June 2, 2021

MEMORANDUM

TO: **Council Members**

FROM: **Gillian Charles, Senior Policy Analyst**

SUBJECT: **Considerations of Large-Scale Renewable Resource Deployment**

BACKGROUND:

Presenter: Gillian Charles

Summary: Staff will present a summary of considerations of a large-scale renewable resource deployment – across the region and the western interconnect (WECC). When we develop a generating resource reference plant as a potential future option for acquisition as part of the power plan analysis, we are creating an estimate based on a single project of typical size and configuration in the Pacific Northwest (for example, a 100 megawatt solar PV plant). With the significant new resource buildout indicated in the draft 2021 Power Plan analysis, staff is exploring potential implications that may not be explicitly accounted for in a single reference plant. For example, when considering a large-scale, expedited deployment of resources, are there concerns regarding supply chain availability, public perception, labor/workforce readiness, land-use, access to transmission, and environmental issues (beyond those accounted for in the reference plant and via the methodology for quantifying environmental costs and benefits) that should be considered when developing a resource strategy?

In addition, staff will provide some recommendations for your consideration in the draft 2021 Power Plan narrative.

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Considerations of Large-Scale Renewable Resource Deployment

June 7, 2021 – Power Committee

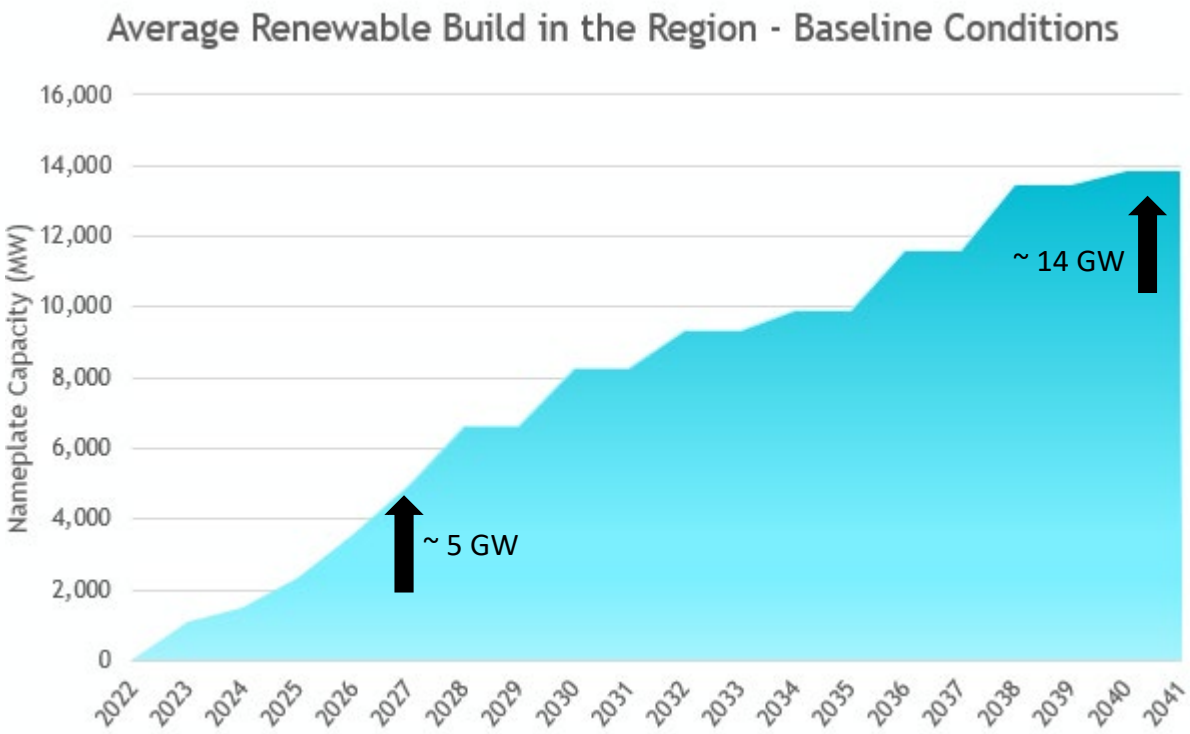
Gillian Charles

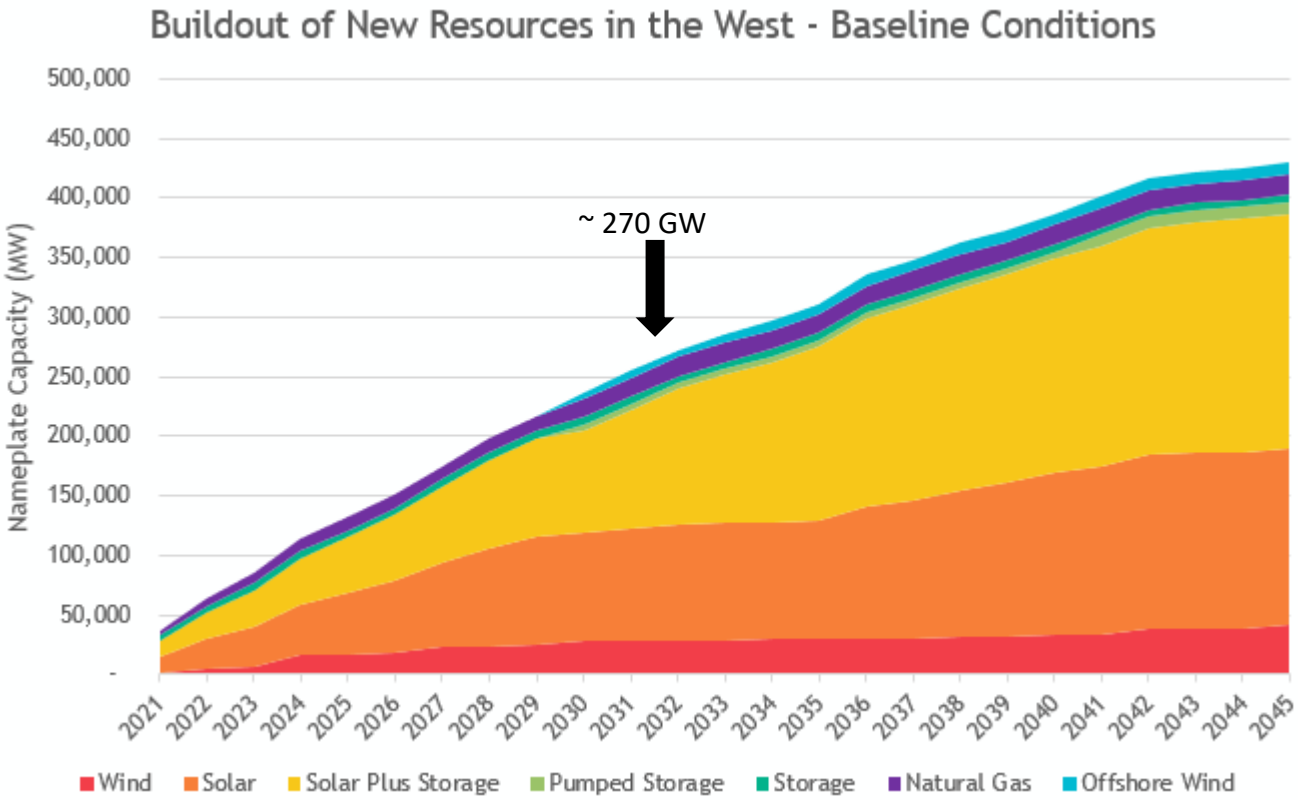
THE 2021 NORTHWEST POWER PLAN

FOR A SECURE & AFFORDABLE ENERGY FUTURE

Potential Buildout* of New Resources – Region & WECC

Roughly 5 GW of new renewable resources acquired in region in the action plan period

