

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

This document describes resource adequacy and reliability results in the IPM 2015 projections for the base case and Toxics 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)	1,028,242
<i>Minus Changes in Policy Case:</i>	
(-) Coal retirements	-9,871
(-) Coal capacity derated	-923
(+)New Capacity Additions	+86
(+)Lower non-coal retirements	+1,410
Net Change in Policy Case	-9,298
<i>Equals Policy Case Operational Capacity</i>	1,018,943 <sup>2</sup>

Since the model must maintain adequate reserves in each region, the reduced operational capacity of 9,298 MW in the policy case is taken 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. As the table shows, the reduction in capacity (excess reserves)

---

<sup>1</sup> Operational capacity is any existing, new or retrofitted capacity that is not retired.

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

is the largest source of change, followed by lower non-coal retirements and new capacity additions. Each of these policy case changes is discussed further below.

### **Reduction in Excess Reserves**

IPM uses a target reserve margin in each region<sup>3</sup> 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.

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, the coal generating areas in western Pennsylvania, West Virginia, Ohio and Indiana all have significant excess generation resources: these areas combined see a decrease less than 2% in their reserve margins and the reserve margin for the combined area remains over 20%.<sup>4</sup> These excess regional reserves above the target margin can be shared among subregion to ensure adequate reserve margins within a 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.

---

<sup>3</sup> 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.

<sup>4</sup> See map of IPM regions and Table of target and projected reserve margins in the Appendix. The three regions referenced in the text are MACW, RFCO and RFCP.

## **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 1,410 MW lower in the policy case compared to the base case. Lower combined cycle retirements contribute 183 MW, lower combustion turbine 455 MW, and lower nuclear 772 MW to the total capacity made available through reduced retirements of non-coal capacity. The distribution of these retirements across IPM regions is shown in the Appendix.

## **New Capacity Additions**

Very few new capacity additions are needed to accommodate coal retirements, once excess reserves and non-coal retirements relative to the base case are considered. Only 86 MW of new capacity are added compared to the base case, consisting of 24 MW of wind and 62MW of landfill capacity.

## **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. Although there are only a few significant differences between the base and policy cases in reserve transfers, some are important. For example, the retired coal capacity in TVA (1134 MW) is replaced by a net increase in transfer of reserves to TVA (1145 MW). Reserve transfers by 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. New Capacity in Policy Case Incremental to Base Case in 2015**

**A5. 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			Non-Coal Additional
	Base	Policy	Change	Base	Policy	Change	in Policy
AZNM	35,577	34,146	-1,431	9,878	8,447	-1,431	0
CA-N	40,930	40,930	0	217	184	-33	33
CA-S	32,676	32,647	-29	213	184	-29	0
COMD	24,963	25,141	178	4,233	4,215	-18	196
DSNY	9,717	9,712	-5	369	364	-5	0
ENTG	40,109	40,128	19	8,397	8,147	-250	269
ERCT	90,402	89,077	-1,325	18,456	17,814	-642	-683
FRCC	55,650	55,093	-557	9,191	8,608	-583	26
GWAY	31,953	31,341	-612	19,630	19,018	-612	0
LILC	5,494	5,219	-275				-275
MACE	30,861	31,186	325	2,434	2,759	325	0
MACS	12,095	12,000	-95	5,107	5,012	-95	0
MACW	31,256	30,896	-360	11,286	10,915	-371	11
MECS	27,692	27,230	-462	10,905	10,443	-462	0
MRO	50,236	50,110	-126	20,796	20,670	-126	0
NENG	33,138	33,140	2	2,695	1,706	-989	991
NWPE	19,667	19,342	-325	12,263	11,938	-325	0
NYC	9,333	9,333	0				0
PNW	48,671	48,638	-33	1,989	1,978	-11	-22
RFCO	48,964	48,640	-324	30,756	30,432	-324	0
RFCP	44,710	44,133	-577	32,632	32,025	-607	30
RMPA	18,464	18,443	-21	7,960	7,939	-21	0
SNV	9,196	9,196	0	2,555	2,555	0	0
SOU	62,857	62,682	-175	24,595	24,420	-175	0
SPPN	17,046	17,032	-14	8,404	7,779	-625	611
SPPS	40,738	40,398	-340	12,023	11,951	-72	-268
TVA	37,713	36,533	-1,180	12,876	11,696	-1,180	0
TVAK	13,109	12,572	-537	9,557	9,020	-537	0
UPNY	15,741	15,719	-22	2,293	2,271	-22	0
VACA	48,942	48,497	-445	18,690	18,245	-445	0
VAPW	22,255	22,110	-145	4,329	4,184	-145	0
WUMS	18,087	17,679	-408	8,470	7,486	-984	576
<b>Total</b>	<b>1,028,242</b>	<b>1,018,943</b>	<b>-9,299</b>	<b>313,199</b>	<b>302,405</b>	<b>-10,794</b>	<b>1,495</b>

