RGGI DRAFT 2012 Reference Case and Sensitivity Analyses Assumptions

August 13, 2012

Presentation Outline

Modeling Overview

RGGI 2012 Reference Case Assumptions

Data Sources

RGGI 2012 Sensitivity Analyses Assumptions

- Higher Emissions Combination
- Lower Emissions Combination

Reference Case Assumptions Outline

- Regional energy and peak demand
- Cost and performance of new generation
- Coal plant construction in RGGI
- Nuclear plant construction in RGGI
- Firmly planned generation and retirements
- Firmly planned transmission additions
- Fuel prices
- Federal environmental policies
- Renewable portfolio standards
- State environmental policies
- Cost and performance of pollution controls and firmly planned control installations
- Transmission capability
- Reserve margins and local reserve requirements
- Offsets
- CO_2 Allowance Budget

What are Reference Case Assumptions?

- IPM relies on several user-defined parameters to set the overall requirements and boundaries for its projections. For example, the user must tell IPM what level of energy demand it must meet by year for each model region.
- Most of these parameters are not known with certainty, so users must make assumptions about their values going forward over the time horizon of the analysis.
- We use the term "assumptions" to describe the collection of input parameters that will go into the model.
- The model's projections are developed using market fundamentals informed by the assumptions.
- IPM generates projections for model "run years" that represent individual years or groups of years. For this analysis, projections will be developed for the years 2012, 2013, 2014, 2015, 2016, 2018 and 2020 (representing 2012-2022).

RGGI 2012 Reference Case Assumption Development Overview

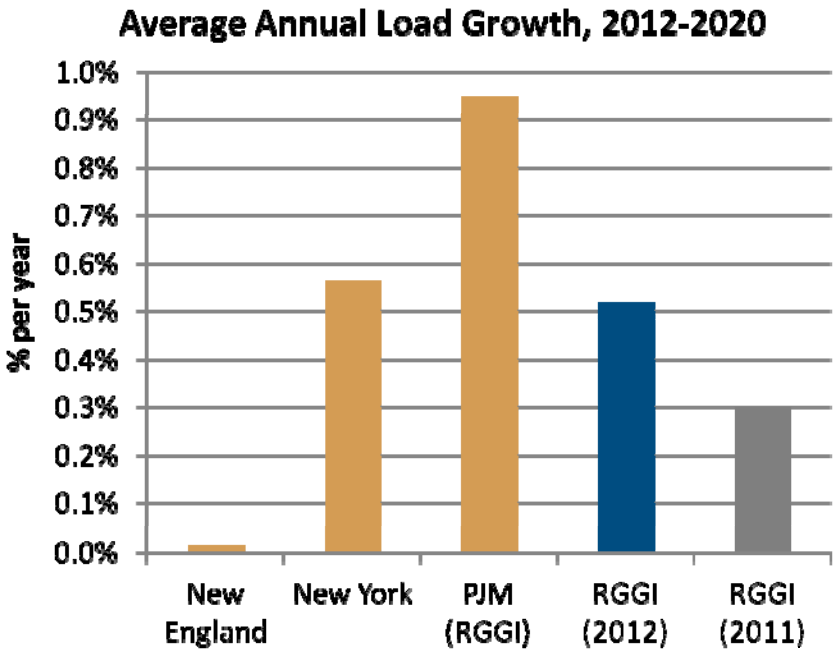
- The following slides describe assumptions that must be defined for the RGGI Reference Case and offer potential approaches for those assumptions.
- The following discussion elements are included for each assumption:
  - Description of the input variable for which the assumption is needed
  - Source of assumption in 2011 RGGI Reference Case
  - 2012 proposed approach for each assumption

Regional Energy and Peak Demand

- DESCRIPTION
  - Energy (MWh) and peak (MW) demand requirements by state for the period 2012 to 2020
  - IPM meets regional energy needs by running existing plants, building new plants and using transmission resources

- 2011 RGGI REFERENCE CASE ASSUMPTIONS
  - RGGI States – ISO projections with state-specific adjustments to reflect efficiency programs, as needed
  - Growth rates for regions outside of RGGI – ISOs, where available, or EIA AEO 2011

- 2012 PROPOSED APPROACH
  - RGGI States – ISO projections, adjusted for efficiency by the states, as needed
  - ISOs and EIA AEO 2012 regional growth rates outside of RGGI
  - See appendix for more information



LEANING: For RGGI region, ISO projections, adjusted for efficiency as needed by the States; ISO or AEO 2012 regional growth rates outside of RGGI

Cost and Performance of New Generation

- DESCRIPTION
  - Capital and operating costs, heat rates, and emission rates for new generating capacity options, including combined cycle gas, coal, nuclear and renewable types
  - IPM builds new capacity to meet energy and peak needs based on relative economics

- 2011 RGGI REFERENCE CASE ASSUMPTIONS
  - EIA AEO 2011 with RGGI region-specific cost adjustments
  - State-specific renewable technology costs, if provided by state

- 2012 PROPOSED APPROACH
  - EIA AEO 2012 with RGGI region-specific cost adjustments
  - State-specific renewable technology costs, if provided by state

LEANING: AEO 2012 with RGGI region-specific cost adjustments

Coal Plant Construction in RGGI

- DESCRIPTION
  - Limits on the amount and type of new coal capacity that can be built within the RGGI region
  - In IPM, such limits supersede decisions based on market fundamentals
- 2011 RGGI REFERENCE CASE ASSUMPTIONS
  - New coal in the RGGI region must be equipped with carbon capture
  - Carbon capture not required on new coal built outside the RGGI region
- 2012 PROPOSED ASSUMPTIONS
  - Only coal with carbon capture will be built in the U.S.

