODE § 8-1-8.5-7 (2015) (exempting construction of facilities "primarily for that person's own use"); *and* MO. ANN. STAT. § 386.020(15) (2015) (noting exemptions including electricity generated for railroads, and private use of private land).

[119] STEVEN FERREY, ENVIRONMENTAL LAW, *supra* note 103, at 502.

[120] Nebraska has no private utilities, and is the only state without a PUC. NEB. POWER REV. BD., NEBRASKA POWER REVIEW BOARD ORIENTATION MANUAL: HISTORICAL PERSPECTIVE, http://www.powerreviewboard.nebraska.gov/prbmanual/2.html (last visited Mar. 8, 2018).

[121] *See id.* at 12-13.

- Whether it applies only to projects of regulated monopoly utilities, or whether it also includes independent power generation companies
- Whether states exercise preemptive legal authority over otherwise local land-use decisions

Distinguishing stand-alone IPP generation from distributed generation, distributed generation is installed on the consumer side of the retail utility meter, and typically serves on-site power requirements before exporting any surplus power to the grid. A stand-alone IPP project generates power from its location primarily for either wholesale sale, or retail sales in those approximately 13 states that allow IPP retail sales of power.

In 22 states of the 50 states, there is no state energy siting authority or permit required, apart from separate state environmental regulation, for new power generation facilities. In this group[122] of almost half of the states, siting electric power facilities is a local determination in the absence of state siting authority.[123] In the other 28 states, there is separate regulation of new power facility siting at the state level set at different size levels of electric generation facilities.[124] Fifteen of these 28 states have a separate energy facility siting authority which exercises siting authority. States have different size thresholds regarding which new facilities they have jurisdiction over:

- Iowa,[125] New York, [126] Oregon,[127] and Washington[128] mandate commission approval and certification for electric generation plants with a generation capacity of 25 Mw or more.
- New Hampshire exercises jurisdiction over facilitates of at least 30 MW.[129]
- Rhode Island may exercise siting jurisdiction over facilities of 40 Mw or more[130]

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[122] These states are Arizona, California, Connecticut, Florida, Maine, Massachusetts, Nebraska, Kentucky, New Hampshire, New York, Ohio, Oregon, Rhode Island, Washington, and Wyoming.

[123] *See generally*, FERREY, ENVIRONMENTAL LAW, *supra* note 103, at 502.

[124] These states include Arizona, California, Connecticut, District of Columbia, Florida, Iowa, Kentucky, Maine, Maryland, Massachusetts, Minnesota, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New York, New Mexico, North Carolina, North Dakota, Ohio, Oregon, Rhode Island, South Dakota, Vermont, Virginia, Wisconsin, and Washington.

[125] IOWA CODE § 476A.1 (2015).

[126] *See* N.Y. POWERS OF MUNICIPALITIES & STATE AGENCIES LAW § 172 (McKinney 2011); Patricia E. Salkin, 2 N.Y. Zoning Law & Prac., § 11:23.10 (2017).

[127] *See* Or. R. Stat. at § 460.300 (defining terms).

[128] *See* ODOE: Energy Facility Siting, OREGON.GOV, http://www.oregon.gov/energy/Siting/Pages/compare.aspx (comparing consolidated review process in Montana, California, and Oregon).

[129] N.H. REV. STAT. §162-H:2 (2014) (defining an "energy facility" subject to regulation by N.H. REV. STAT. § 162-H:4).

[130] R.I. GEN. LAWS §42-93-3 (2014) (defining major energy facility as capable of operating at 40 MW or more).

- Minnesota, [131] Montana, [132] North Dakota[133] and Ohio[134] exercise jurisdiction over new plants of 50 Mw or more.
- Maryland [135] and Nevada[136] regulate new facilities of 70 Mw or more.
- Florida[137] regulates new electric generation facilities of 75 Mw or more,
- Arizona, [138] California, [139] Massachusetts,[140] North South Dakota, [141] and Wisconsin[142] exercise siting authority over facilities of 100 Mw or more.
- New Mexico[143] and North Carolina[144] set jurisdiction at new facilities of 300 Mw or more.

Depending on state law, in these twenty-eight states, the state siting authority will consider different factors for siting, including whether the proposed facility will meet electricity needs, the impact on those living in the area of the facility, aesthetic and environmental considerations, and the economic impact of the facility and its costs, under different standards: Arizona,[145] California,[146] Connecticut,[147] Florida,[148] Iowa,[149] Kentucky,[150] Maine,[151] Maryland,[152] Massachusetts,[153]

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[131] MINN. STAT. § 216B.2421 (2015) (defining what size power plants and transmission lines with be subject to this process).

[132] *See* ODOE: Energy Facility Siting, OREGON.GOV, http://www.oregon.gov/energy/Siting/Pages/compare.aspx (last visited Dec. 13, 2017) (comparing consolidated review process in Montana, California, and Oregon).

[133] N.D. CENT. CODE § 49-22-03(5)(b) (2015).

[134] OHIO REV. CODE. § 4906.04 (2015).

[135] MD. CODE ANN., PUB. UTIL. § 7-207.1 (2013); MD. CODE REGS. 20.79.01.02 (2015) (exempting plants that do not meet definition listed in § 7-207.1).

[136] NEV. REV. STAT. § 704.860 (2015).

[137] *See* FLA. STAT. § 403.506 (2015).

[138] ARIZ. REV. STAT. § 40-360(9) (2015).

[139] *See* Eric Garofano, Note, *Losing Power: Siting Power Plants in New York State*, 4 ALB. GOV'T L. REV. 744 (2011); *see also* CAL. PUB. RES. CODE § 25541 (1999).

[140] *See* MASS. GEN. LAWS ch. 164, § 69G (2017).

[141] S.D. CODIFIED LAWS § 49-41B-2, (6), (13) (2018).

[142] *See* WIS. STAT. § 196.491(g) (2017).

[143] *See* N.M. STAT. §§ 62-9-3(A)-(B) (2018); N.M. STAT. § 62-9-3(a) (2015).

[144] N.C. GEN. STAT. § 62-110.1 (2017) (requiring certificate for any person or generating utility to construct a facility to furnish public utility service); 4 N.C. ADMIN. CODE 11.R8-61 (2018) (clarifying plants that produce over 300 MW or are included in the rate base are subject to greater scrutiny).

[145] *See* ARIZ. REV. STAT. § 40.360.06(A) (2017); *Arizona Corporation Commission,* AZ. CORP. COMM. http://www.azcc.gov/Divisions/Utilities/Electric/LineSiting-FAQs.asp (last visited Mar. 8, 2018).

[146] *See* CAL. ENERGY COMM'N, PUBLIC PARTICIPATION: PRACTICE AND PROCEDURE GUIDE 121 (2006); CAL. CODE REGS. tit. 20, §§ 1745.5(b), 1751(a) (repealed 2015) (dictating decision be based exclusively on evidentiary record from hearing).

[147] CONN. GEN. STAT. § 16-50P (2017).

[148] *See* FLA. STAT. § 403.509(3)(a)-(g) (2018); *see also id.* § 403.5065; *id.* § 403.508(1)(b)-(d).

[149] IOWA CODE § 476A.5 (2018).

[150] *See* KY. REV. STAT. § 278.710(1)(a)-(i) (2018).

[151] PRESENTATION TO VT ENERGY GENERATION SITING POLICY COMM'N, AN INTRODUCTION TO MAINE'S ENERGY SITING LONG-TERM CONTRACTING CONSIDERATIONS, (Dec. 19, 2012),

Minnesota,[154] Montana,[155] Nebraska,[156] Nevada,[157] New Hampshire,[158] New York,[159] Ohio,[160] Oregon,[161] Rhode Island,[162] South Dakota,[163] Vermont,[164] Washington,[165] and Wisconsin.[166]

2. Preemption of Siting Authority at the State Level

In some of the 28 states with state siting authority, the state decision preempts local authority: Arizona,[167] California,[168] Connecticut,[169] Florida,[170] Iowa,[171] Kentucky,[172] Maine,[173] Maryland,[174] Massachusetts,[175] Minnesota,[176] Montana,[177] New Hampshire,[178] New Mexico,[179] New York,[180] Ohio,[181] Oregon,[182] Rhode

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http://sitingcommission.vermont.gov/sites/vegspc/files/documents/publications/ME-Bergeron-121912.pdf; *see also* STATE OF ME. DEP'T OF ENVTL. PROTECTION, SITE LOCATION OF DEV., PERMIT APPLICATION, (Oct. 2015), http://www.maine.gov/dep/land/sitelaw/application-text-2015.pdf, (describing process, including sample application and certification forms).

[152] *See* MD. CODE, Certificate of Public Convenience and Necessity Required § 7-207(b)(1) (LexisNexis 2017).

[153] MASS. GEN. LAWS. ch. 164, § 69J 1/4 (2018) (This finding does not require a determination of need); *see id.*

[154] *See* MINN. STAT. § 216E.03(7) (2015).

[155] MONT. CODE § 75-20-301 (2015).

[156] NEB. REV. STAT. § 70-1014 (2015).

[157] NEV. REV. STAT. § 704.890 (2015).

[158] N.H. REV. STAT. § 162-H:16 (2015).

[159] N.Y, Board Decisions LAW § 168(2) (McKinney 2015).

[160] OHIO REV. CODE § 4906.10(A)(1)-(8) (2015).

[161] *See* OR. ADMIN. R. 345-022-0000 (2015) (offering general standard of review); *see also* ODOE: Energy Facility Siting, OREGON.GOV, http://www.oregon.gov/energy/facilities-safety/facilities/Pages/Siting-Standards.aspx (listing fundamental questions needing to be answered).

[162] *See id.* at 1.13(c)(1).

[163] S.D. CODIFIED LAWS §§ 49-41B-7(1)-(10) (2015).

[164] VT. STAT. tit. 30, § 248 (2015); *Citizens' Guide to the Vermont Public Service Board's Section 248 Process*, Vt. PUB. SERV. BRD., http://puc.vermont.gov/sites/psbnew/files/doc_library/psb-citizens-guide-section-248-process.pdf.

[165] *See* ENERGY FACILITY SITE EVALUATION COUNCIL, Siting /Review Process, http://www.efsec.wa.gov/cert.html#Certification.

[166] WIS. STAT. § 196.491(3)(d) (2015).

[167] ARIZ. REV. STAT. § 40-360.05(2) (2015) (which allows "each county and municipal government and state agency interested in the proposed site" to become a party to the certification proceedings at the state, rather than local, level.).

[168] *See* Eric Garofano, *supra* note 139; *see also* Cal. Pub. Res. Code § 25500 (2014).

[169] *See* CONN. GEN. STAT. §16-50X, §16-243 (2015).

[170] FLA. STAT. § 403.502, § 403.506, § 403.508(f) (2015).

[171] IOWA CODE § 476A.5 (2015).

[172] KY. REV. STAT. § 278.704(1), (3) (2015).

[173] See ME. REV. STAT. tit. 12 § 685 (2015).

[174] MD. PUB. SERV. COMM. § 20.79.01.04 (2015).

[175] *See* MASS. GEN. LAWS. ch. 164 §69K (2014).

[176] MINN. STAT. § 216E.03(1), .05(1), .10 (2015).

[177] MONT. CODE § 75-20-103, 401 (2015).

[178] N.H. REV. STAT. §162-H:1 (2014).

[179] *See* N.M. STAT. § 62-9-3(G) (2015).

Island,[183] South Dakota,[184] Vermont,[185] and Washington.[186] In most but not all of these states with both state and local energy facility siting authority, the state will require that the facility also satisfy local land-use and zoning regulations, although there is the possibility of state preemption: Arizona,[187] California, [188] Connecticut, [189] Florida,[190] Iowa, [191] Kentucky, [192] Maine,[193] Maryland, [194] Massachusetts, [195] Minnesota, [196] Montana, [197] New Hampshire, [198] New Mexico, [199] New York, [200] Ohio, [201] Oregon, [202] Rhode Island, [203] South Dakota, [204] Vermont,[205] and Washington.[206]

Three other states require compliance with local regulations, however, local laws can be preempted under limited special circumstances: New Jersey,[207] Nevada, [208] and Wisconsin.[209] Five of the 28 states with siting statutes still require the applicant to obtain all local land-use and environmental authority approvals as

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[180] N.Y. Powers of Municipalities & State Agencies LAW § 168(e) (2015).

[181] OHIO REV. CODE § 4906.13(B) (2015); *see also* Garofano, *supra* note 139, at 748-49.

[182] *See* The Siting Process for Energy Facilities, OREGON.GOV, http://www.oregon.gov/energy/facilities-safety/facilities/pages/default.aspx (The Council's decision is binding on all state and local entities); *see also* Or. Rev. Stat. § 469.401(3) (2015) (noting certificate binds all state entities, counties, and cities to the approval of the site).

[183] R.I. GEN. LAWS § 42-98-9(a) (2014).

[184] S.D. CODIFIED LAWS § 49-41B-7 (2015).

[185] City of South Burlington v. Vermont Elec. Power Co., 344 A.2d 19 (1975) (Public Service Commission preempted the City's orders).

[186] *See* WASH. REV. CODE § 80.50.030 (2017).

[187] ARIZ. REV. STAT. § 40-360.06(D) (2015).

[188] CAL. ENERGY COMM'N, PUBLIC PARTICIPATION: PRACTICE AND PROCEDURE GUIDE 126 (2006).

[189] *See* CONN. GEN. STAT. §16-50X (2015).

[190] FLA. STAT. § 403.50665 (2015).

[191] IOWA CODE § 476A.5 (2015).

[192] *See* KY. REV. STAT. § 278.704(1)-(2) (2015).

[193] See ME. REV. STAT. tit. 12 § 685 (2015).

[194] MD. PUB. SERV. COMM. § 20.79.01.04 (2015).

[195] *See* MASS. GEN. LAWS ch. 164, §69K (2014).

[196] MINN. STAT. § 216E.03(1) (2015).

[197] MONT. CODE. § 75-20-103 (2015).

[198] N.H. REV. STAT. §162-H:5.4.6.

[199] N.M. STAT. § 62-9-3(G) (2015).

[200] N.Y. POWERS OF MUNICIPALITIES & STATE AGENCIES LAW § 168(e) (2015).

[201] OHIO REV. CODE. § 4906.13(B) (2015); *see also* Garofano, *supra* note 139, at 745.

[202] *The Siting Process for Energy Facilities*, OREGON.GOV, http://www.oregon.gov/energy/Siting/Pages/process.aspx (last visited Nov. 13, 2017) (describing state certification as a one-step process).

[203] R.I. GEN. LAWS § 42-98-9(a) (2014).

[204] S.D. CODIFIED LAWS § 49-41B-28 (2015).

[205] City of South Burlington v. Vermont Elec. Power Co., 344 A.2d 19 (1975) (Public Service Commission preempted the City's orders).

[206] *See* WASH. REV. CODE § 80.50.030 (2010) (detailing process of preempting local land use regulations).

[207] N.J. STAT. § 40:55D-19 (2009).

[208] NEV. REV. STAT. § 704.890 (2015).

[209] EDISON ELECTRIC INST., SURVEY OF TRANSMISSION SITING PRACTICES IN THE MIDWEST, 3 (2004) (hereinafter "EEI").

part of the state siting processes: New Jersey, [210] Nevada, [211] North Carolina, [212] Wisconsin, [213] and Virginia.[214] Local input is obtained either by granting the local officials intervenor party status in the state proceeding or more directly by either creating an advisory committee with local representation, or by having local representation on the state agency considering the permit.

Siting the increasing number of new wind turbines and non-distributed solar photovoltaic generation resources requires approval for the facility and its interconnection to the utility grid. In almost all states, this involves at least permissions from municipal government. Distributed generation, such as a solar panel on a roof or in a yard to serve on-site power needs, often can be allowed as-of-right as an accessory function of the building on the property. Some towns and cities are not permitting the siting of wind power turbines under the local police power over local land use. In response, about half of the states look to preempt local power over wind and/or new power generation siting.

Most states provide their monopoly in-state retail utilities the power of eminent domain to take land rights to build power generation technologies and construct transmission and distribution lines. Even though the large investor-owned utilities are private companies, their exercise of eminent domain is deemed to be for a public purpose of providing electricity. As the utility monopolies grew and extended their services to larger geographic areas, the states extended their eminent domain power to regulated utilities as a necessary government function within the ambit of public use.[215]

With IPPs now creating more than half of new generation facilities each year, should eminent domain power be extended to non-utility independent power producers?[216] In the Connecticut case of *Kelo v. City of New London*, the Supreme Court broadly interpreted the required "public purpose" necessary for the use of eminent domain, holding that private development can constitute "public use."[217] Will states apply eminent domain to new independent power producers?

III. GRID CHANGES TO ACCOMMODATE RENEWABLE INTERMITTENCY

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[210] *See* Eric Garofano, Note, *Losing Power: Siting Power Plants in New York State*, 4 ALB. GOV'T L. REV. 728, 747-48 (2011).

[211] NEV. REV. STAT. § 704.890 (2015).

[212] 4 N.C. ADMIN. CODE 11. R8-63 (2015).

[213] EDISON ELECTRIC INS., SURVEY OF TRANSMISSION SITING PRACTICES IN THE MIDWEST 3 (2004); DEP'T OF NAT. RES. STATE OF WIS., ELECTRIC UTILITY PRE-CPCN APPROVAL AND APPLICATION (2004), http://dnr.wi.gov/files/PDF/pubs/wa/WA606.pdf.

[214] *See id.* at 125; *See also* VA. CODE ANN. § 56-234.3 (2015) (stating requirements for utilities).

[215] *See generally*, In re Bangor Hydro-Electric Co, 314 A.2d 800 (1974).

[216] An independent power producer is a "private entity that operates a generation facility and sells power to electric utilities, wholesalers, or to retail customers." FERREY, THE NEW RULES, *supra* note 103, at 409.

[217] Kelo v. City of New London, 545 U.S. 469 (2005).

Power is only usable when delivered to users over the transmission network.[218] Electricity is essential for the operation of computers, the Internet, medical imaging, national defense and security, and modern communication.[219] A loss of power would disrupt communication and transportation, heating and water supply, and hospitals and emergency rooms.[220] It is not the copper molecule electrons themselves, but the movement of these electrons over transmission and distribution wires, which creates and delivers electric power.[221] The electric power grid must constantly balance supply and demand to keep the grid operational.[222]

Unlike all other forms of energy, moving electrons cannot be efficiently stored as electricity for more than a second before the energy is lost by its conversion to waste heat.[223] Therefore, the supply of electricity must match the constantly changing demand for electricity over the centralized utility grid in real-time every second, to prevent electric system collapse.[224] Either too much or too little power causes system instability.[225] A constant balancing of supply and demand on the grid is required.[226]

There is a controversy as to the extent of the role that renewable power can play in maintaining the grid. Mark Jacobson and his colleagues at Stanford reported in a 2015 report that between 2050 and 2055, the U.S. could be entirely powered by zero-carbon resources, renewable power, and storage with zero use of fossil fuels or nuclear power.[227] They also argued in 2015 that this would be an equally resilient electric grid and would be less expensive than reliance on fossil fuels.[228]

Others argued that this is not possible given the intermittency of solar and wind power as main components of such a plan. In response, a study by a group of prominent climate scientists subsequently responded that the Jacobson study "used invalid modeling tools, contained modeling errors, and made implausible and

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[218] Self-generated distributed power does not require connection to the integrated network, *See* Steven Ferrey, *Exit Strategy: State Legal Discretion to Environmentally Sculpt the Deregulating Electric Environment* 26 HARV. ENVTL. L. REV. 109 (2002) (discussing distributed generation options).

[219] *See* FERREY, *supra* note 70, at § 2:1-2:2 (the use of energy and electricity as the force elevating industry and commerce).

[220] *Id*. at § 4.1.

[221] Steven Ferrey, *Inverting Choice of Law in the Wired Universe*, 45 WM. & MARY L.R. 1839, 1911 (2004).

[222] FERREY, ENVIRONMENTAL LAW, *supra* note 103, at 586.

[223] *Id*.

[224] *Id*.

[225] CRO FORUM, POWER BLACKOUT RISKS, 3.1.2, (Markus Alchinger ed. 2011), https://www.allianz.com/v_1339677769000/media/responsibility/documents/position_paper_power_blackout_risks.pdf.

[226] *See Demanding Times*, ELECTRIC UTIL. WK., Sep. 19, 2008 (discussing challenges of balancing supply and demand within energy grid).

[227] Richard Martin, *Fifty States Plan Charts a Path Away from Fossil Fuels*, MIT TECHN. REV., (June 12, 2015), https://www.technologyreview.com/s/538451/fifty-states-plan-charts-a-path-away-from-fossil-fuels/.

[228] Mark Shwartz, *Stanford Scientist Unveils 50-State Plan to Transform U.S. to Renewable Energy*, (Feb. 26, 2014), https://news.stanford.edu/news/2014/february/fifty-states-renewables-022414.html.

inadequately supported assumptions."[229] They noted that with intermittent renewable energy, there can be a destabilized grid, which leads to its malfunction or collapse.[230] They also argued that the cost of the Jacobson renewable plan is not affordable or cost-effective.[231] "Several of the nearly two dozen researchers (who published the 2017 contrary report) say they were driven to act because the original authors declined to publish what they viewed as necessary corrections, and the findings were influencing state and federal policy proposals."[232]

Jacobson rebutted these criticisms of his work,[233] and then sued his critics for defamation for their criticisms of his work, later dropping his defamation suit in late February 2018.[234] Jacobson's work does not try to justify the cost of his vision, as recently required by the Supreme Court in a decision involving regulation of power generation facilities.[235] The issue is that Jacobson's work assumes a much more robust transmission and distribution system and massive amounts of storage capacity for electricity than exists in fact, in order to move large amounts of solar and wind power across the U.S. to compensate for where the wind and sun are and are not in a given minute. Construction of a more robust system is very expensive and may or may not be cost-effective compared to the existing grid infrastructure.

Wind and solar power are intermittent in supply, and thus distinct from traditional forms of power deployed in the United States. For the constant electric grid balancing process, intermittent wind and solar power cannot reliably supply base-load power to anchor system resiliency. Solar and wind power demonstrate a relatively low availability factor in the 10-40% range of hours during a week or month in which they typically are able to operate.[236] And those hours of wind and solar supply cannot be adjusted to the times that the system desires. The amount of wind power available every day is different in time and duration in each of the 24 hours of the day and from day to day.

The capacity factor of a generation technology documents what percentage of maximum power generation of the equipment is realized in operation. The record U.S. annual wind capacity factor was 33.9% in 2014; the U.S. Department of Energy (DOE) EIA says the median wind capacity over the past decade was

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[229] *See* Victor Clark, MIT TECHNOLOGY REVIEW, https://www.technologyreview.com/s/608126/in-sharp-rebuttal-scientists-squash-hopes-for-100-percent-renewables/; *see also* James Temple, *Scientists Sharply Rebut Influential Renewable-Energy Plan*, M.I.T. TECHN. REV. (June 19, 2017), https://tutorial.glgresearch.com/tutorial/51581/39f3d39e-78d9-4f1d-bdd6-701e993d3329.

[230] *Id.*

[231] *Id.*

[232] *Id.*

[233] Mark Jacobson et al., *The United States Can Keep the Grid Stable at Low Cost with 100% Clean, Renewable Energy in all Sectors Despite Inaccurate Claims*, Proceedings of the National Academy of Sciences, June 19, 2017 (Jacobson replied that "They don't like the fact that we're getting a lot of attention, so they're trying to diminish our work." He stated that "There is not a single error in our paper."); *see also* Temple, *supra* note 230.

[234] Ellen M. Gilmer, *Professor Drops Defamation Suit Over Dueling Energy Research*," E&E NEWS (Feb. 23, 2018), https://www.eenews.net/energywire/2018/02/23/stories/1060074571.

[235] Michigan v. E.P.A., 135 S. Ct. 2699, (2015).

[236] *See* Ferrey, *supra* note 70, § 2:11 (noting inability of intermittent sources to serve as base-load resource).

31%.[237] In the United Kingdom, the wind capacity factor ranged from a low of 21.5% in 2010 to a high of 27.9% in 2013.[238] With solar panels in the United States, the capacity factor is even less than for wind power. Where a technology achieves a capacity factor of less than half of its generating capacity and does so at uncontrollable times, it does not contribute to system required reliability.

The U.S. Department of Energy calculated that approximately 20% of wind power could be accommodated on the grid, without requiring additional storage or other mechanisms to accommodate intermittency.[239] Even at no more than 20% wind penetration in a grid, there could be a 33-50% displacement of the operation of combined-cycle fossil fuel-fired generation units in the system, to accommodate the power from wind turbines when they are turning.[240]

Intermittent renewable power resource operation has already been a factor in grid operations. For example, from February to April 2014, the California Integrated System Operator (CAISO) was required to curtail wind and solar generation four times for a total of six hours to balance supply and demand on the system.[241] The over-generation and subsequent curtailments affected 485 MW of wind and 657 MW of solar during one period, raising system costs.[242] These curtailments can be expected to become a larger issue as intermittent power sources increase in use throughout the United States.

Hawaii provides a second example, where twelve percent of rooftops in Hawaii have solar panels installed, the highest percentage in the United States.[243] With this large number of net metering solar participants, more surplus power was being produced than was being used.[244] Consequently, "the energy (could) flow back to the substation . . . which (could) lead to reliability problems and possibly surges. And if crews are working in the area, there's a potential danger."[245] In response, Hawaii eliminated its net metering program entirely in 2015, replacing it with two

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[237] Planning Engineer & Rud Istvan, *True Costs of Wind Electricity*, CLIMATE ETC.,(May 12, 2015), http://judithcurry.com/2015/05/12/true-costs-of-wind-electricity/.

[238] *Id.*

[239] J. DECESARO & K. PORTER, WIND ENERGY AND POWER SYSTEM OPERATIONS: A REVIEW OF WIND INTEGRATION STUDIES TO DATE, 12 ELECTRICITY J. 34 (2009) (Wind, being at off-peak times in many locations, will tend to displace typical coal base-load power, while solar PV units will tend to displace typical on-peak gas-fired peaking generation units).

