Lake Chelan
Regional Area Planning
Electrical System Reliability
March 13, 2019
Desired Outcome of Presentation:

- Describe PUD long range planning for electrical infrastructure in the Lake Chelan Valley
- Understand the drivers of need for new electrical infrastructure
- Review options for hardening transmission infrastructure against fire risk
- Explain operational constraints for siting a new substation and transmission line
- Community stakeholders provide direct feedback and ask questions
Applying **Lessons Learned** when Planning for New Infrastructure:

- Inform early and often
- Identify & weigh options in partnership with community stakeholders
- Proactively plan for immediate and long term needs
- Incorporate community values into planning
Your Input Helps Guide the Direction of the PUD

• We want you to weigh in on our recommended approach to fire resiliency plans
• We are seeking input on substation siting & transmission line routes
• Your direct feedback will be shared with PUD Board of Commission
• Your input will be shared with future stakeholder groups & shape future outreach activities
**Objectives & Proposed Tactics**

**PUD objectives in Chelan**
- Provide reliable utility services
- Improve resiliency to fire storms
- Ensure sufficient capacity exists for planned growth

**PUD tactical plan in Chelan**
- Balance system loads and strengthen failure points
- Harden the transmission systems by replacing wood poles with steel poles over time
- Build a new substation and connecting transmission line within the Chelan Dam vicinity
The Electric Power System

The Electric Power System is divided into generation, transmission, and distribution.

1. **Hydro Project**
   In Chelan County, electrical power is generated at one of the PUD's three hydroelectric projects.

2. **Transmission lines**
   Transmission lines leave hydro projects and transmission switchyards.

3. **Transmission Switchyard**
   Power moves across large transmission lines to a transmission switchyard where electrical voltage is reduced by transformers.

4. **Local Substation**
   The power then travels along smaller transmission lines to a local substation, where the electrical voltage is reduced to an appropriate level for residential and commercial use.

5. **Distribution lines**
   Distribution lines leave local substations and may be overhead or underground depending on the location and situation.

6. **Your home or business**
   Finally, power travels along distribution lines and is converted to a standard voltage through transformers and into the customer's residence or business.

**Focus today**

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Distribution Substation Planning
Current & Future Locations Countywide

- Existing Substation: 34
- Future Substation: 8
- Seeking Property
- Future Substation: 6
- Property Acquired

Existing Substations:
- Bavarian Sub
- N. Shore Sub
- North Entiat Sub
- Old Mill/Simmer Sub
- Rock Island Sub
- Howard Flats Sub
- CastleRock Sub
- Hawkins Sub
- Mission Ridge Sub
- Mill Pond Sub
- Wenatchee Sub
- Central Sub
- Rock Island Sub
- N. Shore Sub
- Bavarian Sub

Future Substations:
- Chelan Dam Sub
- N. Shore Sub

Property Acquired:
- Roses Sub

Other Locations:
- Entiat
- Bellingham
- Leavenworth
- Okanogan
- Wenatchee National Forest
- Chelan Falls
- Cedar
- Peshastin
- Leavenworth
- Dryden
- Mission Peak
- Mission Ridge Sub
- Mill Pond Sub
- Rock Island Sub
Historical

Chelan Regional Capital Infrastructure Investments:

- Chelan Falls Manson 115KV Rbld 1984
- Submarine Cable lake crossing- 1984
- Expanded Manson Sub - 1991
- Chelan Falls to Rocky Reach II - 1998
- Rebuilt Wapato Sub- 2001
- Knapps Coulee 115KV Line 2003
- Second circuit to Howard Flats 2003
- New South Shore Sub 2004
- 2nd Submarine cable 2008
- Expanded Chelan Substation- 2009
- South Shore Feeder Capacity 2013
- McNeil Canyon Transfer Douglas 2015
- North Shore Substation property 2017
- Union Valley Sub rehabilitation 2018

Since 1984 Investments

> $30 Million
Lake Chelan Regional Electric Grid
Transmission & Substations

30 Year Vision

Legend

- Existing Transmission Line
- Existing Substation
- Existing Switchyard
- Future Substation*

*Note that future substations will require transmission connection not shown on this map
• 2015-2019 Strategic Plan: “Customer-owners were most interested in replacing or rerouting some electric lines to protect against fire and weather risks.”

