

Securing Power Through Energy Conservation and Efficiency in New York

Profiting from California's Experience

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for

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Executive Summary

This is the first of two reports commissioned by Riverkeeper, the Pace Law School Energy Project, and the Natural Resources Defense Council to determine the impact on electric power adequacy and reliability in New York City, Westchester County and Long Island if the Indian Point nuclear power station 35 miles north of Times Square were to be immediately and permanently closed.

This report was researched and written by Charles Komanoff, a long-time consultant and expert witness on electricity policy for environmental groups and governmental bodies, including agencies of the City and State of New York. It finds that the energy equivalent of Indian Point can largely be replaced through energy-efficiency and conservation measures that could be adopted by area businesses, residents and government agencies.

The primary basis for this finding is the striking success of the “crash” energy-efficiency and conservation program that was implemented in California last summer to avert potential electricity shortages during that state’s summer peak. As this report documents, California residents, businesses and agencies last year shut off enough lights, turned down enough air conditioners, switched off enough unnecessary power-using equipment, and bought enough new energy-efficient appliances to eliminate a tenth (10%) of their peak-hour electricity usage on hot summer days — and one-seventh (14%) during the month when the power network was most strained and conservation was most essential.

This report finds that California’s success in scaling back peak electric demand last year can largely be replicated in New York City and its surrounding area, if circumstances here require it. Taking account of climatological differences between California and New York as well as the inevitable forecast uncertainties, the anticipated summer-2002 peak demand in the New York area could be reduced by a substantial amount — between 5.6% and 14.7%, with a central estimate of just under 10%.

These percentages translate into savings from energy conservation and efficiency of at least 1,163 megawatts of generating capacity — equivalent to 60% of the total capability of the two Indian Point reactors — and possibly as much as 3,032 megawatts, a figure that is well over 50% greater than Indian Point’s capacity of 1,935 megawatts. The central estimate of the conservation savings is just over 2,000 megawatts, or slightly more than the power supplied by Indian Point.

The extremely short lead time prior to the summer 2002 peak season dictates that a program to replace Indian Point’s capacity would focus on promoting changes

in consumer usage patterns. Based on the California experience, between 85% and 90% of the savings would be expected to result from decisions by individual householders, businesses and agencies to curb discretionary usage (e.g., turning off lights and equipment, running air conditioners less frequently and intensively), while a smaller level of savings would be garnered through investment in energy efficient equipment. By the following (2003) summer, however, New York's peak-demand savings could be even greater if the additional time was used to intensively market and install power-saving equipment and techniques throughout the downstate region.

Even under the most pessimistic assumptions about energy conservation, then, the net shortfall in capacity from shutting Indian Point would be less than 800 megawatts; as the companion report by Synapse Energy Economics will demonstrate, this amount could be made up through imports of additional power from New England and the Mid-Atlantic region, which have surplus capacity. Under somewhat more optimistic assumptions, the effect of implementing conservation while shutting Indian Point would be an effective *increase* in reserve margins and power reliability in the New York area.

These results indicate that a California-type program of electricity conservation could permit the Indian Point nuclear station to be shut as early as this summer without impairing the reliability of power supply in New York City and the downstate New York region.

California's Conservation Achievement

California conclusively demonstrated last year that energy conservation and efficiency can significantly and rapidly reduce electricity consumption. During one month, June 2001, when supplies of power were tightest and conservation efforts were strongest, statewide peak-hour electricity demand shrank by 14% from June 2000 (after adjusting for year-to-year differences in weather and employment, both of which affect power demand; actual reductions, before adjustments, were 9%). Although the "conservation rate" understandably slipped somewhat after June as power supplies grew more ample, adjusted peak power usage by Californians for the four summer months (June through September) in 2001 averaged 10% less than a year earlier.

There is no precedent in recent American history for electric power savings of this magnitude on such a large scale. Not surprisingly, the circumstances that provoked it, and the policies and measures that helped bring it about, were unprecedented as well. In much of California, whole neighborhoods experienced "rolling blackouts" lasting up to two hours in the winter of 2001. The situation

was expected to be even more dire in summertime, when demand for power reaches a peak. In response, state officials implemented an array of actions, including monetary rewards for frugal customers (and penalties for energy spendthrifts); rebates on purchases of energy-saving lights, appliances and equipment; and media-information campaigns that explained electricity conservation's why's and how's and elevated it to a civic duty.

California governmental agencies are still sorting out last year's events, and it isn't yet known how much of the savings resulted from each program or emanated from the different customer groups (households, stores, offices, farms, factories). What is indisputable is that California residents, businesses and agencies together did what energy-industry insiders insisted was impossible: they shut off enough lights, turned down enough air conditioners, switched off enough unnecessary power-using equipment, and bought enough new energy-efficient appliances to eliminate a tenth or more of usage on the very days when power usage is most essential and the power network is most strained.

Applying the California Experience to New York

California's success in scaling back peak electric demand last year can largely be replicated in New York City and the surrounding area, if circumstances here require it. Based on the peak-demand reductions achieved in California last year, the downstate New York region can count on reducing anticipated peak demand by at least 5.6% and probably by considerably more this summer, in the event that the electricity situation changes here and officials institute a California-type program to achieve immediate large-scale savings. By the following summer (2003), New York's peak-demand savings could be even greater if the additional time was used to intensively market and install power-saving equipment and techniques throughout the territory.

This report constructs six scenarios reflecting different degrees of optimism as to the extent to which New York-area households and businesses will apply electricity-saving practices such as those that achieved such success in California. Each scenario yields an estimate of the percentage by which peak demands in the downstate region would decline from the level currently forecast for the 2002 summer. These percentages yield a range of possible megawatt reductions, each of which in turn equates to a somewhat greater number of megawatts of power supply that could be eliminated in concert with the reductions in demand.

The scenarios are discussed in the body of this report; the megawatt savings they yield are shown in the following table.

