



2018 Biennial Report to the Legislature

...and Where We Go From Here

Oregon Global Warming Commission

Angus Duncan, Chair

Lesley Jantarasami, Staff

Presented to the Joint Committee on Carbon Reduction

January 25, 2019



Takeaways from 2018 Report

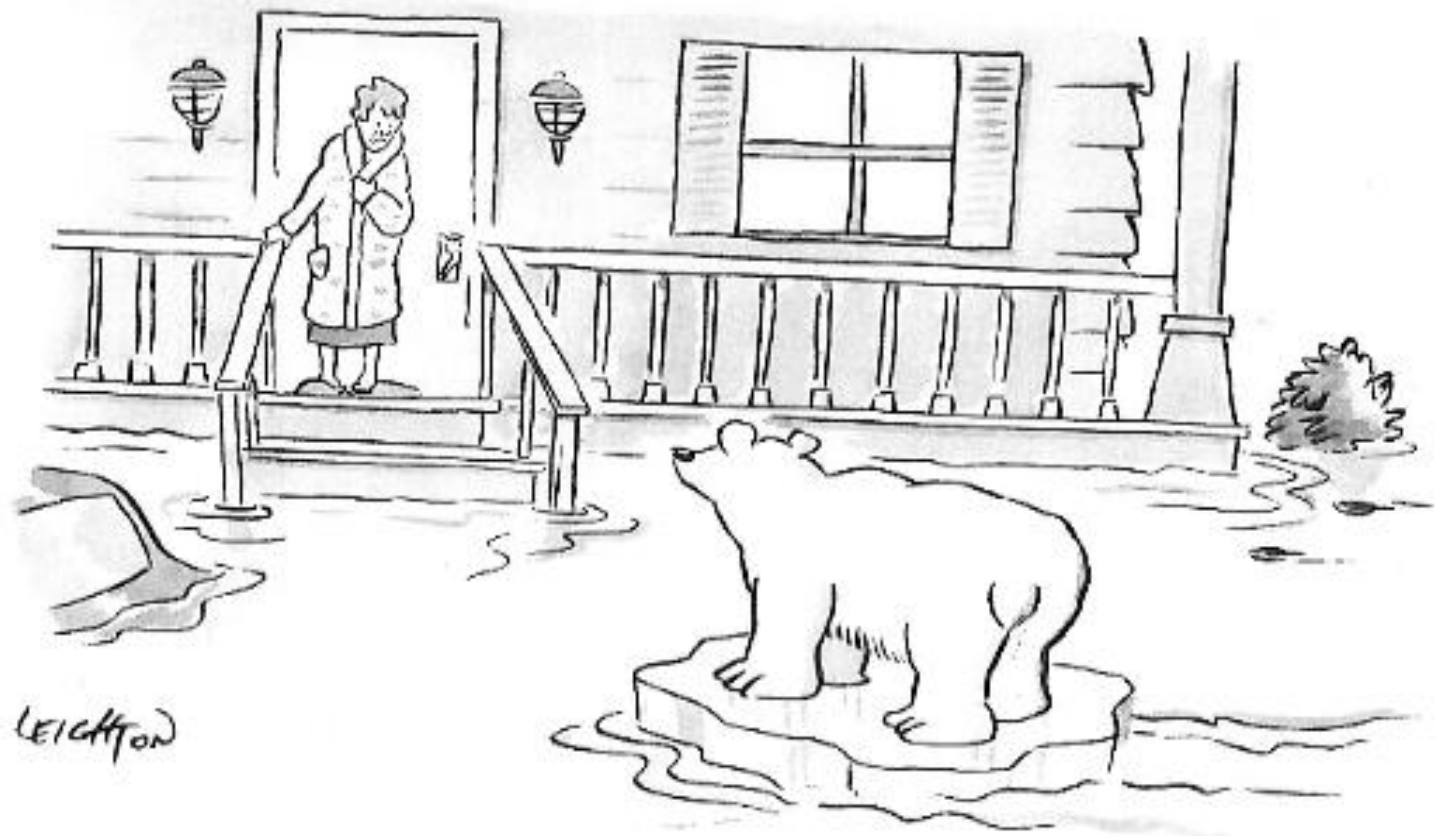
In the 2017-18 biennium, serious, measurable and disruptive climate change arrived in Oregon. Challenging as these effects have been, they are the first and weakest wave of disruption.

Consequences can be documented in communities, economies, public health, ecosystem health, infrastructure at risk, and other critical areas.

At the same time, Oregon's efforts to meet its greenhouse gas reduction goals – to contain and reduce its emissions – were slipping.

Satellite view of wildfire smoke plume, August 14, 2018

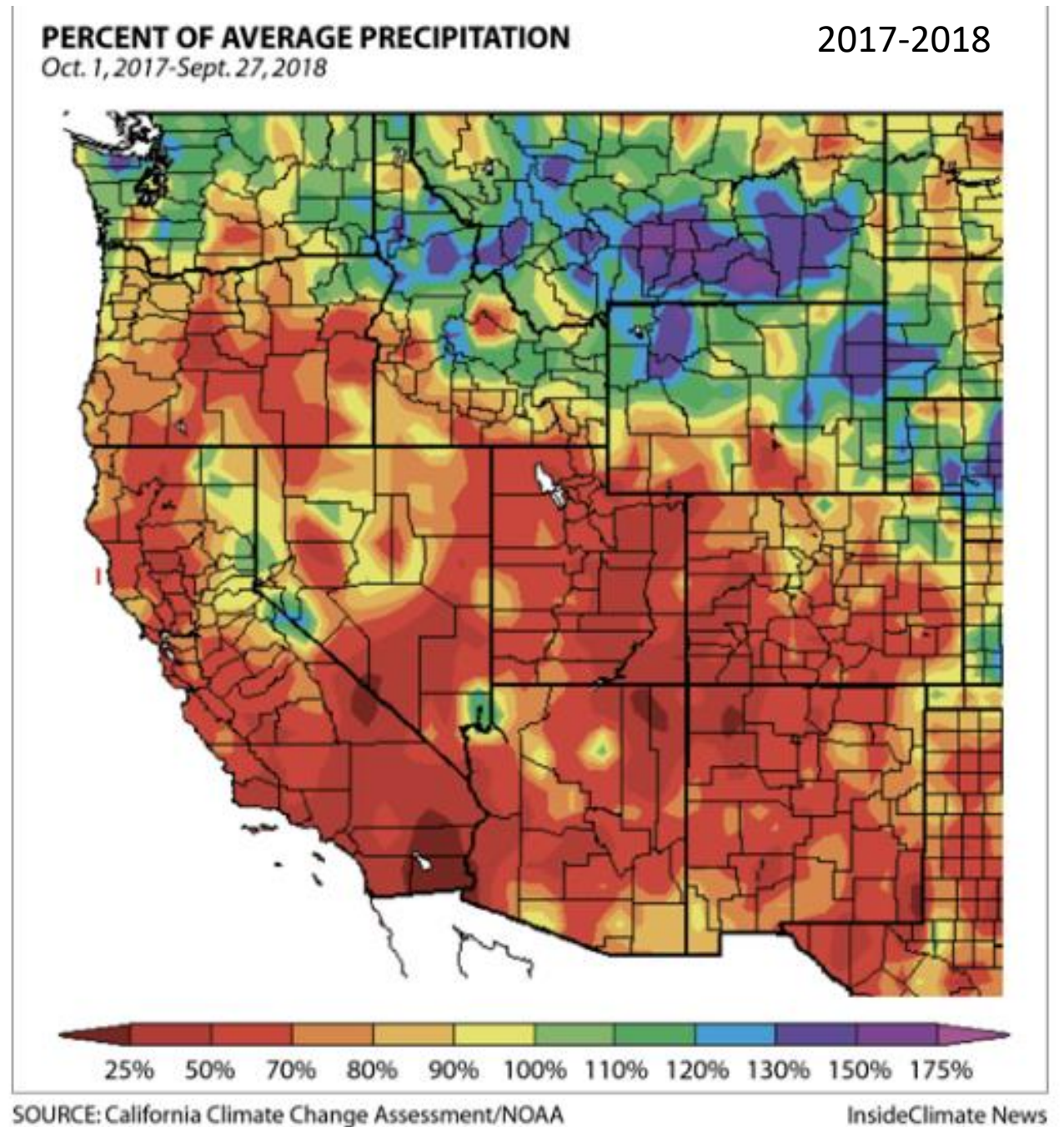
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LEIGHTON

