NYISO Carbon Pricing

Considerations for the Carbon "Clawback" Proposal
Presentation to IPPTF

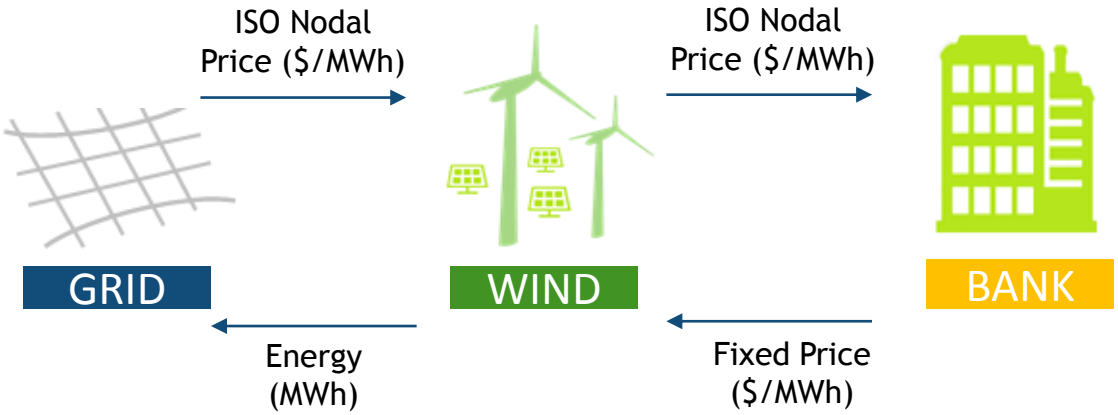
October 22, 2018

Summary

- As proposed by NYISO, removing carbon prices from LBMP is extremely disadvantageous to the economics of projects that have hedges in place
- Energy hedges will settle at the LBMP, but power produced by the unit is settled at the LBMP net of carbon
- Calpine proposes applying a discount that modifies the carbon price to account for the estimated carbon emissions savings from the limited number of Tier 1 resources with existing RECs
- A discount to the social cost of carbon that decreases as REC contracts roll-off could integrate the beneficial impacts of RECs and carbon pricing without disrupting commercial hedging practices that are integral to the economics of renewable projects
- Calpine offers this alternative proposal and welcomes continued discussion on ways to treat resources with existing REC contracts fairly and with minimal impacts on commercial practices and the investment climate

