Executive Summary

PGE's 2009 Integrated Resource Plan is prepared at a time when we face considerable challenges and uncertainty driven by an economic recession, global concerns over CO₂ and other greenhouse gases, an increasing need to integrate new wind resources into our portfolio, significant transmission constraints within the region, new emissions controls mandated for our Boardman coal plant, and uncertainty over the long-term price of natural gas.

In this context, we have prepared this IRP based on some fundamental principles:

- Maintain compliance with all laws and regulations governing PGE and our business activities;
- Preserve the high standard of reliability that our customers are accustomed to and expect;
- Ensure high standards of safety at PGE electric generation and transmission facilities;
- Identify sustainable demand and supply choices that are socially and environmentally responsible;
- Be responsive to the interests of PGE's primary stakeholders, including customers, investors and the communities where we operate;
- Pursue a portfolio that provides diversity of technologies and fuel sources in order to minimize exposure to significant and unexpected changes in future circumstances that could adversely impact PGE and our customers; and
- Balance these quality-of-supply objectives against the imperative of keeping electricity prices affordable and stable.

Planning Context

Traditional electric generation choices and issues are greatly different today than they were just a few years ago. The sudden emergence of wind energy in quantities unimagined even in our last IRP has created new challenges for resource planning and system operations. Innovations in other technologies such as solar power are advancing and may have a considerable impact in future resource plans. At the same time, there is unprecedented uncertainty about the timing, form and cost of potential greenhouse gas legislation; the price for natural gas; and the ultimate impact of renewable energy standards on availability, cost and quality of renewable resources.

As we examined available resource choices to meet the future needs of PGE customers, a few major considerations significantly affected our analysis:

- PGE, like other utilities in the region that have benefited from a historically robust hydro system, has traditionally had greater energy needs than capacity needs. Due to reduced access to hydro, increased reliance on non-dispatchable and intermittent wind generation, and the continued growth of summer peak loads, our capacity needs now exceed our energy requirements and occur sooner (in 2013 versus 2015).
- The Oregon Regional Haze Plan and Oregon Utility Mercury Rule requirements at the Boardman plant have caused PGE to examine the risks and benefits of making substantial investments in new emissions controls against the risks and benefits of ceasing plant operations and replacing the resource with a new source of supply. The implications are significant given the costs of both choices and the important role that the plant has in our portfolio. The Boardman plant currently serves about 15% of our customers' electricity needs and provides a reliable, low-cost source of power. From a portfolio perspective, the plant provides important fuel diversity and benefits from the relative abundance and stable pricing of coal. An early closure would trigger the need to consider a major replacement resource during a timeframe in which additional resource needs are already considerable.
- The outlook for domestic natural gas supply has dramatically improved compared to just two years ago. With the discovery of vast domestic shale gas deposits, combined with drilling innovations enabling its relatively economic extraction, domestic gas supply is expected to be sufficient through at least 2025 without heavy reliance on liquefied natural gas (LNG). However, the future supply-demand balance for natural gas remains uncertain and price volatility will likely continue.
- Passage of the Waxman-Markey legislation in the U.S. House of Representatives gives us more insights regarding a possible near-term framework for regulation of CO₂ and other greenhouse gases. While the policy goals for CO₂ reduction targets and the potential regulatory mechanisms are becoming clearer, actual compliance costs are still uncertain, and the legislation may change considerably in the Senate and over the course of our planning horizon.
- Emerging technologies (e.g., hydro-kinetic technologies other than wave, low-temperature geothermal, CO₂ capture and storage or recycling, and next-generation nuclear) were not modeled as portfolio resource options in this IRP because, as a result of high technological and/or cost hurdles,

they will not be available to meet our customers' needs during this resource planning term. In many instances, substantial regulatory challenges also exist.

- With the passage of Renewable Portfolio Standards (RPS) in Oregon and across the West, the role that renewable resources such as wind are playing in the regional resource mix has increased dramatically. As a result, it has been necessary for utilities in the Northwest to more carefully consider the impact of increasing levels of intermittent resources, as well as changes to portfolio mix and operations to support higher penetration levels. At the same time, RPS standards and concerns about future greenhouse gas legislation have increased the competition for renewable resources. The increased competition adds to the uncertainty regarding both the future availability and cost of these resources. Finally, some renewable resources continue to require existing federal and state tax incentives in order to be cost-competitive. Whether these subsidies will be either necessary or available in the future is uncertain and could have a considerable impact on the cost of meeting RPS requirements.
- Resource choices, both thermal and renewable, tend to be located far away from PGE's loads, underscoring the need for upgraded and new transmission links. We are encouraged by the apparent success of BPA's new approach to transmission expansion via its Network Open Season process. In addition, PGE has been proactive in examining our own options for developing new transmission to meet our current and future needs. These options are presented in detail in this IRP and, where appropriate, included in our recommended resource action plan.

