Natural Gas Integrated Resource Plan
TAC #4

November 18, 2020
Agenda

1. CPA results from AEG (60 minutes) – Ken Walter
2. CPA results from ETO (60 minutes) – Spencer Moersfelder, Ted Light
3. Break (15 minutes)
4. Sendout Model (15 minutes) – Tom Pardee
5. Review assumptions (30 minutes) – Tom Pardee
6. Lunch break (60 minutes)
7. Final modeling results for Expected Case (60 minutes) – Tom Pardee
8. Final modeling results for Other Scenarios (60 minutes) – Tom Pardee
9. Action Plan and Next Steps (30 minutes) – Tom Pardee
2020 Natural Gas IRP Schedule


TAC 2 (Dual Meeting with Power side): Thursday, August 6, 2020: Market Analysis, Price Forecasts, Cost Of Carbon, Environmental Policies
• Demand Results and Forecasting – August 18, 2020

TAC 3: Wednesday, September 30, 2020: Distribution, Avista’s current supply-side resources overview, supply side resource options, renewable resources, Carbon cost, price elasticity, sensitivities and portfolio selection modeling.

TAC 4: Wednesday, November 18, 2020: CPA results from AEG & ETO, review assumptions and action items, final modeling results, portfolio risk analysis and 2020 Action Plan.
AVISTA 2020 NATURAL GAS CPA

CPA Methodology Overview
• Review of AEG Approach
• Levels of Potential
• Economic Screening and IRP Integration
• Retained enhancements from 2018 Action Plan

Summary of Results
• Summary of Potential
  ▪ High level potential
  ▪ Technical Achievable compared to Economic potential
• Comparison to previous CPA
ABOUT AEG

Planning
- Baseline studies
- Market assessment studies
- Program design & action plans
- End-use forecasting

EM&V
- EE portfolio & targeted programs
- Demand response programs & dynamic pricing
- Pilot design & experimental design
- Behavioral programs

Implementation & Technical Services
- Engineering review, due-diligence, QA/QC
- M&V, modeling & simulation, onsite assessments
- Technology R&D and data tools (DEEM)
- Program admin, marketing, implementation, application processing

Market Research
- Program / service pricing optimization
- Process evaluations
- Market assessment / saturation surveys
- Market segmentation
- Customer satisfaction / customer engagement

VISION DSM™ Platform
Full DSM lifecycle tracking & reporting
AEG EXPERIENCE IN PLANNING
Including Potential Studies and End-Use Forecasting

AEG has conducted more than 60 planning studies for more than 40 utilities / organizations in the past five years.

AEG has a team of 11 experienced Planning staff plus support from AEG’s Technical Services and Program Evaluation groups.

Northwest & Mountain:
Avista*
BPA*
Cascade Natural Gas
Chelan PUD
Cheyenne LFP
Colorado Electric*
Cowlitz PUD*
Inland P&L*
Oregon Trail EC
PacifiCorp*
PNGC
PGE*
Seattle City Light*
Tacoma Power*

Midwest:
Ameren Illinois*
Ameren Missouri*
Citizens Energy
Empire District Electric
Indianapolis P&L*
Indiana & Michigan Utilities
Kansas City Power & Light
MERC
NIPSCO*
Omaha Public Power District
State of Michigan
Vectren Energy*

Northeast & Mid Atlantic:
Central Hudson G&E*
Con Edison of NY*
New Jersey BPU
PECO Energy
PSEG Long Island
State of Maryland (BG&E, DelMarva, PEPCO, Potomac Edison, SMECO)

Southwest:
HECO
LADWP
NV Energy*
Public Service New Mexico*
State of Hawaii
State of New Mexico
Xcel/SPS

South:
OG&E
Kentucky Power
Southern Company (APC, GPC, Gulf Power, MPC)
TVA

Regional & National:
Midcontinent ISO*
EEI/IEE*
EPRI
FERC

* Two or more studies
CPA OBJECTIVES

The Avista Conservation Potential Assessment (CPA) supports the Company’s regulatory filing and other demand-side management (DSM) planning efforts and initiatives.

The two primary research objectives for the 2020 CPA are:

• **Program Planning:** insights into the market for natural gas energy efficiency (EE) measures in Avista’s Washington and Idaho service territories
  - For example, CPAs provide insight into changes to existing program measures as well as new measures to consider

• **IRP:** long-term forecast of future EE potential for use in the IRP
  - Economic Achievable Potential (EAP) for natural gas

AEG utilizes its comprehensive LoadMAP analytical models that are customized to Avista’s service territory.
OVERVIEW OF AEG’S APPROACH

Overview – Natural Gas CPA

- **Market Characterization**
  - Avista control totals
  - Customer account data
  - Secondary data
  - Avista market research

- **Identify Demand-Side Resources**
  - EE technologies
  - EE measures
  - Emerging measures and technologies

- **Baseline Projection**
  - Avista Load Forecast
  - Customer growth
  - Standards and building codes
  - Efficiency options
  - Purchase Shares

- **Potential Estimation**
  - Technical
  - Technical Achievable
  - Economic Screen (TRC and UCT)

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![Natural Gas Intensity by End Use & Segment, 2015](chart1)

![Residential Baseline Projection](chart2)

![Residential Cumulative Natural Gas Savings](chart3)
Prioritization of Avista Data

Data from Avista was prioritized when available, followed by regional data, and finally well-vetted national data.

Avista sources include:
- 2013 Residential GenPop Survey
- Forecast data and load research
- Recent-year accomplishments and plans

Regional sources include:
- NEEA studies (RBSA 2016, CBSA 2019, IFSA)
- RTF and Power Council methodologies, ramp rates, and measure assumptions

Additional sources include:
- U.S. DOE’s Annual Energy Outlook
- Technical Reference Manuals and California DEER
- AEG Research
BASELINE PROJECTION
Overview

“How much energy would customers use in the future if Avista stopped running programs now and in the absence of naturally occurring efficiency?”

- The baseline projection answers this question

The baseline projection is an independent end-use forecast of natural gas consumption at the same level of detail as the market profile

The baseline projection:

<table>
<thead>
<tr>
<th>Includes</th>
<th>Excludes</th>
</tr>
</thead>
<tbody>
<tr>
<td>To the extent possible, the same forecast drivers used in the official load forecast, particularly customer growth, natural gas prices, normal weather, income growth, etc.</td>
<td>Expected impact of naturally occurring efficiency (except market baselines)</td>
</tr>
<tr>
<td>Trends in appliance saturations, including distinctions for new construction.</td>
<td>Impacts of current and future demand-side management programs</td>
</tr>
<tr>
<td>Efficiency options available for each technology, with share of purchases reflecting codes and standards (current and finalized future standards)</td>
<td></td>
</tr>
<tr>
<td>Expected impact of appliance standards that are “on the books”</td>
<td></td>
</tr>
<tr>
<td>Expected impact of building codes, as reflected in market profiles for new construction</td>
<td></td>
</tr>
<tr>
<td>Market baselines when present in regional planning assumptions</td>
<td></td>
</tr>
</tbody>
</table>
LEVELS OF POTENTIAL

We estimate three levels of potential. These are standard practice for CPAs in the Northwest:

- **Technical**: everyone chooses the most efficient option when equipment fails regardless of cost

- **Achievable Technical** is a subset of technical that accounts for achievable participation within utility programs as well as non-utility mechanisms, such as regional initiatives and market transformation

- **Achievable Economic** is a subset of achievable technical potential that includes only cost-effective measures. Tests considered within this study include UCT, and TRC.
Two Cost-Effectiveness Tests

In assessing cost-effective, achievable potential within Avista’s Washington and Idaho territories, AEG utilized two cost tests:

- **Utility Cost Test (UCT):** Assesses cost-effectiveness from a utility or program administrator’s perspective.
- **Total Resource Cost Test (TRC):** Assesses cost-effectiveness from the utility’s and participant’s perspectives. Includes non-energy impacts if they can be quantified and monetized.

