Presentation Overview

- Pipeline No. 1 Overview
- Problem Statement
- Regulatory Drivers
- Plan
- Potential Long Term Costs
- Schedule
Pipeline No. 1 Overview

Pipeline Basic Information
Length: 27 miles
Pipe Diameter Size Range: 30” to 78”
Material: Steel and Concrete
Problem Statement

System and operational changes have reduced the flow transferred by Pipeline No. 1 resulting in portions of the pipeline to become unpressurized which increases the potential for infiltration. How can Tacoma Water address the pressurization issue on Pipeline No. 1 to prevent infiltration?

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<tr>
<th>Pipeline Flow Rate (MGD)</th>
<th>% of Pipeline Unpressurized</th>
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<tr>
<td>12</td>
<td>41%</td>
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<td>24</td>
<td>33%</td>
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<td>24%</td>
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## Regulatory Drivers

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<th>Regulatory Items</th>
<th>Definitions/Findings</th>
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<td>GROUP A – PUBLIC WATER SUPPLY SYSTEMS WAC 246-290-230(9)</td>
<td>Transmission lines defined in WAC <a href="#">246-290-010</a> shall be designed to maintain greater than or equal to five psi (35 kPa) during normal operations, except when directly adjacent to storage tanks, and shall be sized according to a hydraulic analysis...</td>
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<td>2018 SANITARY SURVEY FINDINGS FROM WASHINGTON STATE DEPARTMENT OF HEALTH</td>
<td>Significant Deficiency – A deficiency that directly creates a significant public health risk.</td>
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<td>“Please identify the need to develop an approach to pressurizing the pipeline in your current Capital Improvement Program (CIP) and continue to prioritize the replacement of Pipeline 1 as you update your CIP.”</td>
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[246-290-010](#): WAC 246-290-010
The Plan

Comprehensive Evaluation

• Pipeline Assessment (Condition, hydraulics)
• Develop Alternatives (Technical requirements, lifecycle cost)
• Risk Quantification (Support phased, strategic scheduling)
• Develop financing plan
• Finalize Implementation Plan for pressurizing the pipeline
Potential Long Term Costs

Potential Cost

• Range $60 – $150 million over a 20 year period.
Schedule

Approval of Jacobs Contract to Develop the Plan
• Public Utility Board Meeting 12/04/2019

Development of the Plan
• Notice To Proceed – January 2020
• Plan Completion – December 2020
A win-win-win situation

**DRIVER**
- Electricity is less expensive
- EVs need less maintenance

**ENVIRONMENT**
- Reduced GHG emissions
- Domestic source of energy
- Improved air quality, less noise

**UTILITY**
- Increased utility revenues
Current market

- Early adoption stage (<3% of new cars in WA)
- Economics outlook of EVs is good
  - Cheap and clean renewable power, battery cost falling
- Public awareness is still low, many questions
- A period of innovation – best practices have not been set
Self Directed

“...each electric utility, depending on its unique circumstances, can determine its appropriate role in the development of electrification of transportation infrastructure.”

Clarifies what is permitted

“...legislative clarity is important for utilities to offer programs and services, including incentives, in the electrification of transportation...”

Transportation electrification is voluntary

“The governing authority...may adopt an electrification of transportation plan...”
Suggested topics of consideration

“...the governing authority **may** consider some or all of the following...”

1. Applicability of multiple options for electrification of transportation across all customer classes
2. The impact of electrification on the utility’s load, the use of demand response or load management including direct load control and dynamic pricing
3. System reliability and distribution system efficiencies
4. Interoperability concerns for software or hardware
5. Overall customer experience
Gift of Public Funds Prohibitions

- Each program must still adhere to the constitutional prohibitions against “gifts of public funds” as interpreted in case law to not be a donative act (except in cases of “poor and infirm”)
- Satisfied by a Ratepayer Impact Measure (RIM) test

Cost cap

“...utility outreach and investment in the electrification of transportation infrastructure does not increase net costs to ratepayers in excess of one-quarter of one percent.”

