### 2019 Electric Integrated Resource Plan
#### Technical Advisory Committee Meeting No. 1 Agenda
**Wednesday, July 25, 2018**
**Conference Room 130**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Time</th>
<th>Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introductions</td>
<td>9:00</td>
<td>Lyons</td>
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<tr>
<td>TAC Expectations and Process Overview</td>
<td>9:05</td>
<td>Lyons</td>
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<tr>
<td>2017 IRP Acknowledgements &amp; Policies</td>
<td>9:30</td>
<td>Gall</td>
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<tr>
<td>Break</td>
<td>10:15</td>
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<tr>
<td>Demand and Economic Forecast</td>
<td>10:30</td>
<td>Forsyth</td>
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<tr>
<td>Lunch</td>
<td>12:00</td>
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<tr>
<td>2017 Action Plan Updates</td>
<td>1:00</td>
<td>Gall</td>
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<tr>
<td>2019 IRP Draft Work Plan</td>
<td>1:30</td>
<td>Lyons</td>
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<tr>
<td>Break</td>
<td>2:15</td>
<td></td>
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<tr>
<td>Hydro One Merger Agreements</td>
<td>2:30</td>
<td>Gall</td>
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<tr>
<td>Adjourn</td>
<td>3:00</td>
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Integrated Resource Planning

The Integrated Resource Plan (IRP):

- Required by Idaho and Washington every other year
- Guides resource strategy over the next two years
- Current and projected load & resource position
- Preferred Resource Strategy (PRS)
  - Generation resource choices
  - Conservation / demand response
  - Transmission and distribution integration
  - Avoided costs
- Expected case
- Market and portfolio scenarios for uncertain future events and issues
Integrated Resource Planning (Cont)

• Requires significant modeling and assumptions
  – Fuel prices
  – Economic activity
  – Policy considerations
  – Resource costs
  – Energy efficiency

• Action Items – areas for more research in the next IRP

• This is not an advocacy forum

• Not a forum on a particular resource, resource type or any particular issue

• Supports rate recovery, but not a preapproval process
Technical Advisory Committee

• The public process piece of the IRP – input on what to study, how to study, and review of assumptions and results

• Wide range of participants in all or some of the process

• Open forum, but we need to stay on topic to get through the topics

• Welcome requests for studies or different assumptions.
  – Time or resources may limit the studies we can do
  – The earlier study requests are made, the more accommodating we can be
  – January 2019 at the latest to be able to complete studies in time for publication

• Planning team is available by email or phone for questions or comments between the TAC meetings
Today’s Agenda

• 9:00 – Introduction and TAC Expectations and Process Overview, Lyons
• 9:30 – 2017 IRP Acknowledgments and Policies, Gall
• 10:15 – Break
• 10:30 – Demand and Economic Forecast, Forsyth
• 12:00 – Lunch
• 1:00 – 2017 IRP Action Plan Updates, Gall
• 1:30 – 2019 IRP Draft Work Plan
• 2:15 – Break
• 2:30 – Hydro One Merger Agreements, Gall
• 3:00 – Adjourn
TAC Expectations

• Avista:
  – Input about assumptions and areas to study
  – Five TAC meetings with agendas that may change based on input
  – Topics covered later today in the Draft Work Plan

• TAC Members:
  – What are your expectations?
  – Comments or questions about the process
2017 Electric IRP Commission Acknowledgement Update

James Gall, IRP Manager
July 25, 2018
Idaho Commission acknowledged the 2017 IRP on February 1, 2018 in order No. 33971 of AVU-E-17-08.

Comments were provided by the Commission Staff, Idaho Conservation League (ICL), and 23 members of the public.

The Commission in this order confirms … “The appropriate place to determine the prudence of the IRP or the Company’s decision to follow or not follow it, and the validation of predicted performance under the IRP, will be a general rate case or another proceeding in which the issue is noticed.”
Specific Idaho Staff Comments (highlights)

• Scenarios should include renewing the Lancaster contract.
• Clearly state how the Company’s portfolio complies with the EPA’s Clean Power Plan.
• Concern with natural gas prices being "extremely low throughout the entire planning period".
• Failed to provide evidence supporting its claim "that coal price risk is not a significant factor for Colstrip operations."
• Continue analyzing alternatives and cost mitigation strategies for Colstrip.
• Regarding Colstrip, specify significant capital investments required for plant operation and provide a more transparent assessment of the costs and availability of fuel for the plant.
Specific ICL Comments (highlights)

