COMMENTS

ALTERNATIVE SOLUTIONS TO POWER OVERSUPPLY IN THE PACIFIC NORTHWEST

By

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Wind energy is the fastest-growing source of energy in the world. This comes as no surprise in the Pacific Northwest region of the United States where wind turbines are widespread. The advantages of wind energy make it an attractive source of new energy. But integrating wind energy into the existing energy system has proven difficult in the Pacific Northwest where there is an abundance of power. When energy oversupply events occur, the Bonneville Power Administration (BPA) displaces wind energy in favor of federal hydropower generation. Unsurprisingly, wind generators are frustrated with BPA's response, which threatens to eliminate their remuneration. This Comment proposes two storage methods—aquifer recharge and pumped hydropower—as alternatives to curtailing wind generation in the Pacific Northwest.

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I. INTRODUCTION

The Pacific Northwest is uniquely blessed with an abundant supply of electrical power. In fact, power oversupply events can occur when large amounts of wind generation combined with large amounts of hydropower produced by dams on the Columbia River generate electricity in excess of total demand.[1] Oversupply events are likely to occur when power demand is low, and in the springtime when river flows and wind generation are high.[2] Dam operators on the Columbia River can respond by spilling water over the dams without generating electricity, but too much spill exceeds water quality standards[3] and can harm fish and other aquatic species.[4] If dam operators cannot spill water, the water must pass through hydropower turbines, thus generating electricity.[5]

When dam operators must put water through hydropower turbines to protect aquatic life, the Bonneville Power Administration (BPA)[6] displaces non-hydropower generation to maintain system reliability.[7] In response to the oversupply problem, BPA proposed several policies[8] to the Federal

1 Bonneville Power Admin., *Oversupply*, https://www.bpa.gov/Projects/Initiatives/Oversupply/Pages/default.aspx (last visited Feb. 14, 2015).

2 *Id.*

3 BONNEVILLE POWER ADMIN., COLUMBIA RIVER HIGH-WATER OPERATIONS 5 (2010), *available at* http://www.bpa.gov/Projects/Initiatives/Oversupply/OversupplyDocuments/final-report-columbia-river-high-water-operations.pdf ("To protect fish from gas bubble trauma, state water quality standards under the Clean Water Act limit allowable levels of total dissolved gas to 110 percent saturation at any point of collection on the river.").

4 Bonneville Power Admin., *supra* note 1.

5 *Id.*

6 BPA is a federal nonprofit agency based in the Pacific Northwest that markets wholesale electrical power from 31 federal hydro projects in the Columbia River Basin. Bonneville Power Admin., *About Us*, https://www.bpa.gov/news/AboutUs/Pages/default.aspx (last visited Feb. 14, 2015).

7 Bonneville Power Admin., *supra* note 1.

8 *See, e.g.*, BONNEVILLE POWER ADMIN., BPA'S INTERIM ENVIRONMENTAL REDISPATCH AND NEGATIVE PRICING POLICIES (2011) [hereinafter Environmental Redispatch], *available at* https://www.bpa.gov/news/pubs/RecordsofDecision/rod-20110513-Interim-Environmental-Redispatch-and-Negative-Pricing-Policies.pdf (giving an overview of the negative pricing policies of BPA); BONNEVILLE POWER ADMIN.; BPA'S DRAFT OVERSUPPLY MANAGEMENT PROTOCOL (2012) [hereinafter OMP], *available at* http://www.bpa.gov/Projects/Initiatives/Oversupply/OversupplyDocuments/20120207-proposed-protocol/Attachment-P-Narrative-020712.pdf (explaining BPA's protocol in response to oversupply periods).

Energy Regulatory Commission (FERC).[9] Each attempted solution cut off wind generation from the transmission grid to make room for excess hydropower generation.[10] Unsurprisingly, each attempted solution met opposition—first from wind generators whose power sales were cut off without compensation,[11] and then from transmission customers charged with the costs of compensating curtailed wind generators.[12] The fight over how to allocate wind displacement costs is ongoing,[13] but the best solutions to oversupply avoid compensating wind generators altogether by keeping wind generators online during oversupply events.

One alternative to curtailing wind generation is to store surplus power generated during oversupply events.[14] Power storage facilities like aquifer recharge and pumped hydropower projects could enable wind generators to stay online during oversupply events by using excess wind generation to pump water out of the Columbia River and storing the water and power for later use.[15] In this way, aquifer recharge and pumped hydropower are more efficient and more aligned with important policy goals than curtailing wind generation, because they support increased renewable power generation.[16] Wind generation is currently an intermittent source of renewable energy

9 FERC is an independent federal agency that regulates the transmission of electricity, natural gas, and oil between states. Fed. Energy Regulatory Comm'n, *What FERC Does*, https://www.ferc.gov/about/ferc-does.asp (last visited Feb. 14, 2015).

10 *See Iberdrola Renewables, Inc., et al. v. Bonneville Power Admin.*, 141 F.E.R.C. ¶ 61,234 at P 3, 7 (2012).

11 *Id.* at P 2.

12 *See* Initial Brief of Powerex Corp., Proposed 2014 Oversupply Rates (2013) (BPA Docket No. OS-14-B-PX-01).

13 BPA was scheduled to publish its decision on November 21, 2013, but delayed issuing the draft Record of Decision (ROD) by three months, until February 14, 2014. Briefs on Exception were due March 4, 2014, and a Final ROD was issued March 27, 2014. FERC must grant approval of BPA's decision, and if any party takes exception to the decision, the party may appeal to the Ninth Circuit. *See* Bonneville Power Admin., OS-14 Oversupply Rate Proceeding: Administrator's Record of Decision 1, 3 (2014), *available at* http://www.bpa.gov/news/pubs/RecordsofDecision/rod-20140327-OS-14-Oversupply-Rate-Proceeding.pdf. *See generally* Bonneville Power Admin., Fact Sheet: What's a Rate Case (2012), *available at* http://www.bpa.gov/news/pubs/FactSheets/fs-201211-What-is-a-Rate-Case.pdf.

14 *See infra* Part III.

15 Specifically, aquifer recharge facilities could pump water into underground storage, thereby recharging depleted aquifers and storing water for drier periods. And pumped hydropower facilities could pump water up to a storage reservoir and later release the water through hydropower turbines to generate power during periods of increased demand. *See infra* Part III.

16 The phrase "curtailing wind generation" can be misleading. Wind generators do not stop producing electric power when BPA cuts them off from transmission. Windmills produce power when the wind blows. When oversupply events occur, wind generators ground the electric power rather than putting it on the transmission grid. The controversy is over how to pay wind generators for not supplying power to the grid. *See* Ted Sickinger, *BPA Says It Will Tamp Down Windfarms When Too Much Power Floods the System*, Oregonlive, May 13, 2011, http://www.oregonlive.com/business/index.ssf/2011/05/bpa_says_it_will_tamp_down_win.html (last visited Feb. 14, 2015) (summarizing wind generators' complaints that curtailment unilaterally cancels power purchase agreements and requires compensation); *see also infra* Part III.

with the potential technical capacity to power the world.[17] In the Pacific Northwest alone, wind power has the potential to satisfy all of the current electricity consumption in the region four times over.[18] But wind will remain an intermittent, niche energy source without the capacity for storage.[19] Aquifer recharge and pumped hydropower are storage options for wind energy that could enable the integration of wind power in any area where there is great energy capacity and significant water storage concerns.[20]

In addition to being more sustainable, long-term responses to oversupply than curtailing wind generation, aquifer recharge and pumped hydropower projects present a host of other benefits.[21] Aquifer recharge projects can restore critical groundwater areas, which can yield significant environmental and economic benefits in groundwater-limited regions.[22] Pumped hydropower facilities have the potential to return flexibility to the federal hydropower system, because they can store large quantities of water.[23] This gives dam operators more choices when it comes to deciding when to spill water over the dams or generate hydropower, thereby improving the capacity for fish management and ensuring the reliability of the power grid.[24]

While aquifer recharge and pumped hydropower could expand the use of low-cost, low-carbon hydropower and wind energy, and could reduce the severity of excess energy events, they are not free of complications.[25] Permitting processes at the state and federal level can make it difficult for proposed aquifer recharge and pumped hydropower projects to receive authorization.[26] Both aquifer recharge and pumped hydropower must receive state permits to withdraw surface water from the Columbia River.[27] Moreover, aquifer recharge projects must receive authorization to inject appropriated water into underground aquifers, and pumped hydropower projects must receive dam approval by the state.[28] Finally, pumped hydropower projects face the additional hurdle of completing the federal

17 Kate Marvel et al., *Geophysical Limits to Global Wind Power*, 3 NATURE CLIMATE CHANGE 118, 118 (2013).

18 Renewable Nw. Project, *Wind Energy Technology*, http://rnp.org/node/wind-energy-technology (last visited Feb. 14, 2015).

19 *See* U.S. ARMY CORPS OF ENG'RS, TECHNICAL ANALYSIS OF PUMPED STORAGE AND INTEGRATION WITH WIND POWER IN THE PACIFIC NORTHWEST: FINAL REPORT 1-1 (2009), *available at* http://www.hydro.org/wp-content/uploads/2011/07/PS-Wind-Integration-Final-Report-without-Exhibits-MWH-3.pdf.

20 *Id.* at iv.

21 *See infra* Part III.

22 *See infra* notes 93–96 and accompanying text.

23 *See infra* notes 129–130 and accompanying text.

24 *See infra* notes 129–130 and accompanying text.

25 NW. POWER & CONSERVATION COUNCIL, THE EFFECTS OF AN INCREASING SURPLUS OF ENERGY GENERATING CAPABILITY IN THE PACIFIC NORTHWEST 16–17 (2011) [hereinafter EFFECTS OF INCREASING SURPLUS OF ENERGY GENERATING CAPABILITY IN THE PNW], *available at* http://www.nwcouncil.org/media/30034/2011_09.pdf.

26 *See infra* Part IV.A.

27 *See infra* Part IV.A.

28 *See infra* Part IV.A.

licensing process, which can take decades and ultimately make such projects too daunting to finish.[29]

In addition, both aquifer recharge and pumped hydropower projects are costly to implement.[30] Aquifer recharge projects could strain the capacity of the existing infrastructure used to pump water out of the Columbia River, such that costly improvements must be made.[31] Pumped hydropower projects are even more costly to implement than aquifer recharge projects; moreover, the current regulatory treatment of the costs of pumped hydropower adversely affects the feasibility of these projects.[32] Despite the challenges facing proposed aquifer recharge and pumped hydropower projects, over time, these alternative solutions to oversupply arguably will prove more efficient than curtailing wind generation.