NY Conservation Savings for 2002 Summer — Six Scenarios

	Scenarios Based on Jun-Sept			Scenarios Based on June Alone			Mean for All Cases
	Optimist	Mid-range	Pessimist	Optimist	Mid-range	Pessimist	
NY Peak-Usage Conservation Rate	10.4%	8.1%	5.6%	14.7%	11.5%	7.9%	9.7%
NY Peak Demand Savings, MW	1,822	1,423	986	2,569	2,007	1,390	1,700
NY Capacity Savings, MW	2,150	1,680	1,163	3,032	2,368	1,640	2,006
Capacity Savings vs. Indian Pt MW	+11%	-13%	-40%	+57%	+22%	-15%	+4%

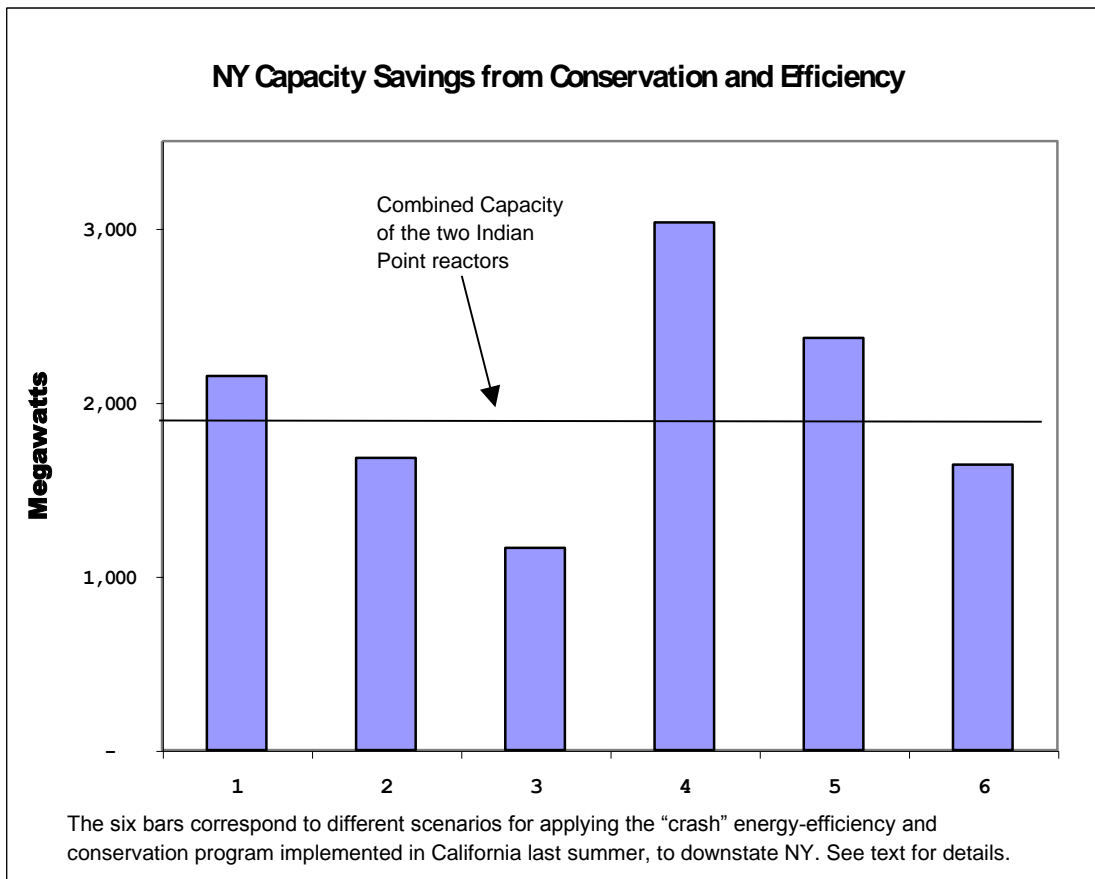
First three scenarios use as baseline California's 10.0% 4-month average peak savings in 2001 vs. 2000, adjusted for weather, employment and curtailments. Baseline for last three scenarios is 14.1% savings for June 2001 alone, adjusted similarly. Conservation Rates are multiplied by combined nominal 2002 peak load of 17,522 MW¹ in downstate NY (New York City, Long Island, and Westchester and Putnam Counties) to yield NY Peak Demand Savings. NY Capacity Savings incorporate 18% reserve margin required by NY Independent System Operator. See text for details.

As the table shows, estimates of peak-demand savings from implementing a California-type crash conservation program in the downstate New York region range from 986 MW to 2,569 MW, with a mean of 1,700 MW. These savings are considerable; by way of comparison, the twin towers of the World Trade Center had a summer peak demand of approximately 80 MW, and the current summer peak for Westchester and Putnam Counties combined is slightly over 2,000 MW. (References and explanatory notes follow text at end of report.)

These figures, while significant in themselves, grow even larger when *reserve margins* required for service reliability are taken into account. Electric utilities must maintain spare generating capacity as insurance against contingencies such as breakdowns at power plants, failures of transmission lines, or stronger-than-anticipated demand for power. Over a long period of time, the New York Independent System Operator, or NYISO, and its predecessor agency have determined that a reserve criterion of 18% — such that reserves equal 18% of projected peak demand — is sufficient to ensure system reliability without overburdening ratepayers with costly spare capacity.

Accordingly, with each megawatt of peak demand that customers avoid, the utilities can subtract 1.18 megawatts from the total capacity they must supply to the grid. Quite literally, every kilowatt of peak demand that can be eliminated through energy efficiency (e.g., replacing incandescent bulbs with compact fluorescent lamps) or conservation (turning off lights, reducing use of air-conditioning, rescheduling discretionary tasks like running the dishwasher until off-peak hours) equates to 1.18 kilowatts of supply that no longer need be kept on the utility system.

This “leveraging” of demand onto supply is captured in the second to last row of the table on the previous page, each entry of which is 18% greater than the corresponding entry above. Estimates of generating capacity that could be shut or retired from implementing a California-type crash conservation program in the downstate New York region thus range from 1,163 MW to 3,032 MW, with a mean estimate of 2,006 MW.



