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Chair
Montana

Rhonda Whiting
Montana

W. Bill Booth
Idaho

James A. Yost
Idaho



Dick Wallace
Vice-Chair
Washington

Tom Karier
Washington

Bill Bradbury
Oregon

Joan M. Dukes
Oregon

March 25, 2011

MEMORANDUM

TO: Council Members

FROM: Terry Morlan

SUBJECT: Presentation by Steve Klein, General Manager of Snohomish County PUD

Snohomish PUD is the second largest publicly-owned utility in the Pacific Northwest and Bonneville's largest customer utility based on their 2010 high water mark load. Steve Klein, the General Manager of Snohomish PUD will brief the Council on their planning and resource activities. "SnoPUD" has been a leader in the region for energy efficiency and renewable resource development and is justifiably proud of its accomplishments.

In addition to significant efficiency improvements, SnoPUD is involved in small hydro, biomass, landfill gas, wind, geothermal, solar, and tidal power development. Their experiences in these areas should be of great interest to the Council. A brief summary of their activities and accomplishments is available at the following link below. A copy also is attached.

<http://www.snopud.com/AboutUs/Leadership/gm/conrenew.ashx?p=1859>

Attachment

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Snohomish County Public Utility District No. 1

Snohomish PUD and Our Conservation & Renewable Resources

By PUD General Manager Steve Klein

At Snohomish PUD, we are excited about the work we're doing on energy efficiency and developing renewable power resources. Environmental and social justice stewardship principles guide our strategies and goals. It is important to us to represent the best interests of the community we serve, and we have strategically chosen to focus on being a world-class organization when it comes to the development of conservation and renewable energy. It is also our desire to develop these programs to the extent possible within our own service territory. By doing so, we can better determine and guide our own destiny and provide economic development and jobs within our own community -- as well as work with local educational institutions to inspire and educate the youth as to the benefits and opportunities in clean energy. We have additionally challenged ourselves to avoid the addition of fossil-fuel-based resources, including natural gas, even though the addition of variable production resources (such as wind) are driving other utilities in the Northwest to add substantially more gas plants.

When you look at Snohomish PUD's resource portfolio, you will find a diverse mix of current and future power sources:

- wind generation (as a percentage of resources in our portfolio, it is more than any other Washington state utility);
- the most innovative and aggressive local-distributed, customer-focused solar program (Solar Express) in the Northwest;
- several local biomass/ cogeneration (both current and future);
- biogas – landfill gas;
- development of tidal energy (we could be installing the first utility-scale turbines in the United States in the year 2013);
- extensive study of the geothermal resource in Snohomish County, culminating in the drilling of five exploratory holes this past summer;
- potential purchase of a utility-scale solar project that will generate more power than our current portfolio of low-impact hydro projects;
- our conservation programs are second to none; this past year we exceeded our goals and captured more than our share of the region's conservation goal; and
- our Energy Challenge Program asked our customers to reduce their energy consumption by 10 percent over a period of three years; in just the first year, PUD employees were successful in reducing our own facility consumption by 7 percent, which further demonstrated that we truly "walk the talk!"

In particular, I'd like to talk a little more on our small hydro projects. Our small portfolio of "low-impact" hydro projects are, in fact, low-impact because, unlike some other projects, our projects do not limit or block sediment transport, do not change the temperature, do not dry up stretches of the river, are above natural impassible barriers so as to not impact anadromous fish migration, and do not negatively impact water

quality. We will also not even consider a site that has endangered species issues whether they be migratory or resident species (such as salmon or bull trout).

The facts of our low-impact hydro projects are as follows:

- **Dam size:** None of the small hydro intake facilities we are working on are huge in scope. Youngs Creek is 12' high and about 65' wide, and Woods Creek is only 5' high and maybe 25' across. Both Hancock and Calligan would have intakes similar to Youngs. Inundation area is less than a quarter-acre for Youngs, Hancock and Calligan.
- **River flow:** The powerhouse in a run-of-the-river project is sized based on a statistical review of the basin hydrology. On the high end, the project is not sized to capture all of the high or peak flow events, and, because there is no reservoir, a significant portion of these flows bypass the project. This leaves the habitat formation and maintenance processes of sediment and wood transport largely intact. The diversions are designed to be overtopped several times annually, allowing sediment passage and channel formation processes. Conversely, on the low end of the hydrograph during summer, the project cannot operate at all because of the hydrology, and the water is simply passed downstream, often for several months. Run-of-the-river projects do not dry up rivers below the intake. In fact, much scientific study is involved to determine a minimum flow between the intake and powerhouse to support local fisheries, and these flows must be approved by various federal agencies.
- **ESA listed fisheries:** All of our projects do not impact ESA listed species. ESA listed resident fish species (like bull trout) are not present, and all the projects under consideration are above an impassible barrier to anadromous fish. Local trout populations are not endangered and are monitored annually for a potential project-related impact. The seasonal minimum flows required of these projects are set to protect and preserve the habitat requirements of the local fish populations.
- **Water Quality and Temperature:** The run-of-the-river projects we are developing will not affect water temperature or adversely impact water quality.
- **Transmission Lines:** We have selected projects with relatively short transmission lines, and most will be buried underground. For Youngs Creek, the only overhead portion was an overbuild over an existing overhead distribution line.
- **Deforestation:** While Youngs Creek did require cutting some trees at the intake, the entire site is under one acre, and there was not enough cut trees to even take a load to the mill. Most was used by workers for firewood. Also, we were able to support our upcoming river enhancement projects on the Sultan River, but setting aside 11 of the larger trees with the root balls intact.
- **Local Workforce:** Most of the workers on Youngs Creek come from the four-county area. In a discussion with Mayor Eslick of Sultan, she indicated the construction had really helped the local economy. In addition, a large share of the components were domestically produced, and the Youngs Creek project provides Snohomish County with well over \$1 million in sales tax revenue.
- **Other Issues:** Our projects were screened to not include projects in old-growth forests, federally designated wilderness areas or wild and scenic river corridors.

There is literally nothing one can do that does not impact the environment in some way so it becomes a matter of making those impacts the least they can be. Every project that Snohomish PUD has underway, no matter how many kudos we receive, has opposition from some individual or group. When you are in a business that must build and maintain things to provide a necessary public service, the best you can do is listen to everyone, take all constructive input seriously and ultimately make balanced decisions based on sound moral and ethical principles that respect both the people and the environment.

CUSTOMER SERVICE (8AM - 5:30PM): **425-783-1000**

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Northwest Power & Conservation Council Meeting

