

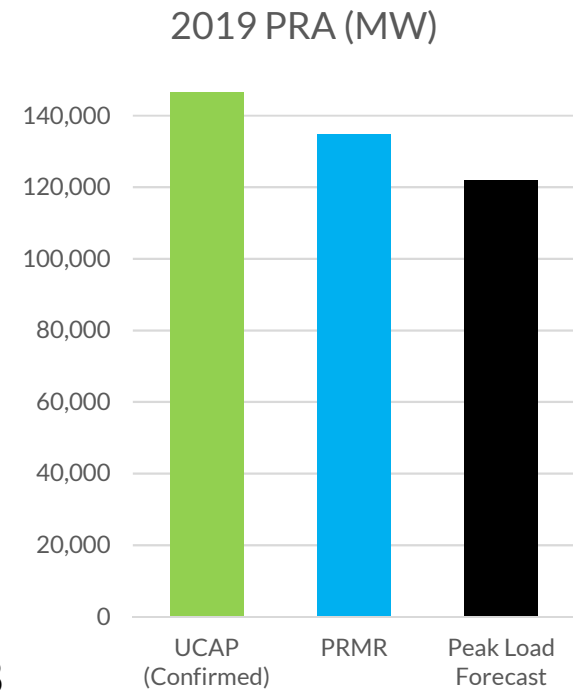


2019/2020 Planning Resource Auction (PRA) Results

Resource Adequacy Subcommittee
May 8, 2019

Summary

- MISO Region has adequate resources to meet its Planning Reserve Margin Requirement of nearly 135,000 MW
- Footprint cleared at **\$2.99/MW-day**
- Zone 7 (MI) cleared at **\$24.30/MW-day**
- Zonal Deliverability Benefit (ZDB) allocation of **\$0.16/MW-Day** for the planning year, applicable to Zone 7 Load
- Regional generation supply consistent with the 2018 OMS-MISO Survey
- Several offers (~1.5MW) were mitigated by the Independent Market Monitor (IMM) for economic withholding, with a **\$0.01/MW-day** impact on Zone 7.



Background

MISO's Resource Adequacy construct combines regional and local criteria to achieve a least-cost solution for the region

Multiple options exist for Load-Serving Entities to demonstrate Resource Adequacy:

- Submit a Fixed Resource Adequacy Plan (FRAP)
- Utilize bilateral contracts with another resource owner
- Participate in the Planning Resource Auction (PRA)

The Independent Market Monitor (IMM) reviews the auction results for physical and economic withholding

Inputs

- Local Clearing Requirement (LCR) = capacity required from within each zone
- MISO-wide reserve margin requirements, which can be shared among the Zones, and Zones may import capacity to meet this requirement above LCR
- Capacity Import/Export Limits (CIL/CEL) = Zonal transmission limitations
- Sub-Regional contractual limitations such as between MISO's South and Central/North Regions

Outputs

- Commitment of capacity to the MISO region, including performance obligations
- Capacity price (ACP = Auction Clearing Price) for each Zone
- ACP price drives the settlements process
- Load pays the Auction Clearing Price for the Zone in which it is physically located
- Cleared capacity is paid the Auction Clearing Price for the Zone where it is physically located

Changes Since 2018 Auction

TREATMENT OF EXTERNAL RESOURCES (ER18-2363):

In Oct. 2018, FERC approved MISO's filing to improve consistency between resources outside of MISO and resources external to a Local Resource Zone but within the footprint.

NEW REQUIREMENTS FOR LOAD MODIFYING RESOURCES (ER19-650):

In Feb. 2019, FERC approved part of MISO's Resource Availability and Need initiative related to Load Modifying Resource (LMR) availability. LMRs must now make themselves available for as much of the year as possible and with the shortest-possible notification times.

ONGOING FLEET CHANGE:

The auction results reflect the industry's ongoing shift away from coal-fired generation and increasing reliance on gas-fired resources and renewables, as well as other trends discussed in our [MISO Forward report](#).

