Policy Review
Michigan's 21st Century Energy Plan

August 22, 2006

Agenda

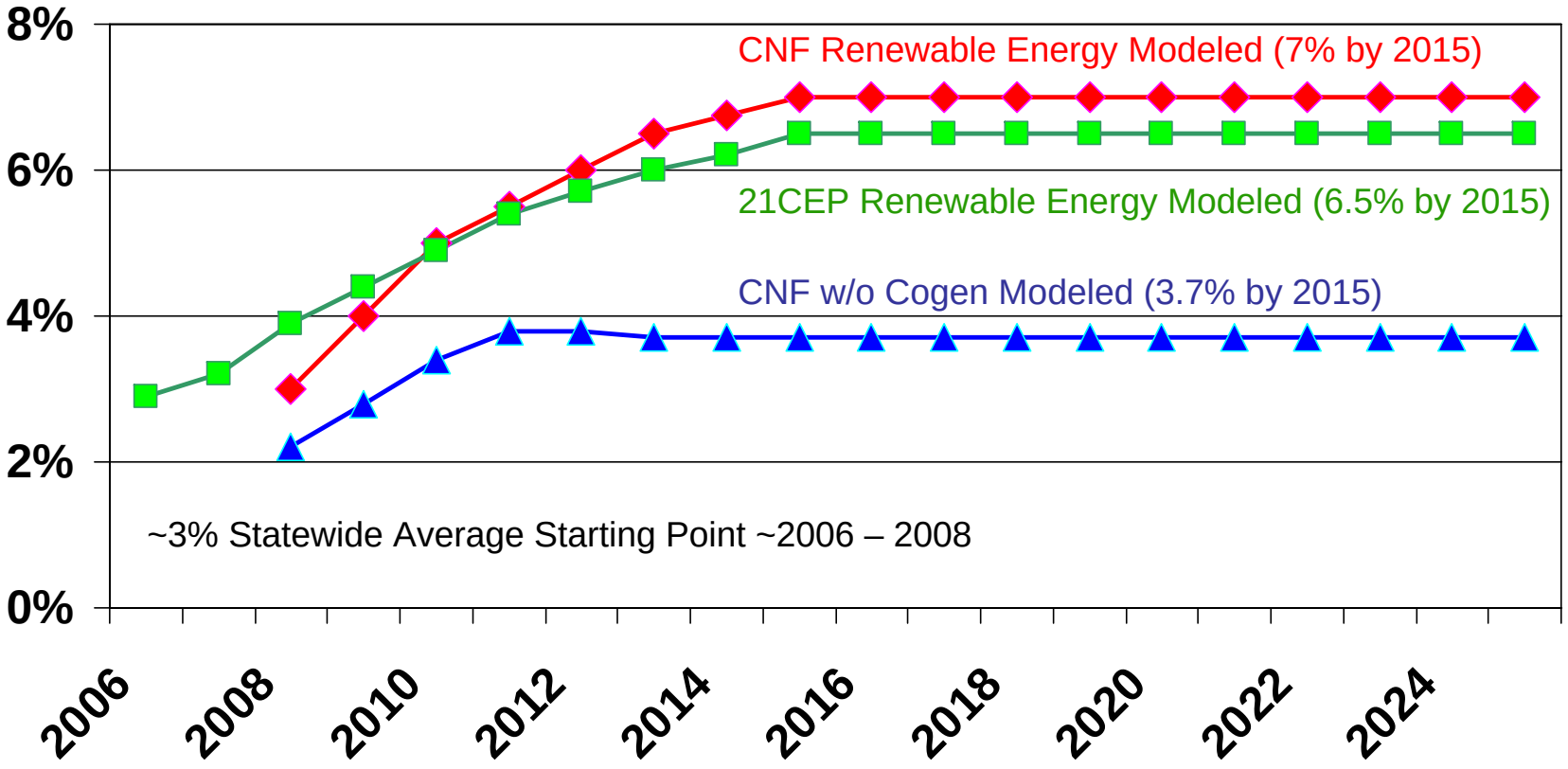
- Choosing a Generating Technology
  - Dale E. Heydlauff, American Electric Power Company
  - Jacob Williams, Peabody Energy
- 21st Century Plan Update
  - Resource option information
  - Modeling update

