GUAM POWER AUTHORITY
ATURIDÅT ILEKTRESEDÅT GUAHAN
P.O.BOX 2977 • AGANA, GUAM U.S.A. 96932-2977

June 17, 2014

Captain Glenn A. Shephard
Commanding Officer
Naval Facilities Engineering Command Marianas
PSC 455, Box 195
FPO AP 96540-2937

And

Joint Guam Program Office Forward
POB 153246
Santa Rita GU 96915

Subject: GPA Comments on Draft Supplemental Environmental Impact Statement

Dear CAPT Shepard:

GPA has completed its review of the Draft Supplemental Environmental Impact Statement (DSEIS) issued by the Department of the Navy. From the draft document, GPA understands that the US Marine Cantonment size has been reduced from 20 MW to 5.7 MW. However, previous coordination meetings with representatives from Naval Facilities Pacific and Marianas regarding military growth indicated that the Marines cantonment was in the order of 7.5 MW. The extensive powerflow runs that GPA had performed to identify impacts to the island wide power system were based on 7.5 MW Marines load growth. If this will be the only load growth associated with the US military, then GPA will concur that the impact to the power system will be mitigated by the projects identified in the DSEIS, since the analysis runs were performed under a higher load requirement for the Marines. However, this assumption seems rather unrealistic and will limit DoD's missions and defense capabilities on Guam.

GPA's island wide power system is interconnected via multiple transmission circuits that facilitate moving bulk power from Cabras Island to the rest of the island. Baseload generation is supplemented by peaking units that is interspersed throughout the island to ensure that military and non-military customer demands are met. When conducting analyses regarding the power system, upstream and downstream parameters such as load and equipment capabilities must all be considered. Hence, GPA's coordination meetings with US military representatives regarding the Military Build-Up attempted to capture all of DoD's anticipated load growth (Air Force, Navy, and Marines) to ensure that the powerflow runs took into account all loading and voltage violations under n-1 (single outages of lines and transmission assets) and in certain applicable cases n-2 contingencies in order to plan the required mitigation projects properly. The total military load considered in the 2010 Final Environmental Impact Statement (FEIS) is approximately 70 MW, while the 2013 Coordination Meetings included approximately 52.6 MW. The powerflow runs were made utilizing the information contained in Table 1 below as provided by the US Navy:

Table 1. Load Growth Scenarios as Provided by US Naval Facilities Pacific

SUBSTATION DESCRIPTION	USMC LOCATION at FINEGAYAN (Scenario 1)			USMC LOCATION at AAFB (Scenario 2)			USMC LOCATION at BARRIGADA (Scenario 3)		
	Other DOD Increase-AAFB & NAVY (MVA)	USMC Load (MVA)	Date	Other DOD Increase-AAFB & NAVY (MVA)	USMC Load (MVA)	Date	Other DOD Increase-AAFB & NAVY (MVA)	USMC Load (MVA)	Date
New North Ramp	0	0.95	2026	0	8.45	2026	0	0.95	2026
Existing Air Force	11.28	0	2024	11.28	0	2024	11.28	0	2024
Existing Potts Junction	0	0	N/A	0	0	N/A	0	0	N/A
Existing Finegayan	0	0	N/A	0	0	N/A	0	0	N/A
New Finegayan	0	7.5	2026	0	0	N/A	0	0	N/A
New Barrigada	0	0	N/A	0	0	N/A	0	7.5	2026
Existing Barrigada	0	0	N/A	0	0	N/A	0	0	N/A
Existing Orote	2.02 (2014)	12.7	2026	2.02 (2014)	12.7	2026	2.02 (2014)	12.7	2026
Existing SRF Substation	3.18 (2016)	8.3	2026	3.18 (2016)	8.3	2026	3.18 (2016)	8.3	2026
Existing Cold Storage	5.10	0	2016	5.10	0	2016	5.10	0	2016
Existing Agana	1.13	0	2014	1.13	0	2014	1.13	0	2014
Existing Piti Substation	0.40	0	2016	0.40	0	2016	0.40	0	2016

The subsequent powerflow runs conducted by GPA concerning the expected military load growth under the various scenarios show significant impact to the transmission system that must be properly mitigated. Attachment A shows the required mitigation projects related to GPA's Transmission and Distribution (T&D) system. The failure to complete these projects within a timely manner consistent with the military growth will cause deteriorated power service to existing military and civilian customers, not to mention future customers.

GPA concurs that we currently have sufficient generation reserve capacity. However, this is predicated on the continued health of GPA's baseload generators as well as its peaking units. The 2010 FEIS provided for the reconditioning of GPA's existing peaking units to ensure that reliability and reserve level targets are met. It is GPA's understanding that this does not change with the DSEIS.

Over the next several years, GPA will be embarking on modifying its fuel source for its power generation to liquefied natural gas (LNG). This will provide for opportunities to reduce fuel costs, to improve operational efficiencies of the generating plants, and to save ratepayers on the costs for electricity in general. GPA will strive to build a strong partnership with the US military on Guam to realize this initiative by ensuring that the military growth allows for securing excess DoD land be designated for LNG, providing joint easements for pipelines, and for properly allocating costs for the maintenance of power production and delivery assets.

