
 <b>California ISO</b> Your Link to Power	<b>OPERATING PROCEDURE</b>	<b>Procedure No.</b>	T-103
		<b>Version No.</b>	8.4
		<b>Effective Date</b>	11/21/08
<b>EOR - SCIT</b>		<b>Distribution Restriction: NONE</b>	

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## QUICK REFERENCE

### SCIT Nomogram Quick Reference

<b>Seasonal SOL:</b>	15,150 MW for SCIT
<b>Type of Limit:</b>	Stability – 20 minutes to return within SOL or Nomogram line
<b>Function of: (Parameters)</b>	Southern California Inertia
<b>EMS Screens:</b>	OV10
<b>PI Screens:</b>	SCIT, SCIT-1-SONGS
<b>Curtailment Table:</b>	Attachment B
<b>Applicable Nomograms:</b>	SCIT Nomogram
<b>Additional Information:</b>	
<b>Related Procedure:</b>	--

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## PURPOSE

Describes limits on Southern California imports based on the parameters of the East-of-River/Southern California Import Transmission Nomogram (SCIT) for the 2008-2009 Winter operating season.

The East-of-River/Southern California Import Transmission (SCIT) Nomogram became effective on October 1, 1991, which replaced the retired West Of the River (WOR) Nomogram.

This Nomogram monitors the following:

- Power flow on five major paths into Southern California area.
- System inertia in Southern California area.
- East Of the River (EOR) flows.

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## PROCEDURE

### 1. SCIT Nomogram


Grid operation within the SCIT Nomogram limits ensures stable operation following the loss of a major transmission path, transformer bank, or Generation in the Southern California area. If a limit violation occurs, the system must be adjusted to return within Nomogram limits within 20 minutes (refer to Attach. A).

#### 1.1. The SCIT Nomogram Plots as Follows:

- Y-axis = Actual Imports (Flow on five paths).
  - X-axis = Actual EOR flow.
  - Diagonal axis = Inertia on line in Southern California area.
- Safe area of operation is anywhere below the applicable diagonal line.

#### 1.2. Data Points Required to Calculate SCIT

- Midway-Vincent No.1, 2, and 3 500 kV Lines
- Pacific DC Intertie (Measured at Sylmar)
- IPP DC Line (Measured at Adelanto)
- North of SCE Lugo Path, as defined below:
  - Kramer-Lugo No.1 230 kV Line
  - Kramer-Lugo No.2 230 kV Line
  - Lugo-Victor No. 1 230 kV Line
  - Lugo-Victor No. 2 230 kV Line
- West of the River (WOR) Transmission System, as defined below:
  - Northern System
    - LDWP McCullough-Victorville No.1 500 kV Line
    - LDWP McCullough-Victorville No.2 500 kV Line
    - LDWP MarketPlace-Adelanto 500 kV Line
    - SCE Eldorado-Lugo 500 kV Line
    - SCE Mohave-Lugo 500 kV Line
    - LDWP Mead-Victorville 287 kV Line
    - SCE Eldorado-Lugo No.1 230 kV
    - SCE Eldorado-Lugo No.2 230 kV
    - SCE Julian Hinds-Mirage 230 kV Line
  - Southern System
    - SCE Palo Verde-Devers 500 kV Line
    - SDGE North Gila – Imperial Valley 500 kV Line
    - IID Ramon – Mirage 230 kV Line
    - SCE Coachella Valley- Devers 230 kV Line
    - IID El Centro-Imperial Valley 230 kV Line

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## 2. Nomogram Operation

### 2.1. PI Tool

The PI spreadsheet to monitor the SCIT nomogram and associated parameters is located in the PI ProcessBook under Operations/Transmission/Path Loadings/SCIT.

### 2.2. Safety Margin

The SCIT Nomogram includes a safety margin to account for variations and uncertainties in study assumptions. A 500 MW safety margin for transient stability conditions had been applied to the Nomogram since the inception of the SCIT nomogram.

On February 1, 2005, the three SCIT owners (LADWP, SCE, and SDG&E) and the SCIT operator (CAISO) agreed to remove the 500 MW safety margin for the 2004-2005 Winter Operating Season based technical study results.

On March 14, 2005, after further evaluation, it was further agreed by the three SCIT owners (LADWP, SCE, and SDG&E) and the SCIT operator (CAISO) that 500 MW safety margin will be applied to Mid and High SCIT Inertia level (80,000 MWS or above). The 500 MW safety margin will be removed only for the Low SCIT Inertia level (below 80,000 MWS).

