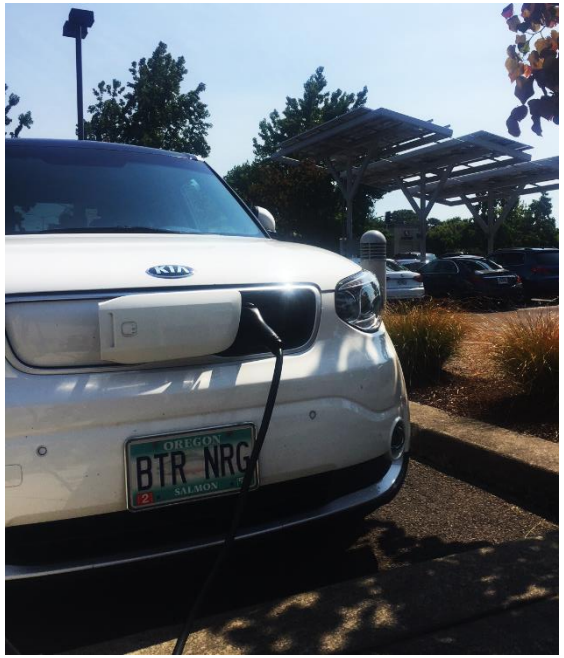
Oregon Department of **ENERGY**



How is the Oregon Energy System Changing?

January 24, 2019

House Committee on Energy & Environment

OREGON DEPARTMENT OF ENERGY

Energy Then and Now

~20 years ago

Oregon passes the nation's first carbon emissions standard for energy facilities

The Toyota Prius is introduced

The "hockey stick" first used to explain the earth's changing temperatures

Enron

~10 years ago

Oregon passes the Renewable Portfolio Standard

The Tesla Roadster is introduced

Crude oil trades around $100/barrel

Residential solar PV costs $9 per watt (it's less than $4 today)

Atmospheric carbon dioxide is 386 parts per million

2018-2019

Oregon is implementing a more aggressive RPS

Oregon's only coal plant will cease burning coal in 2020

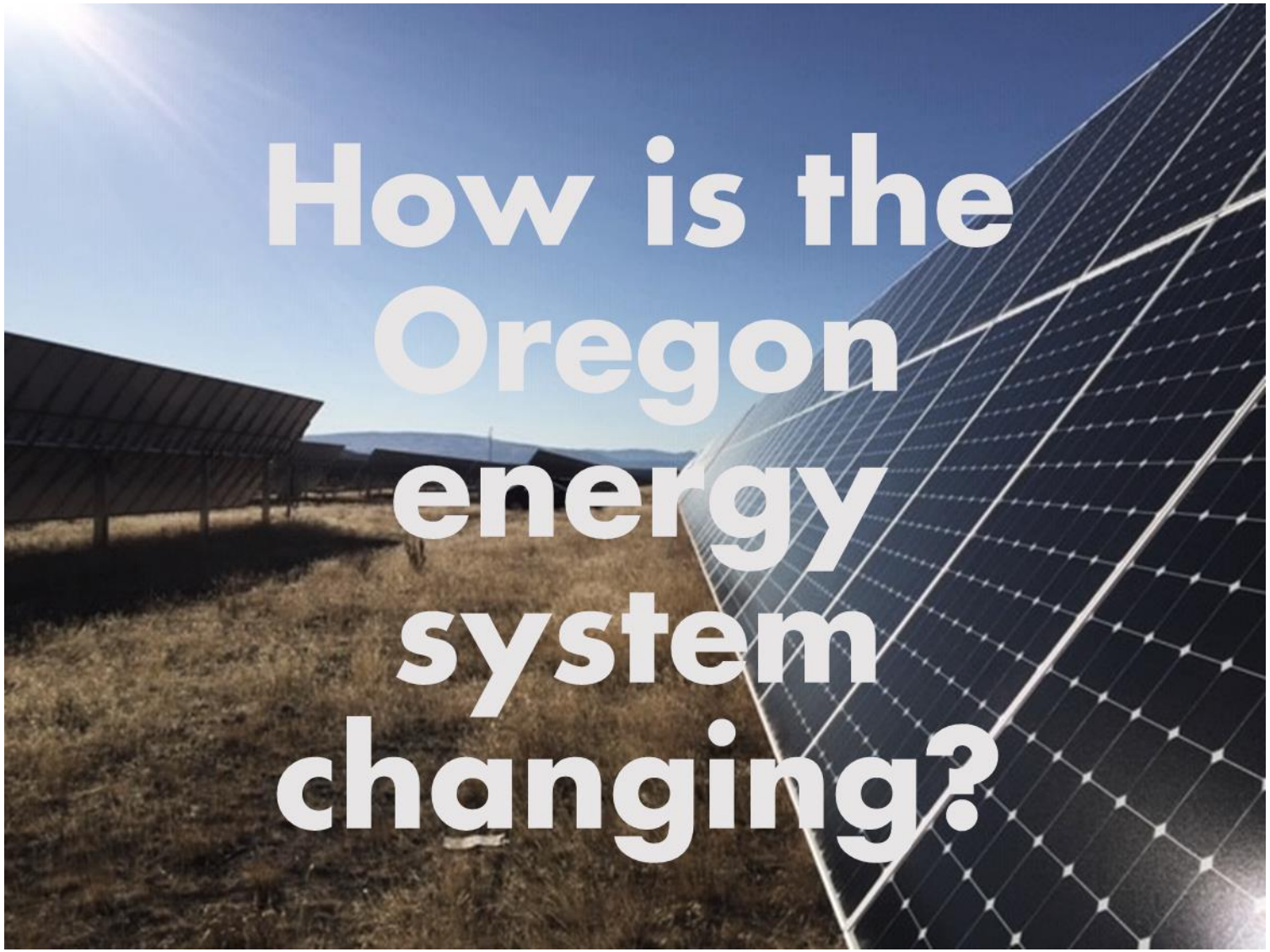
Nearly 19,000 electric vehicles are registered in Oregon

Portland General Electric releases "Exploring Pathways to Deep Decarbonization"

Atmospheric carbon dioxide is 410 parts per million

Three Main Themes

1. We're benefitting from clean energy technology costs going down.
2. We're seeing meaningful results from energy policies implemented in recent years.
3. We're committed to decarbonizing energy in Oregon.



