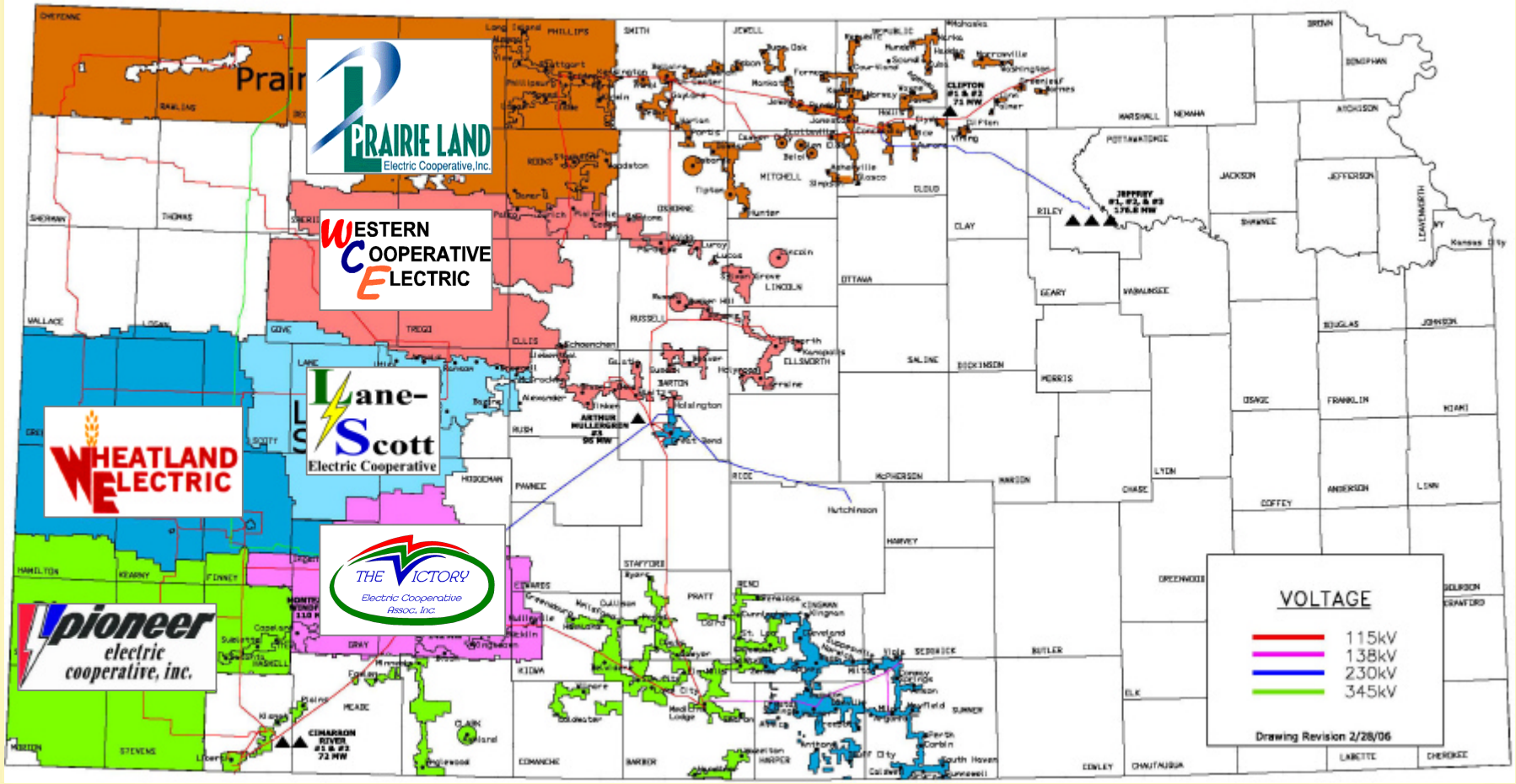
Sunflower Electric Power Corporation

A Touchstone Energy® Cooperative

Member Service Areas



Mid-Kansas Electric Company

- Formed in 2006 in order to bid on the sale of the Kansas Electric division of Aquila
- Same six member cooperatives as Sunflower
- Separate company with separate board of directors
- Functions as a cooperative
- Holds physical assets but has no employees
- Agreement with Sunflower to operate and maintain all assets
- April 1, 2007 physical assets transfer to MKEC and employees transfer to Sunflower or Member Cooperatives

