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An *EDISON INTERNATIONAL* Company

(U 338-E)

Testimony Supporting Application for Approval of Advanced Metering Infrastructure Deployment Strategy and Cost Recovery Mechanism

Volume 1 – Business Vision, Management Philosophy, and Summary of Business Case Analysis

Before the

Public Utilities Commission of the State of California

Rosemead, California

March 30, 2005

EXECUTIVE SUMMARY

Southern California Edison Company (SCE) has completed an extremely rigorous business case analysis of Advanced Metering Infrastructure (AMI). SCE's findings indicate that an integrated AMI solution that leverages additional commercially-available technologies has the potential to provide an effective platform for enhancing routine customer services, providing more sophisticated alternatives for load management and demand response, and increasing operational efficiencies and benefits. However, these enabling technologies have yet to be cost-effectively packaged or integrated into a streamlined meter for application in the United States. Therefore, SCE has concluded that given its operational starting point, an investment in currently-available AMI technology is not cost effective for SCE's customers. Instead, SCE proposes to achieve significant increased operational and demand response benefits through a concerted and aggressive effort to develop an "advanced integrated meter" (AIM) that integrates additional technologies into the next generation of meters.

SCE's business vision for AMI seeks to undertake a deliberate, yet fast-paced effort to design and develop a new AIM platform that will better meet SCE's and its customers' needs by integrating additional proven technologies. The goal of the AIM project will be to add significantly more functionality at the same or lower cost as today's solutions, in order to significantly increase benefits over the current AMI business case.

The AIM development will take a "clean sheet" approach to design a meter that provides additional functional capabilities not available in currently-available metering solutions, including the possible integration of load control, demand limiting, two-way communications, customer information displays, data storage, and/or other proven stand-alone technologies. SCE seeks to significantly increase overall durability and versatility of AMI by using open, extensible and multifunctional meter and communications platforms. The AIM project is expected to leverage commercially-available components through an open design for both the meter device and communications to provide a flexible and sustainable technology platform during its long lifecycle. This is essential given recent and anticipated future technology developments in home connectivity, distribution grid intelligence, distributed generation, and broadband over power lines, all of which may interface with the AIM technology.

SCE has developed a detailed strategy and aggressive timeline for the AIM development project that allows for integrated meter design, prototype development, beta production, and pilot test before a new business case would be prepared for Commission approval of full deployment. If there are no major obstacles and the AIM technology delivers its promised improvements to the business case analysis, SCE envisions completing full deployment of the new AIM system no later than one to two years after the time that full deployment of today's AMI technology could be completed. SCE's customers would nevertheless be advantaged, despite this slight delay, given the superior attributes of the proposed AIM technology, including more durability, versatility and the ability to deliver significant improvements in system reliability, customer billing and service options, outage management and operational efficiencies. Thus, it is critical that SCE's ultimate investment in AMI focus on "getting it right" instead of rushing to "get it done."

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I.

INTRODUCTION

This testimony supports Southern California Edison Company's (SCE) Application for Approval of Advanced Metering Infrastructure (AMI) Deployment Strategy and Cost Recovery Mechanism, in accordance with the Assigned Commissioner and Administrative Law Judge's Ruling issued on November 24, 2004.[1] Based on our rigorous business case analysis of the "best" AMI deployment scenarios, we have concluded that an immediate deployment of AMI is not cost effective due to the limited benefits and high cost. Given the limitations of today's AMI solutions, we have developed an innovative AMI deployment strategy to develop the "next generation" of meters to integrate additional cutting-edge technologies to increase functionality and operational efficiencies.

The purpose of Volume 1 is to describe our business vision and deployment strategy for AMI, based on our underlying management philosophy and business case analysis, as required by the Administrative Law Judge and Assigned Commissioner's Ruling Adopting a Business Case Framework for Advanced Metering Infrastructure issued on July 21, 2004. This Section I is introductory in nature and describes the organization of this volume.

In Section II of this volume, we discuss our business vision for AMI, including an overview of our proposed deployment strategy for AMI and the necessary steps that must be fulfilled for a wide-scale deployment of AMI to be feasible. This section provides the underlying rationale for this deployment strategy and how our vision for developing an "advanced integrated meter" with multiple times the functionality of today's AMI solutions should resolve many of the challenges uncovered in our business case analysis.

[1] Assigned Commissioner and Administrative Law Judge's Ruling Calling for a Technical Conference to Begin Development of a Reference Design and Delaying Filing Date of Utility Advanced Metering Infrastructure Applications, issued November 24, 2004.

Our proposed AMI deployment strategy is set forth in greater detail in Volume 2 of the testimony.

In Section III of this volume, we describe our underlying management philosophy that helped shape the development of our business vision and preferred deployment strategy.

Section IV of this volume sets forth a summary of the results of our business case analysis for the best full deployment and partial deployment scenarios using the July 21, 2004 Ruling's prescribed assumptions and parameters. In this section, we summarize the total costs, total benefits, and net present value of each of the two business case scenarios that are described in detail in Volume 3. We also provide our observations on the results of the cost-benefit analysis as they relate to the potential deployment of AMI.

Section V is conclusionary and summarizes SCE's business vision for aggressively developing an "advanced integrated meter" based on our management philosophy and the poor results of the business case analysis of today's limited technology.

II.