- Interpreted to mean the sum of program costs net of projected benefits plus general expenses explicitly used for programs must not exceed 0.25% of operating expenses for the biennium.
Question of governance

Legislative intent:
• Removes a perceived legal obstacle
• Voluntary and self-directed
• Requires oversight by governing body
• Flexibility in how topics are considered, funds are spent

Reality of the early market:
• Technology is continually changing
• Environmental policy is progressing
• Opportunities for partnerships and funding are fleeting
• Impractical for Board approval of program design and delivery

Required but Permissive Authority

Operational Flexibility
The Strategic Plan

- Contains the strategic vision
- Provides guiding principles
- Codifies interpretation and compliance with HB 1512
- Sets the role of the utility
- Contributes to organizational clarity and consistency
- Establishes governance process
  - Public Utility Board approval of Strategic Plan, review on demand
  - Annual review of Action Plan
  - Describes internal processes for program design and delivery
- Public Input process before adoption
The Action Plan

• Annual update on results of previous year efforts
• Specifies areas of focus for the utility
• Previews program design and delivery for next year
• Aligned with the Strategic Plan
• Not explicitly adopted by the Public Utility Board to provide operational flexibility
• Addresses the “five areas to consider”
• Biennial public input process
<table>
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<th>Date</th>
<th>Event Description</th>
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<tbody>
<tr>
<td>Oct 23, 2019</td>
<td>Public Utility Board has first draft of the Strategic and Action Plans</td>
</tr>
<tr>
<td>Nov 6, 2019</td>
<td><strong>Public Process:</strong> Presentation to Infrastructure, Planning and Sustainability</td>
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<tr>
<td>Dec/Jan 2020</td>
<td>Public Meeting with key stakeholders</td>
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<tr>
<td>Jan 2020</td>
<td>Opportunity to comment via website</td>
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<tr>
<td>Feb 2020</td>
<td>Final document including comments from PUB and Public Process presented for approval</td>
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</table>
Questions?
Our Energy Future Series

Session 3: Resources

Rachel Clark
Resource Planning Manager
IRP Process Overview

Today’s Focus

Needs Assessment
- Load Forecast
- Peak Forecast
- Existing Resources

Resource options
- Resource adequacy
- Cost and risk

Portfolio Analysis

Portfolio Selection
- Cost
- Risk
- Environment

Action Items

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

How do different sets of resources perform?

Which set of resources best meet our needs (and values)?

What are our next steps?

Today’s Focus

Review

• Load Forecast
• Peak Forecast
• Existing Resources

Portfolio Analysis

Portfolio Selection

Action Items

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

How do different sets of resources perform?

Which set of resources best meet our needs (and values)?

What are our next steps?
Our Resources

Our Resource Needs in the Future

Resource Options: BPA

Other Resource Options

Next Steps
Our Resources
Section 1: Our Resources

Our Resources Today

Pie chart showing the distribution of resources:
- BPA: 56%
- Cowlitz: 26%
- Cushman: 5%
- Nisqually: 9%
- Wynoochee: 1%
- Columbia Basin Hydro: 3%
- Grant County: 0%

Map showing transmission capacity and generation resources in the Columbia Basin region.
Section 1: Our Resources

Our Hydro Projects

- **63%** of Tacoma’s average generation
- Total generating capacity = 466MW
- Significant storage and flexibility at Mossyrock
- Continuous outflow at Mayfield
- Diminished storage at Cowlitz due to Riffe Lake upper seismic operating limit

- **22%** of Tacoma’s average generation
- Total generating capacity = 116MW
- Limited storage and some shaping flexibility at Alder
- Continuous outflow at LaGrande

- **12%** of Tacoma’s average generation
- Total generating capacity = 135MW
- Flexible when there are sufficient flows

- **2%** of Tacoma’s average generation
- Total generating capacity = 13MW
- Run-of-river operations
Section 1: Our Resources

Bonneville Power Administration (BPA) Purchased Power

Overview

- Tacoma Power has been a BPA customer since 1940
- BPA is a Federal Power Marketing Agency
  - 21 US Army Corp of Engineer Dams (14,650 MW)
  - 10 Bureau of Reclamation Dams (7,800 MW)
  - Columbia Generating Station (Nuclear, 1,100 MW)
  - Several Wind Generation contracts (58 aMW)
- Power is sold at cost (Currently ~ $32/MWh)
- Tacoma Power is BPA’s 4th largest customer (~$120M/year, ~5.5% of BPA’s total load)
- Current Contract Expires September 2028
Section 1: Our Resources

BPA Slice/Block Product

Slice: A virtual percentage of the federal system – roughly 3%.

