100% Clean Energy, 100% Built-In-Oregon

An Economic Opportunity Analysis for Oregon's HB 2021 Electric Power Decarbonization Statute: Jobs, Tax Revenue, and Labor Income

Winter, 2022/23

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OREGON SOLAR + STORAGE INDUSTRIES ASSOCIATION

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Oregon Coast Energy Alliance Network

Objective

Question:

What is the *scale* of Economic Opportunity to Oregon's Economy of meeting Oregon's statutory 100% Clean Energy requirements if all the new generation were *entirely* built *In-State in Oregon*?

Particularly in terms of job creation, state & local tax revenue, and other indirect benefits

Path to the Answer:

Gross economic contribution analysis that compares the relative impacts of analyzed scenarios -- following the HB 2021 compliance milestones trajectory.

Current Renewable Energy Landscape

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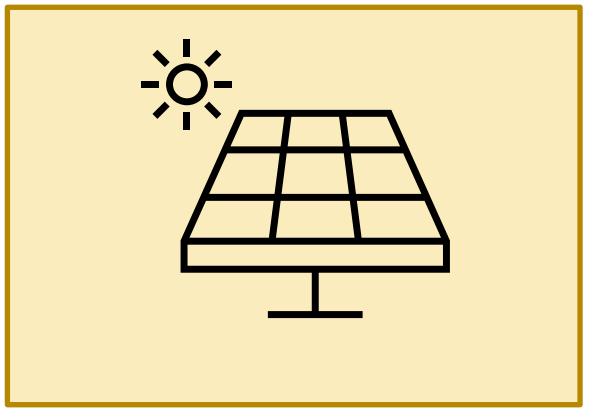
Key Oregon Decarbonization Mandates

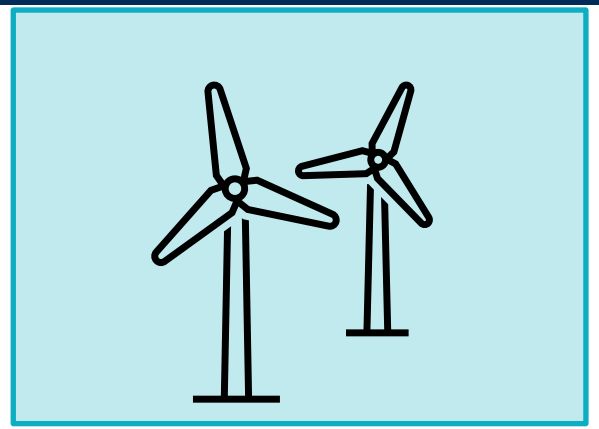
- **HB 2021 (2021) – 100% Clean Energy**
  - Regulates GHG emissions from two investor-owned utilities (IOUs) (PGE and PAC) and electricity service suppliers (ESS's).
  - Milestones for Emissions Reductions (below baseline):
    - **80% by 2030**
    - 90% by 2035
    - 100% by 2040
- **Renewable Portfolio Standard (RPS)**
  - SB 1547 (2016): 50% of electricity sold to retail consumers must be derived from renewable sources by 2040 (IOUs and co-ops). Milestone each 5 years.
  - HB 2021 adds to this.
- **Large Corporate Industrial Loads – Data Centers**
  - Most/all with 100% clean goals or requirements; several GW new load in PNW by 2040

Primary Contributing Renewable Energy Generation



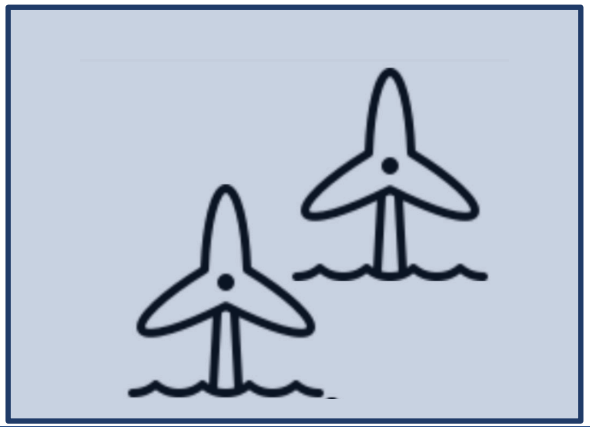
Solar PV

- Current total installed capacity in Oregon: **~1,330 MW**
- Solar generates **~3.06%** of Oregon's electricity
- Currently powers **~166,346 homes**
- Growth potential over next 5 years: **2,511 MW**



Onshore Wind

- Total current installed capacity in Oregon: **4,203 MW**
- Generates **15.7%** of Oregon's utility-scale electricity
- Currently under construction: **40 MW**

