



**2006 Integrated Resource Plan:
Assumptions and Draft Portfolios
Round 2**

*Stakeholder Group
October 5, 2006*



Agenda

- Draft Environmental Impact Statement
- Round 2 Assumptions and Draft Portfolios
- Break
- Resource Costs for Round 2



Round 1 Summary

- Studied risk and resources required to reduce it
- Evaluated a wide range of resources and portfolios
- Developed a Draft Environmental Impact Statement
- Identified resources that perform better
- Developed draft round 2 portfolios



Draft Environmental Impact Statement



Overview of Draft Environmental Impact Statement

- Chapter 1 - Summary
- Chapter 2 - Purpose and Need/Development of Alternatives
- Chapter 3 - Evaluation of Impacts and Mitigation of Alternatives (Portfolios)
- Appendix C - Evaluation of Environmental Impacts of Individual Resources



Structure of Impact Summary Chart

Elements of the Environment	Landfill Gas	Wind	Gas - SCCT	Gas - CCCT	Coal - Pulverized	Coal - IGCC	Transmission	Geothermal	Biomass	Hydro Gorge Tunnel	Conservation	Market Transactions
Soils and Geology												
Construction												
Operation												
Air Quality												
Construction												
Operation												
Surface and Groundwater												
Construction												
Operation												
Plants and Animals												
Construction												
Operation												
Energy and Natural Resources												
Construction												
Operation												
Environmental Health												
Construction												
Operation												
Land Use												
Construction												
Operation												
Aesthetics and Recreation												
Construction												
Operation												
Cultural Resources												
Construction												
Operation												
Economy												
Construction												
Operation												



Summary of Resource Impacts

Elements of the Environment	Landfill Gas	Wind	Gas - SCCT	Gas - CCCT	Coal - Pulverized	Coal - IGCC	Transmission	Geothermal	Biomass	Hydro Gorge Tunnel	Conservation	Market Transactions
Soils and Geology												
Construction	L	M	M	M	H	H	M	H	L	M	N/A	0
Operation	0	L	M	M	H	H	L	H	M	0	0	M
Air Quality												
Construction	L	L	L	L	L	L	L	L	L	L	N/A	0
Operation	L	L	M	M	H	H	L	L	M	L	L	H
Surface and Groundwater												
Construction	L	L	L	L	L	L	M	L	L	L	N/A	0
Operation	L	L	M	M	H	H	M	M	M	0	0	M
Plants and Animals												
Construction	L	M	M	M	H	H	M	H	M	L	N/A	0
Operation	L	M	L	L	H	H	M	M	M	0	0	M
Energy and Natural Resources												
Construction	L	L	L	L	M	M	M	L	L	L	N/A	0
Operation	+	0	H	H	H	H	M	L	L	+	+	H
Environmental Health												
Construction	0	L	L	L	M	M	H	M	M	L	N/A	0
Operation	+	M	M	M	H	H	L	M	M	0	L	M
Land Use												
Construction	L	M	M	M	H	H	H	M	M	L	N/A	0
Operation	L	M	M	M	H	H	H	H	H	L	0	M
Aesthetics and Recreation												
Construction	L	M	M	M	M	M	M	H	M	M	N/A	0
Operation	L	H	M	M	H	H	H	H	H	L	0	M
Cultural Resources												
Construction	0	M	M	M	M	M	L	M	M	L	N/A	0
Operation	0	M	M	M	H	H	M	L	L	0	L	M
Economy												
Construction	+L	+L	+M	+M	+M	+M	+L	+L	+L	+L	+H	0
Operation	+L	+L	+L	+L	+M	+M	+L	+L	+L	+L	+L	+L
	L	= Low impact		M	= Moderate impact		H		= High impact		+, +L, +M = Positive impact	
	0	= No impact		N/A	= Not applicable							



Resources Potentially Causing Significant Impacts

- Both coal-fired resources (pulverized and IGCC)
 - Extensive ground disturbing activities at plant site, mine, and emissions
- Gas Turbines
 - Air quality impacts
- Market Transactions
 - Marginal resources in the market assumed to have high levels of air emissions and fuel extraction impacts
- Geothermal
 - Potential physical disturbance to geologic structures, groundwater impacts, and possibility of location in pristine areas
- Biomass
 - If a dedicated crop area is required, substantial land disturbance and impacts from fuel transportation
- Wind
 - High aesthetic impacts and possible impacts on birds and bats