### 2.3. Capacity Reductions

The base SCIT Nomogram assumes all components in service. Refer to **SCIT Nomogram Axis and Path Reduction Table** (Attachment B) of this procedure for reductions in Nomogram capacity for line and equipment outages. The “Existing Nomogram Axis Reductions” (Attachment B) column apply to the diagonal lines (transient stability limited). Negative numbers indicate an increase in SCIT Nomogram capacity with the line or equipment out of service. The “VAR Margin Limit” column applies to the horizontal lines (voltage stability limited).


The base SCIT Nomogram assumes three Palo Verde Generating Units on line. For each Palo Verde Generating Unit off line, reduce the Nomogram’s SCIT capacity (diagonal lines) as follows:

- 3 Units on line = 0 MW
- 2 Units on line = 200 MW
- 1 Unit on line = 400 MW
- 0 Units on line = 700 MW

## 3. Curtailments

### 3.1. Real-time Within-Hour Curtailments

- **IF** system events occur that violate the SCIT SOL of the Nomogram,

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**THEN adjust** the system to return within the SOL of Nomogram parameters within 20 minutes. The following mitigation measures may be utilized:


- **Adjust** the limit in RTMA on Path 26 so resources south of Path 26 are incremented (except for Hoover, Coolwater, or High Desert\*) and resources north of Path 26 are decremented.
- **Instruct** Hoover, Coolwater and High Desert to a GOTO Max of their Hour Ahead schedule (or less) using the OOS tool.
  - The three plants (Hoover, Coolwater, and High Desert) may be included economically in the decremental resources list along with the units in ZP26, NP15, HUMB, and SF using the OOS tool.
- **If** RMR units can be used to mitigate the Intra-Zonal Congestion, increment RMR units under their RMR contracts or reduce their RMR schedules (not RMR unit market schedules) as needed.
- **Use** available decremental supplemental bids, on the “Defined Paths” using the OOS tool. Instructed Resources are paid “As Bid
- **Instruct** all available Generation from San Diego and SCE resources that have not been RMR or bid into the supplemental market, Out-Of-Market.
- **Curtail** Schedules pro-rata on “Defined Paths”.

**Caution:** DO NOT increase Hoover, Coolwater, or High Desert because this increases SCIT Imports.

### 3.2. Real-time Following-Hour Curtailments

- **IF** the current SCIT dynamic point is near the SCIT SOL or Nomogram limit and following next-hour curtailments are projected, **THEN reduce** or **minimize** the real-time intertie Energy purchases in the following order:
  - East-of-River
  - West-of-River
  - PDCI Paths
- **Coordinate** instruction of resources north of SP15 and on COI with the expected load north of SP15.

**\*Caution:** DO NOT increase Hoover, Coolwater, or High Desert because this will increase SCIT imports.

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**4. Total Import Limits**

The SCIT import limit is limited to the seasonal SOL. See the “East-of-River/Southern California Import Transmission Nomogram” (Attachment A).

**5. Generation Capacity Requirements for SCIT Inertia Support**

- **Refer** to Attachment C for the minimum Generation capacity requirements for SCIT inertia support.

**6. Dynamic / Static Reactive Reserve Monitoring Tool**

The PI spreadsheet tool to monitor the SCIT Nomogram and associated parameters is located in the PI ProcessBook under Operations/Transmission/Path Loadings/SCIT.

In addition, a summary spreadsheet for the bulk dynamic/static reactive reserve monitors including AC-DC, SCIT, and SDG&E Imports has been created and is located in the PI ProcessBook under Operations/Transmission/Path Loadings. The tool is the “Bulk System Dynamic/Static Reactive Reserve Monitor” spreadsheet.

**Reactive Reserve Monitoring Tool**


A dynamic/static reactive reserve monitoring tool has been developed to provide additional monitoring capabilities for the real-time dispatchers. This tool monitors the real-time reactive reserve on key machines and unused static capacitors that are critical for supporting the SCIT nomogram. The reactive reserve was determined through voltage collapse studies, and will be updated seasonally as necessary.

The “Dynamic Devices” tab in the spreadsheet indicates the required MVArS and the actual MVArS in real-time.

If the actual reactive reserve in real-time falls below the required reactive reserve, then additional generation in the LA Basin area may be required (such as starting combustion turbines) or a reduction in the Path 26 and/or SCIT actual flows to increase the actual reactive reserve above the required reactive reserve.

