

Portland General Electric – Power Supply

# PGE Southern Crossing Proposal

West of McNary Generation integration Project  
Regional Planning Project Review Meeting

September 5, 2007

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# Background

- 2002 Integrated Resource Plan (IRP)
  - Identified significant demand and energy requirement
  - Identified the critical nature of transmission
- 2003 Request for Proposals (RFP)
  - Required that proposals to be delivered to PGE
  - Significant response
  - Most proposals were at POI
- 2004 IRP Action Plan, approved with conditions
  - OPUC required PGE to determine how it can facilitate the development of transmission capacity over the Cascades

# Background - cont

- 2004 PGEM initiated a transmission strategy effort to determine how to best meet ongoing transmission needs
- 2004 John Day - McNary Open Season
  - PGE participated, but use is blocked by other flowgates
  - JD-McNary deferred due to lack of funding
- 2005 PGEM initiated a multi-phase study
  - 2005 examined the South of Allston path
  - 2006 examined the Cross-Cascades – South path

# 2005 South of Allston Study

- Investigated a range of solutions, from low-voltage to high-voltage
  - 10:1 ratio, 10 MW JD to Portland needs 1 MW SoA
- Modest capacity could be gained from addressing “limiting” elements,  $\approx$  \$70k per MW
- Medium capacity could be gained by building new 230kV transmission,  $\approx$  \$100k per MW
- Large capacity could be gained from BPA’s G-13 Paul - Troutdale 500kV line,  $\approx$  \$133k per MW
  - Currently Paul – Troutdale is  $\approx$  \$300k per MW

# 2006 Southern Crossing Study

- Goal
  - Conduct technical feasibility study of expanding PGE's transmission system.
- Objectives
  - Increase transfer capacity to PGE for future needs
  - Direct connection of existing and future resources
  - Remove some of the regional transmission constraints
  - Provide access to other potential markets

