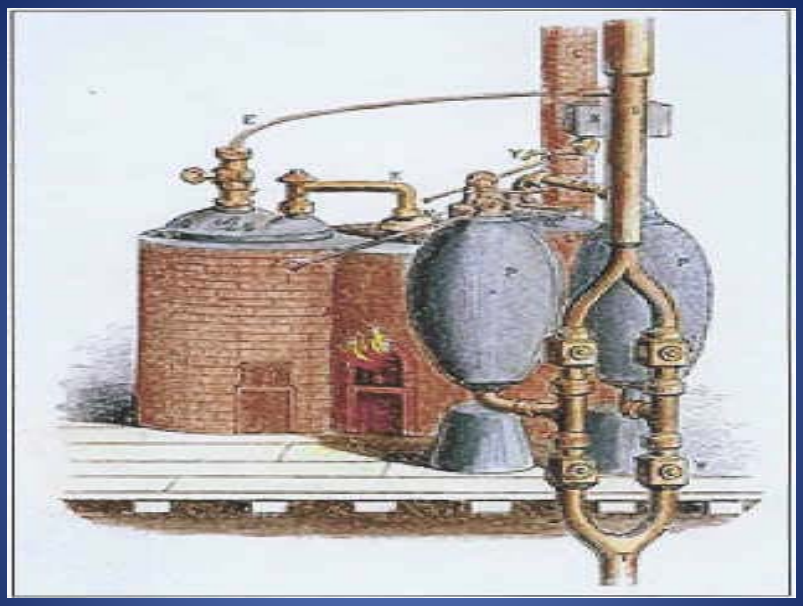
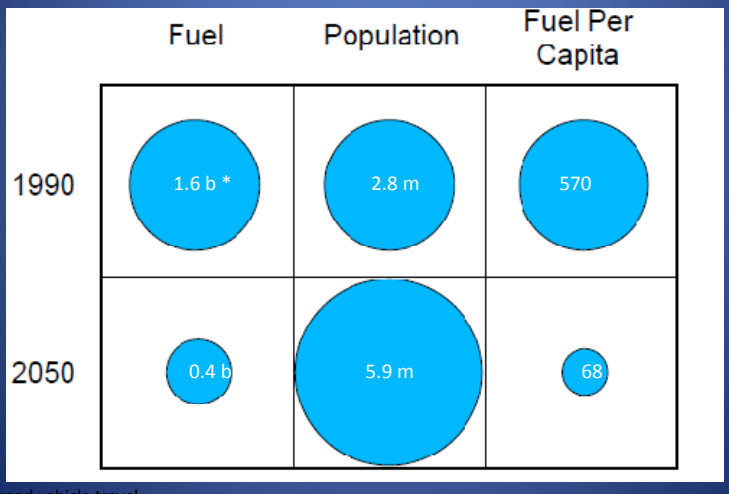


Savery Steam Engine – 1698

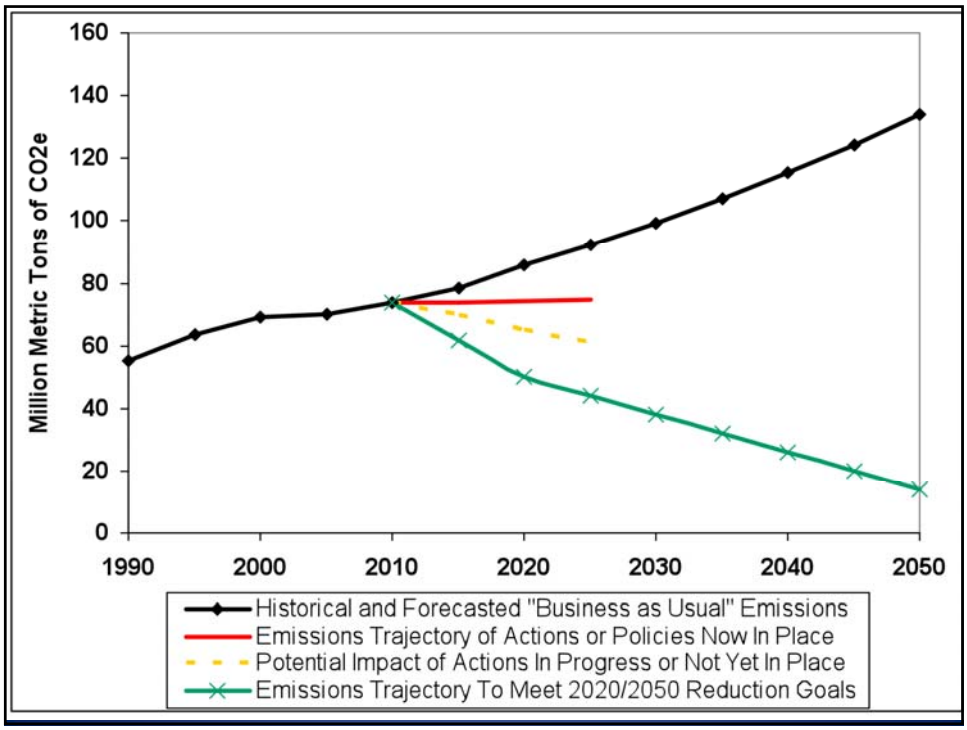
What does a 75% reduction in GHG emissions mean in terms of fossil fuel consumption?



