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JR 5-8-01
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DUKE/FLUOR DANIEL

May 7, 2001

BY FACSIMILE and FEDERAL EXPRESS

Mr. John Robertus, Executive Officer
California Regional Water Quality Control Board
San Diego Region
9771 Clairemont Mesa Boulevard, Suite A
San Diego, CA 92124-1324

SAN DIEGO REGIONAL WATER QUALITY CONTROL BOARD
2001 MAY -8 A 11: 37

SUBJECT: South Bay Power Plant
NPDES Permit No. CA0001368
Request for Modification to Average Daily Thermal Limit During Energy Power Alerts

Dear Mr. Robertus:

California is in the midst of an unprecedented energy crisis that will result in rolling blackouts this summer. To help mitigate this emergency, Governor Gray Davis issued Executive Order D-22-01 that, among other actions, directed State Water Resource Control Boards (SWRCB) to:

> "...take all necessary and immediate action to ensure that power plants in the State of California are not precluded from operating as a result of thermal limits in waste discharge requirements. The SWRCB shall take all necessary and immediate action to determine whether modification of such requirements is appropriate and, if so, to ensure timely modification to assure facility operation."

The Governor's order was clearly directed at facilities such as Duke Energy South Bay LLC's (Duke) South Bay Power Plant (SBPP). Historically, thermal limitation provisions contained in SBPP's waste discharge requirements have constrained potential total daily output from the plant approximately 35 – 40% and the plant has managed generation so as to stay within the limit.

In light of the extreme electrical emergency facing the state and the Governor's Executive Order, Duke felt it was important to inform the San Diego Regional Water Quality Control Board (Board) that there is unused electrical generating capacity at SBPP and to request a modification to the plant's National Pollutant Discharge Elimination System permit enabling this capacity to be utilized. Duke understands that modification to its permit must be based upon a finding by the Board that the incremental increase in the daily average (but not maximum) temperature of the plant's discharge will not have an unacceptable adverse impact on the beneficial uses of San Diego Bay.

As explained below, Duke is requesting that, upon declaration of a System Emergency (Stage 1, 2 or 3 Alert) by the California Independent System Operator (ISO), SBPP be authorized to

operate under a higher daily average thermal permit limit so as to provide additional electrical generation for the state. Duke's suggested modification and pertinent information is described below.

BACKGROUND INFORMATION

Need for Additional Generation in California

On March 22, 2001, the ISO published a document entitled "CAISO 2001 Summer Assessment." A copy of the Executive Summary is included as Attachment 1. In this document, the ISO states that, after mitigation measures are taken into account, it is estimated that the Resource Deficiency at Peak (in Megawatts) will be: -3,647 in June, -1,444 in July, -1,248 in August, and -666 in September. Based on these estimates, the need for additional generation for California is obvious.

In March, 2001, the Cambridge Energy Research Associates (CERA) published a report entitled "Beyond California's Power Crisis: Impact, Solutions, and Lessons." Attachment 2 provides a copy of pages 20 and 21 of CERA's report which describes the summer shortages expected in California. CERA states that "Under expected conditions this summer, supply will fail to meet reserve requirements, resulting in Stage 1, 2, and 3 emergencies. ....This means that the state will have to implement rolling blackouts for 20 hours this summer under expected conditions." Rolling blackouts in California this summer are highly probable.

These two reports, along with Governor Davis's Executive Order mentioned above, point to the fact that there is a very real need for additional generation in California.

South Bay Power Plant Operations

SBPP, which began commercial operation in 1960, is located in the City of Chula Vista on the southern edge of San Diego Bay (Figure 1). The plant includes five electric generation units with a total installed capacity of 737 Megawatts (MW) gross. As such, SBPP is one of the largest single generation sources in California. Each of the SBPP units can generate independently or in conjunction with each other. The four larger generating units (totaling 722 MW gross) are capable of burning natural gas or, during periods of natural gas curtailments, residual fuel oil.

These same four units utilize a closed cycle steam system. In this system, water is turned to steam in boilers, the steam is passed through turbines connected to a generator which then makes electricity, the steam is condensed to water, and the water is returned to the boilers where the cycle in this closed system begins again.

While this is an efficient system that results in little water loss from the boilers, it requires a method to condense the steam to water and then dissipate the heat removed from the steam. The method employed at SBPP to condense the steam is a once-through cooling water system, the

most commonly used technology in the United States. Simply stated, circulating water pumps withdraw water from San Diego Bay through an intake channel. This relatively cool water is passed through the center of tubes contained within a piece of equipment called a condenser. The steam, once it has lost most of its energy by spinning the turbine, passes on the outside of the tubes and transfers heat to the cooling water which causes it to condense into a liquid. The cooling water, which has now picked up the heat from the steam, is then discharged back into San Diego Bay through a discharge channel. For each of the four boiler units, there are two circulating water pumps and one condenser. One circulating water pump feeds one half of the condenser. At full capacity, SBPP utilizes about 601 million gallons per day of San Diego Bay water.

Existing Thermal Limitations

On January 25, 1985, the California Regional Water Quality Control Board, San Diego Region, (RWQCB) adopted Order No. 85-09. This order resulted in the issuance of a National Pollutant Discharge Elimination System (NPDES) Permit (No. CA0001368) for operation of the SBPP to San Diego Gas and Electric Company, Duke's predecessor as operator of the SBPP (it should be noted that the current owner of SBPP is the Port of San Diego which has leased the plant to Duke for approximately ten years). This permit was renewed by the RWQCB on November 14, 1996 and will expire on November 14, 2001. Duke filed an application for another 5-year permit renewal with the Board on May 4, 2001.