Summary of Portfolio Impacts

Elements of the Environment	Portfolios ^a								
	1	2	3	4	5	6	7	8	9
	Rely on the Market-No Action	Renewables	Gas, 100% Block	Gas, Wind, 50% Block	Gas, Wind, Hydro	Gas, Wind, Biomass	Gas	Gas, Coal	Wind, IGCC
Soils and Geology									
Construction	0	H	M	M	M	M	M	H	H
Operation	M	H	M	M	M	M	M	H	H
Air Quality									
Construction	0	L	L	L	L	L	L	L	L
Operation	H	M	H	M	H	M	H	H	H
Surface and Groundwater									
Construction	0	L	L	L	L	L	L	L	L
Operation	M	M	M	M	M	M	M	H	H
Plants and Animals									
Construction	0	H	M	M	M	M	M	H	H
Operation	M	M	M	M	M	M	M	H	H
Energy and Natural Resources									
Construction	0	L	L	L	L	L	L	M	M
Operation	H	L	H	H	H	H	H	H	H
Environmental Health									
Construction	0	M	L	L	L	M	L	M	M
Operation	M	M	M	M	M	M	M	H	H
Land Use									
Construction	0	M	M	M	M	M	M	H	H
Operation	M	H	M	M	M	H	M	H	H
Aesthetics and Recreation									
Construction	0	M	M	M	M	M	M	M	M
Operation	M	H	H	H	H	H	M	H	H
Cultural Resources									
Construction	0	M	M	M	M	M	M	M	M
Operation	M	M	M	M	M	M	M	H	H
Economy									
Construction	0	+L	+M	+M	+M	+M	+M	+M	+M
Operation	+L	+L	+L	+L	+L	+L	+L	+M	+M
	L	= Low impact		M	= Moderate impact		H	= High impact	
	+, +L, +M = Positive impact			0	= No impact				



Summary of Air Quality Impact Levels, Extent, and Duration

Table 3-5. Summary of Air Quality Impact Levels, Extent, and Duration in Each Portfolio

	Construction	Direct-Generation/Fuel Extraction	Indirect-Contract/Market Purchase Impacts
1 - Rely on the Market - No Action	No Impacts - no New Generation	No Impacts - no New Generation	High Impact, Long Duration, Potential for regional extent
2 - Renewables	Low Impact, Short Duration, limited area/extent impact	Low Impact, Long Duration, Potential for regional extent	Moderate Impact, Long Duration, Potential for regional extent
3 - Gas, 100% Block	Low Impact, Short Duration, limited area/extent impact	High Impact, Long Duration, Potential for regional extent	Low Impact, Long Duration, Potential for regional extent
4 - Gas, Wind, 50% Block	Low Impact, Short Duration, limited area/extent impact	Moderate Impact, Long Duration, Potential for regional extent	Low Impact, Long Duration, Potential for regional extent
5 - Gas, Wind, Hydro	Low Impact, Short Duration, limited area/extent impact	Low Impact, Long Duration, Potential for regional extent	High Impact, Long Duration, Potential for regional extent
6 - Gas, Biomass, Wind,	Low Impact, Short Duration, limited area/extent impact	Low Impact, Long Duration, Potential for regional extent	Low Impact, Long Duration, Potential for regional extent
7 - Gas	Low Impact, Short Duration, limited area/extent impact	Moderate Impact, Long Duration, Potential for regional extent	High Impact, Long Duration, Potential for regional extent
8 - Gas, Coal	Low Impact, Short Duration, limited area/extent impact	High Impact, Long Duration, Potential for regional extent	High Impact, Long Duration, Potential for regional extent
9 - Wind, IGCC	Low Impact, Short Duration, limited area/extent impact	High Impact, Long Duration, Potential for regional extent	Low Impact, Long Duration, Potential for regional extent



Mitigation

- Mitigation options described for impacts in each element of the environment
- Can be used to lower or avoid impacts
- Some impacts cannot be mitigated
- Availability of mitigation options can be used to evaluate specific resource opportunities



Next Steps

- Public Hearing - October 10, SMT 4050, 5:30 to 8:00 PM
- Comment Period Closes - October 18
- Incorporate comments/analysis of Refined Portfolios into the EIS
- Publish Final EIS
 - Final EIS could be used for future IRPs, if resources/impacts stay within range considered here (updating with Addendum/Supplemental EIS as needed)
 - Any new generating plant will undergo environmental analysis based on specifics of site/design



Round 2 Draft Portfolios



Round 2 Draft Portfolios

- Objectives
 - Find resource strategies that fully utilize existing resources first
 - Use lower cost resources in the early years to maximize the value of the portfolios
 - Avoid large, single resource commitments
 - Use scalable resources when possible
 - Avoid resources requiring new transmission to be constructed on an unreasonably short timeline
 - Ensure that sufficient new generation in summer months to meet proposed seasonal exchanges
 - Include portfolios that meet the resource adequacy requirement and ballot measure I-937