* On-road vehicle travel

HB 3543 – 2007 Legislature Sets Goals

1. By 2010 Oregon shall have arrested the increase in greenhouse gas emissions and shall begin real reductions.
2. By 2020, Oregon's greenhouse gas emissions shall not exceed a level 10% below 1990 levels.
3. By 2050, Oregon's greenhouse gas emissions shall not exceed a level at least 75% below 1990 levels.



Roadmap to 2020 Guidelines

- Think transformationally
- Think backward from 2050 first, then forward to 2020
- Think outside silos
- No magic bullet technologies

Roadmap to 2020 Recommendations by Sector

- Commission “Integrating” Recommendations
- Industrial Emissions
- Materials/Waste Management
- Agriculture
- Forestry
- *Energy/Utilities*
- *Transportation/Land Use*

Global Warming Commission "Integrating" Recommendations

- *Set 2030, 2040 GHG Reduction Goals*
- *Inventory GHG's and allocate reduction targets by cost-effectiveness, source, use/user, geography*
- Advocate for national carbon cap or comparable GHG reduction tools
- Grow national energy/carbon research funding

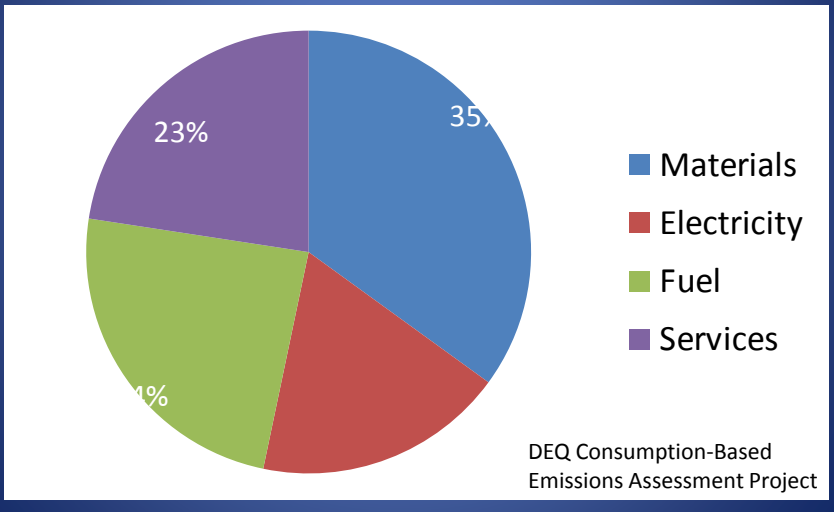
Industrial Emissions

- Sector-targeted efficiency, e.g. boilers served from pipeline gas contracts
- State assistance for finance, technology access; staff training; "best practices" sharing
- *Leadership Initiative: "Top Twentieth" percentile in plant carbon/output – State brands, markets (like Oregon Country Beef)*
- (see also Transportation/Land Use industrial siting and freight recommendations)

Materials/Waste Management

- *Consumption-based GHG inventory*
- *Carbon footprinting; carbon content labeling; consumer information (e.g., food choices)*
- *Upstream "stewardship" responsibilities for manufacturers*
- "Net zero" life cycle carbon footprint buildings
- *Reduce food waste*
- *Research organic waste disposition for optimum carbon outcomes*

GHG Emissions, All Consumers, by Type of Final Demand (est.)