Comparing CNF to 21CEP Modeling for Renewable Energy (2)

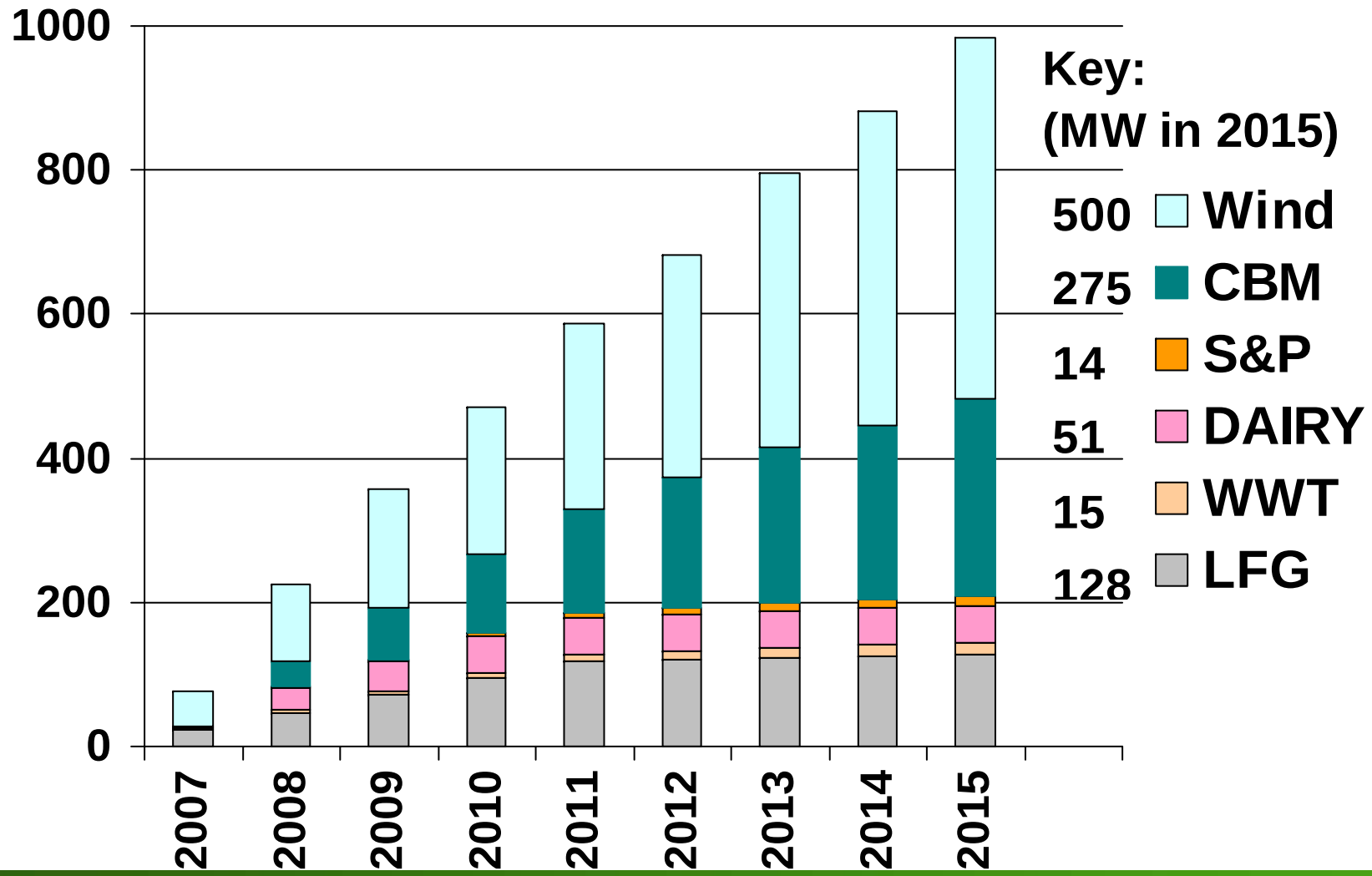
RE Potential (2015 in MW)	CNF Alt-Tech – Scaled-Up	21CEP
Wind	420 – 443	500
LFG	131 – 138	128
Anaerobic Digestion	51 – 54	80
Cellulosic Biomass / CHP	547 – 576 (CHP/COGEN)	275
Total	1149 – 1211	983

