

21st Century Energy Plan: Capacity Needs Forum

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September 21, 2006



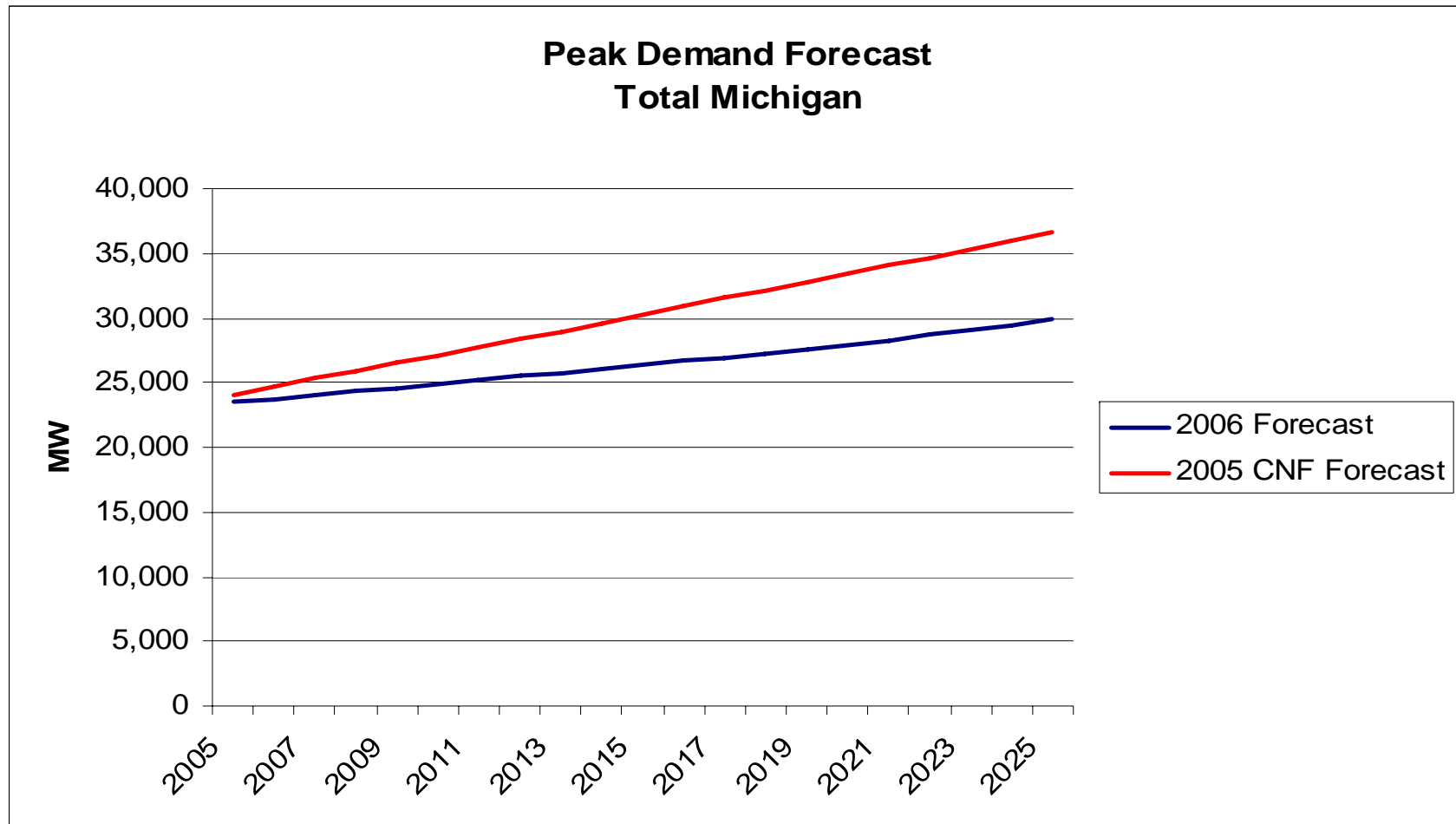
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- **Update of Key Input Assumptions**
- **Traditional Generation Results**
- **List of Scenario/Sensitivities**



