

## Resource Adequacy and Reliability in the IPM Projections for the MATS Rule

This document describes resource adequacy and reliability results in the IPM 2015 projections for the base case and MATS rule policy cases. As used here, the term *Resource Adequacy* means the provision of adequate generating resources to meet projected load and generating reserve requirements in each region, while *Reliability* includes the ability to deliver the resources to the loads so the overall power grid remains stable. IPM is specifically designed to ensure generation resource adequacy, either by using existing resources or through the construction of new resources. IPM addresses reliable delivery of generation resources only for the delivery of electricity between regions, by setting limits to the ability to transfer power between regions using the bulk power transmission system. Within each model region, IPM assumes that adequate transmission capacity exists to deliver any resources located in, or transferred to, the region.

### Summary of Changes in Operational Capacity

Total operational capacity is lower in the policy scenario, primarily as a result of increases in coal retirement. Since most regions are projected to have excess capacity above their target reserve margins, most of these retirements are absorbed by a reduction in excess reserves. Operational capacity<sup>1</sup> changes from the base case in 2015 are summarized below:

Base case operational capacity (MW)	1,025,477
<i>Minus</i> Changes in Policy Case:	
(-) Coal retirements	-4,677
(-) Coal capacity derated	-697
(+)New Capacity Additions	0
(+)Lower non-coal retirements	+386
Net Change in Policy Case	-4,988
<i>Equals</i> Policy Case Operational Capacity	1,020,489 <sup>2</sup>

Since the model must maintain adequate reserves in each region, the reduced operational capacity of 4,988 MW in the policy case is taken largely from excess reserves that are not needed. In order to maintain resource adequacy in each region where coal resources retire, the model relies on this excess reserve reduction, on lower retirements of non-coal capacity and on greater new capacity additions. In some regions there may be fewer retirements under the policy case than under the base case, as a result of shifts in the regions where the model

<sup>1</sup> Operational capacity is any existing, new or retrofitted capacity in the lower 48 states that is not retired.

<sup>2</sup> Numbers in this table may not sum due to independent rounding.

determines that retaining such capacity remains economic. As the table shows, the reduction in capacity (excess reserves) is the largest source of change, followed by lower non-coal retirements. There was no change in aggregate new capacity additions between the base and policy case projections. Each of these policy case changes is discussed further below.

### **Reduction in Excess Reserves**

IPM uses a target reserve margin in each region as the basis for determining how much capacity to keep operational in order to preserve resource adequacy. IPM retires capacity if it is no longer needed to provide energy for load or to provide capacity to meet reserve margin during the planning horizon of the projections. Since current regional reserves are generally higher than the target reserve margin for the region, IPM may retire reserve capacity in 2015 if it is not economic to maintain relative to alternatives such as building new capacity or transferring capacity from another region. As a result, many of the coal plants that are projected to retire in 2015 will not need to be replaced for resource adequacy until later years when demand increases and reserves approach the target reserve margin.

Reserve margin targets are generally based on the NERC 2010 10 Year Assessments for the region, except in cases where there are more stringent state requirements or other exceptions. In one region, ERCOT, the system planners recently raised their target reserve from the 12.5% used in IPM to 13.75%, subsequent to the most recent NERC assessment. However, IPM's projected margin for ERCOT under MATS in 2015 remains above this revised 13.75% target, even when taking into account only the capacity reported by ERCOT as being available.<sup>3</sup>

Table 1 above shows that operational capacity is reduced by less than one percent nationwide in 2015 under the policy. This reduction will have little overall impact, since the weighted average reserve margin at the national level are projected to be approximately 25% in the base case, compared to a default NERC level of 15%. Moreover, coal retirements are distributed throughout the power grid, so there will be only small impacts at the regional level. For example, in the RFC NERC reliability region, containing the coal-fired generating areas in Pennsylvania, West Virginia and the Midwest, there was a decrease less than 2% in policy case and a remaining overall reserve margin of over 20%.<sup>4</sup> These excess regional reserves above the target margin can be shared among subregions to ensure adequate reserve margins within a

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<sup>3</sup> ERCOT recently revised its projection of available capacity for 2015 to be 78,144 MW in 2015 (Report on the Capacity, Demand, and Reserves in the ERCOT Region, June 9, 2011, Revision 2), which is lower than the total capacity of units in ERCOT as tracked by EPA's NEEDS database (the source for determining IPM-projected reserve margins as presented in table A2). However, even ERCOT's revised projection of available capacity in 2015 is more than adequate to meet IPM's 2015 peak summer demand for ERCOT of 65,810 MW, yielding a reserve margin of 18.7% under those revised capacity assumptions.

