

Application No.: 15-06-020

Exhibit No.: _____

Witness: Robert C. Kott

Application of Southern California Gas Company (U 904 G) and San Diego Gas & Electric Company (U 902 G) for Authority to Revise their Curtailment Procedures.

Application 15-06-020

**TESTIMONY OF ROBERT C. KOTT
ON BEHALF OF THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR
CORPORATION**

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2

**BEFORE THE PUBLIC UTILITIES COMMISSION OF THE
STATE OF CALIFORNIA**

Application of Southern California Gas
Company (U 904 G) and San Diego Gas &
Electric Company (U 902 G) for Authority to
Revise their Curtailment Procedures.

Application 15-06-020

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**TESTIMONY OF ROBERT C. KOTT
ON BEHALF OF THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR
CORPORATION**

Q. What is your name and by whom are you employed?

10 **A.** My name is Robert C. Kott. I am employed by the California Independent
11 System Operator Corporation (CAISO), 250 Outcropping Way, Folsom,
12 California as Operations Policy Manager.

13

14 **Q. Please describe your educational and professional background.**

15 **A.** I received a bachelor's degree in Electrical and Electronics Engineering from
16 California State University, Sacramento in 1987 and a master's degree in
17 business administration in 1995 with a concentration in Finance completed
18 in 2000 from Pepperdine University. I am a Registered Professional
19 Engineer in Electrical Engineering in the State of California.
20 Upon graduating from college, I accepted a position at the Los Angeles
21 Department of Water and Power (LADWP). With LADWP, I held a number
22 of positions including Planning Engineer, Project Manager in the Generation
23 Maintenance Department, Transmission Design Engineer, and Manager of
24 Large Customer Contracts. In 2001, I joined the CAISO and have worked in
25 various roles, including Manager of Reliability Contracts in the CAISO's
26 Contracts Department. In this role, I have negotiated and administered the
27 CAISO's reliability agreements including the Reliability Must Run Contract,
28 Summer Reliability Agreements, Dual Fuel Agreements, and Black Start

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1 Agreements. I have also served as Manager of the CAISO's Model and
2 Contract Implementation group responsible for resource setup and
3 maintenance, full network model maintenance, resource testing, resource
4 adequacy management, and reliability agreement administration. In 2015, I
5 assumed my current role as Operations Policy Manager in which I work on
6 gas/electric coordination activities among other responsibilities.

7

8 **Q. What is the purpose of your testimony?**

9 **A.** The purpose of my testimony is to address the following issue set forth in
10 Assigned Commissioner's November 6, 2015 Scoping Memo and Ruling:

11 1. Should natural gas curtailments to electric generation facilities be
12 coordinated with the operational and reliability requirements of the
13 CAISO?

14

15 **Q. What are your recommendations in this proceeding?**

16 **A.** I recommend that the Commission encourage SoCalGas/SDG&E to
17 coordinate natural gas curtailments to electric generation facilities with the
18 operational and reliability requirements of the CAISO. This is a current
19 practice in which real-time operators at the SoCalGas/SDG&E and the
20 CAISO engage. The remainder of my prepared testimony explains the
21 CAISO's current operating procedure that describes real-time coordination
22 between the CAISO and SoCalGas/SDG&E during natural gas curtailment
23 events.

24

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1 **REAL-TIME CURTAILMENT OF NATURAL GAS TO ELECTRIC**
2 **GENERATION SHOULD INCLUDE CONSIDERATION OF THE**
3 **OPERATIONAL AND RELIABILITY REQUIREMENTS OF THE CAISO**

4

5 **Q. Please generally describe the CAISO's efforts to coordinate with**
6 **SoCalGas/SDG&E when there are curtailments of natural gas to**
7 **electric generation operating on the CAISO system?**

8

9 **A.** The CAISO has developed an operating procedure that addresses
10 coordination with SoCalGas/SDG&E when there are curtailments of natural
11 gas to electric generation. Operating procedure 4120 is available on the
12 CAISO's website at. <http://www.aiso.com/Documents/4120.pdf>. I have
13 attached a copy of this operating procedure to my prepared testimony for
14 ease of reference. The highlighted text in this document reflects the latest
15 changes.

16

17 This operating procedure outlines steps for operators to take in instances in
18 which the natural gas curtailment is imminent. In short, these steps provide
19 the CAISO with the opportunity to advise SoCalGas/SDG&E of whether their
20 proposed curtailments may have an adverse impact on electric grid reliability
21 and, if so, to try to mitigate that impact. The operating procedure also
22 addresses returning to normal electric operating conditions once a natural
23 gas curtailment has ended.

24

25 **Q. Can you please outline the steps sets forth in Operating Procedure**
26 **4120?**

27

28 **A.** Yes. If SoCalGas/SDG&E provides the CAISO with notice of an imminent
29 curtailment of natural gas supply, the CAISO will confirm the details of
30 curtailment request with SoCalGas/SDG&E including total MMcf of the

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1 curtailment, the period of the curtailment, and the affected electric
2 generation. As part of the development of gas burn reports discussed in the
3 prepared testimony of Brad Bouillon, the CAISO uses groups of electric
4 generation resources based on information provided by SoCalGas/SDG&E.
5 My understanding is that those groupings correspond to
6 SoCalGas/SDG&E's current gas operating zones.