Comparing CNF to 21CEP Modeling for Renewable Energy (3)

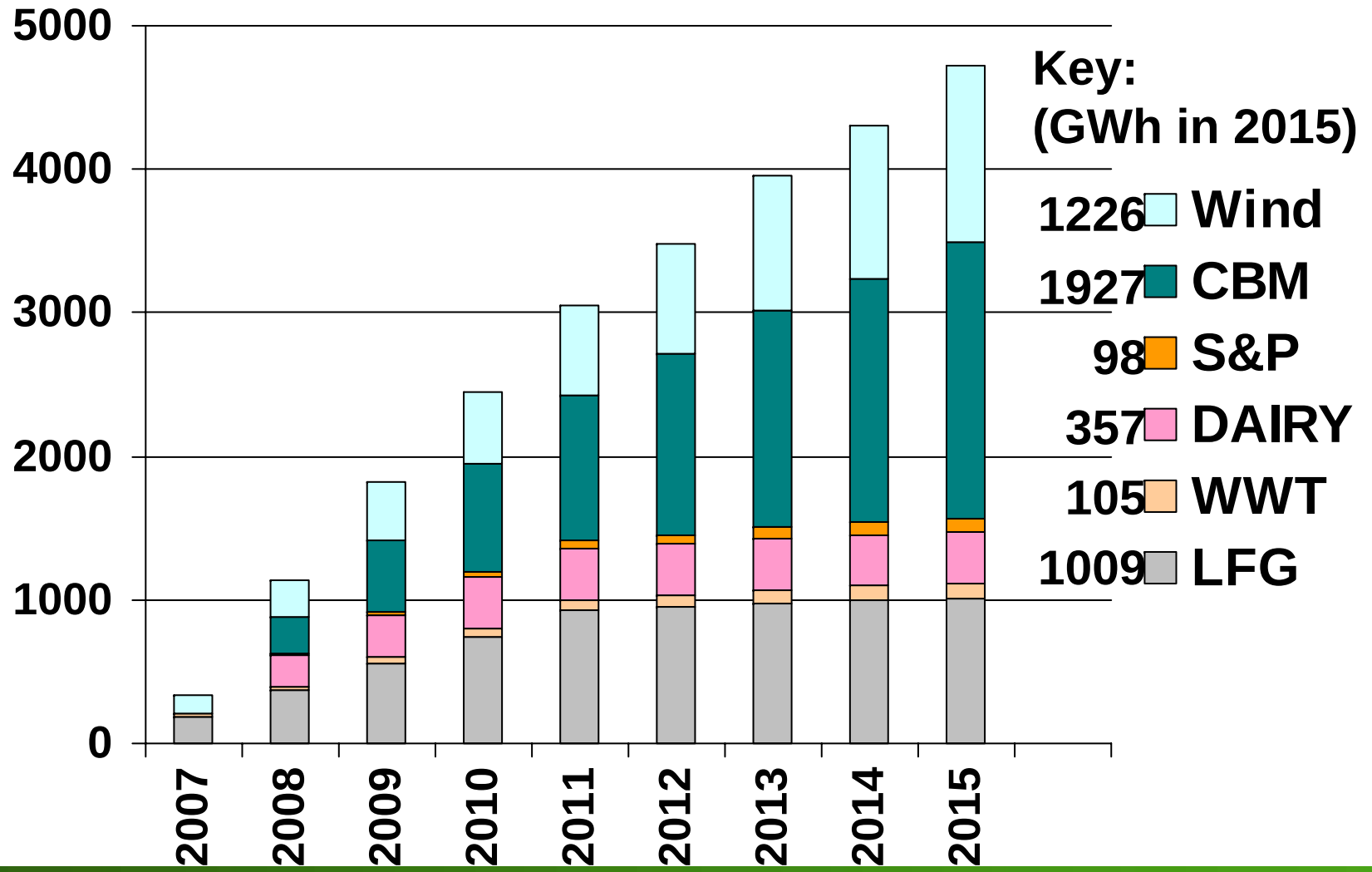
Total Renewable Energy by Year as % of System Needs



