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

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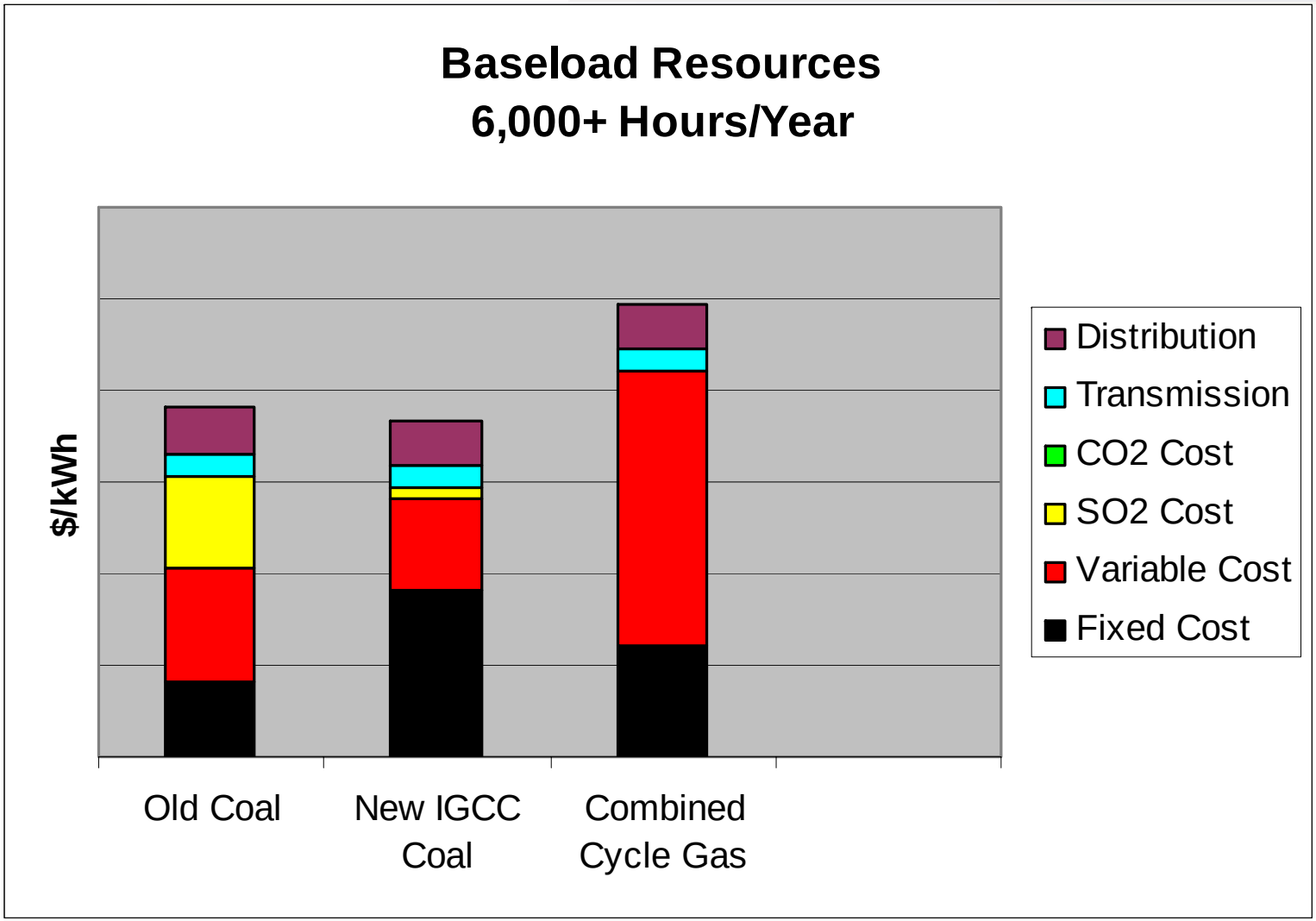
Coal Is Most Economical As a Baseload Resource



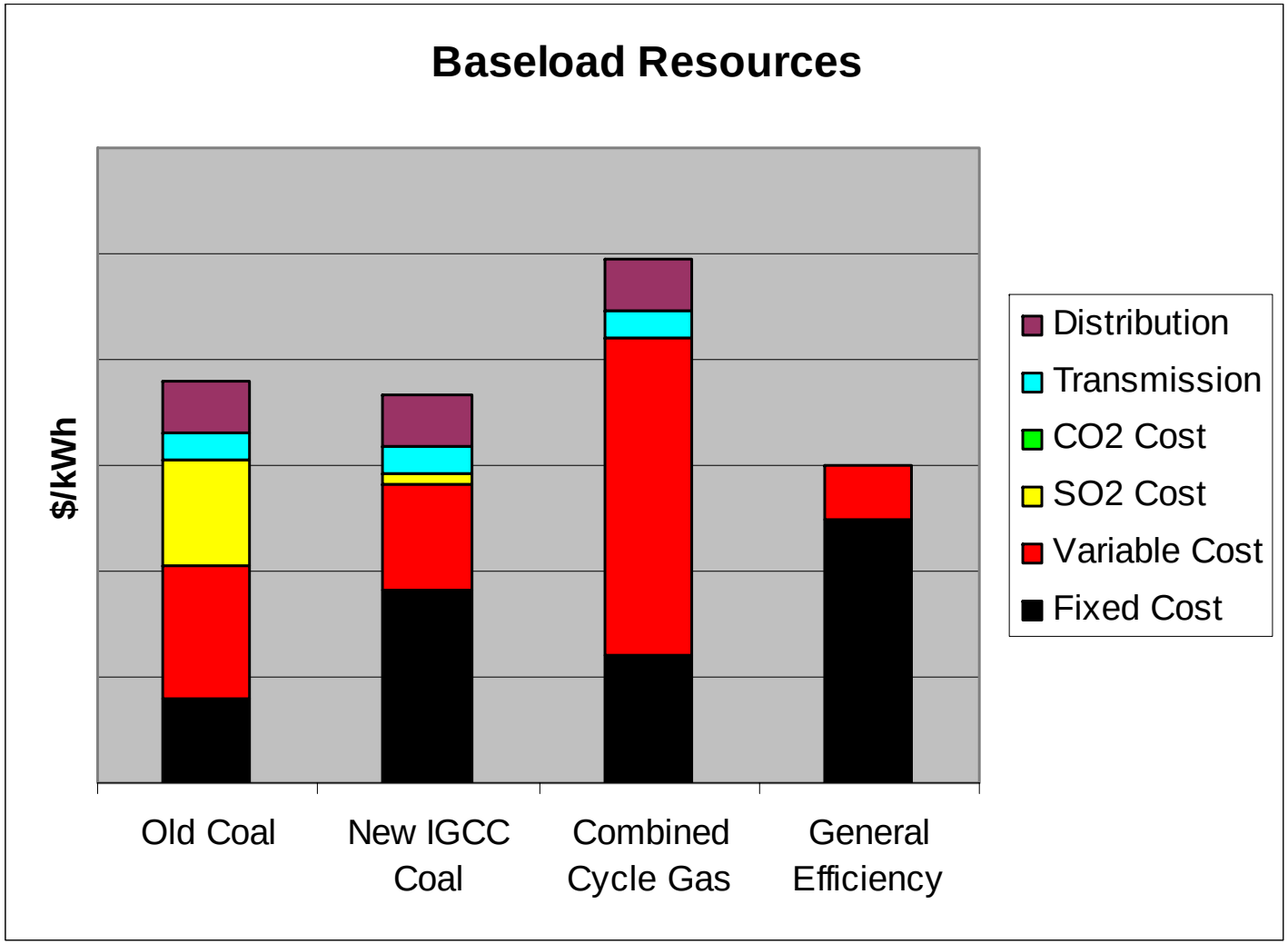
Conservation Assessments Show Low Costs for Savings

