

Oregon Renewable Energy Siting Assessment (ORESAs) Overview

January 2021



OREGON
Department of
Land Conservation
& Development



ORESA Project

The ORESA project is funded through a \$1.1 million **U.S. Department of Defense Office of Economic Adjustment (DOD-OEA)** grant awarded to the Oregon Department of Energy, working with the Department of Land Conservation & Development and Oregon State University's Institute for Natural Resources.

ORESA: Goals and Objectives

DOD Goals

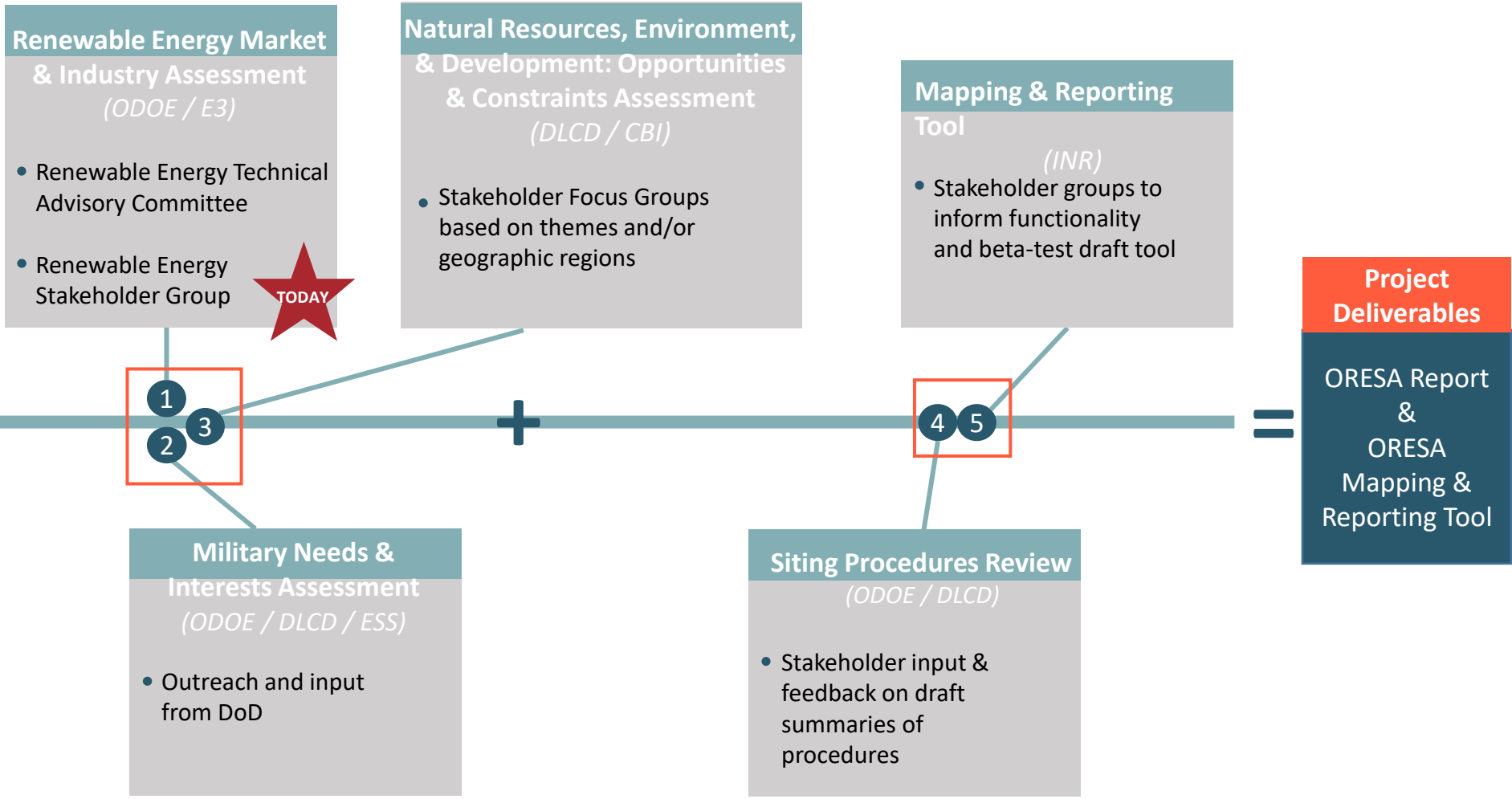
to support military compatibility through coordination with local, regional, and state agencies and raise awareness about the military through the ORESA project.

Project Goals

to create relevant educational tools for stakeholders, agencies, local governments, and policy makers about renewable energy development, military training and operational areas, economic/community benefits, land use considerations, natural, cultural, and environmental resources, and other regulatory requirements.

Project Objectives

to baseline data, information, and perspectives to create a transparent, consistent collection of trusted, accurate information in Oregon, without recommendations or endorsements, and note where information may be imprecise or uncertain.



ORESA Project: 5 Components



1

Renewable Energy Market & Industry Assessment (Led by ODOE and supported by Consulting Firm – E3: Energy and Environmental Economics)

- Collect data and model the future opportunity for development of renewable energy generation and transmission infrastructure in Oregon. Develop cost-optimized, renewable energy build-out scenarios for Oregon over the next 15 years. Build an understanding of the challenges and opportunities that exist in the renewable development community in Oregon and identify gaps that could be addressed for Oregon to meet its long-term energy goals.

STATUS

- E3 hosting preliminary results webinar today
- *Coming soon:* E3 working on draft assessment report

ORESA Project: 5 Components

2

Military Needs & Interests Assessment (Co-led by ODOE and DLCD and supported by Consulting Firm – Epsilon System Services (ESS))

- Collect data and information about current and future military assets, uses, needs, and case studies. Analyze data, protocols, and policies regarding military training and operating areas, including current and anticipated future uses. Note any constraints and opportunities between renewable energy development and military uses.

STATUS

- ESS research and feedback from Military entities
- *Coming soon:* ESS working on draft assessment report

ORESA Project: 5 Components

3

Natural Resources, Environment, and Development: Opportunities & Constraints Assessment (Led by DLCDC and supported by Consulting Firm Conservation Biology Institute (CBI))

- Collect data and information regarding the presence of natural, cultural, and environmental resources, as well as, jurisdictional protections, development constraints, and commercial interests. Collect data and information regarding community and economic opportunities with renewable energy development. Build an understanding of renewable energy opportunities and constraints, including regulatory structures and protections vested with Tribal governments and local, state, and federal agencies.

STATUS

- CBI hosted [webinar series](#) and recordings available [online](#)
- *Coming soon*: CBI working on draft assessment report

ORESA Project: 5 Components

4

Siting Procedures Review (co-led by ODOE and DLCDC)

- Review and analysis of siting regulations, permitting, and project review processes as they relate to notification, identification, and evaluation of potential impacts. Develop summary of siting regulations and process review with feedback from stakeholders. Identify best practices in tools and strategies for engagement and improved coordination.