21CEP Renewables Modeled (MW)



21CEP Renewables Modeled (GWh)



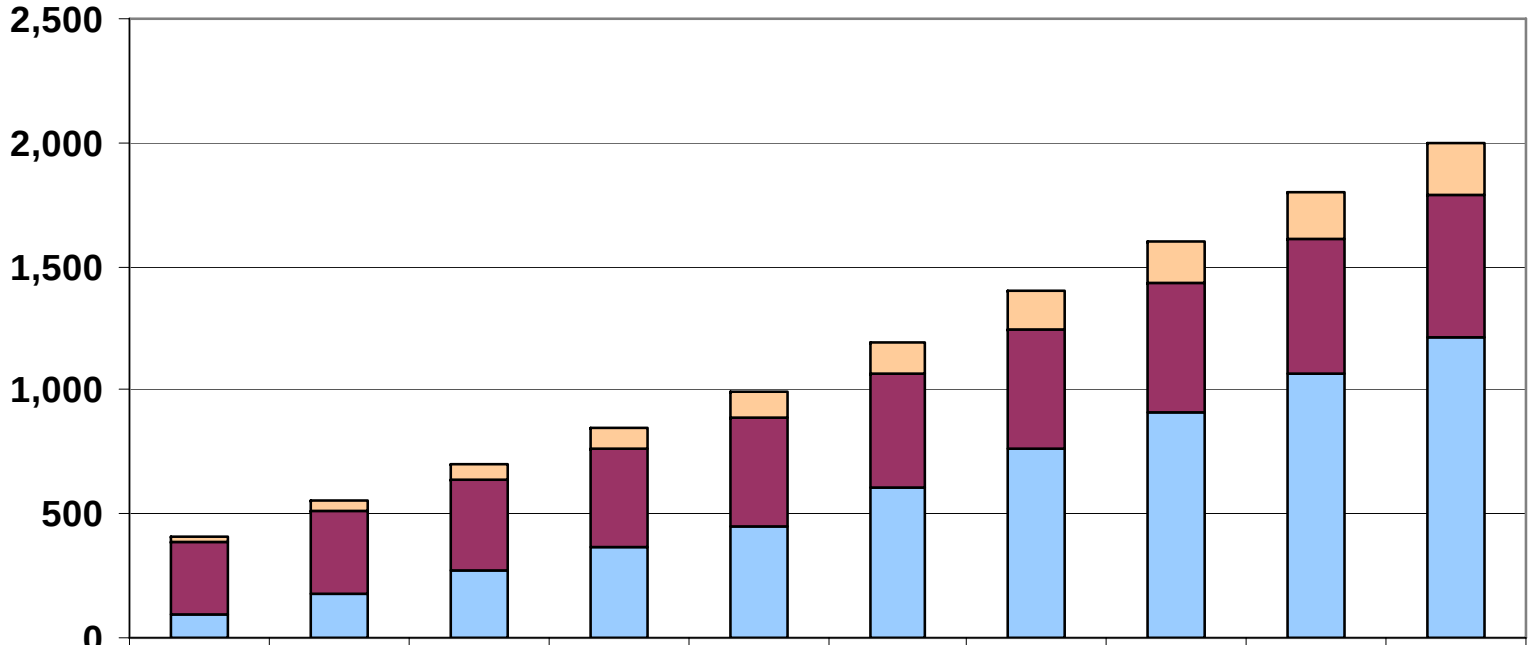
21CEP Renewable Energy Costs

System Type	Capital Cost ($/kW)	Average Cost (¢/kWh)	
		21CEP	CNF
Wind	1,400	7.2	6.9
Cellulosic Biomass	2,000	7.1	n/a
Swine/Poultry	2,825	8.2	n/a
Dairy	2,825	8.2	6.9
Wastewater Treatment Plants			
Landfill Gas (existing – new)	1,130 – 1, 356	7.0 – 7.4	6.6 – 6.9

Central Station Options

Technology	Size (MW)	$/Kw	Fixed O&M	Variable O&M	Heat Rate