Combined Generation Resources

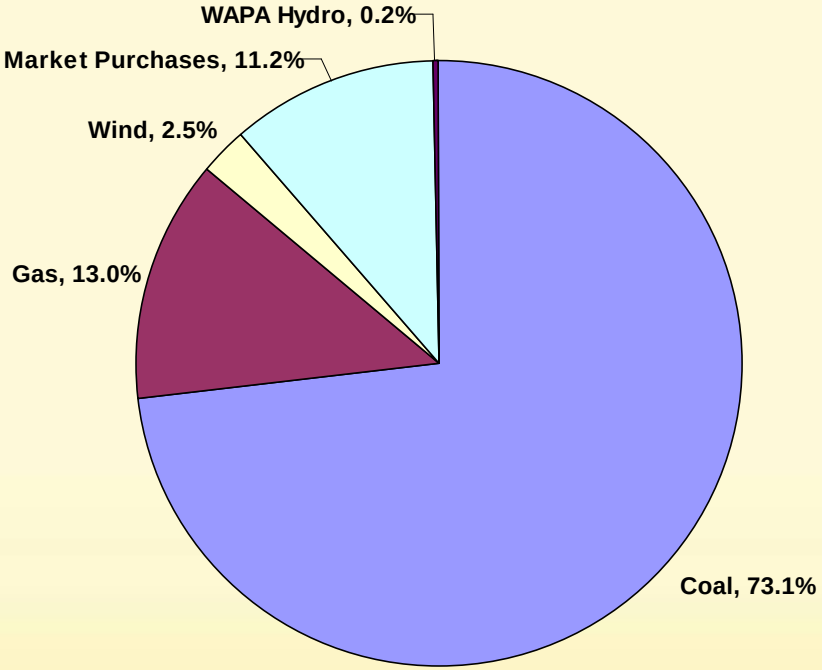
RESOURCE	TYPE and FUEL	RATING (MW)
Holcomb Station	Baseload - coal	360
Jeffrey Energy Center	Baseload - coal	175
Smoky Hill Wind	Intermittent – wind	75
Gray County Wind	Intermittent - wind	50
Fort Dodge Station	Intermediate – natural gas	144
Garden City Station	Intermediate & Peaking – natural gas	225
Great Bend Station	Intermediate – natural gas	98
Cimarron River Station	Intermediate & Peaking – natural gas	76
Clifton Station	Peaking – natural gas	75
TOTAL		**1,278**

Generation Resource Mix

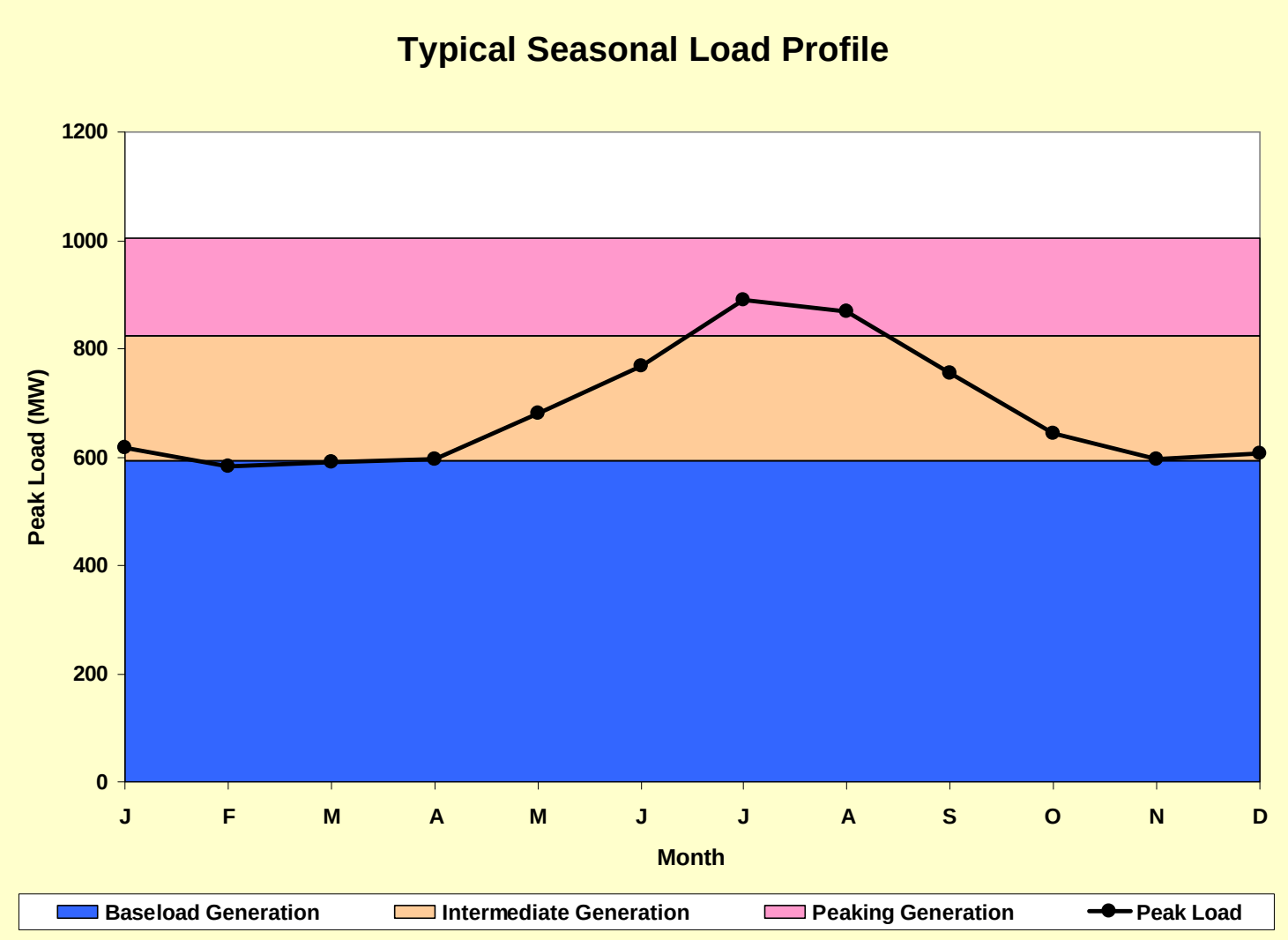
Fuel Type	Total System Resources	Total System Capacity
Natural Gas	48%	53%
Coal	42%	46%
Wind	10%	1%
Total	100.0%	100.0%

