Northwest Power and Conservation Council

January 4, 2006

MEMORANDUM

TO: Council Members

FROM: Terry Morlan

SUBJECT: Briefing by Energy Northwest on Proposed Integrated Coal Gasification Combined Cycle (IGCC) Power Plant

Energy Northwest will brief the Council on its proposed integrated coal gasification combined cycle power plant. The proposed Pacific Mountain Energy Center would include two 300 MW power plants located in Kalama, Washington and is proposed to be completed in 2012.

The staff is tracking developments in IGCC technology. Jeff King has reported to the Power Committee on its current status. Action Item GEN-13 in the Council's power plan asked that the region consider a demonstration plant for IGCC technology. The Energy Northwest proposal partially could fulfill that role so this presentation should be of great interest to the Council.

An Energy Northwest new release on the Pacific Mountain Energy Center proposal is attached for your information.

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851 S.W. Sixth Avenue, Suite 1100
Portland, Oregon 97204-1348
www.nwcouncil.org

Steve Crow
Executive Director

503-222-5161
800-452-5161
Fax: 503-820-2370

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Introducing the

Pacific Mountain Energy Center

Kalama, Washington

Northwest Power and Conservation Council

Vancouver, Washington • January 18, 2006

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IGCC Briefing Agenda

- Overview
- Why Propose an IGCC Project?
- Pacific Mountain Energy Center
  - Overview
  - Development & Site Considerations
  - Operational Characteristics
  - Technology Description
  - Technology Alliances
  - Environmental Considerations
  - Potential Governance Structure

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Energy Northwest

- WA State chartered Joint Operating Agency
  - 19 Public Utility Districts and Municipalities
- Primary focus is generation; work with other entities to encourage innovation and new energy resources
- Provides power to the Northwest region at or near cost
- Supplies 12% of BPA's firm energy

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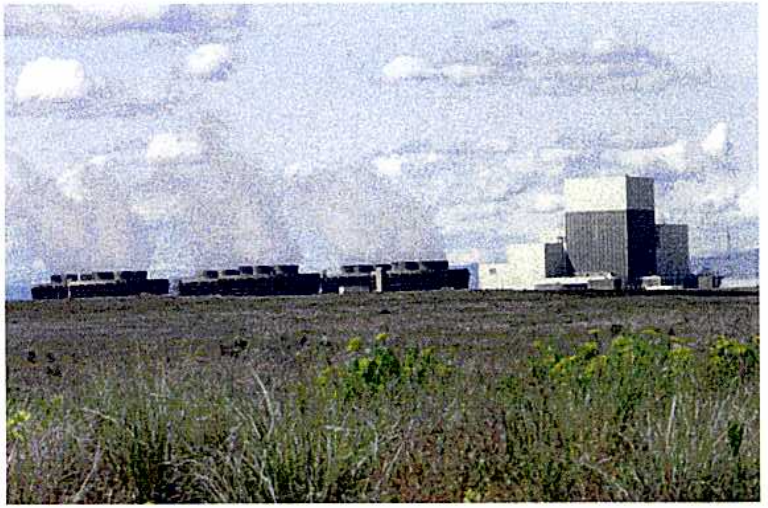
Existing Operations

- Columbia Generating Station
  - NW's Only Nuclear Plant
  - 1,157 MW
    - Power Seattle



- Packwood Lake Hydro Electric Project
  - 27 MW
  - Certified "Green"
  - Fish Friendly

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Existing Operations

- Nine Canyon Wind Project -64 MW
- White Bluffs Solar Station- 39 KW
- H.W. Hill Landfill Gas Power Plant - Klickitat PUD- 10 MW
- Olympic View Generation Plant, Mason PUD-6 MW

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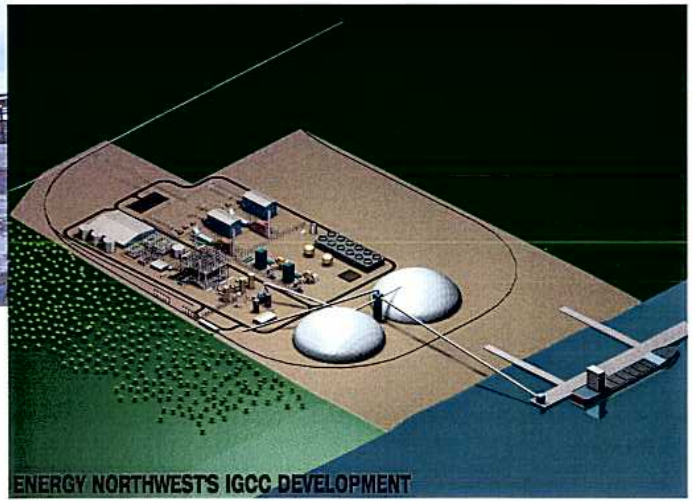
Current Development

- Reardan Wind Project -50 MW
- Nine Canyon Expansion – 35 MW
- BioEnergy Solutions Program
- **Pacific Mountain Energy Center – 600 MW**
- Keeping up with Technology
  - Fuel Cells
  - Geothermal



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- **Why Propose an IGCC Project?**
- Pacific Mountain Energy Center
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Why Propose an IGCC Project?

- Strategic Planning w/Member Input and Involvement
- Evaluation of Future Load Resource Balance
- Recognition of Need for Stable, Baseload Generation
- Evaluation of Generation/Fuel Supply Options
- Evaluation of Environmental Considerations

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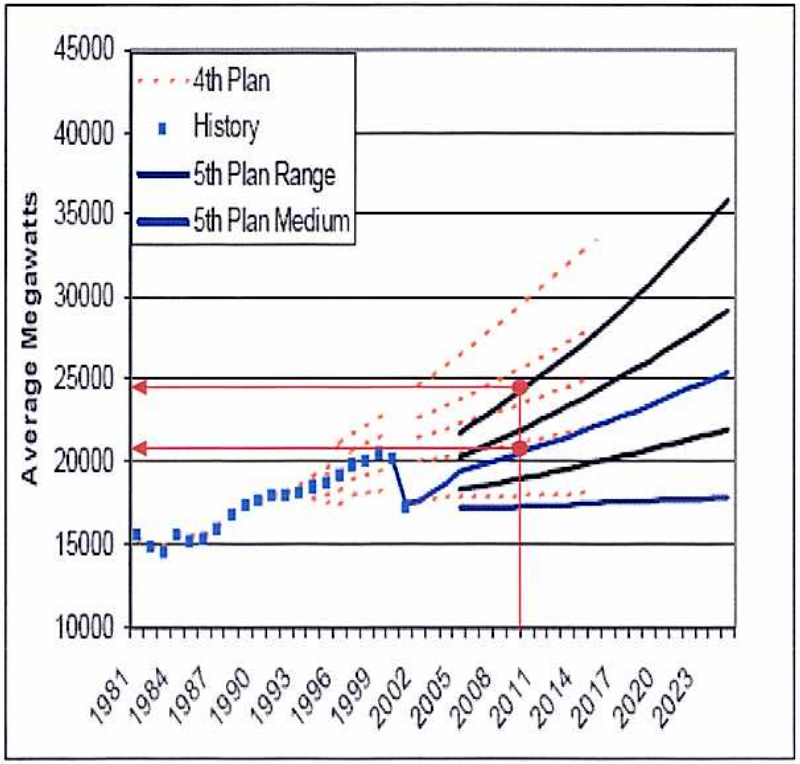
Need for New Generation Resources