Where Oregonians are Already Feeling Effects

- Fire
- Heat
- Public Health
- Drought and Snowpack
- Extreme Weather and Flooding; Sea Level Rise
- Oceans
- Infrastructure
- Local Economies



Where Others Were Affected

FIRE: • Conflagrations in California, Greece, Scandinavia, Russia

HEAT: • Global (17 of 18 warmest years on record since 2000)

PUBLIC HEALTH: • 94% of 244 US cities saw increased risk of mosquito-carried diseases including Zika, West Nile, Dengue fevers.

DROUGHT: • AZ: in 21st year of drought | CA: lowest snowpack in 500 years | Middle East: “worst drought in nine centuries” | also Northern Europe, South Africa (Capetown), Australia, etc.

**EXTREME WEATHER/
FLOODING:** • One word: hurricanes (Florence, Harvey, Mangkut, Haima, Maria, Michael – \$\$ damage in hundreds of billions)

Global and PNW Climate Projections

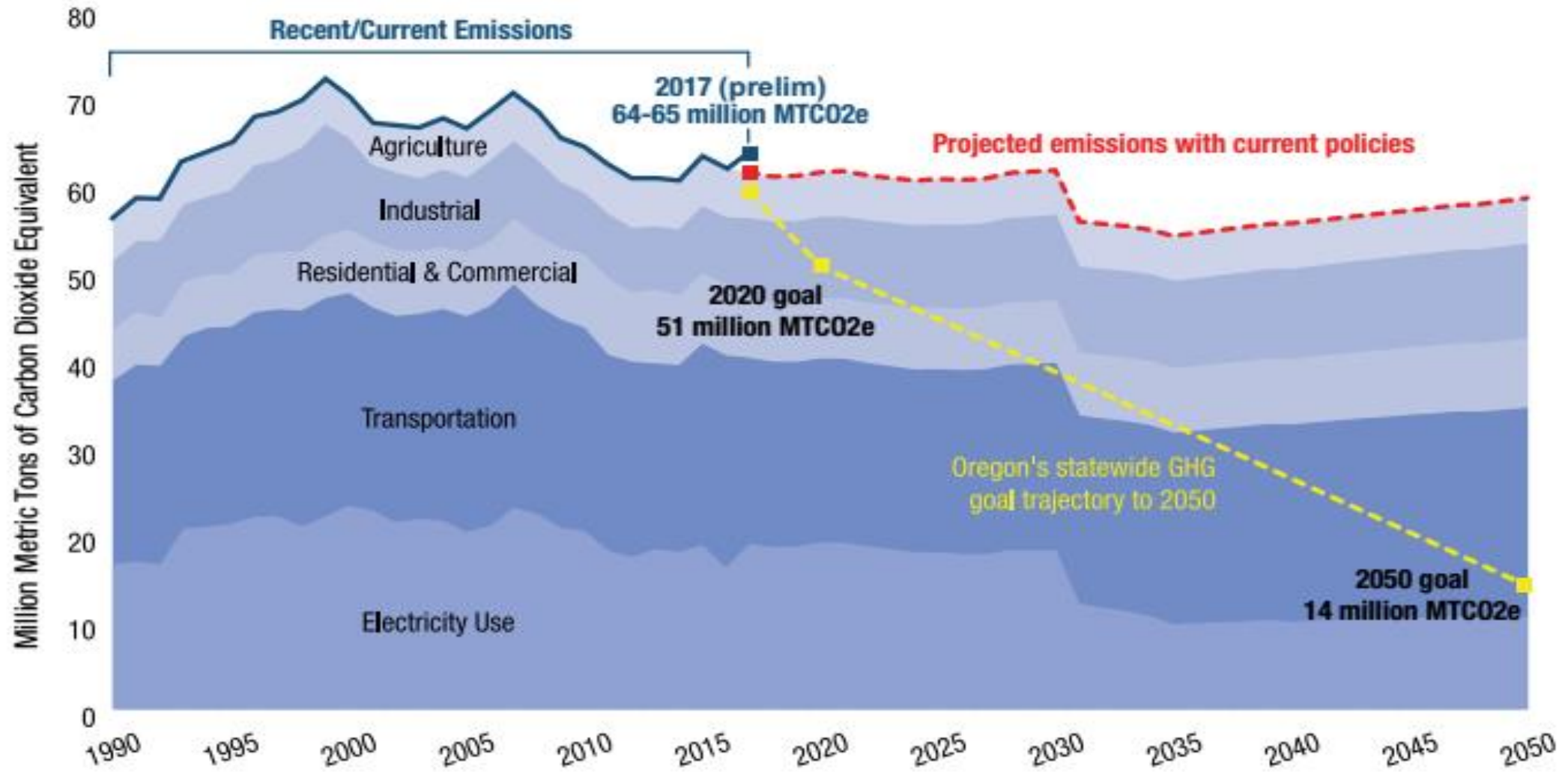
IPCC 2018 Special Report on Limiting Global Warming to < 1.5 °C

- We are already seeing the consequences of 1°C of global warming through more extreme weather, rising sea levels and diminishing Arctic sea ice, among other changes
- [L]imiting global warming to 1.5°C (will) require “rapid and far-reaching” transitions in land, energy, industry, buildings, transport, and cities, (and is) critical in ensuring a safe and sustainable world.

Pacific Northwest chapter of Fourth National Climate Assessment

- The region has warmed substantially—nearly 2°F since 1900 | Warmer winters have led to reductions in the mountain snowpack, increasing wildfire risk | Water scarcity | Speeding the usually slow release of water for communities, agriculture, rivers, and soils | Warmer ocean temperatures (affecting) the marine ecosystem (etc.)