Pulverized Coal					
– Sub-critical	500	1,552	44.26	1.86	9,496
– Super-critical	500	1,628	44.91	1.75	8,864
CFB	300	1,706	46.11	4.37	9,996
IGCC	550	1,866	61.30	.98	9,000
IGCC – PRB	550	2,090	61.30	.98	10,080
Nuclear	1,000	2,470	69.93	.55	10,400
Combined Cycle	500	529	5.57	2.19	7,200
Combustion Turbine	160	425	2.19	3.82	10,450

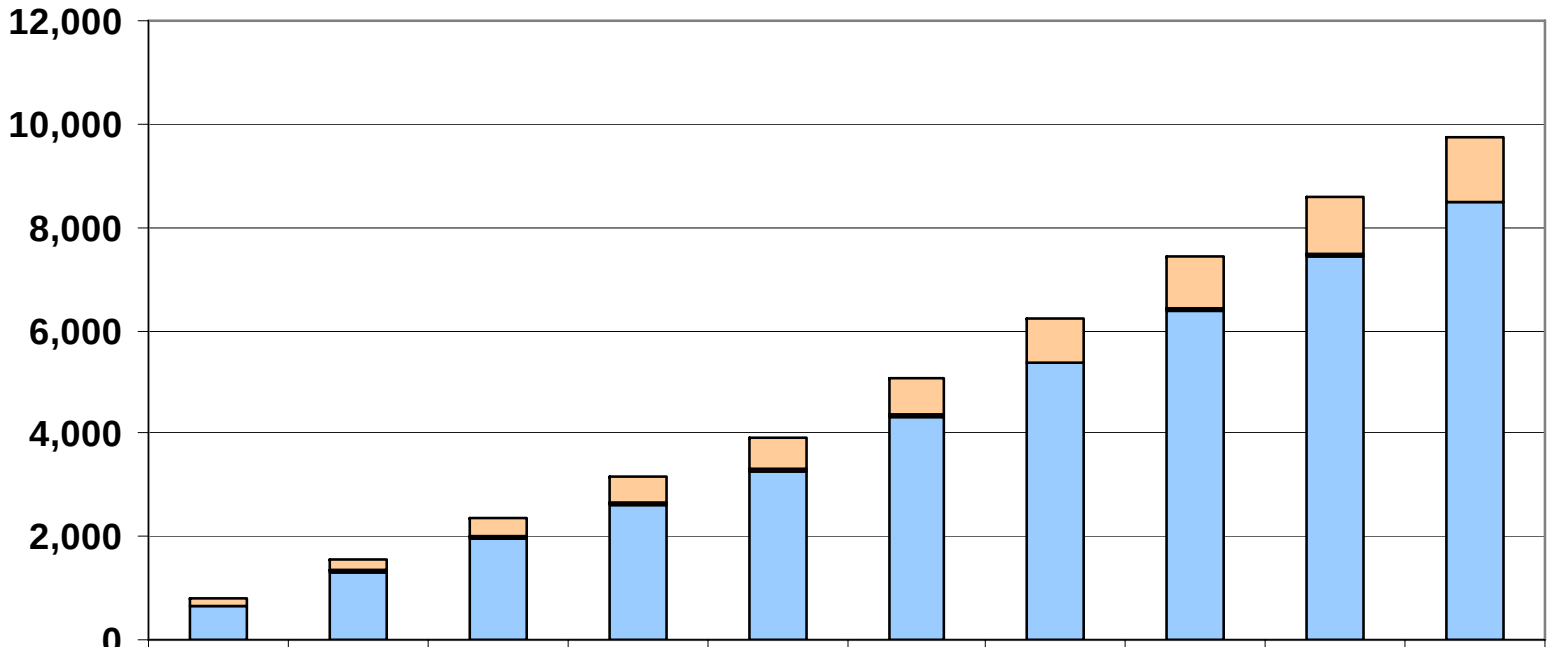
21 CEP Energy-Efficiency Modeled (MW) Peak-Hr Reduction



