



2017 Summer Resource Assessment

May 8th, 2017

Executive Summary

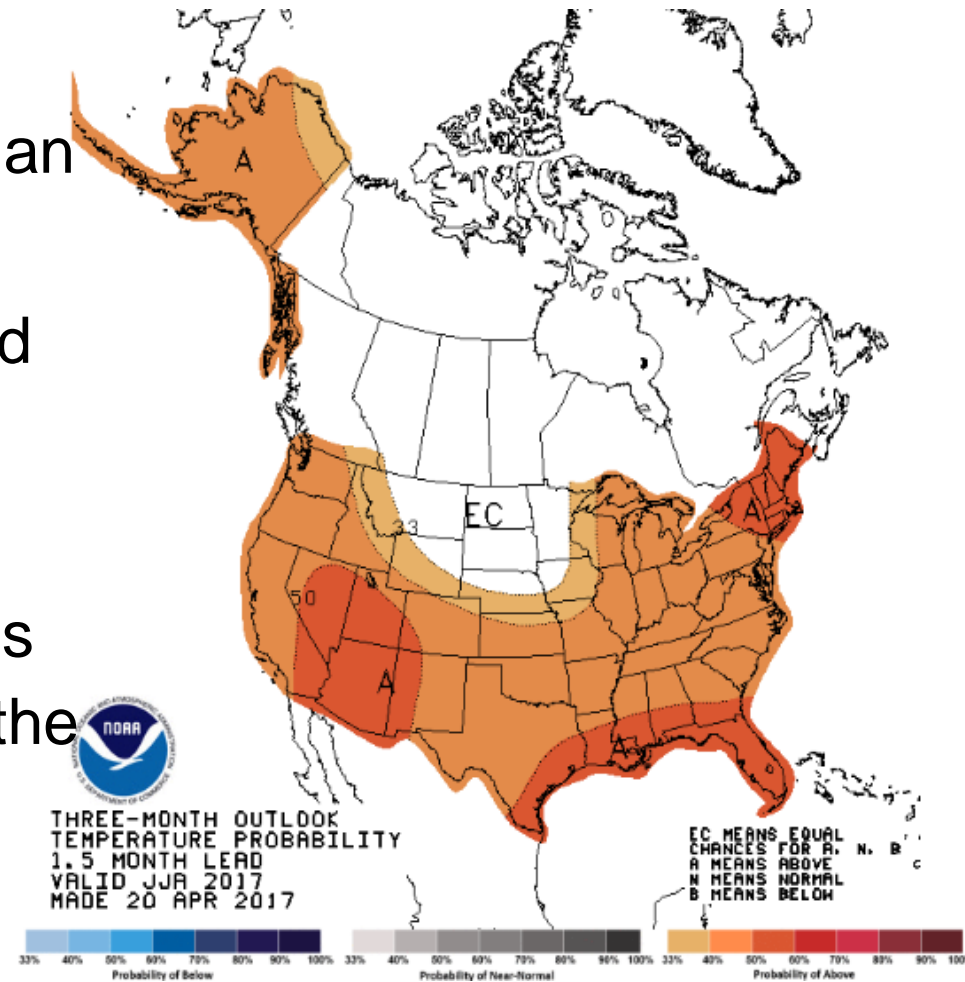
- **MISO capacity levels continue to exceed the forecasted 2017 summer peak demand and reserve margin requirement**
 - This is consistent with the 2016 OMS survey results
- **Demand forecasts submitted by LSE's show overall negative load growth from last year**
 - Negative load growth combined with an increase in N/S transfer limit has resulted in an increase in MISO's base reserve margin
- **MISO 2017 Planning Reserve Margin target: 15.8%**
- **MISO 2017 Summer Base Scenario Reserve Margin at 18.8%**
 - 2017 Summer Projected Reserve Margin Range: 14.1% to 19.7%
 - In a high load scenario, MISO will rely heavily on Demand Response resources

Summer Resource Assessment Assumptions

- Additional non-firm support may be available, but is not included in the assessment scenarios.
- Firm imports, demand response, and energy efficiency resources are counted based on cleared MW's in the 2017 Planning Resource Auction.
- Planned, maintenance, and forced outages are assumed to be consistent with previous 5 years.
- Wind resources are counted based on their capacity credit calculated from ELCC study.
- Post outage cases assume there is no stranded South capacity.