NPCC 2005 Power Forecast

- NW economy is growing
- New generation will be required
- Forward planning essential
- Long lead times for new resources - 5 to 6 Years
  - 1 to 2% Load Growth =1200–2400 MW
  - 600 MW IGCC Proposed
- Only so many options for meeting that growth

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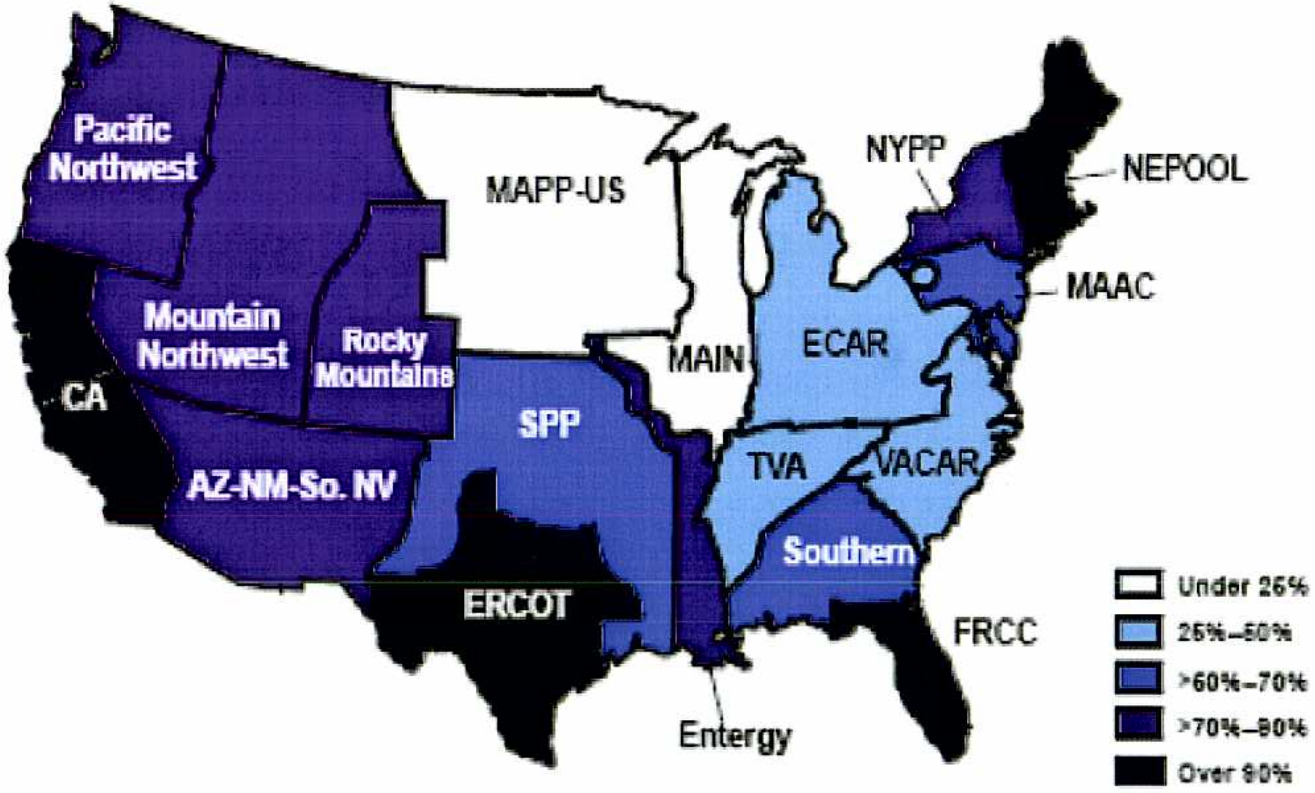
Regional Power Impacts From Natural Gas

Natural Gas Frequently Sets Regional Price

(Percent of time gas and oil on the margin projected in 2004)



