


Building a Utility Portfolio Considering Reliability, Cost, Risk and Local Economic Content

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The Regulatory Assistance Project



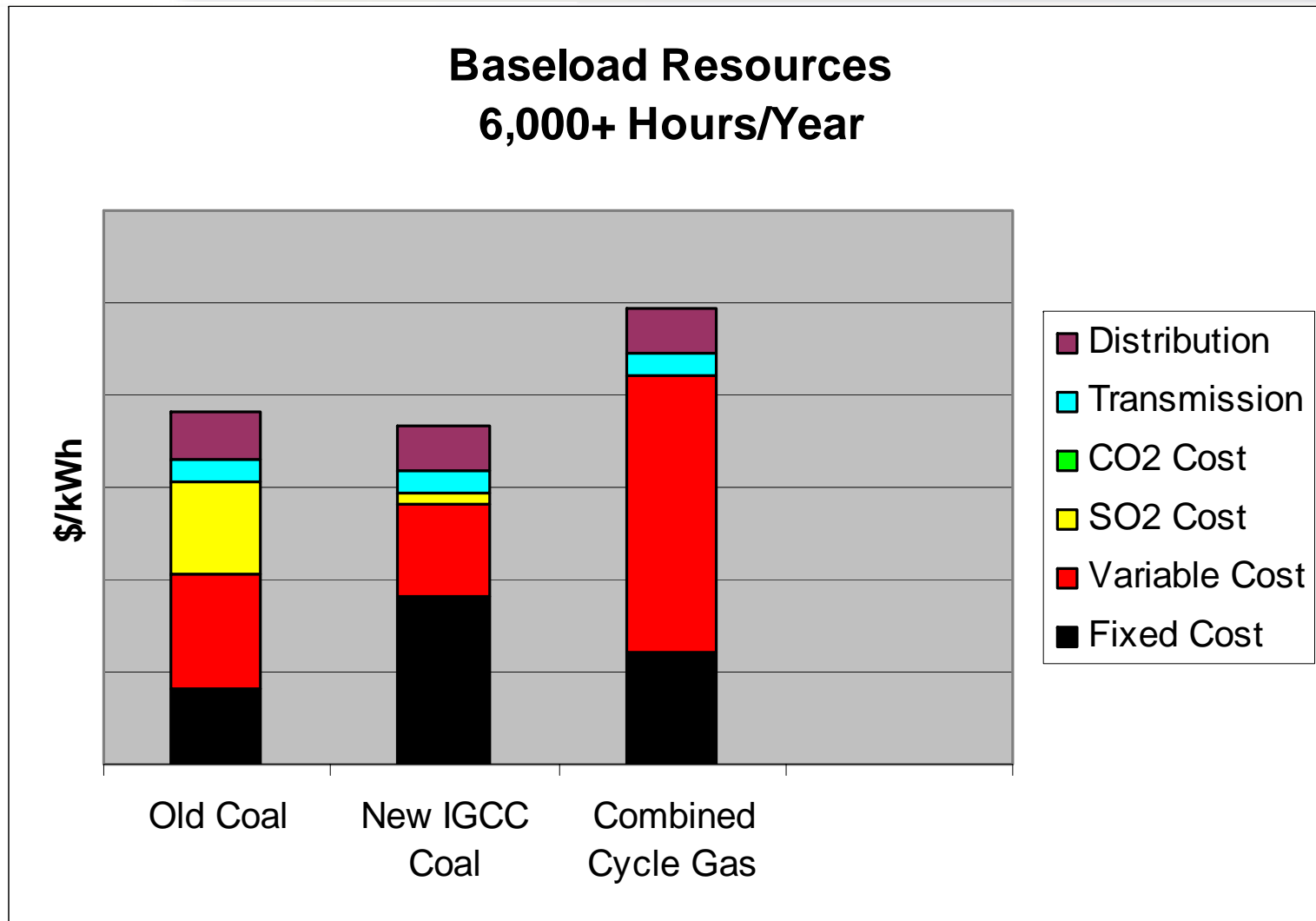
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Coal Is Most Economical As a Baseload Resource



