Data Release & Accessibility Initiative
Phase 1: Transmission Constraints

Wade McCartney
Sr. Market Design & Policy Specialist

Stakeholder Conference Call
December 10, 2009
Data Release & Accessibility Initiative
Phase 1: Transmission Constraints

Wade McCartney
Sr. Market Design & Policy Specialist

Introduction and Overview
December 10, 2009
ISO Stakeholder Process
Data Release and Accessibility
Phase 1: Transmission Constraints

1. Phase 1 Issue Paper on 11/5
2. Proposal Paper and Draft Tariff Language on 12/3
3. Stakeholder Comments on the 12/3 Straw Proposal due on 12/16
   - Onsite Meeting at ISO on 12/10
4. FERC Filing on 12/31

Opportunities for Stakeholder Input

We are here

Implementation TBD
**Agenda for Phase 1 Transmission Constraints**

**On-Site Meeting, 12-10-2009**

<table>
<thead>
<tr>
<th>ESTIMATED TIME</th>
<th>TOPIC</th>
<th>PRESENTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00 – 10:05</td>
<td>Introduction</td>
<td>Chris Kirsten</td>
</tr>
<tr>
<td>10:05 – 10:15</td>
<td>Initiative Overview</td>
<td>Wade McCartney</td>
</tr>
<tr>
<td>10:15 – 11:15</td>
<td>Constraint &amp; Contingency Lists</td>
<td>Mark Rothleder</td>
</tr>
<tr>
<td>11:15 – 11:45</td>
<td>Network Terminology &amp; Nomenclature</td>
<td>Mark Rothleder</td>
</tr>
<tr>
<td>11:45 – 12:30</td>
<td>Lunch Break</td>
<td></td>
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<tr>
<td>12:30 – 1:00</td>
<td>Provision of Contingency Information for Binding Constraint</td>
<td>Darren Lamb</td>
</tr>
<tr>
<td></td>
<td>Shadow Prices</td>
<td>Wade McCartney</td>
</tr>
<tr>
<td>1:00 – 1:45</td>
<td>Constraint Management – Adjustments</td>
<td>Brian Jacobsen</td>
</tr>
<tr>
<td>1:45 – 2:30</td>
<td>Constraint Management Guidelines – Tariff Language</td>
<td>Anna McKenna</td>
</tr>
<tr>
<td>2:30 – 2:45</td>
<td>Next Steps</td>
<td>Wade McCartney</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anna McKenna</td>
</tr>
</tbody>
</table>
Overview: Data Release & Accessibility Initiative

Three phases, staggered start dates, some overlap.

- **Phase 1: Transmission Constraints**

- **Phase 2: Convergence Bidding Information Release**
  Issue paper 12/3.

- **Phase 3:** Other types of market data to support well-functioning, competitive ISO spot markets, including price discovery and outage information.
Phase 1: Transmission Constraints
Overview & Objectives

- The goal of Phase 1 is to discuss and resolve the following three items:
  - **Constraint Enforcement Practices:** Determine what additional information and visibility can be provided with respect to the ISO’s transmission constraint enforcement and practices to account for system conditions in managing the limits of the transmission system.
  - **Constraint & Contingency Lists:** Determine how the ISO can provide (1) the list of enforced and unenforced constraints and (2) the list of active contingencies.
  - **Tariff Guidelines on Constraint Management:** Develop high-level guidelines that describe the ISO’s constraint management processes and include the appropriate level of detail in a tariff filing on or before 12/31/2009.
Data Release & Accessibility Initiative
Phase 1: Transmission Constraints

Mark Rothleder
Director, Market Analysis & Development

Constraint & Contingency Lists
December 10, 2009
Proposal:

- Consistent with a network model build release:
  - Provide a description of changes to network model from previous model

- On a daily basis provide after the market is complete:
  - Description of corridor, nomograms, and contingencies
  - Identify enforced individual transmission elements, corridors, and nomograms
  - Identify active contingencies
# Flowgate Constraints