Energy Business Watch

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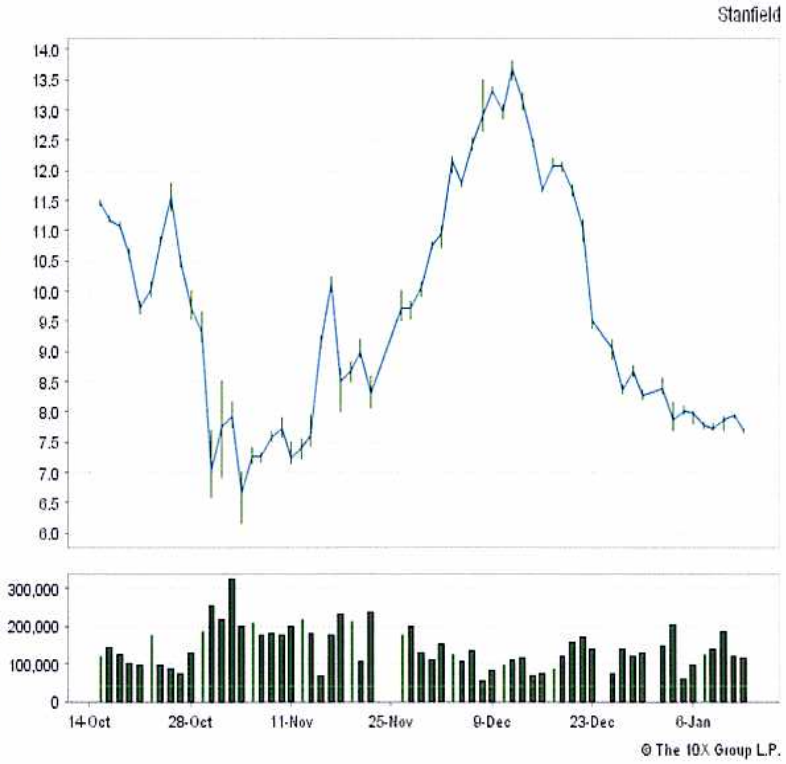
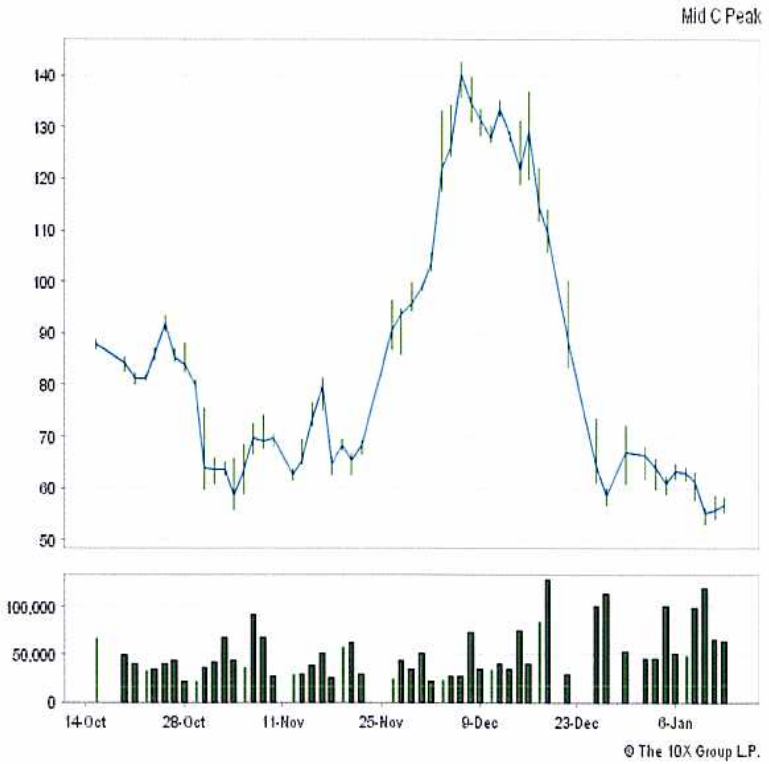
Power & Natural Gas Markets

Risk of Too Much Dependence on Natural Gas



Wholesale Natural Gas



Wholesale Power

10X Energy Data Service

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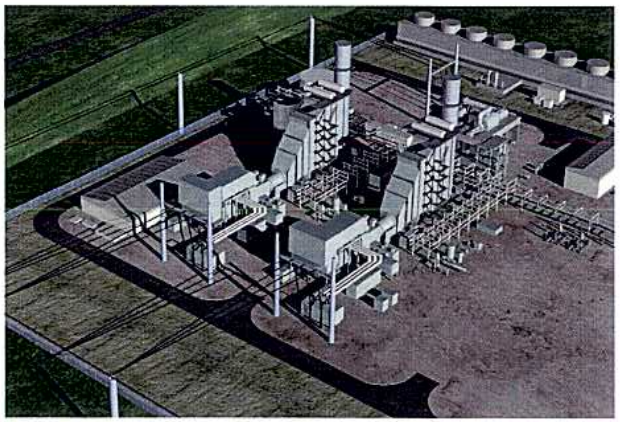
Options Considered

- Natural Gas
  - The Primary Focus for Last Two Decades
  - Significant Issues for Current NG CT Plant Owners
  - Substantial LNG Imports, Alaska Reserves Required
  - Energy Independence Implications
  - 16% US Power Supply from 3% World Reserves of NG
  - Continued High, Volatile Prices Likely



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Options Considered

- Conservation
  - Will Help Offset Load Growth
  - Essential, But Not Likely Enough
- Renewables
  - Wind, Hydro, Biomass, Solar
  - Proceed at Reasonable Rate of Deployment
  - Reasonable Targets Unlikely to Keep Pace
  - Renewables must be Part of Stable "System"
- Advanced Nuclear
  - Gradual US Re-emergence
  - Timing at Issue - Big Unknown
  - Northwest Unlikely to be First

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Options Considered

- Conventional Coal Combustion
  - Low-Cost Option, Historic Price Advantage, Stability
  - Relatively Abundant Supply (At Least 250 Years)
  - Historical Price Stability

BUT – Significant Environmental Issues

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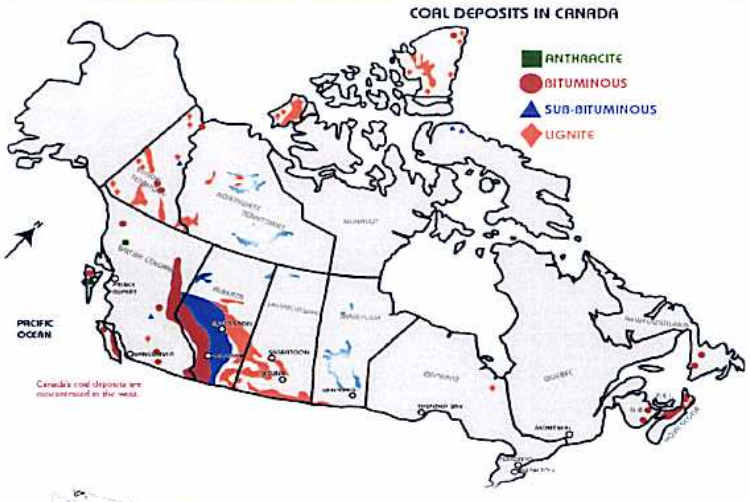
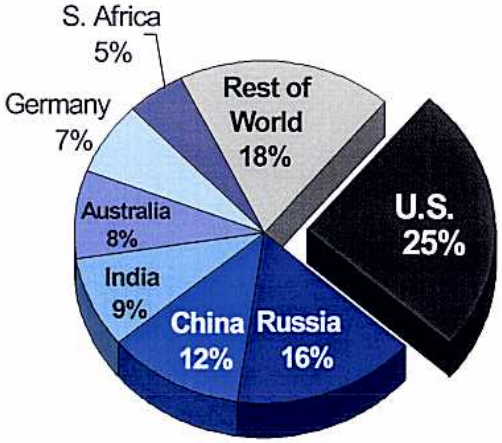
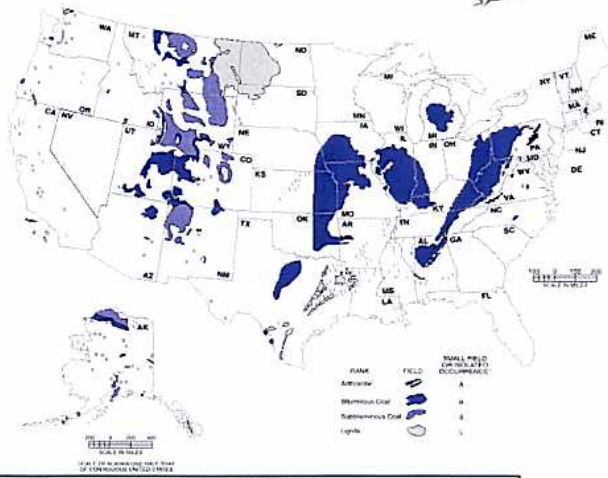
So Why Talk About Coal at All?







