



McCullough Research

6123 S.E. Reed College Place
Portland, Oregon 97202

Voice: 503-771-5090

Fax: 503-771-7695

Internet: robert@mresearch.com

MEMORANDUM

Date: November 29, 2002

To: McCullough Research Clients

From: Robert McCullough

Subject: C66 and the Artificial Congestion of California Transmission in January 2001

In 2001, the California ISO called emergency blackouts in Northern California on seven occasions. At the time, the ISO's public statements concerning the blackouts contained a number of anomalies. The central problem identified by the ISO was its inability to serve loads in Northern California on its inability to wheel power from Southern California to Northern California.

While withholding by generators in California was a clear central cause, the load resource balance in Southern California was significantly better than that in Northern California. The end result was that the ISO had surplus resources in Southern California and faced a deficit in Northern California.

As always, ISO operations were largely secret during this period. The ISO's Stage 3 Emergency filing with the North American Electric Reliability Council (NERC) described the situation as:

1/17/01:

Prescheduled interchange imports are much less on the 17th than the 16th.

From approximately 0515 until 2200, all non firm loads were requested to be interrupted. The estimated total of these non firm loads is 1500 MW.

Pump load is curtailed as available. CDWRs water operations have been severely impacted as a result of the many requests for curtailment.

Generation outages (forced and planned) are approximately 10,000 MW.

From 1140 until 1345, the ISO requested PG&E interrupt 500 MW of firm load. Path 15 limits were being exceeded due to hydro generation in northern California that must be backed due to low water levels. During the reduction of those hydro facilities, a thermal plant in central California tripped

which in turn created an overload on Path 15.¹

The ISO's notification concerning the emergency to the Secretary of Energy was also laconic:

(1) Continuing Transmission Constraint on Path 15: Due to the locational dispersion of resources in California, the CAISO must transmit power from generation capacity in Southern California to Northern California to meet Northern California load. Path 15 has been and will continue to be fully loaded and therefore, no additional power can be transmitted North (where there continues to be a deficiency).

Redaction -- market sensitive information²

ISO reports over this period were very surprising. While loadings going into California over the AC intertie were very light, the ISO weekly market report showed extensive congestion.³

Congestion⁵		SAT 1/13	SUN 1/14	MON 1/15	TUE 1/16	WED 1/17	THU 1/18	FRI 1/19	Weekly Summary	
Day Ahead Congestion Frequency (Percent of Hours)										
Path 15	Peak	88%	69%	44%	75%	100%	100%	0%	Weekly Average	68%
	Off	100%	100%	100%	75%	100%	75%	0%	Weekly Average	79%
Ca-Oregon Intertie	Peak	0%	100%	0%	0%	100%	100%	100%	Weekly Average	57%
	Off	100%	100%	0%	0%	100%	100%	63%	Weekly Average	66%
Palo Verde	Peak	0%	0%	0%	0%	0%	0%	0%	Weekly Average	0%
	Off	0%	0%	0%	0%	0%	0%	0%	Weekly Average	0%
Path 26	Peak	0%	0%	0%	0%	0%	0%	0%	Weekly Average	0%
	Off	0%	0%	0%	0%	0%	0%	0%	Weekly Average	0%
Hour Ahead Congestion Frequency (Percent of Hours)										
Path 15	Peak	25%	0%	25%	13%	69%	38%	100%	Weekly Average	38%
	Off	0%	0%	75%	38%	75%	100%	0%	Weekly Average	41%
CA-Oregon Intertie	Peak	0%	69%	0%	0%	0%	0%	0%	Weekly Average	10%
	Off	75%	100%	0%	0%	0%	0%	0%	Weekly Average	25%
Palo Verde	Peak	0%	0%	0%	0%	0%	0%	0%	Weekly Average	0%
	Off	0%	0%	0%	0%	0%	0%	0%	Weekly Average	0%
Path 26	Peak	0%	0%	0%	0%	0%	0%	0%	Weekly Average	0%
	Off	0%	0%	0%	0%	0%	0%	0%	Weekly Average	0%

On June 5, 2002, I hypothesized that some of the same schemes described in the Yoder/Hall memo might explain the apparent contradiction of an unloaded transmission line facing 100% congestion in the day ahead market.⁴

After nearly six months of energetic discovery efforts, it is now clear that the congestion in California during this period was caused by the ISO itself. A detailed look at the existing

¹NERC Energy Emergency Alert 3 Report, January 17,2001 through January 20,2001, Tamara Elliott.

