



Utility Perspectives & Activities: Portland General Electric Company

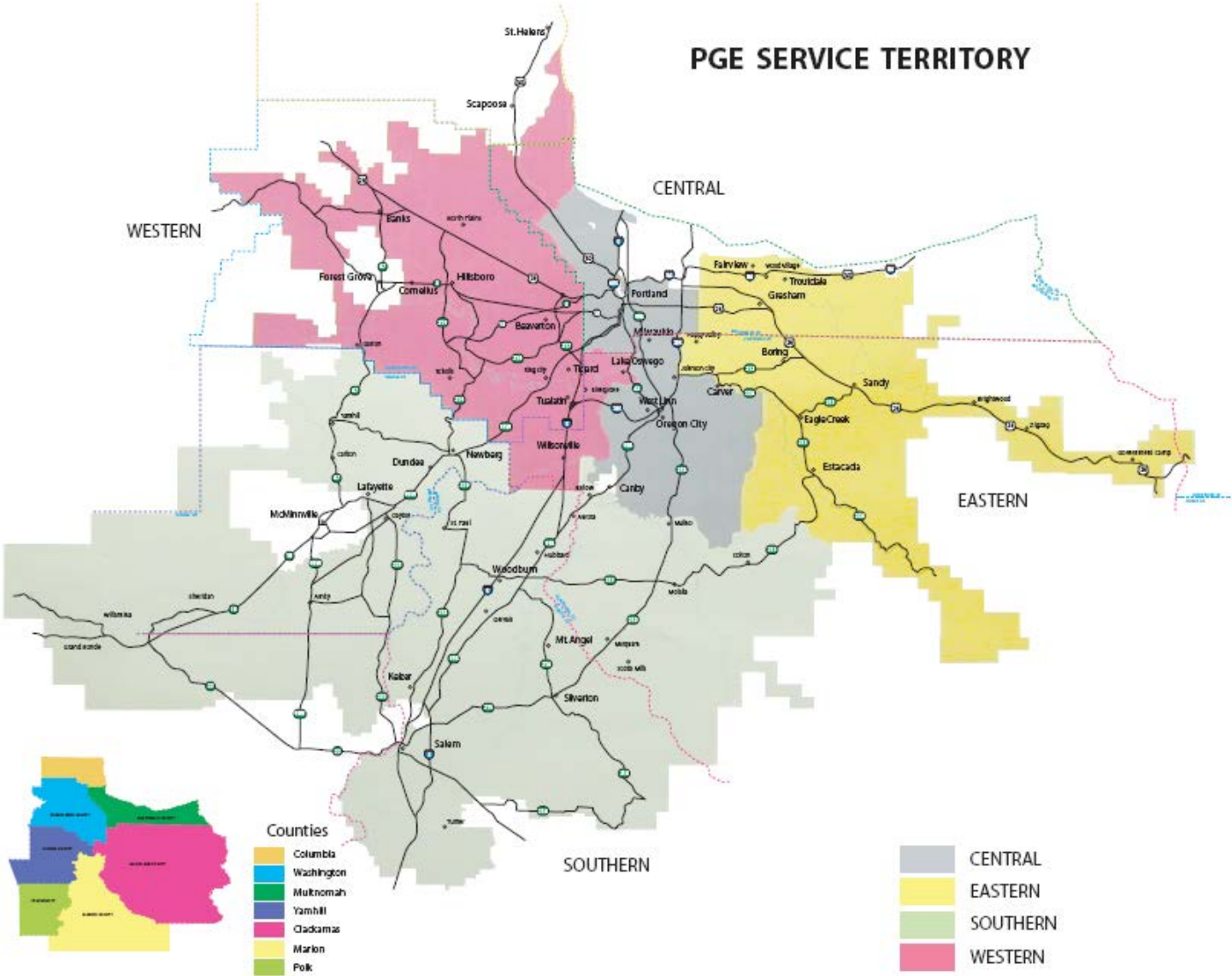
Oregon Geothermal Working Group

09/15/11

PGE

- A completely Oregon utility
 - Serves predominantly the Willamette Valley
 - Includes high population density areas of Portland and surrounding metro areas as well as Salem
 - 820,266 customers
 - 40% residential
 - 39% commercial
 - 21% industrial
 - All time peak load of 4,073 MW
 - Total owned generation of 2,766 MW
 - Renewable generation is 450 MW

PGE SERVICE TERRITORY



Close Geothermal Resources

- | <u>Eastern Oregon:</u> | <u>Developer</u> |
|-------------------------|--------------------------------|
| – Neal Hot Springs | US Geothermal |
| – Mickey Hot Springs | None Currently |
| <u>Southern Oregon:</u> | |
| – Lake View | None Currently |
| – Crump’s Geyser | NGP & ORMAT |
| <u>Central Oregon:</u> | |
| – Newberry Crater | Davenport, also ORMAT |
| – Three Sisters | None Currently (PGE in 1980’s) |
| <u>Northern Oregon:</u> | |
| – Mt Hood | PGE (& Partner ?) |



PGE Perspective

- PGE is unique amongst larger Pacific Northwest utilities due to its compact service territory
- Remote generation is not uncommon in our portfolio, but it is costly to wheel the energy from the source to a sink at PGE
- PGE is currently ahead of its OR-RES targets and is banking RECs from projects and PPAs we have
 - 2011 target is 5% of average load or 120 MW
 - PGE currently has 10.4% of average load at 250 MW of generation, predominately all wind
- The OR-RES does not have a geothermal standard (or minimum requirement from this technology), nor is there a diversity requirement

PGE Perspective (cont.)

