The Renewable Energy Law Review

Editor
Karen B Wong

The Law Reviews

THE RENEWABLE ENERGY LAW REVIEW

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This article was first published in September 2018
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Published in the United Kingdom
by Law Business Research Ltd, London
87 Lancaster Road, London, W11 1QQ, UK

www.TheLawReviews.co.uk

ISBN 978-1-912228-05-8

Printed in Great Britain by
Encompass Print Solutions, Derbyshire
Tel: 0844 2480 112

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ACKNOWLEDGEMENTS

The publisher acknowledges and thanks the following law firms for their learned assistance throughout the preparation of this book:

ASSEGAF HAMZAH & PARTNERS

BAKER & MCKENZIE

BIRD & BIRD

BROAD & BRIGHT

CLEARY GOTTLIEB STEEN & HAMILTON LLP

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PREFACE

I am incredibly honoured to be the editor of the first edition of *The Renewable Energy Law Review*. Little did I know, working as a young associate in the 'early days' of renewable energy projects, that, fast-forward to 30 years later, the industry would be as large and as active as it is today across the globe. As a US-based partner at Milbank practising in the energy industry, I see different political environments, tax and other incentives in place in our 50 states and, having worked on multiple international projects on four different continents, I know that the regimes across the world are equally unique. This compendium has been formulated to provide you with a good overview of the legal framework and current status and challenges in structuring, financing and investing in renewable energy projects in the selected jurisdictions.

Whether you are someone already active in this sector or merely interested in learning more about the policies, legal structures and state of play in the renewable energy industry globally, I hope that this guide will aid you in your efforts as a participant in an industry that is increasing new sources of energy projects with fewer carbon emissions. As a young, naive and idealistic student applying to law school, I had a genuine desire to acquire the necessary skills and tools of a profession that would empower me to change the world. Frankly, I never imagined that I would have a legal career – to date spanning over three decades – that would offer me the opportunity to do just that in my capacity as an attorney facilitating transactions that literally help to keep our skies bluer and our air cleaner globally.

Karen B Wong
Milbank, Tweed, Hadley & McCloy LLP
Los Angeles
July 2018

Chapter 16

UNITED STATES

Karen B Wong and Henry T Scott[1]

I INTRODUCTION

The renewable energy industry in the United States has adjusted to a rapidly changing political landscape. Long-standing state and federal policy drivers, emerging and improved technology, and momentum conducive to the development of renewables have resulted in the US renewable energy industry faring better than many expected over the past year. This chapter contextualises these developing policies and trends by providing a brief and focused overview of renewable energy from the US perspective. First, this chapter summarises major developments over the past year in the US renewable energy industry. Second, this chapter discusses the policy and regulatory framework underlying the development of renewable energy in the United States, project development through common sources of debt financing, and federal renewable energy tax credits and the associated tax equity project finance structures. This chapter also discusses distributed renewable energy and various forms of non-project finance renewable development, such as utility-owned projects and non-profit projects. Lastly, this chapter discusses trends and changes within renewable energy manufacturing, with focus on recent policies affecting domestic solar manufacturing.

II THE YEAR IN REVIEW

Despite lingering uncertainty with respect to changes in tax law and change of government administration in Washington, renewable energy in the United States has been in good health. Renewables surged to 18 per cent of the overall energy mix in 2017;[2] 7,017MW of wind energy capacity and 10,608MW of solar energy capacity (including approximately 6.25GW of utility-scale solar installations) were installed last year, while approximately 13,332MW of

1 Karen B Wong is a partner and Henry T Scott is a senior associate at Milbank, Tweed, Hadley & McCloy LLP.

2 See Bloomberg Finance LP and the Business Council for Sustainable Energy, '2018 Sustainable Energy in America Factbook', 7 (2018).

wind and 6,400MW of solar capacity were still under construction at the end of the year.[3] Additionally, hydroelectric capacity is slated to grow from 101GW to approximately 150GW by 2050, thanks not only to new power plants, but also to upgrades to existing plants and increased pumped storage hydropower capacity.[4]