- Asks the Commission to direct Avista to include a "thorough and detailed discussion" in its 2019 IRP, of the policies and financial plans of the utility co-owners of Colstrip Units 3 and 4, and their impact on the cost of producing and distributing electricity from Avista's share of Units 3 and 4.
  - Such discussion should include analysis of provisions in Puget Sound Energy's (PSE) 2017 settlement with the Washington Utilities and Transportation Commission that (1) changed the depreciation schedule for Units 3 and 4 from 2045 to 2027; and (2) allocated $10 million for transition funds to the community of Colstrip.
- Recommends Avista include analysis of Oregon State Bill 1547, directing PGE and PacifiCorp to end distribution of coal-generated electricity in Oregon by 2030.
- Provide a more transparent accounting and explanation" of how Avista's AURORA and PRiSM models work.
- Avista provide a more thorough analysis "of the fuel price of coal at Colstrip and a forecasted range of price volatility over the 20-year timeframe of the 2019 IRP."
Customer Comments in Idaho

- The Commission conducted a public telephone hearing at which 18 people testified, most of whom were Avista customers.
- The hearing participants testified about retiring Colstrip early, switching from coal to renewables, and other environmental concerns.
- The Commission also received 23 written comments.
- Most comments opposed investing in Colstrip, although a few supported it.
Specific Idaho Recommendations

• We note that customers and Staff commented on alternatives regarding the closure of Colstrip and the inclusion in the PRS of a new gas peaker plant after the expiration of the Lancaster agreement.

• We encourage the Company to continue evaluating all options regarding these resources, and to consider the best interests of its customers when developing the 2019 IRP.

• The Commission appreciates the Company's collaboration with stakeholders in developing the 2017 Electric IRP.
Washington 2017 IRP Acknowledgement

• Washington Commission acknowledged the 2017 IRP on May 7, 2018 in Docket No. UE-161036

• It is important that the Commission take this opportunity to thank the members of the public that participated in the Company’s Advisory Committee process, commented in the docket, and made oral statements at the public meeting.

• Specific Comments:
  – Colstrip Units 3 & 4
  – Conservation potential assessment
  – Demand response & AMI
  – Forecasted natural gas prices
  – Distribution system upgrade planning
  – Optimal planning reserve margin
  – Update legacy studies
  – Portfolio scenario cost comparison
  – Emissions price modeling and cost abatement supply curve
  – Public Process
Colstrip Comments and Recommendations

1. Regarding fuel source cost and risk:
   a. How dependent is Colstrip on a single-source mine for its fuel?
   b. How well understood is the supply of coal from the Colstrip mine?
      i. What are the financial risks of the type of mining used to extract the existing coal?
      ii. As the need for fuel for Colstrip declines, how does the cost per unit of coal from the Colstrip mine increase?
      iii. What are the counter-party risks of mine operation?
      iv. What risks to coal supply and coal cost does the Joint Colstrip ownership agreement impose? How will Avista manage them?
   c. How does the fuel supply risk from Colstrip compare to that of natural gas?

2. Does Avista have an assessment of the cost related to the counter-party risk of Riverstone ceasing operation of its share of Colstrip Unit 3? If not, why not?

3. Does Avista have an assessment of the cost of the counter-party risk of Riverstone being financially unable or otherwise failing to pay its share of decommissioning and Remediation costs for Unit 3?

4. What are the economics of the high-cost scenario under a “low gas” scenario forecast?

5. How are the economics of Colstrip Units 3 & 4 affected if natural gas prices continue to remain relatively flat?

6. What are Avista’s best estimates of remediation and decommissioning costs associated with Colstrip Units 3 & 4?

7. Has the Company quantified capacity replacement costs for Colstrip Units 3 & 4 that it could use as a basis of seeking replacement capacity as an alternative to any large capital investments it faces at Colstrip?

8. What is the risk of the failure of a large cost component of Colstrip Units 3 & 4 (such as: the heat exchangers, steam turbine or drive shafts) over Avista’s expected 20-year life of the plant?
Other Colstrip Recommendations

• Develop a list of events regarding the economic viability of Colstrip
  – For each event identify the cost, probability of occurrence, and cost range
• The 2019 plan should clearly and transparently
  – Identify cost data and discuss in detail the relationship between the range of these input assumptions, portfolio modeling logic, and the output of the modeling, as well as how the Company used such analysis to choose its PRS.
Conservation Potential Assessment

The 2019 IRP must include the following:

1. All conservation measures excluded from the CPA, including those excluded prior to technical potential determination.

2. The rationale for excluding any measure.

3. A description, and source, of Unit Energy Savings data for each measure included in the CPA.

4. An explanation for any differences in economic and achievable potential savings.

- The Company should also share its proposed energy efficiency measure lists with the Conservation Advisory Group prior to completing the CPA.
Demand Response and Advanced Metering Infrastructure (AMI) Project

• The 2017 IRP does not consider the adoption of AMI technology in its energy efficiency or demand response modeling, nor does it demonstrate any potential benefits of deploying AMI.

