MISO Capacity Considerations & Costs Related to EPA RICE NESHAP

IAMU Workshop
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Presentation Overview

- How Much Generation is in the MISO?
- How Much of the MISO Generation is Recip Internal Combution Engine (RICE) Driven?
- How Might the Loss of RICE Capacity Impact the MISO Market?
- MISO Behind-the-Meter Generation Considerations

Data Sources

- MISO Commercial Model & State Estimator Data
- Form EIA-860 Database
- PSA Generation Database

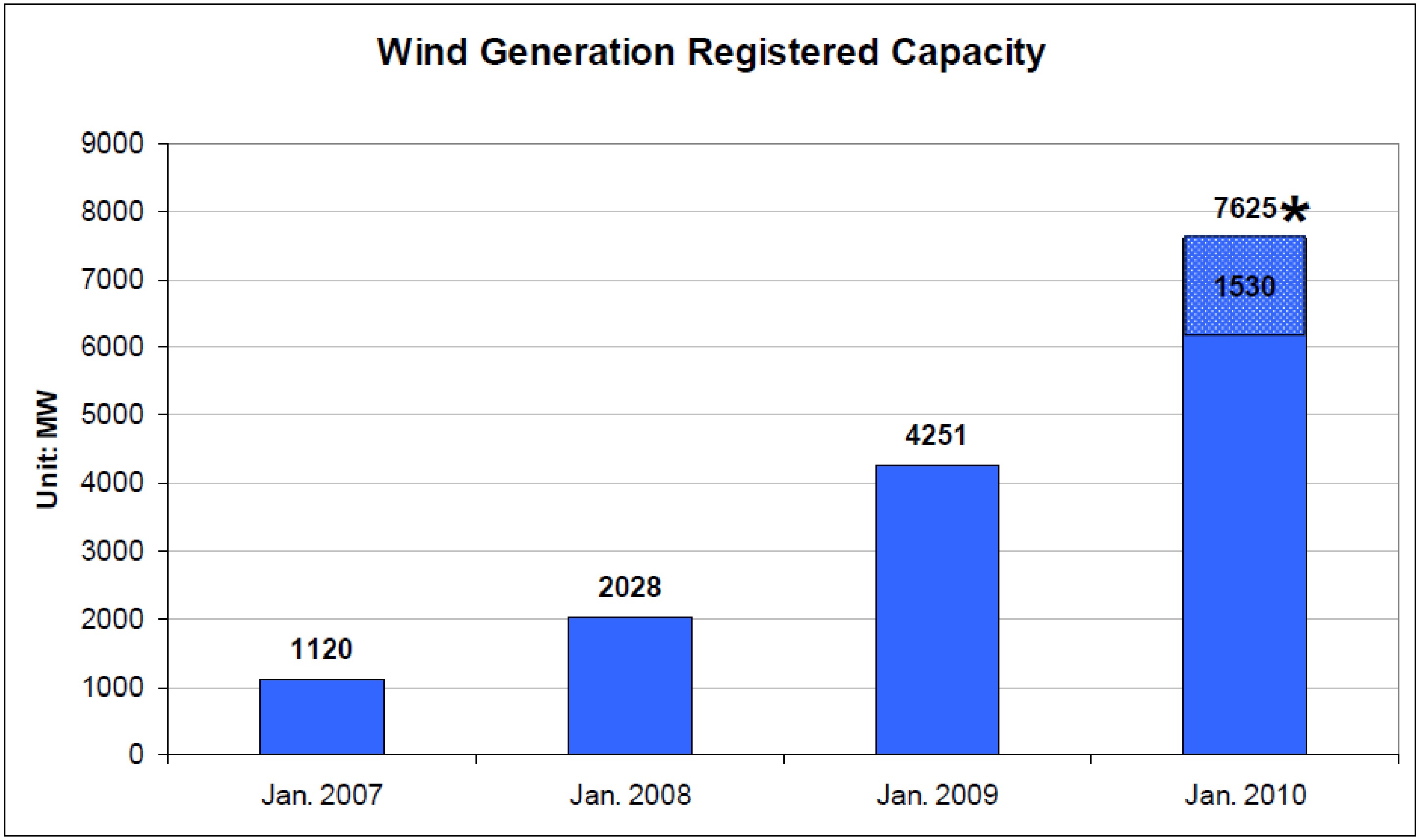
MISO Generation

Estimated Total MISO Generation

MISO state estimator data for June 2009 near peak conditions

		Listed MW Max MW Capacity	Est. Peak Demand MW
1	ALTE	4,331	2,899
2	ALTW	6,662	2,877
3	AMIL	11,818	9,471
4	AMMO	11,364	10,302
5	CIN	16,109	12,003
6	CONS	14,168	9,250
7	CWLD	104	1
8	CWLP	824	586
9	DECO	14,658	9,988
10	DPC	1,383	1,004
11	FE	13,944	10,345
12	GRE	4,782	1,986
13	HE	1,881	1,437
14	IPL	3,550	2,945
15	MDU	764	313
16	MEC	8,412	5,013
17	MGE	683	381
18	MP	3,434	2,144
19	MPW	271	261
20	NIPS	4,051	3,148
21	NSP	13,329	7,900
22	OTP	1,833	783
23	SIGE	2,275	1,744
24	SMP	334	14
25	UPPC	122	25
26	WEC	8,966	5,457
27	WPS	3,342	2,723
		153,391	105,000
	Wind	8,168	Non-Wind Capacity as %of Load
Net of Wind		145,223	138%

Wind Generation in Midwest ISO Market



