Northern Redmond-Kirkland Area Electric System

September 29, 2011
Chapter 1: The Electric System
- How power gets to you

Chapter 2: Electrical System Issues and Solutions
- Issues: Demand, and capacity and reliability
- Solutions: Traditional and non-traditional

Chapter 3: Northern Redmond-Kirkland Area
- Issues, solutions and projects

Chapter 4: Our Project: Sammamish-Juanita
Chapter 1: The System

- How power gets to you

Chapter 2: Electrical System Issues and Solutions

Chapter 3: Northern Redmond-Kirkland Area

Chapter 4: Our Project: Sammamish-Juanita
Chapter 1: The System

How Power Gets to You

Generation
Chapter 1: The System

How Power Gets to You

Bulk Power Transmission
Chapter 1: The System

How Power Gets to You

Distribution

- Generation
- 500 kV and 230 kV Transmission
- Bulk power lines
- Transmission Switching Substation
- Local 115 kV transmission lines
- Distribution Substation
- 12.5 kV neighborhood distribution circuits and laterals
- Individual transformer
- Wiring in home
- Electrical panel
- Service line
- TV
Chapter 1: The System

Power to the Northern Redmond-Kirkland Area

Bulk transmission lines
Local transmission lines
Chapter 1: The System

Chapter 2: Electrical System Issues and Solutions

- Issues: Demand and capacity
- Solutions: Traditional (infrastructure) and non-traditional (reduce demand)

Chapter 3: Northern Redmond-Kirkland Area

Chapter 4: Our Project: Sammamish-Juanita
Chapter 2: The Issues

Customer Demand and Electric Capacity

- Demand for power is growing
- Demand for power pushing limits of system capacity
- Our job is to keep your lights on
Chapter 2: The Solutions

Example of peak load graph
Chapter 2: The Solutions

Traditional Solutions

- Expand or rebuild existing infrastructure
- Build new infrastructure
Chapter 2: The Solutions

Non-Traditional Solutions

- Increase energy efficiency
  - Gas fuel conversion of electric water and space heaters
  - Commercial industrial demand response
  - Smart grid

- Alternative generation
  - Solar
  - Dispatchable distributed generation

- Energy storage

Energy storage system in Charleston, WV
Chapter 3: Solutions

Possible Solutions

Moorlands Peak Summer Load (MW)
July 27, 2009

- Sammamish - Vitulli existing capacity
- Cottage Brook - Moorlands existing capacity
- Sammamish - Moorlands existing capacity
- Total Moorlands System Load - less demand side resources
- Solar SFD 18%
- Gas water heat conversion

Time of day
Chapter 3: Solutions

Possible Solutions

Peak Moorlands Load (MW)
December 9, 2009

- Total Moorlands System Load
- Sammamish-Vitulli Capacity 239 MW
- Sammamish-Moorlands Capacity 176 MW
- Cottage Brook-Moorlands Capacity 169 MW
- Total Moorlands System Load - less demand side resources
- Gas space heat conversion
- Solar SFD 18%
Chapter 1: The System

Chapter 2: Electrical System Issues and Solutions

Chapter 3: Northern Redmond-Kirkland Area

- Issues, solutions and projects

Chapter 4: Our Project: Sammamish-Juanita
Chapter 3: Area Strategy

Northern Redmond-Kirkland Area

Meters served
- Residential: 51,000
- Commercial: 6,000
Keeping the Power on in the Northern Redmond- Kirkland Area

- Bulk transmission lines
- Local transmission lines
- Transmission substation
- Transmission switching station
- Substation
Area Challenges

Challenges to system reliability and redundancy

- **N-1-1**
  - One transmission line out of service for repairs and another is taken out by an accident

- **Transmission substation outages**
  - Loss of a substation component, which could trigger the loss of transmission lines and possibly load
N-1-1 Example

- Out of service
- Repair

Not enough capacity from Vitulli-Moorlands

Reroute power from Moorlands

Out of service – accident –

Reroute power from Moorlands

Out of service – repair –
Transmission Substation Outage Example
Chapter 3: Regional Strategy