OREGON DEPARTMENT OF ENERGY

1

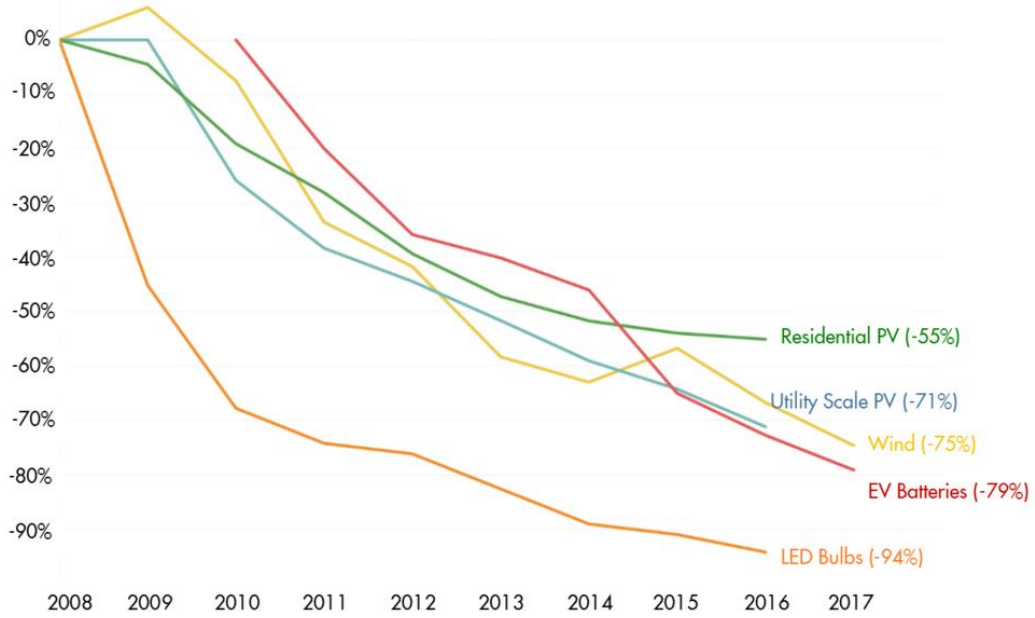
We're benefitting from clean energy technology costs going down.

- Costs of renewable and emerging energy technologies have rapidly declined.
- Renewable energy development continues to grow across the state.
- Lower costs support adoption of new technologies.
- Energy use no longer directly tied to economic growth.

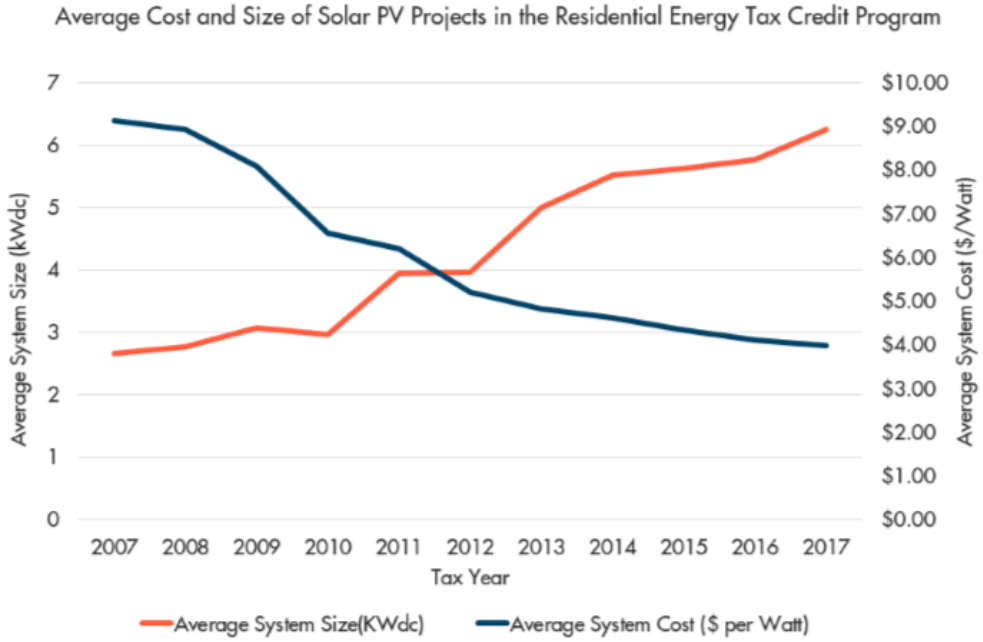
OREGON DEPARTMENT OF ENERGY

Rapid Decline in Technology Costs

- Renewable energy is cost-competitive with fossil fuel-powered energy.
- Energy efficient technologies are less expensive and more accessible.
- Improvements in battery technology are bringing down the costs of electric vehicles and energy storage options.