*To Be Published Daily at Close of the Day Ahead Market*

<table>
<thead>
<tr>
<th>Name of Flowgate</th>
<th>Type</th>
<th>Enforce</th>
<th>Competitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1XXX1_STATIONA_VL.X_1XXX2_STATIONB_VL.Y_BR_1_1</td>
<td>LINE</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>1XXX3_STATIONC_VL.X_1XXX4_STATIOND_VL.Y_BR_2_1</td>
<td>LINE</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>1XXX5_STATIONE_VL.X_1XXX6_STATIONF_VL.Y_BR_1_1</td>
<td>LINE</td>
<td>No</td>
<td>Yes</td>
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<tr>
<td>1XXX7_STATIONG_VL.X_1XXX8_STATIONH_VL.Y_BR_2_1</td>
<td>LINE</td>
<td>No</td>
<td>No</td>
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<tr>
<td>1XXX1_STATIONA_VL.X_1XX10_STATIONA_VLL_XF_1</td>
<td>XFMR</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>1XXX3_STATIONC_VL.X_1XX13_STATIONC_VLL_XF_1</td>
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<td>Yes</td>
<td>No</td>
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<tr>
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<td>Yes</td>
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<tr>
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<td>XFMR</td>
<td>No</td>
<td>No</td>
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## LEGEND

<table>
<thead>
<tr>
<th>LINE</th>
<th>Individual transmission line between two stations</th>
</tr>
</thead>
<tbody>
<tr>
<td>XFMR</td>
<td>Transformer in station transforming from one voltage level to another</td>
</tr>
<tr>
<td>PSHH</td>
<td>Phase shafter holder controlling flow</td>
</tr>
<tr>
<td>SERD</td>
<td>Series device (capacity, reactor)</td>
</tr>
<tr>
<td>TCOR</td>
<td>Transmission Corridor</td>
</tr>
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</table>
Transmission Corridor Constraints
To Be Made Available with Each Model Build

**Table 2**

<table>
<thead>
<tr>
<th>Branch Group Name</th>
<th>Equipment Type</th>
<th>Station Name</th>
<th>Voltage Level</th>
<th>Equipment Name</th>
</tr>
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<tbody>
<tr>
<td>MARKETSCHLIMITA_MSL</td>
<td>LINE</td>
<td>STATION X</td>
<td>500</td>
<td>15XX1_STATIONX_500_1XX1_EXTSUBA_500_BR_1_1</td>
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<tr>
<td>MARKETSCHLIMITA_MSL</td>
<td>LINE</td>
<td>STATION X</td>
<td>500</td>
<td>15XX1_STATIONX_500_1XX1_EXTSUBA_500_BR_2_1</td>
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<tr>
<td>MARKETSCHLIMITA_MSL</td>
<td>LINE</td>
<td>STATION Y</td>
<td>500</td>
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<td>MARKETSCHLIMITA_MSL</td>
<td>XFMR</td>
<td>EXTSUB B</td>
<td>500</td>
<td>2XXX2_EXTSUBB_500_2XXX12_EXTSUBB_230_XF_1</td>
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<td>MARKETSCHLIMITB_MSL</td>
<td>LINE</td>
<td>NOWHERE</td>
<td>500</td>
<td>15XX1_NOWHERE_500_16XX1_NOWHWST_500_BR_1_1</td>
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<tr>
<td>MARKETSCHLIMITB_MSL</td>
<td>LINE</td>
<td>NOWHERE</td>
<td>500</td>
<td>15XX1_NOWHERE_500_16XX1_NOWHWST_500_BR_2_1</td>
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<tr>
<td>MARKETSCHLIMITB_MSL</td>
<td>LINE</td>
<td>SMWHERE</td>
<td>230</td>
<td>24XX1_SMWHERE_230_19XX1_SMWHEAST_230_BR_1_1</td>
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<td>MARKETSCHLIMITB_MSL</td>
<td>LINE</td>
<td>SMWHERE</td>
<td>230</td>
<td>24XX1_SMWHERE_230_19XX1_SMWHEAST_230_BR_2_1</td>
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<tr>
<td>MARKETSCHLIMITC_MSL</td>
<td>LINE</td>
<td>EASTSUB B</td>
<td>500</td>
<td>34XX1_EASTSUB_500_34X11_NOEASTSB_500_BR_1_1</td>
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<tr>
<td>MARKETSCHLIMITC_MSL</td>
<td>LINE</td>
<td>EASTSUB B</td>
<td>500</td>
<td>34XX1_EASTSUB_500_34X11_NOEASTSB_500_BR_2_1</td>
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Table 3