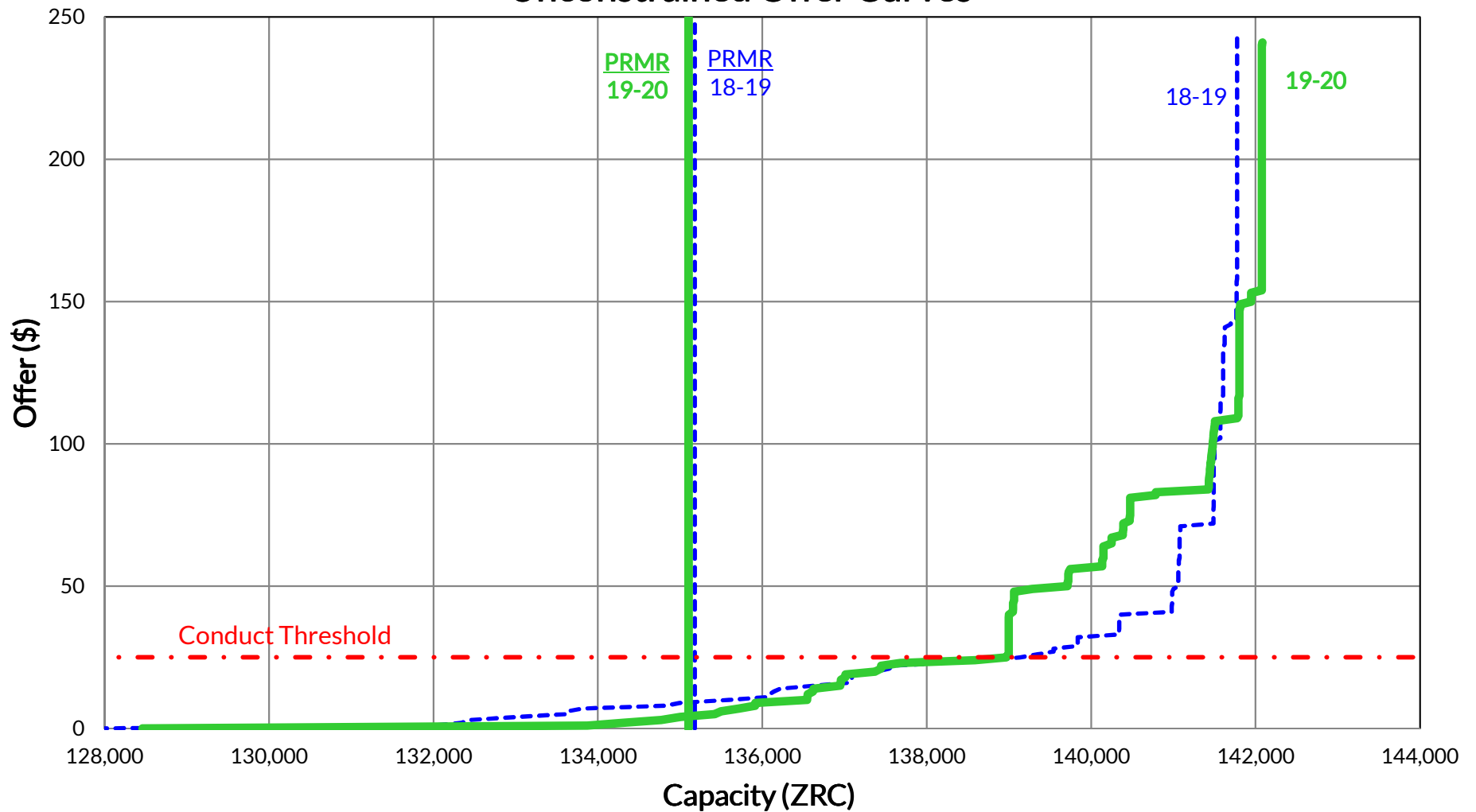
2019/2020 Auction Clearing Price Overview