2017 Summer Weather Outlook

- Summer 2017 is currently forecasted to be warmer than normal
 - Precipitation is expected in the normal range
- Above normal temperatures are forecasted for most of the United States, with higher probabilities for the MISO south region

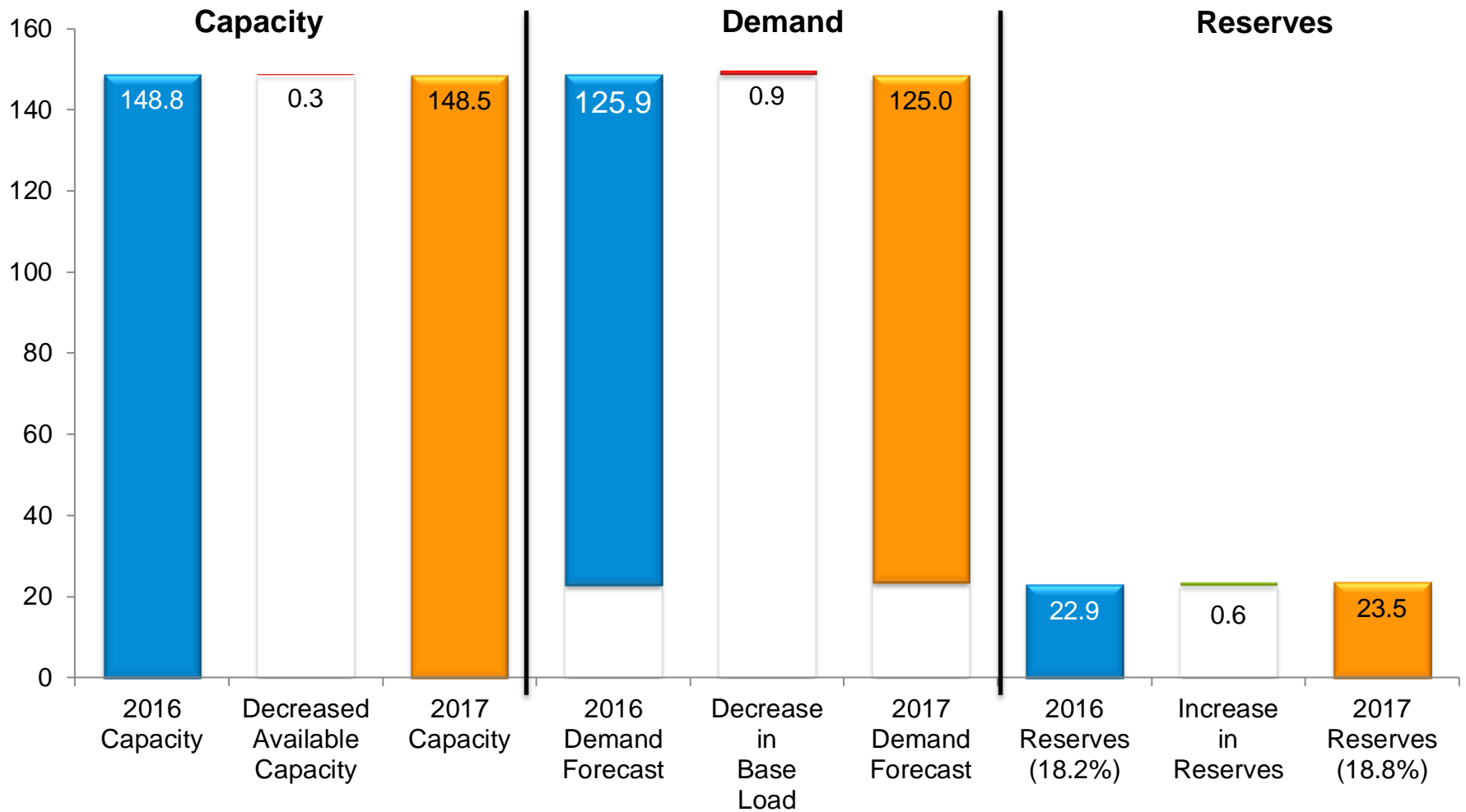


MISO projects adequate reserves to meet 2017 expected summer peak demand forecast