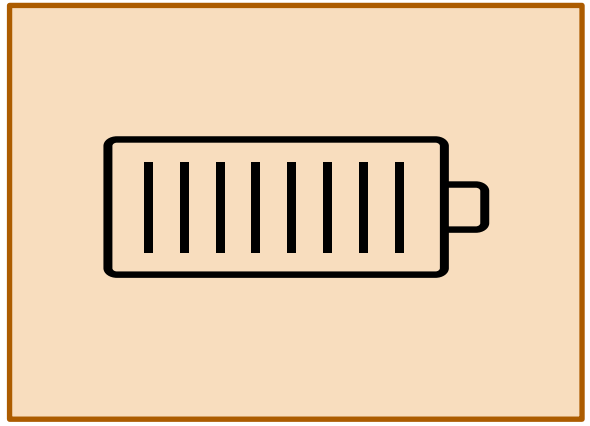


Offshore Wind

- No current projects
- State goal of **3 GW by 2030**

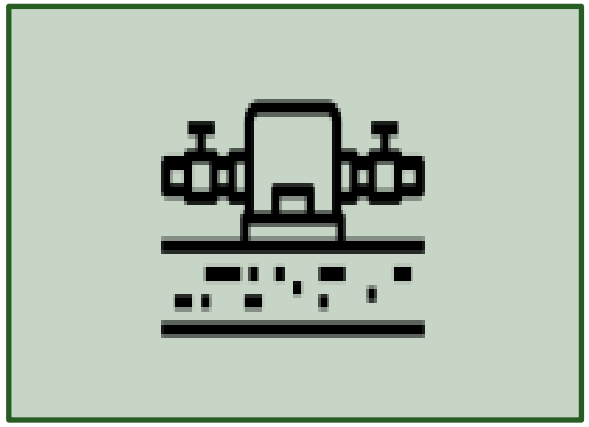
Sources: SEIA, 2022; *U.S. Office of Energy Efficiency & Renewable Energy.*
Oregon Department of Energy, 2021, Wind Power in Oregon.

Storage & Transmission



Battery Storage

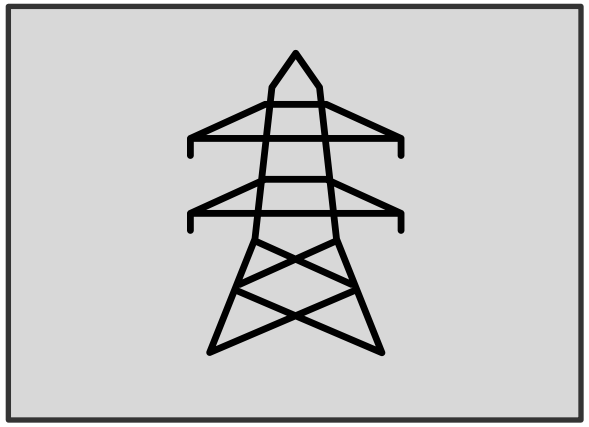
- Peak Power Capacity: **5 MW**
- Total capacity under construction: **430 MW**
- PacifiCorp: **600 MW planned**
- PGE: **240 MW planned**



Pumped Storage

- No completed projects
- Swan Lake Energy Storage: **400 MW** targeting completion in 2026-27

(PacifiCorp is exploring plans to construct three 500 MW facilities in Oregon: 1 @ Owyhee and 2 near Lakeview/Summer Lake. Rye Development also developing Goldendale Pumped Storage, which is in WA state, across Columbia from Oregon POI)



Transmission

In the Western Interconnection*:

- Bonneville Power: **15,209-mi**
- PacifiCorp: **16,600-mi**
- Idaho Power: **4,857-mi**
- **Portland General: 1,274-mi**

***Not all in Oregon**

Sources:
Oregon Department of Energy, *2020 Biennial Energy Report & Energy 101: Transmission*
Swan Lake Energy Storage, 2021
Oregon Department of Energy, *Hydropower*

The Model

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Inputs to Outputs

Inputs

Clean Energy Standards
(HB 2021 w/ RPS)

PGE, PAC, UEC emissions

3 GW new Data Center Loads assumed 100% clean

Conversion factors (U.S. Weighted Marginal Emissions Factor and capacity factors for each source)

Installation costs and distributions from NREL and EIA

IMPLAN

Outputs

Direct and secondary installation jobs

Direct O&M jobs

Labor income (total)

Spending (total)

Personal income tax (total)