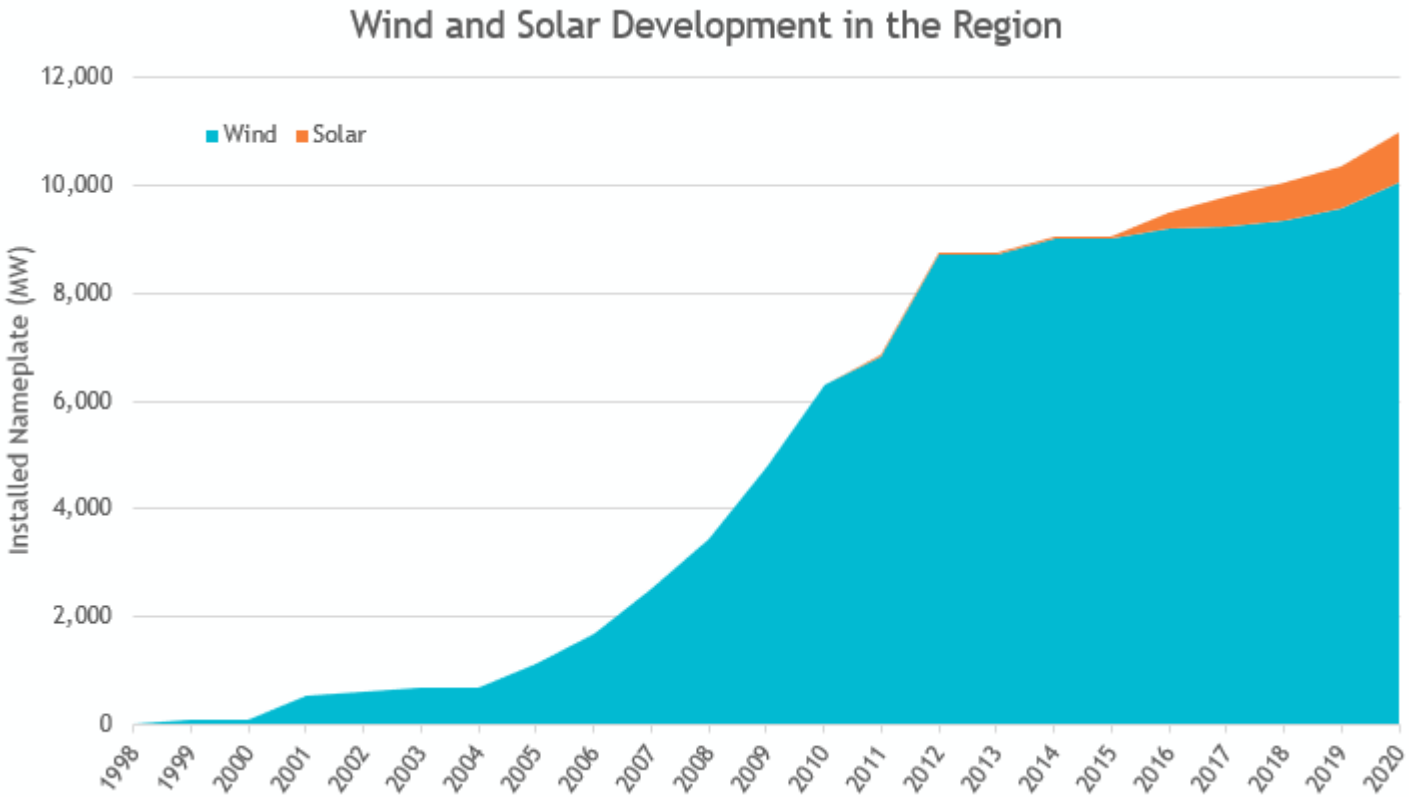




Roughly 200 GW of new resources acquired across the WECC by 2028
(For reference, the installed nameplate capacity in 2020 was ~270 GW)

*Analyses from draft 2021 Power Plan, baseline conditions

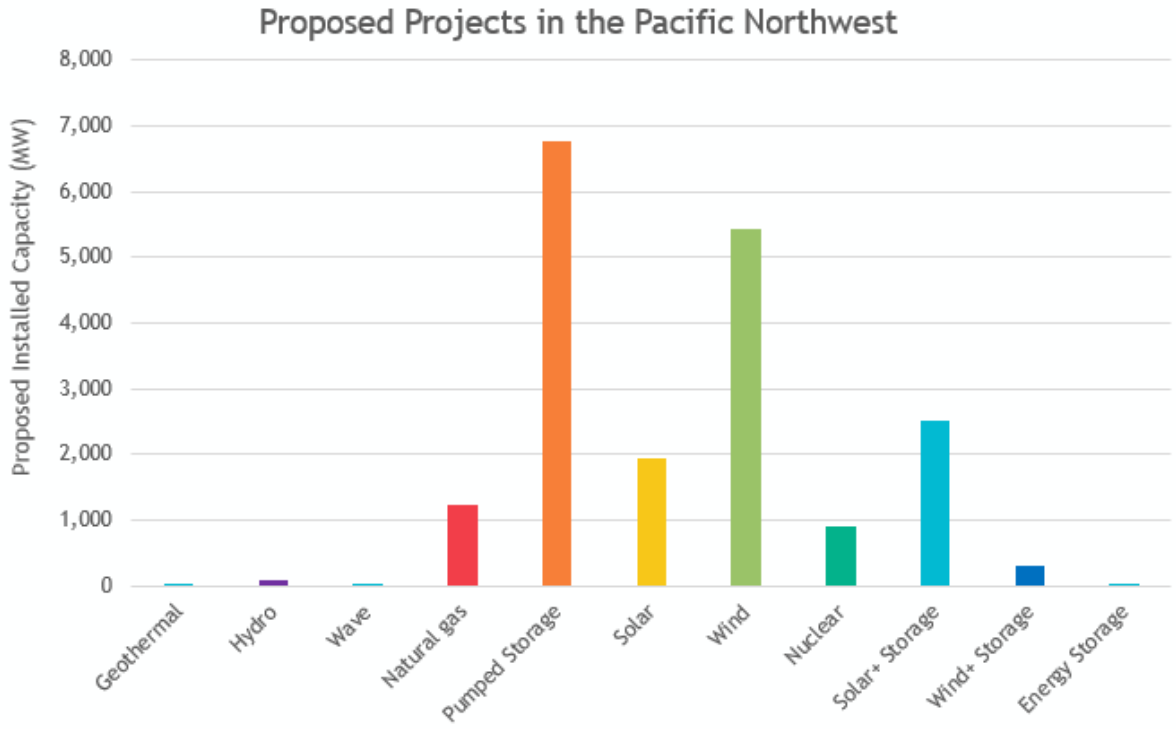
Significant wind resource buildout starting in the mid-2000's