This growth has been propelled by extended federal incentives, advances in green technology and congenial state policies. Twenty-nine states, three territories and the District of Columbia have enacted mandatory Renewable Portfolio Standards (RPS), while eight other states and Guam have voluntary renewable energy standards or targets.[5] Hawaii was the first state to adopt an RPS that mandates that its electric utility companies acquire 100 per cent of its net electricity sales from renewable energy sources by 31 December 2045[6] and Vermont currently boasts an RPS that mandates 90 per cent of net electricity sales from renewable energy sources by 2050.[7] California, which has one of the nation's most ambitious RPS programmes, requires utilities to derive 33 per cent of their energy from renewable sources by the end of 2020, 40 per cent by the end of 2024, 45 per cent by the end of 2027 and 50 per cent by the end of 2030.[8] Although three of the largest California investor-owned utilities have enough renewable energy capacity under contract to meet the 2020 and 2024 thresholds, and one already has enough contracted capacity to reach the 2027 target,[9] there will still likely be a need for additional renewable energy generation in California for the other two investor-owned utilities to meet the 2027 target and if the California legislature enacts Senate Bill 100 that was proposed in 2017,[10] which would increase the state's RPS to 100 per cent by 2045.

Renewable energy projects in the United States continued to rely on the federal production tax credit (PTC) and investment tax credit (ITC) in 2017, with approximately US$6 billion of tax equity investment in wind and $4 billion of tax equity investment in

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3 See American Wind Energy Association, 'US Wind Industry Fourth Quarter 2017 Market Report – AWEA Public Version', available at the American Wind Energy Association website, http://awea.files.cms-plus.com/FileDownloads/pdfs/4Q%202017%20AWEA%20Market%20Report%20Public%20Version.pdf. See the Solar Energy Industries Association website: https://www.seia.org/research-resources/solar-market-insight-report-2017-year-review. The decrease in solar power investment over the 2016 level may be explained in part by the unusually high level of activity in 2016 given the large number of projects that were in advanced stage of development at the end of 2015 to take advantage of the investment tax credit (ITC) that was set to expire at the end of 2016 (as noted below, the availability of the ITC for solar projects was subsequently extended).

4 See Hydropower Vision, A New Chapter for America's 1st Renewable Electricity Source, prepared by the US Department of Energy Wind and Water Power Technologies Office, available at the US Department of Energy website: https://www.energy.gov/sites/prod/files/2018/02/f49/Hydropower-Vision-021518.pdf.

5 See State Renewable Portfolio Standards and Goals, prepared by the National Conference of State Legislatures, available at: http://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx#gu.

6 See US Energy Information Administration, Hawaii and Vermont Set High Renewable Portfolio Standard Targets (29 June 2015), available at: https://www.eia.gov/todayinenergy/detail.php?id=21852.

7 See Vermont Department of Public Service, State Renewable Energy Goals, available at: http://publicservice.vermont.gov/renewable_energy/state_goals.

8 See the California Energy Commission website: www.energy.ca.gov/portfolio/.

9 See the California Public Utilities Commission website: www.cpuc.ca.gov/RPS_Homepage/.

10 See https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180SB100.

solar, respectively.[11] Under the Protecting Americans from Tax Hikes Act of 2015, the PTC was extended to 2020 for eligible wind projects and the ITC was extended to 2022 for eligible solar projects.[12] While there was no direct change to either the PTC or the ITC under the Trump administration's tax plan that passed on 22 December 2017, the reduction in the minimum corporate tax rate from 35 per cent to 21 per cent, the new base erosion and anti-abuse tax, and the ability to elect 100 per cent bonus depreciation under the new tax plan will have a significant impact on projects financed under these tax credits. Further, the imposition of tariffs on imported solar cells and modules of 30 per cent in January 2018 is anticipated to raise prices for the $28 billion solar industry, which relies on panel imports for 80 per cent of its supply.[13]

Similarly, buoyed by state mandates and favourable IRS rulings regarding the applicability of the ITC, the advent of large-scale energy storage could fundamentally change the US renewable energy industry. Storage offers valuable flexibility and resiliency; it can be used to throttle demand, alleviate transmission congestion and increase system reliability.[14] Importantly, it plugs gaps in reliability by making renewable energy available at any hour of the day, fixing the timing imbalance between renewable energy generation and use (referred to colloquially as the 'duck curve').[15]

The private sector's march towards clean power is emblematic of current trends. An ever growing list of the world's most influential companies, including institutions such as Bank of America, large retailer Walmart and Silicon Valley giants Apple and Google, have committed to sourcing 100 per cent renewable power.[16] Indeed, large companies are driving demand for renewable energy: American corporations signed a record 2.8GW of power purchase agreements in 2017; Apple signed the largest ever power purchase agreement between a corporation and a utility: a 200MW agreement with NV Energy to purchase energy from the Techren Solar project.[17]

11 See Emma F. Merchant, 'Tax Equity Investors Break Their Silence on Congressional Tax Bill', Greentech Media, 12 January 2018, available at: https://www.greentechmedia.com/articles/read/tax-equity-investors-break-their-silence-on-tax-bill#gs.AFrcbP0.

