Forecasting and Using Carbon Prices in a World of Uncertainty

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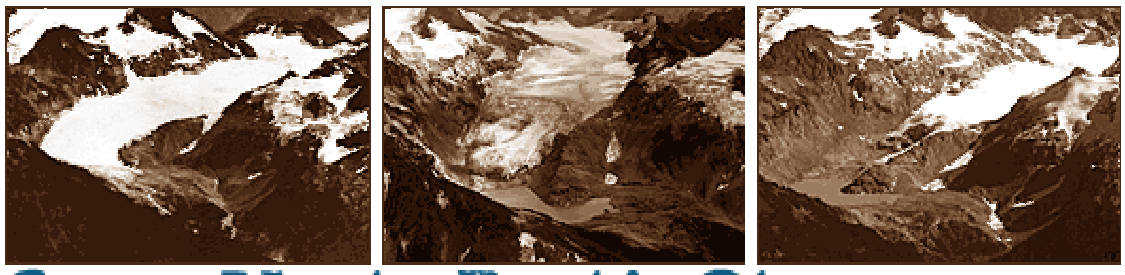
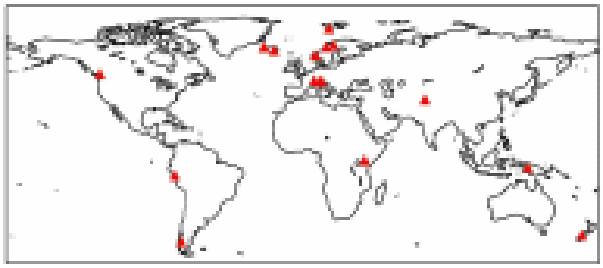
Climate Change
South Cascade Glacier

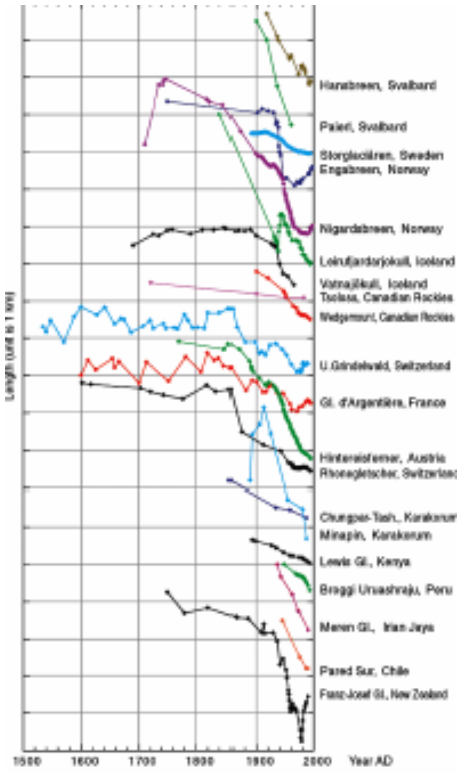
1928 1979 2000



Sizing Up the Earth's Glaciers by Evelyne Yohe
Land Processes DAAC
National Snow and Ice Data Center DAAC

Twenty Glacier Length Records





Carbon price matters!

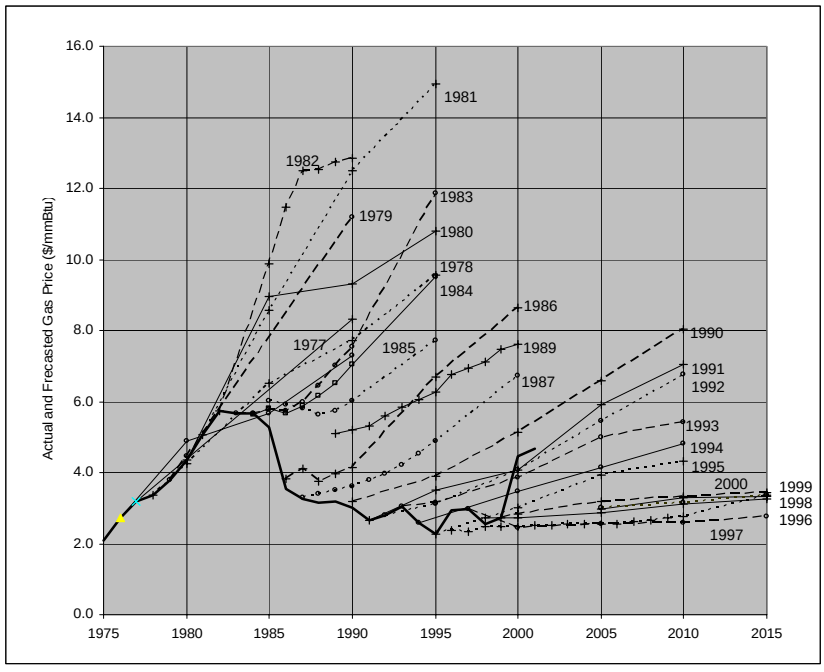
Illustrative Air Emissions Costs (2004 $/MWH) for New Resources