**7. Emergency Overload of SCIT following a Contingency**

**Refer** to CAISO Operating Procedure T-142 “Emergency Overload Mitigation for SCIT Following Contingencies”.

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## SUPPORTING INFORMATION

### Affected Parties

- WECC Control Areas
- Participating Transmission owners (PTO)

### Responsibilities


<b>CAISO Transmission Dispatcher</b>	Monitors actual loading on, and operation of, the defined transmission lines
<b>CAISO Real-time Scheduler</b>	Schedules and curtailments on the defined paths
<b>CAISO Generation Dispatcher</b>	Adjusts generation as required to mitigate operating outside the SOL of the Nomogram.

### References

<ul style="list-style-type: none"> <li>• <a href="#">ISO Tariff</a></li> </ul>	
<ul style="list-style-type: none"> <li>• “Southern California Import Transmission Implementation Principles and Operating Procedures” dated May 1, 1996 and subsequent Exhibit Revisions dated March 6, 1997</li> </ul>	
<ul style="list-style-type: none"> <li>• NERC Standards</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">FAC-011-1</a> R2.2, R2.3, R5, &amp; E1 - System Operating Limits Methodology for the Operations Horizon</li> <li>• <a href="#">TOP-002-2</a> R2, R3, R4, R10, &amp; R11 - Normal Operations Planning</li> <li>• <a href="#">TOP-004-1</a> R1, R2, R6 Transmission Operations</li> <li>• <a href="#">TPL-001-0</a> R1.1, R1.3.2, R1.3.5 to R1.3.9, R3 -System Performance Under Normal Conditions</li> <li>• <a href="#">TPL-002-0</a> R1.1, R1.3.1, R1.3.5-R1.3.12, R3 - System Performance Following Loss of a Single BES Element</li> <li>• <a href="#">TPL-003-0</a> R1.1, R1.3.1, R1.3.3, R1.3.5 to R1.3.12, R3 - System Performance Following Loss of Two or More BES Elements</li> </ul>
<ul style="list-style-type: none"> <li>• WECC</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">TOP-STD-007</a></li> </ul>


### Policy

The CAISO intends to remain within the parameters represented in the SCIT Nomogram in the operation of the Southern California Transmission system.

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## Defined Paths

<b>East-of-River (Non-Simultaneous)</b>	<b>8,055 MW</b>
<ul style="list-style-type: none"> <li>• Moenkopi – Eldorado No. 1 500 kV Line</li> <li>• Navajo – Crystal – McCullough No. 1 500 kV Line</li> <li>• Palo Verde – Devers No. 1 500 kV Line</li> <li>• Hassayampa – North Gila No. 1 500 kV Line</li> <li>• Liberty – Peacock – Mead No. 1 345 kV Line</li> <li>• Perkins – Mead No. 1 500 kV Line</li> </ul>	
<b>SCIT (Non-Simultaneous)</b>	<b>20,391 MW</b>
<ul style="list-style-type: none"> <li>• Midway – Vincent No. 1, 2, and 3 500 kV Lines</li> <li>• Pacific DC Intertie (Measured at Sylmar)</li> <li>• IPP DC Line (Measured at Adelanto)</li> </ul>	4,000 MW 2,722 MW 1,846 MW
<b>North of SCE Lugo Path, as defined below:</b>	<b>1,200 MW</b>
<ul style="list-style-type: none"> <li>• Kramer – Lugo No. 1 230 kV Line</li> <li>• Kramer – Lugo No. 2 230 kV Line</li> <li>• Lugo – Victor No. 1 230 kV Line</li> <li>• Lugo – Victor No. 2 230 kV Line</li> </ul>	
<b>West-of-River (WOR) Transmission System, as defined below:</b>	
<ul style="list-style-type: none"> <li>• Northern System           <ul style="list-style-type: none"> <li>LDWP McCullough – Victorville No. 1 500 kV Line</li> <li>LDWP McCullough – Victorville No. 2 500 kV Line</li> <li>LDWP MarketPlace – Adelanto 500 kV Line</li> <li>SCE Eldorado – Lugo 500 kV Line</li> <li>SCE Mohave – Lugo 500 kV Line</li> <li>LDWP Mead – Victorville 287 kV Line</li> <li>SCE Eldorado – Lugo No. 1 230 kV</li> <li>SCE Eldorado – Lugo No. 2 230 kV</li> <li>SCE Julian Hinds-Mirage 230 kV Line</li> </ul> </li> <li>• Southern System           <ul style="list-style-type: none"> <li>SCE Devers-Palo Verde 500 kV Line</li> <li>SDGE North Gila – Imperial Valley 500 kV Line</li> <li>IID Ramon – Mirage 230 kV Line</li> <li>SCE Coachella Valley – Devers 230 kV Line</li> <li>IID El Centro – Imperial Valley 230 kV Line</li> </ul> </li> </ul>	1,121 MW 1,121 MW 1,291 MW 1,102 MW 1,102 MW 350 MW 200 MW 200 MW 150 MW  1,802 MW 1,386 MW 300 MW 300 MW 150 MW
<b>Total WOR</b>	<b>10,623 MW</b>