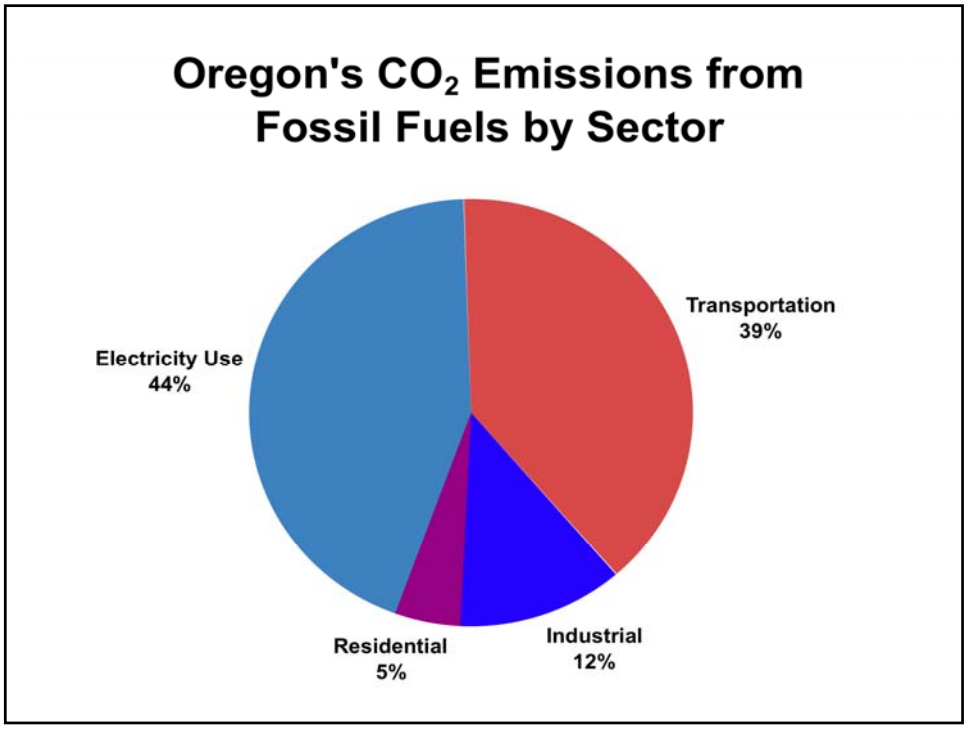


Agriculture

- Increase nutrient use efficiency, information transfer to farmers
- Identify and incent tools for carbon sequestration in soils and permanent vegetation
- *Develop, deploy manure-to-energy technologies*
- Develop adaptation strategies to cope with expected water constraints

Forestry

- Develop forest carbon inventory/tracking tools
- Leave west-side (moist) forests alone to accumulate carbon
- Manage and reduce fuel loading in east-side (dry) forests (result: near-term carbon release)
- Rely upon private forest holdings for product
- No net conversion of forest to non-forest uses

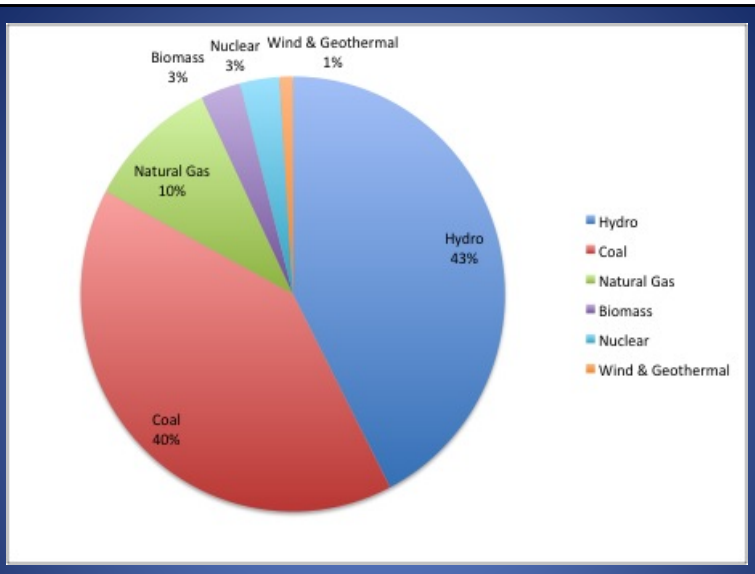


Utility Supply/Service in 2050

"decentralized, distributed" . . . dynamic management and integration mediated by Smart Grid/IT . . . resources and loads integrated vertically (between generation and load) + laterally (load-to-load). . . efficiency is the priority energy/capacity resource . . . "smart" appliances, plug-in EV's can be dispatched along with generating plants and central storage . . . Hydro + renewables = 80% of generation, integrated w/ 20% gas and added transmission capacity . . . new technologies pulled into market by national carbon reduction policies