	Combined Cycle Natural Gas	Pulverized Coal	Integrated Gasification Combined Cycle Coal	Wind or Demand-Side Management
SO_2	0.00	0.72	0.14	0
NOX	0.05	0.47	0.44	0
Hg	0.00	0.35	0.18	0
CO_2	5.15	11.68	10.97	0
Total Air emissions cost	5.20	13.22	11.73	0

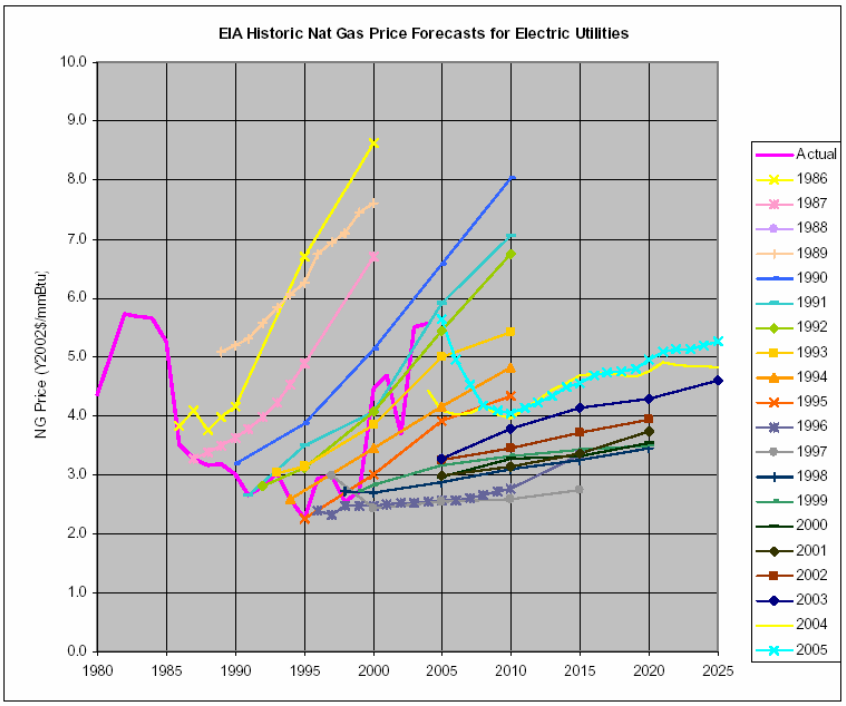
Assumptions for previous slide

	Combined Cycle Natural Gas	Pulverized Coal	Integrated Gasification Combined Cycle Coal	Wind or Demand-Side Management
Emission rates per unit of generation:				
SO_2 (tons/GWH)	0.00	0.66	0.12	0
NOX (tons/GWH)	0.03	0.31	0.29	0
Hg (lbs/GWH)	0.000	0.010	0.005	0
CO_2 (tons/GWH)	415	942	885	0
Emission prices:				
SO_2	$1,085 per ton			
NOX	$1,524 per ton			
Hg	$35,751 per lb.			
CO_2	$12.4 per ton			

Gas Price Projections Since 1975



Gas Price Projections 1986-2005



Carbon price information

Governments worldwide have agreed to respond to climate change by reducing greenhouse gas emissions

State governmental agencies, shareholders, and corporations are working to reduce greenhouse gas emissions from the U.S.

- State and regional policies
- Investor and corporate action
- Carbon inventories

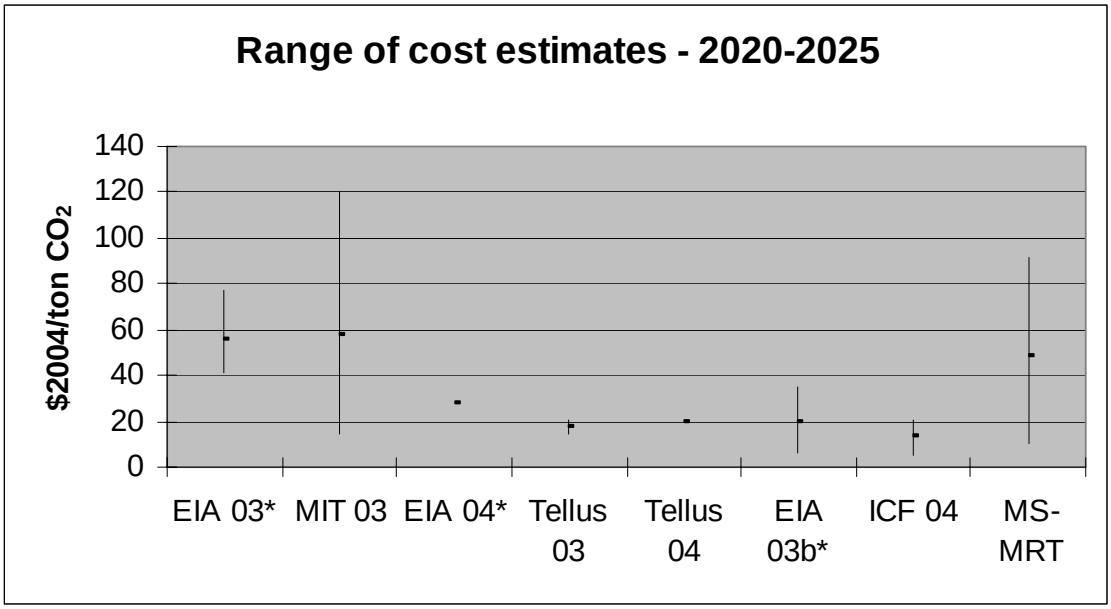
Estimating the cost of reducing carbon emissions