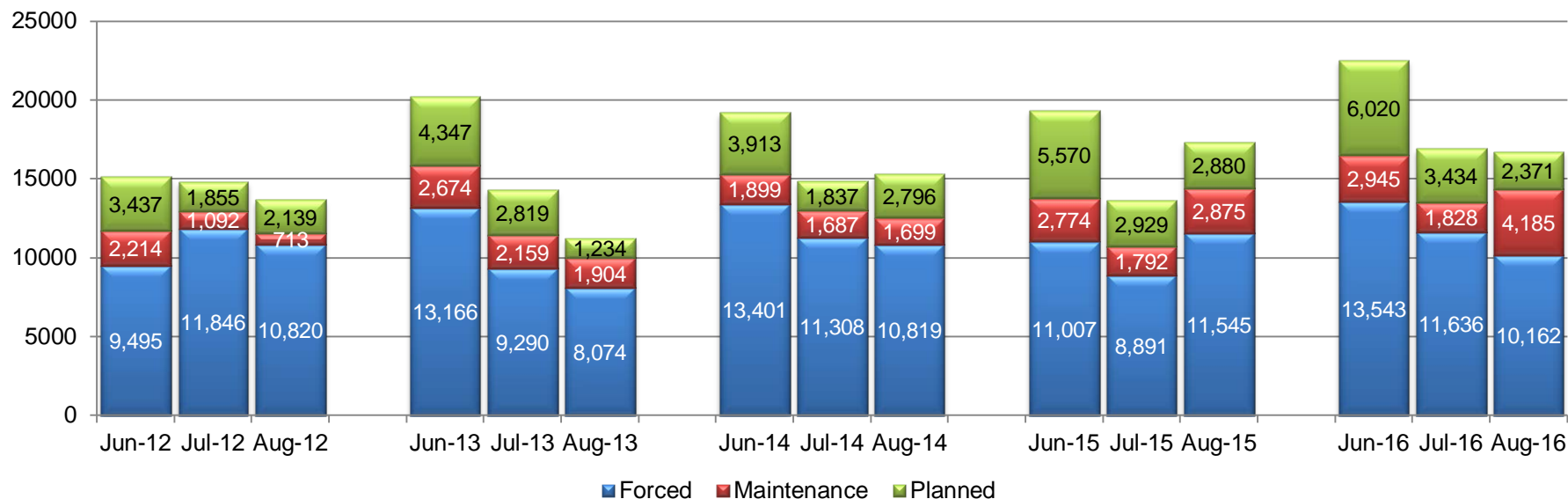
- Overall negative demand growth has resulted in an increase in reserves despite lower supply year-over-year

	Demand Forecast (GW)	Reserve Margin Requirement (GW)	Supply (GW)	Reserves (GW)
2015/16 PY	127.3	145.5	150.3	23.0 (18.0%)
2016/17 PY	125.9	145.1	148.8	22.9 (18.2%)
2017/18 PY	125.0	144.8	148.5	23.5 (18.8%)
2017/18 Minimum Reserve Requirement:				15.8%