SCE'S BUSINESS VISION FOR ADVANCED METERING INFRASTRUCTURE

Our business vision for AMI is to undertake an aggressive process to develop an "advanced integrated meter" (AIM) that can deliver significantly increased functionality and benefits at a lower cost than the best of today's available technologies. Our vision includes significantly improving the cost effectiveness of our AMI deployment business case and resolving many of the key uncertainties that plague our current analysis by integrating currently-available solid-state hardware, meter, and communications technologies to obtain many times the functionality above today's meter capabilities at a potentially lower price. With this vision, we anticipate that a more cost effective and beneficial business case can be achieved than what is possible today, which ultimately is better for our customers.

Based on our thorough business case analysis, it is clear that even the "best" AMI deployment scenarios using today's AMI technology solutions are not cost effective for our customers at this time.[2] From these findings, it is clear that mere "tweaks" to the analysis or to underlying assumptions will not make a substantial difference in the outcome. There are significant challenges to be overcome before AMI can be deployed successfully, including the limitations of today's AMI technology and the level of reliable demand response benefits that could be achieved. We are proposing to address these major challenges so that an AMI deployment will make sense for our customers. To this point, we have not been able to identify a viable AMI deployment strategy using today's commercially-available meters that will provide sufficient quantifiable benefits for our customers.

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[2] *See* Section IV below for a summary of our business case analysis. The details of this business case analysis, including the specific costs, benefits, and uncertainties for each of the scenarios and a discussion of the methodology and assumptions used in preparing this analysis, are presented in Volume 3 of the testimony and the appendices thereto.

This section will focus on how our vision to develop an innovative metering solution that better fits our operations can help overcome the major challenges confronting an immediate deployment of AMI and help maximize potential benefits. Initially, we provide a brief overview of our proposed deployment strategy, followed by a discussion of the challenges that this deployment is designed to overcome.

A. Overview of SCE's Deployment Strategy

We propose to design an innovative metering solution which integrates additional features that will deliver added value and improve the overall business case analysis. By starting with a "clean sheet,"[3] as opposed to attempting to merely modify existing technology with limited and expensive add-on modules, we expect to substantially increase meter functionality at a significantly lower price, while simultaneously increasing future functionality, options for customers to obtain usage data, and the reliability and value of load control and demand response.

This approach is similar to that taken by the Italian utility, Enel. Enel set out to design and build its own meter after determining that its desired level of functionality at an appropriate price did not exist in the commercial meter marketplace. By initiating a "clean sheet approach," Enel was able to integrate selected functionalities into a new meter design rather than attempting to add various modules to an existing meter, resulting in a better end product at reduced manufacturing cost. Although the exact Enel meter design will not work on our distribution system and does not fully suit our specific needs, we believe that the Enel example demonstrates the virtue of an innovative approach to developing a superior, "smarter" meter at a lower cost compared to commercially-available alternatives. Based on recent discussions with embedded system engineers, meter technology vendors and meter manufacturers, we believe we will be able

[3] By "clean sheet" approach, we refer to our strategy to design a meter that integrates additional technologies based on our business requirements, without regard to the functional limitations of merely trying to adapt current meter solutions.

to similarly increase embedded functionality (and associated benefits) and lower the cost to make a future deployment of these next generation meters more cost effective, more versatile, and more functional than any currently-existing alternatives.

Our preferred deployment strategy would be to segregate the AMI deployment process into three phases:

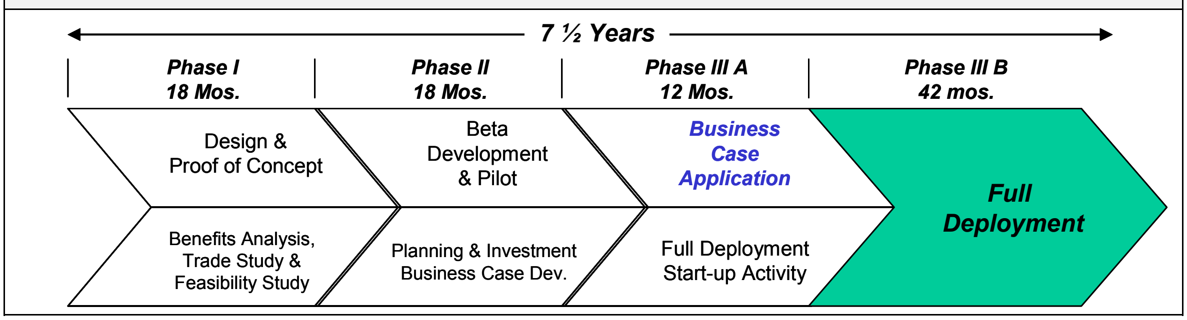
Phase I - Design and Proof of Concept;

Phase II - Beta Testing and Pilot Deployment; and

Phase III - Commercialization and Full Deployment.

As discussed more fully in Volume 2, we would not move forward to the next phase if the goals of the previous phase were not achieved. To be clear, our application in this proceeding seeks authorization only for Phase I and Phase II activities described below. A high level timeline is set out below in Figure 1-1.

Figure 1-1
AIM Project Timeline



Phase I will focus on defining and developing the new meter design from its initial concept to final design and will include the production of working prototypes. As described in greater detail in Volume 2, we propose to engage an engineering design firm to perform the actual design work and other consulting engineers to ensure that the design will in fact meet SCE's business requirements, maximize customer benefits, and be feasible to manufacture at a reasonable price. We estimate that this phase will take approximately 18 months from the time we receive Commission approval. In preparation for this process and in support of this aggressive strategy, we are already conducting market surveys to understand general timing and cost considerations and we are preparing to initiate a formal Request for Information and/or Request for Proposal. At the end of Phase I, we envision submitting a preliminary feasibility report to the Commission providing an update on the design process and expected costs for Phase II.