²CAISO NOTIFICATION: DOE Certification for Operating Date January 17, 2001, Analysis of Load Forecast, Resource Availability Forecast, and Transmission System Conditions that Call for Certification, page 2.

³Weekly Market Watch, California ISO, January 19, 2001, page 5.

⁴Congestion Manipulation in ISO California, Robert McCullough, June 5, 2002, and Traders' Strategies in the California Wholesale Power Market/ISO Sanctions, Christian Yoder and Stephen Hall, December 6, 2000.

transmission contracts on the AC intertie, the DC intertie, Path 15, and a variety of other transmission lines revealed the existence of “66” transmission contracts. C66, the imaginary transmission contract intended to congest day ahead schedules on the AC intertie, caused the congestion reported by the ISO in the table above.

Materials received from the ISO indicate that type “66” contracts were common over this period. The decision to create imaginary congestion in the day ahead market was apparently a part of an ill-judged effort to stop energy from leaking out of California. While the implications of this odd strategy are difficult to estimate, it is clear that these imaginary contracts contributed to higher prices in the Pacific Northwest, unnecessarily cancelled schedules between the regions, and may have reduced the overall supply of energy available to meet load on the West Coast.⁵ Overall, such measures would be expected to raise costs to consumers and profits to suppliers.⁶

The ISO’s discovery responses make it clear that they had justified these steps under a NERC policy called “Capacity Benefit Margin.”

Capacity Benefit Margin (CBM)

Among the less-well-publicized tools at the disposal of the CAISO is the Capacity Benefit Margin (CBM). While this term appears nowhere in the CAISO tariff, nor its appendices, nor its protocols, the term is defined by NERC as follows:

Capacity Benefit Margin (CBM) is defined as that amount of transmission transfer capability reserved by load serving entities to ensure access to generation from interconnected systems to meet generation reliability requirements.⁷

NERC also defines a related concept, the Transmission Reliability Margin (TRM) as follows:

⁵Prescheduling is an important part of the efficient operation of the system. The operation of the AC and DC interties was designed to facilitate hourly, daily, and monthly factoring of energy between the hydro system in the Pacific Northwest and the thermal resources in California. The artificial congestion would have made efficient use of these arrangements difficult, if not impossible.

⁶Last week, Eric Hildebrandt, a manager at the California ISO, released a curious critique of our June 5, 2002 hypothesis entitled “Did Any of Enron’s Trading and Scheduling Practices Contribute to Outages in California?” Since Dr. Hildebrandt participated in the discovery process, he must have been aware that the ISO had provided materials that made it clear that the ISO’s own practices were a central cause of the congestion. Thus the apparent defense of Enron in this critique was a rebuttal to a hypothesis five months out of date, whose explication he had helped provide.

⁷North American Electric Reliability Council reference document *Available Transfer Capability Definitions and Determination*, June 1996. Available at: ftp://www.nerc.com/pub/sys/all_updl/oc/opman/atcfinal.pdf

Transmission Reliability Margin (TRM) is defined as that amount of transmission transfer capability necessary to ensure that the interconnected transmission network is secure under a reasonable range of uncertainties in system conditions.⁸

The CAISO tariff permits the ISO to impose restrictions on the capacity of transmission facilities under a variety of operating conditions. Specifically, ISO counsel has cited section 6.9.1 of the CAISO Dispatch Protocol as granting them authority to restrict transmission capacity through CBM and TRM reservations. In its entirety, the cited section reads:

DP 6.9.1 Security Coordinator

As Security Coordinator, the ISO may direct activities as appropriate to curtail Schedules, Dispatch Generation or impose transfer limitations as necessary to relieve grid Congestion, mitigate potential overloads or eliminate operation outside of existing nomogram criteria.⁹

The ISO's interpretation of Capacity Benefit Margin is inconsistent with the WECC rules set out in the WECC's June 2001 policy document.