<table>
<thead>
<tr>
<th>Component</th>
<th>UCT</th>
<th>TRC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoided Energy</td>
<td>Benefit</td>
<td>Benefit</td>
</tr>
<tr>
<td>Non-Energy Benefits*</td>
<td></td>
<td>Benefit</td>
</tr>
<tr>
<td>Incremental Cost</td>
<td></td>
<td>Cost</td>
</tr>
<tr>
<td>Incentive</td>
<td></td>
<td>Cost</td>
</tr>
<tr>
<td>Administrative Cost</td>
<td></td>
<td>Cost</td>
</tr>
<tr>
<td>Non-Energy Costs* (e.g. O&amp;M)</td>
<td></td>
<td>Cost</td>
</tr>
</tbody>
</table>

*Council methodology includes monetized impacts on other fuels within these categories.
The Measure Assumptions appendix is again available, containing UES data and other key assumptions and their sources.

**Fully Balanced TRC.** Using the same process developed in the 2018 CPA, the balanced TRC test includes an expanded scope of documentable and quantifiable impacts, including:

1. 10% Conservation Credit in Washington
2. Quantified and monetized non-energy impacts (e.g. water, detergent, wood)
3. Projected cost of carbon in Washington
4. Heating calibration credit for secondary fuels (12% for space heating, 6% for secondary heating)
5. Electric benefits for applicable measures (e.g. cooling savings for smart thermostats, lighting and refrigeration savings for retrocommissioning)
GAS ENERGY EFFICIENCY POTENTIAL
Potential Summary – WA & ID All Sectors

Projections indicate that gas savings of 1.5% of baseline consumption per year are Technically Achievable, and 0.8% per year is cost effective under the UCT test.

- TAP savings are 643,198 Dth in 2022, and 4,906,228 Dth in 2030
- UCT savings are 261,833 Dth in 2022 and 2,124,189 Dth in 2030
- Across the study period, ~46% of TAP savings are UCT cost-effective
GAS EE POTENTIAL, CONTINUED
Potential Summary – WA & ID, All Sectors

Cumulative UCT Gas Savings (Dth) by Sector

Cumulative Gas Savings, Selected Years

Summary of Energy Savings (Dth), Selected Years

<table>
<thead>
<tr>
<th>Reference Baseline</th>
<th>2021</th>
<th>2022</th>
<th>2025</th>
<th>2030</th>
<th>2040</th>
<th>2045</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cumulative Baseline</td>
<td>29,137,671</td>
<td>29,434,469</td>
<td>30,325,189</td>
<td>31,617,083</td>
<td>33,626,695</td>
<td>34,510,725</td>
</tr>
<tr>
<td>Achievable Economic TRC Potential</td>
<td>68,091</td>
<td>163,156</td>
<td>364,805</td>
<td>1,125,806</td>
<td>3,188,178</td>
<td>4,257,057</td>
</tr>
<tr>
<td>Achievable Economic UCT Potential</td>
<td>111,637</td>
<td>261,833</td>
<td>686,706</td>
<td>2,124,189</td>
<td>5,585,922</td>
<td>6,625,682</td>
</tr>
<tr>
<td>Achievable Technical Potential</td>
<td>290,015</td>
<td>643,198</td>
<td>1,879,807</td>
<td>4,906,228</td>
<td>9,853,874</td>
<td>10,970,898</td>
</tr>
<tr>
<td>Technical Potential</td>
<td>662,737</td>
<td>1,387,924</td>
<td>3,587,536</td>
<td>7,862,508</td>
<td>13,922,189</td>
<td>15,068,864</td>
</tr>
</tbody>
</table>

Energy Savings (% of Baseline)

| Achievable Economic TRC Potential | 0.2% | 0.6% | 1.2% | 3.6% | 9.5% | 12.3% |
| Achievable Economic UCT Potential | 0.4% | 0.9% | 2.3% | 6.7% | 16.6% | 19.2% |
| Achievable Technical Potential | 1.0% | 2.2% | 6.2% | 15.5% | 29.3% | 31.8% |
| Technical Potential | 2.3% | 4.7% | 11.8% | 24.9% | 41.4% | 43.7% |

Incremental Savings (Dth)

| Achievable Economic TRC Potential | 68,091 | 95,046 | 117,484 | 165,797 | 218,288 | 49,635 |
| Achievable Economic UCT Potential | 111,637 | 150,478 | 202,477 | 345,896 | 343,741 | 56,935 |
| Achievable Technical Potential | 290,015 | 355,639 | 522,562 | 701,742 | 483,964 | 58,801 |
| Technical Potential | 662,737 | 730,524 | 845,047 | 950,617 | 611,563 | 98,433 |
# GAS EE TOP MEASURES

## Achievable Economic UCT Potential

<table>
<thead>
<tr>
<th>Rank</th>
<th>Measure / Technology (Ranked by 1st year potential)</th>
<th>Achievable Economic UCT Potential (Dth)</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2021</td>
<td>2022</td>
</tr>
<tr>
<td>1</td>
<td>Residential - Furnace</td>
<td>35,602</td>
<td>81,473</td>
</tr>
<tr>
<td>2</td>
<td>Residential - Gas Furnace - Maintenance</td>
<td>13,403</td>
<td>30,912</td>
</tr>
<tr>
<td>3</td>
<td>Commercial - Water Heater</td>
<td>8,854</td>
<td>25,070</td>
</tr>
<tr>
<td>4</td>
<td>Commercial - Space Heating - Heat Recovery Ventilator</td>
<td>7,569</td>
<td>15,162</td>
</tr>
<tr>
<td>5</td>
<td>Commercial - Boiler</td>
<td>6,643</td>
<td>17,112</td>
</tr>
<tr>
<td>6</td>
<td>Residential - Insulation - Ceiling, Installation</td>
<td>5,253</td>
<td>11,641</td>
</tr>
<tr>
<td>7</td>
<td>Residential - ENERGY STAR Connected Thermostat</td>
<td>4,435</td>
<td>9,925</td>
</tr>
<tr>
<td>8</td>
<td>Commercial - HVAC - Duct Repair and Sealing</td>
<td>3,777</td>
<td>7,461</td>
</tr>
<tr>
<td>9</td>
<td>Commercial - Insulation - Wall Cavity</td>
<td>3,337</td>
<td>9,043</td>
</tr>
<tr>
<td>10</td>
<td>Residential - Water Heater</td>
<td>2,954</td>
<td>9,266</td>
</tr>
<tr>
<td>11</td>
<td>Industrial - Process Heat Recovery</td>
<td>2,849</td>
<td>5,670</td>
</tr>
<tr>
<td>12</td>
<td>Commercial - Gas Boiler - Insulate Steam Lines/Condensate Tank</td>
<td>2,517</td>
<td>4,965</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Commercial - Insulation - Roof/Ceiling</td>
<td>2,507</td>
<td>6,823</td>
</tr>
<tr>
<td>14</td>
<td>Commercial - Water Heater - Central Controls</td>
<td>1,901</td>
<td>3,766</td>
</tr>
<tr>
<td>15</td>
<td>Commercial - Gas Boiler - Hot Water Reset</td>
<td>1,822</td>
<td>4,002</td>
</tr>
<tr>
<td>16</td>
<td>Commercial - Gas Boiler - High Turndown</td>
<td>1,230</td>
<td>2,424</td>
</tr>
<tr>
<td>17</td>
<td>Commercial - Fryer</td>
<td>1,210</td>
<td>2,946</td>
</tr>
<tr>
<td>18</td>
<td>Commercial - Building Automation System</td>
<td>590</td>
<td>1,735</td>
</tr>
<tr>
<td>19</td>
<td>Commercial - Water Heater - Faucet Aerator</td>
<td>581</td>
<td>1,269</td>
</tr>
<tr>
<td>20</td>
<td>Commercial - Kitchen Hood - DCV/MUA</td>
<td>529</td>
<td>1,055</td>
</tr>
<tr>
<td></td>
<td>Total of Top 20 Measures</td>
<td><strong>107,565</strong></td>
<td><strong>251,718</strong></td>
</tr>
<tr>
<td></td>
<td>Total Cumulative Savings</td>
<td><strong>111,637</strong></td>
<td><strong>261,833</strong></td>
</tr>
</tbody>
</table>
# GAS EE TOP MEASURES