Actual Energy Resource Utilization

Energy Production Resource Mix
SEPC and MKEC Combined
4/1/07 - 12/31/07



Load Diversity



Sunflower Load Growth

- In 1977 the Sunflower system peak was 258 MW and annual sales were 903,790 MWh
- In 1987 the Sunflower system peak was 217 MW and annual sales were 1,494,765 MWh
- In 1997 the Sunflower system peak was 320 MW and annual sales were 2,093,979 MWh
- In 2007 the Sunflower system peak was 457 MW and annual sales were 2,906,931 MWh
- In 2007 the Sunflower and MKEC combined system peak was 996 MW and annual sales were more than 5.7 million MWh

Past Decision Drivers

- 1945 REA Administrator Claude Wickard testified to Congressional committee on numerous cases where construction of cooperative owned power plants lowered the price of power to cooperative consumers
- 1955 U.S. Supreme Court decision on KCPL case
  - Allows REA financing of power plants and high-voltage transmission lines
- Rapid rural load growth through the 1960s and 1970s
- Cooperative relationships with IOUs decline in the late 1950s and early 1960s
- 1973 oil embargo

Past Decision Drivers

- **Mid-1970s natural gas curtailments**
- **Rapid development of Powder River Basin mines in the 1970s and expansion of rail to this region in the 1980s provided access to low cost, low sulfur Wyoming coals**
- **July 1973 at the S2 dedication ceremony Governor Robert Docking remarked**
  - ***"It is essential that we consider the future in our attempts to avert what is projected as a serious energy shortage in America."***
- **1978 Powerplant and Industrial Fuel Use Act**
  - **Restricts construction of power plants using oil or natural gas and encourages use of coal, nuclear and alternative energy**

CO2 Emissions from Existing Resources

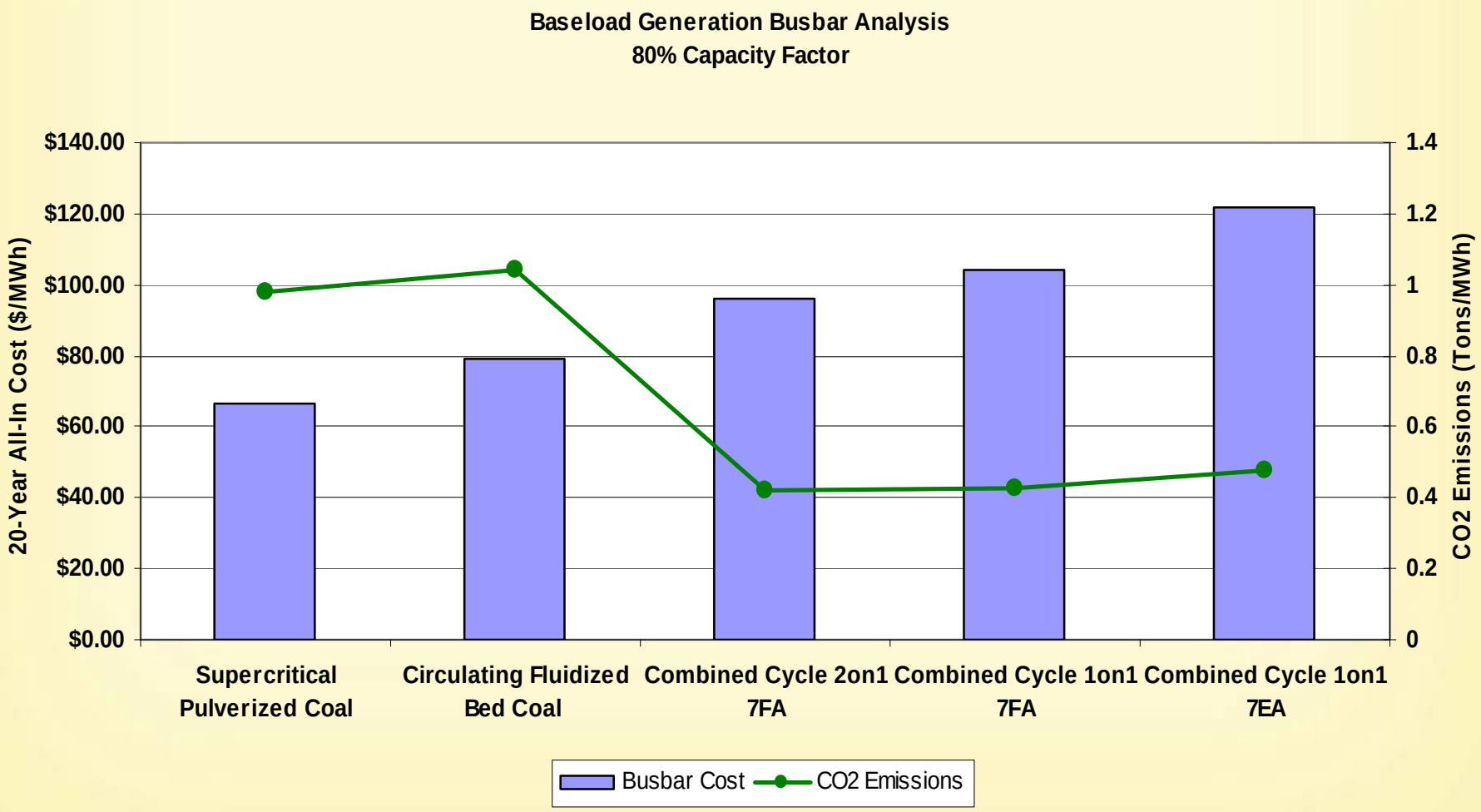
UNIT	Net Generation (MWh) 10/1/06 – 9/30/07	CO2 Emissions (Tons)	CO2 Emission Rate (Tons/MWh)
Holcomb 1	2,823,615	3,014,427	1.07
Jeffrey Energy Center	1,257,273*	1,374,898*	1.09
Fort Dodge 4	427,579	295,349	0.69
Garden City S2	34,187	23,272	0.68
Great Bend 3	128,117	89,514	0.70
Cimarron River 1	142,999	107,787	0.75