- Renewable portfolio standards and federal tax credits aided in the significant buildout of wind in the region
- From 2005 to 2012, over 8 GW of wind was developed in the region

Proposed development pipeline in the region

- The Council tracks proposed projects in various phases of development in the region through the generating resources project database
- Substantial proposed megawatts in the region, however, lots of uncertainty around projects



Reminder: What is a generating resource reference plant?

A **reference plant** is a collection of characteristics that describe a resource technology and its theoretical application in the region. It includes estimates of typical costs, logistics, and operating specifications.

Resource Attributes
- Technology Type
- Configuration (# of units x MW)
- Capacity (MW)
- Location(s)
- Operating Life (yrs)
- Development & construction schedule
- Earliest in operation date (year)

Financials
- Financial Sponsor (IOU, IPP)
- Overnight Capital Cost ($/MWh)
- Fixed O&M ($/kW-yr)
- Variable O&M ($/MWh)
- Fixed Fuel Cost
- Transmission Cost

Operating Characteristics
- Capacity Factor
- Heat Rate
- Seasonal Shape

Development Potential
- Location
- Maximum Build-out

Methodology for quantifying environmental costs & benefits

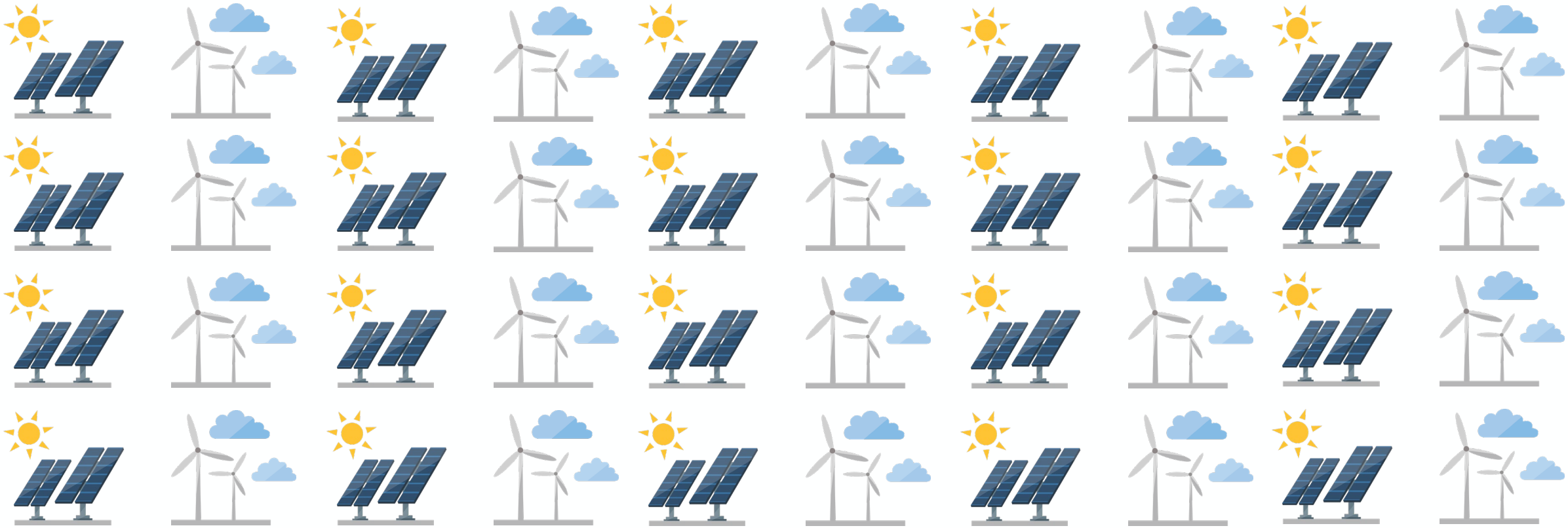
Siting and licensing costs

Decommissioning costs

15 MW and 100 MW Solar PV

216 MW Wind

While we are capturing the costs and characteristics of a single plant, what about a fleet?