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

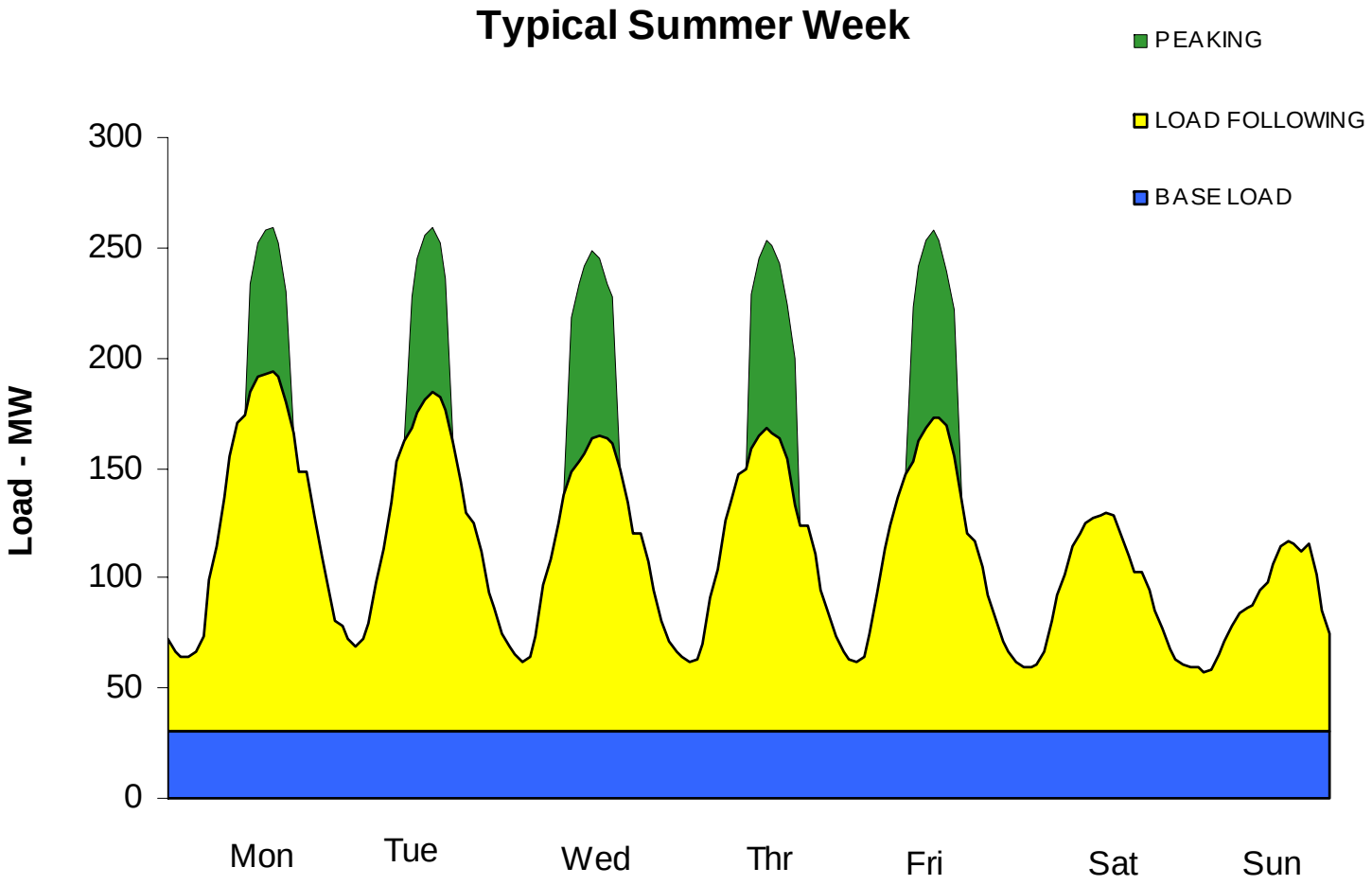
Sector and End-Use	Cost-Effective Savings Potential (MWa in 2025)[4]	Average Levelized Cost (Cents/kWh)[5]	Benefit/Cost Ratio[6]
Commercial New & Replacement Lighting	245	1.2	9.1
Agriculture - Irrigation	80	1.6	3.2
New & Replacement AC/DC Power Converters[7]	156	1.5	2.7
Residential Clothes Washers	135	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**