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Appliance Standards	21	42	63	84	105	126	147	169	190	211
Load Management (AC-Cycling)	294	331	367	400	431	461	489	517	544	569
Energy Efficiency Programming	91	182	273	364	455	608	760	913	1,065	1,218

Energy Efficiency Programming Load Management (AC-Cycling) Appliance Standards

21 CEP Energy-Efficiency Modeled (gWh) Annual Energy Savings



	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Appliance Standards	123	246	369	492	615	738	861	984	1,107	1,231
Load Management (AC-Cycling)	18	20	22	24	26	28	30	31	33	35
Energy Efficiency Programming	657	1,313	1,970	2,626	3,283	4,321	5,359	6,398	7,436	8,474

Energy Efficiency Programming Load Management (AC-Cycling) Appliance Standards

Comparing CNF to 21CEP Modeling for EE

EE Potential (2015)	CNF	21CEP
EE Program (gWh)	4,500	8,474
EE Program Peak Red. (MW)	593	1,218
Load Response (MW)	400-500	569
Appliance St. (gWh)	-	1,231

Distributed Technologies

- Stirling Engines
- Reciprocating Engines
- Fuel Cells
- Micro Turbines
- Advanced Storage
- Smart Grid

Reliability Model Stand Alone Results

Standalone (Without transmission ties)

	BaseCase - CNF		BaseCase - 21 CEP	
	LOLP	**Support* (MW)**	**LOLP**	**Support* (MW)**
METC	0.4	450	0.02	**(-500)**
ITC	32.3	3840	**14.58**	**2840**
MECS	5.2	3370	**0.92**	**1160**
ATC zone2	289.1	315	TBD	

ITC Region Loss Of Load Probability Results Stand Alone Basis

Study	Study Year	LOLP - Stand alone	Imports Needed (MW)
MTEP 06	2006	17	2,862
CNF	2009	32.3	3,840
21 CEP	2009	14.58	2,800
MTEP 06	2011	28	4,600

Loss of Load Probability with Transmission Support
Assumes 1,500 MW of Flow through Michigan System

IESO Phase Shifter Flow = 1500 MW

				CNF		21 CEP	
				BaseCase			
	Imports	Import	Import		Additional Imports		Additional Imports
Sink	From	Value	Value	LOLP	Needed	LOLP	Needed
ITC	MAIN/TVA	1750	**1375**	5.62	2080	**2.3**	**1500**
	VACAR/MAAC/ALL	1500	**1125**	7.63	2145	**3.46**	**1700**
METC	MAIN/TVA/VACAR/MAAC/ ALL	1000	**625**	0.02	(-) 560	**0**	**(-960)**
MECS	MAIN/TVA/VACAR	1500	**750**	1.33	1870	**0.33**	**700**
	MAAC/ALL	1250	**500**	1.68	1800	**0.48**	**630**

