



# Planning for Climate Change

## Climate change and PGE

Portland General Electric's goal is to be our customers' trusted energy partner, meeting their need for reliable, affordable electricity at home and in their businesses with increasingly sustainable energy solutions.

A clear understanding of how climate change may affect our business and our customers has to be part of that effort, so PGE has been an active partner in efforts to find a responsible path for Oregon and the electric power sector to help address this critical issue.

Most recently, PGE was part of a diverse coalition of utilities, customer groups, and advocacy organizations that helped develop and support the Oregon Legislature's 2016 passage of the Oregon Clean Electricity Plan, which puts us on a path to achieve the state's aspirational goals for carbon emissions reductions in the electricity sector by requiring us to serve 50 percent of our customers' demand for electricity from qualifying renewable resources by 2040 and eliminate coal from our energy mix by 2035.

Our support for the OCEP reflected a change in direction that's been unfolding for at least a decade, as concerns around global warming and other environmental issues have intensified. In 2006 PGE acknowledged that the utility industry needs to be part of the global warming solution and called for carbon regulation at the national level. In 2007 we joined with stakeholders to craft and support adoption of Oregon's original renewable energy standard. And our OPUC-acknowledged 2009 IRP incorporated the Boardman 2020 plan, which took a broader view of likely future costs and risks associated with a generating resource that not long ago was viewed as a low-cost choice.

## Resource planning

All of this has driven an adaptation in our resource planning process, changing the focus from meeting projected demand for power with acquisition of conventional resources we know we can deploy today, to achieving a significantly more renewable resource mix for tomorrow, based on new technologies and ambitious goals we've agreed are a priority for Oregon and the communities we serve.

Our resource plans are still firmly grounded in the practical balance of least cost and least risk actions that will meet our customers' energy needs. But we've lifted our long-term vision to take full advantage of new technologies and markets for a smarter, more renewable, more flexible generating portfolio and distribution system – and to create more active partnerships with our customers – so we can meet the mandates of the OCEP and fulfill our customers' expectations of us as a utility that is pursuing our shared goals and vision for Oregon's more sustainable energy future.

## Mitigating what we can't prevent

At the same time, we recognize that PGE and Oregon don't have enough influence on climate, acting alone, to stop or reverse the impact of global climate change. So we're also considering how a changing climate may affect the region we serve and the resources we use to generate power for our customers. In particular, we've looked at how climate change might affect our hydroelectric power plants – plants that in some cases have served our customers with reliable, emissions-free, and low-cost power for more than a century.

In 2015, PGE worked with the Oregon Climate Change Research Institute (OCCRI) at Oregon State University on a study to assess the effects of climate change in our region. Among other findings, the study projects that by the 2040s, the rivers on which PGE hydro resources are located could experience a significant decline in water flows. The reduction is expected to be seasonal, with flows actually increasing in the winter (thereby providing more power generating capacity to our system during the winter months), but decreasing in the spring and summer, resulting in an overall net capacity reduction. The OCCRI report will be published as part of our 2016 Integrated Resource Plan (IRP).

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## Planning for Climate Change, continued

While the projected decrease in stream flows would have many implications for Oregon and Oregonians across a range of policy and environmental stewardship issues, because of the diverse nature of our power resource mix and the seasonal variation in water availability, we estimate that the reduction in flows would translate to an annual reduction of just 2 to 3.4 percent in electricity generated by PGE hydro projects.

This is expected to be a gradual change over the next 30 years with an impact on power generation that is both direct and indirect, since many other utilities in the region are more heavily dependent on hydroelectric resources than PGE. As a result, projected water flow changes could cause increases in wholesale market prices for electricity in the region by virtue of requiring increased use of more expensive alternative resources.

On an annual basis, however, these cost increases are projected to be small, with a manageable impact on customer prices. PGE will reflect any changes in the appropriate regulatory recovery mechanisms the Oregon Public Utility Commission uses to set PGE prices, such as the Annual Power Cost Update Tariff and the Power Cost Adjustment Mechanism.

We will continue to monitor any changes in the capabilities of the hydro resources in our region, and will also continuously work to improve operational efficiency to maintain generation reliability and availability. As we gather more reliable data about water flow declines and transition from projections to actual experience in the coming years, we'll identify any expected shortfalls through our resource planning process and upgrade existing facilities or acquire replacement resources as necessary, mitigating risks to both our customers and our shareholders.

If climate change-related reductions in water resources result in less hydropower capacity for PGE and its customers, we will consider several factors to help us decide on the best course for putting replacement resources in place, including environmental impacts, cost, regulatory requirements and diversification of our power supply mix.

In our 2016 IRP, for instance, we will consider the requirements of the federal EPA's Clean Power Plan and the Oregon Clean Electricity Plan. Under OCEP, investor-owned utilities in Oregon must meet at least 27 percent of their retail load with renewable generation by 2025, with the threshold ramping up to the full goal of 50 percent by 2040.

Any future reductions in hydropower will be addressed in this context, so while PGE's decisions concerning replacement resources are made when the need for those resources arises, we believe that OCEP and other regulatory requirements will require the addition of renewable resources to our power supply portfolio in the future, integrated with the increased use of smart grid technologies to help balance our use of the resources available to us while providing safe, reliable service to customers.

So while we're working hard to limit our contribution to climate change, we're also keeping a close eye on how changes we may not be able to avoid could affect our system and our customers, and we have processes and regulatory frameworks in place to help us assure that as we adapt to a changing climate and potentially to declines in the availability of hydroelectric power, the strategies we use to maintain a reliable supply of electricity for our customers won't themselves increase PGE's greenhouse gas emissions.

As our region works to better understand how climate change will affect all of us, PGE will continue to work with our customers, regulators, shareholders and other stakeholders to find a responsible and sustainable path forward.



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