As the only provider of electricity on Guam, GPA needs to ensure that we understand DoD's load requirements and to ensure that GPA is in a position to meet those needs to support the military's mission. Any adverse effects from the Military Build-Up resulting in a decreased level of service to all of GPA's customers, military and civilian, will have a detrimental effect to island wide power system.

Should you have any questions regarding these comments to the DSEIS, please contact Ms. Melinda R. Camacho, P.E., Assistant General Manager of Operations (mcamacho@gpagwa.com, 648-3205) or Mr. Joven G. Acosta, P.E., Manager of Engineering (jacosta@gpagwa.com, 648-3214).

Sincerely,

Joaquin C. Flores, P.E.
General Manager

/attachments

A. Military Expansion Impact Mitigation Projects
B. Letter to CDR Cyr Re: T&D Solutions for DoD Revised Future Load Projections
C. Powerpoint Presentation to Guam Legislature

ATTACHMENT A

Military Expansion Power System Impact Mitigation Projects
2013 GPA-Navy Coordination Meetings

Scenario	YEAR	Description	Project Name	Qty.	UoM
1	2016	USMC at Finegayan	Piti X20 to Orote X311 OH Upgrade	4.93	miles
1	2026	USMC at Finegayan	New North Ramp Substation	1.00	lump
			New Finegayan Substation	1.00	lump
			Andersen to North Ramp 34.5 kV U/G Line1	2.61	miles
			Andersen to North Ramp 34.5 kV U/G Line2	2.61	miles
			Harmon X82 to Yigo X160 OH Upgrade	6.79	miles
			Orote Substation Capacitor Banks	6.00	MVAr
			New Finegayan Substation Capacitor Banks	6.00	MVAr
2	2016	USMC at AAFB	Piti X20 to Orote X311 OH Upgrade	4.93	miles
2	2026	USMC at AAFB	New North Ramp Substation	1.00	lump
			Andersen to North Ramp 34.5 kV U/G Line1	2.61	miles
			Andersen to North Ramp 34.5 kV U/G Line2	2.61	miles
			Harmon X82 to Yigo X160 OH Upgrade	6.79	miles
			Orote Substation Capacitor Banks	6.00	MVAr
3	2016	USMC at Lower Barrigada Hts.	Piti X20 to Orote X311 OH Upgrade	4.93	miles
3	2026	USMC at Lower Barrigada Hts.	New North Ramp Substation	1.00	lump
			New Lower Barrigada Hts. Substation	1.00	lump
			GAA to Lower Barrigada Hts. Substation 34.5 kV OH Line	3.00	miles
			Lower Barrigada Hts. To Barrigada Substation 34.5 kV OH Line	1.00	lump
			Fiber Optic Communication (GAA/Lower Barr/Barrigada)	4.60	miles
			Andersen to North Ramp 34.5 kV U/G Line1	2.61	miles
			Andersen to North Ramp 34.5 kV U/G Line2	2.61	miles
			Harmon X82 to Yigo X160 OH Upgrade	6.79	miles
			Orote Substation Capacitor Banks	6.00	MVAr
4	2016	USMC at Radio Barrigada	Piti X20 to Orote X311 OH Upgrade	4.93	miles
4	2026	USMC at Radio Barrigada	New North Ramp Substation	1.00	lump
			Radio Barrigada T-23 Transformer Upgrade (20 MVA)	1.00	lump
			Radio Barrigada T-24 Transformer Upgrade (20 MVA)	1.00	lump
			Radio Barrigada to Lower Barrigada Hts. 13.8 kV UG Line	5.20	miles
			Andersen to North Ramp 34.5 kV U/G Line1	2.61	miles
			Andersen to North Ramp 34.5 kV U/G Line2	2.61	miles
			Harmon X82 to Yigo X160 OH Upgrade	6.79	miles
			Orote Substation Capacitor Banks	6.00	MVAr

ATTACHMENT B

GUAM POWER AUTHORITY

ATURIDÅT ILEKTRESEDÅT GUAHAN

P.O.BOX 2977 • AGANA, GUAM U.S.A. 96932-2977

March 29, 2013

Phillip Cyr, P.E.
Guam Build-Up Program Manager
CDR USN
Naval Facilities Marianas
PSC 455, Box 195
FPO AP 96540-2937

Subject: T&D Solutions for DOD Revised Future Load Projections

Dear CDR Cyr:

In response to your e-mail sent on February 19, 2013 with subsequent information provided by Mr. Manuel Garin, P.E. on February 21 and March 7, 2013, GPA has conducted powerflow runs based on three (3) scenarios that the Navy has outlined relating to approximately 53 MVA of load growth directly attributed to the projected military expansion. A fourth scenario was included by GPA to consider serving the load at Lower Barrigada Heights via 13.8 kV underground line from the existing Radio Barrigada Substation instead of a new substation. Please note that the load growth provided by the Navy is a significant departure from the first EIS where approximately 108 MVA of load growth was expected in a short time frame.