2017 Summer Reserves have Increased Due to Decrease in Demand



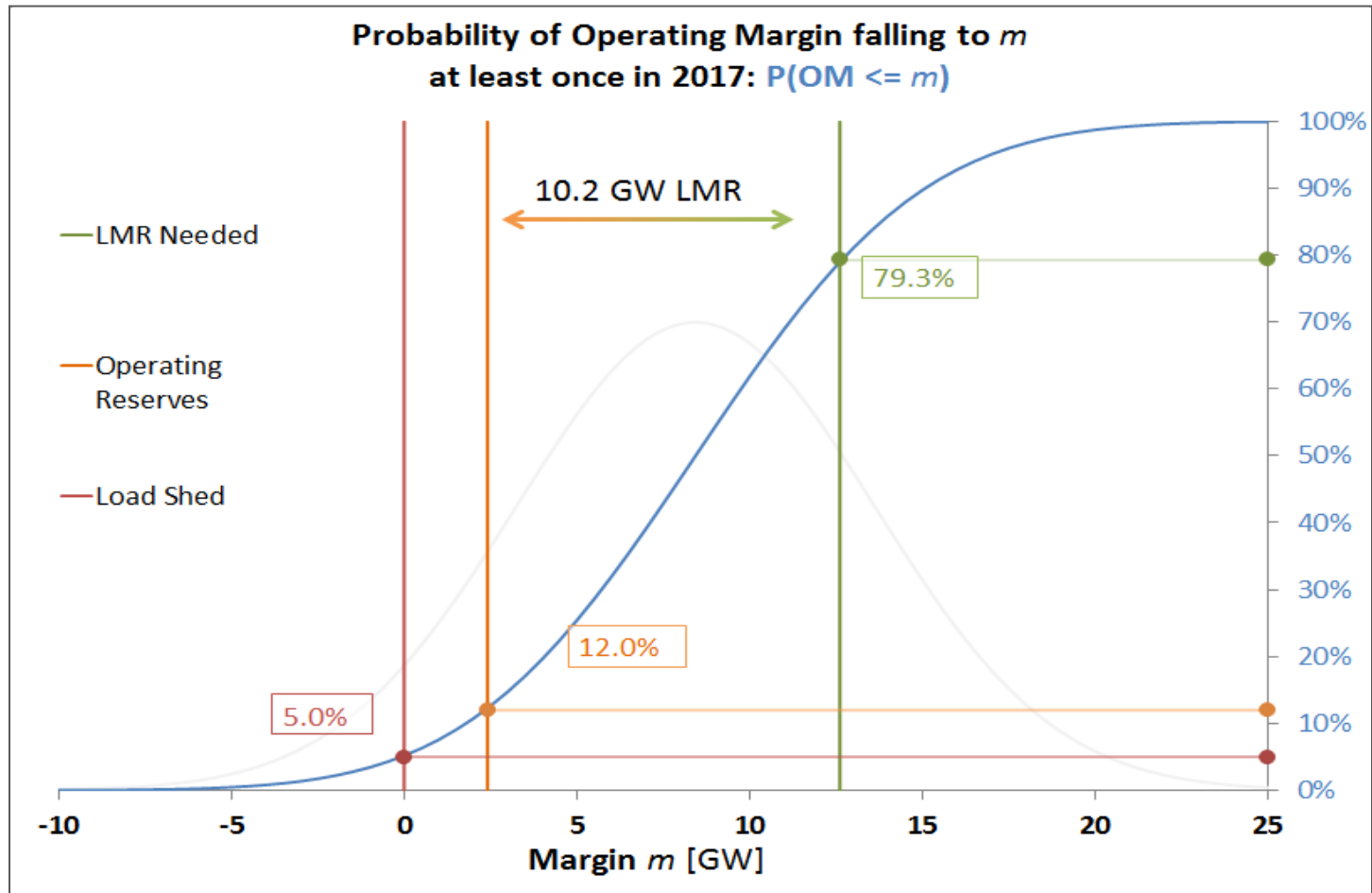
Forced, Planned, and Maintenance Outages Affect Availability During the Summer



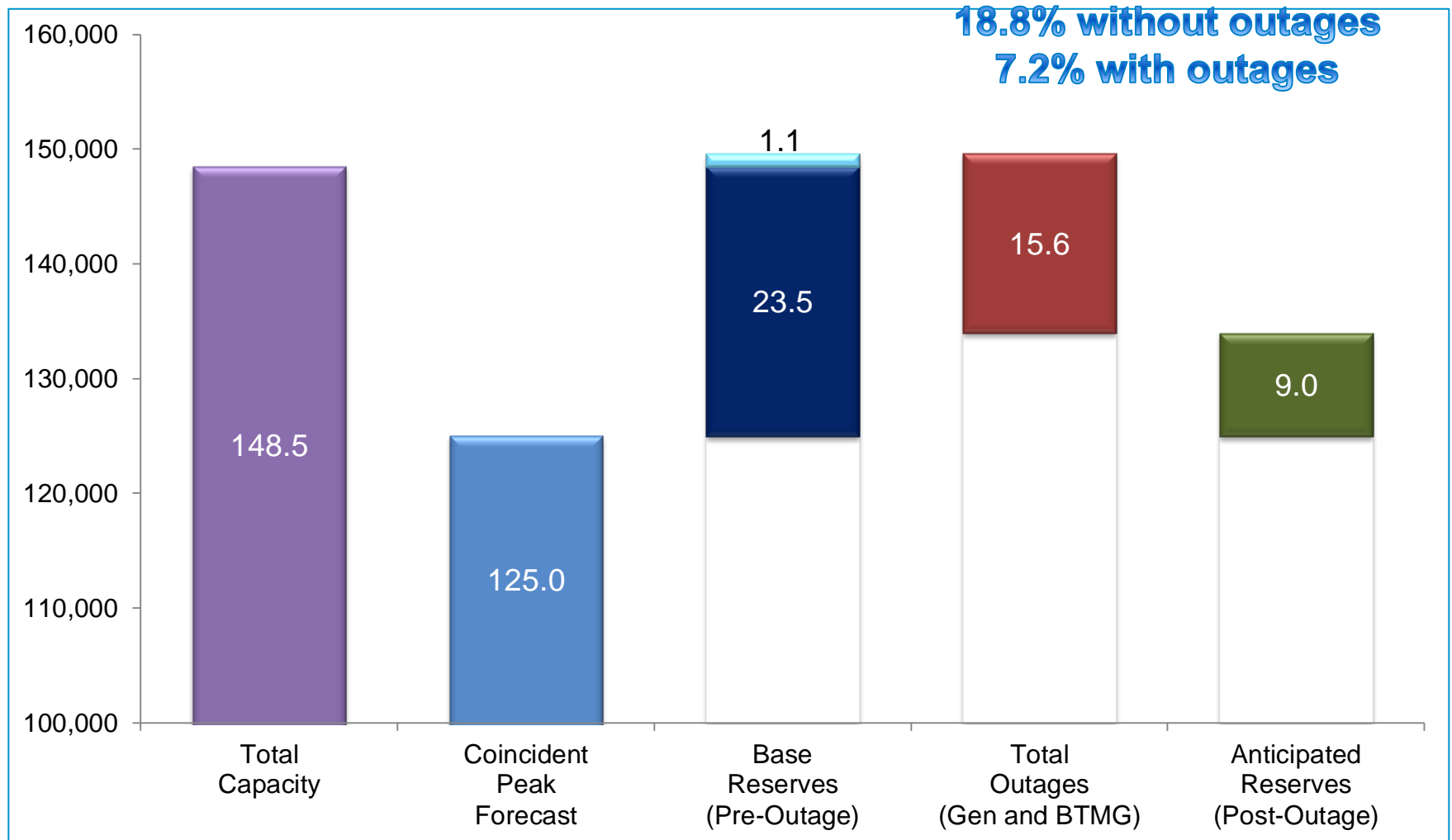
Month	Jun-12	Jul-12	Aug-12	Jun-13	Jul-13	Aug-13	Jun-14	Jul-14	Aug-14	Jun-15	Jul-15	Aug-15	Jun-16	Jul-16	Aug-16
Total Outages (MW)	15,146	14,793	13,672	20,186	14,268	11,212	19,213	14,832	15,313	19,352	13,611	17,300	22,508	16,898	16,718