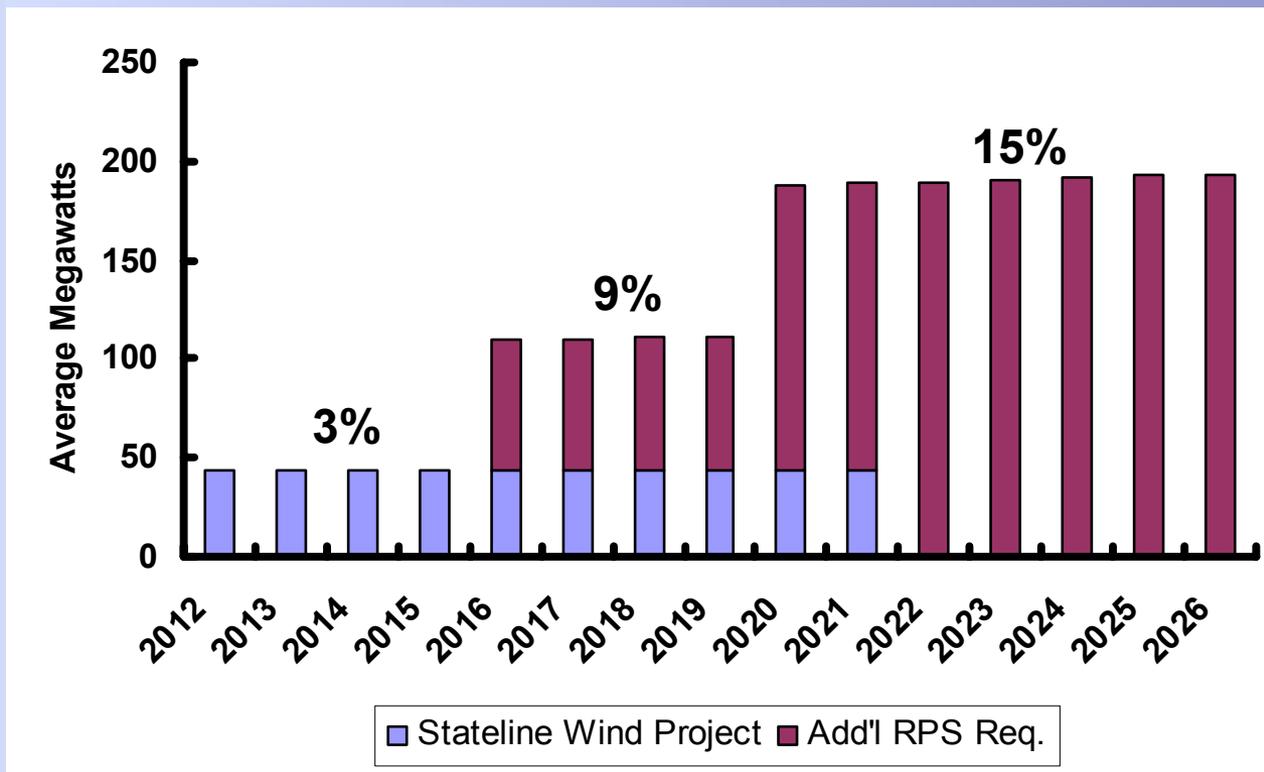


Renewable Portfolio Standard

- Washington Ballot Measure 937
 - Requires purchasing qualifying renewable energy as a percentage of load:
 - 3% by 2012
 - 9% by 2016
 - 15% by 2020
 - Renewable energy does not include hydro (except hydro efficiency projects)
 - Renewable energy must come from the Pacific Northwest
 - All cost-effective conservation resource potential must be acquired at a designated rate
 - Utilities may also comply by purchasing renewable energy credits (RECs). \$55/Mwh fine for failure to comply