**UCT & TRC Potential vs Technical Achievable**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Measure / Technology</th>
<th>2030 Savings (Dth)</th>
<th>% of TAP</th>
<th>2030 Savings (Dth)</th>
<th>% of TAP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>TAP</td>
<td>UCT</td>
<td>TRC</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Residential - Windows - High Efficiency</td>
<td>670,667</td>
<td>905</td>
<td>0</td>
<td>0.1%</td>
</tr>
<tr>
<td>2</td>
<td>Residential - Combined Boiler + DHW System (Storage Tank)</td>
<td>410,862</td>
<td>0</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>3</td>
<td>Residential - Combined Boiler + DHW System (Tankless)</td>
<td>338,983</td>
<td>0</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>4</td>
<td>Commercial - Water Heater</td>
<td>292,125</td>
<td>292,125</td>
<td>292,125</td>
<td>100.0%</td>
</tr>
<tr>
<td>5</td>
<td>Residential - ENERGY STAR Homes</td>
<td>198,515</td>
<td>198,833</td>
<td>0</td>
<td>100.2%</td>
</tr>
<tr>
<td>6</td>
<td>Residential - Gas Furnace - Maintenance</td>
<td>191,846</td>
<td>177,842</td>
<td>0</td>
<td>92.7%</td>
</tr>
<tr>
<td>7</td>
<td>Residential - Water Heater</td>
<td>163,124</td>
<td>162,848</td>
<td>0</td>
<td>99.9%</td>
</tr>
<tr>
<td>8</td>
<td>Residential - Insulation - Wall Cavity, Installation</td>
<td>162,690</td>
<td>8,840</td>
<td>0</td>
<td>5.4%</td>
</tr>
<tr>
<td>9</td>
<td>Residential - Insulation - Ceiling, Installation</td>
<td>145,717</td>
<td>99,329</td>
<td>0</td>
<td>68.2%</td>
</tr>
<tr>
<td>10</td>
<td>Residential - Furnace</td>
<td>136,211</td>
<td>136,211</td>
<td>136,211</td>
<td>100.0%</td>
</tr>
<tr>
<td>11</td>
<td>Residential - ENERGY STAR Connected Thermostat</td>
<td>136,197</td>
<td>114,399</td>
<td>0</td>
<td>84.0%</td>
</tr>
<tr>
<td>12</td>
<td>Commercial - Boiler</td>
<td>131,730</td>
<td>131,730</td>
<td>131,730</td>
<td>100.0%</td>
</tr>
<tr>
<td>13</td>
<td>Residential - Insulation - Floor/Crawlspace</td>
<td>128,866</td>
<td>56,643</td>
<td>0</td>
<td>44.0%</td>
</tr>
<tr>
<td>14</td>
<td>Commercial - Insulation - Wall Cavity</td>
<td>123,131</td>
<td>123,408</td>
<td>115,763</td>
<td>100.2%</td>
</tr>
<tr>
<td>15</td>
<td>Commercial - Water Heater - Solar System</td>
<td>112,885</td>
<td>0</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>16</td>
<td>Residential - Windows - Low-e Storm Addition</td>
<td>108,983</td>
<td>0</td>
<td>121,262</td>
<td>0.0%</td>
</tr>
<tr>
<td>17</td>
<td>Commercial - Insulation - Roof/Ceiling</td>
<td>97,447</td>
<td>89,849</td>
<td>31,527</td>
<td>92.2%</td>
</tr>
<tr>
<td>18</td>
<td>Residential - Insulation - Ceiling, Upgrade</td>
<td>83,492</td>
<td>0</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>19</td>
<td>Residential - Insulation - Basement Sidewall</td>
<td>81,620</td>
<td>0</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>20</td>
<td>Commercial - Building Automation System</td>
<td>74,305</td>
<td>61,280</td>
<td>0</td>
<td>82.5%</td>
</tr>
</tbody>
</table>

**Total of Top 20 Measures** | 3,789,395 | 1,654,278 | 828,619 | 43.3% | 22.9% |
The previous CPA included potential for 2018-2020, which is removed here.

For the 2021-2038 period, the current study shows quite a bit more Technical Achievable potential.

However, UCT Cost Effective potential is lower for this period.

Largest drop is in Residential water heating, due to a combination of factors:

- Lower Water Heater unit savings
- Removal or reduction in WA of HB-1444 affected water saving measures
- New potential from measures like combination DHW+Boiler systems is expensive
ACHIEVABLE POTENTIAL
2030 Savings (TAP) by UCT Cost Bundle – WA + ID All Sectors

<table>
<thead>
<tr>
<th>UCT $/Therm</th>
<th>2030 TAP Savings (Dth)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0.00 - $0.10</td>
<td>616,956</td>
</tr>
<tr>
<td>$0.10 - $0.20</td>
<td>213,315</td>
</tr>
<tr>
<td>$0.20 - $0.30</td>
<td>371,273</td>
</tr>
<tr>
<td>$0.30 - $0.40</td>
<td>146,027</td>
</tr>
<tr>
<td>$0.40 - $0.50</td>
<td>431,922</td>
</tr>
<tr>
<td>$0.50 - $0.60</td>
<td>219,860</td>
</tr>
<tr>
<td>$0.60 - $0.70</td>
<td>132,429</td>
</tr>
<tr>
<td>$0.70 - $0.80</td>
<td>222,526</td>
</tr>
<tr>
<td>$0.80 - $0.90</td>
<td>184,609</td>
</tr>
<tr>
<td>$0.90 - $1.00</td>
<td>55,730</td>
</tr>
<tr>
<td>$1.00 - $1.10</td>
<td>94,636</td>
</tr>
<tr>
<td>$1.10 - $1.20</td>
<td>91,213</td>
</tr>
<tr>
<td>$1.20 - $1.30</td>
<td>140,536</td>
</tr>
<tr>
<td>$1.30 - $1.40</td>
<td>215,089</td>
</tr>
<tr>
<td>$1.40 - $1.50</td>
<td>111,421</td>
</tr>
<tr>
<td>$1.50 - $1.60</td>
<td>109,370</td>
</tr>
<tr>
<td>$1.60 - $1.70</td>
<td>228,011</td>
</tr>
<tr>
<td>$1.70 - $1.80</td>
<td>158,836</td>
</tr>
<tr>
<td>$1.80 - $1.90</td>
<td>625,317</td>
</tr>
<tr>
<td>$1.90 - $2.00</td>
<td>54,020</td>
</tr>
<tr>
<td>$2 or more</td>
<td>483,133</td>
</tr>
</tbody>
</table>
THANK YOU!