By comparison, the combined capacity of the two functioning Indian Point reactors is 1,935 megawatts,² or several percent less than the mean estimate of the capacity that could be replaced through conservation. Even under the most pessimistic scenario, in which (i) New York puts in place only half of the economic incentives that saved power in California, (ii) New Yorkers fall 25% short of their West Coast counterparts in curbing use of air-conditioning, and (iii) no adjustment is made for the drop-off in California’s conservation zeal after their energy crisis ebbed, fully 60% of the total capacity of the Indian Point reactors could be displaced by conservation measures.

Even in that scenario, the shortfall in capacity from shutting Indian Point, amounting to less than 800 megawatts, could be made up through imports from New England and the mid-Atlantic region, which, as the companion report by Synapse Energy Economics will demonstrate, currently have excess capacity. In two other scenarios, the shortfall is less than 300 MW, and in the other three cases there would be an effective *increase* in capacity from implementing conservation while shutting Indian Point, with the net gain ranging from 200 megawatts to over 1,000 MW. These results indicate that a California-type program of electricity conservation could permit the Indian Point nuclear station to be shut as early as this summer without impairing the reliability of power supply in New York City and the downstate NY region.

These findings also belie the assertions by the owners of the Indian Point facility that “There are no real alternatives” to continuing to run the reactors. In a recent advertisement on the op-ed page of *The New York Times*, the Entergy Corporation insisted that “You can’t conserve enough energy to replace Indian Point’s 2,000 megawatts. Even the most optimistic projections on conservation place the potential savings at 500 megawatts.”³ As indicated above, and as this report will document, the range of likely savings from a concerted conservation program designed to replace the output of Indian Point range is a roughly 2-fold to 6-fold multiple of what Entergy’s advertisement characterizes as “the most optimistic” assessment of the power of conservation.

California’s Conservation Savings

Electricity usage has a *peak* component denoting the maximum amount of power used during a short period of time (usually one hour), and an *energy* component reflecting the electric energy used during a particular period (hours, days, months). Unlike the energy crises of the 1970s, which involved insufficiencies in stocks of *commodities* (usually oil, occasionally coal or natural gas), a power crisis involves a possible mismatch between peak power demand and peak generating capacity. California’s electricity-saving efforts in 2001 therefore focused on peak-hour usage, and the same would be true in New York.

In both states, power demand typically peaks in the mid- or late afternoon hours of hot weekdays, particularly during an extended heat wave, when air-conditioners in homes and offices are running at full blast. (Note that the rolling blackouts that afflicted California in January and February of 2001 were an anomaly caused by widespread shutdowns of generating plants, ostensibly for repairs but more likely in a deliberate effort to manipulate power markets.)

California's statewide demand for power reaches a peak sometime during June, July, August or September. Indeed, during the prior year (2000), peak loads in all four months were virtually identical: for the 80% of the state covered by the Independent System Operator (or ISO, the consortium chartered by the state to co-ordinate power supply and delivery), the four monthly peaks in 2000 were identical to within 1% and exceeded all other monthly peaks by at least 10%.⁴ Accordingly, the state's 20/20 energy-saving rebate program, discussed below, targeted usage during June through September.

The table below shows how much Californians cut peak demand in 2001 from year-earlier levels in the four peak months.

California Summer Peak Load Reductions — 2001 vs. 2000

	June	July	August	Sept	Mean
2000 Load (MW, unadjusted)	43,447	43,334	43,509	43,069	43,340
2001 Load (MW, unadjusted)	39,613	40,241	41,155	37,751	39,690
% Difference	-8.8%	-7.1%	-5.4%	-12.3%	-8.4%
2000 Load (MW, adjusted)	39,637	41,599	42,528	39,480	40,804
2001 Load (MW, adjusted)	34,067	37,744	38,732	36,317	36,715
% Difference	-14.1%	-9.3%	-8.9%	-8.0%	-10.1%

All data are hourly peaks for the months shown, and are from California Energy Commission,⁵ except for July 2001 adjusted (discussed directly below). Adjustments are for weather and employment and are by CEC. Percent means are simple averages of the four respective percentages. If not for curtailments, July 2001 load of 40,241 MW would have been 40,891 MW (actual load on July 3 of 40,065 + curtailed load of 826), as reported in private communication by CEC, and we have used the higher figure here. The adjusted figure of 37,744 MW, which replaces the CEC figure of 37,144, was calculated by prorating 40,891 by the ratio of 37,144 to 40,241. Absent this adjustment, the savings percent would have been 10.7% for July and 10.4% for all four months.

The year-on-year peak savings ranged from 8% in September to 14% in June, and average just over 10%. (The downturn after June may reflect a falloff in the intensity of conservation efforts over the course of the summer, as some shuttered generators returned to service and the power crisis ebbed as a result.)

California's Conservation by Sector

The 10% average summer peak saving in 2001 vs. 2000 is an average that conceals underlying variations between customers and among different sectors and types of usage. Unfortunately, the authorities in California haven't yet completed "allocating" the savings to the different consuming sectors and power-usage categories. Pending such an analysis, a reasonable first approximation is that rates of savings were proportionately equal in California's five major consuming sectors (residential, commercial, industrial, agricultural and "other").

This is based primarily on preliminary findings from a survey of power consumption by customers of one of the state's major electric utilities, conducted under the auspices of the California Energy Commission.⁶

In that survey, 590 residential customers of Southern California Edison (SCE) Corp. answered various questions about their energy use and conservation behavior and also permitted researchers to examine their electricity bills during June 2000 and June 2001. Their responses indicate that, on an aggregate basis, the 590 households used 10.7% less electricity during June 2001 than they did a year earlier.⁷

This savings rate for households, which is unadjusted and applies to the entire month of June 2001 rather than the peak hour alone, exceeds the statewide energy savings rate for the same month, which was 8.4%.⁸ Although the juxtaposition of the 10.7% savings rate for SCE households and the 8.4% rate for all usage in the state suggests that residential conservation surpassed that of commercial or industrial customers, it may also be that the more conservation-minded among the SCE householders were more likely to reply to the survey. The conservative approach, then, is to adopt the "null hypothesis" that residential customers conserved at the same rate as other customer classes during peak periods.