April 12, 2011

**Presentation by
Steve Klein – General Manager
Craig Collar – Sr. Mgr. Energy Resource Development
Snohomish PUD**

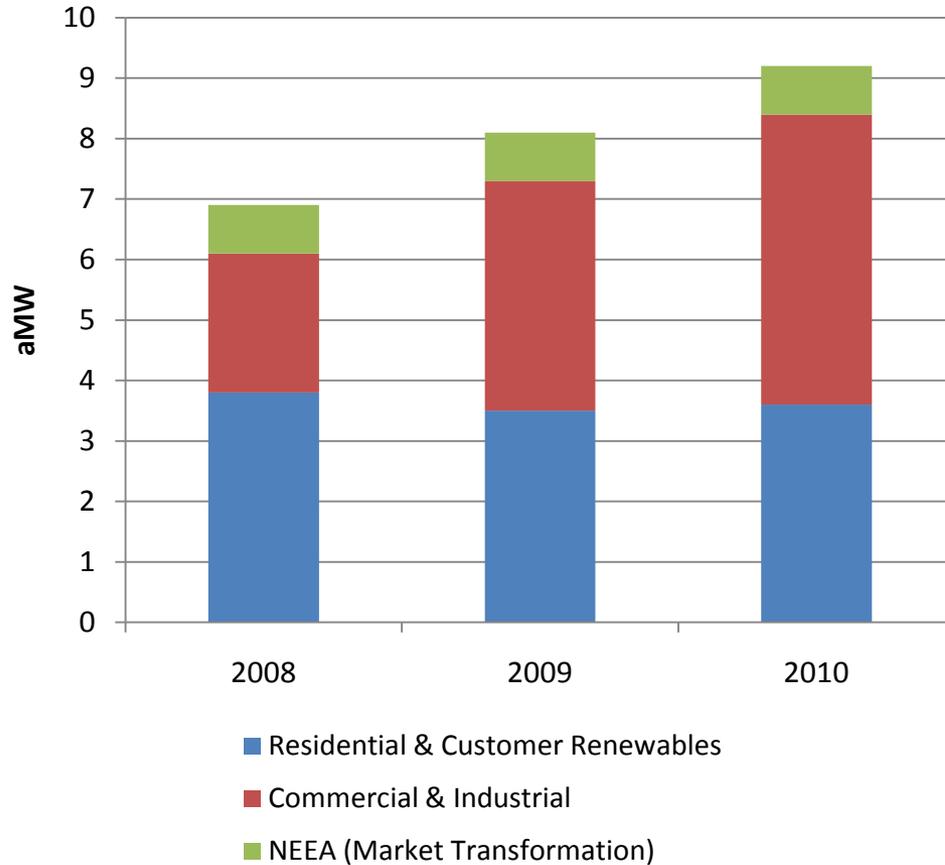
SnoPUD Quick Facts

- 2,200 square mile service territory
- Annual Budget of \$3/4 billion
- 320,000 customers
- One of fastest growing in the northwest
- Begin operations as an electric utility on September 1, 1949
- BPA's largest customer (11.3 percent)
- Peak load 1,600 megawatts

Overall Strategy Snapshot

- Conservation is number one
- Pursuing a diverse mix of renewables with emphasis in our own backyard
- No fossil fuel resources in our portfolio and don't intend to add any, including natural gas
- A national leader in the research and development of new renewables such as tidal and geothermal as well as energy storage technologies & applications
- Smart Grid emphasis first on modernizing grid electric grid to capture efficiencies and accommodate more distributed generation and electric vehicles. Add smart meters when applications abound that customers really desire and business case justifies

2010 - Another Record Year



	2008	2009	2010
Residential & Customer Renewables	3.8	3.5	3.6
Commercial & Industrial	2.3	3.8	4.8
NEEA (Market Transformation)	0.8	0.8	0.8
Total	6.9	8.1	9.2

New Renewables in Our Portfolio

- Wind
- Low Impact / Small Hydro
- Biomass / Dairy – Digester/ Landfill Gas
- Solar



Wind Energy

- Wind is a utility-scale renewable that is commercially available immediately
- Our power supply portfolio went from 0 to 8 percent wind in less than two years
- Three Projects totaling 217 MW in the Columbia Gorge
- Long-term staggered PPA's versus direct immediate ownership



Low Impact / Small Hydro

- Located in areas without anadromous salmon or other ESA listed populations
- Avoids inundation of wildlife habitat
- Run of river
- Projects
 - Woods Creek
 - Packwood
 - Youngs Creek
 - Others under study



Rucker Hill Hydroelectric Project

- 700kW (up to 525 homes) of clean renewable energy by adding turbine/generator to capture wasted energy from Everett's water supply pipe
- No environmental/fish issues
- Received \$154K grant from State Department of Commerce



Biomass/Dairy-Digester/Landfill Gas

- Established Projects
 - Kimberly Clark (paper processing pulp and wood waste)
 - Hampton Lumber (wood waste)
 - Klickitat landfill gas
 - Monroe dairy waste digester
- Projects under discussion
 - Food waste
 - Yard waste
 - Additional dairy manure

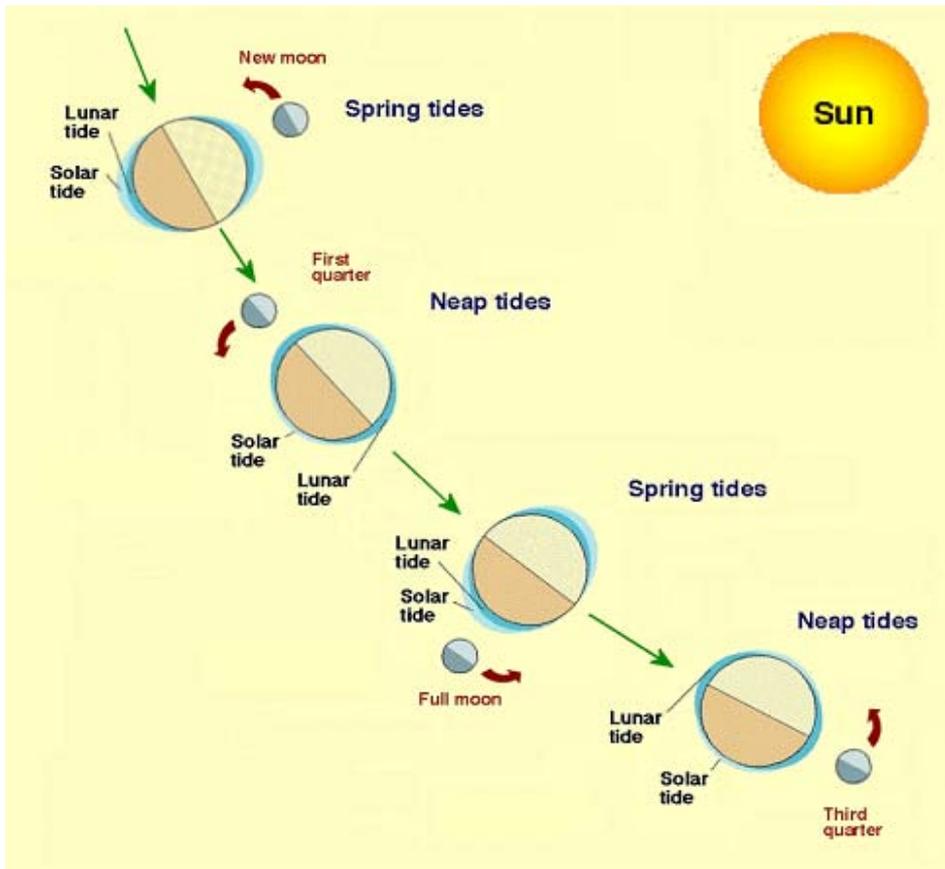


PUD Solar Energy Initiatives

- \$1 million/year program to promote customer-owned solar energy uses
- Loans and cash incentives:
 - Solar photovoltaics
 - Solar water heaters
- Education, demonstration projects, local partners, and economic development



