Full Network Model Development

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TOPICS

- Model testing, calibration and evolution
- Physical constraints and scheduling limits
- Contract path entitlements and transmission expansion
- Congestion rent shortfall allocation

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TESTING AND CALIBRATION

It should be possible for the California ISO to develop methods that will enable it to improve its current forecast of loopflow impacts on internal transmission constraints (i.e. assuming that they will be zero).

- Such improvements will enable it to :
  - Better account for real-time conditions in its day-ahead unit commitment and interchange scheduling,
  - Reduce real-time congestion rent shortfalls, and
  - Improve convergence between day-ahead and real-time prices.
- This is not an unrealistic objective, other ISOs have been able to achieve this.

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TESTING AND CALIBRATION

It should not, however, be assumed that this modeling effort will be easy and the methods the California ISO envisions using to predict real-time loopflows will immediately yield accurate predictions.

- The California ISO needs to be prepared to test its predictions, and adjust its methodology to achieve the intended level of accuracy in loopflow predictions.
- Some adjustments will likely need to be made prior to full network model implementation to ensure that the initial implementation provides some immediate improvement;
- The implementation also needs to be flexible and able to accommodate the likely need for continuing adjustments in the models and methods used to predict real-time loopflows following the initial implementation.

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TESTING AND CALIBRATION

Some of the challenges in improving the modeling of real-time loopflows will be:

- California ISO net interchange will initially be modeled as sourcing and sinking on tie lines, not in balancing authority areas;
- Not all balancing authority areas will initially be modeled in detail;
- The distribution of generation and load in modeled balancing authority areas will not be accurate for every hour;
- The impact of real-time loopflows will be impacted by changes in network topology external to the California ISO;
- The schedules available to the California ISO at the time it solves the day-ahead market will be incomplete and will not be final.

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MODELING PHYSICAL TRANSMISSION CONSTRAINTS

The California ISO already prices interchange taking into account its impact on both physical transmission constraints (on lines other than tie lines) and contract path scheduling limits.

- The congestion component at the ties includes congestion on both physical transmission constraints internal to the California ISO and scheduling limits (if this were not the case the price at the ties would equal the price at the distributed load bus less losses whenever the scheduling limit on that line was not binding).
- Congestion components that account for the impact of flows on both physical constraints and scheduling limits are neither unique to the California ISO nor a recent design. The New York ISO has priced interchange taking account of both physical constraints and scheduling limits for 14 years.

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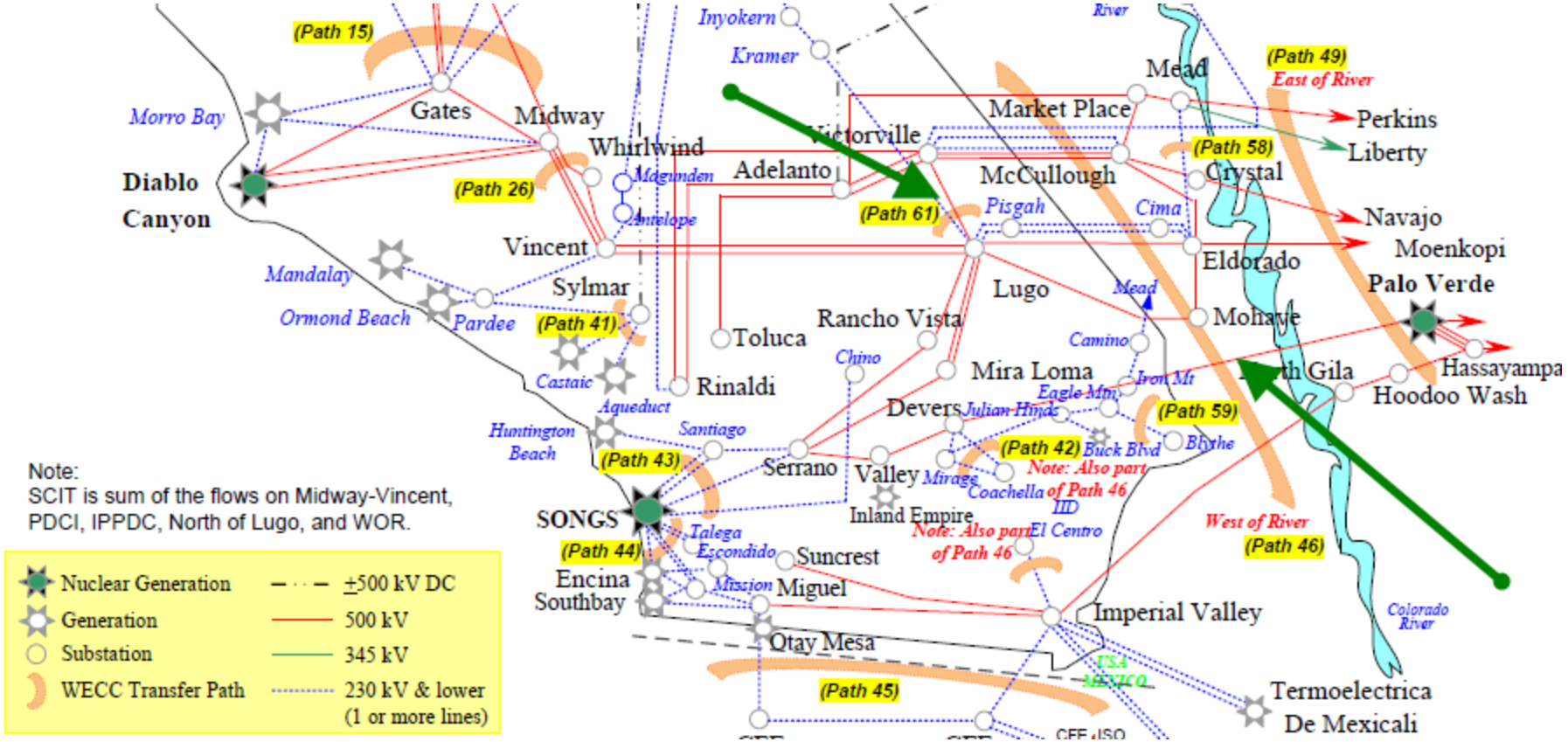
MODELING PHYSICAL TRANSMISSION CONSTRAINTS