STATUS

- ODOE and DLCDC Staff research and drafting summaries
- *Future Stakeholder Engagement*: Feedback on draft summaries after assessment phase

ORESA Project: 5 Components

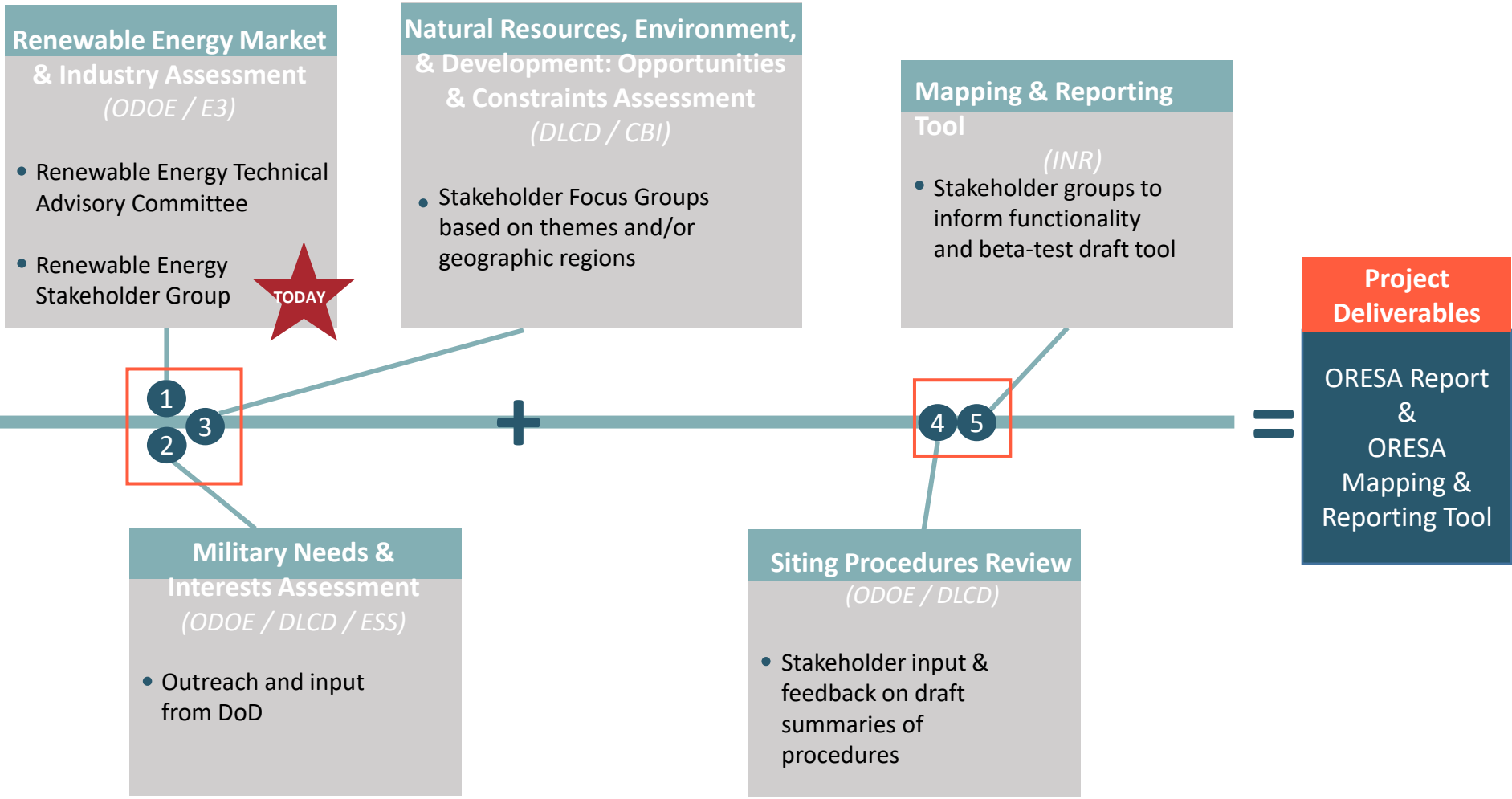
5

Mapping and Reporting Tool (led by INR)

- Develop a mapping and reporting tool, housed on [Oregon Explorer](#), with data and information about renewable energy; military training and operational areas; economic development opportunities; land use considerations; natural, cultural, and environmental resources; and other regulatory requirements. The tool should build a more comprehensive understanding of renewable energy and transmission development and support proactive coordination with stakeholders, agencies, local governments, and policymakers in the state. Development of the tool will involve stakeholders to help define use cases and reporting functionality.

STATUS

- INR coordinating data with consultants; drafted and posted [summary of mapping and reporting tool](#) objectives online
- *Future Stakeholder Engagement*: Convene user groups to inform tool development after assessment phase



Stay in touch!

Learn more about the ORESA project & stakeholder engagement:
<https://www.oregon.gov/energy/energy-oregon/Pages/ORESAspx>

Sign up for email updates on the ORESA project:
<http://web.energy.oregon.gov/cn/a6n53/subscribe>





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Renewable Energy Market Assessment Project Update

Preliminary Results Public Webinar

Tuesday January 19, 2020

Arne Olson, Senior Partner

Nick Schlag, Director

Femi Sawyerr, Consultant

Charles Gulian, Consultant

Emily Leslie (Energy Reflections)



+ Introduction

- REMA Overview
- Scenario Analysis
- Modeling Overview

+ Modeling Assumptions

- Geographic Screens
- Transmission Access
- Renewable Demand Scenarios

+ Results

- All Scenarios
- Individual Scenarios

+ Wrap up & next steps



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Introduction



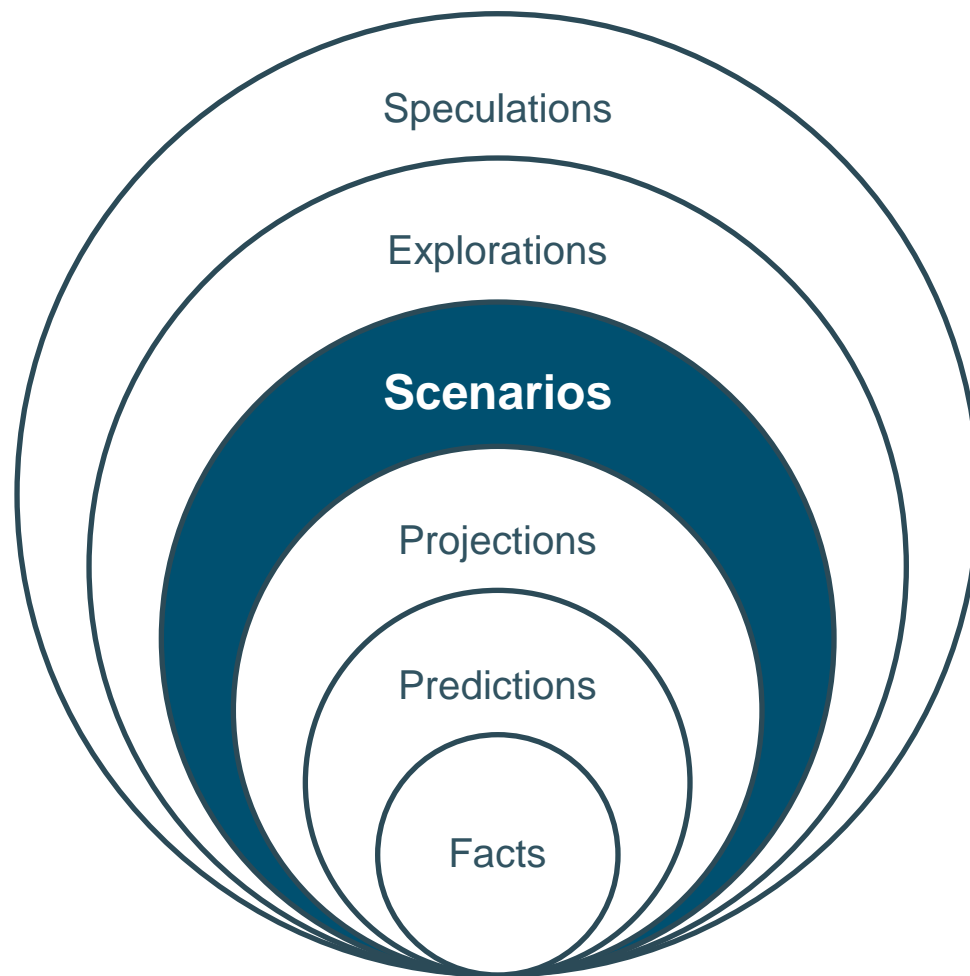
Renewable Energy Market Assessment Overview

- + The primary purpose of the Renewable Energy Market Assessment (REMA) is to provide plausible projections of how much renewable energy and infrastructure might be built in Oregon over the next 15 years**
- + To achieve this purpose E3 is conducting an analysis using a custom spreadsheet model that will utilize a scenario analysis approach to project multiple futures of renewable energy development**
 - Will consider several variables including resource economics, energy policy, commercial interest, and land use impacts
- + There are three main goals of this assessment**
 - Identify the type, quantity, and quality of resources available for Oregon to meet its long-term clean energy goals
 - Understand the existing and future transmission needs for development of these resources
 - Understand the tradeoffs that exist with different geographic resource constraints



