DC Line Scheduling Design

Scott Harvey

NYISO Market Issues Working Group

March 16, 2022

Topics

- Background
- Overview
- Illustrative Examples
  - Designs with constrained DC line
  - Designs with unconstrained DC Line
- Next Steps

Background

NYSERDA's Tier 4 REC initiative has driven the prioritization of this project, which will develop market participation rules for internal controllable lines. The energy market rules proposed in this presentation are designed to accommodate the Clean Path proposal that is being considered by the New York Public Service Commission.

- The project will culminate in a Market Design Concept Proposed (MDCP) by Q4 2022.

The purpose of today's presentation is to discuss examples illustrating the NYISO's thinking on Energy Market scheduling and settlement for internal controllable lines.

- The examples are intended to roughly illustrate the operation of the NYISO design in the context of an internal DC line.
- The NYISO design is intended to accommodate internal controllable lines with a range of different project structures.

Overview

The discussion in these slides and the examples that follow assume:

1. The NYISO optimizes flows over the DC line based on economic dispatch, meeting New York load at least as-bid cost, taking account of the incremental O&M costs and incremental losses of DC line operation.
2. The DC line owner will buy power at the LMP price at the source of the DC line and sell the power it delivers into Zone J at the LMP price at the sink of the DC line.
3. The DC line owner will retain the congestion rents generated by the operation of the line.
4. No TSC will be collected on withdrawals from the grid at the source of the DC line.
5. Any REC payments will occur outside the NYISO settlement system.
6. The NYISO design for internal controllable lines is intended to apply to flows in either direction on an internal DC line but we have not included any examples of that in these slides.

Overview

The NYISO's DC line operation design proposal has the following implications.

- The economic dispatch will be system least-cost given the offers of the resources.
- Wind and solar generators that receive Tier 1 or other REC subsidies are expected to submit negative offers to ensure that their generation is not dispatched down before other resources with higher costs or lower subsidies.
- In periods in which the DC line is fully utilized, the DC line owner will receive congestion rents for delivering power into Zone J.

If the DC line is not fully utilized, prices in either Zone J or E (upstate) can be set by the price of power at the source or sink of the line and the cost of flows over the DC line.

- If the NYISO schedules the DC line based on its variable O&M costs, the DC line owner will just recover its costs in the price difference between the source and sink of the DC line, with the difference in prices equaling the DC line's variable costs.

Examples

Assumptions

The observations above are illustrated in the examples that follow. These examples assume:

- The NYISO schedules use of the line to minimize total production costs taking account of 1) O&M costs and 2) losses.
- The outage of the DC line is not a binding contingency in the real-time dispatch.
- The DC line sinks within a constrained generation pocket within Zone J.
- There is no other transmission line receiving similar payments for delivery of power into Zone J from the same upstate region.
- Tier 1 production will be divided into two categories. The first grouping of Tier 1 wind and solar resources ("Tier 1a") will be offered into the market at -$21, reflecting the value of its Tier 1 REC payments.
- The second group of Tier 1 wind and solar resources ("Tier 1b") have a larger subsidy. Output from the Tier 1b generators is offered at -$21.5 to displace Tier 1a production on the margin.
- Offshore wind production is offered into the market at –$44, reflecting the incentives of the offshore wind contracts. This is a very rough estimate which may not be accurate, but it is used to illustrate potential interactions between the offshore wind REC payments and the REC payments to other resources.

Constrained DC Line Examples

Constrained DC Line

This cases considered in this section are:

- Case 1: Project generation output is less than the flows on the DC line and thermal generation is on the margin in Zone E.
- Case 2: Project generation output exceeds the flows on the DC line, but thermal generation is on the margin in Zone E.
- Case 3: Project generation output exceeds the flows on the DC line and project generation is on the margin in Zone E.