One of the internal constraints that the California ISO believes has been impacted by loopflows is Victorville Lugo.



MODELING PHYSICAL TRANSMISSION CONSTRAINTS

The Victorville Lugo constraint is impacted by flows due to California ISO interchange, internal generation and loopflows.

- Managing the impact of loopflows on this constraint by reducing scheduling limits on the tie lines would be an extremely inefficient way to account for the impact of the loopflows.
- Congestion on the line can be managed by redispatching internal California ISO generation without curtailing imports.
- If the redispatch required to manage congestion is expensive, however, this reduces the value of the imports and should be reflected in the price paid for the imports.
- Import suppliers can determine through their bids whether it is worthwhile to them to pay for the redispatch required to accommodate their transaction.

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MODELING PHYSICAL TRANSMISSION CONSTRAINTS

Enforcing physical transmission constraints on tie lines in the day-ahead market, and including their congestion component in prices, is not a fundamental change, it is simply adding a few more physical constraints to the many physical transmission constraints that are currently enforced in the day-ahead market and impact the price of interchange.

- Physical transmission constraints and scheduling limits tend to be duplicative within the current modeling framework because interchange has a shift factor of 1 on both constraints.
- This pattern will be completely changed with the inclusion of network topology outside the California ISO. Interchange schedules will have fractional shift factors on physical transmission constraints on the tie lines, just as they currently have fractional shift factors on the many other physical transmission constraints currently enforced on the California ISO transmission system.

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MODELING PHYSICAL TRANSMISSION CONSTRAINTS

The modeling of physical transmission constraints on tie lines will need to be guided by the California ISO's testing and calibration effort.

- When enforcing physical constraints on particular lines in the day-ahead market, the California ISO will need to take into account the accuracy of its interchange and loopflow predictions.
- The modeling of interchange as sourced on the tie lines and other approximations could lead to inaccurate flow predictions on some tie lines.
- If these limitations are not accounted for by other elements of the modeling (such as the possible use of compensating injections in some situations), the California ISO may need to adjust the limits enforced in the day-ahead market on some lines.

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CONTRACT PATH ENTITLEMENTS

While the contract path scheduling system has to be used between balancing authority areas that do not coordinate congestion management, it is the physical limits that ultimately limit transfer capability.

- Transmission investments that create contract path entitlements without increasing the physical transfer capability of the grid have no value.
- Transmission investments that create contract path entitlements but do not increase the physical transfer capability of the grid could even raise production costs by increasing flows on internal constraints that requires costly redispatch.
- The California ISO should seek to disincent, not incent, such transmission investments. This goal is supported by ensuring that the impact of interchange flows on binding physical transmission constraints is reflected in day-ahead and real-time prices.

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CONGESTION RENT SHORTFALL ALLOCATION

Cost causation principles would require allocating the cost of real-time loopflows to the entities whose transactions create the loopflows (assuming that their identity could be established).

- There are no virtual bids in real-time and virtual bids do not contribute to real-time loopflows.
- The cost of real-time loopflows is always borne by transmission customers through their inability to fully use the transmission system.

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CONGESTION RENT SHORTFALL ALLOCATION

Allocating real-time congestion rents shortfalls to those who benefit from the mis-modeling in the day-ahead market would entail allocating the costs to:

- Physical power consumers that pay an artificially low price in the day-ahead market, relative to real-time, because of the mis-modeling;
- Physical power sellers that are paid an artificially high price in the day-ahead market, relative to real-time, because of the mis-modeling.

If the transmission constraints impacted by real-time loopflows are modeled in the day-ahead market, virtual bids that are profitable serve to converge day-ahead and real-time prices, raising artificially low prices and lowering artificially high prices.

If the California ISO models loopflows in the day-ahead market to converge day-ahead and real-time prices, no market participants will pay or receive a price that is consistently lower or higher than real-time prices.

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