Block: A fixed monthly volume.
Section 1: Our Resources

Columbia Basin Hydro and Grant County

Columbia Basin Hydro

- 5 Irrigation Canals (Staggered Terms 2022-2026)
- ~27 aMW in months of March through October
- Pricing (~$29/MWh) = Cost (~$12/MWh) + Incentive Payment (~$17/MWh)

Grant County Contract

- .29% “slice” share of Priest Rapids and Wanapum Dams (expires 2052)
- ~2.5 aMW Similar in shape to the BPA Slice product
- Pricing (~$11/MWh) = Cost + Share of proceeds from auction of excess energy
Section 1: Our Resources

Conservation

Achieved Conservation Compared to Target (2010 - Present)

Cumulative Conservation Savings (2007 - Present)

Mayfield Dam
Our Resource Needs in the Future
Section 2: Our Resource Needs in the Future

Our Hydro Projects Alone Don’t Provide Enough Energy

Average Water

Critical Water

Average MW

LOAD AFTER CONSERVATION

Total Tacoma Power Resources

BPA - Block

BPA - Slice

Other Contract Resources
Section 2: Our Resource Needs in the Future

Our Hydro Projects Alone Don’t Provide Enough Capacity

JANUARY PEAK DAY

CURRENT PORTFOLIO

NO BPA

HE: Hour Ending
Section 2: Our Resource Needs in the Future

Our Future Portfolio Needs

- Low Cost
- Low Risk
- Resource Adequacy
- CETA-compliant

Optimal Portfolio
Section 2: Our Resource Needs in the Future

A System in Transition

Old World
- Baseload
- Intermediate
- Peaking

New World
- Dispatchable
- Generation
- Variable
- Renewables
Section 2: Our Resource Needs in the Future

Resource Characteristics

**Predictability**
- Do we know when it will be available?

**Dispatchability**
- Can we control when it is available?

**Flexibility**
- Can it respond quickly (e.g. within seconds) to changing demand?

**Sustained Peak Availability**
- Is it available for a long time during peak demand?

**Emissions Profile**
- How little carbon (or other pollutants) does it emit?
Other Considerations

Cost
• How much does it cost to build/purchase and to run?

Financial Risk
• How uncertain are we about the value and/or cost of the resource?
Section 2: Our Resource Needs in the Future

Types of Resources We Will Consider in this IRP

Supply-side Resources

Demand-side Resources
Resource Options: BPA
Section 3: Resource Options - BPA

Current Product Options: Block Products

**Flat Annual Block** (400 aMW, $34.20/MWh)

**Flat Monthly Block** (400 aMW, $34.30/MWh)

**Diurnal Monthly Block** (400 aMW, $34.50/MWh)

**Diurnal Block with Shaping Capacity** (400 aMW, $34.50/MWh)
Section 3: Resource Options - BPA

Current Product Options (Cont’d)

Slice/Block (453 aMW, $33.05/MWh)

Load Following (549 aMWs, $35.87/MWh)
Section 3: Resource Options - BPA
BPA “Preference” Power Products

BPA’s Statutes Require It To:

- Provide power to public utilities (or “preference customers”) upon request
- Amount of power is based upon the requesting utility’s Total Retail Load less its own resources under “critical water” conditions ("Net Requirement")
- Net Requirement (NR) is determined annually based upon our load forecasts (Example to right):

Key Challenge: BPA has discretion over whether to allow any new resource we acquire to count against our net requirement
Section 3: Resource Options - BPA

Current Contract Framework & Post-2028 Timeline

Regional Dialogue Contracts

- Dedicate Resources: 10/1/2006
- Sign Contract: 10/1/2008
- Start Contract: 10/1/2011

Post-2028 Contracts

- ? Dedicate Resources
- ? Sign Contract
- Start Contract: 10/1/2028
Section 3: Resource Options - BPA

Example: New Wind Plant

Scenario
- Tacoma Power decides to build a new wind plant as part of a “BPA diversification” strategy.
- The plant will generate 25 aMW a year. The remainder of load will be served from existing Tacoma projects and the BPA contract.

Implications
- New wind plant would not displace BPA Preference Power under current contract.
- If current contract timeline is applied, Tacoma would need to declare the resource to load by October 2023 to apply toward net requirement post 2028.
Other Resource Options
Section 4: Other Resource Options

Other Hydropower

Options
• Expand generating capabilities at existing projects
• Contract with other hydropower supplier

Advantages
• Renewable
• Flexible
• Uniquely positioned to integrate other renewables

Challenges
• Licensing
• Operating constraints
• Hydro variability
• Rising costs of fish mitigation
Section 4: Other Resource Options

Wind

Options
- Contract vs. build
- Location
- With or without storage

Advantages
- Renewable
- Decent winter output

Challenges
- Not very predictable
- Not dispatchable
- Transmission constraints
### Section 4: Other Resource Options