Ingrid Rohmund, Sr. Vice President, Consulting
irohmund@appliedenergygroup.com

Ken Walter, Project Manager
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Kelly Marrin, Managing Director
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Agenda

• About Energy Trust
• 2019 Achieved Savings
• Resource Assessment Overview and Background
• Methodology
• Results
• Questions/Discussion
About us

- Independent nonprofit
- Providing access to affordable energy
- Generating homegrown, renewable power
- Building a stronger Oregon and SW Washington
- Serving 1.6 million customers of Portland General Electric, Pacific Power, NW Natural, Cascade Natural Gas and Avista
15 years of affordable energy

From Energy Trust’s investment of $1.5 billion in utility customer funds:

- Nearly 660,000 sites transformed into energy efficient, healthy, comfortable and productive homes and businesses
- 10,000 clean energy systems generating renewable power from the sun, wind, water, geothermal heat and biopower
- $6.9 billion in savings over time on participant utility bills from their energy-efficiency and solar investments
- 20 million tons of carbon dioxide emissions kept out of our air, equal to removing 3.5 million cars from our roads for a year
A clean energy power plant

607 average megawatts saved

121 aMW generated

52 million annual therms saved

Enough energy to power 564,000 homes
and heat 100,000 homes for a year

Avoided 20 million tons of carbon dioxide
Energy Trust’s 2019 Achievements for Avista
Energy Trust Savings Achievements – 2019

• Energy Trust began serving Avista customers in Oregon in 2016.

• Overall achieved 107% of goal
  • Goal 360k Therms
  • Achieved 384k Therms

• Anticipate continued success as we solidify trade ally and customers relationships.

Energy Trust achieved 107% of goal in Avista service territory
Resource Assessment: Purpose, Overview and Background
Resource Assessment (RA) Purpose

- Provides estimates of energy efficiency potential that will result in a reduction of load on Avista’s system for use in Avista’s Integrated Resource Plan (IRP).

- The purpose is to help Avista strategically plan future investment in both supply side and demand side resources.
Resource Assessment Overview

• What is a resource assessment?
  • Model that provides an estimate of energy efficiency resource potential achievable over a 20-year period
  • ‘Bottom-up’ approach to estimate potential starting at the measure level and scaling to a service territory

• Energy Trust uses a model in *Analytica* that was developed by Navigant Consulting
  • The *Analytica* model calculates Technical, Achievable and Cost-Effective Achievable Energy Efficiency Potential.
  • Final program/IRP targets are established via ramp rates that are applied outside of the model.

• Data inputs and assumptions in the model are updated in conjunction with IRP about every two years.
Additional Resource Assessment

Background

• Informs utility IRP work & Energy Trust strategic and program planning.

• Does not specify mechanism of savings acquisition (e.g. programs, market transformation, codes & standards)

• Does not dictate source or measure mix of annual energy savings acquired by programs

• Does not set incentive levels
20-Year Forecast Methodology
Forecasted Potential Types

Technical Potential

Achievable Potential

Cost-Effective Achievable Potential

Final Program Savings Potential

Developed with Programs & Market Information

Calculated within RA Model

Not Technically Feasible

Market Barriers

Not Cost-Effective

Program Design & Market Penetration
20-Year IRP EE Forecast Flow Chart

Technical Energy Efficiency Potential
All technically available energy efficiency potential in service territory

Achievable Energy Efficiency Potential
Technical potential is reduced due to market barriers

Cost-Effectiveness Screen
Measures are screened for cost-effectiveness using the TRC Test

Total Resource Cost Test (TRC) = Benefits / Costs

Cost-Effective Achievable Energy Efficiency Potential
Measures with TRC Ratio > 1.0 included in Cost-Effective Achievable Potential

Deployment of Cost-Effective Achievable EE Potential
Exogenous of the RA Model - Energy Trust works internally with programs and uses NWPPC council methodologies to determine acquisition rates of CE Potential
## RA Model inputs

### Measure Inputs

**Measure Definition:**
- Baseline & Efficient equipment
- Applicable customer segments
- Installation type*
- Measure Life

**Measure Savings**

**Measure Cost**
- Incremental cost for lost opportunity measures
- Full cost for retrofit measures

**Market Data**
- Density
- Saturation of baseline equipment
- Technical suitability

### Utility Inputs

**Customer and Load Forecasts**
Used to scale measure level savings to a service territory
- Residential Stock: Count of homes
- Commercial Stock: Floor Area
- Industrial Stock: Customer load

**Avoided Costs**

**Customer Stock Demographics:**
- Heating fuel splits
- Water heat fuel splits

*Retrofit, Replace on Burnout, or New Construction*
Model Updates

- The RA Model is a ‘living’ model and Energy Trust makes continuous improvements to it.

- Measure updates, new measures and new emerging technologies updated in model

- Alignment with high-level NW Power Council Power Plan deployment methodologies to obtain cost-effective achievable savings within market sectors and replacement types.
Example Measure: Residential Gas Tank Water Heater (>0.70 EF)

Key Measure Inputs:

- Baseline: 0.60 EF gas water heater
- Replacement Type: Replacement on Burnout / New
- Measure Incremental Cost: $218
- Conventional (not emerging, no risk adjustment)
- Lifetime: 13 years
- Savings: 31.6 therms (annual)
- Non-Energy Benefits: $5.34 per year
- Customer Segments: SF, MF, MH
- Density, Saturation, Suitability
- Competing Measures: All efficient gas water heaters
Incremental Measure Savings Approach (Competition group: Gas water heaters)

Savings potential for competing technologies are incremental to one another based on relative TRCs.

Energy Savings (Therms)

EF = 0.67
TRC 1.5

EF > 0.70
TRC 1.1

(Numbers are for illustrative purposes only)

EF = 0.67
All Savings

EF > 0.70
Inc. Savings
Cost-Effectiveness Screen

• Energy Trust utilizes the Total Resource Cost (TRC) test to screen measures for cost effectiveness

\[
TRC = \frac{Measure \ Benefits}{Total \ Measure \ Cost}
\]

• If TRC is > 1.0, it is cost-effective

• Measure Benefits:
  • Avoided Costs (provided by Avista)
    • Annual measure savings x NPV avoided costs per therm
  • Quantifiable Non-Energy Benefits
    • Water savings, etc.

Total Measure Cost:
• The total cost of the EE measure (full cost if retrofit, incremental over baseline if replacement)
Cost-Effectiveness Override

Energy Trust applied this to measures found to be NOT Cost-Effective in the model but are offered through Energy Trust programs.

Reasons:

1. Blended avoided costs may produce different results than utility specific avoided costs
2. Measures offered under an OPUC exception per UM 551 criteria.

