



Energy Efficiency & Coal Retirement/Repowering

ACEEE National Conference on Energy as a Resource

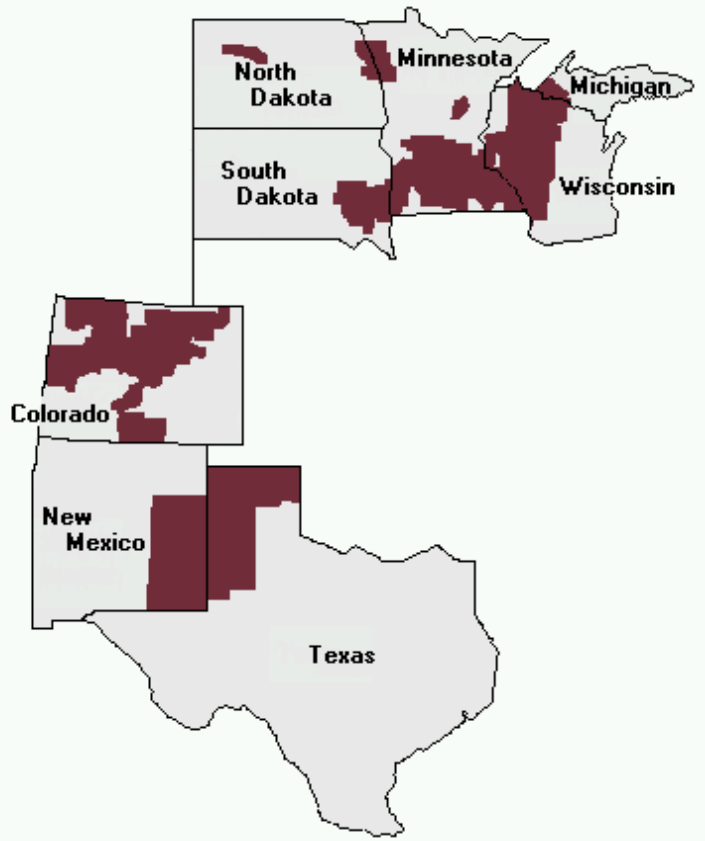
Sept 27, 2011

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Manager, Strategic Analytics**

Outline

- **Xcel Energy – Strategic Analytics Overview**
- **Important Economic Drivers For Coal Retrofit vs Retirement Decision**
 - **Cost of Environmental Controls (Capital & O&M)**
 - **Cost of Replacement Capacity**
 - **Cost of Replacement Energy**
 - **CO2 Assumptions**
 - **Current Rate Base / Accelerated Depreciation**
- **Case Study – Colorado Cherokee 3&4**
 - **Baseline Results**
 - **Role of Current Energy Efficiency**
 - **Role of Additional Energy Efficiency as a Replacement Resource**

Xcel Energy



- ◆ Annual revenues \$10 billion
- ◆ 3.3 million electricity customers
- ◆ 1.8 million natural gas customers
- ◆ NSP – Minnesota, Wisconsin, Dakotas, Michigan
- ◆ PSCo – Colorado
- ◆ SPS – New Mexico & Texas