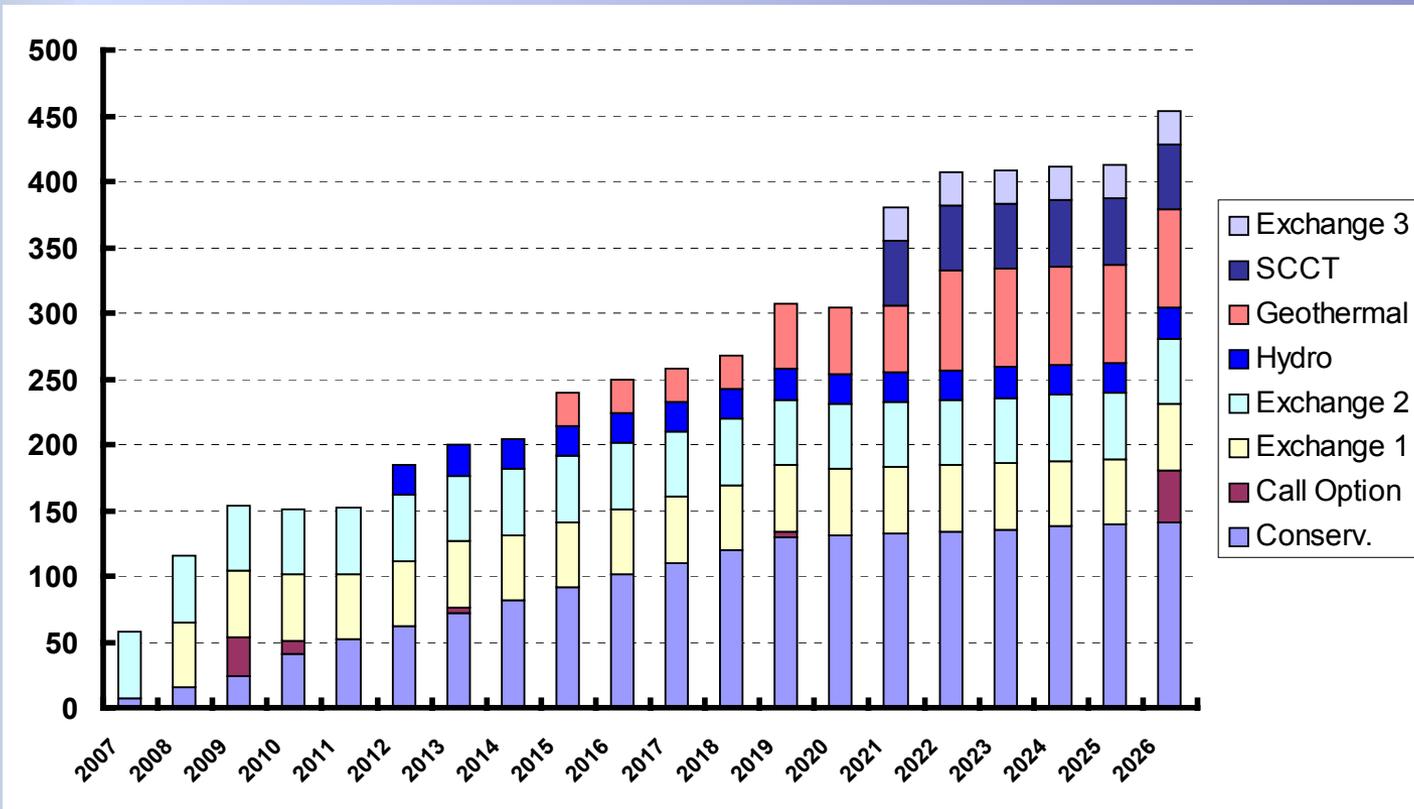


Estimated 937 Requirements for Seattle City Light



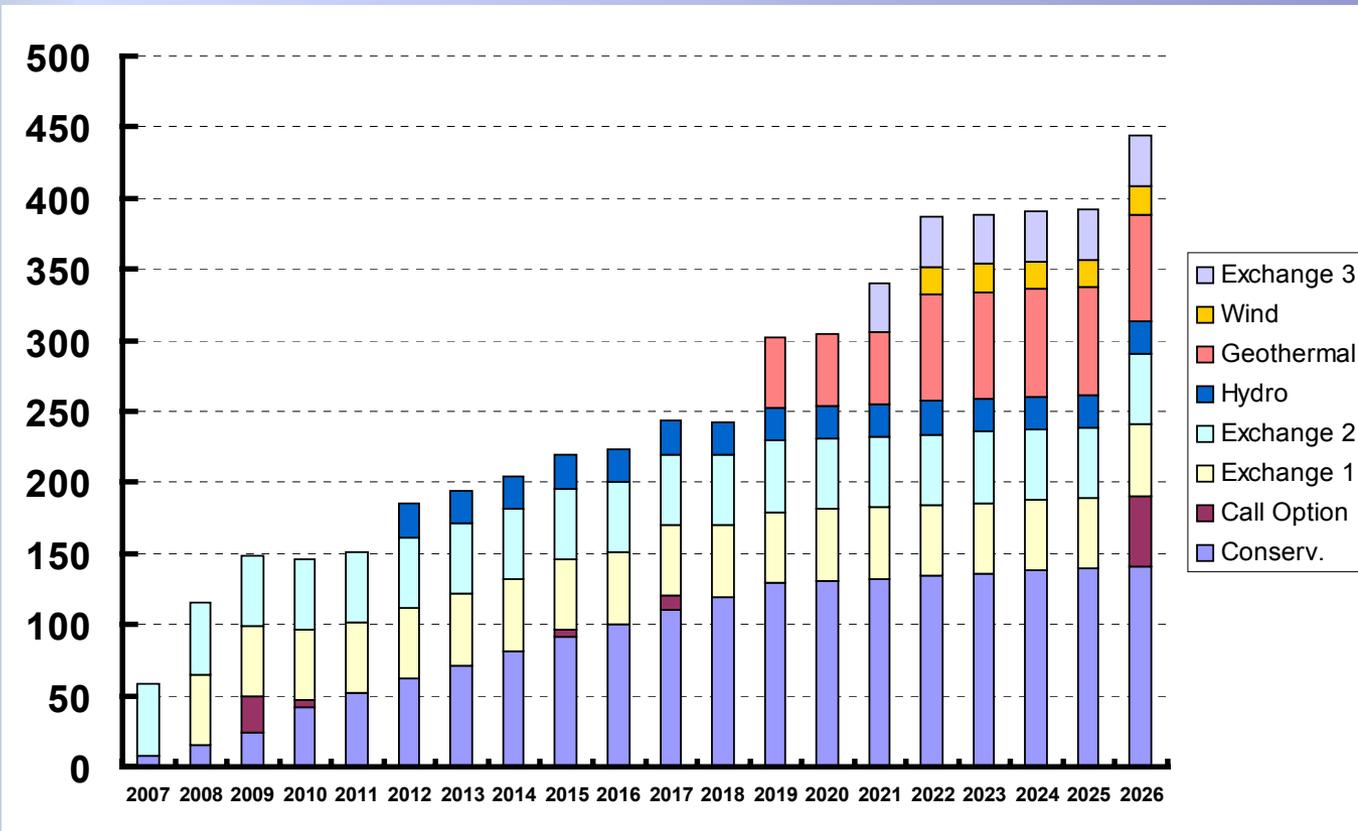


Resource Additions in Draft Portfolio 1