Peak Demand Forecast

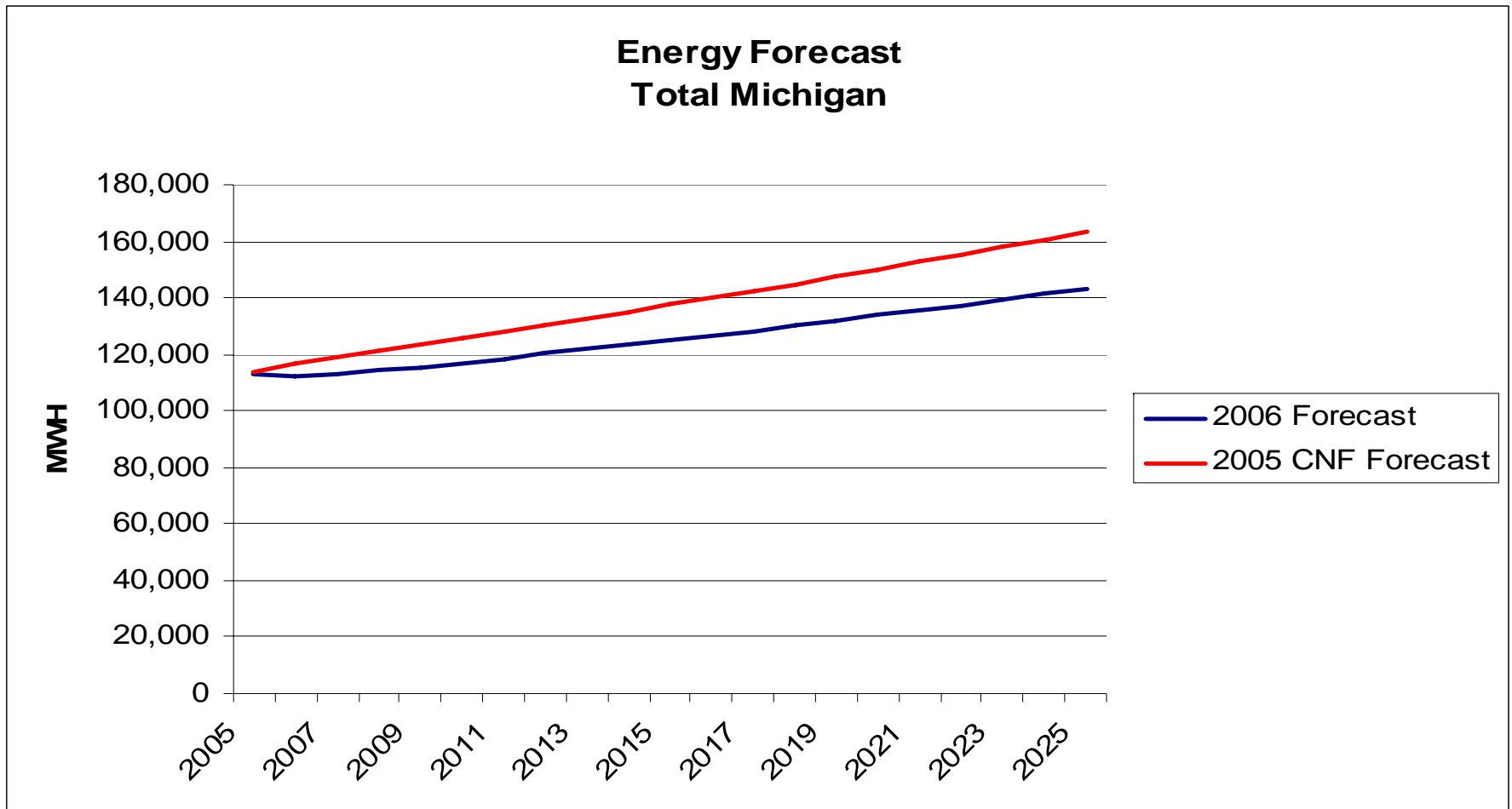
- Demand forecast is 6,300 MW, or 18%, lower than 2005 CNF Forecast by 2025



Energy Requirements Forecast

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- Annual energy requirement is 20,300 GWh, or 12%, lower than 2005 CNF Forecast by 2025