Oregon's Projected GHG Emissions

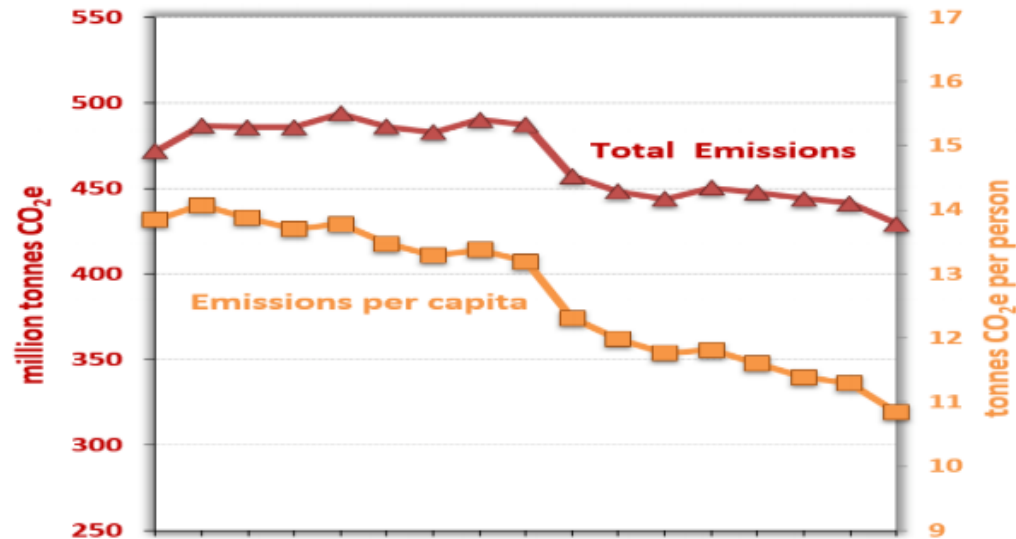


GHG Emissions Intensity Data

Table 4. Oregon's per capita sector-based GHG emissions compared to other jurisdictions (million MT CO₂e per person)

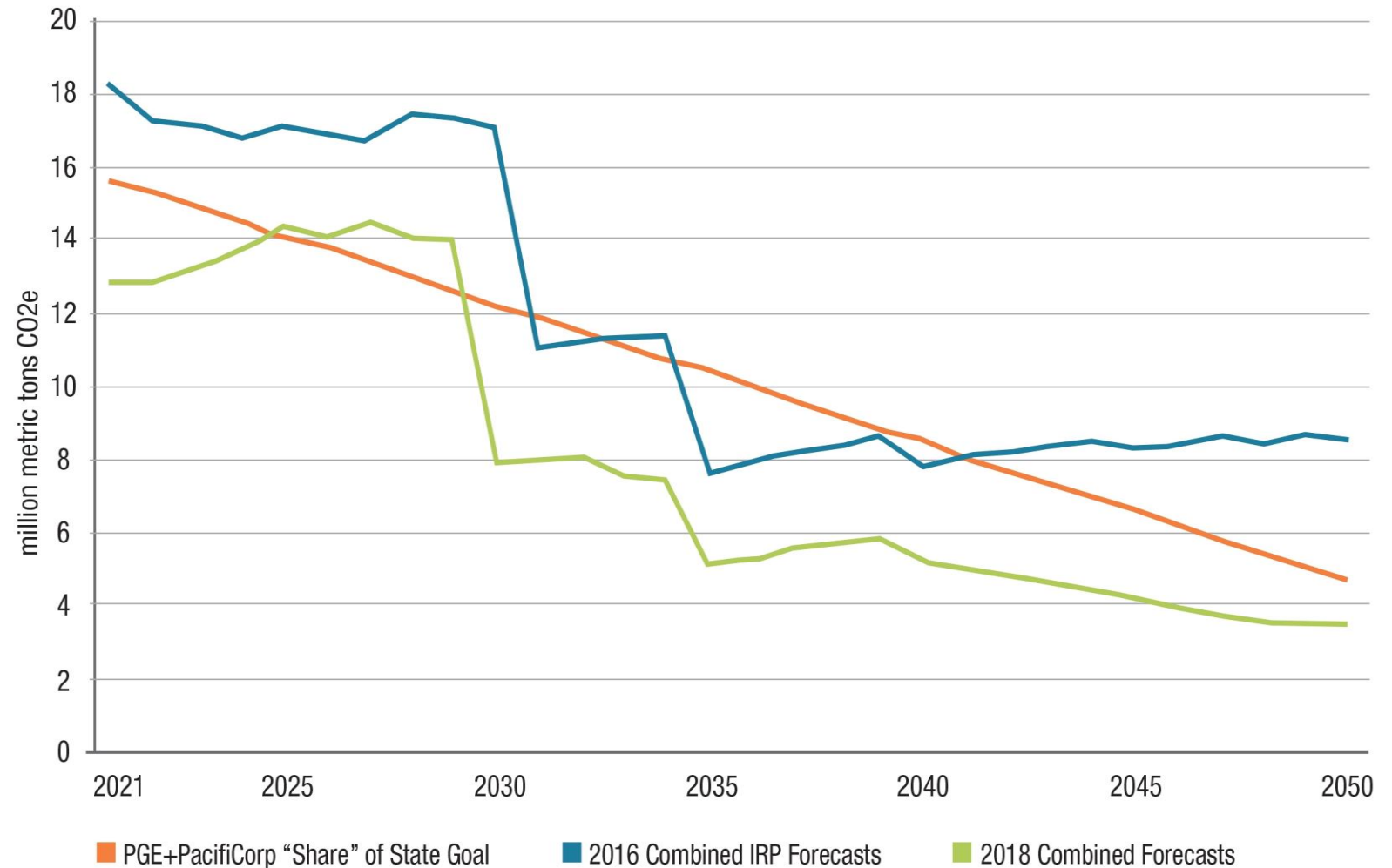
	1990	1995	2000	2005	2010	2011	2012	2013	2014	2015	2016
Oregon	19.7	20.3	20.5	18.3	16.8	16.1	15.6	15.5	15.3	15.7	15.2
California	-	-	-	-	12.0	11.8	11.8	11.7	11.5	11.3	10.9
Washington	18	-	-	-	14	14	14	14	-	-	-
European Union	12	11	11	11	10	9	9	9	8	9	8
United States	26	26	26	25	22	22	21	21	21	21	20

California Total and Per Capita GHG emissions (2000-2016)