Land-use intensity of solar and wind installations

Site specific – dependent on topography and configuration

Wind: Large spatial acreage, but infrastructure directly impacts ~1% of site area

Solar: Dense spatial landscape, ~90% direct impact

Judith Gap, Montana (135 MW) Source: Thomas Lee

Capricorn Ridge, Texas (662 MW), Source: Google Earth, Business Insider

Datong, Shanxi Province, China Source: Chinadaily.com

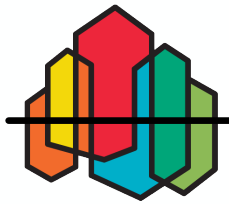
Boise City Solar, ID (40 MW) Source: Origis Energy

Environmental & Cultural Resource Effects

- Potential conflict between carbon-free, renewable resources and the conservation of the habitats and communities they populate
- Significant development of any type risks disturbing or interfering with cultural resources
- Environmental effects of proposed energy developments are analyzed as part of the siting process, through an array of criteria and procedures
- Concern that energy siting decisions may not be as protective of wildlife, habitat, cultural resources, and traditional uses as they could be (WDFW, CRITFC)
  - As scale of development increases, so do the concerns – about the impacts of individual decisions and the growing cumulative effects of projects in aggregate
  - For example, a single site can identify and mitigate for wildlife interactions, but what is the cumulative effect of multiple sites going through siting processes at different times?
- Is there a way to analyze and minimize the cumulative impacts and effects?

Siting and Licensing

- Various levels of siting and licensing regulations and approvals, depending on the location and size
  - Public = Federal agencies
  - Private = State, county jurisdiction
- For example, in Oregon, solar PV developments cannot exceed 12 acres when cited on high value farmland – per the Land Conservation Development Department
  - Scattering of 1.5-2.5 MW projects throughout the Willamette Valley
- Following up on potential environmental effects, is there a way to optimize the siting process across the states to help ensure that new renewable resource development is carried out in a manner that protects the wildlife, fish, and cultural resources of the Pacific Northwest?
  - Incorporate least-conflict siting with a consistent set of baseline protective standards?
  - Include deliberate, strategic outreach and engagement in the process with communities directly impacted by development
  - Ensure tribes are consulted with to understand and preserve cultural resources and traditional uses in vicinity of developments



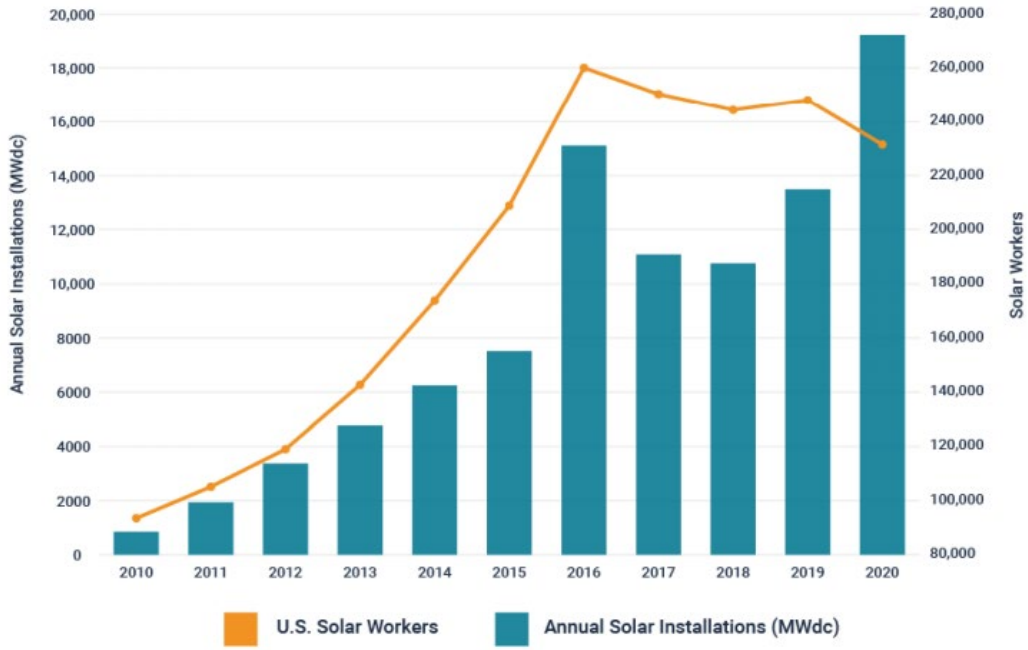
Transmission

- Existing transmission system: Common for a given transmission path to be fully contractually encumbered on a long-term, firm basis while still having substantial available physical capacity most or all hours of the year.
- While unused, short-term firm capacity is marketed for short-term utilization, this can have limited value for project developers who need deliverability guarantees in order to receive financing
- Long-term firm transmission access queues can be long and burdensome
- How can the existing transmission system be coordinated and optimized to meet the needs of future development, without significant new transmission infrastructure?