* Represents 8% of total Jeffrey Energy Center figures as reported in the Kansas Electric Generation: Summary of Existing Power Plants dated May 6, 2008 based on MKEC 8% contract on JEC output.

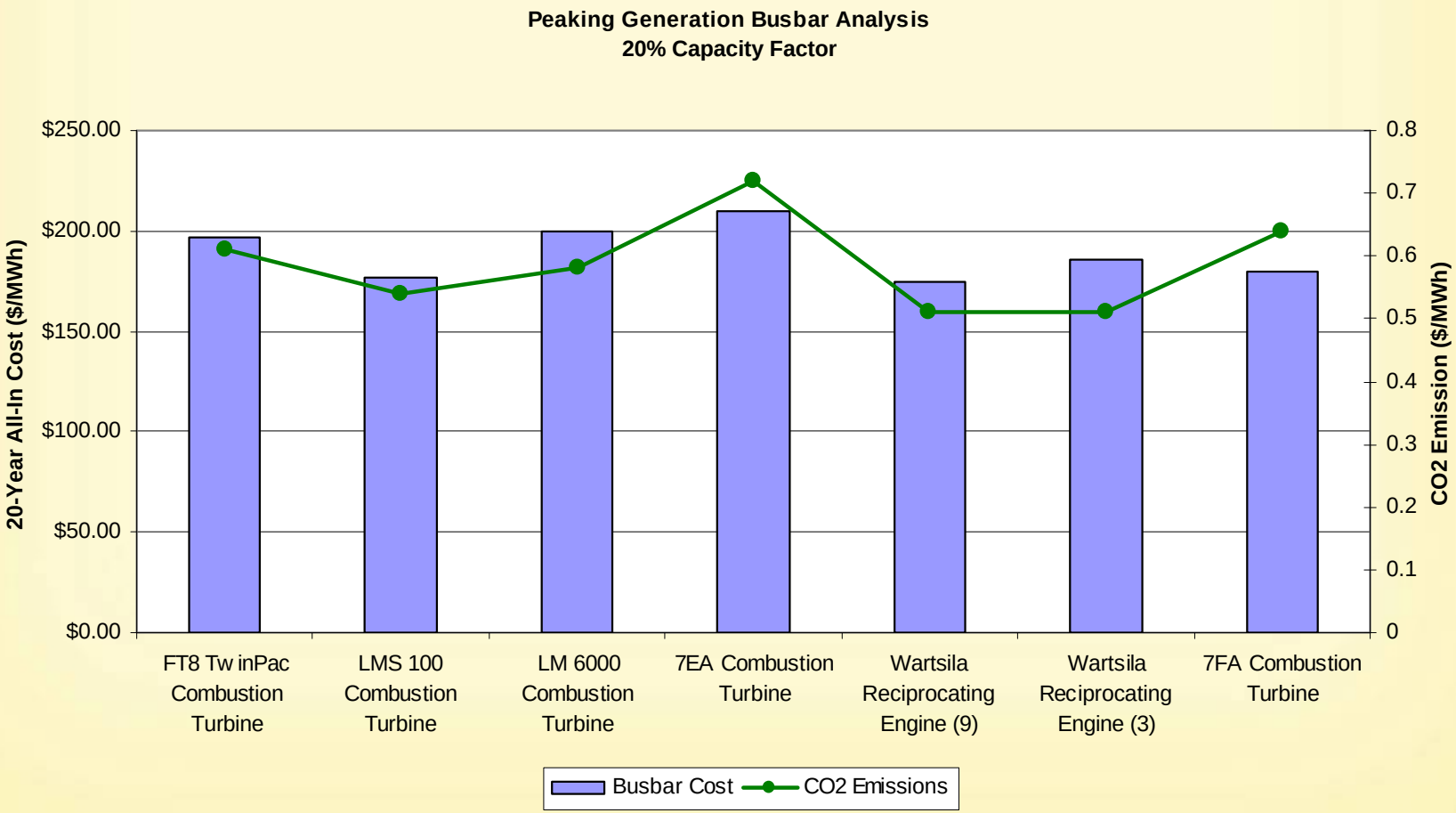
CO2 Emissions from New Resource Choices

Technology	Configuration	CO2 Emission Rate (Tons/MWh)
Coal-Fired Steam	Circulating Fluidized Bed	**1.04**
Coal-Fired Steam	Supercritical Pulverized Coal	**0.98**
Simple Cycle Gas Turbine	General Electric LMS100	**0.54**
Combined Cycle Gas Turbine	General Electric 1-on-1 7EA	**0.48**
Combined Cycle Gas Turbine	General Electric 2-on-1 7FA	**0.42**
Reciprocating Engine	Wartsila	**0.51**
Wind + Simple Cycle Gas Turbine	Wind + LMS100	**0.33**
Wind + Combined Cycle Gas Turbine	Wind + 1-on-1 7EA	**0.30**
Wind + Reciprocating Engine	Wind + Wartsila	**0.31**