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* Including 1530MW from MidAmerican since September 1, 2009

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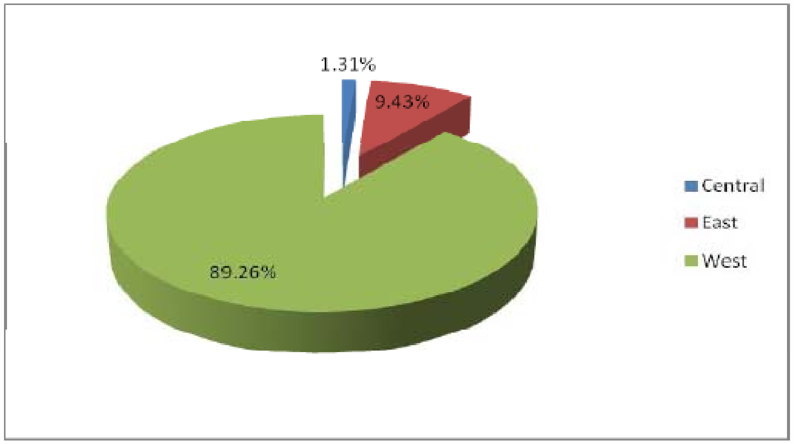
Wind Generation within Midwest ISO

- Wind Generation Registered Capacity as of July 1, 2010
  - Total registered wind generation capacity: 8168.65 MW
  - Wind resource represents 5.6% of the total registered capacity
- Wind Generation Distribution



- Wind Output Statistics
  - On average, wind resources generate at 30% of its total capacity
  - Historically wind generation output ranges from 1% to 72% of its total capacity

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RICE Generation in MISO

Form EIA-860 Database (Example)

Existing Generating Units in the United States by State, Company and Plant, 2008

(Existing generating units as of December 31, 2008)

State	Company	Plant Name	Nameplate Capacity (Megawatts)	Prime Mover	Energy Source 1
IA	American Profol Incorporated	Alliant SBD 9203 Profol	1.8	IC	DFO
IA	American Profol Incorporated	Alliant SBD 9203 Profol	1.8	IC	DFO
IA	Atlantic Municipal Utilities	Atlantic	5.3	IC	DFO
IA	Bancroft Municipal Utilities	Bancroft	0.6	IC	DFO
IA	Bancroft Municipal Utilities	Bancroft	0.3	IC	DFO
IA	Bancroft Municipal Utilities	Bancroft	1.8	IC	DFO

