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Market Manipulation in California's Electricity Markets: ENRON Was the Victim, not the Perpetrator

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ABSTRACT

The early California restructured electricity market was poorly designed. The disassociation of retail with wholesale price together with the effective ban on hedging was a disaster waiting to happen. The refusal to learn from other existing RTOs created a CAISO system that firms were able to exploit in numerous ways. When the system failed a search for villains ensued. A governor lost his job, and ENRON played the role of bogeyman.

ENRON was a company based on financial fraud, but it was one of many firms taking advantage of the weaknesses in the CAISO market. ENRON's perceived culpability was enhanced by its use of clever names such as "Death Star," "Get Shorty," and "Ricochet" for its trading strategies. Yet despite the poor optics, ENRON was not a significant participant in market manipulation in the California market.

The most obvious examples of manipulation, however, were undertaken by the major load serving entities. These strategies reduced the amount these firms had to pay, at the expense of electricity suppliers, including ENRON. The actions of ENRON and others in response to such strategies can be properly seen as arbitrage and hedging, strategies that served to reduce the damage done in California's markets.

I. Introduction

In the 1990s electricity restructuring looked nice in theory. In practice, perhaps not so much. The state of California adopted restructuring, and managed to create an electricity grid system that almost collapsed. In the end, California rate payers were out billions of dollars, while firms such as the infamous ENRON were forced to pay for their actions in "manipulating" this market. In this chapter we will examine what those strategies were, and how to interpret them in an economic context.

Section II contains an explanation of the deeply flawed restructured California electricity market at the turn of the 21st century. After that, the chapter will turn to a brief history of ENRON, and ENRON's presence in the California market. Section IV examines trading strategies of ENRON and other firms designed to take advantages of the weaknesses in California's congestion management system, while Section V reviews the ancillary market based "Get Shorty" strategy. Section VI examines the economic phenomena that was at the core of the other alleged manipulative strategies, that real time power prices were systematically higher than day ahead prices. Section VII uses the theories of Section VI to examine the economic consequences of the strategies designed to take advantage of the difference in prices. Section VIII critiques the legal theory of "gaming" that FERC used to find liability in its litigation, while Section IX contains concluding thoughts.

II. Electricity Restructuring in California

In 1996 the state of California decided to restructure its electricity market. Unfortunately, the plan adopted by the state legislature and implemented by the California Independent System Operator (CAISO) was deeply flawed. There were three basic weaknesses, which together combined to result in economic disaster. (See, for example Considine and Kleit, 2006.)

The first weakness was that, unlike almost every other market in the economy, the retail price of electricity was not directly related to the wholesale price. Thus, the retail price that distribution companies (in the jargon, "Load Serving Entities, or "LSEs") were allowed to charge was determined by the state, while the wholesale price was determined by market forces. This is, unfortunately, a common flaw of electricity restructuring. This restriction, in turn, made the quantity demanded unresponsive to the wholesale price of power, which in turn increased the volatility of the price on the supply side at the wholesale level.

Given that the state mandated price was designed to offer regulated LSEs a market rate of return, this restriction could have been overcome. LSEs could simply have hedged their positions in electricity futures markets through long-term contracts, as discussed in Chapter 1. This is what is typically done in restructured states today. Unfortunately, California imposed another restraint on the market.

Electricity restructuring requires some "vertical" separation between the regulated LSEs and the free-market generation sector. If this does not occur, LSEs have incentives to engage in self-dealing rather than choose low cost generation suppliers. There are a number of ways to achieve this separation. Perhaps the easiest is to forbid LSEs from owning generation plants, and then to require them to enter into long-term contracts for electricity through an auction.

Under the California plan, the three major LSEs were not allowed to own their own generation facilities. Instead of having rules for buying long-term power through arms' length transactions, however, these companies were given rules that caused them to only buy power on the day-ahead (Power Exchange, or PX market) or real time markets (Sweeney, 2002 at 61). While CAISO operated the real-time market, the newly formed PX ran the day-ahead market. Coordination between the two entities was naturally limited.

These affected companies constituted about 78% of the demand for power in California (Sweeney, 2002 at 7). At the time the requirement to buy in the PX was adopted I could not explain why.[1] Two decades have not improved my understanding of this decision. Of course, since you read Chapter One, you know what problem the PX created. Without long term supply contracts or futures, firms could not hedge their risk.

Third, California ignored the experience of the other existing of RTOs in England, New Zealand, and Chile when it set up its own system operator. (Sweeney, 2002 at 30, 71) As a result, the newly formed CAISO was ill equipped to monitor the electricity marketplace. CAISO had limited or no sanctions for fraudulent reporting by electricity entities. It had difficulty understanding when fraud was taking place. It had no method of knowing what was happening outside its footprint in neighboring states. Eventually, this served as a gigantic "kick me" sign for those firms who wanted to take advantage of the system.

No one noticed these limitations in the first two years of the market, as no unusual events occurred. In 2000, however, everything that could go wrong did go wrong. There was a drought in the mountains, reducing power from hydro sources. A pipeline fire limited the ability to obtain natural gas for generators to the state. Wildfires destroyed transmission lines. The pollution permits needed to operate coal and gas generators became scarce. A decade of changing regulatory policy had reduced investment in electricity generation in California just in time for that generation to be needed (Sweeney, 2002 at 100-101, 120-122).

The result was higher prices. In typical markets, higher prices mean lower demand. This did not apply to California's restructured electricity markets, where retail prices were fixed at state-approved levels. Instead, demand remained unaffected as wholesale prices soared.

[1] I have always suspected that this decision was made by someone who had had a very bad experience in their one college class in microeconomics, and could not see past supply and demand curves.

	Energy Only ($/MWh)	Ancillary Services ($/MWh)	Total Energy ($/MWh)		Energy Only ($/MWh)	Ancillary Services ($/MWh)	Total Energy ($/MWh)
All 1998	29.03	3.77	32.80				
All 1999	30.89	1.78	32.66				
Jan 2000	31.64	0.62	32.26	Jan 2001	184.65	13.16	197.81
Feb	30.43	0.58	31.01	Feb	216.57	12.00	228.56
March	29.55	0.60	30.15	March	202.55	10.14	212.69
April	30.78	0.95	31.73	April	190.98	10.33	201.31
May	57.96	3.16	61.12	May	171.59	8.96	180.55
June	146.78	20.18	166.96	June	86.41	9.46	95.87
July	112.07	5.71	117.78	July	72.08	3.38	75.47
Aug	167.93	12.18	180.11	Aug	64.76	2.38	67.13
Sep	118.56	7.39	125.94	Sep	49.94	0.97	50.92
Oct	97.73	2.95	100.68	Oct	45.22	0.79	46.01
Nov	165.12	6.13	171.26	Nov	44.28	0.68	44.95
Dec	241.84	22.65	264.50	Dec	43.81	0.64	44.45

Table One. Average California Monthly Wholesale Electricity Prices During the Crisis. Data taken from https://www.caiso.com/Documents/December2001MarketAnalysisReport-Memorandum.pdf, viewed February 6, 2017.