Phase II will focus on confirming the new product's manufacturability through beta production and on conducting a pilot deployment to field test product functionality and integration with utility systems. Through this beta production and pilot deployment, we hope to uncover any problems early and correct them before ramping up production and mass deployment. This phase will also provide more accurate cost estimates of full production to assist us in preparing a new business case based on the final design of the new AIM system. If no major obstacles are encountered, we estimate that this phase will take approximately 18 months.

We currently estimate we will spend approximately $31 million over the next 36 months to complete the Phase I and Phase II activities. In order to recover these costs, we propose to establish a new balancing account. Similar to other Commission-authorized balancing accounts, the balancing account will ensure that SCE's customers will only pay for the recorded operations and maintenance costs and capital-related revenue requirement ultimately found reasonable by the Commission for Phase I and Phase II activities. Our cost recovery proposal is further explained in Volume 2.

After Phase II, we envision filing a new business case application for AMI deployment based on the costs and benefits of the new AIM. In Figure 1-1 above, we refer to this regulatory interval as "Phase III-A." Provided the analysis for a full deployment of the AIM technology proves to be more cost effective, we expect to begin significant pre-deployment activities during Phase III-A. Upon approval of the business case application, we would then proceed to move into Phase III-B, which is commercial production and deployment of the new AIM system to our customers.

From start to finish, we realistically estimate the entire process from design to the completion of full deployment to take approximately seven and a half to eight years from the time of approval of this application, although it could be more or less depending on whether we encounter substantial obstacles and depending on the timing of regulatory approvals. Although the overall time period for this strategy extends into 2011 or 2012, which is beyond the July 21, 2004 Ruling's desired 2010 completion date, this is an aggressive schedule and will result in a deployment of innovative meters that incorporate proven technologies that can provide increased operational efficiencies and demand response benefits. In the end, despite a slight delay beyond the July 21, 2004 Ruling's original completion date, our customers will be advantaged because we will have deployed the right meter that will be more functional, durable and versatile than what could be deployed today.

B. SCE's Proposed Deployment Strategy Should Resolve The Major Challenges Regarding AMI

There are a number of substantial challenges surrounding an AMI deployment for our customers today, including technological limitations and the unpredictability of reliable and persistent demand response. These primary challenges and uncertainties center on the central cost component (investment in the AMI system and cost to install and maintain) and the central benefit components (operational savings and the avoided cost benefits from demand reductions) of the business case analysis. We have performed statistical analyses to attempt to quantify the uncertainty. On a general level, our analysis indicates that the high degree of uncertainty with the main cost and benefit drivers makes AMI investment too speculative and risky for SCE at this time. An important focus of this proceeding will be to define the challenges of AMI and investigate measures that may resolve or mitigate these uncertainties. We are confident that our proposed deployment strategy will help resolve some of these uncertainties and provide the proper technological scope for a robust, flexible, and more cost effective AMI system deployment.

1. Technological Challenges Must be Resolved Before AMI is Deployed

We find existing off-the-shelf AMI solutions do not support the level of functionality sufficient to support SCE's operational business needs or provide the flexibility for future enhancements without significant retrofit costs. Our findings indicate that an integrated AMI solution that leverages additional commercially-available technologies has the potential to provide an effective platform for increasing operational benefits, enhancing customer energy information, and providing more sophisticated alternatives for load management and routine customer services. The problem is that these enabling technologies have yet to be cost effectively packaged or integrated into a streamlined meter for application in the United States. Given the long life-cycle and significant costs of the AMI metering technology, we believe that it is in our customers' interest to pursue the aggressive development of a new AIM solution that can cost-effectively integrate these additional technologies into the meter itself, thereby increasing functionality and associated benefits at a lower cost.

In short, for SCE, we do not find that the benefits derived from the limited functionality of today's available technology outweigh the relatively high costs thereof. Investing so much money in such limited technology carries a risk of obsolescence given the great potential for developing a smarter meter at a cheaper cost, as proven by Enel's success in Italy. For example, we have determined that based on today's costs and the Commission's prescribed system requirements, the most cost-effective technological solution for AMI would be a RF hybrid network comprised of mesh network for commercial customers and fixed network for residential customers. However, one of the developing technologies or standards, such as residential RF mesh or meters with embedded premise-level communication systems leveraging a standard protocol such as ZigBee, may prove to be more reliable and cost effective, depending on technological advances and economies of scale. If eventually one of these or another technology proves to be a superior and lower-cost alternative to today's proprietary fixed network RF or narrowband power line carrier solutions, there is the risk that an investment in such technologies will become stranded and difficult to maintain. Thus, we hope to mitigate this risk by developing a state-of-the-art meter based on open meter and communications standards that provide a flexible platform for emerging technologies and a wider offering of functionality, ensuring that the new meter technology will be durable and deliver actual benefits for years to come.