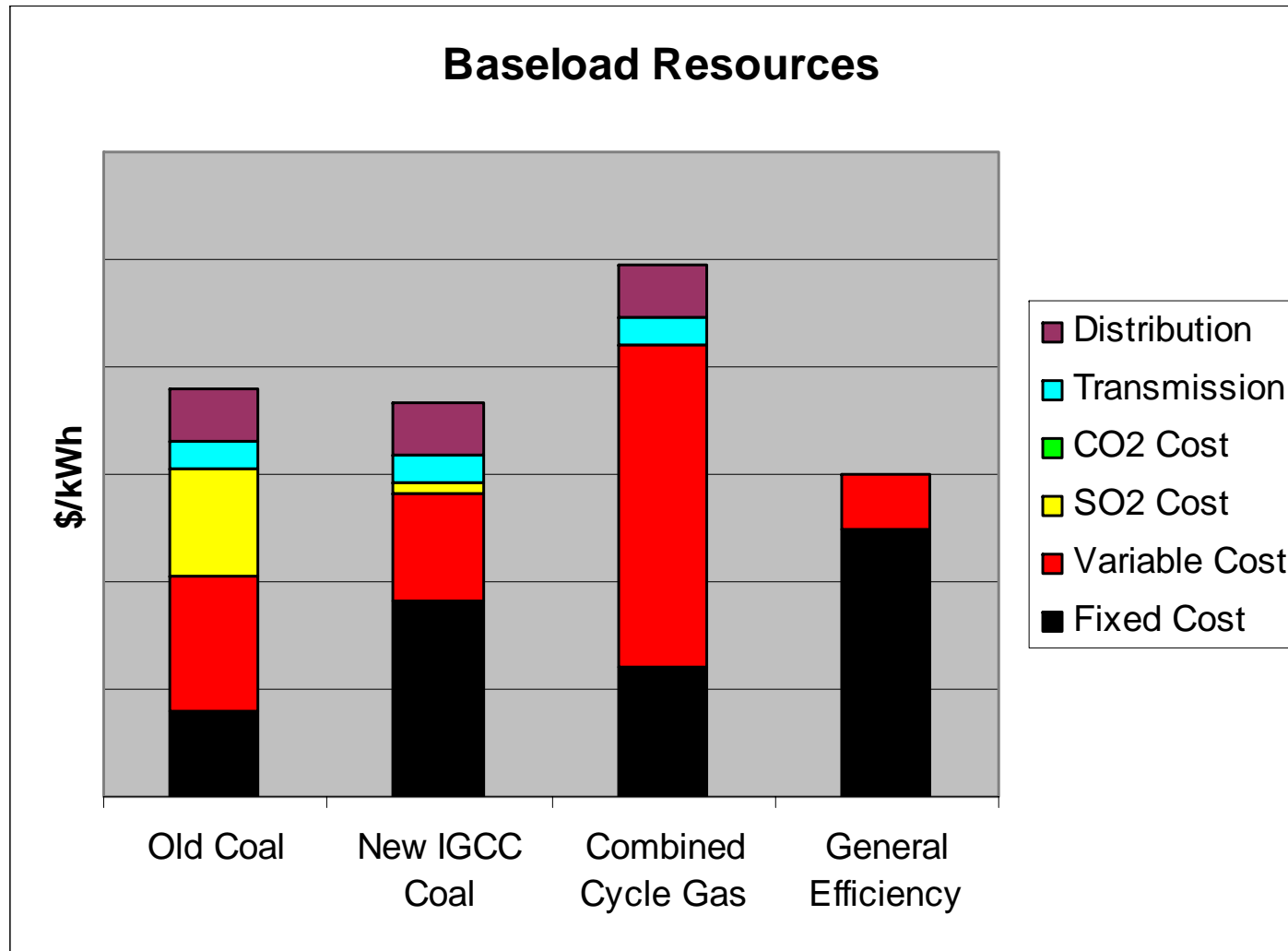


Conservation Assessments Show Low Costs for Savings

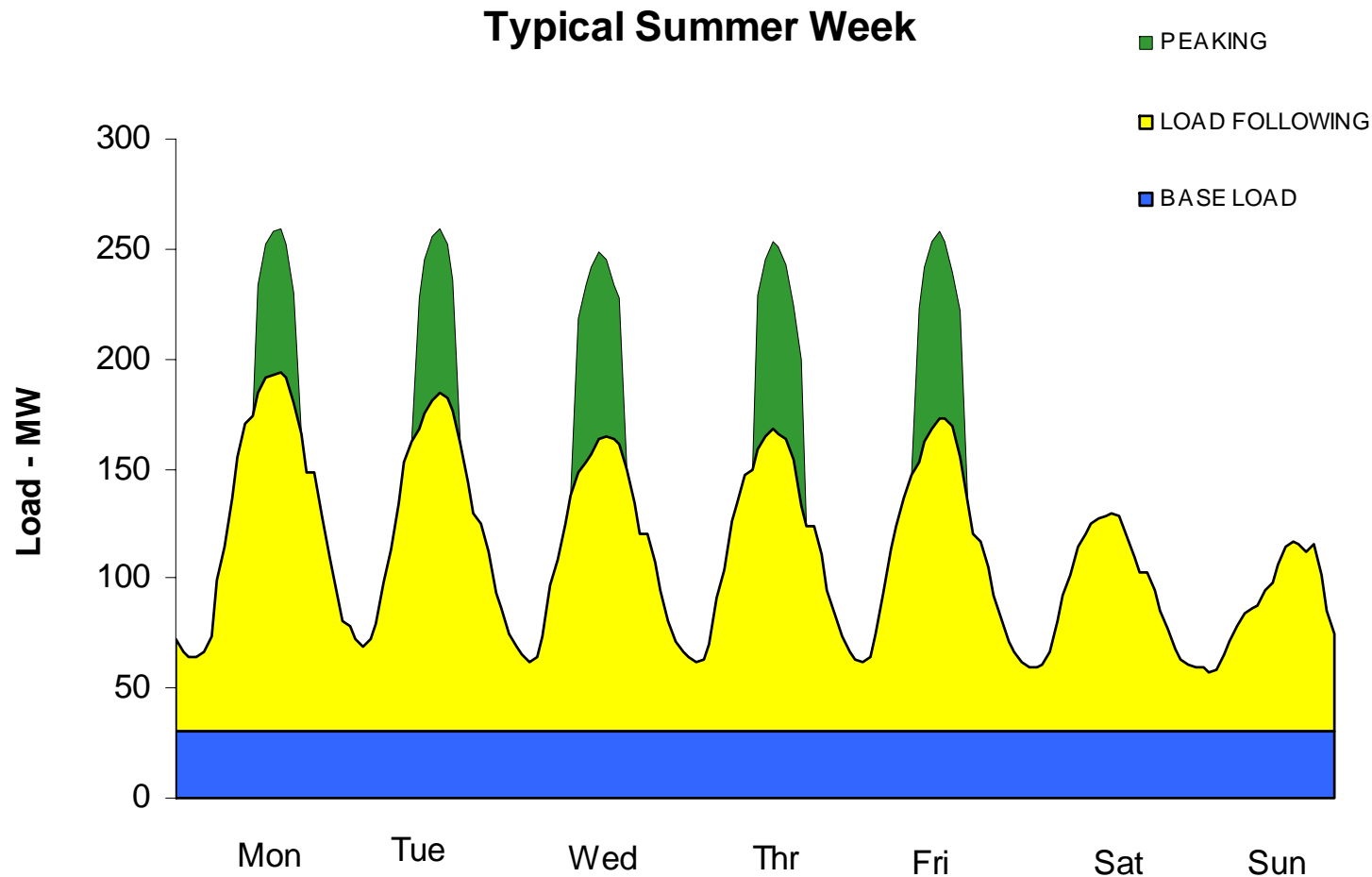
Table 3-1: Achievable and Cost-Effective Conservation Potential

Sector and End-Use	Cost-Effective Savings Potential (MWa in 2025) ⁴	Average Levelized Cost (Cents/kWh) ⁵	Benefit/Cost Ratio ⁶
Commercial New & Replacement Lighting	245	1.2	9.1
Agriculture - Irrigation	80	1.6	3.2
New & Replacement AC/DC Power Converters ⁷	156	1.5	2.7
Residential Clothes Washers	135	5.2	2.6
Residential Dishwashers	10	1.6	2.6
Commercial New & Replacement Infrastructure ⁸	11	1.4	2.4
Residential Compact Fluorescent Lights	535	1.7	2.3
Residential Water Heaters	80	2.2	2.3
Commercial Retrofit Lighting	114	1.8	2.2
Residential Refrigerators	5	2.1	2.2
Commercial Retrofit Equipment ⁹	109	3.4	2.1
Residential HVAC System Conversions	70	4.3	2.1
Commercial New & Replacement Shell	13	1.6	2.0
Industrial Non-Aluminum	350	1.7	2.0
Residential New Space Conditioning - Shell	40	2.5	2.0
Residential Existing Space Conditioning - Shell	95	2.6	1.9
Residential HVAC System Commissioning	20	3.1	1.9
Commercial Retrofit Infrastructure ⁸	105	2.2	1.8
Commercial New & Replacement Equipment ⁹	84	2.2	1.8
Commercial New & Replacement HVAC	148	3.0	1.5
Commercial Retrofit HVAC	117	3.4	1.3
Commercial Retrofit Shell	9	2.9	1.3
Residential HVAC System Efficiency Upgrades	65	2.9	1.2
Residential Heat Pump Water Heaters	195	4.3	1.1
Residential Hot Water Heat Recovery	25	4.4	1.1
Total	2,814	2.4	2.7