LEANING: Only coal with carbon capture will be built in the U.S.

Nuclear Plant Construction in RGGI

- DESCRIPTION
  - Limits on the amount and type of new nuclear capacity that can be built within the RGGI region
  - In IPM, such limits supersede decisions based on market fundamentals

- 2011 RGGI REFERENCE CASE ASSUMPTIONS
  - Existing nuclear units were offered options to relicense and uprate
  - Nuclear additions limited to existing plants with sites for additional units, based on information provided by Nuclear Energy Institute

- 2012 PROPOSED APPROACH
  - (2011 Approach) Limit new nuclear additions to existing sites

LEANING: New nuclear can be built on an economic basis at existing plant sites

Firmly Planned Generation and Retirements

- DESCRIPTION
  - Firmly planned capacity additions and retirements are those that are far enough along in the process to be included in the Reference Case
  - IPM will take firm capacity additions and retirements into account in making projections

- 2011 RGGI REFERENCE CASE ASSUMPTIONS
  - ISO studies and queues, with modifications by States as necessary

- 2012 PROPOSED APPROACH
  - (2011 Approach) ISO studies and queues, with modifications by States as necessary

LEANING: ISO studies and queues, supplemented with additions by States

Firmly Planned Generation and Retirements

Unit-specific Additions in NYISO

Plant Name	Units	State	Nameplate Capacity (MW)	Fuel Type	Modeled Online Year
Steel Winds Wind Farm	1	NY	15.0	Wind	2012
Oneida Herkimer LFG Facility	1	NY	1.6	Gas	2012
Nine Mile Point II	2	NY	115.0	Nuclear	2012
Marble River Wind Farm	1	NY	216.0	Wind	2013
Albany 2 Landfill Generator	4-7	NY	6.4	Gas (LFG)	2013
Mill Street Dam Hydroelectric	1	NY	0.3	Hydro	2013
Black River Facility	1-2	NY	60.0	Biomass	2013
Stuyvesant Falls Hydroelectric	1	NY	6.0	Hydro	2013
Howard Wind Farm (Expansion)	1	NY	4.1	Wind	2013
Stony Creek Wind Farm	1	NY	92.8	Wind	2013
Nine Mile Point II	2	NY	53.0	Nuclear	2014
Stewarts Bridge Hydro (Expansion)	1	NY	2.6	Hydro	2014

Firmly Planned Generation and Retirements

Unit-specific Additions in ISO-NE

Plant Name	Units	State	Nameplate Capacity (MW)	Fuel Type	Modeled Online Year
New Haven Harbor	2-4	CT	134.0	Gas	2012
Plainfield Renewable Energy	1	CT	43.3	Biomass	2014
Southbridge LFGTE Facility	1	MA	1.6	Gas	2012
No Fossil Fuel Kingston Wind	1	MA	6.0	Wind	2012
Lightolier Fall River Wind	1	MA	2.5	Wind	2012
Falmouth Wastewater Treatment Facility	2	MA	1.7	Wind	2012
Westford Solar Field	1-2	MA	2.3	Solar	2012
Fairhaven Wind	1	MA	3.3	Wind	2012
Kingston Wind Independence	1	MA	2.0	Wind	2012
True North Solar Project	1	MA	4.8	Solar	2012
Greenfield Solar Farm	1	MA	2.0	Solar	2012
Commerce Drive Solar	1	MA	2.3	Solar	2012
Canton Landfill Solar Facility	1	MA	5.6	Solar	2012
Medway Branch Solar	1	MA	1.6	Solar	2012
Patriot Place Solar	1	MA	1.0	Solar	2012
Hoosac Wind Project	1	MA	28.5	Wind	2013
Stony Brook	3	MA	280.0	Gas	2014
Cape Wind	1	MA	468.0	Offshore Wind	2016
Cobscook Bay OCGen Tidal	1	ME	0.1	Hydro	2012
Blue Sky East Wind Project	1	ME	34.2	Wind	2013

Firmly Planned Generation and Retirements

Unit-specific Additions in ISO-NE (2)

Plant Name	Units	State	Nameplate Capacity (MW)	Fuel Type	Modeled Online Year
Granite Reliable Power Windpark	1	NH	99.0	Wind	2012
Burgess BioPower	1	NH	75.0	Biomass	2014
Groton Wind	1	NH	48.0	Wind	2013
Antrim Wind	1	NH	30.0	Wind	2014
North Kingstown Green Turbine	1	RI	1.5	Wind	2012
Fields Point WWTP	1	RI	4.5	Wind	2012
Broadrock Biopower I	1	RI	33.3	Gas (LFG)	2013
Deerfield Wind Project	1	VT	30.0	Wind	2013
Georgia Mountain Wind	1	VT	12.0	Wind	2013
Kingdom Community Wind	1	VT	63.0	Wind	2013