Northwest Power and Conservation Council, 2005

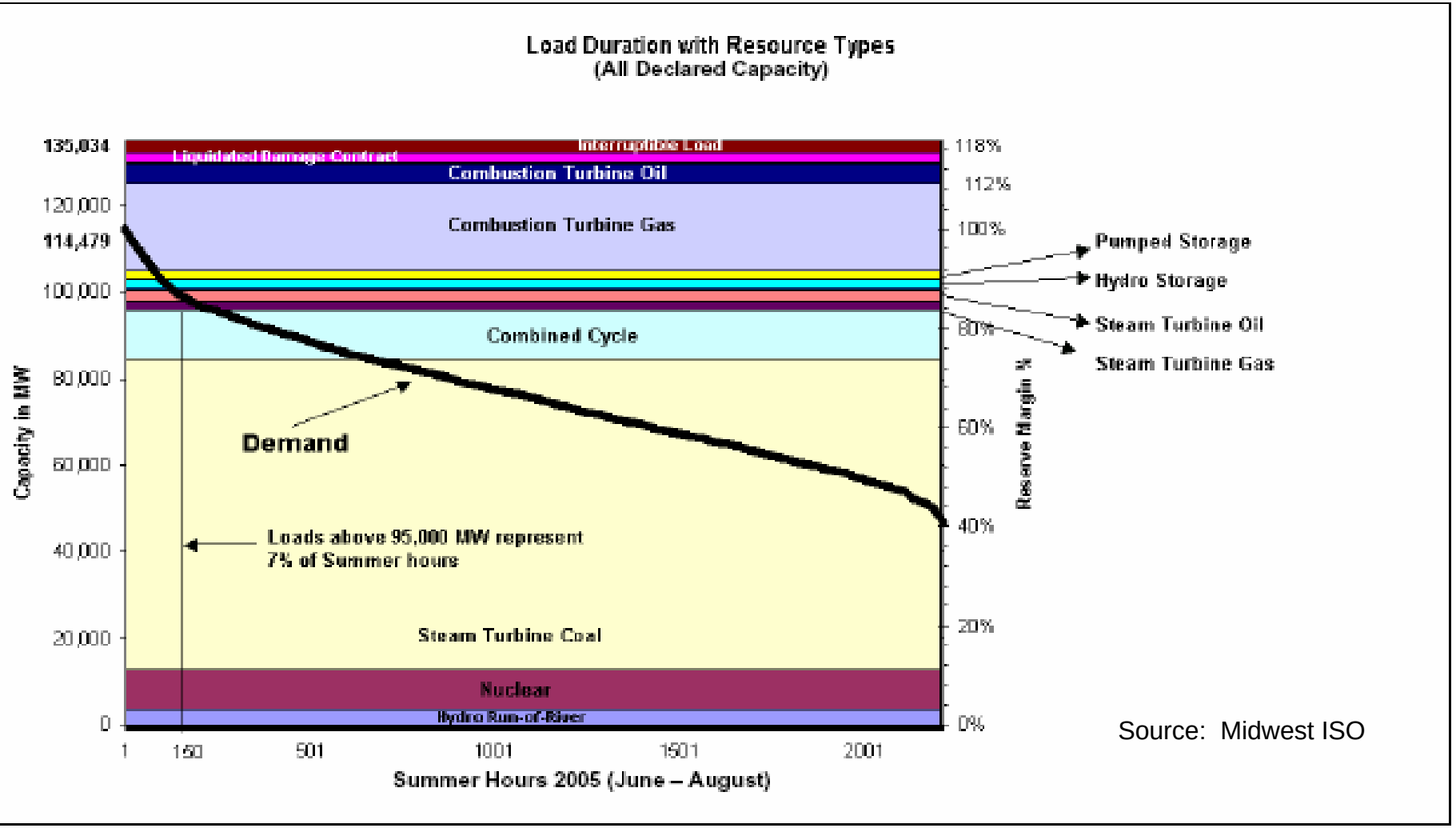
Energy Efficiency Can Be Cheapest – In Large Part Due to T&D Savings