This current SBPP NPDES permit contains thermal limitations for the discharge of cooling water into San Diego Bay. Limits are set for instantaneous increase in water temperature in the receiving water body (25°F) and for an average daily increase in water temperature in the receiving water body (15°F). These differences are referred to as SBPP Delta T limits. The current permit does not allow for any dilution factor or mixing zone.

How SBPP Tracks Cooling Water Temperatures

In order to assure compliance with thermal limitations, resistance temperature devices (RTDs) have been installed directly (within inches) upstream and downstream of the eight pipes that service the condensers. One RTD is located on each of the eight pipes that take water into the condensers and two RTD's (one on each side of the pipe) are on each of the eight pipes that conduct the water after it has passed through the condensers. Each of these 24 RTDs is hard-wired directly into the SBPP's Plant Information system (PI). Each RTD records water temperature every 10 seconds and then calculates an hourly average based on the 360 recordings in an hour. The hourly average is permanently stored in PI. Based on the hourly average for each of the eight intake pipes and using each cooling water pump's design flow characteristics, the PI calculates a single hourly average water temperature for the intake water. The PI uses the same process to calculate a single hourly average water temperature for the discharge water. The difference between the intake and discharge water hourly average temperatures is the Delta T for that hour. The average of the 24 hourly Delta Ts for any one day is the average daily Delta T that is used to document compliance with NPDES thermal limitations.

For purposes of verification, SBPP maintains two (one active and one as a spare) RTDs near the water surface in the center of the intake channel about 100 feet upstream from the Unit 1 intake structure and two near the surface in the discharge channel about 1,460 feet downstream from the Unit 1 discharge structure. These RTDs are also hard-wired into the PI system, and can be used to verify the Delta T calculations at the condensers. However, in performing these verifications, it is necessary to take into consideration that it takes approximately 45 minutes for the cooling water to flow from the condensers to the RTD in the discharge channel.

How SBPP Maintains Compliance with Thermal Limitations

The temperature information generated by PI is placed into a computer model that forecasts the daily average temperature based on current and expected generation loads. If the model shows that the forecasted loads will cause an exceedance of the daily limit, plant operators change the generation output from one or more generating units to ensure compliance.

What Steps Are Being Taken to Maximize Generation within Current Delta T Limits

Prior to considering a request to modify the current SBPP thermal limitations, Duke performed an assessment of its current operational procedures and cooling water equipment to determine if reasonable changes could be made to increase generating capacity without having to increase existing thermal limitations. The assessment concluded that all appropriate maintenance steps are being taken to maximize generation within the current permit constraints. Normal maintenance at SBPP to optimize efficiency of all units includes:

- Inspect unit condensers to be sure they are clean and working efficiently. These are normally cleaned on a weekly basis.
- Inspect intake tunnels to be sure they are clean and working efficiently. These are normally cleaned on a yearly basis.
- Inspect gland steam condensers to be sure air in-leakage is at minimum levels and check monitoring equipment. This is normally inspected on a daily basis.
- Inspect chlorination system and chlorinated tunnels to ensure the system is operating efficiently and no unwanted growth occurs. This is normally monitored on a daily basis.
- Inspect intake screens and trash racks to be sure they are clean and working efficiently. These are normally cleaned on a daily basis.
- Inspect and monitor cooling water pumps to be sure they are operating efficiently. These are normally inspected on a weekly basis.
- Inspect cooling water vacuum pumps to assure proper tunnel vacuum. This is normally inspected on a daily basis.

MODIFICATION OF THERMAL LIMIT REQUEST

In light of the above information, Duke is requesting that the RWQCB modify the existing NPDES permit for SBPP to authorize an increase in the average daily thermal limit from a maximum of 15°F to 23°F during periods when the California Independent System Operator (ISO) declares a Stage 1, 2 and/or 3 Power Alert. This request would not affect the current average daily thermal limit of 15°F when no ISO-declared Power Alerts are in effect nor would it affect any other condition in the current SBPP NPDES permit including the instantaneous maximum Delta T limit of 25°F.

An average daily thermal limit of 23°F was selected based on Duke's best engineering estimate of the average daily temperature of discharge should SBPP be called upon to operate all four generating units continuously. A copy of the engineering evaluation (assumptions/comments/recommendations/charts) is included as Attachment 3.

Estimate of Expected Generation Benefits

Historically, thermal limitation provisions contained in SBPP's waste discharge requirements have constrained potential total daily Megawatt-hour (MWhr) output from the plant by approximately 35 – 40%. Attachment 4 is a graph detailing MWhr generation and Average Cooling Water Differential Temperature (Delta T) on July 31, 2000. This graph is provided as a way to demonstrate that potential generation is significantly constrained from SBPP due to Delta T permit limits. On this particular day, 11,214.3 MWhrs (gross) were generated by the plant. If the plant were to operate without regard to the 15°F limit, the daily generation would have been approximately 17,328 MWhrs. As of late, peak demand has been starting earlier in the day which increases the need for SBPP to provide additional electricity during those times that are on the "shoulders" of the Attachment 4 graph.

As such, generation benefit derived from increasing the average daily Delta T limit provides additional MWhrs during those periods in which SBPP historically would operate at a lower rate. This would amount to about 5,000 MWhrs (net) per day being made available.

Circumstances Dictating When it is Allowable to Exceed Thermal Limit

The current daily average maximum thermal limit of 15°F should be temporarily increased to a limit of 23°F **only** upon declaration by the California Independent System Operator that a System Emergency (Stage 1, 2 and/or 3 Alert) is in effect. These declarations are made on a daily basis, can be confirmed on the ISO web page and can exist from up to a couple of hours to an entire day in duration. Due to the need to maintain some degree of steady-state operations, Duke proposes that the alternate Delta T limit remains in effect for the entire day on which an Alert is declared.