[240] J. NICHOLAS PUGA, *The Importance of Combined Cycle Generating Plants in Integrating Large Levels of Wind Power Generation*, 23 ELECTRICITY J. 33 (2010).

[241] David Howarth & Bill Monsen, *Renewables Face: Daytime Curtailments in California*. PROJECT FIN. NEWSWIRE (Nov. 2014), http://www.chadbourne.com/files/Publication/a92d70c1-4d71-4984-aed2-0d8f3925e51a/Presentation/PublicationAttachment/d77e681e-d47a-4a7d-a149-0dbf574776fd/pfn_1114.pdf#page=12 (accessed Oct. 22, 2016).

[242] *Id.*

[243] *See* Christian Roselund, *Hawaii Shuts Down Net Metering to New Customers*, PV MAG. (Oct. 14, 2015), https://www.pv-magazine.com/2015/10/14/hawaii-shuts-down-net-metering-to-new-customers_100021550/.

[244] *See Net Metering Battles: Hawaii*, ENERGYSAGE, http://news.energysage.com/net-metering-battles-hawaii/ (last visited Nov. 9, 2017).

[245] Anne C. Mulkern, *A Solar Boom So Successful, It's Been Halted*, SCI. AM. (Dec. 20, 2013), https://www.scientificamerican.com/article/a-solar-boom-so-successfull-its-been-halted/.

options: "self-supply" and "grid supply."[246] "Self-supply" "does not allow customers to export any rooftop PV energy back to the grid, except very limited amounts for a short duration,"[247] and its receipt is not compensated by the utility."[248] "Grid supply" allows customer export of energy to the grid, for which they receive a lower-value credit than under net metering.[249]

As solar and wind as a percentage of total generation increase and the unpredictable intermittency of power supply in the system becomes larger, there must be operation of more quick-start spinning reserve to respond to the constantly changing intermittency of solar and wind generation and to provide load-following generation.[250] Spinning reserve typically has fossil fuel-fired and other base-load units "spin" at partial output when not needed to be capable of "ramping" up quickly to fill power gaps from intermittent power output changes. There are both costly financial and negative environmental costs to spinning backup fossil power resources, which I've dealt with in detail in my prior article.[251]

Not all renewable power generation resources are intermittent, including hydroelectric and geothermal power which can be a resilient supply. In the early 1900s, hydroelectric power accounted for more than 40% of the U.S. supply of electricity.[252] Today, more than 2,200 hydropower plants in the United States provide 100,000 Mw of hydropower capacity, about 10% of all installed electric generating capacity in the U.S.[253] Geothermal and hydro renewable power are "base-load" power generation resources that can be operated at times desired by the grid manager and contribute to grid reliability, unlike individual solar and wind projects.

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[246] *See State Net Metering Policies*, NAT'L CONF. OF STATE LEGISLATURES (Nov. 20, 2017), http://www.ncsl.org/research/energy/net-metering-policy-overview-and-state-legislative-updates.aspx; Phil Cross, *Net Metering Skirmishes in Hawaii, California, Mississippi, Nevada*, PUB. UTIL. FORT. (Feb. 2016), https://www.fortnightly.com/fortnightly/2016/02/net-metering-skirmishes-hawaii-california-mississippi-nevada.

[247] *See* NAT'L CONF. OF STATE LEGISLATURES, *supra* note 246.

[248] Mark Dyson and Jesse Morris, *Hawaii Just Ended Net Metering for Solar. Now What?,* RMI OUTLET (Oct.16, 2015), https://rmi.org/news/hawaii-just-ended-net-metering-solar-now/.

[249] *See* Cross, *supra* note 246, at 56; *see* Krysti Shallenberger, *Hawaii Regulators Nix Bid To Raise Caps on Grid-Supply Rooftop Solar Incentive*, UTILITY DIVE (Dec. 15, 2016), http://www.utilitydive.com/news/hawaii-regulators-nix-bid-to-raise-caps-on-grid-supply-rooftop-solar-incent/432464/. Compensation is based on "the 12-month average on-peak avoided cost ending in June 2015," lower than the retail rate.

[250] W. Edward Platt & Richard B. Jones, *The Impact of Carbon Trading on Performance: What Europe's Experience Can Teach North American Generators*, POWER MAG. (Jan. 1, 2010), available at http://www.powermag.com/the-impact-of-carbon-trading-on-performance-what-europes-experience-can-teach-north-american-generators/.

[251] Steven Ferrey, *The Poles of Power: Magnetic Bi-Directional Turn of the Meter*, 8 GEO. WASH. J. ENERGY & ENVTL. L. 39 (2017).

[252] *See* U.S. Department of Interior Bureau of Reclamation, *Hydropower Program: The History of Hydropower Development in the United States*, http://www.usbr.gov/power/edu/history.html (last visited Jan. 14, 2018).

[253] *See* National Hydropower Association, *U.S. Hydropower Industry Snapshot*, http://www.hydro.org/why-hydro/available/industrysnapshot/ (last visited Nov. 14, 2017), available at https://perma.cc/KFG2-ZYXJ.

Grid modifications, upgraded circuits and transformers, and expansion of the transmission and distribution infrastructure are necessary to accommodate an increased percentage of intermittent solar and wind power.[254] In Germany, their switch to more intermittent renewable generation already has resulted in an additional 1 billion euro cost, with tens of billions more of investment still required.[255] From the author's work on renewable energy in developing countries accommodating increased amounts of renewable power, current (which is load) or voltage changes can be a limiting factor for integration of intermittent solar or wind power on a grid or circuit.[256] There is greater impact on systems if the PV facility(ies) is connected a long way from the transformer serving the circuit.[257] Where voltage varies on a circuit, high voltage can affect insulation and result in short circuits, while low voltage can impair connected appliance operation. Compensation equipment can control voltage.[258] A substantial amount of intermittent solar power can be accommodated on a circuit or grid, with compensation.

These spinning power units increasing their use and output will be natural gas-fired units. The projection of the U.S. Department of Energy, going forward, is that there will be a significant increase in U.S. natural gas usage with a corresponding significant decrease in coal use in the next 25 years.[259] With new shale gas supply, the real price of natural gas in 2016 is below the price it was twenty years earlier in 1996.[260] In a recent five-year period, natural gas prices have fallen precipitously to one-third of their prior value.[261]

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[254] Lincoln Davies & Kirsten Allen, *Feed-in Tariffs in Turmoil*, 116 W. VA. L. REV. 937, 1002 (2014)

[255] *Id*. at 1002 & n.419.

[255] *Id*. at 1002 & n.419.

[256] Greater load flow increases the temperature increase in conducting material of the lines, which can create a problem.

[257] As a basic principle, when a circuit has short lines, typically it is current that will be the limiting factor for certain distributed generation solar PV additions for supply, with longer circuit lines, voltage is the limiting factor on PV integration in a system.

[258] Voltage deviations typically are of the greatest amount at the end of a distribution feeder, which can be controlled nearer those variation points with tap changers at specific nodes. PV systems have reactive power to adjust voltage at the point of injection into the grid interconnection line. There also can be active voltage control by modern, sophisticated PV inverters to control reactive power injection actively depending on voltage issues, in order to reduce voltage. PV systems have reactive power that can be harnessed to adjust voltage at the point of injection of that power into the grid interconnection line. In grids with no loading issues, a fixed power factor of 0.95 lagging shows greater capacity in terms of accommodating more PV intermittent power as a percentage on the system.

[259] *Fossils fuels still dominate U.S. energy consumption despite recent market share decline*, TODAY IN ENERGY, ENERGY INFORMATION ADMINISTRATION, U.S. DEPARTMENT OF ENERGY (July 1, 2016), https://www.eia.gov/todayinenergy/detail.cfm?id=26912.

[260] *Henry Hub Natural Gas Spot Price*, ENERGY INFORMATION ADMINISTRATION, U.S. DEPARTMENT OF ENERGY, https://www.eia.gov/dnav/ng/hist/rngwhhdm.htm.

[261] Gail Tverberg, *Why U.S. Natural Gas Prices are so Low-Are Changes Needed?,* OUR FINITE WORLD (Mar. 23, 2012), https://ourfiniteworld.com/2012/03/23/why-us-natural-gas-prices-are-so-low-are-changes-needed/.

[261] Gail Tverberg, *Why U.S. Natural Gas Prices are so Low-Are Changes Needed?,* OUR FINITE WORLD (Mar. 23, 2012), https://ourfiniteworld.com/2012/03/23/why-us-natural-gas-prices-are-so-low-are-changes-needed/.

CONCLUSION

Renewable power has now cleared economic barriers as the technology of economic and environmental choice for new power supply in many countries, including the U.S. Because it is a less concentrated and dense form of energy than fossil fuels, renewable energy requires use of much more land than fossil fuel to convert an equivalent amount of energy to electricity. Because the best wind power sites in the U.S. typically are not near consumers, a significant switch to more wind power requires new transmission infrastructure to move the power from its point of generation to points of consumption. States and localities, and their regulatory law, are the legal bottleneck to site more power transmission facilities. Federal law is not able to significantly influence, override, or preempt transmission infrastructure siting. Each of the states is different in whether state or local permissions, or both, are or are not needed for renewable energy facility location and transmission capacity siting, and whether or not independent non-utility companies are subject to siting permission and/or may exercise eminent domain to obtain necessary land access to generate and transmit power.

For fast increasing solar and wind power, a challenge is their intermittency and effect on grid resiliency, and how the grid will need to be augmented with spinning and ramp-able power supply or power storage. Intermittency of any power supply can be mitigated by technologies to backstop generation capacity, at a price.

To date, there is no discernable diminution in carbon reduction from the U.S. power sector after a significant change with the ongoing repeal and lack of enforcement of the Obama Clean Power Plan or announced withdrawal from the 2015 Paris Agreement on climate. Decreasing costs, existing subsidies, and ease of siting because of minimal environmental concerns, have made renewable energy the dominant form of new U.S. power generation in recent years.[262] The Clean Power Plan, promulgated through regulations rather than through congressional statute, was not scheduled to have any effect until reductions in 2022. There was and is not yet any direct impact of CPP. The next decade will tell.

Renewable energy moved into its primary position for new power development technology because of basic economic factors.[263] Energy law and regulation remain essential for siting and transmission of power and how the power grid is managed. The role of law is to carefully and affectively interface with economic forces as the shape of the grid is reconfigured.

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[262] *See id. at Section I D.*

[263] *Sustainable Energy in America: 2018 Factbook*, *Executive Summary*, BLOOMBERG NEW ENERGY FINANCE (Feb. 15, 2018), http://www.bcse.org/wp-content/uploads/2018-Sustainable-Energy-in-America-Factbook_Executive-Summary.pdf.


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RENWABLE ENERGY AND ELECTRIC GRID STABILITY AFTER THE U.S. PARIS WITHDRAWAL: LOOKING ABROAD FOR GUIDANCE?

Vincent P. Pace[*]

Abstract

The United States had been a long-time leader in facilitating the shift to renewable energy as a key component of the long-term strategy to mitigate climate change. However, after the 2016 Presidential election the Trump Administration pulled out of the Paris Agreement. What does this mean for the United States' ongoing leadership position? This paper argues that the United States will continue to lead through the efforts of state and local authorities as well as the private sector and offers guidance on how to ensure the renewable energy sector's growth in the U.S.

This paper will analyze the renewable energy sectors in Germany, China and Canada, with a specific look at grid stability, in order to make recommendations to the U.S. states and municipalities on renewable energy growth. This paper will also analyze the different methods international players have used to get companies and individuals to engage with the renewable grid, including feed-in tariffs and net metering, in order to provide further recommendations to local, state and private-sector authorities.

Finally, this paper will look at grid-stability lessons from abroad, noting that local and private sector actors will need to ensure that renewable grids are not overly dependent on intermittent weather-dependent renewable sources. This paper will argue that modifications to existing energy market rules and subsidies to non-weather dependent energy generators, while ensuring not to alienate renewable energy sources, are the best ways to ensure grid stability.

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I. INTRODUCTION: WHITHER THE UNITED STATES IN RENEWABLE ENERGY AND CLIMATE CHANG POLICY?

On April 22, 2016, the U.S. joined 197 other parties and signed the Paris Climate Agreement ("Paris Agreement" or "agreement"),[1] pledging to work together through national programs to curb the growth and reduce greenhouse gases. The Paris Agreement exists under the United Nations Framework Convention on Climate Change,[2] Article 3 of which requires signatories to "undertake and communicate ambitious efforts" to mitigate greenhouse gas emissions.[3] Signatories "set a goal of limiting warming to 2 degrees Celsius - or 3.8 degrees Fahrenheit - by the end of this century. If warming and fossil fuel use continue at current levels, the planet could warm 7 or 8 degrees Fahrenheit by 2100."[4] U.N. Secretary-General Ban Ki-moon called it a "monumental triumph for people and the planet."[5]

In June 2016, former President Obama and the leaders of Canada and Mexico jointly announced their support for an equally ambitious goal to have North America strive to collectively achieve 50% clean power generation by 2025.[6] This announcement—coupled with the U.S.'s decision to sign the Paris Agreement approximately two months earlier—signaled to many observers that the U.S. could potentially devote greater federal resources toward renewable energy, and it was

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[1] *See* United Nations Treaty Collection, Paris Climate Agreement, CHAPTER XXVII, ENVIRONMENT, 7. d Paris Agreement, Paris, 12 December 2015, *available at* https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-7-d&chapter=27&clang=_en.

> The Paris Agreement was adopted on 12 December 2015 at the twenty-first session of the Conference of the Parties to the United Nations Framework Convention on Climate Change held in Paris from 30 November to 13 December 2015. In accordance with its article 20, the Agreement shall be open for signature at the United Nations Headquarters in New York from 22 April 2016 until 21 April 2017 by States and regional economic integration organizations that are Parties to the United Nations Framework Convention on Climate Change." *Id.*

[2] Lloyd M'bwana, *COPs 23: Malawi to Spearhead Paris Agreement Implementation*, THE MARAVI POST (AFRICA), Oct. 6, 2017, 2017 WLNR 30598691 (stating "The Paris Agreement has 197 signatories. Of the 197 signatories, 153 States have deposited their Instrument of Ratification. The Paris Agreement entered into force on November 4, 2016 after the threshold of at least 55 countries, accounting for 55 per cent of global greenhouse gas emissions was reached.").

[3] Paris Agreement *supra* note 1 at Article 3.

[4] Paul Rogers, *Warmer Days: Heat Waves Will Become More Frequent, Hotter*, San Jose Mercury News, Sept. 2, 2017. "The historic Paris Climate Agreement approved in December 2015 by 196 nations sets an ambitious goal of holding the global average temperature increase "well below" 2° Celsius (C) above pre-industrial levels." Patrick Parenteau, Mingde Cao, *Carbon Trading in China: Progress and Challenges,* 46 Envtl. L. Rep. News & Analysis 10194 (2016).

[5] *COP21: UN Chief Calls New Climate Change Accord 'Monumental Triumph'*, BALOCHISTAN TIMES, Dec. 13, 2015, 2015 WLNR 36953951.

[6] Maya Rhodan, *President Obama to Make Clean Energy Pledge With Canada, Mexico at Summit*, TIME MAGAZINE (June 27, 2016), http://time.com/4384765/barack-obama-clean-energy-pledge-north-america-canada-mexico/; *US, Canada and Mexico Pledge 50% of Power From Clean Energy by 2025*, GUARDIAN (June 27, 2016), https://www.theguardian.com/environment/2016/jun/28/us-canada-and-mexico-pledge-50-of-power-from-clean-energy-by-2025.

prepared to partner with other nations to achieve that goal. These important developments engendered optimism among those Americans who view renewable energy as a key component of our long-term strategy to mitigate climate change and encourage the development of a more diverse mix of resources to satisfy domestic energy consumption.

The November 2016 U.S. Presidential election, however, had an impact on that optimism. Some proponents of renewable energy viewed the 2016 election as a potential setback to achieving the prior administration's renewable energy goals.[7] Each presidential administration should of course be evaluated based on its overall performance over a four or eight-year term. Even though the current administration has not completed its current term, proponents of renewable energy have focused on the following developments whereby the administration has withdrawn or limited several of the prior administration's renewable energy policies. Those developments include, most importantly, the announcement in June 2017, that the U.S. intended to withdraw from the Paris Agreement.[8] In addition, in September 2017, the administrator of the U.S. Environmental Protection Agency (EPA) announced the administration's intent to repeal the U.S. Clean Power Plan,[9] a 2015 initiative that sought to reduce greenhouse gas emissions from U.S. power plants. In October 2017, the Secretary of the Department of Energy (DOE) asked the Federal Energy Regulatory Commission (FERC) to initiate a rulemaking proceeding to primarily benefit coal-fired power plants.[10] In January 2018, the administration announced it would impose a 30% tariff on foreign-made solar cells and modules, a move designed to benefit U.S.-based manufacturers of this

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[7] *See, e.g.,* Matt Egan, *Trump's Renewable Energy Cuts Alarm Former Officials*, CNN MONEY USA (June 8, 2017), http://money.cnn.com/2017/06/08/investing/renewable-energy-trump-budget-cuts/index.html; Jonathan Hahn, *Trump Orders Clean Power Plan Dismantled in Setback for "Vitally Important" Clean Air,* SIERRA (Mar. 28, 2017), https://sierraclub.org/sierra/green-life/trump-orders-clean-power-plan-dismantled-setback-for-vitally-important-clean-air; Steven Mufson, *These Titans of Industry Just Broke With Trump's Decision to Exit the Paris Accords*, WASHINGTON POST (June 1, 2017), https://www.washingtonpost.com/news/energy-environment/wp/2017/06/01/these-titans-of-industry-just-broke-with-trumps-decision-to-exit-the-paris-accords/?utm_term=.eefd5875d106.

[8] Michael D. Shear, *Trump Will Withdraw U.S. From Paris Climate Agreement,* N.Y. TIMES (June 1, 2017), https://www.nytimes.com/2017/06/01/climate/trump-paris-climate-agreement.html.

[9] Molly Christian, *Washington Week: Power Sector Gets Reassurances on FERC Grid* Action, SNL POWER DAILY WITH MARKET REPORT, Oct. 17, 2017, 2017 WLNR 31946046 (stating "The U.S. Environmental Protection Agency on Oct. 10 formally proposed to repeal the Obama administration's Clean Power Plan, which would have driven substantial cuts in utility carbon emissions. Although utilities expect to keep shifting to lower-emitting generation, the repeal could allow several states to ease decarbonization efforts, particularly those heavily reliant on coal that would have faced steeper reduction targets.").

[10] Donna Bobbish, *DOE Directs FERC To Consider Rule Providing Cost Recovery For Coal- And Nuclear-Fired Generating Facilities Operating In RTO/ISO Markets*, MONDAQ, Oct. 11, 2017, 2017 WLNR 31093206 (stating "DOE's decision to invoke this rarely used provision of the DOE Organization Act has been interpreted by industry observers as a fulfillment of President Trump's campaign promises to help the US coal industry by shielding coal- and nuclear-fired baseload power plants from competitive wholesale markets at the expense of natural gas-, wind- and solar-powered generating facilities.").

technology but which some industry observers have claimed could potentially hamper solar installation rates in the U.S. by driving up overall installation costs.[11]

What does all this mean for U.S. leadership in facilitating the shift to renewable energy as a key component of our long-term strategy to mitigate climate change?

A. *A Shift to the States, Cities, and the Private Sector?*

Following the announcement of the withdrawal from the Paris Agreement, former President Obama stated:

> The nations that remain in the Paris Agreement will be the nations that reap the benefits in jobs and industries created, . . . I believe the United States of America should be at the front of the pack. But even in the absence of American leadership, even as this administration joins a small handful of nations that reject the future, I'm confident that our states, cities, and businesses will step up and do even more to lead the way, and help protect for future generations the one planet we've got.[12]

Additionally, many U.S. governors and mayors have responded to the withdrawal from the Paris Agreement by pledging their continued commitment to carbon reduction goals. For example, the Governors of California, Oregon and Washington stated:

> In response to President Trump's announcement of his intention to withdraw the U.S. from the Paris Climate Agreement, our states played a leadership role in establishing the U.S. Climate Alliance—a coalition of states committed to achieving the U.S. government's prior goal of reducing carbon dioxide emissions 26-28 percent from 2005 levels, by 2025.[13]

In June 2017, a coalition of "[t]hirty states and scores of companies said . . . that they would press ahead with their climate policies and pursue lower greenhouse gas emissions, breaking sharply with President Trump's decision to exit the historic Paris climate accord."[14] For example, Google, Apple, Intel,

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[11] Oliver Millman, *Donald Trump's Tariffs on Panels Will Cost US Solar Industry Thousands of Jobs*, GUARDIAN (Jan. 23, 2018), https://www.theguardian.com/environment/2018/jan/23/donald-trump-tariffs-solar-panels (stating the "decision to impose a tariff on imported solar panels will cost the US solar industry about 23,000 jobs this year and risks slowing the growth of clean energy that would help address climate change, renewable energy advocates warned.").

[12] Alicia Powe, *Obama Pounces Again! Ex-Prez Bashes Trump over Illegal Aliens; Still Insists Nation's Agenda Follow his Outline,* WND (WORLDNETDAILY), Sept. 6, 2017, 2017 WLNR 27419320.

[13] *Connelly: West Coast Governors Tell Trump: No Oil, Gas Leases Off our Coast,* SEATTLE POST-INTELLIGENCER, Aug. 17, 2017, 2017 WLNR 25490901.

[14] Steven Mufson, *These Titans Of Industry Just Broke With Trump's Decision To Exit The Paris Accords*, WASH. POST (June 1, 2017), https://www.washingtonpost.com/news/energy-

Microsoft, Mars, Schneider Electric, Morgan Stanley and other large national and international corporations encouraged the U.S. to remain a signatory to the Paris Agreement.[15] In addition, approximately 350 mayors representing more than 65.8 million Americans in 44 states expressed their continued support for the Paris Agreement.[16] For example, the Mayor of New York stated, "Big problems require big solutions – and New Yorkers are already hard at work to meet the most ambitious goals of the Paris Agreement."[17] Additionally, many U.S.-based nonprofit coalitions were formed to advance the renewable goals of the agreement, including "America's Pledge," which was jointly formed in July 2017 by California Governor Jerry Brown and Michael Bloomberg "to compile and quantify the actions of states, cities and businesses in the United States to drive down their greenhouse gas emissions consistent with the goals of the Paris Agreement."[18]

These developments suggest that U.S. states, municipalities and the private sector are expected to continue to play a strong role domestically in promoting renewable energy. In addition, some U.S. states have endeavored to play a role in international renewable energy policy as well. For example, following the announcement of the withdrawal from the Paris Agreement, California Governor Jerry Brown conducted a California-China climate mission. He also signed a joint statement on climate cooperation between California and Germany, stating:

> China and Germany—two of the most powerful countries in the world—are working with California and with other states to deal with climate change, . . . The current withdrawal from the Paris Accord by the Washington administration is being overcome and countermanded by people throughout the whole world.[19]

In response, German Federal Minister for the Environment, Barbara Hendricks, stated that the "United States' withdrawal from the Paris Agreement underscores the significance of subnational actors in particular in our joint efforts to achieve the overall objective and goals"[20] and "[t]ogether with California,

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environment/wp/2017/06/01/these-titans-of-industry-just-broke-with-trumps-decision-to-exit-the-paris-accords/?utm_term=.6afc6321a986.

[15] *Id.*

[16] Alissa Walker, *350 Mayors Adopt Paris Climate Accord After U.S. Pulls Out*, CURBED (July 11, 2017), https://www.curbed.com/2017/6/1/15726376/paris-accord-climate-change-mayors-trump; Camila Domonoske, *Mayors, Companies Vow To Act On Climate, Even As U.S. Leaves Paris Accord*, NPR (June 5, 2017), http://www.npr.org/sections/thetwo-way/2017/06/05/531603731/mayors-companies-vow-to-act-on-climate-even-as-u-s-leaves-paris-accord.

[17] Press Release issued by City of New York, *NYC Delivers First-Ever City Plan to Meet the Goals of the Paris Climate Agreement*, (Oct. 3, 2017), http://www1.nyc.gov/office-of-the-mayor/news/634-17/nyc-delivers-first-ever-city-plan-meet-goals-the-paris-climate-agreement.

[18] *See* https://www.americaspledgeonclimate.com/.

[19] Joshua S Hill, *California & Germany Sign Joint Statement On Climate Cooperation*, CLEANTECHNICA, June 14, 2017, 2017 WLNR 18344942.

[20] *Id*.

Germany will provide strong leadership for the Under2 Coalition in the COP23 in Bonn this November" 2017.[21]

B. *The Stability of the Grid and the Experience of Other Nations*

Without question, reducing carbon emissions through greater use of renewable energy continues to warrant substantial attention, and these sorts of partnerships between nations abroad and sub-national and private-sector actors in the U.S. will be crucial. But supporters of renewable energy have devoted comparatively less attention to understanding the close connection between the stability of the electric power grid and their goal to expand the use of renewable energy. The National Academy of Engineering described the U.S. electric grid as one of the most sophisticated engineering achievements of the 20th century, now delivering "close to 4,000 terawatt hours to more than 300 million Americans."[22] The grid is an important component of any discussion about how renewable energy can be expanded because carbon free power is unusable unless it is transported over a stable electric grid. New sources of renewable energy cannot be constructed unless the electric grid is capable of reliably integrating them into the electric system. For these reasons, this article focuses on the important, but often underappreciated, connection between electric grid stability and efforts to expand the use of renewables. This Symposium recognizes the importance of that connection, and provides participants with an opportunity to contribute to the discussion of this topic and related topics.

Moreover, consistent with the Symposium's goal of advancing our understanding of the relevance of international laws and policies, this article recommends that U.S. states, municipalities and the private sector should not only look within the U.S.'s borders for guidance. They should also look for guidance to other nations to better appreciate the connection between grid stability and expanding the use of renewables. This is a natural extension of the already expressed willingness of U.S. sub-national and private-sector actors to partner with countries abroad to limit carbon emissions giving rise to climate change.

Although there are many other nations whose renewable energy experiences yield useful comparisons, this article focuses on Germany, China and Canada. Looking to these three nations is appropriate because, following the U.S. decision to withdraw from the Paris accord, "Canada, China and the European Union [led by Germany] immediately reaffirmed their respective commitments to the climate pact . . ."[23]

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[21] *Id*.