- Our key principles:
 - Safe
 - Reliable
 - Least cost energy
- Geothermal has consistently priced itself higher than wind energy on a delivered basis
 - The premium can be as much a 15% to 20% over wind energy
- Reviewed several geothermal projects, discussed many structures from PPAs to partnerships
 - Current preference is probably for a PPA as our first foray into geothermal energy
- PGE is “window shopping” for a good deal in geothermal energy

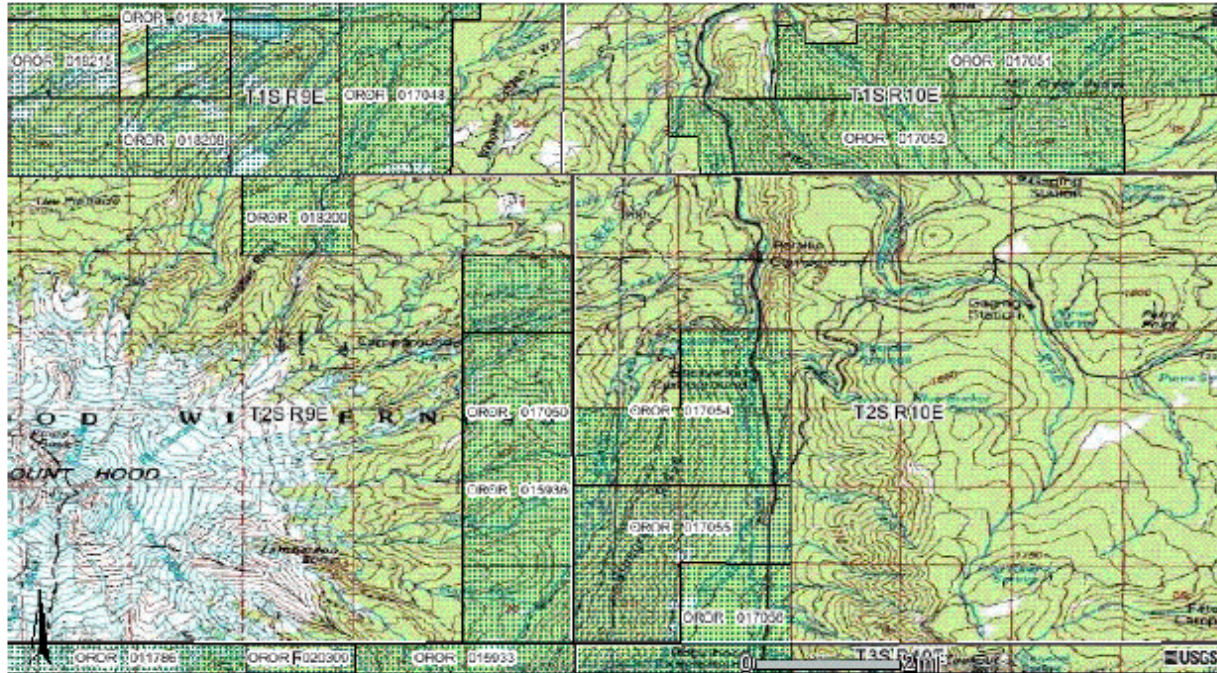
Mt Hood: A Local Opportunity

- PGE applied for BLM geothermal development rights in the 1970's
 - Finally issued leases in Feb 2011
- Approximately 8,800 acres across an old fault northeast of Mt Hood
- Due to the unique location, any development here will involve many stakeholders and require a long lead up time
- Currently investigating the site with non-invasive surface assessments
 - Water geochemistry
 - Field studies and site walk downs
- The location helps reduce cost of delivering geothermal energy significantly because it is adjacent to PGE service territory
 - If a resource is proven the expected cost would be on par with wind energy

View from general area of leases (near, but not on Mt Hood)



PGE geothermal land lease regional map



6/11/2008



No warranty is made by the BLM for the use of the data for purposes not intended by the BLM.

PGE's Geothermal Future

- Wind energy projects being developed in Pacific Northwest are at increasingly lower capacity factors which drives up their cost
 - This economically makes geothermal more attractive compared to its renewable competition
- Mt Hood and other adjacent areas in the Cascade Mountains could provide easy access to geothermal energy for PGE, but are in geographic regions that pose challenges
 - Recent geothermal energy development has been more focused on Basin & Range geological settings or the Salton Sea area
- The future successes of developers like US Geothermal, NGP, and ORMAT to be born out over the next few years will prove the commercial accessibility of geothermal energy to PGE and to the State of Oregon

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