Frequency of Summer 2001 System Emergencies

It is not possible to know how many times the ISO will declare a System Emergency. However, preliminary indications are that it is likely that California will be under a Stage 1, 2 or 3 Alert for a large portion of the summer.

Reporting Requirements if Permit Modification Granted

As a part of the normal monthly reports made to the RWQCB staff, Duke will, in a separate table, detail the days on which the daily average temperature exceeded 15°F Delta T, the Stage(s) declared by the ISO for those days, copies of the ISO declaration notice(s) and the actual average Delta T for each day.

Supplemental Activities

Duke recognizes that this request for a modification to the daily average thermal limit will need to be acted upon by the RWQCB in the very near future if SBPP is going to be able to provide additional generation support this summer. As a result, this means that few studies or detailed analyses can be done to thoroughly explore the ramifications of allowing an increase in the daily average Delta T limit. Accordingly, Duke recommends that the following efforts be made should the permit modification be granted:

- A study to ascertain the extent of temperature increases in the receiving water during periods in which the normal daily Delta T limit is being exceeded (this would include a literature review and physical monitoring).
- A determination of the most temperature-sensitive species in the South San Diego Bay area and effects on that species, if any, due to the permit modification.
- An evaluation of effects on other water quality parameters caused by a temporary average daily Delta T of 23°F (e.g. dissolved oxygen).

Termination of Increased Average Daily Temperature Limit

The increased average daily temperature limit will terminate:

- Should the studies noted above indicate that there are unacceptable effects on the beneficial uses of the South San Diego Bay waters, or
- When the Governor's Executive Order D-22-01 expires, or
- When the current permit expires.

We appreciate your time and consideration of this important request which, we believe, is in the best interest of all California. We also thank your staff for meeting with us on May 2, 2001, to discuss this permit modification request.

Feel free to call me at (805) 595-4295 with any questions or comments.

Very Truly Yours,

Mark S. Hays
Manager of Environmental, Health and Safety
Duke Energy California Operations

MSH:ep

cc: Mr. Winston Hickox – Secretary California EPA
Mr. Art Baggett – Chairman, State Water Resources Control Board
Mr. Terry Winter – Chief Executive Officer – ISO

Attachments

CALIFORNIA ISO
California Independent System Operator

CAISO 2001 Summer Assessment

Operations Engineering

Executive Summary

California is facing an electricity shortage of unprecedented proportions. This report provides a detailed analysis of historical and forecasted near-term peak electricity supply and demand levels for the California Independent System Operator (CAISO) Control Area. The trends of historic data contained in this report indicate a significant supply shortage for Summer 2001. This forecast deficiency suggests that California will experience rotating blackouts for periods this summer.

Two points to note about the CAISO's Peak forecast:

- It focuses on peak levels in order to identify periods during which supply deficiencies will require electricity demand to be curtailed (rotating blackouts) and
- It is conservative, in that potential demand reductions and possible new supply resources are not considered. The CAISO forecasts of supply and demand levels reflect observed demand and proven resources. As an operating organization, these forecasts are used by the CAISO to guide preparations for future operating periods (months away) and must therefore, not count on demand or supply measures that have no track record or that do not have a high probability of materializing.

The following table summarizes forecasted supply and demand conditions that result in a resource deficiency for June through September ranging from 600MW to nearly 3,700 MW. (See Section 1 for a detailed explanation of each line of this table.)

	CONTROL AREA PEAK DEMAND [MW]	SUMMER 2001			
		JUNE	JULY	AUGUST	SEPT.
1	Forecast Summer Season Peak Load	47,703	47,703	47,703	47,703
2	Operating Reserve Requirements	2,600	2,600	2,600	2,600
3	Estimated Total Control Area Capacity Requirement	50,303	50,303	50,303	50,303
	CONTROL AREA GENERATION RESOURCES [MW]				
4	Maximum Net Dependable Capacity of CAISO Control Area Resources (as of February 2001)	42,113	42,113	42,113	42,113
5	Dynamic Schedules into CAISO	1,857	1,857	1,857	1,857
6	Expected New Generation [Cumulative Totals]	390	2,593	2,789	3,371
7	Scheduled Outages	0	0	0	0
8	Estimated Forced Outages/Capacity Limitations	-2,500	-2,500	-2,500	-2,500
9	Estimated Hydro Capacity Limitations	-1,000	-1,000	-1,000	-1,000
10	Estimated Control Area Resource Capacity (at peak)	40,860	43,063	43,259	43,841
	GENERATION IMPORTS [MW]				
11	Required Net Imports [Line 3 - Line 10]	9,443	7,240	7,044	6,462
12	Forecast Net Imports at Peak	3,500	3,500	3,500	3,500
13	Estimated Resource Deficiency Before Mitigation Measures	-5,943	-3,740	-3,544	-2,962
	DEFINITIVE MITIGATION MEASURES [MW]				
14	UDC Interruptible Load Curtailments	400	400	400	400
15	Demand Relief Programs	596	596	596	596
16	Conversion of Non-Spinning Reserve to Energy	1,300	1,300	1,300	1,300
17	**RESOURCE DEFICIENCY AT PEAK [MW] after definitive mitigation measures**	-3,647	-1,444	-1,248	-666

The trends that underlie the anticipated deficiencies are described below:

CAISO Control Area Peak Demand

The needs for electricity (MWh) and generation capacity (MW) have steadily increased over the last decade, in the CAISO control area, in California as a whole, and throughout the Western Interconnection.

- In the CAISO Control Area, the number of days that demand exceeded 35,000 MW increased from 51 in 1998 to 84 in 2000.
- Since the CAISO cannot accurately forecast when the system summer peak will occur; the estimated 2001 summer maximum peak load is applied to every month. It is this peak demand against which the adequacy of generation resources is evaluated.