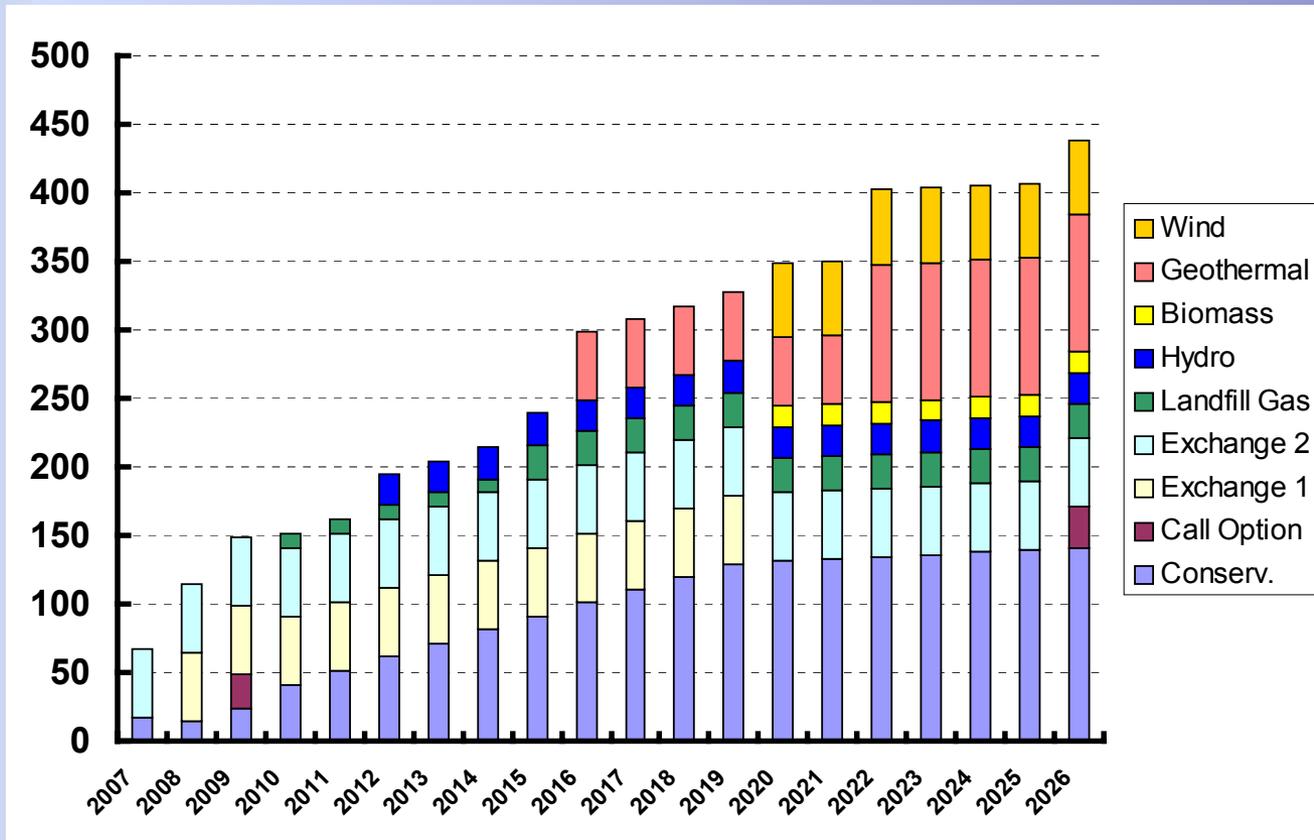


Resource Additions in Draft Portfolio 2



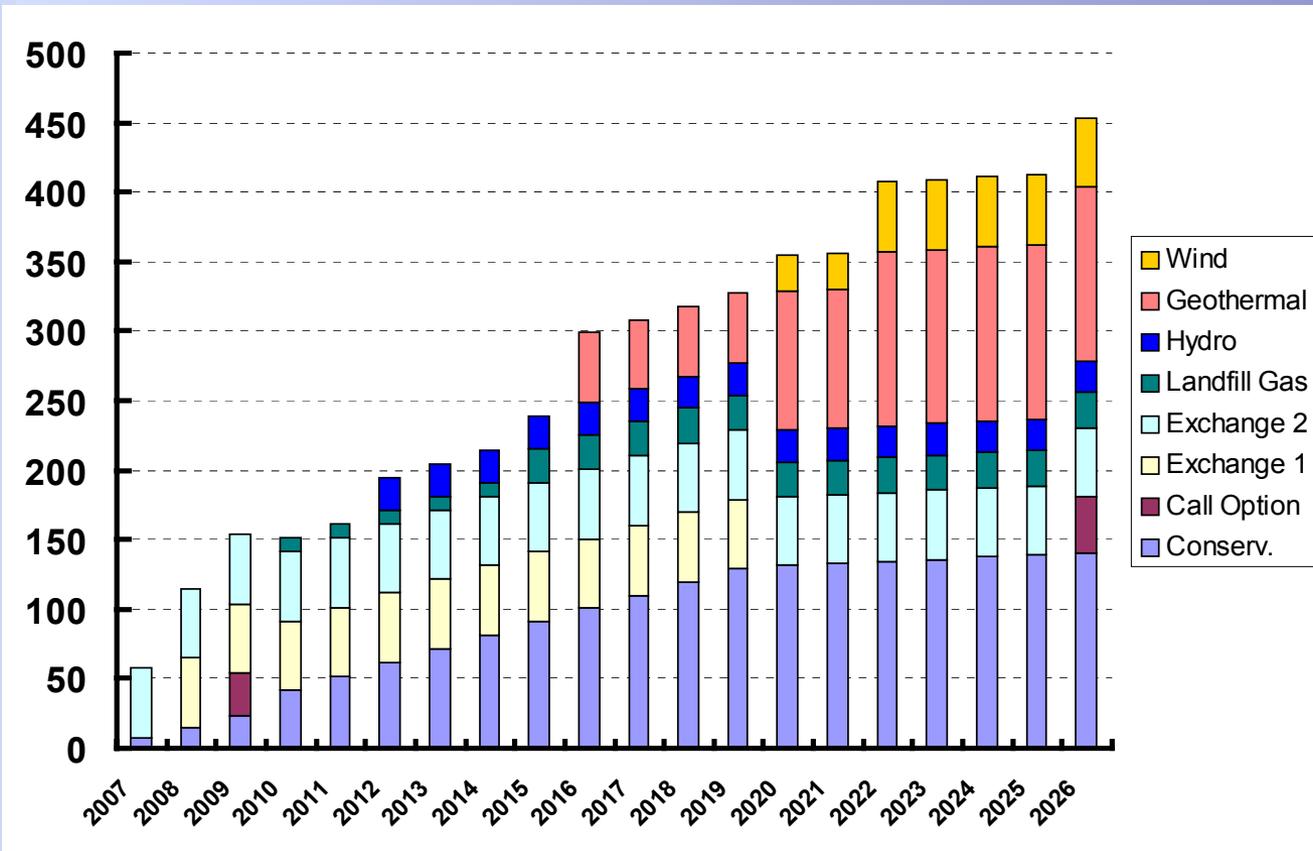


Resource Additions in Draft Portfolio 3



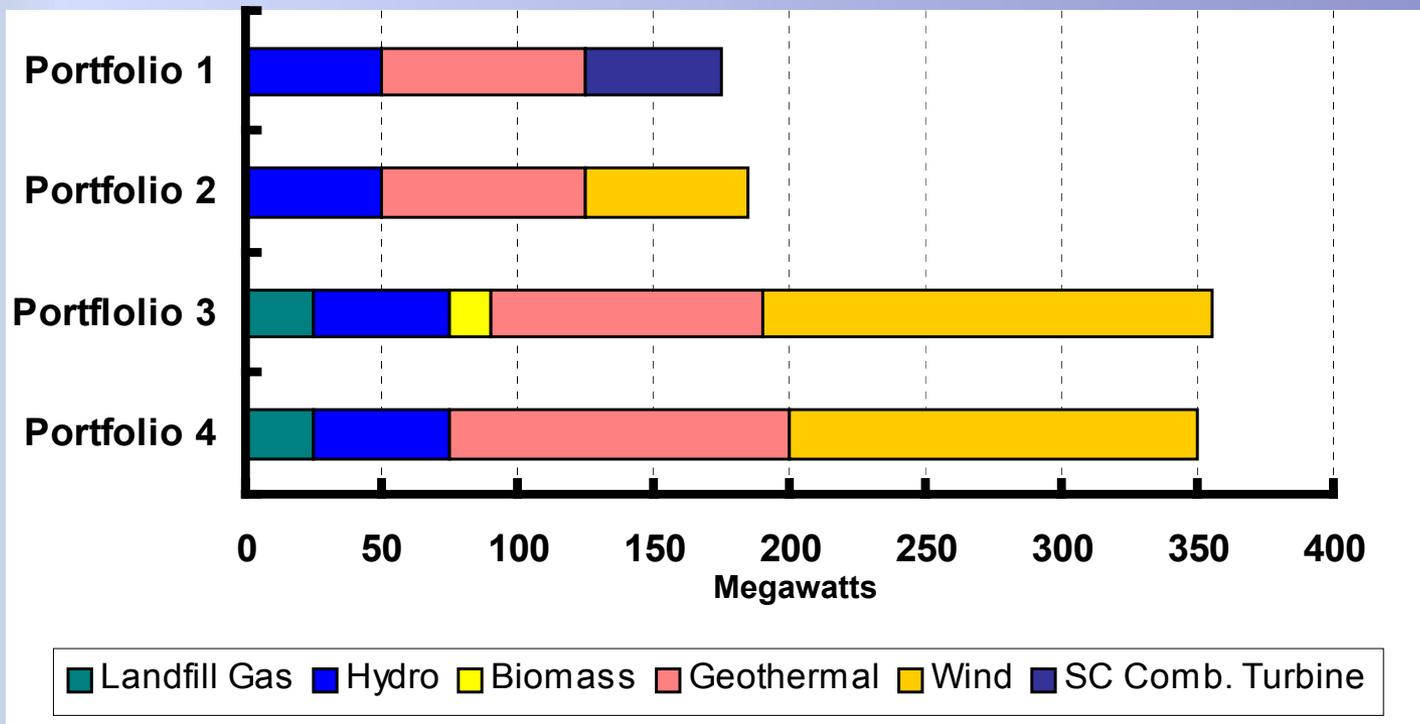


Resource Additions in Draft Portfolio 4





Total New Generation Capacity by Draft Portfolio in 2026*



*Does not include exchanges and call options. Wind assumed to have a 32% capacity factor



What's Next?