• The Commission notes that the IRP is also one of the Company’s opportunities to develop a record for the future demonstration of prudent resource acquisition.
Forecasted Price of Natural Gas

- The Commission does not expect utilities to predict future natural gas prices with perfect accuracy, acknowledging this exercise is a forecast.
- We expect the utility to question and investigate the facts and reasoning used by the consultants to derive their forecasts, given that past IRPs have included a high-side bias to natural gas prices.
- Avista must ensure its natural gas price forecast represents the most reasonable expectation of the future.
Distribution System Upgrade Planning

• Any analysis of a distribution system upgrade should include consideration of storage options that capture locational benefits associated with the site in question.
• The Commission encourages Avista’s use of sub-hourly models in the core IRP development process to identify distribution system enhancements in its next IRP.
• Avista should perform a study to determine ancillary services valuation in the market and use that value to evaluate the cost effectiveness of storage and peaking technologies using intra-hour modeling capabilities.
• Advises Avista to model generic commercially available storage technologies within the IRP, including consideration of efficiency rates, capital cost, operation and maintenance, life cycle costs, and ability to provide non-power supply benefits.
Other Comments and Recommendations

• Optimal Planning Reserve Margin
  – The Commission urges Avista to monitor winter and summer resource adequacy and continue to analyze planning margins, using its loss of load model, and continue to work with the Council to validate and update its requirements while examining additional tools such as Expected Loss of load and Expected Unserved Energy.

• Update Legacy Studies
  – For future IRPs, citations to legacy analysis should be accompanied by a rationale for why the study does not need to be updated.

• Portfolio Scenario Cost Comparison
  – In displaying the costs and risks of a portfolio scenario in its IRP, Avista should prominently display a comparison chart of the present value of revenue requirement of each portfolio scenario along with its associated risk.
Emissions Price Modeling and Cost Abatement Supply Curve

• In future IRPs, Avista should incorporate in its preferred resource strategy the cost of risk of future greenhouse gas regulation in addition to known regulations.
• This cost estimate should come from a comprehensive, peer-reviewed estimate of the monetary cost of climate change damages, produced by a reputable organization.
• We suggest using the Interagency Working Group on Social Cost of Greenhouse Gases estimate with a three percent discount rate.
• Avista should also continue to model other higher and lower cost estimates to understand how the resource portfolio changes based on these costs.
• The Company must also develop a supply curve of emissions abatement measures in its next IRP.
Public Process

• Expect the Company to provide written responses to all Advisory Committee questions submitted to the Company in writing,
• Provide minutes for each Advisory Committee meeting.
Washington IRP Rulemaking

• The Washington Commission opened Docket No. U-161024 on September 2016 to consider the following topics:
  – Energy storage;
  – Requests for proposals;
  – Avoided costs;
  – Transmission and distribution planning;
  – Flexible resource modeling; and
  – General procedural improvements.

• Work has been ongoing for this docket and the process is expected to wrap up before the end of this year.
Load and Economic Forecasts

Grant D. Forsyth, Ph.D.
Chief Economist
First Technical Advisory Committee Meeting
July 25, 2018
Main Topic Areas

• Service Area Economy
• Peak Load Forecast
• Long-run Forecast
Service Area Economy

Grant D. Forsyth, Ph.D.
Chief Economist
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Distribution of Employment: Services and Government are Dominant

WA-ID MSA Employment, 2016

- Private Services: 71%
- Private Goods: 13%
- Other: 15%
- Farm: 1%
- State: 3% (21% Gov)
- Military: 1% (8%)
- Federal, civilian: 2% (10%)
- Local: 9% (61% Gov)

Source: BEA and author's calculations.
Non-Farm Employment Growth, 2009-2018

Non-Farm Employment Growth Since June 2009

Year-over-Year, Same Month Seasonally Adj.