Table One shows wholesale electricity prices during the 2000-2001 crisis. Prior to 2000, the market was considered to be well-functioning, with average prices lower than $33/MWh. This continued through April 2000. Starting in May, however, average prices climbed well above earlier levels, reaching almost $168/MWh on August. Prices declined in September and October, only to reach new heights of $242/MWh in December.

The beginning of 2001 saw the end of the PX and the absorption of the day-ahead market into CAISO. The state Department of Water and Resources began buying power for the bankrupt major LSEs. Despite this, the first five months of 2001 showed little break in the crisis, with prices continuing above $170/MWh.

Then…things calmed down. The blackouts ended in May 2001. By September 2001 prices were below $50/MWh, and stayed there the rest of the year. The crisis was over. It ended as a result of higher rainfall, lower gas prices, lower demand, and new generation coming on line. Of course, the arguments about what happened had just begun.

Perhaps in the minds of most, the California electricity debacle is equated with blackouts. Beginning in June 2000, along with soar prices blackouts occurred because there were times that CAISO was unable to find suppliers to meet demand. As Sweeney (2002 at 170-1) notes, however, blackouts were relatively rare and only affected a small part of the CAISO system at any one time. Perhaps what was more important for residents of California was the threat of blackouts, which existed for almost a year.

B. Price Caps and Finger Pointing

When prices began soaring in 2000, two things happened. First, the three major LSEs, (Pacific Gas & Electric in Northern California, Southern California Edison in Los Angeles, and San Diego Gas & Electric) began to run out of money. With no generation assets of their own, and with prices stuck at levels set by the state, by the summer of 2000 California's major LSEs were desperate. They approached California's governor, Gray Davis, and requested his support for higher rates. Governor Davis said no, eventually allowing him to take much of the political blame and be replaced in a referendum by a muscular resident of Hollywood. This meant that suppliers of electricity could not be too sure that they would be paid for their power. This in turn further increased prices, as suppliers factored the chance of non-payment into their prices. It also meant, as we will see below, that the major LSEs changed their strategies for purchasing power in the day ahead market.

Second, beginning in late summer 2000 CAISO placed price caps (or ceilings) at various levels, ranging from $250 to $750/MWh in the CAISO real time market. In November 2000 FERC took the authority to impose price caps away from CAISO and imposed its own limits.

As Sweeney (2002 at 131) and DeCesaris et. al (2004 at 164) point out, a price cap in the real time market also served as a price cap in the PX market. LSEs would place bids into the PX market. Knowing, however, that they would be able to buy power at the real time price, LSEs would not bid above that price cap in the PX. For example, if the price cap in the CAISO real time market was $500/MWh, why pay more than that in the PX market?

In general, economists hate price caps. (See, for example, Alston, et. al, 1992.) Price caps attack the symptom, rather the causes, of a market problem. To economists, putting a price cap on a market is like shooting the messenger of bad news. In the California case, rather than price caps, the LSEs should have been allowed to hedge their risks and retail prices should have been allowed to rise, attacking the problem.

Price caps generally create three problems. First, they cause excess demand to occur, as price is not allowed to rise to the market clearing level. In this case of electricity, this can create an ever-present threat of blackouts. Second, the lower revenues for producers reduces the investment made in new and older facilities, as such investments become less profitable. Third, the restraint on prices causes producers to seek ways to achieve the prices they would have otherwise been able to achieve in a free market.

In a classic example from the 1970s, as MacAvoy (2000) explains, gas from "old" wells was required to be sold at a fixed price set by the Federal government, while gas from "new" wells could be sold at whatever price the market would bear. Naturally, many owners of existing wells shut off these wells and drilled new ones right next to the old ones. The resulting gas was "new," and could be sold at a higher price, even though it could have been extracted by the old wells.

The California price caps soon created a problem. In a typical market, the price is set so that supply equals demand. With price caps, no such guarantee exists. CAISO found itself running a real time market with insufficient supply. Rather than let demand be greater than supply, and allow widespread blackouts, CAISO searched, at literally the last minute, for any power outside of CAISO. For this "out of merit order" (OOM) power, CAISO was willing to pay whatever it took to turn the needed generators on. Since OOM prices were higher than day ahead and real time power, this may have created tremendous incentives to reclassify in-state day ahead power as out of state OOM power. Economically, this was no different than attempts to reclassify "old" gas as "new" gas.

Naturally, the California crisis created a political firestorm. Just a naturally, the first target of the political circus was California's electricity generators. As Borenstein, et. al (1999) had recently pointed out, electricity markets are especially vulnerable to the exercise of market power. There are at least three reasons for this vulnerability. First, effective storage of electricity does not (at least at this writing) exist, meaning that consumers cannot substitute product delivered soon for power needed currently. Second, because final consumers generally have fixed prices, the demand for power is not responsive to the wholesale price. This increases the returns to firms to raising the price in an anticompetitive manner. Third, at high levels of demand there are only a few generators capable of providing capacity at the margin. This makes the system vulnerable to firms shutting down marginal plants in order to increase the market price.

It was generally thought that ENRON and the other generating firms in the market (who were clever enough to stay out of the limelight) drove up the price of power in California by exercising market power. FERC would eventually find that this was the case.[2] The academic literature on this, however, is somewhat mixed. Certainly California electricity prices rose greatly during this period. The debate, however, centers on whether the price rise was due to the exercise of market power, the scarcity of electricity, or some combination of the two. In turn, much of this depends on whether or not the generation plants that were not available to produce on many days were out of service because of an anticompetitive desire to reduce supply or because they needed extensive maintenance after having been overused. (See, for example, Borenstein, Bushnell and Wolak 2002, Joskow and Kahn, 2002, Puller 2007, Harvey and Hogan, 2001, and Lo Prete and Hobbs, 2015.)

[2] See, for example, the discussion in MPS et al. v. FERC et. al 836 F.2d 1155 (7th Cir., 2016).