• As a result of the Strategic Plan, the PUD conducted a fire risk assessment of the PUD’s high voltage electrical transmission system that was completed in 2017.

• The Chelan service area was included in the top 3 areas that could benefit the most from fire hardening.

• The 2015 Chelan fire burned through both transmission lines that serve the Lake Chelan Valley.

• Power was out for over 36 hours while crews restored the first line, and the second line took 11 days.
• The recommendation is to replace existing wood transmission poles to steel.

• Steel poles reduce the frequency and duration of fire-related transmission outages because fires will burn past them.

• The new steel poles would be constructed in the same alignment and in the same general location as existing poles.

• Some poles may be slightly taller.

• The photo to the left is an example of a steel pole replacement.
Potential transmission line section for conversion to steel poles
(From Chelan Falls to Union Valley)
Timeline For Replacing Transmission Line Wood Poles with Steel

(Chelan Falls – Manson 115KV - from CF to Union Valley)

- **System Modeling**
  - 2018 - 2019
- **Planning & Community Outreach**
- **Final Design & Procurement**
  - 2020 - 2021
- **Construction**
  - 2022
- **In Service**

Current planning condition: We are here now
Why do we need a new substation in Chelan?

• Energy use in the Lake Chelan Valley has grown 3 to 5 times higher than in other areas of the county since 2015
• The existing substations serving this area are nearing capacity
• We are looking for community input as we find a location for the substation and transmission line in southeast Chelan, near the Chelan Dam
• The new substation will meet increased demand while maintaining reliable electrical service
Lake Chelan Area Planning

Future State Electrical System

**KEY**
- **Sub**
- **Distribution Feeder**

(Loading condition above 80% requires new planned construction)

- Manson Sub: 89%
- Wapato Sub: 62%
- Future N. Shore Sub: 50%
- Union Valley: 60%
- Future Gorge Rd Area Sub: 50%
- Future Howard Flats Sub: 50%
- Airport
- North Shore
- South Shore
- State Park
- City of Chelan
- Future State Park
- Lake Chelan

**Legend:**
- Below 70%
- Above 70%
- Above 80%
Substation Coverage Areas
Condition with North Shore Sub Online

- Manson Sub
- Wapato Sub
- N. Shore Sub (Online ~2021)
- Union Valley Sub
- Chelan Sub
- S. Shore Sub
- Maple Creek
- Slidewaters
- Hollywood Beach
- Chelan Falls
Substation Coverage Areas

Future Condition – North Shore Sub and Future Chelan Dam Sub Online

- Manson Sub
- Wapato Sub
- N. Shore Sub (Online ~2021)
- Union Valley Sub
- S. Shore Sub
- Chelan Sub
- Chelan Dam Sub (Online ~2023)
Similar Substation Planned

~ 250 Feet
<table>
<thead>
<tr>
<th>Feasibility Categories</th>
<th>Substation &amp; Transmission Locations</th>
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<tbody>
<tr>
<td>Functional</td>
<td>Community supported</td>
</tr>
<tr>
<td>Safe</td>
<td>Minimized aesthetic impacts</td>
</tr>
<tr>
<td>Reliable</td>
<td>Coexistent with other land use</td>
</tr>
<tr>
<td>Cost effective</td>
<td>Resilient to Fire</td>
</tr>
<tr>
<td>Accessible</td>
<td>Permissible</td>
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<tr>
<td>Standardized components</td>
<td>Future redundant capable</td>
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<tr>
<td>Maintainable</td>
<td>Constructible</td>
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<tr>
<td>Expandable</td>
<td>Clear Zone, Right-of-way impacts</td>
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<tr>
<td>Compatible to environment</td>
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**Types of power lines**

We rely on a system of transmission towers and power lines to carry the electricity produced at our hydro electric plants to the neighborhoods, homes and businesses in the County.