Direct property taxes

Inputs

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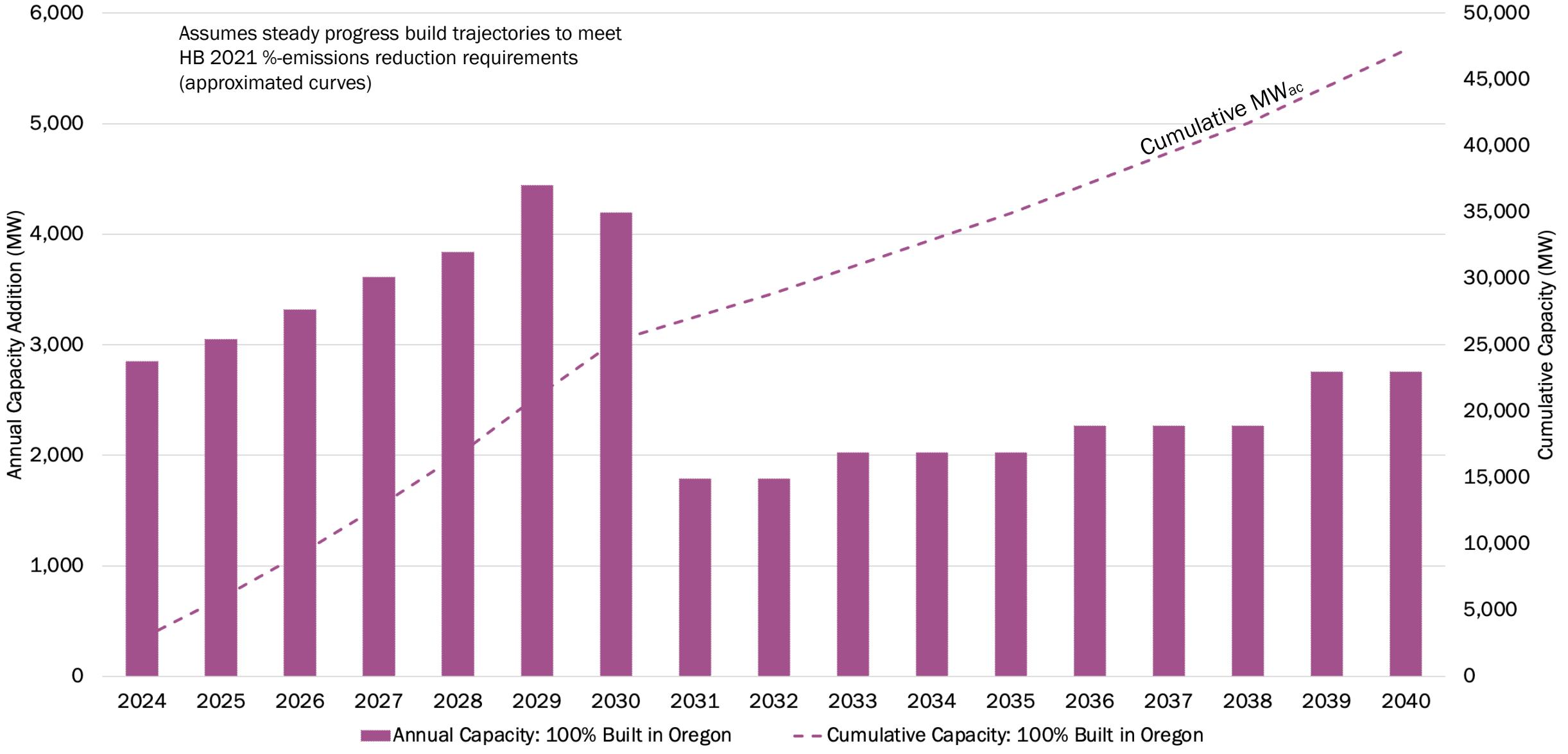
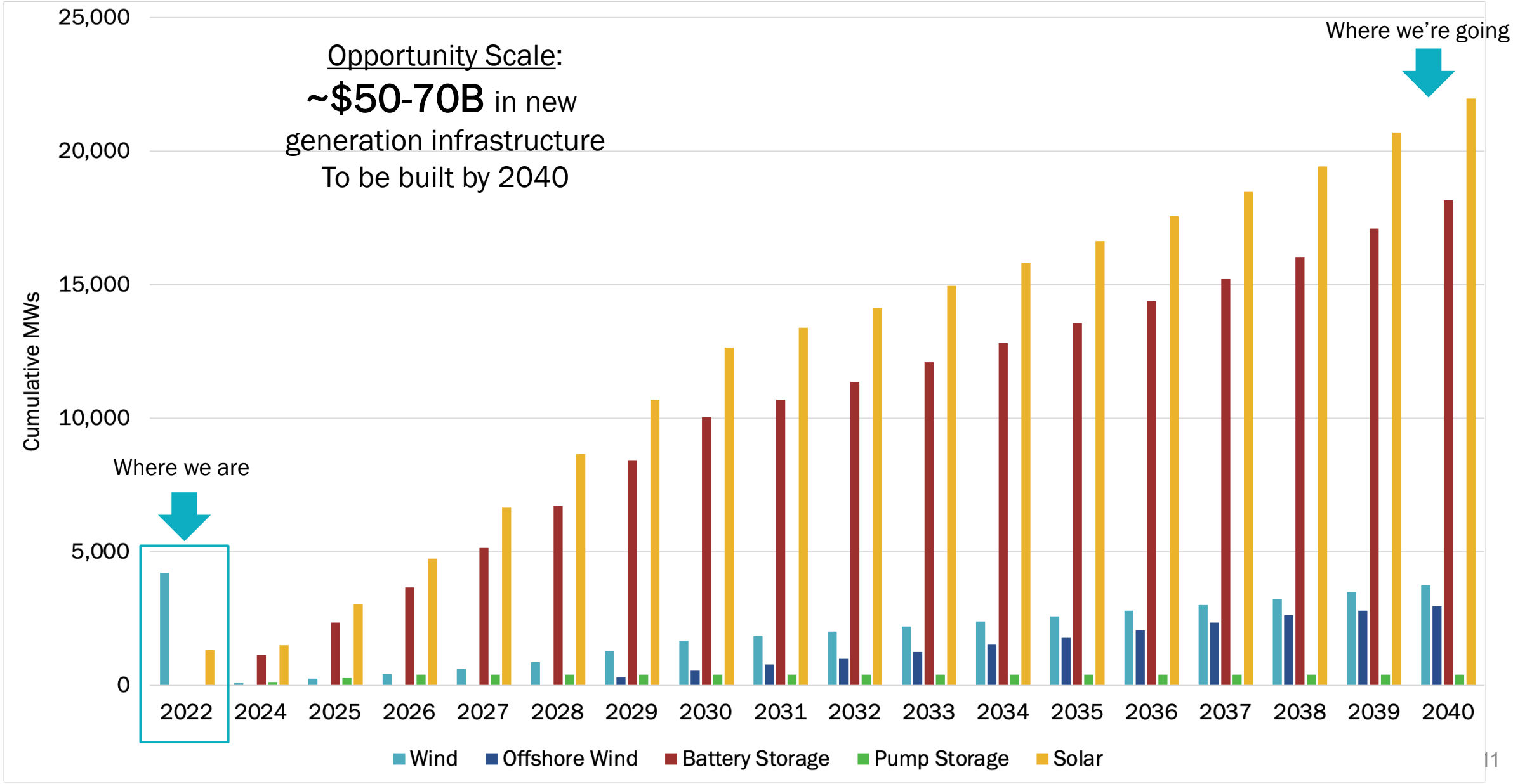
Total Estimated MW of New Generation



Note: Includes renewable generation and non-emitting storage technologies. Based on conversions of carbon emission to clean generators via approx. %CF.