12 Pub. L. No. 114-113, Div. Q, 129 Stat. 2242 (2015).

13 See Dave Keating, 'Trump Follows Europe's Lead With Chinese Solar Panel Tariffs', Forbes, 23 January 2018, available at: https://www.forbes.com/sites/davekeating/2018/01/23/trump-follows-europes-lead-with-chinese-solar-panel-tariffs/#3dd0125d31a8.

14 See Paolo D'Aprile et al., 'The New Economics of Energy Storage', McKinsey & Company, August 2016, available at: https://www.mckinsey.com/business-functions/sustainability-and-resource-productivity/our-insights/the-new-economics-of-energy-storage.

15 See Harnessing the Potential of Energy Storage, prepared by Edison Electric Institute, May 2017, available at: http://www.eei.org/issuesandpolicy/generation/Documents/EEI_HarnessingStorage_Final.pdf.

16 See the RE100 website: http://there100.org/companies; Shayle Kaan, 'The Private Sector May Lead the Charge Against Climate Change During the Trump Administration', Greentech Media, 15 December 2016, available at: https://www.greentechmedia.com/articles/read/the-private-sector-may-lead-the-charge-against-climate-change#gs.5djNUc4 and https://www.apple.com/newsroom/2018/04/apple-now-globally-powered-by-100-percent-renewable-energy/.

17 See Corporations Purchased Record Amounts of Clean Power in 2017, Bloomberg New Energy Finance, 22 January 2018, available at: https://about.bnef.com/blog/corporations-purchased-record-amounts-of-clean-power-in-2017/.

III POLICY AND REGLATORY FRAMEWORK

i The policy background

Recent regulations from the US Environmental Protection Agency (EPA) aimed at limiting greenhouse gas emissions from existing fossil fuel-fired electric generating units have potential to spur substantial growth in renewables, despite changing political attitudes towards renewable energy. The EPA rules set state-specific goals for reducing emissions from the power sector;[18] the wind and solar sectors are poised to help states meet the proposed compliance plans.[19] The final rules were released in August 2015 (the Clean Power Plan) but faced immediate legal challenges from a large number of affected states, state agencies, utility companies and energy industry trade groups. After an emergency stay was granted by the US Supreme Court, the US Court of Appeals for the DC Circuit heard oral arguments on the merits of the case in September 2016. In March 2017, President Trump issued an executive order setting forth his administration's policy to promote energy independence and economic growth, and ordered the EPA to review the Clean Power Plan for consistency with the new policy. Subsequently, at the EPA's request, the US Court of Appeals held the case in abeyance and last extended that status on 26 June 2018 for an additional 60 days.[20] On 16 October 2017, the EPA proposed the repeal of the Clean Power Plan[21] and opened a public comment period that ended on 26 April 2018,[22] and a repeal of the Clean Power Plan is expected before the end of 2018.[23] A repeal of the rules may delay anticipated retirements of coal-fired power plants and curb the need for replacement from cleaner energy generation sources.

ii The regulatory framework

Renewable energy regulation in the United States is centred on the regulation of electric generation and transmission. The applicable regulatory areas for electricity from renewable sources consist of a number of distinct subjects, including: (1) the 'siting' of generation projects – regulation by state authorities of the energy facility's initial construction and operation; (2) the interconnection of generation projects to an electric grid; (3) the rates at which generators sell electric output; (4) the financial, corporate and organisational regulation of generation companies; and (5) the regulation of electrical reliability.

Regulation of electric generation is the responsibility of both state and federal governments. First, electricity generators must obtain certification from state entities to construct and operate generation facilitates. Traditionally, states exercise siting regulation through state laws that require a generation project to obtain a certificate of public

18 See the US Environmental Protection Agency website: https://www.epa.gov/cleanpowerplan/clean-power-plan-existing-power-plants.

19 See 'A Handbook for States: Incorporating Renewable Energy into State Compliance Plans for EPA's Clean Power Plan', by the American Wind Energy Association and the Solar Energy Industries Association, available at the American Wind Energy Association website: http://awea.files.cms-plus.com/FileDownloads/pdfs/Handbook%20for%20States%20final.pdf.

20 See the Environmental Defense Fund website: http://blogs.edf.org/climate411/files/2018/06/15-1363-Per-Curiam-Order-6262018-002.pdf?_ga=2.203632592.158769996.1530162757-1650960671.1530162757.

21 82 FR 48035 (16 October 2017).