[22] *The 21st Century Electricity Challenge: Ensuring a Secure, Reliable and Modern Electricity System: Hearing Before the Subcomm. On Energy & Power of the H. Comm. on Energy & Commerce*, 114th Cong. (2015) (statement of Dean Kamen, Founder and President, Deka Research & Development); *see also Congressional Testimony via FDCH: U.S. Electricity System – Statement of Dean Kamen Founder And President Deka Research & Development*, CQ-ROLL CALL, INC., Mar. 4, 2015, 2015 WLNR 6503753 (hereinafter "Kamen Statement").

[23] Marc Braibant, *Canada, China, EU and Partners Push Forward on Paris Climate Accord*, DIGITAL JOURNAL (BLOG), Sept. 15, 2017, 2017 WLNR 28444199.

The German experience is important because it is both the leading country within the European Union and an international leader in renewable energy development. In 2010, Germany initiated the *Energiewende*, or "energy transition."[24] This is one of the most ambitious renewable energy programs in which the world's fourth "largest economy is currently implementing the largest and most profound energy infrastructure project in the world."[25] Between 2009 and 2016, Germany's percentage of electricity generated from renewables increased from 16.3% to 32.6%.[26]

The Chinese experience is relevant because it is one of the world's leading countries in terms of electricity production from renewable energy,[27] and it has made substantial contributions toward improving the performance and lowering the cost of renewable energy technology.[28] Moreover, there has also been widespread speculation that the U.S. decision to withdraw from the Paris agreement has "place[d] Beijing in a leadership role beside the European Union."[29] Together with Germany and its European partners, China is seen as seeking "to fill the gap created in the collective climate leadership … due to the US' withdrawal" from the Paris Agreement.[30]

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[24] "The German word *Energiewende* is difficult to translate. The term 'Wende' can mean turn, turnabout, turning point, transition, etc. The most common terms used in an English translation are 'energy transition' (indicating the transition from fossil fuels to renewables) and 'energy turnover', 'energy turnaround' or 'energy policy u-turn' (indicating the rather dramatic change in energy policy following the nuclear accident in Japan in March 2011)." David Jacobs, *The German Energiewende - History, Targets, Policies and Challenges*, 3 RENEWABLE ENERGY L. & POL'Y REV. 223, 223 (2012).

[25] Anna Milena Jurca, *The Energiewende: Germany's Transition to an Economy Fueled by Renewables*, 27 GEO. INT'L ENVTL. L. REV. 141, 142 (2014).

[26] BMWi, Erneuerbare Energien – Zeitrihen zur Entwicklung der erneuerbaren Energien in Deutschland, [Federal Ministry for Economic Affairs and Energy – Time Series for the Development of Renewable Energies in Germany] (in German) (December 2017), http://www.erneuerbare-energien.de/EE/Navigation/DE/Service/Erneuerbare_Energien_in_Zahlen/Zeitreihen/zeitreihen.html.

[27] *See, e.g.*, Jake Schmidt, *6 Countries Leading the Way in the Global Renewable Energy Boom*, ECOWATCH (Feb. 28, 2017), https://www.ecowatch.com/global-renewable-energy-2290268181.html (stating "China vaulted to the top of the world in solar power capacity in 2016, passing Germany, which had been the long-standing leader. The country added more than 34 gigawatts of solar capacity last year—nearly 1.5 times the amount the U.S. has installed in its entire history. China also installed more than 23 gigawatts of wind power in 2016, almost three times as much as the U.S. added that year. As the world leader in renewable energy investment, China put almost $88 billion into renewables in 2016—one-third more than the U.S.").

[28] Jonathan Woetzel & Jiang Kejun, *China's Renewable Energy Revolution*, MCKINSEY GLOBAL INSTITUTE (Aug. 2017), https://www.mckinsey.com/mgi/overview/in-the-news/china-renewable-energy-revolution (stating that "These trends suggest that China will be a major source of both energy demand and cutting-edge technology, implying that it will have a unique opportunity to provide global leadership. Its experience in reducing energy intensity can serve as a roadmap for developing countries. And its investments in renewables at home and abroad can lead to additional technological breakthroughs that drive down costs for consumers everywhere.").

[29] Editorial, *Tantalising Vision of Return to Blue Skies*, SOUTH CHINA MORNING POST, July 31, 2017, 2017 WLNR 23563265.

[30] Dhanasree Jayaram, *Five Reasons Why India Can Be A Global Climate Leader*, GUARDIAN, Aug. 5, 2017, 2017 WLNR 24269467.

The Canadian experience is important because of its geographic proximity, direct role in the U.S. energy market, and many similarities to the U.S. in terms of governance structure (notably in terms of confederalism/federalism).

This process of looking to other nations for guidance – and determining how lessons learned from abroad can be transplanted into the host nation – is supported by a rich body of scholarly work called "policy diffusion" and "legal transplants."[31] The work of scholars in this field demonstrates that political, legal, economic, social and other features of the host nation impact the extent to which transplantation of reforms occurs, including whether this process generates hybrid reforms in the host nation.[32] This article seeks to continue that work by encouraging U.S. states, municipalities and the private sector to look for guidance to Germany, China and Canada to help them understand how to maintain a reliable electric grid while simultaneously integrating greater amounts of energy from renewable sources.

Part II briefly summarizes renewable energy policy in these three nations as well as the U.S. Parts III and IV then turn to lessons learned from Germany, China and Canada – or hybrids of those lessons that have been tailored to reflect the U.S.'s unique characteristics – that U.S. states, municipalities and the private sector might consider to help maintain grid stability while simultaneously integrating more renewables. The focus here is on two aspects of this challenge. Part III examines concerns over the so-called "utility death spiral," in which customers leave the grid in favor of renewables like solar, leaving grid owners with an ever-smaller customer base to maintain the grid. Part III also examines whether "feed-in tariffs"[33] and "net metering"[34] policies have an impact on grid reliability.

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[31] *See, e.g.*, Otto Kahn-Freund, *On Uses and Misuses of Comparative Law*, 37 MODERN L. REV. 1, 26-27 (1974); WILLIAM TWINING, GLOBALISATION AND LEGAL THEORY (Cambridge Univ. Press 2000); DAVID A. WESTBROOK, CITY OF GOLD: AN APOLOGY FOR GLOBAL CAPITALISM IN A TIME OF DISCONTENT (Routledge Press 2004); David A. Westbrook, *Keynote Address: Theorizing the Diffusion of Law: Conceptual Difficulties, Unstable Imaginations, and the Effort to Think Gracefully Nonetheless*, 47 HARV. INT'L L.J. 489, 505 (2006) ("I've been trying to suggest that coming to grips with the diffusion of law in an age of globalization requires multiple, rather incommensurate, imaginations of authority."); William Twining, *Diffusion and Globalization Discourse*, 47 HARV. INT'L L.J. 507, 513 (2006) ("Diffusion, interlegality, surface law, legal and normative pluralism, and Westbrook's four categories are just a few concepts that may be useful in analyzing and interpreting the immensely varied and complex processes that constitute diffusion of law.").

[32] Sociologists, who evaluate the different methods that are used to transplant lessons learned from one nation to another, have developed an important body of work known as new institutionalism. *See, e.g.*, Paul J. Dimaggio & Walter W. Powell, *The Iron Cage Revisited: Institutional Isomorphism And Collective Rationality In Organizational Fields*, 48 AM. SOC. REV. 147 (1983); Mark S. Mizruchi & Lisa C. Fein, *The Social Construction of Organizational Knowledge: A Study of the Uses of Coercive, Mimetic, and Normative Isomorphism*, 44 ADMIN. SCI. Q. 653 (1999).

[33] "A feed-in tariff (FIT) is an energy-supply policy focused on supporting the development of new renewable power generation. In the United States, FIT policies provide a guarantee to eligible renewable generators that their utility will be required to purchase either electricity, or both electricity and the renewable energy attributes. The FIT contract provides a guarantee of payments in dollars per kilowatt hour ($/kWh) for the full output of the system for a guaranteed period of time (typically 15-20 years)." *Feed-in Tariff Resources*, U.S. DEPT. OF ENERGY, OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY, https://energy.gov/eere/slsc/feed-tariff-resources.

[34] *Solar Energy and Net Metering*, EDISON ELEC. INST. (Jan. 2016), http://www.eei.org/issuesandpolicy/generation/NetMetering/Documents/Straight%20Talk%20About%2

Part IV then turns to experiences from abroad to illustrate ways to address what we can call the "intermittency" issue. Part IV proposes that—because many technology-related solutions for mitigating grid instability are currently in their infancy—in some circumstances it may be appropriate to provide compensation to non-weather dependent power plants in the near-term to help promote grid stability during those periods when weather dependent renewables like solar and wind cannot operate or operate at suboptimal levels. The examination of potential near-term solutions to this "intermittency" issue requires us to evaluate whether and how sufficient non-weather dependent power sources (like those powered by fossil fuels, nuclear and hydropower) could potentially be used to support grid reliability when intermittent weather-dependent renewables are incapable of meeting electricity demand. Here, too, the German experience is particularly relevant because it has opted, instead of nuclear energy, to use substantial amounts of coal-fired power plants when weather-dependent renewables are unable to meet electricity demand. This choice obviously operates in tension with the goal of reducing greenhouse gas emissions. The German experience demonstrates that compensating non-weather dependent power sources can indeed mitigate the grid destabilization from weather-dependent renewables, but that the choice of which non-weather dependent power sources to compensate (*e.g.*, nuclear vs. coal) can also have an important impact on the overall goal of reducing of greenhouse gases.

II. COMPARING RENEWABLE ENERGY IN GERMANY, CHINA, CANADA AND THE U.S.

The purpose of this Part of the article is to provide a brief overview of renewable energy in Germany, China and Canada as compared to the U.S. This background provides context that will help facilitate making an informed recommendation in later parts of this article about those grid stability lessons from abroad that might be useful to subnational actors and the private sector in the U.S.

A. *Renewable Energy in Germany*

0Net%20Metering.pdf.http://www.eei.org/issuesandpolicy/generation/NetMetering/Documents/Straight%20Talk%20About%20Net%20Metering.pdf.

> Just as the number of utility solar projects grows, there is also growing interest in using rooftop solar panels and other small-scale, on-site power sources known as distributed generation (DG). To encourage the introduction of these systems when they first came to market years ago, many states approved a billing system called net metering. While net metering policies vary by state, customers with rooftop solar or other DG systems usually are credited at the full retail electric rate for any excess electricity they generate and sell to their local electric utility via the electric grid. Electric utilities are required to buy this power, even though it generally would cost them less to produce the electricity themselves or to buy the power on the wholesale market from other electricity providers. *Id.*

In September 2010, the German government published a policy document outlining the *Energiewende*, which sought to have electricity production from renewables reach 35-40% by 2025, 55-60% by 2035 and 80% by 2050.[35] These ambitious goals have caused commentators to describe the *Energiewende* as an "epochal transformation"[36] and an "energy revolution."[37] "German politicians sometimes compare the *[E]nergiewende* to the Apollo moon landing."[38]

An important component of the *Energiewende* is the phase-out of nuclear power plants. Following the 2011 Fukushima disaster, Chancellor Merkel confirmed Germany would phase-out all nuclear units by 2022.[39] The decision in 2011 to phase-out all nuclear units in 2022 accelerated Germany's energy transformation because it now meant that Germany still had to achieve the *Energiewende*'s ambitious carbon reduction goals without assistance from existing carbon-free nuclear units.

Under the *Energiewende*, reliance on renewables, which represented 3.6% of power production in 1990, increased to 29.5% in 2016; and reliance on nuclear power decreased from 27.7% of power production in 1990 to 13.1% in 2016.[40]

B. *Renewable Energy in China*

Although China continues to rely heavily on coal to generate the majority of its electricity needs and has substantial carbon emissions,[41] it is also fast becoming an international leader in renewable energy as measured by a variety of different metrics. In 2017, China issued its "13th Energy Development Five-Year Plan," which seeks to have 15% of the nation's total energy consumption come from

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[35] *Goals of Energiewende*, AGORA ENERGIEWENDE, https://www.agora-energiewende.de/en/die-energiewende/goals-of-energiewende/.

[36] Robert Kunzig, *Germany Could Be a Model for How We'll Get Power in the Future*, NAT'L GEOGRAPHIC MAG. (Nov. 2015), http://www.nationalgeographic.com/magazine/2015/11/germany-renewable-energy-revolution/.

[37] Ruby Russell & Julian Wettengel, *Find Your Way Around The Energy Transition*, CLEAN ENERGY WIRE, Aug. 4, 2017, https://www.cleanenergywire.org/dossiers/germanys-energiewende-easy-guide.

[38] Kunzig, *supra* note 36 (emphasis added).

[39] Adam Arnold, *The Quest for Sustainable Energy: Germany's Nuclear Scrutiny vs. "All of the Above"*, 15 SUSTAINABLE DEV. L. & POL'Y 26, 26 (2015); Dominic Marcellino, Book Review, 3 RENEWABLE ENERGY L. & POL'Y REV. 217 (2012) (reviewing PETER HENNICKE & PAUL J. J. WELFENS, ENERGIEWENDE NACH FUKUSHIMA – DEUTSCHER SONDERWEG ODER WELTWEITES VORBILD? (2012)) (stating "Following the Fukushima disaster, the extensions granted to the nuclear industry were no longer tenable, as massive protests erupted across the country. The subsequent revision of the energy law moved forward the retirement of the nuclear facilities to 2022 and launched the word that has dominated discussions of Germany's energy policy ever since: Energiewende.").

[40] AGORA ENERGIEWENDE, THE ENERGIEWENDE IN A NUTSHELL 6 (2017), https://www.agora-energiewende.de/fileadmin/Projekte/2017/Energiewende_in_a_nutshell/Agora_The_Energiewende_in_a_nutshell_WEB.pdf

[41] Hal Bernton, *There is No Way Back: China Seeks to Move Away from Coal as Leaders Embrace the Science of Climate Change*, SEATTLE TIMES, July 5, 2017, 2017WLNR 20559362 ("Since a 2013 peak, China's coal consumption has dropped 7.3 percent, according to government statistics compiled by Rock Environment and Energy Institute, a Beijing-based think tank. Even with the decline, China remains the world's biggest emitter of greenhouse gases -- by far. In 2015, China accounted for nearly a third of all emissions. Coal still generates about 64 percent of China's energy, compared with 17 percent in the United States.")

renewables by 2020 and 20 percent by 2030, which would represent increases from 11.8 percent in 2015.[42]

China's recent acceleration of its reliance on renewable energy is reflected in the fact that, "at the start of 2017, China announced that it would invest $360 billion in renewable energy by 2020 and scrap plans to build 85 coal-fired power plants."[43] China already invests more than $100 billion annually in domestic renewables, which is "twice the level of US investment in domestic renewable energy and more than the combined annual investment of the US and the European Union."[44] China also invests approximately $32 billion annually on overseas renewables, which is substantially more than any other country spends on overseas renewables.[45] Additionally, "China is already the world's largest renewable energy employer, with 3.5 million people working in the sector."[46]

The accelerated pace of China's movement towards renewables is also reflected in the fact that in one year alone (in 2016), "China added 35 gigawatts of new solar generation . . . [which is] almost equal to Germany's total [solar] capacity, just in one year," and "[e]very hour, China erects another wind turbine and installs enough solar panels to cover a soccer field . . ."[47] China also currently has the world's largest total installed capacity (or number of megawatts –MWs)[48] of solar, wind and hydro resources.[49] As of 2015, China had 496 gigawatts (GWs)[50] of installed solar, wind and hydropower combined, compared to 202 GWs in the U.S. and 97 GWs in Germany.[51]

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[42] *China Steps Up Clean Energy Generation Efforts*, GLOBAL TIMES, June 5, 2017, 2017 WLNR 17305261.

[43] Jiang Kejun & Jonathan Woetzel, *China's Renewable Energy Revolution*, JORDAN TIMES, Oct. 11, 2017, 2017 WLNR 31087270.

[44] *Id*.

[45] *Id*.

[46] *How China is Waging War Against Air Pollution and Tackling climate change*, THE AGE (AUSTRALIA), Oct. 14, 2017, 2017 WLNR 31386656.

[47] Beth Gardiner, *Three Reasons to Believe in China's Renewable Energy Boom*,NAT'L GEOGRAPHIC, May 12, 2017, https://news.nationalgeographic.com/2017/05/china-renewables-energy-climate-change-pollution-environment/.

[48] "Megawatts are used to measure the output of a power plant or the amount of electricity required by an entire city. One megawatt (MW) = 1,000 kilowatts = 1,000,000 watts. For example, a typical coal plant is about 600 MW in size." *How is Electricity Measured?: Understanding Watts, Megawatts, Kilowatt-Hours, and More*, UNION OF CONCERNED SCIENTISTS, https://www.ucsusa.org/clean_energy/our-energy-choices/how-is-electricity-measured.html#.WlnV9a6nHIU.

[49] Wade Shepard, *If China Is So Committed To Renewable Energy, Why Are So Many New Coal Plants Being Built?*, FORBES, July 8, 2016, https://www.forbes.com/sites/wadeshepard/2016/07/08/if-china-is-so-committed-to-renewable-energy-why-are-so-many-new-coal-plants-being-built/#1d4e47295918.

[50] "Gigawatts measure the capacity of large power plants or of many plants. One gigawatt (GW) = 1,000 megawatts = 1 billion watts." *supra* note 48.

[51] John A. Mathews *Latest Trends In China's Continuing Renewable Energy Revolution*, , CLEANTECHNICA, (Sept. 15, 2016), https://cleantechnica.com/2016/09/15/latest-trends-chinas-continuing-renewable-energy-revolution/.

C. *Renewable Energy in Canada*

In 2017, Canada's National Energy Board reported that "[t]wo-thirds of Canada's electricity supply now comes from renewable sources such as hydropower and wind power,"[52] which represents an increase of 17 percent from the amount of renewables used in 2005.[53] By far, the largest component of Canada's reliance on renewables is its abundant supply of hydropower. Canada is the second leading producer of hydroelectric power in the world, with China having produced 29 percent of the world's hydroelectric power supply in 2015 followed by Canada at 10 percent.[54] "In terms of all renewable energy, Canada ranks fourth in production, behind China, the United States and Brazil."[55]

Although Canada is a world leader in power generated by hydroelectric sources and it has made important gains in wind-powered electric generation, it does not rely upon a comparatively large amount of solar. "[S]olar energy accounts for just 0.5 percent of all Canada's generated electricity"[56] and "almost all of that [solar] exists entirely in Ontario."[57]

The remaining approximately 35 percent of Canada's electricity supply comes from coal, natural gas and nuclear power, with approximately 10.7 percent from natural gas, 9.3 percent from coal and 15 percent from nuclear.[58] Between 2005 and 2016, "coal fell from 16 percent to 9.3 percent as a source of power" and "Canada intends to eliminate coal as a source of power by 2030 and only four provinces still get any power from the fossil fuel."[59]

D. *Renewable Energy in the U.S*

In 2009, President Barack Obama's inaugural address called for the expanded use of renewable energy to meet the twin challenges of energy security and climate change. He stated that "each day brings further evidence that the ways we use energy strengthen our adversaries and threaten our planet."[60] Additionally, since 2009, the following two factors have collectively spurred increased development of renewables in the U.S.: (1) the federal government's expansion of meaningful investment tax credits for renewable energy,[61] and (2) increased state-initiated

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[52] *66% Of Electricity In Canada Comes From Renewables*, NAT'L POST, May 3, 2017, 2017 WLNR 13624895.

[53] *Id.*

[54] *Id*.

[55] *Id.*

[56] Mia Rabson, *Renewable energy growing in Canada but solar installations lagging behind*, CANADIAN PRESS, (Dec. 20, 2017), http://www.cbc.ca/news/politics/neb-solar-renewable-energy-1.4457835.

[57] *Id.*

[58] *Id.*

[59] *Id.*

[60] President Barack Obama, Inaugural Address, (Jan. 20, 2009) (transcript available at: https://obamawhitehouse.archives.gov/blog/2009/01/21/president-barack-obamas-inaugural-address).

[61] *See, e.g.,* Kevin Eber, *Clean Energy Aspects of the American Recovery and Reinvestment Act,* RENEWABLE ENERGY WORLD, (Feb. 18, 2009), http://www.renewableenergyworld.com/articles/2009/02/clean-energy-aspects-of-the-american-

funding for renewable energy largely in the Northeast, Mid-Atlantic, Rocky Mountain and Western states. This increase is reflected, for example, in the fact the in 2009 approximately 10.4% of the electricity consumed in the U.S. was generated by renewables (primarily hydropower) and increased to 13.3% in 2015.[62]

In addition, as indicated previously, in June 2016, President Obama joined the Prime Minister of Canada and the President of Mexico in expressing their public support for the North American Clean Power Plan. Under that plan, the three leaders pledged to have their countries collectively seek to produce 50% of their power by 2025 from hydropower, wind, solar and nuclear plants, carbon capture and storage, as well as from energy efficiency measures.[63] The White House explained that the primary goals of the plan were to advance clean and secure energy, promote clean and efficient transportation, protect nature and advance science, and demonstrate global leadership in addressing climate change.[64]

As of 2016, the latest year for which annual data is available, renewable power continues to represent only a small portion of the resources that were used to generate electricity in the U.S. with coal, natural gas and nuclear power continuing to provide the vast majority of the U.S.'s energy supply. The U.S. Energy Information Administration reported that for 2016, the total consumption of electricity in the U.S. was generated by the following sources: natural gas (33.8 percent), coal (30.4 percent), nuclear (19.7 percent), and all renewable sources combined (14.9 percent).[65] The 14.9 percent from renewable energy sources was comprised of hydropower (6.5 percent), wind (5.6 percent), biomass (1.5 percent), solar (0.9 percent), and geothermal (0.4 percent).[66] It remains to be seen whether the policies of the current administration will alter these various shares in any significant manner, most importantly in favor of greater use coal.

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recovery-and-reinvestment-act.html ("President Barack Obama signed the American Recovery and Reinvestment Act of 2009 on Tuesday and the measure includes US $16.8 billion for the DOE Office of Energy Efficiency and Renewable Energy (EERE). The funding is a nearly tenfold increase for EERE, which received $1.7 billion in fiscal year 2008. . . . The tax section of the act provides a three-year extension of the production tax credit (PTC) for most renewable energy facilities, while offering expansions on and alternatives for tax credits on renewable energy systems. The extension keeps the wind energy PTC in effect through 2012, while keeping the PTC alive for municipal solid waste, qualified hydropower, and biomass and geothermal energy facilities through 2013.")

[62] U.S. ENERGY INFO. ADMIN., ELECTRIC POWER MONTHLY WITH DATA FOR OCT. 2016 (2016), http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_1_1

[63] *"US, Canada and Mexico pledge 50% of power from clean energy by 2025"*, THE GUARDIAN (June 27, 2016), HTTPS://WWW.THEGUARDIAN.COM/ENVIRONMENT/2016/JUN/28/US-CANADA-AND-MEXICO-PLEDGE-50-OF-POWER-FROM-CLEAN-ENERGY-BY-2025.

[64] Press Release, The White House, Office of the Press Secretary, North American Climate, Clean Energy, and Environment Partnership Action Plan (June 29, 2016), available at: https://obamawhitehouse.archives.gov/the-press-office/2016/06/29/north-american-climate-clean-energy-and-environment-partnership-action

[65] *What is U.S. electricity generation by energy source?,* U.S. ENERGY INFO. ADMIN., https://www.eia.gov/tools/faqs/faq.php?id=427&t=3 (last visited Feb. 24, 2018)

[66] *Id*.

III. AVOIDING THE "DEATH SPIRAL": PROMOTING ELECTRIC GRID RELIABILITY THROUGH EQUITABLE COMPENSATION TO GRID OWNERS

A. *What is the "Utility Death Spiral"?*

This Part explores experiences from Germany, China and Canada to illustrate an ongoing debate over the appropriate compensation to grid owners as renewables are increasingly added to the power-source mix.

In Germany, the problem has been described as "the utility death spiral." This refers to the situation in which power "customers are increasingly trying to separate themselves from the grid to avoid government fees levied to pay for renewable energy expansion."[67] As a consequence, "grid maintenance costs go up [while] the capital cost of renewable energy moves down," leading "more customers … to leave the grid. In turn, that pushes grid costs even higher for the remainder of customers, who then have even more incentive to become self-sufficient. Meanwhile, utilities are stuck with a growing pile of stranded assets."[68] The financial challenges confronting utilities that own the German electric grid is exacerbated by the fact that their financial health has been weakened at the precise time when the electric grid requires substantial upgrades. [69]

In China, at this time, although industry analysists do not appear to commonly use the phrase "death spiral" commonly and they have not expressed material concerns over the risk of socializing grid maintenance and upgrade costs onto a smaller-and-smaller population of customers. Instead, they appear to focus on a separate, more fundamental issue, involving the need to upgrade China's grid to accommodate additional renewables.[70]

In Canada, at this time, industry analysists do not appear to have expressed a high degree of concern about the potential adverse financial impact on grid owners resulting from integrating additional renewables into the grid. The phrase "death spiral" was, however, used in the description of recent developments affecting the grid for the province of Alberta. In Alberta, concern was expressed that the cost of recent upgrades to the high voltage electric grid would be socialized onto a smaller-and-smaller population of ratepayers as more-and-more large commercial and industrial entities separated from the grid by installing their own on-site power generating sources.[71] The concern expressed about Alberta was that "there are a

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[67] Stephen Lacey, *This Is What the Utility Death Spiral Looks Like*, GREENTECH MEDIA (Mar. 4, 2014), https://www.greentechmedia.com/articles/read/this-is-what-the-utility-death-spiral-looks-like

[68] *Id*.

[69] Kamen Statement, *supra* note 22.

[70] Coco Liu, *Facing Grid Constraints, China Puts a Chill on New Wind Energy Projects*, INSIDE CLIMATE NEWS (Mar. 28, 2016), https://insideclimatenews.org/news/28032016/china-wind-energy-projects-suspends-clean-energy-climate-change.

