SOUTHERN CALIFORNIA EDISON

An EDISON INTERNATIONAL® Company

Southern California Edison

Smart Grid Deployment Plan

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!"#$%&' '"()#*(+$%,"- .%($%/0$-%12324 These investments are primarily focused on building smart grid capabilities into platform infrastructure, enabling key renewable energy policy goals and empowering customers to engage more actively in their energy consumption through demand response and other AMI-enabled programs.

Table 1 below summarizes the remaining costs of SCE's SmartConnect program, as well as projected costs associated with investments in platform and incremental smart grid infrastructure through 2014. It should be noted that while the platform investments summarized below are critical for enabling smart grid capabilities, many of these investments also serve "non-smart grid" utility functions. As a result, the costs of these platform investments are not fully attributable to smart grid capabilities. This document's Cost Estimates chapter contains additional information about the forecasted costs of certain projects in 2015 and beyond. Many such projects, however, are highly speculative in nature and SCE is therefore not able to provide estimates for all projects in this time period.

Table 1 – SCE Smart Grid Cost Estimates

	Annual Costs ($ million, nominal)				
Deployment Category	**2011**	**2012**	**2013**	**2014**	**Total**
Edison SmartConnect™	$ 435	$ 368	$ -	$ -	**$ 803**
Platform Infrastructure	$ 73	$ 117	$ 167	$ 174	**$ 532**
Incremental Investments	$ 138	$ 165	$ 122	$ 110	**$ 535**

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- Safe and reliable integration of bulk and distributed renewable energy resources;
- Safe and reliable integration of electric vehicle charging into grid operations;
- 1,900 MW of demand response program enrollment by 2014;
- 1,000 MW of AMI-enabled demand reduction by 2017;
- Over 250,000 MWh per year of energy savings by 2014 through AMI-enabled programs; and
- Improved customer satisfaction through better response to outages, better management of transmission and distribution assets, and more choices for customers in managing their energy usage.

SCE sees substantial additional long-term value in deploying a smarter grid. The platform investments (*%(.%<#7($>%$+G%#=-%#%. +G$%'#8 < -$*%+G#=. .%6+:-%9-$-,*:4%56(.%J-'"+8 < -$*%!"#$D.%K-$-,*.%C:*(<#*-.%)6#'*-%'=+@(. -.%#%L0#"(*#*@-%. (:)0::(+$%+,%6-:-%+$>-=%*-=<%9-$-,*:4%ABC%-M'-)*.%*%'=+@(. -%#. . (*(+$#%

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1. Research, Develop, Demonstrate, Deploy

SCE is widely recognized in the electric utility industry as a leader in evaluating, adopting and implementing advanced technology. SCE has achieved this leadership position by creating a rigorous and repeatable technology evaluation and testing process. SCE's technology evaluation approach follows industry testing standards developed by, among others, the Institute of Electrical and Electronics Engineers (IEEE) and the International Organization for Standardization (ISO).

To successfully develop and implement smart grid RD&D activities, SCE formed its Advanced Technology organization by pooling existing resources from throughout the company. SCE centralized these resources !"#$%&'($)!*+#%"' , -#.) /#()!$01.!$#/(-2.1.!$#$%"1!-#()#. /3.)'()0#!$'4)"*"0+#$3.*, .!(")#.) /#, -$5#64(-# centralization also enabled SCE to coordinate efforts on key principles such as standards for smart grid technologies or cyber security with external stakeholders, including the CPUC and the CEC. Finally, SCE's Advanced Technology organization allows it to better manage response to and cooperation with policy and regulatory direction from regulators and legislators on key advanced technologies.

The Advanced Technology group has strengthened SCE's leadership role in smart grid development and reinforced SCE's partnerships with regulatory bodies, governmental agencies, and industry leaders. These efforts assist in establishing sound policies and standards to support smart grid development and integration. They have also helped bring federal funding to California to support smart grid development. Through Advanced Technology's efforts, SCE was successful in securing ARRA funding for two demonstration projects. These projects include the Tehachapi Storage Project, a utility-scale energy storage project utilizing automotive-grade batteries. The ARRA projects also include a regional smart grid demonstration in Irvine, California that encompasses the development of a secure energy network for the smart grid.