Cost Reductions in Clean Energy Technologies

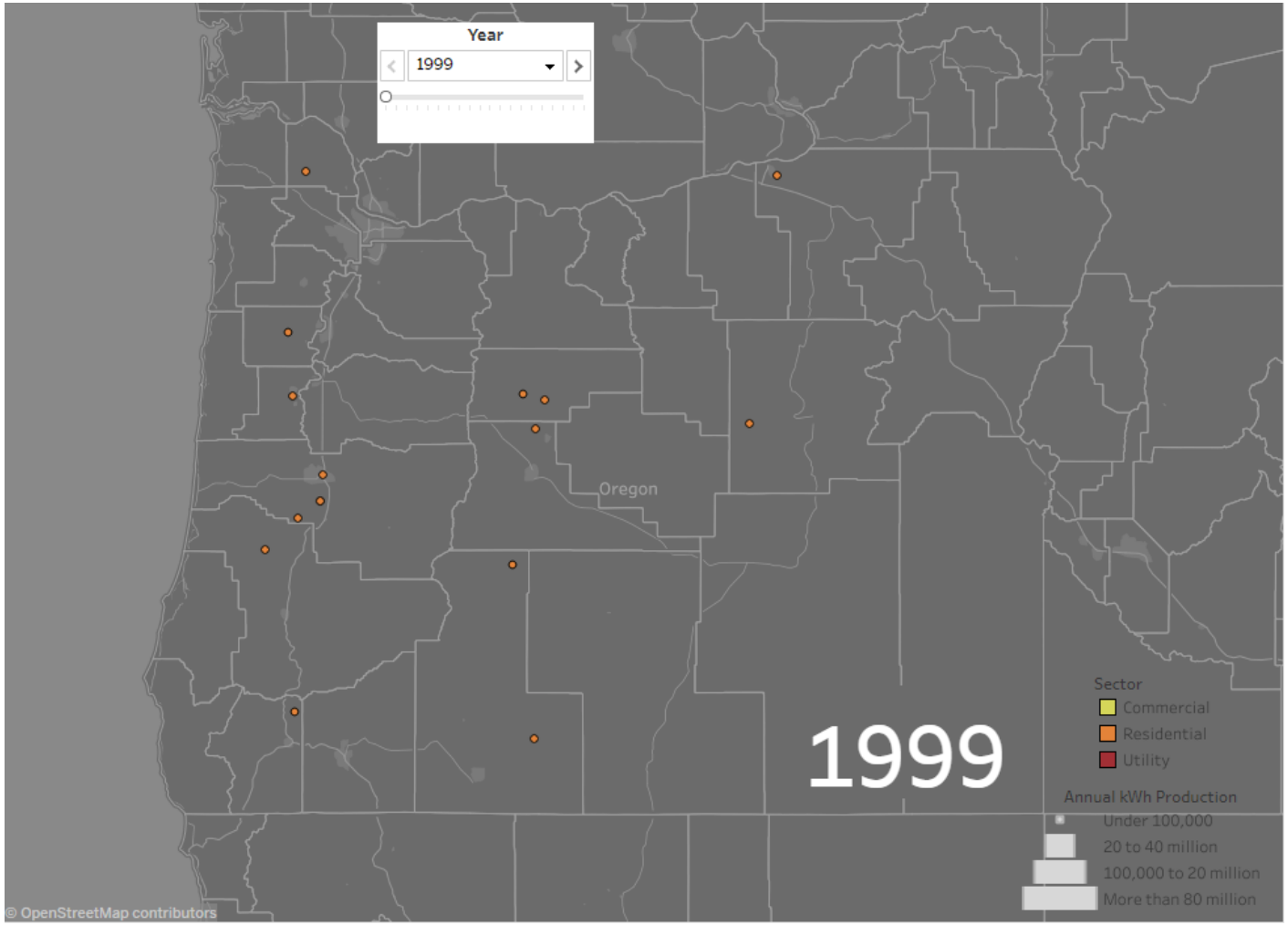


Oregon Residential PV System Size and Cost per Watt

OREGON DEPARTMENT OF ENERGY

Lower Costs of Renewables = More Renewable Projects

- ODOE's Energy Facility Siting Team currently reviewing more solar energy applications than ever before.
- Older renewable projects are being amended to take advantage of technology advances.
- 212,744 megawatt hours of solar PV were added to Oregon's electricity mix between 2015 and 2016.