Source: BLS and author's calculations.
Non-Farm Employment: Finally Catching Up

Non-Farm Employment Level Since 2007 (Dashed Shaded Box = Recession Period)

Source: BLS and author’s calculations.
Population Growth: Recovering with Employment Growth

Population Growth in Avista WA-ID MSAs

Annual Growth

<table>
<thead>
<tr>
<th>Year</th>
<th>Growth Rate</th>
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<tbody>
<tr>
<td>2007</td>
<td>1.9%</td>
</tr>
<tr>
<td>2008</td>
<td>1.4%</td>
</tr>
<tr>
<td>2009</td>
<td>1.2%</td>
</tr>
<tr>
<td>2010</td>
<td>0.8%</td>
</tr>
<tr>
<td>2011</td>
<td>0.5%</td>
</tr>
<tr>
<td>2012</td>
<td>0.5%</td>
</tr>
<tr>
<td>2013</td>
<td>0.8%</td>
</tr>
<tr>
<td>2014</td>
<td>1.1%</td>
</tr>
<tr>
<td>2015</td>
<td>1.3%</td>
</tr>
<tr>
<td>2016</td>
<td>1.8%</td>
</tr>
<tr>
<td>2017</td>
<td>1.9%</td>
</tr>
</tbody>
</table>

Source: BEA, U.S. Census, and author’s calculations.
Peak Load Forecast

Grant D. Forsyth, Ph.D.
Chief Economist
Grant.Forsyth@avistacorp.com
The Basic Model

- Monthly time-series regression model that initially excludes certain industrial loads.

- Based on monthly peak MW loads since 2004. The peak is pulled from hourly load data for each day for each month.

- Explanatory variables include HDD-CDD and monthly and day-of-week dummy variables. The level of real U.S. GDP is the primary economic driver in the model—the higher GDP, the higher peak loads. The historical impacts of DSM programs are “trended” into the forecast.

- The coefficients of the model are used to generate a distribution of peak loads by month based on historical max/min temperatures, holding GDP constant. An expected peak load can then be calculated for the current year (e.g., 2016). Model confirms Avista is a winter peaking utility for the forecast period; however, the summer peak is growing at a faster than the winter peak.

- The model is also used to calculate the long-run growth rate of peak loads for summer and winter using a forecast of GDP growth under the “ceteris paribus” assumption for weather and other factors.
GDP Growth Assumptions: 2015 IRP vs. 2017 IRP

Source: Various and author’s calculations.
Current Peak Load Forecasts for Winter and Summer, 2018-2043

- Winter Peak: 0.34%
- Summer Peak: 0.36%
Current and Past Peak Load Forecasts for Winter Peak, 2011-2043

Winter Peak Forecast: Current and Past

Megawatts

- 2009 IRP
- 2011 IRP
- 2013 IRP
- 2015 IRP
- 2017 IRP
- 2019 IRP
Current and Past Peak Load Forecasts for Summer Peak, 2011-2043

Summer Peak Forecast: Current and Past

Megawatts

- 2009 IRP
- 2011 IRP
- 2013 IRP
- 2015 IRP
- 2017 IRP
- 2019 IRP
Long-Term Load Forecast

Grant D. Forsyth, Ph.D.
Chief Economist
Grant.Forsyth@avistacorp.com
Basic Forecast Approach

1) Monthly econometric model by schedule for each class.
2) Customer and UPC forecasts.
3) 20-year moving average for “normal weather.”
4) Economic drivers: GDP, industrial production, employment growth, population, price, and ARIMA error correction.
5) Native load (energy) forecast derived from retail load forecast.

1) Bootstrap off medium term forecast.
2) Apply long-run load growth relationships to develop simulation model for high/low scenarios.
3) Include different scenarios for renewable penetration with controls for price elasticity and EV/PHEVs.
The Long-Term Residential Relationship, 2020-2040

Load = Customers X Use Per Customer (UPC)

Load Growth ≈ Customer Growth + UPC Growth

Assumed to be same as population growth, commercial growth will follow residential, and slow decline in industrial.

Assumed to be a function of multiple factors including renewable penetration, gas penetration, and EVs/PHEVs.
Average annual growth rate from 2019-2045 = 0.7%. Shape of time-path mimics a combination of IHS (ID) and OFM (WA) population forecasts.
Residential Solar Penetration, 2008-2017

Customer Penetration vs. Customers Since 2008

Share of Residential Solar Customers to Total Residential Customers

- 2008
- 2014
- 2015
- 2016
- 2017
By 2045, penetration will be near 1.5% of residential customers and average size of installed systems will be 10,000+ watts. Current penetration is 0.14% and typical size is 7,800 watts.

Penetration was near 0.5% of residential customers and average size of installed systems was 6,000 watts.
Residential EVs/PHEVs, 2019-2045

Projected Residential EVs/PHEVs

<table>
<thead>
<tr>
<th>Forecast</th>
<th>By 2045</th>
<th>Prob.</th>
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<tbody>
<tr>
<td>Low</td>
<td>20,000</td>
<td>50%</td>
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<tr>
<td>Middle</td>
<td>70,000</td>
<td>30%</td>
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<tr>
<td>High</td>
<td>120,000</td>
<td>20%</td>
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Weighted Average: 63,000

Current ≈ 700
Estimated with DOE data. Assumes 5.18 metric tons of CO2 per gasoline vehicle.

