



# Long Run Marginal Costs Implications for Markets

Presentation to Wade Conference

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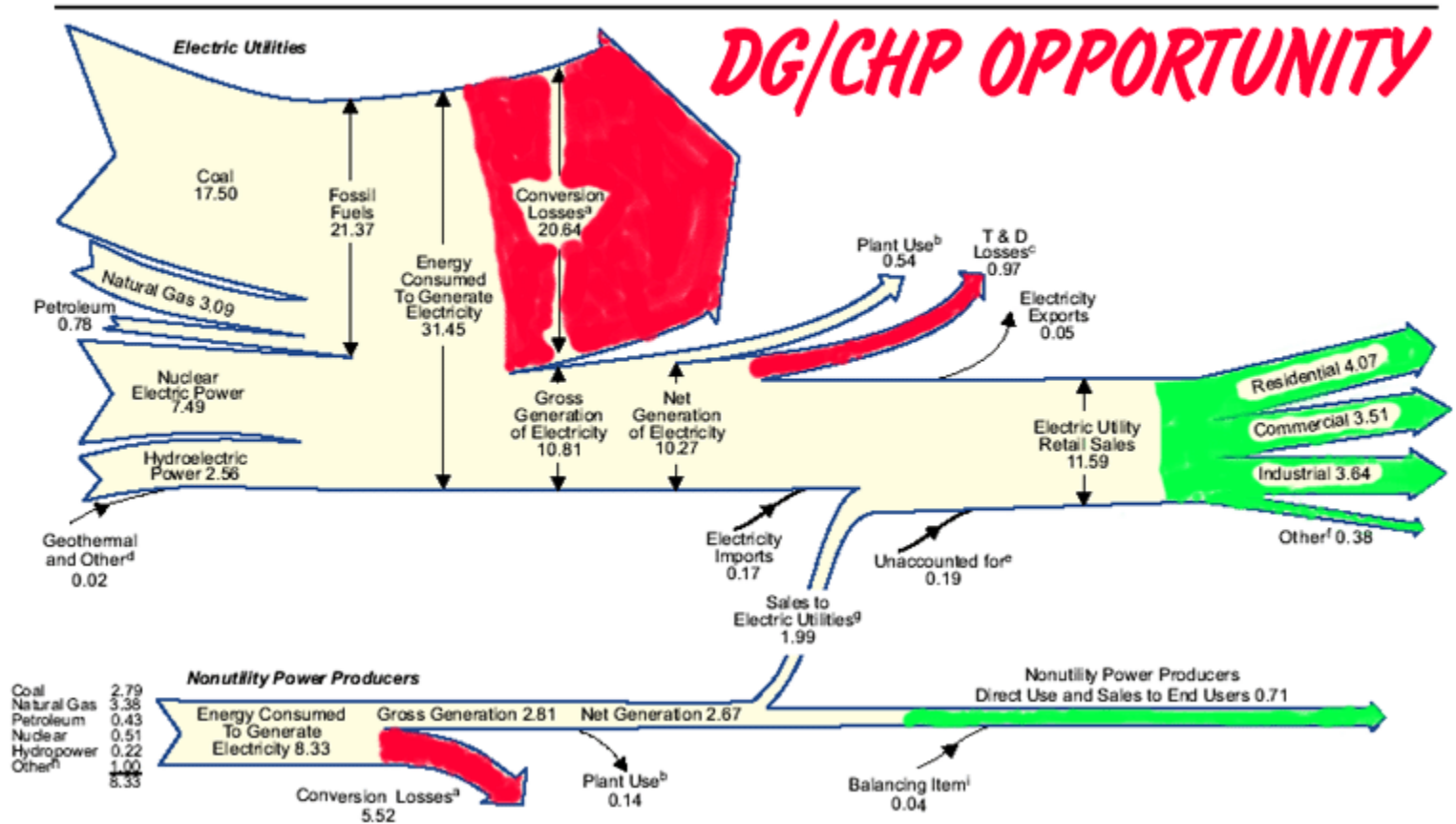
World Alliance for Decentralized Energy