- US 25% World's Coal
- 250 Year Reserve
- PRB is the Largest & Lowest Cost Coal Resource
- Strong Coal Rail Systems
- Supplies over 50% of US power generation

Compare U.S. Resources:

-- 2% of world oil reserves
-- 3% of world natural gas reserves
-- 25% of world coal reserves

Source: Kennedy School – Harvard University

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Options Considered

- Conventional Coal Combustion Will Continue
  - BUT
- IGCC Better Option for Northwest
  - Relative to Coal, Emissions Similar to Natural Gas
  - Ready for Potential CO_2 Sequestration
    - If and When Technically and Economically Viable
  - Multiple Fuels for Better Economics
    - Natural Gas, Coal, Petroleum Coke
    - Stable Power Costs "in the market"

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Petroleum Coke
A Potential Alternative Fuel

- Oil Refinery Waste Product
- Over 14 million tons/yr in Western US & Canada
- High BTU Value- 12000-15000 Btu/lb
- Strong Western Water and Rail Transportation Systems

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Pacific Mountain Energy Center

- 600 MW IGCC Complex, Two Power Plants
  - 300 MW Public
  - 300 MW Private
- Flexible Fuel Design
  - Coal
  - Petroleum Coke (Oil Refinery By-Product)
  - Natural Gas (Startup, Backup)
  - Fuel Hedging ⇔ Competitive Advantage
- $1 Billion Capital Investment
- 80-100 Jobs
- Competitive Cost of Power (~$45/MWh)
- Contribution to Power Grid Stability

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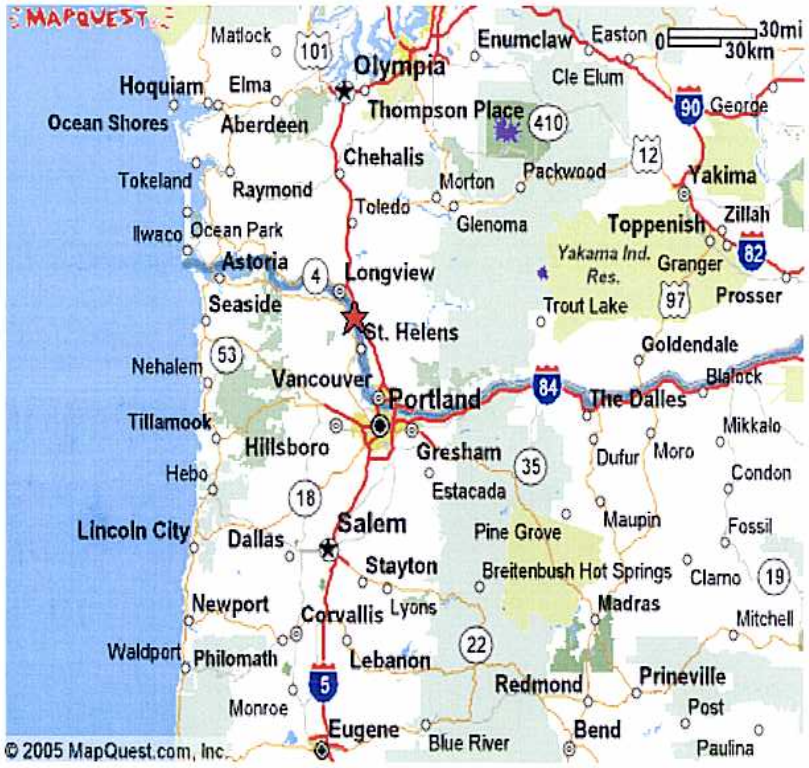
Pacific Mountain Energy Center



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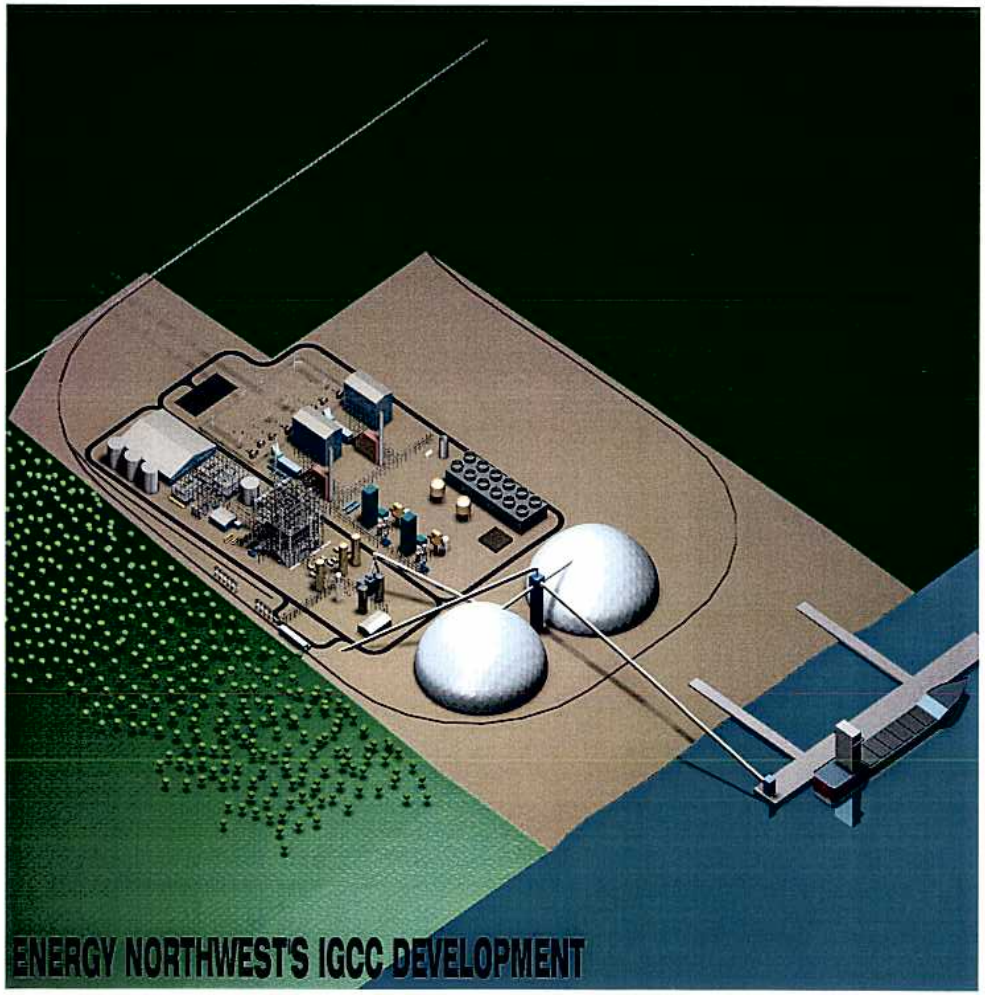
Development & Site Considerations