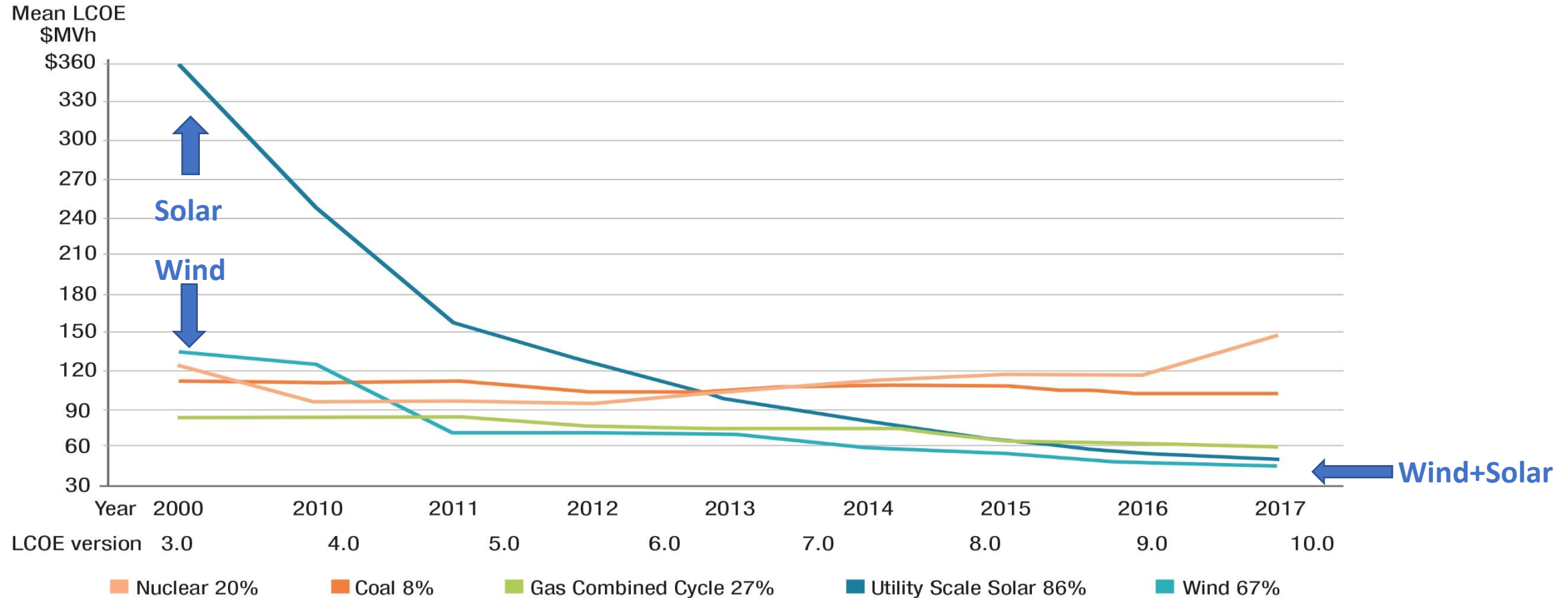
Electric Utility Sector Forecasts

- Projected emissions come from PGE and PacifiCorp's ongoing updates to their Integrated Resource Plans (extended through 2050)
- Their 2018 forecast is substantially lower than 2016.
- By 2050, PGE and PacifiCorp are projected to be below what the OGWC suggests to meet their "share" of the state's goal.



Falling Costs for Renewables vs. Fossil

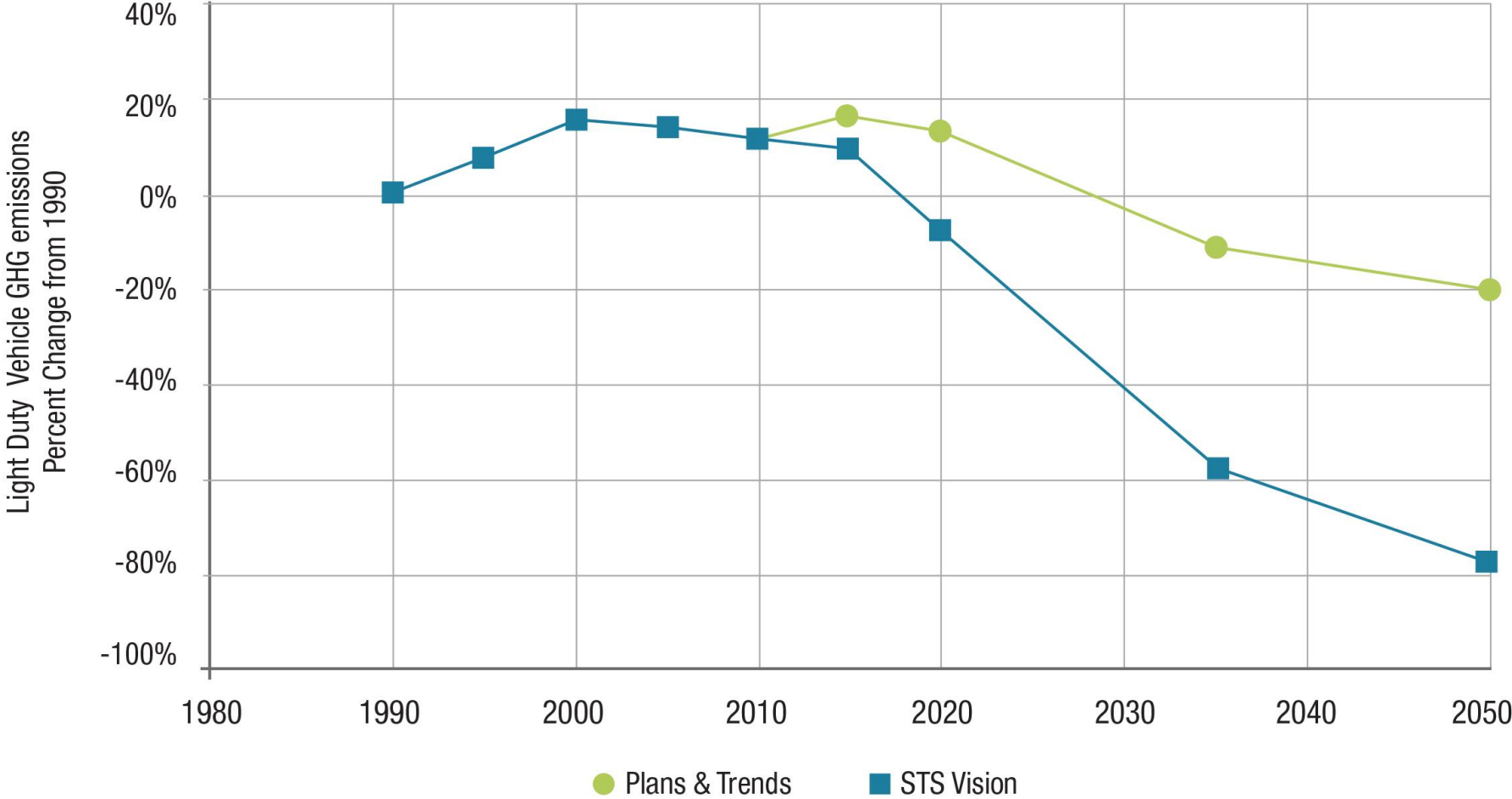
Figure 16. Trends in average levelized cost of energy (LCOE)³⁶ for selected generation technologies



Source: Lazard, 2017. Reflects average of unsubsidized high and low LCOE ranges from past reports, starting with LCOE version 3.0. Primarily reflects North American alternative energy landscape, but also broader/global cost declines.

