Northwest Power and Conservation Council

March 28, 2012

MEMORANDUM

TO: Council Members

FROM: Terry Morlan

SUBJECT: Presentation by Smart Grid Oregon

Action items in the Council's Sixth Power Plan require that staff follow the development of technologies and policies relating to changes in the electricity grid and its operations. These changes often go under the name of "smart grid". One organization working to promote changes to the electricity grid is Smart Grid Oregon.

Three members of the Smart Grid Oregon board will present information about their activities and their roadmap to electricity grid improvements. The presenters include:

- James Mater, Quality Logic and SGO Chair
- Michael Jung, Silver Springs Network and SGO Board Member
- Tom Foley, SGO Vice Chair

Two items are attached describing Smart Grid Oregon and its Smart Grid Roadmap for the Pacific Northwest.

Attachments

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A Smart Grid Roadmap for the Pacific Northwest

March 27, 2012

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Introduction: Coming of the Smart Grid

The Smart Grid represents the largest change in the electrical power network since it was created. The Smart Grid is a major shift in how electricity is generated, distributed and consumed. Where power delivery has been one way, from plants to users, and information flows have been limited, the Smart Grid will open the way for multi-directional flows of power and information. That means customers may have a more active role, capable of both consuming and selling power and services back to the system, and new business players will be on the scene.

If we do Smart Grid deployment right in the Northwest, it will be a major new economic driver that provides many environmental benefits. This requires that all stakeholders have to understand the benefits to them and be involved in the process of defining what is "right" for them, the state and the region. To achieve those goals we need to create a stakeholder process to develop a consensual path forward, a Roadmap for Smart Grid deployment, first in Oregon[1], and then in the region. It will take a concerted effort from all stakeholders to achieve an actionable and effective Roadmap and implement it.

Smart Grid Oregon (SGO), a 501 (c) (6) trade association with board and membership focused solely on Smart Grid is a logical choice to lead the Smart Grid effort in Oregon. SGO is a recognized Party in OPUC Smart Grid related Dockets; has partnered with numerous organizations and companies to bring experts in Smart Grid face to face with the Oregon community, and contributes speakers and moderators to Smart Grid conferences in the region.

Traditional structures for public debate and decisions on changes to the electrical grid are inadequate to deal with the magnitude of the possible outcomes and to include all of the stakeholders that are impacted by the tectonic shifts occurring in the system. Thus, there is a need for a process for initiating and managing the necessary public debate and consensus process. This proposal is for such a process to be developed in Oregon and then extended to the entire region.

Getting From Here to There: Changing a Complex System

Accomplishing the envisioned smart grid transformations could potentially be done within current industry structures and with current participants. However, optimizing grid operation using the new resources (distributed resources, both generation and load management; intermittent renewable resources, and much more dynamic grid operation), will require new business models and policies. These are needed to accelerate the deployment of the new grid technologies and to open up business opportunities that will lead to a more robust, more reliable, and lower cost system. These models and policies will have to be developed with an intimate understanding of the existing structure and operation of the grid.

As we move forward, the electrical system will be facing challenges not contemplated in the past. For example, the Northwest has always been winter peaking system. Trends indicate that large parts of the regions may soon be dual peaking, both summer and winter. This is a potential problem because the wholesale price of power is much higher in the summer, because of California's summer air conditioning use. We also may have to build more transmission, which is getting harder to site. And, we have to solve environmental problems associated with generating power. The planned decommissioning of the Boardman coal plant comes to mind as an example.

[1] We focus on Oregon early, because the region would too big a bite for us. We hope that other states develop similar organizations to SGO in their states. We would look forward to working with other states' organizations.

Policies, technologies, and strategies associated with the Smart Grid will help to ease that burden.

The Northwest regional electrical power system is complex, covering multiple states, jurisdictions, generation resources, and uses. The seven Investor Owned Utilities (IOUs) operating in Montana, Idaho, Oregon and Washington account for 62.4% of the region's population[i] served and 69%[ii] of the power delivered in the region. Yet, 130 other utilities, all publically owned and made up of varying governance models, cover most of the geography of the region.

The system is influenced greatly, but not solely, by the electrical energy generated by The **Federal Columbia River Power System** (FCRPS). The FCRPS dams are operated by the Army Corp of Engineers and the Bureau of Reclamation. The power is marketed by BPA through a network of high-voltage transmission lines, accounting for about 75% of the region's transmission capacity. The system serves most of the Northwestern US through wholesale sales to nearly 150 customers ranging from Rural Electric Cooperatives (57) to Municipal owned utilities (42), Public Utility Districts (29) and various other Federal agencies, investor-owned utilities , major industrial customers, tribal utilities (2) and one port district. Some 419 distinct entities purchase transmission capacity from the BPA system.

All of the customers of BPA and other utilities in the region will be players in making the Smart Grid a reality throughout the Northwest.

Adding to the complexity of establishing policies to accelerate the adoption of Smart Grid are the numerous institutions that participate in influencing and creating public policy, each having a unique special interest with respect to how the electric system is regulated and operated. It will be formidable task, but it can be done with the right approach.

Finally, the years of being able to take low-cost, reliable electricity for granted have driven progressive technology companies with means to lower ratepayer costs to focus on other areas of the country with higher power costs and aggressive Smart Grid agendas, such as Texas, California and the Mid-Atlantic states. These companies have been instrumental in pushing innovative and economically beneficial concepts into the electrical system in those regions.

We think it is time to bring the region together for a serious discussion of what it wants the electrical system to be in 2030 and how can we get there. Although we will start in Oregon, this discussion and follow up action needs to go beyond a single state. As a region, we will have to successfully establish a mechanism for a regional rethinking of the system itself. The regional utilities, state legislatures, policy makers, and other associated organizations will have to come together to agree on what they want from the power grid of the future. That is the goal of the Smart Grid Oregon Smart Grid Roadmap project.

Creating a Roadmap to a Smarter Grid

Other regions and states may be ahead of the Northwest at the moment, and are recognizing the need to bring stakeholders together in a comprehensive planning effort like the one proposed in this paper. But they are not so far ahead that we couldn't catch up and gain from their efforts, including mistakes they have made. If we create a fertile ground here, we can entice technology companies manufacturing Smart Grid related products to do business in the Northwest as they

have done in Illinois and elsewhere. (See Appendix C for references to similar local, state and regional roadmap-like efforts.)

Many stakeholders will benefit from a movement towards a smarter grid. But not many people understand the details of how power is produced and transported to homes and businesses. Even fewer understand how changes in the electric infrastructure will affect them. The Roadmap process is intended to address this situation.

The initial design is to conduct a stakeholder dialogue process that would extend the discussions of the electrical system of the future to both a timeframe and broader set of participants than typically occurs in the state and region. We believe the magnitude of the changing electrical system and the consequent new opportunities for economic development warrant such a broad-based process.