Firmly Planned Generation and Retirements

Unit-specific Additions in PJM

Plant Name	Units	State	Nameplate Capacity (MW)	Fuel Type	Modeled Online Year
DELMARVA (Bloom Energy - Brookside)	1	DE	3.0	Fuel Cell	2012
DEC Solar Energy Farm	1-2	DE	8.0	Solar	2013
W1-062-DEMEC addition	1	DE	67.0	Gas CT	2015
DELMARVA (Bloom Energy- Red Lion)	1	DE	27.0	Fuel Cell	2015
Garrison Energy Center	1	DE	309	Gas CC	2015
Offshore Wind Project(s)	1	DE	200.0	Offshore Wind	2020
IKEA Solar College Park	1	MD	1.2	Solar	2012
Back River Wastewater Solar Farm	1	MD	1.0	Solar	2012
Mount St Marys University Solar	1-3	MD	18.1	Solar	2012
Jessup	1	MD	0	Solar	2012
Emmitsburg	1	MD	14	Solar	2012
Maryland Solar	1	MD	20.0	Solar	2013
SMECO Solar	1	MD	5.5	Solar	2013
Lappans	1	MD	20	Solar	2013
Friendship Manor	1	MD	1	Landfill Gas	2013
Costen	1	MD	4	Solar	2013
Charles County CPV	1	MD	660	Gas	2015
Federal Research Center White Oak	1-6	MD	53.0	Gas	2016
Perryman	6	MD	256	Gas	2016
White Oak	1	MD	29	Gas	2016

Firmly Planned Generation and Retirements

Unit-specific Additions in PJM (non-RGGI)

Plant Name	State	Nameplate Capacity (MW)	Fuel Type	Modeled Online Year
Howard M Down CT	NJ	56	Gas CT	2012
West Deptford Energy Center (LS-Power)	NJ	738	Gas CC	2015
Newark Energy Center	NJ	625	Gas CC	2015
CPV Woodbridge Energy Center	NJ	700	Gas CC	2015
Dresden Energy Facility CC	OH	540	Gas CC	2012
Virginia City Hybrid Energy Center	VA	585	Coal	2012
South Boston Energy Project	VA	50	Biomass	2013
Hopewell	VA	51	Biomass Conv.	2014
Southampton	VA	51	Biomass Conv.	2014
Altavista	VA	51	Biomass Conv.	2014
Warren County	VA	1,300	Gas CC	2015
Wind Projects	Various	993	Wind	2012-2013
Solar Projects	Various	129	Solar	2012-2014
Hydro Projects	Various	302	Hydro	2012-2015
Landfill Gas Projects	Various	40	Landfill Gas	2012-2015

Firmly Planned Generation and Retirements

Unit-specific Retirements in NYISO and ISO-NE (Revised)

Plant Name	Units	State	Nameplate Capacity (MW)	Fuel Type	Modeled Retire Year
Dunkirk Generating Station	1-4	NY	535	Coal	2012
AES Westover	8	NY	81	Coal	2012
AES Greenidge	4	NY	104	Coal	2012
Bowline Point	2	NY	417^	Oil/Gas	2012
Far Rockaway	4	NY	107	Oil/Gas	2012
Astoria	2,4	NY	543	Oil/Gas	2012
Glenwood	4,5	NY	225	Oil/Gas	2012
Astoria Gas Turbines	10,11	NY	34	Oil/Gas	2012
EF Barrett	7	NY	18	Gas	2012
Beebee	13	NY	18	Gas	2012
Ravenswood	3,4	NY	35	Gas	2012
Binghamton Cogeneration	1	NY	48	Gas	2012
Indian Point	2	NY	1,020	Nuclear	2013
Indian Point	3	NY	1,025	Nuclear	2015

Plant Name	Units	State	Nameplate Capacity (MW)	Fuel Type	Modeled Retire Year
Salem Harbor	1,2	MA	160	Coal	2012
Salem Harbor	3,4	MA	587	Coal/Oil&Gas	2015
Vermont Yankee	1	VT	628	Nuclear	2014*

^Bowline 2 has reduced output to 150 MW

*subject to Vermont Public Service Board process and ongoing legal action.

Firmly Planned Generation and Retirements

Unit-specific Retirements in PJM

Plant Name	Units	State	Nameplate Capacity (MW)	Fuel Type	Modeled Retire Year
Benning	15-16	DC	550	Oil/Gas	2012
Buzzard Point	E&W	DC	240	Gas	2012
Indian River Generating Station	3	DE	170	Coal	2014
Fisk Street	19	IL	326	Coal	2013
Crawford (IL)	7-8	IL	532	Coal	2015
State Line Energy	3,4	IN	612	Coal	2012
Tanner Creek	1-3	IN	488	Coal	2015
Big Sandy	1	KY	280	Coal	2015
R Paul Smith Power Station	3-4	MD	115	Coal	2012
Kitty Hawk	1-2	NC	32	Gas	2012
Hudson Generating Station	1	NJ	383	Oil/Gas	2012
Kearny Generating Station	10	NJ	122	Gas	2012
Vineland	10	NJ	23	Coal	2013
Kearny Generating Station	9	NJ	21	Gas	2015
Glen Gardner CT	1-8	NJ	160	Gas	2015
Bergen	3	NJ	21	Gas	2015
Mercer Generating Station	3	NJ	115	Gas	2015
National Park	1	NJ	21	Gas	2015
PSEG Burlington Generating Station	8	NJ	21	Gas	2015
Sewaren	6	NJ	111	Gas	2015
Sewaren	1-4	NJ	453	Gas	2015
Cedar	1-2	NJ	66	Oil/Gas	2016
Deepwater	1, 6	NJ	158	Gas	2016
Missouri Ave CT	B - D	NJ	72	Oil/Gas	2016
Oyster Creek (NJ)	1	NJ	619	Nuclear	2020

