Chapter 1: Response to information requests

Chapter 2: Review past route options

Chapter 3: Project routing model overview
Eastside major electric and natural gas system projects expected to be constructed over the next decade.
Chapter 1: Response to information requests

Chapter 2: Review past route options

Chapter 3: Project routing model overview
Information requested at Meeting #1

- Experience with underground transmission lines
- Trees and canopy cover
- Potential transmission line impacts
  - Noise
  - Radio interference
  - Electric and magnetic fields, science and current research
    - *Drew Thatcher, Board Certified Health Physicist*
  - Visual
  - Construction
  - Easements (existing and new)

- Public meetings notification
Trees and canopy cover

Chapter 1: Responses

PUGET SOUND ENERGY
UTILITY LANDSCAPING ZONE

Danger Zone → Wire Zone → Border Zone → Danger Tree Zone

Roadway
Audible transmission line noise

- 230 kV lines can be associated with audible noise due to the higher electric fields.

- 115 kV lines in general do not produce noise related issues during wet or dry weather.

- Over the years transmission line construction improvements have helped minimize typical audible noises as well as radio frequency interference.
Radio and television interference

- Overhead transmission lines, in general, do not interfere with normal radio or TV reception.
- For a 115 kV line the potential may exist for gap discharges due to tiny separations between connections, resulting in a broad radio frequency (RF) interference that can extend from 20 kHz to 800 MHz.
- This is unusual for new transmission lines due to design improvements.
- If RF interference is identified, the source can be located and repaired.
- In general it is more common for distribution lines to be a source of RF interference.
A comparison of electric and magnetic fields

<table>
<thead>
<tr>
<th>Electric Fields</th>
<th>Magnetic Fields</th>
</tr>
</thead>
</table>

**Lamp plugged in but turned off. Voltage produces an electric field.**

**Lamp plugged in and turned on. Current now produces a magnetic field also.**
Background on EMF studies

- Epidemiology – the study of exposures to humans
- Animal and laboratory studies
- Is there a plausible biological explanation?
EMF is a consequence of using power in our lives

WHO concludes that magnetic fields and health risks are not established nor are they supported by laboratory studies

The international guideline for public exposure is 2,000 mG
- 50 feet from a 115 kV line the exposure is 6.5 mG
- 1 foot from a video screen the exposure is 5 mG

There are no federal or state magnetic fields limits simply because the risks have not been proven
EMF and transmission lines

<table>
<thead>
<tr>
<th>Power Line</th>
<th>Mean Magnetic Field (mG)</th>
<th>Approx. Edge of Right-of-Way</th>
<th>15 m (50 ft)</th>
<th>30 m (100 ft)</th>
<th>61 m (200 ft)</th>
<th>91 m (300 ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>115 kV power line</td>
<td>29.7</td>
<td></td>
<td>6.5</td>
<td>1.7</td>
<td>0.4</td>
<td>0.2</td>
</tr>
<tr>
<td>230 kV power line</td>
<td>57.5</td>
<td></td>
<td>19.5</td>
<td>7.1</td>
<td>1.8</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Electric fields

- An object placed in an electric field becomes “charged”
- The strength of the charge depends on:
  - Strength of the electric field
  - Surface area of the object
  - Distance between the source and the object
- If a charged object touches a grounded object, the charge will discharge into the ground. To prevent an object from becoming energized by an electric field, simply ground the object.
Public meeting notifications

- Public meetings
  - Tentatively planned for December 2011 and February 2012
  - Notifications will include:
    - Postcards mailed to project area residents and landowners
    - Advertisements in local newspapers
    - Email to project email list
    - Project webpage
    - Blog/email post for AG members to inform their communities
    - City communications tools
Chapter 1: Response to information requests

Chapter 2: Review past route options

Chapter 3: Project routing model overview
Chapter 2: Past routing

General transmission line siting considerations

- Access
- Community development plans
- Constructability
- Environmental impacts
- Existing utilities
- Land use regulations
- Maintenance and operation
- Permitting
- Public input
- Reliability

- Rights of way
- Straight, direct route
- Topographic features
- Types of property
- Vegetation
Chapter 2: Past routing

Potential route options from 2009

Map Key
- Route A
- Route B
- Route C
- Route D
- Route E

Willows Run Golf Club
Juanita Bay Park
NE 124th St
NE 116th St
NE 132nd St
Public feedback on 2009 potential route options

- Public meeting with 42 attendees

- We heard these routing themes:
  - Use existing rights of way
  - Route through commercial / industrial areas rather than residential areas
  - Use existing distribution poles
A fresh approach for the project…