CAISO Control Area Generation Resources

Generation capacity additions throughout the Western Interconnection have not kept pace with increases in demand. In California, this is particularly true: no new major generation has been built within the state of California during the last decade.

- In fact, much of the CAISO Control Area generation has already exceeded its useful life, and its maximum generating capability has been degraded due to age.
- Similarly, declining steam field pressure has affected the power output of geothermal units within the CAISO Control Area, thereby reducing the overall maximum "dependable" generating capability.

In addition to existing CAISO Control Area generation capacity, this forecast anticipates new CAISO Control Area generation to come on-line this summer. New generation is essential for minimizing resource deficiencies this summer.

- The new generation anticipated to be on-line this summer includes large thermal plants, peaking plants (Summer Reliability Generation), and renewable energy projects (including biomass restart projects).

Downward adjustments must also be made to *existing* dependable Control Area capacity in order to account for the capacity *expected* to be unavailable to serve the peak demand this summer due to unplanned or forced outages. Forecasted forced outages included here amount to 2,500 MW, the value that the CAISO has historically used to approximate forced outages. That number could vary depending on any number of unforeseen factors.

- CAISO Control Area generation resources have been used more intensively, and therefore experienced more wear, in recent years: total annual energy production from resources located within the CAISO Control Area increased by 14% between 1999 and 2000. Forced outages have also increased recently: Experience in December 2000, where generation had been heavily used during the previous summer, showed the average forced outage rate was over 5,000 MW, with outages exceeding 6,000 MW on 6 individual days.

- Better planned outage coordination (pending approval of legislation and/or proposed tariff amendments) could not only minimize outages during both summer and winter peaking periods, but may also allow some flexibility to soften otherwise unmitigated spikes in forced outages as well. Moreover, as greater emphasis (through incentives or penalties) is placed on providing and adhering to maintenance plans, as well as maximizing availability, scheduled and forced outages may become more predictable.[1]

- Similarly, outages due to generators exceeding air emissions limits are expected to decline this summer: collaborative effort is under way between the California Independent System

[1] This level of forced outages also assumes that Control Area generation capacity is not forced-out due to lack of payment.

Operator, California Energy Commission, California Air Resource Board, local Air Pollution Control Districts, and the owners of California power plants to develop mechanisms, interim rules and regulations that will relax/remove some of the current emissions and other environmental restrictions from these power plants.

Imports into the CAISO Control Area

Historically, the CAISO Control Area is a net importer in most hours. California's current energy crisis is partly a function of declining imports.

- CAISO annual average net import levels declined by 28% between 1999 and 2000.
- Imports have declined because electricity producers outside of California have had less electricity to export to California for two main reasons: increasing electricity demand in the Western Interconnection (causing utilities to sell more to native loads rather than export to CA) and decreasing supplies from hydropower resources in the Pacific Northwest as annual precipitation levels drop.

Definitive Mitigation Measures

Prior to the CAISO curtailing load, the CAISO relies on voluntary demand curtailment and the conversion of non-spin reserves to energy. These two measures are accounted for in the CAISO's forecast of resource deficiency.

- The established demand reduction programs (existing CAISO's Demand Relief Program and the UDCs' Interruptible Load Curtailment program) can offset some of the anticipated supply. Other conservation efforts by the State may further reduce demand but, because their effects cannot be dependably forecast, they are not included in these estimates of demand reduction.
- Similarly, converting of non-spinning reserves (CAISO Control Area generation and/or imports) to energy and utilizing CAISO control area firm load to meet contingency reserve requirements will help lessen demand while maintaining service reliability by adhering to the Western Systems Coordinating Council's (WSCC) Minimum Operating Reliability Criteria (MORC).

Resource Deficiency (after definitive mitigation measures)

For the months of June through September, the CAISO forecasts a peak demand resource deficiency ranging from 600MW to nearly 3,700 MW. Given this forecast, the CAISO expects that load curtailments (blackouts) will occur this summer. The CAISO will revise this forecast as conditions change. The CAISO is committed to working with governmental and private entities, and consumers, to provide the reliable electric service for Summer 2001 and beyond. Minimizing blackouts will require significant and sustained conservation efforts by Californians, careful coordination and conservation of hydroelectric imports from the drought-ridden Pacific Northwest, accelerated construction of new generation, good maintenance and coordination of Control Area generation, and a bit luck.

Summer Shortage: Near-term California Market Outlook

New supplies are desperately needed in California. With the current pace of supply additions in California and the West, new supply additions, including emergency generator installations (e.g., diesel generator), will fall just short of expected demand growth in 2001. In addition, the supply gap will be further aggravated by the following short-term reductions to the supply base that will make markets much tighter than in 2000:

- A large number of gas-fired plants are currently undergoing maintenance and/or emissions upgrades. Many plants ran extensively during the summer and fall of 2000 and need repairs and preventive maintenance. Some of this work was deferred by the previous utility owners of these plants. Operators of these facilities are conducting this work now to prepare for intensive operation during the summer.
- Barring a change to emission restrictions in the various air quality basins in California, many of the gas-fired generators in California will exhaust the available emissions credits much earlier than they did in 2000. Changes to these programs are under review, but the amount of relief that may be granted is unclear.
- A number of liquid-fueled peaker power plants are limited in the number of hours that they may operate during a year, owing to environmental restrictions. These facilities have been operated extensively during the blackouts and near-blackouts in January 2001, significantly reducing the availability of these plants for summer peak-load periods.
- California utilities have employed special tariffs that offer customers a reduced electricity rate in exchange for granting the utilities the right to curtail service during periods of inadequate supplies. These programs limit the number of instances that customers may be curtailed. Most of these customers were curtailed every day at the start of January 2001, exhausting or nearly exhausting this demand relief program, depending on location. In late January 2001, the California Public Utilities Commission (CPUC) suspended the penalties these customers would normally pay if they do not curtail consumption when called upon to do so. As a result, the ability of this demand relief program to stem demand will be eroded in the summer 2001.
- The West has experienced a disappointing precipitation season thus far, with key Pacific Northwest regions at about 60 percent of normal precipitation to date. The West's hydroelectric facilities have been drawn down at a high rate in recent months (December 2000 and January 2001) to meet winter demand levels. Barring high levels of precipitation through the remainder of the year, this drawdown will further reduce hydroelectric supplies for the remainder of 2001. The combination of low precipitation and the early drawdown of hydroelectric resources is expected to reduce hydroelectric production by at least 2,000 MW on average during the third quarter of this year, compared with normal levels. As a result, power prices at the Pacific Northwest's Mid-Columbia delivery hub for calendar year 2001 have quadrupled since the start of the winter precipitation season in November 2000.

