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Resource Adequacy and Reliability in the IPM Projections for the Transport Rule TSD

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Resource Adequacy and Reliability in the IPM Projections for the Transport Rule

This document describes resource adequacy and reliability results in the IPM 2014 projections for the base case and Transport 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 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 reserves that are not needed to meet the target level. Operational capacity[1] changes from the base case in 2014 are summarized below:

Table 1. Operational Capacity Summary in 2014

Base case operational capacity (MW)	1,029,215
Adjusted for Changes in Policy Case:	
(-) Coal retirements	-4,772
(-) Coal capacity derated	-487
(+)New Capacity Additions	+73
(+)Lower non-coal retirements	+1,288
Net Change in Policy Case	-3,898
Equals Policy Case Operational Capacity	1,025,317[2]

Since the model must maintain adequate reserves in each region, the reduced operational capacity of 3,898 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

[1] Operational capacity is any existing, new or retrofitted capacity that is not retired.
[2] Numbers in this table may not sum due to independent rounding.

greater new capacity additions. As the table shows, the reduction in capacity (excess reserves) 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.

Notably, the "retirements" examined here are IPM forecasts that could be muted by utility decisions to hold on to these generating units and make other changes for compliance, which they have the freedom to do under the Transport Rule.

Reduction in Excess Reserves

IPM uses a target reserve margin in each region[3] 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 2014 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 2014 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 half of percent nationwide in 2014 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%.[4] 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 2014 to meet the specific target reserve margin in each region, through reduction in non-coal retirements, construction of new generating capacity and transfers of

[3] 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.

[4] 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.

capacity among regions to meet the specific reserve margin in each region. Each of these adjustments in the 2014 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 1,288 MW lower in the policy case compared to the base case. Lower combined cycle retirements contribute 126 MW, lower combustion turbine 307 MW, and lower nuclear 854 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 73 MW of new capacity are added compared to the base case, all landfill capacity[5].

Reserve Transfers

In cases where it is economic to transfer reserves from a neighboring region rather that 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 noteworthy. For example, the net decrease in coal capacity in RFCP (838 MW in West Virginia and parts of Ohio) is to a large extent offset by a net increase in transfer of reserves into the region (807 MW). Reserve transfers by region are provided in the appendix.

[5] Landfill capacity is from generation produced using capture of methane at landfills as a source for power.

Appendix: Tables by IPM Region

A1. Projected Operational Capacity in 2014

A2. Summary of Target and Projected Reserve Margins in 2014

A3. Policy Case Retired Capacity Incremental to Base Case in 2014

A4. New Capacity in Policy Case Incremental to Base Case in 2014

A5. Capacity Transfers Region in Base and Policy Scenarios in 2014

Map of IPM Regions

A1. Projected Operational Capacity in 2014(MW)

	All Generation Sources			Coal Only			Non-Coal Additional
Region	**Base**	**Policy**	**Change**	**Base**	**Policy**	**Change**	**in Policy**
AZNM	35,544	35,560	16	9,845	9,818	-27	43
CA-N	40,930	40,930	0	217	217	0	0
CA-S	32,676	32,676	0	213	213	0	0
COMD	24,699	25,234	535	4,238	4,229	-9	544
DSNY	9,717	9,717	0	369	366	-3	3
ENTG	40,109	40,384	275	8,397	8,397	0	275
ERCT	90,405	89,843	-562	18,456	18,401	-55	-507
FRCC	55,650	55,632	-18	9,191	9,173	-18	0
GWAY	31,970	31,518	-452	19,647	19,009	-638	186
LILC	5,494	5,485	-9				-9
MACE	30,866	30,808	-58	2,438	2,379	-59	1
MACS	12,141	12,122	-19	5,153	5,107	-46	27
MACW	31,295	30,830	-465	11,325	10,860	-465	0
MECS	27,713	27,607	-106	10,926	10,820	-106	0
MRO	50,193	50,249	56	20,796	20,788	-8	64
NENG	33,136	33,480	344	2,697	2,699	2	342
NWPE	19,666	19,657	-9	12,262	12,263	1	-10
NYC	9,333	9,333	0				0
PNW	48,671	48,671	0	1,989	1,989	0	0
RFCO	48,981	48,521	-460	30,773	30,313	-460	0
RFCP	45,347	44,539	-808	33,269	32,431	-838	30
RMPA	18,464	18,417	-47	7,960	7,960	0	-47
SNV	9,196	9,196	0	2,555	2,555	0	0
SOU	62,895	62,845	-50	24,633	24,583	-50	0
SPPN	17,048	17,228	180	8,559	8,125	-434	614
SPPS	40,738	40,355	-383	12,023	12,023	0	-383
TVA	37,846	36,933	-913	13,009	12,096	-913	0
TVAK	13,352	12,997	-355	9,800	9,445	-355	0
UPNY	15,743	15,731	-12	2,295	2,283	-12	0
VACA	49,131	48,679	-452	18,879	18,427	-452	0
VAPW	22,259	22,251	-8	4,333	4,325	-8	0
WUMS	18,007	17,889	-118	8,489	8,183	-306	188
Total	1,029,215	1,025,317	-3,898	314,736	309,477	-5,259	1,361