Pending contrary evidence, it is also reasonable to assume that the other customer classes (commercial, industrial, etc.) also contributed equally to the 10% average summer peak savings in 2001. Indeed, for the forthcoming (2002) summer the California Energy Commission predicts virtually identical percentage savings by all customer classes, except for a scant 10% lesser savings rate in agriculture.⁹

Why Californians Conserved

What brought about California's impressive power savings during 2001? The California Energy Commission's summary report on the 2001 conservation experience lists five key factors and programs:¹⁰

- Public awareness of crisis and desire to participate in solving it
- Media exposure and reinforcement
- Demand reduction programs
- The 20/20 program
- Electricity price increases and rate restructuring

These are discussed in turn, primarily for the residential sector, relying on the survey of Southern California Edison customers noted earlier.

Public awareness of crisis and desire to participate in solving it

Respondents to the SCE customer survey rated keeping bills down, avoiding blackouts, using energy wisely and stopping overcharging by suppliers as their biggest reasons for conserving electricity.¹¹ Two factors — avoiding blackouts and stopping overcharging — go to the heart of the power crisis that struck the state in early 2001. Almost a third of respondents reported having experienced blackouts in the past six months. Although only one-fifth of that group — and just 6% overall — said they had been “very inconvenienced,”¹² concern about blackouts was widespread, both on the “micro” level of personal or familiar exposure, and also on the “macro” level of worry over jobs and the economy. Clearly, the blackouts rendered the crisis real and made conservation imperative.

Media exposure and reinforcement

Beginning with the rolling blackouts in winter and continuing with the statewide conservation effort, the power crisis was a major news story and topic of conversation from the start of 2001 through the summer. State agencies spent \$57 million publicizing the need to conserve and advertising ways to conserve (and be rewarded for it), and print, radio and TV coverage saturated the state with energy-saving messages. The ubiquitous and repeated dissemination of information contributed greatly to the extraordinarily high rate of public participation in electricity conservation; according to the survey of SCE customers, 82% took some power-saving action during the 2001 summer, with an average of four types of actions per customer.¹³

Demand reduction programs

Long before the 2001 power crisis, California was a national leader in programs to make buildings, heating and cooling systems, appliances and lighting more energy-efficient. The state redoubled and accelerated these efforts last year, particularly by adding to customer rebates for purchasing energy-efficient compact fluorescent lamps, refrigerators, air conditioners, washing machines and dishwashers. Because of the short time horizon, the replacement of inefficient lighting and appliances by new equipment accounted for only a small percentage of the overall peak savings in 2001 (see discussion below). Nonetheless, these direct savings still added up to a substantial number of megawatts. Moreover, the mere existence of this opportunity to conserve energy through “investment” may have contributed to a positive aura surrounding energy savings in general, and thus have leveraged the far greater savings that were achieved through conservation “behavior.”

The 20/20 program

In March 2001, California officials announced that residential customers who used at least 20% less electricity during any summer month, compared to the same month in 2000, would receive a 20% rebate on their electric bill for that month. The “20/20 program” appears to have triggered a significant amount of conservation behavior by residential customers, while also contributing to overall awareness of and participation in saving energy. Based on the SCE customer survey, some 30% of residential customers surpassed the 20% savings threshold; their savings from a year earlier averaged 37% and accounted for three-fourths of the electricity reductions achieved by all residential customers combined.¹⁴

To be sure, these figures apply only to the maximum conservation month (June), and doubtless include some households whose usage would have shrunk without the rebate (owing to natural statistical variability). Still, the 20/20 program was undoubtedly an attention-getter, and it appears to have “energized” many households to conserve. Indeed, residential customers who tried but fell short of the 20% savings threshold also contributed savings.

Electricity price increases and rate restructuring

Prior to the onset of the 2001 summer, the California Public Utilities Commission authorized Southern California Edison and Pacific Gas & Electric to implement what amounted to a two-step rate increase that raised the average price of electricity by 40-45%. These increases were intended to enable the two utilities, the state’s largest, to finance at least part of the skyrocketing power costs charged by electricity wholesalers. It is likely that they also acted as a strong inducement to conserve, reinforcing the overall save-power message with a powerful “stick” that customers ignored at some economic cost.

Actually, the residential increases were structured so as to exempt low and moderate usage and rise progressively more steeply at higher usage levels. To offset these exemptions while achieving the intended overall 40-45% increase in revenues, SCE’s and PG&E’s commercial and industrial customers were allocated rate increases of 50% or more; comparable increases were applied to all household usage above 130% of the residential-sector average. Although the precise effect hasn’t been quantified, rate increases had to have been a factor in provoking the behavior-based conservation that accounted for most of California’s power savings.

How Californians Conserved

The survey of SCE customers, along with numerous communications with California Energy Commission staff, support these provisional findings about electricity conservation in California last year:

“Behavior” vs. “Investment” — Given the short time horizon, the vast majority of power savings in California last summer had to have resulted from purposeful changes in energy-usage behavior. The short (six months or less) “window” between the onset of the power crisis at the start of the year and the start of the summer peak season in June simply didn’t allow for installation of more-efficient equipment at a level that could equate to the huge peak load reductions that were actually realized.

For residential usage, the unofficial and informal consensus among state officials is to credit new equipment such as compact fluorescent lamps and new-model refrigerators with around 10-15% of the peak-usage savings; behavioral changes provided the other 85-90%. For the commercial and industrial sectors, the share of peak savings from replacing equipment may have been slightly higher than 10-15%. Overall, then, equipment changes probably accounted for 15% or less of the peak-megawatt savings, with behavior accounting for 85% or more. (A CEC forecast of post-2001 demand suggests similarly that 13% of summer-2001 savings were “program” and the other 87% were “voluntary.”¹⁵)

Conservation Participation — Among respondents to the SCE survey, 82% took some power-saving action, and the average customer engaged in four types of actions.¹⁶ There is no comparable estimate for commercial or industrial customers, but the breadth of the civic campaign to save electricity, the extent of rate increases, and the sheer magnitude of the realized savings all suggest that participation was extensive across the board.