Summer Shortage: Near-term California Market Outlook (continued)

CERA estimates that California requires 5,000 MW of new supplies to restore the market to balance, while surrounding states require an additional 5,300 MW. Supply additions are expected to total approximately 2,300 MW for the West (including California) this year, falling just short of the increase in Westwide demand. Thus, the supply situation will worsen, perhaps significantly depending on weather and the factors described above, from year 2000 conditions. Under expected conditions this summer, supply will fail to meet reserve requirements, resulting in stage 1, 2, and 3 emergencies. CERA expects as many as 20 hours of extreme shortage over the summer when demand exceeds supply by 3,000 MW. Emergency measures are not likely to correct this degree of supply shortfall. This means that the state will have to implement rolling blackouts for 20 hours this summer under expected conditions.

Figure 13 illustrates CERA's capacity margin outlook for California for the next few years. The "Optimistic Build" case assumes that roadblocks to siting, permitting, and constructing plants are cleared, that state and local permitting agencies work together to speed approvals, and that most proposed facilities move forward rapidly. The "Delayed Build" case illustrates the effects of delays in siting, permitting, obtaining equipment, arranging financing, and completing construction. Both cases incorporate an expected, rather than nameplate, value for dependable capacity from hydroelectric resources. These cases also reflect the shift in power transfers to California as new supplies are added to surrounding regions.

Delayed Build represents CERA's base-case view on the outlook for California capacity margins, given the realities of the siting and permitting procedures currently in place. Capacity margins are expected to degrade in 2001 from year 2000 levels. Although capacity margins improve slightly in 2002, they fail to rise to adequate levels. The year 2003 is the first year when supply additions are expected to restore California to balance. Although a significant number of new facilities are slated for initial operation in 2003, California's protracted siting and permitting process, along with local community opposition, stand as major hurdles to the progress of these facilities.

It is important to note that a capacity margin represents an estimate of available power plant capacity and an estimate of peak demand during the highest demand day of the year. CERA's estimate for California's capacity margin for 2001 is about 6 percent, far below the 15 percent required for reliable system operation. Thus, the degraded condition of the hydroelectric system, growth in demand, normal plant outages, and normal summer weather are the basis for CERA's projection of rolling blackouts for 20 hours this summer.

ENGINEERING EVALUATION
South Bay
CCW delta T Analysis

Assumptions/Comments:

1 Looked at April, May, June, July, August, September, and October for highest CCW inlet water temperatures. The highest ccw inlet temp. were during the months of July and August. Therefore the analysis was performed only using pi data during July and August.

2 Regulatory pi points PLNTCWI, PLNTCWO,SBPLNTCWI, and SBPLNTCWO do not agree with individual unit inlet temperatures nor with the station weighted outlet temperatures.This problem could be due to measuring device location and/or calibration.

3 Assumed CCW pumps to be operating at design flows.
Unit No. 1 = 78,000 gpm Unit No. 3 = 124,600 gpm
Unit No. 2 = 78,000 gpm Unit No. 4 = 136,800 gpm Total Flow = 417,400 gpm

4 Assumed steam loading to condensers to be at design - based upon heat balances for each unit.

5 Assumed the difference between design delta Temp. rise and actual temp. rise to be consistent from day to day per unit. The predicted CCW outlet temperature is calculated using the design delta T rise plus the difference between design and actual temp. rise plus actual inlet temperature. (delta T + (act. Delta T - exp. Delta T) + act. CCW inlet temp.)

6 Unit No. 2 condenser is performing worst than any of the other units based upon measured delta temp. rise (refer to "calcs" sheet). Typically, condensers perform within 1 to 2 degrees of design numbers, and the usual culprit for this difference is cleanliness of the condensers. I suspect possible problems exist with:
1) CCW flow being less than design - pump maintenance required and/or pluggage of tubes and CCW piping exist and/or tide effects.
2) Steam flow to condenser exceeding design for a given load point - poor turbine performance, steam traps leaking, startup vlvs. open/leaking, etc.
3) "Non-condensible gases" blanketing of the condenser tubes - steam jet ejector/vacuum pump malfunctioning and/or excessive air in-leakage

Unit No. 3 condenser is next with a delta temp. rise of 4.4 deg. F above design, while Unit No. 4 follows with a delta temp. rise of 3.3 deg. F above design. Unit No. 1 condenser is reporting the best delta temp. rise above design of 3.0 deg. F, slightly above what I would expect.

7 Each scenario given on the "calcs" sheet used the recorded individual unit ccw inlet temperatures for the month of July.

8 Assumed tide effects were captured in the actual monthly condenser delta T numbers (I.e. "adjusted temp. rise across condenser" value on "calcs" sheet).

Recommendations:

1 I recommend, if the discrepancy between regulatory inlet ccw temp. and unit inlet ccw temp. is not resolved,a differential be applied to the "predicted ccw delta T" value to bring it in-line with the regulatory value.