The project is designed as a phased approach to enable the end product to evolve from a maturing process. Phase 1 is aimed at building an initial Smart Grid framework based on the substantial expertise of SGO members and vetting it with key stakeholders. It is also intended to design the optimal process for a broader stakeholder methodology. that will be informed by challenges identified through vetting the framework and assembled research on what other states and regions have learned in the process of building and implementing Smart Grid roadmaps. In Phase 2 the broader stakeholder community will review and build on the framework to develop of Smart Grid Roadmap for Oregon. Phase 3 would extend the stakeholder methodology to the entire Pacific Northwest. The purpose and outcome of Phase I and 2 of the Roadmap, aimed for completion in 2012 so it can influence the 2013 legislative session, is to:

1. **Develop widespread understanding of and gain stakeholder input and support for a state vision of a Smart Grid through 2030.**

   In Phase I we will develop the framework setting out a vision of where we want to be in Oregon in the year 2030 and use it as a tool to spur conversations with major stakeholders around the potential benefits from Smart Grid deployment and how the stakeholders can best avail themselves of the prospective benefits. Prior to the meetings with stakeholders we will have gathered and reflected in the framework information about the theoretical benefits of Smart Grid and those actually being achieved in other parts of the country and the world. We will start with the most mature projects first, and we will pay particular attention to those pilot projects being conducted in the Pacific Northwest.

   Many of the US-based projects have benefitted from funding made available through the American Recovery and Reinvestment Act of 2009 (ARRA). (See Appendix A for a listing and details of Pacific Northwest pilot projects.) Interestingly, many of these pilots are being conducted by publicly owned utilities. Their efforts are being driven by BPA's move to tiered pricing, which will require utilities using power beyond their allocation from BPA to acquire their own resources beginning in 2012.

   From the study results and in discussion with stakeholders, we will revise the framework as the starting basis for the Phase 2 stakeholder process..

2. **Create a Policy Roadmap (action plan) by the end of 2012 to achieve that vision in the most efficient manner.**

   The stakeholders will review, extensively discuss and revise the framework to develop a Roadmap of actions we need to take to reach our 2030 vision. The Roadmap will include

specific actions by institutions. It would be premature to speculate today what those actions might be before doing the work required in Step 1. The goal is to complete the state Roadmap in time to impact the 2013 Oregon State Legislative session. However, achieving this timetable depends on funding and the challenges in conducting the Roadmap project.

3. **Work with key policy makers and other stakeholders to implement actions needed to reach our collective vision.**

   Once the vision and a set of planned actions have been decided upon, work with all stakeholders to clear the path towards implementation.

Based on successful work in Phase 2, Phase 3 would then extend the mature process of developing a stakeholder roadmap and action plan to the region. We expect to engage regional organizations such as BPA, Northwest Power and Conservation Council, Northwest Energy Efficiency Alliance, Renewable Northwest Project, Northwest Energy Coalition, Climate Solutions and others in Phases 1 and 2 in some form as preparation for extension to the region.

The operating boundaries of the Roadmap are as follows:

1. **Scope.** Energy infrastructure in the Northwest starting with Oregon.
2. **Timeframe.** Planning horizon to 2030. Phase 1, startup, and Phase 2, an action plan for Oregon by the end of 2012, subject to funding and challenges. Phase 3 would apply the process to the Region in 2013.
3. **Stakeholders.** Many, including utilities, customers of utilities, suppliers of Smart Grid technologies, labor unions, legislators, state and regional government and non-profit entities focused on the energy system, service companies such as consultants and law firms. etc. See A for a detailed list of prospective stakeholders.
5. **Deliverables.** A Roadmap for the state and a set of actions to undertake in Oregon, and later in Phase 3, in the region.
6. **Leadership.** Smart Grid Oregon
7. **Resources.** $50,000 for Phase 1 to engage a small staff to coordinate and support research. Phase 2 and 3 resources TBD based on the results and plan from Phase 1.

Why Should Smart Grid Oregon Lead This Effort?

Smart Grid Oregon has created a visionary leadership team to lead this effort. Smart Grid Oregon is a growing industry association with broad stakeholder support and with close connections to key industry players. It is the most knowledgeable resource for Smart Grid in the region, and is ideally suited to work with major stakeholders to devise a sound Roadmap to a Smart Grid in Oregon and the region.

We fully expect to collaborate with key stakeholders and anticipate that they will form a project steering committee to insure a broad-based and balanced approach.

Getting the Roadmap Started: Initial Partners for Phase 1

SGO is seeking an initial group of committed partners to fund and support the Roadmap Project. Initial partners (minimum of 5) would:

- Contribute at least $10,000 to the Project Fund through a designated payment to Smart Grid Oregon
- Be members of the Steering Committee

- Be expected to participate in the Steering Committee meetings and the stakeholder sector(s) they are part of – e.g., an IOU would participate in the stakeholder discussions with other IOUs

What's in it for Roadmap Partners?

Partners in Roadmap Phase 1 will be in on the ground floor and have significant roles in defining the process and shaping its outcomes:

- Utilities will have new channels to build Smart Grid understanding internally and among their customers, and create partnerships for grid modernization to meet challenges they face.
- Technology providers will gain new understandings of their market potentials in the region, and prospectively build markets for their products.
- Advocacy groups will ensure their positions and constituencies are at the table.
- Government officials and agencies will build understanding of needed grid changes, a consensual groundwork on which to make those changes, and drive economic development strategies in energy

The Smart Grid is coming, with many benefits to Oregonians. The proposed Roadmap will ensure that benefits are realized sooner and in a coherent fashion. For that we need widespread participation by power grid stakeholders, and that will require support. For Oregon and the Northwest, this will be an investment with high returns.

Phase 1 Deliverables

Phase 1 is the starting point for the project and is the Phase we are seeking support for now. The deliverables include a Smart Grid framework, initial outreach to a select set of stakeholders to develop the overall engagement process and early results, and a report documenting the process for Phase 2.