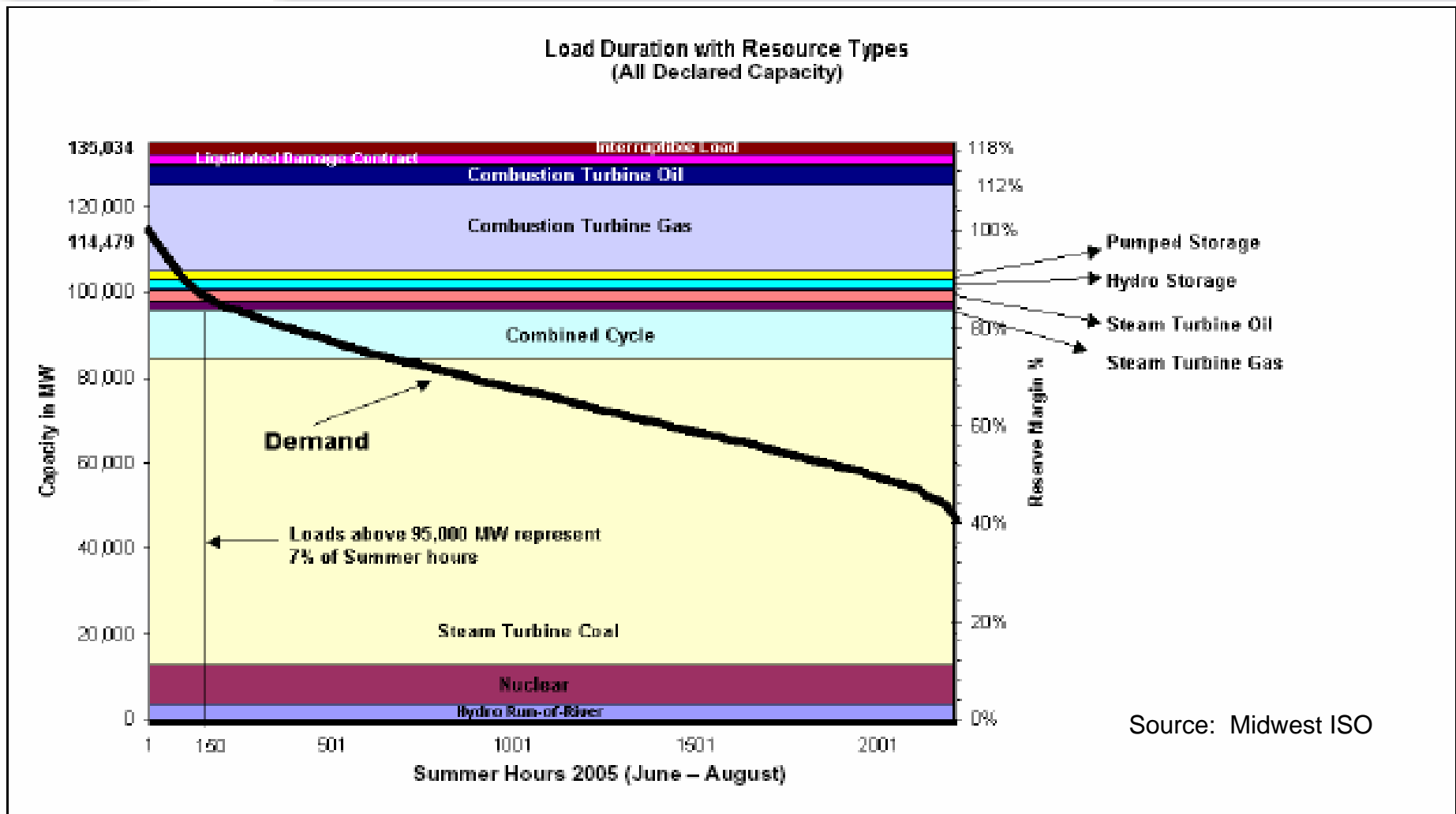
Energy Efficiency Can Be Cheapest – In Large Part Due to T&D Savings