Zone	Local Balancing Authorities	Price \$/MW-Day
1	DPC, GRE, MDU, MP, NSP, OTP, SMP	\$2.99
2	ALTE, MGE, UPPC, WEC, WPS, MIUP	\$2.99
3	ALTW, MEC, MPW	\$2.99
4	AMIL, CWLP, SIPC	\$2.99
5	AMMO, CWLD	\$2.99
6	BREC, CIN, HE, IPL, NIPS, SIGE	\$2.99
7	CONS, DECO	\$24.30
8	EAI	\$2.99
9	CLEC, EES, LAFA, LAGN, LEPA	\$2.99
10	EMBA, SME	\$2.99
ERZ	SPP, PJM, OVEC, LGEE, AECI, SPA, TVA	\$2.99

ERZ = External Resource Zones

Offer Curve: 2018/19 vs 2019/20

Unconstrained Offer Curves



2019/20 Planning Resource Auction Results

	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	ERZ	System
PRMR	18,374.9	13,449.9	9,882.0	9,792.3	8,297.1	18,659.8	21,976.0	7,963.5	21,350.2	4,997.3	N/A	134,743.0
Offer Submitted (Including FRAP)	20,187.3	13,575.1	11,009.4	11,428.8	7,959.7	17,946.9	22,063.2	10,611.8	21,162.4	4,593.0	1,545.0	142,082.6
FRAP	14,318.7	11,278.9	4,124.4	832.1	0.0	1,587.0	12,096.9	489.4	171.9	1,380.3	134.6	46,414.2
Self Scheduled (SS)	3,938.1	2,258.0	6,187.6	6,249.7	7,844.1	13,945.1	9,682.7	9,276.5	18,750.5	2,644.1	1,270.5	82,046.9
Non-SS Offer Cleared	404.4	0.0	79.1	1,523.7	0.0	2,069.4	32.0	443.9	1,232.7	368.9	127.8	6,281.9
Committed (Offer Cleared + FRAP)	18,661.2	13,536.9	10,391.1	8,605.5	7,844.1	17,601.5	21,811.6	10,209.8	20,155.1	4,393.3	1,532.9	134,743.0
LCR	16,588.7	13,017.5	7,960.2	6,222.1	4,860.1	13,226.1	21,811.6	6,116.3	19,525.2	3,048.8	-	N/A
CIL	3,754	1,714	2,896	6,771	5,013	7,067	3,211	4,250	3,631	3,792	-	N/A
ZIA	3,753	1,713	2,987	5,312	5,013	6,924	3,211	4,249	3,631	3,792	-	N/A
Import	0.0	0.0	0.0	1,186.8	453.0	1,058.3	164.4	0.0	1,195.1	604.0	-	4,661.6
CEL	3,373.2	978.7	4,589.7	3,770.2	2,122.0	1,434.5	1,358.0	5,263.1	2,223.6	1,721.0	-	N/A
Export	286.3	87	509.1	0	0	0	0	2,246.3	0	0	1532.9	4,661.6
ACP (\$/MW-Day)	2.99	2.99	2.99	2.99	2.99	2.99	24.30	2.99	2.99	2.99	2.99	N/A

Values displayed in MW UCAP

Historical Auction Clearing Price Comparison

PY	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9	Zone 10	ERZs	
2014-2015	\$3.29	\$16.75							\$16.44		N/A	N/A
2015-2016		\$3.48		\$150.00		\$3.48			\$3.29	N/A	N/A	
2016-2017	\$19.72	\$72.00							\$2.99		N/A	
2017-2018	\$1.50										N/A	
2018-2019	\$1.00	\$10.00									N/A	
2019-2020	\$2.99					\$24.30		\$2.99				

Conduct Threshold	24.24	23.88	23.95	24.22	24.65	24.05	24.34	23.23	22.37	23.12	24.65
Cost of New Entry	242.36	238.82	239.51	242.16	246.47	240.49	243.37	232.27	223.67	231.15	246.47