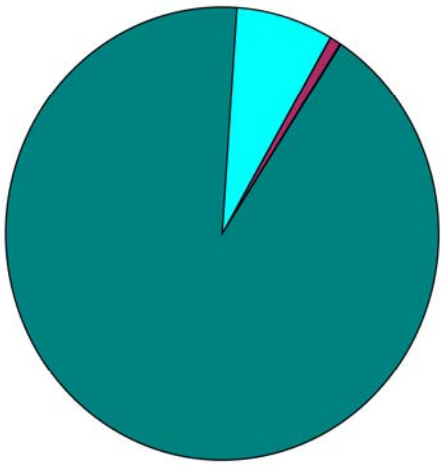
Energy/Utilities Tier One Recommendations

- Develop State Energy/Climate Policy & Benchmarks [*coordinate with EQC/DEQ*]
- Energy Efficiency Codes, Standards, Incentives [*indoor air quality issues?*]
- New Transmission
- OUS Research Priorities
- Gas Infrastructure [*incl. vehicle fuels]*
- Smart Grid/Resource Integration
- Ramp down coal (*GHG/CAA interactions*]



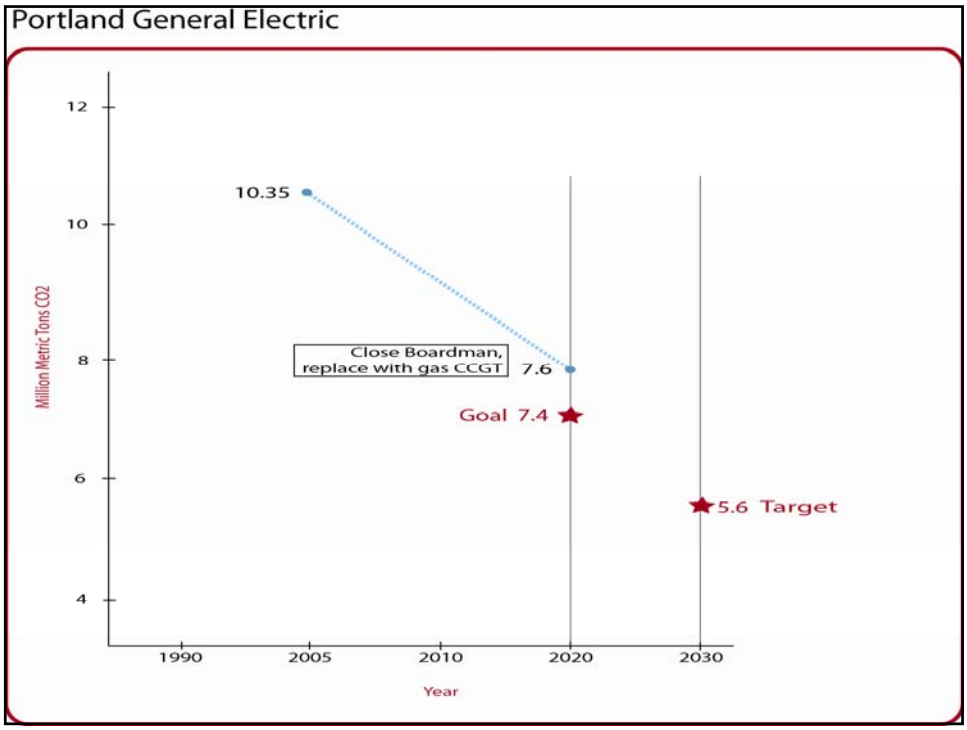
Oregon Electricity Supply Mix - 2005

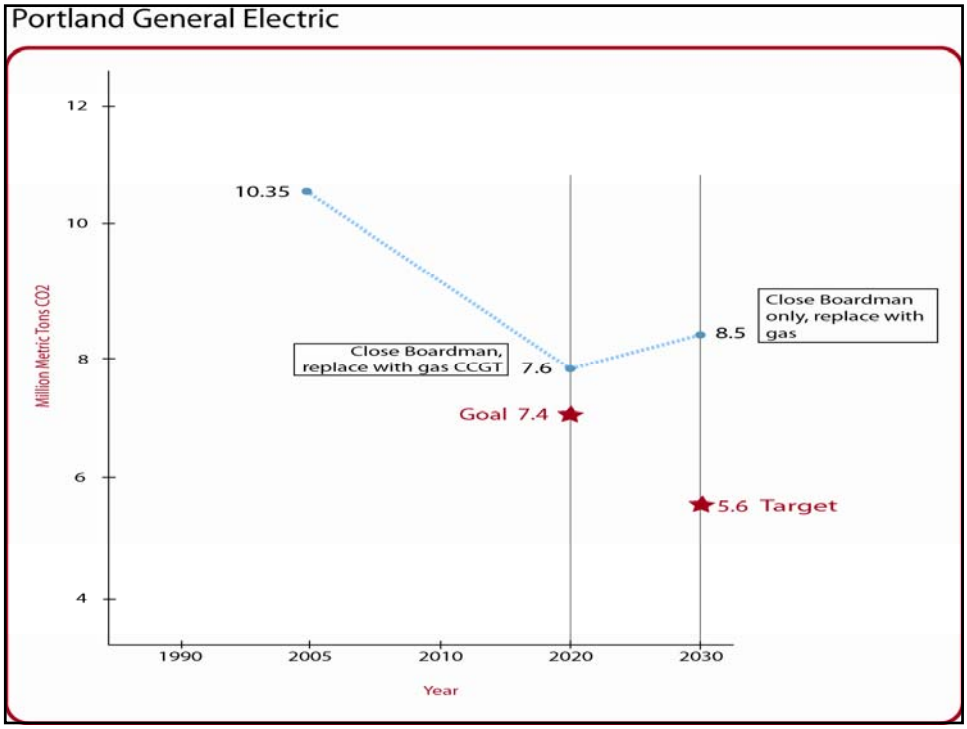
Coal plants account for 82 percent of OR power system CO_2 emissions*