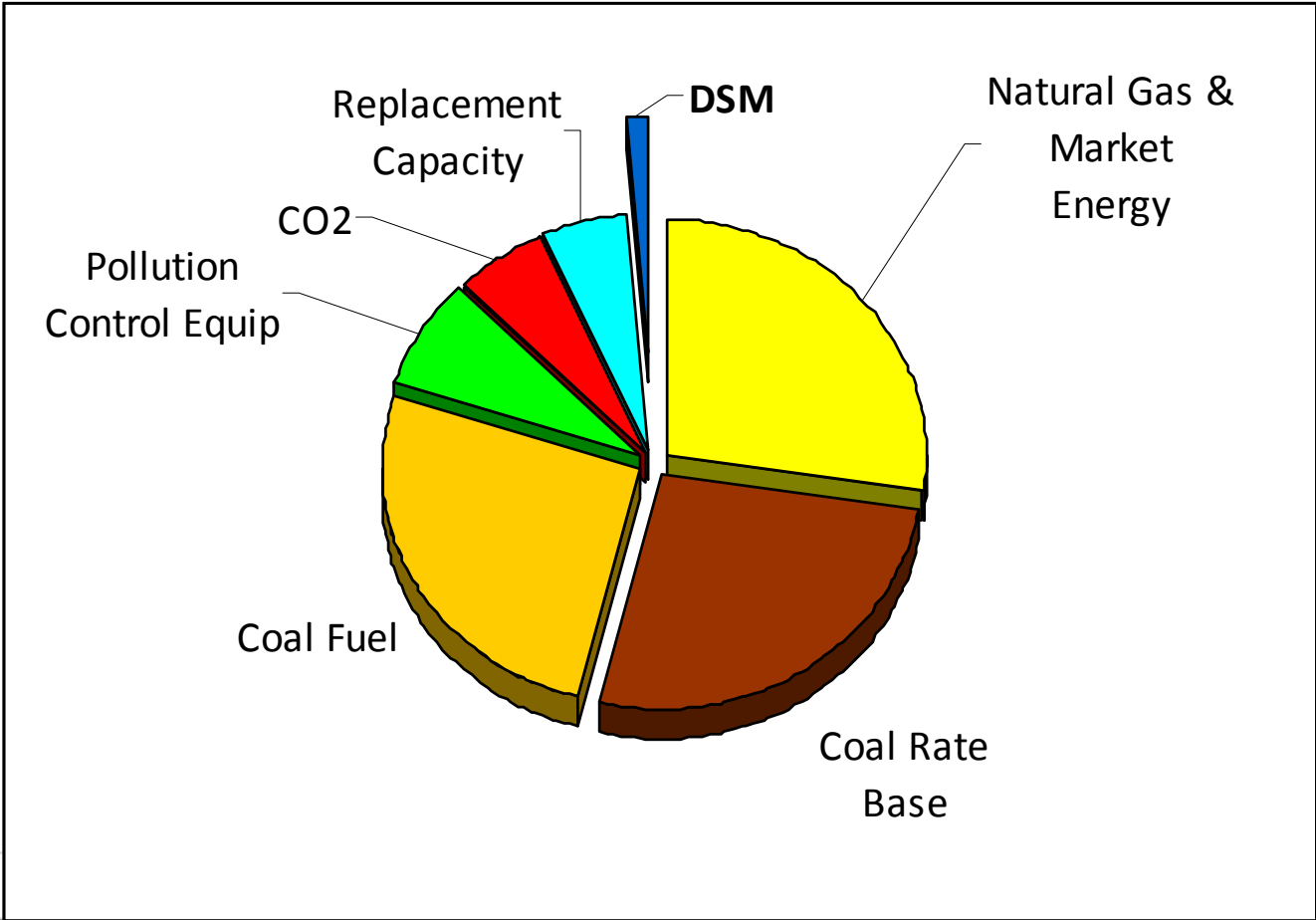
Strategic Analytics

- ◆ **MODELS**
 - ◆ **Strategist – 40yr resource planning**
 - ◆ **Planning & Risk – 5-10yr dispatch model**
- ◆ **PROJECTS**
 - ◆ **Resource Plans**
 - ◆ **Retirement / Repowering**
 - ◆ **RFP Evaluation**
 - ◆ **Emission Forecasting / Compliance**
 - ◆ **Renewable Energy Compliance**

Recent Coal Retirement / Repowering Studies

- **Minnesota**
 - **Unit 3 – 89MW In-service 1955**
 - **Unit 4 – 164MW In-service 1960**
- **Texas**
 - **Harrington 1 – 346MW In-service 1976**
 - **Harrington 2 – 360MW In-service 1978**
 - **Harrington 3 – 360MW In-service 1980**
- **Colorado**
 - **Cherokee 1 – 107MW In-service 1957**
 - **Cherokee 2 – 108MW In-service 1959**
 - **Cherokee 3 – 151MW In-service 1962**
 - **Cherokee 4 – 351MW In-service 1968**
 - **Valmont 5 – 186MW In-service 1964**

Key Economic Drivers



Economic Drivers

Pollution Control Equipment

- **NOx – Selective Catalytic Reduction (SCR)**
 - 85%-95% NOx Removal
 - Capital - \$100-\$500/kW
 - Annual O&M - \$5-\$15/kW/yr
- **SO2 – Lime Spray Dryers (LSD)**
 - 90%-95% SO2 Removal
 - Capital - \$200-\$700/kW
 - Annual O&M - \$15-\$30/kW/yr
- **Hg – Activated Carbon Injection (ACI)**
 - 90% Hg Removal Rate
 - Capital \$5-\$25/kW
 - Annual O&M - \$0.1-\$0.25/kW-yr