- Auction Clearing Prices & are displayed as \$/MW-day
- Conduct Threshold is 10% of Cost of New Entry (CONE)
- Conduct Threshold is \$0 for a generator with a Facility Specific Reference Level

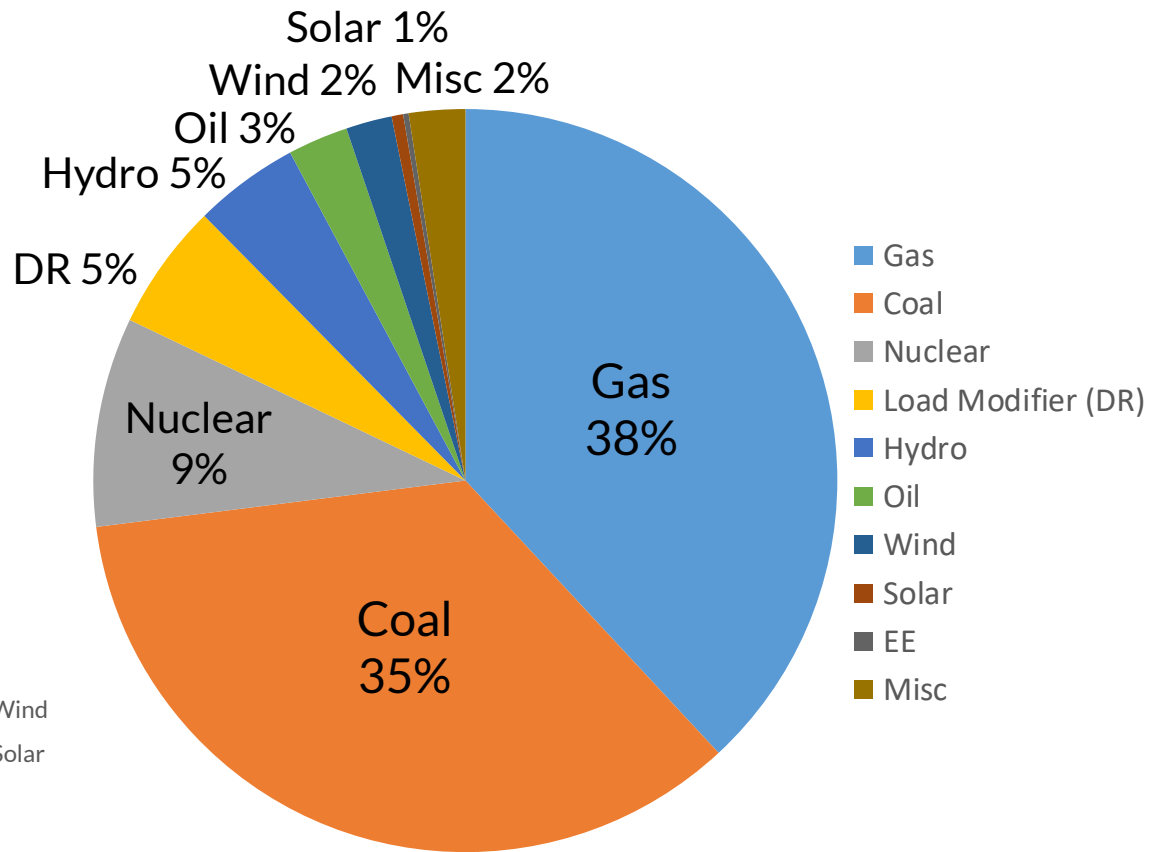
Supply Offered & Cleared

Planning Resource Type	2018-2019 Offered	2019-2020 Offered	2018-2019 Cleared	2019-2020 Cleared
Generation	126,159	125,290	120,855	119,779
External Resources	3,903	4,402	3,089	3,183
Behind the Meter Generation	4,176	4,202	4,098	4,097
Demand Resources	7,370	7,876	6,964	7,372
Energy Efficiency	173	312	173	312
Total	141,781	142,082	135,179	134,743