Constrained DC Line

Case 1

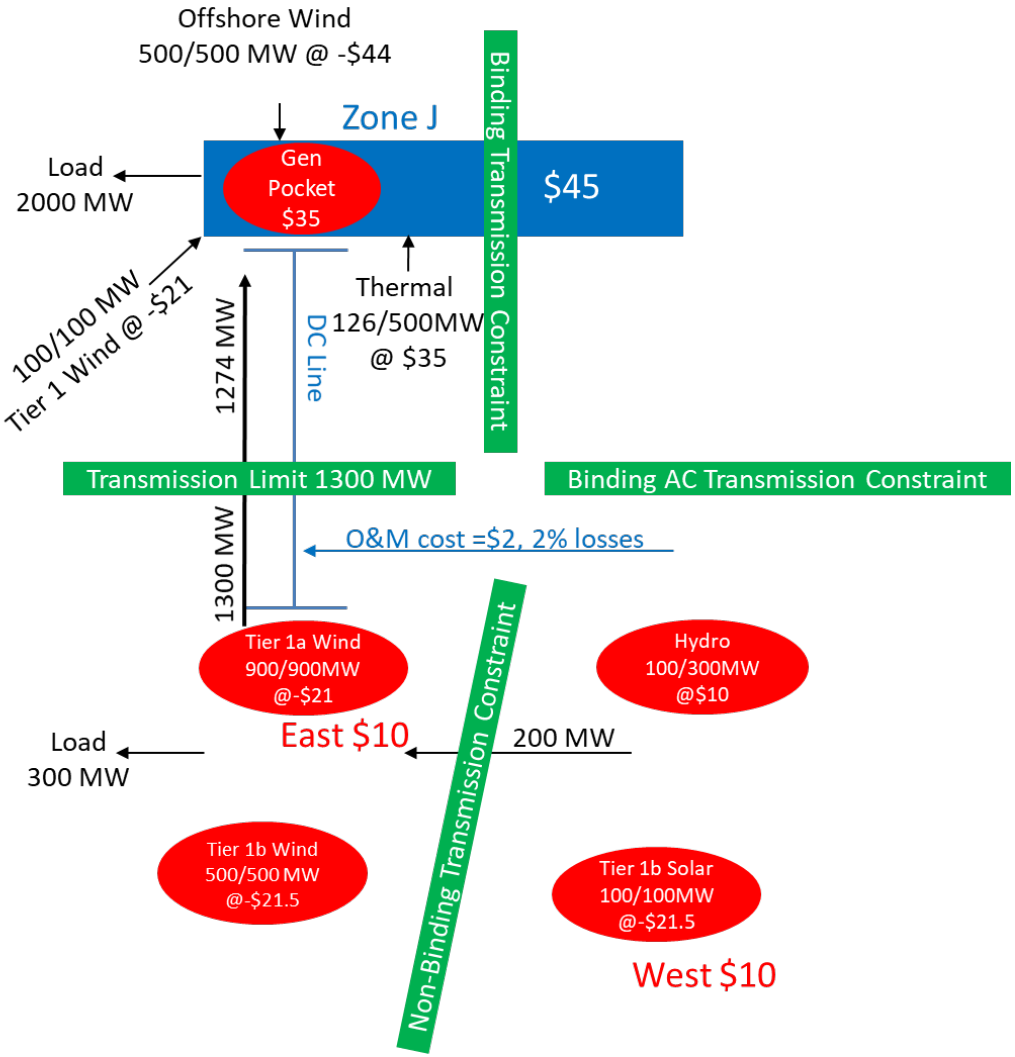
Case 1, the DC line is fully utilized with hydro generation on the margin in Zone E.

- The New York ISO would be revenue adequate with payments from load and payments by the DC line owner to purchase power exactly covering payments to generation and for deliveries by the DC line.
- The DC line owner would earn congestion rents attributable to meeting load in Zone J with the lower cost generation in Zone E.

	DC line net revenues			
MW			Prices	Payments
1,300	purchases		$10	-$13,000
1,274	sales		$35	$44,590
1,274	O&M costs		$2	-$2,548
			margin	$29,042