This Comment uses the oversupply problem in the Pacific Northwest to illustrate the benefits and complications of integrating excess energy supply and water storage in a sustainable way, ultimately concluding that solutions to oversupply that avoid curtailing wind generation are preferable to BPA's chosen alternative. Part II explains the oversupply problem in the Pacific Northwest and details BPA's proposed solutions to oversupply thus far. Part III explains aquifer recharge and pumped hydropower and why they are more attractive solutions to oversupply than curtailing wind generation. Part IV outlines the project authorization process for aquifer recharge and pumped hydropower projects at the state and federal level. Part V explains some of the complications associated with implementing aquifer recharge and pumped hydropower projects. Finally, this Comment concludes with an explanation of why aquifer recharge and pumped hydropower are, nevertheless, more attractive solutions to oversupply than curtailing wind generation.

II. OVERSUPPLY

Oversupply occurs when the minimum generation of the power system—supply—exceeds firm load and secondary sales markets—demand.[33] In the Pacific Northwest, this typically happens in the spring and early summer when demand for power is low and the supply of hydropower and wind-generated power are high because of seasonal storms and annual snowmelt runoff from tributary rivers.[34] Under normal conditions, when power supply exceeds demand, generators in the Northwest sell power to

29 *See infra* Part IV.B.

30 *See infra* Part V.

31 *See infra* Part V.A.

32 *See infra* Part V.B.

33 Memorandum from John Fazio, Senior Power System Analyst, Bonneville Power Admin., to Nw. Power and Conservation Council, *Analysis of Electricity Oversupply* 1 (Mar. 7, 2012), *available at* http://www.nwcouncil.org/media/2455/8.pdf.

34 Nw. Power and Conservation Council, *Analysis Shows Region Likely to Continue Producing Surplus Electricity in the Spring and Early Summer*, http://www.nwcouncil.org/news/press-releases/2012-03-07_analysis_shows_surplus_energy/ (last visited Feb. 14, 2015) [hereinafter *Surplus Analysis*].

utilities in the Southwest over the Pacific Northwest/Pacific Southwest Intertie.[35] But during oversupply events, supply might exceed demand in both the Northwest and Southwest electricity markets.[36]

When oversupply events occur in the BPA balancing authority[37] area, BPA curtails production of the electricity it cannot sell by spilling water over dams on the Columbia River instead of running water through hydropower turbines and generating electricity.[38] But BPA can spill water over the dams only to the extent that spilling does not harm fish and other aquatic species.[39] When BPA must put water through the turbines to protect aquatic species—and therefore generate electricity in excess of load and export amounts—BPA must curtail other sources of generation to protect against the reliability problems associated with overgeneration.[40]

To maintain reliability on the electrical grid, supply and consumption of electrical power must be balanced at all times.[41] Power overgeneration threatens reliability, because too much electricity on the transmission grid causes electrical lines to heat up and sag, thereby forcing grid operators to reroute electricity, which can result in the overuse of other electrical lines and create a domino effect on the whole system leading to blackouts.[42] BPA prevents blackouts and maintains reliability during periods of overgeneration by initially curtailing thermal generators[43] to the lowest possible generating level without threatening reliability.[44] If BPA determines additional generation relief is needed, it curtails variable energy resources,

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35 *Id.*

36 *Id.*

37 A balancing authority is "[t]he responsible entity that integrates resource plans ahead of time, maintains load-interchange-generation balance within a Balancing Authority Area, and supports Interconnection frequency in real time." N. AM. ELEC. RELIABILITY CORP., GLOSSARY OF TERMS USED IN NERC RELIABILITY STANDARDS 10 (2008), *available at* http://www.nerc.com/files/Glossary_of_Terms.pdf.

38 Bonneville Power Admin., *supra* note 1.

39 *Id.*; *see also* Pacific Northwest Electric Power Planning and Conservation Act, 16 U.S.C. § 839b(h) (2012) (requiring the Pacific Northwest Electric Power Planning and Conservation Council to "protect, mitigate, and enhance fish and wildlife" on the Columbia River). The State of Washington's water quality standards are more stringent than Oregon's standards, but whether more stringent standards are actually more protective of salmon is disputed. *See* Nw. Sportfishing Indus. Ass'n v. Wash. Dept. of Ecology, 288 P.3d 677, 680 n.10, 683 n.20 (Wash. App. Div. 2, 2012). Environmental groups recently sued Washington, arguing that spilling water and increasing dissolved gas levels is actually better for salmon than putting the salmon through hydropower turbines. *Id.* at 686.

40 *Iberdrola Renewables, Inc. v. Bonneville Power Admin.*, 137 F.E.R.C. ¶ 61,185 at P 5 (2011).

41 N. AM. ELEC. RELIABILITY CORP., UNDERSTANDING THE GRID 1 (2013), *available at* http://www.nerc.com/AboutNERC/Documents/Understanding%20the%20Grid%20AUG13.pdf.

42 Matthew L. Wald, *What's Next: To Avert Blackouts, A Sag-Free Cable*, N.Y. TIMES, Mar. 4, 2004, http://www.nytimes.com/2004/03/04/technology/what-s-next-to-avert-blackouts-a-sag-free-cable.html (last visited Feb. 14, 2015).

43 Thermal generators convert heat into electricity and include fossil fuel generators, such as coal and natural gas. Bonneville Power Admin., *High River Flows Cause Limits on Thermal, Wind Generation*, http://www.bpa.gov/news/newsroom/Pages/High-river-flows-cause-limits-on-thermal-wind-generation.aspx (last visited Feb. 14, 2015).

44 137 F.E.R.C. ¶ 61,185, at P 6.

such as wind, which may result in moving wind generators completely offline.[45]

Oversupply is not a new problem in the Northwest, but it has become problematic as more wind power is added to the power supply.[46] BPA added about 1,000 megawatts (MW) of wind power to its transmission system in 2012, which brought the total wind capacity within its balancing authority to 4,300 MW.[47] In 2011 and 2012, oversupply totaled about 97,500 megawatt-hours (MWh)[48] and 49,744 MWh,[49] respectively. Oversupply is likely to continue to be a problem in the Pacific Northwest.[50] BPA projected the cost of reimbursing curtailed wind generators would total $10 million in 2013, but noted that because conditions can change quickly, wind displacement costs could exceed $50 million in 2013.[51]

In 2011, BPA made its first attempt to address oversupply through its Environmental Redispatch and Negative Pricing Policies (Environmental Redispatch),[52] under which BPA curtailed wind generators in the BPA balancing authority area during oversupply events, and delivered federal hydropower to wind generator customers.[53] Under Environmental Redispatch, BPA provided federal hydropower for free or at low cost to wind generators, but wind generators did not receive compensation for displacement costs, including lost production tax credits and renewable energy credits.[54] Following a petition against Environmental Redispatch by wind generators, FERC found that Environmental Redispatch violated

45 *Id.*

46 *Surplus Analysis*, *supra* note 34.

47 BONNEVILLE POWER ADMIN., WORKING TOGETHER TO ADDRESS NORTHWEST OVERSUPPLY OF POWER 1 (2012) [hereinafter NORTHWEST OVERSUPPLY OF POWER], *available at* http://www.bpa.gov/news/pubs/FactSheets/fs-201205-working-together-to-address-northwest-oversupply-of-power.pdf.

48 *Surplus Analysis*, *supra* note 34.

49 BONNEVILLE POWER ADMIN., SEASONAL POWER OVERSUPPLY IN 2012, at 2 (2012) [hereinafter SEASONAL POWER OVERSUPPLY IN 2012], *available at* http://www.bpa.gov/Projects/Initiatives/Oversupply/OversupplyDocuments/2013/20130123-Oversupply-2012-Lookback.pdf.

50 *Surplus Analysis*, *supra* note 34.

51 BONNEVILLE POWER ADMIN., POTENTIAL FOR SEASONAL OVERSUPPLY IN 2013, at 1 (2013), *available at* http://www.bpa.gov/Projects/Initiatives/Oversupply/OversupplyDocuments/2013/20130222-Potential-for-seasonal-power-oversupply-in-2013.pdf.

52 Bonneville Power Admin., *supra* note 1.

53 Initial Brief of Powerex Corp., *supra* note 12, at 2.

54 *See id.* at 2–3 (explaining that because the wind generators were granted credits based on the amount of energy generated, they had no incentive to curtail their production). Production tax credits are federal per-kilowatt-hour tax credits for electricity generated by qualified energy resources and sold by the taxpayer to an unrelated person during the taxable year. U.S. Dep't of Energy, *Renewable Energy Production Tax Credit (PTC)*, http://energy.gov/savings/renewable-electricity-production-tax-credit-ptc (last visited Feb. 14, 2015). Renewable energy credits—or renewable energy certificates—represent the environmental benefits of renewable energy, which can be sold together with the electrons produced by renewable energy generation, or treated separately. U.S. DEP'T OF ENERGY ET AL., GUIDE TO PURCHASING GREEN POWER 10 (2010), *available at* http://energy.gov/sites/prod/files/2013/10/f4/purchase_green_power.pdf.

section 211A of the Federal Power Act (FPA)[55] because it failed to provide comparable transmission service to wind generators.[56]

BPA responded to FERC's order on Environmental Redispatch by filing the Oversupply Management Protocol (OMP).[57] The OMP included a new attachment, Attachment P, to BPA's Open Access Transmission Tariff.[58] Pursuant to Attachment P, BPA will compensate displaced wind generators for lost production tax credits, renewable energy credits, and unavoidable contract costs.[59] FERC initially approved the OMP on the condition that BPA must implement a legal cost allocation methodology, but BPA has faced considerable difficulty in figuring out how and, mostly, to whom to legally allocate the cost of compensating curtailed wind generators.[60] Another problem with the OMP is that many states do not include hydroelectricity as a renewable resource for satisfying renewable portfolio standard[61] requirements.[62] Therefore, states relying on wind generation to satisfy renewable portfolio standards could fall short of state mandates when wind generation is replaced with hydropower during oversupply events.[63] Initially, BPA proposed to allocate wind displacement costs equally between generators who submit displacement costs under the OMP—wind

55 16 U.S.C. §§ 791–828c (2012).

56 *Iberdrola Renewables, Inc. v. Bonneville Power Admin.*, 137 F.E.R.C. ¶ 61,185 at P 30, 62–66 (2011). Pursuant to section 211A of the FPA, BPA is required to provide transmission service to wind generators on terms and conditions that are comparable with those under which BPA provides transmission services to itself, and that are not unduly discriminatory or preferential. *See* 16 U.S.C. § 824j-1 (2012). FERC found that Environmental Redispatch failed to provide comparable transmission service to wind generators because BPA interrupted nonfederal generation resources' transmission service without similarly interrupting federal resources' transmission service. 137 F.E.R.C. ¶ 61,185, at P 62.