Deliverable #1: Draft "Smart Grid Framework" ("straw proposal")

Develop draft framework document with the following content:

- Basic Smart Grid concepts, definitions
- Vision 2030 – "A day in the life" of the Smart Grid in Oregon of 2030 illustrating new capabilities, benefits, opportunities
- Current status of Smart Grid development and deployment
    - Oregon/Northwest
    - US/World
- Lessons from other states/regions for the Pacific Northwest
- Path forward – general view on challenges to be overcome, and who needs to be engaged in overcoming them

Deliverable #2: Conduct initial outreach with select key constituencies

- Identify and recruit a select set of key stakeholder constituencies (<5) and representative organizations, with 3-5 key individuals per stakeholder group

- Share draft framework for initial review and responses with the selected set of stakeholders (<5 in Phase 1) that vary widely in terms of interests
- Outreach with key individuals (interviews and or interest area workshops) in the select stakeholder groups to assess
    - Level of overall Smart Grid awareness?
    - Understanding of potential benefits and opportunities to OR/NW, and their own sector
    - Understanding of challenges to achieve Smart Grid benefits for their sector
    - Perception of threats Smart Grid might pose to their sector
    - Suggestions to advance Smart Grid, allay potential threats and overcome challenges
    - Interest and willingness to participate in Phase 2/3 with funding and actions to influence policy
- Revise draft framework based on reviews and interviews

Deliverable #3: Design process to build broad consensus

- Create a Phase 2 plan identifying:
    - Interests, organizations and individuals needed at broad stakeholder table
    - Stakeholder process design
    - Governance of Phases 2 and 3
    - Meeting timeline
    - Working groups
    - Funding requirements and strategy
    - Staffing and external facilitator engagement for Phase 2
    - Expected deliverables from Phase 2
- Begin plan execution
    - Secure funding for Phase 2
    - Create governance group – steering committee
    - Negotiate external facilitator agreement
    - Set meeting timeline
    - Extend invitations to stakeholders
- Deliver updated framework and Phase 2 Plan to Phase 1 sponsors and SGO for approval

q:\council mtgs\2012\april\sgo roadmap proposal to nwpcc by tom.docx

[i] Pacificorp serves 1.7 million customers, 56% in OR, WA, ID, WY or 950,000 retail electric customers in the region. PGE serves 820,000 customers and a population of 1.68 million. Avista serves 357,000 retail electric customers with population of 1.57 million in its service territory (both electric and gas). Idaho Power serves 496,000 retail electric customers in a service area with 1.0 million. Puget Sound Energy serves 1.1 million retail electric customers in a service territory of 4 million (both gas and electric with only some overlap). Northwestern serves about 340,000 retail electric customers with a population of about 790,000. Total IOU customers = 4,063 million. Using a population to customer ration of 2.1, total population served is 8.53 million. Current state population estimates are WA – 6.724; OR – 3.831; ID – 1.568; MT – 0.989; WY – 0.564 millions. Total regional population = 13.676 million. Estimated IOU population coverage = 62.4%.

[ii] The entire planning region in 2012 will consume 19.3 GWa according to the NWPCC Sixth Power Plan. 2011 IRPs for PGE, Idaho Power, Avista and Puget Sound Energy estimate consumption of 2.7 GWa (2011), 1.1 GWa (2012 Quickfacts), 1.3 GWa in 2012 and 2.7 GWa, respectively. The 2011 PacificCorp IRP estimates 12.8 GW total obligations in 2011 versus regional Winter Peak ~ 30 GW according to the Sixth Power Plan or 8.1 GWa for six states including Utah and CA. About 56% is OR, WA, ID, WA or approximately 4.5 GWa. Northwestern Energy Montana 2011 planning estimates 1.8GW total demand or 1.1 GWa. Total IOU delivered energy in 2011 is estimated at 13.4 GWa or 69% of Regional energy.

Smart Grid Oregon™

A Smart Grid for the Northwest

Smart Grid Oregon is a trade association dedicated to promoting and enabling the smart grid industry and infrastructure in Oregon and the Pacific Northwest.

An effective smart grid does not happen on its own. Whether you and your organization build, use, advocate for, or directly benefit from the smart grid, your membership in SGO will help the smart grid industry grow and prosper in Oregon and the surrounding region. While SGO is focused on Oregon, we know that electricity does not stop at state borders. Building an effective smart grid takes planning on many levels, including awareness of national, regional, state, and local issues. Your involvement in Smart Grid Oregon will also help make Oregon and the Northwest leaders in realizing the many exciting possibilities the smart grid holds for our collective energy future.

As a trade association, Smart Grid Oregon has pursued two major goals:

- Advocacy / Public Policy: Smart Grid Oregon has worked with smart grid stakeholders to craft and advocate for effective policies that promote and grow smart grid industry and infrastructure in Oregon and the surrounding region.
- Business Promotion / Networking. Through informational events, conferences, and other forums, Smart Grid Oregon has been a catalyst for smart grid entrepreneurs and leaders to meet, interact, compare notes, and work together to grow and promote the industry in Oregon and the Pacific Northwest.

To our knowledge, Smart Grid Oregon is the first state smart grid trade association in the U.S. While our initial focus will be Oregon, Smart Grid Oregon will seek other appropriate opportunities and partners within the Pacific Northwest and beyond to expand our reach and promote the smart grid.

For more information, call or email:

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kelly@smartgridoregon.org
(971) 212-0936

What is the Smart Grid?

The smart grid is the application and networking of technologies and strategies to make the electricity system more reliable, more efficient, and less costly. The smart grid empowers consumers to actively manage their energy use, and allows the optimal integration and use of conservation and renewable energy resources to reduce fossil fuel reliance and greenhouse gas emissions. In short, the smart grid is the “brain” at the center of Oregon’s energy future.

Coming of the Smart Grid

The Smart Grid represents the largest change in the electrical power network since it was created. The Smart Grid is a major shift in how electricity is generated, distributed, and consumed. Where power delivery has been one way, from plants to users, and information flows have been limited, the Smart Grid will open the way for multi-directional flows of power and information. That means customers may have a more active role, capable of both consuming and selling power and services back to the system, and new business players will be on the scene.

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March 2012 v2.0

Activities and Accomplishments

SGO has already had notable success in a number of areas of related to smart grid planning and policy. Starting with ideas presented to the 2010 legislative session, our Policy Committee has worked to create recommendations to the governor, legislators, and the Oregon Public Utility Commission (PUC). SGO intervened in two major dockets related to smart grid (UM 1460) and electric vehicles (UM 1461), making significant contributions to the outcome in both cases. SGO continues to monitor additional relevant legislative and regulatory actions. Three board members actively participated in the governor's 10-Year Energy Planning task force, including the chair of the task force. Other key accomplishments include:

- Organized state's first smart grid industry conference and tradeshow and made numerous contributions to other major conferences, including speakers for leading events: CUB Policy Center Smart Grid Conference; NEBC Future Energy Conference; and Green Professionals Conference
- A Memorandum of Understanding with GridWise Alliance to collaborate on mutual interests
- Joined the Smart Grid Consumer Collaborative
- An SGO White Paper entitled: "Rethinking Regulation: Five Challenges to Aligning the Smart Grid and Utility Regulation"
- Contributed to and influenced the PSU Smart Grid curriculum in the Hatfield School of Government
- Participation with the Transportation Electrification Executive Council and Business Oregon in the Energizing Oregon planning process to prepare for accelerated adoption of electric vehicles in the state
- Organizing Smart Grid Roadmap Discussion event series to build the Smart Grid community in Oregon and the Region
- Reaching beyond Oregon to engage with regional Smart Grid interests on common Smart Grid issues
- Have defined and are preparing to launch a project to develop a Smart Grid Roadmap for the State of Oregon and the Pacific Northwest Region