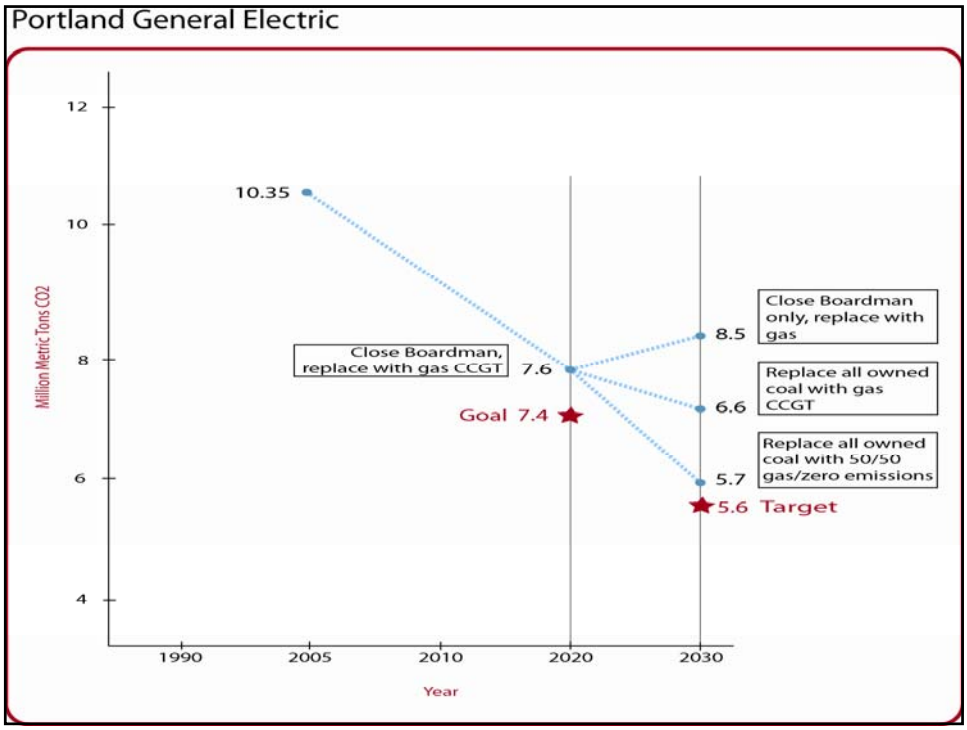


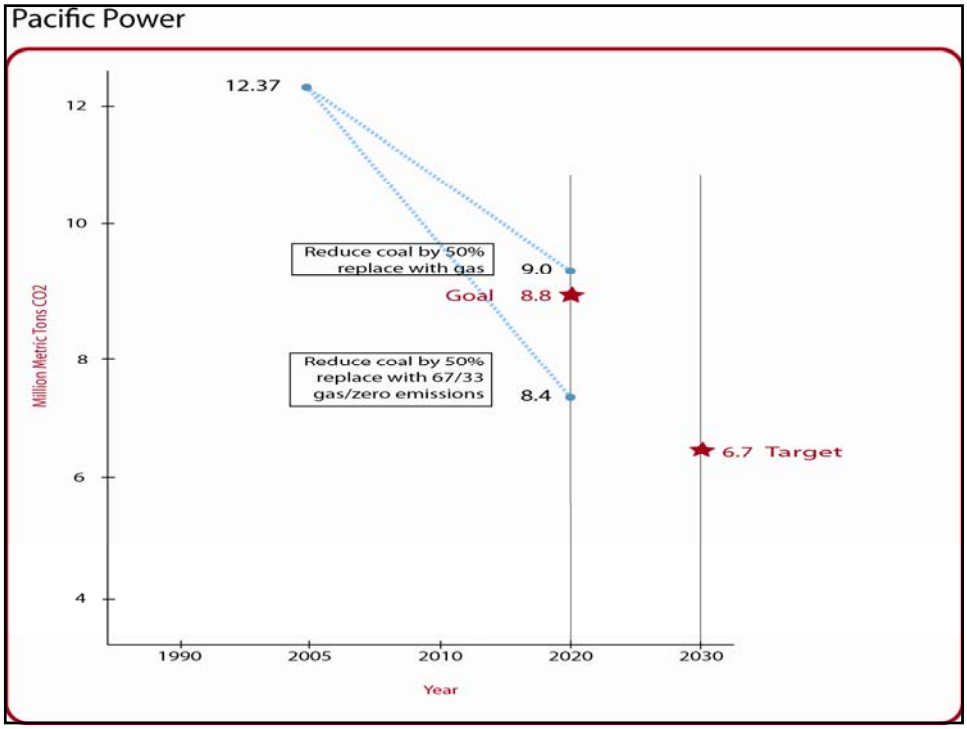
Other
Existing coal