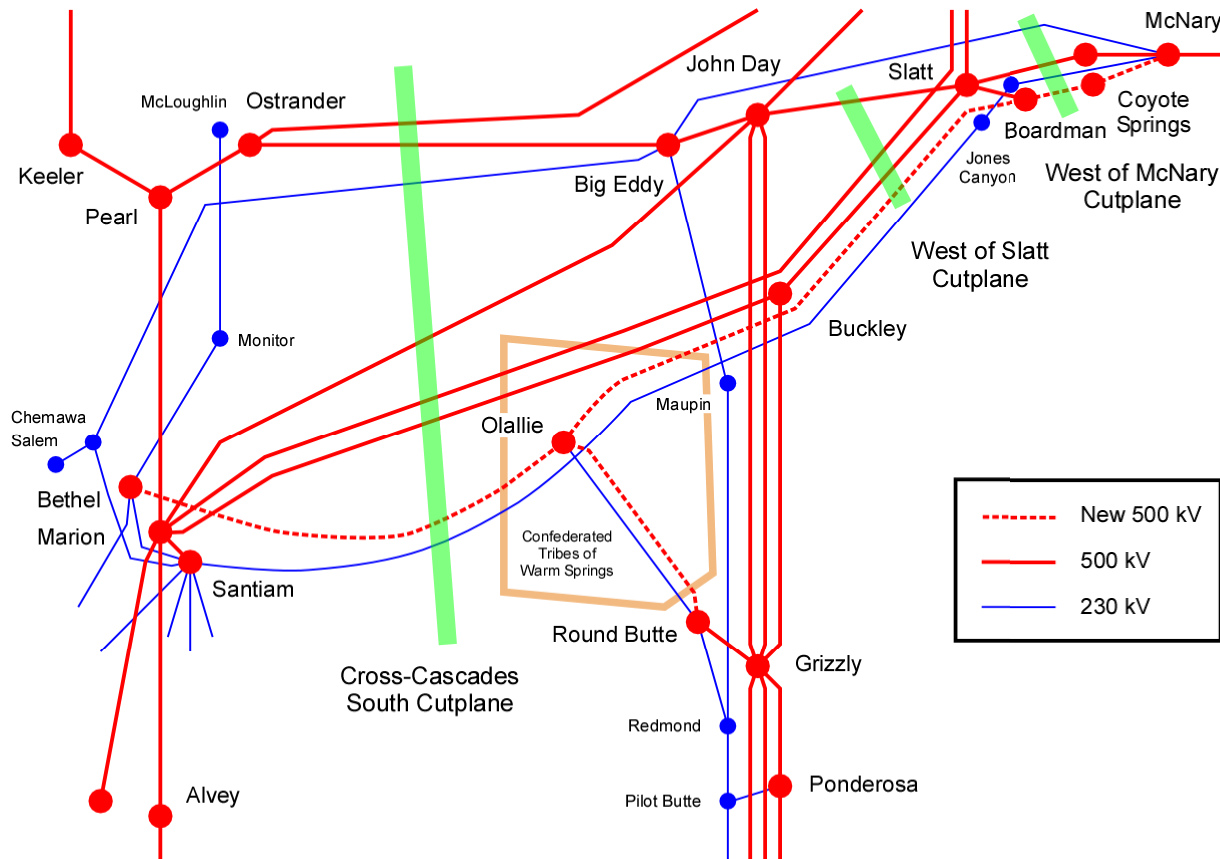
# 2006 Southern Crossing Study

- Elements of proposed project
  - Rebuild existing 230kV cross-Cascade line to 500kV
  - Extend the reach to BPA's McNary Substation
  - Directly integrate PGE's Boardman and Coyote Springs plants
  - New lines occupy existing Rights-of-Way or are adjacent to existing transmission lines
  - Adds significant capacity to three system constraints
    - West of McNary
    - West of Slatt
    - Cross-Cascades - South

# 2006 Southern Crossing Study

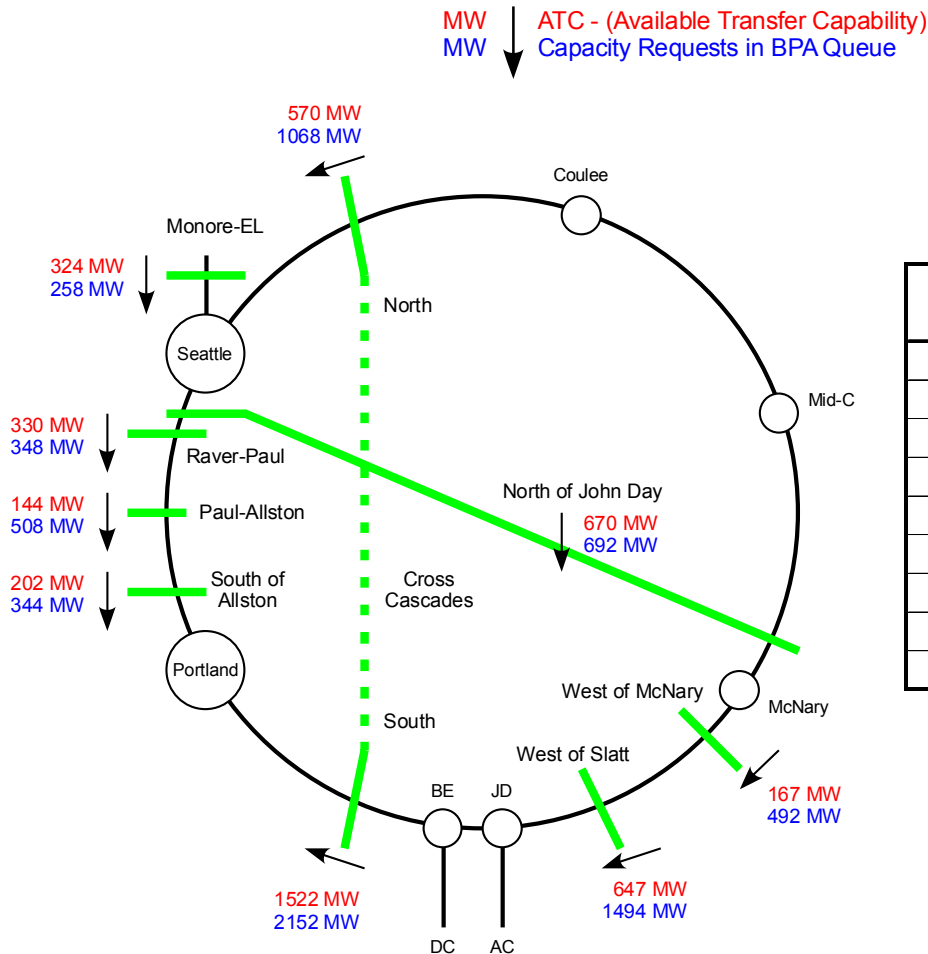
- Two configurations were identified
  - Plan 1 meets the first three objectives. That is, creating transfer capability to PGE, connecting existing resources, and mitigating system constraints.
  - Plan 2 strengthens the electrical connection to the AC Intertie. This added capability enhances the regional aspects of the project, creating synergies with other proposed regional projects or other potential partners.
- Either plan creates significant regional benefits