Scenario analysis framework

- + This study uses scenario analysis to identify and analyze plausible outcomes for renewable development within the state of Oregon over the next fifteen years
- + Goal of scenario analysis is not to predict an outcome—but to highlight key drivers of and differences between scenarios to inform future decision making





Scenario analysis approach provided a range of portfolios

- + The scenarios chosen examined a range of potential outcomes that highlight key challenges and implications of achieving development at scale within the state
 - Key themes chosen in scenario design are **geography**, **technology**, and **transmission**

Analyzed Scenarios

Columbia Gorge Focus

1
Emphasis on continued development of renewables within the Columbia River Gorge

*Low renewable demand (1a)
and
High renewable demand (1b)*

Central/Eastern Oregon Focus

2
Emphasis on development of remote resources in southeast Oregon

High renewable demand

Distributed Resource Focus

3
Emphasis on development of distributed resources near loads that limit need for new transmission

High renewable demand

Offshore Wind Focus

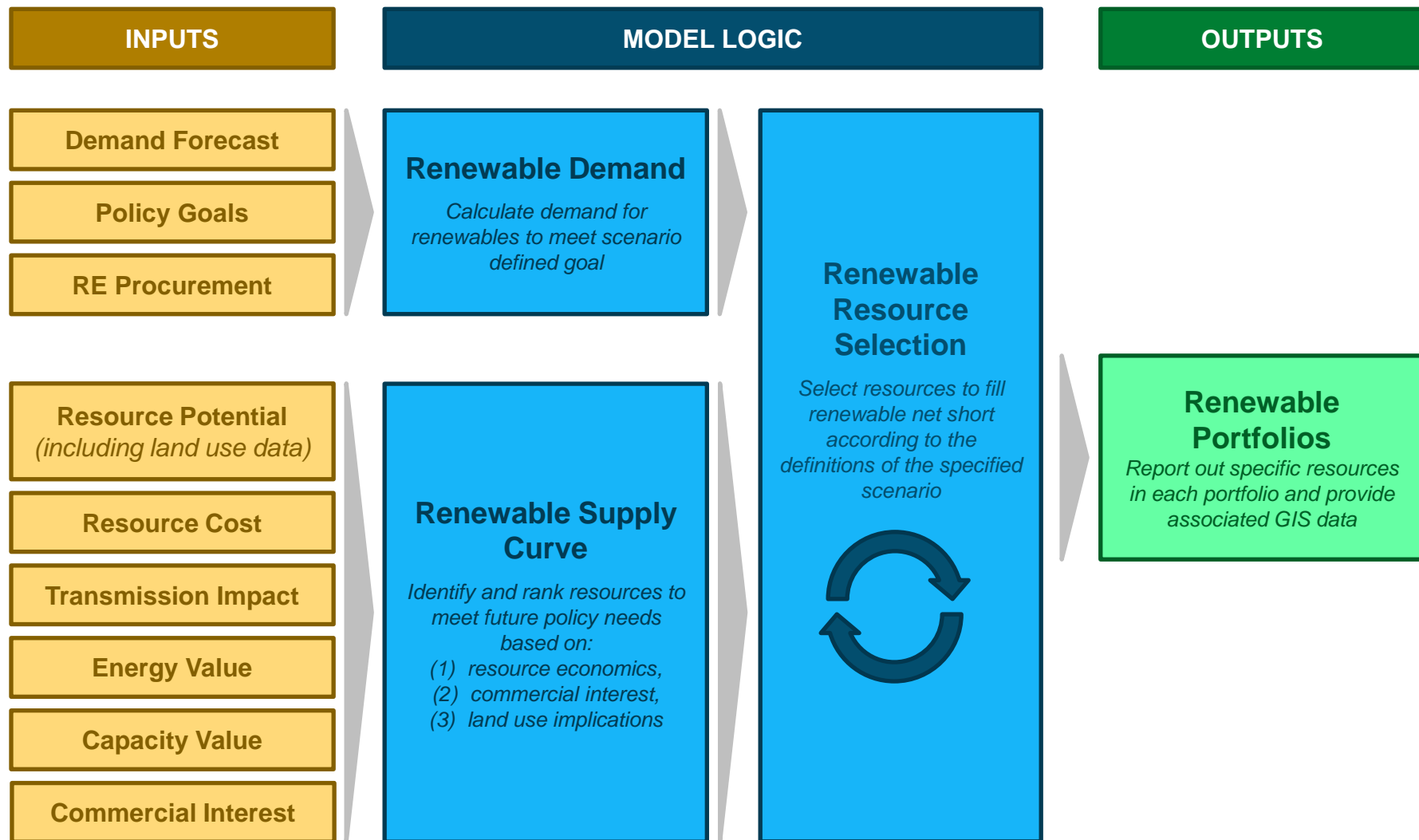
4
Emphasis of development of offshore wind resources to meet Oregon's needs

High renewable demand

Each scenario's focus indicates the primary – but not the only – source for new renewables in that scenario (i.e. each scenario will include some geographic and technological diversity)



Overview of portfolio development





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Modeling Assumptions



Updates to geographic screen representation

- + In the Inputs and Assumptions presentation we presented three geographic screens (Siting Levels 1 – 3) with increasing levels of land-use constraints**
- + Stakeholders and ORESA partners expressed concerns about these screens being overly restrictive for the purposes of this analysis**
 - Stakeholders provided additional context on the historical and current peculiarities of the land-use perspective in Oregon
- + E3 worked with the ODOE, the military, other ORESA partners, and stakeholders to reconfigure the representation of the geographic screens**
- + The outcome of this work is a single supply curve that has a significant amount of renewable potential**
 - The supply curve combines two geographic screens which are discussed in subsequent slides



Geographic screen definitions

Siting Level 0:

Technoeconomic Screen

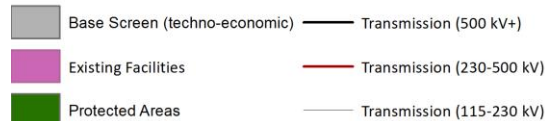
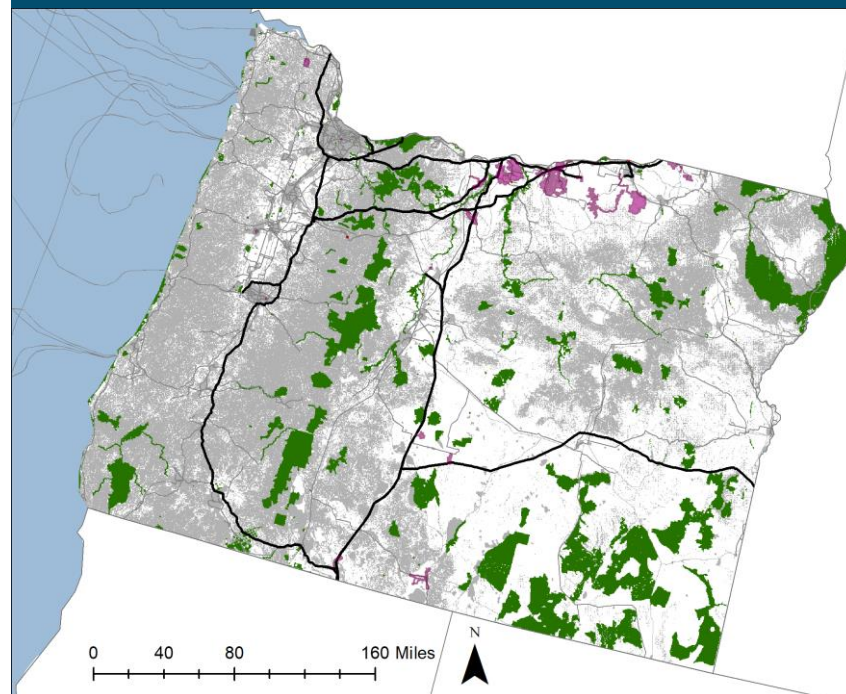
- + Areas where development is unlikely due to technical or economic barriers
- + Examples: steeply sloped areas, water bodies, railways, flood zones

Siting Level 1:

Legally Prohibited Areas

- + Areas where existing Federal, Tribal, State or Local legal restrictions would discourage renewable energy development as a matter of law or management policy
- + Examples: National Wildlife Refuge, National Parks, State Wildlife Areas, State Parks