Transportation Sector Forecasts

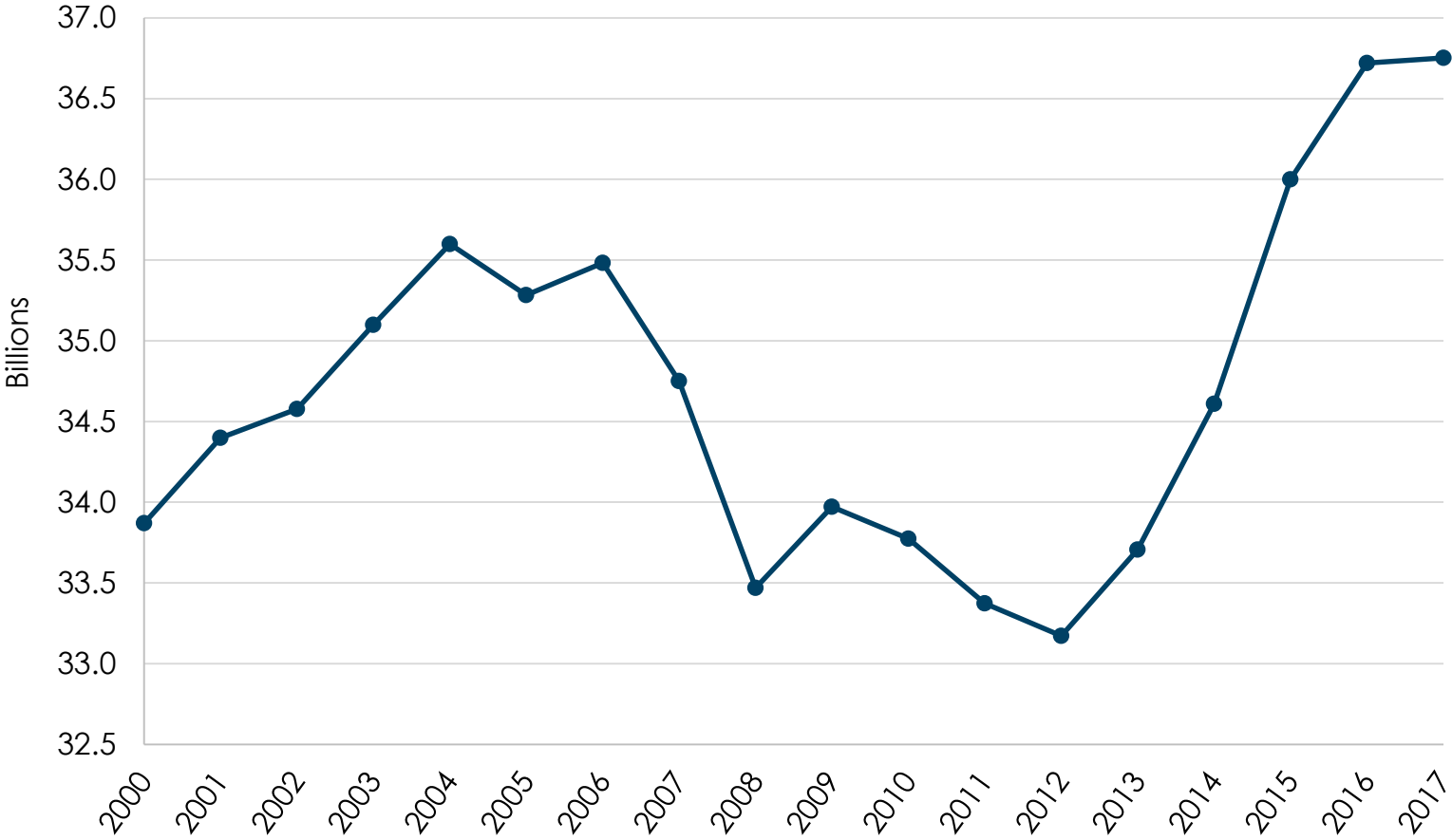
Figure 22. Projected light-duty GHG emissions of current plans and trends compared to the *Statewide Transportation Strategy* vision



Source: ODOT, 2018.

Status of VMT and Vehicle/Fuel Technologies

Oregon Statewide Vehicle Miles Traveled (VMT)



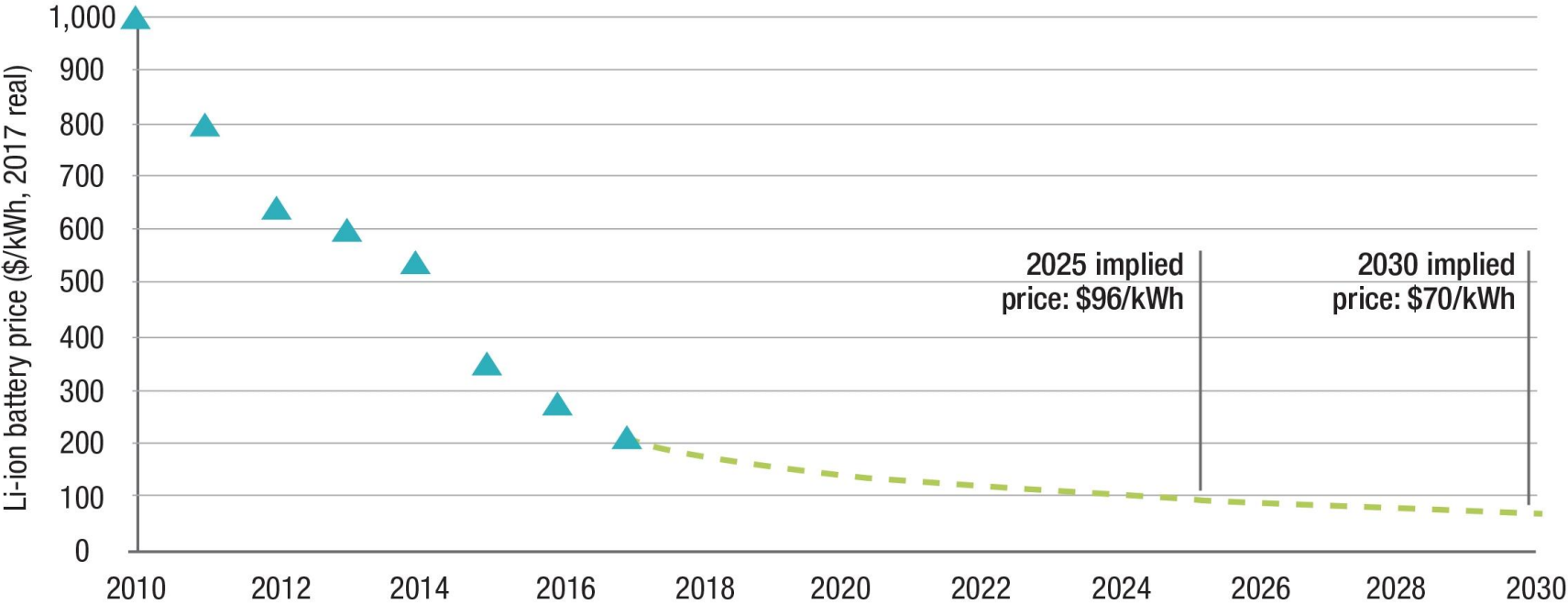
Data source: https://www.oregon.gov/ODOT/Data/documents/VMT_Statewide.pdf

Vehicle Tecnology	
Vehicle Mix	○
Fuel Efficiency (MPG)	◐
Battery Range	●
SUV/Light truck share	◉
Vehicle Age	◉
Fuel Technology	
Fuel Carbon Intensity	◐
Electric Carbon Intensity	●

- on-track with or exceeding the STS vision;
- ◐ moving in the direction of the STS vision;
- little to no progress towards the STS vision; or
- ◉ moving away from the STS vision/trending in a negative direction.