- Using what we heard to inform development of alternatives
- Using a siting model methodology by Ian McHarg
- The siting model will:
  - Incorporate PSE’s and community’s siting criteria
  - Develop route alternatives, which may or may not result in similar routes as from 2009
- Need advisory group’s help to:
  - Confirm model criteria
  - Consider how to weight different criteria
  - Review route alternatives
Chapter 1: Response to information requests

Chapter 2: Review past route options

Chapter 3: Project routing model overview
Chapter 3: GeoRoute Selection Model

- Challenging siting with complex issues
- Promotes discussion of alternative scenarios
- Identify a route the SAG and PSE can support
People make decisions NOT models

- Balance values of the community
- Priority of the data used in the model
- How to interpret/ use the results
Chapter 3: GeoRoute Selection Model

Geo Route

115 kV Transmission Line Route Study
Sammamish – Juanita

AVOIDANCE AREAS
IDENTIFY, WEIGHT, & MAP

OPPORTUNITIES
IDENTIFY, WEIGHT, & MAP

WEIGHTED OPPORTUNITY AREAS
COMMUNITY INPUT

WEIGHTED AVOIDANCE AREAS
COMMUNITY INPUT

COMBINED OPPORTUNITIES & AVOIDANCE AREAS
IDENTIFY, WEIGHT, & MAP

SAMPLE

OUTPUT:
MAP OF ROUTE

Locating a route for a 115 kV transmission line that is compatible with:
- Sensitive Land Uses
- Sensitive Natural Features
- Engineering Design and Safety Standards
- Community Values
Chapter 3: GeoRoute Selection Model

![Diagram of AVOIDANCE AREAS: IDENTIFY, WEIGHT, & MAP]

**Built Environment Layers**
- Parks and Open Spaces (18%)
- Parcel size (≤5 Acres) (3%)
- Schools
- Native Growth Promotion Areas
- Scenic View Corridors
- Interstate Right-of-Way
- Zoning Single Family
- Zoning Multi-Family

**Natural Environment Layers**
- Priority Habitat-Points (11%)
- Priority Habitat-Areas (26%)
- Shoreline Management Area (SMA)
- Streams
- Flood Zones
- Lakes
- Streams with Fish
- Landslide Hazards
- Wetlands
- Seismic Hazards
- Enviros Hazards

**Engineering Layers**
- Interstate Right-of-Way (18%)
- 250 feet from Right-of-Way (20%)
- Steep Slopes - 45%
- Parcel not adjacent to public Right-of-Way (30%)

**Community Input**
- Built Cost Surface (15%)
- Natural Cost Surface (65%)
- Engineering Cost Surface (20%)

MAP IT

GeoEngineers
## Built Environment Data Layers

<table>
<thead>
<tr>
<th>Data Reviewed, Within Study Area</th>
<th>Data Reviewed, Not Within Study Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Family Residential Zoning</td>
<td>Cultural/Historic Resources</td>
</tr>
<tr>
<td>Multi Family Residential Zoning</td>
<td>Areas of property disputes</td>
</tr>
<tr>
<td>Urban Recreation Zoning</td>
<td>Open space taxation parcels</td>
</tr>
<tr>
<td>Parcel Size &lt; 5 acres</td>
<td>Airports</td>
</tr>
<tr>
<td>Local Parks</td>
<td>Scenic Highways</td>
</tr>
<tr>
<td>Native Growth Protection Areas</td>
<td>Surface Mining</td>
</tr>
<tr>
<td>View Corridors (Redmond)</td>
<td>Parcels Fronting Local Access Streets</td>
</tr>
</tbody>
</table>
Chapter 3: GeoRoute Selection Model

Single Family Residences
Chapter 3: GeoRoute Selection Model

Schools and Parks
Natural Environment
### Natural Environment Data Layers

<table>
<thead>
<tr>
<th>Data Reviewed, Within Study Area</th>
<th>Data Reviewed, Not within Study Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wetlands</td>
<td>Shoreline Jurisdiction</td>
</tr>
<tr>
<td>Landslide Hazards</td>
<td>Lakes</td>
</tr>
<tr>
<td>Seismic Hazards</td>
<td>100 year floodplain</td>
</tr>
<tr>
<td>Erosion Hazards</td>
<td>Contiguous Tree Canopy</td>
</tr>
<tr>
<td>Streams</td>
<td></td>
</tr>
<tr>
<td>Steep Slopes &gt;40%</td>
<td></td>
</tr>
<tr>
<td>Sensitive Species (WDFW)</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 3: GeoRoute Selection Model