May 12, 2004

# A Waste of Energy In USA

Diagram 5. Electricity Flow, 2000  
(Quadrillion Btu)

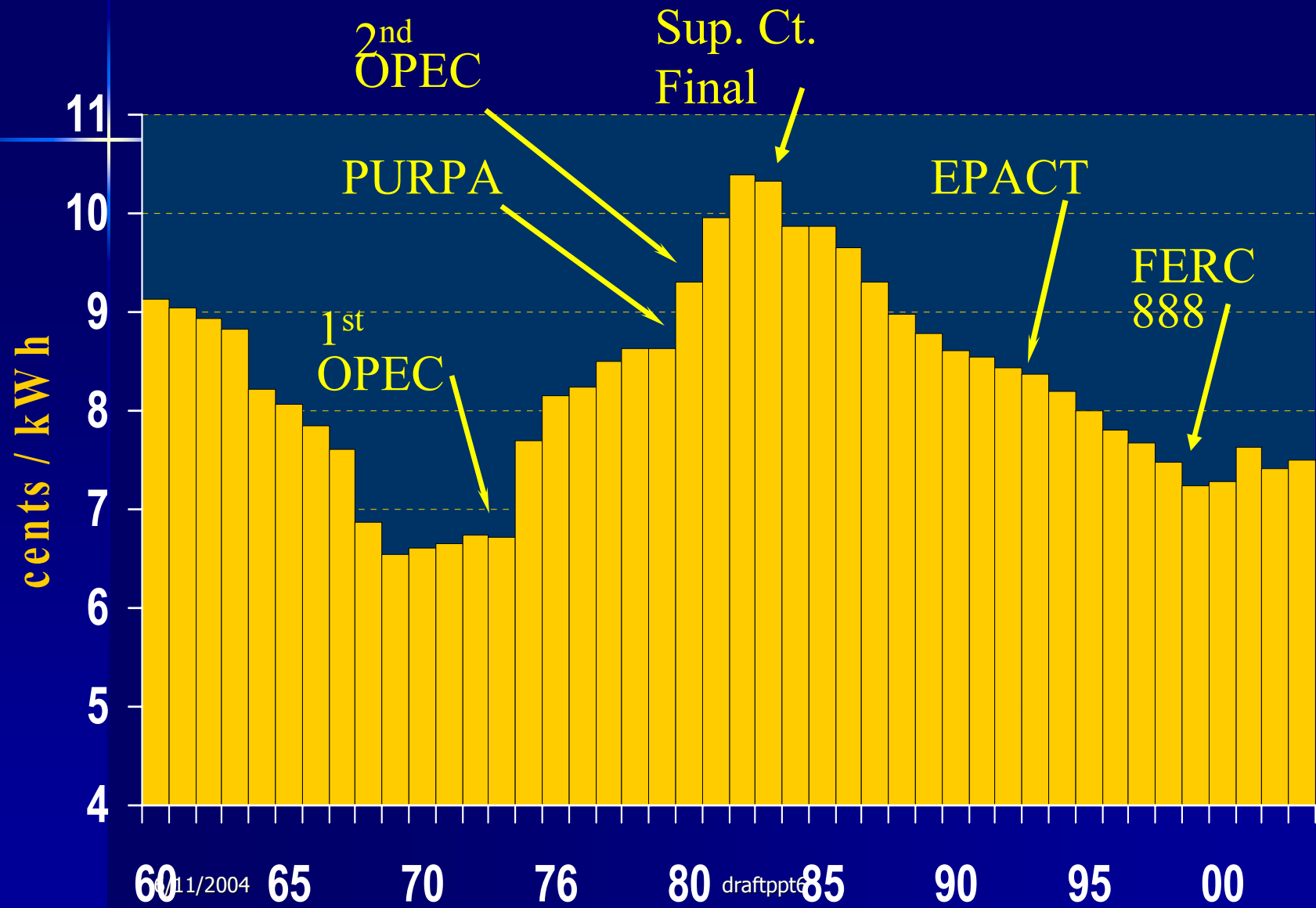
From Energy Information Agency, USDOE, 2000 Annual Energy Review