Savings = Number of EV/PHEV x 5.18
Native Load Forecast, 2019-2045

Average Megawatts

Medium Term

Long Term

2019 IRP Base-Line Native Load

2015 IRP Base-Line Native Load

2017 IRP Base-Line Native Load
Native Load Growth Forecast, 2019-2045

### Native Load Growth

<table>
<thead>
<tr>
<th>Year</th>
<th>IRP</th>
<th>Avg. Annual Growth</th>
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<tbody>
<tr>
<td>2019</td>
<td>0.40%</td>
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<tr>
<td>2017</td>
<td>0.51%</td>
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**EV/PHEV “Bend”**

- 2019 IRP Base-Line Native Load Growth
- 2017 IRP Base-Line Native Load Growth
Residential UPC Growth: 2019-2045

Base-Line Scenario: Residential UPC Growth Rate

- EIA Reference Case Use Per Household Growth
- 2019 IRP Residential Base-Line UPC Growth
Long-Term Load Forecast: Conservation Adjustment

Grant D. Forsyth, Ph.D.
Chief Economist
Grant.Forsyth@avistacorp.com
Monthly Conservation as a Share of Total Actual Retail Load: Navigant Estimates

\[
\text{Ratio} = \frac{\text{Estimated Conservation Month } t, \text{ Year } y}{\text{Actual KWH Load Month } t, \text{ Year } Y}
\]
Median Monthly Conservation as a Share of Total Actual Retail Load: Navigant Estimates

Median Ratio Month $t = \text{Median} \left( \frac{\text{Estimated Conservation Month } t}{\text{Actual KWH Load Month } t} \right)$, excluding 2001
Comparison of Native Load Forecasts, 2019-2045

aMW Load Comparison with Conservation

- Red line: Base-Line Native Load
- Blue line: Base-Line Native Load with Conservation Added Back
Generation Resource Related Analysis

• Continue to review existing facilities for opportunities to upgrade capacity and efficiency.
  – Avista is currently evaluating opportunities at Kettle Falls and Post Falls.

• Model specific commercially available storage technologies within the IRP; including efficiency rates, capital cost, O&M, life cycle, and ability to provide non-power supply benefits.
  – Avista will model a suite of storage options using third party data for cost and operating data. For benefits, Avista will model both distribution and transmission level storage to quantify locational benefits.

• Update the TAC regarding the EIM study and Avista plan of action.
  – Update to be provided later this year.

• Monitor regional winter and summer resource adequacy, provide TAC with additional Avista LOLP study analysis.
  – LOLP/ELCC analysis is currently in process and will be presented at November meeting.

• Update the TAC regarding progress regarding Post Falls Hydroelectric Project redevelopment.
  – Avista is evaluating multiple options at Post Falls, an update on the plan will be at the February 2019 meeting.
Generation Resource Related Analysis

• Perform a study to determine ancillary services valuation for storage and peaking technologies using intra hour modeling capabilities. Further, use this technology to estimate costs to integrate variable resources.
  – Avista plans on performing this study with the Avista’s ADSS model. At this time intra hour logic is not available. If it is not available at the time of the IRP analysis, sensitivities analysis will be performed to simulate this changes in reserve requirements.

• Monitor state and federal environmental policies effecting Avista’s generation fleet.
  – Avista is continually monitoring policies that may impact the generation fleet.
Energy Efficiency and Demand Response

- Determine whether or not to move the T&D benefits estimate to a forward looking value versus a historical value.
  - Avista is participating in the PNUCC and the NPCC investigation into a reasonable methodology to determine T&D deferral values. Avista plans to use the preferred methodology from this effort. As of now, the method is based on the utilization factor of expected capital spending on T&D projects.
- Determine if a study is necessary to estimate the potential and costs for a winter and a summer residential demand response program and along with an update to the existing commercial and industrial analysis.
  - Avista has engaged AEG to conduct this study. The results will be shared at the March Meeting.
- Use the utility cost test methodology to select conservation potential for Idaho program options.
  - Avista is still committed to this methodology
- Share proposed energy efficiency measure list with Advisory Groups prior to CPA completion.
  - A list will be made available prior to the March meeting.
Transmission and Distribution Planning