- Land Use
  - Environmentally Compatible
  - Heavy Industrial Zoning
- Infrastructure
  - Industrial Water
  - Loop Track
  - Dock Access
- Community Support
  - Port
  - Local
  - Regional



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Development & Site Considerations

- Diverse Fuel Transportation
  - Rail
  - Ship/Barge
  - Truck
  - Gas Pipeline
- Transmission Grid Access
  - High Voltage Transmission
  - Load Centers

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Site Footprint

Pacific Mountain Energy Center at the Port of Kalama

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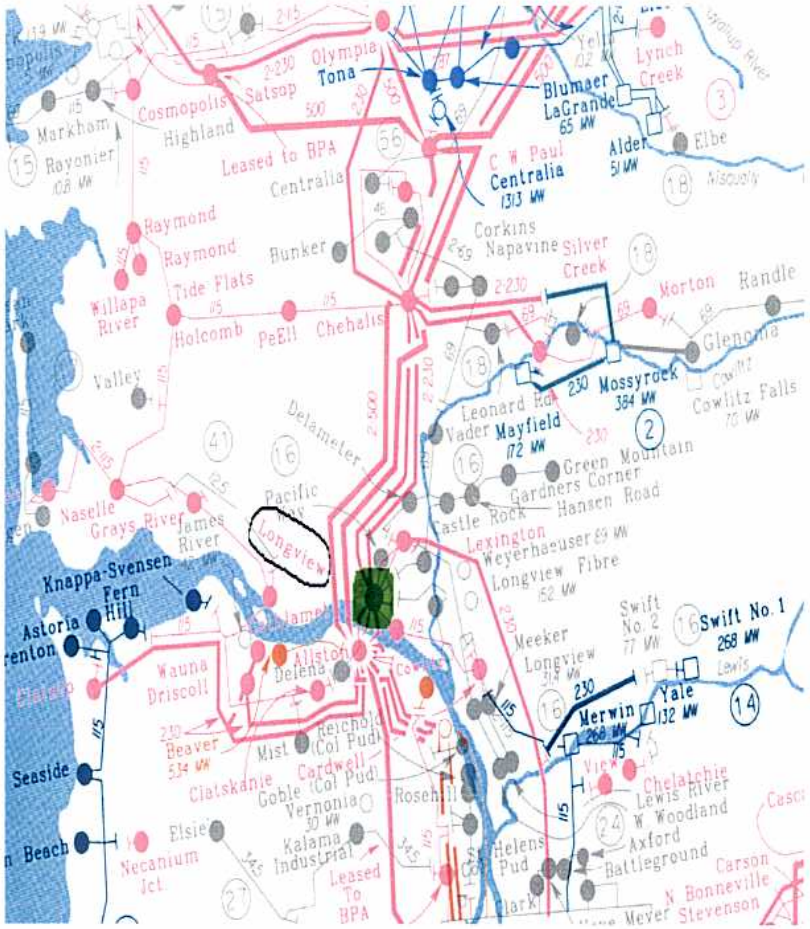
Transmission Interconnection

- Developed a 230 KV Transmission Plan with Cowlitz PUD to Connect to BPA Longview Switching Station
- Included a Direct Service Option for Cowlitz PUD
- Potential to Connect Clark PUD for Direct Service
- Conducted an Introductory Meeting with BPA
- Applying for BPA Transmission Interconnection & Queue
- Fifteen Month Process



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Pipeline Interconnection

- Williams Northwest Pipeline – High Pressure 500-700 psi
- Located Port of Kalama Property
- Strategic Location > North & South on I-5 Corridor
  > Crosses Columbia River
- Dear Island Station- Approximately Four Mile Connection
- Establishing Utility Corridor and Pipeline Easement
- Processing Williams Interconnection Request
  - Initial Review 30 - 45 days

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Operational Characteristics

- Nominal 600 MW Base load Capability
  - Two 300 MW Combined Cycle Generators
- Fuel Flexibility
  - 100% PRB Coal
  - 100% Petroleum Coke
  - 100% Natural Gas
  - 30% Biomass
- Heat rate of 8735-9069 Btu/KWh
- Availability increased from 85% to 92.7% with Spare Gasifier

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Operational Characteristics

- Fuel Adaptively
  - Ability to Adjust Blends "On the Fly"
- 50% Turndown Capability
- Ability to Ramp Down @10%/minute
- Ability to Ramp up @0.5%/minute
- Gasifier Cold Start Up – 48 hrs
- Gasifier Warm Start Up- 8 hrs