Variation in Load During a Typical Week Creates Planning Challenges

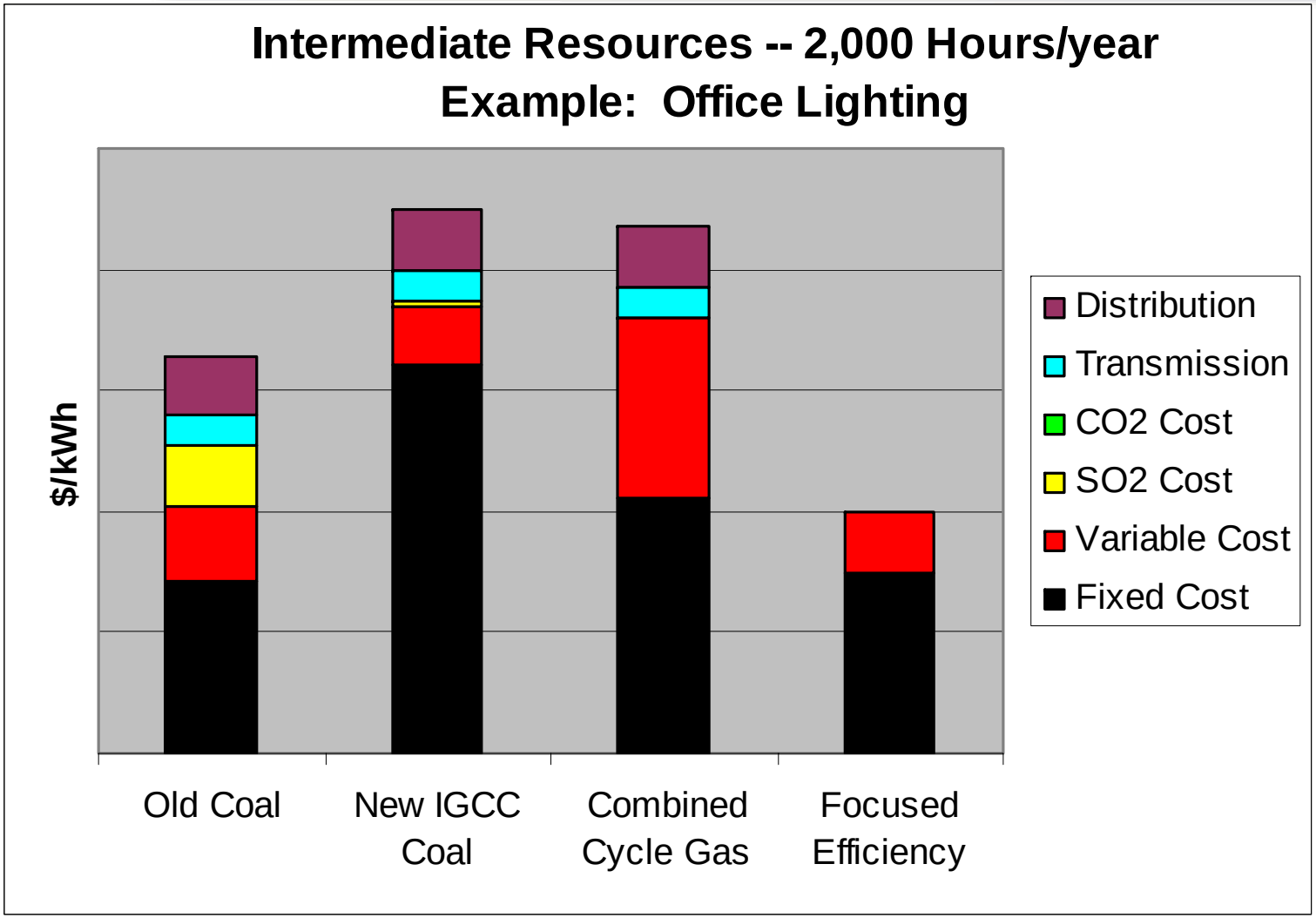


The Midwest is Primarily Coal and Gas Dependent

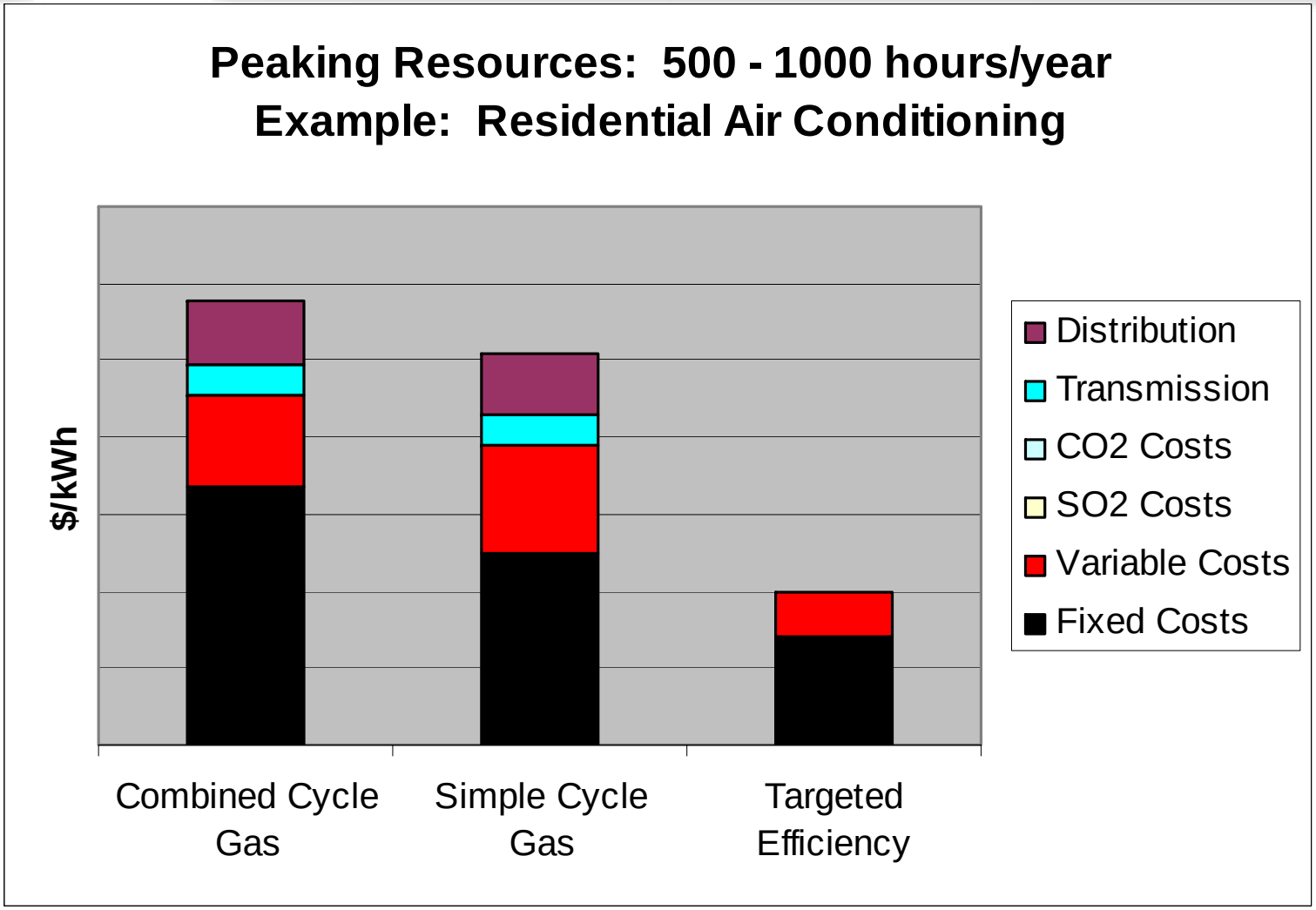


Source: Midwest ISO

In an Intermediate Application Efficiency Looks Even Better