<table>
<thead>
<tr>
<th>Nomogram Name</th>
<th>Resource Name</th>
<th>Coefficient</th>
<th>Corridor Name</th>
<th>Flowgate</th>
<th>Station Name</th>
<th>Enforced</th>
<th>Competitive</th>
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</thead>
<tbody>
<tr>
<td>T-XXX SOL-XX_NG_SU</td>
<td>0.3</td>
<td>CORRIDOR 1_NG1</td>
<td>3XXX2_ESTTNSB_115_32XX0_DNTNSB_115_BR_1_1</td>
<td>ESTNSB</td>
<td>Yes</td>
<td>No</td>
<td></td>
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<tr>
<td>T-XXX SOL-XX_NG_SU</td>
<td>1</td>
<td>CORRIDOR 2_NG2</td>
<td>3XXX8_WSTNSB_115_32XX0_DNTNSB_115_BR_2_1</td>
<td>WSTNSB</td>
<td>Yes</td>
<td>No</td>
<td></td>
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<tr>
<td>G-XXX</td>
<td>STEAM_7_UNIT 1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td>No</td>
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<tr>
<td>G-XXX</td>
<td>STEAM_7_UNIT 2</td>
<td>1</td>
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<td></td>
<td></td>
<td>No</td>
<td>No</td>
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<tr>
<td>G-XXX</td>
<td>HYDRO_7_UNIT 3</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td>No</td>
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</tbody>
</table>
# List of Transmission Contingencies
To Be Published Daily at Close of the Day Ahead Market

<table>
<thead>
<tr>
<th>Title</th>
<th>Enforced</th>
<th>Zone</th>
<th>Equipment Station</th>
<th>Equipmen t Voltage</th>
<th>PTI From Bus Number</th>
<th>PTI From Bus kV</th>
<th>PTI To Bus Number</th>
<th>PTI To Bus kV</th>
<th>PTI Circuit ID</th>
<th>Equipment Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>mTC1-SUNNY-CLOUDY</td>
<td>Yes</td>
<td>TAC-1</td>
<td>SUNNYSB</td>
<td>115</td>
<td>32XX1</td>
<td>115</td>
<td>31XX1</td>
<td>115</td>
<td>' 1'</td>
<td>OP</td>
</tr>
<tr>
<td>mTC1-SUNNY-CLOUDY</td>
<td>Yes</td>
<td>TAC-1</td>
<td>SUNNYSB</td>
<td>115</td>
<td>32XX1</td>
<td>115</td>
<td>31XX1</td>
<td>115</td>
<td>' 2'</td>
<td>OP</td>
</tr>
<tr>
<td>mTC1-SUNNY-CLOUDY</td>
<td>Yes</td>
<td>TAC-1</td>
<td>CLOUDYS B</td>
<td>115</td>
<td>31XX1</td>
<td>115</td>
<td>32XX1</td>
<td>115</td>
<td>' 1'</td>
<td>OP</td>
</tr>
<tr>
<td>mTC1-SUNNY-CLOUDY</td>
<td>Yes</td>
<td>TAC-1</td>
<td>CLOUDYS B</td>
<td>115</td>
<td>31XX1</td>
<td>115</td>
<td>32XX1</td>
<td>115</td>
<td>' 2'</td>
<td>OP</td>
</tr>
<tr>
<td>mTC2-OUTAGE-SPECIAL</td>
<td>No</td>
<td>TAC-2</td>
<td>BRDGSB</td>
<td>115</td>
<td>39XX1</td>
<td>115</td>
<td>37XX1</td>
<td>115</td>
<td>' 1'</td>
<td>OP</td>
</tr>
<tr>
<td>mTC2-OUTAGE-SPECIAL</td>
<td>No</td>
<td>TAC-2</td>
<td>BRDGSB</td>
<td>60</td>
<td>39XX2</td>
<td>115</td>
<td>37XX2</td>
<td>115</td>
<td>' 1'</td>
<td>CL</td>
</tr>
<tr>
<td>mTC2-OUTAGE-SPECIAL</td>
<td>No</td>
<td>TAC-2</td>
<td>TRBWTR</td>
<td>115</td>
<td>37XX1</td>
<td>115</td>
<td>39XX1</td>
<td>115</td>
<td>' 1'</td>
<td>OP</td>
</tr>
<tr>
<td>mTC2-OUTAGE-SPECIAL</td>
<td>No</td>
<td>TAC-2</td>
<td>TRBWTR</td>
<td>50</td>
<td>37XX2</td>
<td>115</td>
<td>39XX2</td>
<td>115</td>
<td>' 1'</td>
<td>CL</td>
</tr>
</tbody>
</table>
Data Release & Accessibility Initiative
Phase 1: Transmission Constraints