2 I recommend the proposed ccw delta T daily average limit be 23 degrees F, based upon the calculations performed in this spreadsheet. This should allow the station to operate at 725 MW gross output with a "unit" inlet CCW temp. of 81 degrees.

South Bay Power Plant

By: pac 3/15/01

Month: August

		Unit No. 1	Unit No. 2	Unit No. 3	Unit No. 4	Station
Load	MW	152.6	152.8	181.9	223.1	710.5
Heat to Condenser	BTU/LB	966.4	968.3	976.2	974.7	
Condenser Steam Flow	LB/HR	692101	692968	822526	1141899	
Heat Load to Condenser	BTU/HR	668820337	670982028	802976563	1112961348	
CCW Flow	GPM	78000	78000	124600	136800	
Exp.Temp. Rise Across Cond.	F	17.1	17.2	12.9	16.3	
Act. Temp. Rise Across Cond.	F	20.2	25.0	17.3	19.6	
Adjusted Temp. Rise Across Cond.	F	3.0	7.8	4.4	3.3	
CCW Inlet Temperature	F	81.7	81.7	81.5	82.0	
Predicted CCW Outlet Temperature	F	101.8	106.7	98.6	101.5	
Actual CCW Outlet Temperature	F	101.8	106.7	98.6	101.5	
Predicted Station CCW Outlet Temp.	F					101.7
Regulatory CCW Outlet Temp.	F					96.8
Weighted Station CCW Temp. Rise	F					20.0
Regulatory Reported CCW Temp. Rise	F					21.6

Month: July

		Unit No. 1	Unit No. 2	Unit No. 3	Unit No. 4	Station
Load	MW	151.4	154.2	180.4	229.6	715.7
Heat to Condenser	BTU/LB	966.9	968.0	976.5	974.0	
Condenser Steam Flow	LB/HR	686860	699385	815344	1177654	
Heat Load to Condenser	BTU/HR	664130297	676997636	796179684	1147011827	
CCW Flow	GPM	78000	78000	124600	136800	
Exp.Temp. Rise Across Cond.	F	17.0	17.4	12.8	16.8	
Act. Temp. Rise Across Cond.	F	19.8	26.3	16.9	20.9	
Adjusted Temp. Rise Across Cond.	F	2.8	8.9	4.2	4.1	
CCW Inlet Temperature	F	80.3	80.6	81.0	81.8	
Predicted CCW Outlet Temperature	F	100.1	106.9	97.9	102.6	
Actual CCW Outlet Temperature	F	100.1	106.9	97.9	102.6	
Predicted Station CCW Outlet Temp.	F					101.6
Regulatory CCW Outlet Temp.	F					97.4
Weighted Station CCW Temp. Rise	F					20.5
Regulatory Reported CCW Temp. Rise	F					22.6

Scenario 1

		Unit No. 1	Unit No. 2	Unit No. 3	Unit No. 4	Station
Load	MW	150.0	160.0	183.0	232.0	725.0
CCW Inlet Temperature	F	80.3	80.6	81.0	81.8	
Predicted CCW Outlet Temperature	F	100.0	107.5	98.1	102.8	
Predicted Station CCW Outlet Temp.	F					101.8
Weighted Station CCW Temp. Rise	F					20.7

Scenario 2

		Unit No. 1	Unit No. 2	Unit No. 3	Unit No. 4	Station
Load	MW	150.0	160.0	183.0	200.0	693.0
CCW Inlet Temperature	F	80.3	80.6	81.0	81.8	
Predicted CCW Outlet Temperature	F	100.0	107.5	98.1	100.4	
Predicted Station CCW Outlet Temp	F					101.0
Weighted Station CCW Temp. Rise	F					19.9