Generation Build-Out Mix - by Technology



Outputs

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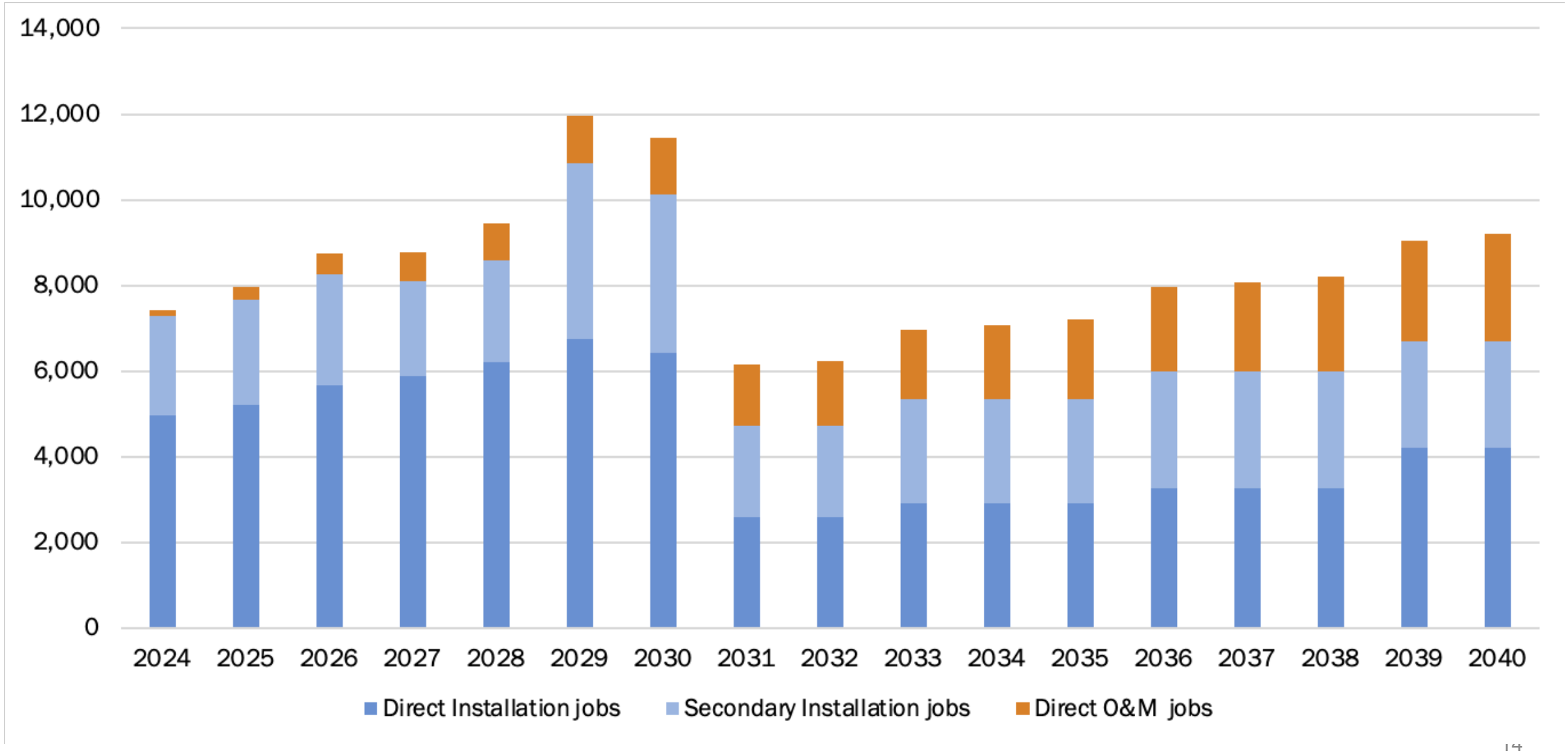
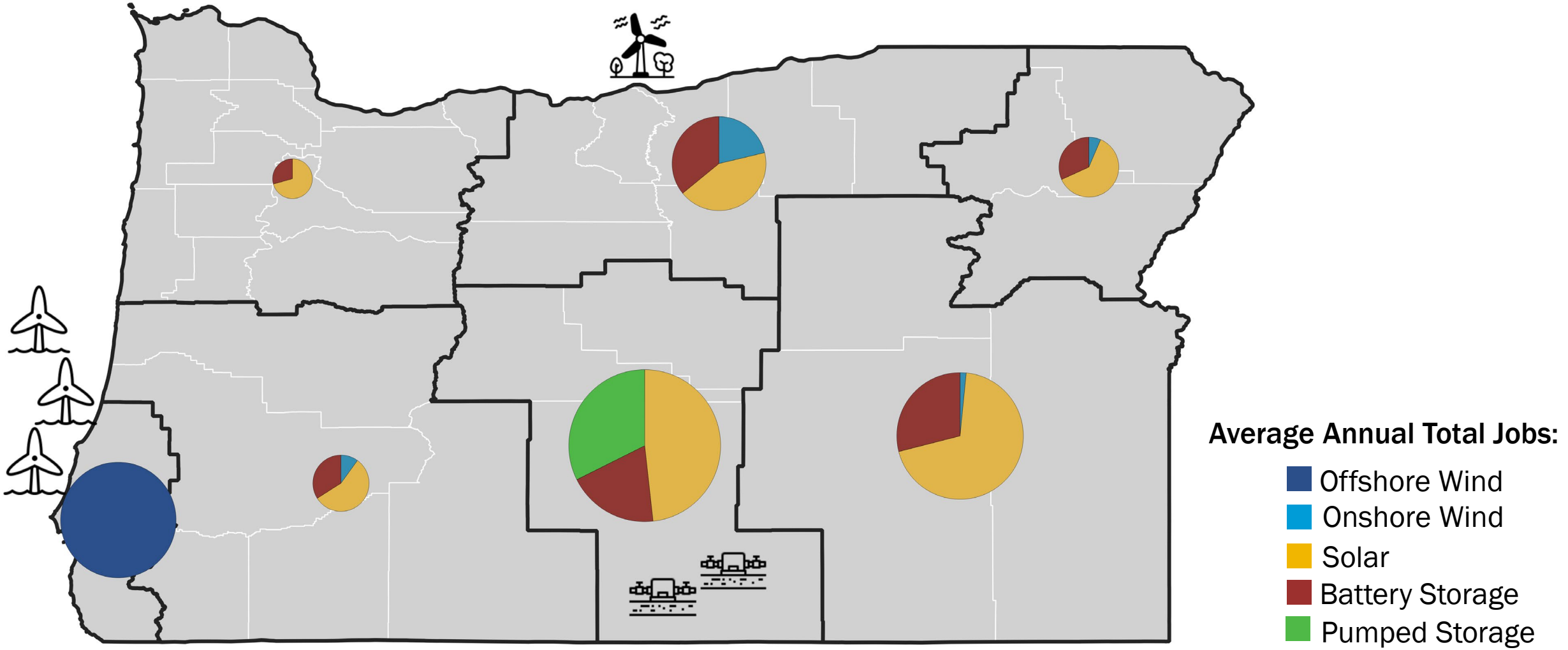
Estimated new capacity will contribute thousands of jobs, billions in economic activity, and generate over one billion in tax revenue.