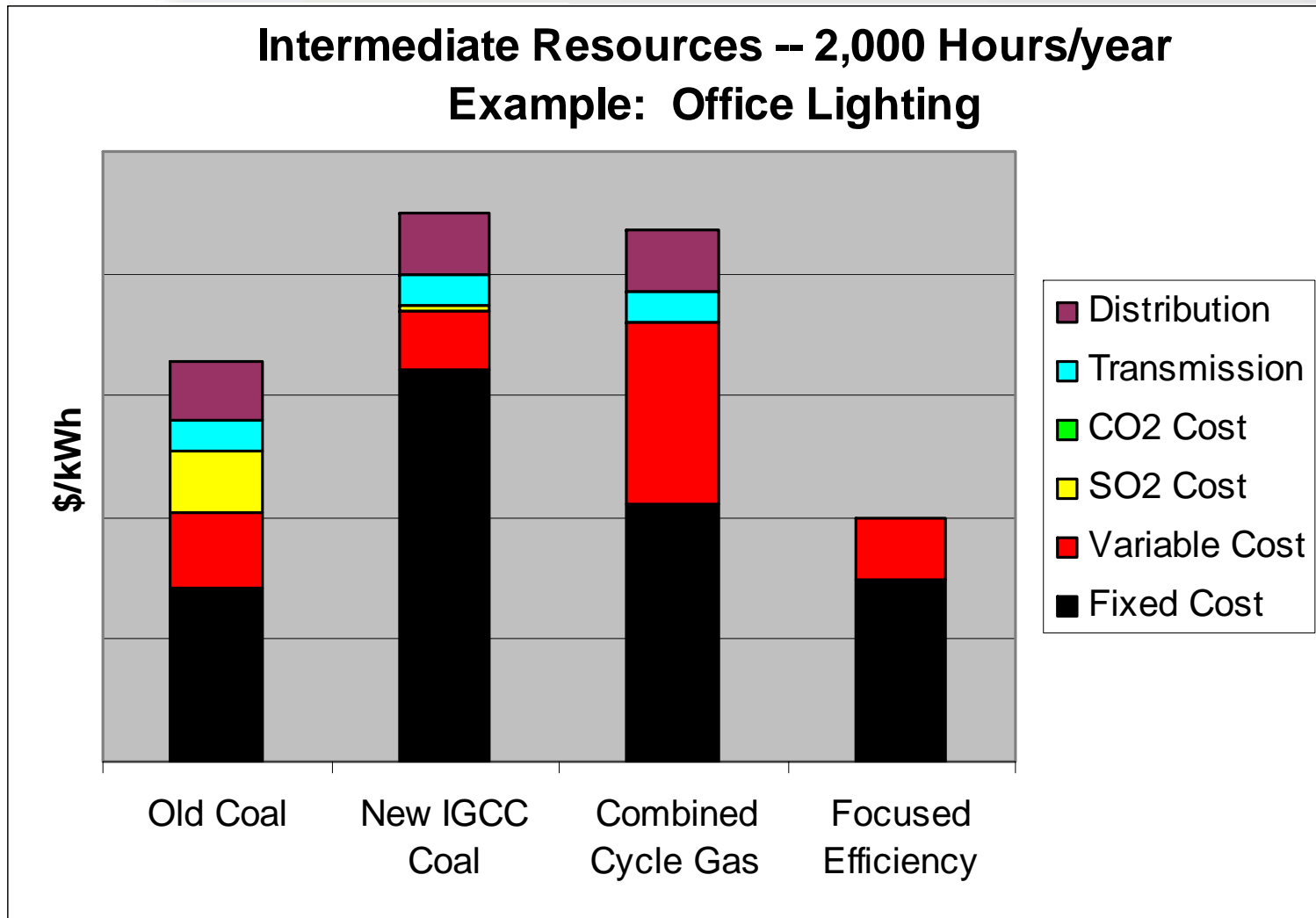
Variation in Load During a Typical Week Creates Planning Challenges