# Economics Drive Markets

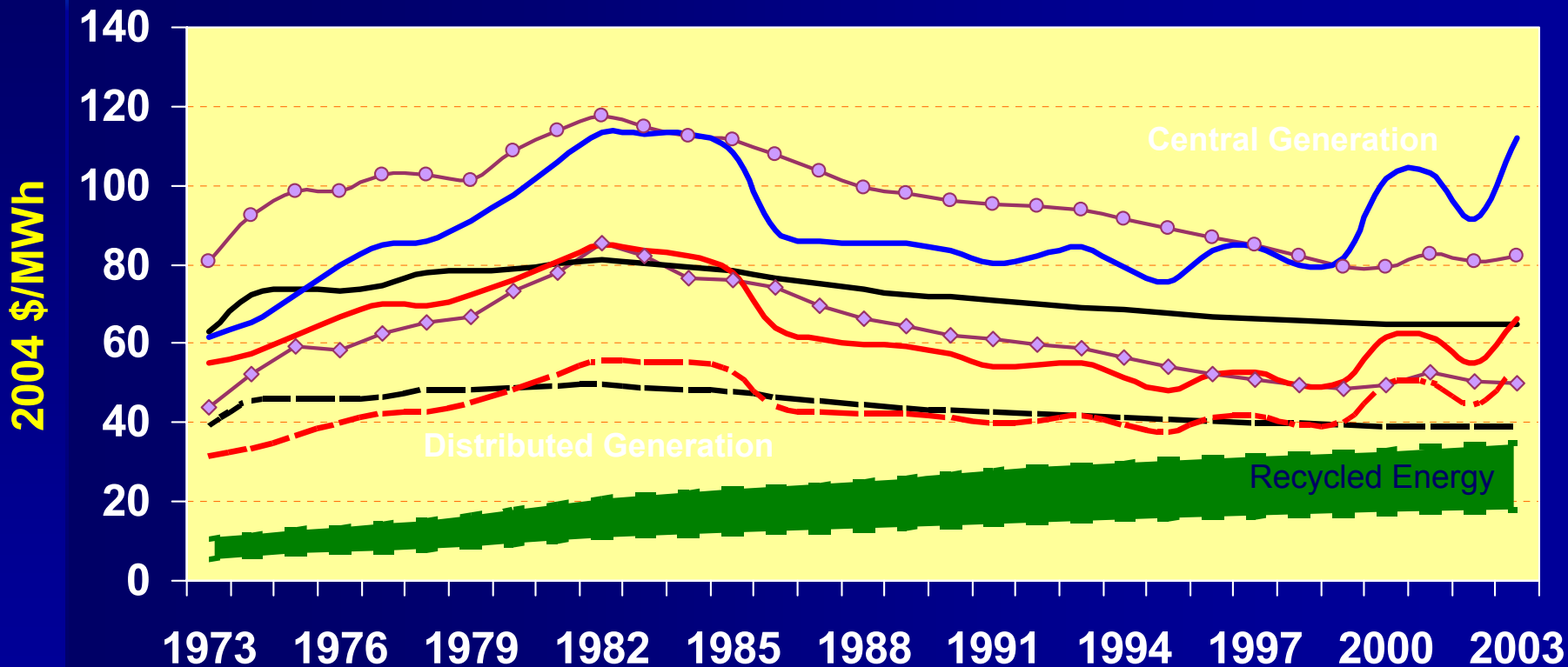
- Quick look at price changes over past three decades
- Implications for DG in US markets;
  - DG has been best option, seldom used
  - Economics narrowed with falling real fuel prices
  - Turn underway
- Optimizing future heat and power