[71] Geoffrey Morgan, *Why Warren Buffett is one of the Very Few Making Money off Alberta's Mostly Unprofitable Electric System*, FINANCIAL POST (June 22, 2016), http://business.financialpost.com/commodities/energy/alberta-electrifies-warren-buffetts-profits-meanwhile-provinces-consumers-are-trapped-like-rats.

> In Alberta, the high voltage grid was upgraded in part to accommodate output from proposed new coal-fired power plants – but now that these proposed coal

decreasing number of consumers in the province being forced to pay an increasing share of the grid's costs since some industrial users are getting off the grid by generating their own power."[72]

But what is meant by this description of Canadian and German utility ratepayers separating themselves from the electric grid or reducing their reliance on the grid? How is that possible? To better understand this concept, it is first necessary to provide additional information about government-sponsored programs known as feed-in tariffs and net metering.

B. *Feed-in Tariffs, Net Metering and Virtual Net Metering*

In general, a feed-in tariff is a government sponsored program that seeks to incentivize electricity consumers to purchase renewable power sources like rooftop solar panels.[73] These programs offer consumers long term contracts (typically between 15-20 years) at specified rates, which serve as an important mechanism through which they can finance their renewable projects. The pricing structure can vary depending on the type of renewable technology used by the consumer (*i.e.*, different prices for wind and solar); and the pricing could decline over time to incentivize the renewable energy industry to reduce the cost of renewable technology over time.[74] Additionally, feed-in tariffs could provide guaranteed access to the electric grid. For example, for a typical homeowner that installs solar panels on her roof, a feed-in tariff provides her with a pre-determined guaranteed price for the energy her solar panels generate over a long-time horizon (typically 15-20 years) although the pricing could decline over time.

In contrast to feed-in tariffs, net metering is a different government-sponsored program under which electric consumers, who own solar panels or other renewable sources, use the energy they generate to meet their own energy needs; they are allowed to sell any excess power they generate to the local utility; and they will not receive an invoice for the energy portion of their utility bill if their net sales of excess electricity to the utility exceed the amount of electricity they purchase from the utility during that month.[75] The details of net metering programs can vary from state-to-state, with some states, for example, allowing net metering credits to reset annually whereas others reset credits monthly.

> plants have been placed on hold or abandoned – there is underutilized capacity on the transmission lines that can accommodate new renewable or comparatively cleaner natural gas fired power plants. *Id*.

[72] *Id*.

[73] Adam Vaughan, *Q&A: Feed-in Tariffs*, GUARDIAN, May 24, 2012, 2012 WLNR 10958873; John Spears, *Setting a New Price for Green Energy,* TORONTO STAR, Feb. 7, 2012, 2012 WLNR 2668559.

[74] Katherine D. Kelly, *Don't Hide Behind Statutory Roadblocks: How the United States Can Resolve Conflicts to Implementing the German Feed-in Tariff Model and Contribute to International Efforts to Control Climate Change*, 50 COLUM. J. TRANSNAT'L L. 726, 740 (2012).

[75] *See, e.g.*, Paul R. Michaud, *New Approach to Solar Net Metering*, NAT'L L. REV, Aug. 24, 2016, 2016 WLNR 25852197.

The following example illustrates the net metering concept using the example of a homeowner that owns rooftop solar panels. Under a typical net metering program that is conducted on a monthly basis, a homeowner that owns or leases rooftop solar panels uses the power generated on sunny days to meet the homeowner's own energy needs and is allowed to sell any surplus energy to the local utility. But each night – and when it rains or is cloudy – all or nearly all of the energy consumed by the homeowner is delivered by the local utility because solar panels do not generate electricity at night, when it rains or is cloudy. At the end of the month, this homeowner will not receive an invoice for the energy portion of the utility bill if the net amount of surplus power the homeowner sold to the utility exceeded the amount of power she purchased from the utility at night, when it rained or when other weather conditions prevented or reduced the output of the solar panels. If this homeowner resided in a state that used an annual net metering program, then any unused credits from a particular month can be carried forward to future months during an annual period.

1. Germany's use of feed-in tariffs

Germany first implemented feed-in tariffs in 1990. In 1998, a new law was passed that authorized feed-in tariffs to provide stronger incentives for both residential and commercial renewable projects.[76] Whereas the 1990 law used a pricing structure that was based on the average cost of electricity from renewable sources, the new law obligated utilities to pay different prices for each type of renewable technology that was based on the cost of generating electricity from each.[77] Germany's use of feed-in tariffs has been widely credited as a critical component of its expansion of renewables, particularly for incentivizing homeowners to purchase rooftop solar panels.[78]

In 2015, however, Germany initiated several pilot programs in which it evaluated whether using competitive auctions (instead of feed-in tariffs) to procure new large-scale renewable projects would help drive-down the cost of these projects.[79] In 2016, Germany announced that it would cease using feed-in tariffs for larger renewable projects beginning in 2017, and thereafter it would use competitive auctions to attempt to further drive-down the cost of larger renewable projects.[80] This change did not, however, apply to smaller renewables like solar

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[76] James Cameron, David J. Robertson & Paul Curnow, *Legal and Regulatory Strategies for Ghg Reductions--A Global Survey*, NAT. RESOURCES & ENV'T, Winter 2001, at 176, 178.

[77] Kelly, *supra* note 74, at 743.

[78] *See, e.g.*, Energy and Electricity Forecast, *Energy Report: Overview: Energy Report Germany 4th Quarter 2016*, Dec. 16, 2016, 2016 WLNR 38940446 ("Renewables growth has been supported primarily by the government's 'feed-in tariffs' (fixed, above-market prices) for solar and wind power delivered to the grid.").

[79] Kerstine Appunn, *EEG reform 2016 – Switching to Auctions for Renewables*, CLEAN ENERGY WIRE, (July 8, 2016), https://www.cleanenergywire.org/factsheets/eeg-reform-2016-switching-auctions-renewables ("An auction system was piloted in 2015 for ground-mounted solar installations.").

[80] Energy and Electricity Forecast, *supra* note 78 ("However, major changes to renewable policies (including the abolition of feed-in tariffs and their replacement with auctions) are due to come into effect from January 2017."); *"E.ON: Uniper Spin-Off Is No Silver Bullet"*, EMERGING MARKETS

panel installations for residential homeowners, who continue to be eligible for feed-in tariffs.[81] Germany's State Secretary at the German Ministry for Economic Affairs and Energy, Rainer Baake, explained the rationale for this change in policy:

> In Germany, renewables need to learn to be competitive and that is why we are currently moving away from feed-in tariffs to a more competitive system, that is, auctions . . . Renewables plants still receive a payment per kilowatt-hour for 20 years – but the level of the payment is now determined through competitive bidding.[82]

Following this change, the first competitive auction Germany conducted in 2017 under the new law was credited with lowering prices for large-scale solar projects by almost 30 percent as compared to the pricing under 2015 auction pilots.[83] As of June 2017, additional results appear to suggest that Germany's use of auctions (instead of feed-in tariffs) continues to drive down the cost of large-scale renewable projects.[84] One potential drawback of Germany's shift to auctions is a potential reduction in investments in Germany renewable energy. "[O]ne issue that may have caused some developers to hold back in 2016 was uncertainty over Germany's switch from feed-in tariff support to auctions."[85] Additionally, although Germany continues to offer feed-in tariffs to incentivize smaller projects like rooftop solar panels on residential homes, the level of compensation offered to new installations has decreased in an attempt to further drive-down the cost of renewables.[86]

ONLINE, Mar. 11, 2016, 2016 WLNR 7750421 ("We have highlighted that Germany is moving away from fixed feed-in tariffs and is currently piloting reverse capacity auctions - which require renewables developers to lodge bids and compete for access to subsidies.").

[81] *See* Amy Gahran, *Germany's Course Correction on Solar Growth*, GREENTECH MEDIA (Nov. 3, 2016), https://www.greentechmedia.com/articles/read/germanys-course-correction-on-solar-growth ("The FIT [feed-in tariff] remains in place for residential solar in Germany.").

[82] Osamu Tsukimori, *INTERVIEW-Countries eyeing coal-fired plants must reassess energy strategy – IRENA*, REUTERS (May 2, 2016), https://www.reuters.com/article/us-g7-japan-energy-irena-idUSKCN0XT19H.

[83] Platts Power in Europe, *"First EEG auction for PV averages €65.80/MWh"*, Issue 743, February 13, 2017 ("Auction oversupplied with 488 MW of bidsprices down nearly 30% since pilots started").

[84] Corinna Klessmann and Silvana Tiedemann, *Germany's First Renewables Auctions Are A Success, But New Rules Are Upsetting The Market*, Energy Post, (June 27, 2017) http://energypost.eu/germanys-first-renewables-auctions-are-a-success-but-new-rules-are-upsetting-the-market/

[85] FRANKFURT SCHOOL OF FINANCE & MANAGEMENT, GLOBAL TRENDS IN RENEWABLE ENERGY INVESTMENT 25 (2017).

[86] *See* Amy Gahran, *Germany's Course Correction on Solar Growth*, GREENTECH MEDIA, (Nov. 3, 2016), https://www.greentechmedia.com/articles/read/germanys-course-correction-on-solar-growth ("The FIT [feed-in tariff] remains in place for residential solar in Germany. Utilities will continue to pay households with existing solar installations their agreed-upon rate, which can be as high as €0.52 per kilowatt-hour. However, the FIT for new residential rooftop solar is only about €0.13 per kilowatt-hour -- substantially less appealing to German consumers.")

2. Canada's use of feed-in tariffs and net metering

In Canada, the province of Ontario implemented a feed-in tariff program in 2009 to incentivize the construction of renewables.[87] Similar to the German model, it provided eligible projects with long-term contracts containing guaranteed pricing over 20 years for solar, wind and biomass resources. In 2017, Ontario's Energy Minister announced the following lessons learned under the program. Although the program incented renewable energy development in the province, it also increased consumer utility bills. This flowed from the fact that Ontario's program used targets for specified quantities of renewable resources and it did not use a competitive bidding process in which all renewable projects competed against one another to yield the lowest cost projects.

For these reasons, Ontario's Energy Minister explained, "[i]n the future, . . . the government must move away from setting targets for specific types of energy—such as wind, solar, hydro . . .—and should instead focus on implementing a system in which energy producers compete for electricity contracts—regardless of what type of energy they produce."[88] As a result of this announcement, the province "no longer intends to favor one type of energy production over another, but will instead implement a competitive bidding process, or an auction-based approach, that will drive future energy procurements in Ontario—something other jurisdictions, like Alberta, have indicated they will do when phasing-out coal."[89] With respect to net metering, all of the Canadian provinces appear to have net metering programs in place.[90]

3. China's use of feed-in tariffs

China has used feed-in tariff programs for solar, offshore wind and other renewable resources.[91] In 2017, however, China announced reductions to the future amounts that will be paid to new solar projects.[92] In addition, it is anticipated that China will reduce feed-in tariff programs for large solar projects because,

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[87] Brian Hill, *Ontario energy minister admits mistake with green energy program*, GLOBAL NEWS CANADA, (Feb. 24, 2017) https://globalnews.ca/news/3272095/ontario-energy-minister-admits-mistake-with-green-energy-program/.

[88] *Id.*

[89] *Id.*

[90] Stephanie Tobin, *Renewable energy and you: What the net-metering policy means for your bill,* CBC NEWS CANADA, (June 3, 2017) *available at* http://www.cbc.ca/news/canada/newfoundland-labrador/net-metering-renewable-energy-nl-policy-1.4143087 (stating "The Newfoundland and Labrador government announced May 19 that the PUB had approved a net-metering plan, making this the last province in Canada to implement one.")

[91] *See, e.g.*, Global Wind and Energy Council, *China Introduces Offshore Wind Feed-In Tariffs,* http://gwec.net/china-introduces-offshore-wind-feed-in-tariffs/; Liu Yuanyuan, *China to Lower Feed-in-Tariff, Cut Subsidies for Solar PV Systems,* RENEWABLE ENERGY WORLD (Oct. 31, 2016), http://www.renewableenergyworld.com/articles/2016/10/china-to-lower-feed-in-tariff-cut-subsidies-for-solar-pv-systems.html.

[92] Frank Xie & Josefin Berg, *China confirms 2017 PV FiT rates – Growing concerns over 2016 PV installations*, IHS MARKIT (Jan. 10, 2017), https://technology.ihs.com/587319/china-confirms-2017-pv-fit-rates-in-line-with-ihs-forecast-assumptions.

among other things, constraints on the high voltage grid restrict or prevent renewable power from being transported to population centers where it is needed.[93] Because China "is grappling with a growing amount of large-scale solar curtailment," in 2017 it was reported that "[a]nalysts believe China will continue reducing feed-in tariffs (FITs) for large-scale solar and replace them with competitive auctions over time. The government could scrap FITs altogether when they come up for review at the end of June next year."[94] The problem, as the *Wall Street Journal* described, is that feed-in tariffs "can make renewable energy seem artificially expensive relative to coal."[95]

C. *Implications of the Experiences Abroad for U.S. electric grid owners*

Many U.S.-based utilities that own the electric grid are monitoring these foreign developments, particularly those in Germany. Some claim that Germany's ambitious integration of renewables without adequately protecting the financial viability of grid owners yields, over time, an unsustainable business model that calls into question who will pay for the billions of dollars needed to maintain and upgrade the grid. Testimony provided in 2015 before the U.S. Committee on House Energy and Commerce Subcommittee on Energy and Power underscored this point:

> Learning the lessons from Germany, avoiding the . . . death spiral and managing our modern electric transition in a way that preserves our grid while maintaining viable business models for our electric utilities is no small task. New utility models and regulatory structures will be required. These models must promote competition while encouraging smart investments to modernize the grid will be required. [96]

Although German feed-in tariffs and U.S. net metering programs use different formulas to compensate owners of renewable generation and have other differences that have been previously described, both programs provide incentives to the owners of renewables that can have repercussions for electric grid owners. In July 2016, Fitch Ratings warned U.S. grid owners that the continued expansion of rooftop solar panels by residential electric customers could precipitate a death spiral for them unless state regulators allowed them to adjust existing electric ratemaking structures to collect a more equitable share of grid costs from owners of

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[93] Jason Deign, *Why China's Solar Market Won't Have Another Year Like 2016*, GTM (June 5, 2017), https://www.greentechmedia.com/articles/read/why-chinas-solar-market-wont-have-another-year-like-2016#gs.ktW=lr8.

[94] *Id*.

[95] Kate Gordon & Anders Hove, *How China Wastes Its Renewable Energy*, WALL ST. J., (Sept. 13, 2016 10:00 PM), https://blogs.wsj.com/experts/2016/09/13/how-china-wastes-its-renewable-energy/.

[96] *U.S. Electricity System Before the H. Comm. Energy and Commerce, Subcomm. On Energy and Power*, (2015) (statement of Dean Kamen, Founder & President, Deka Research & Development).

solar panels and other renewables.[97] The Fitch report concluded that "[t]he conundrum for regulators and [grid owning] utilities from an energy policy point of view is facilitating development of distributed … solar and its clean energy attributes without unduly burdening customers [who do not own renewables] with higher bills due to cross-subsidization."[98]

In light of the German experience – and based on these U.S. developments—some U.S. utilities continue to express concerns about the expansion of renewables, particularly residential rooftop solar panels, absent equitable electric ratemaking policies. U.S. utilities therefore propose that owners of renewables to pay for a more equitable share of the ongoing cost to operate, maintain and upgrade the grid in order to mitigate grid owners' concerns about the utility death spiral. Additionally, this unresolved problem is an obstacle to the expansion of solar power in the U.S., and therefore, solving or mitigating it could facilitate the expansion of renewables in the U.S. For these reasons, the time frame for achieving renewable energy goals in the U.S. could potentially be accelerated if state legislatures or state public utility commissions, who have jurisdiction over retail electric rates, develop an equitable resolution to the death spiral problem. Additionally, addressing this issue now, when solar penetration rates in the U.S. are still comparatively modest, may be easier versus postponing resolution of this issue to the future when solar penetration rates may be higher and it may be more difficult to resolve this issue.

To date, potential solutions to this problem in the U.S. have primarily focused on adjustments to existing electric utility rate structures. "For utilities, the challenge is finding the right tariff structure that can sustain their business in the face of new technologies."[99] In particular, the component of a consumer's electric bill that has received the most attention is known as the "fixed" customer charge component of a utility bill. For example, the 2016 Fitch report "suggested increasing fixed utility charges"[100] to mitigate this problem. The fixed charge is the component of a monthly electric bill that does not change based on the amount of energy consumed. It enables grid owners to recover a portion of their cost for operating, maintaining and upgrading the grid from customers through a fixed monthly amount, with the remainder of a monthly utility bill being impacted by the volumetric amount of energy that was consumed. Because the fixed charge is disconnected from the amount of energy that is consumed by utility customers, many U.S. grid owners recommend assessing a higher fixed charge to the owners of rooftop solar panels and other renewables to recoup their fair share of grid costs.

Under the grid owners' proposal for imposing higher fixed charges, a homeowner with rooftop solar panels who generates a net surplus of electricity at the end of a particular period, would pay a higher fixed charge to ensure that the grid owner receives a more equitable share toward the cost of maintaining the grid. Even though this particular homeowner generated more electricity than the homeowner consumed on a net basis during the month or year in question—when it

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[97] MICHAEL COPLEY, FITCH RENEWS WARNING OF UTILITY 'DEATH SPIRAL', (SNL Electric Utility Report 2016).

[98] *Id.*

[99] *Id.*

[100] *Id.*

rained or at night—this customer obtained 100% of their electricity through the grid. To ensure that the grid can reliably deliver power when weather prevents the customer's solar panels from doing so, the grid owner could claim that a higher fixed charge should be assessed to this customer who owns solar panels to avoid this customer's share of grid costs being socialized onto other customers that do not own renewables.

As a result of these developments, in the past two years, many U.S. grid owners have petitioned state public utility commissions to increase fixed charges to mitigate this problem. To date, the results have been mixed with some grid owners receiving permission to increase their fixed charges, but the magnitude of the increases has fallen far below what grid owners have requested:

> In rate cases during the past two years, state regulators allowed investor-owned utilities to increase fixed charges by about 12% on average, well below the approximately 50% increase companies had sought, according to Kelly Crandall, senior rates and research analyst at EQ Research LLC. Crandall expects the push to continue, with about 40 utility rate cases filed so far this year. [101]

In recognition of this issue, some other states such as Hawaii and Nevada have lowered the value of the net metering energy credits provided to individuals who own solar panels and other renewable sources. It was reported that:

> [In 2015], the Hawaii Public Utilities Commission cut the value of net-metering credits for new solar customers by more than half. The change was "constructive from an IOU [investor owned electric utility grid owner] credit perspective," Fitch said. For the state's solar market, however, the move created a gloomy forecast, the Hawaii Solar Energy Association said. In Nevada, solar advocates are trying to reverse a net-metering ruling that all but killed that state's solar market in 2015. Moody's [Investor Services] said the ruling, which increased net-metering service charges while reducing the value of credits, was credit positive for [the grid owner] NV Energy Inc., a subsidiary of Berkshire Hathaway Energy that owns Nevada Power Co. and Sierra Pacific Power Co. [102]

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[101] *Id*.; *see also* Daniel Mercer, *Nahan in Big Backflip over Electricity Grid Imbalance*, WEST AUSTRALIAN (June 24, 2017), https://www.pressreader.com/australia/the-west-australian/20170624/282080571840432 ("From next month, every household electricity customer will pay an extra $169 a year in so-called supply charges for the right to simply be connected to the grid. What electricity those households take from the grid will not cost a cent more. It is a change that Dr Nahan had long touted as necessary to fix an imbalance that has progressively allowed households without solar panels cross-subsidise the costs of those with them.").

[102] COPLEY, *supra* note 97.

There is no easy solution to this complex problem, which highlights the tension between at least the following three factors: (1) the legitimate need to maintain a reliable electric grid and to help maintain the economic viability of grid owners; (2) the equally important goal of ensuring that all consumers who benefit from a reliable grid pay an equitable share of grid maintenance costs, which includes mitigating the alleged inequity that results when consumers who do not use renewables pay for grid maintenance costs that some claim are attributable to the subset of consumers that own renewables; and (3) the equally important goal of many U.S. states, municipalities and the private sector to expand the use renewables and to provide customers with a cost-effective opportunity to own renewable energy sources. Regarding the last factor, it bears emphasis that this article has presented the perspective of grid owners on this issue, but there is a substantial body of work and commentary from proponents of renewables who claim that fixed utility charges are still too high and they should be lowered to facilitate the expansion of renewables.

For these reasons, this topic has generated disagreement and substantial discussion among energy industry stakeholders. As a result, state legislatures and public utility commissions in the U.S. will have the challenging task of trying to strike the right balance between these three factors when they adjust the amount of fixed utility charges for electric ratepayers, evaluate the magnitude of bill credits under net metering programs, and examine other potential solutions. Although experiences from abroad have not yielded a solution to this issue, they have nevertheless benefited the U.S. by focusing attention on this issue at a time when "the [U.S.] solar market is still small, accounting for only about 1% of U.S. power generation in 2015."[103] That increased awareness – coupled with lessons learned from other nations – provides the U.S. with an opportunity to help avoid or mitigate some of the challenges experienced abroad. [104]

IV. THE INTERMITTENCY PROBLEM: PROMOTING ELECTRIC GRID STABILITY THROUGH MAINTAINING SUFFICIENT NON-WEATHER DEPENDENT POWER PLANTS

This Part examines how Germany and China in particular, and to a lesser extent Canada, have grappled with the challenges associated with simultaneously incorporating large amounts of intermittent weather-dependent renewables like wind and solar into the grid while also seeking to maintain a reliable grid that

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[103] *Id.*

[104] A related issue, which is not directly addressed by this article is: What methodology should state legislatures and regulators use to compensate renewables through net metering and feed-in tariff programs that strikes an equitable balance between (1) the goal of many U.S. states, municipalities, and the private sector to incent renewables and (2) the increasing utility bill impacts of these programs on electric ratepayers. This issue is separate from the fixed charge discussion because the fixed charge issue focuses on what level of compensation should grid owners collect in fixed charges from the owners of renewables to pay for the ongoing cost of operating, maintaining, and upgrading the grid. In contrast, this separate issue focuses on what level of compensation should be paid to owners of renewables through net meting and feed-in tariff programs to achieve an equitable balance between the goals of incenting renewables and maintaining affordable electric rates for consumers.

provides a regular supply of power to meet demand. Mitigating this problem is a key component to expanding the use of renewables, something that subnational actors and the private sector will need to address if they wish to continue the push for renewables in the U.S.

A. *Relevant Experience from Abroad*

1. The German experience

In Germany, the accelerated implementation of renewables has had an adverse financial impact on owners of non-renewable plants powered by nuclear, natural gas and oil.[105] German utilities that own non-renewable plants have suffered substantial shareholder losses, causing some to question their financial viability.[106] Peter Terium, the CEO of German utility, RWE, which owns non-renewable power plants, called Germany's *Energiewende* "the worst structural crisis in the history of energy supply."[107]

Owners of non-renewable power plants in Germany have alleged that their financial difficulties have resulted from a variety of factors, including the rapid expansion of renewable energy projects[108] and policies they allege provide renewables enhanced access to energy markets over non-renewable sources.[109] These and other factors have collectively contributed to the decreased price of electricity in German energy markets. That reduction in the market price for

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[105] Although there are differences of opinion whether carbon-free nuclear power can be classified as a renewable or non-renewable energy source, this article classifies nuclear as non-renewable "because uranium and similar fuel sources are finite." Kevin Lee, *Is Nuclear Energy Renewable or Nonrenewable?,* SCIENCING (Apr. 25, 2017), https://sciencing.com/nuclear-energy-renewable-nonrenewable-4579290.html.

[106] CRAIG MORRIS & ARNE JUNGJOHANN, ENERGY DEMOCRACY : GERMANY'S ENERGIEWENDE TO RENEWABLES 353 (Palgrave Macmillan, 2016); Gilbert Kreijger, Stefan Theil & Allison Williams, *How to Kill an Industry*, HANDELSBLATT GLOBAL (Mar. 24, 2016), https://global.handelsblatt.com/companies-markets/how-to-kill-an-industry-479057 ("The losers include once-stalwart utility giants like E.ON and RWE that are struggling with rising debt and falling shares."); *E.On Blames Losses On Power Price Slump And German Renewable Push*, GUARDIAN (Mar. 9, 2016), https://www.theguardian.com/business/2016/mar/09/eon-blames-losses-on-power-price-slump-and-german-renewable-push.

[107] Stephen Lacey, *This Is What the Utility Death Spiral Looks Like*, GREENTECH MEDIA (Mar. 4, 2014), https://www.greentechmedia.com/articles/read/this-is-what-the-utility-death-spiral-looks-like.

[108] "Like other European competitors, Eon has suffered in recent years from low wholesale electricity prices, competition from subsidized renewable energy, and the German government's decision to ditch nuclear power by 2022." *Eon Logs Record Loss on Fossil Fuels Writedown*, DEUTSCHE WELLE: BUS. BLOG (Mar. 15, 2017), http://www.dw.com/en/eon-logs-record-loss-on-fossil-fuels-writedown/a-37939239.

[109] "In major renewable markets such as Germany, renewable energy enters the power grid with priority over fossil sources, which has been a decisive factor in the rapid build-up of green power, which now meets a third of the country's electricity needs. Removing this rule could mean that cheap and dirty coal-fired power enters the grid ahead of wind and solar." *Germany: EU Could Pull Grid Priority For Renewables*, MENA REPORT, Sept. 30, 2016, 2016 WLNR 29884738.

electricity has in turn placed negative economic pressures on non-weather dependent power plants using oil and natural gas that derive their revenue from electricity markets. Additionally, Germany has forced the closure of several nuclear plants since 2010 and proposes to phase-out all remaining nuclear units by 2022.[110]

It has also been alleged that the forced retirement, or economic non-viability, of non-renewable power plants in Germany has also adversely impacted the reliability of the electric grid due to the "intermittency" problem. The intermittency problem means that some renewable sources like solar and wind cannot generate power on-demand consistently 24 hours per day because the amount of power they generate depends on weather conditions.[111] These resources only generate power when the sun shines or wind blows, whereas non-weather dependent power plants using oil, coal, natural gas and nuclear power can be activated regardless of weather conditions.[112] As a result, some commentators have alleged that Germany's increased reliance on intermittent renewables has exacerbated the stability of its electric grid, claiming:

> Constant renewable electricity generation is simply impossible. It depends on natural forces like wind and sunshine that vary by the second. They require backup from fossil fuel plants that must switch on and off at a moment's notice. But switching back and forth adds tremendous stress to those plants and to the energy grid. According to the European Institute for Climate and Energy, the number of "emergency grid interventions"—sudden regulatory actions to ensure the grid's stability—have increased from only a few in 2006 to more than 3,500 in 2014.[113]

For these reasons, Germany's experience demonstrates that when an electric power system relies too heavily on solar and wind resources, it is necessary to ensure there are sufficient measures in place to maintain grid reliability. For example, the system could experience instability during periods when renewable sources are unable to generate sufficient power to meet demand because there is no or insufficient sun or wind. Additionally, the system can experience instability when renewable energy generated in remote areas is unable to reach population and industrial centers due to "congestion"[114] or bottle-necks on the high-powered electric transmission grid.

