

**2016 Risk Assessment Mitigation Phase
Investigation 16-10-015
Workpapers to
Fail to Blackstart
(Chapter SDG&E-6-WP)**

January 2017



2016 Risk Assessment Mitigation Phase
SDGE-06-WP
Risk: Fail to Blackstart (O&M)

Line No.	Mitigation	Project/Program	Project/Program Description	Recorded (Directs, 2015 \$000)						Forecast Range (Directs, 2015 \$000)						Forecast Methodology
				Status	2011	2012	2013	2014	2015	2017 Low	2017 High	2018 Low	2018 High	2019 Low	2019 High	
1	South Grid Blackstart Project	The South Grid Black-Start Project	The South Grid Black-Start Project is proposed for Cuyamaca Peak Energy Plant (CPEP) to serve as a black-start unit for the southern part of SDG&E electrical grid	B/P	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	
2	South Grid Blackstart Project Subtotal				-	-	-	-	-	-	-	-	-	-	-	
3	Modernization of Grid Control Centers	Transmission Energy Management System Modernization Project	Upgrade antiquated Energy Management System (EMS) visualization tool and control room. Addresses potential scenarios where tools and/or systems our operators utilize are not adequate for blackstart situation	B/P	-	-	-	-	-	170	188	69	77	-	-	Zero-Based
4	Modernization of Grid Control Centers Subtotal				-	-	-	-	-	170	188	69	77	-	-	
5	Substation Backup Power Enhancements (Fuel Cells)	Use fuel cells to provide backup power at major substations and substations on the Blackstart Cranking Paths	Purchase 30-GenCell 5kW Fuel Cells, to be installed in electric substations throughout the SDG&E service territory, as an auxiliary power system for control shelters. Engineering, procurement, training, hydrogen safe handling and refueling, and installation at each designated site	P						-	-	-	-	-	-	
6	Substation Backup Power Enhancements (Fuel Cells) Subtotal				-	-	-	-	-	-	-	-	-	-	-	
7	Maintenance, Certification, and Testing of Existing Blackstart Facilities	Miramar Energy Facility (MEF) I and II blackstart generators maintenance and testing programs	Redundant Blackstart Resources at Miramar Energy Facility have been installed to use one of the Palomar Energy Center (PEC) Combustion Turbines as a target unit during a shutdown condition	B	10	10	10	10	10	10	11	10	11	10	11	5-Year Average
8		Certification of MEF I and II as blackstart units	MEF I and II are currently certified as Blackstart Resources. Per current CAISO Procedure 5360, Blackstart tests shall be completed at least once every three years (EOP-005-2 R9.1)	B	10	10	10	10	10	10	11	10	11	10	11	5-Year Average
9	Maintenance, Certification, and Testing of Existing Blackstart Facilities Subtotal				20	20	20	20	20	19	21	19	21	19	21	
10	Blackstart Training and Procedure Development	Annual SDG&E blackstart/system restoration training and drill	Addresses on-going training and development of operators to blackstart response scenarios with involvement of generating operators within SDG&E's footprint and distribution operators	B	-	-	-	-	40	38	42	38	42	38	42	Zero-Based
11		Development and coordination of Blackstart plans with CAISO, Peak RC, and neighboring utilities through annual SDG&E EOP5005 procedure update	Engineering work required to maintain and update SDG&E blackstart procedure based on annual system, NERC standards, and contractual changes	B	-	-	-	-	20	19	21	19	21	19	21	Zero-Based
12	Blackstart Training and Procedure Development Subtotal				-	-	-	-	60	57	63	57	63	57	63	
13	TOTAL				\$ 20	\$ 20	\$ 20	\$ 20	\$ 80	\$ 246	\$ 272	\$ 145	\$ 161	\$ 76	\$ 84	

Notes:

- Baseline (B) and Proposed (P).
- Numbers in risk chapter tables may differ due to rounding.
- The purpose of Risk Assessment Mitigation Phase (RAMP) is not to request funding. Any funding requests will be made in the General Rate Case (GRC). The forecasts for mitigations are not for funding purposes, but are rather to provide a range for the future GRC filing. This range will be refined with supporting testimony in the GRC.