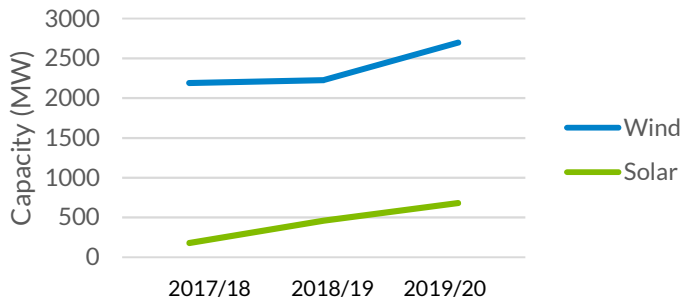
2019 Cleared Fuel Type

While solar still comprises a relatively small percentage of the region's total capacity, 680 MW of solar cleared this year's auction—an increase of 47% over last year's mark of 461 MW.

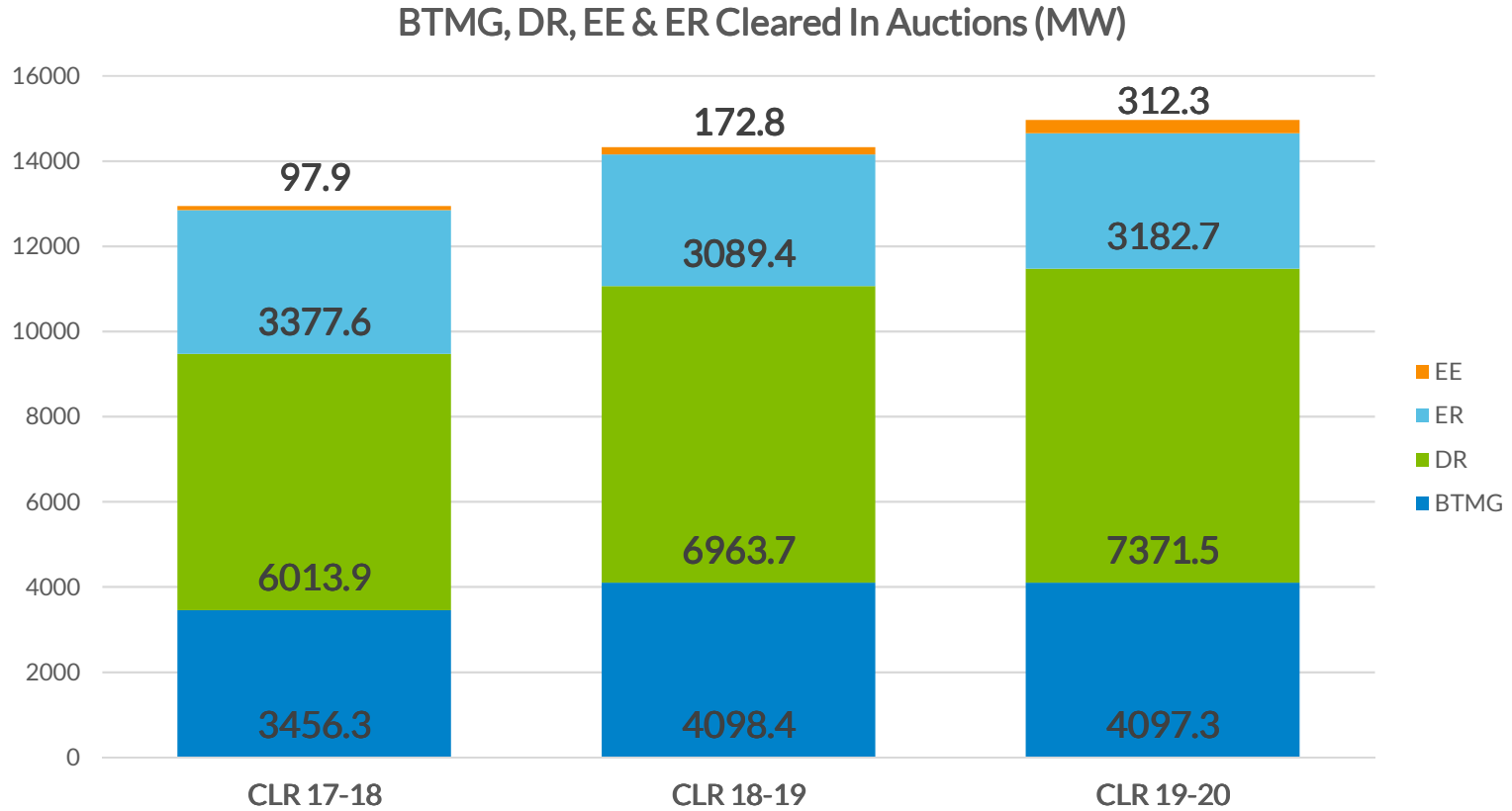
Similarly, 2,698 MW of wind cleared this year, an increase of 21%, or 469 MW, compared to last year.