During Peak Hours, Generation Costs Are Very High



Efficiency Can Be Targeted To Peak Periods

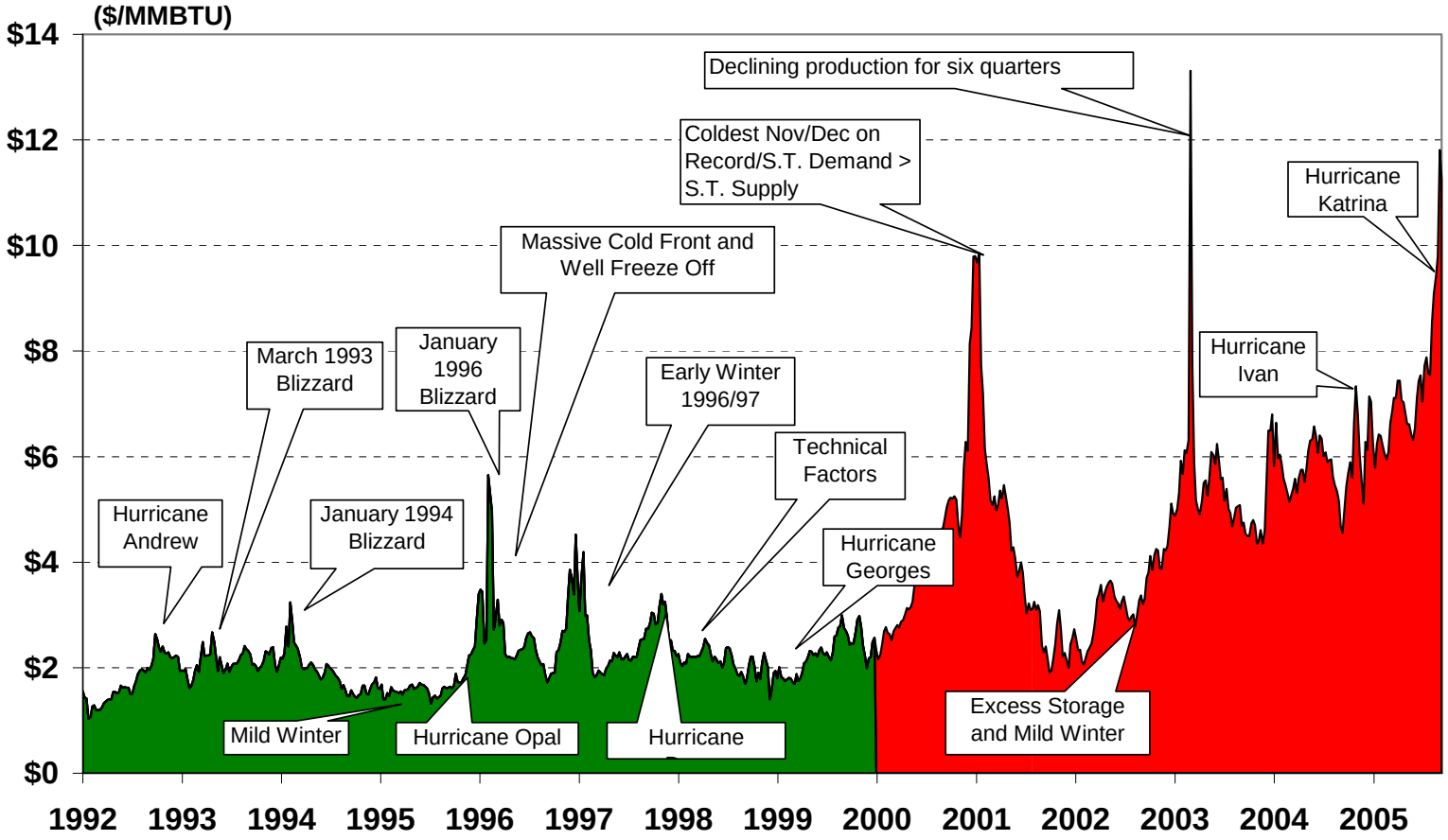
- Energy Efficiency measures address specific end-uses.
- Each end-use has a different load shape
- Residential cooling, office lighting, and office cooling are particularly peak-oriented.