2016 Risk Assessment Mitigation Phase
SDGE-06-WP
Risk: Fail to Blackstart (Capital)

Line No.	Mitigation	Project/Program	Project/Program Description	Status	Recorded (Directs, 2015 \$000)					Forecast Range (Directs, 2015 \$000)								Forecast Methodology
					2011	2012	2013	2014	2015	2017 Low	2017 High	2018 Low	2018 High	2019 Low	2019 High	2017-2019 Low (Sum)	2017-2019 High (Sum)	
1	South Grid Blackstart Project	The South Grid Black-Start Project	The South Grid Black-Start Project is proposed for Cuyamaca Peak Energy Plant (CPEP) to serve as a black-start unit for the southern part of SDG&E electrical grid	B/P	\$ -	\$ -	\$ -	\$ -	\$ 309	\$ 1,173	\$ 1,297	\$ -	\$ -	\$ -	\$ -	\$ 1,173	\$ 1,297	Zero-Based
2	South Grid Blackstart Project Subtotal				-	-	-	-	309	1,173	1,297	-	-	-	-	1,173	1,297	
3	Modernization of Grid Control Centers	Transmission Energy Management System Modernization Project	Upgrade antiquated Energy Management System (EMS) visualization tool and control room. Addresses potential scenarios where tools and/or systems our operators utilize are not adequate for blackstart situation	B/P	-	-	-	29	54	9,883	10,923	4,015	4,437	-	-	13,898	15,360	Zero-Based
4	Modernization of Grid Control Centers Subtotal				-	-	-	29	54	9,883	10,923	4,015	4,437	-	-	13,898	15,360	
5	Substation Backup Power Enhancements (Fuel Cells)	Use fuel cells to provide backup power at major substations and substations on the Blackstart Cranking Paths	Purchase 30-GenCell 5kW Fuel Cells, to be installed in electric substations throughout the SDG&E service territory, as an auxiliary power system for control shelters. Engineering, procurement, training, hydrogen safe handling and refueling, and installation at each designated site	P						2,187	2,959	2,027	2,743	-	-	4,214	5,702	Zero-Based
6	Substation Backup Power Enhancements (Fuel Cells) Subtotal				-	-	-	-	-	2,187	2,959	2,027	2,743	-	-	4,214	5,702	
7	Maintenance, Certification, and Testing of Existing Blackstart Facilities	Miramar Energy Facility (MEF) I and II blackstart generators maintenance and testing programs	Redundant Blackstart Resources at Miramar Energy Facility have been installed to use one of the Palomar Energy Center (PEC) Combustion Turbines as a target unit during a shutdown condition	B	-	-	-	-	-	-	-	-	-	-	-	-	-	
8		Certification of MEF I and II as blackstart units	MEF I and II are currently certified as Blackstart Resources. Per current CAISO Procedure 5360, Blackstart tests shall be completed at least once every three years (EOP-005-2 R9.1)	B	-	-	-	-	-	-	-	-	-	-	-	-	-	
9	Maintenance, Certification, and Testing of Existing Blackstart Facilities Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	-	
10	Blackstart Training and Procedure Development	Annual SDG&E blackstart/system restoration training and drill	Addresses on-going training and development of operators to blackstart response scenarios with involvement of generating operators within SDG&E's footprint and distribution operators	B	-	-	-	-	-	-	-	-	-	-	-	-	-	
11		Development and coordination of Blackstart plans with CAISO, Peak RC, and neighboring utilities through annual SDG&E EOP5005 procedure update	Engineering work required to maintain and update SDG&E blackstart procedure based on annual system, NERC standards, and contractual changes	B	-	-	-	-	-	-	-	-	-	-	-	-	-	
12	Blackstart Training and Procedure Development Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	-	
13	TOTAL				\$ -	\$ -	\$ -	\$ 29	\$ 363	\$ 13,243	\$ 15,179	\$ 6,042	\$ 7,180	\$ -	\$ -	\$ 19,285	\$ 22,359	

Notes:

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2016 Risk Assessment Mitigation Phase
SDGE-06-WP
Risk: Fail to Blackstart (GRC Total - O&M)