The Midwest is Primarily Coal and Gas Dependent

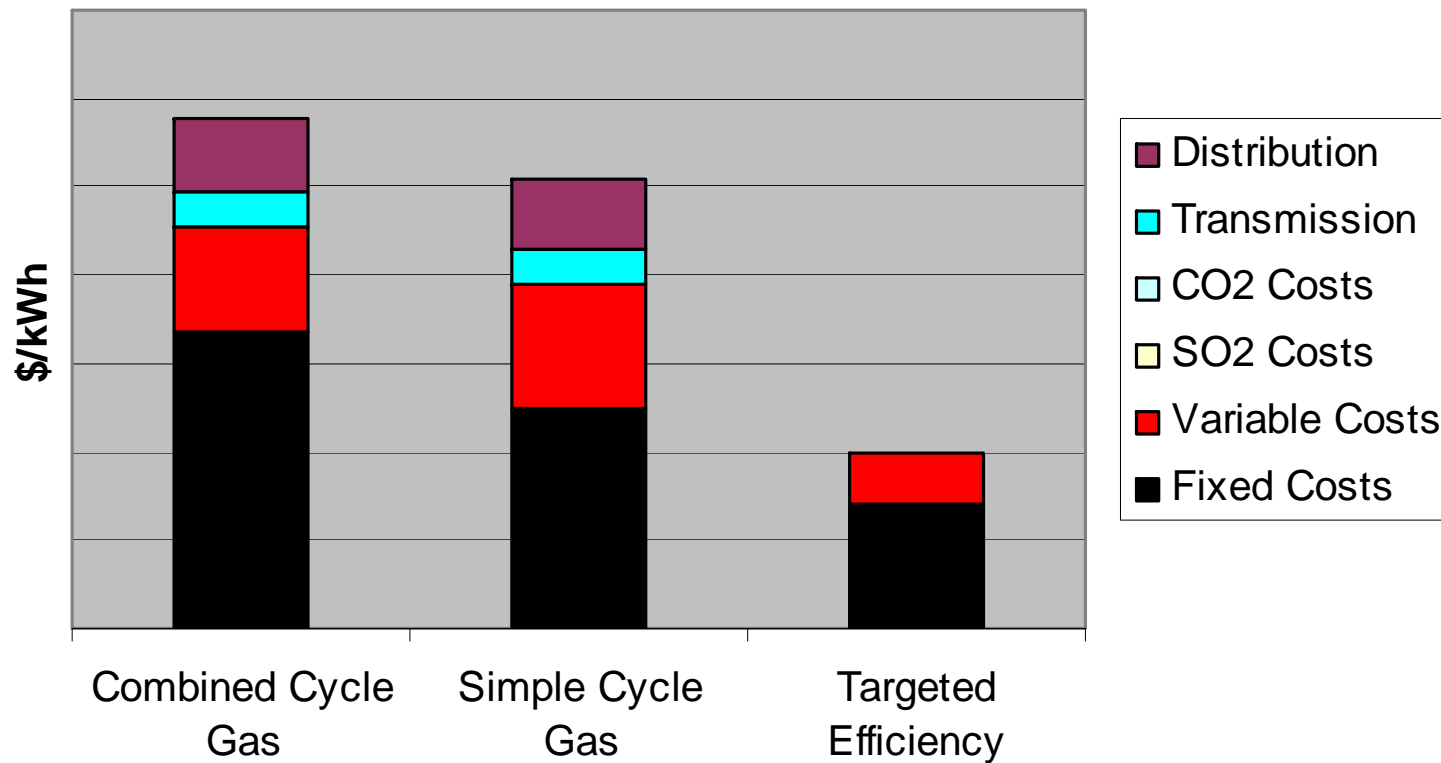


In an Intermediate Application Efficiency Looks Even Better



During Peak Hours, Generation Costs Are Very High

Peaking Resources: 500 - 1000 hours/year
Example: Residential Air Conditioning



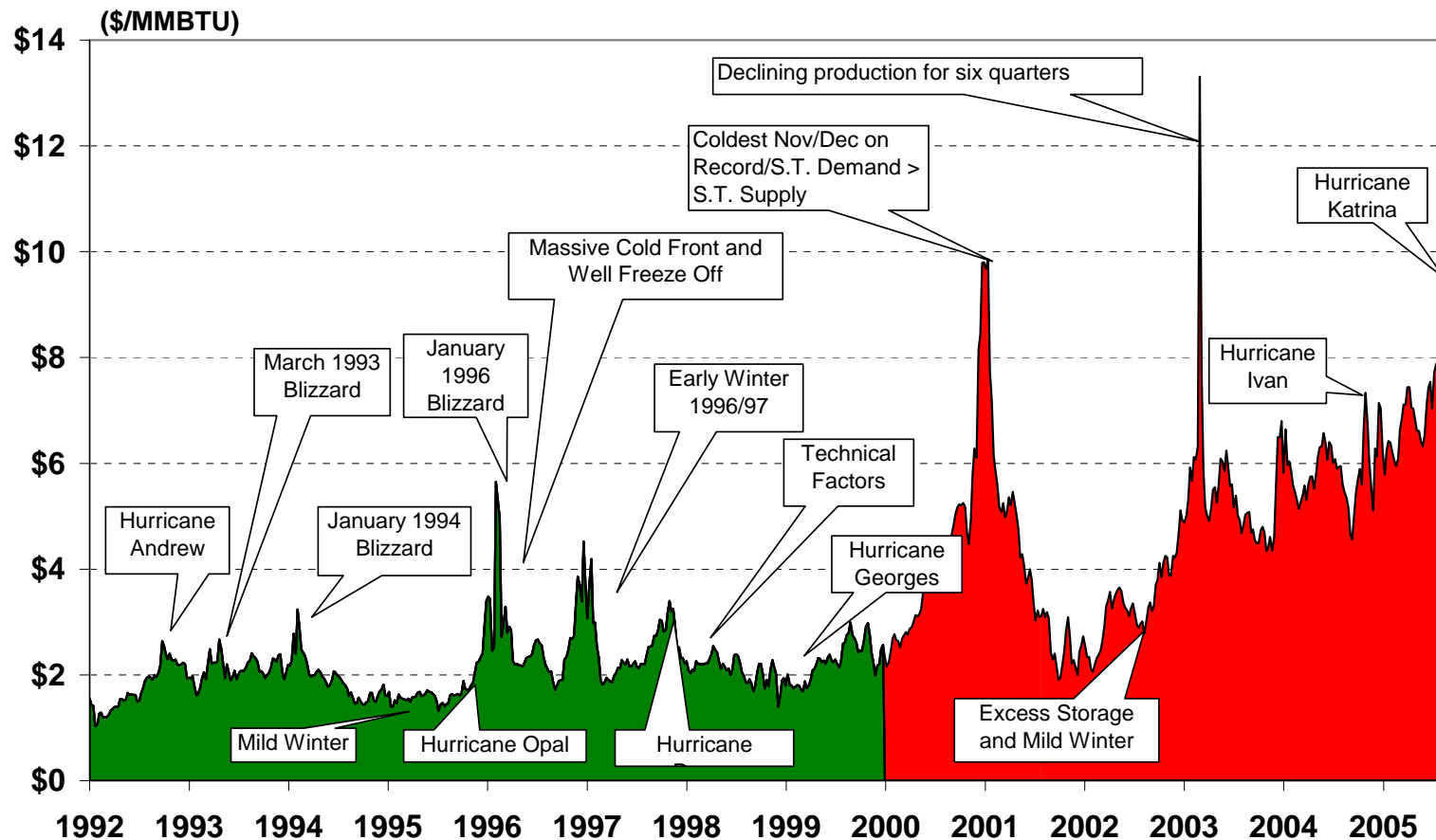


Efficiency Can Be Targeted To Peak Periods

- Energy Efficiency measures address specific end-uses.
- Each end-use has a different load shape
- Residential cooling, office lighting, and office cooling are particularly peak-oriented.
- Northwest Power and Conservation Council Estimated Costs:
 - Commercial Lighting: \$.012/kWh
 - Commercial HVAC: \$.03/kWh
 - Residential HVAC: \$.03/kWh

During On-Peak Hours, The Marginal Resource is Gas

HENRY HUB NATURAL GAS PRICE WEEKLY DATA

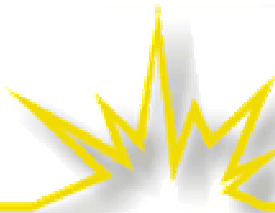


Source: NGW and EVA, Inc.



Efficiency Can Be Targeted To Geographic Areas

- First utility conservation programs were designed to avoid distribution outages.
- Some utilities target strategic fuel switching to alleviate constraints on specific distribution circuits
- Areas with transmission deficiency
- Areas with distribution capacity needs
- Areas with air quality issues



Efficiency Avoids Generation Capacity, Losses, and Reserves

- Savings at Customer
 - 10 mW
- Line Losses
 - Off-Peak: 5%
 - On-Peak: >10%
- Reserves
 - 7% of generation requirement
- Savings at Generation
 - $10 / .9 / .93 = 12 \text{ mW}$