System Peak Load Capacity Issues
Moorlands System Projects

- **Cottage Brook-Moorlands**
- **Moorlands-Vitulli**
- **Sammamish-Juanita-Moorlands**
Cottage Brook-Moorlands Line

- **Challenges:**
  - Small gauge wire
  - Aging equipment

- **Risk:** Tens of thousands of customers could lose power
Chapter 3: Area Projects

Cottage Brook-Moorlands Project

- **Solution: Rebuild**
  - Install higher-capacity wire
  - Replace aging insulators and poles with new structures
  - Add new fiber-optic line

- **Project timeline:**
  - Spring 2011: Planning and engineering
  - Fall 2011: Jurisdictional permitting process
  - 2012: Construction
  - 2013: In service
Moorlands-Vitulli Line

- Challenges:
  - Moorlands-Vitulli segment has small gauge wire and aging equipment

- Risk: Tens of thousands of customers could lose power
Moorlands-Vitulli Project

- **Solution: Rebuild**
  - Install higher-capacity wire
  - Replace aging poles and arms with new structures

- **Project timeline**
  - 2012-13: Planning, engineering and permitting
  - 2013-14: Begin construction
  - 2014: In service
Sammamish-Juanita-Moorlands New Line

- **Challenges:**
  - Load for the Moorlands system is higher than existing capacity
  - **Risk:** Tens of thousands of customers could lose power
Sammamish-Juanita: Needs

- Need to move two substations off the Moorlands system
- Area load is higher than existing capacity in the summer and winter
Chapter 3: Area Projects

Sammamish-Juanita: Solution

Moorlands Peak Load (MW)
December 9, 2009

- Sammamish-Juanita New Line Capacity 320 MW
- Cottage Brook-Moorlands Capacity after Rebuild 320 MW
- Sammamish-Vitulli Capacity 239 MW

Existing Load before Projects

Resulting Load after New Line

Legend:
- Total Moorlands Load (MW)
- Sammamish-Vitulli Existing Capacity
- Moorlands Load after Sammamish-Juanita Line
- Cottage Brook-Moorlands Capacity after Rebuild
- Sammamish-Juanita New Line Capacity
Sammamish-Juanita-Moorlands

- **Solution: Build a new line**
  - Phase 1 - Sammamish-Juanita 115 kV transmission line
  - Phase 2 – Juanita-Moorlands 115 kV transmission line
Chapter 1: The System

Chapter 2: Electrical System Issues and Solutions

Chapter 3: Northern Redmond-Kirkland Area

Chapter 4: Our Project: Sammamish-Juanita
Chapter 4: Our Project

Sammamish-Juanita: Project Study Area
Chapter 4: Our Project

Typical 115 kV Transmission Lines and Poles
Chapter 4: Our Project

Sammamish-Juanita: Not a New Project

- Identified project in local and county comprehensive plans
- Began siting process and developed possible route alternatives
- Hosted public meetings to gather feedback (2008-2009)
- Decided to use transmission line siting model incorporating community input to develop alternatives
- Beginning a more robust community involvement process
Sammamish-Juanita: Advisory Group Process

- **Goal:** Develop a preferred route that reflects community input

- **How we get there:**
  - Give input into a model that produces route options
  - Provide feedback on route options
  - Review community input on route options
  - Continue to work with PSE to select a preferred route
Sammamish-Juanita: Community Involvement

- Local jurisdiction outreach
- Stakeholder advisory group
- Landowner outreach
- Community meetings
Chapter 4: Our Project

Sammamish-Juanita: Schedule

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- **Stakeholder advisory group meetings**
- **Community meetings**
- **Routing analysis and decision**
- **Design and permitting**
- **Construction**
- **Completion**
Questions?

- **Sammamish-Juanita Project Contacts:**
  Barry Lombard
  Project Manager
  barry.lombard@pse.com
  425-456-2230

  Jason Van Nort
  Government and Community Relations Manager
  jason.vannort@pse.com
  425-462-3820