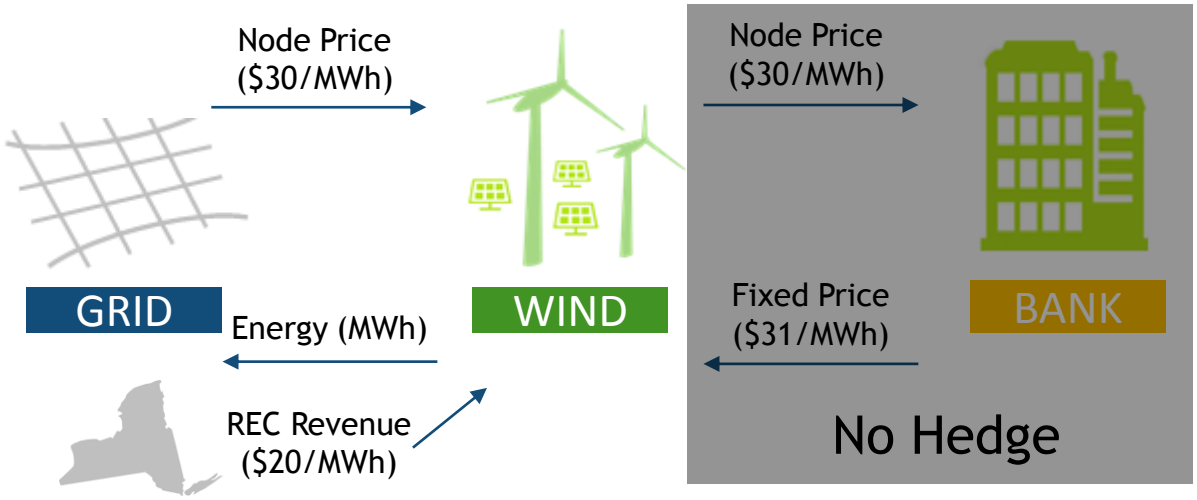
Bank Hedge Overview

- Development projects with REC contracts typically hedge to secure tax equity financing
- The hedge is required by the project lender to make energy revenue more certain
- The most popular type of hedge is a fixed-for-floating price swap
  - Project company receives a pre-agreed fixed $/MWh price from a bank, and the project pays the bank the underlying LBMP – this structure insures a certain amount of energy revenue for the project
  - Such instruments can be done at the price point of the generator, but they are more frequently done at the nearest hub



Clawing back the carbon component is disadvantageous to the economics of projects that have hedges in place - the energy hedge is settled at the LBMP, but power produced by the unit is settled at the LBMP net of carbon ...

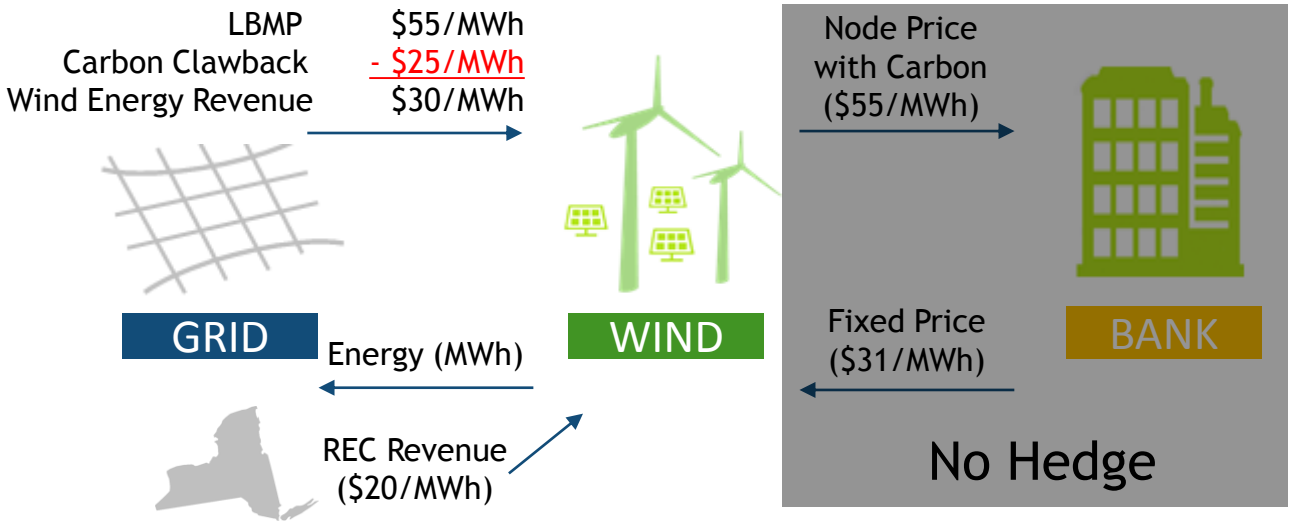
Merchant Project without Hedge - *Pre Carbon*



Pre Carbon	Price/MWh
REC Revenue	$20
Wind Energy Revenue	$30
Total Revenue	**$50**