# US Real Prices of Electricity ('04 \$'s)



# Long Run US Marginal Costs/ MWh

- ◆ Average Price of Industrial Electricity
- ◆ Average Price of Commercial Electricity (\$/MWh)
- Long Term Coal Rankin Cycle Costs
- Long Term Gas/Oil Rankin Cycle Costs
- Long Term Combined Cycle Gas Turbine Costs
- Long Term Cogen Coal Costs
- - Long Term Gas Turbine Cogen Costs
- - High Cost of Recycled Energy
- - Low Cost of Recycled Energy



# Central Generation Paradigm overwhelms DG

- Study indicates DG was optimal since at least 1973
- Government policies heavily biased towards CG, but policy makers unaware bias exists
- Regulatory bias against DG explains non-optimal actions of power market

# WADE Model Analyzes Optimum Approach to Expected Load Growth

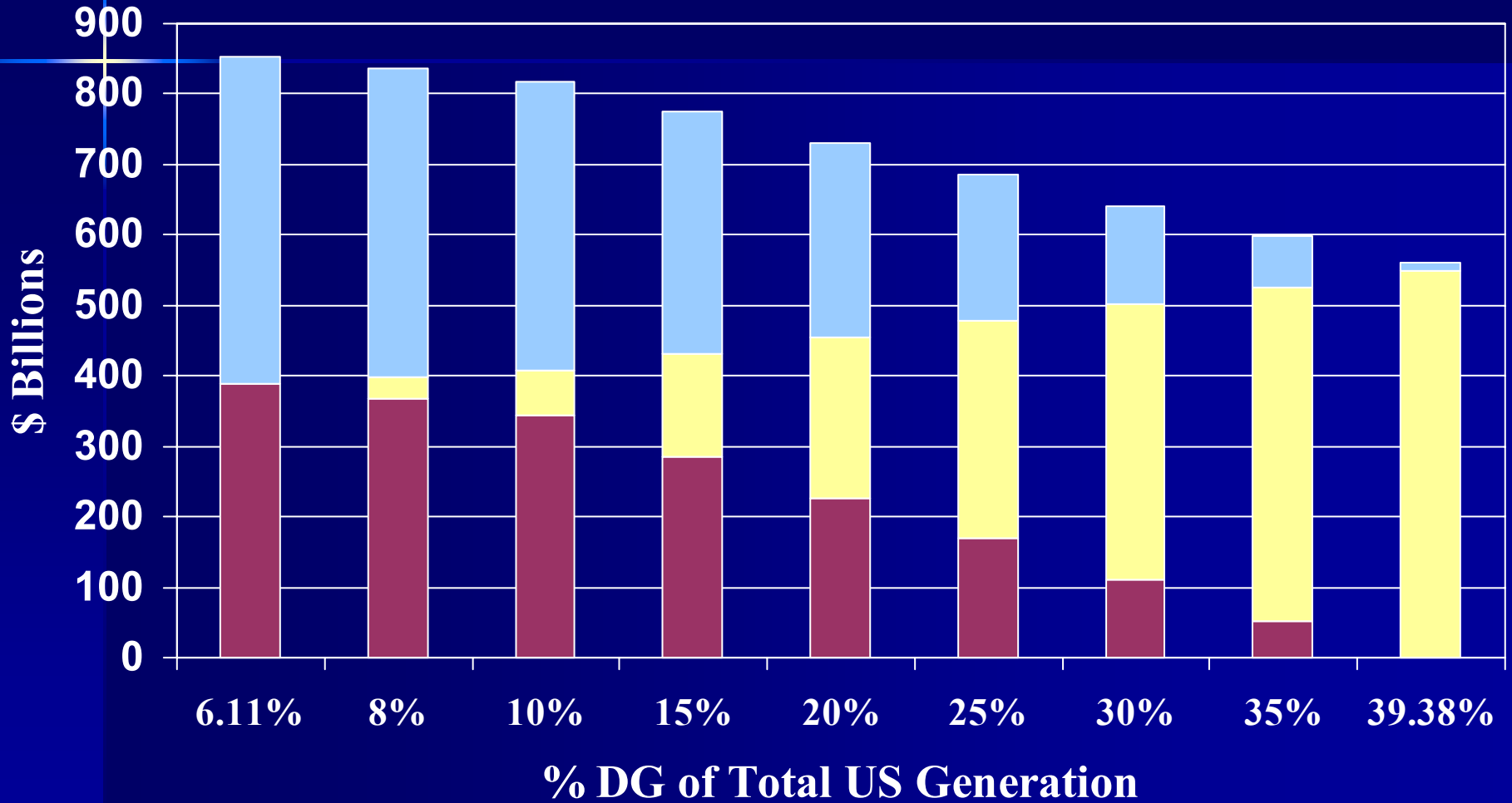
- Starts with data on existing generation
- Large data base of generation options, T&D costs
- Includes capital and operating costs, fuel prices
- Counts line losses, T&D capital recovery
- Builds in cost/efficiency improvements
- Calculates emissions for each scenario