57 OMP, *supra* note 8, at 5.

58 *Id.* An Open Access Transmission Tariff (OATT) is an "[e]lectronic transmission tariff accepted by [FERC] requiring the Transmission Service Provider to furnish to all shippers with non-discriminating service comparable to that provided by Transmission Owners to themselves." N. AM. ELEC. RELIABILITY CORP., GLOSSARY OF TERMS USED IN NERC RELIABILITY STANDARDS 54 (2014), *available at* http://www.nerc.com/files/Glossary_of_Terms.pdf.

59 *Iberdrola Renewables, Inc., et al. v. Bonneville Power Admin.*, 141 F.E.R.C. ¶ 61,234 at P 44 (2012). BPA compensates generators only for lost contract revenues or penalties if they chose to be compensated for displacement costs by a certain date. *Id.* at P 11–12.

60 *Iberdrola Renewables, Inc.* v. *Bonneville Power Admin.*, 143 F.E.R.C. ¶ 61,274 at P 1, 9–10 (2013).

61 Renewable portfolio standards are policies designed to increase renewable energy generation by requiring or encouraging generators within a given jurisdiction to supply a minimum share of their electricity from designated renewable resources. U.S. Energy Info. Admin., *Most States Have Renewable Portfolio Standards*, http://www.eia.gov/todayinenergy/detail.cfm?id=4850 (last visited Feb. 14, 2015). Renewable resources typically include wind, solar, geothermal, and biomass. *Id.*

62 *Iberdrola Renewables, Inc. v. Bonneville Power Admin.*, 137 F.E.R.C. ¶ 61,185 at P 49 (2011).

63 *See id.* (explaining that BPA's curtailment of wind generation and substitution of hydropower will result in failure to meet Renewable Portfolio Standard requirements for states that do not recognize hydroelectric generation as a qualified renewable resource).

generators—and power customers.[64] FERC rejected the proposed fifty-fifty cost allocation methodology because, much like BPA's proposed cost allocation plan under Environmental Redispatch, the OMP cost allocation methodology did not provide comparable transmission service to affected wind generators.[65] FERC stated that all transmission customers should bear an "appropriate cost burden . . . during oversupply situations" and that under the fifty-fifty cost allocation methodology, wind generators using only a fraction of the transmission service were unfairly allocated half of displacement costs.[66] BPA then revised its cost allocation methodology and proposed to incorporate all wind displacement costs into transmission rates, such that transmission customers pay 100% of displacement costs based on their proportional uses of the transmission system during oversupply events.[67] BPA's purported rationale for allocating costs to transmission customers is that oversupply is caused by increased use of the BPA transmission system due to open access transmission policies, not overgeneration due to fish and wildlife concerns.[68] Unsurprisingly, transmission customers went up in arms over BPA's revised cost allocation methodology.[69]

Litigation regarding the best method for allocating wind displacement costs is ongoing.[70] It is not within the scope of this Comment to project the best solution for allocating wind displacement costs. While it is possible BPA will come up with a legal cost allocation methodology, displacing wind generation and forcing customers to compensate wind generators is not the best policy solution to oversupply. Solutions that avoid curtailing wind generation and keep transmission and power rates low are preferable alternatives for BPA and its customers.

64 *Iberdrola Renewables, Inc., et al. v. Bonnevrille Power Admin*, 141 F.E.R.C. ¶ 61,234 at P 17 (2012).

65 *Id.* at P 45.

66 *Id.*

67 Initial Brief of Powerex Corp., *supra* note 12, at 6.

68 *Id.*

69 *See id.* at 18 ("BPA's Proposal 2, which would functionalize all OMP costs to transmission, must be rejected."); Initial Brief of Iberdrola Renewables, LLC at 45, 2014 Oversupply Rate Proceeding (2013) (BPA Docket No. OS-14-B-IR-01) ("[BPA's] Supplemental Proposal received a great deal of criticism from customers."); Initial Brief of Southern California Edison Co. at 15, Oversupply Management Cost-Recovery Rate Proposed as Part of Compliance Filing with the Federal Energy Regulatory Commission (2013) (BPA Docket No. OS-14-B-SC-01) ("Neither the Supplemental Proposal nor the Rebuttal Proposal result in an equitable allocation of displacement costs or provide comparable transmission service that is not unduly discriminatory or preferential with respect to at least one set of customers.").

70 BPA issued the Final ROD on March 27, 2014 stating that the allocation of oversupply costs to transmission customer complies with section 7(g) of the Northwest Power Act and section 211A of the FPA. BONNEVILLE POWER ADMIN., ADMINISTRATOR'S RECORD OF DECISION 32, 36 (March 27, 2014), *available at* http://www.bpa.gov/news/pubs/RecordsofDecision/rod-20140327-OS-14-Oversupply-Rate-Proceeding.pdf. FERC may confirm, reject, or remand the decision. *Id.* at 5.

III. Aquifer Recharge and Pumped Hydropower

Aquifer recharge and pumped hydropower are two potential solutions to oversupply that avoid many of the pitfalls of curtailing wind generation. Both solutions allow wind turbines to remain online during oversupply events by using wind power to divert water from the Columbia River. Oversupply events typically occur at night because electricity demand is low.[71] Coincidentally, most wind power is also generated at night.[72] Instead of kicking wind generators off of the grid during oversupply events, aquifer recharge and pumped hydropower facilities can make efficient use of wind power. Aquifer recharge facilities can use wind power to pump water to recharge depleted aquifers. Pumped hydropower facilities can use wind power to store water in a reservoir and later produce hydroelectric power when there is higher demand for electricity. In effect, aquifer recharge and pumped hydropower facilities are two forms of electricity storage for wind power that could allow wind turbines to stay online by delivering electricity to storage sites and dispatching the stored power when water levels drop or simply using the wind power to replenish depleted aquifers.

A. Aquifer Recharge

The nation's aquifers are shrinking at an alarming rate.[73] The problem is particularly devastating for deep aquifers—like the Umatilla Basin Aquifer in Oregon—that have less water than shallow aquifers, and recharge less easily.[74] The Umatilla Basin Aquifer is a critical groundwater area[75] and has drained quickly over the past forty years, due to heavy agricultural consumption.[76] If this trend continues, the aquifer could be severely depleted

71 Bonneville Power Admin., *supra* note 1.

72 *See* David B. Spence, *Regulation, Climate Change, and the Electric Grid*, 3 San Diego J. Climate & Energy 267, 291 (2011–2012) ("The wind tends to blow harder at night, when the sun isn't shining, and less so during the day.").

73 Leonard F. Konikow, U.S. Geological Survey, Groundwater Depletion in the United States (1900-2008), at 50 (2013), *available at* http://pubs.usgs.gov/sir/2013/5079/SIR2013-5079.pdf (discussing increases in the rate of depletion of the nation's aquifers over the last 75 years).

74 Courtney Flatt, *Study: Aquifers Draining Quickly, Less in PNW*, Or. Pub. Broad., May 20, 2013, http://earthfix.opb.org/water/article/study-aquifers-draining-quickly-less-in-pnw/ (last visited Feb. 14, 2015) [hereinafter *Aquifers Draining*].

75 Or. Water Res. Dep't, Water Rights in Oregon: An Introduction to Oregon's Water Laws 12 (2013) [hereinafter Water Rights in Oregon], *available at* http://www.oregon.gov/owrd/pubs/docs/aquabook2013.pdf (describing "Critical Groundwater Areas" as situations "[w]hen pumping of groundwater exceeds the long-term natural replenishment of the underground water reservoir").

76 *See Aquifers Draining*, *supra* note 74 (noting that a U.S. Geological Survey study found that the Columbia Plateau aquifers have been draining "more quickly in the past 40 years"); Eric Mortenson, *Hunt for Water in Eastern Oregon Has Farmers Scrambling to Tap Columbia River*, Oregonian, Oct. 14, 2012, http://www.oregonlive.com/environment/index.ssf/2012/10/in_the_umatilla_basin_past_wat.html (last visited Feb. 14, 2015) ("Heavy irrigation dropped aquifers [in the Umatilla basin] by up to 500 feet in a matter of decades, among the steepest declines worldwide.").

by 2030.[77] The depletion of the Umatilla Basin Aquifer is particularly concerning because the area economy depends on agricultural production.[78] The Umatilla Basin supports significant food production; crops in two of the basin's counties include potatoes, onions, carrots, corn, and watermelon, just to name a few.[79] The area is heavily dependent on groundwater, and the water table is declining.[80]

One possible solution to the problem in the Umatilla Basin and areas facing similar issues is to restore depleted aquifers using aquifer recharge facilities. Aquifer recharge facilities inject or infiltrate water into underground storage when there is surplus water, and remove stored water during drier times of the year.[81] These "water banking" methods are known as Aquifer Storage and Recovery (ASR) and Artificial Groundwater Recharge (AR).[82] Both methods involve diverting water from a surface water source to an underground reservoir for later retrieval and use.[83] Water stored through ASR is primarily used for drinking water.[84] ASR facilities manage drinking water supplies by capturing surface water flow, treating it to drinking water standards, and injecting the water into aquifers that function as large storage reservoirs.[85] The water displaces and mixes with groundwater and is later withdrawn from the aquifer during high-demand, dry summer months.[86] Water stored through AR is primarily used for irrigation and industrial purposes.[87] AR facilities manage irrigation and industrial water supplies by capturing surface water flow and storing it underground through seepage mechanisms, such as permeable seepage ponds that allow surplus water to drain into the underlying aquifer.[88] Under AR, recharge water does not have to meet drinking water standards, but it cannot impair or degrade groundwater quality.[89]

The state of Oregon encourages areas designated as "groundwater limited" or "critical groundwater areas" to explore aquifer recharge

77 *Aquifers Draining*, *supra* note 74.

78 Lee van der Voo, *Balance Between Farms and Fish Sought in Oregon Water Accord*, Portland Bus. J., Aug. 9, 2012, http://www.sustainablebusinessoregon.com/articles/2012/08/balance-between-farms-and-fish-sought.html?page=all (last visited Feb. 14, 2015) [hereinafter *Balance Between Farms and Fish*].

79 *Id.*

80 *Id.*

81 Or. Dep't of Envtl. Quality, Fact Sheet: Aquifer Storage & Recovery and Artificial Groundwater Recharge 1 (2012) [hereinafter ASR & AR Fact Sheet], *available at* http://www.deq.state.or.us/wq/pubs/factsheets/groundwater/AquiferStorageRecovery.pdf.