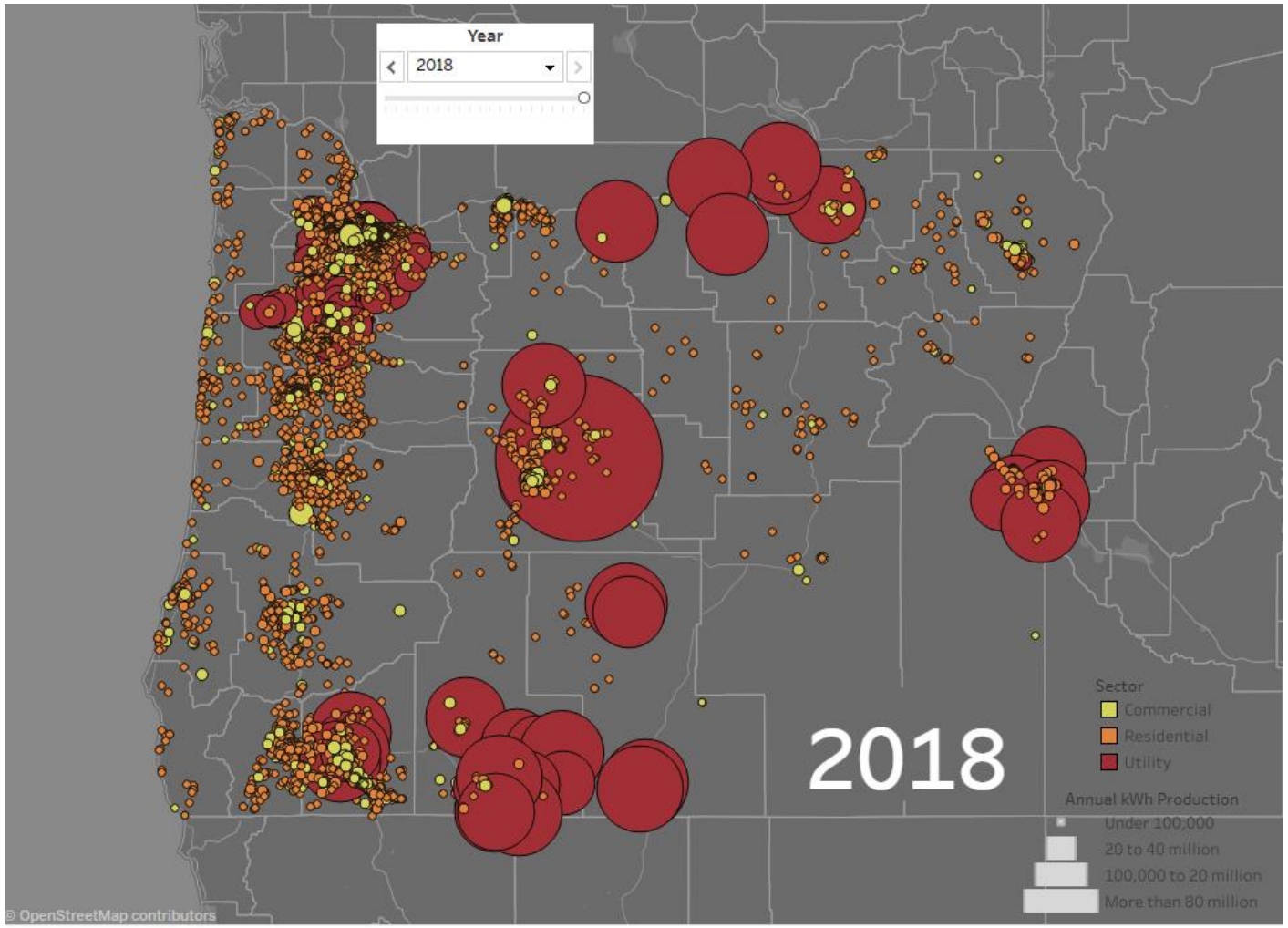


Solar PV Projects in Oregon

OREGON DEPARTMENT OF ENERGY

Lower Costs of Renewables = More Renewable Projects

- ODOE's Energy Facility Siting Team currently reviewing more solar energy applications than ever before.
- Older renewable projects are being amended to take advantage of technology advances.
- 212,744 megawatt hours of solar PV were added to Oregon's electricity mix between 2015 and 2016.

