Sustainable FERC Project

Policies for a Clean Electric Grid

Comments of the Sustainable FERC Project
Quadrennial Energy Review: Electricity Transmission, Storage, and Distribution

On behalf of the undersigned clean energy advocacy organizations, the Sustainable FERC Project is pleased to submit the following comments on Electricity Transmission, Storage, and Distribution to the Quadrennial Energy Review (QER).

The Sustainable FERC Project is a coalition of national and regional clean energy and other public interest organizations focused on breaking down federal regulatory barriers to the accelerated deployment of renewable energy and demand-side resources onto the transmission grid. We provided verbal comments at the QER public meeting in Newark, New Jersey on September 8, focused on transmission and distribution in the East. The following comments serve to reiterate and amplify those verbal comments.

I. Introduction and Summary

The United States electricity system is undergoing more change than it has in many decades. The causes are numerous:

- A changing resource mix – including a large and rapid increase of remotely located renewable generation – driven by falling prices and climate change policy;
- The changing role of utility customers on the distribution grid from simple consumers to both consumers and generators of power;
- Rapid innovation and deployment of advanced power electronics, controllable and dispatchable demand-side resources, and information technology and electricity storage that speeds up system scheduling and dispatch;
- Concerns over cyber-attacks; and
- The need to maintain affordability and reliability.

The realities of climate change dictate the continuation of our changing portfolio mix and its underlying grid towards a clean energy system. Costly and destructive extreme weather events like Superstorm Sandy have underscored the urgency to bolster the system and improve resiliency – the ability to quickly restore service after storm-related or other outages occur. The same changes that make the system more flexible and easily operated make integrating growing amounts of renewable energy resources easier and less expensive. Flexibility, resiliency and security are the critical needs underlying what must be the clean energy grid of the future.

The QER's potential lies in its unique ability to holistically assess the current state of our complex electric grid infrastructure on a nationwide scale and to provide policy makers, grid operators and other stakeholders a comprehensive road map for ensuring the cost-effective continuation of the transition towards a clean, flexible, resilient and secure system. The grid is increasingly interconnected and is not operated on a scale coterminous with state or even regional boundaries. The QER is an opportunity to provide recommendations that recognize the

reality of the interconnected distribution and transmission systems. Finally, "business as usual" is unmitigated climate change; to plan for anything less will result in unacceptable wasted costs and missed opportunities for American consumers.

II. Specific Comments and Recommendations

The QER should ensure flexibility, resiliency and security throughout the continuing transition to a low-carbon future. Our comments address three specific areas and make accompanying recommendations towards this end.

First, investing in and modernizing the transmission system are critical to expanding clean energy resources like wind and solar power. A well connected, diverse grid is also vital to reliability and the efficient operation of wholesale electricity markets over large regions. So long as transmission development is smartly sited and disciplined by robust consideration of demand-side resources, there is broad stakeholder support of transmission expansion to integrate renewables onto the grid.

Second, demand-side resources constitute part of the energy delivery systems that make up the transmission grid. Demand response, energy efficiency, energy storage and other energy-saving "non-transmission" or "non-wires alternatives" can often enhance grid flexibility and reliability just as well and at equal or lower cost than traditional transmission. Reducing and optimizing demand not only reduces the amount of energy that needs to be generated and capacity maintained, but also the amount of transmission capacity that needs to be built. The valuable grid services that demand-side resources provide must be incorporated into QER consideration and recommendations.

Third, existing planning frameworks, specifically FERC Order 1000-compliant regional planning processes and interregional coordination structures, as well as the Eastern Interconnection Planning Collaborative (originally funded by the American Recovery and Reinvestment Act), provide a strong basis for making predictions about future grid needs and ensuring that grid planning moves towards facilitating a clean, flexible, resilient and secure grid system. One of the QER's central recommendations should be strengthening and coordinating these frameworks.

A. Investing in and Modernizing the Transmission System Key to Clean Energy, Efficiency and Reliability

Continuing investment in the interstate transmission system is critical to ensuring a clean and reliable grid. Although demand-side and distributed generation resources are driving innovation in business models, regulation and technology, investment in the bulk electricity grid will continue to be needed. Much of America's vast renewable energy resources are located far from load centers and need hundreds of miles of new or repurposed transmission to reach the people who need these resources. Converting the world's largest economy from a high-carbon emitting to a low-carbon system will require continuous planning and a large amount of renewable energy resources.