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[110] "All of the country's reactors will shut under the German nuclear phase-out law by 2022." Andreas Franke, *German Units Readying For Rare Winter Refueling*, 57 PLATTS NUCLEONICS WEEK 50, Dec. 15, 2016, 2016 WLNR 39731972.

[111] The intermittency problem refers to the fact that renewable sources like solar and wind cannot generate power on-demand. Instead, they only generate power when the sun shines or wind blows, which means they are "intermittent" sources of power. In contrast, non-weather dependent power plants using oil, coal and nuclear power can be activated almost immediately any time of the day any time of the year.

[112] Additionally, other renewable sources like hydropower are comparatively less intermittent and weather dependent when compared to solar and wind.

[113] Andy Koenig, *German Results Flash Caution on Power Plan*, INVESTOR'S BUS. DAILY, Sept. 2, 2015, 2015 WLNR 25959445.

[114] "Transmission congestion means that some power plants can't get on line at peak times, and it may mean that others cannot operate at maximum efficiency. . ." Tony Reid, *Ameren Lays Out Route*

In order to stabilize its electric system – and to ensure that there is sufficient energy to meet demand – Germany has been forced to use dirtier lignite[115] coal generating plants to provide power when solar and wind sources are unable to do so.[116] In 2017, "[l]ignite coal-fired power plants account[ed] for a quarter of Germany's electricity supply and half of the electricity sector's carbon emissions."[117] Additionally, it has been alleged that Germany's increased reliance on intermittent renewables caused grid instability to its neighbors during those periods when it was very windy and sunny in Germany, which created surpluses of renewable power that has been alleged to impact the stability of the electric grids of neighboring Poland and the Czech Republic.[118]

The German experience demonstrates that during the transition period from a fossil-fuel and nuclear-based energy system to a renewable-focused energy system, there should be an appropriate combination of the following two factors: (1) sufficient non-weather dependent power plants to address the intermittency problem to ensure grid stability in which there is always sufficient power supply to meet demand, and (2) utilization of proven technology advancements that provide greater assurance that intermittent renewable energy supplies are capable of continuously and reliably meeting energy demand.

Considerable funds for research and development appropriately continue to be invested in developing technologies to control grid destabilization resulting from increased reliance on intermittent renewables. For example, one focus of research are energy storage systems analogous to large batteries, which can store renewable energy generated during surplus periods and can then be used later when it is needed.[119] One of the largest energy storage systems in Europe, for example, is

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'Illinois Rivers' Power Transmission Line, HERALD & REVIEW (Oct. 3, 2012), http://herald-review.com/news/local/ameren-lays-out-route-illinois-rivers-power-transmission-line/article_ea0720f8-0d13-11e2-8e36-0019bb2963f4.html.

[115] "Lignite, or brown coal, considered the lowest rank of coal, generates more carbon dioxide emissions than hard coal, as well as a host of other poisonous gases when burned, said environmental organisation Greenpeace. While Germany is committed to shifting to clean energy sources, lignite still makes up almost a quarter of the country's energy mix, reported broadcaster Deutsche Welle. The advantages that it offers, including being cheap, and helping to support jobs and the local economy, have meant that Germany is expected to rely on brown coal for its power production till 2040." *Colour Of German Lignite Pollution*, THE STRAITS TIMES (July 15, 2017), http://www.straitstimes.com/multimedia/photos/colour-of-german-lignite-pollution.

[116] Opinion, *Lessons from Germany*, SALINA JOURNAL, May 12, 2016, at A9; Andy Koenig, *German Results Flash Caution on Power Plan*, INVESTOR'S BUS. DAILY, Sept. 2, 2015, 2015 WLNR 25959445.

[117] Olaf Storbeck, *German Climate Change Policy Takes Trumpian Turn*, REUTERS (July 18, 2017), https://www.breakingviews.com/considered-view/german-climate-change-policy-takes-trumpian-turn/.

[118] Carol Paton, *Germany Reaps Reward Of Renewable Revolution*, BUSINESS DAY (SOUTH AFRICA), Oct. 13, 2014, 2014 WLNR 28470929.

[119] *See Japan: NEC and EnspireME to Build Europe's Largest Battery Energy Storage System in Germany,* MENA REPORT, May 21, 2017, 2017 WLNR 12318866 (hereinafter "MENA REPORT"); *see also*, *Findings from J. Michalski and Co-Authors Update Knowledge of Hydrogen (Investment Decisions In Imperfect Power Markets With Hydrogen Storage And L … Hydrogen*, ENERGY WEEKLY NEWS, June 30, 2017, 2017 WLNR 19309990.

being constructed in Jardelund, Germany.[120] Although these research advances are encouraging and important strides continue to be made, it does not appear at the present time that such technologies are mature and cost effective enough to eliminate reliance on some non-renewable power sources to meet Germany's energy supply needs.

2. The Chinese experience

In China, although grid instability is a problem, it appears to have a larger problem with generating renewable power that cannot often be utilized because upgrades to its electric transmission grid have not kept pace with the substantial increase in renewable energy projects. As a consequence, in many instances, wind-generated energy "had no place to go because there's no [electric grid] transmission infrastructure to carry the power to population centers."[121] In addition, the "Chinese National Energy Administration . . . is grappling with a growing amount of large-scale solar curtailment. Grid constraints are preventing the country from exporting power from solar farms in the west to the east . . . ."[122]

Another side-effect of China seeking to integrate additional solar and wind renewables into the grid is that "[t]he intermittent nature of renewable energy also poses safety challenges for grid operators."[123] It is now more difficult for grid operators to consistently ensure they have sufficient energy supply to meet demand.

As a result of these and other developments, the Chinese government imposed limitations on the number of wind-powered renewables that can be constructed in the northern provinces because the electric grid is unable to reliably transport this power to far away population centers reliably.[124] In addition, as a result of these factors, "[i]n 2015 alone, 33.9 billion kilowatt-hours of wind-powered electricity [in China] was wasted, government statistics show—equivalent to the electricity consumed by 3 million American households a year. That was about 15 percent of China's total wind power generation, up from 8 percent a year earlier."[125]

3. The Canadian experience

The negative impacts of renewables on non-weather dependent power plant owners and on grid stability have received considerably less attention among industry analysts who follow Canada. The main reason is that Canada's primary

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[120] MENA REPORT *supra* note 119.

[121] Coco Liu, *Facing Grid Constraints, China Puts a Chill on New Wind Energy Projects*, INSIDE CLIMATE NEWS, (Mar. 28, 2016), https://insideclimatenews.org/news/28032016/china-wind-energy-projects-suspends-clean-energy-climate-change.

[122] Jason Deign, *Why China's Solar Market Won't Have Another Year Like 2016*, GREENTECH MEDIA:, (June 5, 2017), https://www.greentechmedia.com/articles/read/why-chinas-solar-market-wont-have-another-year-like-2016#gs.ktW=lr8.

[123] Coco Liu, *supra* note 121.

[124] *See Id.*

[125] *Id*.

source of renewable energy is hydroelectric power, which is comparatively more stable and less intermittent than solar and wind power.

B. *Lessons for the U.S.*

In the U.S., there is a growing awareness of some of the challenging experiences foreign countries have faced in seeking to increase the use of renewables. For example, a 2017 report prepared by researchers at the University of Texas at Austin concluded:

> The installation of wind and solar capacity in the electric grid can influence net load ramp rates and volatility, affecting grid stability and operating costs. In this study, the statistical analysis of load, wind, and solar data from the Electric Reliability Council of Texas (ERCOT) shows how wind and solar capacity impacts these grid flexibility requirements.[126]

Additionally, claims that increased reliance on intermittent renewables can cause grid instability have also arisen in Hawaii and California, where is has been claimed that:

> With the rapid deployment of renewable energy, the power grid in many areas can no longer take more on-grid solar systems. For instance, Hawaii ended the solar net-metering program in 2015. In April 2016, ISO (Independent System Operator) in California forced a temporary shutdown of large solar farms to avoid grid instability.[127]

To avoid or mitigate the level of grid instability experienced in Germany and China, this article advances two potential near-term options that could facilitate the goal of U.S. states, municipalities, and the private sector to transition toward greater reliance on renewables. These options could potentially serve as important newer-term "bridge" mechanisms that facilitate greater reliance on renewables.

But before addressing these two options, it is important to recognize that it is worthwhile for states, municipalities, and the private sector to continue to invest in research and development of technologies that have the potential to mitigate grid

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[126] *Investigators at University of Texas Report Findings in Energy (The impacts of wind and solar on grid flexibility requirements in the Electric Reliability Council of Texas*, ENERGY WEEKLY NEWS, May 19, 2017, 2017 WLNR 14671676.

[127] *Off-Grid Inverter Supports Heating, Cooling And Refrigeration*, PRODUCT NEWS NETWORK, June 29, 2016, 2016 WLNR 19884459; *but see* Dana Nuccitelli, *Climate Denial Is Like The Matrix; More Republicans Are Choosing The Red Pill*, GUARDIAN, July 19, 2017, 2017 WLNR 21995408 ("These conclusions are consistent with the opinions of grid operators – including in red states where wind supplies a significant fraction of electricity (including Perry's home state of Texas) – that renewables are not undermining grid stability.").

destabilization resulting from increased reliance on intermittent renewables, help ensure that energy supply always meets demand, and mitigate the waste or curtailment of renewable energy. But at the present time, such technologies are incapable of completely displacing the near-term need to rely upon non-weather dependent power sources to help promote grid stability.

Additionally, in many instances, upgrading the transmission grid to accommodate the integration of renewables continues to be an important solution to maintaining grid stability as well as mitigating the waste or curtailment of renewable energy. The Chinese experience was particularly helpful in demonstrating that transmission grid upgrades are an important component of any solution to this challenge.

As explained in greater detail below, the first option this article examines as a potential near-term measure to help maintain grid stability is adjusting the federal rules governing the wholesale energy markets that compensate non-weather dependent power sources. The second is = individual states evaluating whether it is appropriate to provide additional compensation to in-state non-weather dependent generators. I take up each in turn.

1. Mitigation through modifications to wholesale energy market rules

One solution is providing economic incentives to non-weather dependent power sources through changes in the rules governing the wholesale energy market. These would involve adaptation of certain existing models (so-called "RMR" and "MRA" arrangements discussed below) or the creation of new models designed to help ensure there is always sufficient energy supply to meet demand.

Currently, many, but not all, states and regions in the U.S. have competitive electricity markets run either by federally-designated Independent System Operators ("ISOs") or Regional Transmission Organizations ("RTOs"). These markets are principally designed to provide compensation to power plants on a fuel-and technology-neutral basis. For example, the ISO that operates the New England regional energy market explained that its "markets are designed to achieve reliability and long-term efficiency at the lowest costs and on a fuel-and technology-neutral basis."[128] As a result, such markets generally do not provide extra financial incentives to non-renewable power sources, subject to certain exceptions.

One exception is that some U.S. ISOs and RTOs already have the authority to provide compensation to those power plants in economic distress that are deemed necessary to maintain electric system reliability. The energy industry often refers to such arrangements as "reliability-must-run" or "RMR" arrangements. Under such arrangements, if an ISO or RTO determines it is needed for system reliability, a power plant in economic distress (*i.e.*, one contemplating or having already decided to shutdown) can receive a guaranteed revenue stream for a specified time period to

[128] 2016 REGIONAL ELECTRICITY OUTLOOK, ISO NEW ENGLAND INC 21 (2016).

ensure its continued operation.[129] But one important criticism of RMR arrangements is that they provide out-of-market or extra-market payments to a small number of power plants and, therefore, may interfere with the goal of developing truly competitive electricity markets.[130] Another major criticism is that they could be used to allow outdated – and potentially less carbon friendly – fossil fueled plants to continue to operate, which undermines environmental goals.[131]

Another tool that some U.S. ISOs and RTOs currently have to ensure system reliability is to issue requests for proposals for alternative solutions to mitigate or resolve system reliability problems. In Texas, for example, its grid operator "has a process to consider other resources, known as 'Must-Run Alternatives' (MRA). In lieu of paying an uneconomic plant to stay open to ensure grid reliability, . . . [it] issues a Request for Proposals for alternative solutions that can address the specific reliability concern."[132] But if an alternative solution involves constructing new power plants or upgrades to electric grid infrastructure, such alternatives take time to implement and therefore may not provide a timely solution in all instances.

In response to this issue, an important debate is growing among some U.S. ISOs and RTOs as to whether the existing rules governing competitive federally regulated wholesale energy markets should be modified to enable ISOs and RTOs to provide additional compensation to owners of non-weather dependent power plants to help ensure system reliability during the transition toward greater reliance on renewables. Proponents of such changes, who are primarily owners of non-renewable non-weather dependent power plants, claim that federal subsidies in the form of tax credits and state subsidies in the form of above-market payments are currently only provided to renewable sources, which provide these resources with an unfair economic advantage over non-renewable power sources. These proponents claim that in order to create a level playing field in competitive energy markets, the existing market rules should be modified to compensate non-renewable power sources for the important system reliability benefits they provide. They also claim that existing mechanisms like RMR and MRA arrangements provide insufficient economic incentives for them to continue to operate their units.

In response to these claims, some consumer advocates, proponents of renewable energy and other electric industry stakeholders claim that existing mechanisms like RMR and MRA arrangements provide ISOs and RTOs with sufficient tools to ensure the continued operation of non-economically viable power plants that are needed for system reliability. They also claim that providing such non-renewable power plants with additional compensation would be excessive and unwarranted. They further claim that providing non-renewable power sources with additional compensation undermines renewable energy goals by perpetuating the operation of uneconomic, older, and often less carbon friendly units. They also

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[129] John Hall, *4 Ways To Enhance Texas' Approach To Electric Reliability*, ENVT'L. DEF FUND (Nov. 16, 2016) http://blogs.edf.org/energyexchange/2016/11/16/4-ways-to-enhance-texas-approach-to-electric-reliability/.

[130] *Id.*

[131] *Id.*

[132] *Id.*

claim that—instead of allocating additional, scarce funds to non-renewable power sources—those funds would be better spent by investing them in technologies that have the potential to help promote grid stability and the integration of renewables into the grid.

But resolving this problem is difficult. It would require collaboration between FERC, which oversees wholesale energy markets; the ISOs and RTOs, who administer FERC-approved regional energy market rules; and the states who establish state-specific renewable energy goals and provide extra-market payments to renewable sources to promote state carbon reduction goals. The difficulty of this problem is evidenced by published reporting about a May 2017 meeting, which spoke of "[s]ignificant tensions" among members of FERC, representatives of 14 states that participate in the ISOs and industry stakeholders who evaluated potential solutions to this problem.[133] From the perspective of FERC, the problem flowed from:

> state policies that seek to procure or to subsidize certain [primarily renewable] energy resources. Those programs essentially bypass [FERC-approved energy] market payments that all generators [of electricity] are eligible to receive, undercutting unsubsidized resources [that generate electricity] and complicating the market's price signals that aim to dispatch the cheapest resources.
>
> Policies to reduce carbon emissions are central to the issue, particularly as states take on more ambitious greenhouse gas reduction goals or clean energy targets in the absence of a national climate policy. As states find that regional power markets cannot put them on a path to meet those goals, they are developing out-of-market policies.[134]

This May 2017 conference reinforced the complexity of this problem because "several observers say any solution is likely a long way off because states and other stakeholders cannot agree on the scope of the problem, nor can they agree on the extent to which markets should help states meet their goals."[135]

In September 2017, the U.S. took an additional step toward investigating this issue when the DOE asked FERC to develop new wholesale energy market rules that provide extra compensation to nuclear, coal and potentially other non-renewable baseload power plants to help ensure these resources continue to be available for grid reliability purposes. In January 2018, FERC responded to the DOE's request by initiating a new docket to examine this issue.[136]

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[133] Abby Smith, *Officials See No Easy Fix to Power Market Tension with State Climate Goals*, INSIDE EPA/CLIMATE, May 3, 2017, 2017 WLNR 13644638.

[134] *Id.*

[135] *Id.*

[136] *See* U.S. FERC, 162 FERC ¶ 61,012, ORDER TERMINATING RULEMAKING PROCEEDING, INITIATING NEW PROCEEDING AND ESTABLISHING ADDITIONAL PROCEDURES (2018).

These developments collectively demonstrate that greater attention is being devoted to this topic in the U.S., but some commentators have expressed concern that the current administration's focus on this issue appears to be primarily driven by its desire to support the coal and nuclear power industry. When coupled with lessons learned from other nations, the current effort to formulate such rules provides an opportunity to help avoid or mitigate some of the grid instability problems experienced in Germany, but this opportunity should not be limited to an examination of coal and nuclear power only. Any meaningful examination of potential near-term measures to mitigate grid instability resulting from the integration of greater amounts of intermittent renewables should include an analysis of all options, including natural gas and large-scale hydropower which is less intermittent than solar and wind (as well as an examination of the benefits yielded by transmission grid upgrades and other near-term options).

2. Mitigation through additional state-initiated compensation to non-weather dependent generators

A related proposal that could potentially provide near-term mitigation of grid instability from intermittent renewables is state-initiated compensation to non-weather dependent power plants. I discuss this topic separately because subsection (1) discussed potential compensation that could be provided through federally regulated wholesale energy markets, whereas this subsection (2) will evaluate a more recent development in which some states have elected to provide extra-market compensation to in-state nuclear power plants for a variety of reasons such as the preservation of local jobs and tax revenues, maintaining a diverse fuel mix and other reasons.

For example, in 2016, state legislatures in New York and Illinois approved programs in which in-state electric utility ratepayers will compensate nuclear power plants that are allegedly experiencing financial difficulty in order to ensure these plants remain open for at least the next decade.[137] In 2017, Connecticut passed legislation to study this issue.[138] Additionally, state legislatures in Ohio, New Jersey and Pennsylvania have evaluated proposals from in-state nuclear plants for additional compensation from state electric ratepayers.[139]

Owners of nuclear plants claim such additional state compensation is necessary because their units are in financial distress and help to maintain grid reliability as states integrate additional intermittent renewables. They also claim that their units typically employ hundreds or thousands of state residents and provide important tax revenues to affected municipalities, while also serving as

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[137] NAT'L CONF. OF ST. LEGIS., STATE OPTIONS TO KEEP NUCLEAR IN THE ENERGY MIX 25-26 (2017).

[138] Connecticut, June 2017 SS Pub. Act No. 17-3, *An Act Concerning Zero Carbon Solicitation and Procurement*.

[139] Andrew Coffman Smith, *Nuclear Insiders Look to States to 'Re-Regulate' Flawed US Electricity Markets*, SNL ELECTRIC UTILITY REPORT, July 10, 2017, 2017 WLNR 21171325.

important zero-carbon sources of power that are necessary to help states achieve their carbon reduction goals. Moreover, they assert that preserving nuclear units helps maintain a diverse fuel supply in the U.S.[140]

Opponents of state subsidies claim that such proposals, among other things, inappropriately favor nuclear units over non-weather dependent producers, such as natural gas, oil and coal fired plants. They also allege that – in states that have deregulated their electricity industry—such proposals effectively force electric ratepayers to "pay twice" for existing nuclear units that have, in many instances, already been paid for by ratepayers. All of the owners of nuclear units who seek state financial assistance, these opponents claim, have not adequately demonstrated economic hardship and such policies disrupt competitive energy markets because the alleged financial difficulties of nuclear units are primarily driven by market forces like an abundance of low cost natural gas, which may make natural gas-fired power plants more economical. Opponents also assert that such initiatives force states to deploy limited funds toward preserving existing nuclear units, which means there are less state funds available to support the construction of new renewable sources or investment in the development of important technologies that can facilitate the integration of additional renewables into the grid.[141]

In addition to these economic and policy arguments, it is also important to examine whether state-sponsored compensation of in-state nuclear units can withstand legal challenge. Lawsuits have been filed against the Illinois and New York initiatives, alleging, among other things, that state-sponsored compensation schemes for nuclear units are preempted by federal law, which confers exclusive jurisdiction over such wholesale electricity transactions on FERC and its designees, and they also violate the dormant Commerce Clause by favoring intrastate nuclear units over nuclear and other units located out of state.[142]

In evaluating this potential option, once again, it is also helpful to examine relevant experiences from abroad such as the German experience. Because of German concerns about the safety of nuclear energy, the *Energiewende* excludes nuclear units from its long-term solution to this problem by electing to phase-out all nuclear units by 2022. This decision to phase-out all nuclear units does not appear to be a realistic solution for the U.S. First, there is simply no comparable movement to phase-out all nuclear units in the U.S. as there is in Germany (led notably by the Green Party, and prompted in particularly by the 2011 Fukashima disaster). Second, the U.S. has approximately 100 commercial nuclear units[143] that constitute the third leading source of our nation's electric supply in 2016 (trailing

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[140] *Id.*

[141] *See, e.g.*, Joe Nichols, *An Ohio Cure for the Nuclear Subsidy Contagioin*, AKRON BEACON JOURNAL, (July 18, 2017), https://www.ohio.com/akron/editorial/commentary/joe-nichols-an-ohio-cure-for-the-nuclear-subsidy-contagion.

[142] *See, e.g.*, Andrew Coffman Smith, *Federal Court Rejects Claims Against Illinois Subsidy for Nuclear Plants*, SNL POWER DAILY, July 18, 2017, 2017 WLNR 22021454; Bob Matyi, *Exelon Defends New York State Support for At-Risk Nuclear Units*, PLATTS NUCLEONICS WEEK, Vol. 58: 5, Feb. 2, 2017, 2017 WLNR 4977486; Lucas Bifera, *NY Regulators, Joined by Exelon, Move to Dismiss Generators' Subsidy Lawsuit*, SNL POWER POLICY WEEK, Dec. 14, 2016, 2016 WLNR 38476470.

[143] *See* U.S. NUCLEAR REG. COMM'N, LIST OF POWER REACTOR UNITS, https://www.nrc.gov/reactors/operating/list-power-reactor-units.html.

only natural gas and coal).[144]

The more difficult question confronting states with existing nuclear plants is finding the most equitable solution in this context. At this point only two states (Illinois and New York) have provided extra-market compensation to nuclear units. Thus, it is too early to determine whether a state-by-state, regional or national approach is superior. However, it is clear that, if the owner of an existing U.S. nuclear plant (or any other non-weather dependent power plant) proposes to close unless it receives additional compensation, the affected state and regional ISO or RTO (if applicable) should examine several factors. These include: (1) whether the nuclear is unit needed to maintain grid reliability; (2) whether the actual present and future financial condition of the unit's owner is in danger; (3) whether any alternative solutions exist to maintaining grid reliability, at what cost and when they can be brought on line; (4) whether the nuclear unit would benefit from existing mechanisms like RMR arrangements that, in some cases, are paid for by regional ratepayers instead of ratepayers from one state; and (5) if the unit is located in a state that has restructured its electricity industry, whether the receipt of state payments should be conditioned upon the units owner's agreement to be "re-regulated" to ensure that the owner's profit level is limited in the same manner that regulated electric and other utilities experience today.

Electric industry stakeholders of course have different views over whether and the extent to which states should provide additional compensation to non-weather dependent power plants to help maintain grid reliability as the U.S. increases its reliance on renewables. Nonetheless, the developments outlined in this subsection demonstrate that states are devoting greater attention to this topic. Here, too, that increased awareness, coupled with lessons learned from other nations, provides states with another opportunity to mitigate some of the grid instability problems experienced in other nations.

V. CONCLUSION

The Journal's symposium provided participants with an important opportunity to contribute to the on-going discussion about the role of states, municipalities and the private sector post-withdrawal from the Paris Agreement to further reduce carbon emissions primarily through renewable energy resources. This article seeks to contribute to that discussion by demonstrating that renewable energy cannot be expanded in a meaningful way without a reliable electric grid. It also recommended that the U.S. should not only look inward, but also abroad to learn from the experiences of other nations that have confronted grid instability when they attempted to integrate substantial amounts of intermittent, weather-dependent renewables. Those experiences from abroad yielded useful comparisons that could

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[144] *See* U.S. DEPT. OF ENERGY, ELECTRIC POWER MONTHLY WITH DATA FOR NOV. 2017 (Table 1.1) (2018), http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_1_1.

facilitate efforts to resolve or mitigate the challenges triggered by integrating more renewables into the U.S. electric system.


UNIVERSITY OF CONNECTICUT
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RESPONSE TO VINCENT P. PACE'S ARTICLE, 33(3) CONN. J. INT'L LAW 361 (2018)

Robert J. Klee[*]

The Trump Administration's misguided decision to withdraw the United States from the Paris Climate Accord places the United States alone and apart from the rest of the international community and the global consensus to take meaningful steps to address climate change.[1] Connecticut is profoundly disappointed that the United States federal government has abdicated its leadership role on climate change—the number one environmental issue of our time. We are also dumbfounded by the Trump Administration's hostility to any energy technology that is not fossil-fuel based—effectively ceding ground to the rest of the world on the development and deployment of clean energy. This is a strange place for the United States, which has historically led the world in basic science, technological innovation, and entrepreneurial activity.