Constrained DC Line

Case 1



Constrained DC Line — Case 2

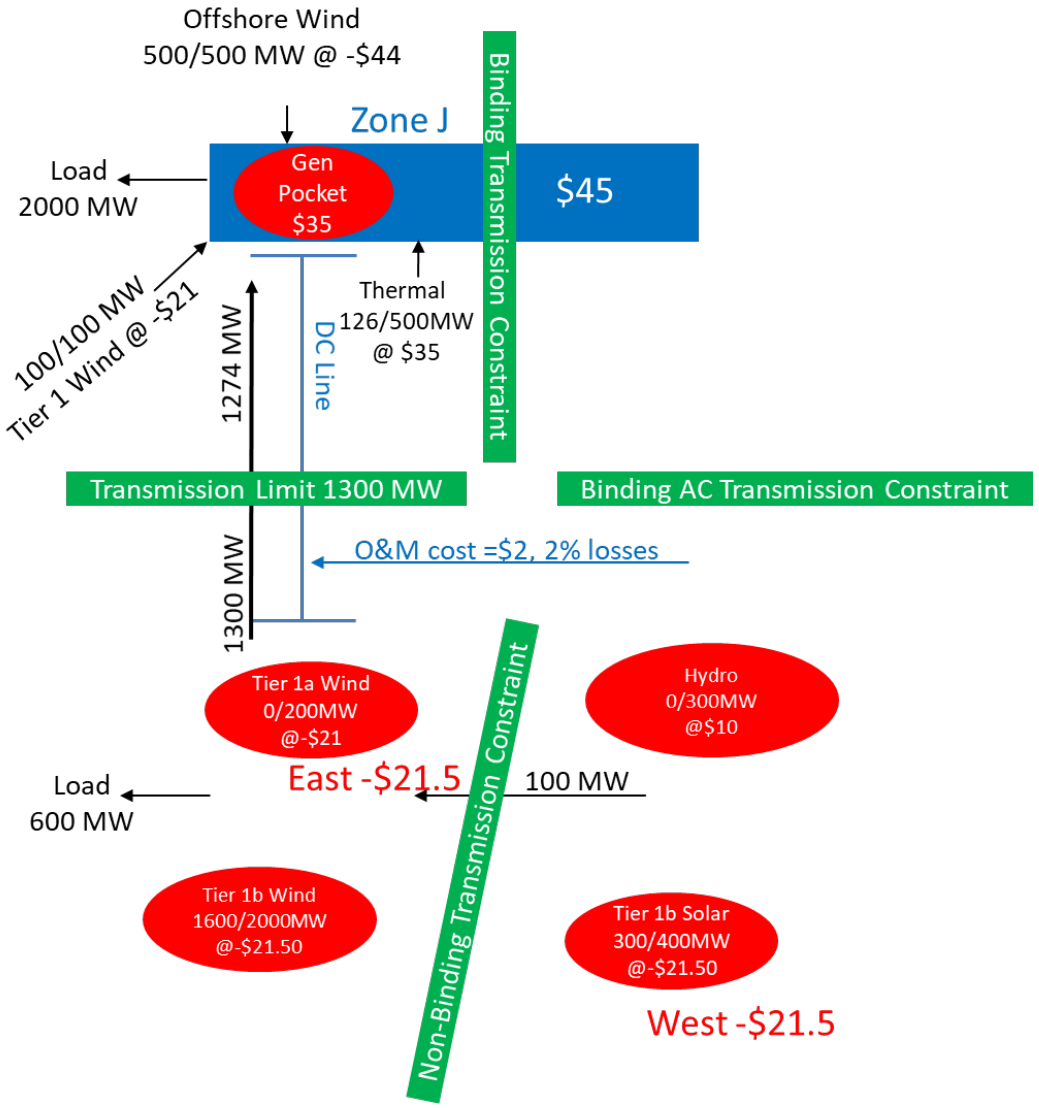
Case 2, the DC line is again fully utilized so prices in Zone J are set by the offer prices of Zone J generation. However, in this example, Tier 1b wind and solar generation is on the margin in Zone E, setting prices.

- The New York ISO would be revenue adequate with payments from load and payments for purchases by the DC line owner exactly covering payments to generation and payments for deliveries by the DC line.
- Output of Tier 1b generation exceeds the load plus flows on the DC line so Tier 1b generator offer prices would set prices in Zone E at -$21.5, slightly below the value of Tier 1a subsidies, displacing Tier 1a generation output offered at -$21.
- The DC line owner would earn congestion rents on the difference between Zone J and Zone E prices.

	DC line net revenues			
MW			Prices	Payments
1,300	purchases		-$21.50	$27,950
1,274	sales		$35.00	$44,590
1,274	O&M Costs		$2.00	-$2,548
			margin	$69,992