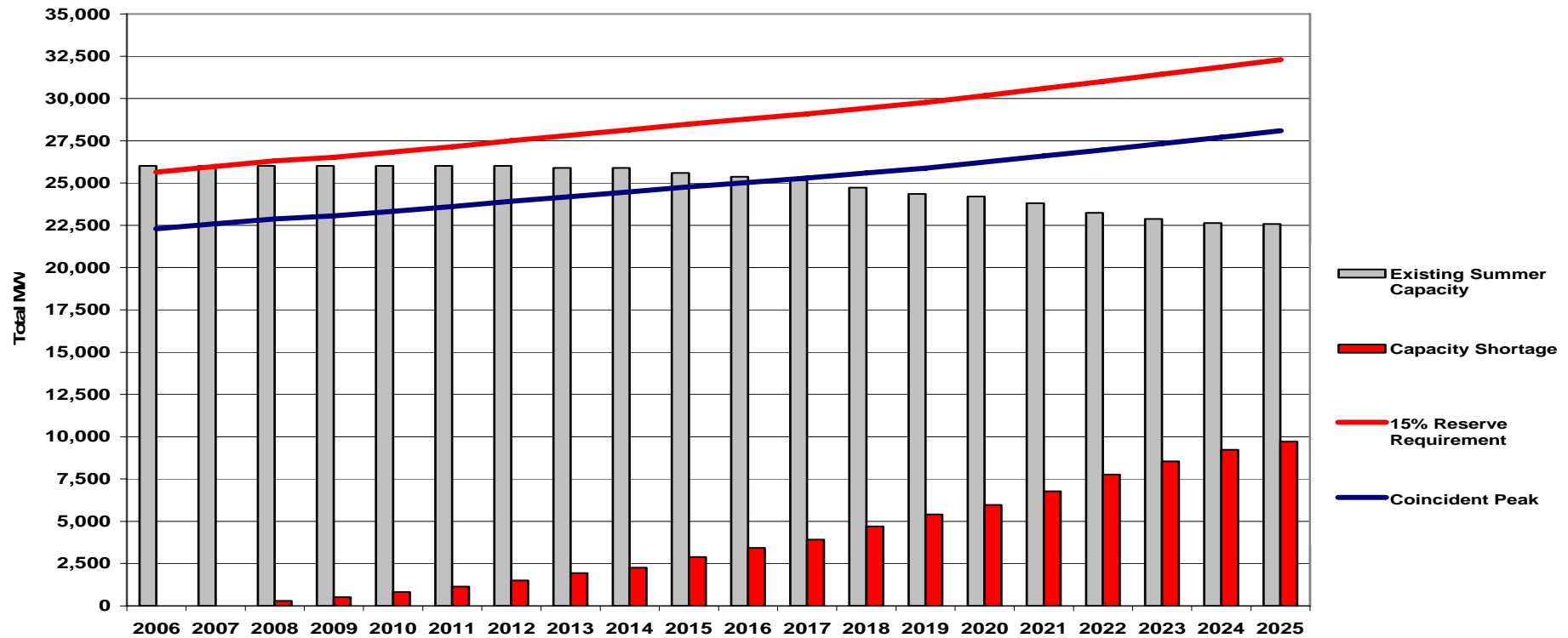
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Supply and Demand Forecast

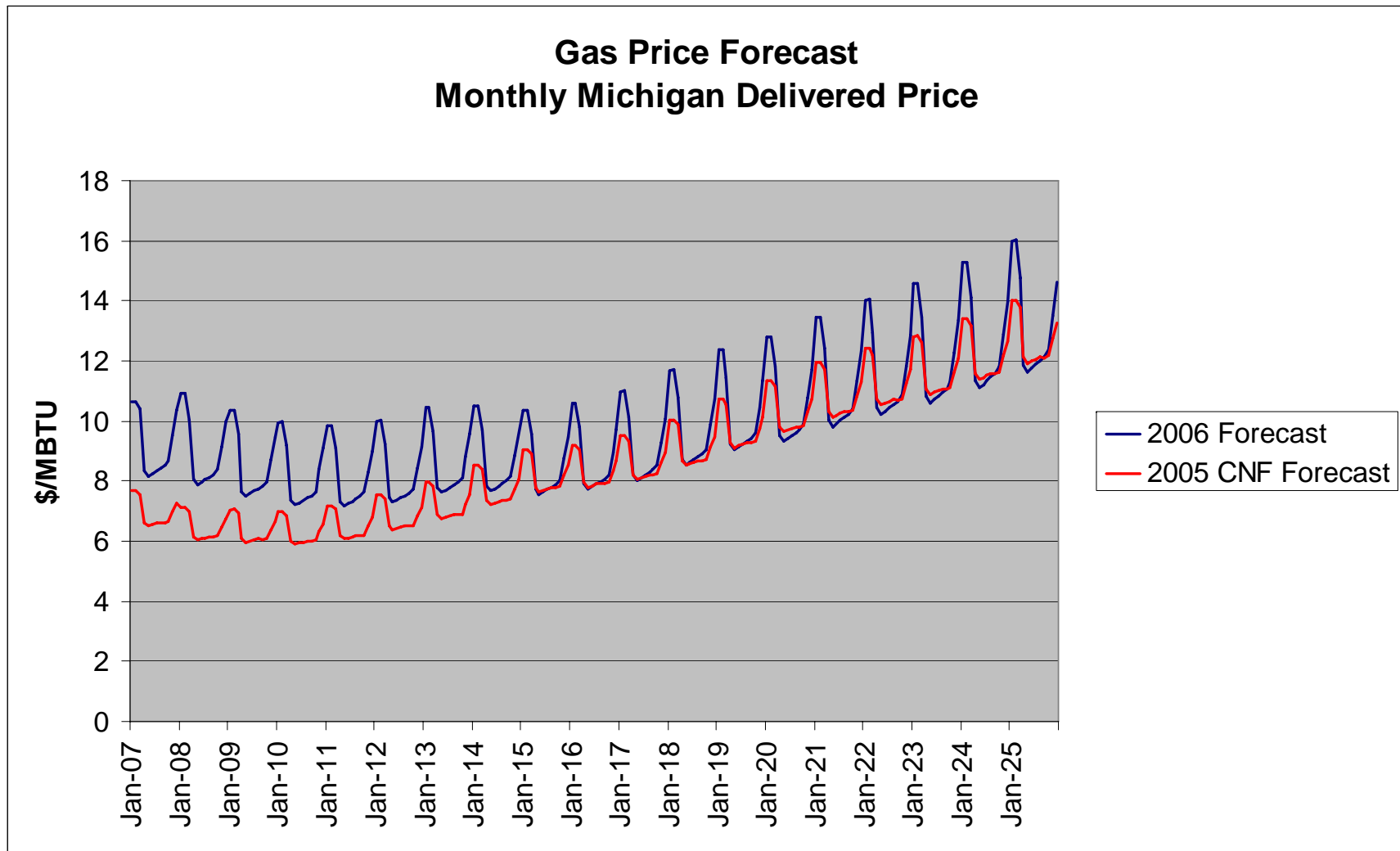
- 300 MW of Firm Summer Capacity needed in MECS by 2008
- 9,700 MW of Firm Summer Capacity need in MECS by 2025