Firmly Planned Generation and Retirements

Unit-specific Retirements in PJM (2)

Plant Name	Units	State	Nameplate Capacity (MW)	Fuel Type	Modeled Retire Year
Bay Shore Plant	2-4	OH	489	Coal	2012
Niles Power Plant	2	OH	108	Coal	2012
Walter C Beckjord	1	OH	94	Coal	2012
Eastlake Power Plant	4-5	OH	837	Coal	2013
Niles Power Plant	1	OH	109	Coal	2013
O.H. Hutchings	4	OH	62		2013
Conesville	3	OH	165	Coal	2013
Picway Plant	5	OH	95	Coal	2015
Muskingum River	1-4	OH	790	Coal	2015
Walter C Beckjord*	1-3	OH	352	Coal	2012
Walter C Beckjord	4-6	OH	868	Coal	2015
Avon Lake Power Plant	7,9	OH	735	Coal	2015
Ashtabula Plant	5	OH	244	Coal	2016
Eastlake Power Plant	1-3	OH	396	Coal	2016
Lake Shore Power Plant	18	OH	245	Coal	2016
O.H. Hutchings	1-2	OH	138	Coal	2016
Brunot Island	1B-1C	PA	30	Gas	2012
Elrama Power Plant	1-3	PA	289	Coal	2012
Eddystone Generating Station	2	PA	309	Coal	2012
Elrama Power Plant	4	PA	171	Coal	2013
Armstrong Power Station	1-2	PA	343	Coal	2013
Portland (PA)	1-2	PA	401	Coal	2015
Shawville Generating Station	1-4	PA	597	Coal	2015
Titus Generating Station	1-3	PA	243	Coal	2015
New Castle Plant	3-5	PA	326	Coal	2015

Firmly Planned Generation and Retirements

Unit-specific Retirements in PJM (3)

Plant Name	Units	State	Nameplate Capacity (MW)	Fuel Type	Modeled Retire Year
New Castle Plant	A, B	PA	6	Diesel	2015
Chesapeake Energy Center	7-10	VA	67	Gas	2012
Potomac River	1-5	VA	482	Coal	2013
Clinch River	1	VA	230	Coal	2015
Yorktown Power Station	1	VA	159	Coal	2015
Chesapeake Energy Center	1-2	VA	222	Coal	2015
Chesapeake Energy Center	3-4	VA	354	Coal	2016
Albright Power Station	1-3	WV	283	Coal	2013
Rivesville Power Station	5-6	WV	121	Coal	2013
Willow Island Power Station	1-2	WV	189	Coal	2013
Glen Lyn Plant	5	WV	90	Coal	2015
Glen Lyn Plant	6	WV	235	Coal	2015
Kammer Plant	1-3	WV	600	Coal	2015
Kanawha River Plant	1-2	WV	400	Coal	2015
Phil Sporn Plant	1-4	WV	580	Coal	2015

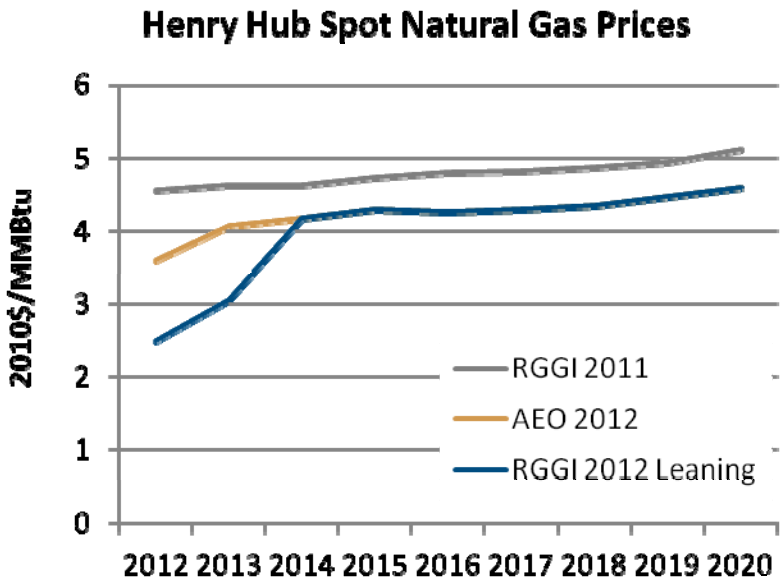
Firmly Planned Transmission Additions

- DESCRIPTION
  - Additions to existing capacity in planning or construction stages and assumed to be firm
  - IPM relies on transmission capability to help meet regional electricity demand
- 2011 RGGI REFERENCE CASE ASSUMPTIONS
  - Capabilities, including any planned additions, based on ISO studies
- 2012 PROPOSED APPROACH
  - (2011 Approach) Based on ISO studies