Generators

Prime Mover Code	Prime Mover Description
ST	Steam Turbine, including nuclear, geothermal and solar steam (does not include combined cycle)
GT	Combustion (Gas) Turbine (includes jet engine design)
IC	Internal Combustion Engine (diesel, piston)
CA	Combined Cycle Steam Part
CT	Combined Cycle Combustion Turbine Part
CS	Combined Cycle Single Shaft (combustion turbine and steam turbine share a single generator)
CC	Combined Cycle - Total Unit
HY	Hydraulic Turbine (includes turbines associated with delivery of water by pipeline)
PS	Hydraulic Turbine – Reversible (pumped storage)
BT	Turbines used in a binary cycle such as geothermal
PV	Photovoltaic
WT	Wind Turbine
CE	Compressed Air Energy Storage
FC	Fuel Cell
OT	Other
NA	Unknown at this time (use only for plants /generators in planning stage)

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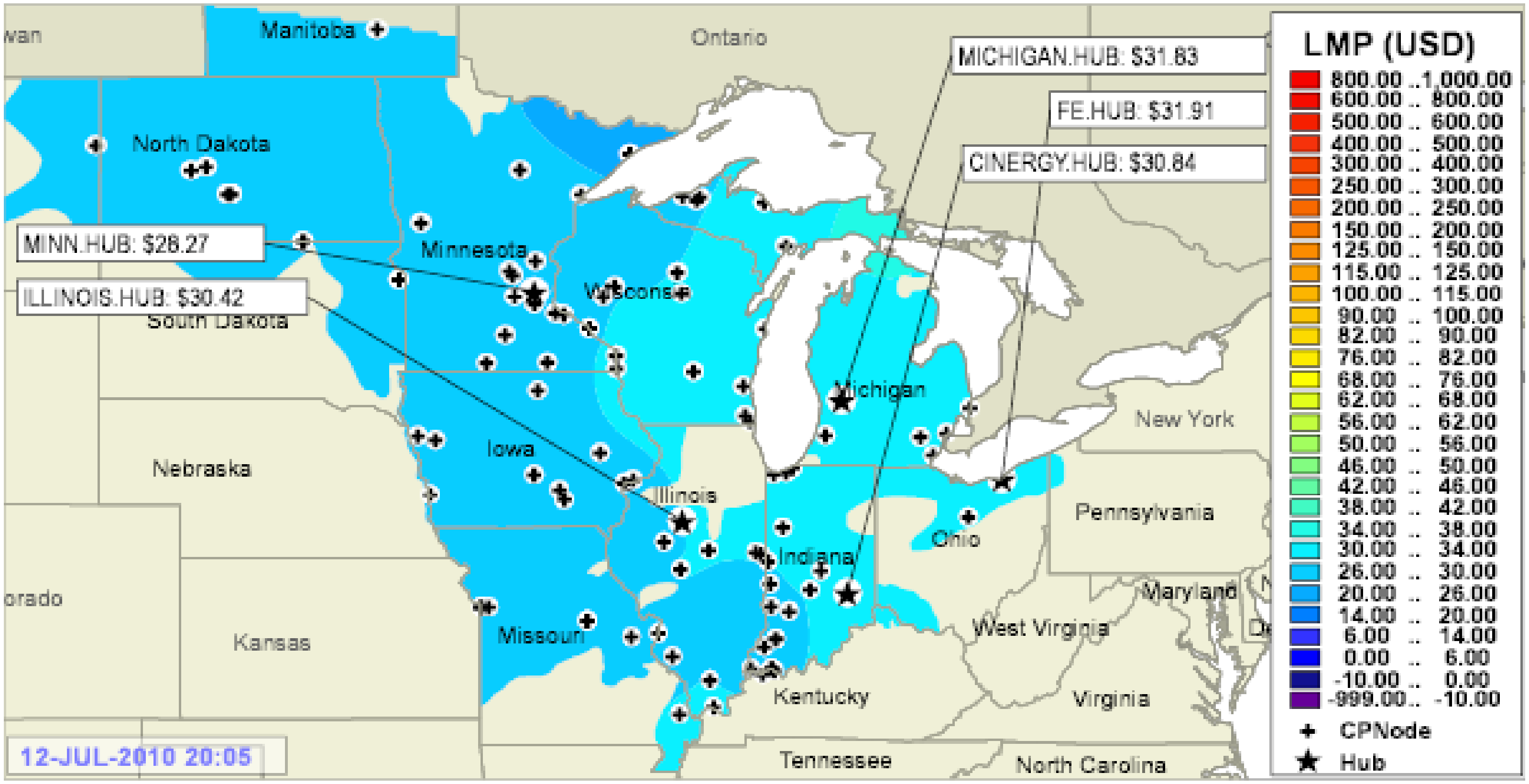
MISO States



