Bend Community Greenhouse Gas Inventory
Fiscal Year 2015-16

Presented by
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Presentation Overview

• Greenhouse gas (GHG) inventory 101
• Sector-based emissions inventory results
  - Building energy
  - Transportation
  - Emissions forecast to 2040
• Emissions from household consumption
• Inventory results and climate action planning
What is being measured?

- GHG Inventory is measuring the weight of GHGs
- Convert all gases into metric tons of carbon dioxide equivalent (MT CO$_2$e) using GWP

<table>
<thead>
<tr>
<th>Greenhouse Gases</th>
<th>Chemical Formula</th>
<th>Global Warming Potential (100 year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon dioxide</td>
<td>CO$_2$</td>
<td>1</td>
</tr>
<tr>
<td>Methane</td>
<td>CH$_4$</td>
<td>28</td>
</tr>
<tr>
<td>Nitrous oxide</td>
<td>N$_2$O</td>
<td>265</td>
</tr>
<tr>
<td>Hydrofluorocarbons</td>
<td>C$_x$H$_y$F$_z$</td>
<td>12 - 12,000</td>
</tr>
</tbody>
</table>

Source: IPCC 5th Assessment Report, 2014
What is 1 MT CO$_2$e?

One MT CO$_2$e is equal to any one of the following:

- one passenger vehicle driven 2,500 miles
- 10% of one home’s energy use for a year
- 40 propane cylinders for home BBQs
- 1.2 acres of US forest sequestration for 1 year
Inventory Boundaries

- **Geographic boundary:** City of Bend, Urban Growth Boundary
- **Time period:** Fiscal Year 2015-16
- **Emissions sources:**
  - Stationary energy
  - Transportation
  - Waste
  - Refrigerant leakage
  - Household consumption of goods and food
  - Upstream energy production
Sector-based Community GHG Emissions

Bend Sector-Based Greenhouse Gas Emissions
776,765 MT CO₂e
9.2 MT CO₂e per capita

- Residential Energy: 236,270 MT CO₂e (30%)
- Commercial Energy: 179,155 MT CO₂e (23%)
- Industrial Energy: 23,581 MT CO₂e (3%)
- Transportation: 257,914 MT CO₂e (33%)
- Waste: 37,378 MT CO₂e (4%)
- Industrial Process and Product Use: 42,466 MT CO₂e (6%)

Community-wide Results
Building Energy = 56% of emissions

GHG Emissions (MT CO2e)

- Residential
- Commercial
- Industrial

Electricity (Location-Based)
Natural Gas
Other Fuels
Electricity use up 5%, 2015 to 2017
Natural gas use up 30%, 2015 to 2017

- Residential: +31.1%
- Commercial: +27.7%
- Industrial: +36.8%
- HDD: +31.1%
Electricity purchases by utility for FY16

Central Electric Cooperative, 181,375,491 kWh 18%

Pacific Power, 799,484,378 kWh 82%
Two accounting methods for electricity

Stationary Energy - Electricity

<table>
<thead>
<tr>
<th>Location-Based Emissions</th>
<th>Market-Based Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northwest Power Pool Average</td>
<td>Pacific Power</td>
</tr>
<tr>
<td>Central Electric Co-op</td>
<td></td>
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</tbody>
</table>

Electricity Emissions (MT CO₂e)
Community renewable energy purchases

- Renewable Purchases: 8%
- Average Retail: 92%
Transportation emissions by source

- Residential Air Travel: 20%
- Passenger Vehicles: 66%
- Commercial Service: 6%
- Heavy-Duty Trucks: 6%
- Bend Airport: 2%
- Transit: <1%
- Rail Freight: <1%
Percentage of Bend fleet electrified

% ICE by Region – 2016DMV

- Corvallis
- METRO
- Eugene/Springfield
- Medford
- Salem/Keizer
- Bend
- Albany
- Middle Rogue
Per Capita and HH Equivalencies

- **2016 GHG Emissions = 945,000 MT CO$_2$e**
  - Per Capita = 11.3 MT CO$_2$e / person
  - Per Household = 27.8 MT CO$_2$e / household

- **Equivalencies Per Capita**
  - Carbon Offset Cost ($) = $170 / year**
  - Tree Seedlings Grown for 10 Years = 293 / year

- **Equivalencies Per Household**
  - Carbon Offset Cost ($) = $417 / year**
  - Tree Seedlings Grown for 10 Years = 720 / year

*Uses market-based electricity emissions

**Assumes a carbon offset cost of $15 / MT CO$_2$e
Bend’s emissions forecast to 2040
Community Emissions with Consumption

FY16 Community GHG Emissions (MT CO$_2$e)

- Sector-Based Emissions
- Sector-Based + Other Scope 3
Consumption-based Emissions

Community Emissions with Consumption

Bend Sector-Based Greenhouse Gas Emissions with Household Consumption and Community Fuel Production

776,765 MT CO$_2$e Sector-Based
871,543 MT CO$_2$e Household Consumption and Community Fuel Production (magenta)

FY16 Community GHG Emissions (MT CO$_2$e)

- Stationary Energy
- Transportation
- Waste
- Process Emissions & Product Use
- Household Goods
- Household Food

- Residential
- Commercial
- Industrial
- Water
- Vehicle Fuel Production
- Air Travel
- On-Road Vehicles
- Other Goods
- Furniture
- Clothing
- Home Construction
- Vehicle Production
- Other Food

Grains
Produce
Dairy
Meat
Consumption-based Emissions

Oregon emissions trends with consumption

Source: ODEQ, Oregon’s GHG Emissions through 2015 (May 2018)
Inventory results and climate action planning

• Bend’s largest sources are similar to other communities and have known action opportunities.
• Frequency of sector-based community inventories is typically every 2 – 5 years.
• Work with partners – ODOT and ODEQ - to improve inventory data / modeling.
• Consumption-based emissions are large, and therefore need to be addressed in CAP, but are currently difficult to track accurately over time.
• Community GHG calculator (ClearPath) has useful climate action features - forecasts, planning scenarios, & monitoring and tracking.
Thank you!

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