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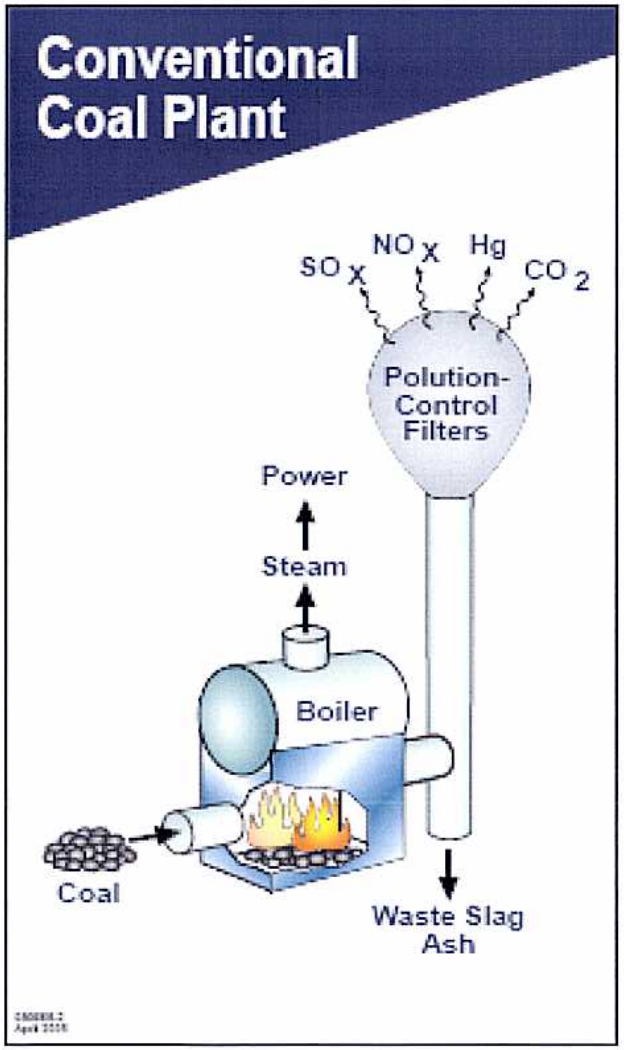
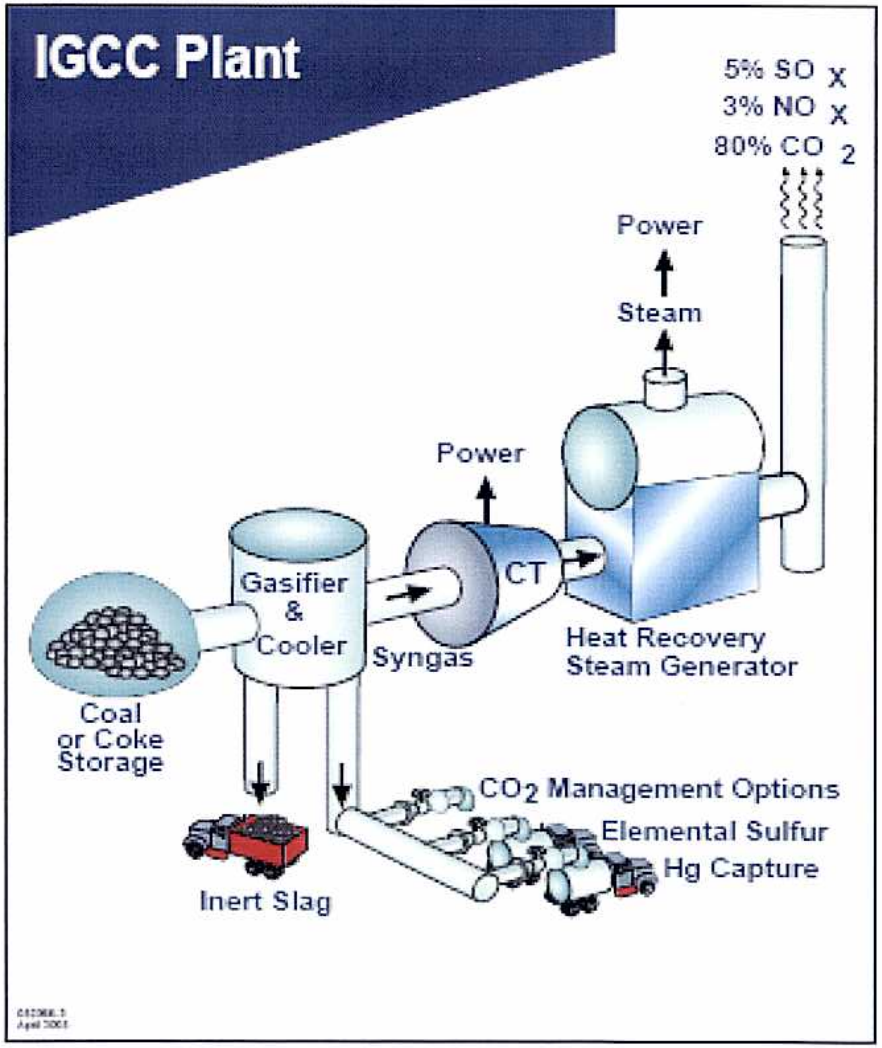
Integrated Gasification Combined Cycle Technology





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IGCC Development Alliances

- ConocoPhillips\ Fluor
- GE\Bechtel
- Shell\Uhde\Black & Veatch
- Siemens Westinghouse

All offer fixed price, turn key, EPC Contracts, Performance Guarantees backed with liquidated damages, Equipment Warranties and extended warranties

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Regulated Emission Comparison

	SO_2	NO_x	CO	PM	VOC
	(Figures are in lbs/million BTU)				
Coal	0.180 (100%)	0.080 (100%)	0.12 (100%)	0.07 (100%)	0.003
IGCC	0.034 (18%)	0.061 (76%)	0.05 (42%)	0.01 (14%)	0.003
PMEC	0.006 (3%)	0.012 (15%)	0.05 (42%)	0.01 (14%)	0.003
Nat Gas	0.010 (6%)	0.028 (35%)	0.02 (16%)	0.01 (14%)	0.003

- ***"IGCC" = Standard IGCC Design***
- ***"PMEC" = Advanced IGCC Design***
  - ***Selxol + SCR***
- ***Advanced IGCC Emissions ⇔ Natural Gas***
- ***Advanced IGCC Emissions Much Less Than Best Coal Combustion***
- ***Advanced IGCC Requires Additional Capital Investment***