Image source: WECC

Workforce

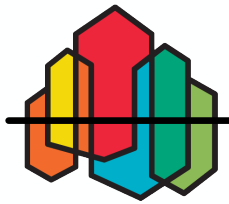
- National Solar Jobs Census 2020 (May 2021) found that solar industry employment in 2020 dopped 6.7% from 2019 levels, due primarily to the Covid-19 pandemic (utility-scale jobs decreased 4.3%)
  - However, 2020 saw record levels of solar capacity installation – attributed to labor productivity improvements such as increased PV system size
- Solar employment forecast to reach 400,000 solar jobs by 2030
  - In order to decarbonize grid and expand domestic manufacturing in alignment with current Administration objectives, census estimates workforce needs to reach 900,000 solar workers by 2035
- Regional efforts to boost workforce and prioritize clean energy jobs
  - E.g. workforce development and apprenticeship standards in CETA



Sources: National Solar Jobs Census 2020, SEIA/Wood Mackenzie Power & Renewables U.S. Solar Market Insight 2020 Year in Review

Supply Chain

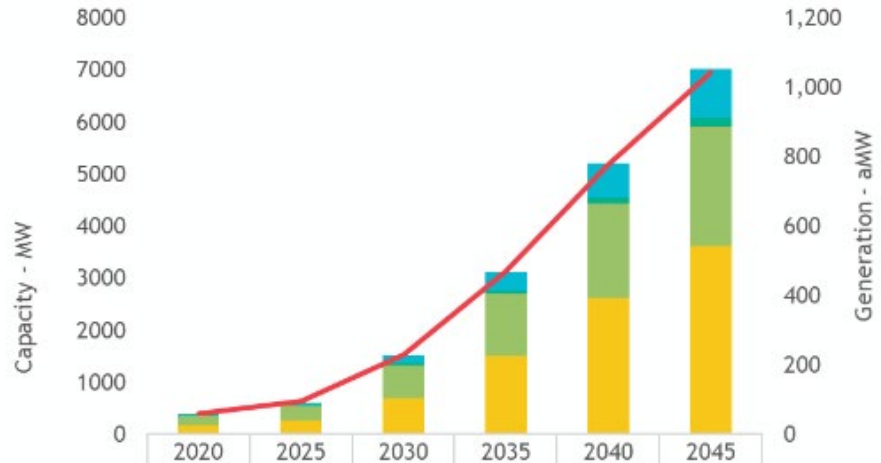
- 2020 was a record year for solar and wind installations in the U.S., even with the pandemic and tariffs
  - NREL and EIA predict 2021 installations to exceed 2020 (expected 21GW solar and 16 GW wind) – NREL Solar Industry Update, Apr 2021
  - First Solar produced record number of PV modules and imports were at historically high levels
- Covid-19 had indirect effect on financial health and profitability of tax-equity partners who collaborate with developers to take advantage of federal tax credits, introducing a level of uncertainty to some renewable investments
- Solar Industry Commitment to Environmental & Social Responsibility (SEIA) – top priority to "help ensure a sustainable and ethical solar supply chain globally"
  - Rising concerns regarding forced labor in sectors of supply chain in China



Potential Opportunities

Distributed Generation

Draft 2021 Plan:
Forecast of Distributed Solar Capacity and Generation



	2020	2025	2030	2035	2040	2045
Forecast Capacity MW - ID	34	57	154	350	647	952
Forecast Capacity MW - MT	8	12	31	64	114	164
Forecast Capacity MW - OR	187	281	634	1,186	1,817	2,289
Forecast Capacity MW - WA	165	264	695	1,503	2,616	3,615
Forecast Generation aMW - NW	61	94	230	467	775	1,041

Image source: Roschetzky Photography

Commercial Rooftop & On-site Solar PV

- Clif Bar bakery in Twin Falls, Idaho has 2MW ground-mounted solar PV installation across 5 acres

Image source: Clif Bar

Image source: Puttman Infrastructure

- Oregon Convention Center in Portland, Oregon has 2MW rooftop solar installation