## A2. Summary of Target and Projected Reserve Margins in 2015 (MW)

### Projected Reserve Margins

IPM Region	Target Reserve		
	Margin	Base Case	Policy Case
AZNM	13.6%	28.8%	23.1%
CA-N	14.6%	17.2%	17.2%
CA-S	14.8%	14.8%	14.8%
COMD	15.3%	19.9%	20.8%
DSNY	18.0%	18.0%	18.0%
ENTG	15.0%	38.8%	34.7%
ERCT	12.5%	25.6%	23.6%
FRCC	19.3%	22.2%	21.0%
GWAY	11.9%	61.7%	58.4%
LILC	18.0%	24.6%	18.0%
MACE	15.3%	15.3%	15.3%
MACS	15.3%	15.3%	15.3%
MACW	15.3%	54.8%	54.6%
MECS	15.3%	47.7%	45.0%
MRO	15.0%	15.0%	15.0%
NENG	15.0%	25.7%	25.6%
NWPE	12.0%	79.0%	75.4%
NYC	18.0%	18.0%	18.0%
PNW	20.0%	44.9%	44.8%
RFCO	15.4%	23.0%	19.3%
RFCP	15.3%	15.3%	15.3%
RMPA	12.3%	12.3%	12.3%
SNV	13.6%	46.6%	46.1%
SOU	15.0%	27.2%	26.1%
SPPN	13.6%	73.2%	73.0%
SPPS	13.6%	20.2%	19.2%
TVA	15.0%	15.1%	15.0%
TVAK	15.0%	38.4%	32.6%
UPNY	18.0%	21.1%	20.9%
VACA	15.0%	15.0%	15.0%
VAPW	15.3%	15.3%	15.3%
WUMS	15.0%	34.2%	30.9%

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

	CC	Coal	CT	Nuclear	OG Steam
AZNM	0	1426	0	0	0
CA-N	0	33	0	0	-33
CA-S	0	29	0	0	0
ENTG	0	213	0	0	-269
ERCT	0	583	0	0	683
FRCC	0	550	0	0	0
GWAY	0	521	0	0	0
LILC	0	0	0	0	275
MACE	0	-325	0	0	0
MACS	0	88	0	0	0
MACW	0	344	-11	0	0
MECS	0	409	0	0	0
MRO	0	38	0	0	0
NENG	0	993	0	0	-961
NWPE	0	299	0	0	0
PNW	0	0	0	0	22
RFCO	0	256	0	0	0
RFCP	0	539	0	0	0
SOU	0	98	0	0	0
SPPN	-183	601	-444	0	16
SPPS	0	0	0	0	267
TVA	0	1134	0	0	0
TVAK	0	532	0	0	0
UPNY	0	12	0	0	0
VACA	0	399	0	0	0
VAPW	0	132	0	0	0
WUMS	0	967	0	-772	0
Grand Total	-183	9871	-455	-772	0

#### A4. New Capacity Policy Case Incremental to Base Case in 2015 (MW)

	CC	CT	Wind	Other	Total
AZNM	0	0	0	0	0
CA-N	0	0	0	0	0
CA-S	0	0	0	0	0
COMD	0	0	0	196	196
DSNY	0	0	0	0	0
ENTG	0	0	0	0	0
ERCT	0	0	0	0	0
FRCC	0	0	0	26	26
GWAY	0	0	0	0	0
MACE	0	0	0	0	0
MACS	0	0	0	0	0
MACW	0	0	0	0	0
MECS	0	0	0	0	0
MRO	0	0	0	0	0
NENG	0	0	24	6	30
NWPE	0	0	0	0	0
NYC	0	0	0	0	0
PNW	0	0	0	0	0
RFCO	0	0	0	0	0
RFCP	0	0	0	30	30
RMPA	0	0	0	0	0
SNV	0	0	0	0	0
SOU	0	0	0	0	0
SPPN	0	0	0	0	0
SPPS	0	0	0	0	0
TVA	0	0	0	0	0
UPNY	0	0	0	0	0
VACA	0	0	0	0	0
VAPW	0	0	0	0	0
WUMS	0	0	0	-196	-196
Total	0	0	24	62	86

## A5. 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	2,307	0	2,307	0	0
CA-N	0	3,515	0	3,515	0	0
CA-S	0	-11,014	0	-11,043	0	-29
COMD	749	321	749	321	0	0
DSNY	447	2,494	447	2,490	0	-4
ENTG	0	142	0	1,311	0	1,169
ERCT	0	0	0	0	0	0
FRCC	0	0	0	0	0	0
GWAY	0	385	0	385	0	0
LILC	0	231	0	235	0	4
MACE	0	-4,419	0	-4,093	0	326
MACS	-946	-2,922	-1,040	-3,016	-94	-94
MACW	2,908	5,791	3,003	5,459	95	-332
MECS	1,968	1,880	1,968	1,880	0	0
MRO	256	-3,029	256	-3,159	0	-130
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	2,482	6,617	3,071	7,553	589	936
RFCP	-5,069	-6,929	-5,646	-7,505	-577	-576
RMPA	0	87	0	66	0	-21
SNV	0	648	0	678	0	30
SOU	0	922	0	1,280	0	358
SPPN	0	570	0	570	0	0
SPPS	0	0	0	0	0	0
TVA	0	0	0	-1,145	0	-1,145
TVAK	0	166	0	166	0	0
UPNY	2,325	1,259	2,325	1,259	0	0
VACA	0	941	0	496	0	-445
VAPW	0	-464	0	-608	0	-144
WUMS	0	256	0	256	0	0

# EPA Base Case v4.0 U.S. Regions