The good news, however, is that leading states have joined together in the U.S. Climate Alliance to say to the Trump Administration that we are "still in" the Paris Climate Accord and we will meet our share of its obligations.[2] The seventeen states[3] in the U.S. Climate Alliance are a formidable coalition: we are bipartisan, we represent 40% of the U.S. population, and we account for more than $9 trillion in combined economic activity—enough to be the third largest economy in the world behind U.S. and China.[4] We also recognize that time is not on our side: we are already paying a price for inaction and are striving to make our states more resilient.

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[1] When war-torn Syria ratified its decision to join on November 7, 2017, the United States achieved the dubious distinction of now being the only country to reject the Paris Climate Accord. *See* Lisa Friedman, *Syria Joins Paris Climate Accord, Leaving Only U.S. Opposed*, N.Y. TIMES (Nov. 7, 2017), https://www.nytimes.com/2017/11/07/climate/syria-joins-paris-agreement.html.

[2] *See* UNITED STATES CLIMATE ALLIANCE, ALLIANCE PRINCIPLES, https://www.usclimatealliance.org/alliance-principles/ (last visited May 5, 2018).

[3] The seventeen states in the U.S. Climate Alliance are California, Colorado, Connecticut, Delaware, Hawaii, Maryland, Massachusetts, Minnesota, New Jersey, New York, North Carolina, Oregon, Puerto Rico, Rhode Island, Vermont, Virginia, and Washington. *See* UNITED STATES CLIMATE ALLIANCE, ABOUT US, https://www.usclimatealliance.org/about-us/.

[4] *See* UNITED STATES CLIMATE ALLIANCE, NON-PARTY STAKEHOLDERS' INPUTS FOR THE TALANOA DIALOGUE 1 (April 2018), https://www.usclimatealliance.org/s/US-Climate-Alliance-Talanoa-Dialogue-Submission-April-Final.pdf.

While Mr. Pace's paper looks to rest of the world for guidance on the challenges and opportunities for deployment of renewable energy and maintaining grid reliability, I would argue that we need not look so far afield. The U.S. Climate Alliance states are world leaders and innovators in the policies and technologies that will drive our clean energy future and we are all actively implementing programs that will continue to make measurable progress towards our global climate goals.

Take, for example, my home state of Connecticut. Our recently amended Global Warming Solutions Act (GWSA) mandates 10% economy-wide greenhouse gas (GHG) reductions below 1990 levels by 2020, 45% reductions by 2030, and 80% reductions by 2050.[5] Our recently amended Renewable Portfolio Standard (RPS) requires that 21% of our electricity comes from Class I renewable sources (solar, wind, small hydro, fuel cells, etc.) by 2020, and 40% comes from Class I renewable sources by 2040.[6] Connecticut was a founding member of the Regional Greenhouse Gas Initiative (RGGI).[7] This nine-state, bipartisan, first-in-the-nation, cap-and-trade market mechanism to reduce GHG emissions has driven down GHG emissions in Connecticut from the power sector by 32% and as a group we have recently committed to an additional 30% reduction by 2030.[8] From 2008 to 2015, Connecticut received $155 million in RGGI auction proceeds and more than 90 percent of these proceeds were invested in energy efficiency projects and renewable energy.[9]

In Connecticut, we recognized early on the value of long term contracts to the development of grid-scale renewables – our RGGI obligations and RPS obligations were not "bankable" enough to attract the financing needed to build grid-scale renewable projects. Therefore Connecticut has statutory authority to procure up to 23% of load from grid-scale Class I renewables through up to 20 year power purchase agreements.[10] We have run three competitive procurements (in 2012, 2013,

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[5] Conn. Gen. Stat. § 22a-200a(a), as amended by Public Act 18-82. *See also infra* note 20.

[6] *See* Conn. Gen. Stat. § 16-245a, as amended by Public Act 18-50; *see also* Conn. Gen. Stat. § 16-1(a)(20) (defining resources that qualify as Class I renewables in Connecticut). *See also infra* note 20.

[7] *See generally* RGGI, INC., REGIONAL GREENHOUSE GAS INITIATIVE, https://www.rggi.org.

[8] *See* RGGI, INC., RGGI STATES RELEASE UPDATED MODEL RULE, CONCLUDING REGIONAL PROGRAM REVIEW PROCESS (Dec. 19, 2017), https://www.rggi.org/sites/default/files/Uploads/Program-Review/12-19-2017/Announcement_Completed_Model_Rule.pdf; *see also* RGGI, INC., SUMMARY OF 2017 MODEL RULE UPDATES, (Dec. 19. 2017), https://rggi.org/sites/default/files/Uploads/Program-Review/12-19-2017/Summary_Model_Rule_Updates.pdf.

[9] *See* RGGI, INC., THE INVESTMENT OF RGGI PROCEEDS IN 2015 16-18 (Oct. 2017), https://www.rggi.org/sites/default/files/Uploads/Proceeds/RGGI_Proceeds_Report_2015.pdf.

[10] *See* Conn. Gen. Stat. §§ 16a-3f, 16a-3g, 16a-3i, 16a-3j. Connecticut also has authority to procure carbon free resources like large scale hydropower, zero emission Class I renewables, and nuclear. *See* Conn. Gen. Stat. § 16a-3m. This additional authority is up to 44% of load, and will again be done through competitive procurement to ensure we are protecting ratepayers. *See id.* Connecticut also has the authority to procure up to 6% of load in what we are calling our "best in class" procurement, focused on emerging technologies like offshore wind, anaerobic digestion, storage, and fuel cells. *See* Conn. Gen. Stat. § 16a-3h, as amended by Public Act 18-50. In this procurement category we can invest in certain technologies that deliver other benefits (e.g., waste management, resiliency, or combined heat and power), or may need more assistance before they are cost competitive with other more established renewable resources (e.g., offshore wind, storage). *See generally* CONN. DEP'T OF ENERGY & ENVTL PROTECTION, 2018 FINAL COMPREHENSIVE ENERGY STRATEGY: ELECTRIC POWER SECTOR, 119 (Feb. 8, 2018),

2016) which will deliver over 500 MW of wind and solar over the next few years. The megawatts deployed are only part of the story. We have harnessed market forces to drive down costs of grid-scale renewables through use of competitive procurements. The average price for grid-scale, Class I renewables dropped from $0.17/kWh in our 2012 procurement, to $0.12/kWh in 2013, to between $0.085 and $0.092/kWh in 2016.[11] This trend in Connecticut seems similar to the 30% reduction in price Germany experienced when it transitioned to competitive auctions for its grid-scale renewables.[12]

At the residential scale, with the help of the first-in-the-nation Connecticut Green Bank, we have also deployed over 150 MW of behind-the-meter solar. The Connecticut Green Bank's Solar Home Renewable Energy Credit Program (SHREC) aggregates residential Renewable Energy Credits (RECs), and allows the Green Bank to sell the RECs in the RPS compliance market to generate funds to reinvest in the program.[13] Again, as is a recurring theme in the Connecticut story, the Connecticut Green Bank has steadily decreased its residential solar subsidies over time—for example, its performance-based incentives decreased from 30 cents/kWh in 2012 to 4 cents/kWh in 2018.[14]

Connecticut's Zero Emissions Renewable Energy Credit (ZREC) and Low Emission Renewable Energy Credit (LREC) programs have deployed over 300 MW of behind the meter (<2 MW) solar and fuel cells at commercial and industrial facilities.[15] Again, we have harnessed market forces to drive down costs by offering the ZREC/LREC incentive through six competitive reverse auctions from 2012 to 2018. In the first five years, average ZREC prices dropped from $133.23/REC to $75.53/REC, and average LREC prices dropped from $66.86/REC to $42.57/REC.[16]

Finally, Connecticut's first-in-the-nation community microgrid program has been deploying distributed clean energy into our communities to ensure critical facilities stay powered when the rest of the grid is down due to severe storms or other

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http://www.ct.gov/deep/lib/deep/energy/ces/electric_power_sector.*pdf* (hereinafter "DEEP 2018 CES: Power") (table summarizing Connecticut's procurement authority for clean energy generation).

[11] *See* DEEP 2018 CES: Power, *supra* note 10, at 118-19, 133. Connecticut has among the highest retail electricity rates in the continental United States. Therefore, we feel that it is our responsibility to ensure we are making frugal, sustainable investments in renewables in order to meet our ambitious climate goals.

[12] *See* Vincent P. Pace, *Renewable Energy and Electric Grid Stability After the U.S. Paris Withdrawal: Looking Abroad for Guidance?*, 33(3) CONN. J. INT'L LAW 361 at 379-80. It appears that Ontario is also moving in the direction of competitive bidding or auctions for grid-scale renewable procurements. *See id.* at 17.

[13] *See* KRISTOFER HOLZ & MILAGROS DE CAMPS, YALE CENTER FOR BUSINESS AND THE ENVIRONMENT: CASE STUDY OF CONNECTICUT'S RESIDENTIAL SOLAR PROGRAM 9, 18 (2017); *see also* DEEP 2018 CES: Power, *supra* note 10, at 131. The SHREC program is capped at 300 MW and will likely be fulfilled within the next few years, or no later than 2022. *See* DEEP 2018 CES: Power, *supra* note 10, at 131.

[14] *See* CONN. DEP'T OF ENERGY & ENVTL PROTECTION, 2018 FINAL COMPREHENSIVE ENERGY STRATEGY: DISTRIBUTED GENERATION COST ANALYSIS, 10 (Feb. 8, 2018), http://www.ct.gov/deep/lib/deep/energy/ces/distributed_generation_cost_analysis.pdf.

[15] *See* DEEP 2018 CES: Power, *supra* note 10, at 134.

[16] CONN. DEP'T OF ENERGY & ENVTL PROTECTION, 2018 FINAL COMPREHENSIVE ENERGY STRATEGY: DISTRIBUTED GENERATION COST ANALYSIS, 8 (Feb. 8, 2018), http://www.ct.gov/deep/lib/deep/energy/ces/distributed_generation_cost_analysis.pdf.

disruptions. Connecticut has authorized over $50M in bond funds which have (so far) created six operational microgrids, with nine more in various stages of development.[17] Connecticut's microgrids are designed to support critical facilities like emergency response, sewage treatment plants, hospitals, shelters or warming stations. But the microgrids can also encompass gas stations, grocery stores, banks, or other amenities of modern life that are sorely missed when the power is out for days or weeks. These funds can support either the "trips and transfers" that island the microgrid from the rest of the grid, or the clean distributed generation (like fuel cells, solar arrays, or microturbines) that provide power to the microgrid in the relatively rare instances when island mode, and distribute clean energy to the grid the rest of the time.[18]

These are a few examples of Connecticut's leadership on clean energy deployment.[19] Similar policies and programs are found in the other U.S. Climate Alliance states who are developing and proposing new policies and programs all the time.[20]

So, while national leadership will ultimately be needed to ensure that *all* of the United States is making the necessary investments to address our climate reality, for now the states will lead the way. That may not be the worst outcome, since we are

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[17] *See* DEEP 2018 CES: Power, *supra* note 10, at 157-58.

[18] *See* CONN. DEP'T OF ENERGY AND ENVTL PROTECTION, MICROGRID GRANT AND LOAN PROGRAM, http://www.ct.gov/deep/cwp/view.asp?a=4405&Q=508780.

[19] This Response focuses solely on renewable deployment, as did Mr. Pace's symposium paper; Connecticut also has additional (and substantial) efforts underway on efficiency and clean transportation.

[20] In the 2018 legislative session, Connecticut Governor Dannel P. Malloy introduced two comprehensive climate change and clean energy bills that build on Connecticut's progress over the last seven years. *See* Senate Bill 7; Senate Bill 9. These bills were a matched pair: one set ambitious goals on economy-wide GHG emissions, and the other proposed updates and expansions of our clean energy deployment programs to meet that goal. Senate Bill 7 proposed an economy-wide GHG reduction target of 45% by 2030, which is a straight-line trajectory from Connecticut's current GHG emissions today, to where they must be in 2050 to meet the requirements of our GWSA. This represents a California or New York level of ambition (or beyond) by 2030, and will require a clean grid, electrification of transportation and electrification of home heating. Senate Bill 9 proposed increasing the RPS to 40% by 2030, which would make Connecticut a national leader in cleaning up the electric grid. Senate Bill 9 also proposed updates to our behind-the-meter programs, to transition from net metering to a feed in tariff either set by competitive auction (for larger commercial and industrial projects); or set by our state electricity regulator, the Public Utilities Regulatory Authority, for residential projects. Connecticut's proposed transition to a feed in tariff model for behind-the-meter renewables would mean that the price reflects the actual cost of the technology, its installation, and a profit for the installer – and not the arbitrary cost of retail energy. This will allow price transparency, and will ensure that as technology advances, prices drop, and installation and soft costs go down, Connecticut ratepayers will benefit from those savings. Both bills passed the Connecticut House and Senate by large margins and with bipartisan support. *See* Public Act 18-82 (Senate Bill 7); Public Act 18-50 (Senate Bill 9). The goal of these reforms is to create robust and sustainable deployment of behind-the-meter renewables out to 2030; and the end result will be similar to the new feed-in tariffs that Germany has developed for residential solar. *See* Pace at 379 & n.89. I do note, however, that Mr. Pace's article missed a valuable opportunity to discuss the market implications of the dramatic drop in Germany's residential solar feed-in tariff from as high as €0.52 ($0.64) per kWh to €0.13 ($0.16) per kWh. An understanding of the customer response and the solar market resiliency to these price corrections would be useful information for states (and other countries) seeking to sustainably evolve their behind-the-meter solar deployment.

the laboratories of policy innovation[21] and where the rubber meets the road on implementation.[22]

While there are many notable examples of progressive renewable deployment policies among the various U.S. Climate Alliance states (and others), the diversity of these states and their approaches to renewable deployment may actually pose a problem with respect to Mr. Pace's central thesis that the United States should look to Germany, China, or Canada for guidance on how to sustainably integrate renewables into the grid. These leading and innovative states are not monolithic and their policies and programs will be hard to generalize for purposes of international comparison and policy transfer.

Even the basic rules governing power companies and the electric grid will differ among the states. Some have deregulated (separating publicly-regulated electricity distribution and rate-setting from market-based merchant power generators), while other states still have vertically integrated power companies. States may be part of a multi-state regional transmission organization (RTO) like ISO-New England, or part of a single-state RTO like ISO-New York—and the different RTOs have different rules governing their markets and the deployment of renewables. States and regions may have very different generation fleets: New England is largely coal-free with substantial amounts of natural gas and nuclear in its grid mix; the Midwest and mountain west have significant amounts of coal, but also large grid-scale renewables; the West Coast has significant large-scale hydropower resources.

This is not to say that international comparisons and lessons from other countries highlighted in Mr. Pace's paper have no relevance to the progressive states in the United States. Rather, these international models for renewable deployment—and the challenges faced elsewhere in the world from significant deployment—may have relevance to some states, but not others, or may have relevance in different ways.

Take, for example, Mr. Pace's discussion of grid reliability challenges due to deployment of renewables.[23] Here in Connecticut and the rest of New England, the

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[21] *See* New State Ice Co. v. Liebmann, 285 U.S. 262, 311 (1932) (Brandeis, J., dissenting) ("[A] single courageous State may, if its citizens choose, serve as a laboratory; and try novel social and economic experiments without risk to the rest of the country.").

[22] Sub-national entities – states, municipalities, and corporations – have been, and will continue to, actively participate in the international Conferences of the Parties and global climate negotiations. *See* Daniel C. Esty & Peter Boyd, *To Move Paris Accord Forward, Bring Cities and Companies On Board*, YALE ENV'T 360 (Mar. 20, 2018), https://e360.yale.edu/features/to-move-paris-accord-forward-bring-cities-and-companies-on-board. While subnational entities may not be able to enter into binding international agreements, *see id.*, at least the U.S. Climate Alliance and other sub-national entities can demonstrate real, measurable, and significant emission reductions, and thereby stand-in for the interest and commitment of United States.

[23] *See* Pace, *supra* note 12, at 385-89. Although Mr. Pace focuses on the deployment of renewables, Germany's reliability issues may be exacerbated by the fact they shifted away from baseload nuclear power plants to lignite (coal) power plants. *Id.* at 388-89. While coal may be a local resource in Germany, and thus not subject to commodity risks like natural gas sourced from Russia, large coal units tend not to be good load followers or peak fillers—they have significant startup and shutdown times. New England's fleet of new, efficient combined cycle natural gas plants, most of which have black start capability and can be dialed in and fine-tuned in real time to meet actual demand, would likely not face similar problems. In fact, the United States, with our geographically large, interconnected grids and a diverse mix of energy resources, has built in resiliency to manage large renewable deployment. For example, wind resources

ISO-New England forward capacity market and its auction system was originally designed to mitigate against future system reliability by paying for capacity. However, in recent years this market has only delivered natural gas resources to the New England region, which is exacerbating our fuel security and fuel diversity problems because pipeline capacity is not being built to meet the needs of the region's merchant natural gas power plants, which generally do not have fixed contracts for gas from the pipelines. But natural gas units also are the lowest cost, most competitive units in New England, which drives out of the market the older, more expensive, more fuel diverse units (like baseload nuclear, coal, and oil). Our grid reliability concerns in New England primarily come from inadequate natural gas pipeline capacity, particularly during winter peak cold snaps when natural gas first goes to home heating where local distribution companies hold firm contracts with the gas pipelines. Natural gas-fired electric generators in New England then buy any remaining gas on a secondary market and when supplies are tight, electricity prices rise to the point where older, dirtier, and more expensive coal-fired and oil-fired units run instead of natural gas.[24] Instead of undermining grid reliability, deployment of renewables (e.g., wind and solar) and maintaining other carbon-free, non-gas generation resources (e.g., nuclear and large-scale hydropower) actually enhances reliability in New England by ameliorating the region's winter peak problem.

Mr. Pace also examines how RTO market rules might deliver grid reliability in the face of dramatic renewable deployment[25] and appears to suggest that the solution to renewable intermittency and grid reliability problems from state programs to expand renewable deployment is to find ways that the grid operator can subsidize and perpetuate old, inefficient, dirty fossil generation. This is an odd conclusion from the perspective of a state that needs those renewable resources to meet our ambitious state clean energy and emissions goals.[26] Moreover, by focusing on ways the RTOs can deliver what states don't want—fossil generation—in the name of grid reliability, Mr. Pace misses an opportunity to focus on the future that our states do want—smart grids and grid-scale storage to ensure reliability and flexibility. Progressive states and regions across the United States are actively exploring how

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spread geographically across a large grid can enhance reliability and diversity, because the wind is often blowing somewhere across a large geographic area, even if it is not blowing everywhere.

[24] ISO-New England recently explored how fuel-security risk – the possibility that power plants will not have or be able to get the natural gas or oil fuel they need to run, particularly in winter – is the foremost challenge to a reliable power grid in New England. *See generally* ISO-NEW ENGLAND, OPERATIONAL FUEL SECURITY ANALYSIS (Jan. 17, 2018). If one of our region's large nuclear facilities (e.g., Millstone in Connecticut, or Seabrook in New Hampshire), or other critical grid resource (e.g., a large LNG storage facility) were unavailable during a winter season, the region would experience rolling blackouts, huge price spikes, and other significant reliability incidents. *Id.* at 8, 47. ISO-New England recognized that renewables, among other resources, could be a potential hedge against fuel security risk. *Id.* at 48.

[25] *See* Pace, *supra* note 12, at 392-94.

[26] In deregulated states, like Connecticut, the existence of a RTO does not supersede a state's retained rights over their resource mixes. States in New England have ambitious public policy goals to reduce greenhouse gasses, and address local air pollution, and have the authority to demand an electric resource mix that meets those legitimate state needs. When the markets fail to deliver the state's needs, the states have sovereign rights to seek those resources, and should not be punished in the market construct for these legitimate state efforts.

grid-scale storage and a smart grid can reliably integrate intermittent renewable power.[27]

In conclusion, even in the absence of federal leadership, the U.S. Climate Alliance states have much to contribute to the global dialogue on deployment of renewable energy and ensuring grid reliability. These diverse and progressive states, while hard to generalize or fit neatly into a mold, may just be the laboratories of innovation the world needs to chart the path towards compliance with the Paris Climate Accord (and beyond).

[27] In California, and other parts of the country, solar deployment has caused mid-day load anomalies where substantial solar power is being created and crowds out baseload resources. One solution is storage to shift renewable generation to the late afternoon peak, when it is needed more. Another is targeted load growth during peak solar production (e.g., charging electric vehicles or using electric water heaters) or to smooth out renewable supply by increasing demand at the right time. *See* JIM LAZAR, TEACHING THE "DUCK" TO FLY (The Regulatory Assistance Project, 2d Ed. 2016).


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PARIS, POLICY, AND THE GRID: HISTORY AND CONTEXT

Joseph Allan MacDougald[*]

"Therefore, in order to fulfill my solemn duty to protect America and its citizens, the United States will withdraw from the Paris Climate Accord — (applause) — thank you, thank you[.]" – President Donald J. Trump[1]

"[W]hat if we could make energy do our work without working our undoing?" – Amory Lovins[2]

INTRODUCTION

Climate change forces us to confront a world where the temperatures of summer[3] and spring[4] arrive ahead of our expectations and the storms of fall and winter appear with ever greater ferocity. [5] Globally, more than a century of unrestrained greenhouse gas emissions has disrupted the climatic system in dangerous and shocking ways. Across the planet, species are changing their habitat ranges by hundreds of miles in

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[1] Donald J. Trump, President, U.S., Statement by President Trump on the Paris Climate Accord (June 1, 2017), https://www.whitehouse.gov/briefings-statements/statement-president-trump-paris-climate-accord/.

[2] Amory Lovins, Arizona State University, Julie Ann Wrigley Global Institute of Sustainability, Climate Change: No Breakthroughs Needed (2014), https://sustainability.asu.edu/media/wrigley-lecture-series/climate-change-renewable-energy-amory-lovins/.

[3] Cheryl Katz, *Summer in March? Warming Climate Alters Europe's Seasons*, NAT'L GEOGRAPHIC (Apr. 4, 2016), https://news.nationalgeographic.com/2016/04/160404-climate-change-Europe-early-summer/.

[4] Jeremy White & Henry Fountain, *Spring Came Early. Scientists Say Climate Change is a Culprit.*, N.Y. TIMES (Mar. 8, 2017), https://www.nytimes.com/interactive/2017/03/08/climate/early-spring.html.

[5] James Samenow, *Rapid Artic Warming and Melting Ice are Increasing the Frequency of Blizzards in the Northeast, Study Finds*, WASH. POST (Mar. 14, 2018), https://www.washingtonpost.com/news/capital-weather-gang/wp/2018/03/14/rapid-arctic-warming-and-melting-ice-are-increasing-the-frequency-of-blizzards-in-the-northeast-study-finds/?utm_term=.a0c82832e678.

short periods of time.[6] Cities around the globe are experiencing the effects of climate change—from the regular flooding in Miami,[7] to the unprecedented heatwaves in Sydney,[8] to the water shortages in Cape Town.[9] Melting ice sheets in Greenland have contributed to a slowing of the Gulf Stream that "is an unprecedented event in the past millennium"[10] which could have "disastrous consequences, bringing rapid sea level rise to the East Coast, more extreme winters to Europe and numerous other side effects."[11]

Recognizing that the complex problems of climate change demand a range of policy responses, nearly 200 government representatives assembled in Paris in late 2015[12] and agreed to a structured, transparent process where each country would craft their national policies in furtherance of the goal of limiting global warming to a sub-2°C maximum.[13] To accomplish this objective, the Paris Agreement provided that all participating nations: accept the goal of reducing greenhouse gas emissions, establish national policies to reach that goal, measure the impact of those policies, and report the results of their country's climate policies to the other signatory nations. This iterative process of public commitment and reporting is designed to inspire each nation to make their own policies ever more ambitious and effective in a continuous cycle of improvement. Some commentators have referred to this system as a program based on international shaming.[14] Others find that the Paris structure shows committed goals and embodies a positive, hopeful source for policy development.[15] Whatever its eventual legacy, the sheer breadth of world support made the agreement, itself, an historic event. As characterized by the UN itself:

> "The Paris Agreement builds upon the Convention and for the first time brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to

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[6] Craig Welch, *Half of All Species are on the Move—and We're Feeling it*, NAT'L GEOGRAPHIC (Apr. 27, 2017), https://news.nationalgeographic.com/2017/04/climate-change-species-migration-disease/.

[7] Amanda Ruggeri, *Miami's Fight Against Rising Seas*, BBC (Apr. 4, 2017), http://www.bbc.com/future/story/20170403-miamis-fight-against-sea-level-rise.

[8] Adam Morton, *How Australia's Extreme Heat Might be Here to Stay*, BBC NEWS (Jan. 13, 2018) http://www.bbc.com/news/world-australia-42657234

[9] Laura Poppick, *What's Behind Cape Town's Water Woes*, SMITHSONIAN (Feb. 13, 2018), https://www.smithsonianmag.com/science-nature/day-zero-looms-cape-town-water-crisis-may-signify-new-normal-180968128/.

[10] L. Caesar et al., *Observed Fingerprint of a Weakening Atlantic Ocean Overturning Circulation*, 556 NATURE 191-96 (2018), https://www.nature.com/articles/s41586-018-0006-5.

[11] Sean Breslin, *Global Warming Has Made Gulf Stream Slowest in 1,600 Years, and That Could Impact Our Weather*, WEATHER CHANNEL (Apr. 12, 2018 10:15 AM), https://weather.com/news/news/2018-04-12-gulf-stream-slowing-climate-change-study.

[12] Earth Day is the 22nd of April each year since April 22, 1970. *See* Kathleen Rogers, *What is Earth Day, and What is it Meant to Accomplish?*, EARTH DAY NETWORK, https://www.earthday.org/earthday/ (last visited July 14, 2018).

[13] *The Eyes of the World are on Paris – COP21 Opening Ceremony*, UNFCCC (Nov. 29, 2015), https://unfccc.int/news/the-eyes-of-the-world-are-on-paris-cop21-opening-ceremony.

[14] Catherine Martini, *Transparency: The Backbone of the Paris Agreement*, YALE CTR. FOR ENVTL. L. & POL'Y (May 29, 2016), https://envirocenter.yale.edu/transparency-the-backbone-of-the-Paris-Agreement.

[15] *9 Reasons for Hope in the Face of Climate Change*, WWF (Mar. 20, 2018), https://www.worldwildlife.org/stories/9-reasons-for-hope-in-the-face-of-climate-change.