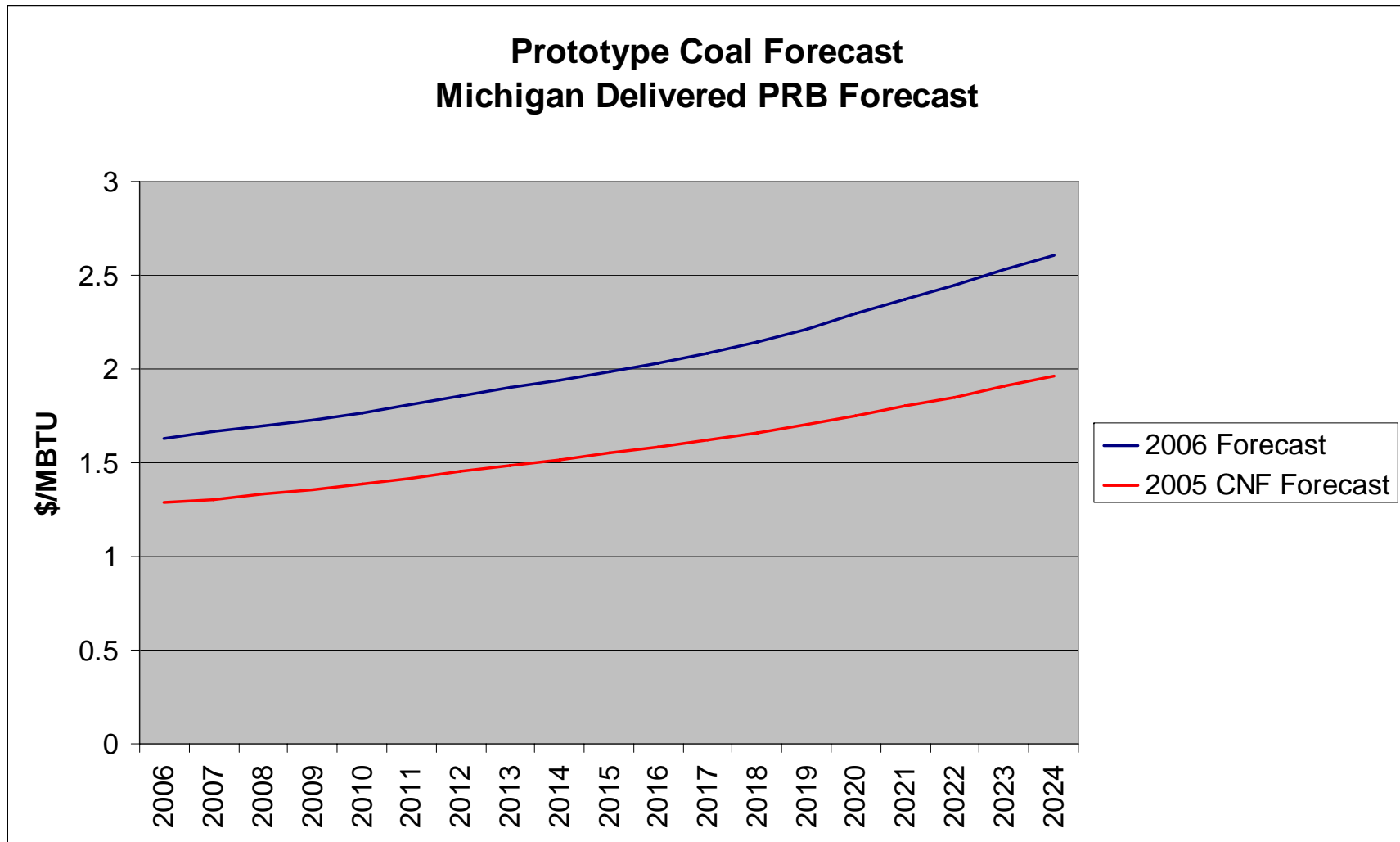
**MECS Resource Gap Analysis
Summer Peak Load and Resource Balance of Existing System**