The following measures had the CE override applied (all under OPUC exception):

- Com Clothes Washers
- Res Insulation (ceiling, floor, wall)
- Res Clothes Dryers
- Res New Homes Packages
## Emerging Technologies

<table>
<thead>
<tr>
<th>Residential</th>
<th>Commercial</th>
<th>Industrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Path 5 Emerging Super Efficient Whole Home</td>
<td>• DOAS/HRV - GAS Space Heat</td>
<td>• Gas-fired HP Water Heater</td>
</tr>
<tr>
<td>• Window Replacement (U&lt;.20), Gas SF</td>
<td>• Gas-fired HP HW</td>
<td>• Wall Insulation- VIP, R0-R35</td>
</tr>
<tr>
<td>• Absorption Gas Heat Pump Water Heaters</td>
<td>• Gas-fired HP, Heating</td>
<td></td>
</tr>
<tr>
<td>• Advanced Insulation</td>
<td>• Advanced Windows</td>
<td></td>
</tr>
</tbody>
</table>

- Model includes savings potential from emerging technologies
- Factors in changing performance, cost over time
- Use risk factors to hedge against uncertainty
<table>
<thead>
<tr>
<th>Risk Category</th>
<th>10%</th>
<th>30%</th>
<th>50%</th>
<th>70%</th>
<th>90%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Market Risk</strong> (25% weighting)</td>
<td>Requires new/changed business model</td>
<td>Requires training of contractors. Consumer acceptance barriers exist.</td>
<td>Training for contractors available.</td>
<td>Trained contractors</td>
<td>Established business models</td>
</tr>
<tr>
<td></td>
<td>Start-up, or small manufacturer</td>
<td></td>
<td>Multiple products in the market.</td>
<td></td>
<td>Already in U.S. Market</td>
</tr>
<tr>
<td></td>
<td>Significant changes to infrastructure</td>
<td></td>
<td></td>
<td></td>
<td>Manufacturer committed to commercialization</td>
</tr>
<tr>
<td></td>
<td>Requires training of contractors. Consumer acceptance barriers exist.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Technical Risk</strong> (25% weighting)</td>
<td>Prototype in first field tests.</td>
<td>Low volume manufacturer. Limited experience</td>
<td>New product with broad commercial appeal</td>
<td>Proven technology in different application or different region</td>
<td>Proven technology in target application. Multiple potentially viable approaches.</td>
</tr>
<tr>
<td></td>
<td>A single or unknown approach</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Data Source Risk</strong> (50% weighting)</td>
<td>Based only on manufacturer claims</td>
<td>Manufacturer case studies</td>
<td>Engineering assessment or lab test</td>
<td>Third party case study (real world installation)</td>
<td>Evaluation results or multiple third party case studies</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Results
The RA Model estimates the in Technical, Achievable and Cost-Effective Achievable potential.

Final Program Savings Potential is deployed exogenously of the model using the Cost-Effective Achievable potential from the RA model in combination with program expertise on what can be achieved.
Overall Cumulative Savings Results

- Technical Potential: 25 Millions of Therms
- Achievable Potential: 17 Millions of Therms
- Cost-Effective Achievable Potential: 13 Millions of Therms
- Energy Trust Savings Projection: 10 Millions of Therms
RA Model Results
Technical, Achievable, and Cost-Effective Achievable
Cumulative Potential by Type and Year

- Technical
- Achievable
- Cost-Effective Achievable
Cost-effective Achievable Potential by End Use

- Heating: 5.78
- Water Heating: 5.14
- Weatherization: 4.80
- Other: 0.71
- Behavioral: 0.56
- Ventilation: 0.42
- Cooking: 0.33
- Process Heating: 0.16
- Appliance: 0.04
- HVAC: 0.03

Millions of Therms
## Cost-Effective Override Effect – (Millions of Therms)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Potential with Override</th>
<th>Potential without Override</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>12.1</td>
<td>10.9</td>
<td>1.2</td>
</tr>
<tr>
<td>Commercial</td>
<td>5.7</td>
<td>5.7</td>
<td>0.0</td>
</tr>
<tr>
<td>Industrial</td>
<td>0.2</td>
<td>0.2</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18.0</strong></td>
<td><strong>16.8</strong></td>
<td><strong>1.2</strong></td>
</tr>
</tbody>
</table>

**Measures with CE Override in Model:**
- Res Insulation (ceiling, floor, wall)
- Res Clothes Dryers
- Res New Homes Packages
- Com Clothes Washers
Top-20 Measures

- Res Smart Thermostat
- Res Gas Absorption HPWH
- Res Path 2 New Home
- Res Window Replacement (U<0.2)
- New Home Market Transformation
- Res Gas Furnace
- Res Path 4 New Home
- Res Path 3 New Home
- Com Strategic Energy Management
- Com New Construction
- Com DOAS/HRV
- Com Demand Control Ventillation
- Res Wall Insulation
- Res Floor Insulation
- Res Attic Insulation
- Com Gas Absorption HPWH
- Res Window Replacement (U=0.3)
- Com DHW Pipe Insulation
- Com Wifi Thermostat
- Res 0.7 EF Tank Water Heater

Cumulative Cost-Effective Achievable Potential (Millions of Therms)
Final Savings Projections - Deployed Results
Final Savings Projection Methodology

Energy Trust sets the first five years of energy efficiency acquisition to program performance and budget goals.

Years 1-2
- Program forecasts – they know what is happening short term best

Years 3-5
- Planning and Programs work together to create forecast

Years 6-20
- Planning forecasts long-term acquisition rate to generally align NWPCC
Cumulative Potential by Type – Millions of Therms

<table>
<thead>
<tr>
<th></th>
<th>Technical Potential</th>
<th>Achievable Potential</th>
<th>Cost-Effective Achievable Potential</th>
<th>Energy Trust Savings Projection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>16.9</td>
<td>15.2</td>
<td>12.1</td>
<td>8.2</td>
</tr>
<tr>
<td>Commercial</td>
<td>7.8</td>
<td>6.8</td>
<td>5.7</td>
<td>6.1</td>
</tr>
<tr>
<td>Industrial</td>
<td>0.3</td>
<td>0.2</td>
<td>0.2</td>
<td>0.5</td>
</tr>
<tr>
<td>All Sectors</td>
<td>24.9</td>
<td>22.2</td>
<td>18.0</td>
<td>14.8</td>
</tr>
</tbody>
</table>

Not all Cost-Effective Potential is projected to be achieved because:
- Lost opportunity with ‘Replacement’ and ‘New Constr.’ measures
- Hard to reach measures (e.g. insulation)
- Other market barriers identified by programs & new service territory
Cost-Effective Savings

- Weatherization
- Water Heating
- Heating
- Cooking
- Other
- Ventilation
- Process Heating
- Large Project Adder
- Behavioral
Projected Savings as Percent of Annual Load

Annual Savings as % of Annual Load

Cumulative Savings as % of Load

2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040

Annual Cumulative
Levelized Cost Supply Curve

Cumulative 20-Year Potential (Millions of Therms)

- $5
- $3
- $1
$1
$3
$5
$7
$9

Levelived Cost ($/therm)
Benefit Cost Ratio Supply Curve
Thank you

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Lighthouse Energy Consulting  
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503.395.5310
Sendout Model
Modeling Transportation In SENDOUT®

• Start with a point-in-time look at each jurisdiction’s resources
  • Contracts – Receipt and Delivery Points
  • Rates
• Contractual vs. Operational
  • Contractual can be overly restrictive
  • Operational can be overly flexible
• Incorporating operational realities into our modeling can defer the need to acquire new resources
• Gas Supply’s job is to get gas from the supply basin to the pipeline citygate
• Gas Engineering/Distribution’s job is to take gas from the pipeline citygate to our customers
• The **major** limiting factor is receipt quantity – how much can you bring into the system?
Modeling Challenges

• Supply needs to get gas to the gate
• Contracts were created years ago, based on demand projections at that point in time
• Stuff happens (i.e. growth differs from forecast)
• Sum of receipt quantity and aggregated delivery quantity don’t identify resource deficiency for quite some time however…..
• The aggregated look can mask individual city gate issues, and the disaggregated look can create deficiencies where they don’t exist
• In many cases, operational capacity is greater than contracted
• Transportation resources are interconnected (two pipes can serve one area)
• WARNING – we need to be mindful of the modeling limitations
What is in SENDOUT®?