Siting Level 1 Visualization



The potential impacts of the additional geographic screens will be discussed qualitatively in the report, highlighting the need for more nuanced and granular analysis



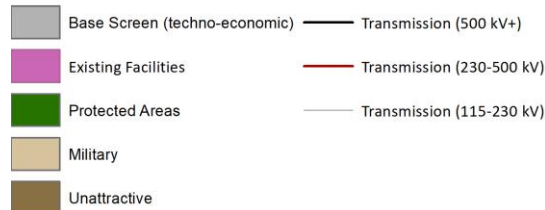
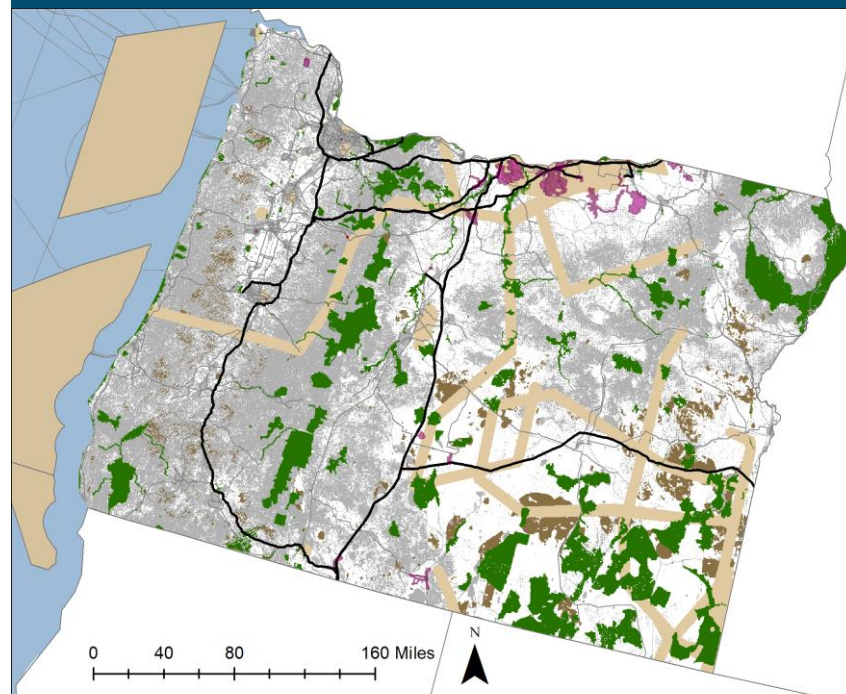
Geographic screen definitions

Siting Level 2:

Administratively Protected Areas with Additional Considerations

- + Areas where the siting of renewable energy projects requires Federal, Tribal, State or Local permitting process with increased regulatory or consultation requirements
- + These are areas on which renewable energy development is considered on a case-by-case basis
- + Examples: Specific military areas, areas subject to Statewide Planning Goal 5 (Natural Resources), areas with cultural resources present, biological wildlife habitat not inventoried in local plans, high-value prime farmland soils, threatened and endangered species

Siting Level 2 Visualization



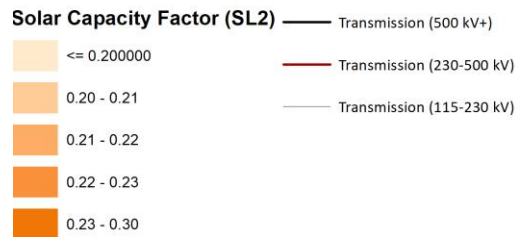
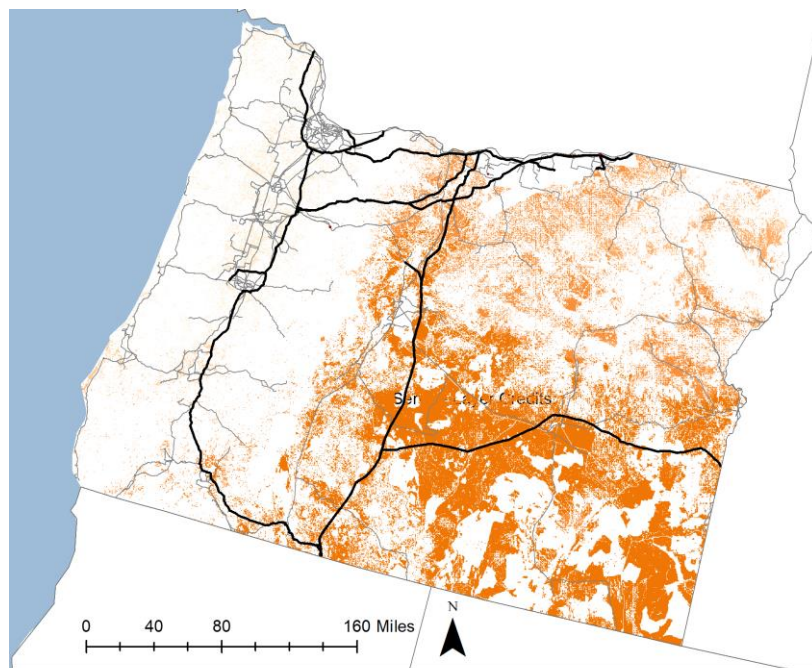
The potential impacts of the additional geographic screens will be discussed qualitatively in the report, highlighting the need for more nuanced and granular analysis



Siting Level 2 removes areas that are unattractive to developers

| Resource | Cap. Factor (%) | SL 2 Potential (GW) |
|----------|-----------------|---------------------|
| Solar | <20% | 196 |
| | 20-21% | 47 |
| | 21%-22% | 194 |
| | 22%-23% | 546 |
| | 23%-30% | 2124 |

Resource Potential, Siting Level 2 - Solar



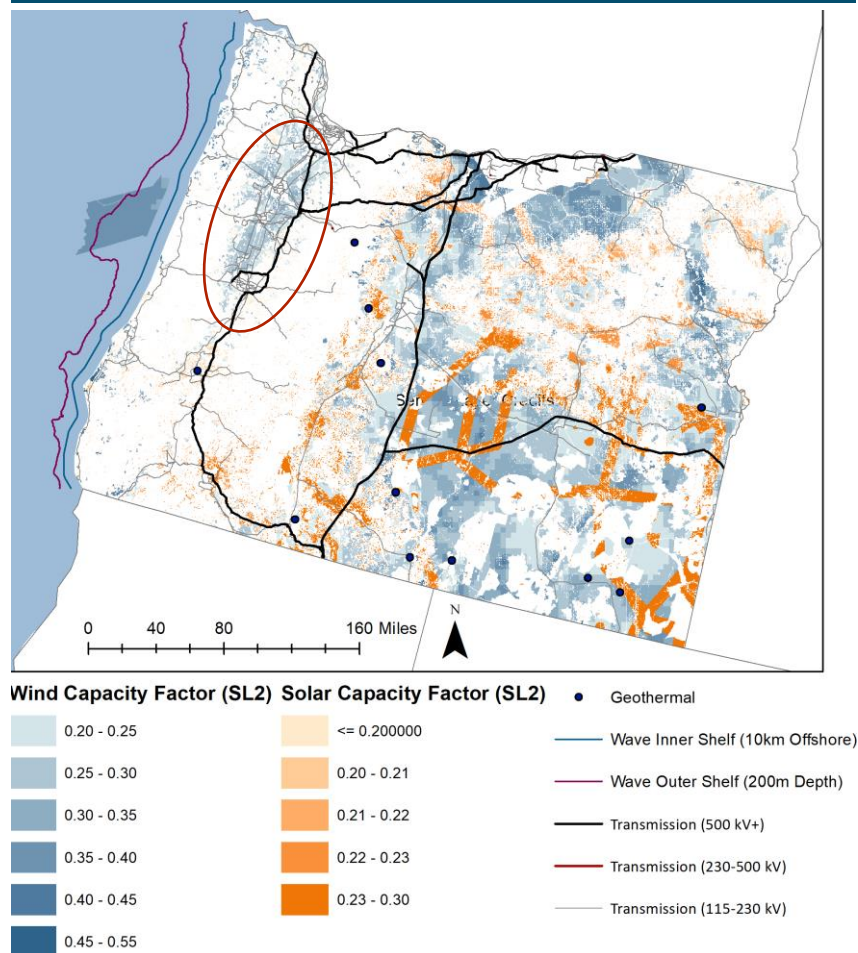


Siting Level 2 removes areas that are unattractive to developers

| Resource | Cap. Factor (%) | SL 2 Potential (GW) |
|---------------|-----------------|---------------------|
| Solar | <20% | 196 |
| | 20-21% | 47 |
| | 21%-22% | 194 |
| | 22%-23% | 546 |
| | 23%-30% | 2124 |
| Wind | 25-30% | 58 |
| | 30%-35% | 42 |
| | 35%-40% | 15 |
| Offshore Wind | 35%-40% | 1 |
| | 40%-45% | 28 |
| | 45%-50% | N/A |
| | 50%-55% | N/A |
| Geothermal | 80% | 0.4 |
| Wave | 25%-45% | 9.0 |