LEANING: Use ISO timing for capability expansion – MAPP in 2019; Susquehanna-Roseland by 2015; Hudson Line by 2013

Fuel Prices

- DESCRIPTION
  - Commodity and delivered prices for natural gas, oil products and coal
  - Delivered fuel prices are included in unit operation and investment decisions
- 2011 RGGI REFERENCE CASE ASSUMPTIONS
  - AEO 2011 for natural gas and oil
  - ICF supply curves calibrated to EIA AEO 2011 for coal
- 2012 PROPOSED APPROACH
  - EIA AEO 2012
  - EIA Short-term Energy Outlook
  - ICF supply curves calibrated to EIA AEO 2012 for coal



LEANING: (Oil and Gas) EIA July 2012 Short-term Energy Outlook (July 10 edition) for 2012 and 2013; EIA AEO 2012 for 2014 to 2020; transportation costs based on 10-year historical averages; (Coal) ICF supply curves calibrated to AEO 2012

Federal Environmental Policies

- DESCRIPTION
  - Federal air pollution requirements for SO_2, NO_X and air toxics under Clean Air Act
  - Regulation of coal combustion residuals (ash) under Resource Conservation Recovery Act (RCRA)
  - Regulation of water intake under Clean Water Act Section 316(b)
  - IPM must comply with assumed regulations as it operates units to meet demand

- 2011 RGGI REFERENCE CASE ASSUMPTIONS
  - Cross-state Air Pollution Rule (CSAPR)
  - National mercury MACT in 2015, requiring 90% removal from fuel input levels

- 2012 PROPOSED APPROACH
  - Final EPA rules
  - CSAPR in 2013
  - Mercury and Air Toxics Standards Rule (MATS) in 2016

LEANING: CSAPR in 2013; MATS in 2016

Renewable Portfolio Standards (RPSs)

- DESCRIPTION
  - RPS programs require that a portion of retail sales be met with generation from qualifying sources
  - IPM will comply with RPS targets in making operation and investment decisions, up to assumed alternative compliance payments (ACP)
- 2011 RGGI REFERENCE CASE ASSUMPTIONS
  - Modeled in three regional markets (New England, New York and PJM)
  - RPS targets met in all states
  - ACP levels specified by states
- 2012 PROPOSED APPROACH
  - Modeled in three regional markets (New England, New York and PJM)
  - RPS targets met in New England and PJM
  - Partial fulfillment of RPS target in New York based upon NYISO certainty criteria, capacity under RPS contract, and RPS funds currently approved for future solicitations.
  - ACP levels specified by states

LEANING: Three regional markets, by ISO, with regional ACPs specified by States

State Environmental Policies

- DESCRIPTION
  - State emission limits for SO_2, NO_X, and mercury, either as statewide cap and trade programs or unit-specific requirements
  - IPM must comply with state requirements in making operation and investment decisions
- 2011 RGGI REFERENCE CASE ASSUMPTIONS
  - Requirements as provided by state agencies
- 2012 PROPOSED APPROACH
  - (2011 Approach) Existing requirements for SO_2, NO_X and mercury, as provided by state agencies

LEANING: Existing requirements, provided by States

Cost and Performance of Pollution Controls and Firmly Planned Control Installations

- DESCRIPTION
  - Capital and operating costs of controls to control emissions of SO_2, NO_X and mercury, along with assumed percentage reduction in emissions
  - Firmly planned installations are those that are far enough along in development (planning or installation) that they are included in the model
  - IPM projects other control installations on an economic basis in response to regulatory requirements

- 2011 RGGI REFERENCE CASE ASSUMPTIONS
  - Control costs from EPA Base Case (v. 4.10 MATS Final)
  - Firmly planned controls based on public announcements, EPA NEEDS database and review by States

- 2012 PROPOSED APPROACH
  - Latest EPA Base Case assumptions
  - States for firm controls

LEANING: Control costs from EPA Base Case; States for firm controls

Transmission Capability

- DESCRIPTION
  - Existing interregional transmission capacity for use in moving energy across regional boundaries
  - IPM relies on transmission capability to help meet regional electricity demand

- 2011 RGGI REFERENCE CASE ASSUMPTIONS
  - Capabilities based on ISO reports and modeling

- 2012 PROPOSED APPROACH
  - Capabilities based on ISO reports and modeling
    - ISO-NE: 2012 Regional System Plan Assumptions (June 2012)
    - NYISO
    - PJM: 2011 RTEP and ICF analysis

- NOTES
  - The tables on the following slides show the transfer capability among RGGI states/regions.
    - "Zonal" limits are those that constrain a single link between two model regions.
    - "Interface" limits are those that constrain one or more links across model regions.