**Transmission lines**
Transmission lines are the big, high voltage power lines that bring electricity from where it’s made at our generating stations to substations near communities.

**Distribution lines**
Distribution lines are the smaller, lower voltage lines that carry electricity from the substation to your home or business.

**What’s a kV?**
kV stands for kilovolt, which is a unit of potential energy. One kV is equal to 1,000 volts.

Transmission Line structures
Similar to these will be required.
Existing Transmission Line

Optional Transmission Routes

A
Chelan Falls Powerhouse → Gorge Road → Chelan Dam vicinity

B
Tap Chelan – Wapato Transmission line → Highway 150 → Cross Gorge → Chelan Dam vicinity

C
Tap Chelan – Wapato Transmission line → Robinson Street → Cross Gorge → Chelan Dam vicinity

D
Tap RR #2 Line → Knapp’s Coulee → South shore of lake → Chelan Dam vicinity (MAY NOT BE FEASIBLE)
## Operational Pros and Cons of Alternatives

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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<tbody>
<tr>
<td><strong>PROS</strong></td>
<td>Gorge Road</td>
<td>SR 150</td>
<td>Robinson St</td>
<td>South shore</td>
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<tr>
<td></td>
<td>Lowest estimated construction costs</td>
<td>Area is zoned industrial/commercial</td>
<td>Uses some existing right-of-way</td>
<td>Uses some existing right-of-way</td>
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<tr>
<td></td>
<td>Shortest distance</td>
<td>Uses existing distribution corridor</td>
<td>Uses existing distribution corridor</td>
<td>Highly accessible</td>
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<tr>
<td></td>
<td>Highest reliability</td>
<td></td>
<td></td>
<td>Less susceptible to fire</td>
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<tr>
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<td>PUD owns property</td>
<td></td>
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<tr>
<td><strong>CONS</strong></td>
<td>Permitting challenges</td>
<td>Permitting challenges</td>
<td>Private property easements</td>
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<tr>
<td></td>
<td>Private property easements</td>
<td>Private property easements</td>
<td>Challenging river crossing</td>
<td>Permitting challenges</td>
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<tr>
<td></td>
<td>Challenging river crossing</td>
<td>Challenging river crossing</td>
<td>Through portion of downtown area</td>
<td>MAY NOT BE TECHNICALLY FEASIBLE</td>
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<tr>
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<td>High estimated construction costs</td>
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Chelan Falls Switchyard

Proposed Substation Vicinity

All Gold outline misc PUD lands
27224110050/140050
Golden Gate Ventures
City UCA zoned RL

27224616030/616035
Darren Fox
zoned B-1

272319616020
JARO, Inc
zoned RR5

Pt of 272318320050
CRE Inc
City UCA RM

Pt of 272320320050
John McQuill
zoned RR10

272330240000/300050/420050
Gordon Dicks
zoned RR10 and RR20

272330210050/220050/230050
Washington State Fish & Wildlife
zoned RR20
Timeline For New Substation & New Connecting Transmission Line

Current planning condition:

We are here now
Planned Activities in 2019:

- Optimize feasibility analysis for alternative substation locations  Q1
- Optimize a set of alternatives for transmission sources to new substation  Q1
- Bring community stakeholders together to:  Q1-Q2
  - Identify with the challenge and options
  - Solicit input from community and interest groups
  - Seek alignment on a selection process
  - Seek alignment on fire hardening recommendation
- Refine a plan & report back to Board of Commission:  Q2
Questions?

More info:
www.chelanpud.org/chelandamsubstation
www.chelanpud.org/firehardening