Loss of Load Probability with Transmission Support
Assumes 0 MW of Flow through Michigan System

				BaseCase CNF		BaseCase 21 CEP	
	Imports	Import	Import		Add Imports		Add Imports
Sink	From	Value	Value	LOLP	Needed	LOLP	Needed
ITC	MAIN	3000	2625	0.69	880	**0.2**	**190**
	TVA/ALL	2800	2425	1.03	1050	**0.3**	**360**
	VACAR	2700	2325	1.24	1100	**0.37**	**510**
	MAAC	2500	2125	1.76	1350	**0.57**	**750**
METC	MAIN	3800	3425	0	(-) 3360	N/A	
	TVA/ALL	3500	3125	0	(-) 2645	N/A	
	VACAR	3250	2875	0	(-) 3720	N/A	
	MAAC	3000	2625	0	(-) 2530	N/A	
MECS	MAIN	3250	**2500**	0.13	120	**0.01**	**(-) 1080**
	TVA/VACAR/ALL	3000	**2250**	0.2	440	**0.02**	**(-) 800**
	MAAC	2800	**2050**	0.28	630	**0.03**	**(-) 600**

Additional Modeling

- Additional Modeling using New Energy's STATGIEST is planned.
- Demand forecast changed from CNF.
- Updated Plant Cost.
- Firmed up Energy Conservation and Renewable estimates.

21st Century Energy Plan
Proposed Integration Scenarios

- Rerun Traditional Scenario with updated data. Sensitivities would include: High/Low Load, and Transmission Reduction.
- Rerun Emissions Scenario with updated data. Sensitivities would include: Full renewable with Conservation, High/Low.
- Rerun Renewable Scenario with updated data and RPS. Sensitivities would include: High/Low Load, and Transmission Reduction.
- Rerun Conservation Scenario with updated data. Sensitivities would include: High/Low Load, and Transmission Reduction.
- Run a Conservation & Renewable Scenario. Sensitivities would include: High/Low Load, and Transmission Reduction.
- Run a Traditional Scenario with only Combustion Turbines. Sensitivities would include: High/Low Load, and Transmission Reduction.

21st Century Energy Plan Proposed Integration Scenarios

	Traditional Power	Emissions	Energy Conservation	Renewable
	Assume Clean Air Interstate Rule and Clean Air Mercury Rule for environmental regulations.	Mercury removal requirements raised to 85% from 1999 baseline emissions in 2018. Carbon tax at $30 per ton carbon by 2018.	Energy conservation portfolio wired in.	Mandated Renewable Portfolio Standard of 3% by 2008, 5% by 2010 and 7% by 2015.
Resource Units				
PC Unit	X	X	X	X
CT Unit	X	X	X	X
GCC Unit	X	X	X	X
IGCC Unit			X	X
IGCC C Seq.		X		
Nuclear Unit		X		X
Renewable		X		X
Energy Conservation			X	
Sensitivities				
High Load	X	X	X	X
Low Load	X	X	X	X
High Gas Cost				
CT only	X			
Max energy conservation and Renewable		X	X	X
Max Import [1]				
Restricted Import[2]	X	X	X	X
Assumptions				
Normal price driven energy conservation	X	X	X	
Carbon tax ($10.00=2010-$30.00=2018)[3]		X		
85% Mercury Emissions Removal		X		
IGCC has CO2 sequestering		X		
Projected energy conservation options			X	
Renewable Porfolio				X
Assumed Transfer Capability(Normal)	3,000-3,500	3,000-3,500	3,000-3,500	3,000-3,500

1) Teir 1 transmission upgrades
2) 1,500 MW transfer to OH
3) Nominal dollars

Contact Information for Policy Issues

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