Wind & Solar Cleared UCAP



Non Traditional Resources



Next Steps

- MAY 8 – Detailed results review at RASC
- MAY 13 – Posting of PRA offer data
- MAY 31 – LSE submit ICAP Deferral info
- JUN 1 – New Planning Year starts

Appendix

ZDB Pro Rata Allocation Calculation Summary

- Deliverability Benefit Zones:
 - Exporting DBZ: LRZ 1-6, 8-10
 - Importing DBZ: LRZ 7
- Over-collection = \$3,503.36/day from load in the importing DBZ
- Excess revenue allocated pro rata to total PRMR in the importing DBZ
- $\$3,503.36 / 21,976 = \$0.16/\text{MW-Day}$

LRZ	PRMR	Cleared Resources	ACP	ACP x PRMR	ACP x Resources
1	18,374.90	18,661.20	\$2.99	\$54,940.95	\$55,796.99
2	13,449.90	13,536.90	\$2.99	\$40,215.20	\$40,475.33
3	9,882.00	10,391.10	\$2.99	\$29,547.18	\$31,069.39
4	9,792.30	8,605.50	\$2.99	\$29,278.98	\$25,730.45
5	8,297.10	7,844.10	\$2.99	\$24,808.33	\$23,453.86
6	18,659.80	17,601.50	\$2.99	\$55,792.80	\$52,628.49
7	21,976.00	21,811.60	\$24.30	\$534,016.80	\$530,021.88
8	7,963.50	10,209.80	\$2.99	\$23,810.87	\$30,527.30
9	21,350.20	20,155.10	\$2.99	\$63,837.10	\$60,263.75
10	4,997.30	4,393.30	\$2.99	\$14,941.93	\$13,135.97
ERZ	N/A	1,532.90	\$2.99	N/A	\$4,583.37
Totals	134,743.0	134,743.0	N/A	\$871,190.13	\$867,686.77
				Surplus =	\$3,503.36

Detailed allocation methodology is further explained and illustrated in BPM11 Appx P.

Capacity Requirements Year Over Year

Local Resource Zone	Local Clearing Requirement (LCR) in MW		Planning Reserve Margin Requirement (PRMR) in MW		Coincident Peak Demand Forecast (CPDF) in MW	
	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20
1	15,832	16,589	18,414	18,375	16,529	16,541
2	12,373	13,018	13,463	13,450	12,204	12,258
3	7,374	7,960	9,805	9,882	8,872	8,966
4	4,960	6,222	10,060	9,792	9,100	8,923
5	5,693	4,860	8,549	8,297	7,773	7,551
6	12,090	13,226	18,741	18,660	16,761	16,820
7	20,628	21,812	22,121	21,976	19,851	19,759
8	4,744	6,116	8,088	7,964	7,279	7,194
9	19,319	19,525	20,976	21,350	18,952	19,330
10	4,463	3,049	4,963	4,997	4,495	4,505