Conservation Actions — The most common and effective power-saving actions by households appear to have been (i) turning off equipment — lights, fans, TV’s, hot tubs, pool heaters — when not in use, and (ii) setting air-conditioning thermostats to higher temperatures or simply turning off air conditioners altogether for periods of time.¹⁷ That these actions were voluntary and recurrent suggests the likely impact of ongoing incentives (whether price-related, civic-oriented or both) and reminders such as PSA’s.

Differences between California and New York

If New York and California were identical, one could posit that the rate of peak demand reductions realized in California last year should be achievable in New

York City and the surrounding suburbs. Needless to say, the two states are not the same. This section delineates the key differences and adjusts the California experience to estimate the peak savings that the New York region should be able to count on in the event that the power situation here warrants a crash conservation effort.

Conservation History and Culture

California's per capita electricity consumption is the lowest of the 50 states. While the (generally) temperate climate helps, it is probably also true that energy efficiency is more ingrained in California than in any other state. California's building codes are the most energy-conscious in the nation, and the various utility and state-agency programs for saving electricity are the longest-standing and most extensive. As well, the state culture is widely considered to include a high degree of environmental awareness. All this gave California a firm foundation on which to base the programs that induced immediate, large-scale electricity savings last year.

The flip side of this strong base is that more of the "low-hanging fruit" for saving electricity had already been harvested in California. With New York having a proportionately larger stock of energy-inefficient equipment, especially high-wattage (but lower lumen-producing) incandescent and halogen lighting, than California did prior to last summer, both investment and behavior change have more scope to make an impact on electricity use here. As well, New York's density may make it feasible to implement conservation "saturation" programs, such as door-to-door energy-saving teams that actually install compact fluorescent lamps and order efficient replacement refrigerators, that weren't undertaken on a large scale in California.

Weighing the respective conservation histories and cultures, there appears to be just as much potential for New York to achieve large energy savings going forward as California had going into last summer.

The Nature and Cause of the Power Emergency

The 2001 California power crisis had both a common threat and a cast of villains. The bad guys were the newly minted, largely out-of-state generating corporations that milked a tight but otherwise manageable power situation to gouge Californians and reap enormous profits. The threat was that the lights might go out, not just once but repeatedly, not just here or there, but everywhere.

It's safe to say that both factors contributed importantly to Californians' widespread participation in saving electricity last year. As noted, "avoiding

blackouts” and “stopping overcharging” were two of the four factors most often cited by residential customers for conserving power. It’s not clear that either factor will operate in quite the same way if a power crisis develops in New York.

The event that could create the possibility of electricity shortages in New York — a policy decision to shut down the nuclear generating station at Indian Point — is *sui generis*. To be sure, the intent of the policy, to foreclose a nightmare scenario in which much of the region could be made uninhabitable for years, would be noble enough. Still, the deep-seated divisions over the comparative dangers and benefits of nuclear power virtually guarantee that a decision to shut Indian Point would be contentious and controversial.

This raises the possibility that the sense of standing together against a common threat, and standing up to smack down a villainous foe, that helped motivate conservation behavior in California, might be less present in New York. On the other hand, having already experienced devastation from terror attacks, New Yorkers may be willing to go to unusual lengths to make the required adaptations, including changing their behavior to use less electricity.

On balance, it seems fair to expect that New Yorkers’ response to a power crisis arising from shutting Indian Point would at least equal Californians’ response to their power crisis arising from the machinations of the electricity wholesalers. However, this will require that political and community leaders unite around the imperative of energy conservation following a decision to turn off the reactors. As well, media messages would need to be tailored to the region’s heightened sensitivities in the wake of the Sept. 11 attacks.

East Coast Heat

Air conditioning accounts for a large percentage of peak electricity loads almost everywhere in the United States. Its share of peak demand in California is ordinarily around 30%.¹⁸ In the downstate area under consideration here, encompassing Long Island, New York City and the two counties directly north of the city, the share of peak demand attributable to air conditioning is even greater, approximately 40%.¹⁹

While the extent of air conditioning conservation in California last summer isn’t yet known, both anecdotal evidence and the SCE residential customer survey suggest it was considerable. State agencies and public service announcements publicized the energy savings to be had from setting indoor thermostats to 78°F (6-8 degrees above normal), and participation by commercial building managers appears to have been widespread. In the residential sector, almost one-third (32%)

of the SCE customers surveyed reported using their air conditioner less or turning it off altogether.²⁰ From the available evidence, and considering that air conditioning is somewhat more subject to real-time user control than some other uses of electricity such as refrigeration, it appears likely that conservation in the air conditioning “end-use sector” *surpassed* the overall statewide peak power savings rate.

New York’s climate, and the conditions for bearing it, are different from California’s. It is generally thought that heat waves here are harder to withstand or escape. Although peak temperature levels in many parts of California exceed those in New York, “East Coast heat” in general is considered harder to bear, due to a number of overlapping factors.

These differences include: higher humidity levels; the lesser degree of overnight cooling; the urban “heat island” effect that locks in the high temperatures and humidity; and the more dense land-use development making it harder to find cooling breezes. As a broad generalization, cooling is probably more readily attainable in California through natural means such as opening windows, using fans or going outside.

On the other hand, one would expect that these differences are already built into the present level of air conditioning loads. Indeed, this would explain why air conditioning’s share of peak loads in the downstate New York area is 10 percentage points greater than in California. In addition, the prevalence of window A/C units here offers the possibility of cooling only certain rooms at a time, whereas central units predominate in California. Moreover, the synergy between lighting and air conditioning means that replacing or turning off large numbers of inefficient incandescent or halogen lamps can contribute greatly to reducing cooling loads.

The foregoing considerations dictate a *range* of estimates of the extent to which savings in the air conditioning sector will track the rate realized in California. The summary calculations further below include a conservative case of 100%, a pessimistic case of 75%, and a mid-range value of 87.5% averaging the two cases.

Economic Incentives

As noted, two sets of economic incentives spurred California’s energy savings last year. One was the 20% bill reduction given to households (residential customers) that cut usage by 20% or more during any summer month; the other was rate increases averaging 40-45% borne by customers of the state’s two largest utilities.