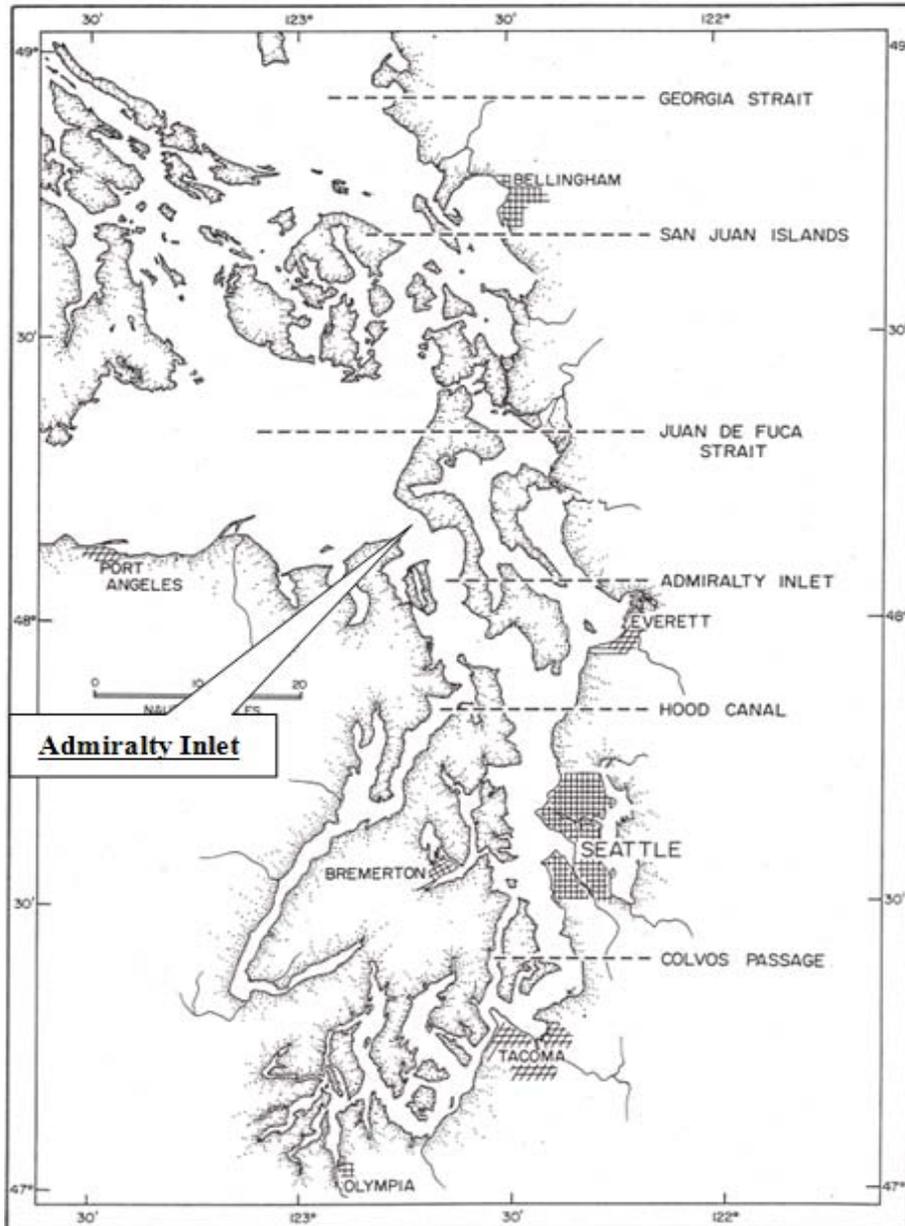
Tidal Energy



- Renewable
 - Meets I-937 requirements
- Clean
 - Zero emissions
- Predictable
 - Easier to integrate
- Close to load
 - Ease transmission constraints
 - Fewer energy losses

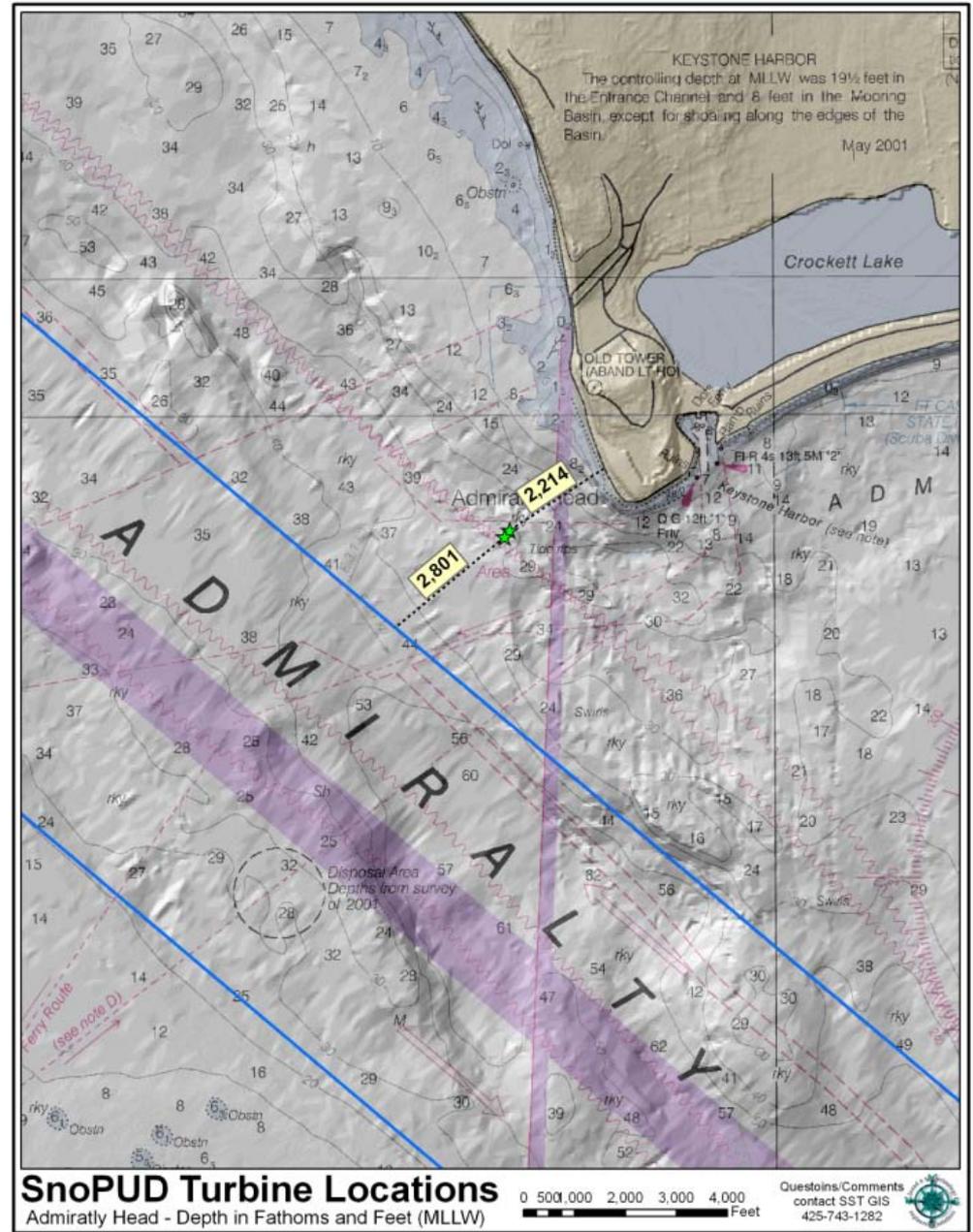
Tidal Energy Exploration Approach

- Develop and evaluate a small scale, temporary, grid connected pilot plant at Admiralty Inlet
- Objective is to generate scientific data to better evaluate the feasibility of tidal energy as well as the associated risks and benefits



Admiralty Inlet Siting

- Adequate tidal current regime
- Commercial waterway (Puget Sound Harbor Safety Committee has no objections to the project)
- Suitable depth/bathymetry
- Adequate grid interconnection options
- Very large site
- Over 100 meetings and presentations with 50+ different stakeholder groups during the past 3 years
- No “showstoppers” identified in over three years of study and outreach

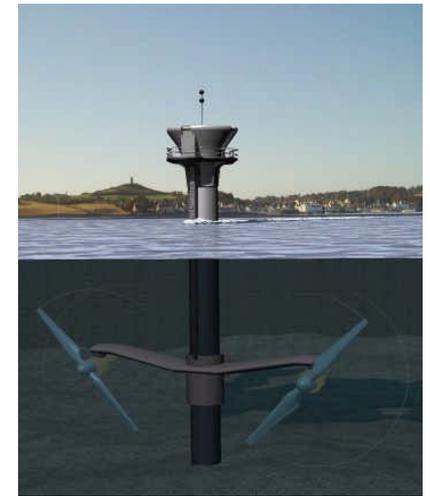




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Verdant Power – U.S.