22 83 FR 4620 (1 February 2018).

23 See the US Environmental Protection Agency's docket, available at: https://www.regulations.gov/docket?D=EPA-HQ-OAR-2017-0355.

convenience and necessity (CPCN), which allows the certificate holder to exercise a right of eminent domain to obtain property necessary for the energy project. More recently, in most (but not all) states, laws have been enacted relaxing the need for a CPCN for some or all generator facilities.

Second, renewable energy is regulated when it is transmitted to an electric grid. Here, the generation project sells electricity to a service provider, typically a local utility or an independent system operator (ISO). While the service provider is the entity that must comply with interconnection regulations, the generation project is still affected. The Federal Energy Regulatory Commission (FERC) has asserted jurisdiction over interconnection to the high-voltage transmission grids (typically 100kV and above, but sometimes lower voltages too) where such grids allow power flows across state lines. State regulatory authorities control the interconnection process in Hawaii, Alaska and Puerto Rico, and in the Electric Reliability Council of Texas, which occupies most of central Texas and is not synchronously interconnected with the rest of the United States. Service providers in FERC jurisdiction offer interconnection agreements to generation projects, to which the parties file the agreements with FERC.

Third, the regulation of electric utility rates is the heart of the regulatory framework. FERC has jurisdiction over wholesale rates for electricity in interstate commerce; it controls the prices at which generating facilities sell power to utilities 'for resale' to customers in any part of the United States where power flows across state lines. FERC has two different methods for determining the rates at which wholesale electricity can be bought and sold: market-based rates and cost-based rates. Cost-based rate regulation is the older system, typically applied to traditional vertically integrated utilities with captive customers and to independent transmission companies. Here, rates are based on accounting costs that comply with FERC's Uniform System of Accounts, including an allowed rate of return on invested capital. Conversely, market-based rate regulation is used by FERC for companies that do not have market power or that have mitigated their ability to exercise market power. Once a generator obtains market-based rate (MBR) authority from FERC under Section 205 of the Federal Power Act, the generator may sell wholesale electric energy, capacity and ancillary services (as specified in the MBR tariff) at market-based rates.

Fourth, FERC's corporate regulation of utility mergers and consolidations, and leases and sales (or other dispositions) of jurisdictional facilities under Section 203 of the Federal Power Act is a significant aspect of electric regulation. FERC has to approve any transaction in which the ownership or control of jurisdictional facilities will change.[24] In deciding whether or not to approve a change of control, FERC considers four factors: the effect of the proposed transaction on competition, the effect on rates, the effect on regulation, and the possibility of any cross-subsidies between cost-based and market-based utilities.[25]

Finally, FERC has imposed electrical reliability standards, pursuant to which it reviews generation facilities' reliability, imposing fines and requiring remedial actions for violations.

This regulatory framework underlies the broader pursuit of renewable energy development in the United States. The National Renewable Energy Laboratory notes that the

24 This includes sales of equity interests of 10 per cent or more, directly or indirectly, in any public utility. It should be noted that 'jurisdictional facilities' include both physical facilities such as transmission or interconnection facilities, and 'paper facilities' such as contracts, rate schedules or a tariff (including an MBR Tariff) that have been accepted for filing under FPA Section 205.

25 This last factor was added by the US Congress pursuant to the Energy Policy Act of 2005.

aim of renewable energy regulation is fourfold: facilitating new renewable energy generation, ensuring adequate grid infrastructure, ensuring a secure short-term electricity supply and ensuring long-term electricity security.[26] These goals can only be understood and achieved through a regulatory framework that works in conjunction with national and foreign policy, tariffs and project development of renewable energy.

IV RENEWABLE ENERGY PROJECT DEVELOPMENT

i Project finance transaction structures

Consistent with project financing transactions worldwide, the use of a special purpose vehicle (SPV), known as the 'project company' is commonly used in the US project finance transactions. Moreover, many project sponsors will develop multiple projects using different single-purpose project companies with separate financing transactions for each project.

Limited liability companies (LLCs) are the most common type of business organisation used for project companies because an LLC offers limited liability protection similar to that of a corporation but can be treated as a disregarded or flow-through entity for US federal tax purposes. The flow-through nature of an LLC enables gains, losses and depreciation from a project to be passed to the holder of an ownership interest in an LLC, referred to as a 'member', and avoids the double taxation that would result when using a traditional corporation. This is particularly advantageous in the renewable energy sector when the sponsor of a renewable energy project cannot efficiently or fully utilise the tax benefits from PTCs or ITCs. By utilising an LLC entity, parties can structure the management and ownership of a project company to facilitate a tax equity transaction, in which management rights can be vested in the strategic developer but ownership can be shifted to passive tax equity investors, who can avail themselves of the PTCs to be generated by the project or the ITCs associated with the project. In addition, parties can agree on adjustments to the allocations of gains and losses as necessary to address different risk allocation factors.