Steps to Assembling An Energy Efficiency Portfolio To Match Other Resources



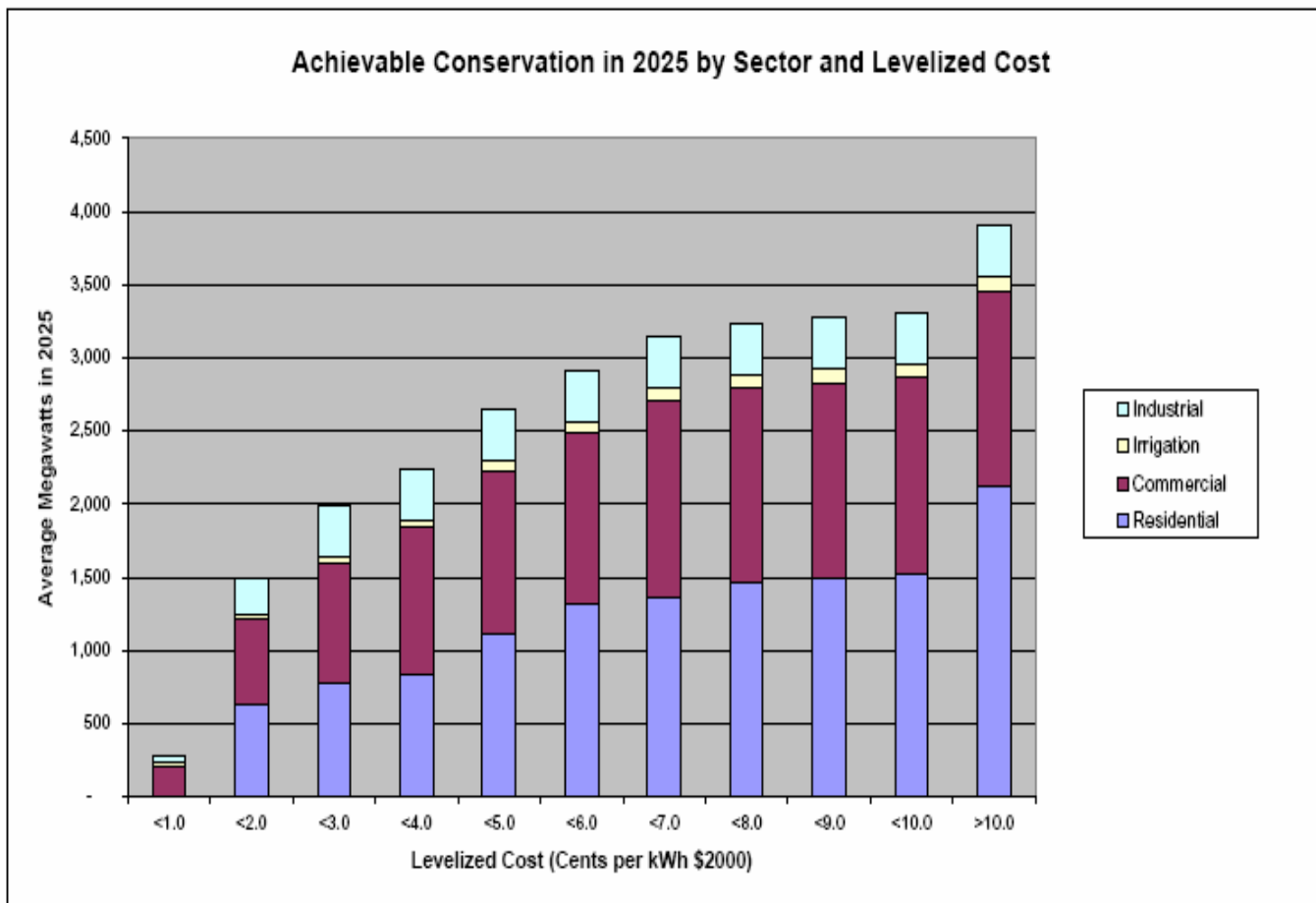
Supply and Load Analysis

- Determine load shape of utility system
- Determine costs of meeting each area of the load duration curve with supply
- Identify high-cost distribution locations
- Identify technology risks

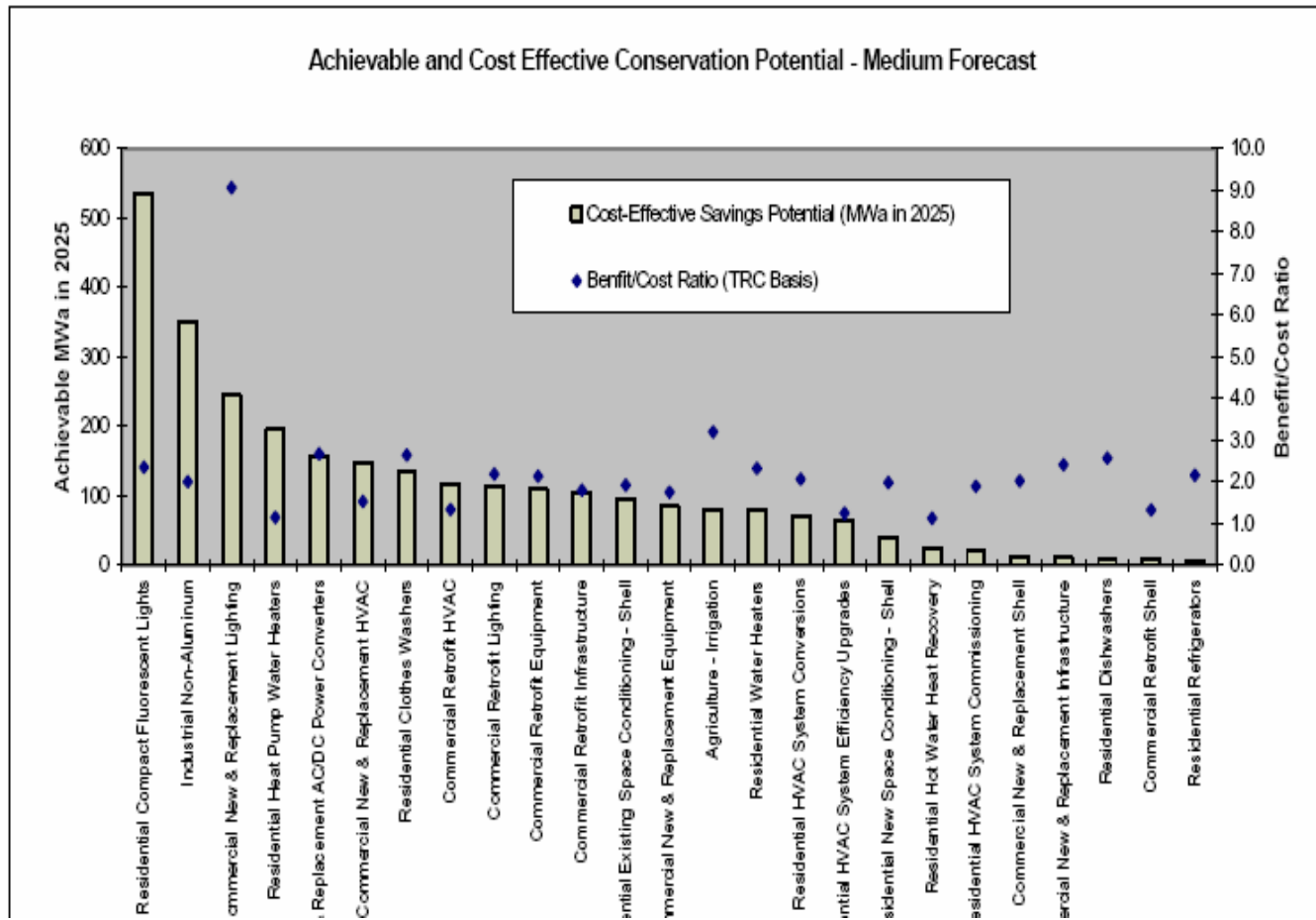
Efficiency Analysis

- Identify available resources.
- Determine costs
- Identify implementation mechanisms
- Identify funding and cost-recovery mechanisms