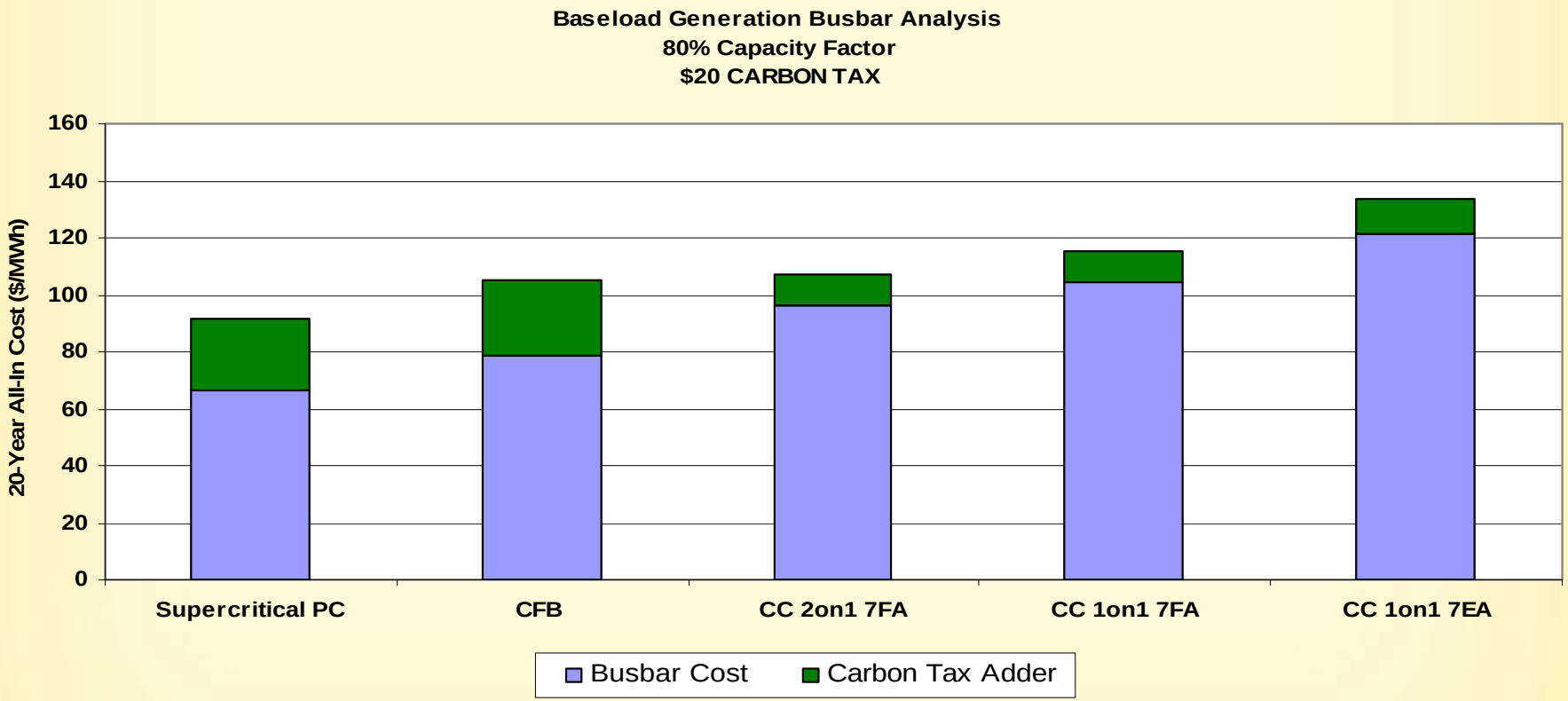
Busbar Analysis – For New Baseload Resources