Smarter Policy for A Smarter Grid

Presentations and speaker bios from our smart grid conference are available at our website:

www.smartgridoregon.org

Key Partnerships & Affiliations

Through March 2012

GridWise Alliance
Smart Grid Consumer Collaborative
Northwest Energy Coalition
Energy Trust of Oregon
Northwest Energy Efficiency Alliance
Citizens' Utility Board of Oregon
Drive Oregon
Renewable Northwest Project
Portland General Electric
Pacific Northwest National Labs
Oregon Institute of Technology
Sharp Labs
Silver Spring Networks
Elster
QualityLogic
Lane Powell
Ater Wynne
KPMG

NWPCC and the Smart Grid

Accelerating Grid Modernization

April 2012

AGENDA

1. PNW REGIONAL POWER CHALLENGES
2. WHAT IS THE SMART GRID?
3. WHY SHOULD NWPCC CARE?
4. WHEN?
5. NWPCC LEADERSHIP
6. SMART GRID OREGON
7. SUMMARY

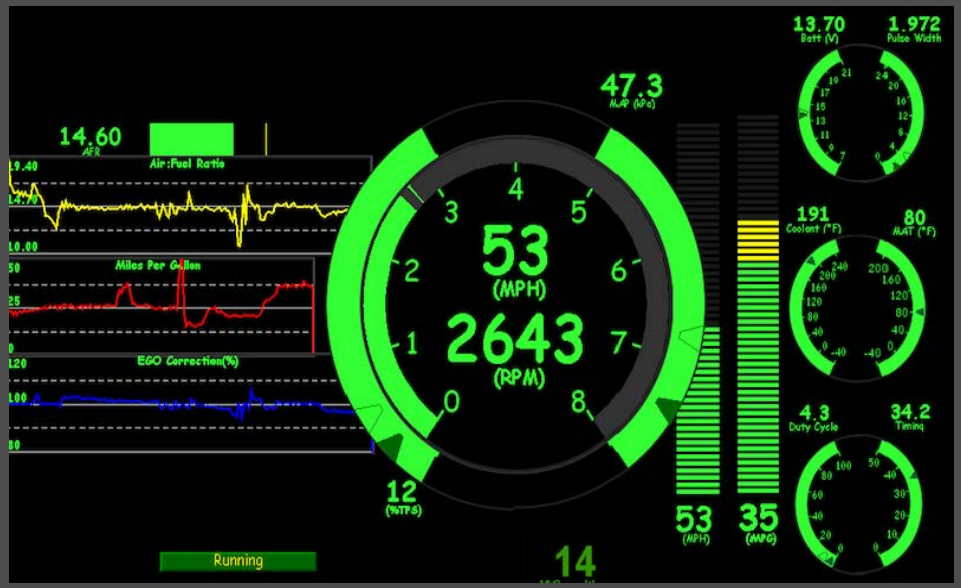
PNW Grid Challenges

- Integrating renewable resources
- Reduced BPA power system capacity and flexibility (due to fish operations)
- Dealing with “Peakier” demand
- Reducing GHG emissions
- Transport electrification – EVs
- Scaling of traditional control systems

What is the Smart Grid?

- Applying today's digital technology to managing our electrical system!

For instance…



Energy use
- **Instantaneous**
- **Speed, MPG …**

Energy use…
- **Once a month**
- **Total KwH only**

The Smart Grid - Application

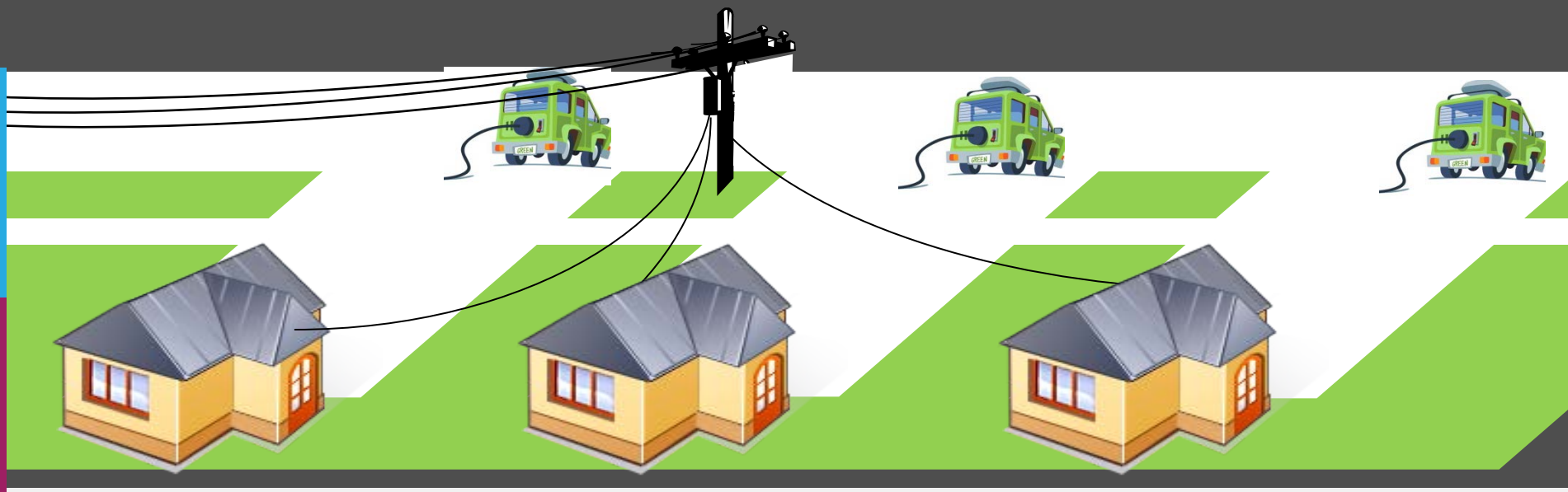
Annual Energy Consumption
(Identical Assets)