**Solar**

<table>
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<tr>
<th>Options</th>
<th>Advantages</th>
<th>Challenges</th>
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<td>Contract vs. build</td>
<td>Renewable</td>
<td>Low winter output</td>
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<td>Location</td>
<td>Fairly predictable</td>
<td>Not dispatchable</td>
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<td>With or without</td>
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<td>storage</td>
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**Options:**
- Contract vs. build
- Location
- With or without storage

**Advantages:**
- Renewable
- Fairly predictable

**Challenges:**
- Low winter output
- Not dispatchable
Section 4: Other Resource Options

Pumped Storage

Options
- Build on existing projects
- Partner with others to build on another site

Advantages
- Renewable
- Long duration

Challenges
- Large investment
- Licensing

Predictability  Dispatchability  Flexibility  Sustained Peak  Emissions  Cost  Risk
## Battery Storage

### Options
- Independent
- Combined with wind and/or solar

### Advantages
- Carbon-free
- Dispatchable & flexible
- Modular

### Challenges
- Limited duration
- Limited lifespan

<table>
<thead>
<tr>
<th>Predictability</th>
<th>Dispatchability</th>
<th>Flexibility</th>
<th>Sustained Peak</th>
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</table>
Section 4: Other Resource Options

Conservation

Examples
- Weatherization
- More efficient lighting
- Improved HVAC systems

Advantages
- Carbon-free
- Reliable
- Modular
- No need for long-distance transmission

Challenges
- Not dispatchable
- Easy opportunities waning

Predictability: Green
Dispatchability: Red
Flexibility: Red
Sustained: Green
Peak: Green
Emissions: Green
Cost: Green
Risk: Green
Section 4: Other Resource Options

Demand Response

Options
- Agreements with large industrial customers
- Interaction with residential/commercial heating equipment (thermostats, water heaters, etc.)

Advantages
- Carbon-free
- Dispatchable
- No need for long-distance transmission

Challenges
- Current market structure keeps incentives for capacity products like DR low
- Administrative costs of residential/small commercial DR program

Predictability Dispatchability Flexibility Sustained Peak Emissions Cost Risk
## Summary

<table>
<thead>
<tr>
<th>Resource Type</th>
<th>Predictability</th>
<th>Dispatchability</th>
<th>Flexibility</th>
<th>Sustained Peak</th>
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Section 4: Other Resource Options

Other Promising Resources for the Future

Supply-Side: Renewable Hydrogen
- Using surplus renewable energy to convert water into hydrogen gas, which is used later as fuel for transportation, industrial processes or power generation

Supply-Side: New Battery Technologies
- Lithium-sulfur, solid-state, vanadium-flow, potassium-ion, silicon batteries, etc.

Supply-Side: Small Modular Nuclear
- “Smaller, safer, cheaper” nuclear power

Supply or Demand-Side: Formic Acid
- A safer, more efficient fuel cell

Demand-Side: Self-Generation with Storage
- Incentivizing customers to store behind-the-meter power generation and use it when it is most beneficial to the grid

Demand-Side: Vehicle-to-Grid Storage
- Demand response using electric vehicle batteries

Demand-Side: Rate Design
- Time-of-use rates, real-time pricing, time-varying demand charges, critical peak pricing, etc.
Next Steps
Section 5: Next Steps

Action Items for Resources Considered in 2020 IRP

Regional Engagement
- Working to gain more clarity on BPA product options for 2028
- Seeking more flexibility from BPA in resource dedication policies post-2028

Modeling Tools
- Starting to model resources in system model

Resource Cost Estimates
- Estimating costs specifically for Tacoma Power

Stakeholder Engagement
- Working on plan (schedule, invite list, etc.) for community input meetings (to start around mid-January)
### Section 5: Next Steps

#### Anticipated Study Session Schedule

<table>
<thead>
<tr>
<th></th>
<th>Study Session Title</th>
<th>Study Session Date</th>
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<td>Resource Planning 101</td>
<td>August 28 (complete)</td>
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<td>September 11</td>
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<td>Resource Adequacy</td>
<td>October 9 (complete)</td>
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<td>Our Current Portfolio &amp; Resource Options</td>
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<td>4</td>
<td>Small Nuclear Reactors</td>
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<td>Load Management</td>
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<td>Load forecast, Current Position &amp; Metrics</td>
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<td>8</td>
<td>Scenarios &amp; Resources Considered</td>
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<td>Preliminary Analysis Results</td>
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<td>10</td>
<td>Final Results &amp; Portfolio Recommendation</td>
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