Busbar Analysis – For New Peaking Resources

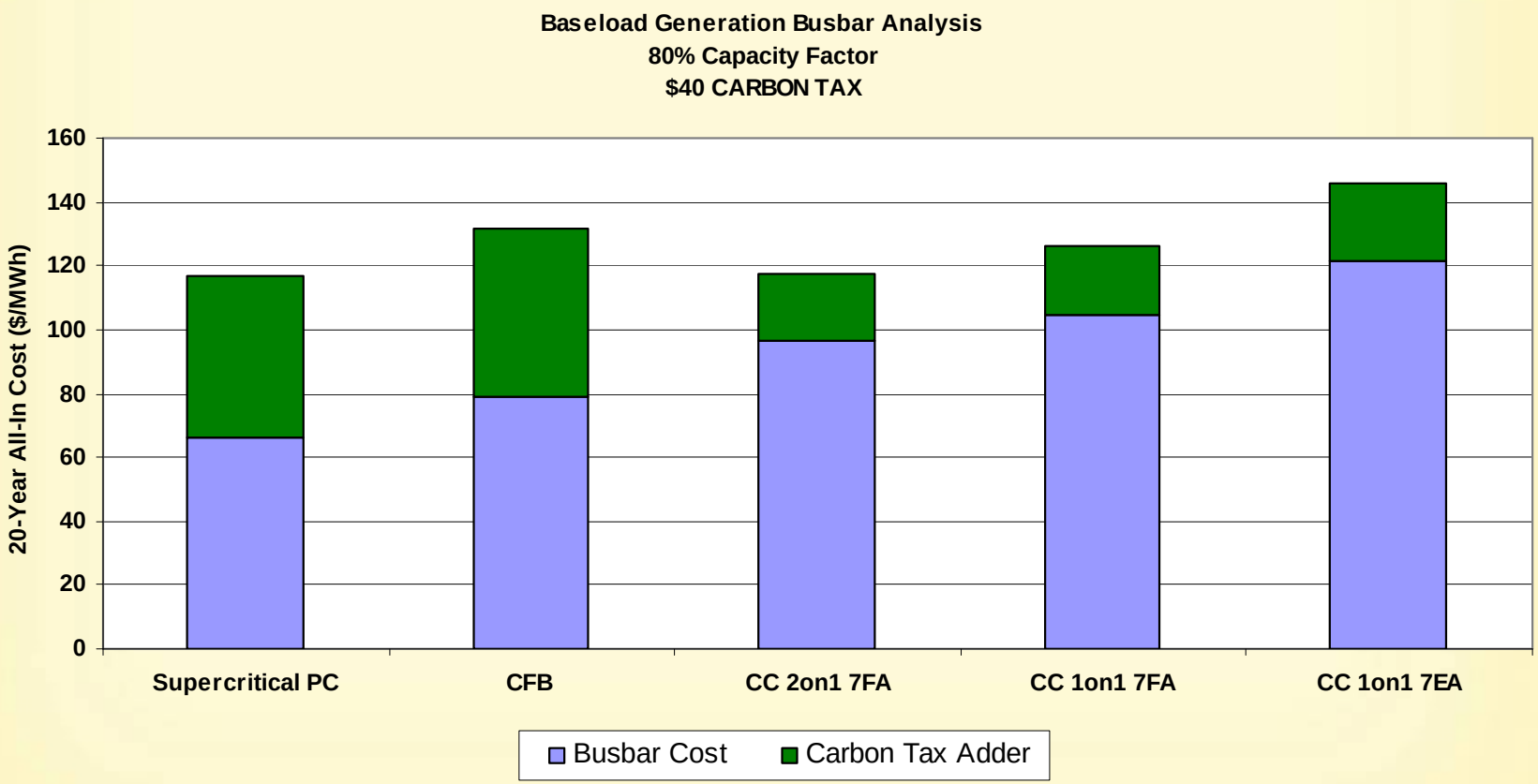


$20 Carbon Tax Impact



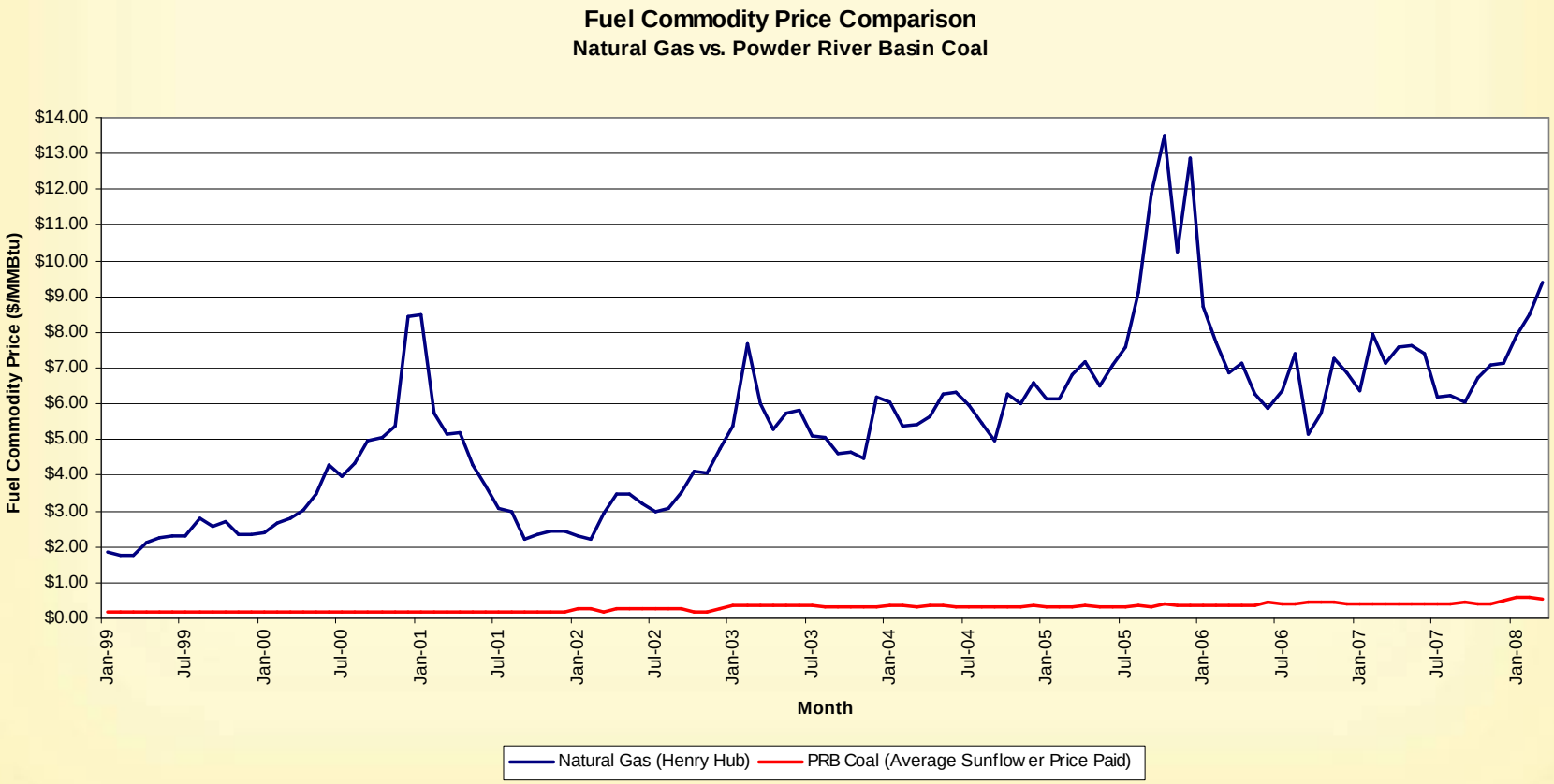
- Supercritical pulverized coal is still the lowest cost option
- Busbar costs for supercriticial pulverized coal increases by 38%