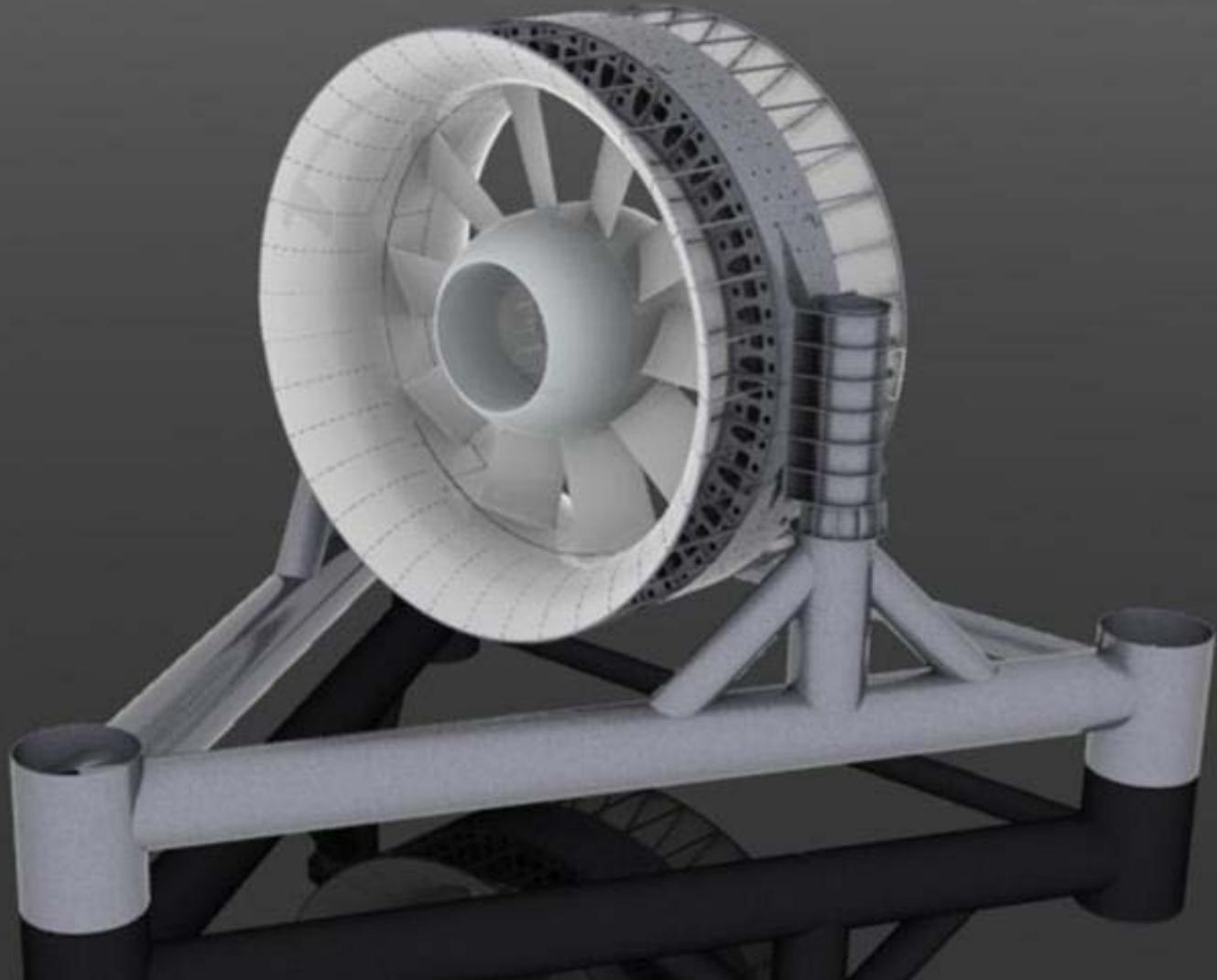


Marine Current Turbines - UK



Open Hydro - Ireland

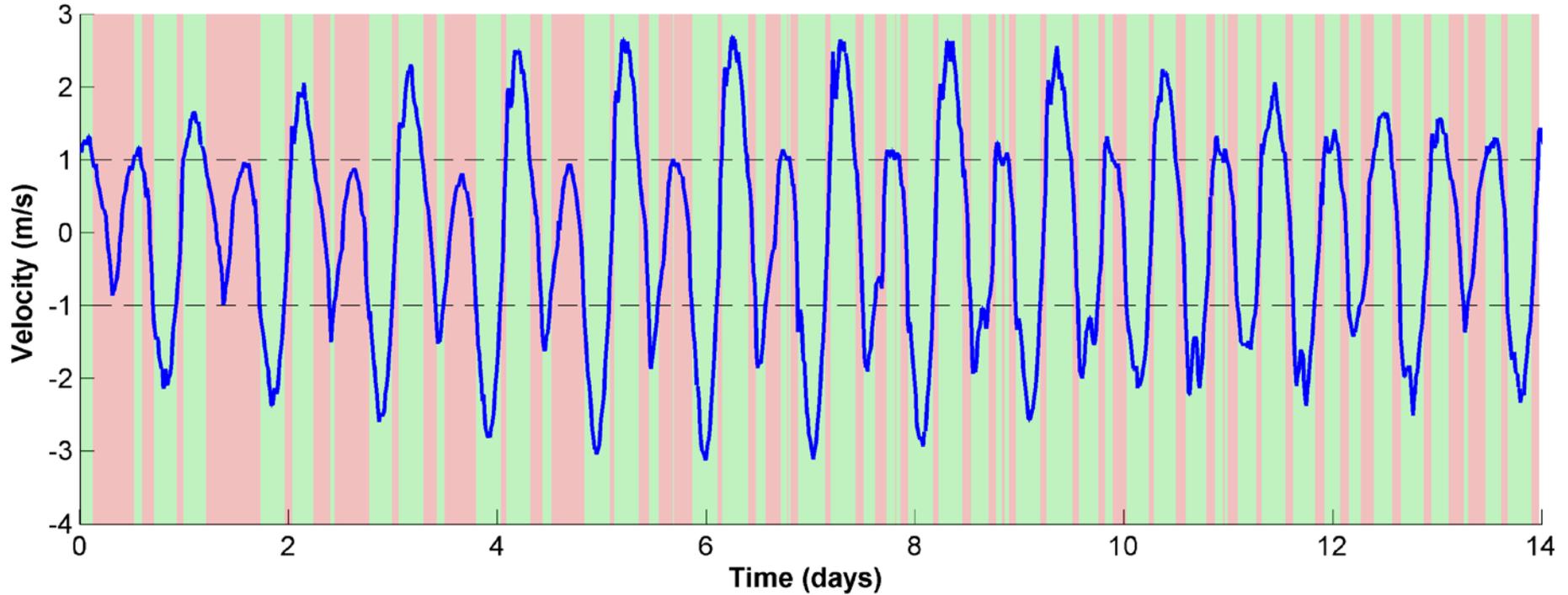
Bay of Fundy 10-meter Turbine



openhidro
tidal technology



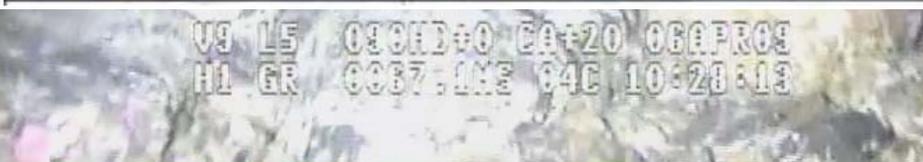
Turbine Operation



- Hub height velocity (m/s) (ADCP measurements from May-August, 2009 – fortnightly window)
- Turbine rotor stopped (off)
- Turbine rotor turning (on) (cut-in and cut-out velocity of 1 m/s)

Site Studies

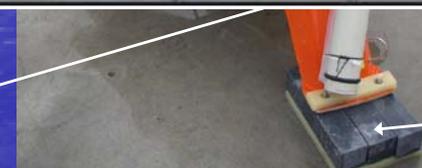
Coordinating closely with the efforts of the Northwest National Marine Renewable Energy Center at the University of Washington



(background noise)