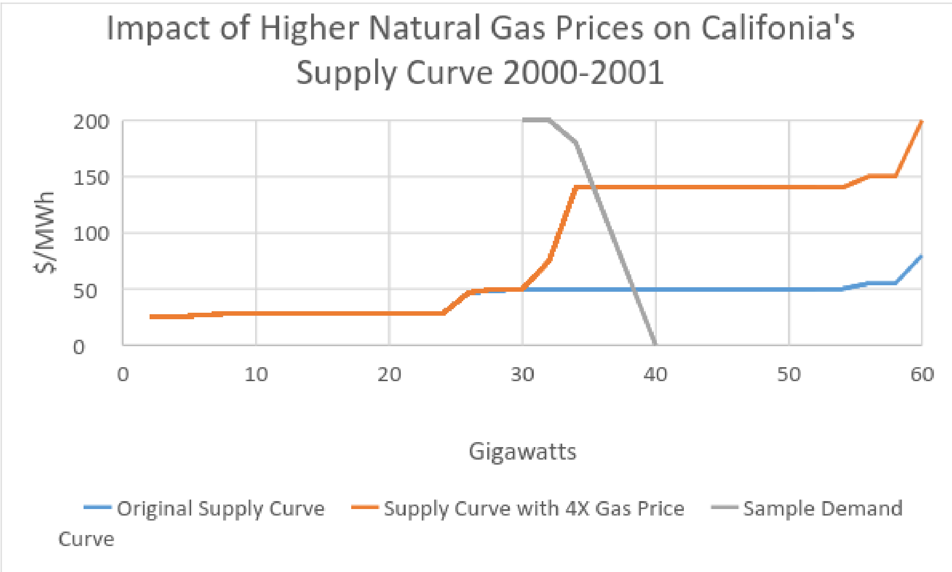

Figure 1: Supply Curves in California 2001-2002. (Re-created from Considine and Kleit, 2006 at 23.)

Given the nature of electricity markets, large price increases are possible from increases in input prices, even if such markets are perfectly competitive. Figure 1 is a re-creation from Considine and Kleit (2006), representing events in the California wholesale electricity market. There are two supply curves representing the supply sector in California. The lower curve represents supply available at supply prices existing in 1999. The higher supply curve represents the impact on supply with a quadrupling of natural gas prices, which applied to 2000. This second curve underestimates the supply impacts in California for 2000, as it does not address reduced hydro supplies, limits on pollution permits, or times when the price of natural gas was more than four times its 1999 level. Note that both supply curves slope sharply upward on the right side of the graph. The reason for this is that marginal or "peaking" electricity generators can have very high marginal costs.

For this example, I have added in a "typical" downward sloping demand curve that could have been expected to have occurred during the relevant period. Note that the curve is very steep ("inelastic" in economic jargon). The reason for this is that most electricity consumers generally do not see the changes in the wholesale price of power. Thus, even if the wholesale price soars, the retail price remains unchanged. Indeed, the actual demand curve may have been almost completely vertical. In this context, a change in the price of natural gas can cause a very large increase in the price of power. For the example of Figure 1, a fourfold increase in natural gas prices would have increased the wholesale price of electricity from $50 to $140/MWh.

Of course, there is no reason why higher prices in California could not have had more than one cause. Inelastic demand makes it easier for non-competitive firms to raise prices. The sharp upward slope on the right hand side of the supply curves can serve to magnify the impact of shutting down even a relatively small electricity plant. Sorting out all these effects is, of course, complicated.

III. ENRON

A. What Was ENRON?

In the 1990s ENRON was the company to work at. A group of aggressive young executives had taken over a stodgy regulated natural gas pipeline firm and created a truly innovative energy company. ENRON specialized in creating markets for newly deregulated products. In no small part due to ENRON numerous electricity trading hubs arose during this period.

My own experience with ENRON was typical. By the mid-1990s, ENRON was involved in regulatory proceedings across the United States, attempting to restructure electricity markets state by state. In doing so, they were perhaps the largest employers of industrial organization economists in the country. At the time I was teaching at Louisiana State University, so I became ENRON's energy expert for the Pelican State.

ENRON was a great client. Although I did not get rich, they were fun to deal with, and they paid well and on-time. There was only one problem: I could not figure out any way on planet Earth that the state public service commission was going to restructure Louisiana's electricity markets. (I will spare you the gory details.) At one point I asked my client how restructuring in Louisiana was going to happen. I was told, "don't worry we have a plan." I shrugged my shoulders and kept working.

It turns out that ENRON told everyone everywhere they had a plan. Of course, they did not. Indeed, to the surprise of most of the people who worked there, ENRON was a gigantic fraud. ENRON reported large profits based on its own tortured accounting. When the money ran out and investors, the media, and the government started to examine ENRON closely, both the company and the major accounting firm that advised it collapsed rather quickly into bankruptcy in late 2001. Well before that, ENRON had its name driven through mud. The leaders of ENRON were convicted of felonies, while many of its employees lost their retirement savings and much of their own personal reputations. (See McLean and Elkin, 2003, and Eichenwald, 2005.) Further, ENRON received much of the blame (some or most of it undeserved) for the California electricity debacle.

An example of how poorly ENRON was viewed publicly came in the renaming of ENRON Field in Houston. ENRON had previously bought the naming rights to the new home of the Houston Astros baseball team. After ENRON's bankruptcy clearly those rights would be of little use to ENRON. Instead of requesting to be released from its contract with the Astros, however, ENRON's creditors insisted on being paid to relinquish its rights. Given the threat that it would continue to be associated with ENRON, the Astros paid ENRON's creditors $2.1 million in 2002 to take back the stadium's naming rights.[3]

[3] See Chris Isidor, "Astros Strike out Enron: Team Pays ENRON Creditors $2.1 Million to Get Back Naming Rights to 2-Year-Old Stadium, CNN February 27, 2002, http://money.cnn.com/2002/02/27/companies/enron_astros/, accessed December 8, 2016.

B. ENRON in the California Crisis

From the public outcry, you might have thought that ENRON was the largest generator of electricity in California. It was not. While the numbers vary across sources, it is clear that ENRON controlled less than ten percent of the generation capacity in California.

ENRON did, however, have other valuable assets and contracts. First, ENRON owned Portland Gas and Electric, a regulated utility in Oregon. As became typical, regulated PG&E had an unregulated trading arm. This served as a conduit for ENRON to employ a variety of trading strategies.

Second, ENRON had entered into a number of management contracts and informal agreements with municipal utilities in California that were not directly regulated by the state. In particular, ENRON was in charge of making load estimates that were to be submitted to the PX. As we will see below, ENRON found that submitting biased estimates could increase its trading profits and those of its partners.