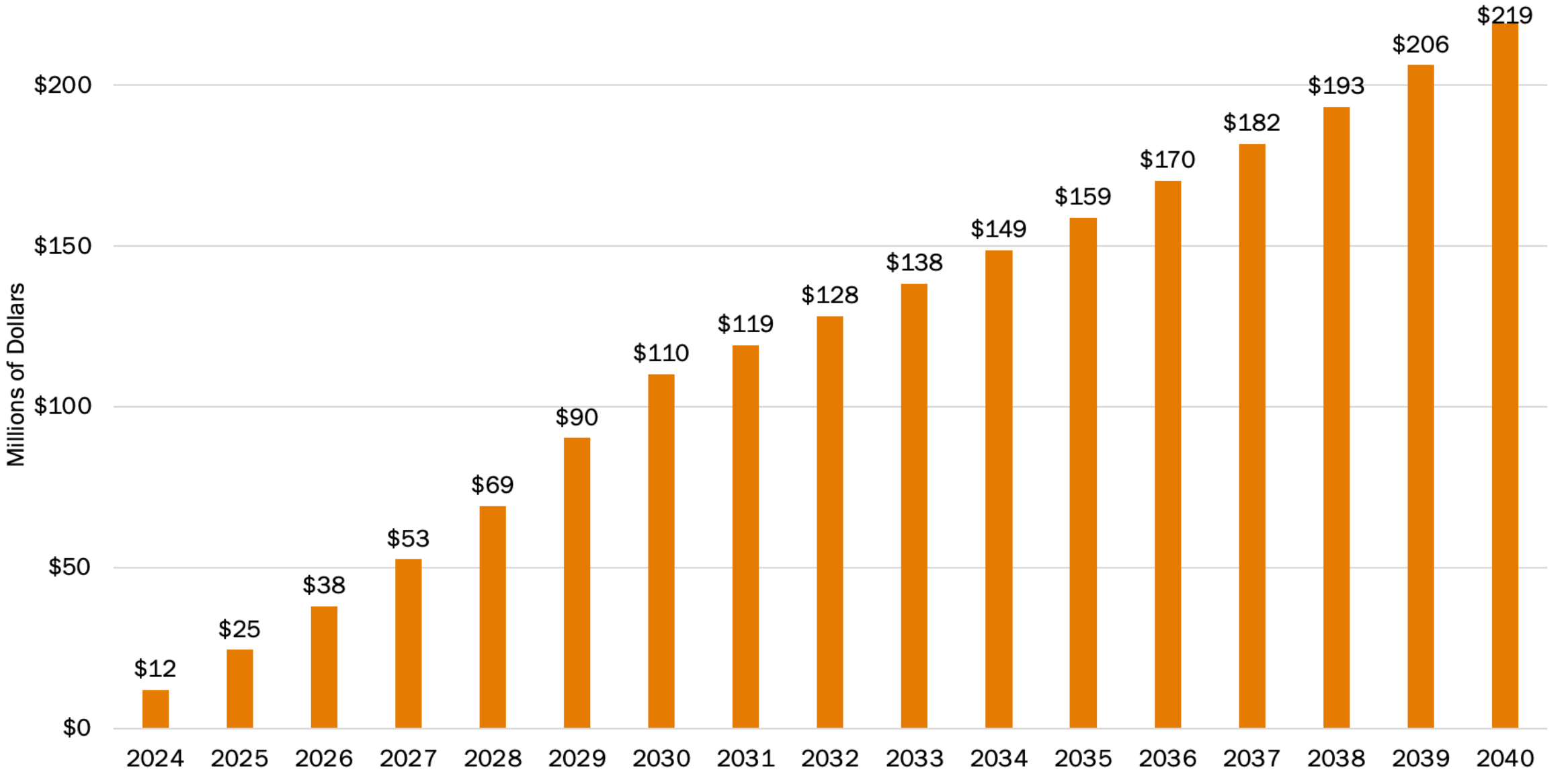
100% Built in Oregon: Estimated Jobs by Type



Regional Economic Job Estimates – Avg/Year (2024-2040)



100% Built in Oregon: Estimated Annual Property Taxes



Note: Does not include lease or energy generation revenue fees.
Assumes $7000/MW solar PILOT program, not central assessment or RED zone or other tax deferral programs; assumes $9,755/MW for onshore/offshore wind; assumes $6,628/MW for pumped storage.

