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2013 Economic Planning

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Process Overview and Timeline

- ATC Economic Project Planning
  - During February, we hold an initial stakeholder meeting to review the market congestion summary and potential fixes and to discuss economic study scenarios, drivers, ranges, and assumptions.
  - By March 1, we work with stakeholders to request and prioritize new/other economic studies and recommend study assumptions.
  - By April 15 – we identify preliminary areas of economic study, study assumptions and models and solicit further comments from stakeholders.
  - By May 15 – we finalize areas of economic study, study assumptions and models to be used in analysis.
  - By November 15 – we provide a summary of the results of the economic analyses to our stakeholders.

MISO MTEP 13 Futures Definitions

Future	Narrative
Business as Usual	The Business as Usual future is considered the status quo future and continues current economic trends. This future models the power system as it exists today with reference values and trends. Renewable portfolio standards vary by state and 12.6 GW of coal unit retirements will be modeled.
Robust Economy	The Robust Economy future is considered a future with a quick rebound in the economy. This future models the power system as it exists today with historical values and trends for demand and energy growth. Demand and energy growth is spurred by a sharp rebound in manufacturing and industrial production. Renewable portfolio standards vary by state and 12.6 GW of coal unit retirements will be modeled.
Limited Growth	The Limited Growth future models a future with low demand and energy growth rates due to a very slow economic recovery and impacts of EPA regulations. This can be considered a low side variation of the BAU future. Renewable portfolio standards vary by state and 12.6 GW of coal unit retirements will be modeled.
Generation Shift	The Generation Shift future considers a future with continued impact from the economic downturn on demand and energy growth rates. This future models a changing baseload power system due to many power plants nearing the end of their useful life. In addition to the 12.6 GW of coal unit retirements modeled as a minimum in all futures, this future will also model the retirement of each thermal generator (except coal or nuclear) in the year that it reaches 50 years of age or each hydroelectric facility in the year that it reaches 100 years of age during the study period. Renewable portfolio standards vary by state.
Environmental	The Environmental future considers a future where policy decisions have a heavy impact on the future generation mix. Mid-level demand and energy growth rates will be modeled. An even greater EPA presence will be represented through a carbon tax and state-level renewable portfolio standard mandates and goals will be modeled. 23 GW of coal unit retirements will be modeled.

Source: MISO 2-27-2013 PAC Meeting (https://www.midwestiso.org/Events/Pages/PAC20130227.aspx)

MISO MTEP 13 Futures Definitions

Demand Response Program	Description
Commercial and Industrial (C&I) Curtailable/Interruptible Programs	Curtailable programs are those in which a customer commits to curtailing a certain amount of load whenever an event is called in exchange for lower energy price. Interruptible programs are programs in which a customer agrees to be interrupted in exchange for a
C&I Direct Load Control (DLC)	These programs are where the C&I customer agrees to allow the utility to directly control equipment such as an air conditioner or hot water heater during events in exchange for a payment of some type (a flat fee per year or season and/or a per-event payment). A controlling device such as a switch or programmable thermostat is required.
C&I Dynamic Pricing	Dynamic pricing programs are structured so that customers have an incentive to reduce their usage during times of high energy demand or high wholesale energy prices. Under a critical peak pricing program, the customer pays a higher electricity rate during critical peak periods and pays a lower rate during off-peak periods. Often times, a critical peak pricing rate is combined with a time-of-use rate. Under a peak-time rebate program, the customer receives an incentive for reducing load during critical peak periods, and there is no penalty if the customer chooses not to participate.
Residential DLC	These programs are where the residential customer agrees to allow the utility to directly control equipment such as an air conditioner or hot water heater during events in exchange for a payment of some type (a flat fee per year or season and/or a per-event payment). A controlling device such as a switch or programmable thermostat is required.
Residential Dynamic Pricing	Dynamic pricing programs are structured so that customers have an incentive to reduce their usage during times of high energy demand or high wholesale energy prices. Under a critical peak pricing program, the customer pays a higher electricity rate during critical peak periods and pays a lower rate during off-peak periods. Often times, a critical peak pricing rate is combined with a time-of-use rate. Under a peak-time rebate program, the customer receives an incentive for reducing load during critical peak periods, and there is no penalty if the customer chooses not to participate.

Source: MISO 2-27-2013 PAC Meeting (https://www.midwestiso.org/Events/Pages/PAC20130227.aspx)

MISO MTEP 13 Futures Definitions

Energy Efficiency Program	Description
Residential Energy Efficiency Programs*	Appliance incentives/rebates; Appliance recycling; Lighting initiatives; Low income programs; Multifamily programs; New construction programs; Whole home audit programs; All other residential programs
Commercial and Industrial Energy Efficiency Programs*	Lighting programs; Prescriptive rebates; Custom incentives; New construction programs; Retrocommissioning programs; All other C&I programs

* Note: Both Residential and C&I EE programs are split into low and high cost blocks for EGEAS modeling purposes; the cutoff is $1,000/kW

Source: MISO 2-27-2013 PAC Meeting (https://www.midwestiso.org/Events/Pages/PAC20130227.aspx)

MISO MTEP 13 Futures Matrix

	Uncertainties																														
	Capital Costs														Demand and Energy					Fuel Cost (Starting			Fuel Escalations			Emission Costs			Other Variables		
Future	Coal	CC	CT	Nuclear	Wind Onshore	IGCC	IGCC w/ CCS	CC w/ CCS	Pumped Storage Hydro	Compressed Air Energy	Photovoltaic	Biomass	Conventional Hydro	Wind Offshore	Demand Response Level	Energy Efficiency Level	Demand Growth Rate	Energy Growth Rate	Natural Gas Forecast	Oil	Coal	Uranium	Oil	Coal	Uranium	SO_2	NO_x	CO_2	Inflation	Retirements	Renewable Portfolio Standards
Business as Usual	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	L	L	L	M	L	M
Robust Economy	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	H	H	H	M	M	M	H	H	H	L	L	L	H	L	M
Limited Growth	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	L	L	L	M	L	M	L	L	L	L	L	L	L	L	M
Generation Shift	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	L	L	M	L	L	M	L	L	L	L	L	L	L	M	M
Environmental	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	H	L	L	H	M	M	M	L	L	M	M	H	H