Economic Drivers

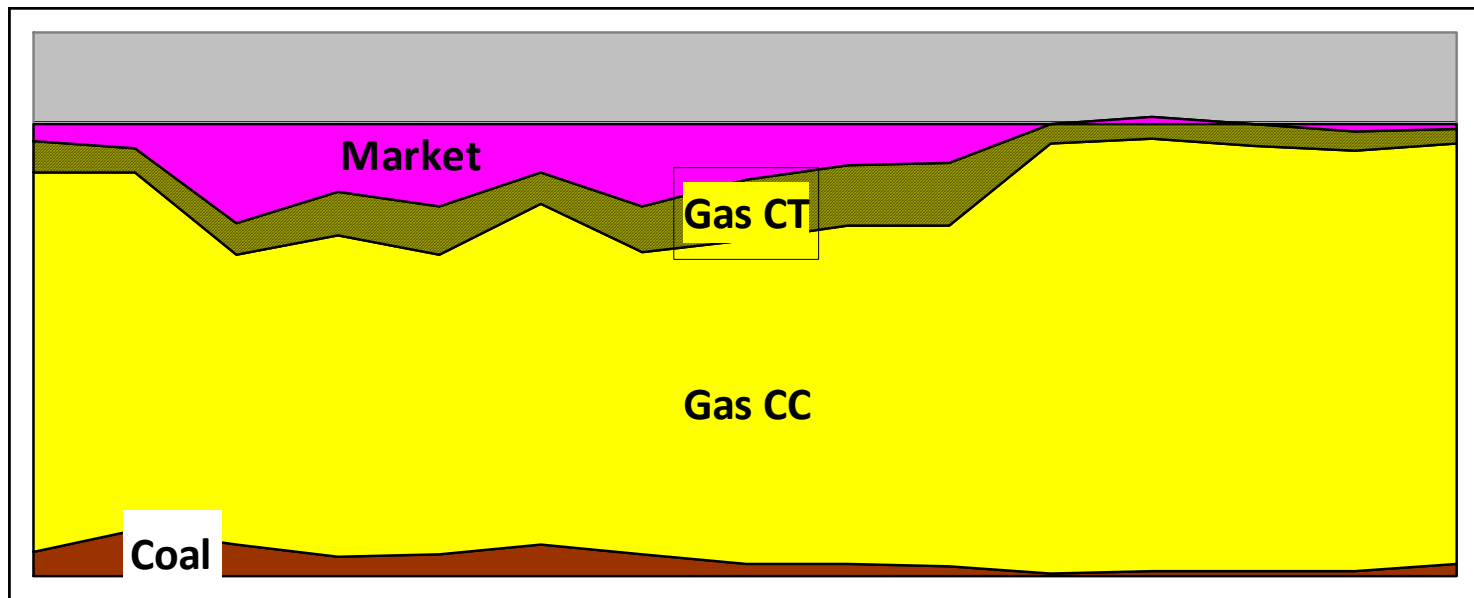
Replacement Capacity

- **Natural Gas Combined Cycle**
 - **\$900-\$1200/kW**
 - **7mmBtu/MWh**
- **Natural Gas Combined Cycle**
 - **\$500-\$800/kW**
 - **10mmBtu/MWh**