Inside:

- Demand forecasts at an aggregated level
- Existing firm transportation resources and current rates
  - Receipt point to aggregated delivery points/“zone”
  - Jurisdictional considerations
  - Long term capacity releases
- Potential resources, both supply and demand side
What is outside SENDOUT®?

Outside:

- Gate station analysis
  - Forecasted demand behind the gate
    - Growth rates consistent with IRP assumptions
    - Actual hourly/daily city gate flow data
  - Gate station MDDO’s
  - Gate station operational capacities
New Planning Software

• Avista is looking for a new software solution to model our natural gas system and the increasingly complex system with carbon reduction goals
• We hope to have this software available for the next round of Integrated Resource Planning (IRP) and to model it in parallel with Sendout
Assumptions Review
Firm Customers (Meters) by State and Class, 2019

Firm Customers by State

- WA: 47%
- OR: 29%
- ID: 24%

Firm Customers by Class

- Residential: 90%
- Commercial: 10%
- Industrial: 0.1%
WA-ID Region Firm Customer Range, 2021-2045

<table>
<thead>
<tr>
<th>Variable</th>
<th>Low Growth</th>
<th>Base Growth</th>
<th>High Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>WA-ID Customers</td>
<td>0.7%</td>
<td>1.1%</td>
<td>1.5%</td>
</tr>
<tr>
<td>WA Population</td>
<td>0.4%</td>
<td>0.7%</td>
<td>1.0%</td>
</tr>
<tr>
<td>ID Population</td>
<td>0.8%</td>
<td>1.4%</td>
<td>2.0%</td>
</tr>
<tr>
<td>WA-ID Population</td>
<td>0.5%</td>
<td>0.8%</td>
<td>1.2%</td>
</tr>
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</table>
OR Region Firm Customer Range, 2021-2045

<table>
<thead>
<tr>
<th>Variable</th>
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<th>Base Growth</th>
<th>High Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers</td>
<td>0.5%</td>
<td>0.7%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Population</td>
<td>0.3%</td>
<td>0.5%</td>
<td>0.7%</td>
</tr>
</tbody>
</table>
System Firm Customer Range, 2021-2045

<table>
<thead>
<tr>
<th>Variable</th>
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<th>Base Growth</th>
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<td>Customers</td>
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<td>1.3%</td>
</tr>
<tr>
<td>Population</td>
<td>0.4%</td>
<td>0.8%</td>
<td>1.1%</td>
</tr>
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</table>
## Summary of Growth Rates

<table>
<thead>
<tr>
<th>System</th>
<th>Base-Case</th>
<th>High</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>1.0%</td>
<td>1.4%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Commercial</td>
<td>0.5%</td>
<td>0.8%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Industrial</td>
<td>-0.8%</td>
<td>2.2%</td>
<td>-3.8%</td>
</tr>
<tr>
<td>Total</td>
<td>1.0%</td>
<td>1.3%</td>
<td>0.6%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WA</th>
<th>Base-Case</th>
<th>High</th>
<th>Low</th>
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</thead>
<tbody>
<tr>
<td>Residential</td>
<td>1.0%</td>
<td>1.3%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Commercial</td>
<td>0.4%</td>
<td>0.7%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Industrial</td>
<td>-0.8%</td>
<td>1.9%</td>
<td>-3.6%</td>
</tr>
<tr>
<td>Total</td>
<td>1.0%</td>
<td>1.3%</td>
<td>0.7%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ID</th>
<th>Base-Case</th>
<th>High</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>1.4%</td>
<td>2.0%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Commercial</td>
<td>0.4%</td>
<td>1.0%</td>
<td>-0.2%</td>
</tr>
<tr>
<td>Industrial</td>
<td>-1.0%</td>
<td>1.8%</td>
<td>-3.4%</td>
</tr>
<tr>
<td>Total</td>
<td>1.3%</td>
<td>1.9%</td>
<td>0.7%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OR</th>
<th>Base-Case</th>
<th>High</th>
<th>Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>0.7%</td>
<td>0.9%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Commercial</td>
<td>0.6%</td>
<td>0.8%</td>
<td>0.4%</td>
</tr>
<tr>
<td>Industrial</td>
<td>0.0%</td>
<td>4.5%</td>
<td>-10.6%</td>
</tr>
<tr>
<td>Total</td>
<td>0.7%</td>
<td>0.9%</td>
<td>0.5%</td>
</tr>
</tbody>
</table>
Base Coefficients (July and August Averaged)
# Heat Coefficients

<table>
<thead>
<tr>
<th>Planning Area - Residential Class</th>
<th>2 Year</th>
<th>3 Year</th>
<th>5 Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roseburg (Oregon)</td>
<td>0.008829</td>
<td>0.008046</td>
<td>0.00699</td>
</tr>
<tr>
<td>Medford (Oregon)</td>
<td>0.00639</td>
<td>0.0065</td>
<td>0.006068</td>
</tr>
<tr>
<td>La Grande (Oregon)</td>
<td>0.006223</td>
<td>0.007297</td>
<td>0.00665</td>
</tr>
<tr>
<td>Klamath Falls (Oregon)</td>
<td>0.005284</td>
<td>0.005268</td>
<td>0.004902</td>
</tr>
<tr>
<td>Idaho</td>
<td>0.006445</td>
<td>0.006344</td>
<td>0.005896</td>
</tr>
<tr>
<td>Washington</td>
<td>0.006307</td>
<td>0.006313</td>
<td>0.005957</td>
</tr>
</tbody>
</table>

*Avg. of monthly heat coefficient

*Historic Data – adjusted by price elasticity and DSM
Price Elasticity

• The elasticity as measured in the Medford and Roseburg areas will be used for the entire system as estimated elasticity.
• 0.81% decrease only for each price rise of 10%
• This elasticity is measured through heat coefficients and annual price changes
Avista Weather Planning Standard

- Utilize coldest day for each of the past 30 years with a 99% probability supply can be fulfilled

<table>
<thead>
<tr>
<th>Area</th>
<th>99% Probability Avg. Temp</th>
</tr>
</thead>
<tbody>
<tr>
<td>La Grande</td>
<td>-11</td>
</tr>
<tr>
<td>Klamath Falls</td>
<td>-9</td>
</tr>
<tr>
<td>Medford</td>
<td>11</td>
</tr>
<tr>
<td>Roseburg</td>
<td>14</td>
</tr>
<tr>
<td>Spokane</td>
<td>-12</td>
</tr>
</tbody>
</table>
Henry Hub Expected Price and Average Annual Price Forecasts

- Levelized Price 2022-2045: $4.11
- Levelized Price 2022-2041: $3.90
Stochastic Prices (Results from 1000 Draws)
2020 Henry Hub Prices - Nominal

- High Price (95%)
- Expected Price
- Low Price (25%)
Prices by Gas Hub (Henry Hub Expected Price + Basis)
Expected Case
Cost of Carbon by State - Summary

• Washington - Social cost of carbon @ 2.5% discount rate;
  – upstream emissions associated with natural gas drilling and transportation of natural gas to its end use.