Generally, the bank market and the private placement market provide the primary sources of debt financing for US renewable energy projects. Banks typically provide project companies with construction and term loan facilities for the development, construction and operation of a renewable energy project, as well as letter of credit facilities to enable project companies to satisfy certain credit support obligations required under project contracts. In addition, banks often offer other specialised debt facilities, such as equipment supply loans to facilitate the purchase of wind turbine generators prior to a project's completed development and final permitting. Often construction and term loan facilities will refinance these turbine supply loans. Sometimes banks will provide equity bridge loans to support the project's equity contribution commitments. A unique bank product that has developed in the renewable energy industry is a 'back-leveraged term loan', which is essentially a term loan made at a level above the project company and is secured by the membership interests owned by a project developer in the parent of a project company (and not the direct assets of a project company). Back-leveraged term loans have evolved to minimise interparty negotiations with

26 Mackay Miller and Sadie Cox, National Renewable Energy Laboratory, *Overview of Variable Renewable Energy Regulatory Issues* (2014) https://www.nrel.gov/docs/fy14osti/61350.pdf.

tax equity investors when a 'partnership-flip' structure has been implemented. Banks also offer back-leveraged term loans to project holding companies, which include the partnership-flip structure discussed below.

Institutional investors that participate in the private placement transaction also offer a source of debt financing with fixed interest rates. Here, projects are financed through the issuances of bonds in capital markets, which are offered under Section 4(2) or Rule 144A of the Securities Act of 1933. Private placements under Section 4(2) are typically made only to accredited investors, such as a pension fund or an insurance company. Offerings in the bond market under Rule 144A are made only to qualified institutional buyers, which are sophisticated purchasers with over US$100 million of qualifying assets. While Section 4(2) private placements are usually made to a very small number of accredited investors through an administrative agent mixed with bank transactions, Rule 144A offerings are usually sold to a large number of investors administrated by a trustee under an indenture on behalf of qualified institutional buyers. Rule 144A transactions typically require less oversight and consent requirements than traditional bank transaction and Section 4(2) placements and offer a less onerous covenant package, given that waivers and modifications are harder to obtain when the transaction has been widely syndicated.

PTCs and ITCs have also changed the landscape of renewable energy project finance structures to the extent that a tax equity investor must own the renewable energy project to avail itself of these tax credits and other tax benefits. The partnership-flip transaction is a popular vehicle for project companies to implement to monetise their PTCs and ITCs and other tax benefits. In this structure, a tax equity investor enters into an equity contribution agreement or a membership interest purchase agreement prior to or during the construction phase of a project, pursuant to which the tax equity investor commits to contribute capital contributions or to purchase a membership interest in the project company (or parent) at the time (or immediately before in the case of a project monetising the ITCs) that the project is placed in service. The proceeds from the tax equity investment are applied to repay the construction debt. There are variations to this structure, known as the pay-as-you-go, or PAYGO, structure, in which the tax equity investor contributes less than 100 per cent of the equity provided under a traditional partnership-flip structure and agrees to make ongoing contributions during the operational period of the project as PTCs are generated.

The single investor lease or a leveraged lease transaction is an alternative structure used to monetise the ITCs associated with a renewable energy project. In a lease structure, a tax equity investor acquires the project and its tax attributes, and then leases the asset back to the developer, who operates the project and pays rent to the tax equity investor–lessor.

ii Distributed and residential renewable energy

Distributed generation covers technologies that generate electricity at or near where it will be used. In the United States, distributed energy is comprised of microgrids – such as structures on residential homes, industrial facilities or college campuses – that feed into larger electrical grids maintained by utility companies.[27] Distributed generation capacity, which is 90 per cent sourced from solar panels but also relies on wind, fuel cells and heat power, amounts to

27 See EPA, D*istributed Generation Electricity and Its Environmental Impacts*, https://www.epa.gov/energy/distributed-generation-electricity-and-its-environmental-impacts#ref1.

nearly one-sixth of the nation's capacity from existing centralised power plants.[28] While some distributed generation systems are isolated from any centralised electrical grid, almost all distributed generation systems allow for net metering – connecting customers to a centralised grid from which they can purchase power when they are under-producing and to which they can sell any excess power generated.[29]