LEANING: ISO studies and modeling

Transmission Capability

Total Transfer Capabilities

New York

Source: NYISO

Sending Region	Receiving Region	Capacity (MW)	Energy (MW)	Sending Region	Receiving Region	Capacity (MW)	Energy (MW)
Zone A-E	Zone F	2750	2750	Zone F	Zone A-E	1999	1999
Zone A-E	Zones G-I	1600	1600	Zones G-I	Zone A-E	1600	1600
Zone A-E	Quebec	1000	1000	Quebec	Zone A-E	1310	1500
Zone A-E	Ontario	0	2050	Ontario	Zone A-E	0	2250
Zone A-E	PJM West	600	600	PJM West	Zone A-E	1080	1320
Zone A-E	Vermont	100	100	Vermont	Zone A-E	0	0
Zone F	Zones A-E	1999	1999	Zones A-E	Zone F	2750	2750
Zone F	Zones G-I	3200	3200	Zones G-I	Zone F	2000	2000
Zone F	Western MA	800	800	Western MA	Zone F	500	500
Zones G-I	Zones A-E	1600	1600	Zones A-E	Zones G-I	1600	1600
Zones G-I	Zone F	2000	2000	Zone F	Zones G-I	3200	3200
Zones G-I	Zone J	4350	4350	Zone J	Zones G-I	3500	3500
Zones G-I	Zone K	1200	1200	Zone K	Zones G-I	350	350
Zones G-I	CT	800	800	CT	Zones G-I	500	500
Zones G-I	PSEG	0	2100	PSEG	Zones G-I	0	100
Zone J	Zone K	0	0	Zone K	Zone J	270	270
Zone J	Zones G-I	3500	3500	Zones G-I	Zone J	4350	4350
Zone J	PSEG	0	-620	PSEG	Zone J	620	2060
Zone K	Zones G-I	350	350	Zones G-I	Zone K	1200	1200
PJM	NYISO	1080	2600	NYISO	PJM	2175	2175
ISONE	NYISO	300	1400	NYISO	ISONE	1400	1400

Transmission Capability

Total Transfer Capabilities

ISO-New England

Source: ISO-NE: Transmission Transfer Limits for Transportation Models: 2012 Regional System Plan Assumptions (June 2012)

	Interface Limit Assumptions (MW)						
Interface	2012	2013	2014	2015	2016	2017	2018-2020
New Brunswick–New England	700	700	700	700	700	700	700
Orrington–South Export	1,200	1,200	1,200	1,200	1,200	1,200	1,200
Surowiec–South	1,150	1,150	1,150	1,150	1,150	1,150	1,150
Maine–New Hampshire	1,600	1,600	1,600	1,600	1,600	1,600	1,600
North–South	2,700	2,700	2,700	2,700	2,700	2,700	2,700
Boston Import	4,900	4,900	4,850	4,850	4,850	4,850	4,850
SEMA Export	No limit	No limit	No limit	No limit	No limit	No limit	No limit
SEMA/RI Export	3,000	3,000	3,000	3,000	3,000	3,300	3,300
East–West	2,800	2,800	2,800	2,800	2,800	3,500	3,500
Connecticut Import	2,500	2,500	2,600	2,600	2,600	3,400	3,400
Southwest Connecticut Import	3,200	3,200	3,200	3,200	3,200	3,200	3,200
Norwalk–Stamford	1,650	1,650	1,650	1,650	1,650	1,650	1,650
Cross-Sound Cable (Export)	346	346	346	346	346	346	346
Cross-Sound Cable (Import)	0	0	0	0	0	0	0
NY–NE Summer	1,400	1,400	1,400	1,400	1,400	1,400	1,400
NY–NE Winter	1,875	1,875	1,875	1,875	1,875	1,875	1,875
NE–NY Summer	1,400	1,400	1,400	1,400	1,400	1,400	1,400
NE–NY Winter	1,400	1,400	1,400	1,400	1,400	1,400	1,400
HQ–NE (Highgate)	200	200	200	200	200	200	200
HQ–NE (Phase II)	1,400	1,400	1,400	1,400	1,400	1,400	1,400

https://www.npcc.org/Library/Resource%20Adequacy/NE_2011_Comprehensive_Review_of_Resource_Adequacy%20-%20RCC%20Approval%20-%2020111129.pdf

Transmission Capability

Total Transfer Capabilities

Eastern PJM (1)

Source: RTEP and ICF Analysis

Zonal Limits	Current		2019+ (with MAPP)	
	Capacity (MW)	Energy (MW)	Capacity (MW)	Energy (MW)
DPL to PSEG-N	-	-	-	-
PSEG-N to DPL	-	-	-	-
BGE to DPL	-	-	793	1,793
DPL to BGE	-	-	793	1,793
DPL to PSEG-S	-	1,265	-	1,265
PSEG-S to DPL	-	1,099	-	1,099
JCPL-W to PSEG-N	428	473	428	473
PSEG-N to JCPL-W	276	464	276	464
JCPL-W to PSEG-S	1,710	2,641	1,710	2,641
PSEG-S to JCPL-W	1,714	2,017	1,714	2,017
JCPL-E to PSEG-S	1,481	2,170	1,481	2,170
PSEG-S to JCPL-E	1,748	2,170	1,748	2,170
PEPCO to DOM	1,502	3,652	2,795	3,915
DOM to PEPCO	1,514	2,547	2,184	3,915
BGE to PECO	-	1,095	-	1,095
PECO to BGE	609	609	609	609
BGE to West Central	1,858	3,352	1,858	3,352
West Central to BGE	2,088	2,221	2,088	2,221
BGE to PEPCO	3,175	4,407	4,010	5,645
PEPCO to BGE	3,329	4,400	4,487	5,381
APS to PEPCO	1,670	3,689	1,670	3,689
PEPCO to APS	1,639	4,195	1,639	4,195
APS to BGE	-	-	-	-
BGE to APS	-	-	-	-