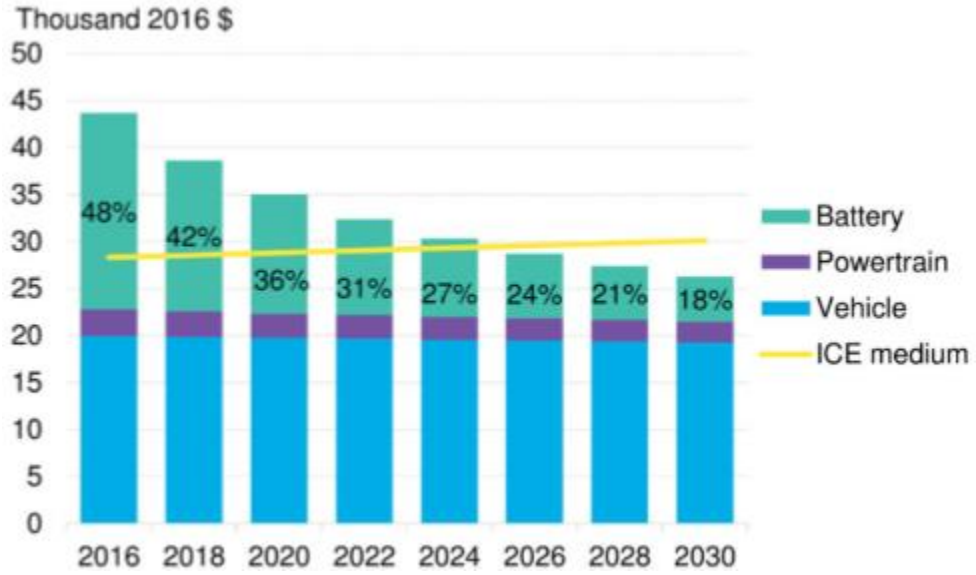


Solar PV Projects in Oregon

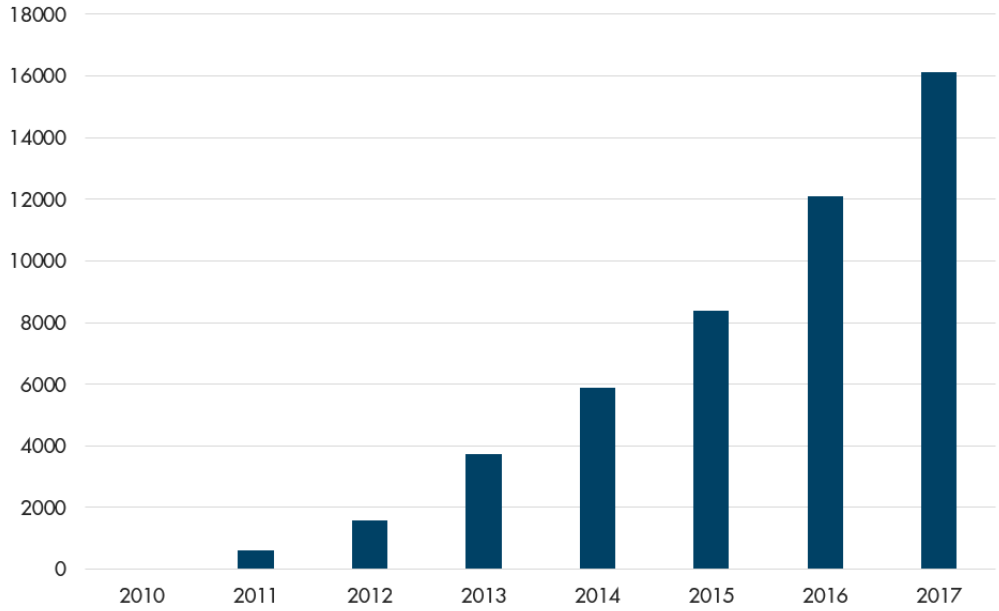
OREGON DEPARTMENT OF ENERGY

Lower Technology Costs = More Adoption

- As electric vehicle battery prices go down, the batteries and ranges get larger and the number of EVs on Oregon roads goes up.
- The Oregon Energy Facility Siting Council just approved a utility-scale battery storage facility in Morrow/Umatilla Counties.
- New technologies are helping utilities to more efficiently manage the power grid.



Cost Parity for Battery Vehicles vs. Internal Combustion Engines



Cumulative Total Electric Vehicle Registrations in Oregon

OREGON DEPARTMENT OF ENERGY

2

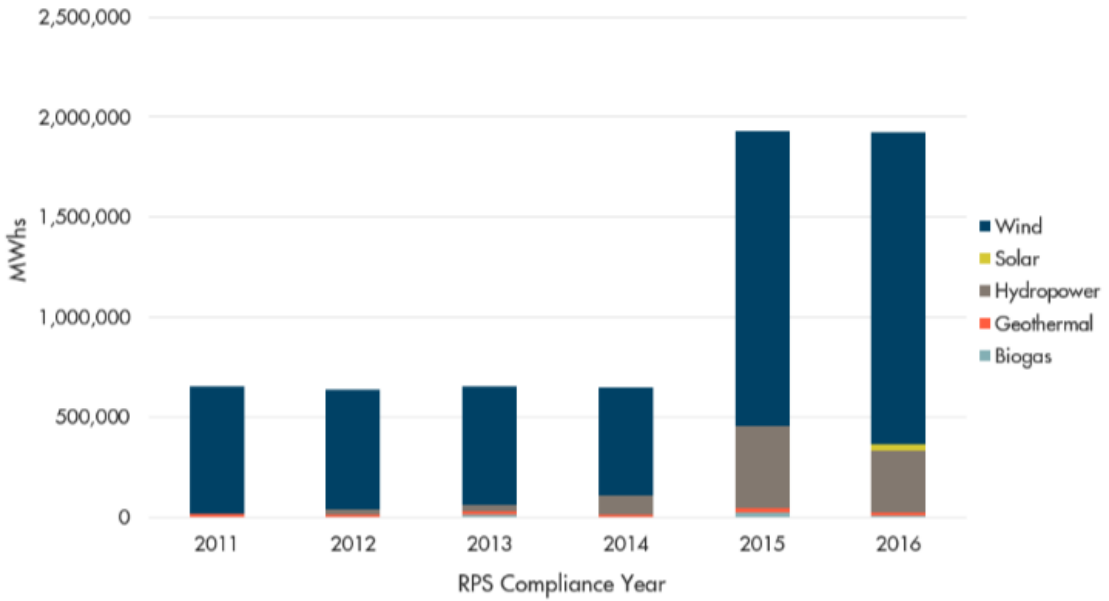
We're seeing meaningful results from energy policies implemented in recent years.

- Oregon's leadership on energy policy – such as the Renewable Portfolio Standard – has encouraged more and different types of clean energy technologies.
- Our investment in energy efficiency pays and will continue to pay significant dividends.