Economic Drivers

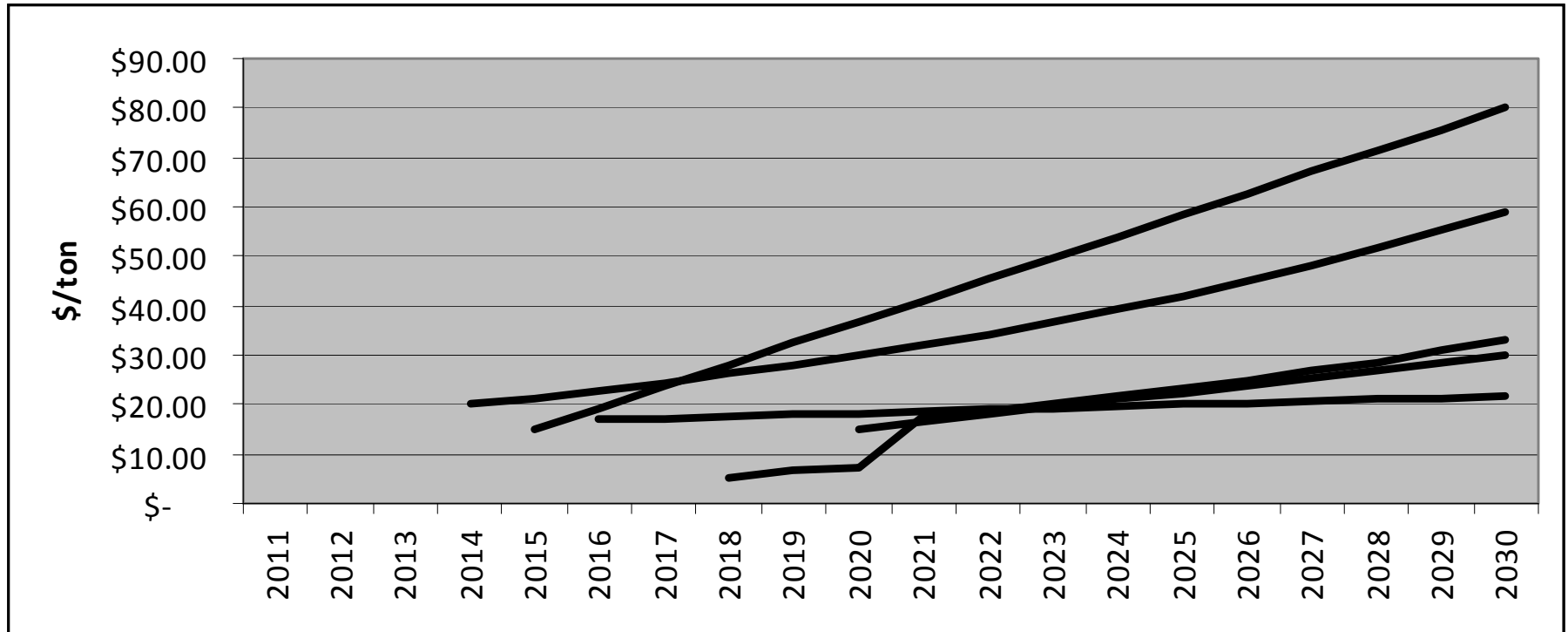
Cost of Replacement Energy

- Dependent on Remaining Thermal Units
- Dependent on Access to External Power Markets

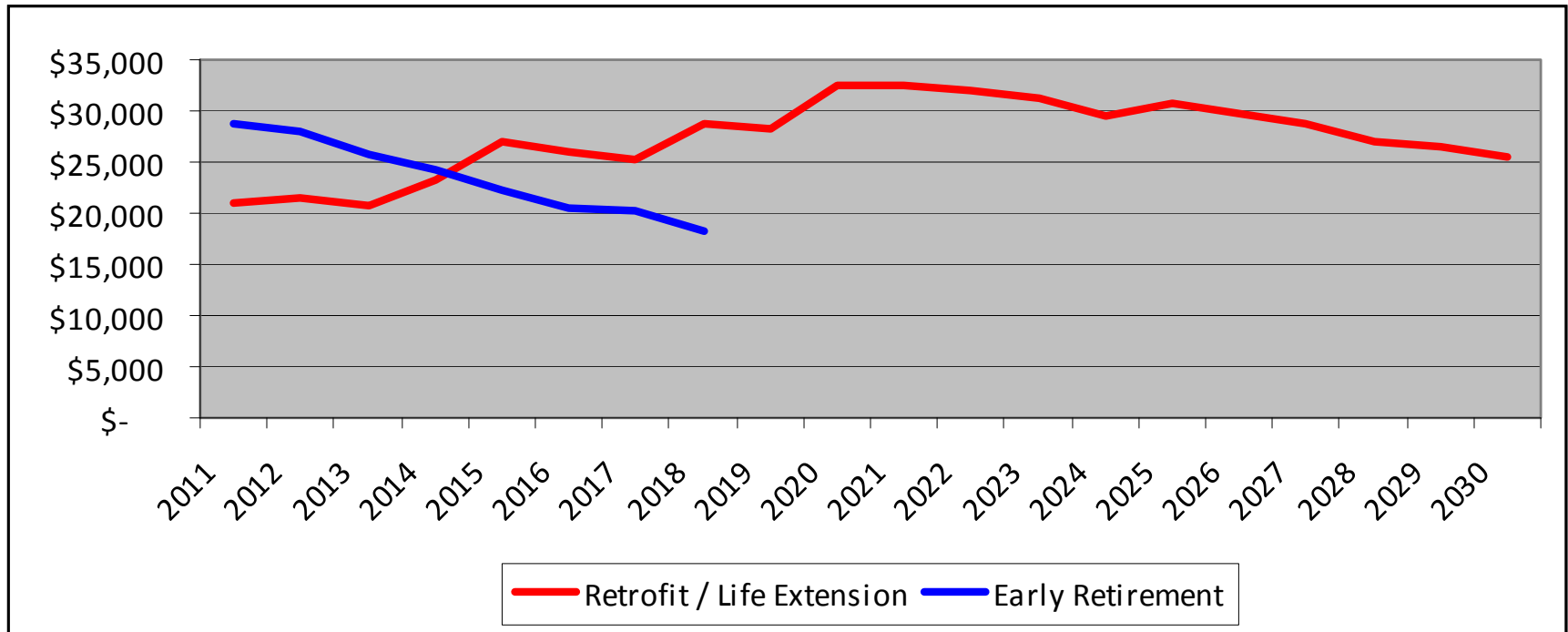


Economic Drivers

CO2 Assumptions ???



