

# Headline: The “EnergyWeb”: Model for 2010

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Editor’s Note: This article is a visionary--and realistic--assessment of the expanded partnerships that are possible between utilities and energy users. It’s exciting. Bonneville has taken the lead in exploring our energy future, and offers a remarkable guide for the next 10 years.

Early in 1999, Bonneville Power Administration (BPA) executives commissioned a team of employees to come up with new ideas for Renewables and Conservation programs (ReCon) for strategic planning purposes. The team chose to look at the future of the energy industry, to think about how it could change, and how those changes might affect energy users and (consequently) BPA. The team quickly shifted focus from renewables and conservation to technologies and market principles that already are, and will continue to alter, the energy marketplace at levels--wholesale, industrial, commercial, and residential. To keep from bogging down in day-to-day details, the team picked 2010--a point 10 years in the future--as the focus for its vision.

As they conducted industry reconnaissance, the team kept turning up evidence that the power system is starting to move from a centrally planned hierarchy to an “EnergyWeb.” Many of the associated technological advances involve radically more efficient energy use and more use of renewables. Conservation and renewables have therefore become part of the larger subject of the move to an EnergyWeb. Like the Internet, the EnergyWeb is expected to be driven by the choices and contributions of individual energy users. It would offer them many products and transparent product information to consumers in complex, competitive energy markets. Emergence of this user-driven EnergyWeb raises fundamental strategic issues for a central-system wholesale utility:

- How should a utility or energy service company position its power products as the market changes?
- How should a utility fulfill its public duties in a decentralized, consumer-driven industry?
- What vision should reflect the EnergyWeb idea?
- How could a utility structure its capital investment criteria, particularly for long-term investments?

Utilities have a long tradition of applying emerging technological advances to achieve their missions and a history of seeing what can be done and doing it. The results include the high-voltage power, national interconnection, solid state control systems, and fiber optics on our lines today. All these efforts have

improved the quality of life across the world. As a scenario for the future, the EnergyWeb suggests a range of options for how utilities could respond to and participate in this industry shift to fulfill business imperatives and environmental values. The EnergyWeb can mean increased choices for users, happier customers, and a more efficient energy system.

### **The Vision of the EnergyWeb in 2010 (Possible Future Scenario for the Pacific Northwest)**

**It is now the year 2010.** The integrated power system of large powerplants and a regional grid has been supplemented by a wide array of providers of decentralized energy products and services. Central plants and dispatchable small-scale generation, dispatchable demand-side management (DSM), energy storage, energy management control systems, and telecommunications networks are linked in an EnergyWeb that is adaptable, self-regulating, and remarkably stable.

Overall, the EnergyWeb could dramatically increase the following for consumers:

- Choices of energy products and services;
- Choices of integrated energy, communication and other interactive services;
- Control over how their needs are met;
- Efficiency of energy use; and
- Reliability and quality of power.

For utilities, the EnergyWeb also means increased:

- Efficiencies of centralized power facilities;
- Utilization rates of centralized generation and transmission assets.

A single Transco transmits electricity on the grid for the Pacific Northwest region (e.g., purposes). System stability is founded on an adequate, diverse, adaptable supply of power linked by communications and control systems that are transparent to the end-user.

Distributed generation now provides 5 percent of the region's electricity, and most is grid-connected. Net-metering contracts are the norm for owners of distributed generation; power dealers purchase surplus generation.

By 2010, electricity and gas markets have converged. A wide variety of marketers, brokers, independent power producers, and others participate in robust futures and cash markets. Prices are set by the equilibrium between supply and demand across several fuels, mostly gas and electricity. The number of energy-related decisions (bilateral sales, load interruptions, consumer sales to the grid of peak load reduction, and so on) is three orders of magnitude greater compared to those in 1999. There are some very large players in the EnergyWeb, resulting from the national trend toward consolidation. But there are also many small niche public utilities and many providers of a wide range of specialized products and services.

Energy users can control how their power needs are met, if they so choose. The typical consumer now sees energy, communication, and other interactive services as an integrated set. Users can create their own power supply over the Internet, just as they can order a computer built to their own specifications. Real net energy costs are lower than in 1999. Environmental attributes are components of energy commodities. Green power is traded much as emissions trading was, back in the 1990's.

Centralized power generation has been "tweaked" to optimize output value. Efficiencies are up, monitoring of performance is improved, and controls are effective. This improved performance is in part due to a richer set of price signals that reflect many types of opportunity costs (e.g., transmission congestion).