- Modeling of Draft Round 2 Portfolios
 - Testing and fine-tuning of portfolios
 - Refining conservation analysis
 - Rating portfolios on reliability, cost, environmental impacts, and risk
 - Scenario analysis
- Identification of Recommended Portfolio
- Another Stakeholder Meeting
- Presentation of Information, Recommendation, and Other Options to the Mayor and City Council



Round 2

New Generating Resources Assumptions & Costs



Assumptions

- \$/MWh
 - Real \$2006 - representative capacity factor
- Natural Gas
 - Located in Western Washington
 - Uses GED PNW Gas Price Forecast
 - Assumes 80% CF for CCCT, 20% CF for SCCT
 - Assumes new transmission needed for CCCT at > BPA rate
 - Assumes transmission upgrades needed for SCCT at = BPA rate
- Wind
 - Location in SE Washington/NE Oregon
 - Assumes new 1.5 MW turbines and 32% CF
 - Assumes new transmission needed at > BPA rate



Assumptions (continued)

- **Geothermal**
 - Binary technology located in the Pacific Northwest
 - Assumes 95% capacity factor
 - Assumes transmission upgrades at = BPA rate
- **Landfill Gas**
 - Located in Western Washington
 - Assumes 90% capacity factor
 - Assumes transmission upgrades at = BPA rate
- **Biomass**
 - Located in Western Washington
 - Fuel is wood waste and is at \$0 cost, and \$0 transportation cost
 - Assumes 90% capacity factor

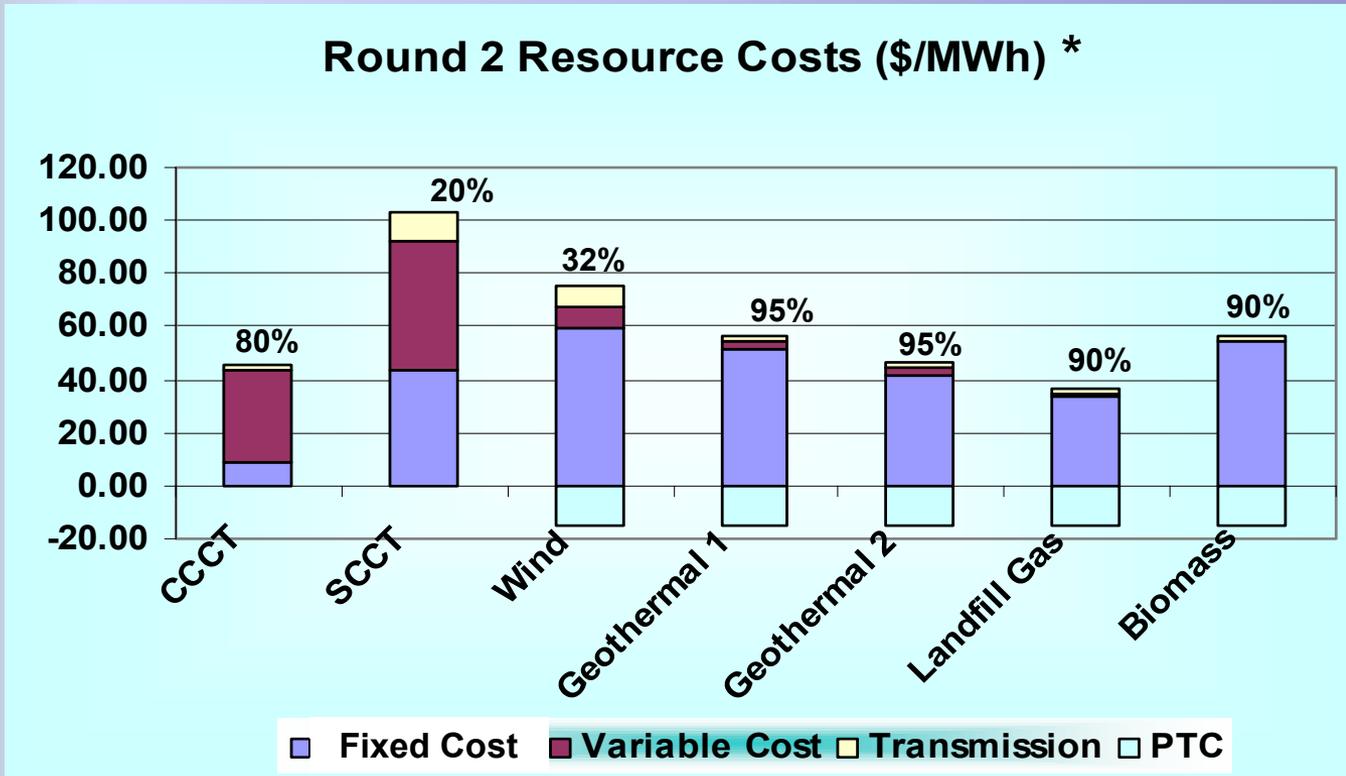


Assumptions continued

- Production Tax Credit
 - SCL not eligible for PTC
 - SCL eligible for CREB
 - PTC through 2011 for wind
 - PTC through 2013 for other renewable resources
 - CREB not available



Representative Resource Costs



Notes: *2006 dollars. Bars above "0.00" are before tax credits, at indicated capacity factors.