A2. Summary of Target and Projected Reserve Margins in 2014 (MW)

		Projected Reserve Margins	
IPM Region	Target Reserve Margin	Base Case	Policy Case
AZNM	13.6%	28.7%	28.6%
CA-N	14.6%	17.2%	17.2%
CA-S	14.8%	14.8%	14.8%
COMD	15.3%	18.6%	21.3%
DSNY	18.0%	18.0%	20.8%
ENTG	15.0%	38.8%	37.1%
ERCT	12.5%	25.6%	24.8%
FRCC	19.3%	22.2%	22.2%
GWAY	11.9%	61.7%	59.3%
LILC	18.0%	24.6%	20.4%
MACE	15.3%	15.3%	15.3%
MACS	15.3%	15.3%	15.3%
MACW	15.3%	55.1%	51.2%
MECS	15.3%	47.8%	47.2%
MRO	15.0%	15.0%	15.0%
NENG	15.0%	25.7%	27.1%
NWPE	12.0%	79.0%	78.9%
NYC	18.0%	18.0%	18.0%
PNW	20.0%	44.9%	44.9%
RFCO	15.4%	25.1%	21.3%
RFCP	15.3%	15.3%	15.3%
RMPA	12.3%	12.3%	12.3%
SNV	13.6%	46.6%	46.6%
SOU	15.0%	27.8%	26.7%
SPPN	13.6%	73.2%	75.2%
SPPS	13.6%	20.2%	19.1%
TVA	15.0%	15.5%	15.0%
TVAK	15.0%	41.0%	37.2%
UPNY	18.0%	21.1%	21.0%
VACA	15.0%	15.0%	15.0%
VAPW	15.3%	15.3%	15.3%
WUMS	15.0%	33.5%	32.6%

A3. Policy Case Retired Capacity Incremental to the Base Case in 2014 (MW)

IPM Region	CC	Coal	CT	Nuclear	OG Steam
AZNM	0	27	0	0	0
CA-N	0	0	0	0	0
ENTG	0	0	0	0	-275
ERCT	0	15	0	0	507
GWAY	0	621	0	0	-186
LILC	0	0	0	0	8
MACE	0	55	0	0	0
MACS	0	45	0	0	0
MACW	0	424	0	0	0
MECS	0	82	0	0	0
NENG	0	0	0	0	-344
NWPE	0	0	0	0	0
PNW	0	0	0	0	0
RFCO	0	374	0	0	0
RFCP	0	751	0	0	0
SPPN	-126	431	-307	0	-181
SPPS	0	0	0	0	347
TVA	0	915	0	0	0
TVAK	0	326	0	0	0
UPNY	0	0	0	0	0
VACA	0	427	0	0	0
VAPW	0	0	0	0	0
WUMS	0	279	0	-854	123
Grand Total	-126	4772	-307	-854	-1