A fifth of the growth in the Northwest region's power supply since 1999 has come from sources that do not use carbon-based fuels. One-third of the growth in distributed generation has been fuel cells. Technological and market changes have also made it possible to reconfigure use of the Northwest's hydroelectric resources to support fish and wildlife needs, without driving up power costs. The base for a sustainable environmental and energy future for the region is in place.

## **The Utility's Role in EnergyWeb 2010**

In the year 2010, the utility will have been the most significant single institution in developing the nation's new EnergyWeb. In advocating and acting to develop the Web, the utility itself has been transformed into two entities.

- Powerco – Generation
- Transco - Transmission

### ***Powerco 2010***

#### *Building the Energy Web*

Powerco has been active in setting new standards for how the energy grid functions. It has helped form the new, more diverse market that goes far beyond bulk wholesale and retail power. New products and services abound, and are actively marketed through the utility's distribution channels--its customers. These services include premium power and interruptible power, both of which reflect customer value.

#### *Technology Investment*

By investing over the past 10 years in technologies that enhance its power production and sales systems, the Powerco has boosted its competitiveness. Powerco has participated in development of control and communication technologies necessary for the EnergyWeb. These include improved monitoring of generators, new-generation diagnostic tools, new marketing tools (e.g., trading floor technologies), and improved communications with suppliers and customers.

### *Environmental Focus*

Powerco has embraced environmentally friendly power production (e.g., renewables) in its resource mix and has advocated increased efficiency in power production and consumption. The proportion of the utility's power provided by Powerco has decreased since the turn of the century, but the value of that power has increased in relation to all other sources of power in the region. The inherent advantages of Powerco's reliability still cannot be matched by any other resource.

### **Transco 2010**

Transco's role in the EnergyWeb is based on actively applying new technical concepts to EnergyWeb development, participating in developing national and regional interconnection standards.

### *Building the Energy Web*

Transco, along with Powerco, has provided the principal analytic capability to test new concepts of system stability and control. It has also provided technical support to independent power producers, distribution companies, and energy service companies that affect the quality of power products and services.

Transco has been extremely active in working with Institute of Electrical and Electronic Engineers and Electric Power Research Institute to develop standards for interconnection, communication, and control of power resources that connect to the EnergyWeb (even at the remotest points at the distribution level where interconnection may occur) to ensure overall system quality.

The Transco adopted policies that encourage diversity in energy resources, including access to the EnergyWeb by intermittent, small-scale resources and dispatchable DSM. The resulting web is robust, environmentally sustainable, and provides more end-user choice than was the case back in 1999.

### *Technology Investment*

Transco has adapted its internal systems so that can flex readily to meet changing demands. It has helped develop/has invested in technology that gives it the flexibility it needs, in areas such as diagnostics, telecommunications, and analysis of large, complex systems and controls.

## *Environmental Focus*

Transco has distinguished itself by its attention to environmental values, which have additionally given it a competitive advantage as the industry evolved. Internal operations are at the leading edge of industry practice. Minimum requirements are exceeded. All actions are assessed in terms of their environmental costs and benefits.

Transco's policies and practices enable and support renewable and other non-conventional technologies in the open, competitive market. Rates, terms, and conditions of transmission service are models for the world in terms of their support for renewable resources and environmentally friendly power.

## **The Foundations for Actions**

"Looking back" from 2010, it is clear that the utility consciously chose to help develop the EnergyWeb. Specifically, it chose to lead in the following areas:

- Developing and applying new energy technologies such as fuel cells, diagnostics, controls and related ideas.
- Hard-wiring the system with information and control technologies.
- Promoting energy efficiency.
- Embracing an increasingly environmentally friendly power supply.

The utility chose this direction because it saw it could **help their customers** to reflect values and expectations, to survive, and to capture opportunities, as follows:

- **Reflecting user values and expectations:**
  - Increase the value of the regional economy.
  - Foster green, renewable, energy-efficient resources and a healthy environment.
  - Foster independent, self-sufficient communities and individuals.
  - Help new, environmentally sound industries thrive.
  - Increase opportunities for businesses and residents to live and work in energy-efficient, environmentally sustainable ways, while retaining comfort and reducing costs.