Zonal Import and Export Limits Year Over Year

Resource Zone	Capacity Import Limit (CIL)		Zonal Import Ability (ZIA)	Capacity Export Limit (MW)		Import/(Export) in Auction (MW)	
	2018-19	2019-20	2019-20	2018-19	2019-20	2018-19	2019-20
1	4,415	3,754	3,753	516	3,373	-516	-286
2	2,595	1,713	1,713	2,017	979	121	-87
3	3,369	2,897	2,987	5,430	4,590	-651	-509
4	6,411	6,771	5,312	4,280	3,770	1,133	1,187
5	4,332	5,013	5,013	2,122	2,122	606	453
6	7,941	7,067	6,924	3,249	1,435	-346	1,058
7	3,785	3,211	3,211	2,578	1,358	320	164
8	4,834	4,250	4,249	2,424	5,263	-2,299	-2,246
9	3,622	3,631	3,631	2,149	2,224	1,513	1,195
10	2,688	3,792	3,792	1,824	1,721	120	604
ERZ	N/A	N/A	N/A	N/A	1,607*	N/A	-1,533
Z1 - Z7	1,500	1,500	N/A	3,000	3,000	683	447
Z8 - Z10	3,000	3,000	N/A	1,500	1,500	-683	-447

FRAP & Offer Information Year Over Year

LRZ	FRAP + Self Schedule (SS)		Price Sensitive Offer		Total (FRAP + ZRC Offer)		FRAP + SS as % of Total Offers	
	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20
1	18,477	18,257	1,082	1,931	19,560	20,187	94%	90%
2	13,127	13,537	827	38	13,954	13,575	94%	100%
3	10,148	10,312	736	697	10,884	11,009	93%	94%
4	7,772	7,082	3,231	4,347	11,002	11,429	71%	62%
5	7,934	7,844	10	116	7,944	7,960	100%	99%
6	17,908	15,532	1,313	2,415	19,221	17,947	93%	87%
7	21,449	21,780	588	284	22,036	22,063	97%	99%
8	10,146	9,766	793	846	10,939	10,612	93%	92%
9	16,681	18,922	4,515	2,240	21,196	21,162	79%	89%
10	4,286	4,024	760	569	5,046	4,593	85%	88%
ERZs	N/A	1,405	N/A	140	N/A	1,545	N/A	91%
System	127,926	128,461	13,855	13,622	141,781	142,083	90%	90%

Cleared Capacity by Fuel Type Year Over Year

Planning Year	2018-19		2019-20		Change	
GADS Fuel Type	System (MW)	% Fuel	System (MW)	% Fuel	Delta (MW)	Delta (%)
Coal	48,916	36%	47,059	35%	-1,857	-1.3%
Gas	50,528	37%	51,317	38%	789	0.7%
Nuclear	12,527	9%	12,274	9%	-252.7	-0.2%
Load Modifier (DR/EE)	7,137	5%	7,722	6%	585	0.5%
Hydro	5,994	4%	6,176	5%	182	0.2%
Oil	3,751	3%	3,528	3%	-222.7	-0.2%
Wind	2,228	2%	2,698	2%	469.5	0.4%
Solar	461	0%	680	1%	219	0.2%
Misc	3,636	3%	3,289	2%	-348	-0.2%
SYSTEM	135,179	100%	134,743	100%	-435	-