Fortunately, since 2005, investment in large-scale transmission infrastructure has rebounded and increased by at least $59 billion.[1] It is clear that further investment in large-scale transmission is necessary to integrate location-constrained wind and solar resources and to facilitate improved coordination between currently balkanized balancing areas. The QER does not need to start from scratch to determine the roadmap for continuing investment. Numerous studies exist to demonstrate where new transmission infrastructure is likely to contribute cost-effectively to reliability improvements and the integration of renewable energy resources. Recent examples include PJM's Renewable Energy Integration Study[2] and the Eastern Interconnection Planning Collaborative's Phase I and Phase II results.[3]

Another study by Synapse Energy Economics, Inc. compares the net present value of costs for each of the scenarios modeled in the Eastern Interconnection Planning Collaborative Process (i.e., a carbon reduction future with nationally implemented federal carbon constraints and increased energy efficiency and demand response; a future with a regionally implemented national renewable portfolio standard; and a business-as-usual future).[4] The study affirms the reality that continuing grid investment is going to prove expensive in any case (approximately $2.4 trillion, in fact). Importantly, the study finds that the price of the future generation and transmission infrastructure mix necessary to slash carbon pollution to 80 percent below "business-as-usual" levels by the year 2030 – through more energy efficiency and transmission to move renewable power sources like solar and wind – would be essentially the same as the costs of a mix designed without regard for carbon controls. Adding in the cost of avoided carbon emissions, the low carbon future could save $1 trillion in grid infrastructure investment as compared to planning for what is still, surprisingly, considered "business as usual."

The Synapse study highlights an important point that the QER should embrace as the basis for its recommendations: while continuing transmission investment will be critical to facilitating the high levels of renewable energy and reliability that the United States will demand over the next several decades, unfettered support for transmission build-out will result in unnecessary consumer costs and is likely to send law and policy makers down the wrong path when developing the legislative and regulatory framework to incent further infrastructure development. The QER should state explicitly in its guidance that support for transmission development will be shaped to facilitate the ongoing transition to a clean energy future.

In addition, it is impossible to ignore the reality that new large-scale transmission development can pose real environmental and cultural resources risk. Constructing and maintaining

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[1] This is the sum of actual investments by shareholder-owned electric utilities from 2006 to 2011. Edison Electric Institute, Transmission Investment (June 2013), http://www.eei.org/issuesandpolicy/transmission/Documents/transmission_investment.pdf.
[2] PJM Renewable Integration Study (March 2014), http://www.pjm.com/committees-and-groups/task-forces/irtf/pris.aspx.
[3] *See* Eastern Interconnection Planning Collaborative, Phase I Resources, http://www.eipconline.com/Resource_Library.html and Phase II Documents, http://www.eipconline.com/Phase_II_Documents.html.
[4] Synapse Energy Economics, Inc., An Expanded Analysis of the Costs and Benefits of Base Case and Carbon Reduction Scenarios in the EIPC Process,http://bit.ly/1xyWWKD.

transmission lines can increase soil erosion, degrade rivers and wetlands, impact water quality, adversely alter habitats, and conflict with cultural values of certain communities.[5] To this end, the Sustainable FERC Project supports the comments submitted by the Natural Resources Defense Council (NRDC) on July 11, 2014 (attached) in their entirety. The NRDC comments provide important recommendations on how to facilitate transmission development while avoiding and mitigating environmental and cultural resource degradation both by strengthening the process for choosing locations of new development and by ensuring that new transmission is justified by first considering more efficient use of existing infrastructure and demand-side resources.