Mark Rothleder
Director, Market Analysis & Development

Network Terminology & Nomenclature
December 10, 2009
Network Terminology & Nomenclature

Example:

Line/Branch
12345_STATIONA_VLL_54321_STATIONB_VLL_BR_1_1

Transformer
12345_STATIONA_VLL_54321_STATIONA_VLL_XF_1_1
Network Terminology & Nomenclature

Example:

Corridor-Market Scheduling Limit
  INTERTIENAME_MSL

Corridor-Branch Group
  DEScriptiVeNAME_BG

Corridor-Used to Create Nomogram
  DEScriptiVeNAME_NG
Network Terminology & Nomenclature

Examples:

Nomogram

- $T-XXX\_DESCRIPTION\_NG\_SUM/WIN$ (Trans. Procedure)
- $T-XXX\_DESCRIPTION\_NG\_SUM/WIN$ (Gen. Procedure)
- $DESCRIPTIVENAME\_NG$ (Major Path)
- $SLICENUMBER\_NG$ (Temp. constraint to support outage)

Contingency:

$mTC1\_STATIONFRO M-STA TIONTO$
Data Release & Accessibility Initiative
Phase 1: Transmission Constraints

Darren Lamb
Sr. Market Design Specialist
and
Wade McCartney
Sr. Market Design & Policy Specialist

Provision of Contingency Information
for Binding Constraint Shadow Prices

December 10, 2009
When constraints bind, shadow prices are produced.

Binding constraints are caused either due to:

- Base case conditions (no outages or derates), or
- Contingency conditions.

Other ISOs provide data on monitored constraints, as well as the associated contingencies, in the event that a constraint becomes binding under contingency conditions. MISO, ISO-NE, NYISO, PJM.

In contrast, CAISO provides the shadow price and identifies the binding constraint but does not provide the cause for a constraint that was binding or a description of the associated contingency where applicable.
- CAISO only reports monitored single line facilities, as shown above.
- The reason for the constraint is not provided, i.e., we do not know what facility is associated with the Binding element – the contingency or base case.
Existing Information on OASIS (Prices)

- **Nomogram/Branch Shadow Prices:**
  Posts the hourly constraint pricing at each Nomogram and Branch, for each Market Process (DAM, HASP) in $/MWh, and the 15-Minute Shadow Price in $/MWh for the RTPD run in RTM.

- **Intertie Constraint Shadow Prices:**
  Posts the hourly constraint pricing at Transmission Interfaces and Intertie Constraints, for each Market Process (DAM, HASP) in $/MWh, and the 15-Minute Shadow Price in $/MWh for the RTPD run in RTM.

- **Interval Intertie Constraint Shadow Prices:**
  Posts the 5-Minute constraint pricing at Transmission Interfaces and Intertie Constraints in $/MWh, for the RTD run in the RTM.

- **Interval Nomogram/Branch Shadow Prices:**
  Posts the 5-Minute constraint pricing at each Nomogram and Branch in $/MWh, for the RTD run in the RTM.
Implementation: Two Options
To Provide Binding Constraint Contingency Information

- Two Options:
  1. On OASIS
     - Modify the existing pricing reports shown in the previous slide.
     - Create new pricing reports that contain the new contingency information.
  2. On CAISO.com

- Do Stakeholders have a preference for either approach?
Data Release & Accessibility Initiative
Phase 1: Transmission Constraints

Brian Jacobsen
Manager, Market Operations

Constraint Management – Adjustments
December 10, 2009
Constraint Management – Adjustments Discussion

- Brian Jacobsen will lead a stakeholder discussion on this issue.
- Specific slides may post on 12/9/2009.
Data Release & Accessibility Initiative
Phase 1: Transmission Constraints

Anna McKenna
Senior Counsel

Constraint Management Guidelines
December 10, 2009
This presentation will consist of a detailed, page-turn review and discussion of Attachment B to the Phase 1 Straw Proposal on Transmission Constraints:

Data Release Phase 1 - Straw Proposal on Transmission Constraints
Attachment B: Proposed Transmission Constraint Management Guidelines

Attachment B:  http://www.caiso.com/247a/247a5c09708b0.pdf

Data Release Phase 1 webpage,
http://www.caiso.com/244c/244cae3b46bb0.html