Hybrid Projects

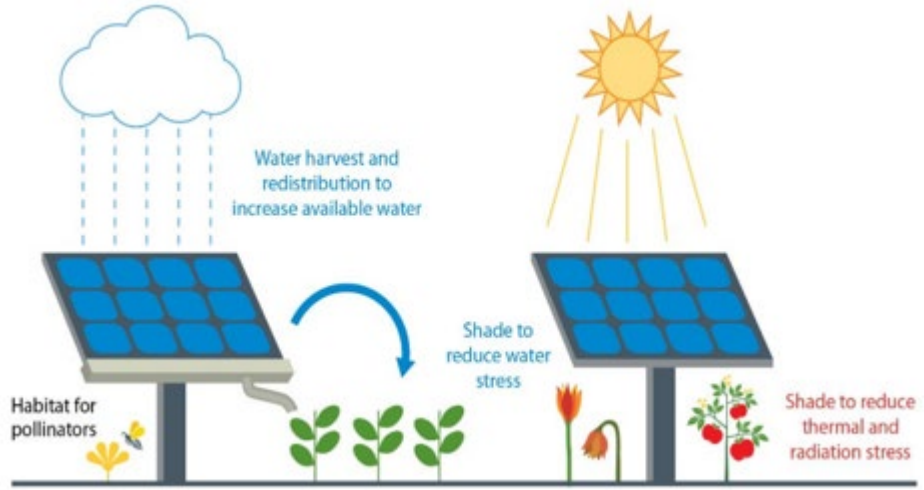
- Hybrid projects pair two or more technologies and share a single connection to the grid
- Over 2,500 MW proposed renewable + battery storage hybrid projects in the region's development queue
- Benefits and challenges to hybrid projects and they are often designed to be very site-specific

Wild Horse Wind and Solar Facility, Image source: CL Shebley, Shutterstock

Low-Impact Solar Development

- Low-impact solar PV aims to “improve soil health, retain water, nurture native species, produce food” – InSPIRE
- Preserves natural habitat, rather than leveling the land and removing topsoil in favor of gravel or artificial grass
- Significant research underway to learn best practices and beneficial pairings

Source: NREL



Source: Solar on Agricultural Lands: The DOE InSPIRE Project, Jordan Macknick (NREL) presented to NCSL Natural Resources and Infrastructure Committee (5/21/20)

InSPIRE project = Innovative Site Preparation and Impact Reductions on the Environment

Dual Purpose Projects

- Co-locate and integrate renewable energy with a complimentary trade, with stacked benefits gained from working together

Livestock grazing; Oregon State University

Apiaries @ Eagle Point Solar Farm, Jackson Cty, OR (Image Source: Pine Gate Renewables)

Agrivoltaics; Source: PV Magazine

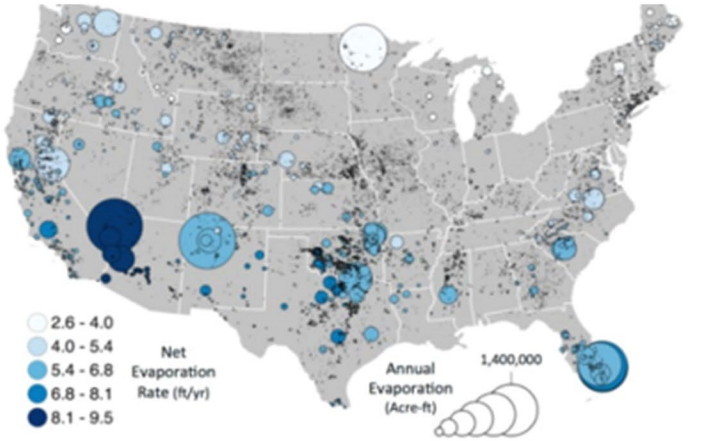
"The whole thing is just about doing better than the status quo. Looking at each site and figuring out what makes sense for the given region, for the site conditions, and what we are able to do that can benefit the physical land itself and the community beyond the power that's generated by the panels."
Julianne Wooten, Pine Gate Renewables, re: Eagle Point (interview with Solar Power World, 8/29/18)

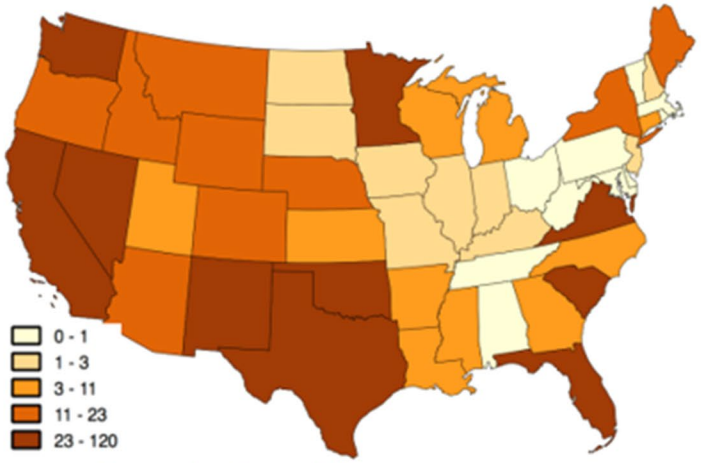
Key Highlight: Floating Solar on Agricultural Reservoirs