Onshore wind in the Willamette Valley area was excluded from the supply curve used in the model based on stakeholder feedback on historical and current wind development trends

Resource Potential, Siting Level 2 – All



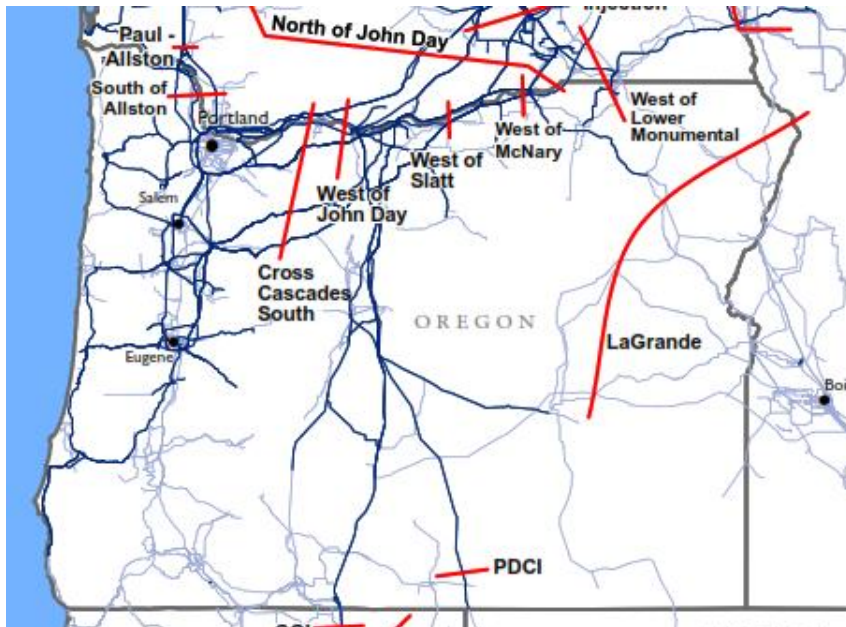


Developing transmission zones for Oregon

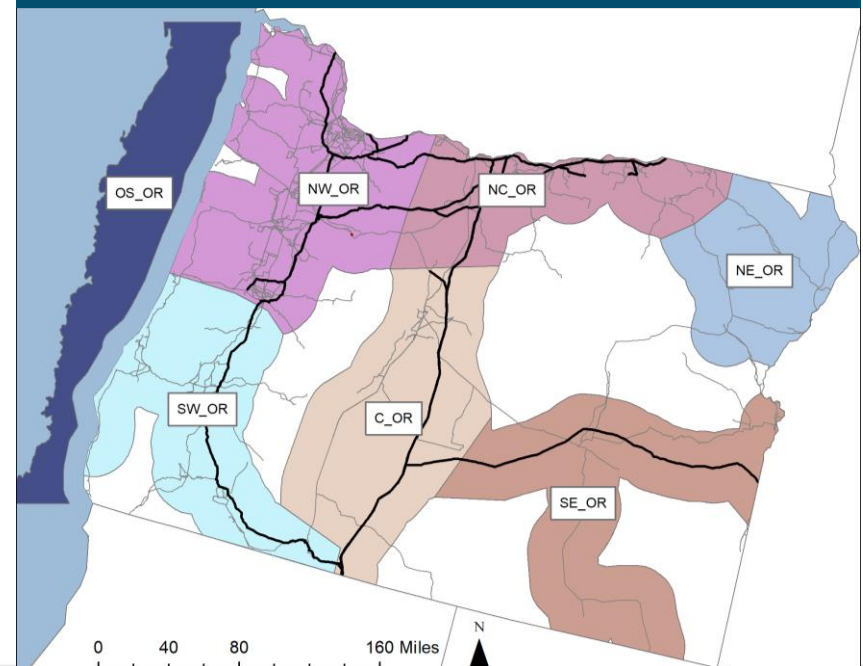
+ Based on discussions with BPA and NorthernGrid, renewable supply curve is divided into regions to reflect transmission constraints

- NW and NC zones are separated by the Cross Cascades South flow gate
- Central zone is constrained by Pacific AC Intertie to the North
- NE zone is constrained by La Grande flow gate on the West
- SE zone will require new transmission development to connect to the Central zone

Key BPA Flowgates in Oregon



REMA Transmission Zones

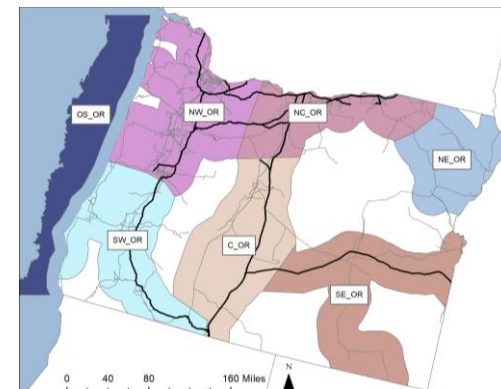




Transmission capability values for key Oregon related flowgates

+ The flowgate constraint values were obtained from 2020 BPA long-term available transfer capability (ATC) and conditional transfer capability (CTC) data

- This will be used to represent the transmission headroom for interconnection of new renewable resources within the zones; primarily to deliver to loads in the NW zone



| Zone | Headroom | | Tx Upgrade ³ | | |
|---------------|-------------------------------|-------------------------------|-------------------------|-----------|-----------|
| | Bulk System (MW) ¹ | Local Needs (MW) ² | Capital Cost (\$MM) | Cost Type | Size (MW) |
| Northwest | – | 572 | 528 | High | 1,500 |
| Southwest | – | 122 | 1,340 | High | 1,500 |
| North Central | 1,031 ⁴ | 22 | 944 | Mid | 1,500 |
| Central | 1,391 ⁵ | 104 | 1,096 | Mid | 1,500 |
| Northeast | 126 | 65 | 1,112 | Mid | 1,500 |
| Southeast | – | 18 | 1,472 | High | 1,500 |
| Offshore | – | – | 2,955 | High | 1,500 |

¹ Based on Available Transmission Capacity (ATC) as reported by BPA

² Assuming 5% of annual load within the zone can be served with renewables without major transmission upgrades (10% in “Distributed Focus” scenario)

³ Transmission upgrade characteristics assume delivery to NW Oregon load center

⁴ Available in all scenarios except “Southeast Oregon Focus” scenario

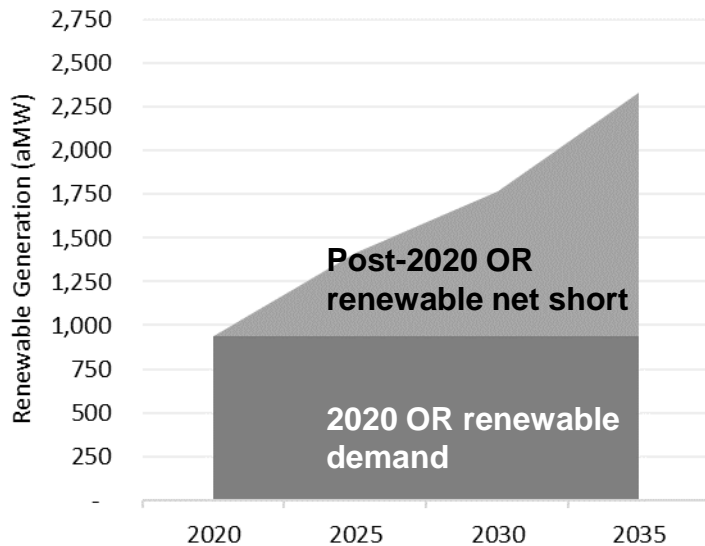
⁵ Available only in “Southeast Oregon Focus” scenario,