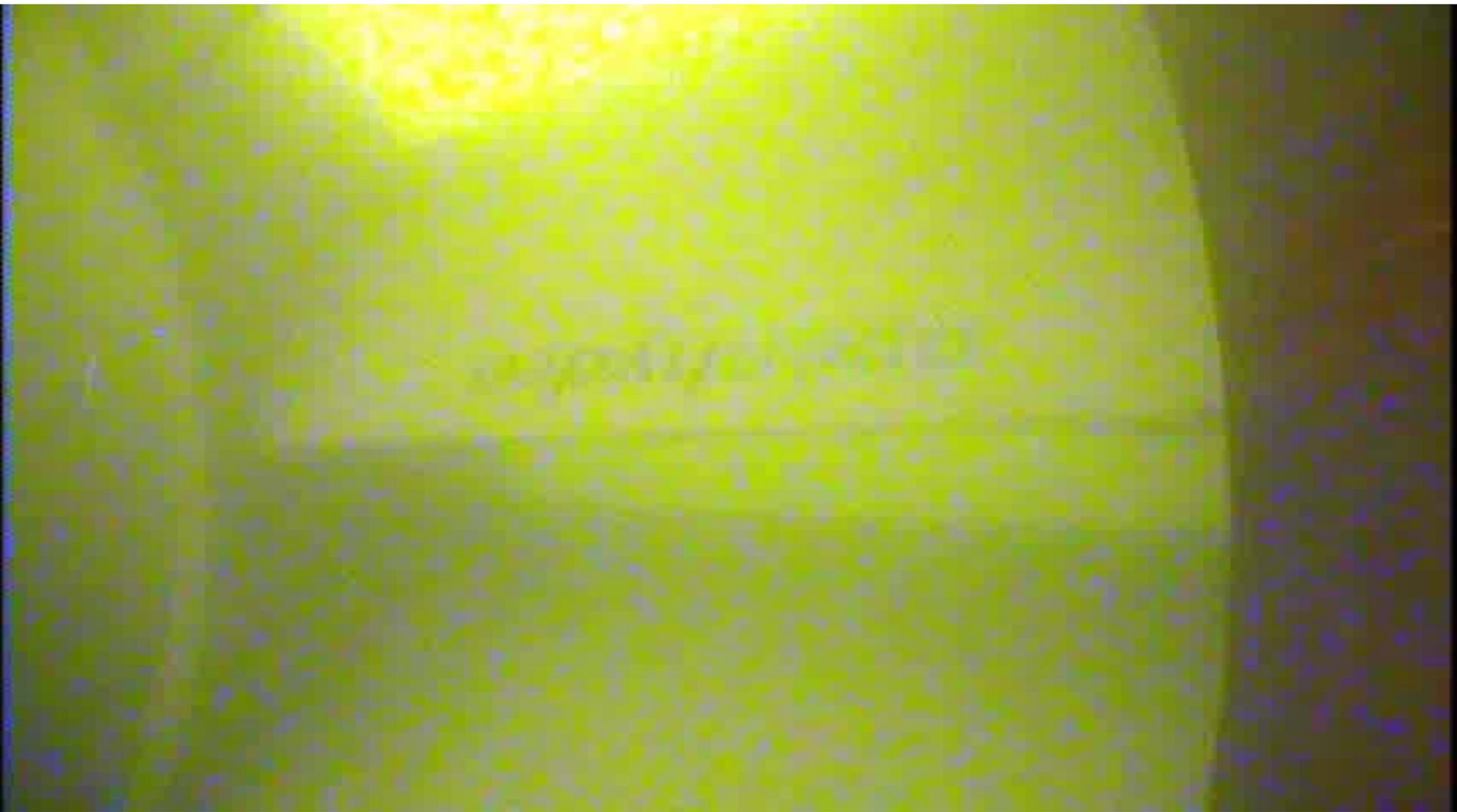
Sea Spider

(heavy duty fiberglass frame)



Lead Weight

(600 lbs)



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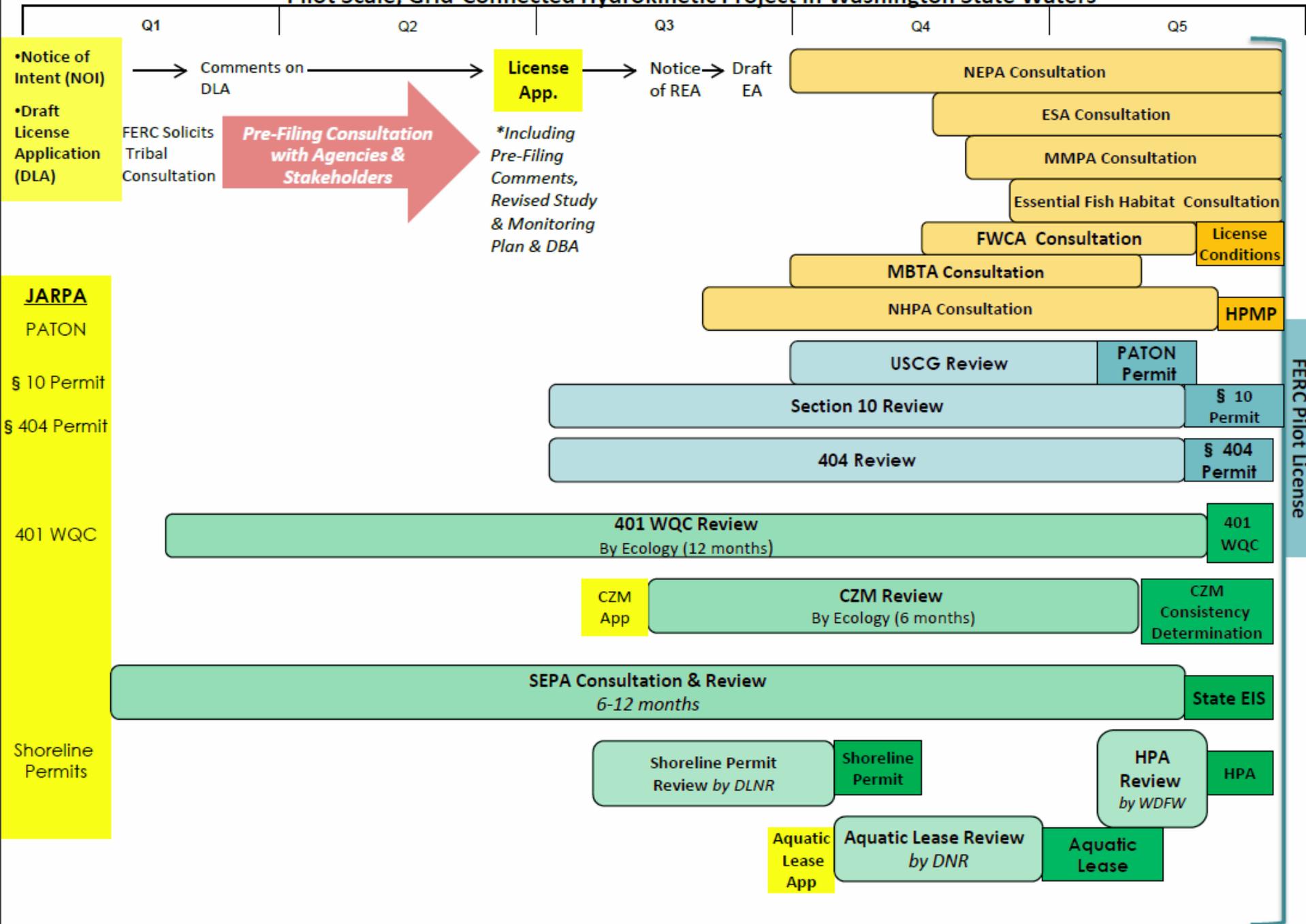
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- **Regulatory Issues**
 - Complexity and lack of clarity regarding federal/state/local permitting process and requirements.

In the U.S., permitting may be an even bigger hurdle to marine energy deployment than financing. Between 25 and 35 different U.S. federal, state and local regulatory agencies claim some jurisdiction over marine power deployment. In the UK, two agencies handle permitting.

- License from the Federal Energy Regulatory Commission.
- Clean Water Act Section 401 Water Quality Certification from the Washington Department of Ecology.
- Marine Mammal Protection Act incidental take permit from the National Marine Fisheries Service.
- Endangered Species Act (ESA) compliance through ESA Section 7 consultation with the National Marine Fisheries Service and U.S. Fish and Wildlife Service.
- Essential Fish Habitat Program review from the National Marine Fisheries Service pursuant to the Magnuson-Stevens Fishery Conservation and Management Act.
- National Historic Preservation Act Section 106 compliance through consultation with the Washington State Historic Preservation Officer, as well as the Tribal Historic Preservation Officer of any affected federally recognized Indian tribe.
- Migratory Bird Treaty Act permit from U.S. Fish and Wildlife Service.
- Clean Water Act Section 404 permit from the U.S. Army Corps of Engineers.
- Rivers and Harbors Act Section 10 permit from U.S. Army Corps of Engineers.
- U.S. Coast Guard review for navigation impacts under the Ports and Waterways Safety Act and Coast Guard and Maritime Transportation Act of 2006.
- Water right for a non-consumptive appropriation of waters of the State.
- Hydraulic Project Approval from Washington Department of Fish and Wildlife.
- Aquatic land lease from Washington Department of Natural Resources.
- Coastal Zone Management Act (CZMA) Consistency Certification from Washington Department of Ecology. Under Washington's CZMA program, activities that require federal approval and affect any land use, water use or natural resource of the State's coastal zone must comply with the enforceable policies within the six laws identified in the CZMA program document:
 - the Shoreline Management Act (including local government shoreline master programs);
 - the State Environmental Policy Act;
 - the Clean Water Act;
 - the Clean Air Act;
 - the Energy Facility Site Evaluation Council; and
 - the Ocean Resource Management Act.