- 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 mW

Steps to Assembling An Energy Efficiency Portfolio To Match Other Resources

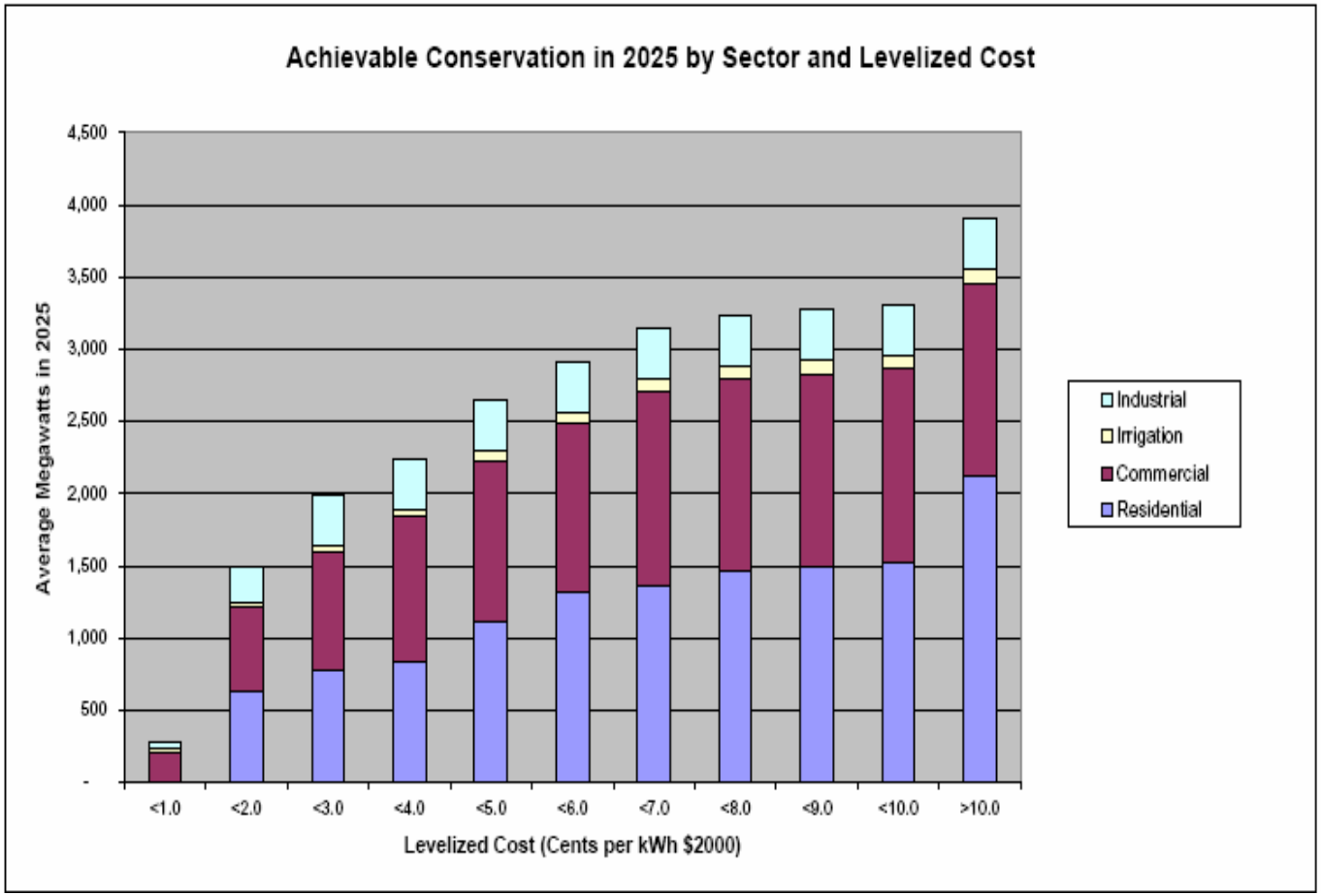
Supply and Load Analysis

- 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

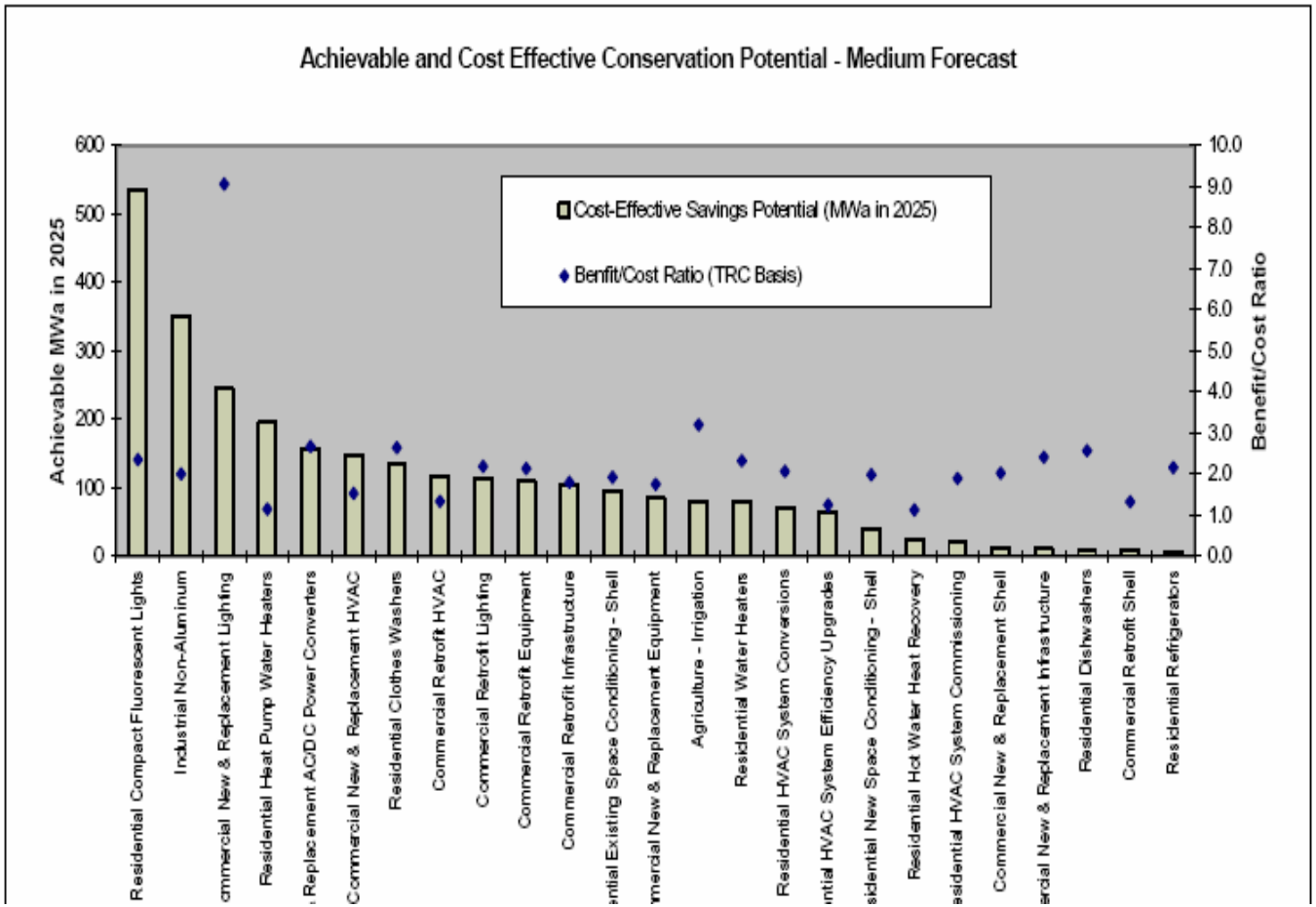
- Identify available resources.
- Determine costs
- Identify implementation mechanisms
- Identify funding and cost-recovery mechanisms