<sup>4</sup> See map of IPM regions and Table of target and projected reserve margins in the Appendix. The IPM regions comprising the RFC NERC regions are MACE, MACS, MACW, RFCO, RFCP, MECS and COMD.

larger reliability region. IPM permits these transfers of reserves, but limits their level to ensure the reliability of the bulk power system (see discussion below.)

Although there are substantial existing regional variations in reserve margin, IPM adjusts regional capacities in 2015 to meet the specific target reserve margin in each region, through reduction in non-coal retirements, construction of new generating capacity and transfers of capacity among regions to meet the specific reserve margin in each region. Each of these adjustments in the 2015 projections is described below.

### **Reduction in Non-coal Retirements**

Reducing non-coal retirements relative to these retirements in the base case is the second largest adjustment needed to balance the loss of coal capacity. Overall combined cycle, combustion turbine and nuclear retirements are 386 MW lower in the policy case compared to the base case. Lower nuclear retirement of 440 MW in the policy case occurred because this capacity became economic to maintain under policy in order to offset retirements of coal. The increased nuclear capacity under the policy was offset by increased retirement of 54 MW of gas-fired capacity, for a net reduction of 386 MW. The distribution of these retirements across IPM regions is shown in the Appendix.

### **Reserve Transfers**

In cases where it is economic to transfer reserves from a neighboring region rather than supply reserves from within a region, IPM will transfer reserves, subject to summer and winter limits that are designed to ensure that these reserves can be transferred reliably. The transfer of reserves can occur, for example, if a region must retire a large amount of coal capacity that was used in the base case to meet reserve requirements. There are only a few significant shifts between the base and policy cases in reserve transfers, and most of these occur in neighboring IPM regions. For example, there is a net increase in transfer of summer reserves out of MACW (an increase of 1,729 MW) and a net decrease in transfer of summer reserves out of RFCP (a decrease of 1,345 MW). Reserve transfers by IPM region are provided in the appendix.

# **Appendix: Tables by IPM Region**

**A1. Projected Operational Capacity in 2015**

**A2. Summary of Target and Projected Reserve Margins in 2015**

**A3. Policy Case Retired Capacity Incremental to Base Case in 2015**

**A4. Capacity Transfers Region in Base and Policy Scenarios in 2015**

**Map of IPM Regions**

## A1. Projected Operational Capacity in 2015(MW)

Region	All Generation Sources			Coal Only		
	Base	Policy	Change	Base	Policy	Change
AZNM	35,829	34,974	-855	9,603	8,749	-854
CA-N	41,285	41,285	0	217	217	0
CA-S	32,676	32,675	-1	213	212	-1
COMD	25,232	25,240	8	4,227	4,235	8
DSNY	9,747	9,742	-5	369	364	-5
ENTG	40,298	40,108	-190	8,397	8,360	-37
ERCT	89,845	89,837	-8	18,409	18,149	-260
FRCC	55,632	55,616	-16	9,173	9,157	-16
GWAY	31,829	31,914	85	19,320	19,437	117
LILC	5,487	5,423	-64			
MACE	30,626	30,626	0	2,759	2,759	0
MACS	12,111	12,003	-108	5,109	5,001	-108
MACW	30,852	30,939	87	10,882	10,969	87
MECS	27,607	27,585	-22	10,820	10,798	-22
MRO	50,038	49,962	-76	20,801	20,725	-76
NENG	33,106	33,103	-3	2,699	2,608	-91
NWPE	19,726	19,468	-258	12,263	12,005	-258
NYC	9,333	9,333	0			
PNW	49,147	47,741	-1,406	1,990	584	-1,406
RFCO	48,174	47,450	-724	29,966	29,242	-724
RFCP	44,413	44,241	-172	32,305	32,144	-172
RMPA	18,374	18,573	199	7,529	7,728	199
SNV	9,196	8,490	-706	2,555	1,849	-706
SOU	62,845	62,550	-295	24,583	24,288	-295
SPPN	17,228	17,230	2	7,905	7,961	56
SPPS	40,168	40,188	20	12,023	12,133	110
TVA	37,065	36,851	-214	12,228	12,014	-214
TVAK	12,998	12,994	-4	9,445	9,441	-4
UPNY	15,776	15,724	-52	2,328	2,276	-52
VACA	48,680	48,347	-333	18,428	18,095	-333
VAPW	22,251	22,241	-10	4,325	4,315	-10
WUMS	17,903	18,036	133	8,229	7,922	-307
Total	1,025,477	1,020,489	-4,988	309,100	303,737	-5,374

