WELCOME!

We look forward to working with you.
1. Public Process
2. IRP Basics
3. Planning for Uncertainty
4. Major 2020 Focus Areas
5. Modeling Overview
6. Public Comment Period
7. Next Steps and Action Items
Public Process

What can you expect?
Public Process Overview

Objectives
✓ Listen and understand stakeholder objectives and concerns
✓ Provide a forum for productive stakeholder feedback
✓ Increase community understanding of Tacoma Power’s planning process

Working Group
✓ Selected to ensure commitment and balance of perspectives
✓ Four workshops to review inputs, analyses and recommendations

Other Efforts
✓ All meeting materials posted on website
✓ Public comment opportunities inside & outside of workshops
✓ Occasional public surveys
What You Can Expect

**Opportunity for input on....**
- What scenarios of the future we should include
- What resources we should consider
- Which portfolio should be the preferred portfolio
- What our action items after the IRP should be
- And more!

**Materials**
- Materials to be posted one week before workshop
- Notes to be circulated 10 days after workshop
IRP Basics

What is an IRP?
What is an IRP?

An integrated resource plan:

☑ Is a roadmap for providing reliable and low-cost power in an uncertain future
☑ Helps us make sure sufficient resource are available when needed and not before
☑ Ensures we meet environmental regulatory requirements cost-effectively
☑ Is required by Washington State law (19.280 RCW)
☑ Is a plan for meeting clean energy mandates

20-year time horizon
States with Integrated Resource Planning or Similar Processes

- State has an IRP rule and filing requirement
- State is developing or revising an IRP rule and filing
- State has a filing requirement for long-term plans
- State does not have filing requirements for long-term plans

Source Regulatory Assistance Project (2013)
Overview of IRP Process

Do we have enough resources to meet our load under most conditions?

Which set of resources best meet our needs, risk tolerance and values?

What are our next steps?
Key Findings from Last Time

1. Sufficient resources to meet load over next 20 years
2. Conservation is the only resource needed
3. State mandates for new renewables to be fulfilled through purchase of Renewable Energy Credits (RECs)
2017 Action Plan

- Acquire 6.4 aMW of conservation in 2017-2019 biennium
- Investigate future value of capacity
- Explore expansion of IRP to include DER planning
- Investigate resource planning tools and analysis methodologies

2017-2019 Actions

- Acquired 8.4 aMW of conservation to date
- Work began in 2018 and continues today
- EV Study to understand charging patterns, DR potential study, downtown network deferral study
- Updated modeling tools & analysis approach
Planning for Uncertainty

How are we dealing with future unknowns?
If you are sure of tomorrow, there is no fool greater than you!

Mehmet Murat ildan
Who knows what the future holds?

Policy

- Accelerated decarbonization?
- Fish regulation changes?

Loads

- Electrification?
- Industrial loads?
- Retail competition?

Fuel

- Bad water year?
- Climate impacts?
- Gas pipelines?

Technology

- Renewable hydrogen?
- Molten salt storage?
- Battery alternatives?

Markets

- Capacity markets?
- Organized market?

Prices

- High or low?
- Volatile or stable?
How IRP will address uncertainty

**Scenarios**

- **Base Case**
  - Existing laws and trends

- **Alternative Scenario 1**
  - Alternative set of assumptions 1

- **Alternative Scenario 2**
  - Another alternative set of assumptions 2

**Random Variability**

- Run many simulations with different weather & prices
- Run many simulations with different weather & prices
- Run many simulations with different weather & prices
Major Focus Areas of 2020 IRP

What are the major questions we need to answer this time?
What major changes have occurred since last time?
Columbia Basin Hydro (CBH) Contract Renewal

- 5 Irrigation Canals
- \(\sim 27\) aMW in months of March through October
- 3% of portfolio on average
- Staggered contracts expiring 2022-2026
- 2020 IRP will make a recommendation on whether or not to renew

Key Questions

1. Should we renew the contracts?
2. If not, what resource (if any) will we need in order to replace them?
Conduct Preliminary Analysis

**BPA Contract Renewal/Product Selection**

- Federal Power Marketing Agency
- Power sold at cost
- Tacoma Power has been a BPA customer since 1940
- Over 50% of Tacoma’s portfolio on average
- Current contract expires 2028
- 2020 IRP will conduct *preliminary analysis* on value of renewing current contract vs. alternative product selection

**Key Questions**

1. Given current product offerings and expected policy framework, which product(s) seem likely to meet Tacoma’s needs in the future?
2. Is there any potential value in a more diverse portfolio (i.e. complementing BPA contract with another resource)?
3. What do we need to know before conducting a more definitive analysis?
Incorporate New Laws

Clean Energy Transformation Act (CETA)

- 100% of load met by non-emitting resources or alternative compliance 2030-2044 (up to 20% from alternative compliance)
- 100% of load met by non-emitting resources by 2045
- Incorporate Social Cost of Carbon into planning and resource decisions
- 10-year Clean Energy Action Plan by 2020
- 4-year Clean Energy Implementation Plan by 2022
- Ensure equitable distribution of benefits and reduction of burdens to vulnerable populations and highly impacted communities
- Many details TBD in rulemaking

Initial analyses suggest current portfolio will comply with 2030-2044 mandate
Climate Change Impacts on Tacoma