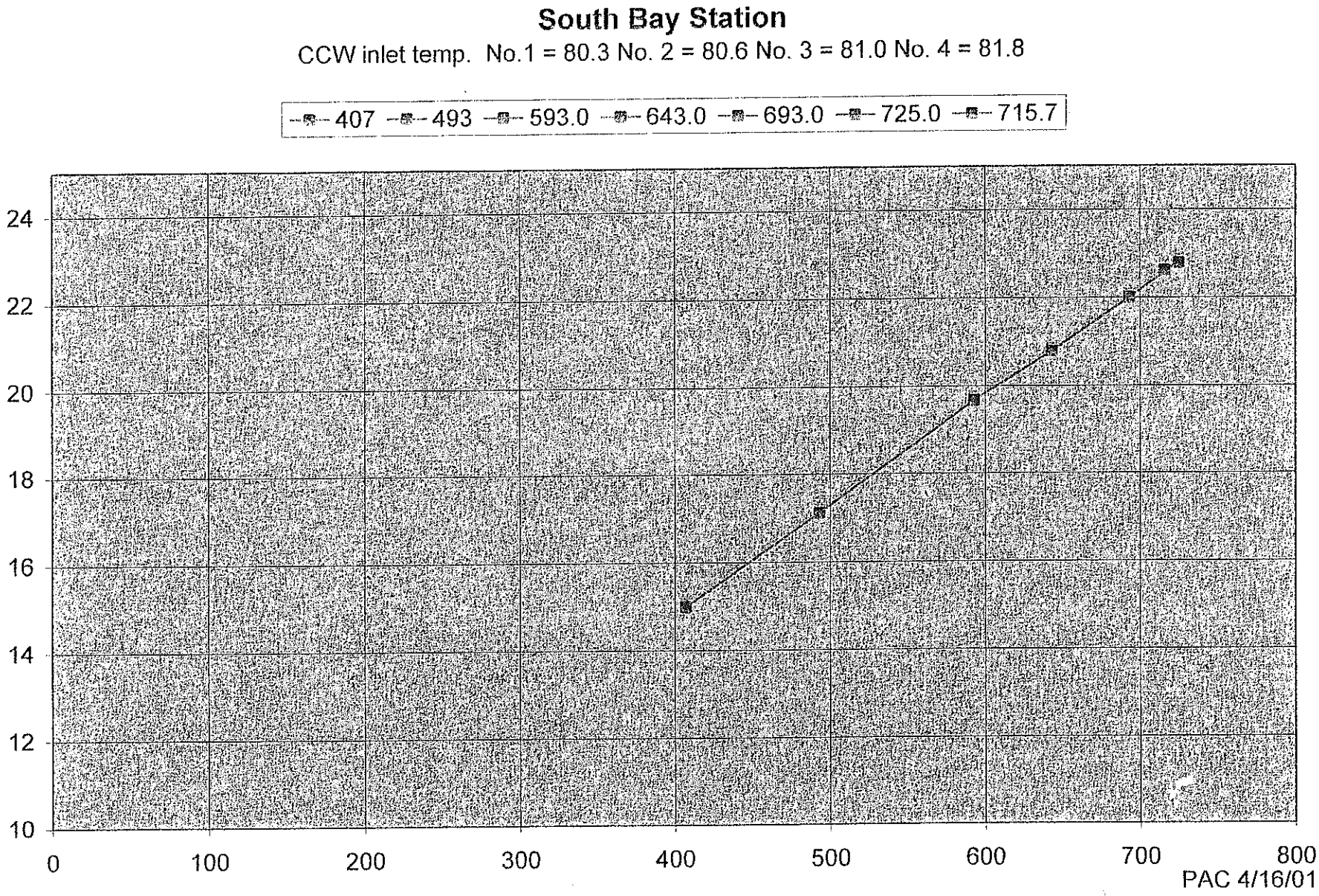
Scenario 3

		Unit No. 1	Unit No. 2	Unit No. 3	Unit No. 4	Station
Load	MW	150.0	160.0	183.0	150.0	643.0
CCW Inlet Temperature	F	80.3	80.6	81.0	81.8	
Predicted CCW Outlet Temperature	F	100.0	107.5	98.1	96.7	
Predicted Station CCW Outlet Temp.	F					99.8
Weighted Station CCW Temp. Rise	F					18.7

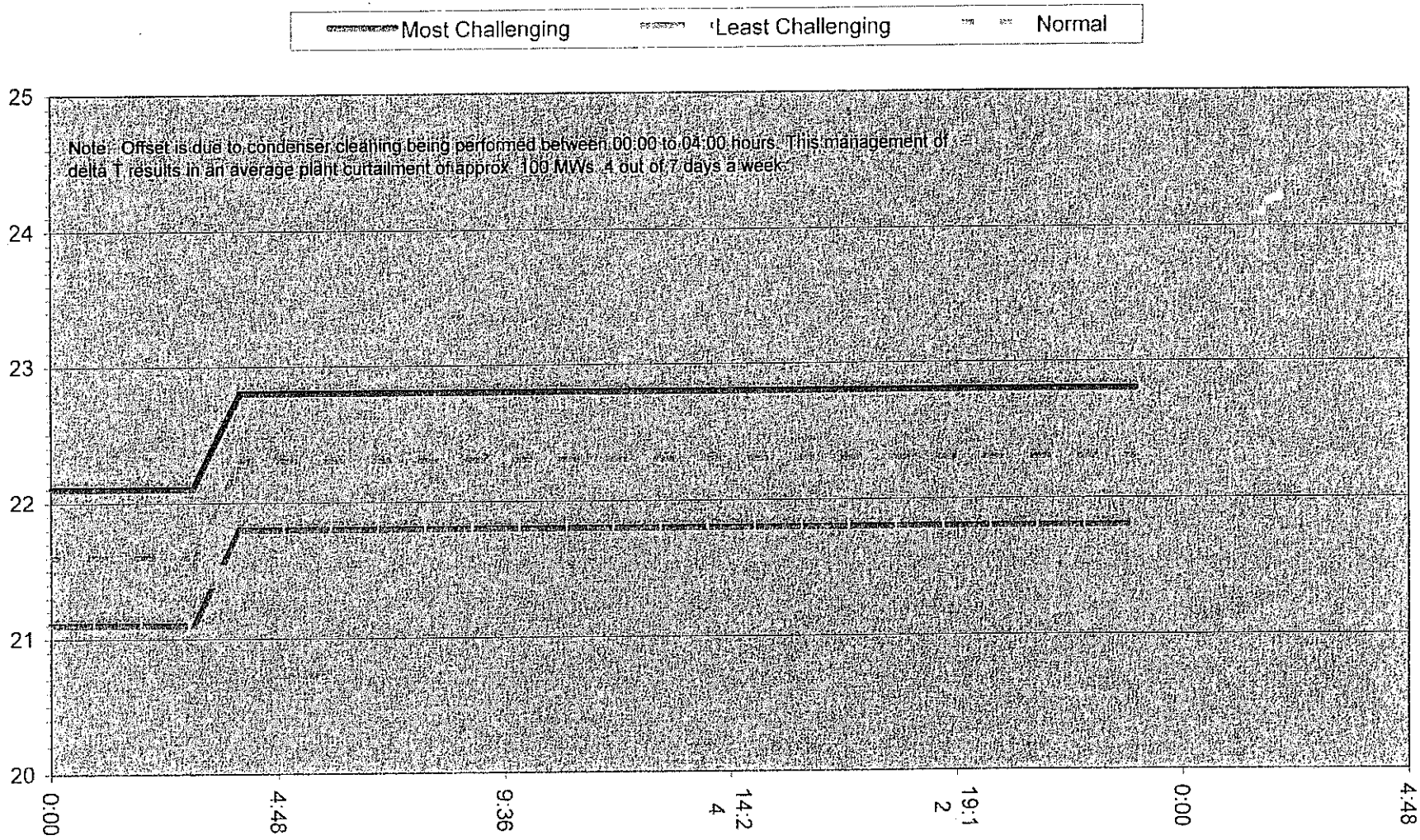
Scenario 4

		Unit No. 1	Unit No. 2	Unit No. 3	Unit No. 4	Station
Load	MW	150.0	160.0	183.0	100.0	593.0
CCW Inlet Temperature	F	80.3	80.6	81.0	81.8	
Predicted CCW Outlet Temperature	F	100.0	107.5	98.1	93.3	
Predicted Station CCW Outlet Temp.	F					98.6
Weighted Station CCW Temp. Rise	F					17.6