- Historic data shows significant amounts of planned outages during actual MISO peak hour
- Outages for summer 2017 are expected to be in line with what is shown above.

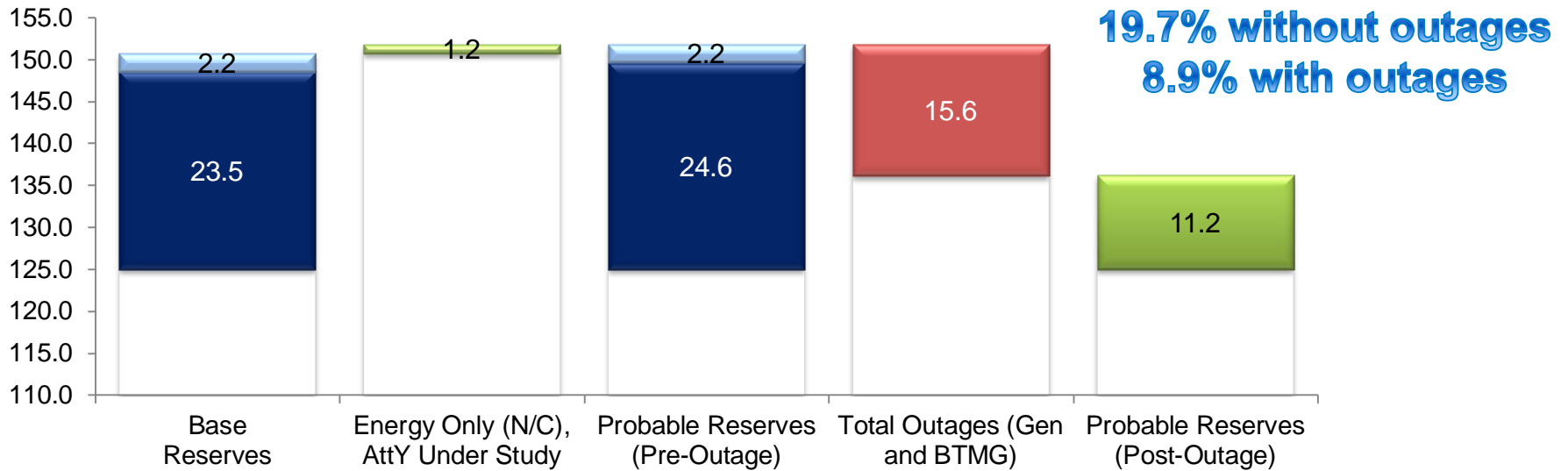
2017 Summer: 79.3% Chance of Initiating Maximum Generation Emergency Step 2b or Higher @ Probable Forecasted Reserve Margin