7

8 After confirming the details of the gas curtailment notice, the CAISO
9 calculates a pro rata reduction for electric generators within an operating
10 zone or zones based on a calculated gas burn at the generator location in
11 order to achieve the targeted MMcf reduction. The CAISO assesses
12 whether the corresponding reduction in the electric generation schedules will
13 have an adverse impact on electric grid reliability. If no adverse impact to
14 electric reliability is apparent, the CAISO provides the calculation to
15 SoCalGas/SDG&E and asks SoCalGas/SDG&E to verify that it will send a
16 gas curtailment notice to the affected electric generation.

17

18 After SoCalGas/SDG&E notifies electric generation of its maximum
19 allowable hourly gas burn in MMcf for the curtailment period, the CAISO
20 expects the operator of that electric generation to notify its CAISO
21 scheduling coordinator of the natural gas limitation. If the operator of the
22 electric generation wants to request a modification to its allowable hourly
23 gas burn, it needs to contact SoCalGas/SDG&E. Once the CAISO
24 scheduling coordinator for the electric generation learns of the natural gas
25 limitation, the CASIO expects the scheduling coordinator to submit
26 information about its resources' limitation into the CAISO outage
27 management system. The CAISO reviews and approves the outage
28 request, which then informs the CAISO's market systems of the natural gas
29 limitation at the resource level. With this information, the CAISO market

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1 systems can re-dispatch resources as necessary to serve load and maintain
2 required resources.

3

4 **Q. What, if anything, does the CAISO do if the proposed curtailment to**
5 **electric generation will adversely affect electric grid reliability?**

6

7 A. If a proposed natural gas curtailment will adversely impact electric system
8 reliability, the CAISO will confer with SoCalGas/SDG&E and request
9 adjustments to the gas curtailment request. This process might require
10 iterative discussions between the CAISO and SoCalGas/SDG&E. If
11 SoCalGas/SDG&E can accommodate the adjustments, the CAISO
12 understands that SoCalGas/SDG&E will notify the operator of the electric
13 generation of the adjusted allowable hourly gas burn in MMcf for the
14 curtailment period. At that point, the CAISO expects the scheduling
15 coordinator for the electric generation will adjust information in the CAISO's
16 outage management system, so that the CAISO's market systems have
17 access to this information.

18

19 **Q. What, if anything, would the CAISO do if conditions on the CAISO grid**
20 **change during the natural gas curtailment to electric generation that**
21 **threaten electric reliability?**

22

23 A. If additional output from natural gas fired generation would resolve the threat
24 to electric reliability, the CAISO will confer with SoCalGas/SDG&E and
25 request adjustments to allowable hourly gas burn in MMcf at the electric
26 generation resource or resources that can mitigate the reliability issue. If
27 SoCalGas/SDG&E can accommodate the adjustments, the CAISO requests
28 that SDG&E/SoCalGas notify electric generation operator of the adjusted
29 allowable hourly gas burn in MMcf for the curtailment period. At that point,
30 the CAISO expects the scheduling coordinator for the electric generation will

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1 adjust information in the CAISO outage management system so that the
2 CAISO's market systems have access to this information.

3

4 **Q. What, if anything, would the CAISO do if there was insufficient time for**
5 **the coordination activities set for in Operating Procedure 4120?**

6

7 **A.** The CAISO has authority under its tariff to issue exceptional dispatches to
8 resources participating in its market. The CAISO's operators issue these
9 exceptional dispatches. The CAISO may use this authority to direct an
10 electric generation operator to reduce the electric output at its resource or
11 maintain its electrical output to ensure the resource does not exceed its
12 allowable hourly gas burn in MMcf for the curtailment period. The CAISO
13 expects, however, that SoCalGas/SDG&E would contact the electric
14 generation operator who would then communicate with the scheduling
15 coordinator for that resource to ensure submission of information concerning
16 the gas limitation into the CAISO's outage management system.

17

18 **Q. What steps, if any, does the CAISO take at the end of a natural gas**
19 **curtailment period?**

20

21 **A.** The CAISO evaluates the impact to the electric system of allowing electric
22 generation to return their market schedules. If there are no concerns, the
23 CAISO expects SoCalGas/SDG&E to notify their electric generation
24 customers that curtailments have ended. Thereafter, the CAISO expects
25 the scheduling coordinator for the electric generation to update the
26 information in the CAISO's outage management system, *i.e.*, remove the
27 outage cards. The CAISO will then approve the removal of outage cards to
28 allow the electric generation to return to normal operating conditions.

29

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1 **Q. What changes, if any, do you anticipate making to Operating**
2 **Procedure 4120 in the future.**

3

4 **A.** The coordination practices between the CAISO and gas transmission
5 pipeline operators continue to evolve based on experience and input from
6 users of the electric grid and gas transmission system. Operating conditions
7 are dynamic and continue to change. As we gain experience, receive input
8 and address different operating conditions, we may identify refinements to
9 our operating procedure for real-time coordination with gas transmission
10 pipeline operators.