2. Build Smart Grid Capability Requirements into Platform Infrastructure

As discussed above, to enable its smart grid capabilities, SCE will need to leverage many devices, networks and systems that SCE deploys as part of its core provision of utility service. SCE views these infrastructure elements as platform investments. Because this infrastructure enables conventional utility functions as well as smart grid capabilities (i.e., SCE would make these investments even if it were not pursuing smart grid capabilities), a variety of considerations beyond the needs of smart grid capabilities inform the timing and nature of deploying this infrastructure. SCE's holistic capability-based framework allows it to identify platform infrastructure that will eventually lead to smart grid capabilities and build necessary requirements into periodic upgrades and refreshes of this infrastructure when they occur. This design approach helps SCE avoid making single-purpose and duplicative investments that create unnecessary integration costs as smart grid systems converge and interact in the future.

f) Energy Storage

SCE intends to deploy a combination of energy storage system technologies for a number of purposes, all directed at improving the company's utilization of renewable resources, reducing system loading and losses, and increasing reliability of service to its customers. As an increased amount of intermittent resources are added to SCE's energy supply mix to meet legislative and regulatory policy goals, energy storage is expected to become a viable option to facilitate and enhance distribution grid operations. In the 2011-2014 time period, SCE will conduct a number of demonstration projects and limited deployments that evaluate the utilization of energy storage devices for DER Integration:

!" As part of the Integrated Smart Distribution pilot project[126], SCE will conduct limited deployment of energy storage units with advanced inverter systems to address circuit overloading and #$%&' ( )"*+ ,&+ '&-$." '&"&/)"0-1&2-3+&-$.%)#)%4"5 .)2(6"1&$2' ( )"0)#-,)1"0)7%$6)0"+ . 0)2"&/ -1"- . -& '&-#)" 8-%&"1&$2)") .)2(6",2) '&) 0"36"- .&)2 9 -&&) .&"( ) .)2'&-$."2) 1$+2,)1":$2' 9 $2)") :; ,-) .&"' . 0") ::) ,&-#)" utilization by customers. Similar to DSVCs, storage units coupled with advanced inverters ,' ."72$#-0)":' 1&<' ,&- . (") .)2(6" 9 $0+%'&-$."&$"3 %' . ,)"$+&"%$, "%#$%&' ( )"*+ ,&+ '&-$. 1", '+1) 0"36" distributed photovoltaics and other intermittent generation technologies.[127] SCE plans to conduct a preliminary deployment of one transportable energy storage system in each of the years 2012, 2013, and 2014 to prepare for an expected, increased utilization of these devices in 2015 and beyond. The cost of these systems is expected to be $10.6 million from 2012-2014.

!" A Community Energy Storage (CES) system will be deployed as part of the ISGD project. CES are distributed energy storage units connected to the secondary transformers serving a few houses or 1 9 "%&', $ 9 9)2, - "%"&/$ ' 0 14"=>5"8 -%&&) 1&"' . 0") # "%+ '&)"&/)"' 3%&6"$:">5="&$"72$#-0)"#$%&' ( )"*+ ,&+ '&-$." 9 -&-('&-$.?"- 9 72$#)"1)2#-,)"2)%' 3%&6"' . 0",-2, +-&") :; ,-) . ,6?"' . 0" 9 - . - 9 @)"&/)"- 9 7 ' ,&"$:"A5B"' . 0" customer DER. The ISGD project will also demonstrate a large transportable energy storage system CDE FGH4I E F /J"&$")K7%$2)", $.&2$%"' . 0"72$&) ,&-$."1&2 '&) (-) 1"8 -&/"1-(. -; , ' .&"2)#)21)"7$ 8)2"*$ 8" capability. Two distribution circuits which can be operated either radially or as a single loop will be used to evaluate various strategies of circuit constraint management.

SCE has not formalized plans for demonstration or deployment of distribution-sited energy storage beyond 2014. While continuing testing and evaluation of different storage technologies in the lab, SCE will %)#)2' ( )"&/)"; . 0- . (1":2$ 9 "&/)"' :$2) 9) .&-$.)0"7%$&"72$L) ,&1"&$"' 11) 11"&/)"#-' 3%&6"$:"1&$2' ( )"+1) 0":$2" integration of intermittent renewables on the distribution system. The information obtained from these

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126 *Ibid.*, p. 60.

127 Inverters are typically coupled with distributed generators or storage systems to convert DC electric current into the AC electric current that is required for use on the grid. Inverters are therefore a necessary component of many energy storage systems but, with improved automation and intelligence, they can be coordinated or programmed to balance rapid fluctuations in a manner similar to DSVCs.

pilots will instruct future deployments by helping SCE to collect data on cost, performance, and grid impacts while also gaining experience in the installation, operation, and maintenance of said devices.

g) Summary

Figure 25 on the following page summarizes the baseline status of the infrastructure elements described above, planned deployments of this infrastructure between 2011 and 2020, and the future state vision for each of these infrastructure elements.