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

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August 11, 2016

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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)
A	Wind	1000	$-	0	$-	$-
B	Nuclear	1200	$10	0	$-	$10.00
C	Coal	1500	$30	1.035	$20.70	$50.70
D	Gas CC	3000	$35	0.427	$8.54	$43.54
E	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 ($/MWh)	Dispatch	Emissions (tons CO2)	CSC Charge / Credit	Payment (+/- CSC)	Gross Margin ($)
A—Wind	$-	1,000	-	$-	$43,540	$43,540
B—Nuke	$10.00	1,200	-	$-	$52,248	$40,248
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%

Bid stack shifts

Renewable margins up

Conventional margins down

Coal displaced, dropping emissions

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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