# **Testing WADE Model for Expected US Electric Load Growth**

# US results Strongly Favor DG

<b>DG as % of Total US Generation</b>				
<b>Impact of Generating 2020 Load Growth with Central or Decentralized Generation</b>				
	<b>100% CG</b>	<b>100% DG</b>	<b>Savings</b>	<b>% Change</b>
<b>Total Capital Cost</b>				
(Capacity + T&D)				
Billions of Dollars	<b>\$853</b>	<b>\$562</b>	<b>\$291</b>	<b>34%</b>
<b>2020 Incremental Power Cost</b>				
Billions of Dollars	<b>\$149</b>	<b>\$97</b>	<b>\$52</b>	<b>35%</b>
<b>2020 Incremental Power Cost</b>				
Cents / KWh	<b>8.89</b>	<b>5.78</b>	<b>3.11</b>	<b>35%</b>
<b>Emissions from New Load</b>				
Thousand Metric Tonnes				
NO <sub>x</sub>	<b>255</b>	<b>80</b>	<b>175</b>	<b>68%</b>
SO <sub>2</sub>	<b>175</b>	<b>16</b>	<b>159</b>	<b>91%</b>
PM10	<b>155</b>	<b>146</b>	<b>9</b>	<b>5%</b>
<b>Million Metric Tonnes CO<sub>2</sub></b>	<b>720</b>	<b>387</b>	<b>332</b>	<b>46%</b>