11

12 **Q. Does this conclude your testimony?**

13 **A.** Yes, it does.

14

Attachment

 California ISO	Operating Procedure	Procedure No. 4120
		Version No. 4.0
		Effective Date 1/15/16
Gas Transmission Pipeline Derates or Outages		Distribution Restriction: None

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Purpose

The Purpose of this procedure is to coordinate with the applicable **Natural Gas Transmission Pipeline System Operator** concerning gas limitations imposed on generation resources that occur in Real Time, to ensure both gas and electric reliability to the extent possible.

This procedure outlines the steps taken when there is a natural-gas reduction or insufficiency in a region, requiring curtailment of multiple generator resources consistent with the gas company's tariff as interpreted by the gas company.

1. Responsibilities

Natural Gas Transmission Pipeline System Operator	<p>Communicates with CAISO Operations Planning or Real-Time Operations to provide the same information as well as availability of gas supply to the extent known.</p> <p>Communicates with the impacted generators the gas limitations per the gas company tariff.</p> <p>Communicates to the impacted generators the end of the gas limitations.</p>
Generator Operator	<p>Informs its Scheduling Coordinator of Curtailment/ Outage and supply insufficiency information received from Gas Transmission Operator.</p> <p>Requests Generation Outages as required due to impacts of curtailment.</p>
Scheduling Coordinator	<p>Informs CAISO about generating resources affected by natural gas curtailments.</p> <p>Works with the CAISO Generation Dispatcher to determine a generation output pattern that provides the most effective unit output.</p>

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CAISO Day-Ahead Market Operator (DAM Operator)	<p>Reviews market results to determine potential curtailment effects by performing the following:</p> <ul style="list-style-type: none"> • Reviews yesterday’s Day Ahead Market (DAM), D+2, and D+3 results • Reviews actual Load and forecasts • Determines whether any Minimum On-Line Capacity (MOC) constraint needs to be enforced • Runs Extremely Long-Start Commitment Process (ELC) to determine ELC commitment • Determines whether any constraint enforcement is necessary • Verifies DAM closed automatically • Evaluates output of Residual Unit Commitment (RUC) process • Evaluates DAM results • Runs Market Power Mitigation model (MPM), Reliability Requirement Determination model (RRD), Integrated Forward Market model (IFM), and RUC. • Runs power flow studies with Scheduled Outages and curtailments
CAISO Generation Dispatcher	<ul style="list-style-type: none"> • Works with the Scheduling Coordinator to determine a generation output pattern that provides the most effective unit output. • Reviews and approves instructions from Real-Time Market (RTM) and sends instructions to Market Participants via Automated Dispatch System (ADS) • Logs all compliance issues • Ensures RTM model runs at the designated intervals • Dispatches resources with Exceptional Dispatch as requested by the Shift Supervisor • Constrains resources as required for reliability purposes • Sends Market Notification (Market Notification System (MNS) and ADS) market messages as required • Utilizes RTM/Exceptional Dispatch to modify resources in RTM • Adjusts RTM (as needed) for proper Dispatching

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CAISO Operations Planning	<ul style="list-style-type: none"> • Confirms receipt of requests for electric generation and transmission Outages and provides notice of rejection, approval, and other communications • Analyzes outages for impacts to reliable operations of the Bulk Electric System • Evaluates potential reductions or outages to natural gas supply, providing input on what impact an event may have on reliable Bulk Electric System operation
CAISO System Operations	Participate in and coordinate event reporting and notification of gas curtailment events that can impact the operation of the Day-Ahead and Real-Time markets and reliability of the grid.
CAISO Operations Engineer (Real-Time)	Performs operations engineering studies to support reliable operations. Performs contingency analysis in Day-Ahead (DA) and Real-Time (RT) as required and makes recommendations regarding outage plans and unit commitment requirements. Considers critical variables and requirements that Systems Operations needs for planning and mitigating grid conditions.

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2. Scope/Applicability

2.1 Background Maintenance (planned gas transmission outages and curtailments, gas pressure reductions, etc.) of natural-gas infrastructure systems required for reliable operation of the CAISO Controlled Grid shall be coordinated between Gas Transmission Operators, CAISO Operations Planning, and the CAISO System Operations, especially when actions or events may impact electric system reliability.

Natural gas transmission pipelines are not subject to the jurisdiction or authority of the CAISO, but are primarily regulated by state and/or federal regulatory agencies. Therefore, Natural Gas Transmission Pipeline System Operator cooperation with these procedures is voluntary, does not operate as a waiver or consent to CAISO jurisdiction, and may be limited by or subject to compliance with state and/or federal agency rules and regulations. Information shared between the Natural Gas Transmission Pipeline System Operator and CAISO in accordance with any Non-Disclosure Agreement (NDA) shall be governed by the NDA.

2.2 Scope/Applicability

Gas and electric operations coordination is critical to electric grid reliability and to the natural gas supply infrastructure due to the support provided by electric generation fueled by gas. Outages of the gas transmission system may occur with advance notice (e.g., tests), or without advance notice (e.g., leaks, dig-ins).