Falling Costs for Battery vs. Internal Combustion Vehicles

Figure 19. Lithium-ion battery price, historical and forecast



- Estimated parity price point = \$100/kWh battery pack
- Beyond 2025, EVs projected to be less expensive than comparable ICE models
- A fleet shift to EVs must be combined with shift to a decarbonized electricity supply

Adopting a Comprehensive Climate Strategy

1) Cap . . . and link to Western Climate Initiative

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2) Programmatic actions, including:

- Utilities: accelerate renewables, efficiency
- Transport: EVs, transit, urban design
- Waste Management

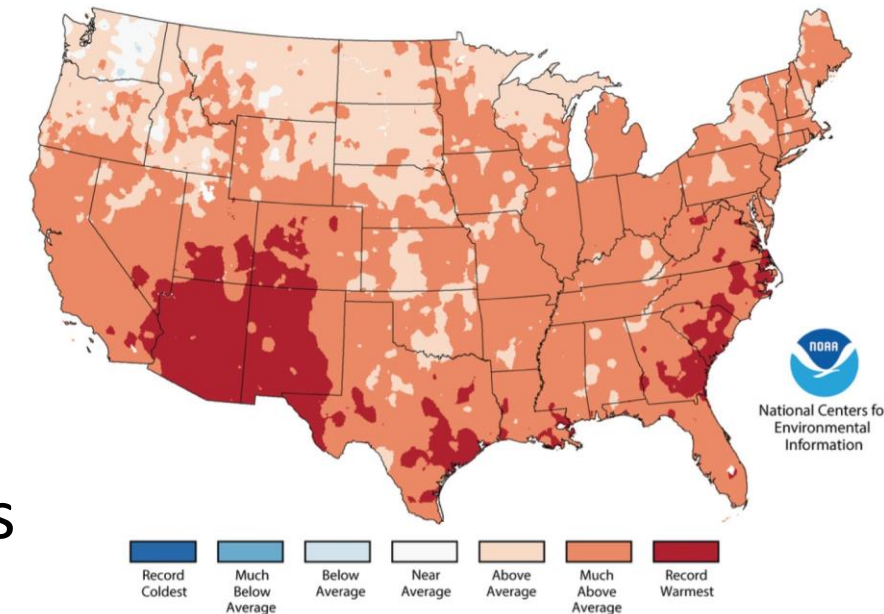
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3) Working Lands: Forest and Agricultural Practices

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3) Adaptation Planning and Implementation

Figure 2. Average annual temperature in 2017 ranked against average from 1895-2017



Source: National Oceanic and Atmospheric Administration (NOAA), 2018, <https://www.ncdc.noaa.gov/temp-and-precip/us-maps/12/201712#us-maps-select>

Costs of Climate Disruption to Oregon

- 2018 Wildfire:
 - \$40 million (ODF) for firefighting
 - \$ 5 million wheat farmers' loss to Stateline fire
- 2017 Wildfire: \$51 million in lost tourism revenues (e.g., Ashland Shakespeare and Sisters Folk Festival smoke-caused cancellations)
- Growing risks to OR agriculture (\$4.5 B), ocean fisheries (\$200 million), tourism (\$11.8 B/150,000 jobs), public health, infrastructure (2800 miles in 100-yr flood plain)



Costs of Capping Emissions?

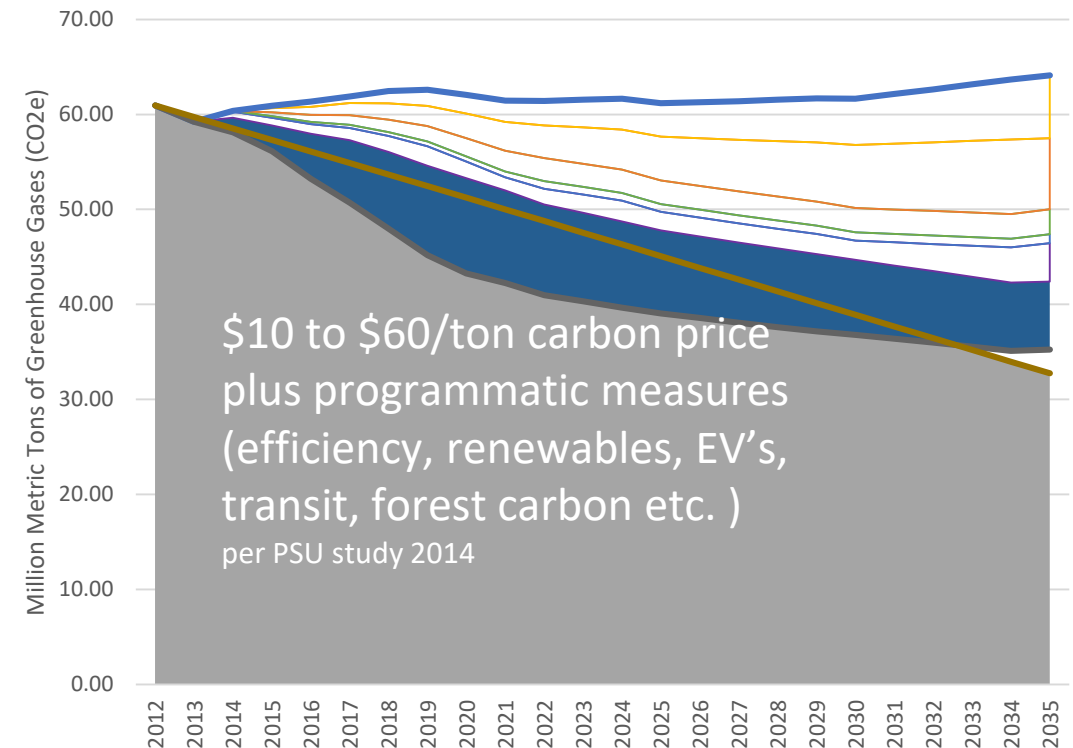
Stay tuned: Current economy-wide modeling results due soon from Carbon Policy Office's consultant

DEQ & E3 2017 Analysis of "Market Approach"

- 16 modeling scenarios for OR C&T
- GDP effect -0.08% to +0.19% (vs. historical OR GDP swings from -1.5% to +10.9%)
- Jobs impact from -0.07% (-1543 jobs) to +0.32% (+6578 jobs)

2013 PSU study found that when carbon pricing revenues are returned to economy:

- Positive job growth (+7000 jobs)
- Positive labor income growth
- Slight reduction in output (- 0.3%)
- Distributional issues (but scenario includes revenue set-asides for low income and at-risk industry; and effects further mitigated if neighbors – CA, WA, BC – adopt comparable GHG regulation)



OGWC 2018 Biennial Report Recap

- In the 2017-18 biennium, serious, measurable and disruptive climate change arrived in Oregon.
- Challenging as these effects have been, they are the first and weakest wave of disruption that will impact Oregonians.
- Costs can be documented in local communities. Climate change is affecting where and how Oregonians live, work and play..
- At the same time, Oregon's efforts to meet its greenhouse gas reduction goals – to contain and reduce its emissions – showed slippage.

Owing to past neglect, in the face of the plainest warnings, we have now entered upon a period of danger ... The era of procrastination, of half-measures, of soothing and baffling expedients, of delays, is coming to its close. In its place we are entering a period of consequences ... We cannot avoid this period; we are in it now.