Clearly, the more that New York can replicate, or at least simulate, these economic incentives, the more power will be saved here. This section outlines several potential means for doing so and assesses the extent to which their combined effect might rival that in California.

1. 20/20 Rebate Program — This program was offered to all residential customers in California; it would seem to be indispensable to a successful crash power-saving program in New York. Essentially, any residential customer consuming 20% fewer kilowatt-hours in any of the four summer billing months (extending roughly for all of June, July, August and September) would have that month's bill discounted by 20%. Perhaps surprisingly, the annual cost of the rebates would amount to no more than 1% of total electric revenues (owing to the fractional nature of the qualifying customer base, of the eligible months of the year, and the rebate percentage itself, all of which are compounding).²¹ This means that the 20/20 program could be financed through an almost unnoticeable surcharge to all customers' rates.

To compensate for the absence of large rate increases as a spur to conservation, the 20/20 rebate program could be offered to commercial customers as well (see discussion below). As on the residential side, this could provide a direct impetus to savings (while also enhancing the breadth of participation in the conservation effort), for relatively little cost.²²

2. Inverted Rates for Residential Customers — As noted, residential customers of California's two largest utilities whose power use was low or moderate were largely shielded from rate increases in 2001, whereas higher-usage customers saw their rates increase sharply for consumption above a certain threshold. (The mechanism was a CPUC decision in May 2001 to allocate a system-wide 3¢/kWh increase entirely onto "blocks" of residential consumption exceeding 130% of average use, with progressively stiffer increases at higher usage levels.²³)

Utility rate-design experts call this type of rate structure "inverted" because it turns the traditional volume-discount structure upside down; in this instance the California authorities applied the term "conservation rates" because they encouraged lower usage.

Conservation rates could be adopted in New York as well, without rate increases, simply by re-designing residential rates to shift costs away from the lowest usage "blocks" and into the highest. This would create a powerful incentive to conserve without having to raise the aggregate amounts paid by residential customers. Over a longer period — perhaps in time for the 2003 summer — residential customers could be offered time-of-use rates as well (see discussion directly below).

3. Commercial Rate Restructuring — So-called commercial customers — stores, offices, schools, hospitals — account for half or more of peak loads in the downstate New York region.²⁴ This suggests a strong need to develop economic incentives for commercial customers to maximize peak-power conservation here. Here are several (largely complementary) possible approaches.

20/20 rebate program — As noted above, the 20/20 program could be expanded to include commercial customers. Whether or not it proves feasible to offer the rebates to very large customers, small and medium-size customers could certainly be included, for an incremental cost equivalent to a mere several-tenths of one percent of current electricity revenues.

Inverted (conservation) rates — The need here is to transfer costs from the initial to the tail blocks, without penalizing large enterprises simply for their size and not for any inordinate appetite for power. A possible approach is to expand the number of size-based rate classifications for commercial customers, and design inverted-block rate structures within each subgroup.

Time-of-use rate restructuring — Some 14% of the peak load in the downstate New York area (an estimated 2,400) is currently metered for time-of-use (t-o-u).²⁵ In return for paying a premium for peak usage, these customers obtain offsetting discounts at other times when capacity is not scarce and electricity can be supplied less expensively. There is no technical impediment to increasing the peak-use charges (and reducing off-peak charges commensurately), as would be economically appropriate if power supplies tighten due to a shutdown of the Indian Point plant. This would give these customers, accounting for around 25% of peak commercial and industrial load in the region, strong incentives to reduce peak usage, without the burden of rate increases. Moreover, as noted above, residential customers should be permitted and encouraged to opt in to t-o-u rates, and these should be designed differently from current rates to target only the true summer peak hours.

Prospects for New York

Overview

Four California-New York differences have been discussed here. One, the different conservation history and culture, appears to cut both ways, and can be considered a non-factor. Another, concerning the difference in the source and type of power emergency, conceivably could lead to lesser rates of participation in energy savings in New York, but the effect need not be significant if public officials and public service campaigns disseminate a “message” of unity and

purpose. A third issue, New York as a heat island, could point toward a lower rate of energy savings, perhaps as much as 25%, in the air conditioning “end use” for New York.

The fourth difference, in economic incentives, is one that would tend to affect the overall conservation effort, rather than just a single end-use or customer segment. Although electricity usage is sometimes assumed to be “price-inelastic,” i.e., insensitive to price (and particularly so for peak usage, where comfort is a big consideration), this designation is relative, and the literature is replete with empirical studies linking rising prices to declining usage. The precise importance of the California rate increases to the statewide decline in peak demand cannot be estimated at this time, but the study of SCE customers suggests that higher rates were both a motivating force and an attention-getting factor in residential electricity conservation last year.

The irony is that New York, unlike California, cannot “count on” 40-45% average rate increases to induce conservation. This makes it imperative for New York to implement (and perhaps broaden) California’s 20/20 rebate program, and also to modify rate structures to induce peak-usage conservation without increasing overall utility bills.

Calculations

The various uncertainties in both the analysis of California savings and the future situation for New York give rise to 6 scenarios with different estimates of key variables, as follows:

California months used as baseline for New York — The baseline for three scenarios was the four summer months, with an average 10.0% peak savings rate (adjusted for weather and employment) vs. year-earlier levels. For the other three scenarios the baseline was June, the most successful conservation month, with an adjusted peak savings rate of 14.1%. These two sets of scenarios capture two contrasting views of the decline in the peak savings rate over the course of last summer: (i) that Californians couldn’t quite sustain their initial level of interest in electricity conservation, and (ii) that the decline in conservation was an appropriate response to the easing of the supply crunch as the summer wore on.

Air conditioning’s “conservation intensity” in California — Because air conditioning looms so large in New York-area peak usage, and because it isn’t clear that New Yorkers will cut back on air conditioning at the same rate that Californians did, the extent to which A/C loads declined in California last year is somewhat of a pivotal factor in the analysis here. Unfortunately, that figure isn’t

yet (and may never be) known. Reflecting this uncertainty, the extent of energy conservation in air conditioning in California last year is allowed to vary between 50% greater than, 25% greater than, and the same as, the average extent of conservation in all other end-uses.