• Work to maintain Avista’s existing transmission rights, under applicable FERC policies, for transmission service to bundled retail native load.
  – Avista is committed to this Action Item and actively engages in this area.
• Continue to participate in BPA transmission processes and rate proceedings to minimize costs of integrating existing resources outside of Avista’s service area.
  – Avista is committed to this Action Item and actively engages in this area.
• Continue to participate in regional and sub-regional efforts to facilitate long-term economic expansion of the regional transmission system.
  – Avista is committed to this Action Item and participates in these efforts.
• IRP and T&D planning will coordinate on evaluating opportunities for alternative technologies to solve T&D constraints.
  – Avista will model at least five locations for both transmission and distribution assets where the system could alternatively be upgraded with a distributed energy resources (DER) rather than traditional assets to test whether or not a coordinated DER is a lower cost to customers.
Draft 2019 Electric IRP Work Plan

John Lyons, Ph.D.
First Technical Advisory Committee Meeting
July 25, 2018
Tentative TAC Meetings

- **TAC 1 (July 25, 2018):** TAC Meeting Expectations and IRP process overview, review of 2017 IRP Commission acknowledgement letters and policy statements, demand and economic forecast, draft 2019 Electric IRP Work Plan, and Hydro One’s merger agreement’s impact on the 2019 IRP.

- **November 2018:** Modeling process overview, generation options (costs and assumptions), resource adequacy and ELCC analysis, overview of home heating technologies and efficiency, expected case key assumptions (regional loads, CO2 regulation, etc…), and market and portfolio scenarios.

- **February 2019:** Natural gas price forecast, electric market forecast, IRP transmission planning studies, distribution planning within the IRP, existing resource overview – Colstrip, Lancaster and other resources, and final resource needs assessment.

- **March 2019:** Ancillary services and intermittent generation analysis, conservation and demand response potential assessment (AEG), Pullman Smart Grid Demonstration Project review, draft Preferred Resource Strategy, and draft market and portfolio results.

- **April 2019:** Review of final PRS, market scenario results, portfolio scenario results, carbon cost abatement supply curves and 2019 Action Items.
## 2019 Draft Electric IRP Timeline

<table>
<thead>
<tr>
<th>Preferred Resource Strategy (PRS) Tasks</th>
<th>Target Date</th>
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<tbody>
<tr>
<td>Finalize energy forecast</td>
<td>July 2018</td>
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<tr>
<td>Identify Avista’s supply resource options</td>
<td>September 2018</td>
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<tr>
<td>Begin Aurora market model development</td>
<td>October 2018</td>
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<tr>
<td>Energy efficiency load shapes input into Aurora</td>
<td>November 2018</td>
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<tr>
<td>Finalize data sets/statistics variables for risk studies</td>
<td>November 2018</td>
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<tr>
<td>Transmission and Distribution studies due</td>
<td>December 2018</td>
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<tr>
<td>Finalize natural gas price forecast</td>
<td>December 2018</td>
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<tr>
<td>Communicate energy efficiency options to TAC</td>
<td>December 2018</td>
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<tr>
<td>Finalize deterministic &amp; stochastic expected case market studies</td>
<td>January 2019</td>
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<tr>
<td><strong>Due date for additional study requests</strong></td>
<td><strong>January 15, 2019</strong></td>
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<tr>
<td>Develop PRiSM model</td>
<td>January 2019</td>
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<tr>
<td>Finalize peak load forecast</td>
<td>February 2019</td>
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<tr>
<td>Finalize PRiSM model assumptions</td>
<td>February 2019</td>
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<tr>
<td>Simulation of risk studies “futures” complete</td>
<td>February 2019</td>
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<tr>
<td>Simulate market scenarios in Aurora</td>
<td>February 2019</td>
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<tr>
<td>Evaluate resource strategies against market futures and scenarios</td>
<td>March 2019</td>
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<tr>
<td>Present preliminary study and PRS to TAC</td>
<td>March 2019</td>
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# 2019 Draft Electric IRP Timeline

<table>
<thead>
<tr>
<th>Writing Tasks</th>
<th>Target Date</th>
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</thead>
<tbody>
<tr>
<td>File 2019 IRP Work Plan</td>
<td>August 31, 2018</td>
</tr>
<tr>
<td>Prepare report and appendix outline</td>
<td>October 2018</td>
</tr>
<tr>
<td>Prepare text drafts</td>
<td>April 2019</td>
</tr>
<tr>
<td>Prepare charts and tables</td>
<td>April 2019</td>
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<tr>
<td>Internal drafts released at Avista</td>
<td>May 2019</td>
</tr>
<tr>
<td>External draft released to the TAC</td>
<td>May 31, 2019</td>
</tr>
<tr>
<td><strong>TAC comments and edits due</strong></td>
<td><strong>June 28, 2019</strong></td>
</tr>
<tr>
<td>Final editing and printing</td>
<td>August 2019</td>
</tr>
<tr>
<td>Final IRP submission to Commissions and distribution to TAC</td>
<td>August 31, 2019</td>
</tr>
</tbody>
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2019 IRP Modeling Process