load	delta T	Regulatory delta T
407	12.9	15
493	15	17.1
593.0	17.6	19.7
643.0	18.7	20.8
693.0	19.9	22.0
725.0	20.7	22.8
715.7	20.5	22.6

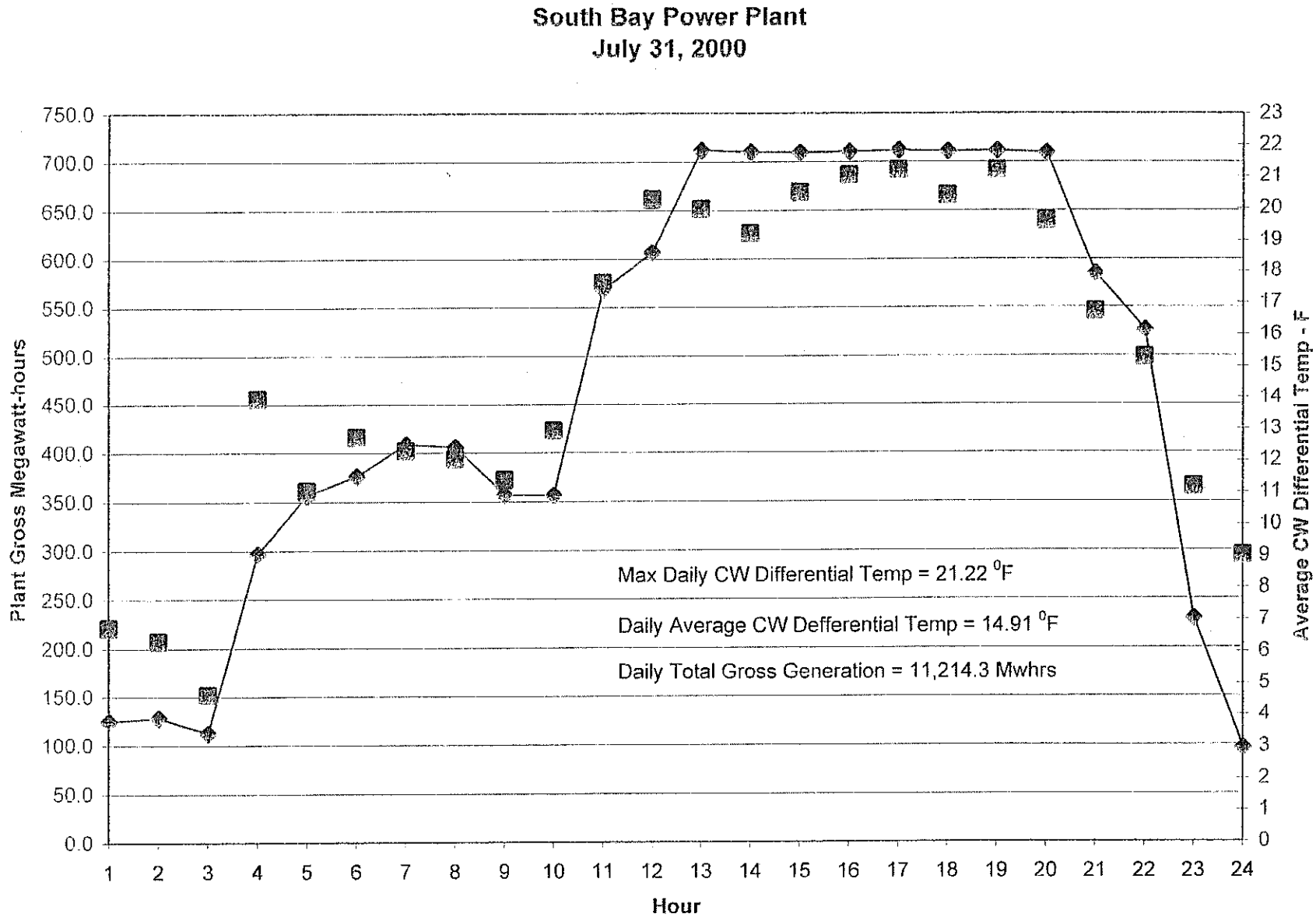

South Bay Station
CCW inlet temp. No.1 = 80.3 No. 2 = 80.6 No. 3 = 81.0 No. 4 = 81.8
407
493
593.0
643.0
693.0
725.0
715.7
24
22
20
18
16
14
12
10
0
100
200
300
400
500
600
700
800
PAC 4/16/01

South Bay CCW Delta T
Full Power Output - 725 MW



PAC 4/16/01

FIGURE 1


South Bay Power Plant
July 31, 2000
Plant Gross Megawatt-hours
Average CW Differential Temp - F
Hour
Max Daily CW Differential Temp = 21.22 °F
Daily Average CW Defferential Temp = 14.91 °F
Daily Total Gross Generation = 11,214.3 Mwhrs
750.0
700.0
650.0
600.0
550.0
500.0
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24