"Welcome to the Future"

Planning and Engineering for a More Reliable, Clean and Affordable Western Grid

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NW Energy Coalition

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NW Energy Coalition

The NW Energy Coalition is an alliance of about 100 environmental, civic, and human service organizations, progressive utilities, and businesses in Oregon, Washington, Idaho, Montana and British Columbia.

We promote development of renewable energy and energy conservation, consumer protection, low-income energy assistance, and fish and wildlife restoration on the Columbia and Snake rivers.

NW Energy Coalition

- Formed in 1981
- Operates in WA, OR, ID, MT and BC
- 3 Offices, 12 Staff – Seattle, Portland, Helena
- 110 Organization Members:
  Environmental, Community, Labor, Utilities
- Several hundred individual members
- Executive Director – Nancy Hirsh
- Board Chair – Ben Otto, Idaho Conservation League
- Spring and Fall conferences
  next: November 2, 2017 – Seattle Hilton

The NW Energy Coalition and its members advocate a clean and affordable energy future for the region based on:

- Meeting all new energy demand with energy efficiency and new renewable resources
- Full and fair accounting for the environmental effects of energy decisions
- Protecting and restoring the fish and wildlife of the Columbia River Basin
- Consumer and low-income protection
- Informed public involvement in building a clean and affordable energy future

Advocacy Organizations

- So many to choose from! – nobody speaks for everybody
- Consumer, environmental, promotional (technology, trade association)
- Structure: informal to network to formal/bureaucratic
- Functional focus: campaigning, institutional, analytical
- Time horizon: near term to very long
- Traditional focus on policy choice and investment decisions …
- Not on implementation and operations (e.g. reliability)

Where does the future come from?

- Existing system + technology, policy, markets
- Current and future needs and gaps
- Complex interaction of utilities, third party suppliers (IPPs, etc.), advocacy organizations, consumers, state and federal regulators, legislatures, governors, federal government
- Also: researchers, media, …
- *Hint:* who is usually not strongly involved …

Example #1: Energy Efficiency

- A transformative and highly successful policy
- Two channels: programs and codes/standards
- Cheapest, cleanest, fastest electric resource
- “The low hanging fruit that grows back” – technology innovation
- Energy and capacity benefits
- Slow and complex but substantial accomplishments
- Alignment issues with cost of service rates and current utility business model (addressable with decoupling)

Example #2: Renewable Portfolio Standard

- A transformative and highly successful policy -- with some limitations
- Top-down (state legislative or initiative) policy
- Measurably and predictably changing the resource mix
- Energy-only policy (not explicitly including capacity and balancing)
- Operational challenges (interconnection, integration, balancing, forecasting)

OK, so where do we go from here?

- Big changes ahead . . .
- Deep energy efficiency
- Flexible demand (storage, power electronics)
- Economies of scale/experience for renewable energy
- 2nd generation clean energy policy – e.g. Oregon and California advanced RPS
- Climate change/impacts

So let's go back to basics . . .

Characteristics of the electric power system

- Conversion of dispersed energy resources into concentrated electric energy flow
- Constrained by laws of electricity
- Not consumed directly
- Essential service in a technological society
- Embedded in the economy
- Guided by public policy
- Production-consumption balance in realtime (currently)

Four major sectors

- Generation (a/k/a supply)
- Transmission
- Distribution
- Consumption (a/k/a demand)

All 4 elements play an active role in the system

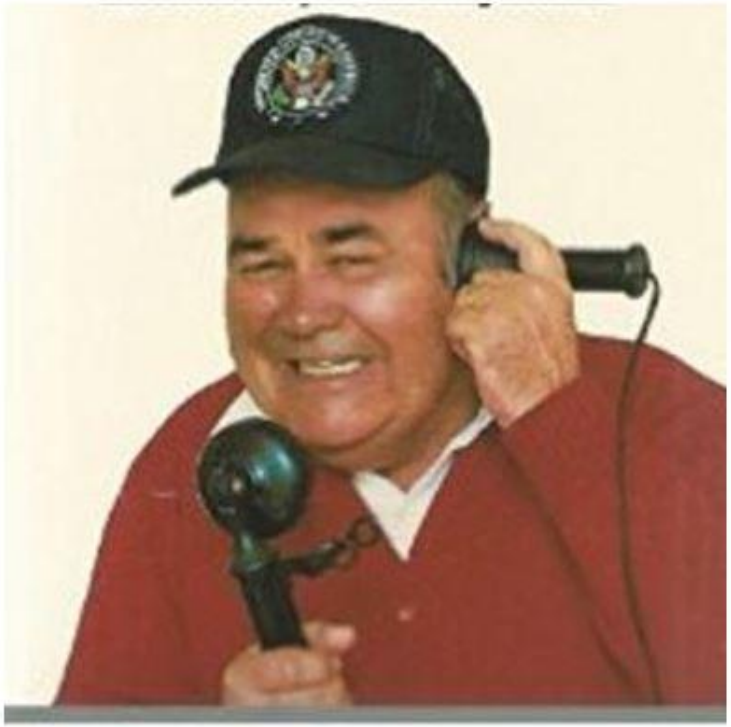
Industry structure/history

- Punctuated equilibrium – "solution eras" where each solution creates new problems
- 1890-1920 free market ("ruinous competition")
- 1920-1935 state regulation (interstate electric trusts and corruption)
- 1935-1992 New Deal federalism (strict state-federal separation, stability -> stagnation)
- 1992-2001 price and ownership deregulation
- 2001- cooperative federalism, mixed/transitional structure
- The future … ? *(it's up to us)*