Manitoba
Ontario
North Dakota
Minnesota
Wisconsin
South Dakota
Iowa
Nebraska
Illinois
Michigan
Indiana
Ohio
New York
Pennsylvania
Maryland
West Virginia
Virginia
Kentucky
Tennessee
North Carolina
Missouri
Kansas
MINN.HUB: $28.27
ILLINOIS.HUB: $30.42
MICHIGAN.HUB: $31.83
FE.HUB: $31.91
CINERGY.HUB: $30.84
LMP (USD)
800.00 .. 1,000.00
600.00 .. 800.00
500.00 .. 600.00
400.00 .. 500.00
300.00 .. 400.00
250.00 .. 300.00
200.00 .. 250.00
150.00 .. 200.00
125.00 .. 150.00
115.00 .. 125.00
100.00 .. 115.00
90.00 .. 100.00
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76.00 .. 82.00
68.00 .. 76.00
62.00 .. 68.00
56.00 .. 62.00
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20.00 .. 26.00
14.00 .. 20.00
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-10.00 .. 0.00
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IC Generators in MISO States

(Form EIA-860 2008 Data)

	Low End Est		High End Est	
State	Units	IC MW	Units	IC MW
IA	405	726	405	726
IL	341	606	341	606
IN	77	112	77	112
MI	257	491	257	491
MN	230	467	230	467
MO	258	539	258	539
MT	-	-	10	57
ND	22	27	22	27
SD	-	-	27	54
	1590	2968	1627	3078

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IC Generation in Iowa

(Form EIA-860 2008 Data)

	Company	MW		Company	MW		Company	MW
1	American Profol Incorporated	3.6	27	City of Lenox	4.1	53	Dayton City of	1.8
2	Atlantic Municipal Utilities	5.3	28	City of Manning	1.0	54	Des Moines Metro WRF	1.8
3	Bancroft Municipal Utilities	4.5	29	City of McGregor	2.0	55	Gowrie Municipal Utilities	2.4
4	Bloomfield City of	8.5	30	City of Milford	6.5	56	Grand Junction City of	1.7
5	Cascade Municipal Utilities	5.2	31	City of Montezuma	9.6	57	Grundy Center Mun Light & Power	8.7
6	City of Algona	16.1	32	City of Mt Pleasant	24.0	58	Harlan City of	3.4
7	City of Alta	2.1	33	City of New Hampton	26.5	59	Indianola Municipal Utilities	12.8
8	City of Anita	2.9	34	City of Ogden	3.9	60	Industrial Energy Applications Inc	76.4
9	City of Bellevue	8.6	35	City of Onawa	3.1	61	Interstate Power and Light Co	12.0
10	City of Brooklyn	4.3	36	City of Osage	16.6	62	Iowa Methodist Medical Center	3.5
11	City of Coggon	3.2	37	City of Panora	4.5	63	John Deere Dubuque Works	9.0
12	City of Coon Rapids	5.4	38	City of Pocahontas	4.0	64	La Porte City Utilities	5.5
13	City of Corning	6.8	39	City of Preston	3.2	65	Lake Park City of	4.0
14	City of Denison	2.0	40	City of Primghar	1.7	66	Maquoketa City of	32.4
15	City of Dike	2.2	41	City of Rockford	2.9	67	MidAmerican Energy Co	56.0
16	City of Durant	4.8	42	City of Sibley	6.3	68	Pella City of	28.0
17	City of Earlville	1.8	43	City of State Center	6.3	69	Rock Rapids Municipal Utility	2.5
18	City of Estherville	17.6	44	City of Strawberry Point	3.6	70	Story City City of	13.9
19	City of Forest City	22.0	45	City of Sumner	5.6	71	Stuart City of	4.6
20	City of Graettinger	3.6	46	City of Tipton	4.9	72	University of Iowa	1.7
21	City of Greenfield	9.7	47	City of Traer	10.1	73	Villisca City of	4.0
22	City of Hopkinton	4.5	48	City of West Bend	4.2	74	Vinton City of	16.7
23	City of Independence	21.9	49	City of West Liberty	6.3	75	Waverly Municipal Elec Utility	32.4
24	City of Lake Mills	18.5	50	City of Whittemore	1.9	76	Winterset City of	13.6
25	City of Lamoni	5.5	51	City of Wilton	9.2	77	WM Renewable Energy LLC	11.2
26	City of Laurens	1.6	52	Davenport City of	1.6			
							Total MW	**726**