• Oregon is based off a Wood Mackenzie estimate for Cap and Trade

• Idaho - carbon prices will not be included
Carbon Costs

Levelized Cost per MTCO2e
- OR Cap and Trade: $44.92
- WA SCC: $113.75
- High Carbon Price: $234.45
- Low Carbon Price: $0
Carbon Costs
LDC Upstream Emissions

<table>
<thead>
<tr>
<th></th>
<th>Avista Specific Natural Gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combustion</td>
<td>Lbs. GHG/MMBtu</td>
</tr>
<tr>
<td>CO2</td>
<td>116.88</td>
</tr>
<tr>
<td>CH4</td>
<td>0.0022</td>
</tr>
<tr>
<td>N2O</td>
<td>0.0022</td>
</tr>
<tr>
<td>Total Combustion</td>
<td></td>
</tr>
<tr>
<td>Upstream</td>
<td></td>
</tr>
<tr>
<td>CH4</td>
<td>0.313406851</td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>

*Avista gas purchases
An average of the total volume purchased over the past 5 years by emissions location

Upstream Emissions

<table>
<thead>
<tr>
<th>Upstream Emissions</th>
<th>Avista's Purchases</th>
<th>Emissions Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.77</td>
<td>89.72%</td>
<td>Canada</td>
</tr>
<tr>
<td>1.00</td>
<td>10.28%</td>
<td>Rockies</td>
</tr>
<tr>
<td>0.79</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Avoided Cost Comparison
DSM
Expected Case
Safe Harbor Statement

This document contains forward-looking statements. Such statements are subject to a variety of risks, uncertainties and other factors, most of which are beyond the Company’s control, and many of which could have a significant impact on the Company’s operations, results of operations and financial condition, and could cause actual results to differ materially from those anticipated.

For a further discussion of these factors and other important factors, please refer to the Company’s reports filed with the Securities and Exchange Commission. The forward-looking statements contained in this document speak only as of the date hereof. The Company undertakes no obligation to update any forward-looking statement or statements to reflect events or circumstances that occur after the date on which such statement is made or to reflect the occurrence of unanticipated events. New risks, uncertainties and other factors emerge from time to time, and it is not possible for management to predict all of such factors, nor can it assess the impact of each such factor on the Company’s business or the extent to which any such factor, or combination of factors, may cause actual results to differ materially from those contained in any forward-looking statement.
### Proposed Scenarios

<table>
<thead>
<tr>
<th>Proposed Scenarios</th>
<th>Expected Case</th>
<th>Average Case</th>
<th>Low Growth &amp; High Prices</th>
<th>Carbon Reduction</th>
<th>High Growth &amp; Low Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INPUT ASSUMPTIONS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Customer Growth Rate</strong></td>
<td>Reference Case Cust Growth Rates</td>
<td>Low Growth Rate</td>
<td>Reference Case Cust Growth Rates</td>
<td>High Growth Rate</td>
<td></td>
</tr>
<tr>
<td><strong>Use per Customer</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Demand Side Management</strong></td>
<td>Expected Case CPA</td>
<td>High Prices DSM</td>
<td>Low Prices DSM</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Weather Planning Standard</strong></td>
<td>99% probability of coldest in 30 years</td>
<td>20 year average</td>
<td>99% probability of coldest in 30 years</td>
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<td></td>
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<tr>
<td><strong>GWP</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Prices</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Price curve</strong></td>
<td>Expected Case CPA</td>
<td>High Prices DSM</td>
<td>Low Prices DSM</td>
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<td></td>
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<tr>
<td><strong>Carbon Legislation ($/Metric Ton)</strong></td>
<td>SCC @ 2.5% WA; Cap and Trade forecast - OR; NO Carbon adder in ID</td>
<td>Carbon Cost - High (SCC 95% at 3%)</td>
<td>SCC @ 2.5% WA; Cap and Trade forecast - OR; NO Carbon adder in ID</td>
<td></td>
<td>$0</td>
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</table>

*1,000 Draws per scenario will be run stochastically*
Existing Resources vs. Peak Day Demand

Expected Case – Washington/Idaho (DRAFT)
Existing Resources vs. Peak Day Demand
Expected Case – Medford/Roseburg (DRAFT)
Existing Resources vs. Peak Day Demand
Expected Case – Klamath Falls (DRAFT)
Existing Resources vs. Peak Day Demand
Expected Case – La Grande (DRAFT)
Expected Case - Emissions
Expected Case Costs

<table>
<thead>
<tr>
<th>Year</th>
<th>Millions</th>
<th>$100</th>
<th>$200</th>
<th>$300</th>
<th>$400</th>
<th>$500</th>
<th>$600</th>
<th>$700</th>
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<tbody>
<tr>
<td>2020-2021</td>
<td></td>
<td>200</td>
<td>100</td>
<td>50</td>
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<td>2</td>
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<tr>
<td>2021-2022</td>
<td></td>
<td>220</td>
<td>110</td>
<td>60</td>
<td>15</td>
<td>7</td>
<td>4</td>
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<tr>
<td>2023-2024</td>
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<td>240</td>
<td>120</td>
<td>70</td>
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<td>8</td>
<td>5</td>
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<tr>
<td>2024-2025</td>
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<td>260</td>
<td>130</td>
<td>80</td>
<td>19</td>
<td>9</td>
<td>6</td>
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<tr>
<td>2025-2026</td>
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<td>280</td>
<td>140</td>
<td>90</td>
<td>21</td>
<td>10</td>
<td>7</td>
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<tr>
<td>2026-2027</td>
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<td>300</td>
<td>150</td>
<td>100</td>
<td>23</td>
<td>11</td>
<td>8</td>
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<tr>
<td>2027-2028</td>
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<td>110</td>
<td>25</td>
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<td>9</td>
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<tr>
<td>2028-2029</td>
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<td>170</td>
<td>120</td>
<td>27</td>
<td>13</td>
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<tr>
<td>2029-2030</td>
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<td>2030-2031</td>
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<td>190</td>
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<td>2031-2032</td>
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<td>2032-2033</td>
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<tr>
<td>2033-2034</td>
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<td>440</td>
<td>220</td>
<td>170</td>
<td>37</td>
<td>18</td>
<td>15</td>
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</tr>
<tr>
<td>2034-2035</td>
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<td>460</td>
<td>230</td>
<td>180</td>
<td>39</td>
<td>19</td>
<td>16</td>
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<tr>
<td>2035-2036</td>
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<td>480</td>
<td>240</td>
<td>190</td>
<td>41</td>
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<td>2036-2037</td>
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<td>500</td>
<td>250</td>
<td>200</td>
<td>43</td>
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<td>2037-2038</td>
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<td>520</td>
<td>260</td>
<td>210</td>
<td>45</td>
<td>22</td>
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<td>2038-2039</td>
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<td>540</td>
<td>270</td>
<td>220</td>
<td>47</td>
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<td>2039-2040</td>
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<td>230</td>
<td>49</td>
<td>24</td>
<td>21</td>
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</tbody>
</table>

- **All Other Costs**: $3.9B
- **Carbon Tax**: $3B
Expected Case distribution

*1000 Simulations

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
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<tbody>
<tr>
<td>Average</td>
<td>$6.876</td>
</tr>
<tr>
<td>Std Dev</td>
<td>$1.610</td>
</tr>
<tr>
<td>Min</td>
<td>$4.482</td>
</tr>
<tr>
<td>Max</td>
<td>$17.713</td>
</tr>
<tr>
<td>Median</td>
<td>$6.455</td>
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</tbody>
</table>
Expected Case
1,000 Draws
Other Scenarios
Energy Demand