82 *Id.*

83 *Id.*

84 Or. Dep't of Water Res., Aquifer Storage & Recovery and Artificial Recharge in the State of Oregon 11 (2011), *available at* www.oregon.gov/owrd/docs/interagencyasrpresentation.pdf.

85 ASR & AR Fact Sheet, *supra* note 81.

86 *Id.*

87 Or. Dep't of Water Res., *supra* note 84.

88 *Id.*

89 *Id.*

projects.[90] Concerned stakeholders in the Umatilla Basin recently created the Umatilla Basin Aquifer Restoration Project (Aquifer Recharge Project)[91] to capture water from the Columbia River during high river flows in the winter months and store it for use during dry spring and summer months.[92] Through the Aquifer Recharge Project, stakeholders commit to take water from the Columbia River when aquatic species do not need it, and store the water for use when aquatic species and irrigators do need it.[93] Stakeholders envision water storage could help meet and exceed environmental outcomes, and could broaden possibilities for crop production and other uses.[94] For example, studies estimate the economic benefits of restoring 100,000 acre feet (acf) of water to the Umatilla Basin at "between $116 million and $144 million in increased business activity, up to 2,074 jobs and $72 million in increased labor income, and as much as $5 million in added tax revenue to the state."[95] The environmental benefits of recharging the Umatilla Basin Aquifer include improving groundwater quality, aiding recovery of basalt and alluvial aquifers in Morrow and Umatilla counties, and improving ecosystem health in the watershed.[96] In 2013, Oregon Governor Kitzhaber predicted the Aquifer Recharge Project will be up and running within three years.[97]

Recharging the Umatilla Basin Aquifer will likely involve a combination of techniques—AR surface spreading and infiltration, and ASR injection—because there are confined and unconfined aquifers[98] in the basin.[99] Injection systems withdraw surface water, treat it to drinking water quality standards, and store water in deep or confined aquifers bound above and below by low permeability layers.[100] The system can pump out stored water for agricultural or municipal use with the same well.[101] Infiltration systems withdraw surface

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90 Or. Water Res. Dep't, Oregon's Integrated Water Resources Strategy 91 (2012) [hereinafter Integrated Water Resources Strategy], *available at* http://www.oregon.gov/OWRD/Pages/law/Integrated_Water_Supply_Strategy.aspx.

91 Shonee D. Langford, *Full Steam Ahead for the Umatilla Basin Aquifer Restoration Project*, W. L. & Pol'y Rep. Jan. 2010, at 67, 67.

92 *Id.* at 69.

93 *Balance Between Farms and Fish*, *supra* note 78.

94 *Id.*

95 *Id.*

96 *Id.*

97 Steven DuBois, *Deal Eases Umatilla Basin Water Dispute*, Bend Bull., Feb. 16, 2013, http://www.deschutesriver.org/media/news/deal_eases_umatilla_basin_water_dispute (last visited Feb. 14, 2015) [hereinafter *Deal Eases Water Dispute*].

98 A confined aquifer is "[a]n aquifer that contains water that would rise above the top of the aquifer in a penetrating well"; an unconfined aquifer is "[a]n aquifer in which the water table is exposed to the atmosphere through openings in the overlying materials." U.S. Geological Survey, Definition of Terms 118, 120, *available at* http://pubs.usgs.gov/ha/ha747/pdf/definition.pdf.

99 Or. Water Res. Dep't, *Below Ground Storage Site Details: Umatilla Basin Consolidated & Confined*, http://apps.wrd.state.or.us/apps/planning/owsci/gw_project.aspx?gw_project_id=40 (last visited Feb. 14, 2015).

100 Or. Water Res. Dep't, Inventory of Potential Below Ground Storage Sites 7 (2009) [hereinafter Inventory of Potential Storage Sites], *available at* http://www.oregon.gov/owrd/law/docs/owsci/owsci_gw_study_text.pdf.

101 *Id.*

water and spread the water into shallow basins or canals, which allows infiltration into unconsolidated or highly fractured aquifers that are close to the surface.[102] Water users recover stored water through nearby wells or water flows underground and into streams, thereby increasing water flow and improving water quality for fish and wildlife.[103]

If the Aquifer Recharge Project can function in the winter when there are high river flows in the Columbia River, it follows that a similar project could work during springtime oversupply events. Existing water rights holders could use surplus wind power to pump water out of the Columbia River during oversupply events, and use the water to recharge the Umatilla Basin Aquifer and other depleted aquifers in states that the Columbia River and its tributaries run through.[104] Water users could later recover the water for agricultural use and allow some of the water to move through the aquifer and discharge to the surface to enhance stream flow.[105] Expediting the process of recharging the Umatilla Basin Aquifer could have a beneficial economic and environmental impact in the area. Furthermore, recharging the Umatilla Basin Aquifer and similarly situated aquifers could alleviate the oversupply problem by using surplus wind power and increasing upstream water withdrawals, thereby decreasing the amount of water that must either spill over the dams or be used to generate electricity.[106]

BPA completed the initial work identifying available water rights for aquifer recharge; rough estimates place the potential at 1,500 to 2,000 cubic feet per second (cfs), which would reduce hydropower generation by about 75 to 100 MW, or 657,000 to 876,000 MWh per year.[107] BPA displaced about 135 megawatt-months of non-hydropower generation, or 97,500 MWh, in 2011 and about 70 megawatt-months of non-hydropower generation, or 49,744 MWh in 2012.[108] Thus, aquifer recharge has the potential capacity to reduce hydrogeneration by 876 million kilowatt-hours (kWh) per year where it needed to reduce hydrogeneration by only 97.5 million kWh during 2011 and 49.7 million kWh during 2012.[109] This means aquifer recharge has the potential capacity to completely alleviate the oversupply problem in the Pacific Northwest, provided that it can be implemented on a large scale.

102 *Id.* at 8.

103 *Id.*

104 NW. POWER & CONSERVATION COUNCIL, OVERSUPPLY TECHNICAL OVERSIGHT COMMITTEE RECOMMENDATIONS 6, 15 (2012) [hereinafter OTOC RECOMMENDATIONS], *available at* http://www.nwcouncil.org/media/11080/OTOC_Infrastructure_Recommendations_Final.pdf (estimating that 1,500 to 2,000 cubic feet of water per second could be removed from the Columbia River to recharge aquifers, reducing hydro system generation by about 75 to 100 megawatts).

105 INVENTORY OF POTENTIAL STORAGE SITES, *supra* note 100, at 8.

106 EFFECTS OF INCREASING SURPLUS OF ENERGY GENERATING CAPABILITY IN THE PNW, *supra* note 25, at 17.

107 OTOC RECOMMENDATIONS, *supra* note 104, at 6, 15. To figure out how many MWh of electric energy that 75 to 100 MW of power would produce on an annual basis, I multiplied MW by 8,860, the number of hours in a year (24 hours per day times 365 days per year). *See* Wisconsin Valley Improvement Co., *How Hydropower Works*, http://www.wvic.com/Content/How_Hydropower_Works.cfm (last visited Feb. 14, 2015).

108 SEASONAL POWER OVERSUPPLY IN 2012, *supra* note 49, at 2.

109 These calculations are based on the fact that one MWh equals 1000 kWh.

Currently, BPA is working with the United Electric Co-op and the Southwest Irrigation District in Idaho to test a small-scale aquifer recharge project to determine if BPA can expand the technology to address oversupply.[110] The Oversupply Technical Oversight Committee (OTOC)[111] recommended aquifer recharge as one cost-effective solution to oversupply deserving of more in-depth analysis.[112] A feasibility study of recharge of the Eastern Snake River Plain Aquifer suggests there is little capital investment required for recharge facilities.[113] Aquifer recharge facilities can be as simple as deepening natural depressions to create pools of water fed by controlled irrigation discharges,[114] or by using existing diversions and canals during low irrigation periods.[115] If aquifer recharge can be expanded on a large scale to address oversupply, it will likely become one of the more cost-effective and feasible solutions available. But aquifer recharge projects are limited by the physical capacity of aquifers; if storage needs during oversupply events exceed aquifers' storage capacity, above-ground alternative storage facilities may be necessary.[116]

B. Pumped Hydropower

Pumped hydropower is an above-ground storage alternative that could supplement aquifer recharge projects along the Columbia River. Pumped hydropower projects store energy and generate electricity by moving water between reservoirs located at different elevations.[117] When electricity demand is low, pumped hydropower projects can use excess electric generation to pump water from a lower reservoir to an upper reservoir.[118] When electricity demand is high, releasing the stored water from the upper reservoir to the lower reservoir through a hydropower turbine generates electricity.[119] This process could store excess electric energy during oversupply events and provide capacity for peak electricity demand during the day.

The benefits of pumped storage are overwhelming, particularly in the Pacific Northwest. Pumped storage has unique potential in the Pacific

110 OTOC RECOMMENDATIONS, *supra* note 104, at 6, 15.

111 OTOC was appointed by the Northwest Power and Conservation Council's Wind Integration Forum Steering Committee. *Id.* at 1.

112 *Id.* at 6, 15.

113 EFFECTS OF INCREASING SURPLUS OF ENERGY GENERATING CAPABILITY IN THE PNW, *supra* note 25, at 17.

114 *See, e.g.*, *id.* (discussing use of controlled irrigation-fed ponds as recharge facilities).

115 *See, e.g.*, *id.* (discussing the use of existing canals and diversions in the Snake River study).

116 *See* INVENTORY OF POTENTIAL STORAGE SITES, *supra* note 100, at 10 (discussing storage capacity as a consideration for the feasibility of underground storage, but stating that "[a]lthough underground storage can be less expensive than constructing above ground storage facilities, the cost can still be significant").

117 Fed. Energy Regulatory Comm'n, *Pumped Storage Projects*, http://www.ferc.gov/industries/hydropower/gen-info/licensing/pump-storage.asp (last visited Feb. 14, 2015).

118 *Id.*

119 *Id.*

Northwest, where much wind generation is already integrated into the transmission system.[120] In areas with recently increased wind capacity, grid operators can greatly improve grid reliability, using new pumped storage projects instead of increased fossil-fueled generation.[121] Pumped storage has bulk storage potential, which is a relatively unique bulk storage concept.[122] This means one or two projects could go a long way in alleviating the oversupply problem.[123]

FERC has noted that additional transmission or comparable alternatives are necessary to reliably integrate variable generation resources.[124] Grid-scale energy storage[125] is an alternative that could reduce the amount of new transmission required to support many states' renewable generation goals.[126] Furthermore, grid-scale storage would be a valuable asset for long-term expected levels of wind in the future.[127]

Finally, pumped storage could provide BPA with an opportunity to return flexibility to the federal hydropower system by giving dam operators an alternative to spilling water over the dams, potentially harming fish and

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120 *See* Wayne Todd, Bonneville Power Admin., Presentation at Northwest Hydroelectric Association Meeting: Pumped Storage Evaluation 3 (Feb. 24, 2011) [hereinafter Pumped Storage Evaluation], *available at* http://www.nwhydro.org/events_committees/docs/2011_annual_conference_presentations/thursday/wayne%20todd.ppt (quoting U.S. Energy Secretary Steven Chu, stating that "a higher percentage of wind generation" is integrated into the Pacific Northwest's transmission system).