ENRON appears to have been an innovator in creating strategies to take advantage of the CAISO system. You should not think, however, that ENRON was the primary or even the largest mover in this clever game. Borenstein et. al (2008 at 342) tell us that trades by ENRON only constituted about 28 percent of all the "Ricochet" trades discussed below. Taylor et. al (2015 at 147) point to Powerex, the trading arm of provincially owned British Columbia Hydro, as the apparent major evildoer, with over a billion dollars in asserted ill-gotten gains. The initial FERC decision dealing with the California debacle (the "Gaming Order") lists over 40 companies as litigation targets.[4]

IV. Congestion Related Strategies

The question here, however, is whether or not ENRON and other electricity supply and trading firms manipulated California's bad designed electricity market in the 2000-1 period. The answer is "Yes," "No," and "Maybe." There are two reasons for this. First, the trading companies used several strategies, each of which with a different colorful name and different impacts. Second, to address the behaviors that the traders engaged in, FERC created an additional definition of manipulation for electricity markets, called "gaming." This definition is inherently vague and subject to criticism.

To start the journey, this section will review trading strategies centered on taking advantage of how CAISO dealt with congestion management.

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[4] American Electric Power Service Corporation, Order to Show Cause Concerning Gaming and/or Anomalous Market Behavior ("Gaming Order") 103 FERC P 61,345 2003. http://www.energy.ca.gov/sitingcases/tesla/documents/intervenors_files/2003-07-23_Regulation.PDF viewed January 20, 2017. At that time two firms had already reached settlements with FERC. Even in the remaining litigation in 2016, MPS et al v. FERC et al, *supra*, four defendants remained. ENRON's creditors had long since reached an agreement with FERC.

A. Load Shifting

This is the easiest of the strategies to explain (and the one without a clever name). Assume you own Financial Trading Rights (FTRs) between points A and B, and the FTRs are settled on the day ahead (or here, the PX) price. Also assume that you are in charge of sending day ahead demand information on expected load to the PX. What is needed at this point is for you to send an overestimate of your load at Point B, and an underestimate of your load at Point A. This will increase the day ahead price at Point B, and lower it at Point A. Since your payment on your FTRs is Price B minus Price A, you have now have increased your return to your FTRs.

You still have to bury the corpse, however. At Point B, you are buying too much power in the day ahead market, you have to sell the excess power in the real time market. At Point A, you do the reverse, and are forced to buy power in the real time market. FERC reports that 9 different firms engaged in this strategy (Gaming Order at Attachment B.)

At this time CAISO, was not operated on a "nodal" type system as was presented in the last chapter. Rather, it was operated in a way that there were two important prices, the prices in the northern zone of CAISO, and the price in the southern zone of CAISO. Thus, trading companies had to choose a point B in the higher price zone in which to overstate demand, and a point A in the lower price zone to understate the demand. A straightforward manipulative scheme. Indeed, according to DeCesaris et al (2004 at 174), "Load Shift is the only clear example of pure market manipulation that we find" in the California electricity debacle.

Having said all this, it seems unlikely that that trading companies made a great deal of money on this strategy. Their generation market shares were simply too small. Indeed, FERC reports that FTR prices were set by major LSEs rather than any trading firm.[5] This implies that the trading companies did not find this strategy very profitable.

B. Death Star and Cut Schedules

"Death Star" is a pretty good name, right! Certainly better than the original title, "Forney Perpetual Loop," named after the creative ENRON trader who came up with the scheme. This tactic was based on the way CAISO handled congestion relief.

Since CAISO had a "zonal" rather than a nodal system, it could not use prices at individual nodes to deal with congestion. Thus, the three node model of Chapter Four with prices based on generators' impact on congestion did not apply here. Exactly what CAISO did do for congestion relief appears lost to history, but it was clearly a clumsy *ad hoc* system. (Sweeney, 2002 at 82, reported that FERC in January 2000, before the crisis, described the CAISO congestion management system as "fundamentally flawed.") Here is the best approximately that I can come up for the congestion management system used that relates to the Death Star strategy.

[5] See FERC Staff Report on Western Markets Investigation, VI-13, 14, https://www.ferc.gov/legal/maj-ord-reg/land-docs/PART-I-3-26-03.pdf. See also DeCesaris et al (2004 at 169).

Recall that for our purposes, California can be divided into two zones, North and South, with limited transmission capacity between them. Imagine Point A is at the southern edge of the northern zone, while Point B is at the northern edge of the southern zone. Assume that the transmission line between the two zones runs through these two points. Also assume that the price in the northern zone is higher (though in California the price difference between north and south changes by seasons). This implies that the transmission line from B to A is constrained.

It is possible, however, to get more flow from north to south. As in our nodal example in the last chapter, if a generator at Point A produces more power, it creates more counterflow, allowing more power to flow from B to A. In a nodal system, the value of the counterflow is priced into the nodal price. In a zonal system, however, generators at Point A are paid the same price as the other generators in the zone, which did not address any congestion problems. To address this issue, CAISO made "side" payments to generators who created counterflow.

Mr. Forney's particular genius was to discover that not only did CAISO make payments to generators who created valuable counterflow, but that CAISO also would pay for the *appearance* of counterflow. What ENRON did under his direction (which was copied by other firms) was to acquire transmission rights from outside of California (say Malin Oregon) to Point A in the northern zone. Then ENRON gained rights from A to B in the northern zone (which was unlikely to be difficult, since the flow was the other way). To round out the loop, ENRON would gain rights from Point B to an outside CAISO node (say Palo Verde, Arizona), and from this outside node to the original node. This constituted a complete loop.

The nice part about this from the point of view of ENRON and the 30 other traders who engaged in congestion related strategies (Gaming Order Attachment B) was that dispatching electricity in a closed loop is the same as not dispatching any energy at all! Hence the "perpetual" part of Mr. Forney's idea. This scheme only required that trading companies (together with other confederates) gain the rights to the four branches of the transmission lines needed.

Of course, this plan is simply a complicated form of stealing. Whether or not to call it "manipulation," under the definition of Chapter One, is not clear. The Death Star strategy may well have changed the prices CAISO paid for congestion, but we really do not know. In any event, it does not seem that the profitability of the trades depended on changing prices. Thus, the scheme may not fit our definition of manipulation. To get around this problem, FERC called this "gaming," a definition we will discuss below in this chapter.