The emergence of significant distributed generation installations in the United States has sparked policy debates over the price customers are compensated at for sales of energy to utility companies.[30] As of October 2016, 45 states and the District of Columbia compensated customers for distributed energy, though rates and prices varied greatly.[31] Some states use set scales to compensate customers at the same rates they pay for consumption of energy, others impose lower rates for energy produced versus consumed, and others still impose special 'standby' charges for the right to sell energy.[32] For states imposing lower rates for energy produced by distributed generation installations, the lower prices are justified by utility companies as an 'avoided cost' – the costs the utility company would have incurred in producing the energy itself.[33] While there is no federal policy on distributed energy pricing, there is proposed US Senate legislation, backed by environmentalists and renewable energy supporters, that would regulate and standardise rates and prevent unjustified utility charges.[34] Likewise, utility companies have largely opposed distributed energy because of concerns over lost profits, resulting in many utilities lobbying states for decreased compensation. Regardless, standardised regulation will be necessary to support the continued growth of distributed energy.

iii Non-project finance development

While the vast majority of renewable energy projects are developed through project finance structures sponsored by private SPVs, utility-sponsored projects and non-profit sponsored projects have grown in popularity in recent years.

Utilities have sponsored community solar projects funded through upfront or ongoing payments directly from community ratepayers.[35] The customer buys, from the utility or a third-party owner, the rights to the benefits of the solar energy produced by the community project. Utility-sponsored programmes can make solar power more accessible for residents – as opposed to distributed generation or residential solar – because it requires less purchase power per resident and allows customers to purchase solar electricity in monthly increments.

28 See EPA, *Distributed Generation Electricity and Its Environmental Impacts*, https://www.epa.gov/energy/distributed-generation-electricity-and-its-environmental-impacts#ref1. Distributed generation estimated at about 200 gigawatts in a 2007 study by the Federal Energy Regulatory Commission (FERC). The total nameplate capacity of US centralised power plants was more than 1,100 gigawatts as of 2012, according to the US Energy Information Administration.

29 See Richard Revesz, *Managing the future of the Electricity Grid: Distributed Generation and Net Metering*, 41 Harv. Envtl. L. Rev. 43 (2017).

30 Id. at 46.

31 Id. at 47.

32 Id.

33 Id. at 47.

34 Id. at 48.

35 See US Department of Energy, *Guide to Community Solar: Utility, Private, and Non-Profit Project Development* (2012) https://www.nrel.gov/docs/fy12osti/54570.pdf.

Two examples of such projects are the Sacramento Municipal Utility District's Solar Shares[36] and Tucson Electric Power's Bright Tucson[37] programmes. Electric co-ops, municipal utilities and public utility districts cannot benefit from renewable energy tax incentives for their community solar projects, since these entities do not pay federal taxes; however, they can take advantage of Clean Renewable Energy Bonds, which are not available to private entities. Since 2008, private and investor-owned utilities have qualified for the PTC[38] or the 30 per cent ITC[39] by meeting certain requirements.

Non-profit organisations have also created successful renewable energy projects financed through tax-deductible community donations. These donations are used to cover project construction costs, in which the donors receive tax deductions – if the donors receive a return benefit, such as electrical savings, their donation would constitute a quid pro quo contribution and their donation would not be tax-deducible. The generated energy is sent directly to the non-profit, such as a school or church, which is connected through a distributed generation model to a utility. The non-profit uses the electricity directly or receives compensation for over-production. While the non-profit is not eligible for federal commercial ITCs, it is eligible for other grants and funding not available to public utilities or private entities. The non-profit model has been successful throughout the country for small-scale projects, such as the community solar project in Bainbridge Island, Washington, in which 26 community organisations and individuals donated to the cost of construction of solar panels that support the local school's energy needs.

Feed-in tariffs have also been introduced, albeit on a relatively limited basis, in the United States.[40] These policies provide guaranteed payments to renewable energy producers (including individual homeowners) for the actual amount of energy they produce. This makes renewable energy investments far more attractive to homeowners and other investors, as feed-in tariffs can be used to guarantee a reasonable rate of return on the levelised costs of energy for a project.[41] Further, data from Europe (where feed-in tariffs are more widely implemented) tends to show that feed-in tariffs are more cost-effective per kWh than upfront rebates and net metering, and encourage faster renewable energy uptake than these other options.[42]

V RENEWABLE ENERGY: MANUFACTURING AND OUTLOOK

Renewable energy manufacturing in the United States has dramatically shifted over the past year in the wake of the Trump administration's policies. An 'America first' protectionist stance on trade, significant funding decreases to the Office of Energy Efficiency and Renewable Energy, and Trump's administration's repeal of Obama-era renewable and clean energy goals has focused the Trump administration's energy policies on non-renewable energy sources such

36 See Sacramento Municipal Utility District, *Power Sources*, https://www.smud.org/en/Corporate/Environmental-Leadership/Power-Sources.