121 *See* NAT'L HYDROPOWER ASS'N, PUMPED STORAGE DEV. COUNCIL, CHALLENGES AND OPPORTUNITIES FOR NEW PUMPED STORAGE DEVELOPMENT 2 (2012), *available at* http://www.hydro.org/wp-content/uploads/2014/01/NHA_PumpedStorage_071212b12.pdf.

122 Pumped Storage Evaluation, *supra* note 120, at 3.

123 *See* NAT'L HYDROPOWER ASS'N, *supra* note 121, at 2 ("[F]or the foreseeable future hydropower pumped storage stands alone as the only commercially proven technology available for grid-scale energy storage.").

124 *See Iberdrola Renewables Inc. v. Bonneville Power Admin.*, 137 F.E.R.C. ¶ 61,185 at P 35 (2011) ("Adequate transmission capacity is necessary to relieve constraints and reliably integrate new generation resources. With additional transmission or comparable alternatives, Bonneville may have the flexibility necessary to . . . fully integrate the variable energy resources . . . .").

125 Four Peaks Technologies, Inc., Solar Cell Cent., *Grid Electricity* Storage, http://solarcellcentral.com/grid_storage_page.html (last visited Feb. 14, 2015). Grid-scale storage is essentially large-scale storage, and refers to a method of storing large amounts of electricity within an electrical grid when energy production exceeds consumption. The stored energy is later used when consumption exceeds production. In this way, production need not be drastically scaled up or down to meet momentary consumption. U.S. DEP'T OF ENERGY, GRID ENERGY STORAGE REPORT 4 (2013) (noting that grid-scale energy storage is essential for "improving the operating capabilities of the grid, lowering cost and ensuring high reliability . . . [and] energy storage can be instrumental for emergency preparedness . . . .").

126 NAT'L HYDROPOWER ASS'N, *supra* note 121, at 2; *see, e.g.*, Or. Dep't of Energy, *A Renewable Portfolio Standard (RPS) for Oregon*, http://www.oregon.gov/ENERGY/RENEW/pages/RPS_home.aspx (last visited Feb. 14, 2015) (Oregon requires large utilities to provide 25% of their retail sales of electricity from renewable sources of energy by 2025); Inst. for Energy Research, *Washington Renewable Electricity Mandate Status*, http://www.instituteforenergyresearch.org/renewable-mandates/washington-renewable-electricity-mandate-status (last visited Feb. 14, 2015) (Washington requires utilities to provide 15% of retail sales from renewable sources of energy by 2020).

127 Pumped Storage Evaluation, *supra* note 120, at 7.

other aquatic species, or generating hydroelectricity, thereby causing overgeneration, threatening reliability, and curtailing non-hydropower generators.[128] Because hydroelectric oversupply events and wind power generation often coincide,[129] pumped storage offers BPA the unique alternative of using surplus wind power to divert water from the river during oversupply events.[130] BPA already uses on-stream pumped storage in Washington State behind the Grand Coulee Dam.[131] The John W. Keys III Pump-Generating Plant (Keys Plant) pumps water from Franklin D. Roosevelt Lake up to Banks Lake, which is later used to irrigate approximately 670,000 acres of farmland in the Columbia Basin Project and grow more than sixty crops distributed nationwide.[132] The Keys Plant also has untapped potential for wind integration.[133] According to the Bureau of Land Reclamation, "[a]t full load, the project [can draw] about 600 MW and can pump about 18,000 cfs up to Banks Lake."[134] But the Keys Plant is underutilized as a resource for wind integration.[135] Available storage at Banks Lake and its limited ability to discharge to the Columbia Basin Irrigation Project may constrain the amount and frequency of withdrawal.[136] During a June 2010 oversupply event at Grand Coulee Dam, flows reached approximately 195,000 cfs.[137] The Keys Plant could have diverted about 9% of those flows.[138] Further, this diversion would have also reduced flow at all downstream projects.[139] But the pumps at the Keys Plant only came on for approximately nine hours at night during the June 2010 oversupply event, and the pumps never operated at full load, because the primary purpose of the plant is to supply water to the Columbia Basin Irrigation Project, rather than to alleviate oversupply conditions.[140]

In 2013, farmers, environmentalists, government regulators, and the tribes entered a "declaration of cooperation" on several projects to increase

128 *See id.* at 3; BONNEVILLE POWER ADMIN., BPA PROPOSES RESOLUTION TO ELECTRICITY OVERSUPPLY 3 (2012), *available at* http://www.bpa.gov/news/pubs/FactSheets/fs-201202-bpa-proposes-resolution-to-electricity-oversupply.pdf.

129 *See e.g.*, BONNEVILLE POWER ADMIN., NORTHWEST OVERGENERATION: AN ASSESSMENT OF POTENTIAL MAGNITUDE AND COST 11 (2012), *available at* https://www.bpa.gov/Projects/Initiatives/Oversupply/OversupplyDocuments/BPA_Overgeneration_Analysis.pdf (discussing the coincidence of high winds and hydroelectric generation in 1970).

130 *See* NORTHWEST OVERSUPPLY OF POWER, *supra* note 47, at 1–2; SEASONAL POWER OVERSUPPLY IN 2012, *supra* note 49, at 6.

131 SEASONAL POWER OVERSUPPLY IN 2012, *supra* note 49, at 6; EFFECTS OF INCREASING SURPLUS OF ENERGY GENERATING CAPABILITY IN THE PNW, *supra* note 25, at 16.

132 BUREAU OF RECLAMATION, DEP'T. OF THE INTERIOR, JOHN W. KEYS III PUMP-GENERATING PLANT (2011), *available at* http://www.usbr.gov/pn/grandcoulee/pubs/powergeneration.pdf.

133 Bureau of Reclamation, *Columbia Basin Project*, http://www.usbr.gov/projects/Project.jsp?proj_Name=Columbia+Basin+Project (last visited Feb. 14, 2015).

134 BUREAU OF RECLAMATION, *supra* note 132.

135 Pumped Storage Evaluation, *supra* note 120, at 7.

136 EFFECTS OF INCREASING SURPLUS OF ENERGY GENERATING CAPABILITY IN THE PNW, *supra* note 25, at 16.

137 *Id.*

138 *Id.*

139 *Id.*

140 *Id.*

water availability for irrigation in the Umatilla Basin without harming fish and other aquatic species.[141] One of the projects that won consensus was building a water storage reservoir in Juniper Canyon.[142] Juniper Canyon is located on the Oregon side of the Columbia River in Northeastern Oregon.[143] The storage reservoir will pump approximately 50,000 acf of water from the Columbia River during the winter.[144] The next phase of the project is completing a feasibility study and construction could occur in the next five to ten years depending on Oregon's budget-approval process.[145]

If the Juniper Canyon storage facility can divert water from the Columbia River in the winter when there is excess water, it follows that the same facility could divert water during springtime oversupply events. A Juniper Canyon pumped hydropower facility could use surplus wind power to pump water out of the Columbia River during oversupply events, store it in the Juniper Canyon reservoir, and use the stored water to generate hydroelectric power during periods of increased demand.

The proposed pumped storage project at Juniper Canyon and the Aquifer Recharge Project in the Umatilla Basin illustrate the potential effectiveness of storage mechanisms as solutions to oversupply. If expanded on a large scale and employed during oversupply events, these types of projects could enable wind generators to stay online during periods of overgeneration. These solutions eliminate the conflict surrounding how and to whom to allocate the cost of compensating curtailed wind generators. Moreover, they support the important policy goals of increasing renewable generation, recharging depleted aquifers, and restoring flexibility to the federal hydropower system.

However, there are advantages and disadvantages to any potential solution to the oversupply problem. While BPA's proposed solution is arguably inefficient, curtailing wind generation and compensating generators for their losses is a relatively simple solution to oversupply, provided that BPA can implement a legal cost allocation methodology. Aquifer recharge and pumped hydropower avoid the pitfalls of curtailing wind generation and support important policy goals, but they must receive authorization and be implemented in a cost-effective manner to achieve those benefits.

141 Oregon Solutions, Columbia River-Umatilla Solutions Taskforce Declaration of Cooperation 7, 15–16 (2013), *available at* http://orsolutions.org/wp-content/uploads/2013/03/CRUST-DOC-Final-Fully-Signed-PDF-2.26.13.pdf.

142 *Id.* at 7.

143 Map Locator & Downloader, Juniper Canyon, OR, U.S. Geological Survey, Map Locator & Downloader, Juniper Canyon, Or., http://columbiariverimages.com/Regions/Places/juniper_canyon.html (last visited Feb. 14, 2015).

144 *Deal Eases Water Dispute*, *supra* note 97.

145 *Id.*

IV. PROJECT AUTHORIZATION

Aquifer recharge and pumped hydropower cannot be viable solutions to oversupply without water to pump, the infrastructure to pump the water, and facilities to store the water. Any water project proposing to reallocate federal reservoir water on the Columbia River must go through detailed permitting processes before receiving authorization.[146] Aquifer recharge and pumped hydropower projects in Oregon are both subject to the state permitting authority.[147] New uses of water are carefully allocated to preserve the investments already made in the state, such as in cities, farms, factories, or for the improvement of fish habitat.[148] Pumped storage facilities are also subject to additional federal regulation.[149] The federal licensing process for pumped storage facilities like the proposed project at Juniper Canyon has recently been criticized for being an unnecessarily difficult and time-consuming process.[150] These permitting processes at the state and federal level can make it difficult for proposed aquifer recharge and pumped hydropower projects to receive authorization.[151]

A. State Permits

All water is publicly owned in Oregon.[152] Prospective water users must obtain a permit or water right from the Oregon Water Resources Department (OWRD) to use water from any surface water or groundwater source, and "the water must be used for a beneficial purpose, without waste."[153] Several state agencies work together to authorize aquifer recharge projects.[154] The Oregon Health Authority Drinking Water Program, Oregon Department of Environmental Quality Water Quality Program, and OWRD jointly regulate

146 WATER RIGHTS IN OREGON, *supra* note 75, at 15–20. *See generally* FED. ENERGY REGULATORY COMM'N, HANDBOOK FOR HYDROELECTRIC PROJECT LICENSING AND 5 MW EXEMPTIONS FROM LICENSING (2004) [hereinafter FERC HANDBOOK FOR HYDROELECTRIC PROJECT LICENSING], *available at* http://www.ferc.gov/industries/hydropower/gen-info/handbooks/licensing_handbook.pdf.