# Southern Crossing – Plan 2



# Available Long-term Transmission

Data as of February 2007



| Cut-Plane              | ATC (MW) | Queue (MW) | ATC - Queue (MW) |
|------------------------|----------|------------|------------------|
| West of Slatt          | 647      | 1,494      | -847             |
| Cross Cascades - South | 1,522    | 2,152      | -630             |
| Cross Cascades - North | 570      | 1,068      | -498             |
| Paul - Allston         | 144      | 508        | -364             |
| West of McNary         | 167      | 492        | -325             |
| South of Allston       | 202      | 344        | -142             |
| North of John Day      | 670      | 692        | -22              |
| Raver - Paul           | 330      | 348        | -18              |
| Monroe - Echo Lake     | 324      | 258        | 66               |

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# SC – Study Methodology

- Feasibility study, not a rating study
- Assess summer and winter (BPA budget cases)
- Stress tested both seasons
  - Summer stressed with 2,000 MW AD/DC increase
  - Winter stressed with 2,000 MW load increase
- Each stressed case included two dispatches
  - Hydro, using Columbia River hydro
  - Wind, using new resources in JD to McNary area

# Base Case Summary

## Base Case Parameters:

|                | Summer (A10) |             | Winter (J10) |             |
|----------------|--------------|-------------|--------------|-------------|
|                | MW           | % of Rating | MW           | % of Rating |
| Area Transfers |              |             |              |             |
| W of McN       | 2,045        | 71%         | 1,468        |             |
| W of S         | 3,310        | 81%         | 1,655        |             |
| S of A         | 2,723        | 88%         | 902          |             |
| N of JD        | 6,772        | 87%         | 1,380        |             |
| CC South       | 4,443        |             | 5,890        | 79%         |
| AC Intertie    | 2,653        | 55%         | 806          | 17%         |
| DC Intertie    | 2,153        | 69%         | 497          | 16%         |
| Total AC/DC    | 4,806        | 61%         | 1,303        | 16%         |
| Loads          |              |             |              |             |
| NW Total       | 24,862       |             | 31,047       |             |
| PGE            | 3,816        |             | 4,214        |             |
| Losses         |              |             |              |             |
| NW Total       | 1,071        |             | 1,034        |             |
| PGE            | 62           |             | 75           |             |

## Screening Study Results:

| Overloaded Facility      | Outages  |
|--------------------------|--|
| Round Bu - Redmond 230kV | Grizzly - Summer Lake 500kV<br>Ponderosa 500/230kV |

### Notes:

- 1) Pelton/Round Butte at 66% (summer)
- 2) 2006 NWPP Rants study identified this as a study area that needs coordination