CBM is the amount of firm transmission transfer capability reserved by Load Serving Entities (LSEs) on the host transmission system where their load and generation resources are located, to enable access to generation from interconnected systems to meet generation reliability requirements. CBM is a unidirectional quantity with identifiable beneficiaries, and its use is intended only for the time of emergency generation deficiencies. CBM reservations may be sold on a non-firm basis.

Reservations should be made according to the applicable Transmission Provider's tariff. The determination of CBM reservations according to this Section 6.3.4 is only for purposes of determining required transmission capacity for generation reliability and is not intended to address any payment obligations associated with such reservations.

Each Transmission Provider should make its CBM values and calculation methodology publicly available, including a description of the procedure for the use of CBM in an energy emergency. Actual usage of CBM should be posted by the Transmission Provider.¹⁰

The California ISO has stated that their application of CBM was public, but we have not been able to find any mention of CBM during the period in question in any location other than Enron's internal files. Enron apparently received a briefing on CBM on April 3, 2001.¹¹

The basic problem with the ISO's use of CBM is that it was designed to preserve transmission paths to reserves situated off-system. If the ISO had reserves in the Pacific Northwest and they had

⁸Ibid.

⁹California Independent System Operator, FERC Electric Tariff, First Replacement Volume II, Dispatch Protocol, page 475. Available at <http://www.caiso.com/docs/2002/02/12/2002021215381518908.pdf>.

¹⁰Determination of Available Transfer Capability Within The Western Interconnection, page 14, available at <http://www.wecc.biz/documents/policy/ATC-apprdec01.pdf>.

¹¹"Re: TTC/ATC with the attachment!!", Steve Walton, April 4, 2001 and "ISO Market Stabilization, ATC Reductions, and Manipulation of Industry Practice and Protocol", Sean Crandall, April 4, 2001.

wished to implement CBM to protect their access to the reserves, they would have reserved transmission capacity north to south on the AC intertie. As it happens, they reserved capacity south to north, which would only protect capacity reserves in the Pacific Northwest, not California.

A second problem is that the CBM was designed to completely exhaust open capacity going south to north. The WECC rules for calculation of the CBM are:

Allowance for CBM generation reliability requirements should be determined in one of two ways, namely (1) using a Loss of Load Expectation (LOLE) probability calculation, or (2) deterministic based upon the largest single contingency. An LOLE of 1 day in 10 years is recommended. This calculation is made using commonly accepted probabilistic generation reliability techniques. The calculation is performed on a monthly basis. The generation requirement is then converted to a CBM requirement for each interconnection based upon historical purchases at peak times, typical load flow patterns and an assessment of adjacent and beyond control area reserves. The generation reliability requirement is updated at least annually.¹²

The ISO's actual approach was more pragmatic:

- 2) The "formula" used by staff to determine how much capacity was withheld each day.

The ISO imposed transmission limitations for the purpose of maintaining system reliability; we did not withhold capacity. The capacity subject to the transmission limitations was used in Real Time for actual power flow.

During the time period specified in the request, December 1, 2000 through January 31, 2001, the transmission limitations imposed by the ISO were equal to the Available Transmission Capacity of COI, which was determined as the Operating Transfer Capability of the line less Existing Contract Rights less Firm Transmission Rights of approximately 33 MW.¹³

In practice, the ISO simply filled the south to north access on the line with an imaginary contract known as "C66." This allowed the ISO to block prescheduled transmission to the Pacific Northwest. The ISO's claim that they were no withholding capacity is not completely true. Capacity was withheld from legitimate preschedules and reserved for the real time use of the ISO itself.

¹²Determination of Available Transfer Capability Within The Western Interconnection, page 15.

¹³Email from Beth Ann Burns to Christian Schreiber, November 19, 2002.