Wetlands
Chapter 3: GeoRoute Selection Model

Landslide Hazards
Chapter 3: GeoRoute Selection Model

Engineering
### Engineering Data Layers

<table>
<thead>
<tr>
<th>Data Reviewed, Within Study Area</th>
<th>Data Reviewed, Not Within Study Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Curved Streets</td>
<td>BPA Crossing</td>
</tr>
<tr>
<td>Structures within 15’ of R/W</td>
<td>Future WSDOT Improvement areas</td>
</tr>
<tr>
<td>Parcels not adjacent to Public R/W</td>
<td></td>
</tr>
<tr>
<td>Interstate Highway Crossing</td>
<td></td>
</tr>
<tr>
<td>Steep Slopes &gt;40%</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 3: GeoRoute Selection Model

Street Curves
Chapter 3: GeoRoute Selection Model

Steep Slopes >40%
Chapter 3: GeoRoute Selection Model

- Built Environment Criteria Most Important

100%

0%

0%
Chapter 3: GeoRoute Selection Model

- Engineering Criteria Most Important

![Map with GeoRoute selection model]
Chapter 3: GeoRoute Selection Model

Geo Route
115 kV Transmission Line Route Study
Sammamish – Juanita

AVOIDANCE AREAS
IDENTIFY, WEIGHT, & MAP

OPPORTUNITIES
IDENTIFY, WEIGHT, & MAP
WEIGHTED OPPORTUNITY AREAS
COMMUNITY INPUT
WEIGHTED AVOIDANCE AREAS
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COMBINED OPPORTUNITIES & AVOIDANCE AREAS
IDENTIFY, WEIGHT, & MAP

OUTPUT:
MAP OF ROUTE

Locating a route for a 115 kV transmission line that is compatible with:
- Sensitive Land Uses
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- Community Values
Chapter 3: GeoRoute Selection Model

OPPORTUNITIES
IDENTIFY, WEIGHT, & MAP

WEIGHTED OPPORTUNITY AREAS
COMMUNITY INPUT

- Railroad Right-of-Way (10%)
- Existing Right-of Way (20%)
- Arterial Streets (30%)
- Zoning-Industrial/Commercial
- Parcel Size (>20 Acres)

MAP IT
### Opportunities Data Layers

<table>
<thead>
<tr>
<th>Data Reviewed, Used for Modeling</th>
<th>Data Reviewed, Not Used for Modeling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial/Industrial Zoning</td>
<td>Open Vegetative Cover</td>
</tr>
<tr>
<td>Arterial Street</td>
<td>Community Plan Compatibility</td>
</tr>
<tr>
<td>Trails R/W</td>
<td></td>
</tr>
<tr>
<td>Railroad R/W</td>
<td></td>
</tr>
<tr>
<td>Parcel size &gt; 5 acres</td>
<td></td>
</tr>
<tr>
<td>Existing PSE Rights-of-Way</td>
<td></td>
</tr>
</tbody>
</table>
Chapter 3: GeoRoute Selection Model

Arterial Streets
Chapter 3: GeoRoute Selection Model

Industrial/Commercial Zoning
Chapter 3: GeoRoute Selection Model
Chapter 3: GeoRoute Selection Model

Engineering Criteria Most Important, No Opportunities Considered

Potential Route - No Opportunities Considered
Chapter 3: GeoRoute Selection Model

Engineering Criteria Most Important, Opportunities Considered
Chapter 3: GeoRoute Selection Model

Natural Environment Criteria Most Important, No Opportunities Considered
Chapter 3: GeoRoute Selection Model

Natural Environment Criteria Most Important, Opportunities Considered

Potential Route - Opportunities Considered

Potential Route - No Opportunities Considered
Chapter 3: GeoRoute Selection Model

SAG Input?

??%

??%

??%
Next steps

• Over the next two months PSE and the Advisory Group will:
  • Validate the model weighting and criteria
  • Develop and discuss possible alternatives
  • Narrow the alternatives to three potential alternatives for public review

• PSE will host an open house later this fall to ask the public for feedback on three potential route alternatives
Public comment from audience
Next meeting

• Before the meeting:
  • Review the criteria list and advise PSE if you think there are missing criteria that should be mapped

• During the Nov. 3 meeting, we will:
  • Discuss and validate the model’s criteria and weights
  • Run the model to develop possible alternatives
  • Begin discussing alternatives
Mark your calendars for...

- Advisory group meetings
  - November 3
  - November 17

- Project area bus tour
  - October 28 from 2:00 p.m. to 4:00 p.m.
  - October 29 from 9:00 a.m. to 11:00 a.m.
Questions?

- **Sammamish-Juanita Project Contacts:**
  - Barry Lombard
    - Project Manager
    - barry.lombard@pse.com
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    - jason.vannort@pse.com
    - 425-462-3820
Thank You!