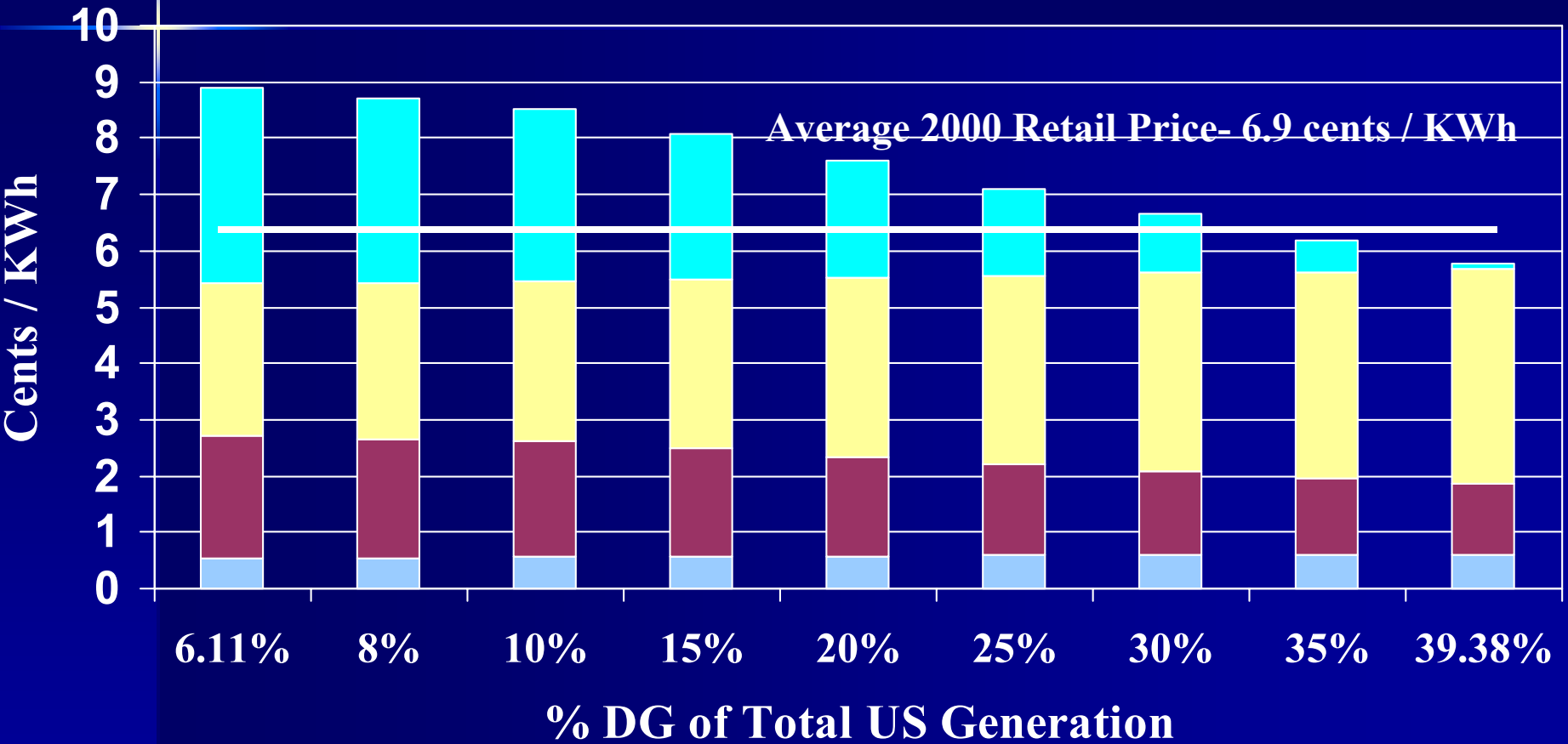
# Capital Cost to Supply 2020 Electric Load Growth



6/11/2004  
 Inv. In New Cent. Gen.    Inv. In new Dist. Gen.    Inv. In T&D<sup>10</sup>