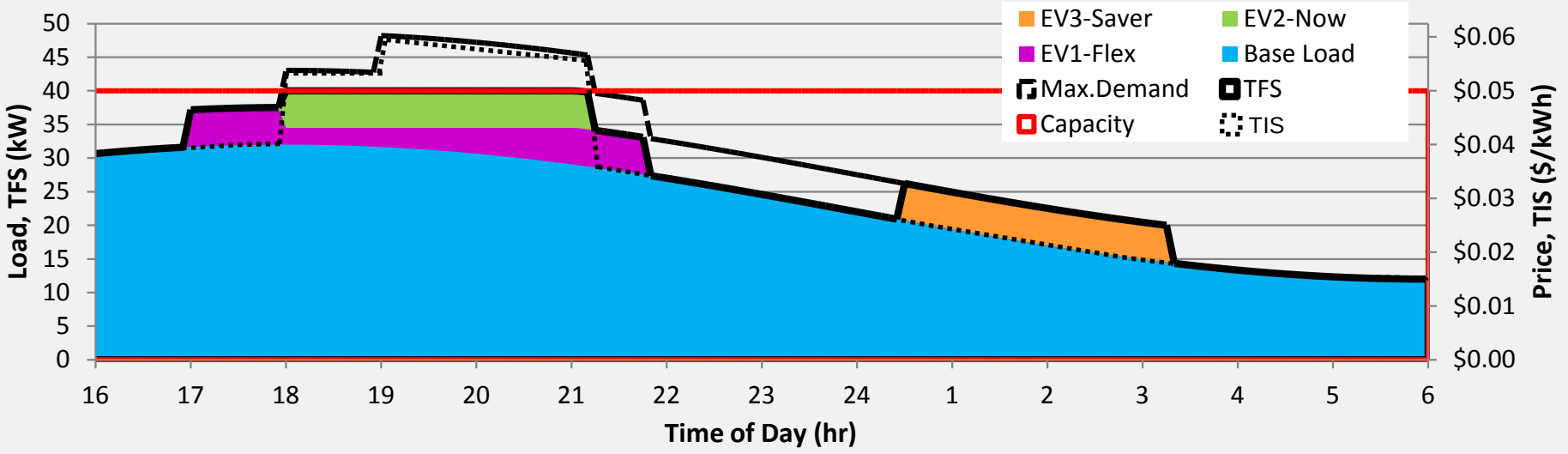
18-25% Wasted Energy on Average

- ✓ "Hidden" Source of High Energy Consumption
- ✓ 250,000+ in USA
- ✓ Poorly maintained for lack of cost-effective analytical tools.

klatu networks

The Smart Grid – New Application

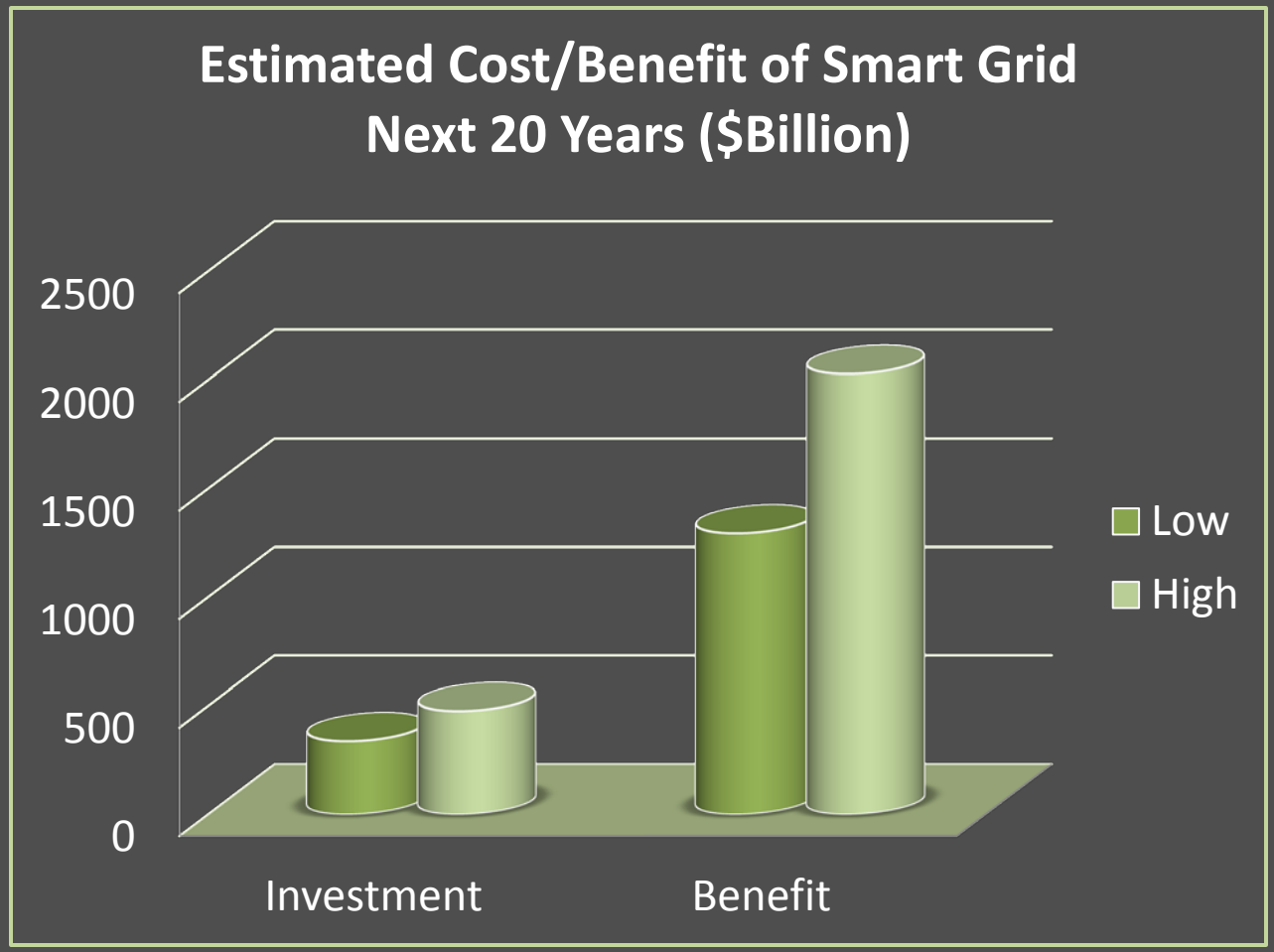




Why is Smart Grid Important?

- *Major component in solving regional power issues*
  - *E.g., enables scaling demand management to match wind generation variability*
  - *And demand shifting to reduce peak loads*
  - *And protecting fish by increasing generation flexibility*

Why?



Source: "Estimating the Costs and benefits of the Smart Grid" 2011 EPRI Technical Report

When?

- It’s started: multi-year and multi-decade process
- Over 20 smart grid investment and demonstration projects in the Region (hundreds nationally)
- >$400 million investment
- PNW Regional Smart Grid Demo Project operational this year

NWPCC Leadership

Sixth Power plan supports Smart Grid…

- SG-1. **Monitor development and adoption of smart** grid technology…
- SG-2. **Evaluate smart grid demonstration projects and** develop additional demonstration projects…
- SG-3. **Develop methodology for evaluating demand** response used for ancillary services…

We support Council's current actions and would like to see additional actions defined and implemented

The SGO mission

Smart Grid Oregon is dedicated to

- Making Oregon and the Region a leader in the implementation of Smart Grid technologies, and
- Supporting NW companies that build and market Smart Grid products and services.

