Integrating Markets and Public Policy: Using Competitive Markets to Achieve New England's Energy Decarbonization Goals

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Goal of the IMAPP effort

- Preliminary Step(s)
- Potential Solution Set



Goal: Align Markets and State Climate Policies

- Region-wide adoption of 80% by 2050 GHG reduction
- 70% of regional load (CT and MA) mandates reduction
- Markets dictate the nature of new resources
- Designed to reward traditional fossil generators

Do energy markets undermine environmental goals?



Goal: Fundamental Market Reform

- Markets produce resource mix that undermines state public policy
- Misalignment results in "unjust and unreasonable" rates
- Reform must remedy undue discrimination being caused by ISO/Markets
 - "benefits to some customers at the expense of others"
- Failure to remedy risks susceptibility to FPA § 206 complaint



A compliant market must account for climate costs and benefits.

Preliminary Step(s)

- Develop understanding of what we want the markets to deliver
 - Emissions-compliant, reliable mix trajectory through 2050
- Comprehensive, cross-sector 2050 roadmap modeling
 - Roadmap to inform trajectory of carbon price and help identify market-based approaches for achieving state policy goals
 - Tested, peer-reviewed, open-source model exists (initial results ~ 4 months)



Potential Solution Set

- Cost-effectively procure & reliably operate an emissions-compliant Grid
 - Energy Market (e.g., shadow / actual carbon pricing and dispatch)
 - Capacity Market (e.g., full compensation for all resources necessary to meet emissions laws)
 - Other Existing/New (e.g., Forward Reserve, balancing, storage)



Carbon-Intensity Dispatch Framework

- Establish Carbon Shadow Price (CSP)
 - Stakeholder agreement needed
 - Start low to moderate cost impact
 - Steady growth to high target to guide investment & retirements
- ISO MMU calculates Carbon Shadow Cost (CSC) for each generation block
 - Deduct RGGI price (if applicable) from CSP
 - CSC = (CSP RGGI) × Heat Rate × Fuel carbon content
- ISO MMU adds CSC to energy offers (as-bid or mitigated)
 - Dispatch Cost = Offer price + CSC
- ISO commits and dispatches system based on Dispatch Cost
 - LMPs reflect CSC of marginal unit(s)



Settlements in Carbon-Intensity Dispatch

- Suppliers paid LMP less unit-specific CSC
 - Creates a settlement surplus
- ISO credits sum of CSC to load



Example of Carbon-Intensity Dispatch CSP = \$20/ton CO2

Hypothetical Bid Stack

Unit	Unit Type	Capacity (MW)	Bid Cost (\$/MWh)	Emissions Rate (Tons CO2/MWh)	CSC (\$/MWh)	Dispatch Cost (\$/MWh)
Α	Wind	1000	\$-	0	\$-	\$-
В	Nuclear	1200	\$10	0	\$-	\$10.00
С	Coal	1500	\$30	1.035	\$20.70	\$50.70
D	Gas CC	3000	\$35	0.427	\$8.54	\$43.54
Е	Oil	500	\$40	0.88	\$17.60	\$57.60
F	Gas CT	800	\$42	0.61	\$12.20	\$54.20



Example of Carbon-Intensity Dispatch Load = 5,000 MW

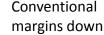
	As-Bid Dispatch						
Unit	Bid Cost (\$/MWh)	Dispatch	Emissions (tons CO2)		Payment (\$)	Gross Margin (\$)	
A—Wind	\$-	1,000	-		\$35,000	\$35,000	
B—Nuke	\$10.00	1,200	-		\$42,000	\$30,000	
C—Coal	\$30.00	1,500	1,553		\$52,500	\$7,500	
D—CC	\$35.00	1,300	555		\$45,500	\$-	
E—Oil	\$40.00	-	-		\$-	\$-	
F—CT	\$42.00	-	-		\$-	\$-	
System	\$35.00	5,000	2,108		\$175,000	\$72,500	

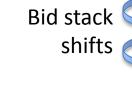
Carbon-Intensity Dispatch						
Unit	Dispatch Cost (\$/MWh)	Dispatch	Emissions (tons CO2)	CSC Charge /	Payment (+/- CSC)	Gross Margin
A—Wind	(\$/1010011)	1,000	(tons coz)	\$-	\$43,540	(\$) \$43,540
B—Nuke	\$10.00	1,200	_	\$-	\$52,248	
D—CC	\$43.54	2,800	1,196	\$23,912	\$98,000	
C—Coal	\$50.70		-	\$-	\$-	\$-
F—CT	\$54.20	-	-	\$-	\$-	\$-
E—Oil	\$57.60	-	-	\$-	\$-	\$-
System	\$43.54	5,000	1,196	\$23,912	\$193,788	\$83,788
Change	24%		-43%		11%	16%



Renewable margins up

Conventional





Coal displaced, dropping emissions



Total Stakeholder Impacts

- Zero- and low-emissions supply resources
 - LMPs with carbon adder improves energy market margins
- Conventional supply resources
 - Energy margins now depend greatly on carbon intensity
 - Capacity revenues likely decline, as new units set clearing price
- Consumers
 - Some increase in energy prices, partly offset by CSC rebate
 - Expected decline in capacity prices
 - Expected decline in cost of existing renewables support programs



Preferred Outcomes: How we Achieve Them

Outcomes:

- Market comes to reflect realistic cost of carbon
- Dispatch prioritizes low and no-carbon generators
- Firming resources adequately compensated

Achieving Them:

- Transparent process
 - Post all documents on state, NESCOE, NEPOOL and ISO websites
 - Provide portal for public comment
 - Meetings for non-NEPOOL participants
- Independent modeling and analysis for ISO-NE
 - Access to supporting data and analysis