Efficiency Portfolio by Cost Level



Efficiency Portfolio by Program and Cost-Effectiveness





Implementation Strategies

- Utility Direct Investment - California
- Energy Efficiency Utility
 - Efficiency Vermont, Energy Trust of Oregon
- Codes and Standards
 - California Title 24 Energy Code



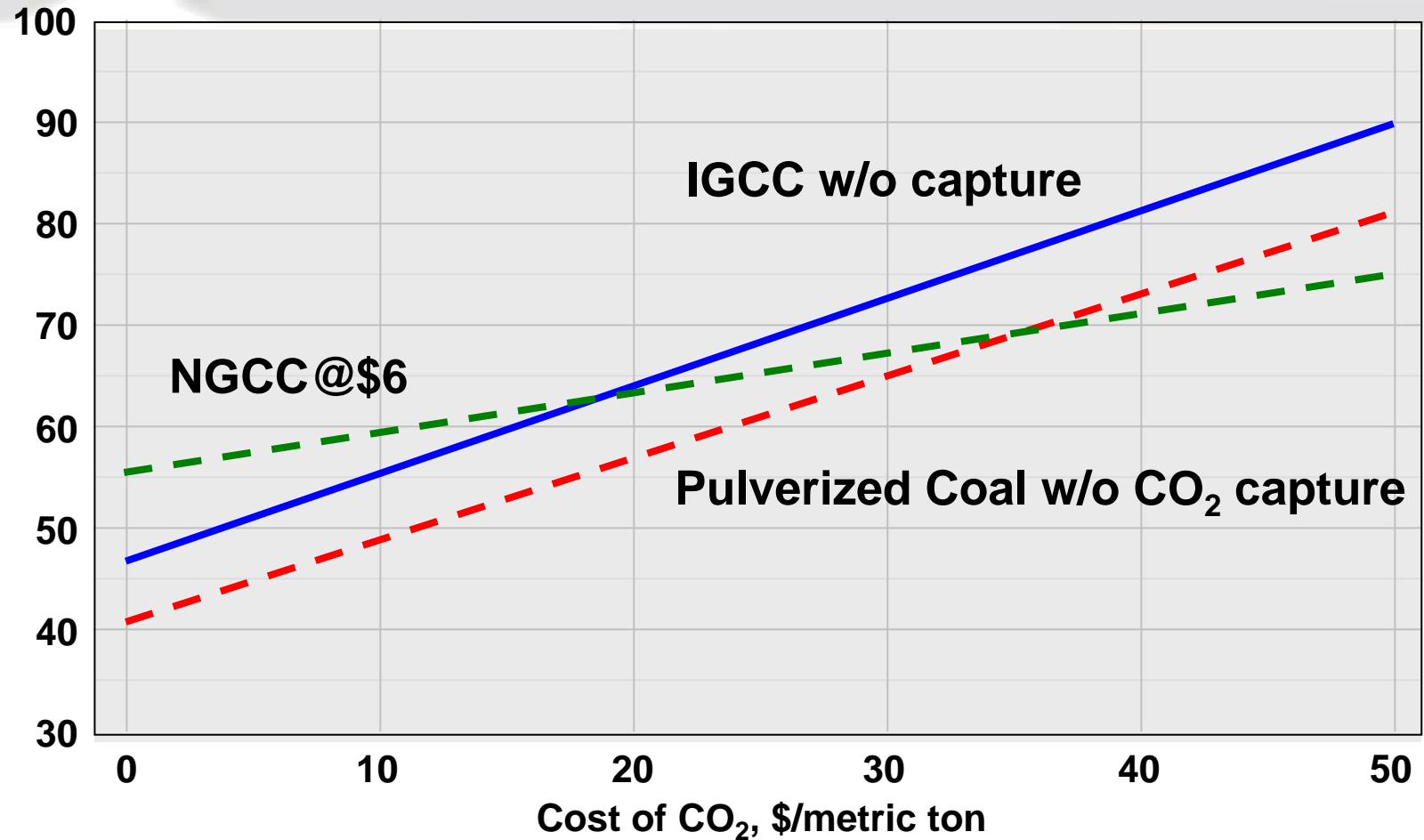


CO2 Risk Should Be Considered In Developing a Portfolio

- Estimated CO2 costs range from \$0/ton to \$40/ton
- Likely date for monetization is 2009+
- If imposed, probably will be phased in slowly.
- Much more of an issue for baseload coal than for gas-fired generation.
- Coal
 - \$10/ton = \$.01/kWh
 - \$20/ton = \$.02/kWh
- Gas CCCT
 - \$10/ton = \$.004/kWh
 - \$20/ton = \$.008/kWh
- Gas Peaker
 - \$10/ton = \$.006/kWh
 - \$20/ton = \$.012/kWh