Siting on reservoirs can reduce evaporation and algae growth

Avoid conflicts with land used for agriculture

Recent NREL study identified over 25,000 man-made reservoirs that could supply 10% of U.S. power





Generation Potential (TWh/year)

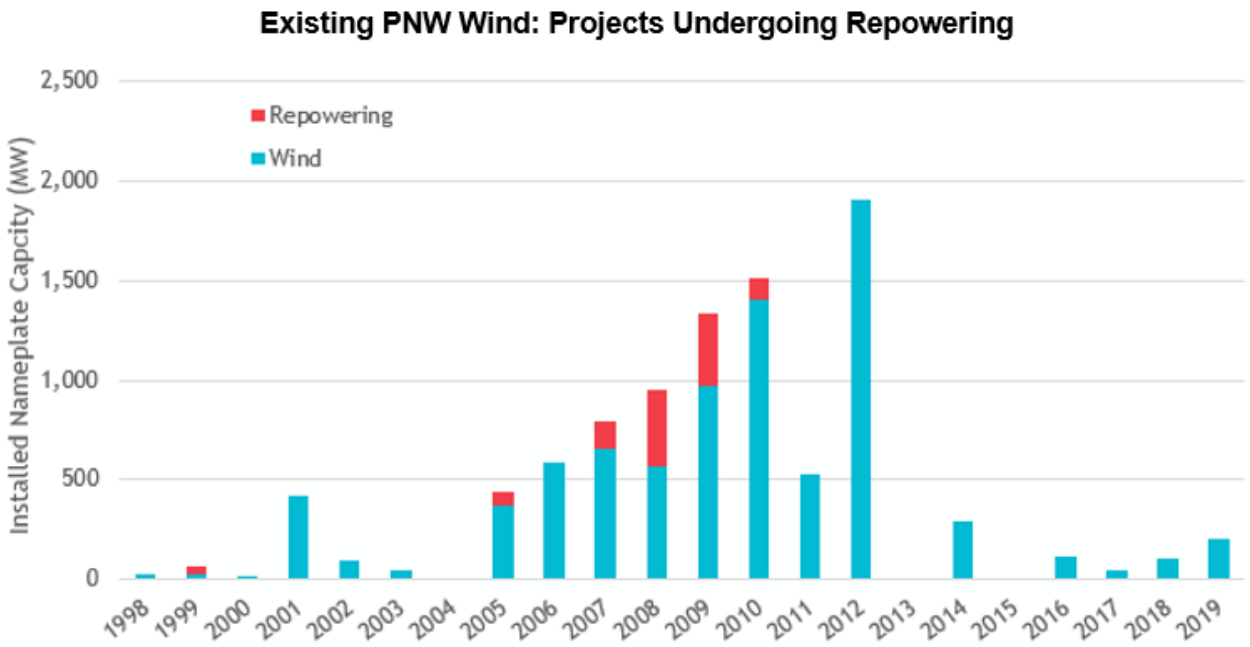
Floating Photovoltaic Systems: Assessing the Technical Potential of Photovoltaic Systems on Man-Made Water Bodies in the Continental United States, Robert S. Spencer, Jordan Macknick, Alexandra Aznar, Adam Warren, and Matthew O. Reese. Environ. Sci. Technol., 2019, 53 (3), pp 1680–1689

NREL | 22

Source: Solar on Agricultural Lands: The DOE InSPIRE Project, Jordan Macknick (NREL) presented to NCSL Natural Resources and Infrastructure Committee (5/21/20)

Repowering Existing Projects

- Repowering a wind project consists of replacing aging wind turbine components with new, more efficient products and technologies
- Improve efficiency of projects, and often capacity as well
- Maintain and improve valuable wind resource sites



Potential Considerations for Draft 2021 Power Plan

Potential Considerations for the Draft 2021 Power Plan

Consider language in the narrative that encourages any/all of the following:

- Diversification of renewable resource technologies, including distributed renewables, commercial rooftop solar PV, hybrid developments, low-impact development, dual-purpose projects, repowering of existing sites
- Engagement and collaboration between developers, state siting agencies, utilities, and local communities to work through and ensure equitable energy development
- Collaboration and consideration of regional transmission coordination to help ease barriers to transmission access and avoid excessive new infrastructure or transmission expansion
- Responsible siting and licensing in a manner that encourages least-conflict development and protects F&W and cultural resources in the Pacific Northwest (due consideration)