$40 Carbon Tax Impact



- 2-on-1 7FA Combined Cycle breaks even with supercritical coal
- Cheapest technology busbar cost increases by 76%

10 History of Fuel Price



Price Comparisons 2001

- **Capital cost estimates:**
  - **Coal fired generation - $1,250 per kW**
  - **Wind generation - $1,100 per kW**
  - **Combined-cycle natural gas generation - $625 per kW**
  - **Simple cycle natural gas generation - $400 per kW**
  - **Cost ratio of 1 to 1 comparing coal to wind**
  - **Cost ratio of 2 to 1 comparing coal to combined-cycle**
  - **Cost ratio of 3 to 1 comparing coal to simple cycle**
- **Fuel costs at the Holcomb site**
  - **$1.05 per mmBtu for PRB coal (delivered)**
  - **$2.50 per mmBtu for natural gas (delivered)**
  - **Fuel cost ratio of 2.38 to 1**

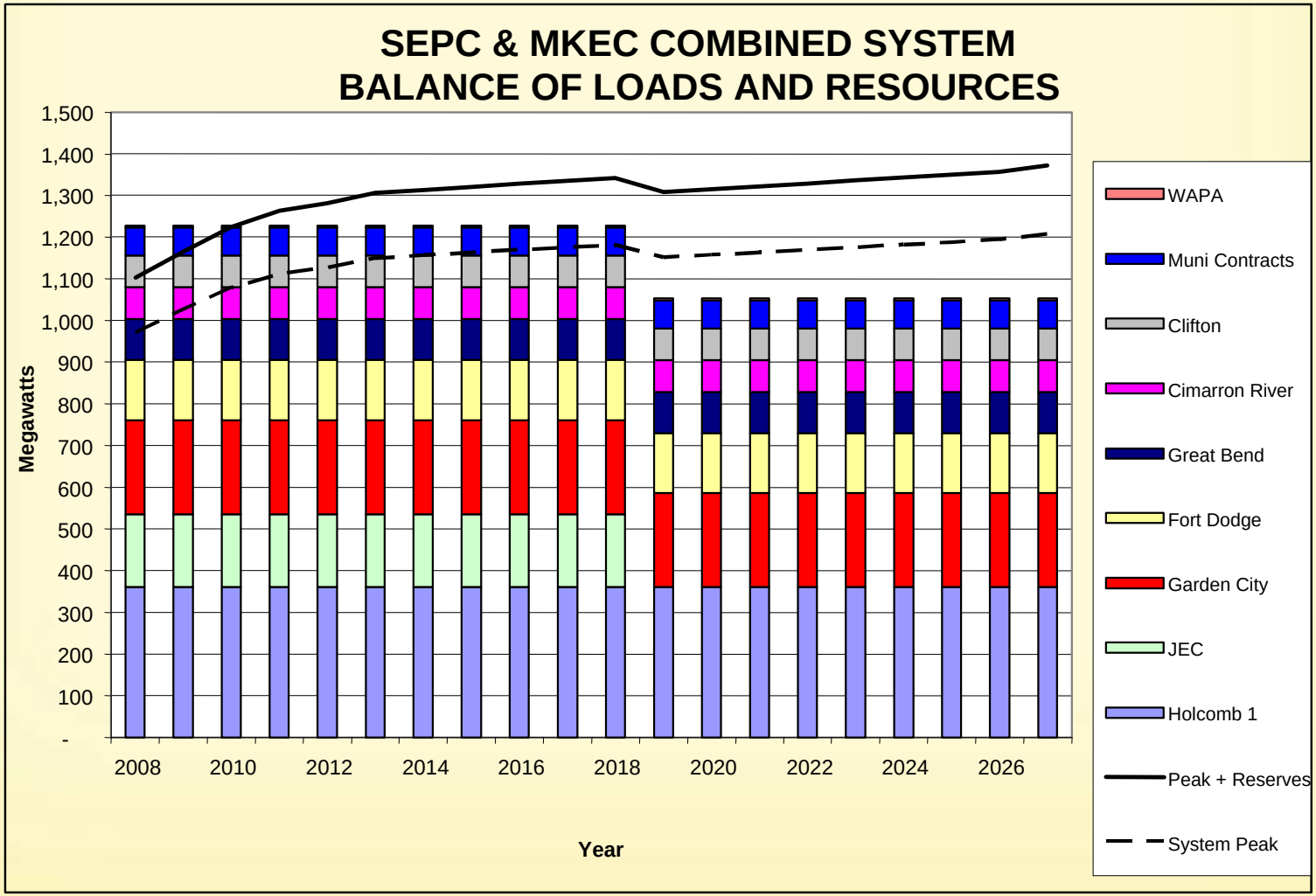
Price Comparisons 2008

- **Capital cost estimates:**
  - **Coal fired generation - $2,500 per kW**
  - **Wind generation - $2,300 per kW**
  - **Combined-cycle natural gas generation - $1,250 per kW**
  - **Simple cycle natural gas generation - $850 per kW**
  - **Cost ratio of 1 to 1 comparing coal to wind**
  - **Cost ratio of 2 to 1 comparing coal to combined-cycle**
  - **Cost ratio of 3 to 1 comparing coal to simple cycle**
  - **Capital cost ratios are <u>unchanged</u> in 8 years**
  - **Realization that all technologies require concrete, steel, copper, skilled labor, etc. and the escalations apply across all technology choices**
- **Fuel costs at the Holcomb site:**
  - **$1.50 per mmBtu for PRB coal (delivered)**
  - **$10.25 per mmBtu for natural gas (delivered)**
  - **Fuel cost ratio has increased dramatically to 6.83 to 1**

Long Term Planning Efforts

- **Power System Engineering completed an Integrated Resource Plan**
  - **Summarize existing resources**
  - **Complete a system load forecast**
  - **Identify future capacity and energy shortfalls**
  - **Discuss supply-side resource options**
  - **Discuss demand-side resource options**
- **Burns & McDonnell is completing a Generation Resource Study**
  - **Assess condition of existing generation resources**
  - **Identify most economical technology options**
  - **Complete a detailed site selection study**
  - **Recommend new resource options including technology type, location, and installation schedule**

Balance Loads and Resources



Residential Energy Efficiency Program Projections

Program	Average Annual Cost ($ per year)	Demand Savings in 10th Year (MW per year)	Energy Savings in 10th Year (MWh per Year)
Low-Income Energy Efficiency	$95,527	0.1	1,048
Compact Fluorescent Lighting	$291,669	9.5	43,259
High Efficiency HVAC	$346,373	6.4	11,066
Audit and Information	$210,740	2.8	8,336
TOTAL	**$944,309**	**18.8**	**63,709**

Information compiled by Applied Energy Group (AEG) – February 2007

Commercial Energy Efficiency Program Projections