Merchant Project without Hedge - *Post Carbon*

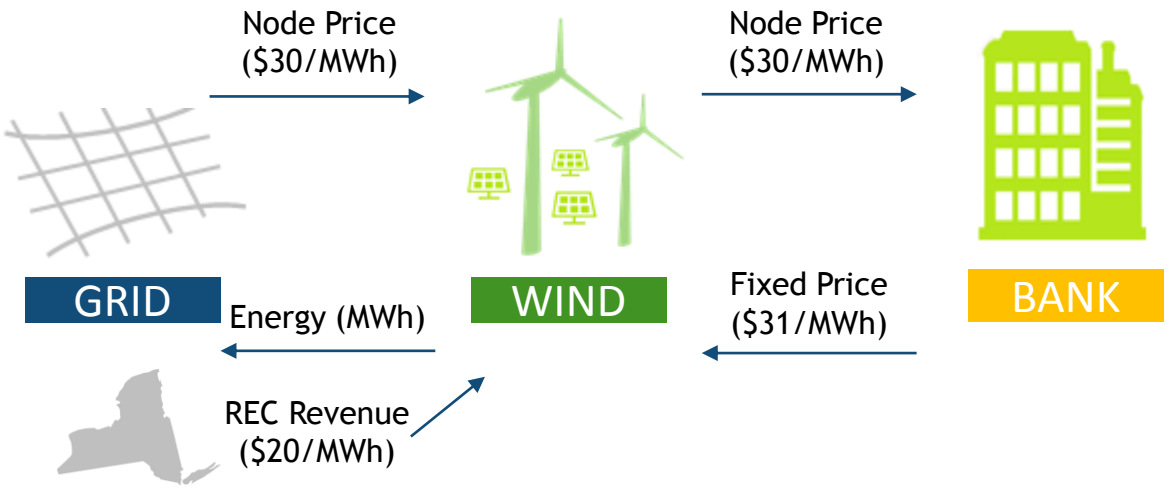
Post Carbon



Post Carbon	Price/MWh
REC Revenue	$20
LBMP (with Carbon)	$55
Carbon Clawback	($25)
Wind Energy Revenue	$30 ($55-$25)
Total Revenue	**$50**

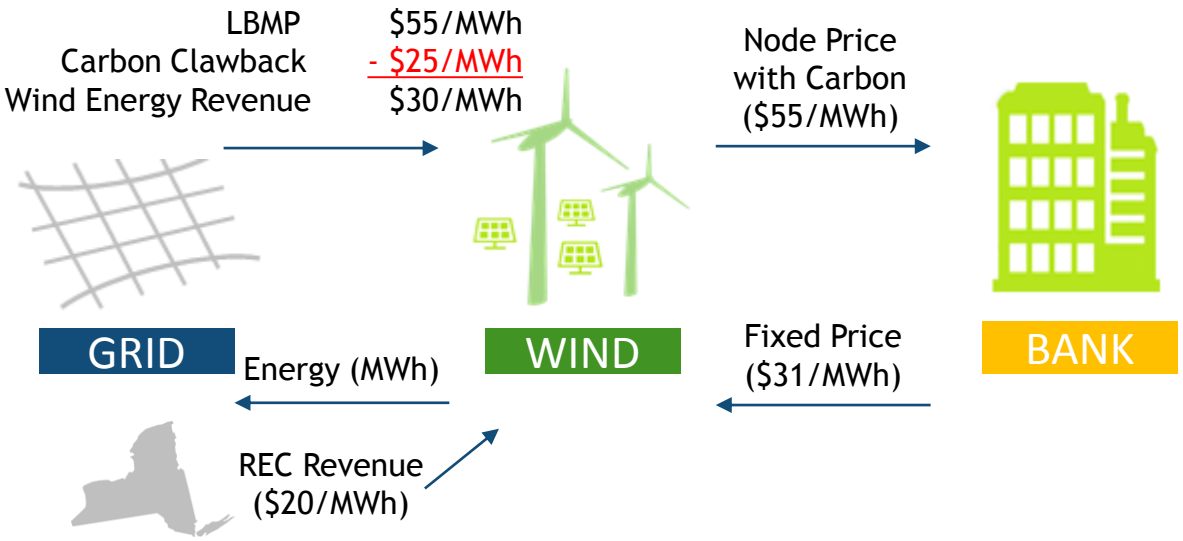
Merchant transactions are unaffected by the clawback of the carbon price