Transmission Capability

Total Transfer Capabilities

Eastern PJM (2)

Source: RTEP and ICF Analysis

Interface Limits	Current		MAPP Limits (2019+)	
	Capacity (MW)	Energy (MW)	Capacity (MW)	Energy (MW)
BGE to neighbors	5,632	7,988	6,012	8,528
neighbors to BGE	4,506	4,843	4,882	5,309
PEPCO to neighbors	4,859	8,900	6,861	11,400
neighbors to PEPCO	5,211	7,329	5,827	7,788

Reserve Margins and Local Requirements

- DESCRIPTION
  - Reserve margins reflect backup capacity required above peak demand to maintain system reliability, expressed as a percentage of peak demand. NYISO also has locational minimum installed capacity requirements for Zones J and K, specified as a percentage of peak load that must be met with in-zone resources
  - IPM must use existing capacity, transmission and new capacity options to meet reserve requirements in each region
  - Other requirements include units that must operate at certain times in order to maintain system reliability or that must burn specific fuels to meet state or local rules. These choices might not otherwise be made on an economic basis.

- 2011 RGGI REFERENCE CASE ASSUMPTIONS
  - ISO projections for all regions
  - NYISO local reserve requirements for Zones J and K. Included minimum unit operation levels to meet reliability and minimum fuel burn requirements in New York based on guidance from NYISO

- 2012 PROPOSED APPROACH
  - (2011 Approach) ISO projections, including local requirements for NYISO Zones J and K (see table below)
  - (2011 Approach) Include minimum unit operation levels to meet reliability and minimum fuel burn requirements in New York based on guidance from NYISO
  - NYISO requirements increase to 17% and 18% with retirements of Indian Point units 2 and 3

	2012	2013	2014	2015	2016	2017	2018	2019	2020+
ISO-NE	13.6%	12.6%	14.6%	14.4%	14.4%	14.4%	14.3%	14.2%	14.2%
NYISO	16.0%	16.0%	17.0%	17.0%	18.0%	18.0%	18.0%	18.0%	18.0%
PJM	15.5%	15.3%	15.3%	15.3%	15.3%	15.3%	15.3%	15.3%	15.3%

LEANING: Latest ISO projections for PJM and ISO-NE; projected 2012 reserve margin for NYISO, held constant; NYISO Zone J and K local requirements; Reliability unit requirements based on guidance from NYISO

Offsets (Additional Clarification)

- DESCRIPTION
  - Offsets are CO_2-equivalent emission reductions generated by eligible projects in sectors not affected by the RGGI program. Eligible categories are:
    - Landfill Gas
    - Agricultural Methane
    - SF_6
    - Afforestation
    - End-Use Energy Efficiency
  - Offsets can be used to meet 3.3% of a compliance obligation; this increases to 5% at a stage one trigger event ($7); and 10% at a stage two trigger event ($10). International offsets are only eligible following a stage two trigger event.

Offsets (Additional Clarification)

- 2011 RGGI REFERENCE CASE ASSUMPTIONS
  - (Domestic) EPA Marginal Abatement Curves (MACs), for Landfill Gas, Agricultural Methane, SF_6 and Afforestation, adjusted for RGGI
  - (International) Offsets available at market prices, based on World Bank report
- 2012 PROPOSED APPROACH
  - (Domestic) EPA Marginal Abatement Curves (MACs), for Landfill Gas, Agricultural Methane, SF_6 and Afforestation, adjusted for RGGI.
    - Model conservatively assumes no domestic offsets will be available for use in the RGGI market until CO_2 allowance prices reach $10/ton.
    - States considered market research on potential supply and prices, transactional costs for project developers, and the potential demand from other regulatory offset programs in selecting the $10/ton assumption above.
  - (International) Offsets projected price to be $8 from 2013-2020, based on recent Point Carbon historical and projected data. International offsets are only eligible following a stage two trigger event.

LEANING: Domestic- EPA adjusted supply when allowance prices reach $10/ton; International- Market Projections ($8/ton)

CO_2 Allowance Budget

- The modeling includes approximately 45 MM first control period allowances banked by market participants. These represent the difference between allowances in circulation and first control period compliance obligations.

- The proposed CO_2 allowance budget will be decreased by approximately 5MM a year for behind-the-meter units in DE, MD and NY.