**A2. Summary of Target and Projected Reserve Margins in 2015**

**Projected Reserve Margins**

IPM Region	Target Reserve	Projected Reserve Margins	
	Margin	Base Case	Policy Case
AZNM	13.6%	34.8%	29.4%
CA-N	14.6%	18.4%	18.4%
CA-S	14.8%	14.8%	14.8%
COMD	15.3%	21.3%	21.3%
DSNY	18.0%	18.0%	18.0%
ENTG	15.0%	37.2%	35.8%
ERCT	12.5%	24.8%	24.8%
FRCC	19.3%	22.2%	22.1%
GWAY	11.9%	61.0%	60.5%
LILC	18.0%	24.7%	18.0%
MACE	15.3%	15.3%	15.3%
MACS	15.3%	15.3%	15.3%
MACW	15.3%	53.4%	41.8%
MECS	15.3%	47.2%	47.0%
MRO	15.0%	15.0%	15.0%
NENG	15.0%	25.7%	25.3%
NWPE	12.0%	79.2%	76.4%
NYC	18.0%	18.0%	18.0%
PNW	20.0%	46.6%	41.6%
RFCO	15.4%	19.8%	15.4%
RFCP	15.3%	15.3%	15.3%
RMPA	12.3%	12.3%	12.3%
SNV	13.6%	13.6%	13.6%
SOU	15.0%	26.7%	26.2%
SPPN	13.6%	75.2%	74.4%
SPPS	13.6%	18.8%	18.9%
TVA	15.0%	15.0%	15.0%
TVAK	15.0%	37.2%	38.9%
UPNY	18.0%	21.4%	20.9%
VACA	15.0%	15.0%	15.0%
VAPW	15.3%	15.3%	15.3%
WUMS	15.0%	32.7%	33.3%

**A3. Policy Case Retired Capacity Incremental to the Base Case in 2015  
(MW)**

	<b>CC</b>	<b>Coal</b>	<b>CT</b>	<b>Nuclear</b>	<b>OG Steam</b>	<b>Total</b>
AZNM	0	1151	0		0	1151
ENTG	0	0	0		153	153
ERCT	0	236	0		-252	-16
GWAY	0	-167	0		32	-135
LILC	0	0	0		65	65
MACE	0	0	0		0	0
MACS	0	102	0		0	102
MACW	0	-102	0		0	-102
MECS	0	0	0		0	0
NENG	0	84	0		-88	-4
NWPE	0	232	0		0	232
PNW	0	1405	0		0	1405
RFCO	0	685	0		0	685
RFCP	0	81	0		0	81
RMPA	0	0	0		0	0
SOU	0	245	0		0	245
SPPN	3	-77	51		0	-23
SPPS	0	0	0		90	90
TVA	0	163	0		0	163
TVAK	0	0	0		0	0
UPNY	0	53	0		0	53
VACA	0	293	0		0	293
VAPW	0	0	0		0	0
WUMS	0	293	0	-440		-147
<b>Total</b>	<b>3</b>	<b>4677</b>	<b>51</b>	<b>-440</b>		<b>4291</b>