The new loads were modeled utilizing the existing transmission assets, and powerflow runs were performed against n-1 contingencies (single outages of lines and transmission assets) as is consistent with GPA's transmission planning criteria. Loading and voltage violations that will be detrimental to GPA's service to the US military as well as island residents were noted and a project list was developed to mitigate these violations.

Attached are the following:

1. Project Estimates for Various Scenarios
2. Summary of Scenarios with Proposed Upgrades
3. Voltage Reports for Various Scenarios
4. Loading Reports for Various Scenarios

Should you have any questions regarding these T&D Solutions to the Military Expansion, please contact Ms. Melinda R. Camacho, P.E. (mcamacho@gpagwa.com, 648-3205) or Mr. Joven G. Acosta, P.E. (jacosta@gpagwa.com, 648-3214).

Sincerely,

Joaquin C. Flores, P.E.
General Manager

/attachments

Military Expansion Project Listing Per Scenario

Scenario	YEAR	Description	Project Name	Qty.	UoM	Unit Cost	Total Cost
1	2016	USMC at Finegayan	Piti X20 to Orote X311 OH Upgrade	4.93	miles	$ 600,000	$ 2,956,800
1	2026	USMC at Finegayan	New North Ramp Substation	1.00	lump	$ 7,500,000	$ 7,500,000
			New Finegayan Substation	1.00	lump	$ 7,500,000	$ 7,500,000
			Andersen to North Ramp 34.5 kV U/G Line1	2.61	miles	$ 2,100,000	$ 5,481,000
			Andersen to North Ramp 34.5 kV U/G Line2	2.61	miles	$ 2,100,000	$ 5,481,000
			Harmon X82 to Yigo X160 OH Upgrade	6.79	miles	$ 600,000	$ 4,072,200
			Orote Substation Capacitor Banks	6.00	MVAr	$ 40,000	$ 240,000
			New Finegayan Substation Capacitor Banks	6.00	MVAr	$ 40,000	$ 240,000
						TOTAL	$ 33,471,000
2	2016	USMC at AAFB	Piti X20 to Orote X311 OH Upgrade	4.93	miles	$ 600,000	$ 2,956,800
2	2026	USMC at AAFB	New North Ramp Substation	1.00	lump	$ 7,500,000	$ 7,500,000
			Andersen to North Ramp 34.5 kV U/G Line1	2.61	miles	$ 2,100,000	$ 5,481,000
			Andersen to North Ramp 34.5 kV U/G Line2	2.61	miles	$ 2,100,000	$ 5,481,000
			Harmon X82 to Yigo X160 OH Upgrade	6.79	miles	$ 600,000	$ 4,072,200
			Orote Substation Capacitor Banks	6.00	MVAr	$ 40,000	$ 240,000
						TOTAL	$ 25,731,000
3	2016	USMC at Lower Barrigada Hts.	Piti X20 to Orote X311 OH Upgrade	4.93	miles	$ 600,000	$ 2,956,800
3	2026	USMC at Lower Barrigada Hts.	New North Ramp Substation	1.00	lump	$ 7,500,000	$ 7,500,000
			New Lower Barrigada Hts. Substation	1.00	lump	$ 7,500,000	$ 7,500,000
			GAA to Lower Barrigada Hts. Substation 34.5 kV OH Line	3.00	miles	$ 100,000	$ 300,000
			Lower Barrigada Hts. To Barrigada Substation 34.5 kV OH Line	1.00	lump	$ 100,000	$ 100,000
			Fiber Optic Communication (GAA/Lower Barr/Barrigada)	4.60	miles	$ 237,500	$ 1,092,500
			Andersen to North Ramp 34.5 kV U/G Line1	2.61	miles	$ 2,100,000	$ 5,481,000
			Andersen to North Ramp 34.5 kV U/G Line2	2.61	miles	$ 2,100,000	$ 5,481,000
			Harmon X82 to Yigo X160 OH Upgrade	6.79	miles	$ 600,000	$ 4,072,200
			Orote Substation Capacitor Banks	6.00	MVAr	$ 40,000	$ 240,000
						TOTAL	$ 34,723,500
4	2016	USMC at Radio Barrigada	Piti X20 to Orote X311 OH Upgrade	4.93	miles	$ 600,000	$ 2,956,800
4	2026	USMC at Radio Barrigada	New North Ramp Substation	1.00	lump	$ 7,500,000	$ 7,500,000
			Radio Barrigada T-23 Transformer Upgrade (20 MVA)	1.00	lump	$ 750,000	$ 750,000
			Radio Barrigada T-24 Transformer Upgrade (20 MVA)	1.00	lump	$ 750,000	$ 750,000
			Radio Barrigada to Lower Barrigada Hts. 13.8 kV UG Line	5.20	miles	$ 1,400,000	$ 7,280,000
			Andersen to North Ramp 34.5 kV U/G Line1	2.61	miles	$ 2,100,000	$ 5,481,000
			Andersen to North Ramp 34.5 kV U/G Line2	2.61	miles	$ 2,100,000	$ 5,481,000
			Harmon X82 to Yigo X160 OH Upgrade	6.79	miles	$ 600,000	$ 4,072,200
			Orote Substation Capacitor Banks	6.00	MVAr	$ 40,000	$ 240,000
						TOTAL	$ 34,511,000