37 See Tucson Electric Power, *Bright Tucson Community Solar*, https://www.tep.com/community-solar/.

38 Section 45 of the Internal Revenue Code of 1986, as amended.

39 Section 48 of the Internal Revenue Code of 1986, as amended.

40 See Karlynn Cory and Toby Couture, State Clean Energy Policies Analysis (SCEPA) Project: An Analysis of Renewable Energy Feed-in Tariffs in the United States, National Renewable Energy Laboratory (June 2009).

41 Id.

42 Id.

as coal. The most dramatic effect of changing policy priorities has been on US manufactured solar panels. More than 80 per cent of US solar installations use imported panels, with most manufactured in Asia. The Trump administration placed a 30 per cent tariff on all imported solar panels, falling to 15 per cent over a period of four years, which was levied in response to competition from Chinese manufacturers. The 30 per cent tariff has added about 10 cents per watt to the cost of solar energy in the United States,[43] and while it has generally helped US manufacturers, including FirstSolar and Tesla, it has not slowed the dominance of Chinese solar panel manufactures and exporters. Indeed, Jinko Solar, JA Solar and Longi Green Energy already had plans to build US factories. Ironically, many of the US solar manufacturers that have benefited from the tariff are not American; Suniva is majority-owned by a Chinese investor and SolarWorld is the US subsidiary of a German company – at least until SunPower (the dominant US Solar manufacturer) acquires SolarWorld later this year.[44] With manufacturing only accounting for 14 per cent of jobs in the solar industry, the most pronounced effect of the tariff and shifting US priorities for renewables is the increased cost of solar panels, triggering a possible slowdown in future solar deployment and innovation.

Despite energy policy shifts away from renewable energy sources, renewable wind and solar energy has hit a record high of 10 per cent of total monthly electrical generation in March 2017, in the United States.[45] This increase in generation has been attributed to continued growth of US wind turbine and solar panel manufacturing. With more than 500 US manufacturing facilities specialising in wind power components, centred mostly in the east and north-east United States, costs for commercial and distributed wind technology have dramatically dropped, with exports and domestic sales doubling from 2014 to 2016.[46]

Further opportunities and challenges abound in the electrification of the transportation system. The ongoing succession of petrol-powered vehicles by plug-in electric vehicles (EVs), an ongoing trend that is projected to continue, entails a concomitant increase in electric energy demand.[47] In fact, EVs could create up to 774TWh of electricity demand (on par with the entire US industrial sector);[48] electricity consumption from EVs is projected to rise from 6TWh in 2016 to 800TWh by 2040.[49] The conventional wisdom from the previous decade has been that night-time charging would alleviate strain on the electric grid. Yet, recent experience has been that solar energy production in the middle of the day has outstripped demand in areas with high solar retention. Plug-in electric vehicles, and other forms of electric storage, are a congenial solution to the problem of overproduction during peak solar

43 International Trade Commission and Bloomberg New Energy Finance (2017) in Chris Martin, Jim Efstathiou and Air Natter, *World's Biggest Solar Players Say Trump's Tariffs Could have Been Worse*, Bloomberg (2018) https://www.bloomberg.com/news/articles/2018-01-23/world-s-solar-leaders-say-trump-s-tariffs-could-have-been-worse.

44 Paula Mints, Altenergystocks, *SunPower and SolarWorld, Strange Bedfellows*, (30 April 2018) http://www.altenergystocks.com/archives/2018/04/sunpower-and-solarworld-strange-bedfellows/.

45 US Energy Information Administration, Owen Comstock, *Wind and Solar Electricity Generation March 2017*, (14 June 2017) https://www.eia.gov/todayinenergy/detail.php?id=31632.

46 North American Clean Energy, *U.S. Wind Turbine Manufacturers Work Together*, (6 July 2016) http://www.nacleanenergy.com/articles/23751/u-s-wind-turbine-manufacturers-work-together.

47 See Electric Vehicle Outlook 2017, Executive Summary, Bloomberg New Energy Finance (July 2017).

48 See Samantha Raphelson, U.S. Utilities Look To Electric Cars As Their Savior Amid Decline In Demand, NPR Here & Now Compass (29 March 2018) https://www.npr.org/2018/03/29/598032288/u-s-utilities-look-to-electric-cars-as-their-savior-amid-decline-in-demand.