Constrained DC Line

Case 2



Unconstrained DC Line Example

Unconstrained DC Line

Case 3

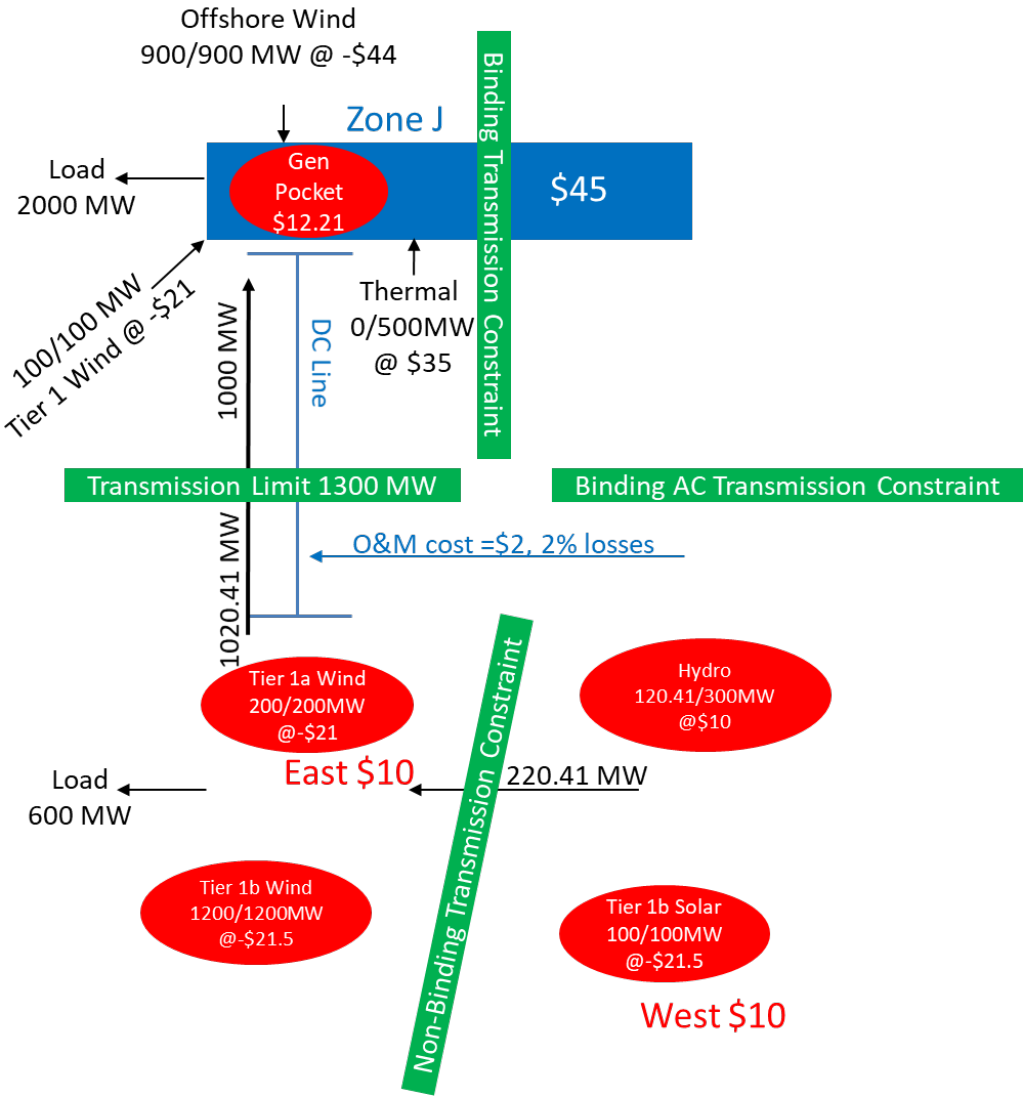
Case 3: In this case the DC line is not fully utilized so Zone E production is on the margin in Zone J, displacing all thermal generation in Zone J.

- The New York ISO would be revenue adequate with payments from load and payments for purchases by the DC line owner exactly covering payments to generation and payments for deliveries by the DC line.
- The DC line owner would basically break even in NYISO markets if the DC line were scheduled based on its O&M costs by the NYISO.

	DC line net revenues			
MW			Prices	Payments
1,020.41	purchases		$10	-$10,204.10
1,000	sales		$12.21	$12,210
1,000	O&M Costs		$2	-$2,000
				$6
			margin/MWh	$0.01

Unconstrained DC Line

Case 3



Next Steps

April, May: Continued discussions on Energy Market design (ICAPWG/MIWG)

April, May: Capacity Market design discussions (ICAPWG/MIWG)

May, June: Discuss any open items (ICAPWG/MIWG)

July, August: Consumer Impact Analysis discussions (ICAPWG/MIWG)

End of Q4: Market Design Concept Proposed

Appendix

Previous Presentations

- 2/3/22: Kick-Off presentation discussing project scope and timeline
  - 2/3/22 MIWG Presentation