Scenario 1: USMC Load at Finegayan

Year 2016

Loading:

Total system Load:
- Base case with existing DoD Load: 272 MW
- With new DoD Load: 284 MW

DoD load distribution:

			Existing DoD Load		New DoD Load				Total Load		
					Other	USMC	Total				
Substation	Transformer	MVA	MW	MVAR	MW	MW	MW	MW	MW	MVAR	PF
Potts Junction	T-110	5.27	0.76	0.47	0.00	0.00	0.00	0.00	0.76	0.47	0.85
Finegayan (NCS)	T-47	10.50	0.77	0.48	0.00	0.00	0.00	0.00	0.77	0.48	0.85
Orote	T-10	14.00	1.40	0.27	2.02	0.00	2.02	2.02	3.42	0.66	0.98
	T-11	14.00	6.67	3.13	0.00	0.00	0.00	0.00	6.67	3.13	0.91
	T-12	14.00	0.02	0.01	0.00	0.00	0.00	0.00	0.02	0.01	0.89
	T-13	14.00	5.86	3.59	0.00	0.00	0.00	0.00	5.86	3.59	0.85
SRF	T-17	14.00	3.70	2.74	3.18	0.00	3.18	3.18	6.88	5.09	0.80
	T-18	14.00	0.39	0.11	0.00	0.00	0.00	0.00	0.39	0.11	0.96
Cold Storage	T-25	14.00	4.20	1.97	5.10	0.00	5.10	5.10	9.30	4.36	0.91
Agana	T-9	17.92	2.84	1.76	1.13	0.00	1.13	1.13	3.97	2.46	0.85
Piti	T-8	10.50	1.53	0.76	0.40	0.00	0.40	0.40	1.93	0.96	0.90
Andersen	T-15	30.00	10.81	5.30	0.00	0.00	0.00	0.00	10.81	5.30	0.90
	T-16	30.00	7.51	2.21	0.00	0.00	0.00	0.00	7.51	2.21	0.96
Radio Barrigada	T-23	9.38	0.08	0.06	0.00	0.00	0.00	0.00	0.08	0.06	0.80
	T-24	9.38	0.78	0.57	0.00	0.00	0.00	0.00	0.78	0.57	0.81
Total			47.32	23.43	11.83	0.00	11.83	11.83	59.15	29.47	

New and Upgraded Facility / Equipment:

Existing Transmission Line Upgrades:

Substation	Substation	Voltage (kV)	Conductors	Notes
Piti (X20)	Orote (X311)	34.5	1 X 927 kcmil AL O/H Wires	Via Cold Storage

Year 2026

Loading:

Total system Load:
- Base case with existing DoD Load: 272 MW
- With new DoD Load: 327 MW

DoD load distribution:

			Existing DoD Load		New DoD Load				Total Load		
					Other	USMC	Total				
Substation	Transformer	MVA	MW	MVAR	MW	MW	MW	MW	MW	MVAR	PF
Potts Junction	T-110	5.27	0.76	0.47	0.00	0.00	0.00	0.00	0.76	0.47	0.85
Finegayan (NCS)	T-47	10.50	0.77	0.48	0.00	0.00	0.00	0.00	0.77	0.48	0.85
Orote	T-10	14.00	1.40	0.27	2.02	12.70	14.72	7.72	9.12	1.76	0.98
	T-11	14.00	6.67	3.13	0.00	0.00	0.00	0.00	6.67	3.13	0.91
	T-12	14.00	0.02	0.01	0.00	0.00	0.00	7.00	7.02	3.51	0.89
	T-13	14.00	5.86	3.59	0.00	0.00	0.00	0.00	5.86	3.59	0.85
SRF	T-17	14.00	3.70	2.74	3.18	8.30	11.48	3.48	7.18	5.32	0.80
	T-18	14.00	0.39	0.11	0.00	0.00	0.00	8.00	8.39	2.37	0.96
Cold Storage	T-25	14.00	4.20	1.97	5.10	0.00	5.10	5.10	9.30	4.36	0.91
Agana	T-9	17.92	2.84	1.76	1.13	0.00	1.13	1.13	3.97	2.46	0.85
Piti	T-8	10.50	1.53	0.76	0.40	0.00	0.40	0.40	1.93	0.96	0.90
Andersen	T-15	30.00	10.81	5.30	11.28	0.00	11.28	5.28	16.09	7.89	0.90
	T-16	30.00	7.51	2.21	0.00	0.00	0.00	6.00	13.51	3.96	0.96
Radio Barrigada	T-23	9.38	0.08	0.06	0.00	0.00	0.00	0.00	0.08	0.06	0.80
	T-24	9.38	0.78	0.57	0.00	0.00	0.00	0.00	0.78	0.57	0.81
North Ramp	T-NNR	30.00	0.00	0.00	0.00	0.95	0.95	0.95	0.95	0.59	0.85
New Finegayan	T-NF	30.00	0.00	0.00	0.00	7.50	7.50	7.50	7.50	4.65	0.85
Total			47.32	23.43	23.11	29.45	52.56	52.56	99.68	46.13	