- Fill the gap in conservation/renewable funding during industry restructuring.
- Meet expectations that the utility will actively participate in solving energy system problems where it has responsibility (e.g., keep the lights on in hot or cold snaps).
- **Surviving**
  - Anticipate and shape the transformation to the integrated EnergyWeb, rather than react to it too late.
  - Avoid potential capital investments that might be unneeded before amortization is complete, and hence avoid any “stranded” costs; in other words, consider a wide-range of alternative actions.
  - Help customers avoid load loss; develop new business lines as industry changes.
  - Avoid obsolescence of products. Transform existing products for emerging markets.
- **Capturing Opportunities**
  - Provide new products and services.
  - Reduce costs of serving customers.
  - Leverage small funding into revenue streams to fund conservation or renewables.
  - Build customer relationships, new business partnerships with customers. Fulfill customer requests.
  - Build new positive relationships with various interest groups

## **The Utility Role**

The utility will help lead development of the integrated EnergyWeb to benefit the public:

- Utilities are well-connected electrically and in relationships with customers and constituents.
- Utilities are a valued distribution channel.
- Utilities can address issues such as regulatory concerns on the national stage and demonstrate solutions in partnership with customers or constituents.

- EnergyWeb development offers opportunities to strengthen the utility's relationships with user-customers as they explore new ways to serve consumers in a deregulated industry.
- Utilities can speak authoritatively on national issues, including the technological effects of regulatory choices for connecting distributed power sources to the grid. Department of Energy (DOE) has taken up the cause of distributed generation and combined-heat-and-power in the 1999 version of its national energy legislation.
- Utilities know how to bring big ideas to fruition, technically and politically. Historically, utilities have been among the first to apply new technical concepts, usually on a much larger scale than anyone else has.

However, this transformation is not a guaranteed outcome. Instead of the stunning success that provides widespread benefits, an alternate future could arise, in which standards for interconnection are not robust enough to ensure that the system as a whole functions well. Success is *not* automatic with complex systems like this. Reliability can be compromised, and the cost of reliable power can rise. Environmental consequences can be exacerbated.

Success depends on concerted utility effort. Utilities are in a good position to help realize an integrated EnergyWeb that is truly functional and brings widespread benefits. Just as utilities led development of the region's transmission network and interconnections with other regions, Transco and Powerco could play a similar role in developing the new EnergyWeb.

### **A Lighter Environmental Footprint**

Increasingly, utilities are looking to ways to help users by producing reliable power, and by "walking more lightly" on the interdependent natural resources of the earth. This is a wise and respected move. Utilities should live by an ethic that respects the value of the natural environment for its own sake and for the sake of future generations. Active support for building the EnergyWeb is consistent with this ethic and will strengthen a utility's position as a renewable resource utility. There is a natural alliance between environmental interests and EnergyWeb development.

The EnergyWeb will not consist of all renewable power sources. Natural gas-driven microturbines and fuel cells or propane driven reciprocating engines are market contenders. But even the fossil-fueled generators will be more efficient. Much end-use generation allows secondary use of waste heat, which is best captured in energy-efficient systems design. If a utility wishes actively to pursue leadership in building the EnergyWeb, its leadership position will be strengthened by upholding an environmental ethic throughout its operations.

A utility can also use its transmission rates to encourage preferred environmental practices. The utility could send price signals to encourage the development and operation of generation close to load centers and the further development of renewables. The utility could set rates to encourage DSM and offer price breaks for low-impact generation.

## **Show Me the Money**

EnergyWeb development is a broad-based set of business and value-added opportunities. The utility would use its business and financial criteria to evaluate EnergyWeb 2010 projects against other business opportunities and solutions. Some areas, such as research and development, require funding upfront, even though they may create revenue downstream.

**Market Advantage:** Green Power can produce a premium for power certified as preferred. There are many potential market advantages in making Powercos and Transcos greener and more efficient.

**Cost-Effective Solutions:** Considering DSM, small generation, and improved transmission/distribution technologies can solve congestion problems for lower economic and environmental costs than building a line.

**Solution Auctions:** Sacramento Municipal Utility District (SMUD) has a Request for Proposals out for distributed generation solutions as an alternative to line construction.

Pacific Gas & Electric (PG&E) is auctioning solutions to some of its problems. This has the added advantage of keeping PG&E ahead on the latest technologies and their costs, which it could then apply in other situations.

**Leveraged Co-Funding:** Utilities can take advantage of co-funding from the DOE to implement fuel cell solutions for customers.

**Value-Added Partnerships:** Columbia Storage Power Exchange (CSPE) was set up as a non-profit corporation, with shares providing value to customer utilities. CSPE funds paid for construction of Columbia River Treaty dams--which doubled Columbia River system storage for power and flood control. BPA administered power distributed to CSPE members.