MISO State Estimator IC Gen MW
Alliant West & MidAmerican Energy

Area:BusName	Alt/Common Name Location	Owner	Max MW	EIA PRIME MOVER	EIA EGY SRC1
MEC:INDMUNI:3	Indianola	Indianola	13	IC	DFO
MEC:KNOXIND8:IT	Knoxville Industrial	MEC	16	IC	DFO
MEC:LUNDQST5:IT	Waterloo Lundquist	MEC	18	IC	DFO
MEC:MONTEZU8:9	Montezuma, IA	Montezuma	12	IC	NG
MEC:PELLA 8:5	Pella	Pella	12	IC	DFO
MEC:SHENDOA:1	Shenandoa, IA	Shenandoa, IA	20	IC	DFO
		Subtotal	91.0		
ALTW:8TH_ST_:2	Dubuque	Alliant	18	IC	DFO
ALTW:GR JCT 5:IT	Grand Junction	?	15	IC	DFO
ALTW:INDEP M8:1	Independence	Independence	20	IC	DFO
ALTW:INDEP M8:2	Independence	Independence	9	IC	DFO
ALTW:SPRVALL8:4	Spring Valley	?	3	IC	DFO
		Subtotal	65		
		Total MW	156		

-From PSA database which correlates MISO generators in the state estimator and commercial model with EIA 860 & other data

- Does not include MEC/Geneseo, Illinois (26 MW) or ALTW/Worthington, MN (6 MW)

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Summary & Observations

- The estimated ~3,000 MW of internal combustion generation comprises approx. 2% of the ~145,000+ MW of dispatchable generation in the MISO footprint recognized in the MISO state estimator.
- Much (perhaps most) IC generation is registered with the MISO as Behind-the-Meter Generation (BTMG) vs. dispatchable (Front-of-Meter) generation.
- The MISO state estimator does not include all Behind-the-Meter Generation. I.e. the actual available generation within the MISO is likely to exceed the 145,000 MW estimate if all BTMG were included.

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Summary & Observations (cont'd)

- Based on the MISO capacity recognized in the MISO state estimator, and excluding wind, the MISO footprint currently exceeds the annual peak demand by nearly 40%.
- The MISO currently appears to have an abundance of capacity and may perceive the potential loss of 3,000 MW +/- of IC **reserve** capacity to be of little consequence.
- The potential value of capacity (without energy) appears low based on the MISO voluntary capacity auction (VCA) results. However, VCA is not a good indicator of

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MISO Voluntary Capacity Auction

(another indication of perceived over-capacity)