B. Incorporation of Demand-Side Resources Not Only Justifies Transmission Investment but Provides Key Flexibility and Resiliency Benefits to Grid

The explosion of distributed energy – primarily solar but also combined heat and power, various forms of energy storage and other clean distributed generation – by many consumers may represent the biggest shift the grid will experience this century. Households and businesses no longer get power only from utility companies. They generate it themselves or buy it from competitive suppliers, and the distribution grid that was once a dropping off point for electricity from power companies is the focus of a complex web of transactional relationships among electricity customers, utility companies and innovative third parties. This shift, along with reduced electricity consumption and increasingly effective demand response programs is forcing a major reconsideration of utility business models across the U.S.[6] as well as a revolution in technology innovation (including electricity storage), regulation, and grid operations as the once clear line between the distribution and transfer of bulk electricity increasingly blurs.

FERC has long recognized that while these resources typically come online behind the retail meter, their existence can have significant implications on the higher voltage transmission system and should be considered and treated fairly in the transmission planning and wholesale markets context.[7] On paper at least, grid planners must give "comparable consideration" to

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[5] *See generally* Bureau of Land Management, U.S. Department of Interior, *Electric Transmission Facilities & Energy Corridors*, http://www.blm.gov/wo/st/en/prog/energy/transmission.html; Public Service Commission of Wisconsin, Environmental Impacts of Transmission Lines (2013), http://psc.wi.gov/thelibrary/publications/electric/electric10.pdf.

[6] Ronald Lehr, America's Power Plan, Utility and Regulatory Models for the Modern Era, The Electricity Journal, Vol. 26, Issue 8, Oct. 2013, pp. 35–53.

[7] On the transmission planning and operations side, FERC Orders 890 and 1000 require "comparable treatment" for non-transmission alternatives throughout the planning process, while Order 792 attempts to provide fair treatment for small generation interconnection. *Preventing Undue Discrimination and Preference in Transmission Service*, Order No. 890, FERC Stats. & Regs. ¶ 31,241, *order on reh'g*, Order No. 890-A, FERC Stats. & Regs. ¶ 31,261 (2007), *order on reh'g*, Order No. 890-B, 123 FERC ¶ 61,299 (2008), *order on reh'g*, Order No. 890-C, 126 FERC ¶ 61,228 (2009), *order on clarification*, Order No. 890-D, 129 FERC ¶ 61,126 (2009); *Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities*, Order No. 1000, FERC Stats. & Regs. ¶ 31,323 (2011), *order on reh'g*, Order No. 1000-A, 139 FERC ¶ 61,132, *order on reh'g and clarification*, Order No. 1000-B, 141 FERC ¶

demand-side resources (energy efficiency, demand response, PV solar, combined heat and power, electric vehicles and other storage) in load forecasting, modeling and in the development of solutions to identified grid needs. In practice, transmission planning processes tend to be biased towards transmission infrastructure and often discount the value of demand-side resources at the load forecasting and solutions stage of local and regional planning.

The grid manager for New England (ISO-NE) has proven a hopeful example in attempting to capture the impact of demand-side resources in regional load forecasting. By improving their methodology for capturing energy efficiency in their load forecasts,[8] ISO-NE has estimated over $400 million savings from avoided transmission investment in the last few years.[9] The grid managers in New York (NYISO) and California (CAISO) are undertaking similar efforts related to energy efficiency, and starting to explore the impacts of aggregated distributed generation on their load forecasts as well.

In our experience, grid planners have also favored "iron-in-the-ground" options over non-transmission alternatives during the solutions phase of local and regional transmission planning processes. While it is true that targeted energy efficiency or distributed generation cannot replace, for example, the need for a new high voltage transmission project to transport location-constrained wind power, demand-side resources can serve as solutions to more localized reliability needs and, in combination, can address bigger grid needs as well.

In addition to directly affecting transmission grid needs by lowering load forecasts and providing reliability and potentially economic congestion solutions, energy storage, distributed energy resources and demand-side resources provide flexibility and control that improve grid resiliency in a manner that central station generation resources often cannot provide as effectively. As dispersed energy resources, they are less vulnerable to large unexpected outages from weather, fuel supply, and other problems. As a result, demand-side resources should not only be considered as direct competitors to new transmission infrastructure development, but also as a

