LIPA
Long Island Power Authority

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Providing for Beneficial Electrification

Beneficial Electrification

Some load growth results in negative net carbon emissions, increased generator margins, and reduced rates. If appropriately reflected, loads, generators, transmission and the environment could benefit.

- Technologies that improve load factor can reduce customer rates as fixed costs are spread over more MWh sold.
- BE includes any load growth that reduces customer rates and results in a switch from a higher carbon intensity non-electric fuel to a lower carbon electric application. Examples include:
  - Vehicle electrification (replacing gasoline)
  - Ground source heat pumps (replacing oil, etc.)
  - Load from existing carbon reduction programs would also be included.

BE Load Growth

But, BE can:

- Increase marginal E&AS prices as dispatch increases
- Increase the marginal emission rate
- So, how do we parse these impacts assuring that load pays and generators are paid prices that reflect marginal carbon, while reflecting the value of BE at reducing carbon, but without skewing dispatch?

Example

Suppose an 80% efficient oil-fired home heating system is replaced with a ground source heat pump.

- Fuel Oil – 161 lb CO2/MMBTU
- <u>LB CO2 per Useable MMBTU = 201</u>
- GS Heat Pump Coefficient of Performance = 3
- 3.413 MMBTU/MWh * 3 = 10.239 MMBTU/MWh
- Electric System MER 0.5 Tons/MWh
- 1000 lbs/10.239 MMBTU
- <u>LB CO2 per Useable MMBTU = 98</u>
- Net Savings = 103 lb CO2/MMBTU
- Net Savings = 34 lb CO2/MWh

Reflecting Carbon Reductions of BE

As shown, BE load growth may create beneficial net carbon emission reductions, but should these be reflected in the price BE load growth pays, and if so, how?

Pros:

- Provides a greater BE incentive
- More accurately reflects the carbon impact of BE

Cons:

- More Complex to implement
- More difficult to measure and verify

Proposal:

- Reflect all BE load growth and existing BE program load as zero marginal emissions.

Proposal

Although BE load growth may create beneficial net carbon emission reduction, reflecting these carbon reductions in electric carbon pricing could be difficult to administer. However, BE load growth could be represented in the electric sector as having zero marginal carbon impact without skewing dispatch:

- BE load growth pays no carbon component of LBMP.
- Non-BE load pays normal marginal carbon component of LBMP.
- Generators bid and receive SCC less BE load growth carbon offset
- Generator margins with BE load growth are greater than or equal to margins without BE growth.
- BE Offsets awarded through LSE.

Why Award Offsets through the LSEs?

The proposal awards SCC offsets through the LSE's for beneficial load growth within its customer set:

- NYISO's is a wholesale tariff and LSE's are wholesale entities.
- Allows continued funding for current LSE carbon abatement incentive programs.
- Provides an incentive for LSE's to encourage beneficial load growth, through customer incentives, etc.
- Creates a premium for LSE's serving customers in beneficial categories.
- Provides the PSC with continued jurisdiction over the treatment of offset revenues at the retail level.

What Should Be Considered BE?

A variety of electrification efforts might result in carbon reductions; however, not all will benefit customers. Some additional considerations should apply:

- Should improve load factor.
- Should prevent increases in fixed costs to regulated natural gas customers.
- Should consider offsetting increases in the fixed cost to electric customers associated with load growth at the sub-transmission, feeder and distribution levels.

Simple Example – Two Generator System

Suppose an area has two generators:

Generator 1:

- Energy Cost - a 95 MW, 8,000 Heat Rate unit burning gas at \$3/MMBTU for an Energy cost component of \$24/MWh.
- Carbon Damage Cost - With gas at 113 lbs CO2/MMBTU, the unit's marginal emissions rate is 0.452 Tons/MWh, at \$60/ton yields a \$27.12/MWh carbon adder.
- Carbon Damage Cost Adjusted for BE - \$60/ton less say 10% from BE yields \$54/ton yields a \$24.41/MWh carbon adder.
- Total marginal cost Generator 1 - \$48.41/MWh

Simple Example – Two Generator System

Generator 2:

- Energy Cost - a 20 MW, 10,000 Heat Rate unit burning gas at $3/MMBTU for an Energy cost component of $30/MWh.
- Carbon Cost - With gas at 113 lbs CO2/MMBTU, the unit's marginal emissions rate is 0.565 Tons/MWh, at $60/ton yields a $33.90/MWh carbon adder.
- Carbon Damage Cost Adjusted for BE - $60/ton less say 10% from BE yields $54/ton yields a $30.51/MWh carbon adder.
- Total marginal cost Generator 2 - $60.51/MWh

Simple Example – No BE Load Growth

Suppose that absent BE load growth, the load is 90 MW:

- Regular Load – 90 MW
- Marginal Generator is a 95 MW, 8000 Heat Rate unit burning gas at $3/MMBTU for an Energy cost component of $24/MWh.
- Carbon Damage Cost Adjusted for BE – Generator 1's carbon cost $24.41/MWh carbon adder.
- The LBMP is $48.41/MWh
- Generator margins are zero since Generator 1 is marginal

Simple Example – With BE Load Growth

Suppose BE increases load by 10 MW:

- Regular Load – 90 MW
- BE Load Growth – 10 MW (or 10% of total load)
- Marginal Generator becomes Generator 2, the 20 MW, 10,000 Heat Rate unit burning gas at $3/MMBTU for an Energy cost component of $30/MWh and adjusted carbon cost component of $30.51/MWh at an LBMP of $60.51.
- BE increases generator margins for inframarginal Generator 1.

Settlement Summary (Generation)

	Fuel Cost $ /MWh	CO2 Cost $ /MWh	Adj. CO2 Cost $ /MWh	Total Cost $ /MWh	Out-put MWh	LBMP $ /MWh	Re-venue $	Fuel Cost $	Adj. CO2 Cost $
Gen 1	24.00	27.12	24.41	48.41	95	60.51	5,748	2,280	2,319
Gen 2	30.00	33.90	30.51	60.51	5	60.51	303	150	153
Total					**100**		**6,051**	**2,430**	**2,471**

Settlement Summary (Load)

	Load MWh	LBMP $ /MWh	Load Pays $	BE Re-bate $	Rem. Re-bate $	Total Re-bate $	Net Pay-ment $	Net Pay-ment $ /MWh
Reg Load	90	60.51	5,446	-	2,166	2,166	3,280	36.44
BE Load	10	60.51	605	305	-	305	300	30.00
Total			**6,051**	**305**	**2,166**	**2,471**	**3,580**	

Measurement and Verification

Load forecasting typically includes some statistical evaluation of appliance saturation and the econometric forecasting of changes in appliance saturation by type as driven by econometric forecasts.

- In addition, incentive programs track participant data providing additional clarity in appliance saturation.
- This proposal uses near term load forecast measure saturations, backed by incentive program participant data, and survey data as needed.

Matching Carbon Pricing and BE Load Reductions

The NY MER will change as dispatch changes. How do we match BE load shape with hourly MER trajectory?

- This proposal uses the forecast BE hourly load shape and NYISO's DAM hourly MER.

Software Considerations

Degree of software effort is an important consideration especially for initial implementation.

- This proposal uses the forecast BE hourly load shape which can be prepared in advance and NYISO's DAM hourly MER which needs to be produced in any case.
- Although changes to dispatch software would not be needed, changes to settlement software would be needed.