Million Dth

2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040

Energy Demand

- Carbon Reduction
- Average Case
- Expected Case
- Low Growth
- High Growth
Emissions

*Emissions assume carbon intensity of the supply resources*
Average Case

Average: $5.69
Min: $5.50
Max: $6.12
Std Dev: $0.05
Median: $5.69

*Billions ($)
Low Growth and High Prices

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>$ 9.80</td>
</tr>
<tr>
<td>Min</td>
<td>$ 9.60</td>
</tr>
<tr>
<td>Max</td>
<td>$ 10.01</td>
</tr>
<tr>
<td>Std Dev</td>
<td>$ 0.06</td>
</tr>
</tbody>
</table>

![Histogram showing distribution of growth and prices](image)
High Growth & Low Prices
Least Cost/Risk - RNG solve

<table>
<thead>
<tr>
<th>Solve - No Unserved</th>
<th>Average</th>
<th>Stdev</th>
<th>Median</th>
<th>Max</th>
<th>Min</th>
</tr>
</thead>
<tbody>
<tr>
<td>RNG Resources Only</td>
<td>$2.683</td>
<td>$0.043</td>
<td>$2.681</td>
<td>$2.861</td>
<td>$2.542</td>
</tr>
<tr>
<td>Plymouth, RNG in La Grande</td>
<td>$2.721</td>
<td>$0.043</td>
<td>$2.719</td>
<td>$2.901</td>
<td>$2.580</td>
</tr>
<tr>
<td>GTN - RNG in La Grande</td>
<td>$2.734</td>
<td>$0.042</td>
<td>$2.675</td>
<td>$2.855</td>
<td>$2.540</td>
</tr>
<tr>
<td>Medford Lateral Expansion, RNG in La Grande</td>
<td>$2.734</td>
<td>$0.044</td>
<td>$2.731</td>
<td>$2.915</td>
<td>$2.600</td>
</tr>
</tbody>
</table>

*$ in Billions
**1,000 draws each scenario
Carbon Reduction Scenario
Carbon Reduction scenario

- Carbon reduction goals to meet 2035 targets of 45% below 1990 emissions and criteria are not known
- Any actual availability of physical RNG resources and rate impact by year can be further studied in future Integrated Resource Plans
- Actual projects will be considered on an ad-hoc basis to determine costs and environmental attributes which may make different RNG types a least cost solution
- Exact 1990 emissions are not known and are estimated based on prior 10k’s
- Many of the rules from EO 20-04 will be coming out after this IRP is submitted
- Allowances are not considered
## Resources Considered

<table>
<thead>
<tr>
<th>Resource</th>
<th>Dth per year</th>
<th>Levelized Cost Per Dth (Year 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distributed Renewable Hydrogen Production - WA</td>
<td>60,509</td>
<td>$47.25</td>
</tr>
<tr>
<td>Distributed Renewable Hydrogen Production - OR</td>
<td>60,509</td>
<td>$48.01</td>
</tr>
<tr>
<td>Distributed LFG to RNG Production - WA</td>
<td>231,790</td>
<td>$15.90</td>
</tr>
<tr>
<td>Centralized LFG to RNG Production - WA</td>
<td>662,256</td>
<td>$14.11</td>
</tr>
<tr>
<td>Dairy Manure to RNG Production - WA</td>
<td>231,790</td>
<td>$14.30</td>
</tr>
<tr>
<td>Wastewater Sludge to RNG Production - WA</td>
<td>187,245</td>
<td>$23.34</td>
</tr>
<tr>
<td>Food Waste to RNG Production - WA</td>
<td>108,799</td>
<td>$33.14</td>
</tr>
<tr>
<td>Distributed LFG to RNG Production - OR</td>
<td>231,790</td>
<td>$14.34</td>
</tr>
<tr>
<td>Centralized LFG to RNG Production - OR</td>
<td>662,256</td>
<td>$12.54</td>
</tr>
<tr>
<td>Dairy Manure to RNG Production - OR</td>
<td>231,790</td>
<td>$30.59</td>
</tr>
<tr>
<td>Wastewater Sludge to RNG Production - OR</td>
<td>187,245</td>
<td>$20.36</td>
</tr>
<tr>
<td>Food Waste to RNG Production - OR</td>
<td>108,799</td>
<td>$37.46</td>
</tr>
</tbody>
</table>

*Prices include carbon intensity, carbon costs, capital and overhead, and electricity and are considered Avista owned and operated

**Estimates are from a Black and Veatch study
## Carbon Intensity

<table>
<thead>
<tr>
<th>Source</th>
<th>Current Carbon Intensity (g CO2e/MJ)</th>
<th>Percent of estimated Carbon reduction as compared to natural gas (as base value)</th>
<th>lbs. per Dth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas</td>
<td>78.37</td>
<td></td>
<td>128.27</td>
</tr>
<tr>
<td>Landfill</td>
<td>46.42</td>
<td>41%</td>
<td>75.98</td>
</tr>
<tr>
<td>Dairy</td>
<td>-276.24</td>
<td>-452%</td>
<td>(580.40)</td>
</tr>
<tr>
<td>WWT</td>
<td>19.34</td>
<td>75%</td>
<td>31.65</td>
</tr>
<tr>
<td>Solid Waste</td>
<td>-22.93</td>
<td>-129%</td>
<td>(165.80)</td>
</tr>
</tbody>
</table>

*Green H2 is considered to have no carbon or -128.27 lbs. per Dth as compared to Natural Gas*

Source: California Air Resources Board
Climate Goals

WA and OR Emissions Only

Expected Emissions MTCO2e
Emissions with Climate Goals and EO

WA and OR only

Millions of Dth

2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039

Dairy Fossil Fuels
Resources Needed

Estimated Dairy Costs

Levelized Cost of $29M per year
Carbon Reduction

Average $5.695
Min $5.857
Max $5.542
Std Dev $0.048
Median $5.695
Carbon Reduction Summary

• Dairy
  – With a high carbon intensity and its ability to reduce emissions, dairy becomes the preferred resource in this IRP to reduce carbon
  – As the cost of carbon gets higher, dairy becomes more economic as the carbon intensity combined with the SCC creates a low price
  – Unlike some other RNG resources, a dairy farm has the potential to be reproduced unlike a landfill or waste water treatment plants

• Hydrogen
  – If the high carbon offset of dairy can be mitigated with a lower price of H2, this is both the primary and viable path
  – Green H2 has a large potential to offset emissions and provide the amount of energy demand forecasted

• Carbon offsets through allowances and the associated costs need to be considered to fully understand least cost and least risk

• Other RNG type programs will be modeled at a detailed level as projects are available and depending on costs and offsets could change least cost and least risk solution
Action Plan

• Further model carbon reduction
• Investigate new resource plan modeling software and integrate Avista’s system into software to run in parallel with Sendout
• Model all requirements as directed in Executive Order 20-04
• Avista will ensure Energy Trust (ETO) has sufficient funding to acquire therm savings of the amount identified and approved by the Energy Trust Board
Next Steps

2020 Natural Gas IRP Draft Timeline

The following is Avista’s tentative 2020 Natural Gas IRP timeline:

- June - November 2020 – Technical Advisory Committee meetings
- December 2020 – Prepare draft of IRP
- January 4, 2021 – Draft of IRP document sent to TAC
- February 1, 2021 – Comments on draft due back to Avista
- February 2021 – TAC final review meeting (if necessary)
- March 2021 – Final editing and printing of IRP
- April 1, 2021 – File IRP submission to Commissions and TAC