**Patent License Fees:** Utilities invented much of the high-voltage technology generally used today. Utilities could, in the future, charge license fees for use of their patented technology to recoup technology development investments.

**Test-Bed:** Utilities can serve as the test site for externally funded technology development projects.

## **The EnergyWeb 2010 Strategic Plan**

This section suggests goals and actions to reach those goals for the EnergyWeb 2010.

### **Vision**

By 2010:

- The US energy system has been transformed into an interactive, consumer-driven, integrated EnergyWeb that works well and connects users to a wide choice of products and services.
- Users, producers, and suppliers are pleased with how it works.
- The EnergyWeb has fostered stable, low energy costs for all segments of society and provides a wide variety of services that users value. For example, it features a higher proportion of renewable and environmentally preferred energy sources.
- The energy system now produces fewer environmental impacts and is environmentally sound.

### **Strategy Statement**

Utilities will be active players in causing the EnergyWeb 2010 to come about in an environmentally responsible way.

### **Suggested Goals**

1. Enhance the natural environment.
2. Enhance the nation's power system for the shareholders and public's benefit.
3. Lead the creation of the physical/electronic integrated EnergyWeb.
4. Lead the creation of market structures/elements that support the Web.
5. Market, to the emerging EnergyWeb, a set of products and services that meet consumer, producer, and supplier needs.
6. Be an active partner in the creation and deployment of new technologies that serve the EnergyWeb and the environment.
7. Provide outreach and advocacy for the broad public interest in creation of the EnergyWeb.
8. Provide broad environmental leadership for the country.

## Roles in Working toward [EnergyWeb 2010](#)

The table on the next page shows areas for action and roles a utility should/may take in developing and benefiting from the EnergyWeb.

<u>Role</u>	<u>Description</u>
<b>Build Infrastructure</b>	Advance the emerging EnergyWeb through market transformation and development of the Web's physical and electronic infrastructure.
<b>Market to the New EnergyWeb</b>	<p>Develop an ever-increasing array of products and services to sell into the changing market.</p> <p><i>Examples:</i></p> <ul style="list-style-type: none"> <li>• <b>Powerco</b> helps build a Green Power Market and actively participates in it for profit and the benefits it brings to the utility.</li> <li>• <b>Transco</b> provides products and services that reflect increasing sophistication and diversity in how powerflows, is produced, is marketed, and managed.</li> </ul>
<b>Partner in Technological Innovation</b>	<p>Identify leverage points in new technologies and practices that contribute to development of the new more efficient, environmentally friendly EnergyWeb. (Technologies relate to the production, transmission, distribution, control, marketing, and use of energy.)</p> <p>Enter into business with partners to advance and exploit new technologies, both hardware and software, that the market resists providing. (Partnering provides financial leverage and risk reduction.)</p>
<b>Advocacy</b>	<p>At all levels, advocate the development of the new EnergyWeb, based on environmental enhancement, consumer empowerment, and energy efficiency principles.</p> <p>Target new forums regionally, nationally, and internationally. Advocacy requires both discussion <b>and</b> credible action. Since those actions would probably cost ratepayers, they need to be seen as legitimate.</p>

<b><u>Role</u></b>	<b><u>Description</u></b>
<b>Leading in Operations</b>	Conduct business with an active awareness of environmental impacts and enhancement opportunities, e.g., recycling, equipment, public health and safety, aesthetics.

## **Building Infrastructure**

### *Near-Term:*

- Assess potential role in creating the network features of the EnergyWeb.
- Assess potential role in creating market mechanisms that support the EnergyWeb.

### *Medium-Term:*

- Accept communication protocols and interconnection standards in the region for broad application in linking distributed generation, major loads, dispatchable DSM, and other elements of the EnergyWeb.

### *Long-Term:*

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## **Market to the EnergyWeb**

### *Near-Term:*

- Assess potential products and services that address the EnergyWeb.

### *Medium-Term:*

- Expand range of products and services and establish rates that meet the needs of the EnergyWeb.

## **Partner in Technological Innovation**

### *Near-Term:*

- Business-driven technology strategies in place

*Medium-Term:*

- Make available in the service area (in just five years) distributed generation for (*target goal*) cents a kilowatt-hour, at 80+ percent efficiency.

**Advocacy**

*Near-Term:*

- Ensure that regulators, energy agencies, and energy users understand the EnergyWeb and its value to them.

**Outreach**

*Near-Term:*

- Educate users to the value of the Energy Web.

**Lead in Operations**

- Set operational standards that promote implementation of the EnergyWeb.

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