Multiple factors will affect demand for renewable development in Oregon

+ Oregon's RPS policy will require utilities to procure significant amounts of new renewable resources

- 50% by 2040 for large IOUs
- 25% by 2025 and thereafter for large COUs (>3% of retail sales) – with exemptions
- 10% by 2025 and thereafter for small COUs (1.5% - 3% of retail sales) – with exemptions
- 5% by 2025 and thereafter for smallest COUs (<1.5% of retail sales) – with exemptions



To meet 2035 RPS goals under current policy, OR utilities will have to procure a total of 1,400 aMW of new generation (based on NWPPCC 2021 Power Plan draft demand forecast)

The amount of new generation built in the state of Oregon over this period could be substantially lower due to procurement of resources outside Oregon to meet Oregon's RPS goals

Other factors could cause this "net short" to increase and could lead to more development within Oregon:

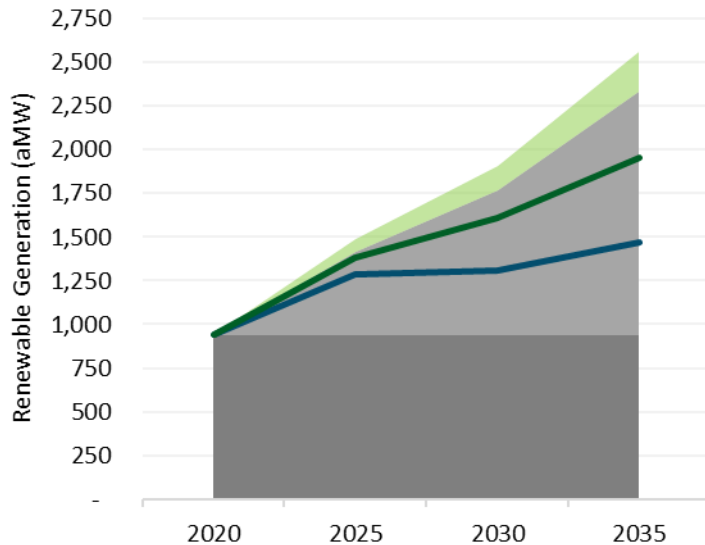
- *Voluntary commitments by utilities and corporate entities*
- *Increased policy goals*
- *Higher load growth due to electrification*



Multiple factors will affect demand for renewable development in Oregon

+ Recognizing the uncertainties that will affect the amount of development in the state, our analysis considers two levels of “demand” for renewable development within the state of Oregon:

1. “**Low Renewable Demand**” based on current RPS targets and utility plans as filed in IRPs
2. “**High Renewable Demand**” that reflects a combination of:
 - 62% reliance on Oregon in-state resources by 2035 to meet current policy goals;
 - Reflecting a future where other WECC jurisdictions require their own resources to meet their own policy goals
 - Increased demand due to higher loads driven by electrification



B

High Renewable Demand Scenario

- Not intended to be predictive but to test impacts of higher levels of in-state development
- All utilities meet 62% of renewable needs with in-state resources by 2035
- High Electrification and consistent with high CES policy
- Modeled in Scenarios 1-4

A

Low Renewable Demand Scenario

- PacifiCorp & PGE procure resources within OR consistent with most recent IRPs and interconnection queue information
- Modeled only in Scenario 1

■ 2020 Renewable Generation Demand ■ Post-2020 RNS - Low RE Demand
■ Incremental Post-2020 RNS - High RE Demand — High RE Demand Trajectory
— Low RE Demand Trajectory



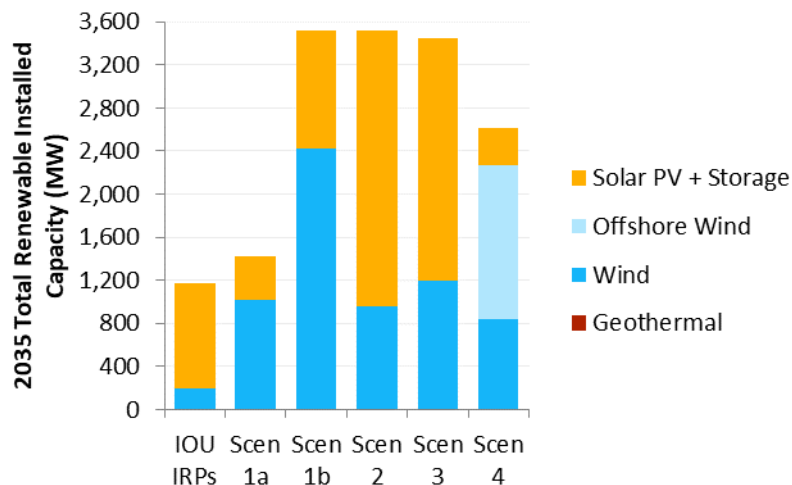
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Results



All Scenarios 2035 Snapshot

Cumulative Selected Renewable Capacity (MW)



All solar resources are modeled as a hybrid solar + 4-hr battery storage resource with the battery capacity sized to 25% of the solar capacity

Questions for Stakeholders:

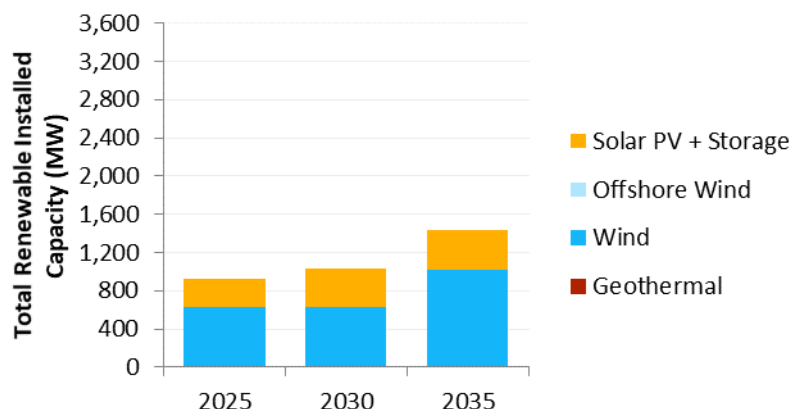
- What would be needed to achieve the buildout in each scenario?
- What obstacles exist to developing the resources in each scenario?

- + **Columbia Gorge Focus scenarios reflect continued development Gorge wind and solar resources located closer to load centers**
 - This will likely strain the existing transmission system in the High Demand
- + **Development of solar at a significant scale in the SE takes advantage of northbound capability on BPA system**
- + **Siting of solar resources near loads may require tradeoffs between high-value lands for ground-mounted and higher costs for rooftop systems**
- + **Addition of large quantities of offshore wind displaces significant levels of onshore wind and solar**

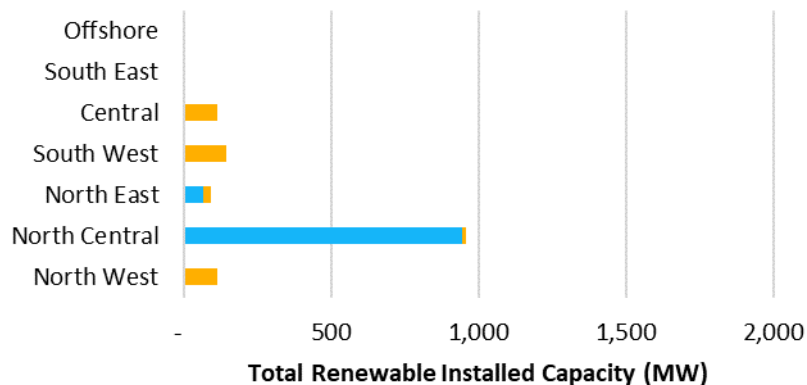


Scenario 1a – Columbia Gorge LD Results

Cumulative Selected Renewable Capacity (MW)