Stochastic Inputs
- Fuel Prices
- Fuel Availability
- Resource Availability
- Demand

Deterministic Inputs
- Existing Resources
- Resource Options
- Transmission

AURORA
“Wholesale Electric Market”
500 Simulations

PRiSM
“Avista Portfolio”
Efficient Frontier

Avoided Costs
- T&D Projects/Costs
- Conservation Measures/Costs
- Demand Response Measures/Costs
- Generation/Storage Options & Costs

Prefered Resource Strategy

Environmental Policy
- Conservation Trends
- Avista Load Forecast

Existing Resources
- Energy, Capacity, & RPS Balances
2019 Electric IRP Draft Outline

• Executive Summary
• Introduction and Stakeholder Involvement
• Economic and Load Forecast
  – Economic Conditions
  – Avista Energy and Peak Load Forecast
  – Load Forecast Scenarios
• Existing Supply Resources
  – Avista Resources
  – Contractual Resources and Obligations
2019 Electric IRP Draft Outline

• Energy Efficiency and Demand Response
  – Conservation Potential Assessment
  – Demand Response Opportunities

• Long-Term Position
  – Reliability Planning and Reserve Margins
  – Resource Requirements
  – Reserves and Flexibility Assessment

• Policy Considerations
  – Environmental Concerns
  – Greenhouse Gas Issues
  – State and Federal Policies
2019 Electric IRP Draft Outline

• Transmission & Distribution Planning
  – Avista’s Transmission System
  – Future Upgrades and Interconnections
  – Transmission Construction Costs and Integration
  – Transmission and Distribution Efficiencies

• Generation Resource Options
  – New Resource Options
  – Avista Plant Upgrades
2019 Electric IRP Draft Outline

• Market Analysis
  – Marketplace
  – Fuel Price Forecasts
  – Market Price Forecast
  – Scenario Analysis

• Preferred Resource Strategy
  – Resource Selection Process
  – 2017 Preferred Resource Strategy
  – Efficient Frontier Analysis
  – Avoided Cost
2019 Electric IRP Draft Outline

• Portfolio Scenarios
  – Portfolio Scenarios
  – Tipping Point Analyses

• Action Plan
  – 2017 Action Plan Summary
  – 2019 Action Plan
Hydro One Merger Agreements Related to Resource Planning

James Gall, IRP Manager
First Technical Advisory Committee Meeting
July 25, 2018
Avista’s Proposed Merger with Hydro One

• Regulatory process update:
• Announced proposed merger July 2017
• Applications for approval filed in September 2017
• Federal approvals received
• Approvals from Alaska and Montana received
• Settlement agreements reached and filed in Washington, Idaho and Oregon. Approvals are still pending in these states.
• We continue to work through the regulatory process toward approval

More information at www.myavista.com/hydroone
Presentation Objective

• This presentation will review agreements between Avista, Hydro One and intervening parties related to the Electric IRP per the merger agreements in Washington & Idaho.
• These agreements will include methodology and specific goals the next IRP shall include if the merger is approved.
Hydro One acknowledges Avista’s obligations under applicable renewable portfolio standards, and Avista will continue to comply with such obligations.

Avista will acquire all renewable energy resources required by law and such other renewable energy resources as may from time to time be deemed advisable in accordance with Avista’s integrated resource planning (“IRP”) process and applicable regulations.
Avista’s non-fossil fueled generation resources constitute more than 50% of its generation portfolio, and Avista exceeds the renewable energy standards currently applicable to the company under RCW 19.285.040(2).

Avista makes the following renewable energy commitments. Both commitments are made only to the extent resources are reasonably commercially available and are (1) necessary to meet load and (2) consistent with the lowest reasonable cost resource portfolio pursuant to Avista’s established IRP and pursuant to the Commission’s resource evaluation and acquisition rules and policies.
Avista will commit to initiating a Request for Proposal with the intent of acquiring additional eligible renewable energy resources as part of this process above and beyond the current renewable energy standards in law. Avista will commit to obtain approximately 50 aMW of expected energy from new eligible renewable resources by 2022.

The aMW obtained under this commitment may be used to satisfy any increase that may be caused by changes to the renewable energy standards in law after the date an Order approving this merger has been entered.
ID #52: Renewable Energy Resources

Avista will continue to offer renewable power programs in consultation with stakeholders.