Economic Drivers Accelerated Depreciation



Case Study Cherokee 3&4

504MW

Approx. 3,200GWh/yr

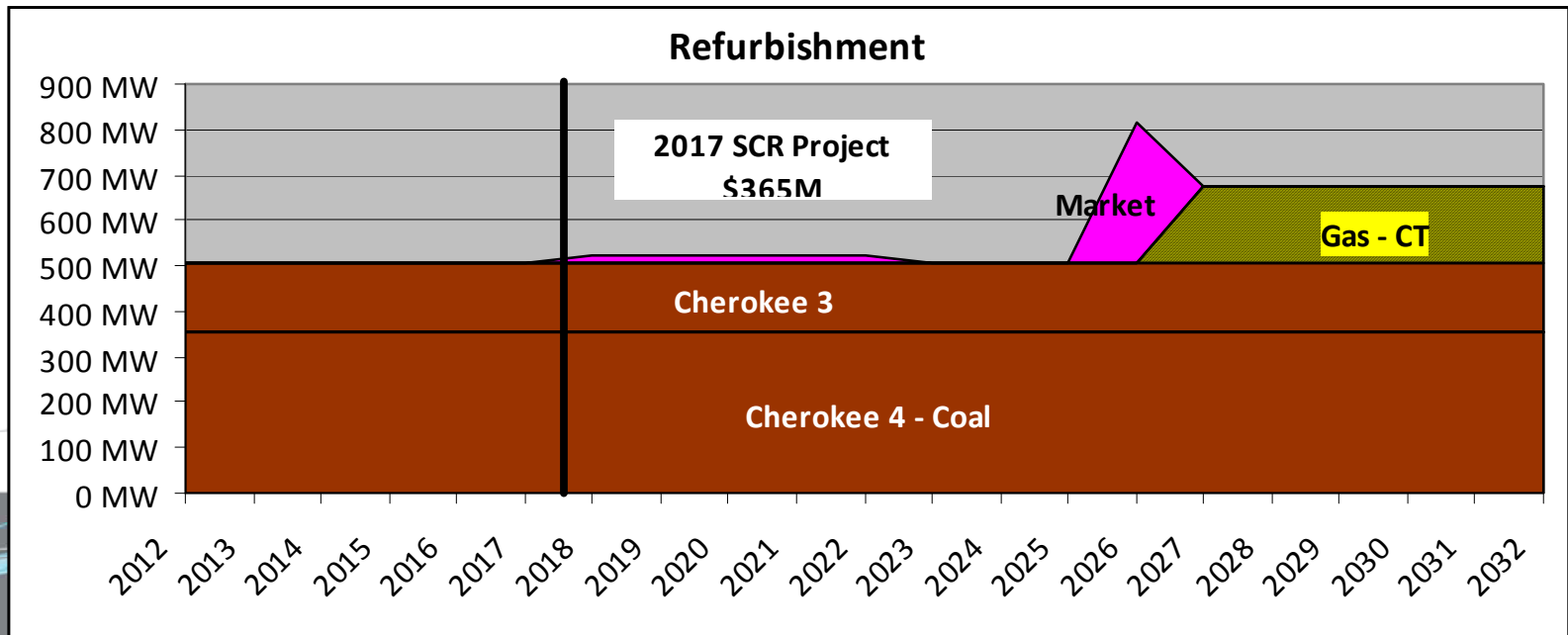
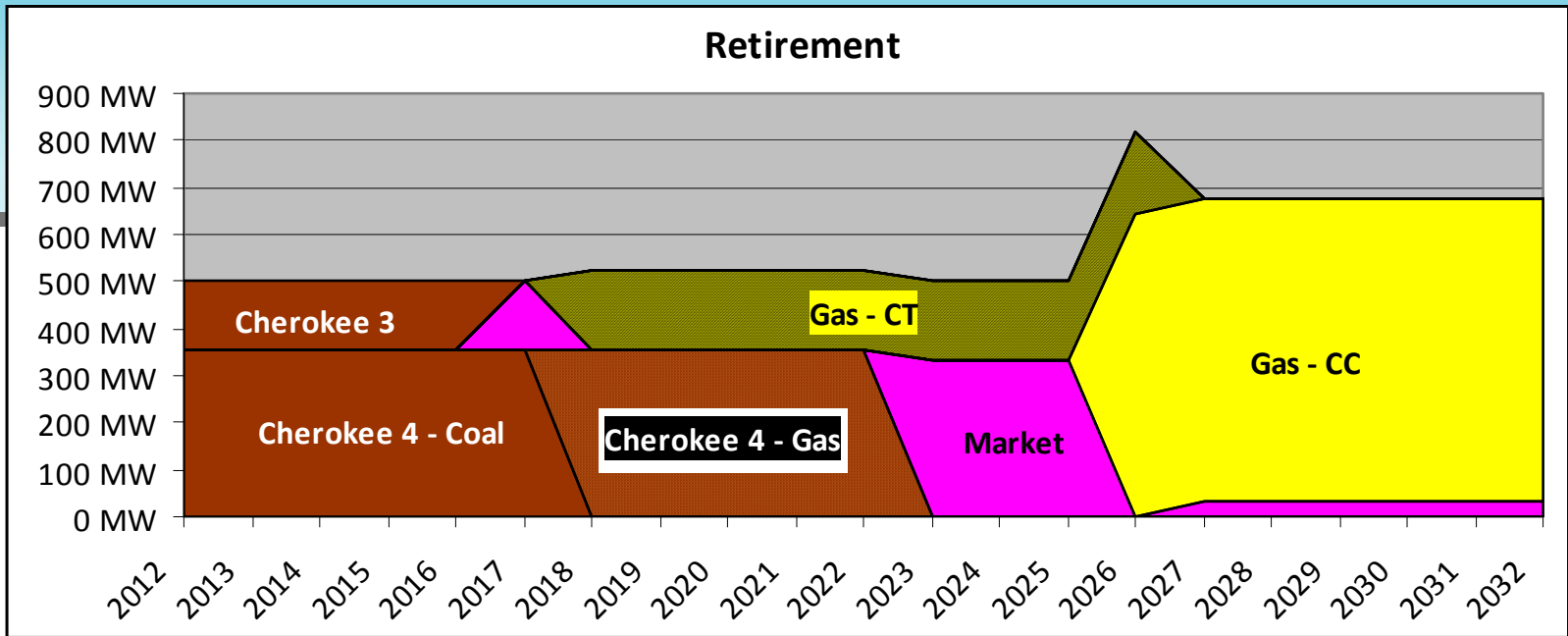
In-Service 1962-1968