In general, the historic trend toward increasing electrification appears to be continuing. Just as wind energy and compact fluorescent light bulbs were not under consideration as resource options 20 years ago, many opportunities for new supply and end uses with the potential to change how we do business are on the horizon. These include plug-in vehicles (PIV); smart metering and smart grid advancements; biogenic capture and recycling of CO₂ and biomass co-firing at coal plants; thermal and PV solar applications that are closer to cost parity with more traditional supply alternatives; ocean energy and other hydrokinetic forms of generation; next-generation nuclear plants; and various end uses such as LED lighting and water heat pumps.

For now, however, there are limited resource alternatives available to meet our action plan requirements. Traditional utility generation technologies (hydro, coal, nuclear) face environmental and statutory concerns that hinder their development at this time. For all practical purposes, our current, large-scale renewable energy options are largely limited to wind. Non-wind renewables are constrained by economics, physical availability of the resource, geographic limitations, or a combination of these.

Compared with most utilities in the U.S., PGE is in a good position in that we currently have a diverse resource mix, a comparatively small environmental footprint and relatively competitive power prices. However, we anticipate that the general historical trend of stable or declining real costs for electricity may reverse as our portfolio evolves to meet the future requirements of growing customer demand, new legislation, and changes in technology and fuel availability.

Resource Needs

By 2015, we will need more than 800 MWa of new supply and demand resources to meet our annual average energy gap, as shown in the chart below. This shortfall is driven, in part, by ongoing load growth and by resource expirations. See Figure ES-0-1 below.

In that same timeframe, we will need to acquire over 1,700 MW of capacity¹ to meet the needs of the highest hour of the year under normal (1-in-2) weather conditions, inclusive of required operating and planning reserves.

As with energy, our capacity shortfall is driven in part by continued growth in peak load requirements, but the greater driver is the loss of expiring hydro and capacity contracts. In addition, due to rapid growth in central air-conditioning, PGE has transitioned from being a winter-peaking utility to being a dual-season peaking utility. See Figure ES-0-2 below.

¹ before accounting for the capacity contribution of energy actions to fill our 800+ MWa energy need



Figure ES-0-1: PGE Energy Load-Resource Balance to 2020





Our Planning Approach

We have made every effort in this IRP to account for both the letter and spirit of the OPUC's IRP Guidelines. In doing so, we engaged in frequent interactions with OPUC Staff, documenting every major topic of analysis called for in the Guidelines with briefing sheets that were shared with Staff for their review and comment. Over the course of a year, we also conducted six day-long public stakeholder meetings,

presenting our assumptions, analytics and results, while also seeking – and greatly benefiting from – stakeholder feedback.

To arrive at a portfolio of new supply and demand resources that provides the best combination of expected cost and associated risk and uncertainties, we evaluated 15 candidate portfolios with major resource additions out to the year 2020 under 21 futures², with hourly economic dispatch through 2040, inclusive of end effects³ thereafter. In our analysis, we used a combination of expected cost under reference case conditions in conjunction with scenario (deterministic) and stochastic risk metrics to assess cost uncertainty. In addition, we evaluated portfolios for reliability, as well as fuel and technology diversity. We then took the performance of our portfolios based on expected cost and the risk metrics described above and applied weighting factors to arrive at a composite portfolio score.

Most of the foregoing metrics are specifically called for in the OPUC IRP Guidelines. A few others provide additional insights not contemplated in the Guidelines. The IRP Guidelines provide a detailed framework for examining the strengths and weaknesses of resource plans and underscore the inherent and increasing complexity of IRP. Although we have performed a rigorous evaluation of portfolio cost performance while considering a wide range of risks and uncertainties, such an analysis cannot account for or quantify every consideration. We must also emphasize that a portfolio scoring approach does not replace prudent utility judgment or the necessity to consider qualitative factors and the viability of implementing a preferred resource action plan.

We also have included a detailed analysis of our transmission needs, along with proposed actions, recognizing that the region's current transmission infrastructure is not capable of bringing diverse new resources, such as wind energy from remote areas east of the Cascades, to load centers without significant new investments to improve both reliability and capacity of the bulk transmission system.