Death Star was difficult to detect, because it involved transactions among potentially several firms. To discover a death star scheme required investigators to track a series of transactions and show that they constituted a loop. A similarly motivated strategy, "Cut Schedules," was easier to detect. Firms would schedule power to be sent on already congested transmission lines. Under the CAISO congestion protocols, these firms would then be offered the chance to gain congestion revenues by reducing their projected use of transmission lines. Such firms would happily agree, since they had no intention of actually using the lines in the first place. Again, a "money for nothing" scheme. The Cut Schedules strategy, however, was effectively eliminated by CAISO rules implemented in August 2000 (Taylor at al, at 169).

V. **An Ancillary Market Strategy - "Get Shorty**"

Ancillary markets exist to ensure that the electricity system is stable, with demand meeting supply at all times. In CAISO then and now the ancillary markets had both day ahead and real time markets. That allowed ENRON to arbitrage these markets – even though it was against CAISO rules.

Reserve markets were unusually important in the California market. In a well-functioning electricity market, reserve resources should only be called rarely into the energy market.[6] In California, however, with a real time market chronically short of power and a system operator in constant need of more resources, it seems that reserve services were called quite often. In that case, the generator received both the reserve and the energy price – often when both of these prices were at the price cap. In this sense, therefore, bidding into ancillary services can be seen as a method of evading the price cap.

In "Get Shorty" ENRON and other traders bid into CAISO day-ahead ancillary markets without having arranged for underlying generation to be available. Then the trading companies had two available options they could take. First, the traders could have bought their obligations back in the real time market. Thus, they were engaging in simple arbitrage in the reserve market.

Second, the trading companies could let their positions "ride" and see if CAISO would call the supply they bid into the ancillary market. If the power was "called" by CAISO the traders would then have an hour to arrange for generators owned by municipal companies to supply the real time market with the required power. The trading companies appear to have made informal arrangements with these companies to supply such power beforehand. Taylor et al (2015 at 173) describe how ENRON had arrangements with the municipal utility of Glendale California, Southern California Metropolitan Water District, the Valley Electric Coop of Nevada, and the Los Angeles Department of Water and Power to supply such services. The firms had agreed (at some level) to pay ENRON a "marketing fee" for selling into the ancillary market.

Taylor et al (2015 at 174) report that ENRON was the major participant in this short scheme prior to the beginning of the crisis in May 2000. They were joined in May by two unidentified participants. By October 2000 ENRON had greatly reduced its role in this strategy, apparently leaving the field to the two unidentified companies. FERC, however, reports that 26 firms engaged in this strategy (Gaming Order, Appendix C).

It is difficult to see what economic purpose was served by the rule requiring backing reserve bids with generation. If the traders covered their day ahead positions in the real time market ("flattening their position") that would appear no different than what speculators do in other financial markets all the time. If they did not cover their position, and were unable to supply ancillary power, than financial sanctions would appear appropriate, similar to what which occurs on other financial exchanges.

Taylor et al (2015 at 174) argue that "Get Shorty" reduced the reliability of CAISO since the "mere contractual agreements to supply energy on short notice" did not meet the rules of the

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[6] For example, Choi and Kleit (2015) report that reserve power was called into the Texas ERCOT market less than one percent of the time in 2011.

Western State Power Pool (WSPP). WSPS required CAISO to have set aside specific generators for its operating reserve. Of course, that implies that CAISO's day ahead ancillary market, which did not require notification of specific generators from importers, was also not fully consistent with WSPP requirements.

Here we come to another position where breaking a rule is equated with "manipulation." In this context, the trading companies are accused of manipulation because they did exactly what constitutes "going short" on a standard commodity exchange. Conducting an economic analysis of this argument would require an investigation of why such a requirement was needed. Perhaps the argument would be made that a shortage in an electricity market is far more serious than a shortfall in the grain market. Such an argument, however, would also face the difficulty of explaining why the benefits of allowing this option – which was clearly legitimate for firms that had uncommitted capacity- did not apply here.

Indeed, what the trading companies did mirrors a recent innovation for electricity markets, the market for "virtuals" (see Li et al 2015). Several RTO have now established markets where speculators can go long or short in the day ahead energy market and then cash out their positions in the real time market. The purpose of markets for virtuals is to allow speculation to create better price signals – exactly how ENRON defended their "Get Shorty" strategy.

This brings us to another question: why did the municipal generators work together with the traders rather than market their ancillary services themselves. The most obvious answer is that they believed the trading companies were better able to market their products. Thus, we now have an argument how "Get Shorty" may have enhanced the efficiency of the ancillary market by enhancing the ability of municipal generators to bring their product to this market.

This takes us to the legal crux of the matter, the nature of the "control" the trading companies had over the generating assets of the municipal utilities. In front of FERC this placed at least ENRON between a litigation rock and a hard place. Other parts of the FERC complaint centered on alleged conspiracies between ENRON and municipal generators. To have asserted a strong link in their dealings with municipals for ancillary markets would have therefore increased ENRON's vulnerability to charges of conspiracy. This, ENRON had to argue that there was no specific agreement between them and the municipals, but enough of an "alliance" to ensure that power would be delivered.[7]

VI. Why Were Real Time Prices Higher Than Day-Ahead Prices?

The harder strategies to analyze are those that were based on taking advantage of the observation that real time (CAISO) prices were systematically higher than day-ahead (PX) prices. By September 2000 RT prices were higher than DA prices 70% of the time at an average 15% premium (Borenstein, 2008 at 349). Typically the day ahead market accounted for about

[7] See Testimony of Jan Paul Acton on Behalf of ENRON, ENRON Power Marketing, Inc. and ENRON Energy Services Inc., Docket No. EL03-180-000, October 3, 2003. (Accessed through FERC eLibrary, January 3, 2017.

90% of trade volume. However, during higher demand periods the real time market trade share went up to as much as 33%. (Borenstein et al, 2008 at 351).

When this happened, traders such as ENRON were able to find ways to engage in "arbitrage" or "laundering" (depending on your point of view) to get their day ahead energy reclassified as real time power. To understand the impacts of these strategies we need to know why real time prices were higher than day-ahead prices, in a way that traders could determine when such price differences were likely to occur.

Note that, at least in theory, the expected value of the real time price in any day should equal the day ahead price. That is to say that while the two prices are likely to be different, the expected value of those differences over time is zero. While this is not quite true (see Li et al, 2015), this assumption is certainly good enough for a first approximation. Thus, we must delve further into how the California market operated, and what about that market caused real time prices to systematically diverge from day ahead prices.