Existing gas

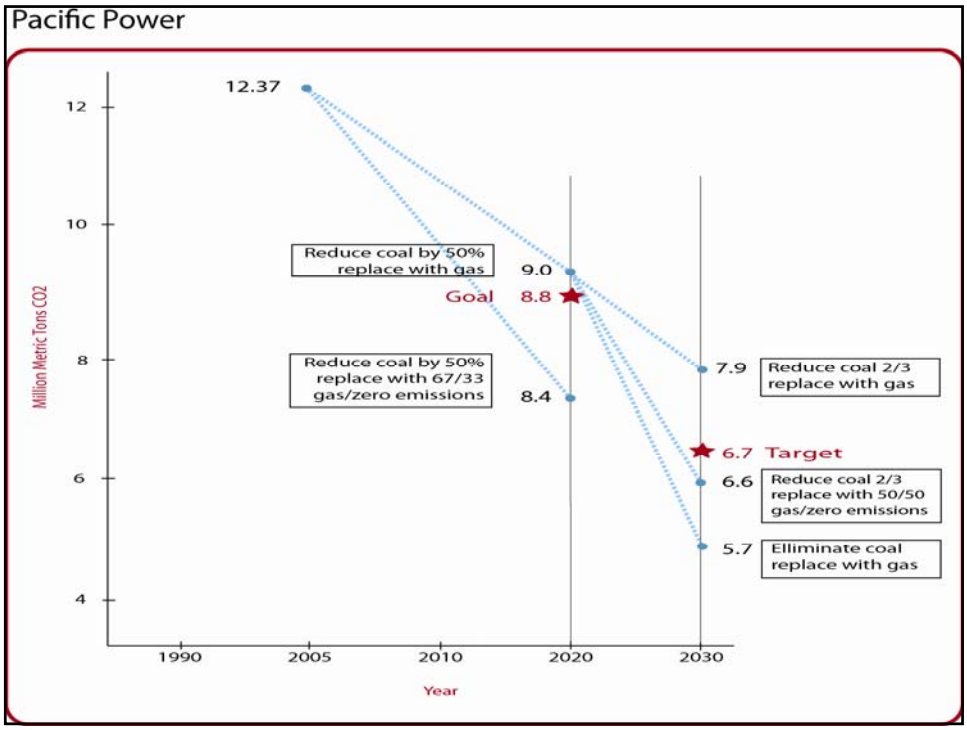
*and 33% of overall Oregon GHG emissions