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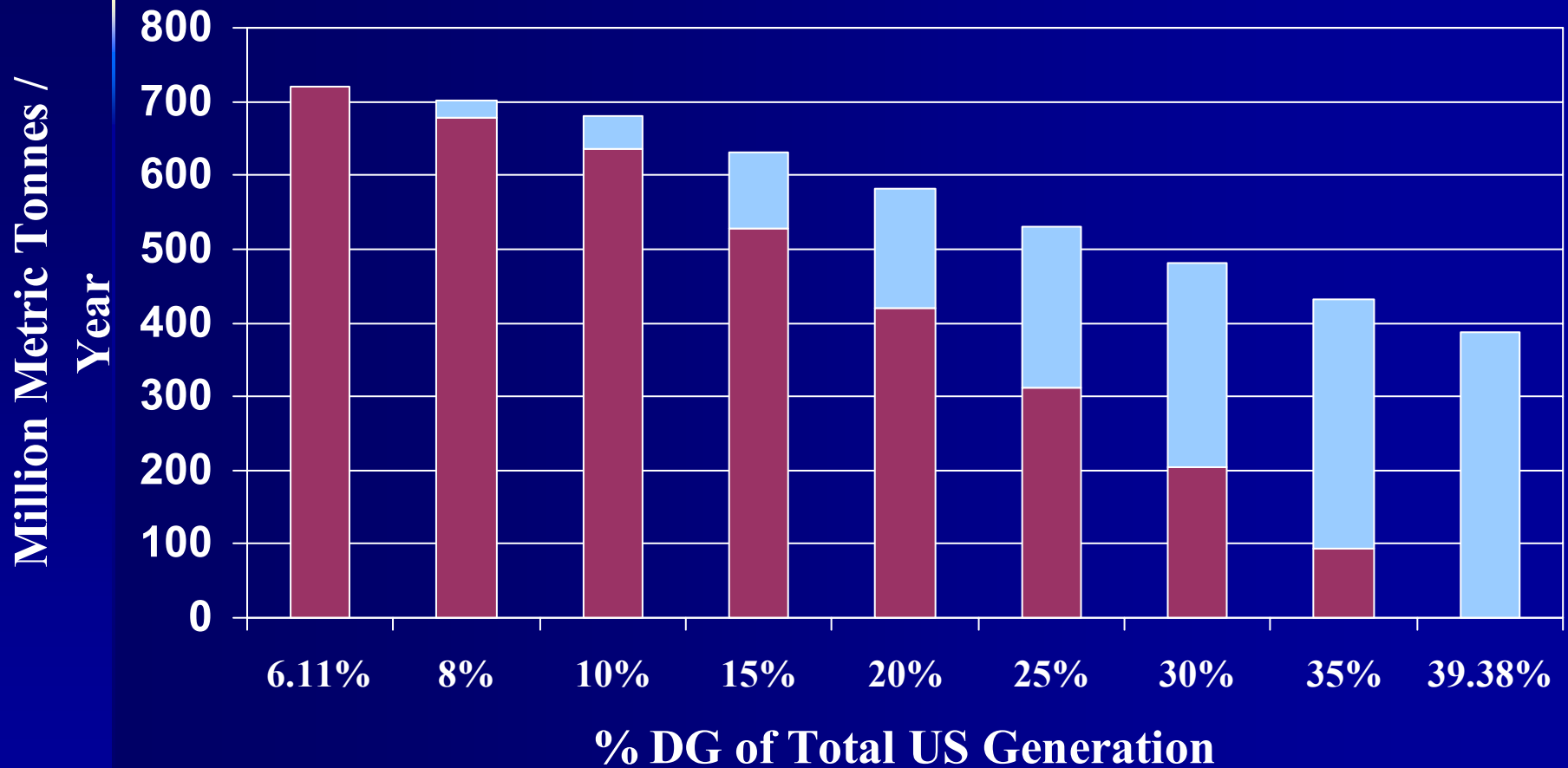
# Retail Costs per KWh for Incremental 2020 Load



6/11/2004

- T&D Amorization on New T&D
- Capital Amorization + Profit on New Capacity
- Fuel
- O&M of New Capacity

# Added Annual CO2 Emissions for Incremental 2020 Load



6/11/2004 draftppt6  
■ CO2 emitted for added Cent. Gen. ■ CO2 emitted for added Dist. Gen.

# Key Choice – Central or Decentralized Generation

- DG saves \$291 billion capital over 20 years, 35% of capital cost
- DG cuts incremental power costs 35%
- DG cuts emissions 5% to 91%
- DG reduces CO<sub>2</sub> by 46% versus central generation option

# WADE Model for Other Nations

- Now applying WADE model to Thailand, Nigeria, China, EU
- Sell model to members at a discount
- Welcome comments, questions and corrections
- Goal is credible tool to select optimal approach to supplying electric load growth



**Thank You For Listening**