Changes in Round 2

- Eliminated Coal, IGCC, Large Biomass
- Wind - Adopted NPCC 7/2006 update
 - Increased capacity factor 27% - 32%
 - Increased capital cost \$1,350/kW to \$1,500/kW
 - Added integration \$8.25/MWh, deducted PTC \$15.20/MWh
 - Overall reduction in cost from \$69.60/MWh to \$59.82/MWh with PTC

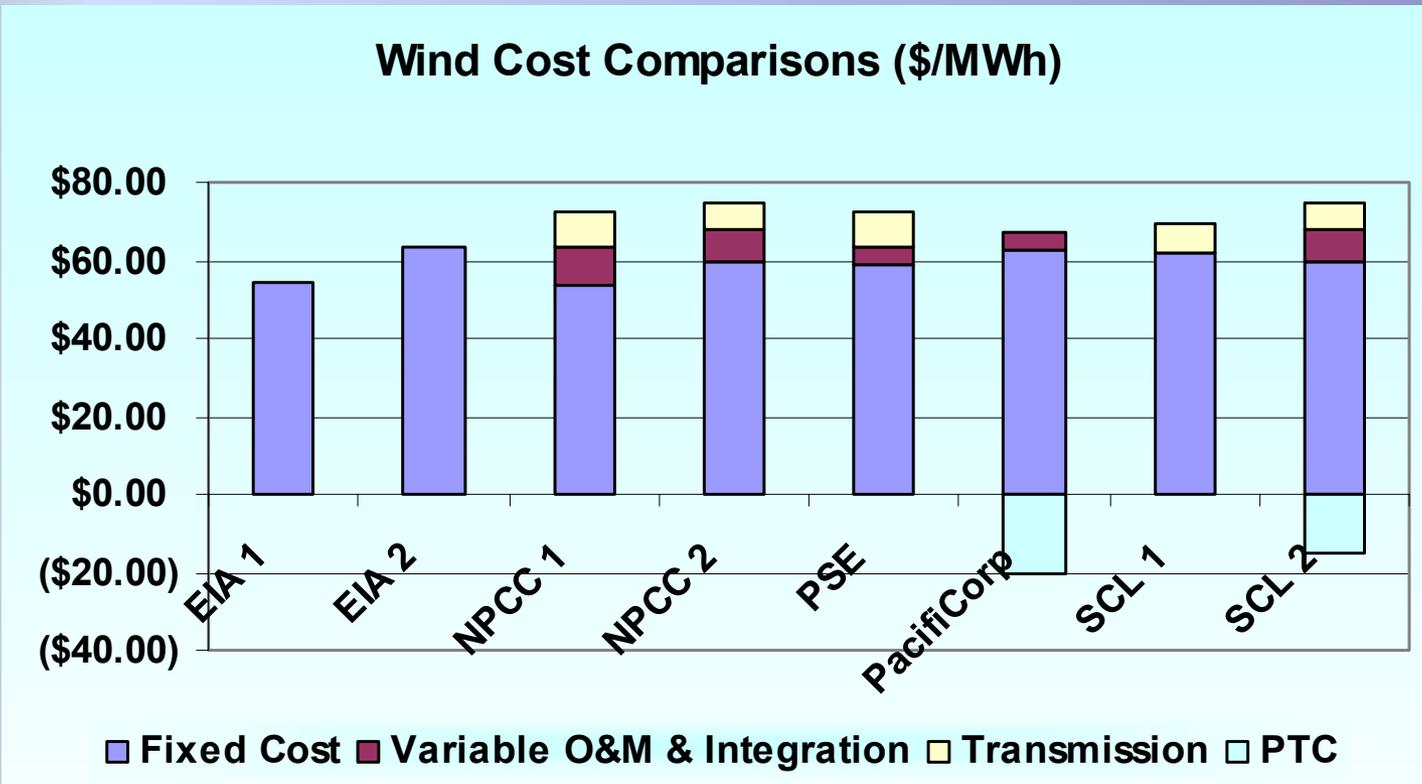


Changes (continued)

- **Geothermal, binary**
 - Increased capital cost \$2,000/kW to \$3,150/kW
 - PTC \$15.20/MWh
 - Overall reduction in cost from \$46.06/MWh to \$41.37/MWh with PTC
- **Landfill gas**
 - Increased capital cost \$1,045/kW to \$1,500/kW
 - PTC \$15.20/MWh
 - PTC reduces cost from \$31.28 to \$20.92/MWh
- **Biomass - 15 MW “small”**
 - PTC \$15.20/MWh
 - PTC reduces cost from \$56.48 to \$41.28



Wind Cost Comparisons



Notes: Costs depend in part upon assumptions about capacity factors, discount rates, and depreciable asset lives. If this information was unavailable, a common assumption was applied. NPCC and PSE use production tax credits in their cost assumptions, but amounts are unavailable



Cost References

- EIA Assumptions to the Annual Energy Outlook 2006 & Forecasts
- Global Energy Decisions
- Northwest Power & Conservation Council 5th Plan
 - plus Wind Update July 2006
- Western Governor's Association
 - Geothermal Task Force Report - 1/2006
 - Biomass Task Force Report - 1/2006
- NREL- Power Technologies Energy Data Book - Apr 2005
- GEA - Factors Affecting Costs of Geothermal Power Development - 8/2005
- Northwest Transmission Assessment Committee
- USDA - Various Reports on Biomass
- Puget Sound Energy 2005 Least Cost Plan
- PacifiCorp 2004 IRP Update
- SCL New Resources & Transmission Team Research & Assessment
- Renewable Developers



Questions?

IRP Website Address:

<http://www.seattle.gov/light/news/issues/irp/>

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