Such systems include but are not limited to natural gas pipelines that have California power plants as end-users:

- Pacific Gas and Electric Company (PG&E)
- Southern California Gas Company (So Cal Gas)
- Kern River Gas Transmission

Under normal circumstances the Generator Operator or Scheduling Coordinator is responsible for notifying CAISO about these types of supply Outages. In the case of a larger natural gas constraint or Outage, the Gas Transmission Operator will be engaged to actively coordinate Outage planning and project communication. Maintenance and Operations of supporting infrastructure systems required for reliable operation of the CAISO Controlled Grid and Balancing Authority Area should be coordinated with either CAISO Operations Planning (Operations Planning Horizon) or System Operations (Real-Time Operations Horizon) when actions or events may affect electric system reliability.

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3. Procedure Detail

CAISO makes available to each Natural Gas Transmission Pipeline System Operator, two Estimated Gas Usage reports. The first when D+1 is completed, and the second when D+2 is completed. The estimated gas usage reports provide hourly and daily totals for each Natural Gas Transmission Pipeline System Operator entity for the areas they specify. Unit level hourly and daily estimated gas usage details supporting these reports is available to the Natural Gas Transmission Pipeline System Operator upon demand subject to terms of the executed NDA.

Time is of the essence during any potential gas curtailment events and reliability of the gas and electric systems are top priority. As such, the CAISO and the Natural Gas Transmission Pipeline System Operator shall ensure all curtailment calculations are completed and communications occur as expeditiously as possible. Should the integrity of the gas or electric system be at eminent risk, both Operators shall take whatever means necessary to safeguard system reliability.

3.1 Natural-gas reduction or insufficiency in So Cal Gas Transmission area

This section applies to So Cal Gas for natural-gas reduction or insufficiency with **little or no advance notice**. These reductions may occur either before or after the gas day begins.

Step	Natural Gas Transmission Pipeline System Operator Actions
1	Notify CAISO with a request for curtailment of MMcf <ul style="list-style-type: none"> • Specify percent of reduction of IFM or RUC forecasted gas burn necessary • Specify the region and/or resources affected • Specify date and begin and end time of curtailment period
Step	CAISO Shift Supervisor and/or Generation Dispatcher Actions
2	Confirm with the Gas company, which generation resources will be considered for gas curtailment, the required reduction amount and the expected duration.

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3	<p>Calculate pro rata reduction of schedules, necessary to reduce the region or resource(s) by the required MMcf. For a curtailment prior to the start of the gas day, use the resource specific hourly MMcf values from the estimated gas burn report. For a curtailment event after the start of the gas day, use the resource hourly MMcf values based on the real time output at the time of the notice. Confirm basis of calculation with the Natural Gas Transmission Pipeline System Operator before performing calculations.</p> <p>Review pro rata results to ensure grid reliability is maintained. Adjust and reallocate curtailments as necessary.</p>
4	<p>Communicate to Natural Gas Transmission Pipeline System Operator the results of required pro rata curtailments, sub totaled per generating station at point of receipt. Verify that curtailment notification to affected generating plants will be made by the Natural Gas Transmission Pipeline System Operator.</p> <p>Reference contact list in CAISO Operating Procedure 4120A CAISO & Gas Pipelines Coordination Contact List</p> <p>For electric generation resources within the gas limited area, the gas company should advise ISO operations as to if and when the resource is available for curtailment.</p>
Step	Natural Gas Transmission Pipeline System Operator Actions
5	<p>Notify Generating Station of agreed upon maximum allowable hourly gas burn in MMcf for the curtailment period.</p>
Step	Generator Operator Actions
6	<p>Notify Scheduling Coordinator of the plant-level gas limitation considering most effective use of available resources and supply. Should the generator operator or SC determine curtailment modifications are necessary or desired, then contact Natural Gas Transmission Pipeline System Operator (or representative) for their approval.</p>
Step	Scheduling Coordinator Actions
7	<p>Submit outage information for each generating unit to meet total generating station curtailment via outage management system. Outages (Ambient, not due to Temp) must be submitted for the duration of the anticipated gas limitation.</p>

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Step	CAISO Shift Supervisor and/or Generation Dispatcher Actions
8	Issue Market Notification (MNS and ADS) Message Example Market Notification to all SC's: <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p style="text-align: center;">Market Notification for natural-gas reduction or insufficiency in a region</p> <p><i>“Due to imposed fuel limitations for hour(s) ending ____ through ____, the CAISO requests Scheduling Coordinators adjust their generator availability in Web OMS to maximize available MW output across affected units at each generating station. Confirm ALL unit shutdowns with ISO Generation dispatcher PRIOR to shutting unit down.</i></p> </div>
9	Review and approve outage cards for gas curtailments.
10	Monitor generator output to ensure unit is dispatched in accordance with any fuel availability reductions and in a manner that meets system reliability needs. If not, issue an exceptional dispatch as necessary to meet reliability needs.
11	Consider increasing a generating unit above its Web OMS limitation if system needs necessitate: <ul style="list-style-type: none"> • Calculate the additional MMcf necessary • Contact affected Natural Gas Transmission Pipeline System Operator ensure additional gas burn can be accommodated • Request Natural Gas Transmission Pipeline System Operator to adjust the plant level curtailment to allow for additional calculated MMcf • Notify the Scheduling Coordinator of the anticipated generating unit output adjustment
Step	Natural Gas Transmission Pipeline System Operator Actions
12	Notify Generator Operator with newly adjusted gas limitation
Step	Scheduling Coordinator Actions
13	Adjust Web OMS outage card for the affected generating unit(s) accordingly. Reference Operating Procedure 3220 Generation Outages
Step	CAISO Shift Supervisor and/or Generation Dispatcher Actions
14	Consider: <ul style="list-style-type: none"> • Implementing restricted maintenance operations per Operating Procedure 4420 System Emergency.