New and Upgraded Facility / Equipment:

New Substations:

Substation
North Ramp
New Finegayan

New Transmission Lines:

Substation	Substation	Voltage (kV)	Conductors	Notes
Andersen	North Ramp	34.5	1 X 750 kcmil CU U/G Cables	Line 1
Andersen	North Ramp	34.5	1 X 750 kcmil CU U/G Cables	Line 2

Existing Transmission Line Upgrades:

Substation	Substation	Voltage (kV)	Conductors	Notes
Piti (X20)	Orote (X311)	34.5	1 X 927 kcmil AL O/H Wires	Via Cold Storage
Harmon (X82)	Yigo (X160)	34.5	1 X 927 kcmil AL O/H Wires	

New Transformers:

Substation	MVA	kV
North Ramp	30	34.5/13.8
New Finegayan	30	34.5/13.8

New Capacitor Banks:

Substation	MVAR
Orote	6
New Finegayan	6

Scenario 2: USMC Load at AAFB

Year 2016

Loading:

Total system Load:
- Base case with existing DoD Load: 272 MW
- With new DoD Load: 284 MW

DoD load distribution:

			Existing DoD Load		New DoD Load				Total Load		
					Other	USMC	Total				
Substation	Transformer	MVA	MW	MVAR	MW	MW	MW	MW	MW	MVAR	PF
Potts Junction	T-110	5.27	0.76	0.47	0.00	0.00	0.00	0.00	0.76	0.47	0.85
Finegayan (NCS)	T-47	10.50	0.77	0.48	0.00	0.00	0.00	0.00	0.77	0.48	0.85
Orote	T-10	14.00	1.40	0.27	2.02	0.00	2.02	2.02	3.42	0.66	0.98
	T-11	14.00	6.67	3.13	0.00	0.00	0.00	0.00	6.67	3.13	0.91
	T-12	14.00	0.02	0.01	0.00	0.00	0.00	0.00	0.02	0.01	0.89
	T-13	14.00	5.86	3.59	0.00	0.00	0.00	0.00	5.86	3.59	0.85
SRF	T-17	14.00	3.70	2.74	3.18	0.00	3.18	3.18	6.88	5.09	0.80
	T-18	14.00	0.39	0.11	0.00	0.00	0.00	0.00	0.39	0.11	0.96
Cold Storage	T-25	14.00	4.20	1.97	5.10	0.00	5.10	5.10	9.30	4.36	0.91
Agana	T-9	17.92	2.84	1.76	1.13	0.00	1.13	1.13	3.97	2.46	0.85
Piti	T-8	10.50	1.53	0.76	0.40	0.00	0.40	0.40	1.93	0.96	0.90
Andersen	T-15	30.00	10.81	5.30	0.00	0.00	0.00	0.00	10.81	5.30	0.90
	T-16	30.00	7.51	2.21	0.00	0.00	0.00	0.00	7.51	2.21	0.96
Radio Barrigada	T-23	9.38	0.08	0.06	0.00	0.00	0.00	0.00	0.08	0.06	0.80
	T-24	9.38	0.78	0.57	0.00	0.00	0.00	0.00	0.78	0.57	0.81
Total			47.32	23.43	11.83	0.00	11.83	11.83	59.15	29.47	

New and Upgraded Facility / Equipment:

Existing Transmission Line Upgrades:

Substation	Substation	Voltage (kV)	Conductors	Notes
Piti (X20)	Orote (X311)	34.5	1 X 927 kcmil AL O/H Wires	Via Cold Storage

Year 2026

Loading:

Total system Load:
- Base case with existing DoD Load: 272 MW
- With new DoD Load: 327 MW

DoD load distribution:

			Existing DoD Load		New DoD Load				Total Load		
					Other	USMC	Total				
Substation	Transformer	MVA	MW	MVAR	MW	MW	MW	MW	MW	MVAR	PF
Potts Junction	T-110	5.27	0.76	0.47	0.00	0.00	0.00	0.00	0.76	0.47	0.85
Finegayan (NCS)	T-47	10.50	0.77	0.48	0.00	0.00	0.00	0.00	0.77	0.48	0.85
Orote	T-10	14.00	1.40	0.27	2.02	12.70	14.72	7.72	9.12	1.76	0.98
	T-11	14.00	6.67	3.13	0.00	0.00	0.00	0.00	6.67	3.13	0.91
	T-12	14.00	0.02	0.01	0.00	0.00	0.00	7.00	7.02	3.51	0.89
	T-13	14.00	5.86	3.59	0.00	0.00	0.00	0.00	5.86	3.59	0.85
SRF	T-17	14.00	3.70	2.74	3.18	8.30	11.48	3.48	7.18	5.32	0.80
	T-18	14.00	0.39	0.11	0.00	0.00	0.00	8.00	8.39	2.37	0.96
Cold Storage	T-25	14.00	4.20	1.97	5.10	0.00	5.10	5.10	9.30	4.36	0.91
Agana	T-9	17.92	2.84	1.76	1.13	0.00	1.13	1.13	3.97	2.46	0.85
Piti	T-8	10.50	1.53	0.76	0.40	0.00	0.40	0.40	1.93	0.96	0.90
Andersen	T-15	30.00	10.81	5.30	11.28	0.00	11.28	5.28	16.09	7.89	0.90
	T-16	30.00	7.51	2.21	0.00	0.00	0.00	6.00	13.51	3.98	0.96
Radio Barrigada	T-23	9.38	0.08	0.06	0.00	0.00	0.00	0.00	0.08	0.06	0.80
	T-24	9.38	0.78	0.57	0.00	0.00	0.00	0.00	0.78	0.57	0.81
New North Ramp	T-NNR	30.00	0.00	0.00	0.00	8.45	8.45	8.45	8.45	5.24	0.85
Total			47.32	23.43	23.11	29.45	52.56	52.56	99.88	46.13	