Pilot Scale, Grid-Connected Hydrokinetic Project in Washington State Waters



Funding/Grants

Tidal Project

- U.S. DOE Advanced Water Power Projects Program: **\$1.2 million**
- Bonneville Power Administration Renewable Energy Technology Program: **\$483K**
- U.S. DOE Advanced Water Power Projects Program: **\$600K**
- Congressionally Directed Project Grant: **\$476K**
- U.S. DOE Advanced Water Power Projects Program: **\$10 million**

- Total = \$12,759,000

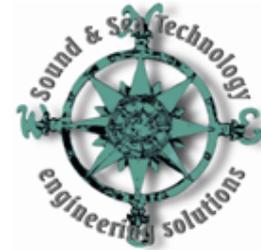


U.S. DEPARTMENT OF ENERGY



Pacific Northwest NATIONAL LABORATORY

HDR



Marine Sciences Laboratory

The Whale Museum
Promoting stewardship of whales and the Salish Sea ecosystem for 30 years through education and research.



NORTHWEST NATIONAL MARINE RENEWABLE ENERGY CENTER (NNMREC) - CENTER HOME

University of Washington Branch: In-stream Energy



openhydro tidal technology



About the Center

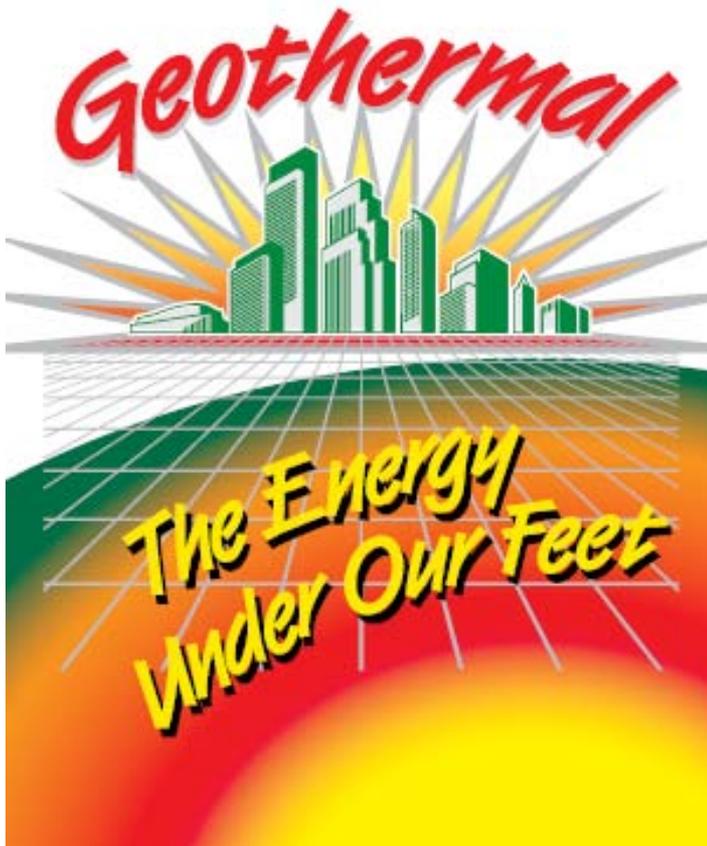
In-stream Energy

Projects

Links

Internal

Geothermal Energy



- ❑ Renewable
 - ❑ Meets I-937 requirements
- ❑ Clean
 - ❑ No/low emissions
- ❑ Baseload
 - ❑ 90+% availability
- ❑ Potentially Close to load
 - ❑ Ease transmission constraints
 - ❑ Fewer energy losses

Status of Geothermal Exploration in Washington

- Historically low power prices
- Little oil/gas exploration
- Rainfall/moisture masks geothermal signatures
- National Parks and Wilderness areas
- Focus on wind



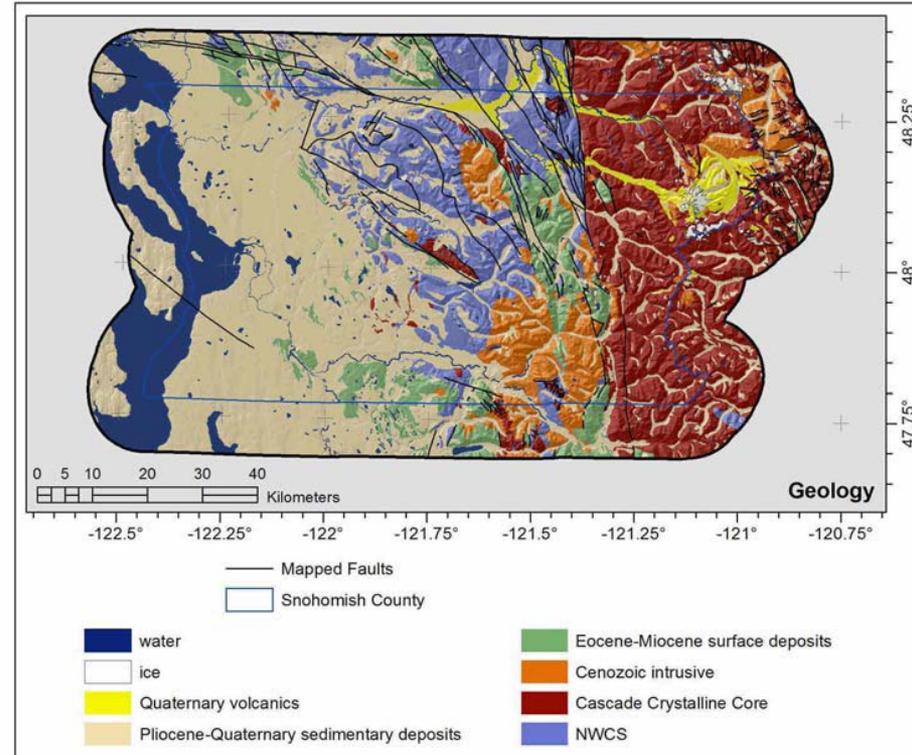
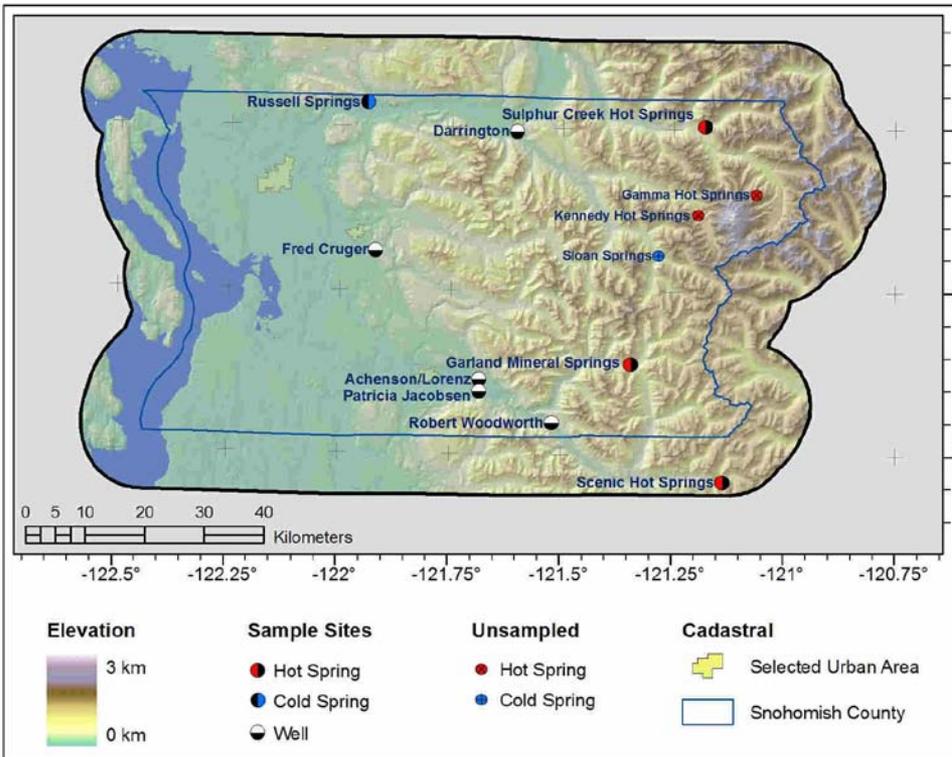
Very little geothermal exploration...but the resource potential clearly exists.