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61,044 (2012); *Small Generator Interconnection Agreements and Procedures*, Order No. 792, 145 FERC ¶ 61,159 (2013).
On the markets side, FERC Orders 745, 755, and 784 recognize the grid services that demand-side resources can provide and attempt to prevent undue discrimination against these resources in wholesale markets while ensuring just and reasonable rates. *Demand Response Compensation in Organized Wholesale Energy Markets*, Order No. 745, FERC Stats. & Regs. ¶ 31,322, *order on reh'g and clarification*, Order No. 745-A, 137 FERC ¶ 61,215 (2011); *Frequency Regulation Compensation in Organized Wholesale Power Markets*, Order No. 755, 137 FERC ¶ 61,064 (2011); *Third-Party Provision of Ancillary Services; Accounting and Financial Reporting for New Electric Storage Technologies*, Order No. 784, 144 FERC ¶ 61,056 (2013). (The recent D.C. Circuit decision vacating Order 745 on jurisdictional grounds inserts uncertainty into the role of demand-side resources in wholesale markets. *Elec. Power Supply Ass'n v. FERC*, 753 F.3d 216, 221 (D.C. Cir. 2014).)

[8] ISO-NE Energy Efficiency Forecast Report for 2018-2023 (June 2014), http://www.iso-ne.com/committees/planning/energy-efficiency-forecast.

[9] *See* http://www.env-ne.org/media-center/release/regional-grid-operator-looks-to-clean-affordable-ways-to-meet-energy-needs.

key complement to that development and a component of the electricity delivery systems necessary to facilitate a cost-effective path to a clean, reliable, resilient and secure grid.

C. Existing System Planning Frameworks Should Be Strengthened and Coordinated

Existing planning frameworks, specifically the Eastern Interconnection Planning Collaborative (EIPC) and Order 1000-compliant regional planning processes and interregional coordination, provide a strong basis for predicting future grid needs and shaping a clean, flexible, resilient and secure grid system.

The EIPC process was successful in producing transmission system planning scenarios endorsed by a wide range of stakeholders across the Eastern Interconnection. EIPC is the only stakeholder-driven, interconnection-wide planning effort that currently exists. Through significant efforts by DOE and others, it is viewed by almost all stakeholders involved as a legitimate process that produced valuable scenarios and results. EIPC has the unique potential to provide valuable data to guide the development of the interregional transmission infrastructure necessary to facilitate a clean and reliable grid. For example, truly understanding the grid implications of the U.S. EPA's proposed Clean Power Plan requires going beyond state and even regional boundaries from a transmission planning perspective. An EIPC process could inform states and regions about potentially cost-effective compliance plans. The QER should recommend maintaining and providing continuing agency funding for the EIPC.

FERC's Order 1000-compliant planning processes also provide significant value towards identifying the grid needs related to climate and other local, state and energy policies. However, the regional planning components of the rule have more strength and potential than its interregional coordination provisions, the impact of which remain uncertain pending FERC decisions. Both EIPC and Order 1000 recognize that the grid implications of clean energy policies transcend state boundaries. Even Order 1000 faces limitations however, in that the rules governing transmission grid planning and energy markets differ by region and only "coordination" and not true interregional planning is not required under the rule.

The multiple layers of boundaries also impede flexibility and innovation. State and even some federal climate policies (the U.S. EPA Clean Power Plan) are designed around state boundaries. The North American Electric Reliability Corporation reliability regions and regional grid market/planning areas add more layers. The QER could complement Order 1000 planning by providing guidance on how planners and policy-makers can reconcile state energy policies (carbon, renewable, energy efficiency, other) with grid and regional transmission organization footprints that do not share the same boundaries. Further, the QER should recommend greater interregional planning beyond Order 1000's interregional coordination requirements. Interregional planning could occur through the existing EIPC framework.

III. Conclusion

The Sustainable FERC Project appreciates the opportunity to comment on the QER, and commends DOE in its effective framing of the issues and opportunities for public comment. We

look forward to continuing dialogue with DOE and other stakeholders as the QER process moves toward a conclusion and recommendations.