A Vision for the Future of the Electric Sector

- More Reliable
- Clean
- Affordable

Is this a “3-body problem”?



You want it fast, cheap and good?
Pick two and call me back!

More Reliable

- "Keeping the lights on" - more than a slogan
- Intentional at every level and time scale
- Always involves tradeoffs
- An evolving perspective in the “resilience era”
- External drivers (climate, cyber, physical)

Clean

- Traditional focus of environmental groups
- "Pollution" (air, water) from generators
- Increasingly about land, habitat and climate (local to global)
- Expanding focus: from stack emissions to life cycle impacts

Affordable

- Traditional focus of consumer groups
- Lowest direct cost
- Equity in focus (low-income, disadvantaged communities, environmental and climate justice)

Fields of Play:

Technology, Policy, Markets

Technology Innovation

- Chemical (from the galvanic cell to the flow battery)
- Mechanical (pistons, rotors, switches, relays, …)
- Electrical
- Solid state/electronic

Policy

- Incentives
- Constraints / regulation
- Allocation of costs and benefits

Markets

- "There is more than one way to do it"

Engineering Perspective*

- Evidence
- Rules
- Tradeoffs

**according to me, a non-engineer*

Changing the Development Paradigm*

- Sequential (waterfall process)
- Iterative (project life cycle)
- Systemic (adaptive management)

**according to me, a software developer*

Next Steps

- Coordination across silos/sandboxes
- Generation – transmission – distribution – demand
- All become more flexible
- Basic engineering – functional separation, loose coupling, efficient coordination
- Centralizing everything doesn't work well (Insull, RTO)
- Decentralizing everything doesn't work well
- Adaptive management (“learning under uncertainty”) is about finding the right balance

Focus Areas

- Time-shifting generation toward demand (hydro, battery and thermal storage)
- Rapidly developing flexible load
- Dynamic grid operation and security (flow based management, DLR, transmission-distribution coordination, broadening ancillary service base)

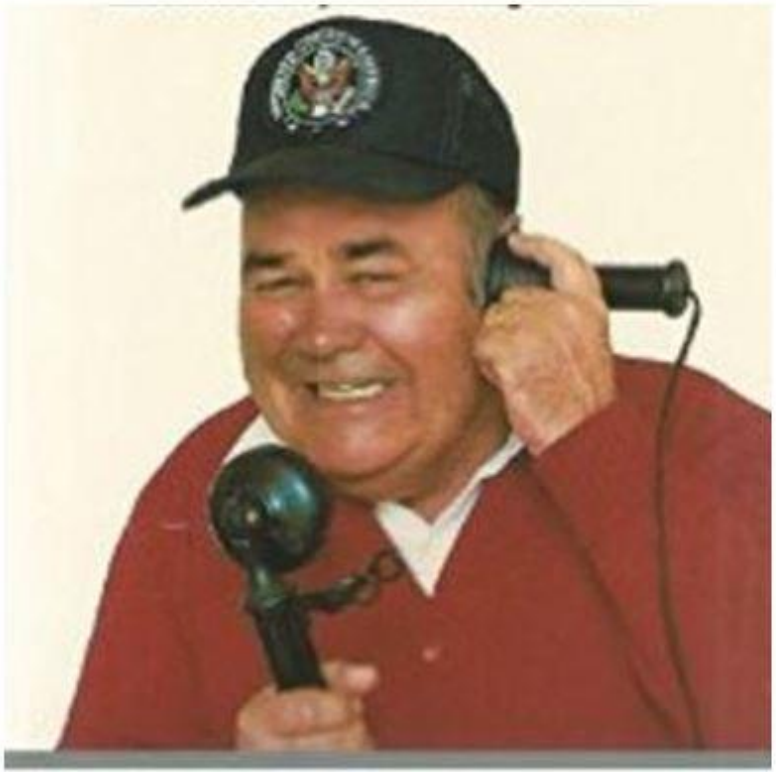
Creating the future

- Desired state: a more reliable, clean and affordable western grid
- We are moving toward intentionally coordinated and co-optimized planning and operations

Regional coordination is the low hanging fruit.

-- Arne Olsen, E3

Thank you for your attention!



You want it more reliable, clean and affordable?

Let's go with that!