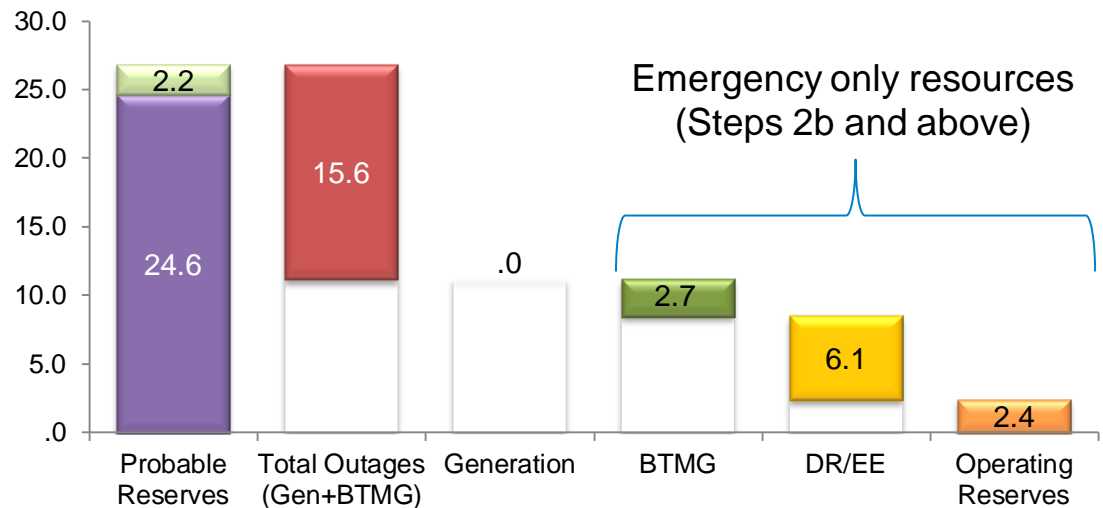
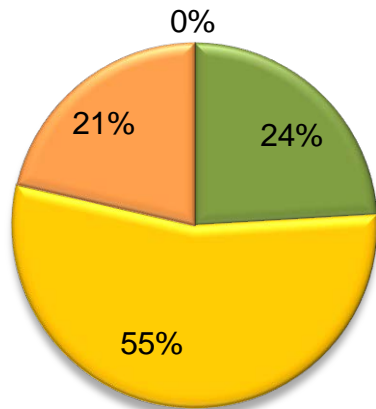
Base Scenario: MISO Projects Sufficient Reserves Before and After Outages, for Summer 2017