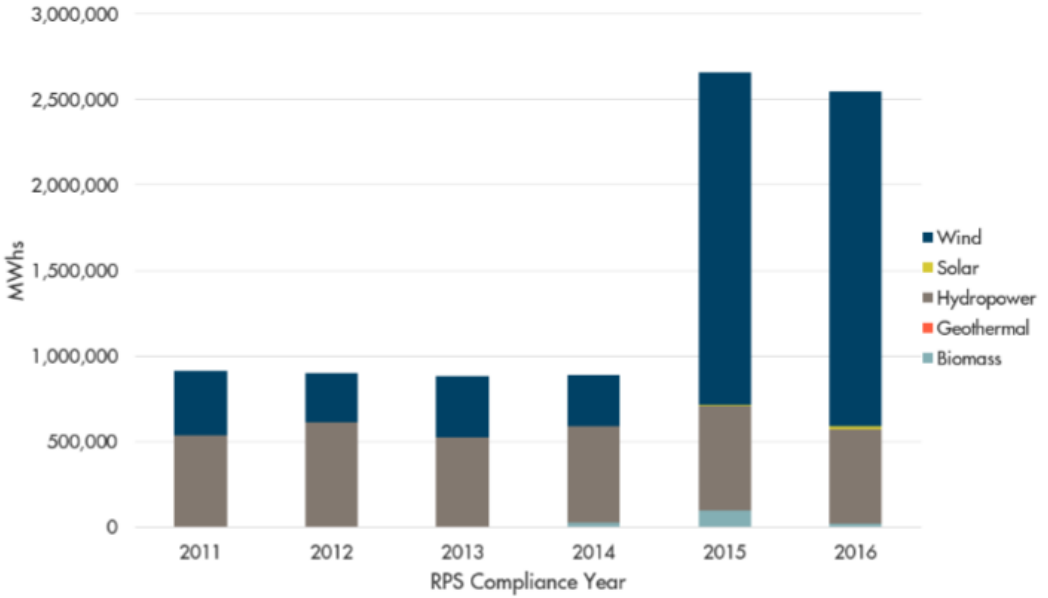
OREGON DEPARTMENT OF ENERGY

Oregon's Electricity Mix Is Cleaner

- Oregon utilities are meeting the Renewable Portfolio Standard.
- 741% increase in wind energy consumed in Oregon between 2004 and 2016.
- In 2008, Oregon's energy mix had just 28 MWh of solar; in 2016, it was 266,000 MWh.



PacifiCorp RPS Compliance Resources 2011-2016



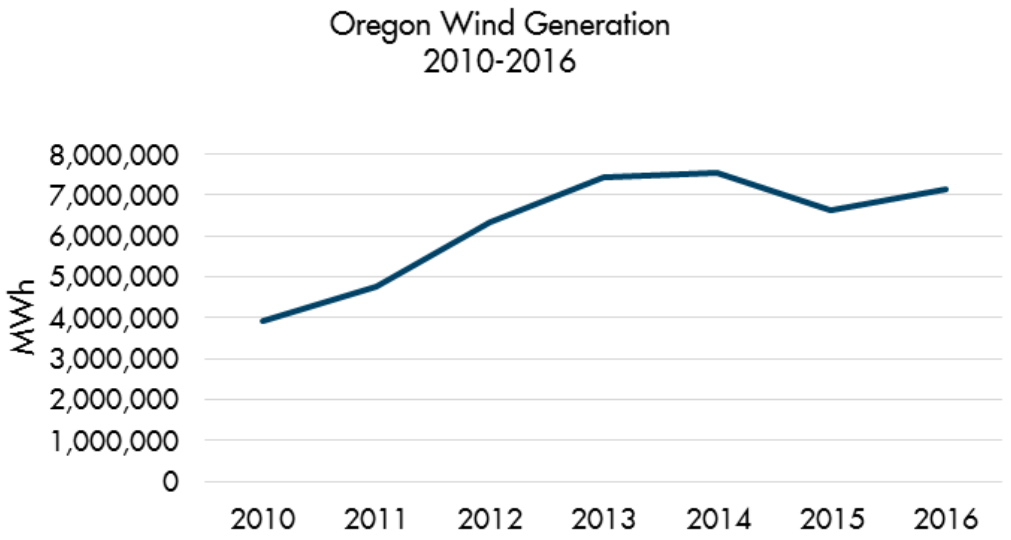
PGE RPS Compliance Resources 2011-2016

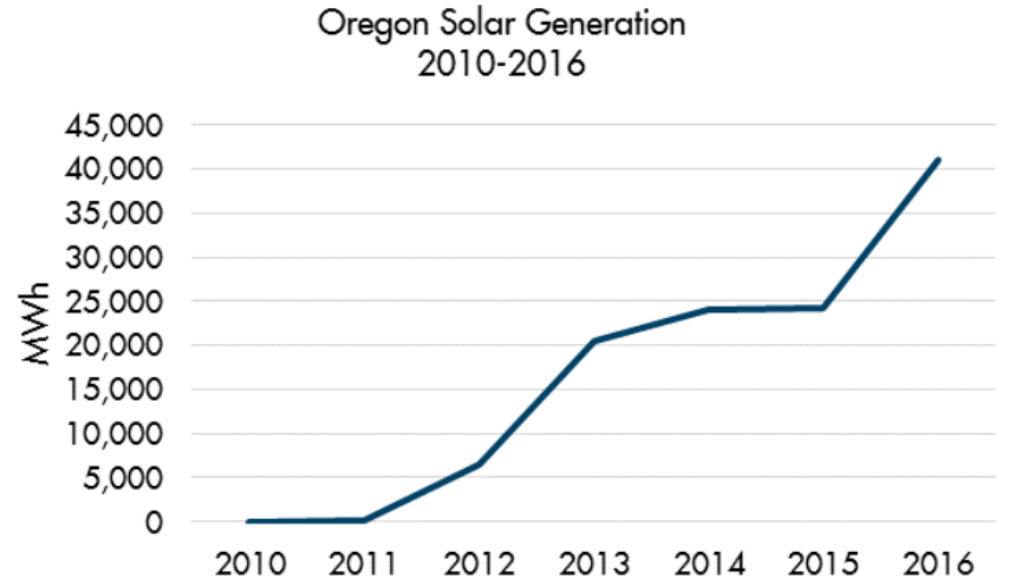
OREGON DEPARTMENT OF ENERGY

Diverse Renewable Electricity Generation

Oregon is seventh in the nation for renewable energy generation:

- 8,865 MW of hydropower capacity
- 3,383 MW of wind capacity
- 331 MW of wood and other biomass capacity
- 296 MW of solar capacity for projects 1 MW or larger
- 51 MW of biogas/renewable natural gas capacity
- 33 MW of geothermal capacity
- 10 MW of energy storage capacity
- Marine energy pilot projects off the Oregon coast



