

The Financial Markets' View of Western Utilities

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State of the Markets

- Well established need for baseload capacity starting in the next decade
- Past capacity additions displayed clear trends – Preponderance of Coal, Nuclear or Gas in different times
- Today, several forces are pulling in different directions
 - Volatility in international energy markets / gas prices / even coal
 - Concerns over global warming
 - Rising utility Bills
 - National Security
- Sharply Rising Construction Costs
 - Equipment costs are rising due to global demand
 - Labor availability is scarce
 - EPC Contract terms are less favorable

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State of the Markets - Incentives for technology diversity

Two Certainties

- Fuel and technology diversity is a reality
 - Coal, IGCC, Nuclear, Gas, Wind, Geothermal, Solar are all being seriously considered
 - Only the first four are contenders for baseload generation
- Cost of electricity will remain a key driver for States
 - Fiduciary duty to minimize rates for customers
 - All costs must be considered – CO₂, Decommissioning etc.

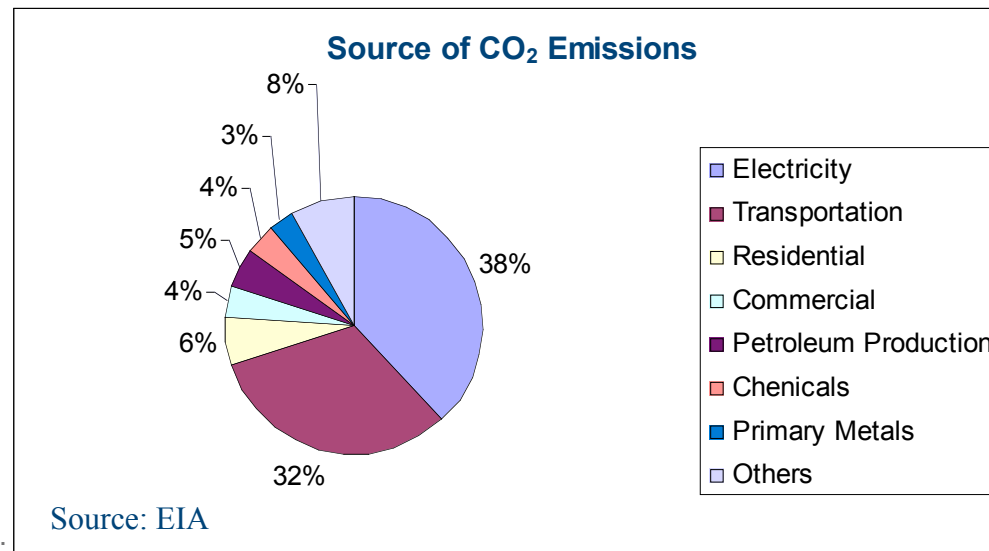
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Global Warming is a Growing, Overarching Concern

- Global Warming is emerging as the policy tie connecting all these technologies
- Significant potential for federal carbon regulations
 - Utilities maybe held to a 20/20 hindsight standard
- No consistent federal policy mandate
 - State-level initiatives like AB 32 and RGGI
 - Renewable Portfolio Standards
 - Subsidies for specific technologies
- The “Insurance Premium” analogy
- The power sector is the largest source of CO₂



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Technology Cost Comparison

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Technology Cost Comparison

Global Assumptions

Plant Capacity (MW)*	500
CO ₂ transportation (\$/ton)	6
CO ₂ storage (\$/ton)	4
Market price of CO ₂ emission (\$/ton)	30
Market price of gas (\$/MMBtu)	7
Market price of coal (\$/MMBtu)	1.7
Owners costs as % of EPC cost	20%
Ratio of upfront investment to annual capital recovery	9.43

*1600 MW for Nuclear

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Technology Cost Comparison

Technology Cost Assumptions

	IGCC	PC	Nuclear	NGCC
EPC Cost (\$/KW)*	1750	1450		
Total Plant Cost (\$/KW)	2100	1740	3000	600
Capacity factor	80%	85%	85%	65%
Heat Rate (MMBtu/Mwh)	8.5	10		7.1
Variable O&M (\$/Mwh)	2	2	0	1.5
Fixed O&M (\$/Kw-yr)	40	60	130	20
Decommissioning Costs (\$ bill)			3.0	
Carbon Capture Assumptions				
Capital Cost (\$/KW)	450	940	0	470
Operating Cost (\$/Mwh)	2.7	8.3	0	2.6
Energy penalty to capture CO ₂	15%	25%	0	13%
Ton/MWh CO ₂ emitted rate (before)	1	1	0	0.368
Ton/MWh CO ₂ emitted rate (after)	0.088	0.105	0	0.042

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Technology Cost Comparison

Cost of Electricity

\$/MWh	IGCC	PC	Nuclear	NGCC
Plant Capital Cost	32	25	56	11
Plant Fuel Cost	14	17	5	50
Plant O&M	11	8	23	5
Production Costs	57	50	68	66
CO ₂ capture capital cost	10	20	0	13
CO ₂ Energy penalty	12	26	0	12
CO ₂ other costs	14	21	0	7
CO₂ Related Costs	37	67	0	32
Grand Total	94	117	68	98

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