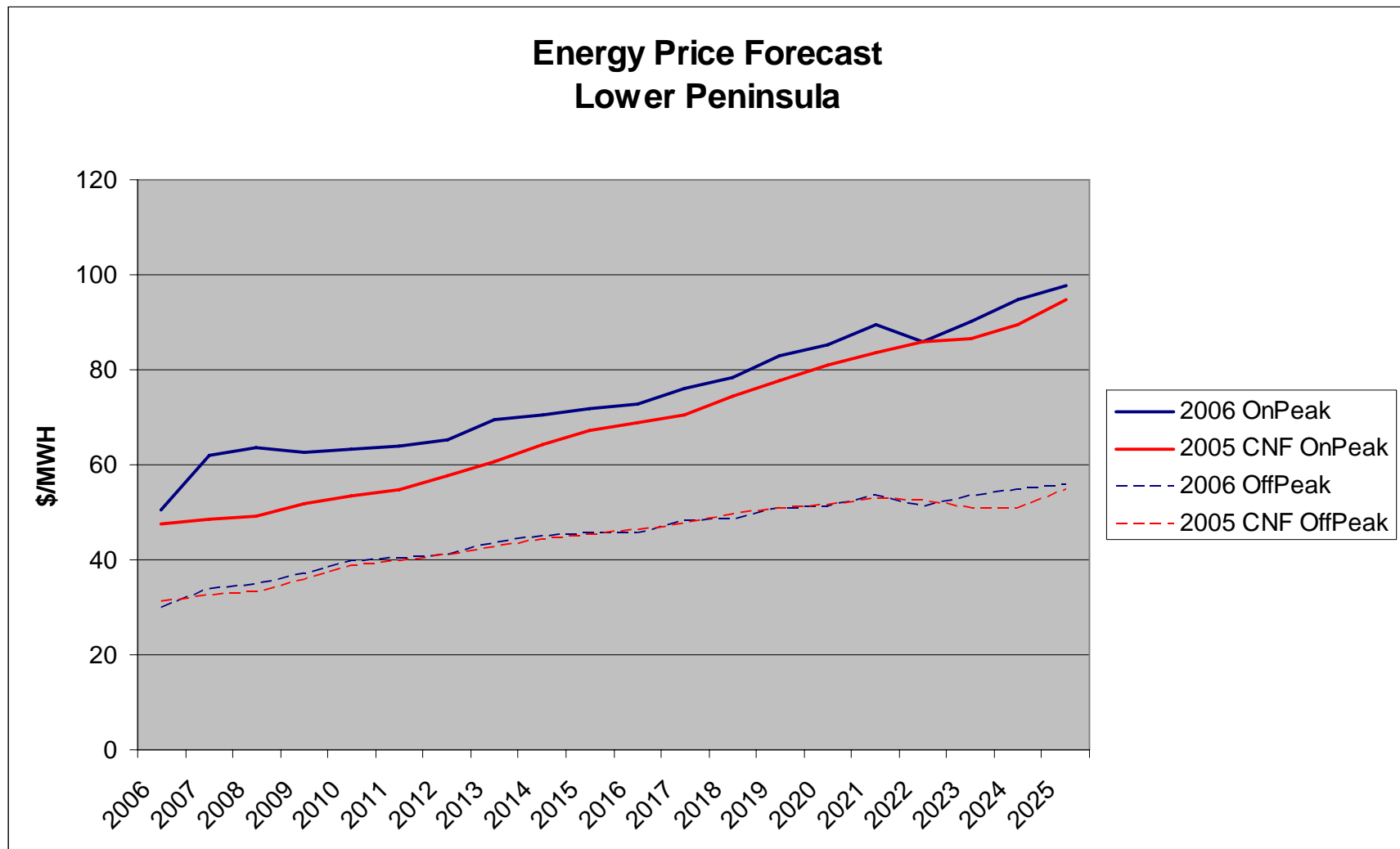


* Excludes Upper Peninsula









Prototype Assumptions

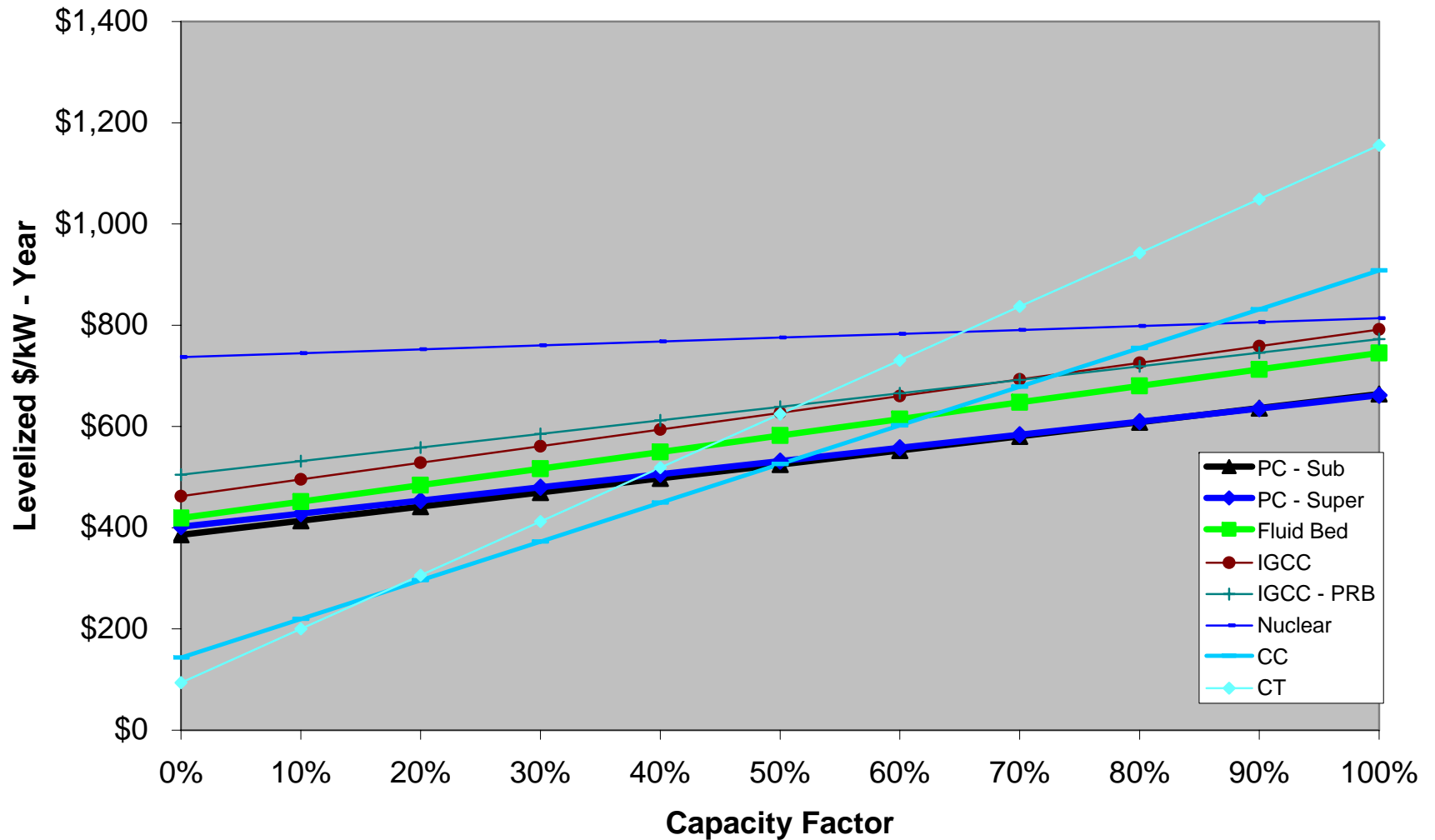
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Type	Construction Cost (\$/kW)		FOM (\$/kW-yr)		VOM (\$/MWH)	
	CNF	21st CEP	CNF	21st CEP	CNF	21st CEP
PC-Sub	1,370	1,478	42.97	44.26	1.80	1.86
PC-Super	1,437	1,551	43.60	44.91	1.70	1.75
Fluid Bed	1,505	1,628	44.77	46.11	4.24	4.37
IGCC	1,647	1,785	59.52	61.30	0.95	0.98
IGCC-PRB	1,845	1,999	59.52	61.30	0.95	0.98
Nuclear	2,180	2,352	67.90	70.04	0.53	0.55
CC	467	529	5.41	5.57	2.12	2.19
CT	375	425	2.12	2.19	3.71	3.83

- A transmission interconnection fee of \$77.56/kW, calculated based on 5% of the average coal construction cost, is added to all technologies.
- A firm gas reservation charge of \$20.18/kW and \$5.12/kW is added to the fixed cost of the Combined Cycle and Combustion Turbine, respectively
- All other operational parameters remained the same, including unit capacity, heat rates, and emission rates.