> its effects, with enhanced support to assist developing countries to do so. As such, it charts a new course in the global climate effort."[16]

Yet, political realities drive policy. Since the Paris Agreement was constructed as an agreement and not a treaty to be ratified by the United States Senate under the provisions of the Constitution,[17] the United States (U.S.) joined the agreement through an exercise of President Barack Obama's executive authority.[18] As a consequence of this structure, the U.S. involvement in the Paris Agreement could be terminated via a similar route. Hence, on June 1, 2017, President Donald Trump announced his intention to withdraw the United States from the same Paris Agreement that the government had supported the prior year.[19]

Despite this rapid reversal of national policy, the U.S. effectively remains in the agreement until 2020. According to a clarifying article posted on the website of the United Nations Framework Convention on Climate Change, "The Paris Agreement entered into force on 4 November 2016. This means that, for Parties that had joined by then, the earliest date that any of them may leave the Agreement is 4 November 2020."[20]

When first announced, it was not clear how the proposed withdrawal of the U.S., one of the world's largest emitters of greenhouse gases, might damage the Paris Agreement's progress. However, it quickly became apparent that the other signatories intended to still abide by the fundamental guidelines of the Agreement without change, effectively leaving the U.S. isolated.[21] Additionally, several U.S. states[22] and corporations are also proceeding as if the Paris Agreement will remain

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[16] Paris Agreement, Apr. 22, 2016, I-54113 (U.N.T.S. volume number not yet assigned).

[17] Giving the Power to the President "by and with the Advice and Consent of the Senate, to make Treaties, provided two thirds of the Senators present concur" U.S. CONST. art. II, § 2, cl. 2.

[18] Tanya Somanader, *President Obama: The United States Formally Enters the Paris Agreement*, WHITE HOUSE (Sept. 3, 2016), https://obamawhitehouse.archives.gov/blog/2016/09/03/president-obama-united-states-formally-enters-paris-agreement.

[19] Michael D. Shear, *Trump Will Withdraw U.S. From Paris Climate Agreement*, N.Y. TIMES (June 1, 2017), https://www.nytimes.com/2017/06/01/climate/trump-paris-climate-agreement.html.

[20] *On the Possibility to Withdraw from the Paris Agreement: A Short Overview*, UNFCC (June 14, 2017), https://unfccc.int/news/on-the-possibility-to-withdraw-from-the-paris-agreement-a-short-overview. NB; November 4, 2020 is the day after the United States Presidential election.

[21] *See* Elaina Zachos, *Syria to Join Paris Climate Pact, Leaving U.S. Isolated*, NAT'L GEOGRAPHIC (Nov. 7, 2017), https://news.nationalgeographic.com/2017/11/syria-to-join-paris-climate-agreement-leaves-united-states-isolated-spd/#close.

[22] *E.g.*, Jacob Pramuk, *New York, California and Washington Say They'll Stick to Paris Deal as Trump Backs Out*, CNBC (June 1, 2017, 5:55 PM), https://www.cnbc.com/2017/06/01/ny-ca-and-wa-say-theyre-sticking-to-paris-deal-after-trump-backs-out.html; Alessandra Potenza, *Three US States Rebel Against Trump's Paris Climate Agreement Withdrawal*, VERGE (June 1, 2017, 5:37 PM), https://www.theverge.com/2017/6/1/15726974/california-new-york-washington-climate-change-coalition-paris-deal-trump.

in effect[23] and continue to support a climate focused agenda, including the aggressive support for electrical generation from renewable energy sources. [24]

It was this transformation of international and national policies, developing in real time on the world stage, that inspired the April 20, 2018 conference entitled *Paris, Policy, and the Grid*, held at the University of Connecticut School of Law. Organized jointly by the University of Connecticut School of Law's (UConn Law) Center for Energy & Environmental Law and the Connecticut Journal of International Law, the event focused on the international and domestic energy policy implications of the U.S.'s announced intention to withdraw from the Paris Agreement. The conference agenda was structured to first explore the status of international climate negotiations; next to provide a comparative energy law perspective from among certain key nations in reaction to the imminent US Paris withdrawal; and finally, to focus on the effects these international policies will have on regional, grid-scale renewable energy policy in the Northeast.

This commentary will provide some brief historical and policy context that helped frame the Paris Agreement, the UConn Law conference, and some of the articles in this edition.

I. THE LONG ROAD FROM SCIENCE TO POLICY

Structurally, the meeting that led to the historic Paris Agreement was the 21st annual meeting of the parties to the United Nations Framework Convention on Climate Change (UNFCCC). This international meeting process may have started over two decades ago, yet the scientific journey that led to Paris is much older. While some of the foundations underlying the scientific community's understanding of man-made climate change date back beyond 200 years, many people mark the beginning of modern climate science with Svante Arrhenius's formulation of a key climate equation just before the end of the 19th century.[25] In 1898, recovering from a divorce,[26] Arrhenius, who would later win the Nobel Prize in chemistry in 1903, occupied his time by calculating the impact of increased Carbon dioxide (CO_2) on the earth's global temperature.[27] Starting from the well-established observation that CO_2, like other greenhouse gasses, was transparent to sunlight, letting it stream through to the earth (like a window), but that CO_2 blocked the heat caused by that sunlight from leaving earth (like a blanket), Arrhenius derived the fundamental mathematical relationship between atmospheric CO_2 and global temperatures—a

[23] Michael D. Regan, *U.S. Cities, States Pledge Support for Climate Accord*, PBS NEWS HOUR (Nov. 11, 2017, 12:39 PM), https://www.pbs.org/newshour/nation/u-s-cities-states-pledge-support-for-climate-accord.

[24] Patrick Bayer & Johannes Urpelainen, *The Paris Climate Agreement Calls for Big Investments in Renewable Energy. Here's Why Governments Love It.*, WASH. POST (Mar. 14, 2016), https://www.washingtonpost.com/news/monkey-cage/wp/2016/03/14/the-paris-climate-agreement-calls-for-massive-investments-in-renewable-energy-heres-why-governments-love-it/?utm_term=.03084177e70f.

[25] An excellent book on the scientific discovery of climate change is SPENCER R. WEART, THE DISCOVERY OF GLOBAL WARMING: REVISED AND EXPANDED EDITION (2008).

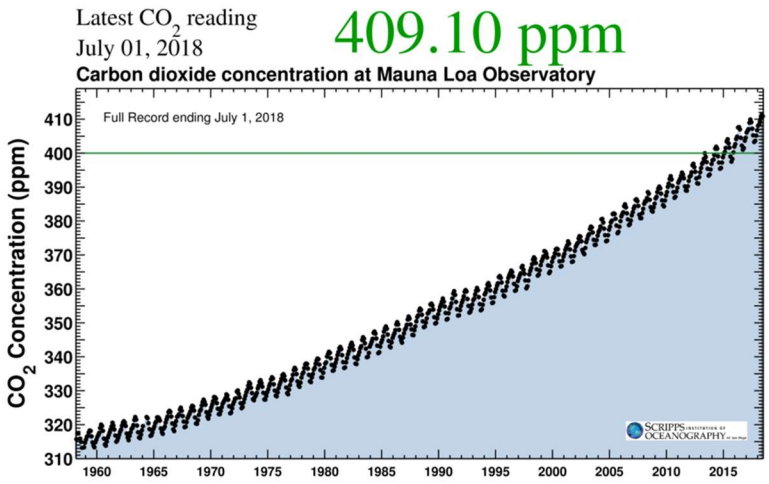
[26] Elisabeth Crawford, *Svante Arrhenius*, ENCYCLOPEDIA BRITANNICA, https://www.britannica.com/biography/Svante-Arrhenius.

[27] Ian Sample, *The Father of Climate Change*, GUARDIAN (June 30, 2005, 6:55 AM), https://www.theguardian.com/environment/2005/jun/30/climatechange.climatechangeenvironment2.

relationship that substantially holds today.[28] He calculated that a doubling of CO_2 would warm the planet between 4 to 6 degrees Celsius.

Over the coming decades, scientists and engineers further considered the climatological implications of mankind's deposition of tons of CO_2 into the atmosphere via the burning of fossil fuels, notably coal. Guy Stewart Callendar, in his paper *The Artificial Production of Carbon Dioxide and Its Influence on Temperature*,[29] published in 1938, predicted that these tons of CO_2 emitted into the atmosphere were already creating a greenhouse effect that was actually warming the planet at that time.[30]

Up to this point, estimates of atmospheric CO_2 concentrations were derived. The missing piece was measurement. In 1958, Charles David Keeling of the Scripps Institute developed a device to measure atmospheric CO_2.[31] Charting these results, year after year, yielded the now-famous "Keeling Curve."[32]



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[28] *See id.* ("Unwittingly, he uncovered secrets of the Earth's atmosphere and in doing so triggered research into what many see as the biggest threat to modern humans. He is arguably the father of climate change science.").[29] Guy Stewart Callendar, *The Artificial Production of Carbon Dioxide and Its Influence on Temperature*, Q.J. ROYAL METEOROLOGICAL SOC'Y 223 (1938).

[29] Guy Stewart Callendar, *The Artificial Production of Carbon Dioxide and Its Influence on Temperature*, Q.J. ROYAL METEOROLOGICAL SOC'Y 223 (1938).

[30] *Id*.

[31] *Charles David Keeling Biography*, SCRIPPS CO_2 PROGRAM (2017), http://scrippsco2.ucsd.edu/history_legacy/charles_david_keeling_biography.

[32] *See id*. ("Keeling's postdoctoral studies suggested that away from the influences of vegetation and urban pollution the carbon dioxide concentration was remarkably constant from place to place and over time.").

[33] *The Keeling Curve*, SCRIPPS INST. OF OCEANOGRAPHY, https://scripps.ucsd.edu/programs/keelingcurve/wp-content/plugins/sio-bluemoon/graphs/mlo_full_record.png (last visited May 25, 2018). It appears to include reconstructed CO_2 data measurements pre-dating Charles David Keeling's first measurements.

The Keeling Curve graphically depicts the relentless upward climb of the concentration of CO_2 in our atmosphere as expressed in parts-per-million (ppm).[34] The curve began with measurements in the 1950s at 315 ppm of CO_2 and as of this writing, the current CO_2 level measured by the Scripps Institute is 409.10 ppm.[35]

II. THE PIVOT TO POLICY

By the mid-1980s, the alarming implications of climate science and the trend of the Keeling Curve began to penetrate the consciousness of the body politic. A pivotal moment that brought climate change out of the laboratory and into the halls of government was Dr. James Hansen's 1988 testimony to Congress.[36] Speaking in a crowded committee room, Hansen was both bold and direct, announcing, "[t]he Earth is warmer in 1988 than at any time in the history of instrumental measurements."[37] He was unequivocal about the cause of this warming, "[t]here is only a 1 percent chance of an accidental warming of this magnitude….The greenhouse effect has been detected, and it is changing our climate now."[38] In an explicit call for action, Dr. Hansen later told reporters: "It's time to stop waffling so much and say that the evidence is pretty strong that the greenhouse effect is here[.]"[39]

In that same year, the World Meteorological Organization and the United Nations Environmental Programme cooperated to form a broad-based scientific group, the Intergovernmental Panel on Climate Change (IPCC) ". . . to assess on a comprehensive, objective, open and transparent basis the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation."[40] The IPCC's work has been referred to as the "gold standard" of climate change reports.[41] The release of its periodic Assessment Reports, a combined work of hundreds of scientists, other experts and reviewers, are newsworthy events and represent the best, most comprehensive scientific review of the topic. The first Assessment report was released in 1990 and the sixth is due to be released in 2022.[42]

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[34] Marc Lallanilla, *What is the Keeling Curve?*, LIVESCIENCE (May 2, 2013), https://www.livescience.com/29271-what-is-the-keeling-curve-carbon-dioxide.html. Keeling discovered that "[y]ear after year, the amount of CO_2 in the atmosphere was gradually increasing due to the combustion of fossil fuels."

[35] The Scripps institute releases daily totals for CO_2 measurements as found at *The Keeling Curve*, *supra* note 33.

[36] Dr. James Hansen, Director, NASA Goddard Institute for Space Studies, Statement to Congress (1988), https://climatechange.procon.org/sourcefiles/1988_Hansen_Senate_Testimony.pdf.

[37] *Id*.

[38] *Id*.

[39] Ben Block, *A Look back at James Hansen's Seminal Testimony on Climate, Part Two*, GRIST (June 18, 2008), https://grist.org/article/a-climate-hero-the-testimony/.

[40] INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, PRINCIPLES GOVERNING IPCC WORK, https://www.ipcc.ch/pdf/ipcc-principles/ipcc-principles.pdf.

[41] Daniel Grossman, *Après Paris Accord, What Next for IPCC Reports?*, YALE CLIMATE CONNECTIONS (Dec. 19, 2015), https://www.yaleclimateconnections.org/2015/12/apres-paris-settlement-what-next-for-ipcc-reports/.

[42] United Nations Intergovernmental Panel on Climate Change, *The Fifth Assessment Report of the IPCC* (Dec. 4, 2014), *available at* https://unfccc.int/topics/science/workstreams/cooperation-with-the-ipcc/the-fifth-assessment-report-of-the-ipcc.

Each assessment delivers an ever increasingly more certain and refined understanding of the human impact on the climate.

Four years after Hansen's testimony, the United Nations (UN) hosted the 1992 Earth Summit in Rio de Janeiro. At the time, the Earth Summit was the largest collection of world leaders ever assembled.[43] President George H. W. Bush, who attended in-person, offered his support for voluntary emission reduction targets, seeking to return the world to levels measured in 1990.[44] Had these targets been followed or made mandatory, the world would have needed to reduce CO_2 concentrations only from roughly 355 to 353 ppm.[45]

While the Rio summit initiated several agreements[46] it was the signing of the United Nations Framework Convention on Climate Change (UNFCCC)[47] that led directly from Rio to Paris. The UNFCCC established the meeting and subcommittee process that provided the world with a forum in which to discuss and develop international climate policy.[48] The parties to the UNFCCC agreed to regular meetings, each to be called a Conference of the Parties, further designated by a number. For instance, the Kyoto Protocol of 1997 came into being at the third Conference of the Parties (COP) and was otherwise known as COP 3.[49]

The Kyoto Protocol was the first attempt at global climate governance, forming a worldwide cap and trade system.[50] The protocol created a financial incentive to engage in activities that would reduce actual greenhouse gas emissions by securitizing this decline and creating a trading market for those emissions reductions.

Practically, the Kyoto Protocol suffered from issues related to its complexity.[51] Politically, a significant concern among U.S. lawmakers was that the Kyoto Protocol did not cap the emissions of China and India, two very large emitters of greenhouse gasses whose economies in 1997 were rapidly ascending in global socio-economic

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[43] UN Conference on Environment and Development, UN (1992), http://www.un.org/geninfo/bp/enviro.html.

[44] An interesting and informative history of the political development from Dr. James Hansen's speech, through Rio, and into Kyoto, can be found on PBS's 2007 "Hot Politics" episode of the long running show, Frontline. *Frontline: Hot Politics* (PBS television broadcast 2007), https://www.pbs.org/wgbh/frontline/film/hotpolitics/.

[45] *See Monthly CO_2*, CO_2-EARTH (July 5, 2018), https://www.co2.earth/monthly-co2 for monthly average CO_2 measurements dating back to 1958. The earliest measurement listed is 315.71 ppm of CO_2; the latest as of this writing is 410.31 or a roughly one-third increase.

[46] Stephanie Meakin, *The Rio Earth Summit: Summary of the United Nations Conference on Environment and Development*, UN (Nov. 1992), http://publications.gc.ca/Collection-R/LoPBdP/BP/bp317-e.htm.

[47] *What is the United Nations Framework Convention on Climate Change?*, UNFCC, https://unfccc.int/process/the-convention/what-is-the-united-nations-framework-convention-on-climate-change.

[48] *Id*.

[49] Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 10, 1997, U.N. Doc FCCC/CP/1997/7/Add.1, 37 I.L.M. 22 (1998).

[50] Toni Johnson, *The Debate Over Greenhouse Gas Cap-and-Trade*, COUNCIL ON FOREIGN REL. (Nov. 3, 2011), https://www.cfr.org/backgrounder/debate-over-greenhouse-gas-cap-and-trade.

[51] *Id*.

prominence. (China's emissions would surpass those of the U.S. in 2007.)[52] Although the U.S. delegation to COP 3 supported the Kyoto Protocol, the Senate voted 95-0 to pass the Hagel-Byrd amendment,[53] which declared that the U.S. should not be a signatory to any agreement that did not include *developing nations* and that hurt the U.S. economy.[54] Facing broad opposition, President Clinton never submitted the Protocol for ratification by the Senate.

In the next administration, President George W. Bush, who voiced support for mandatory climate restrictions during his campaign, withdrew any remaining support for the Kyoto Protocol, calling it "fatally flawed" and, with a reference to the India and China omission, noted that, "This is a challenge that requires a 100 percent effort; ours, and the rest of the world's."[55] Nevertheless, the George W. Bush administration went beyond abandoning the protocol, they also substantially disengaged from the international conversation. Although reasonably modest polices in 1992 or 2002 might have changed the reality we live in today, by the time of the 2008 Presidential election, CO_2 levels had risen to 382 ppm and the physical manifestations of climate change were appearing with greater frequency.[56]

Recognizing the public concern over climate change, partially driven by former Vice President Al Gore's 2006 Academy Award-winning documentary *An Inconvenient Truth*,[57] then-Senator Barack Obama made his pro-climate policy stance explicit during his campaign. Despite his enthusiasm, the process still languished in the early years of his presidency.[58] A significant breakthrough came as his negotiations with China eventually led to a joint commitment from the U.S. and China to come together to regulate greenhouse gasses when they attended the Paris Conference.[59] President Obama later credited this 2014 agreement as having ". . . set us on the road to Paris by jumpstarting an intense diplomatic effort to put other countries on the same course."[60]

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[52] *China Overtakes U.S. in Greenhouse Gas Emissions*, N.Y. TIMES (June 20, 2007), https://www.nytimes.com/2007/06/20/business/worldbusiness/20iht-emit.1.6227564.html.

[53] S. Res. 98, 105th Cong. § 1 (1997).

[54] *Byrd-Hagel Resolution*, NAT'L CTR. (1997), https://nationalcenter.org/KyotoSenate.html.

[55] George W. Bush, President, U.S., Remarks on Global Climate Change (June 11, 2001), http://www.presidency.ucsb.edu/ws/index.php?pid=45985. The aesthetics of George W. Bush's Kyoto withdrawal press conference were notably similar to President Trump's 2017 Paris withdrawal press conference.

[56] Gerard Wynn, *CO_2 Rise in Atmosphere Accelerates in 2008*, REUTERS (Feb. 25, 2009, 10:24 AM), https://www.reuters.com/article/us-climate-co2/co2-rise-in-atmosphere-accelerates-in-2008-idUSTRE51O4FG20090225.

[57] Michael Svoboda, *Communicating Climate Change Five Years After An Inconvenient Truth*, YALE CLIMATE CONNECTIONS (May 5, 2011), https://www.yaleclimateconnections.org/2011/05/an-inconvenient-anniversary/.

[58] Marianne Lavelle, *2016: Obama's Climate Legacy Marked by Triumphs and Lost Opportunities*, INSIDECLIMATE NEWS (Dec. 26, 2016), https://insideclimatenews.org/news/23122016/obama-climate-change-legacy-trump-policies.

[59] David Nakamura & Steven Mufson, *China, U.S. Agree to Limit Greenhouse Gases*, WASH. POST (Nov. 12, 2014), https://www.washingtonpost.com/business/economy/china-us-agree-to-limit-greenhouse-gases/2014/11/11/9c768504-69e6-11e4-9fb4-a622dae742a2_story.html?utm_term=.7c5d7229f047.

[60] Barack Obama, President, U.S., Remarks by President Obama on the United States Formally Entering into the Paris Agreement (Sept. 3, 2016), https://obamawhitehouse.archives.gov/the-press-office/2016/09/04/remarks-president-obama-united-states-formally-entering-paris-agreement.

III. THE PARIS AGREEMENT

With China and the U.S. publicly committed to the upcoming climate negotiations, excitement started to build for COP 21 in Paris, France.[61] By the conclusion of COP 21, ". . . 195 nations reached a landmark accord that will, for the first time, commit nearly every country to lowering planet-warming greenhouse gas emissions to help stave off the most drastic effects of climate change . . . [and was met with an] eruption of cheers and ovations from thousands of delegates gathered from around the world."[62]

The Paris Agreement calls for a series of Nationally Determined Contributions to the Agreement (NDC). These "NDCs embody efforts by each country to reduce national emissions and adapt to the impacts of climate change,"[63] and include elements such as direct emissions reductions, switching energy portfolios from carbon intensive fuels to greener sources of power, like renewable energy, and many other options.[64] Specifically, the agreement provides that:

> "2. Each Party shall prepare, communicate and maintain successive nationally determined contributions that it intends to achieve. Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions.
>
> 3. Each Party's successive nationally determined contribution will represent a progression beyond the Party's then current nationally determined contribution and reflect its highest possible ambition, reflecting its common but differentiated responsibilities and respective capabilities, in the light of different national circumstances."[65]

This flexible, nation-defined model is very different from the centralized structure of the Kyoto Protocol. The road to Paris covers over 100 years of scientific discovery; 60 years of watching the Keeling Curve rise; 25 years of UN-based conversations, and a two-year road ahead until the U.S. withdrawal becomes effective. Yet, today, the Paris Agreement represents a novel form of international coordination and places the world on an optimistic footing that requires faith in the efforts of all national signatories.

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[61] Jeff Mason, *Obama, China's Xi Pledge to Push for Climate Deal in Paris*, REUTERS (Nov. 30, 2015, 4:14 AM), https://www.reuters.com/article/us-climatechange-summit-obama-xi-idUSKBN0TJ0QN20151130.

[62] Coral Davenport, *Nations Approve Landmark Climate Accord in Paris*, N.Y. TIMES (Dec. 12, 2015), https://www.nytimes.com/2015/12/13/world/europe/climate-change-accord-paris.html.

[63] *Nationally Determined Contributions (NDCs)*, UNFCC, https://unfccc.int/process/the-paris-agreement/nationally-determined-contributions.

[64] A country by country view of the variety of programs in the NDC's can be found at *NDC Registry (interim)*, UNFCC, http://www4.unfccc.int/ndcregistry/Pages/All.aspx (last visited July 14, 2018).

[65] Paris Agreement, *supra* note 16, at art. 2-3.

A. *The First Round of NDCs: Some Examples*

At the time of this writing, many of the Paris signatories have submitted a description of their nation's plans to abide by the Paris agreement in their initial NDCs.[66] A non-comprehensive review shows that a primary feature of many of the NDCs is a planned transition from a reliance on fossil fuels toward low-carbon renewable energy. Following are a few examples:

The European Union (EU) countries submitted a collective, first NDC that "committed to a binding target of an at least 40% domestic reduction in greenhouse gas emissions by 2030 compared to 1990."[67] To meet this goal, the EU members refer to a common agreement among them, the 2020 Climate and Energy Package.[68] This package places heavy emphasis on the adoption of renewable energy, specifically: "the package sets three key targets: 20% cut in greenhouse gas emissions (from 1990 levels); 20% of EU energy from renewables; and, 20% improvement in energy efficiency."[69]

India's contributions are also focused on power generation from renewables. After pointing out India's long-term commitment to renewable energy, India's NDC lists several specific goals, such as installing 60 gigawatts of wind generated electricity, powering 55,000 petrol pumps from solar energy, and installing 10 gigawatts of biomass power.[70]

Australia, like the U.S. plan presented below, is working within an already existing regulatory structure with a target that, ". . . over 23 per cent of Australia's electricity will come from renewable sources by 2020."

Similarly, Brazil intends to move its renewable energy mix from 40% of the energy portfolio, an already high number, to 45% by 2030, overall, and expand non-hydro energy sources from 28% to 33% by 2030. [71]

China's policies may, structurally, appear similar to many other NDCs, but the document is actually quite different. China, the world's largest greenhouse gas emitter, is frank in planning for growing greenhouse gas emissions, estimating that they will peak in 2030; however, China is simultaneously taking steps toward cleaner power generation, including increasing non-fossil fuels to 20% of its energy portfolio by 2050. China has set a near-term goal of rapid renewable energy expansion

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[66] *See* Remarks by President Obama, *supra* note 60.

[67] SUBMISSION BY LATVIA AND THE EUROPEAN COMMISSION ON BEHALF OF THE EUROPEAN UNION AND ITS MEMBER STATES, LATVIAN PRESIDENCY OF THE COUNCIL OF THE EUR. UNION (Mar. 6, 2015).

[68] *2020 Climate & Energy Package*, EUR. UNION, https://ec.europa.eu/clima/policies/strategies/2020_en.

[69] *Id*. (minor punctuation added for clarity).

[70] INDIA'S INTENDED NATIONALLY DETERMINED CONTRIBUTION: WORKING TOWARDS CLIMATE JUSTICE, GOV'T OF INDIA, http://www4.unfccc.int/ndcregistry/PublishedDocuments/India%20First/INDIA%20INDC%20TO%20UNFCCC.pdf.

[71] INTENDED NATIONALLY DETERMINED CONTRIBUTION TOWARDS ACHIEVING THE OBJECTIVE OF THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE 3, FEDERATIVE REPUBLIC OF BRAZ., http://www4.unfccc.int/ndcregistry/PublishedDocuments/Brazil%20First/BRAZIL%20iNDC%20english%20FINAL.pdf.

including 200 gigawatts of wind power, 100 gigawatts of solar, and substantial thermal energy by 2020.[72]

Canada, by contrast, has a broad scale plan that includes emissions reductions from expanded forestry practices, public transportation, clean fuel standards, vehicle efficiency standards, and, of course, renewable energy.[73] Canada's first plan does not have a dominant renewable energy focus, but reads more like an infrastructure and land use plan where energy sources clearly play a role.