Communications with customers shall accurately reflect the environmental attributes associated with power delivered to such customers. Hydro One and Avista acknowledge that Avista retains the burden of proof to demonstrate the prudence of any resource acquisition.

Nothing in this Commitment prohibits Avista from selling renewable energy credits that arise from resources included in base rates applicable in Idaho. Hydro One acknowledges Avista's obligations under applicable renewable portfolio standards, and Avista will continue to comply with such obligations.
RFP Schedule

- June 6, 2018 – RFP Issuance
- June 20, 2018 – Preliminary Information due (CLOSED)
- June 29, 2018 – Short list identified
- July 20, 2018 – Detailed Proposals due from short-listed bidders (Exhibit C)
- July 23, 2018 through August 15, 2018 – Negotiations with short-listed bidders
- August 29, 2018 – Final bidder(s) selected
- November 2, 2018 - Final contracting complete with successful bidder(s)
RFP Bid Summary

- Nearly 900 aMW from 48 bids
- Proposals included wind, solar, geothermal, fuel cells, and storage
- From Washington, Idaho, Montana, Oregon, and Nevada
- Both PPA’s and build to own transfers were received
WA #53 (b) Renewable Energy Resources

Avista will commit to obtain at least 90 aMW of expected energy from new eligible renewables resources to become operational approximately within a year of the timeframe that Colstrip 3 and 4 go offline.

“Resources” is understood to include Power Purchase Agreements (“PPAs”). Nothing in either commitment prohibits Avista from retaining or selling renewable energy credits associated with such resources that are surplus to Avista’s needs to meet Washington Renewable Portfolio Standards targets.

Communications with customers shall accurately reflect the environmental attributes associated with power delivered to such customers. Hydro One and Avista acknowledge that Avista retains the burden of proof to demonstrate the prudence of any resource acquisition.

The utility should work with an independent third-party consultant, with expertise in renewable energy resources, to ensure that the utility has up-to-date resource cost and performance assumptions, as well as the appropriate learning curves.
WA #54 & ID #56 Greenhouse Gas and Carbon Initiatives

Hydro One acknowledges Avista’s Greenhouse Gas and Carbon Initiatives contained in its current Integrated Resource Plan, and Avista will continue to work with interested parties on such initiatives.
Hydro One acknowledges Avista’s energy efficiency goals and objectives set forth in Avista’s 2017 Integrated Resource Plan and other plans, and Avista will continue its ongoing collaborative efforts to expand and enhance them.
Avista and its affiliates agree to consider in all resource planning and acquisition efforts both demand-side and renewable energy resources that are consistent with the Idaho Commission's resource evaluation and acquisition rules and policies.

- Avista and its affiliates agree that "Resources" to be considered in all IRPs include Power Purchase Agreements ("PPAs").
- Avista commits to calculating a variable generation resource's contribution to capacity in terms of that resource's contribution to resource adequacy and that resource's ability to reduce the loss of load probability in some or all hours or days utilizing the Effective Load Carrying Capability ("ELCC") methodology or an appropriate approximation. [WA #60]
- Avista will work with an independent third-party consultant, with expertise in renewable energy resources, to ensure that the utility has up-to-date resource cost and performance assumptions, as well as the appropriate learning curves, for use in the 2019 IRP process.
- Unless it conflicts with any instructions contained in the Commission's acknowledgement letter in response to Avista's current integrated resource plan (IRP), beginning with the next IRP, Avista commits to modeling a range of potential costs for greenhouse gas emissions, and will work with its IRP Advisory Group to determine the appropriate values to model. [WA #55]
WA #76 & ID #69 Colstrip Depreciation

Hydro One and Avista agree to a depreciation schedule for Colstrip Units 3 and 4 that assumes a remaining useful life of those units through December 31, 2027.

WA: See Attachment A to Appendix A (Master List of Commitments in Washington) to the Settlement Stipulation, “Colstrip Commitment Summary and Description”
ID: See #69 for full description of commitment
Other “IRP” Related Items

WA #58: Optional renewable power program
WA #59 & ID #54: Energy Imbalance Market (“EIM”)
WA #61: Industrial customers’ self direct conservation
WA #62 & ID #55: Transport electrification
WA #63: Professional home energy audit
WA #65 & ID #58: Low-income energy efficiency funding
WA #67: Funding for low-income participation in new renewables
WA #69: Replacement of manufactured homes
WA #70: Low-income weatherization
ID #59 & #60: Industrial load DSM assistance
ID #71: Colstrip transmission planning