				Recorded (Directs, 2015 \$000)								Forecast Range (Directs, 2015 \$000)									
Line No.	Mitigation	Project/Program	Project/Program Description	Status	GRC 2011	GRC 2012	GRC 2013	GRC 2014	GRC 2015	Non-GRC 2015	O&M Total 2015	GRC 2017 Low	GRC 2017 High	GRC 2018 Low	GRC 2018 High	GRC 2019 Low	GRC 2019 High	Non-GRC 2019 Low	Non-GRC 2019 High	O&M Total 2019 Low	O&M Total 2019 High
1	South Grid Blackstart Project	The South Grid Black-Start Project	The South Grid Black-Start Project is proposed for Cuyamaca Peak Energy Plant (CPEP) to serve as a black-start unit for the southern part of SDG&E electrical grid	B/P	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
2	South Grid Blackstart Project Subtotal				-	-	-	-	-	-	-										
3	Modernization of Grid Control Centers	Transmission Energy Management System Modernization Project	Upgrade antiquated Energy Management System (EMS) visualization tool and control room. Addresses potential scenarios where tools and/or systems our operators utilize are not adequate for blackstart situation	B/P	-	-	-	-	-	-	-										
4	Modernization of Grid Control Centers Subtotal				-	-	-	-	-	-	-										
5	Substation Backup Power Enhancements (Fuel Cells)	Use fuel cells to provide backup power at major substations and substations on the Blackstart Cranking Paths	Purchase 30-GenCell 5kW Fuel Cells, to be installed in electric substations throughout the SDG&E service territory, as an auxiliary power system for control shelters. Engineering, procurement, training, hydrogen safe handling and refueling, and installation at each designated site	P																	
6	Substation Backup Power Enhancements (Fuel Cells) Subtotal				-	-	-	-	-	-	-										
7	Maintenance, Certification, and Testing of Existing Blackstart Facilities	Miramar Energy Facility (MEF) I and II blackstart generators maintenance and testing programs	Redundant Blackstart Resources at Miramar Energy Facility have been installed to use one of the Palomar Energy Center (PEC) Combustion Turbines as a target unit during a shutdown condition	B	10	10	10	10	10	-	10	10	11	10	11	10	11	-	-	10	11
8		Certification of MEF I and II as blackstart units	MEF I and II are currently certified as Blackstart Resources. Per current CAISO Procedure 5360, Blackstart tests shall be completed at least once every three years (EOP-005-2 R9.1)	B	10	10	10	10	10	-	10	10	11	10	11	10	11	-	-	10	11
9	Maintenance, Certification, and Testing of Existing Blackstart Facilities Subtotal				20	20	20	20	20	-	20	19	21	19	21	19	21	-	-	19	21
10	Blackstart Training and Procedure Development	Annual SDG&E blackstart/system restoration training and drill	Addresses on-going training and development of operators to blackstart response scenarios with involvement of generating operators within SDG&E's footprint and distribution operators	B	-	-		-	-		40	-	-	-	-	-		38	42	38	42
11		Development and coordination of Blackstart plans with CAISO, Peak RC, and neighboring utilities through annual SDG&E EOP5005 procedure update	Engineering work required to maintain and update SDG&E blackstart procedure based on annual system, NERC standards, and contractual changes	B	-	-	-	-	-		20	-	-	-	-	-		19	21	19	21
12	Blackstart Training and Procedure Development Subtotal				-	-	-	-	-		60	-	-	-	-	-		57	63	57	63
13	TOTAL				\$ 20	\$ 20	\$ 20	\$ 20	\$ 20	\$ 60	\$ 80	\$ 163	\$ 181	\$ 78	\$ 86	\$ 19	\$ 21	\$ 57	\$ 63	\$ 76	\$ 84

Notes:

- Baseline (B) and Proposed (P).
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- The purpose of Risk Assessment Mitigation Phase (RAMP) is not to request funding. Any funding requests will be made in the General Rate Case (GRC). The forecasts for mitigations are not for funding purposes, but are rather to provide a range for the future GRC filing. This range will be refined with supporting testimony in the GRC.