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Version	Change	By	Date
	Drafted		12/3/97
	Revised		10/31/98
	1999 Spring Update		3/22/99
	1999 Summer Update		6/3/99
	1999-2000 Winter Update		9/30/99
	Curtailment Table and De-rate Update		1/31/00
4.1	Spring 2000 Update- Nomograms, removed 2.3, added more detailed instructions 3.1 and 3.2		3/30/00
	Summer 2000 Update- Nomograms. Added Eldorado Energy Project to 3.1 & 3.2. SCIT import limit added to 4.0		6/1/00
	Changed Path 26 OTC from 2800 to 3000 MW		8/25/00
	2000-2001 Winter Update- Nomogram		9/29/00
	2001 Spring Update- Nomogram		2/28/01
	2001 Summer Update- Nomogram		4/26/01
	Stability Limit 10 to 20 minutes		7/26/01
	2001-2002 Winter Update- Nomogram		9/24/01
	Revised EMS Screen titles & added Section 2.2, PI Tool		12/18/01
4.10	Changed Palo Verde-N. Gila to Hassayampa-N. Gila pg 7		2/13/02
5.0	2002 Spring Update		3/26/02
5.1	2002 Summer Update		4/26/02
5.2	2002-2003 Winter Update		9/20/02
5.3	2003 Spring Update		2/28/03
5.4	2003 Summer Update		4/9/03
5.5	2003-2004 Winter Update		9/23/03
5.6	Minor change to section 3.1		11/10/03
5.7	Modified Section 3.1 to be consistent with Market Applications		12/18/03
6.0	Complete revision to T-103C for new methodology for SCIT generation requirements.		1/7/04
6.1	Add Sec. 5 for outage of the Devers – Valley 500 kV line		2/6/04
6.2	2004 Spring update. SCIT OTC is decreased to 12,800 MW due to the new study methodology on the use of SCE RMR capacitors; New Section on Dynamic Reactive Reserves		03/17/04
6.3	Updated for MD02.		3/19/04
6.3	2004 Summer update		4/21/04
6.4	2004 Summer OTC increased to 14,500 MW due to the implementation of SCE RMR capacitor scheme		6/4/04
6.5	MRTU updates		9/15/04
6.6	2004-2005 Winter update		9/30/04
6.7	Section 2.3 revised due to the removal of 500 MW Safety Margin.		2/1/05
6.8	2005 Spring Update		3/21/05
6.9	EMS to PI de-rate change		5/20/05
7.0	Summer update		6/1/05
7.1	Winter update		10/28/05
7.2	Removed Mohave Plants		1/1/06
7.3	Spring Update		3/31/06

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7.4	Summer update		6/2/06
7.5	Winter update		10/27/06
7.6	Changed SCIT Nomogram from EMS to PI		11/30/06
7.7	Spring Update		4/4/07
7.8	Summer update		6/1/07
7.9	Winter update		11/7/07
8.0	Spring update		4/2/08
8.1	Summer Update		6/4/08
8.2	Updated Total SCIT NON SIMULTANEOUS limit from 19,191 MW to 20,391MW (page 9)		7/16/08
8.3	Winter 20008-09 Updates		11/5/08
8.4	Added section 7 and revised section 2.1		11/21/08

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## TECHNICAL REVIEW

Reviewed By Content Expert	Signature	Date
Operations Support		11/21/08
Regional Transmission		11/5/08
Grid Ops		11/21/08
Market Ops		6/1/07
Outage Coordination		6/4/07
Scheduling		6/1/07

## APPROVAL

Approved By	Signature	Date
Director of Engineering and Maintenance		6/1/07
Director of Grid Operations		6/4/07

## APPENDIX

- Attachment A: [East-of-River/Southern California Import Transmission Nomogram](#)
- Attachment B: [SCIT Nomogram Axis and Reduction Tables](#)
- Attachment C: [Minimum Generation Capacity Requirement for SCIT Inertia Support](#)