Portland General Electric
Million Metric Tons CO2
12
10
8
6
4
10.35
Close Boardman, replace with gas CCGT
7.6
Goal 7.4
8.5
Close Boardman only, replace with gas
5.6 Target
1990
2005
2010
2020
2030
Year


Portland General Electric
Million Metric Tons CO2
12
10
8
6
4
10.35
Close Boardman, replace with gas CCGT
7.6
Goal 7.4
8.5
Close Boardman only, replace with gas
6.6
Replace all owned coal with gas CCGT
5.7
Replace all owned coal with 50/50 gas/zero emissions
5.6 Target
1990
2005
2010
2020
2030
Year


Pacific Power
12.37
12
10
8
6
4
Million Metric Tons CO2
Reduce coal by 50% replace with gas
9.0
Goal
8.8
Reduce coal by 50% replace with 67/33 gas/zero emissions
8.4
6.7 Target
1990
2005
2010
2020
2030
Year

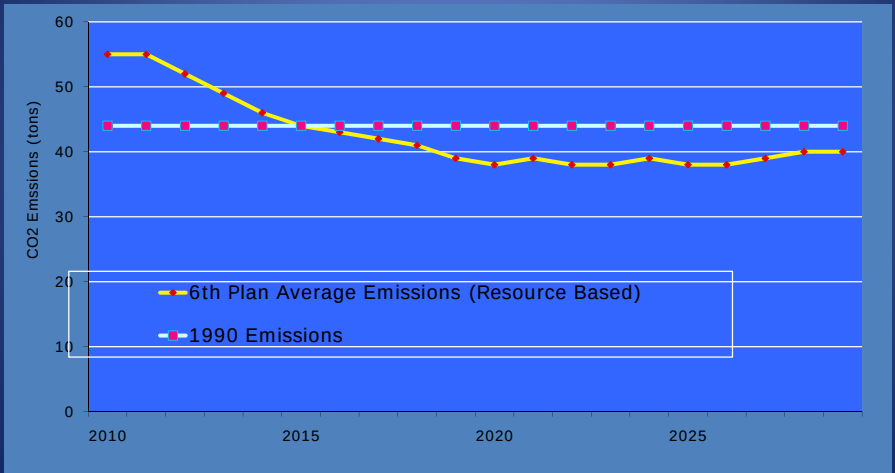

Pacific Power
12.37
12
10
8
6
4
Million Metric Tons CO2
Reduce coal by 50% replace with gas
9.0
Goal
8.8
Reduce coal by 50% replace with 67/33 gas/zero emissions
8.4
7.9
Reduce coal 2/3 replace with gas
6.7 Target
6.6
Reduce coal 2/3 replace with 50/50 gas/zero emissions
5.7
Elliminate coal replace with gas
1990
2005
2010
2020
2030
Year

Resource Acquisitions to 2030 (% reliance - estimated)

	NW Power Council	NW Utilities	PGE
Efficiency	68	45	23
Wind/Renewables	17	25	13
Gas	13	30	64
Other	2		

10/09

Four Actions Dropped PNW Electric Utility Carbon Emissions 15% Below 1990 Levels by 2020



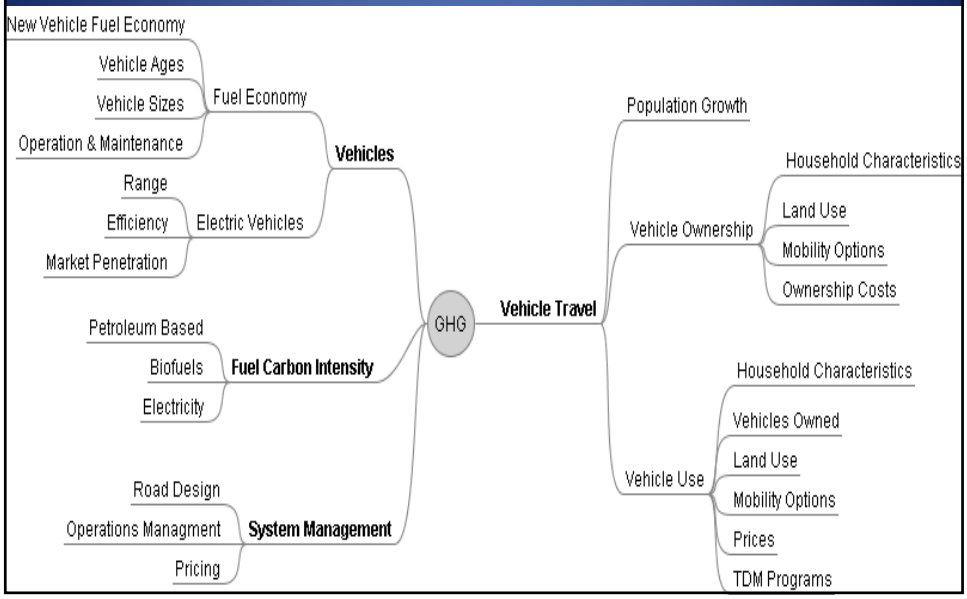
NW Conservation and Power Planning Council Sixth Power Plan