Given the attention AMI is receiving and given how quickly the marketplace can adapt to technological innovations (*e.g.*, advances in computers, cellular phone technology, television technology, *etc.*), the possibility that there is a better, faster, cheaper and more reliable technology right around the corner is very real, especially if we engage in a proactive, aggressive process to develop the next generation of meters that can meet our specific business requirements. As such, an additional technological risk is investing in today's technology too soon or at too high a cost. Our proposal mitigates this risk by seeking to develop the "next generation" now. In addition, our proposal mitigates the risk associated with designing a new meter because it will rely on separate proven technologies that will be integrated into one product and because our proposed product development process incorporates a thorough beta production and pilot deployment process to resolve any technological issues.[4]

As described above, there are several technological challenges and substantial associated risks that are further compounded by the fact that the vast majority of AMI technologies available today are each proprietary. This means that none of the existing AMI communication or meter technologies are compatible with one

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[4] The July 21, 2004 Ruling's required deployment schedule for the required business case analysis did not allow time sufficient for a staged deployment to work through technological issues, and thus, we would expect high initial failure rates in a deployment of AMI today. In our proposed deployment schedule, sufficient time and resources would be available to test the new product and system integration thoroughly prior to the widescale deployment.

another's systems or components. As such, a failure of a vendor or its technology to perform would mean that another vendor's technology would be required to retrofit the non-performing system. This type of event would create significant negative financial and schedule impact. In our proposed AIM design, we hope to mitigate this uncertainty by creating a design structure that does not rely on proprietary and incompatible systems, but rather uses open standards and flexible design to extend the effectiveness of the technology. In pursuing a more open design with multiple manufacturers, we hope to avoid problems associated with maintaining such systems in the future, when dealing with repairs or obtaining replacement parts.

We believe that load control capability and or compatibility are an integral element for an advanced metering infrastructure. Therefore, another considerable risk is the availability of integrated load control functionality within the communications and meter architecture. Most existing AMI technology solutions, including that selected by SCE as the technology of choice for the business case analysis, do not yet possess commercially available hardware with related embedded load control functionality. Although most of the vendors providing responses to our RFI stated they were willing to explore development with third-party vendors, were currently working on hardware prototypes, or were willing to further explore the issue,[5] there are inherent risks associated with true commercial availability in the near-term. This uncertainty will be resolved through our proposed AIM development project, as this effort intends to proactively integrate additional functionality that simply does not exist in the U.S. market.

In sum, for any deployment of AMI to be successful, the substantial uncertainty about the functionality and cost of the technology currently available must be

[5] Respondents did not provide any details regarding how they plan to achieve these objectives.

resolved. Through our proposed deployment strategy, we believe that these major technological challenges can be resolved or mitigated, to the benefit of our customers.

2. Demand Response Challenges Must be Resolved Before AMI is Deployed

The business case for an AMI deployment will ultimately require actual demand response benefits to be cost effective. Today's meter technology delivers primarily remote interval read capability and does not integrate load control or demand limiting functionality. These load control and demand limiting technologies have the potential to not only help customers respond to dynamic prices or price-responsive programs, but may also provide reliability-based demand response in day-of emergency situations. The potential benefit of such advances is immense and may help resolve key challenges surrounding the reliability and persistence of demand response benefits.

There are issues and considerations regarding customer responsiveness to dynamic pricing that create substantial uncertainty in reliably estimating customer demand reductions in the business case scenarios. These issues and considerations include persistence of the Statewide Pricing Pilot (SPP) results and their applicability to a large scale deployment. Although the SPP observed behavior is the most relevant for estimation of price elasticity in the business case analysis, actual customer behavior could vary significantly according to the prior research.[6] Thus, because an AMI deployment will ultimately depend on demand response that can actually avoid generation costs, it is crucial that the key uncertainties about the reliability and persistence of demand response

[6] The SPP only tested short-run price elasticities. Literature on the subject suggests that long-run price elasticities can be higher than short-run because customers will make investments in response to prices. This is likely to be true, although long-run price elasticities may have little effect on the business case. Long-run effects include customer investments such as insulation or new appliances over a long period of time, especially towards the end of the study period where the impact would be highly discounted in present value. *See, e.g.,* King, Chris, "Summary of Dynamic Pricing, Demand Response, and Advanced Metering Studies," October 1, 2002. Also, Essential Services Commission, Melbourne, Victoria Installing Interval Meters for Electricity Customers – Costs and Benefits, Position Paper, November 2002, pp. 61-67.

be resolved. Through our deployment strategy, we believe that the integration of newer technologies will be able to assist the customer in responding to dynamic rates, as well as potentially delivering load control or demand limiting capabilities for reliability demand response.

Another challenge that exists concerning demand response is that for AMI to be successful, dynamic pricing tariffs must approximate actual market prices, rather than be designed solely to elicit demand response. If rates only approximate actual market prices some of the time and signal customers with wrong prices the rest of the time, there could be perverse and undesirable outcomes. Only real-time retail prices that track wholesale prices in a functioning wholesale market will accomplish that goal. To meet this principle, it is imperative that the uncertainty in the development of a functioning electricity market that is capable of providing appropriate price signals be resolved. Although our meter development proposal does not and cannot fix the market, the timing of our proposal does align itself well with the timeframe in which a functional, transparent market is anticipated to be operational.

The last significant challenge concerning demand response is, as alluded to in the November 24, 2004 Ruling, legislative constraints on rate design modifications that have a considerable impact on the benefits derived from the full deployment of AMI.[7] The legislative constraints result from Section 80110 of the California Water Code enacted by AB1-X as a result of the 2000-2001 energy crisis, prohibiting the Commission from increasing any electricity charge for residential customers' usage of up to 130 percent of the then-existing baseline allowance. This prohibition is in place until the CDWR power contracts expire, which is currently expected to occur in 2013.[8]

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[7] November 24, 2004 Ruling, p. 3.

[8] This sunset is based on the assumption that AB1-X is in effect until the last CDWR power contract expires, which is presently 2013.