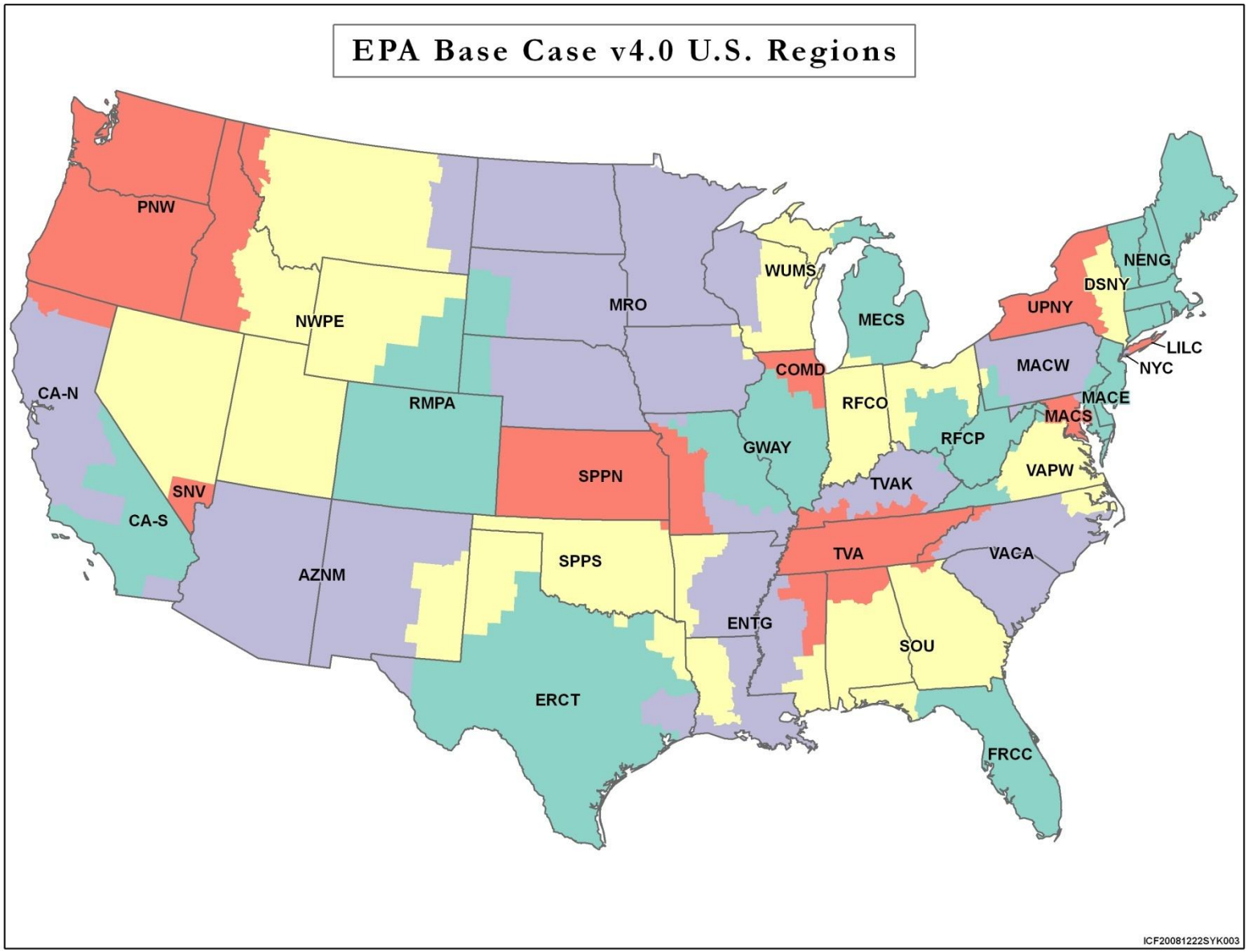
A4. New Capacity Policy Case Incremental to Base Case in 2014 (MW)

Region	CC	CT	Wind	Other	Total
AZNM	0	0	43	0	43
CA-N	0	0	0	0	0
CA-S	0	0	0	0	0
COMD	0	0	0	544	544
DSNY	0	0	3	0	3
ENTG	0	0	0	0	0
ERCT	0	0	0	0	0
FRCC	0	0	0	0	0
GWAY	0	0	0	0	0
MACE	0	0	28	-27	1
MACS	0	0	0	27	27
MACW	0	0	0	0	0
MECS	0	0	0	0	0
MRO	0	0	21	43	64
NENG	0	0	-2	0	-2
NWPE	0	0	-10	0	-10
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	-47	0	-47
SNV	0	0	0	0	0
SOU	0	0	0	0	0
SPPN	0	0	0	0	0
SPPS	0	0	-36	0	-36
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	-544	-544
Total	0	0	0	73	73

A5. Net Capacity Transfers by IPM Region in Base and Policy Scenarios in 2014 (MW)

(Net outflows are positive; net inflows negative)

	Base Case		Policy Case		Net Change in Policy Case	
Region	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	-11,014	0	0
COMD	749	321	749	321	0	0
DSNY	447	2,494	447	2,325	0	-169
ENTG	0	142	0	902	0	760
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	399	0	168
MACE	0	-4,414	0	-4,496	0	-82
MACS	-899	-2,875	-920	-2,896	-21	-21
MACW	2,860	5,787	2,881	5,870	21	83
MECS	1,968	1,880	1,968	1,880	0	0
MRO	256	-3,072	256	-3,031	0	41
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	1,832	5,944	2,656	6,767	824	823
RFCP	-4,432	-6,291	-5,239	-7,098	-807	-807
RMPA	0	87	0	71	0	-16
SNV	0	648	0	648	0	0
SOU	0	699	0	1,188	0	489
SPPN	0	570	0	570	0	0
SPPS	0	0	0	0	0	0
TVA	0	0	0	-745	0	-745
TVAK	0	166	0	166	0	0
UPNY	2,325	1,259	2,325	1,259	0	0
VACA	0	1,131	0	680	0	-451
VAPW	0	-459	0	-466	0	-7
WUMS	0	256	0	256	0	0


EPA Base Case v4.0 U.S. Regions
PNW
NWPE
CA-N
CA-S
SNV
AZNM
RMPA
SPPN
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ERCT
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WUMS
MECS
COMD
GWAY
RFCO
RFCP
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