Respectfully submitted October 10, 2014,

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Comments of the Natural Resources Defense Council (NRDC) for the US DOE Quadrennial Energy Review Transmission, Storage, and Distribution of Electricity Public Hearing Lewis & Clark College, Portland, Oregon July 11, 2014

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I. Introduction and Summary:

The United States electricity system is undergoing more change than it has in many decades. The causes are numerous: a changing mix of resources – including a large and rapid increase of remotely located variable renewable generation – driven by lowering prices, climate change and policy considerations; the changing role of utility customers on the distribution grid from simple consumers to both consumers and generators of power; the rise of unconventional gas resources that is putting pressure on baseload conventional power sources like coal and nuclear energy; concerns over reliability and cyber-attacks; and the need to contain costs as future needs are identified and met in a timely way, to name some of the most important.

This rapid change is also being fed by rapid innovation and deployment of advanced power electronics, controllable and dispatchable energy efficiency and demand response programs, markets, and policies; as well as information technology and electricity storage that is increasing the speed of system scheduling and dispatch. Costly and destructive extreme weather events such as Superstorm Sandy have underscored the urgency to bolster the system and improve resiliency, the ability to quickly restore service after storm-related or other outages occur. A premium is being placed on consolidating and better coordinating control areas and enhancing situational awareness, both to enhance reliability and address perceived system vulnerabilities. The same changes that make the system more flexible and easily operated make integrating growing amounts of variable renewable energy resources easier and less expensive. Speed, efficiency, and enhanced coordination and control are some of the most important characteristics defining the 21st century grid. Flexibility, resiliency and security are the system's most critical needs.

II. Specific Comments and Recommendations

<u>Efficient use of the existing System: build what we need, not what we don't need</u>

In determining what we need to do in terms of modernizing the grid for the 21st Century several key questions need to be answered:

1. How does the investment reduce Greenhouse gas emissions?
2. What does the 21st Century consumer want?
3. How can modernization and expansion occur at least cost and be best justified?

Let's look at these questions in turn.

1. <u>How does the investment reduce Greenhouse gas emissions?</u>

Greenhouse gas reduction is one of the most powerful drivers guiding public and private investment in the nation's transmission infrastructure, and for good reason. According to the National Climate Assessment and the Intergovernmental Panel on Climate Change, the effects of global warming are already being felt in the United States and across the entire planet[1][2]. Globally, the 12 hottest years on record have occurred since 1998. According to NASA's Goddard Institute for Space Studies, nine of the 10 warmest years ever recorded have occurred since 2000.The vulnerability of our economy to climate impacts such as rising sea levels, wildfire and drought and abnormally destructive weather events are major concerns driving public policy decisions across the nation at all levels of government. All are relevant in the Western Interconnection.

The challenge of preserving the health and safety of our communities and environment in the face of these impacts is already guiding resource choices as detailed in President Obama's Climate Action Plan, state renewable power procurement and climate goals and EPA's carbon rule[3]. According to the Environmental Protection Agency[4], average temperatures have risen in most states since 1901. Climate and weather disasters in 2012 cost the American economy more than $100 billion. The ranges of plant and animal species and habitats and the migratory behavior of many wildlife species are changing measurably. Impacts once just forecast are now occurring and the scientific consensus that urgent action is needed to limit the harm is overwhelming.

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[1] Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds., 2014: *Climate Change Impacts in the United States: The Third National Climate Assessment*. U.S. Global Change Research Program, 841 pp. doi: 10.7930/J0Z31WJ2.

[2] IPCC, 2014: Summary for Policymakers. In: Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1-32.

[3] Environmental Protection Agency, 06/18/2014, Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, proposed rule, U.S. Federal Register, https://www.federalregister.gov/articles/2014/06/18/2014-13726/carbon-pollution-emission-guidelines-for-existing-stationary-sources-electric-utility-generating n

[4] EPA FACT SHEET: Clean Power Plan, Overview of the Clean Power Plan Cutting Carbon Pollution From Power Plants, June 2014.

Electricity generation resource choices in this regulatory environment will profoundly affect the design and operation on the 21st century grid. These choices will also have a influence how we plan and operate the system to best take advantage of the more variable yet potentially synergistic operating characteristics or renewable energy generation.

2. <u>What does the 21st Century consumer want?</u>

Some of the most obvious consumer desires are the same as they have always been: reliability, reasonable cost, and a system that can meet present and reasonably forecast future needs.