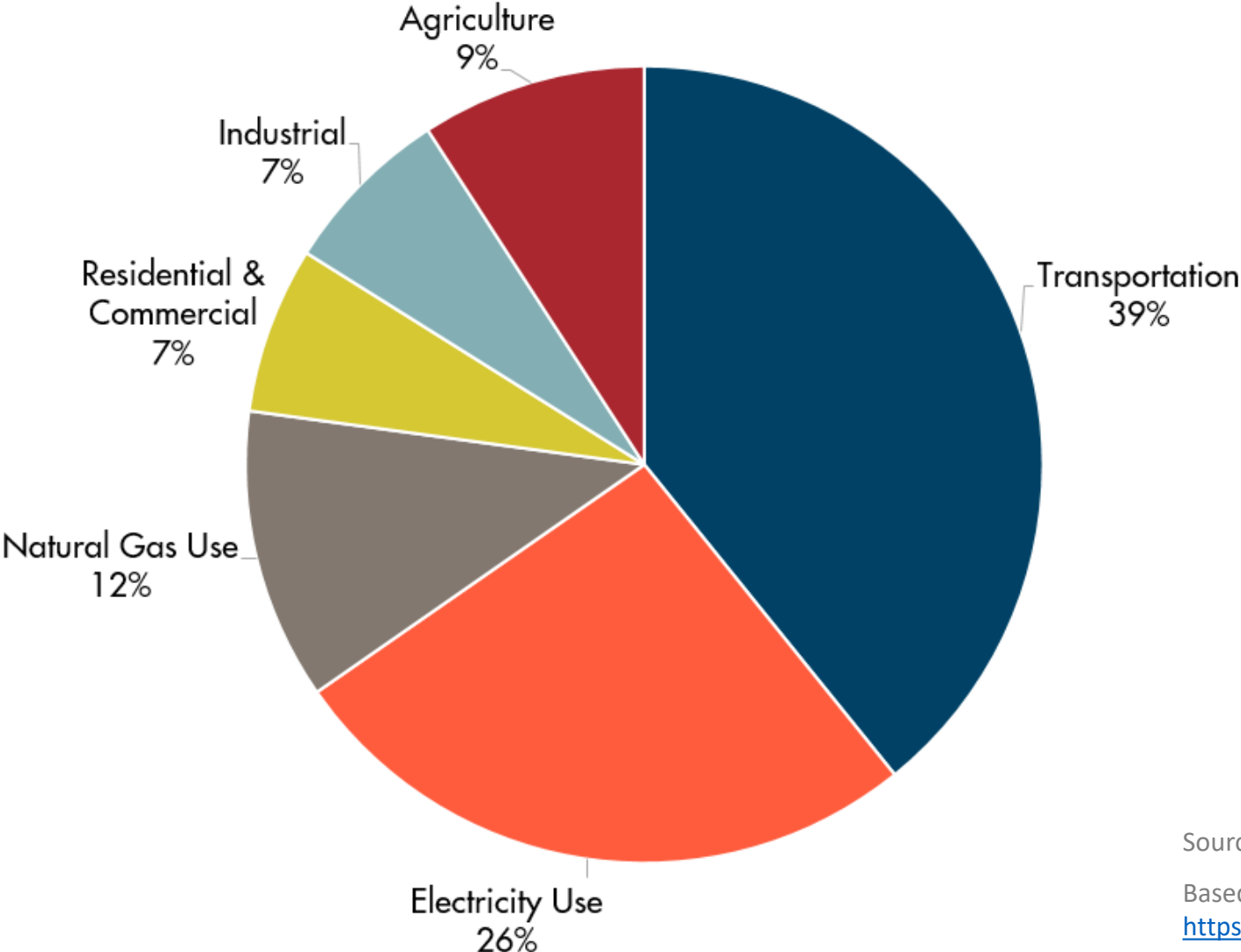
Winston Churchill, in the House of Commons, November 1936



Questions?

www.keeporegoncool.org/reports

Sectoral Breakdown of Oregon's 2016 GHG Emissions



Source: <https://energyinfo.oregon.gov/ber/>

Based on data from:
<https://www.oregon.gov/deq/air/programs/Pages/GHG-Inventory.aspx>

Bloomberg New EV Sales Projections

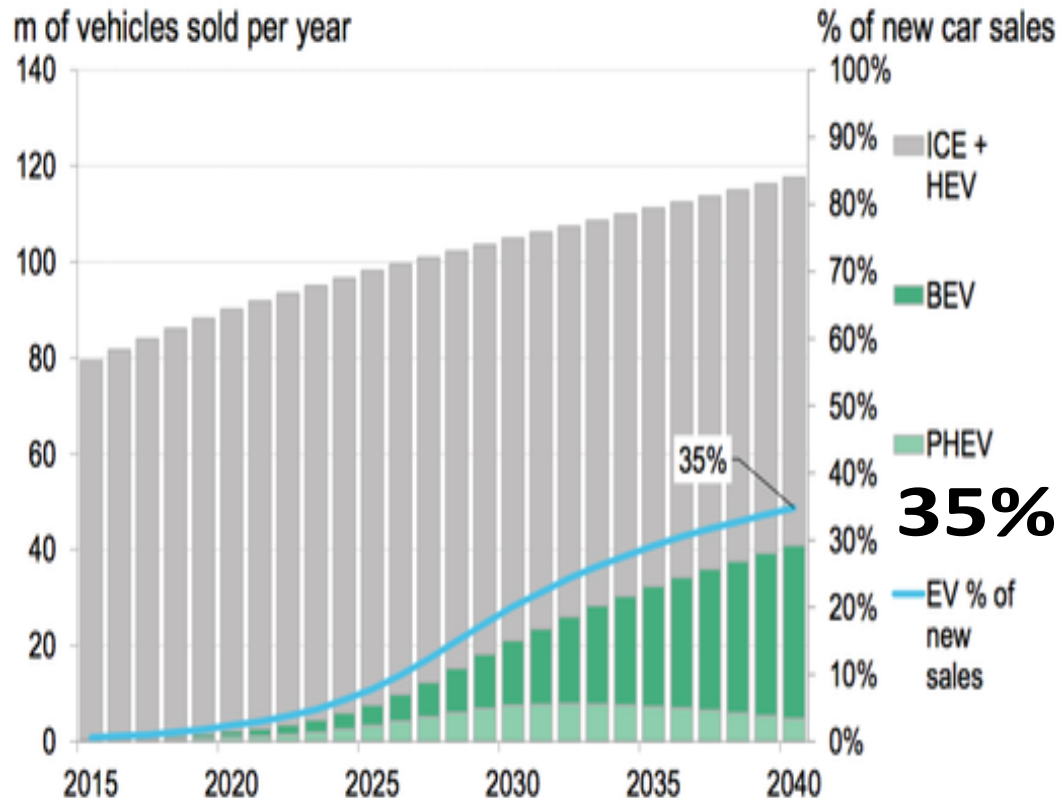
[2015-2040]