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15	Monitor generator output to ensure unit is dispatched in accordance with any fuel availability reductions and in a manner that meets system reliability needs. If not, issue an exceptional dispatch to meet reliability needs.
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3.2 Reduction/ Outage Implementation in Real-Time for all other Natural Gas Transmission Pipeline System Operator

This section applies to a natural-gas reduction or insufficiency with **little or no advance notice**.

Applicable to the following Gas Companies:

- Pacific Gas and Electric Company (PG&E)
- Kern River Gas Transmission

Step	Natural Gas Transmission Pipeline System Operator Actions
1	Contact their affected end-use customer (Generator Operator) with information on the natural-gas curtailment and maximum daily or hourly gas consumption limit.
2	Notify CAISO of impacts to end-use customers that include one or more Generator Operators as appropriate to coordinate Outage, which may include but is not limited to: <ul style="list-style-type: none"> • Which end-use gas customers (Generating Units) will be affected • Degree of impact • Reduction/outage start time and date, and end time and date
3	Communicate any gas issues with the CAISO and other affected Gas Transmission Operators as early as possible. Reference contact list in CAISO Operating Procedure 4120A CAISO & Gas Pipelines Coordination Contact List .

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Step	Scheduling Coordinator Actions				
4	<p>Notify the CAISO Generation Dispatcher of impacts to the Generating Unit using the outage management system per CAISO Operating Procedure 3220 Generation Outages.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #add8e6;">If...</th> <th style="background-color: #add8e6;">Then...</th> </tr> </thead> <tbody> <tr> <td style="vertical-align: top;"> An anticipated or unanticipated gas-supply interruption threatens a Generating Unit's ability to run at full capacity, </td> <td style="vertical-align: top;"> <ul style="list-style-type: none"> Provide timely notification to the CAISO Generation Dispatcher. Collaborate with the CAISO Generation Dispatcher to determine a generation output pattern that provides the most effective unit output based on gas availability, load forecast and transmission availability, if possible. Once the best possible generation output pattern has been determined, collaborate with the CAISO Generation Dispatcher to determine if the generation output pattern should be entered via an outage management system ambient de-rate not due to temperature or via an Exceptional Dispatch. <p><i>Note: The CAISO Generation Dispatcher may issue Exceptional Dispatch to shut down units if shutting down individual units may provide gas availability to units that are more effective for maintaining reliability.</i></p> </td> </tr> </tbody> </table>	If...	Then...	An anticipated or unanticipated gas-supply interruption threatens a Generating Unit's ability to run at full capacity,	<ul style="list-style-type: none"> Provide timely notification to the CAISO Generation Dispatcher. Collaborate with the CAISO Generation Dispatcher to determine a generation output pattern that provides the most effective unit output based on gas availability, load forecast and transmission availability, if possible. Once the best possible generation output pattern has been determined, collaborate with the CAISO Generation Dispatcher to determine if the generation output pattern should be entered via an outage management system ambient de-rate not due to temperature or via an Exceptional Dispatch. <p><i>Note: The CAISO Generation Dispatcher may issue Exceptional Dispatch to shut down units if shutting down individual units may provide gas availability to units that are more effective for maintaining reliability.</i></p>
If...	Then...				
An anticipated or unanticipated gas-supply interruption threatens a Generating Unit's ability to run at full capacity,	<ul style="list-style-type: none"> Provide timely notification to the CAISO Generation Dispatcher. Collaborate with the CAISO Generation Dispatcher to determine a generation output pattern that provides the most effective unit output based on gas availability, load forecast and transmission availability, if possible. Once the best possible generation output pattern has been determined, collaborate with the CAISO Generation Dispatcher to determine if the generation output pattern should be entered via an outage management system ambient de-rate not due to temperature or via an Exceptional Dispatch. <p><i>Note: The CAISO Generation Dispatcher may issue Exceptional Dispatch to shut down units if shutting down individual units may provide gas availability to units that are more effective for maintaining reliability.</i></p>				
5	<p>Submit bids for Real-Time Market as appropriate for the impacted timeframe consistent with the updated gas availability for the Trade Day. For Real-Time this includes any adjustments required from the Day-Ahead Market Awards and Schedules.</p>				