90% NO_x Reduction
Target

SCR Capital \$700/kW

SCR O&M \$10M/yr





No DSM Results

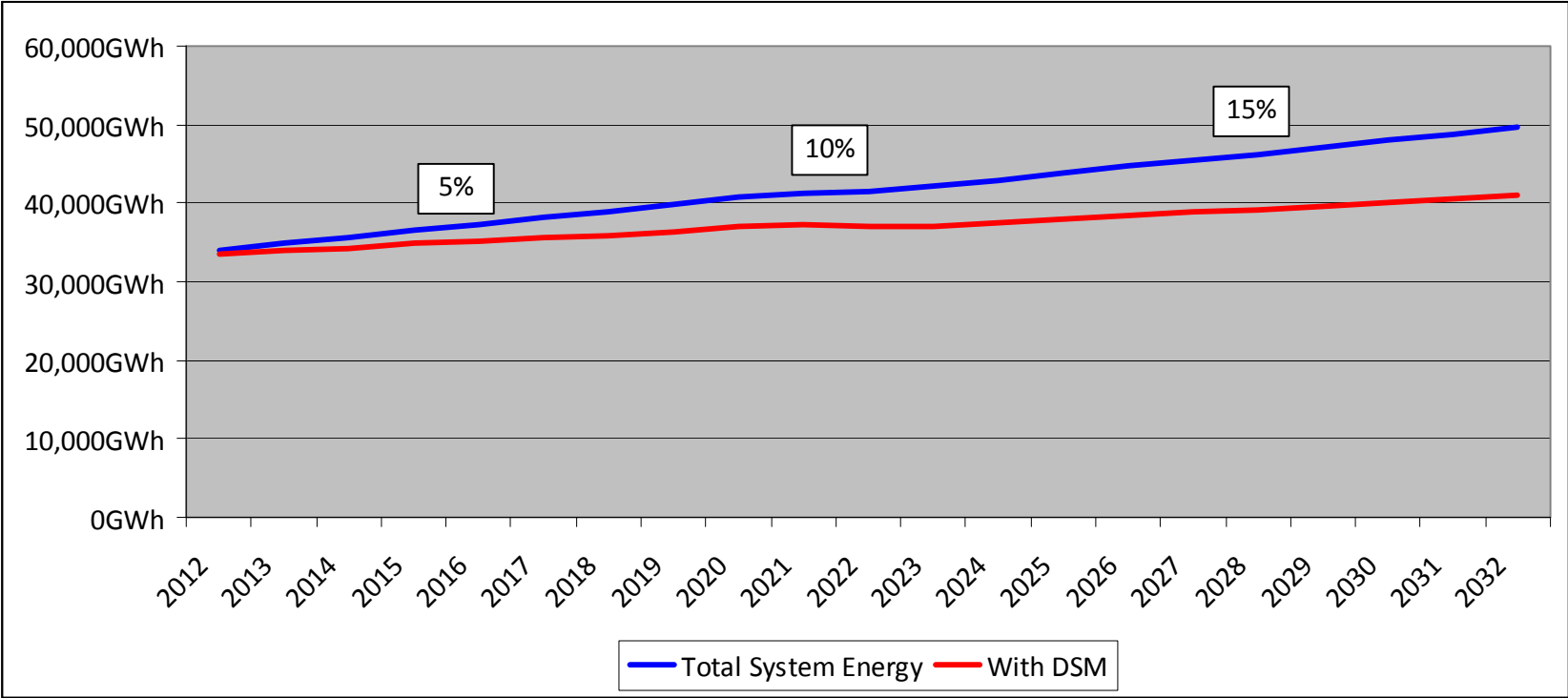
NPV (\$millions)