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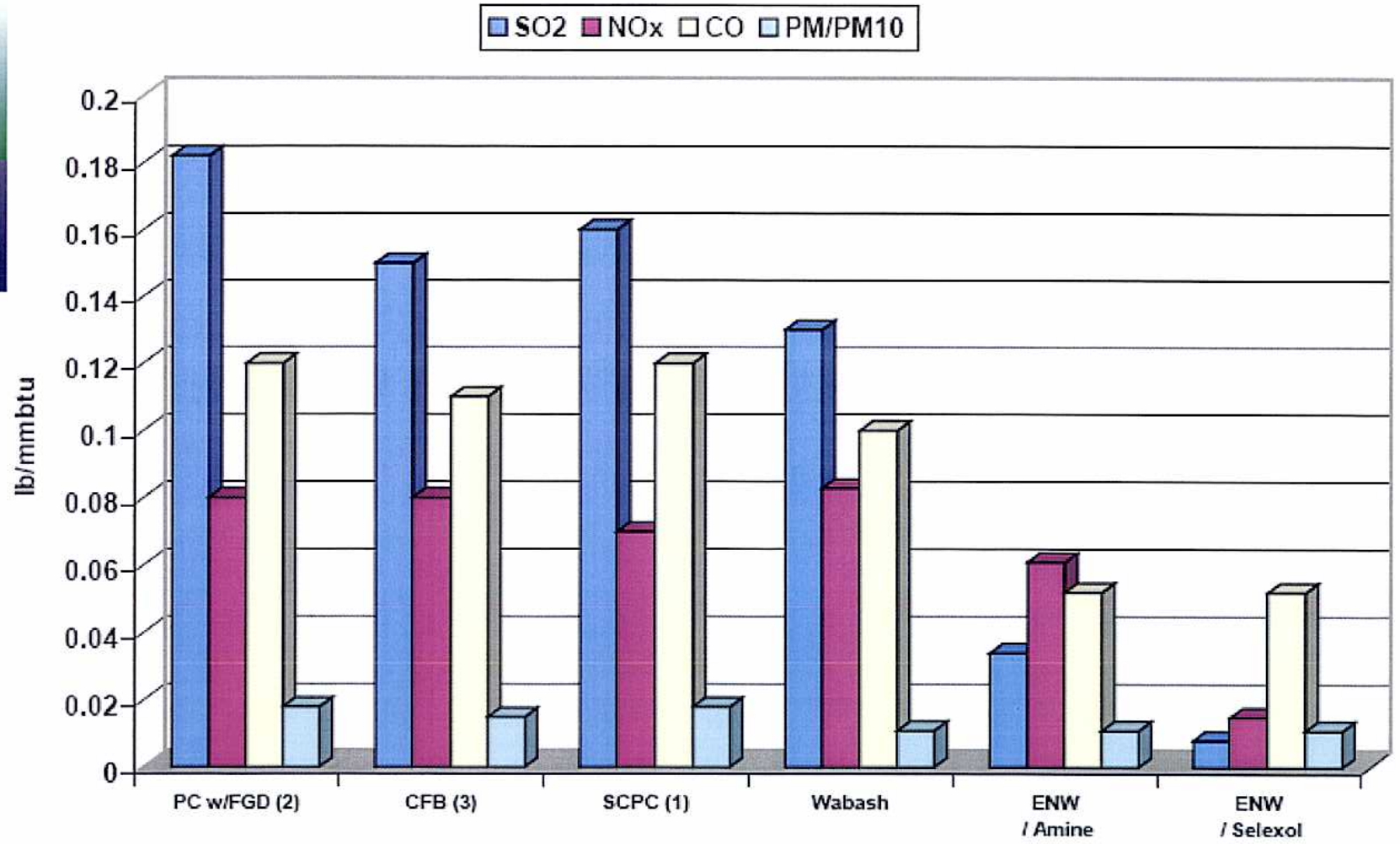
Regulated Emission Comparison



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Unregulated Emissions

- Carbon Dioxide (CO_2) Unregulated
- Potential Future Regulation
  - Carbon Tax
  - Capture and Sequester
- Capture = Separate CO_2 from Synthesis Gas
- Sequestration = Isolate Captured CO_2
  - Isolate From Atmosphere
  - Terrestrial or Geological

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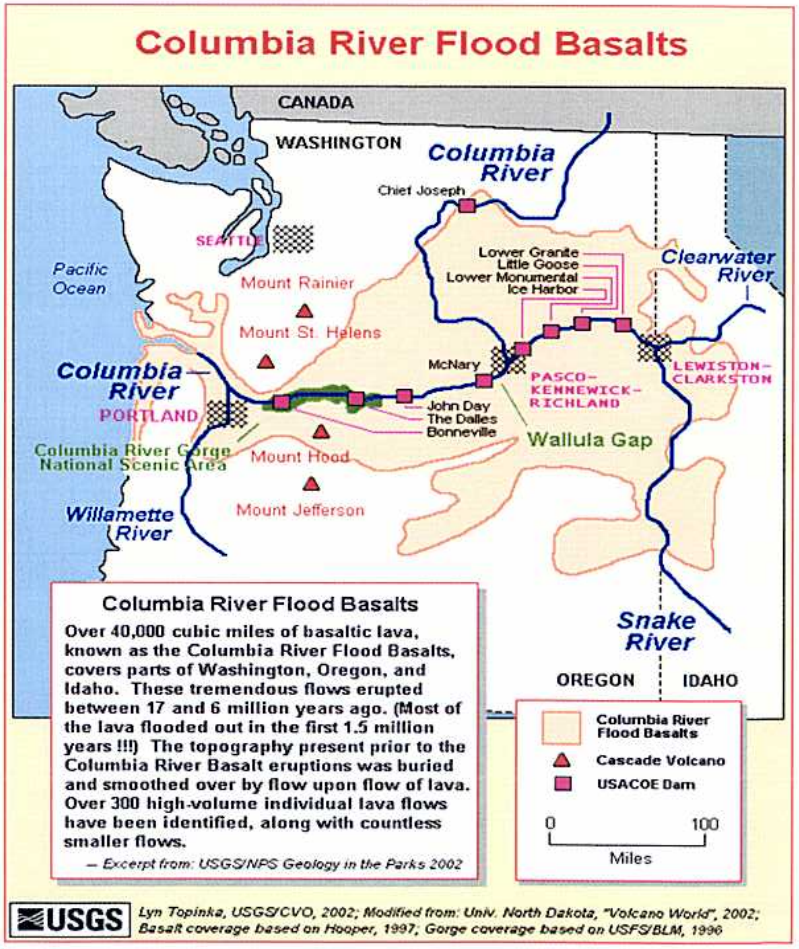
Carbon Sequestration Possibilities

- Teaming Agreement with Big Sky Carbon Sequestration Partnership (BSCSP)
- PNNL is Scheduled to Field Test CO2 Injections
- BSCSP Will Characterize Kalama Site
  - Basalt Applications
  - Possible Saline Aquifers
- Apply Technology Plan to Pacific Mountain Energy Center