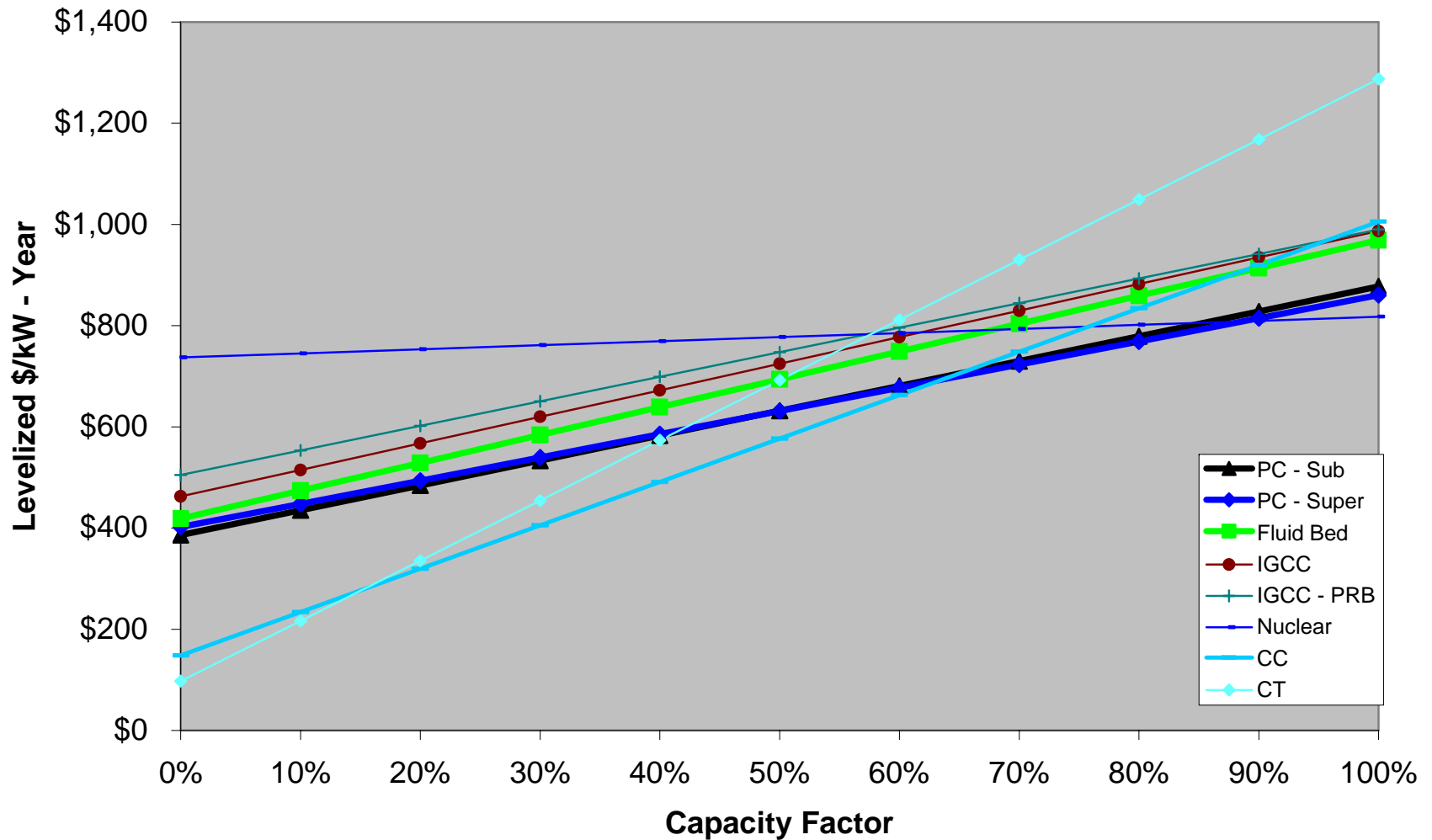
Technology Screening Curves Base Case 2006



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Technology Screening Curves Emissions Case 2006