Project with Hedge - *Pre Carbon*



Pre Carbon	Price/MWh
REC	$20
NY Carbon Adder	$0
LBMP	$30
Hedge Fixed Price	$31
REC Revenue	$20
Wind Energy Revenue	$30
Bank Hedge Value	$31-$30 = $1
Total Revenue	**$51**

Project with Hedge - *Post Carbon*



Post Carbon	Price/MWh
REC	$20
NY Carbon Adder	$25
LBMP	$55
LBMP (net carbon adder)	$30
Hedge Fixed Price	$31
REC Revenue	$20
Wind Energy Revenue	$30
Bank Hedge Value	$31-$55 = ($24)
Total Revenue	**$26**

Project Owner must pay LBMP with carbon to Bank despite carbon being removed

Alternative Proposal

- Calpine Proposal – Discount social cost of carbon by the carbon savings provided by Tier I RECS

Illustrative Example

Cost of Carbon	$45/ton
NYSERDA RECS	6,000,000 MWh/year
Carbon Savings/MWh of REC	0.4 tons/MWh
NYISO Carbon Emissions	24,000,000 tons/year

Social Cost of Carbon Discount = $\frac{0.4\ tons}{MWh} \times \frac{6{,}000{,}000\ MWh}{24{,}000{,}000\ tons} \times \frac{\$45}{ton}$ = $4.50/ton

Use $40.50/ton net of RGGI to calculate the LBMP

- Discounted carbon price:
  - Integrates the benefits of RECs and carbon pricing within wholesale markets and reduces consumer costs.
  - Recognizes the costs ode to existing REC contracts and avoids over-paying resources for the same attribute.
  - Reduces load overall payments (and rebates) and allows for single LBMP at each node.
  - Enables important commercial practices like energy price hedging.
  - The discount to the Social Cost of Carbon decreases as existing REC contracts roll off.
- Discount would likely not be enough to systematically change dispatch so we do not expect it to cause increased carbon emissions

APPENDIX

Merchant Project without Hedge

Without Bank Hedge

Pre Carbon	Price/MWh	Post Carbon	Price/MWh
REC(1)	$20	REC(1)	$20
NY Carbon Adder	$0	NY Carbon Adder	$25
LBMP	$30	LBMP(2)	$55
		LBMP (net carbon adder)	$30
REC Revenue	$20	REC Revenue	$20
Wind Energy Revenue(3)	$30	Wind Energy Revenue(3)	$30
Total Revenue	**$50**	**Total Revenue**	**$50**

(1) Renewable Energy Credits only paid if renewable energy generated

(2) Wholesale energy price + carbon adder

(3) Wholesale energy price stays the same, but carbon portion is removed

Project with Hedge

With Bank Hedge

Pre Carbon	Price/MWh	Post Carbon	Price/MWh
REC	$20	REC	$20
NY Carbon Adder	$0	NY Carbon Adder	$25
LBMP	$30	LBMP[(1)]	$55
		LBMP (net carbon adder)	$30
Hedge Fixed Price[(2)]	$31	Hedge Fixed Price[(2)]	$31
REC Revenue	$20	REC Revenue	$20
Wind Energy Revenue[(3)]	$30	Wind Energy Revenue[(3)]	$30
Bank Hedge Value[(4)]	$31-$30 = $1	Bank Hedge Value[(4)]	$31-$55 = ($24)
Total Revenue	**$51**	**Total Revenue**	**$26**

(1) Wholesale energy price + carbon adder

(2) Hedge put in place against all known forecasted LBMP data

(3) Revenue from merchant sale of energy at Hub

(4) Hedge Value at Hub= Hedge Fixed Price – LBMP (with Carbon Adder)