Baseload Generation Costs vs. Potential Cost of CO₂ Penalties

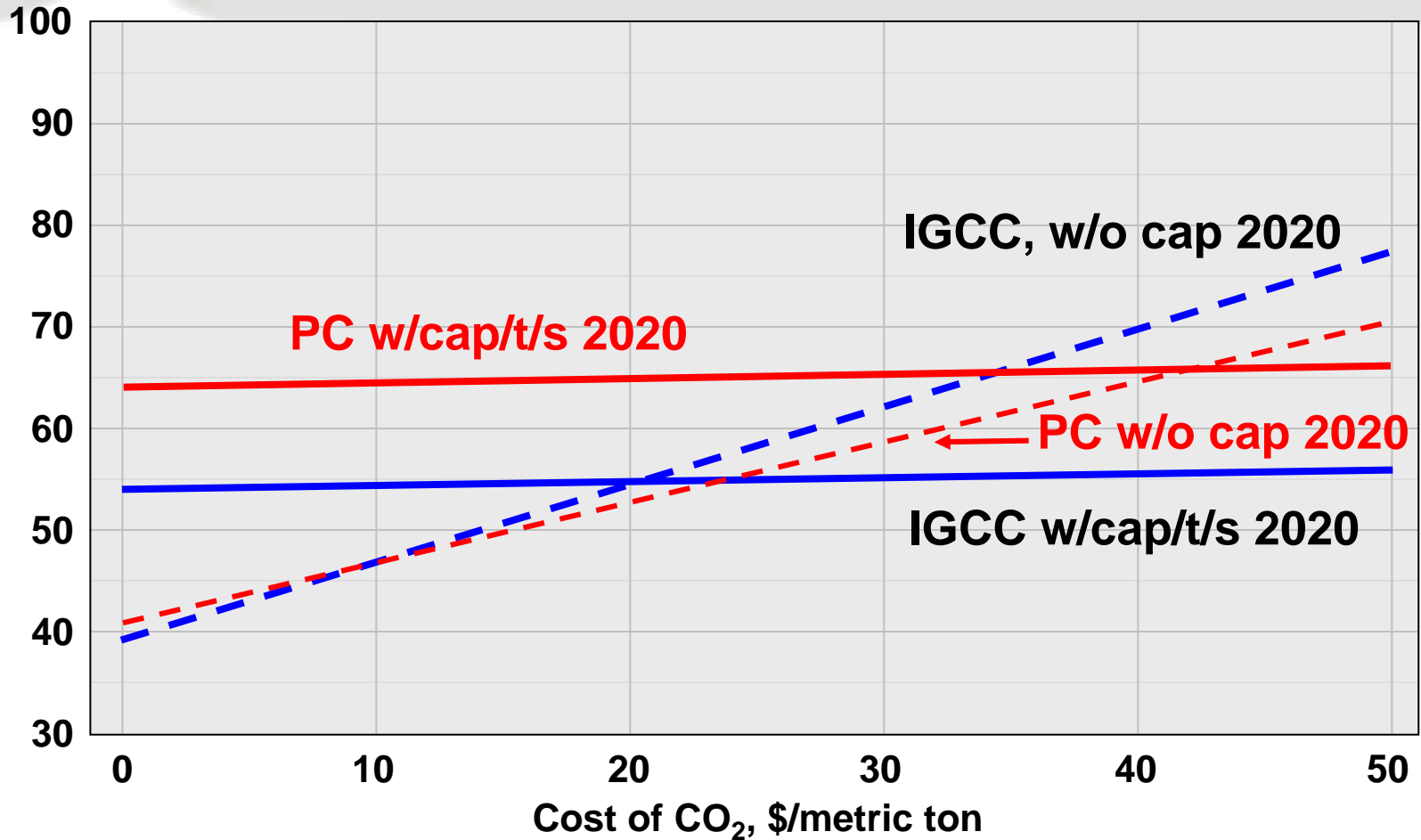
Levelized Cost of Electricity, \$/MWh



Source: EPRI, October 20, 2005

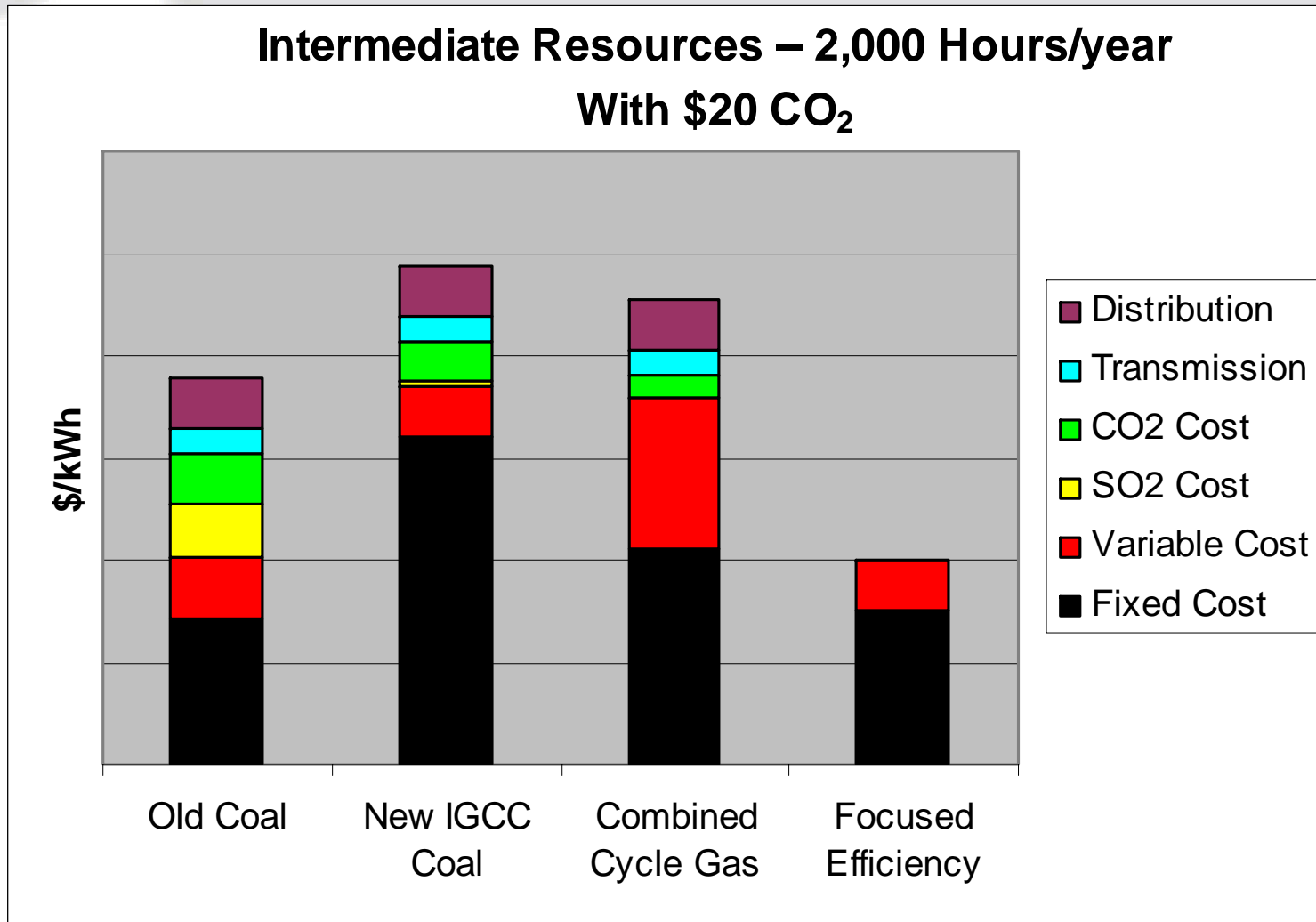
IGCC With Capture Is a Realistic Option But it Does Not Come Cheap

Levelized Cost of Electricity, \$/MWh



Source: EPRI, October 20, 2005

With CO2 Costs Included, the Efficiency Cost Advantage Widens



Efficiency Advantages

- Cost-Effectiveness
- Reliability – many small units
- Scalability – build as needed
- Peak-Oriented
- No Carbon Risk
- Can be targeted geographically
- Transmission and Distribution Savings
- High Labor and other Local Economic Content