2035 Cumulative Selected Capacity by Zone (MW)



+ Beyond resources under construction, this scenario reflects a future with limited development of renewables in the state of Oregon

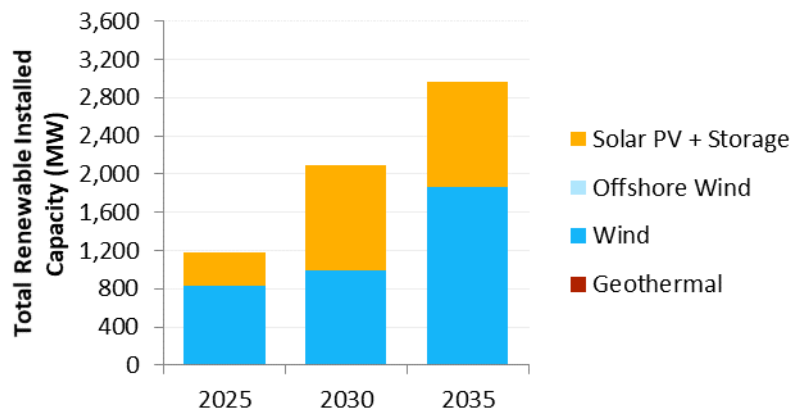
+ This level of renewable development within the state of OR is feasible only if utilities rely heavily on out-of-state resources to meet RPS needs over analysis horizon

- About 65% of incremental IOU RPS need is implicitly supplied by OOS resources and/or RECs
- Implies access to out-of-state resources will not be inhibited by other states' clean energy goals

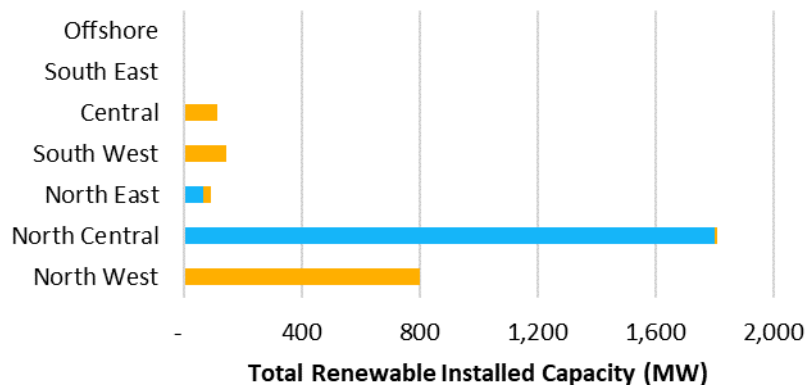


Scenario 1b – Columbia Gorge HD Results

Cumulative Selected Renewable Capacity (MW)



2035 Cumulative Selected Capacity by Zone (MW)



+ Scenario results reflect a combination of continued development of Gorge wind and solar resources located closer to load centers

- Especially in light of recent technological improvements, high quality wind sites in the Gorge remain to be developed
- Cost of solar has plummeted over past decade, and even in the Northwest it is still competitive

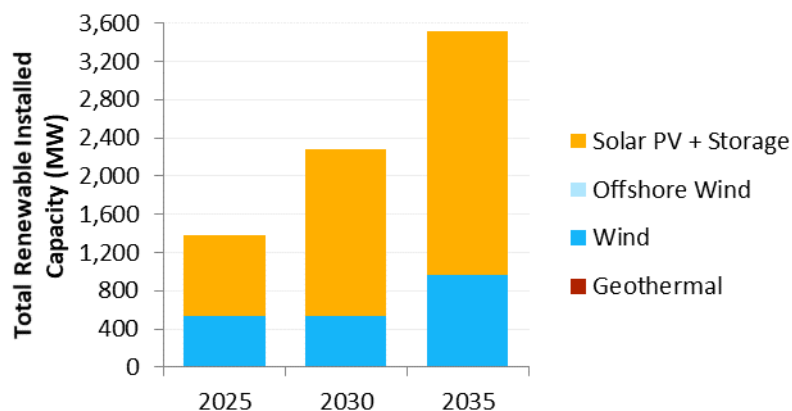
+ Buildout of wind in the Columbia Gorge will likely strain existing transmission network

- Buildout of wind in the Gorge will rely on all/most ATC and CTC remaining on the BPA system

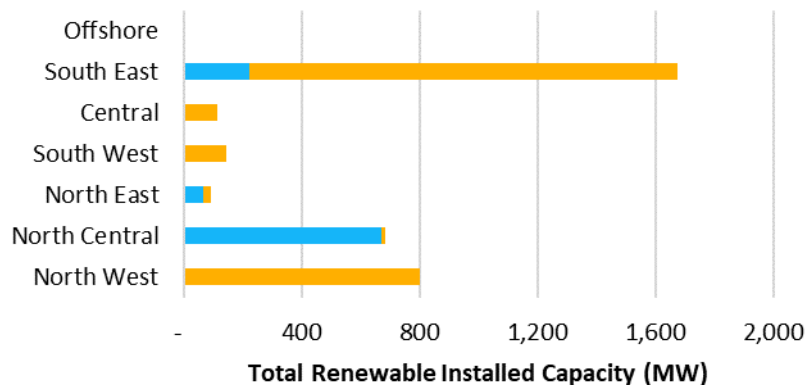


Scenario 2 – SE Oregon Results

Cumulative Selected Renewable Capacity (MW)



2035 Cumulative Selected Capacity by Zone (MW)



+ Development of solar at a significant scale in the SE takes advantage of northbound capability on BPA system

- Lower voltage transmission “gathering systems” are likely needed to achieve buildout at this scale
- Hybridization of solar with storage allows better utilization of transmission system and greater levels of installed capacity on the existing system

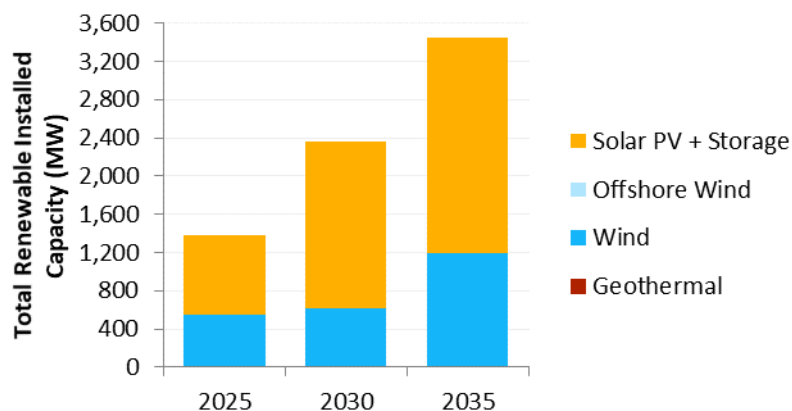
+ Location of solar resources to the east of the Cascades is likely flexible and can be further optimized:

- Central and Southeast solar resources are of relatively similar quality

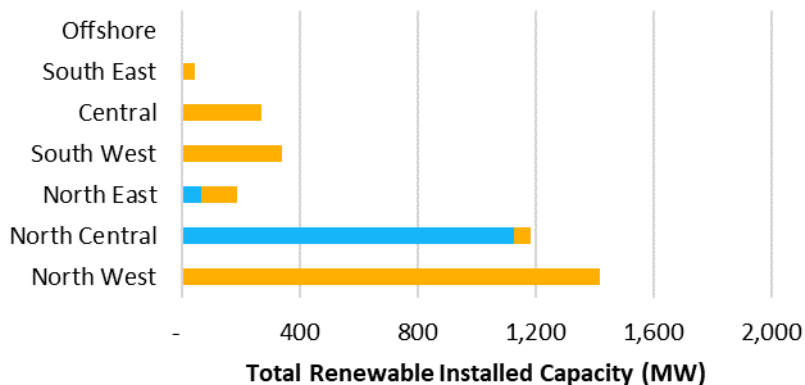


Scenario 3 – Distributed Energy Results

Cumulative Selected Renewable Capacity (MW)