New and Upgraded Facility / Equipment:

New Substations:

Substation
North Ramp

New Transmission Lines:

Substation	Substation	Voltage (kV)	Conductors	Notes
Andersen	North Ramp	34.5	1 X 750 kcmil CU U/G Cables	Line 1
Andersen	North Ramp	34.5	1 X 750 kcmil CU U/G Cables	Line 2

Existing Transmission Line Upgrades:

Substation	Substation	Voltage (kV)	Conductors	Notes
Piti (X20)	Orote (X311)	34.5	1 X 927 kcmil AL O/H Wires	Via Cold Storage
Harmon (X82)	Yigo (X160)	34.5	1 X 927 kcmil AL O/H Wires	

New Transformers:

Substation	MVA	kV
North Ramp	30	34.5/13.8

New Capacitor Banks:

Substation	MVAR
Orote	6

Scenario 3: USMC Load at Barrigada

Year 2016

Loading:

Total system Load:
- Base case with existing DoD Load: 272 MW
- With new DoD Load: 284 MW

DoD load distribution:

			Existing DoD Load		New DoD Load				Total Load		
					Other	USMC	Total				
Substation	Transformer	MVA	MW	MVAR	MW	MW	MW	MW	MW	MVAR	PF
Potts Junction	T-110	5.27	0.76	0.47	0.00	0.00	0.00	0.00	0.76	0.47	0.85
Finegayan (NCS)	T-47	10.50	0.77	0.48	0.00	0.00	0.00	0.00	0.77	0.48	0.85
Orote	T-10	14.00	1.40	0.27	2.02	0.00	2.02	2.02	3.42	0.66	0.98
	T-11	14.00	6.67	3.13	0.00	0.00	0.00	0.00	6.67	3.13	0.91
	T-12	14.00	0.02	0.01	0.00	0.00	0.00	0.00	0.02	0.01	0.89
	T-13	14.00	5.86	3.59	0.00	0.00	0.00	0.00	5.86	3.59	0.85
SRF	T-17	14.00	3.70	2.74	3.18	0.00	3.18	3.18	6.88	5.09	0.80
	T-18	14.00	0.39	0.11	0.00	0.00	0.00	0.00	0.39	0.11	0.96
Cold Storage	T-25	14.00	4.20	1.97	5.10	0.00	5.10	5.10	9.30	4.36	0.91
Agana	T-9	17.92	2.84	1.76	1.13	0.00	1.13	1.13	3.97	2.46	0.85
Piti	T-8	10.50	1.53	0.76	0.40	0.00	0.40	0.40	1.93	0.96	0.90
Andersen	T-15	30.00	10.81	5.30	0.00	0.00	0.00	0.00	10.81	5.30	0.90
	T-16	30.00	7.51	2.21	0.00	0.00	0.00	0.00	7.51	2.21	0.96
Radio Barrigada	T-23	9.38	0.06	0.06	0.00	0.00	0.00	0.00	0.06	0.06	0.80
	T-24	9.38	0.78	0.57	0.00	0.00	0.00	0.00	0.78	0.57	0.81
Total			47.32	23.43	11.83	0.00	11.83	11.83	59.15	29.47	

New and Upgraded Facility / Equipment:

Existing Transmission Line Upgrades:

Substation	Substation	Voltage (kV)	Conductors	Notes
Piti (X20)	Orote (X311)	34.5	1 X 927 kcmil AL O/H Wires	Via Cold Storage

Year 2026

Loading:

Total system Load:
- Base case with existing DoD Load: 272 MW
- With new DoD Load: 327 MW

DoD load distribution:

			Existing DoD Load		New DoD Load				Total Load		
					Other	USMC	Total				
Substation	Transformer	MVA	MW	MVAR	MW	MW	MW	MW	MW	MVAR	PF
Potts Junction	T-110	5.27	0.76	0.47	0.00	0.00	0.00	0.00	0.76	0.47	0.85
Finegayan	T-47	10.50	0.77	0.48	0.00	0.00	0.00	0.00	0.77	0.48	0.85
Orote	T-10	14.00	1.40	0.27	2.02	12.70	14.72	7.72	9.12	1.76	0.98
	T-11	14.00	6.67	3.13	0.00	0.00	0.00	0.00	6.67	3.13	0.91
	T-12	14.00	0.02	0.01	0.00	0.00	0.00	7.00	7.02	3.51	0.89
	T-13	14.00	5.86	3.59	0.00	0.00	0.00	0.00	5.86	3.59	0.85
SRF	T-17	14.00	3.70	2.74	3.18	8.30	11.48	3.48	7.18	5.32	0.80
	T-18	14.00	0.39	0.11	0.00	0.00	0.00	8.00	8.39	2.37	0.96
Cold Storage	T-25	14.00	4.20	1.97	5.10	0.00	5.10	5.10	9.30	4.36	0.91
Agana	T-9	17.92	2.84	1.76	1.13	0.00	1.13	1.13	3.97	2.48	0.85
Piti	T-8	10.50	1.53	0.76	0.40	0.00	0.40	0.40	1.93	0.96	0.90
Andersen	T-15	30.00	10.81	5.30	11.28	0.00	11.28	5.28	16.09	7.89	0.90
	T-16	30.00	7.51	2.21	0.00	0.00	0.00	6.00	13.51	3.98	0.96
Radio Barrigada	T-23	9.38	0.06	0.06	0.00	0.00	0.00	0.00	0.06	0.06	0.80
	T-24	9.38	0.78	0.57	0.00	0.00	0.00	0.00	0.78	0.57	0.81
North Ramp	T-NNR	30.00	0.00	0.00	0.00	0.95	0.95	0.95	0.95	0.59	0.85
New Barrigada	T-NB	30.00	0.00	0.00	0.00	7.50	7.50	7.50	7.50	4.65	0.85
Total			47.32	23.43	23.11	29.45	52.56	52.56	99.68	46.13	

New and Upgraded Facility / Equipment:

New Substations:

Substation
North Ramp
New Barrigada

New Transmission Lines:

Substation	Substation	Voltage (kV)	Conductors	Notes
Andersen	North Ramp	34.5	1 X 750 kcmil CU U/G Cables	Line 1
Andersen	North Ramp	34.5	1 X 750 kcmil CU U/G Cables	Line 2

Existing Transmission Line Modifications:

Substation	Substation	Voltage (kV)	Conductors
GAA	New Barrigada	34.5	1 X 927 kcmil AL O/H Wires
New Barrigada	Barrigada	34.5	1 X 927 kcmil AL O/H Wires

Note: These two lines are created by splitting the existing GAA to Barrigada 34.5 kV overhead transmission line in two with the open ends connected to the New Barrigada Substation.

New Fiber Optic Communication Lines:

Substation	Substation	Notes
GAA	New Barrigada	Required to alleviate relay miscoordination due to short
New Barrigada	Barrigada	transmission Lines

Existing Transmission Line Upgrades:

Substation	Substation	Voltage (kV)	Conductors	Notes
Piti (X20)	Orote (X311)	34.5	1 X 927 kcmil AL O/H Wires	Via Cold Storage
Harmon (X62)	Yigo (X160)	34.5	1 X 927 kcmil AL O/H Wires	

New Transformers:

Substation	MVA	kV
North Ramp	30	34.5/13.8
New Barrigada	30	34.5/13.8

New Capacitor Banks:

Substation	MVAR
Orote	6

Scenario 4: USMC Load at Radio Barrigada

Year 2016

Loading:

Total system Load:
- **Base case with existing DoD Load: 272 MW**
- **With new DoD Load: 284 MW**

DoD load distribution:

			Existing DoD Load		New DoD Load				Total Load		
					Other	USMC	Total				
Substation	Transformer	MVA	MW	MVAR	MW	MW	MW	MW	MW	MVAR	PF
Potts Junction	T-110	5.27	0.76	0.47	0.00	0.00	0.00	0.00	0.76	0.47	0.85
Finegayan (NCS)	T-47	10.50	0.77	0.48	0.00	0.00	0.00	0.00	0.77	0.48	0.85
Orote	T-10	14.00	1.40	0.27	2.02	0.00	2.02	2.02	3.42	0.66	0.98
	T-11	14.00	6.67	3.13	0.00	0.00	0.00	0.00	6.67	3.13	0.91
	T-12	14.00	0.02	0.01	0.00	0.00	0.00	0.00	0.02	0.01	0.88
	T-13	14.00	5.86	3.59	0.00	0.00	0.00	0.00	5.86	3.59	0.85
SRF	T-17	14.00	3.70	2.74	3.18	0.00	3.18	3.18	6.88	5.09	0.80
	T-18	14.00	0.39	0.11	0.00	0.00	0.00	0.00	0.39	0.11	0.96
Cold Storage	T-25	14.00	4.20	1.97	5.10	0.00	5.10	5.10	9.30	4.36	0.91
Agana	T-9	17.92	2.84	1.76	1.13	0.00	1.13	1.13	3.97	2.46	0.85
Piti	T-8	10.50	1.53	0.76	0.40	0.00	0.40	0.40	1.93	0.96	0.90
Andersen	T-15	30.00	10.81	5.30	0.00	0.00	0.00	0.00	10.81	5.30	0.90
	T-16	30.00	7.51	2.21	0.00	0.00	0.00	0.00	7.51	2.21	0.96
Radio Barrigada	T-23	9.38	0.08	0.06	0.00	0.00	0.00	0.00	0.08	0.06	0.80
	T-24	9.38	0.78	0.57	0.00	0.00	0.00	0.00	0.78	0.57	0.81
Total			47.32	23.43	11.83	0.00	11.83	11.83	59.15	29.47	