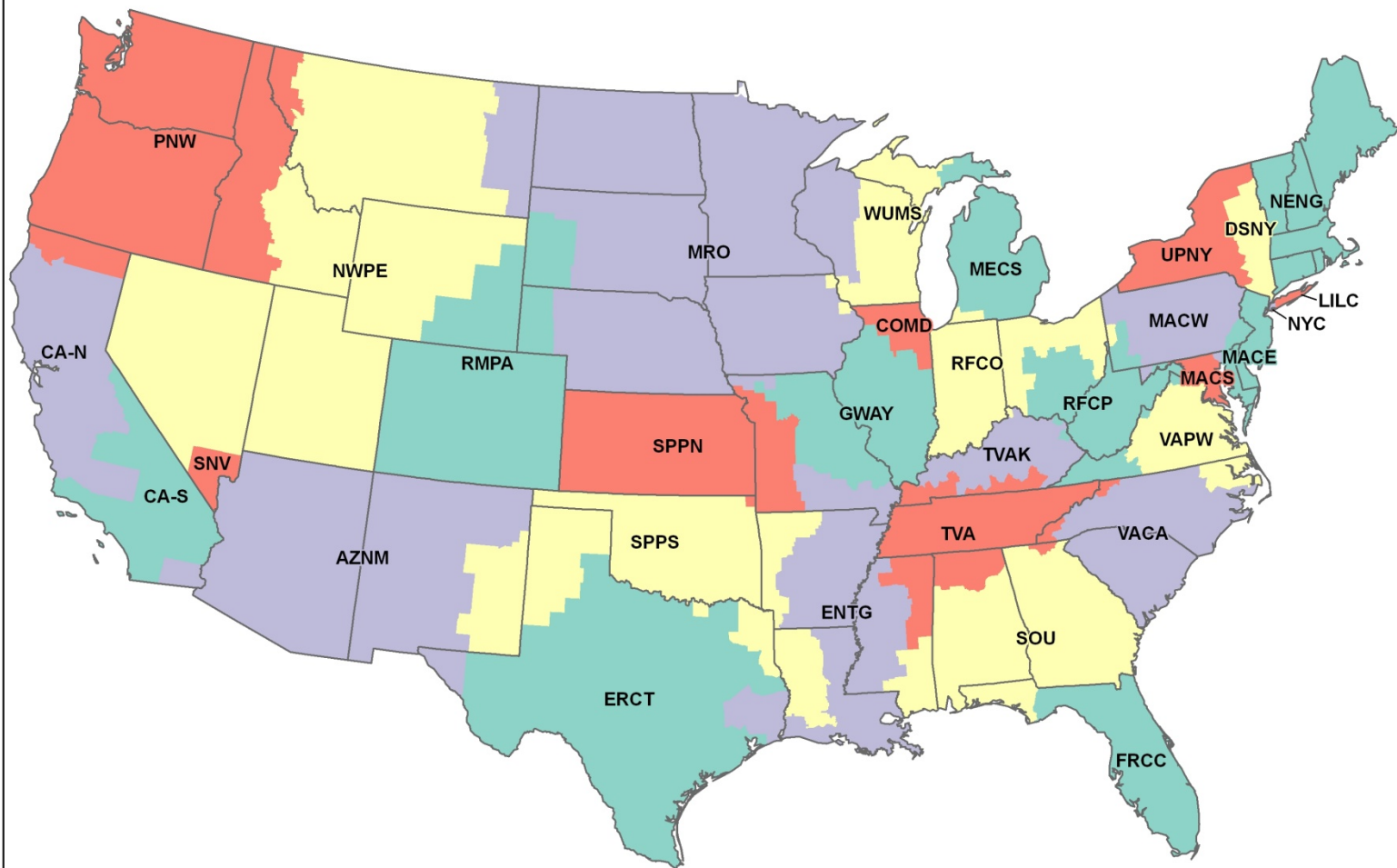
#### A4. Net Capacity Transfers by IPM Region in Base and Policy Scenarios in 2015 (MW)

(Net outflows are positive; net inflows negative)

Region	Base Case		Policy Case		Net Change in Policy Case	
	NetWinter	NetSummer	NetWinter	NetSummer	NetWinter	NetSummer
AZNM	0	681	0	1,185	0	504
CA-N	0	3,515	0	3,515	0	0
CA-S	0	-11,014	0	-11,014	0	0
COMD	749	321	749	321	0	0
DSNY	447	2,502	447	2,498	0	-4
ENTG	0	768	0	987	0	219
ERCT	0	0	0	0	0	0
FRCC	0	0	0	0	0	0
GWAY	0	385	0	385	0	0
LILC	0	222	0	439	0	217
MACE	0	-4,205	0	-4,205	0	0
MACS	-932	-2,908	-1,096	-3,072	-164	-164
MACW	2,893	5,573	1,119	7,302	-1,774	1,729
MECS	1,968	1,880	2,617	1,880	649	0
MRO	256	-3,085	256	-3,240	0	-155
NENG	1,803	0	1,803	0	0	0
NWPE	0	1,966	0	1,966	0	0
NYC	-437	-2,670	-437	-2,670	0	0
PNW	0	2,945	0	2,945	0	0
RFCO	2,786	6,909	3,691	7,108	905	199
RFCP	-5,367	-7,226	-6,712	-8,571	-1,345	-1,345
RMPA	0	-225	0	-27	0	198
SNV	0	2,505	0	1,798	0	-707
SOU	0	1,189	0	1,113	0	-76
SPPN	0	570	0	570	0	0
SPPS	0	0	0	0	0	0
TVA	0	-613	250	-827	250	-214
TVAK	0	166	166	0	166	-166
UPNY	2,325	1,259	2,325	1,259	0	0
VACA	0	679	416	345	416	-334
VAPW	0	-467	929	-477	929	-10
WUMS	0	256	0	256	0	0



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