2035 Cumulative Selected Capacity by Zone (MW)



+ Utilization of existing transmission allows some development of wind in the Gorge area, but most new development occurs in or near loads

- Local solar resources may help avoid costly transmission upgrades

+ Siting of solar resources near loads may pose challenges to development and create tension between land use and cost:

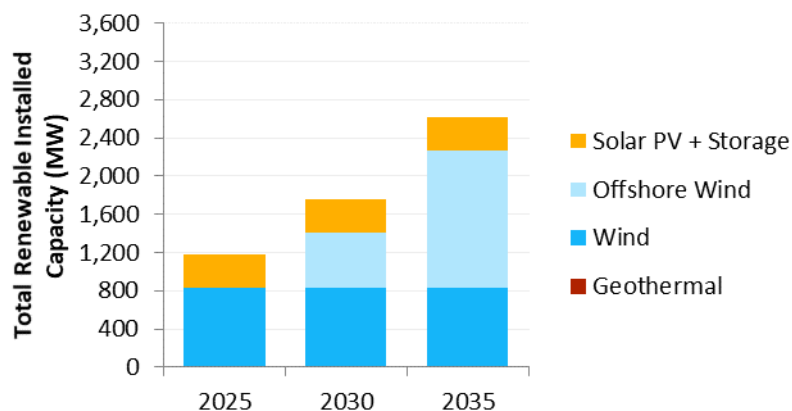
- Tradeoff between use of high value lands for low-cost ground-mounted solar PV or rooftops for higher cost solar PV resources

+ High levels of local solar resources may require storage and/or local transmission upgrades to integrate effectively

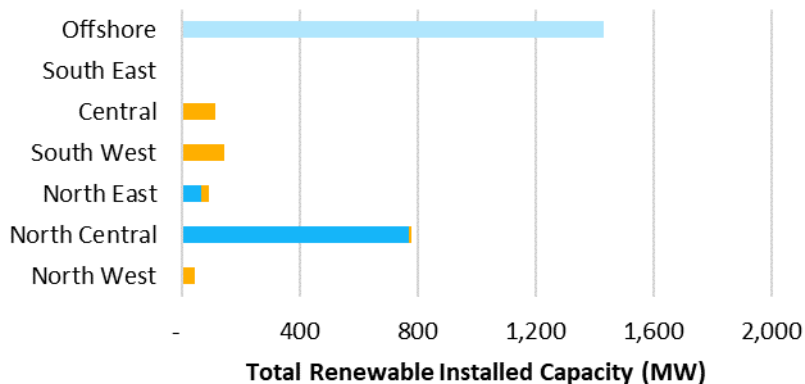


Scenario 4 – Offshore Wind Results

Cumulative Selected Renewable Capacity (MW)



2035 Cumulative Selected Capacity by Zone (MW)



- + Addition of large quantities of offshore wind displaces significant levels of onshore wind and solar
- + Implications for transmission system will be significant:
 - New transmission investments are likely needed to deliver offshore wind to load
 - Injection of offshore wind into load centers will cause changes to historical flow patterns and could affect how existing system is utilized
 - More study is needed to understand full implications for transmission system
- + While theoretical potential is significant, offshore wind is not a mature technology, and significant cost risks exist
 - Onshore resources provide stiff competition from a cost perspective



Summary of Key Takeaways

- + The potential for renewable energy development within Oregon significantly exceeds the renewable energy demand in Oregon over the next 15 years**
- + Columbia Gorge Focus scenarios reflect continued development Gorge wind and solar resources located closer to load centers**
 - This is feasible in the Low Demand scenario only if utilities rely heavily on out-of-state resources to meet RPS needs over the analysis horizon
 - This will likely strain the existing transmission system in the High Demand scenario
- + Development of solar at a significant scale in the SE takes advantage of northbound capability on BPA system but may require supporting transmission investments**
 - Location of solar resources to the east of the Cascades is likely flexible and can be further optimized
- + Siting of solar resources near loads will require tradeoffs between high-value lands for ground-mounted and higher costs for rooftop systems**
- + Addition of large quantities of offshore wind displaces significant levels of onshore wind and solar**
 - While theoretical potential is significant, offshore wind is not a mature technology, and significant cost risks exist



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Wrap up and next steps



+ Final Stakeholder Interviews

- Over the next couple weeks, E3 will follow-up with some stakeholders on responses from the industry assessment survey that might require deeper conversation

+ Assessment Report



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Thank You

Energy and Environmental Economics, Inc. (E3)

44 Montgomery Street, Suite 1500

San Francisco, CA 94104

Tel 415-391-5100

www.ethree.com

Arne Olson, Senior Partner (arne@ethree.com)

Lakshmi Alagappan, Partner (lakshmi@ethree.com)

Nick Schlag, Director (nick@ethree.com)

Femi Sawyerr, Consultant (femi@ethree.com)



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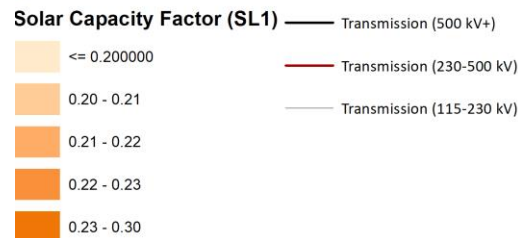
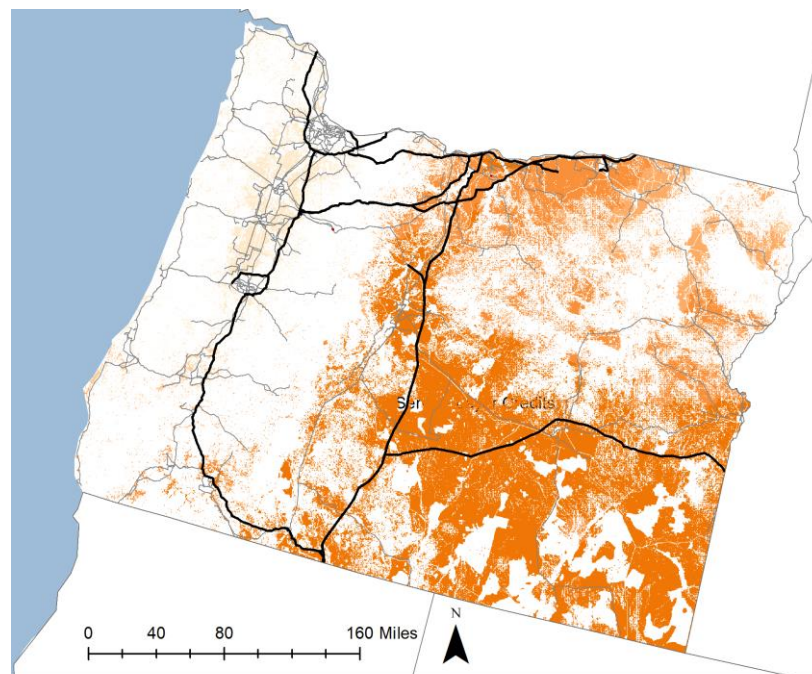
Appendix



Siting Level 1 allows vast amounts of RE potential

| Resource | Cap. Factor (%) | SL 1 Potential (GW) |
|----------|-----------------|---------------------|
| Solar | <20% | 326 |
| | 20-21% | 55 |
| | 21%-22% | 273 |
| | 22%-23% | 822 |
| | 23%-30% | 2,616 |

Resource Potential, Siting Level 1 - Solar





Siting Level 1 allows vast amounts of RE potential

| Resource | Cap. Factor (%) | SL 1 Potential (GW) |
|---------------|-----------------|---------------------|
| Solar | <20% | 326 |
| | 20-21% | 55 |
| | 21%-22% | 273 |
| | 22%-23% | 822 |
| | 23%-30% | 2,616 |
| Wind | 25-30% | 86 |
| | 30%-35% | 63 |
| | 35%-45% | 28 |
| Offshore Wind | 35%-40% | 29.4 |
| | 40%-45% | 110.5 |
| | 45%-50% | 13.2 |
| | 50%-55% | 22.0 |
| Geothermal | 80% | 0.4 |
| Wave | 25%-45% | 9.0 |