As the November 24, 2004 Ruling recognizes, the rate design restrictions required by Section 80110 will impede the ability to derive substantial price responsive demand response benefits under a full deployment in the years prior to expiration of this constraint in 2013.[9] This is because under the statute, rates cannot be designed to elicit response to dynamic price signals for a residential customer's entire usage, given that usage up to 130 percent of the customer's baseline allowance would not be subject to dynamic pricing.[10] Our meter design proposal does not directly affect the applicability of the Section 80110 restrictions. However, given the necessary timeframe to design and develop, test, and deploy the AIM product, we estimate that our AIM deployment would just be completed when these statutory restrictions expire in 2013. Thus, our proposal works well within the realities of the legislative constraints.

[9] In accordance with Agency Staff direction, the demand response benefit calculations in our business case analysis set forth in Volume 3 have not taken these statutory restrictions into account.

[10] In fact, a residential customer using less than 130 percent of its baseline allowance would never be charged time-of-use or critical peak prices due to the constraints of Section 80110. For SCE, this would include fifty-five percent of its existing residential customer bills.

III.

SCE'S MANAGEMENT PHILOSOPHY CONCERNING INVESTMENT IN ADVANCED METERING INFRASTRUCTURE

In the July 21, 2004 Ruling, the Commission ordered each utility to describe its underlying management philosophy or the business vision used to develop its AMI specifications and approach, including a discussion of how key market factors, regulatory constraints, or internal business constraints shaped or affected the development of its AMI business case.[11] Our recommendation to the Commission in this filing is based on our management philosophy, as explained in this section.

The underlying management viewpoint that has helped shape our analysis and recommendation is consistent with the management philosophy that guides our investment decisions in other areas of the business, namely, *we will pursue investments that are demonstrated to enhance value for our customers, given the likely costs and benefits of the project and in relation to other investment opportunities.* This overarching philosophy also drives our decisions to adopt new technology or processes when it makes economic sense to do so and is beneficial to customers. Thus, the decision of when to invest in AMI technology necessarily involves assessing the impact on our customers and determining whether investing in AMI at this time is in our customers' best interest or whether an AMI investment in the future or on a different scale may be more beneficial to them. This management philosophy has shaped our business case analysis of AMI and has influenced our proposed AIM deployment strategy, which seeks to proactively develop a new meter solution that meets our business requirements on a very aggressive schedule.

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[11] July 21, 2004 Ruling, p. 3 ("The analysis the utilities will perform is crucial to the Commission's understanding of the tradeoffs made by the utilities in developing their functional AMI specifications that underlie the benefit cost analysis. In order to enhance this understanding, the utilities should describe the underlying management philosophy or business vision used to develop its functional specifications and approach. Specifically, we are interested in a discussion from each utility of how key market factors, regulatory constraints, or internal business constraints shaped or affected the development of its AMI specifications and cost benefits estimates.").

Our innovative approach seeks to increase functionality to enhance potential benefits at a lower bundled cost compared to today's commercially available solutions.

In concert with this management philosophy, there are two important principles that should help guide the evaluation of whether AMI provides real value to our customers: (1) the investment must be cost effective and deliver actual benefits, and (2) AMI should be consistent with the overarching policy objectives adopted by the Commission.

We demonstrated in our preliminary filings in the AMI rulemaking proceeding that an investment in today's commercially-available technology is not cost effective and delivers too few functions and actual benefits for SCE. Our updated analysis of our best cases further confirms that conclusion. A better approach is to develop alternative, more cost-effective AMI technologies which possess added functionality. We believe we can increase the functionality of today's meters many time over at the same or a lower price. This approach is similar to that implemented by the Italian utility Enel, whose successful design of a new meter with additional capabilities and lower costs was used for its wide-scale deployment in Italy. With this development/deployment strategy, we anticipate that a more cost effective and beneficial business case can be achieved for SCE than is possible today, and will ultimately result in a better investment for our customers, consistent with our management philosophy and principles.

A. SCE Pursues Investments When They Are Cost Effective And Deliver Benefits To Our Customers

We are in a new age of information and technology which offers great promise in many areas of our business. We know from the dot-com boom/bust cycle that there are many more ideas than there are actual profitable ventures. The pace of change is so rapid that it is simply not feasible to immediately adopt every technical improvement that comes along. The question of whether and when to upgrade technology must look beyond the current generation of technology and anticipate even further technological improvements. By applying this principle, we have and continue to make cost-effective technology improvements and upgrades in many areas, including metering.

Our proposed AIM will couple the effectiveness and efficiency gains of new technology with the benefits of peak load reductions. For years, we have relied on cost-effective reliability-based demand response programs[12] to serve an important role in meeting our customers' capacity needs. We are confident that an improved AMI can support various approaches to help balance California's electricity supply/demand equation, including not only reliability-based programs, but also dynamic pricing,[13] market/economic-triggered demand response programs,[14] and/or demand-limited programs.[15] We believe that innovative, cost-effective technology that can meet our needs is within our grasp if we simply set forth to integrate these proven technologies into one, open platform.

We have evaluated the two best AMI business cases required by the November 24, 2004 Ruling by the same standards as we use to evaluate other ratepayer investments of a similar magnitude. This work demonstrated where the incremental benefits of AMI fall short for SCE and provided direction on where we may be able to develop a cost-effective solution for our customers.

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[12] By "reliability-based demand response," we refer to demand curtailment programs that do not have a price-responsive element and instead are activated upon system emergency, such as the interruptible or direct load control programs.