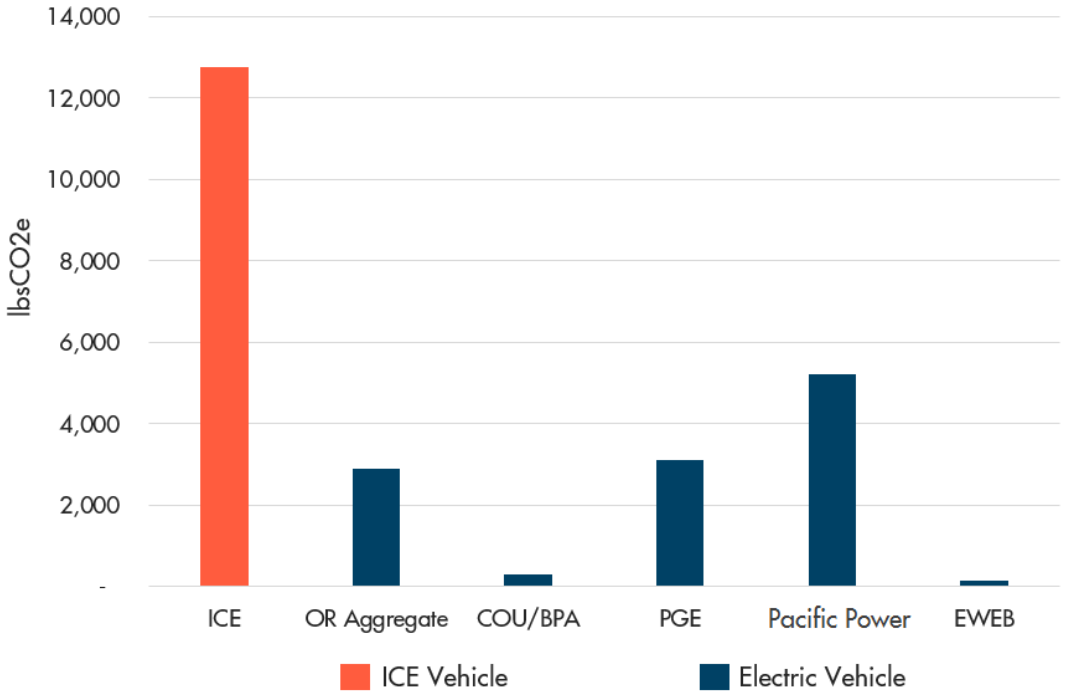


OREGON DEPARTMENT OF ENERGY

Diverse Renewable Electricity Generation

Oregon is seventh in the nation for renewable energy generation:

- 8,865 MW of hydropower capacity
- 3,383 MW of wind capacity
- 331 MW of wood and other biomass capacity
- 296 MW of solar capacity for projects 1 MW or larger
- 51 MW of biogas/renewable natural gas capacity
- 33 MW of geothermal capacity
- 10 MW of energy storage capacity
- Marine energy pilot projects off the Oregon coast

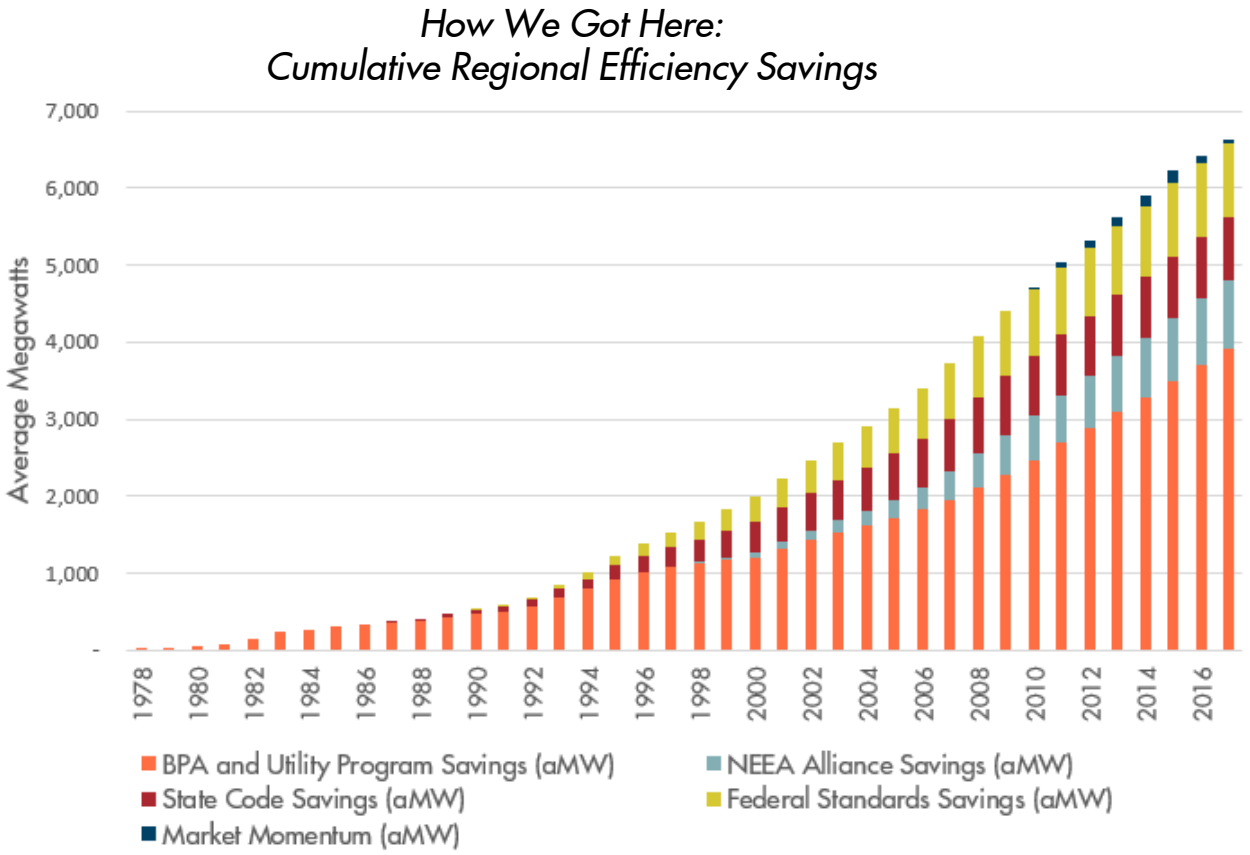


Annual Vehicle GHG Emissions in Oregon — Internal Combustion Engine vs. Electric Vehicle