In turns out that there were not one but two potential reasons for prices to diverge. The first was that, as discussed above, there were effective price caps on the day ahead and real time markets. When those price caps were binding, firms had incentives to obtain more money for their power by having it classified as "out of market." Under the rules of the system, CAISO could not purchase power for any period until an hour before that period was to begin. With price caps and looming shortages, CAISO was constantly in a rush to buy power to stop the grid from collapsing at literally the last minute (Sweeney, 2002 at 169, DeCesaris et al 2004 at 164). In particular, CAISO often used its authority to buy Out of Market (OOM) power from importers at prices above the real time price cap.

The price evasion rationale was what FERC stated (Gaming Order at 21) drove the behaviors discussed here. Taylor et al (2015 at 148), however, are skeptical that this was what was going on, calling the FERC analysis "inconsistent with … basic economics." The reasons for this doubt is that while OOM purchases only began in earnest in November 2000, most of the suspect transactions actually occurred before that date. (See also DeCesaris et al, 2004 at 166.)

Borenstein et al (2008 at 373) suggest that this price different was create by what they called monopsony behavior, the exercise of market power by buyers in a market. According to these authors (at 353) the three major LSEs made up 90% of the buyers in this market. The authors, however, note (at 369) that by August 2000 these companies were only bidding between 70 and 80 percent of their demand in the day ahead market. [8]

Because these firms were generally subject to rate of return regulation, we might expect that their incentives to mask their demands were limited. The events of the California market changed these incentives. By the summer of 2000 the major LSEs were now losing money on reselling power, with no obvious way to get the money back. While CAISO's rules (see Sweeney, 2002 at 51) required that LSEs submit "balanced schedules," the major LSE

[8] For example, DeCesaris et al (2004 at 166) explain how Pacific Gas and Electric only bought 3800 MWh (42%) in the day ahead market for the noon hour on February 26, 2000 when their load was 9000MWh, leaving 5200 MWhs to be purchased in the real time market. Hausman and Tabors (2004 at 4) report that PG&E only purchased 8000 MWhs (69%) of their 11,641 MWhs load for the 4pm hour on December 26, 2000.

understood that CAISO had no penalty for making false demand projections. (Borenstein et al 2008 at 351)). Seeing an opportunity, the major LSEs lowered their stated demand in the day ahead market in order to drive the price down.[9]

These firms were able to reduce their bids in the day ahead market, lowering prices in that market. This seems to have more than made up for any increase in the generally smaller real time market price, as generators that otherwise would have supplied the day ahead market were likely available to supply the real time market. Thus, the net increase in demand in the real time market from this strategy was matched by a real time increase in supply from those generators whose bids did not clear in the day ahead market because of this strategy. Hausman and Tabors (2004) point out that the prohibition of long-term contracts greatly increased the profitability of this strategy. If the major LSEs had had long term contracts, only a small fraction of their costs would have taken place in the day ahead or real time markets.

Borenstein et. al. refer to this strategy as exercising "monopsony power." [10] Rather than exercising monopsony power, using the taxonomy of Chapter One, it would appear that the major LSEs were acting to manipulate the market. By changing their bids without changing any their demand for electricity, the LSEs were making money by changing the price of what in effect were financial instruments.

[9] There is some discrepancy in reports on when this strategy began. Borenstein et al (2008 report ii began in the summer of 2000, but Hausman and Tabors (2004 at 2) suggest that at least PG&E was underscheduling at the beginning of 2000.

[10] Bush and Mayne (2004 at 271) also discuss the exercise of "monopsony power" by the major LSEs.

% of Energy Revenues Spent in Day Ahead Market		% Energy Procured in Day Ahead Market	
1998	74.7%		
1999	78.9%		
Jan 2000	80.8%	Jan 2001	90.3%
Feb	75.9%	Feb	90.1%
March	75.5%	March	93.8%
April	74.3%	April	94.4%
May	67.6%	May	93.4%
June	63.9%	June	98.4%
July	73.4%	July	98.2%
Aug	66.8%	Aug	102.5%
Sep	70.1%	Sep	100.0%
Oct	76.4%	Oct	101.5%
Nov	71.7%	Nov	101.8%
Dec	72.9%	Dec	99.2%

Table 2, Energy Procurement in Day Ahead Markets. The data across years are not consistent because of the shutdown of the PX and the takeover of the day ahead market by CAISO in January 2001. Data taken from https://www.caiso.com/Documents/December2001MarketAnalysisReport-Memorandum.pdf. Accessed February 6, 2017.

Table 2 looks at the available data on day ahead purchases. Something odd was clearly going on. In a well-designed market, day ahead purchases should constitute nearly 100 percent of energy purposes. Even in the early "good years" of the California market, however, less than 80% of energy purchase revenues were spent in the day ahead market. By August of 2000, however, that figure had fallen to less than 67%. While rebounding slightly, this amount was below 73 percent in December 2000.[11]

By January 2001 the PX had closed and CAISO had taken over the day-ahead market. The type of data reported by CAISO changed, making direct comparisons unavailable. In the crisis month of January 2001 the day ahead procurement was only slightly above 90 percent. By June, however, it approach 100 percent and remained at that level through the rest of the year.

By 2004 FERC was certainly aware of what the major LSEs had done, but imposed no fines. The Commission stated:

> Under the then-existing market rules, the utilities were required to satisfy their need for energy with purchases from the PX and were to bid in their generation in the PX day-ahead market in an amount equal to their load. However, during 2000, in an effort to minimize their energy costs, the three California public utilities

[11] Borenstein et al (2008 at 351) point out that looking at averages here can be deceiving, as the day-ahead share would be far lower in high demand hours.

> began to routinely underschedule their load in the PX day-ahead market. Due to the large size of the three California public utilities, changes in their purchasing strategies had a significant impact on market outcomes, including the market-clearing prices in the PX day-ahead market. By moving a significant amount of their load out of the PX day-ahead market, less supply bids were needed to clear the market which, in turn, resulted in lower market clearing prices in the PX day-ahead market. As a direct result of the underscheduling by the three public utilities in the day-ahead market, however, the ISO had to meet a larger percentage of the load in real time, causing serious operational and reliability problems.
>
> Because Underscheduling Load required the utilities to submit false schedules with regard to their loads to the PX, this conduct was certainly troublesome and is not condoned by the Commission. Moreover, it violated the MMIP by unfairly taking advantage of the rules and caused a demonstrable detriment to the efficiency of the market.
>
> Although we disapprove of the practice of Underscheduling Load and we have the authority to order disgorgement of unjust profits, there are no profits to disgorge since this was a price-reducing purchasing strategy. (Gaming Order at 27-28.)