B. *The United States' NDC and the Clean Power Plan*

The U.S.'s NDC plan relies heavily on an energy-focused regulatory scheme called the Clean Power Plan (CPP). Authorized through the Clean Air Act,[74] under the CPP ". . . the E.P.A. assigned each state a goal for limiting [greenhouse gas] emissions from existing power plants and gave the states broad latitude in meeting those goals, such as switching from coal to natural gas or building new wind or solar farms."[75]

However, the CPP's implementation was halted on February 9, 2016 when the U.S. Supreme Court took an unusually aggressive stance and granted a stay in the face of federal litigation, pending in a lower court, that challenged the authority for the plan.[76] Later, President Trump issued an executive order seeking a review of the CPP and indicated that, if appropriate, the EPA shall "as soon as practicable, suspend, revise, or rescind the guidance, or publish for notice and comment proposed rules suspending, revising, or rescinding those rules."[77] Unsurprisingly, the EPA proposed to repeal the CPP in October 2017, beginning the administrative process to remove the stayed plan.[78]

With the EPA's stance now hostile to its own former rule, the court case challenging the CPP remained in a permanent stasis, with both sides of the litigation

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[72] ENHANCED ACTIONS ON CLIMATE CHANGE: CHINA'S INTENDED NATIONALLY DETERMINED CONTRIBUTIONS 7, DEP'T OF CLIMATE CHANGE, NAT'L DEV. & REFORM COMMISSION OF CHINA, http://www4.unfccc.int/ndcregistry/PublishedDocuments/China%20First/China%27s%20First%20NDC%20Submission.pdf.

[73] CANADA'S 2017 NATIONALLY DETERMINED CONTRIBUTION SUBMISSION TO THE UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE 5, GOV'T OF CANADA, http://www4.unfccc.int/ndcregistry/PublishedDocuments/Canada%20First/Canada%20First%20NDC-Revised%20submission%202017-05-11.pdf.

[74] *What is the Clean Power Plan, and How Can Trump Repeal It*, N.Y. TIMES (Oct. 10, 2017), https://www.nytimes.com/2017/10/10/climate/epa-clean-power-plan.html ("The Obama administration touted the Clean Power Plan as evidence that the United States was serious about taking meaningful action on climate change during the Paris climate talks in late 2015."). The Clean Air Act is found at 42 U.S.C. §§ 7401-7671 (2012).

[75] *Id*.

[76] Chamber of Commerce, v. E.P.A., 136 S.Ct. 999 (2016) (Mem).

[77] Presidential Executive Order on Promoting Energy Independence and Economic Growth, WHITE HOUSE (Mar. 28, 2017), https://www.whitehouse.gov/presidential-actions/presidential-executive-order-promoting-energy-independence-economic-growth/.

[78] *See* Repeal of Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units 82 Fed. Reg. 48,035 (Oct. 16, 2017).

adopting a similar posture. Recognizing the situation, on June 26, 2018, the U.S. Court of Appeals for the District of Columbia gave every indication that it was granting its final stay of the litigation, saying, explicitly, that:

> The upshot is that the Petitioners and EPA have hijacked the Court's equitable power for their own purposes. If EPA or the Petitioners wish to delay further the operation of the Clean Power Plan while the agency engages in rulemaking, then they should avail themselves of whatever authority Congress gave them to do so, rather than availing themselves of the Court's authority under the guise of preserving jurisdiction over moribund petitions.[79]

However, until this case is resolved or dismissed, the CPP resides, now, on an administrative law and litigation death row awaiting its end or reprieve.

Putting aside the United States' disjointed posture, it is difficult to read these NDCs together and not conclude that the diversity of approaches is a strength. Brazil notes it is a leader in renewable energy as a percentage of its total power; China acknowledges that it will continue to grow emissions but elaborates on its many new renewable energy policies; and Canada has a broad scale emissions mitigation approach. Collectively, these examples, and others, showcase the Paris Agreement's structural premise of encouraging nation-scale, customized solutions toward global climate goals. These NDCs showcase a wide variety of responses addressing each country's realities and strengths.

IV. THE WORLD AS THE LABORATORY OF CLIMATE IDEAS

Justice Louis Brandeis famously wrote that "[i]t is one of the happy incidents of the federal system that a single courageous State may, if its citizens choose, serve as a laboratory; and try novel social and economic experiments without risk to the rest of the country."[80] However, in the era of the Paris-Agreement, it is now becoming clear that the entire, integrated world is the laboratory of ideas. The Paris Agreement's great strength is that it encourages innovation from a network of countries. Each county will define its NDC, but also its proposal on how to achieve even further reductions. Unlike Brandeis's context, where states were developing a national policy for the U.S., in the world as we find it today, it is the nations of the world that are using the arena of the Paris Agreement's meetings to form a networked mesh that will evolve into the world's climate policy. Seen from this perspective, it is perhaps less remarkable that, despite the U.S.'s announced plan to withdraw, the Paris Agreement appears vital and the coalitions are undeterred. This is a collective conversation toward a global goal—and if the U.S. is missing from the discussion for a few years, the process is not derailed; simply that part of the mesh is weakened.

So how can we continue to develop our understanding of climate policy going forward? Gone are the days where we can review the COP meetings, looking exclusively for changes to a centralized structure. Instead, climate policy is being

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[79] West Virginia v. EPA, No. 15-1363 (D.C. Cir. June 26, 2018) (order directing abeyance) (J. Wilkins, concurring).

[80] New State Ice Co. v. Liebmann, 285 U.S. 262, 311 (1932).

weaved throughout the globe, every day in every participating nation. This places a greater burden on all of us to stay engaged. But it is a burden attached to the most vital of interests--our planetary climate but, also, the future of how we will live together as a collective of nations.

In that light, the structure of the UConn Law conference forms a useful outline of the policy pillars to monitor the emerging new world of climate policy. International discussions, national-scale comparative energy policies, and the national and local renewable energy policies must be read together to see the world coalescing around a consensus climate policy.

First, international discussions: One should watch the ongoing COP discussions as they serve as the monitor and facilitator of this world dialogue. Today, the COP process looks resilient. Yet high participation rates, a cooperative tone, and a commitment to transparency are more important now than ever. The COP process has cemented itself as even more critical to developing global policy as each successive round of NDCs are presented in context. In each future COP, we should see a world climate policy forming as the NDC's continue to develop and refine.

Second, national-scale energy policy as expressed in the NDCs: In an international laboratory of ideas, what was once before a matter of largely national concern, takes on a new, international dimension. Each nation's energy policy is now cast as part of a whole—both for that country, but as a model for others. These first NDCs are, in most cases, remarkably revealing policy and communication documents. They express how the member-countries see the world and their own national priorities and capabilities. Comparing China's need to grow emissions while heavily investing in renewable energy to Canada's focus on natural resource planning and mitigation provides the reader with a snapshot of these countries' national concerns. The NDC process also builds a library accessible to any country should their national priorities shift direction toward ground already covered by another country's NDC. Importantly, where attention was previously focused primarily on the policies of the largest emitters, under an NDC approach, even smaller countries that track their progress can present innovative programs that will move global policy. The Paris Agreement is a policy equalizer. However, in the time-period between the NDC updates and COP meetings, emphasis and comparative study needs to be directed towards the national energy policies as they develop. By the time they are presented at the COP, these policies will already be enacted and measured.

Third, renewable energy policy: Renewable energy policy development is the engine that will lead us all to a cleaner, greener, safer, and more predictable climate. But renewable energy also requires a sophisticated set of grid and transmission policies. The two must go hand in hand in future updates to the NDC. While not every nation has the same incentive to rapidly expand its renewable energy portfolio, it is a near certainty that under this new post-Paris adoption reality, the success of a nation's renewable energy polices will serve as a proxy for their climate policy effectiveness, overall.

CONCLUSION

There is much to worry about in the world. Our emissions are rising, and the physical manifestations of climate change are becoming more disruptive. We are in a time that demands aggressive emissions reductions, rapid deployment of non-carbon energy technologies, and larger investments in, and reliance on, science. The history of world climate policy is open to many criticisms: the long gap between scientific understanding and policy; the potentially-recrimination-filled mistake of not making the initial emissions targets mandatory; the challenges of the Kyoto Protocol treaty process; the too-modest temperature goals of Paris, and, finally, the potential U.S. withdrawal from the Paris Agreement. These may all appear to be setbacks to policy. Any one of these challenges might be discouraging to the point of inaction.

Yet, there is cause for optimism. It is through these areas of challenge that the international community has showed the sterner stuff of true commitment. We are in a time of nearly magical technological advancements and scientific understanding and, thanks to the Paris Agreement, a world of engaged nations as full policy development partners on one of the most pressing issues of our time. Viewed another way, climate policy has been one of the longest exercises in perseverance and constancy of purpose. There have been setbacks and there are challenges, but by coming back into the policy arena, again and again, we currently have most of the world, for the first time, working together to form a global climate solution of many parts.

As President Theodore Roosevelt, might have reminded all nations, particularly the United States: "The credit belongs to the [*nation*] who is actually in the arena, whose face is marred by dust and sweat and blood; who strives valiantly; who errs, who comes short again and again, because there is no effort without error and shortcoming; but who does actually strive to do the deeds[.]"[81]

[81] Theodore Roosevelt, Speech at the Sorbonne: The Man in the Arena (Apr. 23, 1910), http://www.theodore-roosevelt.com/trsorbonnespeech.html. With apologies to President Roosevelt, the word *nation* was substituted for *man* by the author, who does not believe the great environmentalist would have minded.


UNIVERSITY OF CONNECTICUT
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UNDERMINING A WEAK AGREEMENT: FOSSIL CAPITALISM, NEOLIBERAL CLIMATE GOVERNANCE, PARIS AND A JUST TRANSITION AFTER TRUMP

J. Timmons Roberts [*]

Year after year, at the UN climate negotiations, the nations of the world gathered with the hope that finally the world's largest historic polluter would come to the table and join efforts to address climate change.[1] Year after year, the peculiarities of the United States (US) Republican Party's denial of climate science, and the institutional roadblocks of the need for a supermajority in the US Senate for ratification of any treaty, were widely known and discussed. The US delegation repeatedly described how their hands were tied by a resolution passed in July 1997 prohibiting the nation from joining any international agreement that did not also bind India, China and other developing nations during the same time-period.[2] Ambitious global action to address the problem was hamstrung for over two decades by this lead player's inability to move decisively, and without that leadership, other nations wondered why they should sacrifice their own development.

This dynamic finally shifted during Barack Obama's second term. After receiving a Nobel Peace Prize in the exuberance of the global community that the superpower might act more multilaterally, Obama took the lead at Copenhagen in 2009 in redirecting the expectations of nations in addressing the problem of climate change.[3] Instead of binding and differentiated expectations for emissions reductions based on national wealth and level of responsibility for the problem of climate change (their historical emissions), countries would "pledge" whatever level of reductions they chose, and then would "review" each other's efforts. The next six years of negotiations leading up to the Paris Agreement were spent turning that new approach into a defensible proposition.

Arguably, the Paris Round was successful in moving the countries of the world on climate. The US made a series of joint announcements, first with the new world-leading emitter, China, in November 2014. Each country proposed its own pledges

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[1] *See, e.g.*, DAVID CIPLET, J. TIMMONS ROBERTS & MIZAN KHAN. POWER IN A WARMING WORLD: THE NEW GLOBAL POLITICS OF CLIMATE CHANGE AND THE REMAKING OF ENVIRONMENTAL INEQUALITY 67 (MIT Press 2015).

[2] The Byrd-Hagel Resolution has been widely believed to be binding, but in fact is a non-binding "Sense of the Senate" resolution. S. Res. 98, 105th Cong. (1997).

[3] CIPLET ET AL., *supra* note 1.

(called Intended Nationally-Determined Contributions, or INDCs).[4] 197 countries came together in November and December of 2015 and agreed to the new approach, and together their pledges summed to about 1°C reduction in the warming the Earth was expected to experience by 2100, from about 3.6°C to about 2.7°C.[5] The Paris round pledges were understood to be inadequate to stay below the 2°C that scientists argued was needed to "avoid dangerous climate change", as was agreed upon in the original 1992 UNFCCC.[6] But with "global stocktakes" of progress scheduled for every five years, and new pledging rounds to follow, there was hope that a durable framework had been forged. Since participation was voluntary, nations felt more confident to pledge greater action, so the logic went.[7]

While the ink was still drying on the ratification of the Paris Agreement, Donald Trump was elected President of the US, and he began to ardently undermine what he saw as a "terrible deal" for the country. Global leaders proclaimed their devotion to the Agreement, and business, nonprofit, and local leaders in the US declared they were "still in." Then, on June 1, 2017, Trump stood at a podium in the Rose Garden and proclaimed the US would be withdrawing from the Paris Agreement. The durability of the agreement was put in doubt.

I. PARIS: INADEQUATE BUT ESSENTIAL

The Paris Agreement represents a culmination of the principles of neoliberal environmental governance, as David Ciplet and I describe in a recent piece in Global Environmental Change.[8] The Agreement's model is novel and unproven. The emissions reductions are voluntary; the finance pledge relies heavily upon private investment and loans, rather than public grants; there is a strong reliance on reporting and transparency mechanisms; and the whole thing rests on the ability of "naming and shaming" of non-complying countries by other nations to change their actions.[9]

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[4] David Ciplet & J. Timmons Roberts, *Climate Change and the Transition to Neoliberal Environmental Governance*, 46 GLOBAL ENVT'L CHANGE 148 (2017).

[5] *The CAT Thermometer*, CLIMATE ACTION TRACKER, https://climateactiontracker.org/global/cat-thermometer/ (last visited November 2015); *Climate Scoreboard: UN Climate Pledge Analysis*, CLIMATE INTERACTIVE, https://www.climateinteractive.org/programs/scoreboard/ (last visited November 2015). Note that current May, 2018 estimated temperature rises by 2100 are now at 3.3 and 3.2 degrees C on these sites.

[6] United Nations Framework Convention on Climate Change, May 9, 1992, S. Treaty Doc No. 102-38, 1771 U.N.T.S. 107.

[7] On the optimistic picture on Paris pledges, *see, e.g.*, Charles F. Sabel & David G. Victor, *Governing Global Problems Under Uncertainty: Making Bottom-Up Climate Policy Work*, 144 CLIMATIC CHANGE 15 (2017); and Robert O. Keohane & David G. Victor, *Cooperation and Discord in Global Climate Policy*, 6 NATURE CLIMATE CHANGE 570 (2016). For more critical reviews of Paris outcomes, *see, e.g.*, Robert Falkner, *The Paris Agreement and the New Logic of International Climate Politics*, 92 INT'L AFF. 1107 (2016); Raymond Clémençon, *The Two Sides of the Paris Climate Agreement: Dismal Failure or Historic Breakthrough?*, 25 J. OF ENV'T & DEV. 3 (2016)**;** Joyeeta Gupta, *Climate Change Governance: History, Future, and Triple-Loop Learning?*, 7 WIREs CLIMATE CHANGE 192 (2016); Christian Holz, Sivan Kartha & Tom Athanasiou, *Fairly Sharing 1.5: National Fair Shares of a 1.5 °C-Compliant Global Mitigation Effort*, 18 INT'L ENV'L AGREEMENTS 117 (2018).

[8] CIPLET AND ROBERTS, *supra* note 1.

[9] *See also* VAN ASSELT ET AL., EUROPEAN CAPACITY BLDG. INITIATIVE, POCKET GUIDE TO TRANSPARENCY UNDER THE UNFCCC (2017); Ciplet et al., *The Transformative Capability of Transparency in Global Environmental Governance*, GLOBAL ENVT'L POLITICS (forthcoming 2018); Clémençon, *supra* note 7; Aarti Gupta & Michael Mason, *Disclosing or Obscuring? The Politics of*

There is little evidence base to support the viability of these expectations.[10] There are vague promises of building capacity in developing countries in (Article 11), but no substantial funding or mandatory elements to assure it happens.[11] There is mention of a mechanism to address "losses and damages" for climate impacts beyond the ability to adapt (Article 8), but there is little interest by wealthy nations in implementing it or paying for it.[12] There is also a window to continue developing carbon trading mechanisms (Article 6), but with no clear reason countries would purchase permits abroad, when the treaty has no binding elements beyond reporting of pledges and progress.[13] All discussion of justice, and the need for special attention to vulnerable nations and peoples' rights, are relegated to the non-binding Preamble.[14]

Having developed over four decades in a nonlinear and historically specific way, environmental treaties have shifted from being largely precautionary, binding, and based on mandatory flows of public finance, from developed to developing countries. They now are largely voluntary, non-binding, and reliant on private financing and market-based mechanisms. We argue these are largely based on libertarian theories of efficacy and justice (see table 1).[15]

Transparency in Global Climate Governance, 18 CURRENT OPINION IN ENVT'L SUSTAINABILITY 82 (2016).

[10] *See, e.g.*, Carlo Carraro et al., *The IPCC at A Crossroads: Opportunities for Reform*, 350 SCIENCE 34.

[11] MIZAN KHAN ET AL., THE PARIS FRAMEWORK FOR CLIMATE CHANGE CAPACITY BUILDING (Routledge/Taylor and Francis ed., 2018).

[12] Craig A. Johnson, *Holding Polluting Countries to Account for Climate Change: Is "Loss and Damage" Up to the Task?*, 34 REVIEW OF POL'Y RESEARCH 50 (2017); J. Timmons Roberts et al., *How Will We Pay for Loss and Damage?*, 20 ETHICS, POLICY & ENV'T 208 (2017); Jonathan Gewirtzman et al., *Financing Loss and Damage: Reviewing Options Under the Warsaw International Mechanism*, CLIMATE POLICY 1 (2018); Kenneth Shockley & Marion Hourdequin, *Addressing the Harms of Climate Change: Making Sense of Loss and Damage*, 20 ETHICS, POL'Y, AND ENV'T 125 (2017).

[13] *See, e.g.*, J. MECKLING, CARBON COALITIONS: BUSINESS, CLIMATE POLITICS, AND THE RISE OF EMISSIONS TRADING (MIT Press 2011).

[14] CIPLET ET AL., *supra* note 1; Clémençon, *supra* note 7.

[15] CIPLET ET AL., *supra* note 1.

Key characteristics	**Guiding logics**	**Omitted and excluded principles and practices**
Libertarian justice ideals	Sustainability can best be achieved by protecting individual liberties and property rights, and enabling the rational pursuit of sovereign self-interest between unequal parties based on plural conceptions of the good; responsibility for taking environmental measures should be shared by all actors voluntarily.	Distributive justice in response to structural inequalities
Marketization	Market mechanisms, private sector engagement, and purportedly 'objective' scientific considerations are most effective and efficient forms of governance.	Precautionary principle and regulatory forms of governance; human rights, social well-being, equity, social and environmental justice; Indigenous and other knowledge systems; and scientific norms that don't conform with market interests or that are not readily measurable.
Governance by disclosure and voluntarism	Primary obstacles to sustainability are 'imperfect information', lack of transparency, and onerous regulatory structures that inhibit innovation.	Regulatory and compliance based forms of governance; responsibility of environmental action based on "polluter-pays" principle, capability and historical considerations.
Exclusive decision-making	Intensified minilateralism and bilateralism between states, often outside of the constraints of the regime, are seen as more efficient and effective means of governance in the context of transnational complexity and coordination problems.	Consensus-based, universalist decision-making, rooted in state sovereignty; pluralistic global governance; representation of vulnerable actors.

Table 1: Defining characteristics of international neoliberal environmental governance (from Ciplet and Roberts 2017)

Crucially, fairness is entirely transformed from earlier days of climate governance. In the early days, wealthy nations were understood to have created the problem and be the most able to reduce their emissions, due to their national wealth. This bedrock principle is summarized in the language of countries acting "according to principles of equity" who will act according to their "common but differentiated responsibility and respective capabilities" (UNFCCC 1992). But that expectation is lifted under the Paris Agreement. All nations are expected to act, and to report their progress in doing so.

II. COULD IT HAVE BEEN DIFFERENT?

There has been a strong drumbeat, nearly resembling mainstream consensus, that Paris was the best deal that was possible at the time. I would argue that this was substantially due to the institutional blockages and politics in the US described above. But it was not inevitable.

First a counterfactual: Based on scientists' warnings of a growing hole in the ozone layer over Antarctica, the global community mobilized to hammer out a binding, adequate, treaty based both on fairness and raising and distributing finance to help developing countries comply.[16] The Montreal Protocol included the rapid replacement of Chlorofluorocarbons with less damaging chemicals in developing countries, giving extra time for China and India to make the transition. Financial mechanisms were set up to raise and deliver adequate finances to help them and other developing countries comply, and these promises have been met.[17] The Agreement has not been perfect, but compliance is good, the ozone is healing, and trust in the agreement has been enduringly high.

But Montreal was penned in 1987, before the Reagan/Thatcher libertarian/neoliberal revolution became hegemonic.[18] Unluckily, climate governance arose in the 1990s, and faced a mobilized fossil fuel industry. The anti-regulatory efforts of that industry included the building of networks with other conservative factions to defeat social protections, welfare state, taxation, and environmental regulations.[19] The effort--led by groups such as Charles and David Koch's foundations and companies--included massive campaign finance, lawsuits and other legal efforts, lobbying, public relations spending, the creation and steering

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[16] BRIAN GAREAU, FROM PRECAUTION TO PROFIT: CONTEMPORARY CHALLENGES TO ENVIRONMENTAL PROTECTION IN THE MONTREAL PROTOCOL (Yale University Press 2013).

[17] *See, e.g.*, Elizabeth R. DeSombre, *The Experience of the Montreal Protocol: Particularly Remarkable, and Remarkably Particular*, 19 UCLA J. ENVTL. L. & POL'Y 49 (2000); M.P. Chipperfield et al., *Quantifying the Ozone and Ultraviolet Benefits Already Achieved by the Montreal Protocol*, 6 NATURE COMMUNICATIONS 1 (2015); Penelope Canan et al., *Introduction to the Special Issue on Ozone Layer Protection and Climate Change: The Extraordinary Experience of Building the Montreal Protocol, Lessons Learned, and Hopes for Future Climate Change Efforts*, 5 J. ENVT'L STUDIES & SCI. 111 (2015).

[18] CIPLET ET AL., *supra* note 1.

[19] *See, e.g.*, Robert J. Brulle, *Institutionalizing Delay: Foundation Funding and the Creation of U.S. Climate Change Counter-Movement Organizations*, 122 CLIMATIC CHANGE 681 (2014); RILEY E. DUNLAP & AARON M. MCCRIGHT, *Organized Climate Change Denial*, *in* THE OXFORD HANDBOOK OF CLIMATE CHANGE AND SOCIETY 144 (2011); JANE MAYER, DARK MONEY: THE HIDDEN HISTORY OF THE BILLIONAIRES BEHIND THE RISE OF THE RADICAL RIGHT (Anchor 2016).

of think tanks, university programs, and many other efforts at the national, international and state levels.[20]

On climate change, the effort crystalized immediately after the UNFCCC's 1997 third Conference of the Parties (COP3) in Kyoto, Japan. In a memo leaked to the *New York Times*, a strategic plan was laid out for a Global Climate Coalition, to undermine public and policymaker belief in climate science and fight off regulatory and international agreements.[21] The effort was highly successful in delaying and weakening climate action in the US and globally.

CONCLUSION: THE IMPACT OF THE US WITHDRAWAL ON THE GLOBAL ENERGY TRANSITION

It is, of course, uncertain whether humanity can make the rapid transition to a near-zero carbon energy system fast enough to save ourselves from massive disruption of Earth's life-support systems.[22] Even more unclear is whether the US withdrawal from the Paris Agreement might slow or reverse the rise of renewable energy. Plunging prices and new technologies in renewables makes this transition easier. But the US withdrawal is clearly not helping, and it could be damaging to both the confidence and the will of other nations when they decide whether to take bold steps towards converting their economies and switch to renewable energy. This can weaken momentum in markets to scale up production and sale of solar, wind, batteries and other renewable power and storage sources.

The response at the local and state level, and by businesses and NGOs and nonprofits in the US to say that "We Are Still In," is undoubtedly helpful to avoid complete despair at home, and to reflect to the world what is a deeply divided nation. State programs are crucial--including renewable energy standards, renewable energy growth supports, "least cost procurement" requirements--to meet energy demand through efficiency, rather than building new fossil fuel electricity generation, and so on. Promising carbon pricing legislation of the tax and dividend type have been introduced in all three southern New England states and several other neighbors. But for all intents and purposes, we as a nation are not "still in."

After the end of the Trump Administration, after years of strategic action to support ambitious climate action, at some moment when climate disasters strike in a way that finally galvanizes the world to act, there may be an opportunity to retool climate governance at the local, state, regional, national, and international levels. The unproven model of neoliberal climate governance must be evaluated and potentially replaced by a more reliable, and perhaps hybrid, model.[23] In actions and agreements,

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[20] MAYER, *supra* note 19; Theda Skocpol & Alexander Hertel-Fernandez, *The Koch Network and Republican Party Extremism*, 14 PERSPECTIVES ON POLITICS 681 (2016).

[21] John Cushman, *U.S.: Industrial Group Plans to Battle Climate Treaty*, NEW YORK TIMES, Apr. 26, 1998, https://www.nytimes.com/1998/04/26/us/industrial-group-plans-to-battle-climate-treaty.html.

[22] For major summaries of the science of measured climatic changes and models for expected future changes, *see, e.g.*, RAJENDRA PACHAURI ET AL., IPCC, CLIMATE CHANGE 2014: SYNTHESIS REPORT. CONTRIBUTION OF WORKING GROUPS I, II AND III TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 151 (2014); JERRY M. MELILLO ET AL., U.S. GLOBAL CHANGE RESEARCH PROGRAM, CLIMATE CHANGE IMPACTS IN THE UNITED STATES: THE THIRD NATIONAL CLIMATE ASSESSMENT 841 (2014).

[23] CIPLET ET AL., *supra* note 1.

attention needs to be given to procedural and distributional justice.[24] To have ambition, we need perceived justice. To move forward on climate, there needs to be conceptualization and implementation of a truly "just transition" away from fossil fuels, with a broader range of social-economic and governance models on the table. The neoliberalism at the core of the Paris Agreement is unlikely to be adequate, and waiting for it to fail would not be sound policy.

[24] Sonja Klinsky et al., *Why Equity is Fundamental in Climate Change Policy Research*, 44 GLOBAL ENVTL CHANGE 170 (2017).