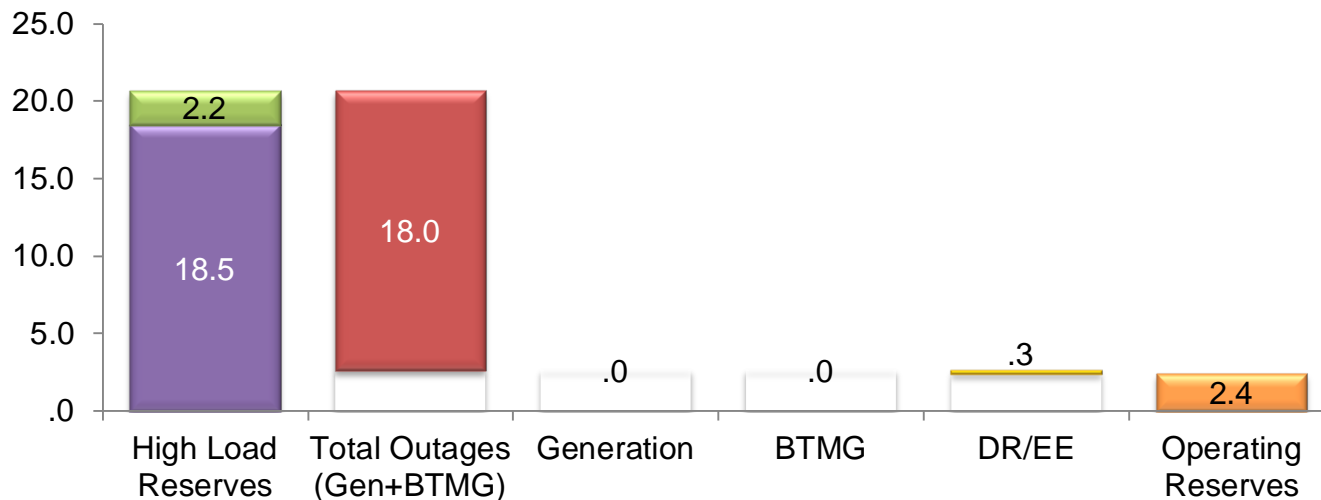
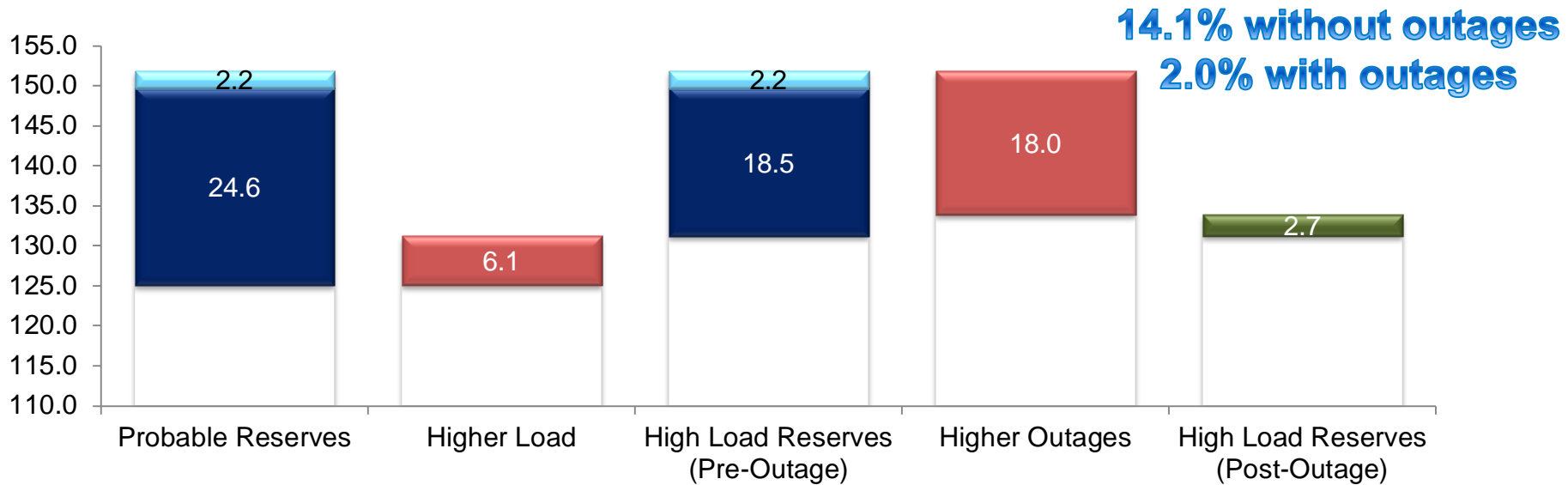
Probable Scenario: MISO Expects Additional Energy Only to Serve Load