Transportation/Land Use Tier One Recommendations

- Change Transportation funding strategy
- Expand Urban, Intercity Transportation Options/
- Create Compact Neighborhoods within existing urban growth boundaries
- Enable lower-carbon freight movement
- Demand reduction
- Manage/price parking
- *Vehicles/Fuels: Low Carbon Fuel Standards/Electric Vehicle market uptake, infrastructure*

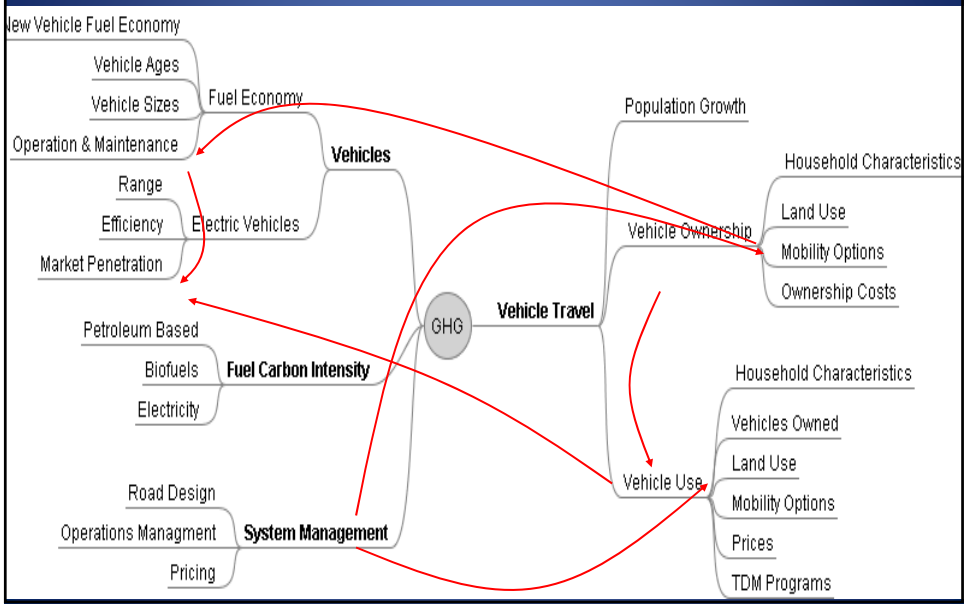
Many factors affect light vehicle GHG emissions

[ODOT GreenSTEP Model]



Factors are interconnected

[ODOT GreenSTEP Model]



GreenSTEP addresses a large number of factors affecting GHG emissions

- Demographic and income changes
- Relative amounts of development occurring in urban and rural areas
- Metropolitan and other urban area densities
- Urban form (i.e. mixed-use)
- Amounts of metropolitan area public transit service
- Highway capacity
- Vehicle proportions: autos, light trucks, EVs, PHEVs
- Vehicle ages
- Vehicle fuel efficiency
- Pricing of fuel, carbon, VMT, parking
- Use of bicycle & other light-weight vehicles
- TDM and eco-driving
- Effects of congestion on fuel economy
- Lifecycle carbon content of fuels
- CO2 production from electrical power use for transportation

"Roadblocks"

Oregon

- Need Data
- Need GHG Reduction "Least Cost Plan"
- Equity Issues
- Incremental Thinking / Transformational Challenge

National

- Absence of Carbon Signal
- Cost (Recession Shock)
- Technology Development, Market Penetration
- Population
- Status Quo Money = Status Quo Politics

KeepOregonCool

Oregon Global Warming Commission