147 *See infra* Part IV.A.

148 WATER RIGHTS IN OREGON, *supra* note 75, at 15. Oregon is cautious in approving new water uses because its water laws are based on the Western principle of prior appropriation, which means "the first person to obtain a water right on a stream is the last to be shut off in times of low streamflows." *Id.* at 5. Surpluses beyond the needs of the senior right holder pass to the holder with the next oldest priority date, who can take as much remaining as necessary to satisfy his or her needs and so on down the line until there is no surplus or until all rights are satisfied. *Id.* "In most of [Oregon], surface water is no longer available for new uses in summer months." *Id.* at 15.

149 *See infra* Part IV.B.

150 *See* Susan Kraemer, *Thought Solar Was Hard to Permit? Try Pumped Storage!*, CLEAN TECHNICA, Apr. 18, 2011, http://cleantechnica.com/2011/04/18/thought-solar-was-hard-to-permit-try-pumped-storage/ (last visited Feb. 14, 2015).

151 *See infra* Part IV.A–B.

152 WATER RIGHTS IN OREGON, *supra* note 75, at 5.

153 *Id.*

154 OR. WATER RES. DEP'T, *supra* note 84, at 13, 43.

aquifer recharge projects.[155] Potential issues with aquifer recharge include withdrawal rights and control of injection water quality.[156] First, OWRD requires a pre-application conference.[157] After the initial conference, anyone seeking to operate an aquifer recharge project in Oregon must obtain a permit[158] from OWRD to appropriate water from the river and a secondary groundwater permit[159] to pump the recharged water to a beneficial use.[160] Further, if there is not an in-stream water right attached to the water source, an applicant must receive Oregon Department of Fish and Wildlife (ODFW) approval before OWRD may issue a permit, to ensure the project does not endanger fish and wildlife.[161] If the recharge project involves the subsurface injection of water, the applicant may also have to submit an Underground Injection Control Program application to the Oregon Department of Environmental Quality.[162] "[R]echarge water must maintain the aquifer water at its original quality or better."[163] And while raw surface water sometimes meets those standards, periodic water quality monitoring is necessary to assure sufficient water quality.[164]

Similarly, pumped hydropower projects on the Columbia River are subject to state authority. These projects require a permit to appropriate surface water for storage,[165] a permit to use stored water,[166] and dam approval by OWRD.[167] Fortunately for both pumped hydropower and aquifer recharge projects, oversupply conditions could alleviate some concerns regarding sufficient water supply for permit authorization, which is arguably the most substantial barrier to obtaining water permits and water rights in Oregon.[168] During oversupply events, there may be surplus water available in excess of any conflicting downstream water rights on the Columbia River.[169] Therefore, procuring water rights could be less daunting for new water uses

155 *Id.* at 13; INTEGRATED WATER RESOURCES STRATEGY, *supra* note 90, at 91; Or. Dep't of Envtl. Quality, *Water Quality Groundwater Protection*, http://www.deq.state.or.us/wq/groundwater/agencies.htm (last visited Feb. 14, 2015); Or. Dep't of Envtl. Quality, *Water Quality Oregon Drinking Water Protection Program*, http://www.deq.state.or.us/wq/dwp/contacts.htm (last visited Feb. 14, 2015).

156 EFFECTS OF INCREASING SURPLUS OF ENERGY GENERATING CAPABILITY IN THE PNW, *supra* note 25, at 17.

157 OR. ADMIN. R. 690-350-0120(2) (2013).

158 OR. REV. STAT. § 537.135(1) (2013).

159 *Id.* § 537.135(2).

160 OR. ADMIN. R. 690-350-0120(1).

161 INVENTORY OF POTENTIAL STORAGE SITES, *supra* note 100, at 14; OR. REV. STAT. § 537.135(5).

162 OR. ADMIN. R 340-044-0012 (2013).

163 INVENTORY OF POTENTIAL STORAGE SITES, *supra* note 100, at 13.

164 *Id.*

165 OR. REV. STAT. § 537.140 (2013).

166 *Id.* § 537.147 (2013).

167 *Id.* § 540.350 (2013).

168 *See* WATER RIGHTS IN OREGON, *supra* note 75, at 5, 15.

169 *See generally* BONNEVILLE POWER ADMIN., COLUMBIA RIVER HIGH-WATER OPERATIONS (2010), *available at* http://www.bpa.gov/Projects/Initiatives/Oversupply/OversupplyDocuments/final-report-columbia-river-high-water-operations.pdf.

that divert surface water only during oversupply conditions than it would be for similar projects during normal water flow conditions.

B. Federal Licensing

The federal licensing process is one significant hurdle exclusively facing pumped storage projects.[170] Pumped storage projects can take decades to get online. The FERC licensing process can take five years or longer to complete before the developer even has the authority to begin project construction.[171] Then there is a construction period of about five years.[172] In January 2014, there was no alternative licensing approach to shorten this time frame and very few financial institutions were willing to finance these lengthy projects.[173] But in August 2013, President Obama signed the Hydropower Regulatory Efficiency Act of 2013 (HREA) into law.[174] The HREA directed FERC to investigate the feasibility of a two-year licensing process for hydropower development at closed-loop pumped storage projects.[175] In January 2014, FERC issued a news release soliciting pilot projects to test the two-year licensing process and a notice setting forth minimum criteria for projects that may apply for expedited licensing.[176] The goal of the pilot project is to streamline the licensing process for projects with obvious minimal environmental constraints, which also supports the development and integration of renewable energy.[177]

170 NAT'L HYDROPOWER ASS'N, *supra* note 121, at 10. *See generally* FERC HANDBOOK FOR HYDROELECTRIC PROJECT LICENSING, *supra* note 146, at 2-1 (detailing application steps for hydroelectric permits).

171 NAT'L HYDROPOWER ASS'N, *supra* note 121, at 10.

172 *See id.*; Susan Kraemer, *Thought Solar Was Hard to Permit? Try Pumped Storage*, CLEAN TECHNICA, Apr. 18, 2011, http://cleantechnica.com/2011/04/18/thought-solar-was-hard-to-permit-try-pumped-storage/ (last visited Feb. 14, 2015).

173 *See* NAT'L HYDROPOWER ASS'N, *supra* note 121, at 10.

174 H.R. 267, 113th Cong. (2013) (enacted).

175 *Id.* § 6(a).

176 Fed. Energy Regulatory Comm'n, *FERC Seeking Pilot Projects to Test Two-Year Hydro Licensing Process*, http://ferc.gov/media/news-releases/2014/2014-1/01-06-14.asp#.UyOIO2R4aoo (last visited Feb. 14, 2015). The minimum criteria include: "The project must cause little to no change to existing surface and groundwater flows and uses; The project must be unlikely to adversely affect federally listed threatened and endangered species; If the project is proposed to be located at or use a federal dam, the request to use the two-year process must include a letter from the dam owner that the applicant's plan of development is conceptually feasible; If the project would use any public park, recreation area, or wildlife refuge established under state or local law, the request to use the two-year process must include a letter from the managing entity indicating its approval of the site's use for hydropower development; and For a closed loop pumped storage project, the project must not be continuously connected to a naturally-flowing water feature." FED. ENERGY REGULATORY COMM'N, NOTICE SOLICITING PILOT PROJECTS TO TEST A TWO-YEAR LICENSING PROCESS 1–2 (2014), *available at* http://ferc.gov/media/news-releases/2014/2014-1/AD13-9-000.pdf (citations omitted).

177 NAT'L HYDROPOWER ASS'N, *supra* note 121, at 10.

Any qualifying project must be "closed-loop" pumped storage and meet the minimum criteria set forth by FERC.[178] Closed-loop pumped storage projects have "reservoirs in areas that are physically separated from existing river systems."[179] These projects do not impact existing river systems, because they aim to avoid such systems entirely.[180] Traditional pumped storage projects consist of at least one dam along a river or stream, thereby "altering the ecology of the river system."[181] Closed-loop projects avoid most of these impacts by pumping water to an off-stream reservoir and preventing the adverse impacts on aquatic systems resulting from in-stream project development.[182] The proposed project at Juniper Canyon exemplifies closed-loop pumped storage, because it is designed to pump water from behind a dam during excess water events using renewable wind energy and store the water in a canyon separate from the river.[183] If the project can satisfy the other criteria for streamlined licensing, pumped storage could be an even more feasible solution to oversupply. Thus, provided the pilot project is successful and FERC adopts it as a permanent streamlined licensing option for closed-loop pumped storage projects, a pumped storage project designed as a solution to oversupply could qualify for expedited licensing.[184]

While the benefits of pumped hydropower and aquifer recharge projects are many, the reality is that these proposed solutions to oversupply must receive authorization from state and federal authorities to deliver those benefits.[185] Conversely, BPA's alternative solution of curtailing wind generators can be implemented with relative ease, provided that BPA can find a way to compensate wind generators without violating the FPA.[186] An expedited federal licensing process for pumped storage projects and state support for aquifer recharge projects would alleviate some of the difficulty associated with project authorization for these storage projects. But even if an aquifer recharge or pumped storage project receives authorization, implementing such a project could still be too costly to be feasible.

178 H.R. 267, 113th Cong. § 6(a) (2013); Fed. Energy Regulatory Comm'n, *supra* note 176, at 2.

179 Nat'l Hydropower Ass'n, *supra* note 121, at 9.

180 *Id.*

181 *Id.*

182 *Id.*

183 Columbia River-Umatilla Solutions Taskforce Update 2 (2014), *available at* http://orsolutions.org/wp-content/uploads/2014/02/CRUST-Update-2.142.pdf; Stephen J. Wright, Bonneville Power Admin., U.S. Dep't of Energy, Record of Decision for the Electrical Interconnection of the Juniper Canyon I Wind Project 1, 21 (2010), *available at* http://efw.bpa.gov/environmental_services/Document_Library/Juniper_Canyon_Wind/JuniperCanyon_I_WindEner gyROD-5-10-2010.pdf.

184 H.R. 267, 113th Cong. § 6(a) (2013); Fed. Energy Regulatory Comm'n, *supra* note 176, at 2.

185 *See supra* notes 150–165, 168–169 and accompanying text.

186 *See supra* notes 52–68 and accompanying text.