Source: MISO 2-27-2013 PAC Meeting (https://www.midwestiso.org/Events/Pages/PAC20130227.aspx)

MISO MTEP 13 Futures Uncertainty Variables

MTEP13 FUTURES MATRIX				
Uncertainty	**Unit**	**Low (L)**	**Mid (M)**	**High (H)**
New Generation Capital Costs[1]				
Coal	($/KW)	2,641	2,934	3,668
CC	($/KW)	921	1,023	1,279
CT	($/KW)	608	676	845
Nuclear	($/KW)	4,973	5,525	6,906
Wind-Onshore	($/KW)	1,993	2,214	2,768
IGCC	($/KW)	3,406	3,784	4,730
IGCC w/ CCS	($/KW)	5,939	6,599	8,249
CC w/ CCS	($/KW)	1,886	2,095	2,619
Pumped Storage Hydro	($/KW)	4,759	5,288	6,610
Compressed Air Energy Storage	($/KW)	1,164	1,294	1,617
Photovoltaic	($/KW)	3,486	3,873	4,841
Biomass	($/KW)	3,703	4,114	5,143
Conventional Hydro	($/KW)	2,642	2,936	3,670
Wind-Offshore	($/KW)	5,607	6,230	7,788

[1] All costs are overnight construction costs in 2013 dollars

Source: MISO 2-27-2013 PAC Meeting (https://www.midwestiso.org/Events/Pages/PAC20130227.aspx)

MISO MTEP 13 Futures Uncertainty Variables

MTEP13 FUTURES MATRIX				
Uncertainty	**Unit**	**Low (L)**	**Mid (M)**	**High (H)**
Demand and Energy				
Demand Growth Rate[2]	%	0.53%	1.06%	1.59%
Energy Growth Rate[3]	%	0.53%	1.06%	1.59%
Demand Response Level	%		MECT Estimates[4]	
Energy Efficiency Level	%		MECT Estimates[4]	

[2] Mid value for demand growth rate is the Module-E 50/50 load forecast growth rate

[3] Mid value for energy growth rate is the Module-E energy forecast growth rate

[4] Starting in Dec. 2012, LSE's voluntarily report DR and EE data for MTEP planning purposes in MECT

Source: MISO 2-27-2013 PAC Meeting (https://www.midwestiso.org/Events/Pages/PAC20130227.aspx)

MISO MTEP 13 Futures Uncertainty Variables

MTEP13 FUTURES MATRIX				
Uncertainty	**Unit**	**Low (L)**	**Mid (M)**	**High (H)**
Natural Gas				
Natural Gas[5]	($/MMBtu)	See 20130227 PAC Item 04 MTEP13 Futures Matrix spreadsheet at https://www.midwestiso.org/Events/Pages/PAC20130227.aspx		
Fuel Prices (Starting Values)				
Oil	($/MMBtu)	Powerbase default -20%	Powerbase default[6]	Powerbase default + 20%
Coal	($/MMBtu)	Powerbase default -20%	Powerbase default[7]	Powerbase default + 20%
Uranium	($/MMBtu)	0.91	1.14	1.37

[5] Prices reflect the Henry Hub natural gas price

[6] Powerbase default for oil is $19.39/MMBtu

[7] Powerbase range for coal is $1 to $4, with an average value of $1.69/MMBtu

Source: MISO 2-27-2013 PAC Meeting (https://www.midwestiso.org/Events/Pages/PAC20130227.aspx)

MISO MTEP 13 Futures Uncertainty Variables

MTEP13 FUTURES MATRIX				
Uncertainty	**Unit**	**Low (L)**	**Mid (M)**	**High (H)**
Emissions Costs				
SO_2	($/ton)	0	0	500
NO_x	($/ton)	0	0	NO_x: 500 Seasonal NO_x: 1000
CO_2	($/ton)	0	50	N/A

Source: MISO 2-27-2013 PAC Meeting (https://www.midwestiso.org/Events/Pages/PAC20130227.aspx)

MISO MTEP 13 Futures Uncertainty Variables

MTEP13 FUTURES MATRIX				
Uncertainty	**Unit**	**Low (L)**	**Mid (M)**	**High (H)**
Other Variables				
Inflation	%	1.5	2.5	4.0
Retirements	MW	12,600 MW	12,600 MW + 7,500 MW age-related retirements = 20,100 MW[8]	23,000 MW
Renewable Portfolio Standards	%	Reduced state mandates	State mandates only	State mandates and goals

[8] 8,100 MW value is based on MTEP12 database

Source: MISO 2-27-2013 PAC Meeting (https://www.midwestiso.org/Events/Pages/PAC20130227.aspx)

Study Assumptions

- 2013 Futures Development
  - Continued Review of MISO MTEP 13 Development
  - Review of MISO PROMOD Models
- Analysis of Projects
  - Study Year - 2023
  - Futures – All MISO Futures

Next Steps

- Project / Analysis Development
  - Review of Congestion
  - Stakeholder Feedback
  - Perform Economic Planning Analysis
- Timelines
  - April 15: Define Preliminary Assumptions
  - May 15: Finalize Assumptions
  - November 15: Provide Analysis Update

Questions?

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