Thus, FERC knew what was going on. The underscheduling by the largest LSEs allowed them to reduce their payments below the market clearing levels by lowering the day ahead price. These actions meet any definition of manipulation. The LSEs engaged in financial transactions in order to move prices so that they would profit. This, in turn, implies that any strategies by traders to respond to the increased real time demand by moving supply to the real time market can be seen as attempts to counter the manipulation by LSEs that also broke tariff rules.

FERC was aware of what the major LSEs had done, saying that because there were no profits, there could be no disgorgement of profits. This seems (to this non-lawyer) a narrow interpretation of their disgorgement power. The major LSEs did not make money, but they certainly lost less money than they otherwise would have.

FERC's decision created a tremendous irony. Much effort and expense has been expended on the part of the LSEs in litigation, going after trading companies for "manipulation." The clearest examples of systematic manipulation we have from the crisis, however, was committed by these same distribution companies.

VII. Interpreting Price Arbitrage Strategies

Recall that Chapter 1 presented two definitions of arbitrage. Ross et al. (2007 at 395) define arbitrage as "the simultaneous purchase and sale of different but substitute assets." Hull (2009 at 773) defines arbitrage more broadly, as "a trading strategy that takes advantage of two or more securities being mispriced relative to each other." If we adopt Hull's broader definition, we can see that day ahead prices were mispriced with respect to real time prices. Naturally, this was a situation that other firms would try to use to their advantage. The strategies that trading firms adopted to take advantage of this mispricing are described in this section.

A. “Ricochet”

1. The Strategy

The focus of much of the California manipulation litigation revolved around a strategy generally referred to as “Ricochet.” Under the “Ricochet” strategy, ENRON and other traders bought transmission rights out of CAISO and announced for the day ahead market that it was exporting power to, for example, Oregon. They then bought transmission rights from Oregon to a third place (say Nevada). Finally, they bought transmission rights from the third placed back into CAISO. With these transmission acquisition, traders was able to use CAISO rules and 1) declare that it was exporting power that would therefore not be available in the day ahead market, and 2) not bid this power into the real time market; and 3) make this power available for real time supply bids. FERC report that 24 firms engaged in this strategy (Gaming Order, Attachment A).

Of course, these actions made no physical difference in where the electricity flowed. As we saw in Chapter 4, electricity knows no master. What the trading companies were doing was doing was “laundering” day ahead power and turning it into real time power, at least from the point of view of CAISO. In doing so, they were taking advantage of real time prices that were higher than the day-ahead prices. From a legal point of view, as Taylor et al (2015 at 16) emphasize, the trading companies were violating their tariff with FERC, their legal promise to FERC about how they were going to behave in the California market. (Of course, the major LSEs were doing so as well!) Since this is an economic review, however, we hold our analysis to a higher standard.

2. Economic Analysis of Ricochet

Economic analysis of the Ricochet strategy is difficult, as there are several different approaches one could take. For example, one approach would be to determine whether this strategy imposed additional production costs in the California market. At first blush, it would seem that there was no difference in which generators plants operated, and therefore, no difference in production costs. Retail customers were not affected, as their rates were fixed. The strategy caused a transfer of funds from the major LSEs to the trading firms. In that case, since a pure economic efficiency standard is not interested in transfers from consumers to producers (or the other way around), Ricochet might have not imposed any harm. I say “might” because Taylor et at (2015 at 160) assert that moving supply from the day ahead market to the real time market increased the cost of system reliability. Such costs would have eventually been paid by retail customers. Taylor et al, however, offer no explanation of this argument.

Now assume that Ricochet was simply an “end around” around price caps. At this point the economic and legal analyses divide. Given price caps, one might infer that purchasers, here LSEs, “deserved” the lower prices. If so, one could interpret Ricochet and similar strategies as simply stealing.

Looking at the question more dynamically, however, might lead to a different answer. When firms make money (above the competitive level), and these profits are not from the exercise of market power, economists refer to them as “rents.” The desire to capture rents is what drives production in a market system. The more rents are available, the more entry of firms (here generators) can be expected to occur. Thus, if restructured electricity markets are to flourish, generators need to have the opportunity to make money. This is an ongoing problem in electricity markets, where regulators and RTOs continue to impose price caps, reducing incentives for investment and perhaps threatening the ability of these markets to meet demand.[12]

Here again we move toward a question of who "deserves" the relevant prices. If a competitive market is truly the norm, then the LSEs were taking funds that were "owed" to generators. To the extent that the trading companies were also generators, they were simply taking back monies that they should have already received. If the trading companies were not generators they were reducing the ill-gotten gains of the manipulating LSEs. Of course, we still have the dynamic problem of firms not gaining the funds needed to cover their expenses and to induce efficient entry into the market.

Another approach might be to view these strategies as simply forms of regulatory arbitrage. The trading firms were simply buying low priced day ahead power and selling high priced real time or OOM power. If the price differences were the result of price caps, such strategies were unlikely to raise the day ahead price (since it was already capped). Nor was it likely to have lowered OOM prices, as the increased supply of OOM power would have been matched by the increased demand.

Now let us assume that the reason for the price difference was that the LSEs were manipulating the day ahead market. In this case, withdrawing supply from the day ahead market through a Ricochet strategy would have increased the day-ahead price toward the competitive level. Increased supply in the real time market, however, would have been matched by increased demand. Thus, in this view the actions of the trading companies would have reduced the spread between day-ahead and real time prices, but only by impacting the day ahead price.

From an economic perspective, it may be the trading company's actions did not create any harm. The strategy did not impact which generators operated, and therefore had no apparent impact on costs. The amount final consumers paid was not affected, since they were paying a regulated price. Whether the amount paid by the wholesale purchasers of power (the three large LSEs) rose or fell is a complicated matter. ENRON's strategy reduced the quantity that these companies were able to purchase at the relatively low day ahead capped price, and increased the amount they purchased at the higher real time price.

In this context, the trading companies can be seen as either engaging in regulatory arbitrage or defending themselves against manipulation by the major LSEs. The "Ricochet" strategy likely did cause real time prices to change, but not in a way that helped the trading companies. Thus, the trading companies did not engage in manipulation while using this strategy. The same cannot be said for the major LSEs.