The reliability of the electrical system is arguably the single most important factor in maintaining a healthy economy. As the grid of the 21st century will be built to serve cleaner, more variable renewable energy, reliability will demand better operational coordination, situational awareness, communications, and more effective automated information and controls. These improvements, (and other operational changes identified in several different reports) which enable system operators to more efficiently dispatch resources and better utilize transmission assets, are serendipitously both beneficial to the least cost integration of renewable energy resources and system overall reliability.[5][6][7][8] The more flexible, coordinated and efficient the grid is the cleaner, more reliable and less costly it is for the environment and consumers.

Consumers are increasingly interested in having more choice about how their energy is provided and more control over their resources. This is perhaps best exemplified by the rapidly growing move into distributed energy – primarily solar – by many consumers. No longer do many households just buy power from utility companies, they make it themselves, and the distribution grid that was once a dropping off point for electricity from power companies, is the focus of a transactional relationship between electricity customers and the utility companies. This shift, along with reduced electricity consumption and increasingly effective demand response programs is forcing a major reconsideration of utility business models across the U.S.[9] as well as a revolutionary wave of innovation in technology (including electricity storage), regulation, and grid operations as the once clear line between the distribution and transfer of bulk electricity becomes increasingly blurred. As a result, the control architecture of the electricity system, on both sides of the meter, is and must continue to see major improvement. This is a role especially suited to the Department of Energy in its research and development programs.

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[5] Schwartz, Lisa, Porter, Kevin, Mudd, Christina, Fink, Sari, Rogers, Jennifer, Bird, Lori, Hogan, Mike, Lamont, Dave and Kirby, Brendan (June 2012). "Meeting Renewable Energy Targets in the West at Least Cost: The Integration Challenge," WGA, http://www.westgov.org/initiatives/rtep

[6] National Renewable Energy Laboratory (2012), "Renewable Electricity Futures Study." Hand, M.M.; Baldwin, S.; DeMeo, E.; Reilly, J.M.; Mai, T.; Arent, D.; Porro, G.; Meshek M.; Sandor, D. eds. 4 vols. NREL/TP-6A20-52409. Golden, CO: National Renewable Energy Laboratory. http://www.nrel.gove/analysis/re_futures/

[7] See also: Western Electricity Coordinating Council, September 8 Event Recommendations, June 30, 2014,Monthly Progress Dashboardhttp://www.wecc.biz/About/sept8/Documents/Progress%20Dashboard%20June%202014.pdf

[8] Carl Linvill, Janine Migden-Ostrander, Mike Hogan, "Clean Energy Keeps the Lights On," Regulatory Assistance Project, June 2014

[9] "Utility and Regulatory Models for the Modern Era", America's Power Plan, Ronald Lehr former Public Utilities Commissioner, The Electricity Journal, Volume 26, Issue 8, October 2013, Pages 35–53

Finally, polling has consistently shown consumer preferences for clean energy resources and energy conservation over polluting, high carbon ones, further driving resource choices that will require a more flexible, resilient, coordinated and efficiently operated transmission system at both the bulk and distributed levels.[10]

3. How can modernization and expansion occur at least cost (and be best justified)?

Despite distribution system changes that are driving innovation in business models, regulation and technology, investment in the bulk electricity grid will continue to be needed. This is because much of the best of America's vast renewable energy resources are located far from load centers and need hundreds of miles of new or repurposed transmission to reach the people who need it. Converting the world's largest economy from a high carbon emitting to a low-carbon system will require decades of work and a large amount of renewable energy resources. The progress being made on the conservation and distribution system will not be sufficient by themselves. Justifying the need for this transmission to regulators and the public is not an easy task, but it can be done, as the Bonneville Power Administration showed in the 1990s by aggressively pursuing energy efficiency and demand response programs *before* turning to new transmission. Build what we need, by all means, but show we really need it.

By making real gains in these areas BPA was able to reduce the amount of new infrastructure it needed and better make the public case for modernization and expansion of its system. They encountered less public opposition to transmission they truly needed. This was a valuable lesson and extremely relevant today. This approach is in fact a central part of FERC's Order 1000 transmission planning rule, which requires transmission planners to consider non-wires alternatives to meeting system energy and grid reliability needs.[11] Having a solid justification for building the lines is one way beneficiaries can be more easily identified and costs allocated fairly. This in turn should ease approval and cost recovery by state and local permitting and state utility regulatory authorities.