Supplemental Data for PRMR and LCR

Local Resource Zone	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10	SYSTEM
CPDF (Coincident Peak Demand Forecast)	16,541	12,258	8,966	8,923	7,551	16,820	19,759	7,194	19,330	4,505	121,845
CPDF + Transmission Losses	17,030	12,465	9,158	9,075	7,690	17,294	20,367	7,381	19,787	4,631	124,878
Planning Reserve Margin (PRM)	7.90%										
PRMR (Planning Reserve Margin Requirement)	18,375	13,450	9,882	9,792	8,297	18,660	21,976	7,964	21,350	4,997	134,743
ZCPDF (Zonal Coincident Peak Demand Forecast)	17,197	12,476	9,266	9,118	7,741	17,034	20,684	7,439	20,148	4,513	125,615
ZCPDF + Trans. Losses	17,673	12,688	9,470	9,272	7,892	17,491	21,350	7,633	20,547	4,647	128,663
LRR (Local Reliability Requirement) Factor	1.151	1.161	1.156	1.244	1.251	1.152	1.172	1.358	1.127	1.472	N/A
LRR	20,342	14,730	10,947	11,534	9,873	20,150	25,023	10,365	23,156	6,841	N/A
ZIA (Zonal Import Ability)	3,753	1,713	2,987	5,312	5,013	6,924	3,211	4,249	3,631	3,792	N/A
Non-Pseudo Tied Exports	6	0	74	102	0	0	0	64	0	0	246
LCR (Local Clearing Requirement)	16,589	13,018	7,960	6,222	4,860	13,226	21,812	6,116	19,525	3,049	N/A
LCR as a % of PRMR	90%	97%	81%	64%	59%	71%	99%	77%	91%	61%	N/A

UCAP Confirmation and Conversion

LRZ	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9	Zone 10	ERZ	Total	Formulas
UCAP Total	20,822	13,645	11,257	13,888	7,967	18,528	22,316	10,878	21,741	4,623	1,607	147,271	A
UCAP (Confirmed)	20,401	13,645	11,252	13,879	7,967	18,273	22,293	10,878	21,741	4,623	1,607	146,558	B
UCAP (Unconfirmed)	421.1	0	4.9	9.4	0	254.8	22.2	0	0.9	0	0	713.3	C=A-B
Converted UCAP (ZRC)	20,257	13,577	11,033	11,691	7,962	18,127	22,113	10,765	21,163	4,621	1,600	142,908	D
Unconverted UCAP	143	67	219	2,188	5	146	180	113	578	2	8	3,650	E=B-D
FRAP + ZRC Offer	20,187	13,575	11,009	11,429	7,960	17,947	22,063	10,612	21,162	4,593	1,545	142,083	F
ZRC Not Offered/FRAP	70	2.3	23.1	262	2.3	179.8	50	153.4	0.2	28.1	54.5	826	G=D-F
MW/ZRC not participating in MISO PRA	634	70	247	2,459	8	581	252	266	579	30	62	5,189	H=C+E+G

- Non-participating MW/ZRC represents total of Unconfirmed UCAP, Confirmed but Unconverted UCAP and Converted UCAP (ZRCs) that were not offered or used in a FRAP
- Common reasons why ZRCs may not participate in a PRA:
 - Capacity sales to other markets
 - Suspensions not participating in PRA
 - Exclusion granted by the IMM
 - General withholding from the PRA within the Physical Withholding Threshold

Cleared MW by Resource Type by LRZ

- MISO groups multiple LRZs together as needed to ensure data confidentiality

RESOURCE TYPE	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10
Demand Resources	1,145	1,008	1,493			1,375	1,250	1,101		
Behind the Meter Generation	1,163	292	554	370		544	1,027	148		
Energy Efficiency	313									
External Resources	3,183									
Generation	14,957	12,193	9,211	7,166	7,697	15,648	19,463	9,600	19,643	4,202

Acronyms

ACP: Auction Clearing Price
ARC: Aggregator of Retail Customers
BTMG: Behind the Meter Generator
CIL: Capacity Import Limit
CEL: Capacity Export Limit
CONE: Cost of New Entry
DR: Demand Resource
EE: Energy Efficiency
ER: External Resource
ERZ: External Resource Zones
FRAP: Fixed Resource Adequacy Plan
ICAP: Installed Capacity
IMM: Independent Market Monitor

LCR: Local Clearing Requirement
LMR: Load Modifying Resource
LRZ: Local Resource Zone
LSE: Load Serving Entity
PRA: Planning Resource Auction
PRM: Planning Reserve Margin
PRMR: Planning Reserve Margin Requirement
RASC: Resource Adequacy Sub-Committee
SS: Self Schedule
SFT: Simultaneous Feasibility Test
UCAP: Unforced Capacity
ZIA: Zonal Import Ability
ZRC: Zonal Resource Credit



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