- Slightly higher temperatures (+1.8°F to +4.3°F), especially in summer
- Little change in total inflows
- More water in winter, less in summer
- Higher peak flows, lower low flows
- Impacts on Columbia River system (BPA) less extreme

Source: UW Climate Impact Group study prepared for Tacoma Power (2015)
Other Changes

New Modeling Tools
• Discussed next

New Portfolio Performance Metrics
• Discussed next time

Regional Resource Adequacy Program
• Its existence/absence could impact future prices and opportunity to buy and sell capacity products

Tacoma Participation in CA Energy Imbalance Market
• Not modeled in 2020 IRP but is likely to increase value of highly flexible resources

Transportation Electrification Plan
• Could impact expectations for future loads
Modeling Overview

What modeling tools are we using?
How do they fit together?
Tacoma’s Toolset

Western Resource Build

Price Simulation

Tacoma Resource Dispatch

Portfolio Performance
How does Aurora work and what are the key inputs we use?

Aurora WECC Model
Aurora: Capacity Expansion

**Inputs:**
- **Zonal Definition**
  - Zones
  - Areas
  - Transmission
- **Existing Resources**
  - Costs
  - Physical Properties
  - Operational Constraints
- **Early Retirement Resources**
- **Candidate Resources**
- **Demand Forecasts**
- **Fuel Cost Forecasts**
- **Policy Constraints**
- **Other inputs**

**Outputs:**
- Resource buildout by zone
- Economic resource retirement by zone
- Total build costs
Changes to AURORA’s Database:
- Separated “OWI” zone into separate “OR”, “WA”, and “ID” zones.
- Updated Early Coal Retirements
- Updated WECC RPS constraints
- Added CETA constraint
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Announced Early Coal Retirements

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity (MW)</th>
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<tbody>
<tr>
<td>2019</td>
<td>400</td>
</tr>
<tr>
<td>2020</td>
<td>500</td>
</tr>
<tr>
<td>2023</td>
<td>2000</td>
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<td>2025</td>
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<td>2026</td>
<td>4000</td>
</tr>
<tr>
<td>2027</td>
<td>5000</td>
</tr>
<tr>
<td>2028</td>
<td>6000</td>
</tr>
<tr>
<td>Total</td>
<td>7000</td>
</tr>
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</table>

- Colstrip (2)
- Colstrip (3)
- Colstrip (4)
- Colstrip (1)
- Craig (2)
- Jim Bridger (1)
- Jim Bridger (2)
- Naughton (1)
- Naughton (2)
- Naughton (3)
- North Valmy (1)
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Aurora: Production Cost Model

Inputs:
- Zonal Definition
- Modified Resources
  - Output from Capacity Expansion Step
- Demand Forecasts
  - Weather Adjusted
- Hydro Capability
  - Weather/“Water Year” Adjusted
- Fuel Cost Forecasts
  - Risk Simulations
  - Other Inputs

Outputs:
- Hourly, Weather Adjusted, Long-Term Price Forecasts
Changes to AURORA’s Database:

• Included 1950-2007 water year adjusted hydro capability
• Simulated 5 natural gas risk iterations
• Adjusted demand forecasts to 1950-2007 water years
Aurora: Production Cost Model

Changes to AURORA’s Database:

- Included 1950-2007 water year adjusted hydro capability
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- Adjusted demand forecasts to 1950-2007 water years

[Graph showing natural gas price from 1997 to 2045]
Aurora: Production Cost Model

Changes to AURORA’s Database:

• Included 1950-2007 water year adjusted hydro capability
• Simulated 5 natural gas risk iterations
• Adjusted demand forecasts to reflect 1950 to 2007 temperatures
How will Tacoma’s system operate for a given weather simulation and market scenario?

IRP System Model (SAM)
Plug and Play Resources

- Hydro-Electric
- Solar
- Wind
- Natural Gas
- Pumped Hydro
- Battery Storage
- BPA Slice Contract
- BPA Block Contract
- Other Contracts
Plug and Play Resources

- Each Resource has set a parameters that define its constraints and determine its dispatch

- A resource scenario consists of a set of resources and their resource parameters

- For a given run the resource scenario defines Tacoma Generation
Model Dispatches Tacoma Generation

- Regional Inflows
- Regional Generation
- Regional Load
- Prices
- Weather
- Tacoma Load
- Tacoma Inflows
- Tacoma Generation
IRP System Model S

Model Dispatches Tacoma Generation

**INPUTS**
- Resource Scenario
- Weather
- Prices

**OUTPUTS**
- Hourly Dispatch for each Resource
  - Meets all Resource Constraints
  - Meets all System Constraints
Public Comment Period
Next Steps and Action Items

What are we covering next?
Workshop Plan

1. **Workshop 1**
   - IRP Overview

2. **Workshop 2**
   - Present key inputs
   - Present and discuss metrics
   - Present and discuss scenarios

3. **Workshop 3**
   - Review current situation
   - Present and discuss resource alternatives

4. **Workshop 4**
   - Present analysis results
   - Present and discuss preferred portfolio
   - Discuss action items
Key Inputs and Assumptions

Base Case
- Tacoma Conservation Potential Assessment
- Tacoma Load Forecast
- WECC Buildout Assumptions
- WECC Price Simulations

Resources
- Tacoma’s Current Portfolio

Analysis Framework
- Portfolio Performance Metrics
- Preliminary Scenarios of the Future

Please complete our online survey to weigh in on scenarios of the future!