Each assumption dictates a correspondingly lesser rate of saving in all other end-uses, in order for the overall savings rate to “true up” to the actual amount (10% for the entire summer, 14.1% for June alone). Perhaps paradoxically, the “high” air conditioning assumptions actually favor the prospects for peak power conservation in New York, owing to air conditioning’s huge share of system peak loads (which more than offsets the possibility that New Yorkers may not reduce use of their air conditioners at the same rate as Californians).

Air conditioning’s “conservation intensity” in New York — The percentage by which air conditioning loads are reduced from current levels during peak periods in New York is assumed to be either 75%, 87.5% (seven-eighths), or 100% as great as the percentage by which air conditioning loads were reduced in California.

Importance of price incentives to California’s conservation — The share of peak power conservation in California that was attributable to the various economic incentives (combined), is another important factor that can only be approximated at this time. Here it is assumed to be either 50%, 62.5% (five-eighths) or 75%.

Extent to which NY can duplicate California’s price incentives — This factor is varied between 50%, 75% and 100%. That is, the various incentive programs (20/20 rebates) and rate restructuring (inverted tail blocks, higher peak charges for time-of-use customers) that would be implemented in the downstate New York region, are assumed to provide half as much as, three-fourths as much as, or all of, the “price wallop” that Californians experienced from their 20/20 program and steep electric rate increases.

Power Usage Baseline — This is not a variable, but the “baseline” power-usage level to which to apply the overall “conservation percentage(s)” generated by each set of assumptions. The peak demand projected for this (2002) summer for the area served by Indian Point — New York City, Long Island, and Westchester and Putnam Counties — is 17,522 MW.²⁶

Combining the variables above yields the conservation percentages shown in the table near the start of this report; multiplying those percentages by 17,522 MW yields the megawatt savings estimates in that table. The key results are reproduced here:

Downstate NY Peak-Demand Savings for 2002 Summer — Six Scenarios

	Scenarios Based on Jun-Sept			Scenarios Based on June Alone		
	Optimist	Mid-range	Pessimist	Optimist	Mid-range	Pessimist
1. CA Overall Peak Conservation Rate	10.0%	10.0%	10.0%	14.1%	14.1%	14.1%
2. A/C Share of CA System Peak	30%	30%	30%	30%	30%	30%
3. CA Ratio, A/C to non-A/C Conservation Rate	150%	125%	100%	150%	125%	100%
4. CA A/C Conservation Rate	13.0%	11.6%	10.0%	18.3%	16.4%	14.1%
5. CA, non-A/C Conservation Rate	8.7%	9.3%	10.0%	12.2%	13.1%	14.1%
6. A/C Share of Downstate NY System Peak	40%	40%	40%	40%	40%	40%
7. Ratio, NY to CA A/C Conservation Rate	100%	87.5%	75%	100%	87.5%	75%
8. Downstate NY A/C Conservation Rate	13.0%	10.2%	7.5%	18.3%	14.3%	10.6%
9. Downstate NY, non-A/C Conservation Rate	8.7%	9.3%	10.0%	12.2%	13.1%	14.1%
10. NY Conservation Rate, w/o price-adjustment.	10.4%	9.6%	9.0%	14.7%	13.6%	12.7%
11. Role of Price Incentives in CA Conservation	50%	62.5%	75%	50%	62.5%	75%
12. NY duplication of CA Price Incentives	100%	75%	50%	100%	75%	50%
13. NY Conservation Loss from Lesser Incentive	0%	15.6%	37.5%	0%	15.6%	37.5%
14. NY Overall Peak Conservation Rate	10.4%	8.1%	5.6%	14.7%	11.5%	7.9%
15. NY Peak-Demand Savings, MW	1,822	1,423	986	2,569	2,007	1,390
16. NY Capacity Savings, MW	2,150	1,680	1,163	3,032	2,368	1,640
17. Capacity Savings vs. Indian Pt MW	+11%	-13%	-40%	+57%	+22%	-15%

All “NY” figures are for Downstate NY area analyzed here (NYC, Long Island, Westchester and Putnam Counties). First three scenarios use as baseline California’s 10.0% 4-month average adjusted peak savings in 2001 vs. 2000. Last three scenarios use 14.1% adjusted savings for June 2001 alone. Rows 4 and 5 yield Conservation Rates for air-conditioning (“A/C”) loads and all other loads that equate to overall rates in Row 1. Rows 7 and 8 allow for variation (between 75% and 100%) in NY’s ability to match CA’s A/C Conservation Rate. Row 9 equals Row 5, by hypothesis that non-A/C conservation in NY will duplicate that in CA — save for possible differences in price incentives, which are captured in Rows 11-13. Row 10 is derived algebraically from Rows 6, 8 and 9. Row 11 allows for variation (between 50% and 75%) in the extent to which price incentives brought about conservation in CA. Row 12 allows for variation (between 50% and 100%) in NY’s ability to match CA’s price incentives. Rows 13 and 14 follow algebraically from prior rows. Figures in Row 15 are the Row 14 figures multiplied by combined nominal 2002 peak load of 17,522 MW in downstate NY. Figures in Row 16 are 1.18 x figures in Row 15, and correspond to the six columns in the “NY Capacity Savings” bar chart appearing earlier. Figures in Row 17 are the Row 16 figures divided by the 1,935 MW capacity of Indian Point. See text for details.

The savings estimates are apart from “curtailment” measures, under which certain customers would be severed from the load under agreed-upon conditions of tight supplies (in return for monetary savings in power bills). Some such programs, sometimes referred to as “demand response,” were in place in California last year, although they only had to be implemented a few times, owing to the easing of shortages due to both reduced demand and improved supply conditions.²⁷

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Notes

¹ New York Independent System Operator (NYISO), *Locational Installed Capacity Requirements Study*, Feb. 28, 2002 (revised March 14, 2002), available at http://www.nyiso.org/services/documents/studies/pdf/lr_2002_report.pdf. The table on p. 4 gives the following summer-2002 peak loads for the four “load zones” that make up the downstate NY area: Zone K (Nassau + Suffolk Counties), 4,776 MW; Zone J (New York City), 10,665 MW; Zone I (Consolidated Edison’s Westchester County service territory, comprising most of the county), 1,486 MW; Zone H (the remainder of Westchester County, including Indian Point itself, plus most of Putnam County), 595 MW. The sum total of the loads is 17,522 MW. Although Long Island (Zone K) is some distance removed from Indian Point, it is included in the analysis because it is a highly “constrained” zone and imports power from New York City. Accordingly, any generating resources freed up through conservation on Long Island could be exported to the City to serve loads there.