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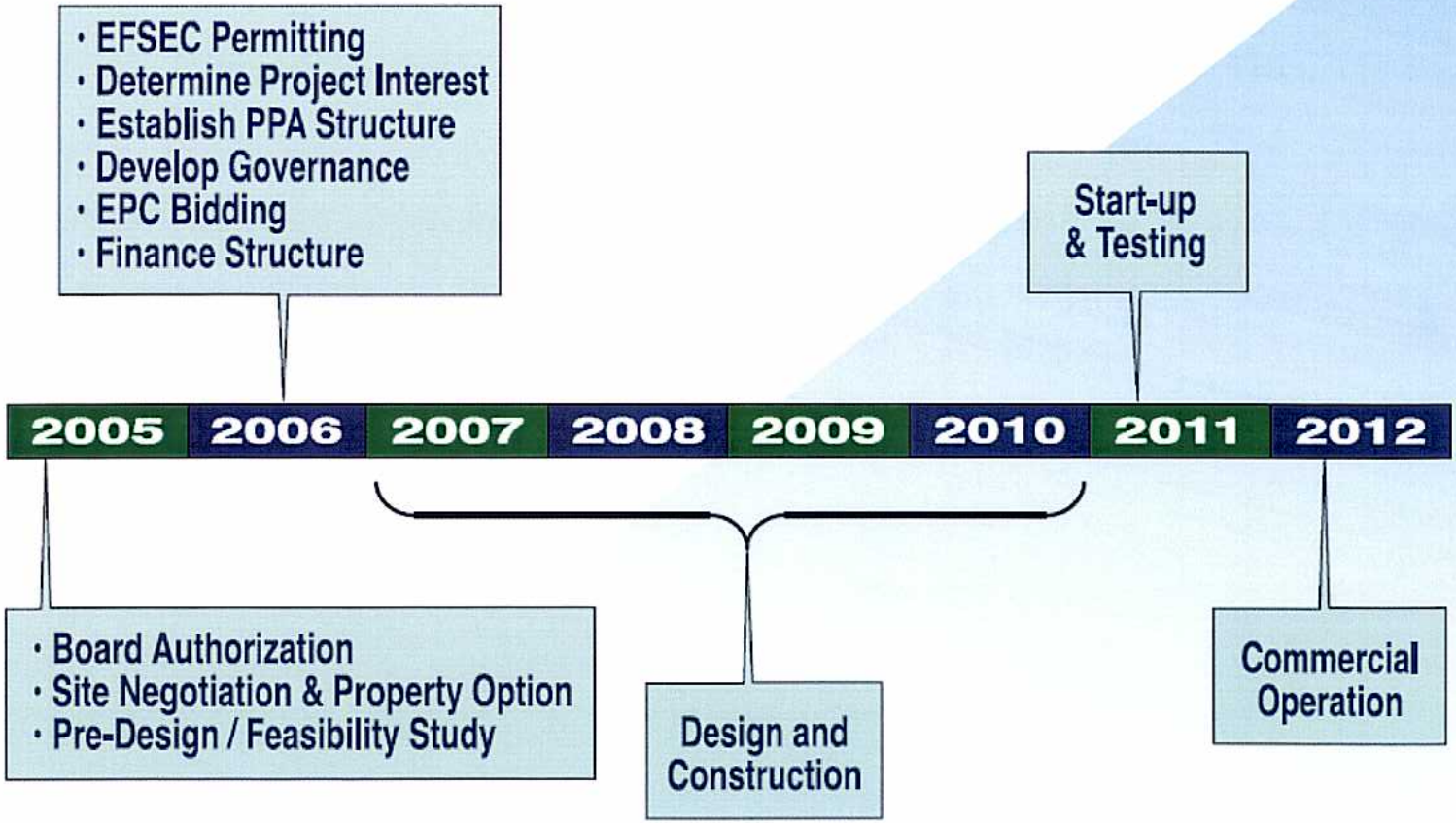
Project Schedule

Development Timeline



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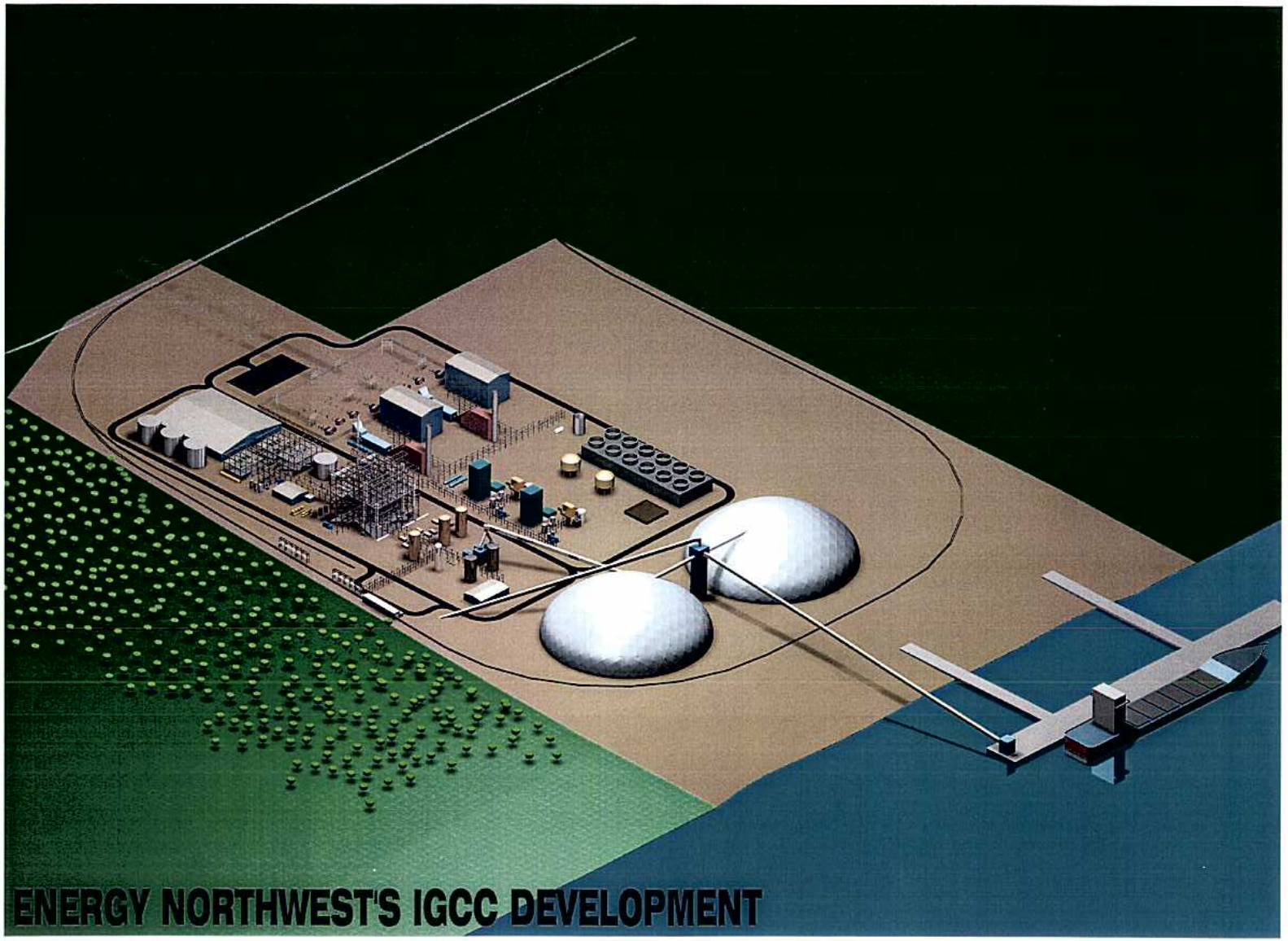
Questions?



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Questions?