[13] By "dynamic pricing," we refer to tariffs that enable electric customers to respond to a signal of actual costs or market prices, such as time-of-use or critical peak pricing.

[14] By "market/economic-triggered demand response," we refer to load curtailment programs that can be activated in response to market prices, such as the demand bidding program.

[15] By "demand limited programs," we refer to tariffs that limit customers to fixed levels of demand during critical peak periods by "ratcheting" down their available electricity.

1. SCE Pursues New Technology and Processes that Provide Increased Operational Efficiency

SCE constantly assesses the potential for improving operational efficiency and evaluates new processes and technologies that have demonstrated the ability to deliver benefits to our customers through enhanced services or lower costs. We are on the forefront in utilizing automated processes and adopting technology where it is economic to do so based on operational efficiencies or process improvements. Today, we already read more than 500,000 meters remotely through our Automated Meter Reading (AMR) program, which targets those meters that are the most difficult to access and most expensive to read. We also have a long and extremely successful history of developing automated load control programs, such as the highly successful air-conditioner load control program, which continues to deliver very reliable and cost-effective demand curtailment. Moreover, we have helped innovate new uses for technology to improve demand response programs, such as testing and supporting the development of smart thermostats and other technology to provide pricing information to our customers.

In addition, we have already made significant investment (and continued investment) in highly-effective automated systems that help system operators better understand load and demand requirements. SCE continues to improve automation and data communications for its substation operations with Intelligent Electronic Devices (IEDs) that communicate through a Local Area Network to our Supervisory Control and Data Acquisition (SCADA) System. This modern protection and control equipment provides remote, self monitoring control of all substation functions, identifies potential problems, and allows a quick response to reliability events.[16] We have already invested in highly effective outage management and transformer load management systems that are

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[16] Among the many types of automation and sophisticated electronic equipment for our substations and operations network are satellite communications for substation data collection and remote system control in areas where conventional methods of communication are not available or are too costly.

delivering real operational benefits to our customers today. As these investments show, consistent with our management philosophy, we embrace technology when it makes sense to do so operationally and when it can reduce costs and provide real value to our customers.

Having already made investments in these successful operational systems, we are already reaping the benefits that these systems deliver and will continue to deliver, even without an immediate deployment of AMI. Given that we already derive many of these benefits, additional investment in today's AMI technologies may not result in significant additional value to SCE from these types of operational benefits. However, as noted above in Section II and in Volume 2, we expect that by incorporating additional components into an open meter and communications platform, we will be able to increase the level and type of benefits that AMI can deliver.

We recognize that technological innovation is a constant and never-ending cycle. We also recognize that economic efficiency requires flexibility to adopt technological changes as they occur, as well as the careful consideration of the optimal time to invest. Thus, one of the essential questions in this proceeding is whether a large-scale investment in the AMI technology of today will maximize benefits for SCE's customers or would such investment now end up costing our customers more due to today's less capable technology and the lost opportunity to capitalize on improved and/or less expensive technology in the near future. There are promising technological advances that present the unique opportunity to work to integrate solid-state technologies in the near term that can increase meter functionality at a reduced price. These increased metering capabilities may provide additional operational efficiencies and far more reliable benefits than are possible from existing AMI technology, which will ultimately be a better investment for our customers. In addition, by developing a new meter with an open meter and communications design, it will be more flexible with "plug and play" capabilities and will be more versatile and extensible for technology advances in the future, such as broadband over power line.

2. Demand Response Resources Must be Cost Effective in Relation to Other Resources

Our business vision regarding AMI takes a comprehensive view of demand response versus other resource options. Although demand response offers the potential to reduce peak load, the fact remains that demand response from time-differentiated rates ultimately relies on customer behavior. This "behavioral" aspect makes dynamic pricing demand response more uncertain than other resource options, including, among others, supply-side resources, permanent installations of energy efficient equipment targeted at reducing peak consumption, and dispatchable load control programs. Generally, these other resources are more permanent and have much greater reliability over the long term than price-responsive demand response resources, which continue to be subject to economic, political and behavioral changes.[17] Specifically, for demand response resources to be valued as high as supply alternatives, they must provide equivalence in key attributes such as reliability and flexibility.

The role and success of other resource options, as well as the overall market, may directly affect the economics of whether AMI is the right investment to make for our customers at this time. For example, major regulatory changes to the status of direct access, community choice aggregation, or the introduction of a core/non-core market structure could completely alter the assumptions of how many customers would continue to be utility customers subject to time-differentiated rates, especially if higher rates were required to fund the cost of AMI. This is an important issue because non-utility customers

[17] For example, during the 2000-2001 energy crisis, customers responded to the crisis by reducing their electrical usage, but gradually, these reductions have waned as customers return to their old usage patterns. Reductions from customer behavior, as opposed to load control or permanent energy efficiency equipment, will always be less predictable and reliable and will take continual customer education and marketing to keep informing and reminding customers of the desired behavior.

will be subject to the generation pricing of their energy supplier who has no obligation to offer dynamic electricity pricing structures. In addition, major changes in the wholesale electricity market, including the role of the Resource Adequacy Requirement, will directly influence the cost effectiveness of AMI.[18]

B. AMI Should Be Consistent With Overarching Policy Objectives Adopted By The Commission

AMI is a substantial investment in the power delivery infrastructure that will affect a wide-range of business activities and customer services. In addition to enabling time-differentiated pricing for all customers, AMI may offer ways to enhance system reliability, customer billing and service options, outage management and operational efficiencies. So far, the context of this proceeding has been centered on the Commission's vision for the future that includes preference for energy efficiency and demand response. The Commission's intent with this preference is summarized by an earlier ruling in this proceeding, which stated:

> "This vision is intended as a broad statement for encouraging demand responsiveness in California. It should be read in the context of maximizing the efficient use of resources, while maintaining the economic vitality of businesses in the state, as well as the health, welfare, and comfort of residential electricity users."[19]

AMI is a means for accomplishing objectives that include demand responsiveness and maximizing the efficient use of resources, but it should be done in recognition of broad overarching policies of economic welfare. In addition to operational benefits, AMI should deliver reliable demand response that does not sacrifice the comfort of residential customers.