Efficiency Portfolio by Cost Level



Northwest Power and Conservation Council, 2005

Efficiency Portfolio by Program and Cost-Effectiveness



Northwest Power and Conservation Council, 2005

Implementation Strategies

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

Super Good Cents

Efficiency Vermont
your resource for energy savings

EnergyTrust of Oregon, Inc.™

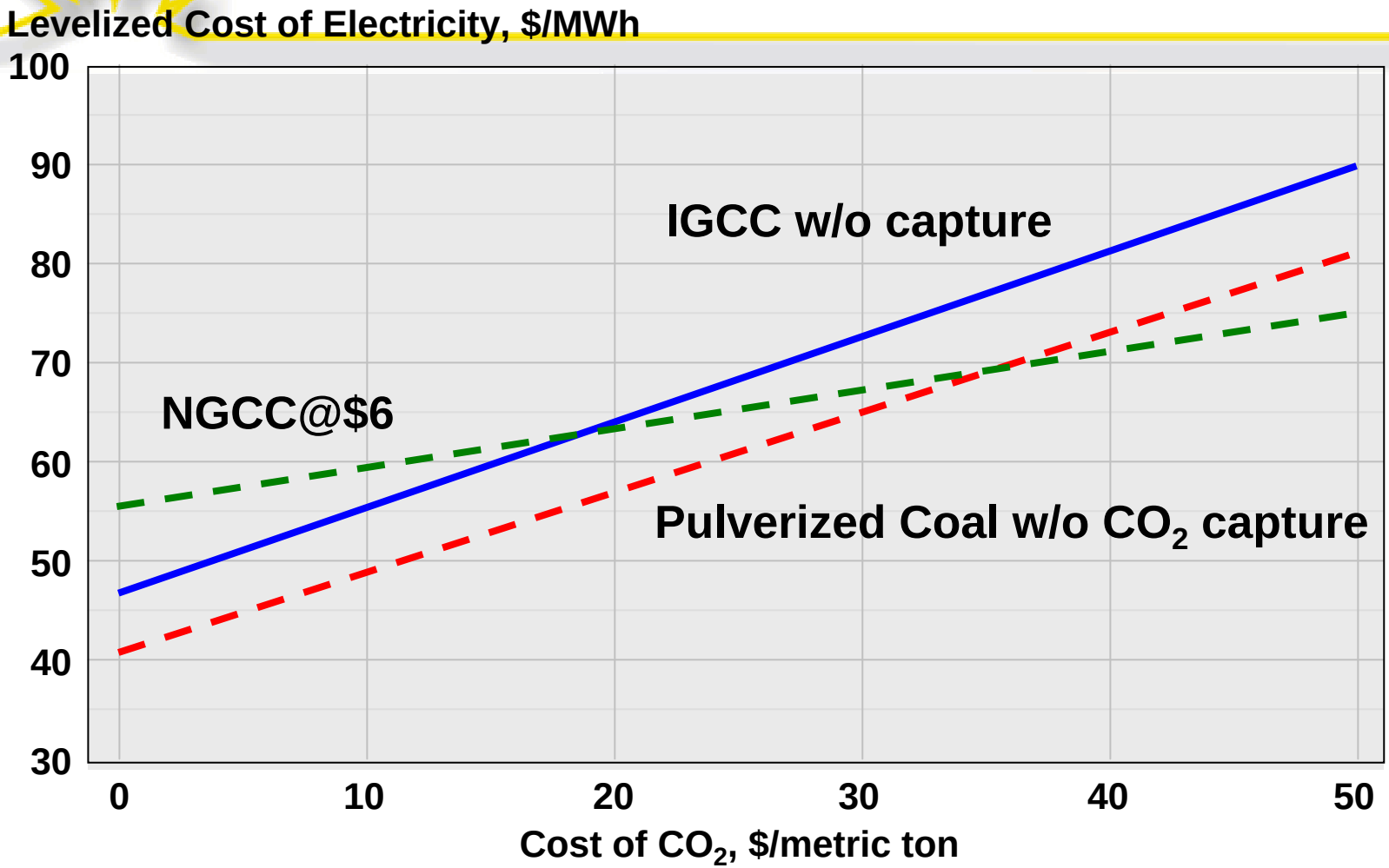
ENERGY STAR

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.