49 Electric Vehicle Outlook 2017, Executive Summary, Bloomberg New Energy Finance, 3 (July 2017).

hours, by providing a way to 'store' excess solar energy remotely. Accordingly, policies (from those that determine charging station locations to time-of-use rates for electricity) aimed at having consumers charge EV batteries with energy from renewable sources would do well to track this relationship.

VI CONCLUSIONS AND OUTLOOK

As renewable energy in the United States approaches grid parity – in which the cost of electricity generated is as affordable as electricity purchased from the grid sourced from fossil fuels – the continued success of the robust renewable energy industry is facing some uncertainty in the wake of shifting national policy priorities away from clean technology and expiring government subsidies and tax credits.[50] Furthermore, the US electrical grid has constrained renewable energy growth in areas that have seen success internationally. For example, in the United States there is currently only a single 30MW offshore wind project in operation compared to the 10GWs of electricity in Europe sourced from offshore wind projects.[51] However, new advances in predicting wind patterns offshore through experimental aircraft and satellite weather modelling have made offshore projects more viable in the very near future, and a number of offshore wind projects are currently under development.

Looking to the future, any increase in renewable capacity must account for the challenges of lower demand for electricity for industrial and commercial customers, and those posed by the mass adoption of plug-in EVs. The electrification of the transportation sector requires utilities to increase capacity, upgrade infrastructure and adopt demand-management techniques,[52] such as time-of-usage rates, to support the influx in demand and prevent displaced fossil fuels from being replaced by dirty 'peaker' plants.[53] The marriage of renewable energy and the electrification of transportation will be supported by the country's increased funding for electric transportation research[54] and states' growing Renewable Portfolio

50 See Chrissy Astbury, *How America's Solar Energy Policies Should Follow (and Stray) from Germany's Lead: Working Towards Market Parity Without Subsidies*, 27 Ind. Int'l & Comp. L. Rev. 2019 (2017).

51 Tatiana Schlossberg, *America's First Offshore Wind Farm Spins to Life*, New York Times (14 December 2016) https://www.nytimes.com/2016/12/14/science/wind-power-block-island.html; Cooperative Institute for Research in Environmental Sciences at University of Colorado, *High-Res Forecasts Could Help U.S. Expand Offshore Wind Power*, (2 May 2018) https://cires.colorado.edu/news/high-res-forecasts-could-help-us-expand-offshore-wind-power.

52 See Keith Dennis, Ken Colburn and Jim Lazar, *Environmentally Beneficial Electrification: The Dawn of 'Emissions Efficiency'*, *The Electricity Journal*, Vol. 29 Issue 6 (2016).

53 See Kevin Bullis, 'Could Electric Cars Threaten the Grid?', MIT Technology Review, 6 August 2013, available at: https://www.technologyreview.com/s/518066/could-electric-cars-threaten-the-grid/; News Release: NREL Research Determines Integration of Plug-in Electric Vehicles Should Play a Big Role in Future Electric System Planning, prepared by National Renewable Energy Laboratory, available at: https://www.nrel.gov/news/press/2018/nrel_research_determines_integration_of_electric_vehicles.html; Stephen Schey et al., 'A First Look at the Impact of Electric Vehicle Charging on the Electric Grid in The EV Project', EVS International Battery, Hybrid, and Fuel Cell Electric Vehicle Symposium, at 1, 2 (May 2012).

54 See, e.g., Office of Energy Efficiency & Renewable Energy, *Energy Department Announces $15 Million for Batteries and Electrification to Enable Extreme Fast Charging*, (23 October 2017) https://www.energy.gov/eere/articles/energy-department-announces-15-million-batteries-and-electrification-enable-extreme.

Standards.[55] In addition, the deployment of energy storage and other technology advances in the renewable energy industry will help transform the intermittent nature of wind and solar resources to enable these low-cost renewable energy sources to ultimately function as more reliable baseload facilities. Moreover, given that renewable energy projects are now lower-cost generation resources than ageing coal and oil-fired plants, market forces will likely continue to drive investments in clean energy projects despite the phase out of current US federal tax benefits.

55 See UtilityDrive, *Transportation Electrification Should Build on Energy Efficiency and Renewables Program Success*, (13 April 2018) https://www.utilitydive.com/news/transportation-electrification-should-build-on-energy-efficiency-and-renewa/521008/.

Appendix 1

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ISBN 978-1-912228-05-8