² The “summer capability” of Indian Point 2 is 953 MW, and that of Indian Point 3 is 982 MW, for a total summer capability of 1,935 MW, according to NYISO, *2001 Load & Capacity Data*, available at the NYISO web site.

³ Entergy Corp. advertisement appearing on *The New York Times* op-ed page, April 2, 2002.

⁴ California Energy Commission, spreadsheet of 2001 vs. 2000 peak demand and energy, available at http://www.energy.ca.gov/electricity/peak_demand/demand_reduction.xls.

⁵ Ibid.

⁶ Loren Lutzenhiser, *An Exploratory Analysis of Residential Electricity Conservation Survey and Billing Data: Southern California Edison, Summer 2001*, submitted to California Energy Commission, December 6, 2001 (subsequently revised slightly).

⁷ Lutzenhiser (op. cit.) Table 3, Consumption Subgroups and Their Relative Contributions to Demand Reduction, gives the June 2000 and June 2001 kWh consumption of various “bins” of households. From this, respective monthly mean consumption figures can be computed, 652 and 589 kWh, indicating a 10.7% decrease.

⁸ California Energy Commission, [demand_reduction.xls](#), op. cit.

⁹ California Energy Commission, spreadsheet of non-coincident peak demand, [ncpeak.xls](#) provided by staff, March, 2002.

¹⁰ California Energy Commission, *The Summer 2001 Conservation Report*, Jan. 15, 2002, http://www.energy.ca.gov/efficiency/2001_conservation_report.pdf

¹¹ Lutzenhiser, *op. cit.*, p. ii.

¹² Lutzenhiser, *op. cit.*, pp. 18-19.

¹³ Lutzenhiser, *op. cit.*, pp. ii, 4, 6.

¹⁴ Lutzenhiser, *op. cit.*, p 3.

¹⁵ California Energy Commission, *October 12, 2001, Committee Workshop on Staff Proposed California Energy Demand Forecast*, p. 18 table "Demand Reduction Scenarios," http://www.energy.ca.gov/energyoutlook/documents/worksh0p_2001-10-12.pdf

¹⁶ Lutzenhiser, *op. cit.*, pp. ii, 4, 6.

¹⁷ Lutzenhiser, *op. cit.*, pp. v, 21-22.

¹⁸ California Energy Commission, spreadsheet breakout of major end-uses' shares of peak demand, *endusepeak98.xls*, provided by staff, March, 2002.

¹⁹ Estimated year-2002 air-conditioning loads for the four downstate NY load zones are: Zone K (Nassau + Suffolk Counties), 1,855 MW; Zone J (New York City), 4,454 MW; Zone I (Con Edison's Westchester County service territory), 637 MW; Zone H (the remainder of Westchester County plus most of Putnam County, both of which are served by NY State Electric & Gas Corp.), 214 MW. The sum total of the air-conditioning loads is 7,160 MW, which is 41% of the total 2002 peak loads for the four zones (see Endnote 1). The respective air-conditioning loads were estimated from detailed studies of customer end-uses performed in the early 1990s for Con Edison and Orange & Rockland Utilities (the latter study was used as a proxy for Zones K and H, which have similar demographic and climate characteristics to ORU, absent access to data for those service territories). The early-1990s data were scaled to 2001 based on recorded growth in total megawatt-hours consumed in each zone; the 2001 estimates were then scaled to 2002 at an increase rate of 0.4%, the figure for statewide load growth assumed in the NY ISO report, *Power Alert II — New York's Persisting Energy Crisis*, March 27, 2002, p. 12. For conservatism, the 41% calculated for air-conditioning's share of peak loads was reduced to 40%. *Power Alert II* is available at http://www.nyiso.org/topics/articles/news_releases/2002/poweralert2_final.pdf.

²⁰ Lutzenhiser, *op. cit.*, p. 13.

²¹ Assuming that: 40% of revenues are from residential customers; 30% of households qualify (as occurred for the surveyed SCE customers in June 2001); those households save an average of 37% (SCE customers in June 2001); and base usage is 20% higher in summer than year-round; the 20% rebates would equate to 0.7% of annual electric revenues.

²² Applying the assumptions directly above to 100% of customers, the rebates would still equal only 1.5% of annual electric revenues.

²³ See California Public Utilities Commission, Decision 01-05-064, May 15, 2001, available at <http://www.cpuc.ca.gov/cyberdocs/libraries/webpub/common/decsearchdsp.asp>, search under "Decisions." Under the decision, residential usage in "Tiers" 1 and 2 (usage up to the baseline amount, and within 100-130% of baseline, respectively) is now billed at 12.6 and 14.3¢/kWh. Tier 3, 130-200% of baseline, is priced at 19.3¢/kWh. Usage at 200-300% costs 23.6 cents, and beyond 300% is billed at 25.8 cents. These are PG&E rates; SCE rates are similar.

²⁴ An exact tally isn't available because Con Edison classifies some apartment dwellers as commercial customers. Counting industrial customers, which appear to account for only several percent of downstate peak loads, the non-residential share of the peak is almost certainly greater than 50%.

²⁵ According to the staff of the New York State Department of Public Service, about 20% of Consolidated Edison's total "coincident" peak load is accounted for by time-of-use-metered customers (personal communication, March 25, 2002). On current (2002) Con Ed peak load of 12,151 MW, this equates to 2,430 MW. LIPA's t-o-u customer base is virtually nil, and we conservatively assume the same for Zone H.

²⁶ See Endnote 1.

²⁷ The California curtailments made what would have been a 9.3% savings in peak demand in July 2001 appear somewhat greater, 10.7%. The lower rate has been employed in this report, since it corresponds to the power that customers wished to use.