■ Generation ■ BTMG ■ DR/EE ■ Operating Reserves



High Demand, High Outage: MISO Expects to Rely Heavily on Demand Response

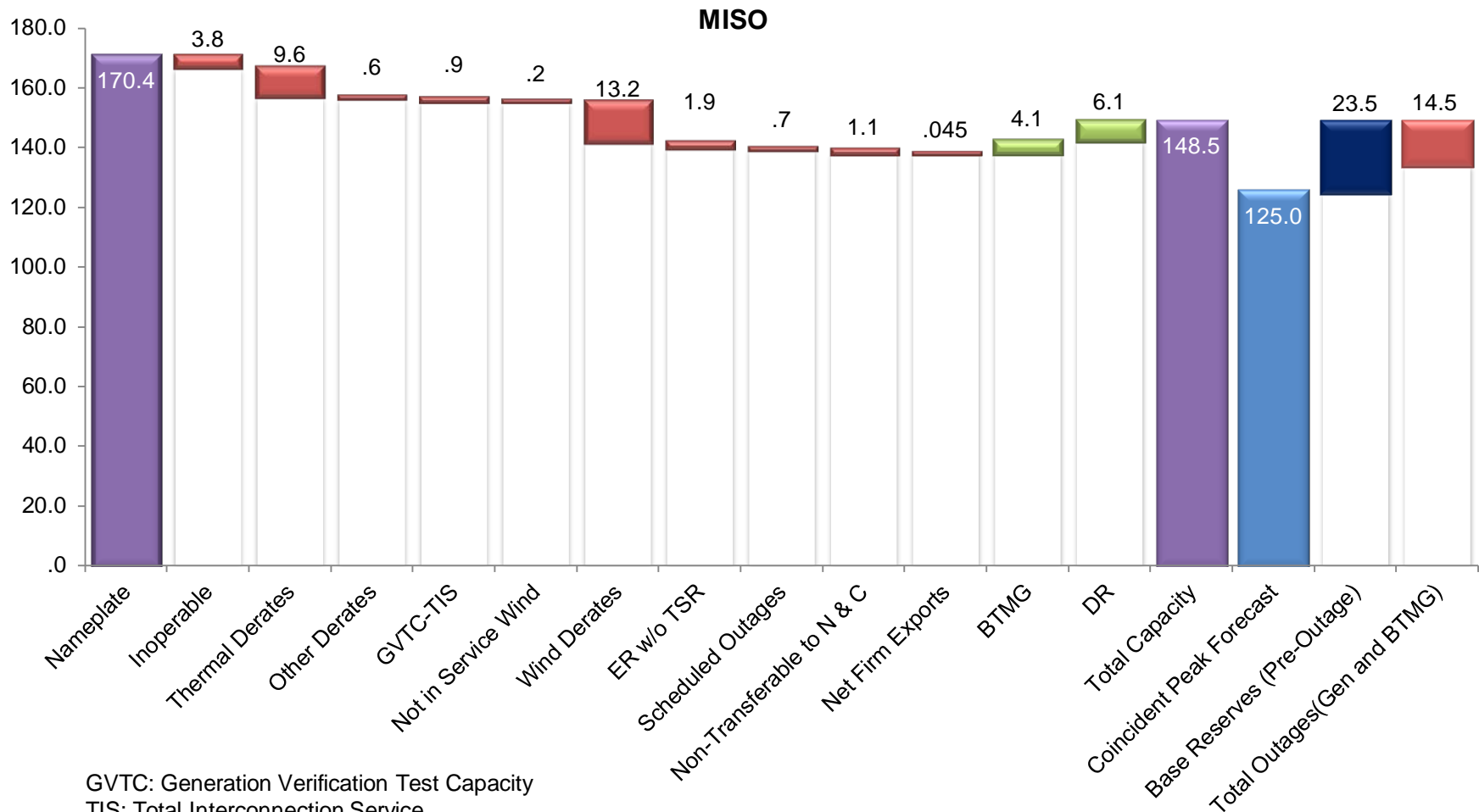


Generation Resource Assessment Appendix

Appendix

Base Case Scenario		
1a	Nameplate Capacity, MW	170,409
2a	Inoperable Resources, MW	(3,842)
3a	Thermal Derates	(9,601)
4a	Other Derates	(564)
5a	GVTC-TIS	(903)
6a	Not in Service/provisional-Wind	(203)
7a	Wind Derates	(13,241)
8a	ER w/o TSR	(1,886)
9a	Scheduled Outages	(696)
10a	Net Firm Imports	(45)
11a	Behind-the-meter Generation, MW	4,059
12a	Demand Response/Energy Efficiency, MW	6,112
13a	Non-Transferable to North/Central	(1,134)
a	Total Available Capacity- Base Scenario	148,465
b	Coincident Peak Demand plus TL- Base Scenario	125,002
a-b	Base Reserves, MW	23,462
(a-b)/b	Base Reserves, %	18.8%
c	Forced Outages(Generator and BTMG)	(14,505)

Base Scenario



GVTC: Generation Verification Test Capacity
 TIS: Total Interconnection Service
 ER: Energy Resources
 TSR: Transmission Service Request
 BTMG: Behind The Meter Generation
 DR: Demand Response

Outage Calculation for SRA Scenarios

Formula		MW
A	2012 Average	14,537
B	2013 Average	15,222
C	2014 Average	16,453
D	2015 Average	16,754
E	2016 Average	18,708
$F=(A+B+C+D+E)/5$	Overall Average	16,335
G	Max Average Over 5 Years	18,708
H	Known Planned Outages for Summer 2017	696
$I=F-H$	Outages in Base and Probable Scenarios	15,639
$J=G-H$	High Load/High Outage Scenario	18,012