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Step	CAISO Shift Supervisor and/or Generation Dispatcher Actions	
6	If... CAISO is aware of unplanned pending or current gas reductions, or unintended consequences of planned gas reductions,	Then... Evaluate the impacts of gas reductions to reliable electric operations. Provide input regarding requirements and adjustments to Generating Units' Outage plans as required to Real-Time Market, which may include: <ul style="list-style-type: none"> • Duration – How long are the curtailments going to be in effect? • What area(s)/units are affected? • Can current burn rate be maintained? • Can reductions now be stored for later use (e.g., at peak)? • Can gas curtailment be isolated to a given area and increased in another? • Are Operating Reserves impacted? Actions may include: <ul style="list-style-type: none"> • Cancellation/Reschedule of approved electric transmission outages. • Collaborating with Scheduling Coordinators to determine unit specific generation output patterns that best support electric system reliability. This includes requesting Scheduling coordinator to submit ambient de-rates and the use of Exceptional Dispatch. • Cancellation/Reschedule of approved generation unit outages. • Additional unit commitments needed for electric reliability • Adjustments to electric market mechanisms as necessary.

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Step	CAISO Shift Supervisor and/or Generation Dispatcher Actions
7	<p>Consider:</p> <ul style="list-style-type: none"> • Implementing restricted maintenance operations per Operating Procedure 4420 System Emergency. <p><i>Note: The specific actions and the order of the actions taken may vary due to system conditions as well as the impacts of natural gas supply issues.</i></p>
Step	CAISO System Operations Actions
8	<p>Continue to coordinate planning and communications internal to the CAISO prior to and throughout reduction/outage implementation timeframe.</p>

3.3 Reduction/ Outage Implementation in Day-Ahead:

This section applies to a natural-gas reduction or insufficiency in the Day-Ahead. (Procedures for natural-gas reductions with advance notice are given in Section 3.3, above.)

Applicable to the following Gas Companies:

- Pacific Gas and Electric Company (PG&E)
- Kern River Gas Transmission

Step	Gas Transmission Operator Actions					
1	<p>Contact each affected end-use customer (Generator Operator) with information on the natural-gas curtailment and maximum daily or hourly gas consumption limit.</p>					
2	<p>Notify CAISO of impacts to end-use customers that include one or more generators, as appropriate to coordinate outage planning per CAISO Operating Procedure 3220 Generation Outages, which may include but is not limited to:</p> <ul style="list-style-type: none"> • Which Generating Units will be affected • Degree of impact • Reduction/outage start date and time, and end date and time <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #e1f5fe;">If...</th> <th style="background-color: #e1f5fe;">Then...</th> </tr> </thead> <tbody> <tr> <td>Reduction /shortage is anticipated 1 to 2 days in advance,</td> <td>Notify the CAISO System Operations Shift Supervisor by telephone.</td> </tr> </tbody> </table>		If...	Then...	Reduction /shortage is anticipated 1 to 2 days in advance,	Notify the CAISO System Operations Shift Supervisor by telephone.
If...	Then...					
Reduction /shortage is anticipated 1 to 2 days in advance,	Notify the CAISO System Operations Shift Supervisor by telephone.					
3	<p>Communicate any gas issues with the CAISO and other affected Gas Transmission Operators as early as possible. Reference contact list in Operating Procedure Attachment 4120A CAISO & Gas Pipelines Coordination Contact List.</p>					

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Step	Scheduling Coordinator Actions	
4	Notify CAISO Day-Ahead Operator of impacts to the Generating Unit using the outage management system per CAISO Operating Procedure 3220 Generation Outages .	
	If... Reduction/shortage is anticipated 1 to 2 days in advance,	Then... Provide timely notification to the CAISO Day-Ahead Operator by telephone AND submit an ambient not due to temperature derate card via the outage management system.
5	Submit bids for Day-Ahead Market as appropriate for the impacted timeframe consistent with the updated gas availability for the Trade Day.	
	If... Shortage occurs after the close of the Day-Ahead Market but prior to Real-Time,	Then... Notify the CAISO Generation Dispatcher by telephone AND submit an ambient not due to temperature derate card via the outage management system.
Step	CAISO Day-Ahead Market Operator Actions	
6	If... Anticipating an increase in unit commitments for the next day,	Then... Notify the Shift Supervisor to contact the impacted Gas Transmission Operators to advise them of forecasted increase in demand for supply.
	CAISO Shift Supervisor and Day-Ahead Market Operator Actions	
7	Communicate any gas issues between the CAISO and each Gas Transmission Operator as early as possible. Reference contact list in CAISO Operating Procedure 4120A CAISO & Gas Pipelines Coordination Contact List <i>Note: Also consider a peak day call mechanism to alert market participants.</i>	