# Flow Summary

| Case Comparison<br>Case 0 vs. Case 1316<br>MW Flow |         | Summer         |       |           |        |           |        | Winter              |        |       |           |        |           |        |           |
|--|---------|----------------|-------|-----------|--------|-----------|--------|---------------------|--------|-------|-----------|--------|-----------|--------|-----------|
|  |         | AC/DC Transfer |       |           |        |           |        | Extra Heavy Loading |        |       |           |        |           |        |           |
|  |         | Hydro          |       |           | Wind   |           |        | Hydro               |        |       | Wind      |        |           |        |           |
|  |         | Case 0         | Delta | Case 1316 | Case 0 | Case 1316 | Case 0 | Case 1316           | Case 0 | Delta | Case 1316 | Case 0 | Case 1316 | Case 0 | Case 1316 |
| Interfaces   | OTC     | 0              |       |           |        |           |        |                     |        |       |           |        |           |        |           |
| North of John Day                                  | 7800 VS | 6772           | 10    | 6782      | 8175   | 8177      | 6774   | 6784                | 1380   | 8     | 1388      | 2636   | 2604      | 1207   | 1222      |
| West of McNary                                     | 2900 T  | 2045           | 330   | 2375      | 2389   | 2791      | 1965   | 2257                | 1468   | 194   | 1662      | 1670   | 1926      | 1297   | 1408      |
| West of Slatt                                      | 4100 T  | 3310           | 422   | 3732      | 3908   | 4410      | 4289   | 4736                | 1655   | 281   | 1936      | 1921   | 2302      | 2387   | 2631      |
| South of Allston                                   | 3000 T  | 2723           | -71   | 2652      | 3106   | 3007      | 2817   | 2725                | 902    | -80   | 822       | 1256   | 1174      | 1030   | 919       |
| Cross Cascades -South                              | 7500 VS | 4443           | 31    | 4474      | 4449   | 4470      | 4689   | 4696                | 6083   | 137   | 6220      | 6978   | 7338      | 7161   | 7558      |
| Transmission Line Flows                            |         |                |       |           |        |           |        |                     |        |       |           |        |           |        |           |
| To Bethel  |         | 58             | 358   | 416       | 22     | 334       | 32     | 392                 | 188    | 610   | 798       | 211    | 917       | 220    | 973       |
| To Round Butte 230kV/500kV                         |         | -58            | 577   | 519       | -23    | 779       | -33    | 814                 | -194   | -62   | -256      | -218   | -280      | -228   | -241      |
| To Grizzly 500kV (Round Butte)                     |         | -49            | 523   | 474       | -19    | 719       | -31    | 748                 | -103   | -98   | -201      | -143   | -249      | -155   | -217      |
| To Redmond 230kV (Round Butte)                     |         | 200            | 53    | 253       | 205    | 266       | 207    | 274                 | 226    | 37    | 263       | 232    | 275       | 233    | 282       |
| To Olallie 500kV (Boardman)                        |         | 945            |       | 1127      |        | 1223      |        | 545                 |        | 643   |           | 738    |           |        |           |
| To Boardman 500kV (Coyote)                         |         | 934            |       | 1146      |        | 755       |        | 570                 |        | 676   |           | 292    |           |        |           |
| To Coyote PGE (McNary)                             |         | 715            |       | 927       |        | 536       |        | 350                 |        | 456   |           | 72     |           |        |           |

| Cutplane               | Line                  | Summer |           |
|------------------------|-----------------------|--------|-----------|
|                        |                       | Case 0 | Case 1316 |
| West of McNary (500kV) | Coyote Spr - Slatt    | 1,408  | 900       |
|                        | Coyote Spr - Boardman |        | 934       |
| West of Slatt          | Slatt - John Day      | 1,425  | 1,164     |
|                        | Slatt - Buckley       | 1,884  | 1,620     |
|                        | Boardman - Olallie    |        | 945       |

| Cutplane                     | Line                 | Winter |           |
|------------------------------|----------------------|--------|-----------|
|                              |                      | Case 0 | Case 1316 |
| CC - South (345kv and 500kV) | Wautoma - Ostrander  | 703    | 647       |
|                              | Big Eddy - Ostrander | 1,208  | 1,151     |
|                              | McNary - Ross 345 kV | 329    | 302       |
|                              | Total to Portland    | 2,240  | 2,100     |
|                              | John Day - Marion    | 849    | 781       |
|                              | Ashe - Marion        | 688    | 625       |
|                              | Buckley - Marion     | 1,011  | 903       |
|                              | Olallie - Bethel     |        | 798       |
|                              | Total to Salem       | 2,548  | 3,107     |