Did ENRON and the other trading companies engage in manipulation through the Ricochet strategy? My definition of manipulation refers to profiting by causing changes in prices. The Ricochet strategy may well have changed prices – but not in the directions that the trading companies would have liked. Again, just like any changes in the price of silver caused

[12] See, for example, Brennan (2006). The impact of price caps and the resulting fear of a lack of investment has led to the widespread adoption of "capacity markets," a complex topic I am desperately trying to avoid. For a sense of the controversies around capacity markets see Newberry (2016).

by the Hunt Brothers, any change in prices here was a bug, not a feature, of the strategies undertaken.

B. **Overgeneration and Fat Boy**

"Overgeneration" was another way to take advantage of the day ahead/real time price differentials. LSEs not connected to the three major LSEs would overbid their demand in the real time market. For example, an LSE might expect that its demand for an hour would be 500 MWh. It could demand 600 MWh in the day ahead market, and only consume 500. By RTO rules, it would then sell the excess 100 MWh in the real time market, If the real time price was, for example, $150/MWh while the day ahead price was $130, the total cost to the LSE would by (600*130)-(100*150)=78,000-15,000=$63,000. This would be less expensive than simply buying 500 units in the day ahead market, which would have cost (500*130=) $65,000.

A slightly more complicated strategy, "Fat Boy" was available to importers. DeCesaris et al (2004 at 167) describe how ENRON would arrange for import of power to be supplied to its affiliate ENRON Energy Services (EES). EES, however, would only have arranged for part of the imports to be supplied to LSEs. The rest of the power would be allocated by CAISO, and reimbursed at the higher real time rate.

Note that the Fat Boy strategy could not have been driven by the desire to evade price caps. Under the rules of the system, the price cap evasion was driven by the opportunity to capture OOM payments from CAISO. The LSEs excess demand, however, was settled at the real time price. During periods of binding price caps, these prices were equal to the day ahead prices. Of course, this strategy also violated the CAISO's rule (see Sweeney, 2002 at 51) that LSEs submit "balanced schedules."

Thus, we can see "Fat Boy" as a response to the manipulative strategies of the major LSEs. The major LSEs acted to drive the price of the day ahead market down, while Fat Boy drove them back up, acting to counter the manipulation. Indeed, FERC and CAISO supported this strategy. According to FERC:

> The market participants who engaged in Overscheduling Load did so as a direct response to the utilities' practice of Underscheduling Load. Overscheduling Load actually helped reduce reliability problems in the real-time market. In fact, Overscheduling Load was often actively encouraged by the ISO because it reduced the need for real-time energy due to the utilities' underscheduling. (Gaming Order at 28.)

VIII. Gaming

At this point, you may have noticed that some of the things trading companies did do not fit anyone's previous definition of manipulation. Thus, to address the issues that arose in the California electricity debacle, FERC borrowed a phrase from a CAISO tariff an dcreated its own definition. FERC used the term "gaming" and equated it with manipulation. Under FERC's latest (at this writing) definition, gaming "includes behavior that circumvents or takes unfair advantage of market rules or conditions in a deceptive manner that harms the proper functioning of the market and potentially other market participants or consumers." (See FERC, 2016 at 23.) This definition is refined from FERC's original statement that gaming constitutes

> effectively riskless transactions executed for the purpose of receiving a collateral benefit; conduct that is inconsistent or interferes with a market design function; and conduct that takes unfair advantage of market rules to the detriment of other market participants and market efficiency," American Electric Power Services Corporation, 106 FERC ¶ 61,020 (2004).

The original statement lacks the term "deception," making it harder to interpret. I found, however, the phrase "market design function" used in the original definition, somewhat clearer than the revised terminology.

Some of these terms have clear definitions. "Deceptive manner," for example, would appear to relate to parties telling CAISO that they planned to ship power one way when they did not plan to do so, or promising to offer ancillary services without the means to do so. "Circumventing market rules" would apply to weaknesses in the RTO rules. As discussed in Chapter 4, RTOs are terribly complicated creatures. Even now, 20 years after the first American RTOs were created, rules are often changed to make these markets work more efficiently. In the early years of the flawed California plan, it seems there were many contingencies that were not considered.

Other words in the statement are not so clear. "Unfair" is always a tricky word, with fairness seemingly defined in the eye of the beholder. "Proper functioning" may also rest on personal judgement, as there may be more than one interpretation on how a market should operate.

Should FERC have expanded the definition of "manipulation" to include "gaming"? One could make arguments either way. Echoing *Cargill*, as discussed in Chapter Three, however, FERC strongly asserted its right to create new definitions of manipulation.

> ENRON (and others) would demand that a regulatory agency have the prescience to include in a rate schedule all specific misconduct in which a particular market participant could conceivably engage. That standard is unrealistic and would render regulatory agencies impotent to address newly conceived misconduct and allow them only to pursue, to phrase it simply, last year's misconduct – essentially, to continually fight the last war and deny the capability to fight the present or next one *Am. Elec. Power Serv. Corp.*, 106 FERC ¶ 61,020 at P 45

Were the actions of ENRON of the other traders "gaming"? Given the political and social views of ENRON at the time (and even today!) I doubt that it was possible for a regulatory agency to evaluate ENRON's claims in an unbiased manner. Any critiques of FERC "gaming as manipulation" policy, however, would lay largely dormant until the *Powhatan* case, as we will see in Chapter XXX.

IX. Conclusion

The early California restructured electricity market was poorly designed. The disassociation of retail with wholesale price together with the effective ban on hedging was a disaster waiting to happen. The refusal to learn from other existing RTOs created a CAISO system that firms were able to exploit in numerous ways. When the system failed a search for villians ensued. A governor lost his job, and ENRON played the role of bogeyman.

ENRON was a company based on financial fraud, but it was one of many firms taking advantage of the weaknesses in the CAISO market. The most obvious examples of manipulation, however, were undertaken by the major LSEs, who have escaped blame for their successful efforts to profit by changing the price of financial assets.

Will this happen again? Unlikely. Today's RTOs operate both day ahead and real time markets, and impose a variety of reporting rules that are enforced quite closely. As discussed in Chapter 4 modern market monitoring watches over market participants quite closely to make the behaviors discussed in this chapter are not repeated. Further, the root of many of the issues, underscheduling by the major LSEs, would be far less profitable in today's RTOs, which allow LSEs to engage in long-term contracting.

The California restructuring plan was fatally flawed. The great irony is that the firms that clearly manipulated the market were not punished. Indeed, they have been able to gain funds in litigation from those firms who had counter strategies.

Two conclusions remain. First, RTOs are extremely complicated machines. Profit-seeking entities will always be looking for "holes" in the relevant rules. Second, armed with its gaming standard, FERC can be expected to act against such firms. We will see both of these elements reemerge in future chapters.

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