DATA SOURCES

Potential Assumptions Sources

- This presentation included the following possible sources of assumptions:
  - **EIA AEO**: U.S. EIA's 2012 (Final) Annual Energy Outlook
  - **EIA Short-term Energy Outlook**: EIA's July 10, 2012 Edition
  - **ISOs**: Reports of PJM, ISO-NE, and NYISO, including:
    - PJM – 2011 Regional Transmission Expansion Plan (RTEP) and 2012 Load Forecast
    - ISO-NE – 2012 Capacity, Energy, Loads and Transmission report (CELT)
    - NYISO – 2012 Load & Capacity Data (Gold Book)
  - **EPA Base Case**: EPA Base Case v. 4.10 MATS Final
  - **Other**
    - State agencies
    - Other federal agencies
    - Utility public announcements and filings
    - Publicly available analyses

Data Sources for "Leaning" Assumptions

- **EIA:**
  - 2012 Final Annual Energy Outlook: http://www.eia.doe.gov/oiaf/aeo/assumption/index.html
  - Short-Term Energy Outlook (July 10, 2012): http://205.254.135.7/forecasts/steo/index.cfm

- **ISOs**:
  - PJM RTEP – http://pjm.com/documents/reports/rtep-documents/2011-rtep.aspx
  - PJM Load Forecast – http://pjm.com/~/media/documents/reports/2012-pjm-load-report.ashx
  - ISO-NE CELT – http://www.iso-ne.com/trans/celt/report/index.html
  - NYSIO Gold Book – http://www.nyiso.com/public/webdocs/services/planning/planning_data_reference_documents/2012_GoldBook.pdf

- **EPA:**
  - MATS Base Case: http://www.epa.gov/airmarkets/progsregs/epa-ipm/toxics.html

2012 RGGI SENSITIVITY ANALYSES ASSUMPTIONS

2012 RGGI Sensitivity Analysis of Reference Case

- No single set of assumptions or resulting projection is going to be "right" because of the uncertainty affecting many of the underlying drivers of power sector behavior.
- Important points of uncertainty can be examined by altering assumptions in sensitivity analysis to develop bounds around the Reference Case projections.
- The states have developed proposed 2012 sensitivity assumptions based upon the 2010/2011 IPM modeling for program review
- The states are proposing assumptions for two sensitivity analyses
  - Higher emissions combination with higher gas prices and higher regional energy and peak demand than the Reference Case
  - Lower emissions combination with lower gas prices and lower regional energy and peak demand than the Reference Case and changes in generation

Sensitivity Analyses Assumptions (Revised)

- The sensitivity analyses varies natural gas prices, electricity demand and generation.
- The table below summarizes the proposed assumptions for the cases
  - Natural gas prices for the cases are taken from high and low natural gas resource scenarios for AEO EIA 2012
  - Electric demand based on a combination of historical variation in load and projected differences by EIA and ISOs.

	Natural Gas Price Assumption	Demand Assumption	Generation
Higher Emissions Case	EIA "Low Estimated Ultimate Recovery" Scenario, resulting in gas prices 16% higher than Reference Case levels by 2020	Demand 3% higher than Reference in near-term, 4% higher in long-term	
Lower Emissions Case	EIA "High Technically Recoverable Resources" Scenario, resulting in gas prices 35% lower than Reference Case levels by 2020	Demand 3% lower than Reference in near-term, 4% lower in long-term	Indian Point not retired

Appendix-Regional Energy and Peak Demand Assumptions

Regional Energy and Peak Demand Assumptions
NY & New England Assumptions

- ISO-NE:
  - Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont: 2012 ISO-NE Forecast with Passive Demand Resources (PDR)

- New York: 2012 NYISO Forecast

Regional Energy and Peak Demand Assumptions

DE and MD Assumptions

- Delaware Load Forecast Assumptions:
  - 2012 PJM forecast for DPL Zone adjusted for efficiency
  - The DPL Zones of 3 Delaware counties and 2 Virginia Counties used assumptions for an EE forecast using the individual state goals for consumption (energy) reductions and peak demand reduction for DE and VA counties.
    - The Delaware forecast was based on a hard 15% reduction from 2007 numbers by 2015. Delaware assumed an additional 5% over the period 2016-2025 for a maximum 20% efficiency and stable to 2030
    - The Virginia forecast was based on the state's voluntary goal of 10% use reduction by 2022 with continuing moderate increase to 2025 and stable to 2030.While Virginia may not have intended its goal to apply to peak demand, the Virginia portion was only 47 MWs at maximum contribution.
  - Individual State starting points were established based on an allocation of the PJM forecast by population which assumes a similar diversity of customer classes. Actual state forecasts are not available.
  - Each of the states will take the actions necessary to achieve their stated goals and EE will not suddenly stop at 2015, but is anticipated to slow dramatically as less opportunity will be available.
  - The state goals are separate from the EE that PJM has qualified in its base capacity auctions since the PJM forecast does not yet include public policy goals.

Regional Energy and Peak Demand Assumptions
DE and MD Assumptions (2)

- Maryland Load Forecast Assumptions:
  - 2012 PJM Forecast was adjusted to reflect energy efficiency savings in accordance with EmPower Maryland goals.
  - Energy Forecast:
    - Years 2012 – 2014: reflect projected savings in accordance with utility plan submissions for EmPower goals.
    - Years 2015 and beyond: assume that the utilities reach at least 60% of their energy efficiency EmPower Maryland 2015 goals.
  - Peak Demand Forecast:
    - Years 2012 – 2014: reflect projected savings in accordance with utility plan submissions for EmPower goals.
    - Years 2015 and beyond: assume that the utilities reach at least 100% of their peak demand EmPower Maryland 2015 goals.