# Contingency Performance

Select outages to show project performance on constrained paths

| Case Contingency Comparison<br>Case 0 vs. Case 1316 |                                   |     |                     | Change in Percent of Emergency Rating |        |           |        |                   |        |           |        |           |        |           |    |     |
|---|-----------------------------------|-----|---------------------|---------------------------------------|--------|-----------|--------|-------------------|--------|-----------|--------|-----------|--------|-----------|----|-----|
|   |                                   |     |                     | Summer                                |        |           |        |                   |        | Winter    |        |           |        |           |    |     |
|   |                                   |     |                     | AC/DC Transfer                        |        |           |        | Extra Heavy Loads |        |           |        |           |        |           |    |     |
|   |                                   |     |                     | Hydro                                 |        | Wind      |        | Hydro             |        | Wind      |        |           |        |           |    |     |
| Level   | Contingency<br>Facility Outage    | kV  | Problem<br>Facility | kV                                    | 0<br>% | 1316<br>% | 0<br>% | 1316<br>%         | 0<br>% | 1316<br>% | 0<br>% | 1316<br>% | 0<br>% | 1316<br>% |    |     |
| N-1   | Slatt - Buckley                   | 500 | Slatt - John Day    | 500                                   | *      | -20       | 13     | -8                | 27     | -3        | *      | -4        | 5      | -8        | 14 | 0   |
| N-1   | Coyote Spr - Slatt                | 500 | Harvalum - Big Eddy | 230                                   | *      | -19       | CNS    | -8                | 2      | -14       | *      | -10       | 5      | -6        | -3 | -10 |
|   |                                   |     | McNary - Ross       | 345                                   | *      | -24       | CNS    | -22               | 1      | -20       | *      | -7        | 6      | -2        | 4  | -2  |
|   |                                   |     | McNary - Franklin   | 230                                   | *      | -21       | CNS    | -28               | -3     | -20       | *      | -8        | 2      | -9        | 4  | -2  |
| N-2   | John Day - Grizzly #1             | 500 | Buckley - Grizzly   | 500                                   | *      | -19       | CNS    | 0                 | 28     | 0         | *      | -1        | 3      | 1         | 5  | 2   |
|   | John Day - Grizzly #2             |     | Slatt - Buckley     | 500                                   | *      | -15       | CNS    | -2                | 24     | 1         | *      | -4        | 7      | 1         | 12 | 5   |
| N-2   | Ashe - Marion                     | 500 | Ostrander - Pearl   | 500                                   | *      | -11       | -4     | -11               | 12     | -1        | *      | -2        | 8      | 4         | 11 | 5   |
|   | Slatt - Buckley                   |     | Slatt - John Day    | 500                                   | *      | -24       | 6      | -16               | 27     | -6        | *      | -5        | 6      | 0         | 15 | 0   |
| N-2   | Ashe - Marion<br>Buckley - Marion | 500 | Ostrander - Pearl   | 500                                   | *      | -6        | -6     | -7                | 8      | -1        | *      | -3        | 10     | 5         | 10 | 6   |

CNS = Case Not Solved

\* = Base Value

# Conclusions – Plan 1

- Plan 1 met PGE's objectives and became the preferred plan in the absence of other regional projects:
  - Added significant flow and transfer capability to west-side loads, reducing flows into Portland on critical lines from the north (I-5) and east (Ostrander lines).
  - Significantly increased West of McNary and West of Slatt transfer capability.
  - Allows for significant integration of renewable resources in the John Day to McNary area.

# Conclusions – Plan 2

- Plan 2 includes a stronger connection to the AC Intertie, and in addition to the benefits of Plan 1:
  - Provides significant support to West of Slatt, e.g., in the stressed summer case (AC/DC at 6,800 MW with 2,000 MW of resource additions):
    - Slatt – John Day line loading reduced 30% (of thermal limit) for critical N-1 and 25% to 33% for critical N-2's.
    - Slatt – Buckley line loading reduced 23% (of thermal limit) for critical N-2.
  - Provides a backbone system addition to consider other regional project additions terminating at McNary or Boardman (from the north or east).

# Future Work

- Examine synergies with other regional projects or maximizing AC Intertie support.
  - The Boardman – Olallie line addition was without series compensation. The line is in parallel to the compensated Slatt – Buckley line.
  - Model other regional projects with a termination option at Boardman:
    - Northern Lights, Idaho to NW, Montana to NW, etc.
  - Model other southern Interties to California
    - Northern terminal (AC/DC) at Boardman, or extending south from Round Butte (separated from existing Intertie) and terminating at Capt Jack, etc.

# Questions?