V. PROJECT IMPLEMENTATION

It is important to implement alternative solutions to oversupply that are most likely to address the problem at a lower cost than the cost of compensating curtailed wind generators.[187] Both aquifer recharge and pumped hydropower projects require significant capital investments.[188] Aquifer recharge projects require improved pumping technology and infrastructure to pump sufficient quantities of water out of the Columbia River to alleviate oversupply conditions.[189] Pumped storage projects require large capital investments, because they involve the construction of an entirely new dam and storage reservoir.[190] BPA expects it to cost approximately $12 million per year to compensate curtailed wind generators for the revenue they would otherwise receive for generation, including production tax credits, renewable energy credits, and revenue from power purchase agreements.[191] "Spreading that over the several thousand megawatts of potential oversupply in some hours implies that alternative infrastructure solutions must cost less than a few dollars per kilowatt per year . . . ."[192] This presents a significant cost hurdle because the cost of compensating curtailed wind generators is less than the capital cost of a new pumped storage project.[193] For aquifer recharge and pumped hydropower projects to be feasible responses to oversupply, project proponents must find a way to make the projects cost-effective.

A. Aquifer Recharge Projects

The costs associated with underground storage are typically less than constructing above ground storage facilities, but implementing an aquifer recharge project on a large scale requires a significant capital investment.[194] Expenses vary but typically include the cost of conducting a feasibility study, evaluating and improving infrastructure, and ongoing maintenance of

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187 OTOC RECOMMENDATIONS, *supra* note 104, at 3 (asserting that the high cost of displacing wind is undesirable compared to low cost infrastructure solutions).

188 *See infra* Part V.A–B; NAT'L HYDROPOWER ASS'N, *supra* note 121, at 13.

189 *See infra* Part V.A.

190 *See supra* notes 117–119. Pumped storage project costs vary based on "site-specific conditions," which include "geology, water availability, access to the transmission grid, and overall construction cost." NAT'L HYDROPOWER ASS'N, *supra* note 121, at 13. For example, a 1,000 MW project could cost anywhere from $1,500/kW to $2,500/kW, i.e. $1.5 billion to $2.5 billion. *Id.*

191 BONNEVILLE POWER ADMIN., BPA PROPOSES RESOLUTION TO ELECTRICITY OVERSUPPLY 2 (2012), *available at* http://www.bpa.gov/news/pubs/FactSheets/fs-201202-bpa-proposes-resolution-to-electricity-oversupply.pdf. "A power purchase agreement is a long-term agreement to buy power from a company that produces electricity." Ryan Park, *The Power Purchase Agreement (PC for Solar)*, *in* ENERGY PROJECT FINANCING: RESOURCES AND STRATEGIES FOR SUCCESS 93 (Albert Thumann & Eric Woodruff eds., 2009), *available at* http://regulationbodyofknowledge.org/wp-content/uploads/2013/10/Thumann_Energy_Project_Financing.pdf.

192 OTOC RECOMMENDATIONS, *supra* note 104, at 3.

193 *Id.*

194 INVENTORY OF POTENTIAL STORAGE SITES, *supra* note 100, at 10.

the project.[195] Feasibility studies in the Umatilla Basin, including hydrogeologic site characterization, water quality, water level monitoring, surface water availability, and other important characteristics, are already underway due to the anticipated Aquifer Recharge Project.[196] But the Aquifer Recharge Project is currently designed to recharge the Umatilla Basin Aquifer during the winter months using existing irrigation infrastructure.[197] Using the very same infrastructure for aquifer recharge projects during springtime oversupply events is more problematic because oversupply events and irrigation season coincide.[198] Therefore, aquifer recharge during oversupply events will place additional pumping demand on existing infrastructure.[199]

Prior to implementing any aquifer recharge project designed to alleviate oversupply, it will be necessary to evaluate and improve pumping technology and infrastructure, which include "pumping systems, pipes, water treatment filtration and disinfection systems, and monitoring and injection wells."[200] The additional costs placed on the system associated with transportation and pumping costs must be identified and allocated to the respective parties.[201] These measures would require substantial time and capital investment, but if implemented using existing infrastructure to the greatest extent possible, aquifer recharge could be a cost-effective solution to oversupply.[202]

B. Pumped Hydropower Projects

Pumped hydropower projects face even more significant challenges than aquifer recharge projects regarding project implementation due to the federal regulatory treatment of pumped storage.[203] FERC generally classifies pumped storage facilities as a form of wholesale power generation, which means pumped storage facilities do not receive guaranteed cost recovery and are far more difficult to implement as a result.[204] However, FERC will grant a pumped storage project guaranteed cost recovery if the facility ensures reliability.[205] Pumped storage projects designed as a solution to oversupply arguably deserve guaranteed cost recovery, because they are

195 *Id.*

196 Langford, *supra* note 91, at 69–70.

197 *Id.* at 69 (stating the existing pump stations, pipelines, and canals will hopefully be used to divert water).

198 *See* SAID AMALI & PAUL WATTENBURGER, IRZ, TECHNICAL MEMORANDUM, TASKS 1.J & 3.D—CONCEPTUAL ENGINEERING DESIGNS 18 (2009) (listing infrastructure concerns with the simultaneous irrigating and filling of aquifers).

199 INVENTORY OF POTENTIAL STORAGE SITES, *supra* note 100, at 10.

200 *Id.*

201 OTOC RECOMMENDATIONS, *supra* note 104, at 15.

202 EFFECTS OF INCREASING SURPLUS OF ENERGY GENERATING CAPABILITY IN THE PNW, *supra* note 25, at 16.

203 NAT'L HYDROPOWER ASS'N, *supra* note 121, at 10.

204 *See infra* notes 215–225 and accompanying text.

205 *See infra* notes 233–237 and accompanying text.

implemented to mitigate the reliability problems associated with overgeneration.[206] If pumped storage solutions to oversupply obtain guaranteed cost recovery, the implementation of these projects becomes more likely.

The FPA[207] gives FERC jurisdiction over pumped storage projects.[208] Specifically, the FPA gives FERC jurisdiction over "the sale of electric energy at wholesale" and the "transmission of electric energy."[209] FERC regulates wholesale generation and transmission differently.[210] Pumped storage projects can qualify as both generation and transmission facilities, thus creating complicated issues surrounding how FERC should regulate pumped storage facilities.[211] The main issue associated with classifying pumped storage as wholesale generation or transmission is cost recovery. Wholesale generators recover costs under market-based rates,[212] whereas transmission facilities generally enjoy guaranteed cost recovery.[213] Therefore, proponents of pumped storage projects favor classification as transmission facilities.[214] But in *Norton Energy Storage*,[215] FERC decided that transactions where energy is sold to storage providers and used to charge storage facilities constitute wholesale transactions within FERC's regulatory jurisdiction.[216] FERC also implied it has jurisdiction over storage facilities' energy discharges and that its jurisdiction is grounded in wholesale sales, rather than its jurisdiction over transmission.[217]

Despite FERC's decision in *Norton*, storage providers continue to seek classification as transmission facilities with incentive rate treatment.[218] FERC defines "transmission facilities" as "any facilities of a public utility used to deliver electric energy in interstate commerce to a wholesale

206 *See infra* notes 233–237 and accompanying text.

207 16 U.S.C. §§ 791–828c (2012).

208 *Norton Energy Storage, LLC*, 95 F.E.R.C. ¶ 61,476, at p. 62,698, 62,702–03 (2001).

209 16 U.S.C. § 824(b)(1).

210 Unlike wholesale generation facilities, transmission facilities are eligible for certain incentive rate treatment under section 219 of the FPA and FERC Order 679. 16 U.S.C. §§ 824s, 825s; Order No. 679, *Promoting Transmission Investment Through Pricing Reform*, 116 F.E.R.C. ¶ 61,057 at P 41–43, 71 Fed. Reg. 43,294 (2006) (to be codified at 18 C.F.R. pt.35) [hereinafter Order 679].

211 *W. Grid Dev., LLC*, 130 F.E.R.C. ¶ 61,056 at P 44 (2010), *reh'g denied*, 133 F.E.R.C. ¶ 61,029 (2010) ("[E]lectricity storage devices . . . do not readily fit into only one of the traditional asset functions of generation, transmission or distribution. Under certain circumstances, storage devices can resemble any of these functions or even load.").

212 COLLIN CAIN & JONATHAN LESSER, A COMMON SENSE GUIDE TO WHOLESALE ELECTRIC MARKETS 16 (2007), *available at* www.bateswhite.com/media/publication/55_media.741.pdf.

213 16 U.S.C. § 824s (2012).

214 *See, e.g.*, *Nevada Hydro Co.*, 122 F.E.R.C. ¶ 61,272 at P 1–4 (2008) (illustrating Nevada Hydro's attempt at becoming classified as a transmission facility).

215 *Norton Energy Storage, L.L.C.*, 95 F.E.R.C. ¶ 61,476 (2001).

216 *Id.* at p. 62,702.

217 *Id.* at p. 62,703 (in "exchanging energy with its customers," a storage facility is "engaged in a wholesale energy transaction").

218 *See* 122 F.E.R.C. ¶ 61,272 at P 1; *W. Grid Dev.*, 130 F.E.R.C. ¶ 61,056, at P 1 (2010), *reh'g denied*, 133 F.E.R.C. ¶ 61,029 (Jan. 21, 2010).

purchaser."[219] Transmission facilities include "devices used for metering and controlling the flow of bulk energy," and "devices which are necessary to keep the parts of the interconnected system or systems 'in tune.'"[220] Pumped storage facilities look like transmission facilities, because "[t]hey control the flow of bulk energy and keep generation and distribution 'in tune,' *i.e.*, in temporal alignment."[221] Furthermore, unlike conventional hydropower generation facilities, when a pumped storage facility sells its output at wholesale, it does not begin the process of electricity generation. Rather, the pumped storage facility already received generation and stored it to later produce electricity from the same energy.[222] In this way, pumped storage facilities look even more like transmission facilities.

Nevertheless, FERC typically classifies pumped storage facilities as wholesale generators rather than transmission, because they function like generation facilities operated for the benefit of their owners' power sales business.[223] This makes sense if the overarching goal of the storage facility is to purchase energy at a low price during off-peak periods and sell it at a higher price during on-peak periods.[224] But this categorization is improper for a pumped storage facility built as a solution to oversupply.