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[18] The development of a functional energy market is an important unknown that must be resolved before price-responsive demand response can be truly effective.

[19] Administrative Law Judge's Ruling Seeking Comment on Vision Statement, R.02-06-001, issued on November 29, 2002, Item 3, p. 1.

1. AMI Must Deliver Reliable and Persistent Demand Response Benefits

The success of AMI is greatly enhanced by realizing benefits from *reliable* demand response, whether that be achieved from integrated load control on end-use devices inside the home, at the meter itself, and/or through dynamic time-differentiated rates. Assessing the value of these benefits requires the consideration of whether these types of resources will reliably lower the peak demand and avoid the cost of additional generation capacity and energy purchases.

As described in Volume 2, we expect that load reduction technologies can be integrated into the meter itself, thereby providing the means for effective and efficient load control programs that can deliver reliable demand response when necessary. Moreover, this technology may also be used in combination with dynamic pricing tariffs to help customers better respond to pricing signals. Thus, with more advanced technology integrated into the meter, we are striving to increase the level and reliability of load control and demand response.

For price-induced demand response programs to be truly effective (both in short-term emergency situations and in affecting the overall demand curve and market prices in the longer term), the price signals must be cost or market-based, rather than simply created to produce a predetermined response. As a general principle, economic efficiency is promoted when customers make decisions based on current costs that reflect the actual economic impact of their decisions. It is also a matter of economic efficiency that rate components reflect their underlying cost structure. A customer's decision to increase the thermostat setting or otherwise reduce or defer energy consumption becomes the optimal economic decision when rates reflect the actual costs avoided.

In addition to being cost-based, dynamic pricing rates should provide a sufficient bill reduction when customers reduce or shift electricity usage to low-cost hours. Many customers could "lose" on dynamic rates, with higher bills despite the same or even reduced demand levels.[20] This bill impact analysis is troubling because most customers who significantly alter their behavior will only see minimal bill savings – and many customers will actually see *increased* bills. Such little reward – or negative bill impact – creates customer dissatisfaction and can create a backlash to dynamic pricing tariffs. Experience tells us that customers who have a negative experience will be less likely to choose to participate in future demand response programs.[21]

We realize that important work still needs to be completed before a true "market" price will be readily accessible. It is unclear in what form capacity pricing will be reflected in the electricity market and how the Resource Adequacy Requirement will affect the volatility of energy prices in that market. Nevertheless, it is important that dynamic price signals mirror actual costs as closely as possible so that efficient demand response programs can be implemented. Thus, to the extent AMI relies on actual demand response benefits from price-responsive programs, it will be imperative that a functional wholesale market is operating from which we can develop appropriate cost-based retail rates.

2. Customers Should Be Informed And Allowed To Make A Choice

Our business case analysis establishes that an AMI deployment at any level will ultimately depend on significant and reliable demand response benefits to justify the cost. Ideally, we believe that the AMI business case should be cost effective based on operational savings and realistic assumptions of demand response from voluntary tariffs.

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[20] For example, our analysis of critical peak pricing shows that 13% of residential customers will likely see a bill increase of 10% or greater, even though they reduce their usage during CPP events on critical peak days by 20%, while only 16% of customers will see a bill decrease of at least 10%. *See* Appendix K.

[21] This potential outcome is similar to what happened to the Puget Sound Energy demand response program in which the customer bill reductions were relatively small despite significant customer behavior changes. Once customers realized they were saving so little or even paying more despite significant effort to reduce demand, they opted out of the program in large numbers, leading the utility to cancel the program altogether. *See* Williamson, Craig, "Primen Perspective: Puget Sound Energy and Residential Time-of-Use Rates – What Happened?," Energy Use Series, Volume 1, Issue 10, December 2002.

To the extent demand response benefits play this key role in the AMI cost benefit analysis, the Commission must be willing to put the appropriate policies in place to ensure that the required levels of demand response are realized. Given the size of the gap between the costs and operational benefits, achieving significant and persistent demand response would likely require that all customers take service on a tariff involving time-differentiated rate structures. We anticipate that with our proposed deployment strategy to increase benefits and lower costs, we can narrow this gap and reduce the dependency of the business case on demand response benefits, and hence, the need for mandatory dynamic pricing. In addition, by a significant increase in the functionality of the meter, we expect to embed technologies (such as load control, demand limiters, and communications for in-home display) that will facilitate customers' demand reductions, provide them with choices of tariffs and control technologies, and improve the reliability of demand response.

IV.

SUMMARY OF BUSINESS CASE ANALYSIS

The July 21, 2004 Ruling required that we perform at least seventeen unique business case analyses involving various operational and demand response scenarios for our preliminary analysis. For this final analysis, the November 24, 2004 Ruling directed us to present the best full deployment scenario and best partial deployment scenario. In reviewing the business case analysis, we determined that the best full deployment[22] and partial deployment scenarios[23] involved a default CPP rate without reliability.