OREGON DEPARTMENT OF ENERGY

Oregon is a Leader in Energy Efficiency

- From the passage of the Northwest Power Act in 1980, energy efficiency is Oregon's priority resource.
- At an estimated $30 per MWh, energy efficiency continues to be a more cost effective resource compared to traditional sources of electricity.
- Regional energy efficiency efforts have reduced carbon emissions by 23.5 million tons.



OREGON DEPARTMENT OF ENERGY

3

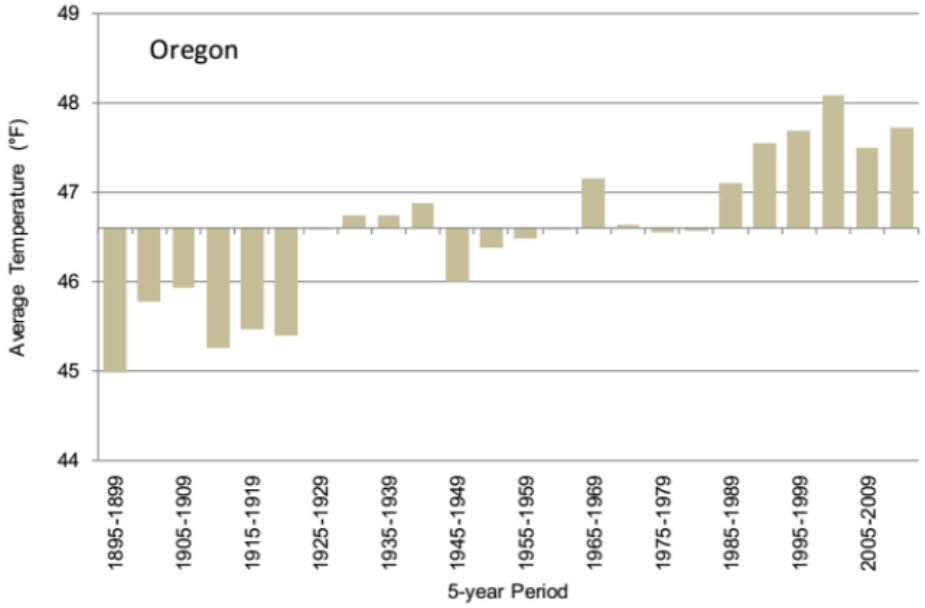
We're committed to decarbonizing energy in Oregon.

- The state is ramping up our efforts to address climate change.
- Consumers are choosing cleaner power.
- Oregonians recognize that more action to reduce greenhouse gas emissions is needed.

OREGON DEPARTMENT OF ENERGY

Increased Urgency to Address Climate Change

- Oregon is experiencing the effects of climate change.
- About 80 percent of GHG emissions in Oregon come from daily energy use.
- Reducing greenhouse gas emissions is a focus not just for the state, but also for utilities, businesses, and tribes.

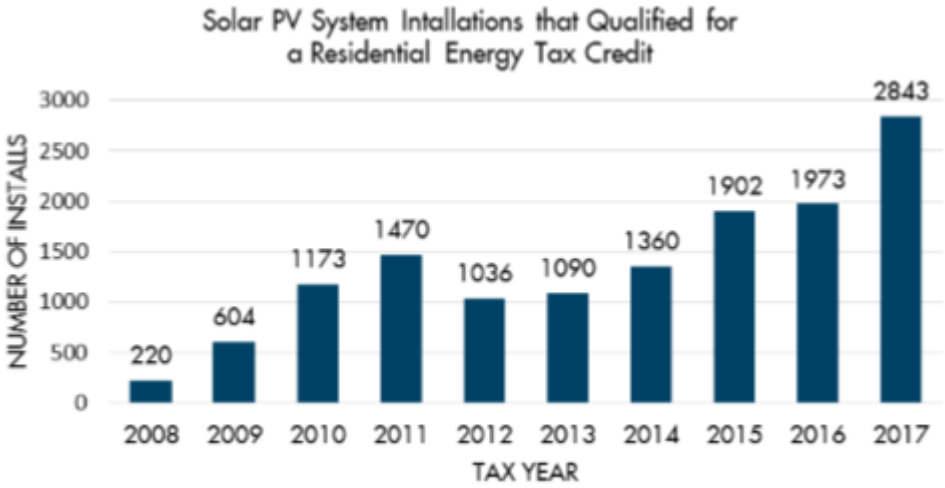


Observed Average Daily Temperature – Annual

OREGON DEPARTMENT OF ENERGY

Oregonians Are Choosing Cleaner Power

- PGE and PacifiCorp have two of the most successful voluntary green power programs in the country.
- Consumers are increasingly looking to either support green power programs or produce their own renewable energy.
- Businesses commit to purchasing green power as a way to demonstrate their environmental commitments.



OREGON DEPARTMENT OF ENERGY

Oregon's Energy Landscape Is Still Changing

OREGON DEPARTMENT OF ENERGY