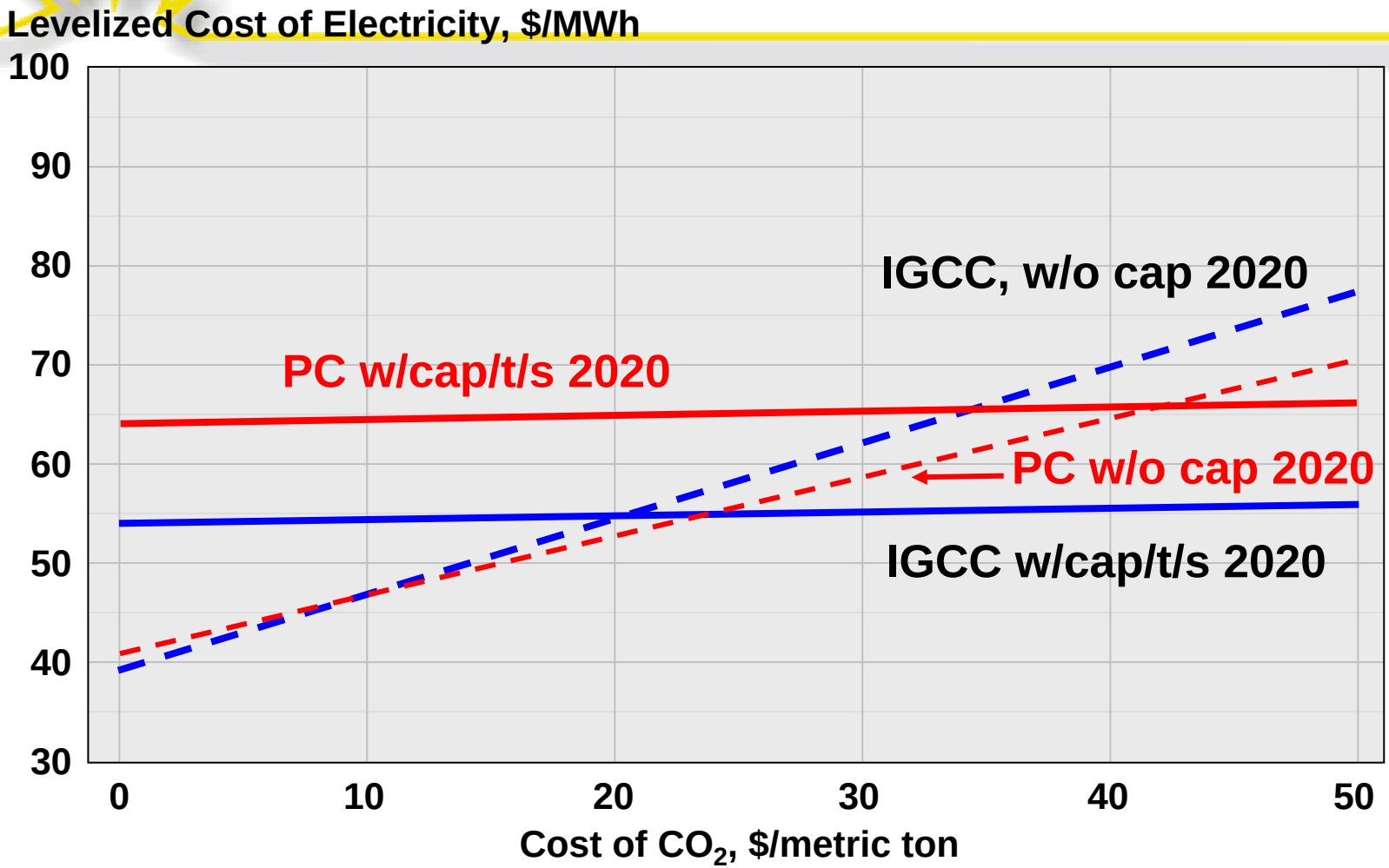
- Coal
  - $10/ton = $.01/kWh
  - $20/ton = $.02/kWh
- Gas CCCT
  - $10/ton = $.004/kWh
  - $20/ton = $.008/kWh
- Gas Peaker
  - $10/ton = $.006/kWh
  - $20/ton = $.012/kWh

Baseload Generation Costs vs. Potential Cost of CO_2 Penalties



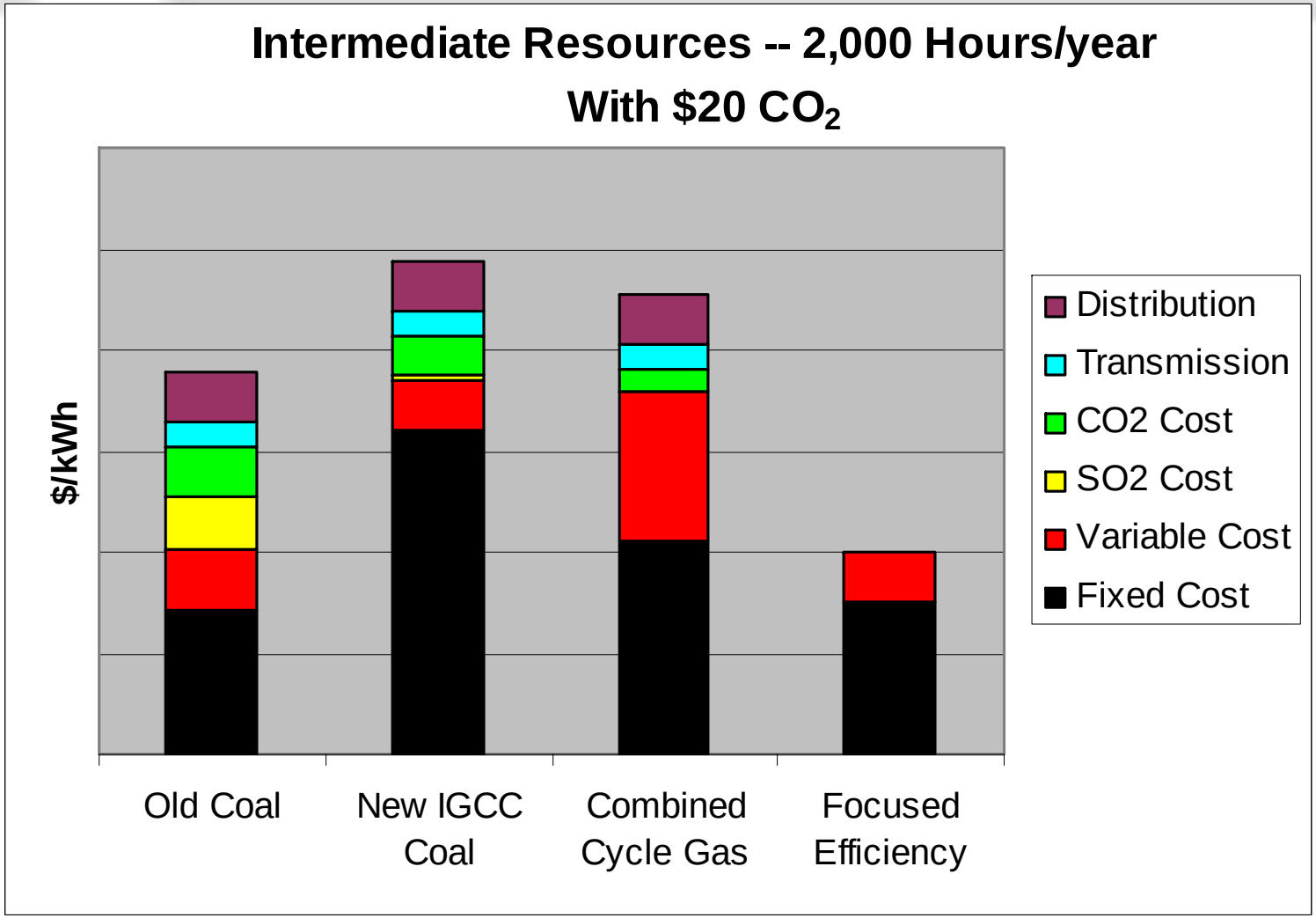
Source: EPRI, October 20, 2005

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



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