Traditional Generation Resources Scenario Overview

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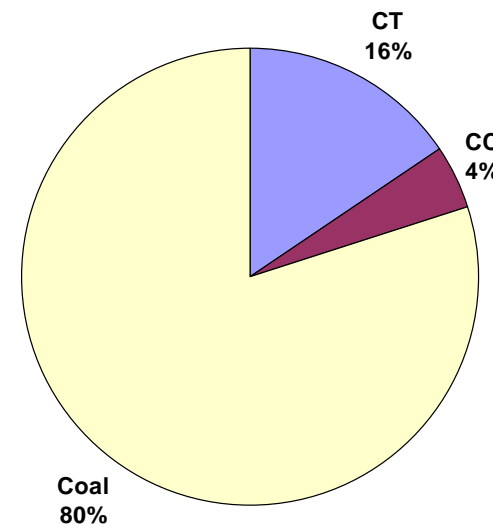
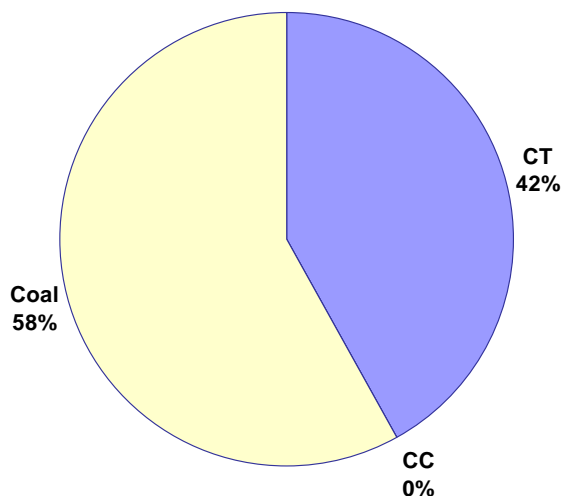
- Traditional Generation Resources Expansion Plan
- Plan Specifics
 - No Specialties in Traditional Generation Resources Expansion Plan
- Alternatives Considered
 - 160 MW CT – all regions
 - 500 MW CC – all regions
 - 500 MW PC – all regions
 - 150 MW CFB – UP only
- Alternatives Screened Out
 - IGCC
 - IGCC – PRB coal
 - Nuclear
 - CFB – except UP

Traditional Generation Resources Scenario Expansion Plan Results

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■	2006 to 2015	
■	Capacity Additions	
■	CT	1,440 MW
■	CC	0 MW
■	PC	2,000 MW
■	Nuclear	0 MW
■	IGCC	0 MW
■	Other	0 MW
■	Total	3,440 MW
■	Demand Growth	1.17 %
■	Reserve Margin	15.26 %
■	Plan Costs	
■	NPV Utility Cost	\$ 32,073.0 M
■	NPV Emissions	\$ 3,385.6 M
■	NPV CO2	\$ 0.00 M

■	2006 to 2025	
■	Capacity Additions	
■	CT	1,760 MW
■	CC	500 MW
■	PC	9,000 MW
■	Nuclear	0 MW
■	IGCC	0 MW
■	Other	0 MW
■	Total	11,260 MW
■	Demand Growth	1.21 %
■	Reserve Margin	15.52 %
■	Plan Costs	
■	NPV Utility Cost	\$ 56,716.9 M
■	NPV Emissions	\$ 5,602.8 M
■	NPV CO2	\$ 0.00 M



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Traditional Generation Resources Scenario Expansion Plan Schedule

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Traditional Generation		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
2	CT - METC	-	-	1	1	-	-	-	-	-	-
7	CT - ITC	-	-	2	-	2	2	-	-	-	-
2	CT - ATC2	-	-	-	-	-	-	1	-	-	-
0	CC - METC	-	-	-	-	-	-	-	-	-	-
1	CC - ITC	-	-	-	-	-	-	-	-	-	-
0	CC - ATC2	-	-	-	-	-	-	-	-	-	-
6	COAL - METC	-	-	-	-	-	-	-	-	-	-
12	COAL - ITC	-	-	-	-	-	-	1	1	1	1
0	COAL - ATC2	-	-	-	-	-	-	-	-	-	-
0	CFB - ATC	-	-	-	-	-	-	-	-	-	-

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
CT - METC	-	-	-	-	-	-	-	-	-	-
CT - ITC	-	-	-	-	-	-	-	-	-	1
CT - ATC2	1	-	-	-	-	-	-	-	-	-
CC - METC	-	-	-	-	-	-	-	-	-	-
CC - ITC	-	-	-	-	-	-	-	-	-	1
CC - ATC2	-	-	-	-	-	-	-	-	-	-
COAL - METC	1	1	-	1	-	1	1	1	-	-
COAL - ITC	1	-	1	1	1	1	1	1	1	-
COAL - ATC2	-	-	-	-	-	-	-	-	-	-
CFB - ATC	-	-	-	-	-	-	-	-	-	-



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■ Traditional Generation

- Base Conditions
- High Load
- Low Load
- Reduced Import
- Expanded Transmission

■ Emissions (Carbon)

- Base Conditions
- High Load
- Low Load
- Renewable w/ Conservation

■ Full Renewable Generation

- Base Conditions
- High Load
- Low Load
- Reduced Import

■ Energy and Demand Conservation

- Base Conditions
- High Load
- Low Load
- Reduced Import

■ Conservation and Renewables

- Base Conditions
- High Load
- Low Load
- Reduced Import

■ Combustion Turbines Only

- Base Conditions
- High Load
- Low Load
- Reduced Import