Public Policy

We work with smart grid stakeholders to craft and advocate for effective public policies that promote and grow the Region's smart grid industry and infrastructure.

Some Members

- Ater Wynne
- Azuray
- Battelle NW
- BPL Global
- Citizen's Utility Board
- Elster Solutions
- EnergySec
- Lane Powell
- NWPCC
- Oregon Institute of Technology
- PECI
- Portland General Electric
- Renewable NW Project
- Sharp Labs America
- Silver Springs Networks
- Others to be announced

A Smart Grid Roadmap for the Region

- Create a common vision of desired outcomes *and priorities for Oregon and the Region* through 2030
- Create a Policy Roadmap to achieve the vision
- Design and execute an action plan for implementation of the Policy Roadmap

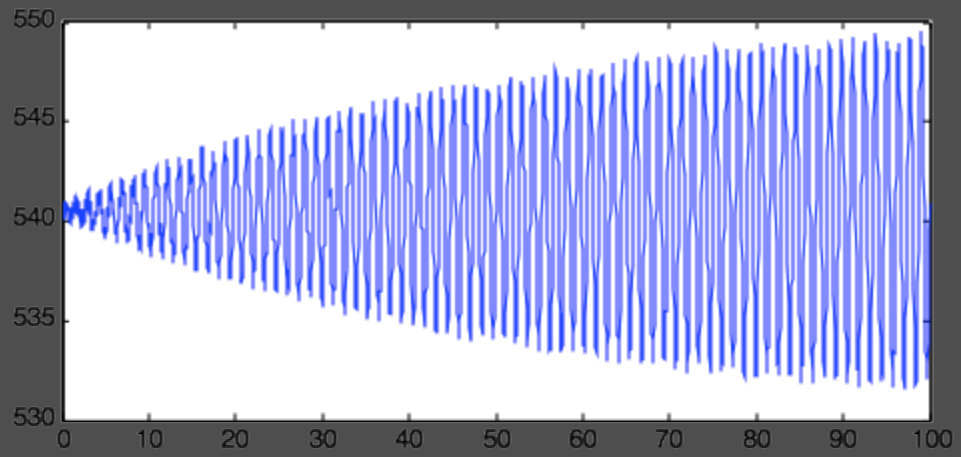
In Summary

- The Smart Grid is here and can help solve Regional power issues
- Major investments already underway in the Region
- NWPCC can be a leader in accelerating Smart Grid benefits for the Region
- SGO appreciates your support