FERC should classify any pumped storage facility designed to alleviate oversupply conditions as a transmission facility eligible for incentive rate treatment. FERC will approve a pumped storage facility for incentive rate treatment only if the facility satisfies the requirements of FPA section 219 by either ensuring reliability or reducing the cost of delivered power by reducing transmission congestion.[225] Oversupply is certainly a reliability issue because it forces BPA to curtail wind generation during power overgeneration events to maintain grid reliability.[226] Therefore, any project designed as a solution to the oversupply problem should satisfy the requirements of FPA section 219, rendering the project eligible for incentive rate treatment.[227] In this situation, the storage facility functions more like transmission and for the benefit of its transmission customers, because the

219 Order No. 888, *Promoting Wholesale Competition Through Open Access Non-Discriminatory Transmission Services by Public Utilities; Recovery of Stranded Costs by Public Utilities and Transmitting Utilities*, 75 F.E.R.C. 61,080 (App. G), 61 Fed. Reg. 21,540, 21,731 (1995) (to be codified at 18 C.F.R. pts. 35, 385) [hereinafter Order 888].

220 Conn. Light & Power Co., 3 F.P.C. 132, 142 (1942), *aff'd sub nom.* Conn. Light & Power Co. v. Fed. Power Comm'n, 141 F.2d 14 (D.C. Cir. 1944), *rev'd*, 324 U.S. 515 (1945).

221 David E. Pomper, *Pausing the Speed of Light: Rethinking the Basis for Federal Jurisdiction over Storage Services*, ELECTRICITYPOLICY.COM, 2011, at 7, *available at* http://www.spiegelmcd.com/files/Pomper_merged_2011_11_15_02_26_56.pdf.

222 *Id.* at 7–8.

223 *See, e.g.*, *Norton Energy Storage, L.L.C.*, 95 F.E.R.C. ¶ 61,476, at p. 62,702 (2001) (discussing how pumped storage hydroelectric facilities and compressed air energy storage facilities are both energy storage facilities).

224 *See id.* (discussing FERC's views on pumping energy).

225 *Nevada Hydro Co.*, 122 F.E.R.C. ¶61,272 at P 23 (2008).

226 *See supra* text accompanying notes 6–13.

227 *See infra* text accompanying notes 230–235.

overarching goal of the facility is to alleviate the oversupply problem.[228] For this reason, FERC should classify pumped storage facilities designed to alleviate oversupply conditions as must-run reliability resources[229] and, therefore, as transmission facilities deserving of guaranteed cost recovery.

FERC Order 1000[230] creates an alternative opportunity to classify pumped storage as transmission, provided that the pumped storage facility is selected in a regional transmission planning and cost allocation process.[231] Order 1000 requires "public utility transmission providers to participate in a regional transmission planning process" that produces a regional transmission plan.[232] The regional transmission plan must include a regional cost allocation method for the cost of new transmission facilities selected in the regional transmission plan.[233] This planning process is intended to achieve two primary objectives:

> (1) ensure that transmission planning processes at the regional level consider and evaluate . . . possible transmission alternatives and produce a transmission plan that can meet transmission needs more efficiently and cost-effectively; and (2) ensure that the costs of transmission solutions chosen to meet regional transmission needs are allocated fairly to those who receive benefits from them.[234]

A transmission facility selected in a regional transmission plan as a more efficient or cost-effective solution to regional transmission needs likely satisfies the requirements of FPA section 219, making the facility eligible for incentive rate treatment.[235]

As a nonpublic utility, BPA is not subject to Order 1000 or its requirements.[236] However, BPA voluntarily submits to the requirements of

228 If BPA operates the pumped storage facility and any revenue from the facility is credited to transmission ratepayers, such a facility is more likely to be classified as transmission and receive incentive rates. *See W. Grid Dev., LLC*, 130 F.E.R.C. ¶ 61,056 at P 49 (2010), *reh'g denied*, 133 F.E.R.C. ¶ 61,029 (2010); 122 F.E.R.C. ¶ 61,272 at P 23.

229 A must-run reliability resource is a generation "unit that must run for operational or reliability reasons, regardless of economic considerations." Fed. Energy Reg. Comm'n, *Guide to Market Oversight Glossary*, http://www.ferc.gov/market-oversight/guide/glossary.asp (last visited Feb. 14, 2015).

230 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. 49,841 (2011) (to be codified at 18 C.F.R. pt. 35) [hereinafter Order 1000].

231 NAT'L HYDROPOWER ASS'N, *supra* note 121, at 12.

232 Order 1000, 136 F.E.R.C. at P 6.

233 *Id.* at P 9.

234 *Id.* at P 4.

235 NAT'L HYDROPOWER ASS'N, *supra* note 121, at 12.

236 BPA is a federal power marketing administration within the United States Department of Energy and is not a public utility subject to sections 205 and 206 of the FPA. *Iberdrola Renewables, Inc. v. Bonneville Power Admin.*, 137 F.E.R.C. ¶ 61,185 at P 2 (2011); *see also Avista Corp. et al.*, 143 F.E.R.C. ¶ 61,255 at P 2, n.4 (2013) ("We recognize that Bonneville Power is not a public utility under section 201 of the FPA, 16 U.S.C. § 824 (2006), and is not subject to Commission directives made pursuant to FPA section 206 . . . .").

Order 1000.[237] In May 2013, BPA submitted a petition seeking FERC approval of its revised transmission planning process developed in response to Order 1000.[238] FERC reviewed BPA's petition under the reciprocity standard to determine whether BPA's "revisions substantially conform or are superior to" the requirements of Order 1000.[239] FERC found BPA's compliance filing only partially complied with the provisions of Order 1000 addressing transmission needs driven by public policy requirements[240] in the regional transmission planning process.[241] BPA restricted its compliance filing to transmission needs for increased transmission capacity.[242] FERC decided this unreasonably restricted "the types of transmission needs driven by public policy requirements that stakeholders may propose" and directed BPA to revise its filing to allow stakeholders to propose transmission needs driven by other public policy requirements.[243]

Regardless of how BPA chooses to amend its compliance filing, pumped storage appears to qualify as a solution to at least one of the transmission needs driven by public policy requirements that stakeholders may propose: the need for increased transmission capacity. If a pumped storage project proposed as a response to oversupply qualifies as a capacity increase project,[244] it likely satisfies the requirements of FPA section 219 and qualifies for incentive rate treatment.[245]

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237 *See generally* BONNEVILLE POWER ADMIN., PETITION FOR RECIPROCITY APPROVAL OF AMENDMENTS TO ATTACHMENT K TO OPEN ACCESS TRANSMISSION TARIFF LOCAL AND REGIONAL TRANSMISSION PLAN PROCESSES AND EXEMPTION FROM FILING FEE (2012), *available at* http://www.ferc.gov/industries/electric/indus-act/trans-plan/filings.asp (download document at NJ13-1-000). In Order 888, FERC established a safe harbor procedure for nonpublic utilities to file reciprocity tariffs. Order 888, F.E.R.C. Stats. & Regs. ¶ 31,036, 31,760, 61 Fed. Reg. 21,540, 21,613–14 (1996). Under this procedure, nonpublic utilities may voluntarily submit a transmission tariff and petition to FERC for a declaratory order requesting a finding that the tariff meets FERC's nondiscrimination standards. *Id.* If FERC finds that the terms and conditions of the tariff substantially conform or are superior to FERC's standards, FERC will require public utilities to provide open access transmission service upon request to that nonpublic utility. *Id.*

238 BONNEVILLE POWER ADMIN., PETITION FOR RECIPROCITY APPROVAL OF AMENDMENTS TO ATTACHMENT K TO ITS OPEN ACCESS TRANSMISSION TARIFF ADDRESSING ORDER NO. 1000 INTERREGIONAL REFORMS AND FOR EXEMPTION FROM FILING FEE 1 (2013), *available at* http://www.bpa.gov/transmission/Doing%20Business/Tariff/Documents/att-k-interregional-petition-letter.pdf.

239 *Avista Corp. et al.*, 143 F.E.R.C. ¶ 61,255 at P 40 (2013).

240 Order 1000 required transmission providers to consider transmission needs driven by public policy requirements. *Id.* at P 109. Public policy requirements are established by local, state, or federal law or regulations. *Id.* Order 1000 specifies that "the consideration of transmission needs driven by Public Policy Requirements means: (1) the identification of transmission needs driven by Public Policy Requirements; and (2) the evaluation of potential solutions to meet those identified needs." *Id.*

241 *Id.* at P 129.

242 *Id.*; BONNEVILLE POWER ADMIN., *supra* note 237, at A-12.

243 143 F.E.R.C. ¶ 61,255 at P 129.

244 BONNEVILLE POWER ADMIN., *supra* note 237, at A-12.

245 NAT'L HYDROPOWER ASS'N, *supra* note 121, at 12.

IV. Conclusion

This Comment does not identify all of the costs associated with aquifer recharge and pumped hydropower. Only a detailed feasibility study of these projects during oversupply events could successfully capture all of the advantages and disadvantages of these proposed solutions. But this Comment does identify many of the factors that deserve consideration when deciding whether other solutions to oversupply are more efficient and consistent with policy concerns than curtailing wind generators and charging BPA's power and transmission customers for the associated costs. While aquifer recharge and pumped hydropower require significant capital investments, detailed permitting and application processes, and other regulatory hurdles, these solutions to oversupply are more equitable, efficient, and sustainable than BPA's proposed alternative.

Aquifer recharge and pumped hydropower projects can harness surplus wind power during oversupply events. This furthers federal, state, and local incentives in favor of making efficient use of wind-generated power.[246] While aquifer recharge and pumped hydropower projects can require significant up-front capital investments, they eliminate the conflict surrounding allocating wind displacement costs among BPA power and transmission customers. It is also possible that these long-term solutions to the oversupply problem will cost less than allocating approximately $12 million in displacement costs every year that oversupply events occur. This becomes even more likely when one considers the possibility that more wind farms will be built in the Pacific Northwest over the next few years.

Any cost comparison between allocating wind displacement costs and the costs associated with aquifer recharge and pumped hydropower must give weight to the other benefits of nondisplacement solutions to oversupply. It is possible to reallocate water stored behind federal dams to serve a broader range of beneficial uses and meet energy, agricultural, and environmental needs.[247] Therefore, cost-effective aquifer recharge and pumped hydropower solutions to oversupply deserve further consideration by BPA and other interested parties when determining the best solution to the oversupply problem in the Pacific Northwest.

246 U.S. Energy Secretary Steven Chu advocated for pumped storage in a letter to the Governors of Oregon, Washington, Idaho, and Montana. Chu recognized that "[p]umped storage has a unique potential in the Pacific Northwest where a higher percentage of wind generation has already been integrated into the region's transmission system than anywhere else in the nation." Pumped Storage Evaluation, *supra* note 120, at 3. He stated that "the Administration places a priority on improving the Nation's capabilities to integrate renewable resources into its electricity supply," encouraged the "full exploration of pumped storage potential in the context of providing necessary intermittent renewable integration services." *Id.*

247 Integrated Water Resources Strategy, *supra* note 90, at 92.