Study Activities: 2008-09

- Updated GIS database utilizing data from historical BPA studies
- Existing data review
 - Temperature with depth maps
 - Geochemistry
 - Geology
 - Fracture/fault mapping
 - Seismic data
 - Stress/tectonic regime
 - Transmission lines
 - Access/land availability
- Gathered new geochemistry data from springs and wells
- Preliminary costs: exploration, wells, plant
- Potential exploration/development options



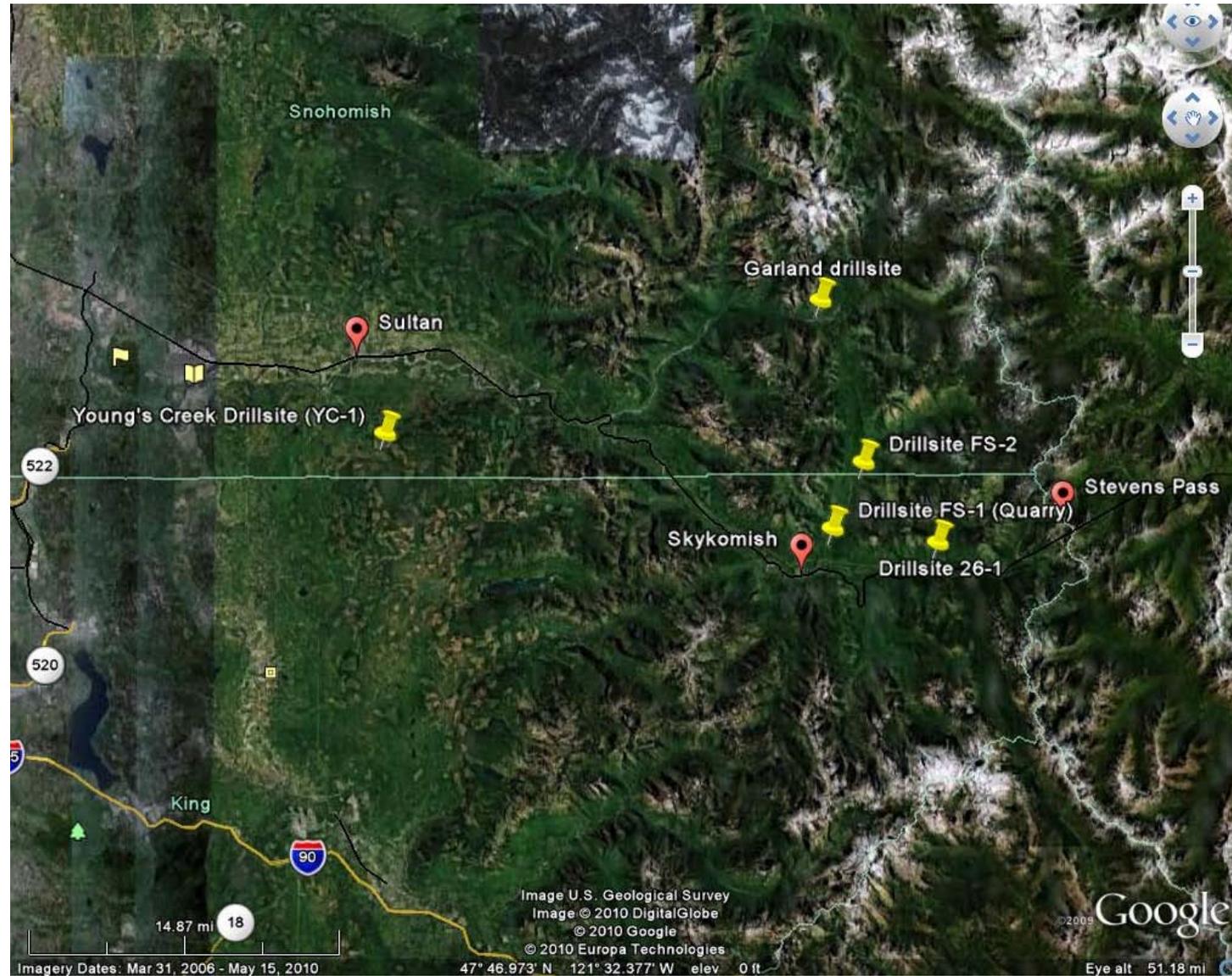
Snohomish County



2010 Drilling

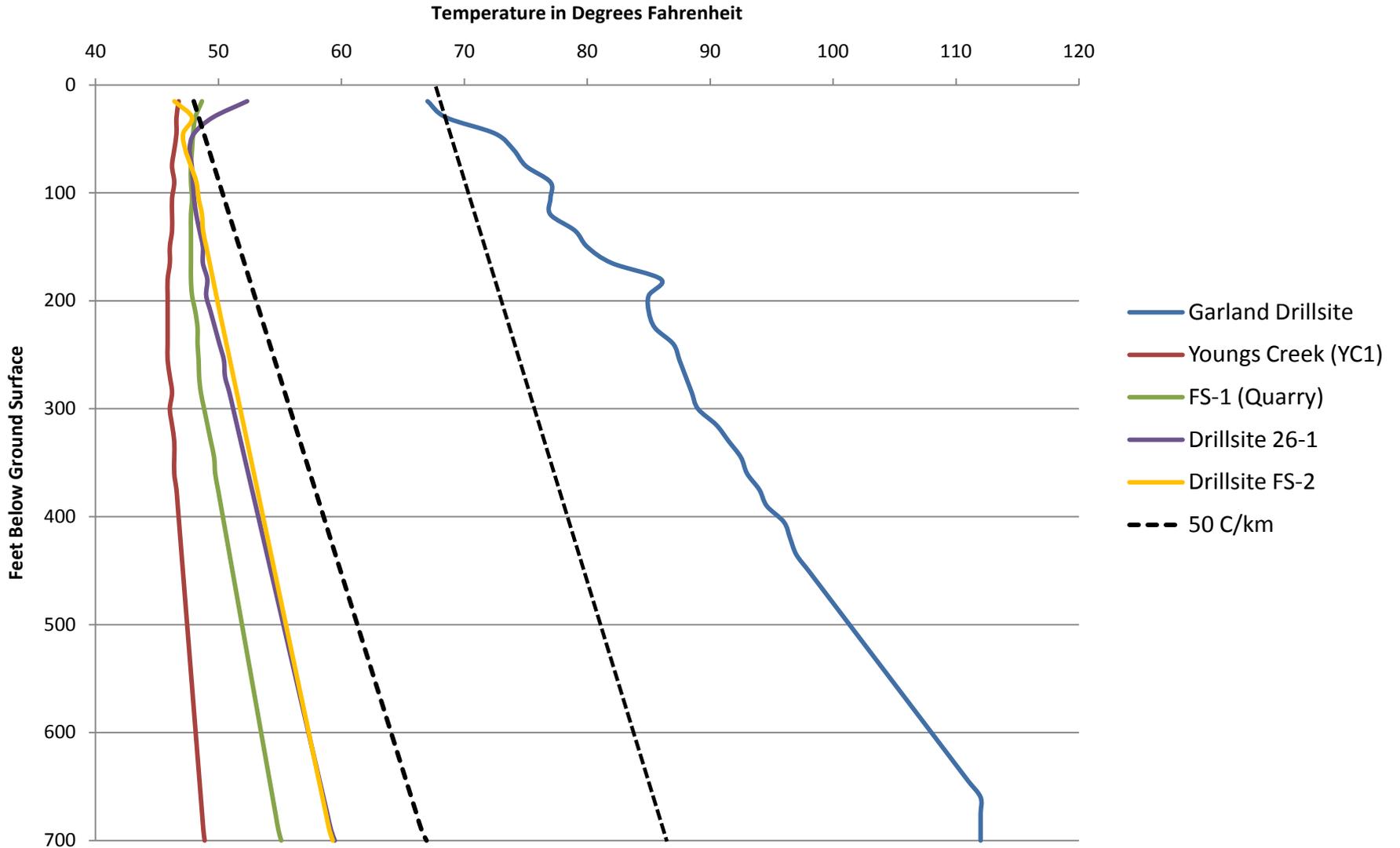
Temperature Gradient Drilling

- Several sites of interest selected
- Mix of federal, state, and private land
- Five drill sites
- 700' deep wells