Refurbishment	
SCRs	\$316
Other Refurbishment	\$446
Fuel	\$709
CO2	<u>\$264</u>
Total	\$1,734

Retirement	
Replacement	
Capacity	\$246
Fuel	\$1,300
<u>Accl Depr</u>	<u>\$41</u>
Total	\$1,586

Net Savings (\$149)

PSCo DSM Forecast



2012-2032 Growth Rate - With DSM 1% - Without DSM 1.9%

With DSM Results

NPV (\$millions)

Refurbishment		
SCRs		\$316
Other Refurbishment		\$446
Fuel		\$649
CO2		<u>\$246</u>
Total		\$1,657

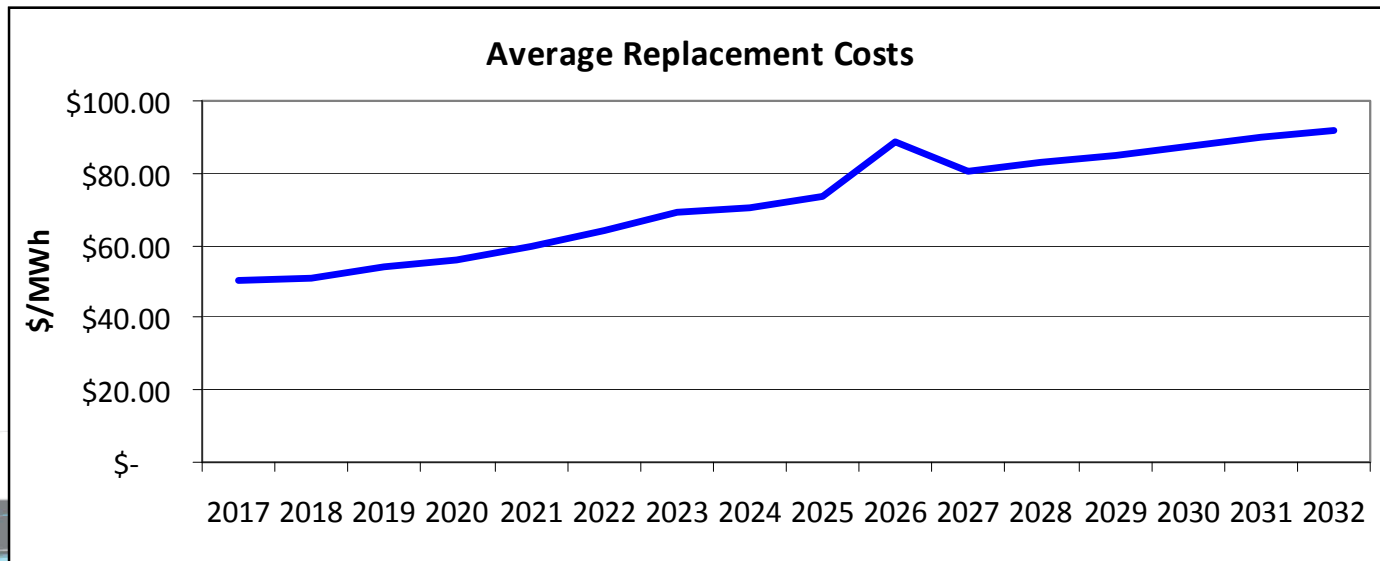
Retirement		
Replacement		
Capacity		\$233
Fuel		\$1,180
<u>Accl Depr</u>		<u>\$41</u>
Total		\$1,453