Getting the most out of what we have

Another major consideration in accomplishing modernization and expansion at least cost is utilizing the existing system better and building what we do construct today to meet both present and future needs. How can we take better advantage of existing transmission assets? Can the capacity transmission of corridors we have now be increased to avoid having to create new rights of ways? Can we optimize and operate the system more efficiently so variable resources can be more easily integrated, reserves and flexible capacity can be shared, and available transfer capacity freed up? As we phase out high carbon resources, such as uneconomic coal-fired power plants does that open up transmission capacity that can be used by cleaner energy resources? Then answer to these questions appears to be yes, but not always yes. In some cases new rights of ways will need to be established and transmission built. If we can plan and locate them to

[10] See April 2, 2014, *Gallup Politics*, "Americans Still Favor Energy Conservation Over Production, Americans look to conservation and renewable energy for solutions", http://www.gallup.com/poll/168176/americans-favor-energy-conservation-production.aspx

[11] For an in-depth look at the rule and its justification see: http://www.ferc.gov/industries/electric/indus-act/trans-plan.asp

avoid environmental and cultural resource conflicts the prospects for building them will be greater and recent tools including those developed at the Western Electricity Coordinating Council by their Environmental Data Task Force (EDTF) can help address these challenges at the planning level. [12][13]

Recommendation: DOE should integrate analysis of the risk of encountering environmental and cultural resources conflicts for transmission projects in its EPACT 2005 transmission corridor congestion and designation efforts, utilizing tools such as the WECC EDTF methodology and data viewer.

In the West, efficient grid utilization is constrained by the reliance on bilateral contracts instead of real-time energy markets, resulting in a costly and ineffective use of valuable assets. Sharing flexibility and contingency reserves is not easily done, and there is a risk of unnecessary development of gas-fired balancing resources and transmission. Situational awareness, the ability to see and understand conditions in neighboring parts of the system is in the process of being improved, but coordination of the system between grid operators is still far from optimal. There is not a single system or even a handful to coordinate, but many. Public utilities resist controlling with investor owned utilities, and Power Marketing Administrations struggle with grid coordination and modernization in the face of protests by their preference customers. Complicating matters further there are 38 balancing area authorities in the WECC footprint, each responsible for keeping the system synchronized and in balance between generation and demand in their respective control areas.

This balkanization is a well understood weakness in the Western grid. It needs to change but political concerns about control and responsibility continue to hamper progress in this area. WECC's Variable Generation Subcommittee has been studying the benefits of regional coordination, operational improvements such as 10 minute scheduling and balancing area consolidation. Major investments are being made in information technologies such as synchrophasors, providing real time information on system conditions and congestion, but the information is as yet not being fully taken advantage of. DOE played a major role in funding this work and has a stake in seeing better grid coordination as a result. Finally major progress in the form of the CAISO-PacifiCorp EIM could help improve this situation when the market goes live in October 2014. The market will facilitate renewable integration by providing access to and sharing flexibility reserves, providing geographic diversity to participating BAAs, and enhancing situational awareness and reliability for participants via the integrated control platform for the market. DOE should do all it can to encourage this reliability enhancing and cost-efficient market.

Recommendation: DOE should support existing and initiate additional efforts to consolidate and better coordinate balancing control areas and prioritize research related to integrated control architectures, information technologies and communications across the Western Interconnection, including the CAISO-PacifiCorp EIM..