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Step	CAISO Shift Supervisor and/or Generation Dispatcher Actions
8	<p>Consider:</p> <ul style="list-style-type: none"> • Implementing restricted maintenance operations per Operating Procedure 4420 System Emergency. <p><i>Note: The specific actions and the order of the actions taken may vary due to system conditions as well as the impacts of natural gas supply issues.</i></p>
Step	CAISO Operations Engineering Services Actions
9	<p>Study and analyze next worst contingencies for affected regional areas and Bulk Electric System.</p> <ul style="list-style-type: none"> • Consider path and transfer capabilities and limitations for procurement of energy and Operating Reserves • If appropriate, refer to applicable Bulk and/or Regional procedures for studied operating scenarios and requirements • Prepare market contingencies, nomograms and displays as appropriate
10	<p>Provide input regarding forecast gas burn and gas requirements and adjustments for the Day-Ahead Market as applicable to Shift Supervisor and appropriate operators which may include:</p> <ul style="list-style-type: none"> • Planned Generating Units on line • Day-Ahead schedule • Adjustments needed to maintain reliability and gas fuel curtailments • Units commitments needed for reliability • Generating Units commitments needed for reliability
Step	CAISO System Operations Actions
11	<p>Continue to coordinate planning and communications prior to and throughout reduction/ outage implementation timeframe.</p>

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3.4 Recovering from Natural-gas reduction or insufficiency

Take the following actions when Natural Gas Transmission Pipeline System Operator has notified affected Generator Operators that gas limitations are no longer in effect.

Step	CAISO Shift Supervisor and/or Generation Dispatcher Actions
1	<ul style="list-style-type: none"> • Review reliability impacts of returning generating units to schedule in coordination with the Natural Gas Transmission Pipeline System Operator. • Notify Generation Dispatchers of anticipated return to normal system operations
Step	Scheduling Coordinator Actions
2	Adjust Web OMS outage card for the affected generating unit(s) accordingly.
Step	Natural Gas Transmission Pipeline System Operator Actions
3	Inform s electric generation resources impacted by the fuel limitation that the fuel limitation has been lifted and normal gas usage can be resumed.
Step	CAISO Generation Dispatcher Actions
4	Approve Web OMS cards and allow generating units to return to their schedules.
5	Utilize exceptional dispatches as necessary to maintain system reliability while returning to normal system operations.
6	Make all necessary Market Notifications (MNS and ADS)

3.5 Market Notification (MNS and ADS) Scripts

The following are sample Market Notification (MNS and ADS) messages to consider when sending market message to participants through MNS and ADS:

<p>Notification, Natural-gas reduction or insufficiency in So Cal Gas Transmission area:</p> <p><i>“Due to imposed fuel limitations for hour(s) ending ____ through ____, the CAISO requests Scheduling Coordinators adjust their generator availability in Web OMS to maximize available MW output across affected units at each generating station.</i></p>
<p>Notification, Recovering from natural-gas reduction or insufficiency :</p> <p><i>For HE ____, the CAISO expects the imposed fuel limitations to be lifted and requests Market Participants resume normal operation.</i></p>

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<p>Notification, in advance of the Day-Ahead Market:</p> <p>The CAISO has confirmed with [Natural Gas Transmission Pipeline System Operator] that the gas delivery system outage of [broad description of aggregated outage area] is scheduled to commence at [date, time] for a period of [outage period – hours/days]. Please ensure your Day-Ahead Market Bids are consistent with this outage.</p>
<p>Notification, after the Day-Ahead Market but before Real-Time Market:</p> <p>The CAISO has been notified by [Natural Gas Transmission Pipeline System Operator] that a gas delivery system outage of [broad description of aggregated outage area] is scheduled to commence at [date, time] for a period of [outage period – hours/days]. Please ensure your Real-Time Market Bids are consistent with this outage and that your unit(s) availability is updated using an outage management system ambient not due to temperature derate card. The CAISO requests Scheduling Coordinators adjust their generator availability in Web OMS to maximize available MW output across affected units at each generating station.</p>
<p>Notification, during Real-Time Market:</p> <p>The CAISO has been notified by [Natural Gas Transmission Pipeline System Operator] of a gas delivery outage. The outage is estimated to be for a period of [outage period – hours/days, if known]. Please ensure your Real-Time Market Bids are consistent with this outage and that your unit(s) availability is updated using an outage management system ambient not due to temperature derate card.</p>
<p>Notifications, during Real-Time Market due to gas supply insufficiency:</p> <p>Due to [issue] in [broad description of aggregate outage area], the CAISO is repositioning the generation fleet to prepare for the evening ramp. Restricted Maintenance has been declared for HE [xx] until HE [xx] as a result of this issue.</p> <p>Due to [issue] in [broad description of aggregate outage area], the CAISO is extending the Restricted Maintenance Operations until HE [xx].</p>
<p>Note: To the extent that the Natural Gas Transmission Pipeline System Operator is willing to assist in providing the “description of aggregate outage area” the shift supervisor should consult and consider their proposal for wording. Examples of a “broad description outage area” are “San Diego” or “SP 15.”</p>

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4. Supporting Information

Operationally Affected Parties Public, Peak RC

References Resources studied in the development of this procedure and that may have an effect upon some steps taken herein include but are not limited to:

CAISO Operating Procedure	3220 Generation Outages
CAISO Operating Procedure	4110 System Operations Emergency Preparation, Notifications and Reporting
CAISO Operating Procedure	4420 System Emergency
CAISO Operating Procedure	4510 Load Management Programs and Underfrequency Load Shedding

Definitions Unless the context otherwise indicates, any word or expression defined in the Master Definitions Supplement to the CAISO Tariff shall have that meaning when capitalized in this Operating Procedure.