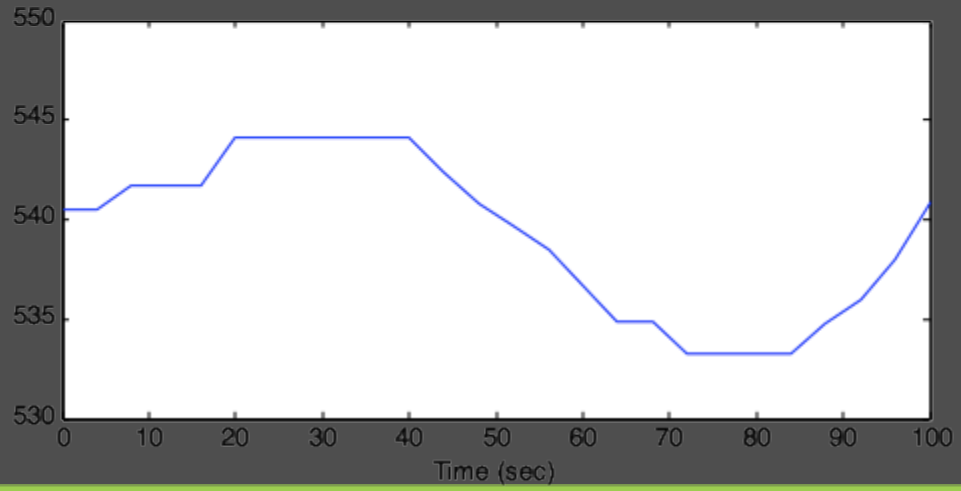
BACKUP SLIDES

- Time Permitting -

Oscillations Seen by Synchrophasors and SCADA



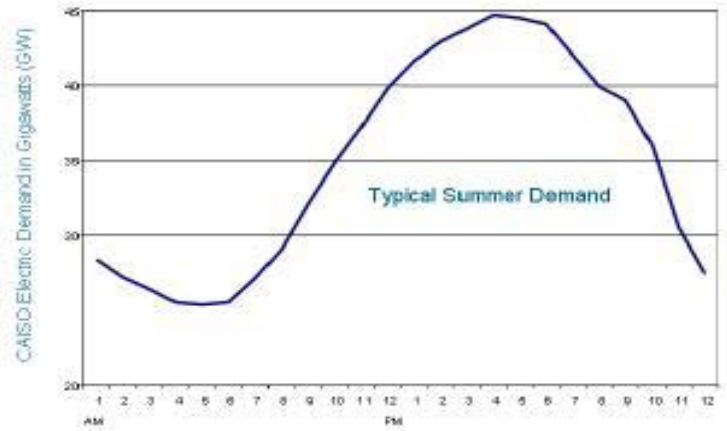
<< Synchrophasors



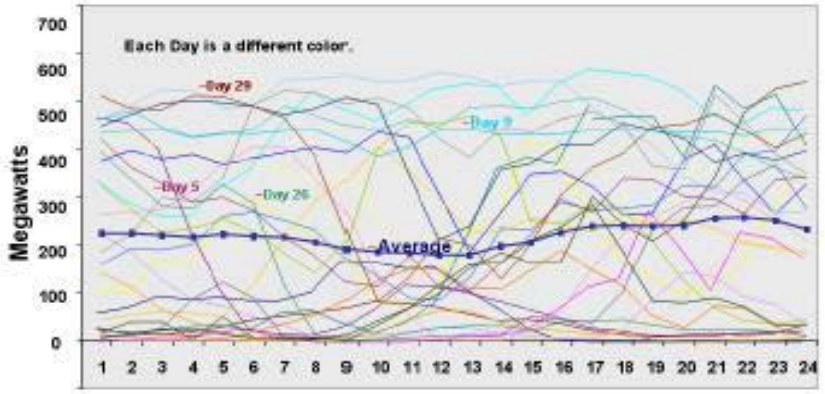
<< SCADA

Key Challenges

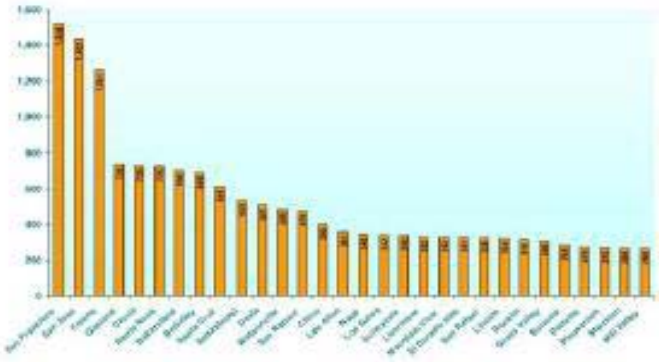
Peak = 2X Base Load



Intermittent Renewables



Local Concentrations of DG

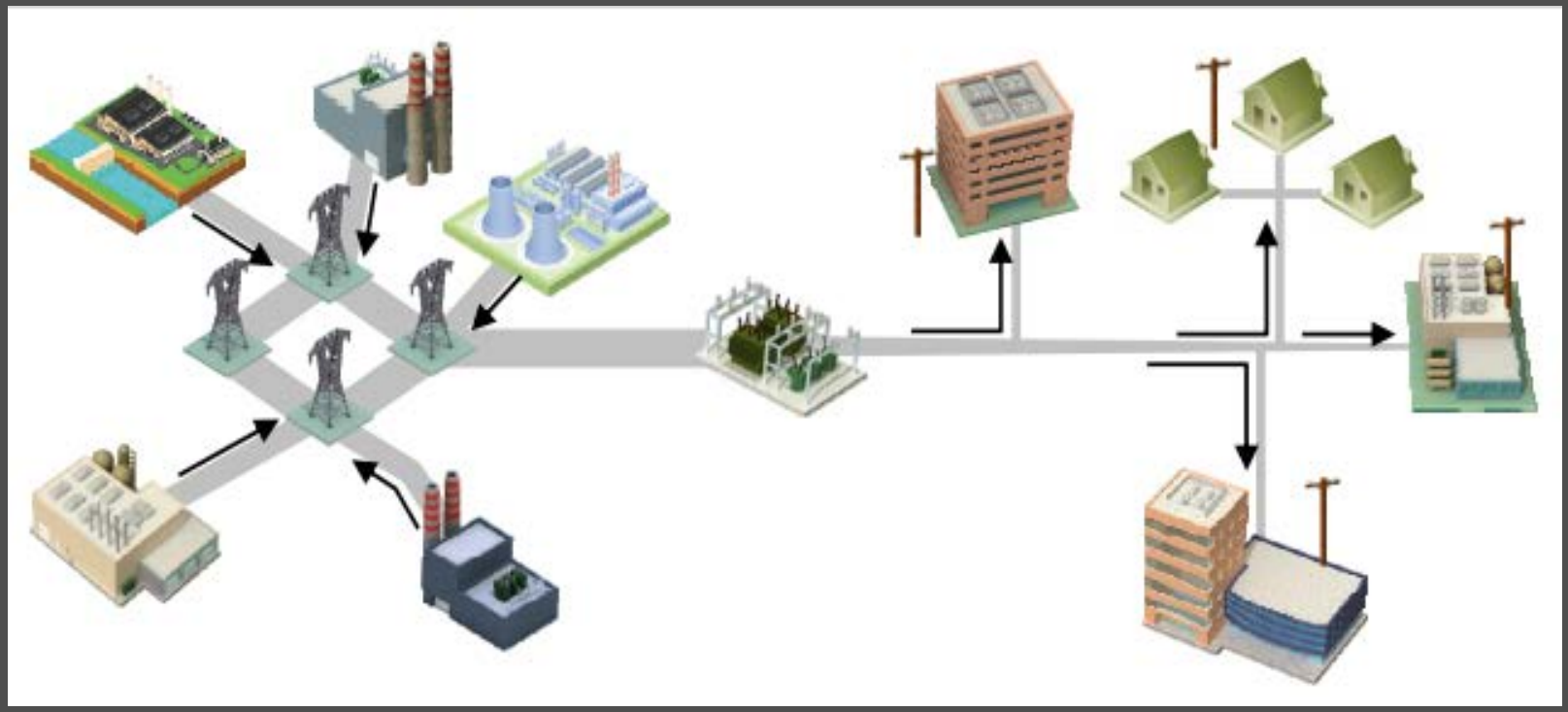


Local Concentrations of EVs

Source: PG&E Smart Grid Presentation to Sac State: http://www.ecs.csus.edu/CASmartGrid/lectures/100630_sacstate_lecture_final.pdf?PHPSESSID=4f997875242dc30b275b33728ca04627

How Does the Grid Work Now?

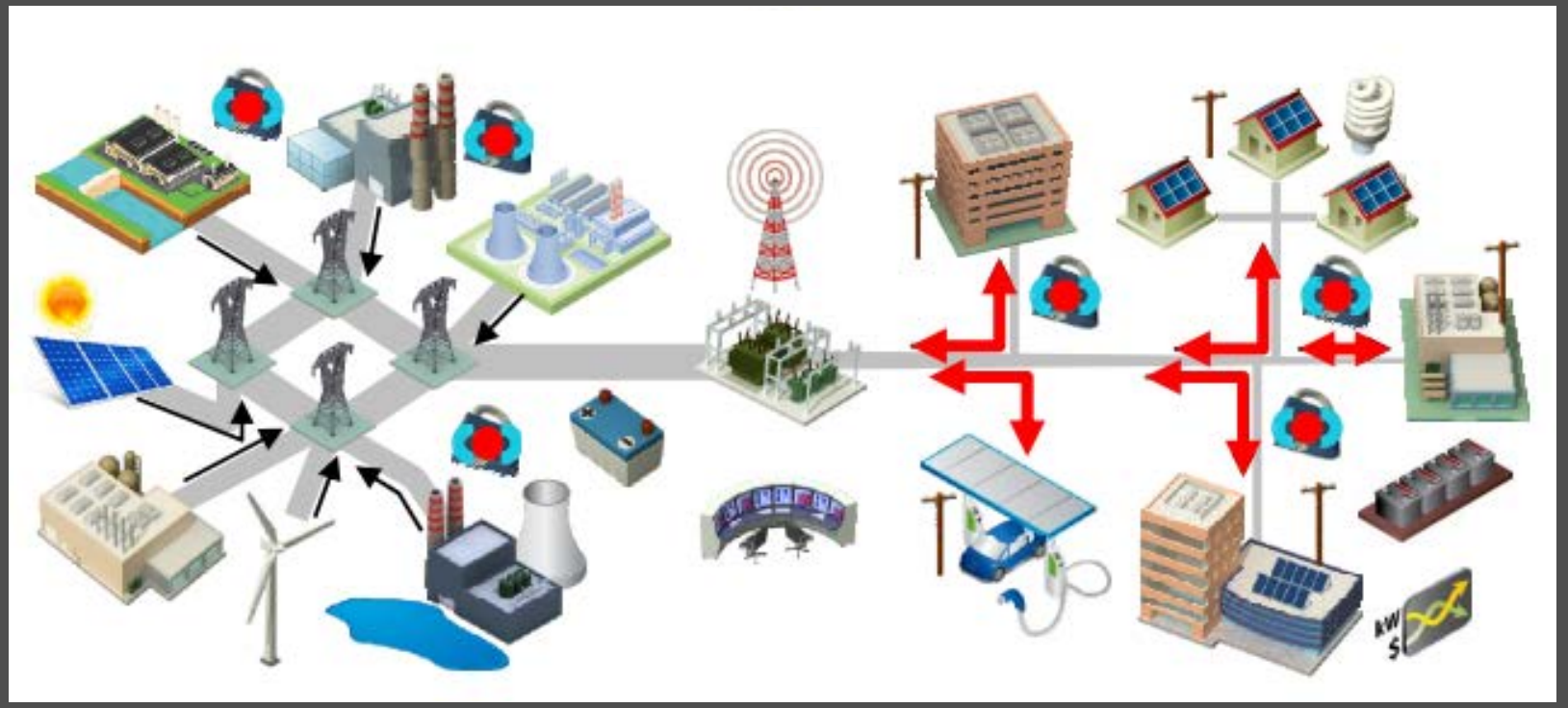
Traditional Power System: A One-Way Process