Summary of Gross Economic Contributions

	Estimated Annual Average	Total 2024-2030	Total 2030-2040
Total Installation Jobs*	6,900	8,700	5,700
O&M Jobs*	1,400	700	1,900
Total Labor Income	$599M	$5.2B	$5.0B
Total Value Added	**$856M**	**$7.3B**	**$7.2B**
Total Personal Income Taxes	**$38M**	**$329M**	**$321M**
Direct Property Taxes	**$121M**	**$397M**	**$1.7B**

*Jobs across time shown as annual averages

Note: Labor income includes employee compensation and proprietors' income but does not include O&M jobs.

Key Takeaways

The construction of over 45,000 MW of clean generation (~$50-70B):

- Contributes: **$15B by 2040 to Oregon's economy**
  - Labor Income: Oregon workers earn $10B.
- Property Tax Revenue: ~$2.0B by 2040.
- Average annual jobs:
  - Installation: **7,000**
  - O&M: **1,400**

Appendix

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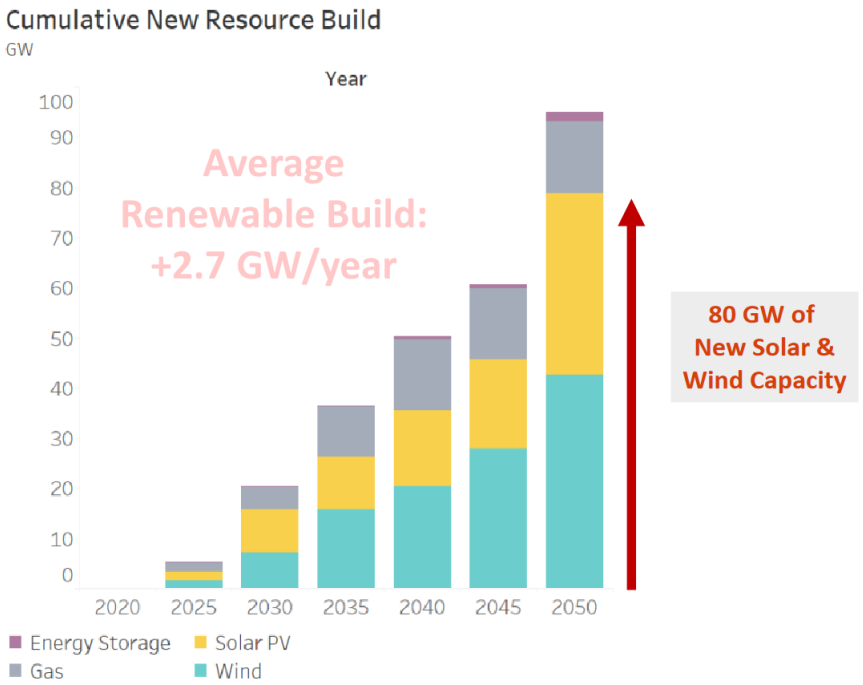
Clean Energy Demands For the PNW & Oregon



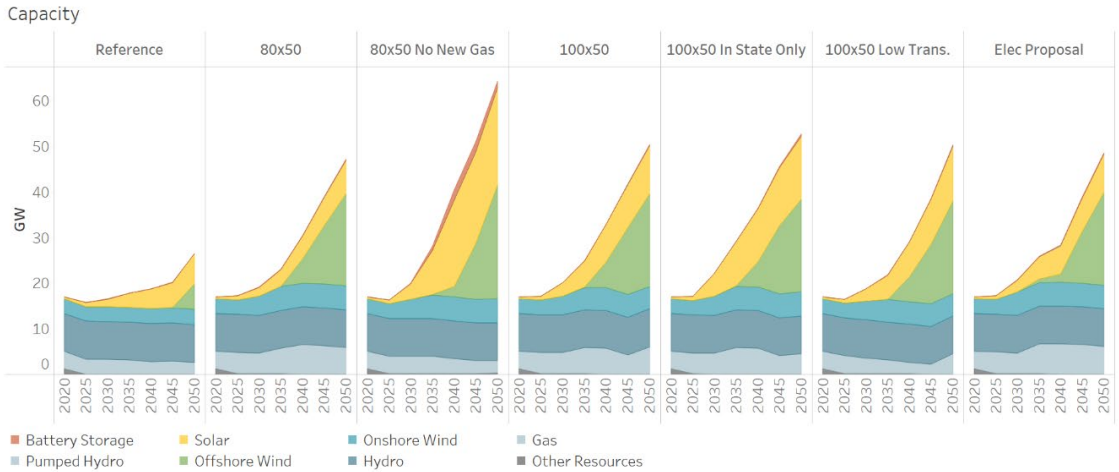
80 GW of New Solar & Wind Capacity

Clean Energy Transition Institute

EVOLVED ENERGY RESEARCH

Deep Decarbonization Pathways Study:

Cumulative new resource build (renewables, gas, and storage) through 2050 in the Pacific Northwest.