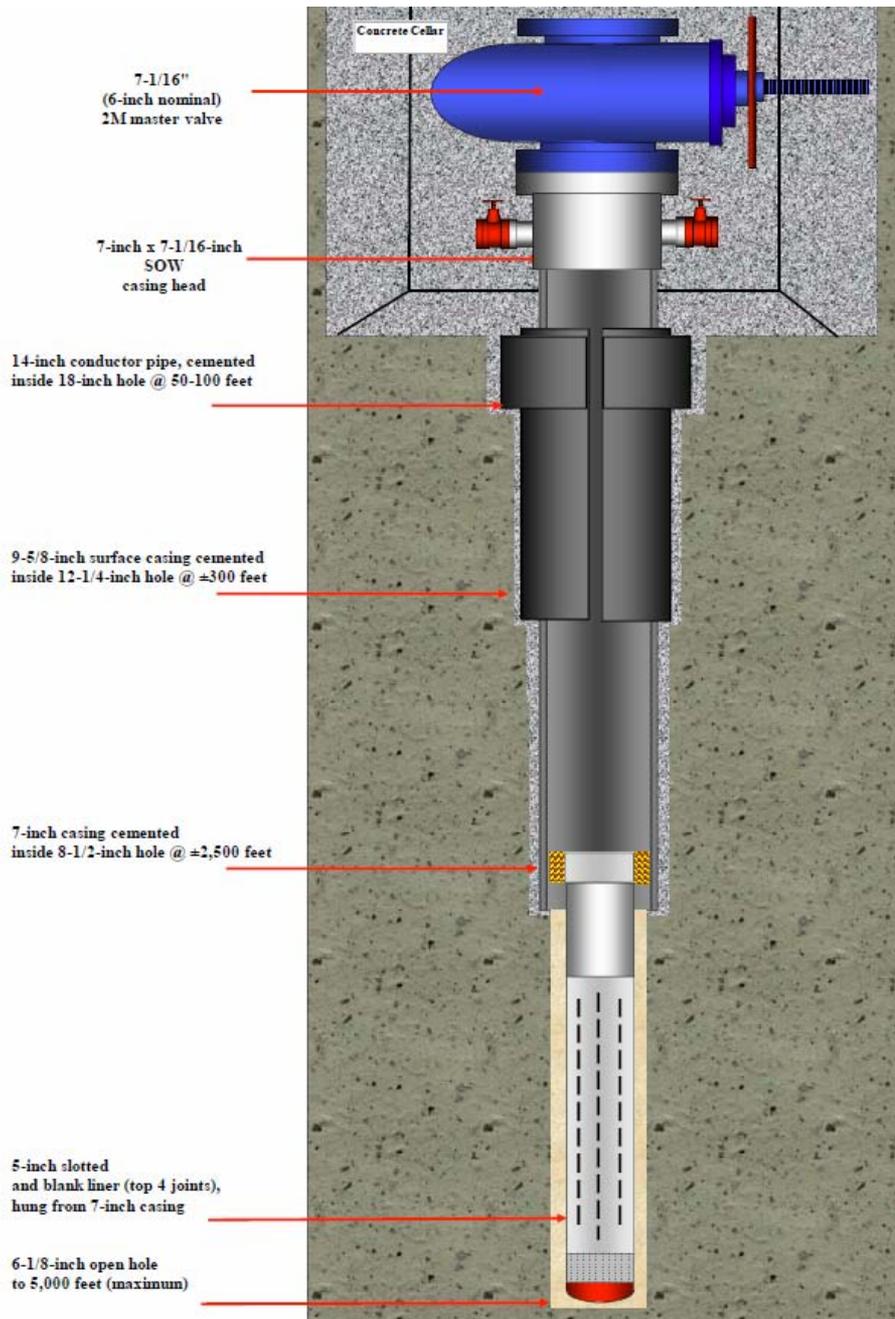


Snohomish County PUD Temperature Gradient Holes

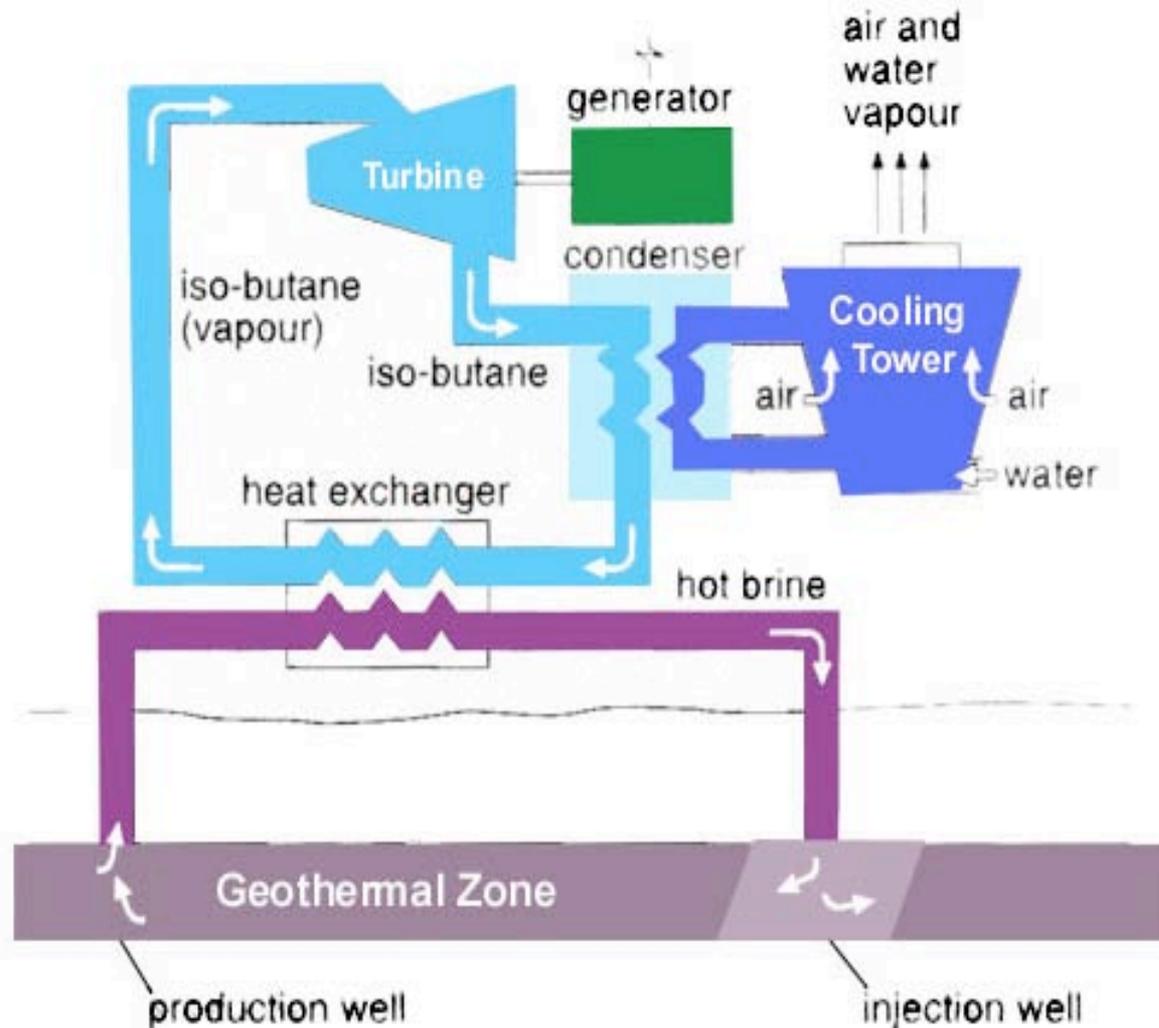


Next Drilling Phase:

- 5,000 foot well at one site
- Temperature gradient and flow testing
- Mud rotary drilling
- ~\$2 million
- Targeting late summer 2011



Power Generation – Binary System





60 MW
Binary Plant
Mammoth
Lakes, CA

16 MW Binary Plant – Raft River, ID