The Boardman Decision

In Chapter 12 we present a careful analysis of the considerations and tradeoffs of continued operations of the Boardman plant with full Oregon Regional Haze Plan and Oregon Utility Mercury Rule compliance versus cessation of plant operations and replacement supply options. PGE recommends proceeding with the Phase 1 and 2 emissions control upgrades and retaining Boardman in our resource portfolio. This recommendation is based on the results of our portfolio analysis, which indicate similar

² Futures are a set of input assumptions for the behavior of a set of variables over the planning horizon; see Chapter 10 – Modeling Methodology for more detail,

³ End effects are calculated for generation projects that have a book life beyond 2040 and reflect the value of these plants which would otherwise not be captured in our modeling planning horizon, which extends to 2040; see Chapter 10 – Modeling Methodology for more detail.

expected cost results between the top-performing portfolio that retains Boardman through 2040 and the top-performing early closure case that ceases Boardman operations in 2014. In addition, the preferred 2040 Boardman portfolio performs considerably better across most risk metrics, including scenario and stochastic price risk, and supply reliability measures. The Boardman 2040 portfolio also provides for increased fuel and technology diversity when compared to the early shutdown cases. Further details regarding the results of our portfolio analysis for Boardman can be found in Chapter 12.

Proposed Action Plan

Our proposed Action Plan is a subset of our preferred portfolio and includes actions that we would undertake in the next two to four years with the goal of new supply being in place by no later than 2015. The Action Plan calls for a mix of new energy efficiency (EE), renewable resources and efficient natural gas generation for both energy and capacity needs.

Specifically, the Action Plan features the following elements:

- Acquire all cost-effective EE (215 MWa), which offsets almost 60% of PGE's load growth through 2015. This EE acquisition exceeds the implied amount targeted for PGE in the draft Northwest Power and Conservation Council's 6th Plan. Because EE delivers nearly 1.5 times more energy savings during winter peaking conditions than on an annual average, it also provides a substantial reduction in PGE's capacity requirements.
- 2. Acquire at least 122 MWa of new renewable energy by 2015 to be in compliance with the 2015 Oregon Renewable Portfolio Standard target. This action was previously found to be reasonable in our last IRP; however, we have not yet been able to fill this target.
- 3. Acquire cost-effective Dispatchable Standby Generation (52 MW), resulting in 120 MW of peaking capability by 2015.
- 4. Acquire approximately 400 MWa of new, high-efficiency natural gas generation by 2015.
- 5. Acquire up to 200 MW of new flexible natural gas generation by 2013 to meet peaking needs and future load and intermittent resource variability.
- 6. Implement all emission controls required under the Oregon Regional Haze Plan and the Oregon Utility Mercury Rule to continue operations at the Boardman plant in order to capture the value of its fuel diversity and reliability of supply.

- 7. Exercise one of our options under the BAL Leasing agreements to acquire an additional 15% share of the Boardman plant output, thereby adding 72 MWa of existing Boardman generation to PGE 's portfolio.
- 8. Acquire 100 MWa of energy supply from the mid-term market via rolling PPAs to hedge against load uncertainty.
- 9. Acquire up to 283 MW of limited duration peaking supply (160 MW winter, and 123 MW bi-seasonal) from the market.
- 10. Continue building a demand response (DR) supply portfolio targeted at 60 MW of bi-seasonal supply by 2015.
- 11. Conduct preliminary engineering, siting and permitting activities and, subject to achieving certain milestones and participation described in Chapter 8, construct a 500-kV double-circuit transmission line connecting the southern portion of our service territory near Salem, Oregon, to our Boardman and Coyote Springs plants near Boardman, Oregon.
- 12. PGE will immediately issue one or more RFPs for action items 2, 4, 5 and 9 upon obtaining Commission acknowledgment of the plan. PGE will submit a benchmark wind resource and benchmark energy and capacity natural gas resources into the RFP(s).

Conclusion

Our basic choices to meet future load in this IRP are energy efficiency and demand response, renewable resources (primarily wind), and natural-gas-fired generation. We plan to maximize the acquisition of EE by continuing to work closely with the Energy Trust of Oregon and our customers. While we considered out-of-state nuclear and IGCC coal options, our top-performing portfolios exclude these in favor of a mix of new renewable resources and high-efficiency natural gas generation.

In the end, while PGE has resources sufficient to meet our customers' needs in 2009 and 2010, we will require capacity and energy resource additions beginning as soon as 2013. Given the lead times for construction of new generation, as well as the timelines to meet the requirements of the Oregon Regional Haze Plan and Oregon Utility Mercury Rule, PGE feels a sense of urgency in receiving acknowledgement of the Action Plan so that we may move forward in a timely manner to prepare for and implement the resource decisions.