The July 21, 2004 Ruling's requisite analysis parameters included the assessment of uncertainty and risk in both a quantitative (such as with Monte Carlo simulation techniques) and qualitative manner.[24] We have done both. We prepared Monte Carlo simulations of the cost parameters and the demand response benefit elements to derive a range of results and an expected value.[25] The method employed is described in Volume 3, as are the quantitative results and a qualitative assessment of risk factors. We have taken great care in evaluating both the cost and benefit side of the business case and applied a net present value of cash flow method, as we do for other types of utility investments. We employed the framework and assumptions required by the Ruling but supplemented the analysis with a discount rate and other key assumptions consistent with investments of a similar long-term nature.

[22] This was Scenario 4 from our January 12, 2005 Preliminary Analysis.

[23] This was Scenario 17 from our January 12, 2005 Preliminary Analysis.

[24] July 21, 2004 Ruling, pp. 12-13.

[25] The Monte Carlo simulations were performed and the results of these simulations are presented in Volume 3 and discussed in Appendix E.

A summary of the revised costs, benefits, and Net Present Value (NPV) on both an after-tax cash flow and a revenue requirement basis for each of the best scenarios is presented below in Table 1-1.[26]

Table 1-1
Summary of AMI Business Case Analysis
(in millions 2004 Present Value dollars)

No.	Scenario Description	Rate Details	Total Costs	Total Benefits	After-Tax NPV	Rev. Req. NPV
4	Full Deployment Operational + Demand Response	CPP-F/CPP-V Default with 20% opt-out	$(1,298.4)	$804.6	$(402.8)	$(951.8)
17	Partial Deployment Operational + Demand Response	CPP-F/CPP-V Default with 20% opt-out	$(164.2)	$77.7	$(60.9)	$(129.9)

As indicated above, neither of the best deployment scenarios establish that an investment in today's AMI technology is cost effective using the Ruling's required assumptions. The case with the least negative NPV case is Scenario 17, which includes dynamic pricing on a default enrollment basis for a partial deployment and limited AMI deployment to certain customers within Climate Zone 4 that contains the hottest, desert areas of our service territory. Yet, even this "best" scenario has a negative present value of $(60.9) million, and a negative revenue requirement impact of nearly $(130) million (2004 present value).

These results are at the optimistic or high-side of the spectrum of outcomes. In both scenarios, demand response benefits contribute significantly to total benefits which are calculated based on the November 24, 2004 Ruling's assumptions for valuation of those benefits which we believe are too optimistic. When we correct for the limitations of ability to call a CPP event, demand response benefits are cut almost in half, as discussed in Volume 3.

[26] The details of this business case analysis, including the specific costs, benefits, and uncertainties for each of the scenarios and a discussion of the methodology and assumptions used in preparing this analysis, are presented in Volume 3.

We also considered the effects of the lost value of service to customers from the imposition of high peak prices. When customers forego usage they enjoy at today's prices, the procurement saving benefits obtained from lower usage at new prices are offset by the customers' loss of comfort and convenience. We calculated this benefit offset but did not include them in the tables above.[27]

Further, we caution the Commission against viewing the results of the partial deployment scenario as simply less unfavorable than the full deployment result. In relative terms, the partial deployment case is worse than the full case in many significant respects. Importantly, the negative NPV as a percent of investment cost is much higher in partial deployment than in the full deployment case. This is because the cost of infrastructure is higher in the partial case on a per meter basis because fixed costs are spread over fewer participants than in the full case.

For an AMI deployment to have a positive NPV, either costs must decrease and/or benefits must increase substantially compared to today's business case. A proactive and aggressive effort is needed to develop cost-effective technology that delivers an integrated metering solution to gain additional operational efficiencies unique to SCE and significant reliable demand response.

Given that the November 24, 2004 Ruling's required business case analysis using today's technology results in a significant negative NPV, even using highly optimistic assumptions, it is clear that the existing AMI technology is not a prudent investment for our customers at this time. However, we have identified many additional functions that could be incorporated into an integrated AMI system to provide SCE greater operational and demand response benefits. As described above, we are optimistic that we can undertake an aggressive deployment strategy to develop a new advanced integrated meter that can deliver increased operational efficiencies and yield additional benefits at a lower

[27] *See* Appendix J.

bundled cost, thereby making this alternative AMI investment a more prudent approach for SCE compared to an investment today in currently-available off-the-shelf AMI technology.

V.

CONCLUSION

Our business case analysis illustrates that without substantial modification, all of the AMI deployment scenarios under the July 21, 2004 Ruling's required assumptions are far from being cost effective. The results establish that an imminent deployment of today's AMI technology – as envisioned in the July 21, 2004 Ruling's framework – is not cost effective or reasonable from the customers' perspective. SCE's proposed deployment strategy would first seek to resolve the major challenges surrounding the AMI business case by developing better technology at a lower cost, while increasing operational, demand response and customer benefits. With the development of the "right" metering solution, it is likely that a future deployment of AMI will achieve the types of durable benefits and customer value that today's technology cannot deliver. Even though our development strategy may slightly delay the overall timing of a full deployment than if today's technology were installed now, our customers would nonetheless be advantaged because our new AIM system would deliver more benefits and would be more functional and adaptable to future technology. Ultimately, AMI may be a good investment for our customers if we are willing to work to "get it right" instead of rushing to "get it done."