Net Savings	(\$204)
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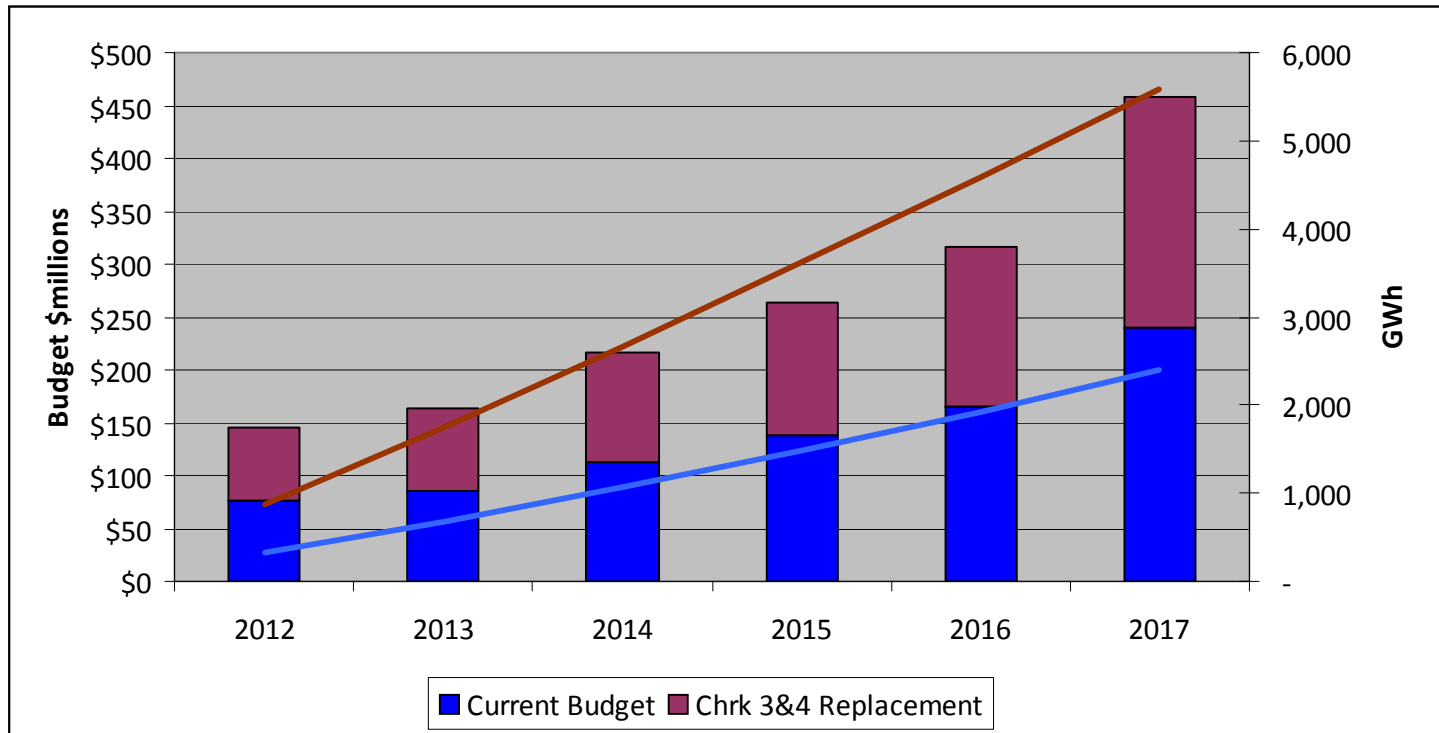
With PSCo's planned DSM levels
coal retirement improves by \$55million

DSM As Replacement Capacity

- **Replacement Capacity**
 - **37% CT, 13% Market, 50% CC,**
- **Replacement Energy**
 - **3% Coal, 8% CT, 8% Market, 81% CC**



DSM Replacement For Cherokee 3&4



To replace Cherokee DSM must increase energy goals 140% with only a 90% increase in budget.

Disclaimer

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