The following additional terms are capitalized in this Operating Procedure when used as defined below:

Point of Receipt (POR)	Point(s) of interconnection on the Transmission Provider's Transmission System where capacity and/or energy transmitted by the Transmission Provider will be made available to the Delivering Party. The Point(s) of Receipt shall be specified in the Service Agreement.
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Version History

Version	Change	By	Date
Draft	Initiated draft		6/1/11
Draft	Split it into Day-Ahead and Real-Time. Minor changes made by Debi		9/19/11
1.0	Final comments/ Edits		10/6/11

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2.0	<p>1) Changed term “Outage Management” to “Outage Coordination Office” to align with Tariff language</p> <p>2) Incorporated edits as per conversation with PG&E:</p> <ul style="list-style-type: none"> - The term Gas Company was changed to Gas Pipeline throughout the procedure. - Section 1. Responsibilities: <u>all responsibilities have been updated.</u> - Section 2.1 Background: updated and added clarification on Non-Disclosure Agreement (NDA)s. - Section 2.2 Scope/Applicability: updated first paragraph and the list of Gas Pipelines, and clarified that “under normal circumstances, the <u>Generator or Scheduling Coordinator</u> is responsible for notifying the CAISO about these types of supply outages.” - Section 3.1 <u>Gas Pipeline Actions and Scheduling Coordinator Actions</u> have been significantly revised. -Section 3.1 Step 6 <u>CAISO Generation Dispatcher actions</u> has a minor change on the wording. -Section 3.1 Step 8 <u>CAISO Shift Supervisor and Generation Dispatcher Actions</u> : the “If” portion of the statement has been rephrased and changed “immediate gas reductions” to “unplanned pending or correct gas reduction”. - Section 3.1 Step 9: minor word change from “fuel gas” to “natural gas.” -Section 3.1 Step 10 <u>CAISO OE Actions</u> has been revised (Rule of Thumb bullet equation). - Section 3.2 <u>Gas Pipeline and Scheduling Coordinator Actions</u> have been revised. 	2/1/12	
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	<ul style="list-style-type: none"> -Section 3.2 Step 10 <u>CAISO OE actions</u> have been revised (rule of thumb bullet-formula). -Section 3.3 Gas Pipeline Actions have been revised. - Section 3.3 Step 4 <u>Scheduling Coordinator Actions</u>, “If, Then” statement revised to read “ Provide timely notification to CAISO” instead of “Notify CAISO”. -Section 3.3 Step 7 has been revised. Reference to the MSN messages has been deleted. - Section 3.3 Step 10 <u>CAISO OE actions</u> have been revised (rule of thumb bullet-formula). - Section 3.4 MNS Scripts have been revised to read “broad description of aggregated outage area.” - Revised Attachments 4120A and 4120B: Changed term “Gas Company” to “Gas Pipeline and deleted Huntington Beach units 3&4 		
2.1	Section 3.1 step 10, Section 3.2 steps 9-10, Section 3.3 steps 10-11: Changed action responsibility from ops engineering to ops planning.		2/17/12
2.2	Replaced references to 4220 Restricted Maintenance Operations to 4420 System Emergency since 4220 has been merged with 4420.		8/24/12
2.3	Corrected spelling errors Section 3.1 and 3.2 CAISO Shift Supervisor Actions: added notifications to the WECC RC and adjacent BAs and to the SOC.		2/28/13
3.0	Sections 3.1 and 3.3: Added actions on collaboration between Scheduling Coordinator and Generation Dispatcher to determine generation output patterns and reporting		2/27/15

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	<p>requirements, in the event that a unit's ability to run at full capacity is threatened.</p> <p>Changed CAISO Operations Engineering Planning actions to CAISO Operations Engineering Services actions.</p> <p>Replaced all references of SLIC to outage management system and replaced WECC RC with Peak RC throughout the document.</p>		
4.0	<p>Major update/rewrite to better align with current practices, including new Section 3.1 Natural-gas reduction or insufficiency in So Cal Gas Transmission area, and 3.4 Recovering from Natural-gas reduction or insufficiency.</p>		1/15/16

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5. Periodic Review Procedure

Review Criteria There are no specific review criteria identified for this procedure, follow instructions in Procedures 5510 and 5520. Gas Transmission Operator entities should notify ISO whenever they are planning for changes in their regulatory requirements or operations practices that would have an impact on these procedures, and this action would trigger a review.

Frequency Review as recommended in Procedures 5510 and 5520.

Incorporation of Changes There are no specific criteria for changing this document, follow instructions in Procedures 5510 and 5520.

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Technical Review

Reviewed By Content Expert	Signature	Date
Operating Procedures		1/12/16
Real-Time Operations		1/13/16
Operations Planning – North		1/15/16
Operations Planning - South		1/15/16
Manager, Operations Engineering		1/13/16

Approval

Approved By	Signature	Date
Executive Director, System Operations		1/13/16
Director, Operations Engineering Services		1/15/16

Appendix

[4120A CAISO & Gas Pipelines Coordination Contact List](#)
[4120B CAISO & Gas Pipelines Power Plant Reference List](#)