Planning Year	Month	Auction Clearing Price ($/APRC)	Total Amount of APRCs Bid into the Auction	Total Amount of APRCs Offered into the Auction	Total Amount of APRCs that Cleared Auction
PY 2009-2010	Jun	50	864	7525.3	864
PY 2009-2010	Jul	10015	1216.6	363.8	363.8
PY 2009-2010	Aug	1	110	3588	110
PY 2009-2010	Sep	0.01	300	13729.5	300
PY 2009-2010	Oct	0.05	614.9	22312.5	614.9
PY 2009-2010	Nov	0.5	1038.6	22424.9	1038.6
PY 2009-2010	Dec	0.75	1226	19688.3	1226
PY 2009-2010	Jan	0.25	1281.2	19982.2	1281.2
PY 2009-2010	Feb	0.25	1341.8	21548.7	1341.7
PY 2009-2010	Mar	0.5	1533	23985.9	1532.9
PY 2009-2010	Apr	0.35	1339.6	27683.4	1339.5
PY 2009-2010	May	0.35	1537.5	21609.9	1537.4

Planning Year	Month	Auction Clearing Price ($/APRC)	Total Amount of APRCs Bid into the Auction	Total Amount of APRCs Offered into the Auction	Total Amount of APRCs that Cleared Auction
PY 2010-2011	Jun	5	1680.8	9083.7	1629.8
PY 2010-2011	Jul	10	723.5	4528.5	563
PY 2010-2011	Aug	10	972.2	5455.6	830.8

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Conclusions

- One potential impact of RICE NESHAP is the removal of some RICE capacity from the MISO market footprint.
- Assuming that most RICE capacity is BTMG which is held in reserves and is called upon only in case of MISO emergencies, and total capacity availability including BTMG significantly exceeds demand, the removal of RICE BTMG may have little impact on the MISO energy market. (There is no MISO capacity market.)

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Conclusions (cont'd)

- HOWEVER, the impact on individual Load Serving Entities could be significant as they would be required to procure replacement capacity at uncertain costs & transmission availability risk if they do not retro-fit.
- Long-term capacity replacement costs for bilateral purchases are uncertain, but are anticipated by to be in the $24.00 to $36.00/kW-year range.
- If BTMG capacity is replaced with bilateral purchases, communities will lose the added reliability benefit of local generation

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Behind-the-Meter Generation Considerations

MISO Business Practice Manual Excerpt re. Behind-the-Meter Generation / Load Modifying Resource

4.9 Load Modifying Resources [69.3.2]

Load Modifying Resources are classified as either a Demand Resource (DR) or Behind the Meter Generation (BTMG). A Demand Resource shall mean a resource registered with the Midwest ISO defined as Interruptible Load or Direct Control Load Management and other resources, that result in additional and verifiable reductions in end-use customer demand during an Emergency. Behind the Meter Generation is defined as a generation resource used to serve wholesale or retail load that is located behind a CPNode. BTMG is not included in the Midwest ISO's Dispatch Instructions.

4.9.1 Load Modifying Resource Obligations and Penalties

Accredited LMRs that have been converted to PRCs and such PRCs are designated to an LSE's PRMR must be available for use in the event of an Emergency declared by the Midwest ISO. The LSE that has designated LPRCs from an accredited LMR (or had its accredited DRs netted from its LSE Forecast Requirement) would be subject to penalties if that LMR fails to respond in an amount greater than or equal to the target level of Load reduction for DRs or target level of generation increase for BTMG as directed by the Midwest ISO or LBA in accordance with emergency operating procedures.

- The MISO permits a notification time of up to 12 hours for BTMG, which limits its usefulness and likelihood of being called upon during immediate emergencies. It is more likely to be called upon under sustained major plant outage conditions or loss/lack of availability of other intermediate or base load resources to meet unexpectedly high short-term load forecasts.
- When called upon during emergencies, MISO contacts control area operator to request/order demand reduction of specified amount based upon available LMRs.
- Alternatively, BTMG can be used as a hedge against high Day Ahead Real Time prices, which would not be considered emergency generation.

Open & Important Questions ….

- Will the EPA accept the MISO definition of an "Emergency" in applying the RICE NESHAP rules to Behind-the-Meter Generation?
- Will the MISO (and other RTOs) and EPA agree upon emergency or ISO required operating limits that will permit continued use of BTMG to meet resource capacity requirements and provide local reliability benefits without incurring excessive costs for emission control requirements for units that rarely operate?

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Other Questions / Discussion?

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