- Market transactions
- Values in utility planning
- Analyses of carbon emissions reduction costs

CO2 values considered by CPUC

Source Document	Value
Final E3 Avoided Cost Report	$8/ton C02 2004 $12.50 by 2008 $17.50 by 2013
PG&E internal RFO review	$8
PacifiCorp 2003 IRP -	$8
NRDC opening brief -	$12 beginning 2008
Idaho Power Co IRP -	$12.30 beginning 2008
EIA analysis of proposed legislation	$15-$25 in 2010 $14-$36 in 2020

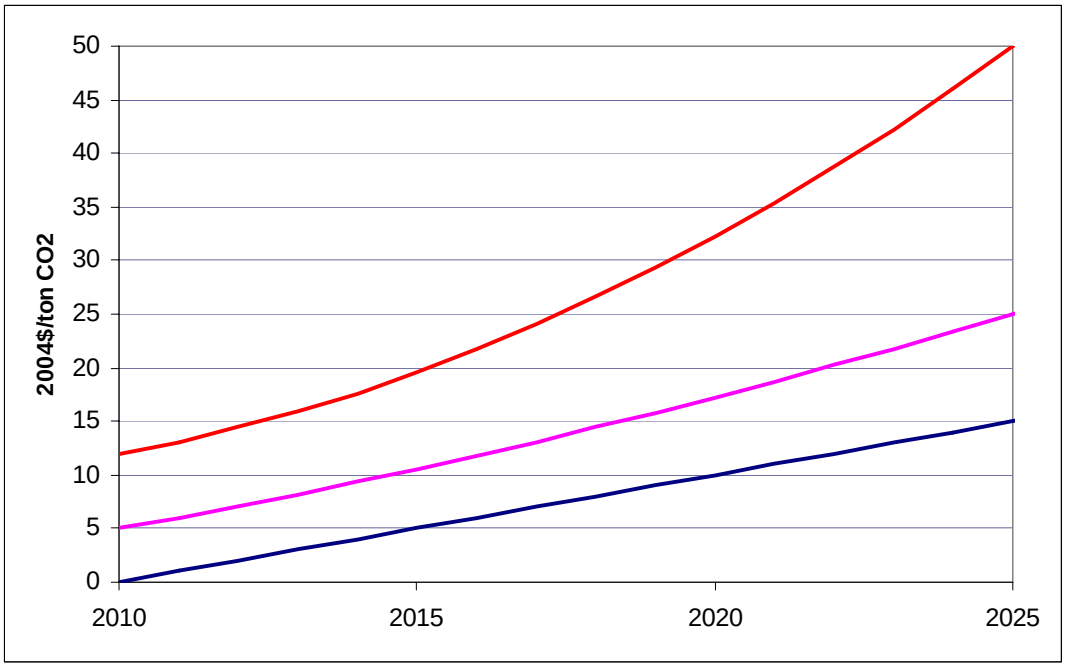
CO2 prices from models



Price Forecast $/ton CO2 (2004)

Year	Low	Mid	High
2010	0.0	5.0	12.0
2011	1.0	6.0	13.1
2012	2.0	7.1	14.4
2013	3.0	8.2	15.9
2014	4.0	9.4	17.6
2015	5.0	10.6	19.6
2016	6.0	11.8	21.7
2017	7.0	13.1	24.0
2018	8.0	14.4	26.5
2019	9.0	15.8	29.3
2020	10.0	17.2	32.2
2021	11.0	18.7	35.4
2022	12.0	20.2	38.7
2023	13.0	21.8	42.3
2024	14.0	23.4	46.0
2025	15.0	25.0	50.0
Levelized	6.1	12.4	23.9

Synapse CO2 Price Forecast



Reports available online

- Considering Climate Change in Electric Resource Planning: Zero is the Wrong Value
- Testimony of Bruce Biewald in Indiana Utility Regulatory Cause Nos. 42622 and 42718
- A Responsible Electricity Future: An Efficient, Cleaner and Balanced Scenario for the US Electricity System
- Portfolio Management: How to Procure Electricity Resources to Provide Reliable, Low-Cost, and Efficient Electricity Services to All Retail Customers

Carbon considered in planning

- Collect information – all sources
- Develop a carbon price forecast – and a range!
- Use the forecast consistently across various decision-making activities (DSM, IRP, plant retirement, environmental compliance, etc.)
- Update the forecast in light of new information