EVOLVED ENERGY RESEARCH

Oregon Clean Pathways Study:

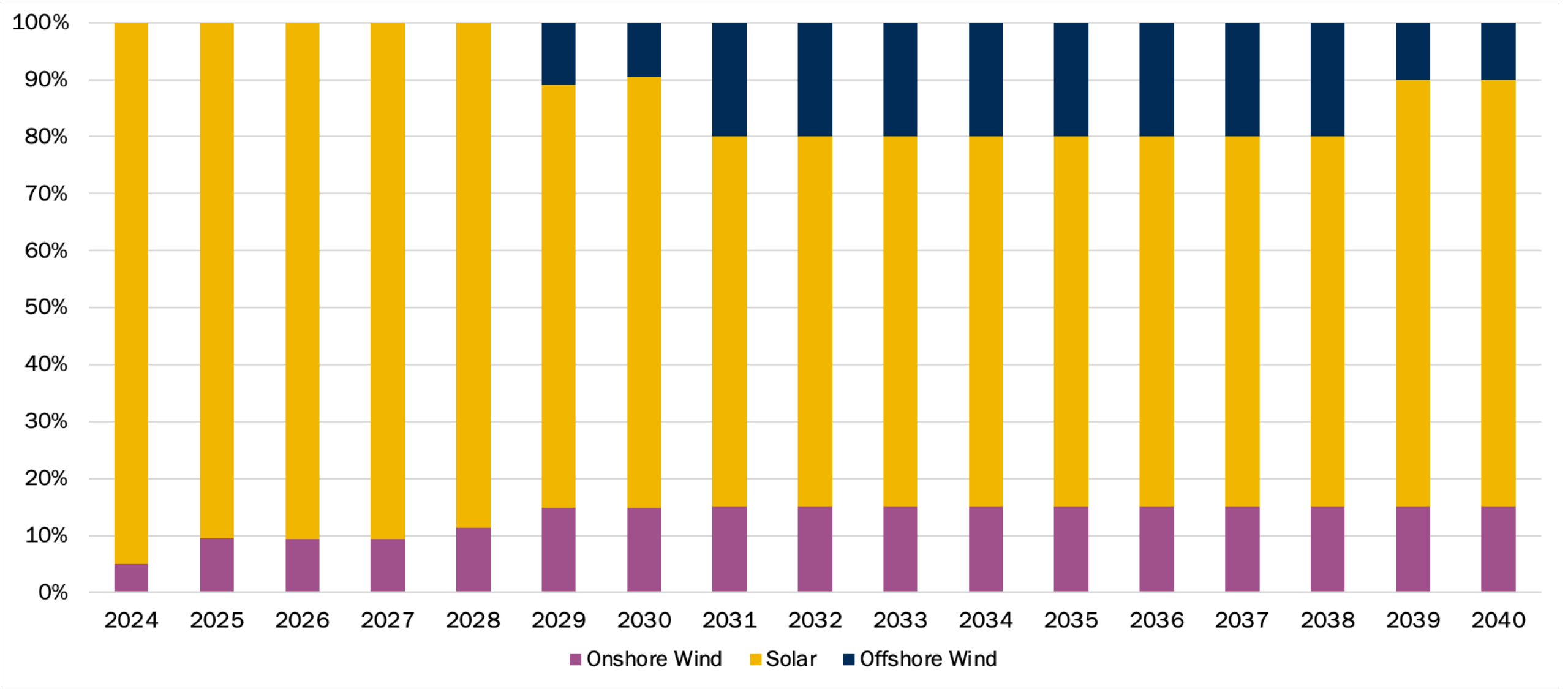
Modeling different scenarios for Oregon through 2050.

Across Modeled Scenarios:

~30 GW of new renewables needed by 2050

Source: Oregon Clean Pathways Study, p. 39

Assumed % Mix of Renewable Technology Types



Note: Renewable generation source mix based on recognition of limited further in-state onshore wind opportunity, assumption of state policy goal for offshore wind, balance from solar.

Potential Next Steps and Refinements

- Refinement of build out schedule for upcoming 5 years
- Inclusion of clean fuels generation load projections
- Inclusion of behind the meter utility scale renewables
- Inclusion of corporate tax revenues to the state

Key Model Assumptions

- 90% of HB 2021 requirements for clean energy will be met through new renewable energy sources.
- Model focuses on utility-scale electricity generation only. Other sources of renewable energy generation will increase the model outputs.
- Assumes the labor and financial capital and regulatory environment needed to support growth in renewable energy economy will exist for each analyzed scenario → 100% in-state generation

Key Model Limitations

- Gross economic contributions (model outputs) represent the share of in-state economic activity related to HB 2021
  - Not a marginal impact analysis. Not net of existing jobs and economic activities in emitting electricity sector. Not net of in-state generation of renewable energy under current RPS (which has no in-state requirement)
- Does not include:
  - Economic contributions of electrolysis derived renewable hydrogen as energy storage and firming resource
  - New electricity demand from data centers and other rapidly emergent loads
  - Proceeds from lease auction proceeds or electricity generation tariffs for OSW
  - Transmission build out costs and their economic contributions to same

Model Installation Costs

Distribution of Total Spending

Standardized Sector	Onshore Wind	Offshore Wind	Solar	Battery Storage	Pump Storage
Engineering and Planning	2%	11%	10%	15%	11%
Construction	20%	44%	25%	7%	22%
Equipment / Materials	69%	32%	61%	73%	51%
Other (financial, etc.)	8%	13%	4%	4%	16%

Distribution of Local (Oregon) Spending

Standardized Sector	Onshore Wind LPP	Offshore Wind LPP	Solar LPP	Battery Storage LPP	Pumped Storage LPP
Engineering and Planning	20%	20%	20%	20%	79%
Construction	83%	83%	83%	83%	82%
Equipment / Materials	5%	20%	0%	5%	25%
Other (financial, etc.)	20%	20%	20%	20%	20%

- The direct economic contribution to Oregon is the portion of total installation spending that flows directly to Oregon suppliers or workers.
- Many of the materials needed for solar, wind, and storage facilities are not produced in Oregon.
- Most of the construction and some engineering, planning, legal, and financial services will take place in Oregon.
- It is assumed that these distributions remain constant over the period.