Program	Average Annual Cost ($ per year)	Demand Savings in 10th Year (MW per year)	Energy Savings in 10th Year (MWh per Year)
Prescriptive Rebate Retrofit	$279,608	5.4	30,309
Custom Rebate	$179,858	2.4	9,637
Retro-Commissioning	$54,442	0.4	2,887
LEED Program for Existing Buildings	$36,353	0.2	1,924
Information	$154,211	1.0	594
Industrial and Agricultural	$945,311	10.8	7,589
TOTAL	**$1,649,783**	**20.2**	**126,581**

Information compiled by Applied Energy Group (AEG) – February 2007

Energy Efficiency Program Results and Cost Summary

- **Residential Programs**
  - **Total 10-Year Investment – $9.4M**
  - **Reduction in Demand – 18.8 MW**
    - **1.6% Reduction in System Peak Demand**
  - **Reduction in Annual Energy – 63,709 MWh**
    - **0.95% Reduction in System Energy Requirements**

- **Commercial Programs**
  - **Total 10-Year Investment - $16.5M**
  - **Reduction in Demand – 20.2 MW**
    - **1.8% Reduction in System Peak Demand**
  - **Reduction in Annual Energy – 126,581 MWh**
    - **1.9% Reduction in System Energy Requirements**

New Resource Technology Selection

Advanced computer modeling tools are used to optimize resource mix and identify new resource installation schedules

- **Model Inputs:**
  - Load Forecast
  - Energy and Capacity Market Forecast
  - Fuel Price Forecast
  - Projected O & M Costs – Existing Units and New Resource Options
  - Emission Allowances Market Forecast
- **Model Outputs:**
  - Optimum Generation Resource Technologies
  - Schedule for Implementation of New Units
  - Numerous Scenarios Ranked by Lowest Cost

Alternate Scenarios

Computer model includes analysis of numerous alternate scenarios based on changing input variables to identify sensitivities

Alternate scenarios address items such as:

- **Energy Market Price Volatility**
- **Fuel Price Volatility**
- **Potential Climate Change Legislation**
- **Various Levels of Wind Capacity**
- **Ability to Build New Coal Plants**
- **Various Levels of Demand Side Management**

Preliminary Technology Selection Results

- **Gas-fired reciprocating engines and small simple cycle combustion turbines are the evaluated lowest cost alternative to meet short-term capacity reserve requirements**
- **In addition to meeting capacity requirements, gas-fired reciprocating engines provide operational flexibility that assist in balancing wind resources and provide economical peaking power**
- **Supercritical coal-fired units continue to be the evaluated lowest cost resources to meet baseload needs**
- **Coal units remain lowest cost baseload option even with substantial carbon taxes**
- **Eliminating coal as a new resource option increases projected total production costs for Sunflower & MKEC by over 25% over the next 20 years**

Questions?

- Sunflower and Burns & McDonnell would like to thank the Council for the opportunity to present this information
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