Source: EPRI 2011

How Does the Smart Grid Work?

Tomorrow's Power System: An Interactive Process



Source: EPRI 2011

Why a Roadmap

- Current industry (structured for stability rather than innovation)
  - Moving from one solution du jour to another without an overall strategy - e.g. energy efficiency vies for attention with:
    - demand-response solutions
    - time-varying rates of various flavors (TOU, CPP, RTP),
    - interoperable systems,
    - storage and
    - numerous other components of a holistic solution.
  - General agreement on the forces pushing for change and that major changes are required.
    - Few coherent implementation strategies being offered: none that have gained general agreement and investment to implement.
  - Mishmash of pilots, public policies and strategic directions without a cohesive discussion or debate.

NWPCC Sixth Power Plan

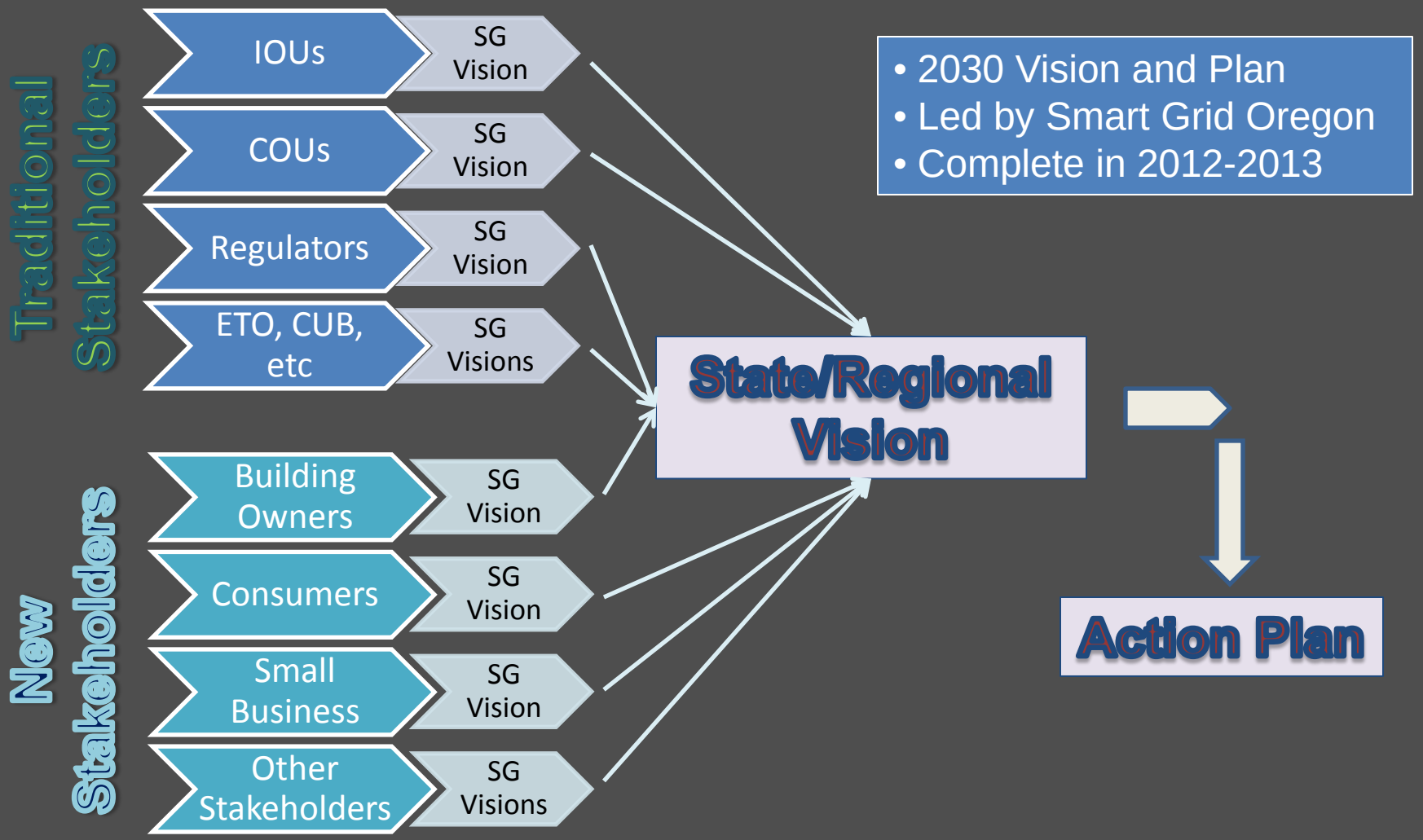
- Electricity load (before accounting for new conservation) is expected to grow by about 7,000 average megawatts between 2009 and 2030…
- residential sector is an anticipated increase in air conditioning and consumer electronics…summer peak electricity use is expected to grow more rapidly than annual energy.
- Sixth Power Plan…resource needs must consider capacity to meet peak load and the flexibility to provide within-hour, load-following, and regulation services…because of the growing amount of variable wind generation located in the region.

What is the "Smart Grid?"

New strategies, communication and information flows, technologies, transaction structures, and control of the electricity system in order to:

- Lower costs and give more choices for consumers
- Improve system reliability and efficiency
- Provide economic development in Oregon

Roadmap Overview



Economic Benefits of Smart Grid

Smart Grid blurs the distinction between resources and loads, opening business opportunities throughout the electricity system, enabling:

- Avoidance of cost increases of electricity in the future that dampen the economy
- Buildings that become resources/storage opportunities, opening new financing options for energy efficiency and building retrofits
- Better integration of renewable power and distributed demand and supply resources
- Attraction of smart grid researchers, service providers, product developers, and investors to Oregon