2016 Rpt

vs

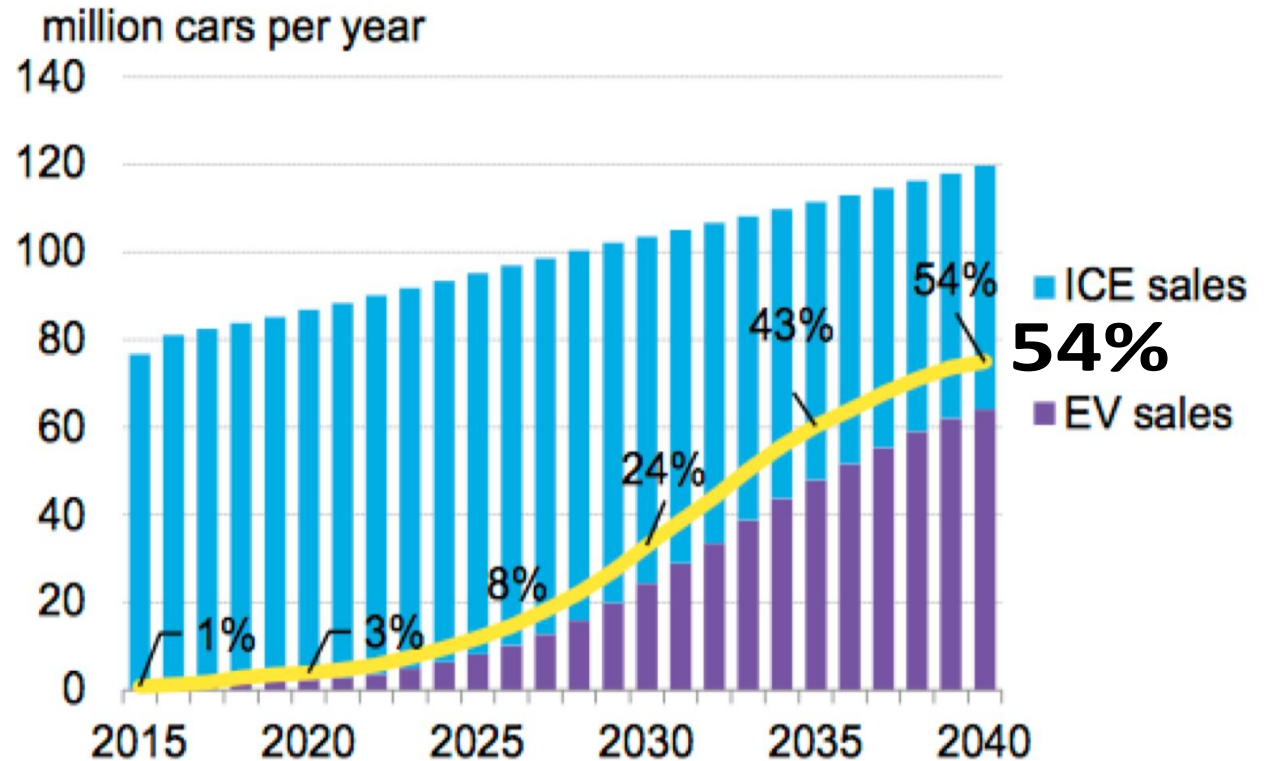
2017 Rpt

Figure 1: Global LDV and EV yearly sales, 2015 – 2040 (m vehicles sold per year)



Source: Bloomberg New Energy Finance Note: ICE+HEV = internal combustion engine and hybrid BEV = battery electric vehicles, PHEV = plug-in hybrid electric vehicles.

Figure 1: Annual global light duty vehicle sales



Source: Bloomberg New Energy Finance

Oregon's Consumption-Based GHG Emissions

Notes:

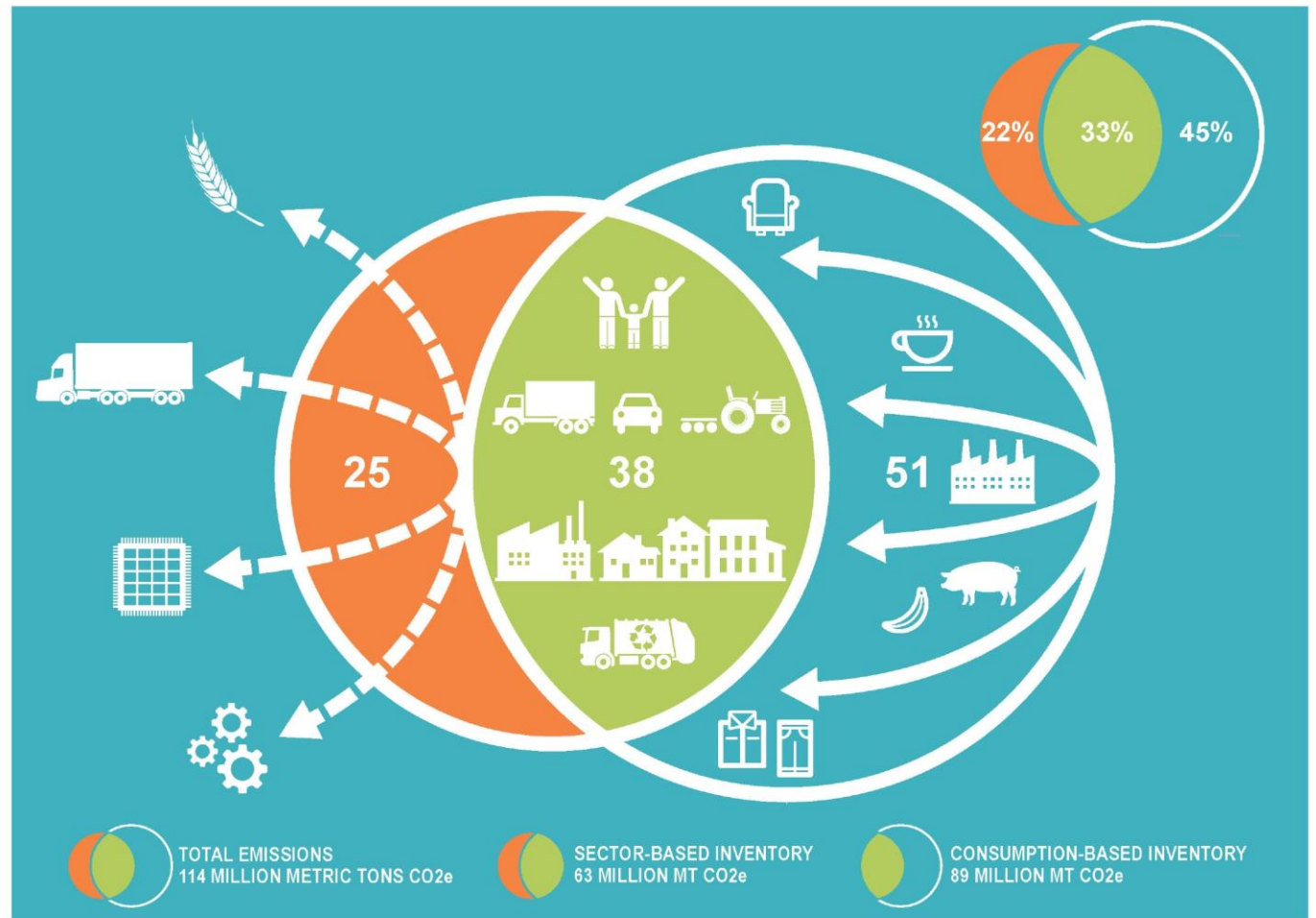
The **left segment** shows emissions occurring in Oregon from making products and services that are exported.

The **right segment** shows emissions occurring elsewhere in making products and services imported into Oregon.

The **middle segment** shows emissions occurring in Oregon from making products and services in Oregon that are also consumed in Oregon.

Consumption-based emissions are up 44% since 1990, due to greater reliance on imported goods and services. Put another way, Oregon may be "offshoring" its emissions rather than reducing them.

Figure 11. Comparison of Oregon's 2015 sector- and consumption-based greenhouse gas emissions expressed in millions of tons of CO₂e



Source: DEQ, 2018. Note that the *left segment* shows emissions occurring in Oregon from making products and services that are exported. The *right segment* shows emissions occurring elsewhere in making products and services imported into Oregon. The *middle segment* shows emissions occurring in Oregon from making products and services in Oregon that are also used in Oregon.