2016 Risk Assessment Mitigation Phase
SDGE-06-WP
Risk: Fail to Blackstart (GRC Total - Capital)

				Recorded (Directs, 2015 \$000)										Forecast Range (Directs, 2015 \$000)											
Line No.	Mitigation	Project/Program	Project/Program Description	Status	GRC 2011	GRC 2012	GRC 2013	GRC 2014	GRC 2015	Non-GRC 2015	Capital Total 2015	GRC 2017 Low	GRC 2017 High	GRC 2018 Low	GRC 2018 High	GRC 2019 Low	GRC 2019 High	GRC 2017-2019 Low (Sum)	GRC 2017-2019 High (Sum)	Non-GRC 2017-2019 Low	Non-GRC 2017-2019 High	Capital Total 2017-2019 Low	Capital Total 2017-2019 High		
1	South Grid Blackstart Project	The South Grid Black-Start Project	The South Grid Black-Start Project is proposed for Cuyamaca Peak Energy Plant (CPEP) to serve as a black-start unit for the southern part of SDG&E electrical grid	B/P	\$ -	\$ -	\$ -	\$ -	\$ 309	\$ -	\$ 309	\$ 821	\$ 907	\$ -	\$ -	\$ -	\$ -	\$ 821	\$ 907	\$ 352	\$ 390	\$ 1,173	1,297		
2	South Grid Blackstart Project Subtotal				-	-	-	-	309	-	309	821	907	-	-	-	-	821	907	352	390	1,173	1,297		
3	Modernization of Grid Control Centers	Transmission Energy Management System Modernization Project	Upgrade antiquated Energy Management System (EMS) visualization tool and control room. Addresses potential scenarios where tools and/or systems our operators utilize are not adequate for blackstart situation	B/P	-	-	-	-	46	8	54	8,401	9,285	3,412	3,772	-	-	11,813	13,057	2,085	2,303	13,898	15,360		
4	Modernization of Grid Control Centers Subtotal				-	-	-	-	46	8	54	8,401	9,285	3,412	3,772	-	-	11,813	13,057	2,085	2,303	13,898	15,360		
5	Substation Backup Power Enhancements (Fuel Cells)	Use fuel cells to provide backup power at major substations and substations on the Blackstart Cranking Paths	Purchase 30-GenCell 5KW Fuel Cells, to be installed in electric substations throughout the SDG&E service territory, as an auxiliary power system for control shelters. Engineering, procurement, training, hydrogen safe handling and refueling, and installation at each designated site	P							-	-	-	-	-	-	-	-	-	4,214	5,702	4,214	5,702		
6	Substation Backup Power Enhancements (Fuel Cells) Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4,214	5,702	4,214	5,702		
7	Maintenance, Certification, and Testing of Existing Blackstart Facilities	Miramar Energy Facility (MEF) I and II blackstart generators maintenance and testing programs	Redundant Blackstart Resources at Miramar Energy Facility have been installed to use one of the Palomar Energy Center (PEC) Combustion Turbines as a target unit during a shutdown condition	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
8		Certification of MEF I and II as blackstart units	MEF I and II are currently certified as Blackstart Resources. Per current CAISO Procedure 5360, Blackstart tests shall be completed at least once every three years (EOP-005-2 R9.1)	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
9	Maintenance, Certification, and Testing of Existing Blackstart Facilities Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
10	Blackstart Training and Procedure Development	Annual SDG&E blackstart/system restoration training and drill	Addresses on-going training and development of operators to blackstart response scenarios with involvement of generating operators within SDG&E's footprint and distribution operators	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
11		Development and coordination of Blackstart plans with CAISO, Peak RC, and neighboring utilities through annual SDG&E EOP5005 procedure update	Engineering work required to maintain and update SDG&E blackstart procedure based on annual system, NERC standards, and contractual changes	B	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
12	Blackstart Training and Procedure Development Subtotal				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
13	TOTAL				\$ -	\$ -	\$ -	\$ -	\$ 355	\$ 8	\$ 363	\$ 9,222	\$ 10,192	\$ 3,412	\$ 3,772	\$ -	\$ -	\$ 12,634	\$ 13,964	\$ 6,651	\$ 8,395	\$ 19,285	\$ 22,359		

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