100% Built in Oregon: Economic Contributions Over Time

Jobs	2024-2027	2028-2033	2034-2040
Avg Annual Direct Installation Jobs	5,400	4,600	3,400
Avg Annual Total Installation Jobs	7,800	7,400	6,000
Avg Annual O&M Jobs	400	1,300	2,100

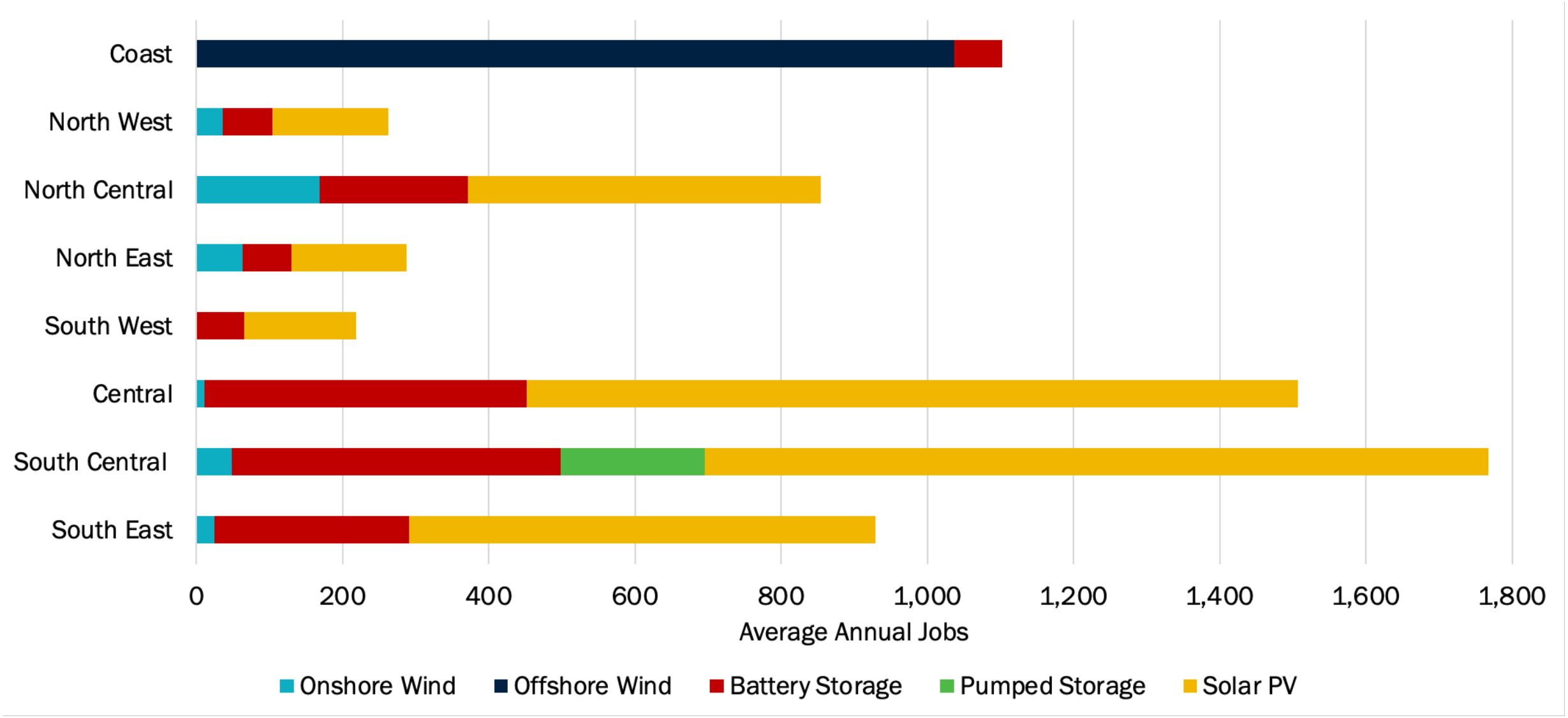
Labor Income	2024-2027	2028-2033	2034-2040	Total
Direct Labor Income	$1.6B	$2.2B	$1.9B	**$5.7B**
Total Labor Income	$2.6B	$3.9B	$3.7B	**$10.2B**

Value Added	2024-2027	2028-2033	2034-2040	Total
Direct Value Added	$2.0B	$2.7B	$2.4B	**$7.1B**
Total Value Added	$3.7B	$5.5B	$5.3B	**$14.6B**

Taxes	2024-2027	2028-2033	2034-2040	Total
Personal Income Taxes from Labor	$164 MM	$248 MM	$237 MM	**$650 MM**
Property Taxes	$127 MM	$655 MM	$1.3B	**$2.1B**
Corporate Activity Taxes	$1.6 MM	$1.8 MM	$1.6 MM	**$5.05 MM**

Note: Labor income defined as employee compensation and proprietor income. Labor income does not include O&M jobs. All values rounded.

100% Built in Oregon: Estimated Regional Jobs by Type



Note: Does not include O&M jobs

100% Built in Oregon: Estimated Personal Income Taxes

Note: Personal income taxes from O&M jobs not included.

100% Built in Oregon: Estimated Output & Income by Type

Note: Labor income defined as employee compensation and proprietor income. Labor income does not include O&M jobs.