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[12] Carl Zichella, Johnathan Hladik, "Siting: Finding a Home for Renewable Energy and Transmission, America's Power Plan," The Electricity Journal, Volume 26, Issue 8, October 2013, Pages 125–138

[13] For a summary see Western Electricity Coordinating Council, WECC 2013 Interconnection-wide Transmission Plan, pp 33 -34, November, 2013

DOE's Power Marketing Administrations (PMAs) also need to become part of the better coordinated transmission grid in the West and across the nation. In the West substantial portions of the grid are operated by PMAs. Under Secretary Chu DOE advanced a modest reform agenda in the form of "Joint Operating Team" (JOT) recommendations for grid coordination that provide a good start. These should be followed up on. Grid modernization cannot advance without PMA participation. Indeed utility participation in market reforms like the CAISO-PacifiCorp Energy Imbalance Market will require PMA cooperation. To its credit, BPA has signed a cooperation agreement with CAISO and PacifiCorp to assist with the first phase of the EIM, and the Western Area Power Administration (Western) can play a similar key role in facilitating the participation of other western utilities that will need their assistance in gaining access to transmission assets that allow them to trade in the EIM. Xcel Energy is one such utility that, if it chooses to participate in the EIM, would need to coordinate transmission access with Western.

Recommendation: DOE should follow through on grid coordination efforts involving PMAs, beginning with but not limited to the JOT recommendations.

Recommendation: DOE should encourage and direct PMAs to assist and collaborate with utilities seeking to participate in the CAISO-PacifiCorp EIM but which need access to their transmission systems to do so.

Optimization and renewable energy zones

Another important strategy to reliably integrate deep penetrations of renewable energy at least cost is to plan development and transmission together both to avoid resource conflicts and maximize the performance of the transmission system with variable generation sources. Forecasting –with both historical and current weather data – is one tool that can assist with this strategy as resource load shapes can be compared across broad geographies and variability aggregated to reduce the need for unnecessary balancing or flexibility resources and maximize transmission utilization.

One such tool has been privately developed by Northrop-Grumman using data from defense work performed for the U.S. Government. Called "MorePower" the system uses radar derived data to optimize placement of wind & solar installations to reduce variability impacts and maximize high quality power. In essence, renewable power can be located in resource zones using geographically specific information about when it operates to make the system operate more smoothly.[14]

Similar work on the system benefit of geographic diversity has been done by the University of Wyoming[15], the Midcontinent Independent System Operator, PJM and the National Renewable Energy Laboratory (NREL).[16][17]

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[14] For an overview of this system see: http://bit.ly/morepowerGN, slide 31,

[15] Jonathan Naughton, Thomas Parish, and Jerad Baker, Wind Diversity Enhancement of Wyoming/California Wind Energy Projects, Wyoming Infrastructure Authority, January 2013

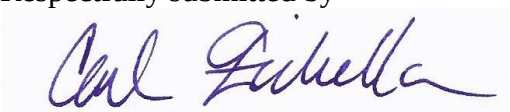
Renewable resource zoning has been undertaken by numerous western states (among them California, Colorado, Nevada, Utah, Arizona), The Bureau of Land Management (Solar Programmatic Environmental Impact Statement), state-federal partnerships such as the Desert Renewable Energy Conservation Plan in California, the Western Governors Association, Argonne National Laboratory, and the Electricity Reliability Council of Texas to name the most important. None of these have captured all the beneficial locational factors in one place, however. Some have focused only on resource quality (Texas, Colorado), while others have added environmental factors (WGA, California, BLM, DRECP). The gap in all these approaches is the optimization of geographies for more efficient grid integration and operation of renewable energy resources.

Recommendation: DOE can facilitate this work by assigning NREL to work with state and regional planners to identify complementary resource zones that, when combined with environmental and cultural resource risk data, identify development areas for which transmission – either existing transmission which could be upgraded or new builds – should be prioritized.

III: Conclusion:

Meeting America's electricity needs in this century will mean matching scale of the electricity and transmission system with present and future real world needs and conditions. As we plan operate, modernize and expand the grid we need to make sure current assets are being efficiently used, while resource conflicts and the construction of duplicative infrastructure are avoided.

Respectfully submitted by



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[16] D. Corbus, D. Hurlbut, P. Schwabe, E. Ibanez, M. Milligan, G. Brinkman, A. Paduru, V. Diakov, and M. Hand, California-Wyoming Grid Integration Study Phase 1—Economic Analysis National Renewable Energy Laboratory March 2014

[17] GE Energy Consulting, (2010). *Western wind and solar integration study, phase 1*, Retrieved from http://www.nrel.gov/ docs/fy10osti/47781.pdf.