New and Upgraded Facility / Equipment:

Existing Transmission Line Upgrades:

Substation	Substation	Voltage (kV)	Conductors	Notes
Piti (X20)	Orote (X311)	34.5	1 X 927 kcmil AL O/H Wires	Via Cold Storage

Year 2026

Loading:

Total system Load:
- **Base case with existing DoD Load: 272 MW**
- **With new DoD Load: 327 MW**

DoD load distribution:

			Existing DoD Load		New DoD Load				Total Load		
					Other	USMC	Total				
Substation	Transformer	MVA	MW	MVAR	MW	MW	MW	MW	MW	MVAR	PF
Potts Junction	T-110	5.27	0.76	0.47	0.00	0.00	0.00	0.00	0.76	0.47	0.85
Finegayan (NCS)	T-47	10.50	0.77	0.48	0.00	0.00	0.00	0.00	0.77	0.48	0.85
Orote	T-10	14.00	1.40	0.27	2.02	12.70	14.72	7.72	9.12	1.76	0.98
	T-11	14.00	6.67	3.13	0.00	0.00	0.00	0.00	6.67	3.13	0.91
	T-12	14.00	0.02	0.01	0.00	0.00	0.00	7.00	7.02	3.51	0.89
	T-13	14.00	5.86	3.59	0.00	0.00	0.00	0.00	5.86	3.59	0.85
SRF	T-17	14.00	3.70	2.74	3.18	8.30	11.48	3.48	7.18	5.32	0.80
	T-18	14.00	0.39	0.11	0.00	0.00	0.00	8.00	8.39	2.37	0.96
Cold Storage	T-25	14.00	4.20	1.97	5.10	0.00	5.10	5.10	9.30	4.36	0.91
Agana	T-9	17.92	2.84	1.76	1.13	0.00	1.13	1.13	3.97	2.46	0.85
Piti	T-8	10.50	1.53	0.76	0.40	0.00	0.40	0.40	1.93	0.96	0.90
Andersen	T-15	30.00	10.81	5.30	11.28	0.00	11.28	5.28	16.09	7.89	0.90
	T-16	30.00	7.51	2.21	0.00	0.00	0.00	6.00	13.51	3.98	0.96
Radio Barrigada	T-23	9.38	0.08	0.06	0.00	7.50	7.50	4.50	4.58	3.44	0.80
	T-24	9.38	0.78	0.57	0.00	0.00	0.00	3.00	3.78	2.76	0.81
North Ramp	T-NNR	30.00	0.00	0.00	0.00	0.95	0.95	0.95	0.95	0.59	0.85
Total			47.32	23.43	23.11	29.45	52.56	52.56	99.88	47.05	

New and Upgraded Facility / Equipment:

New Substations:

Substation
North Ramp

New Transmission Lines:

Substation	Substation	Voltage (kV)	Conductors	Notes
Andersen	North Ramp	34.5	1 X 750 kcmil CU U/G Cables	Line 1
Andersen	North Ramp	34.5	1 X 750 kcmil CU U/G Cables	Line 2

Existing Transmission Line Upgrades:

Substation	Substation	Voltage (kV)	Conductors	Notes
Piti (X20)	Orote (X311)	34.5	1 X 927 kcmil AL O/H Wires	Via Cold Storage
Harmon (X82)	Yigo (X160)	34.5	1 X 927 kcmil AL O/H Wires	

New Distribution Lines:

Substation	Service Area	Voltage (kV)	Conductors	Notes
Radio Barrigada	Lower Barrigada Hts.	13.8	1 X 500 kcmil AL U/G Cables	

New Transformers:

Substation	MVA	kV
North Ramp	30	34.5/13.8

Existing Transformer Upgrades:

Substation	Transformer	MVA	kV
Radio Barrigada	T-23	20	34.5/13.8
Radio Barrigada	T-24	20	34.5/13.8

New Capacitor Banks:

Substation	MVAR
Orote	6

Scenario 1: USMC Load at Finegayan -- Voltage Violations

- There are no Voltage violations under normal system configuration with additional DoD load for both year 2016 and 2026

- Voltage violations under n-1 contingency:

Case descriptions:

Case 1: GPA projected base case load for the years 2016 and 2026 with no additional DoD load.
Case 2: Case 1 with DoD additional load for the year 2016.
Case 3: Case 2 with Piti X20 to Orote 34.5kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 4: Case 1 with DoD additional load for the year 2026.
Case 5: Case 4 with Piti X20 to Orote 34.5 kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 6: Case 5 with Harmon to Yigo 34.5 kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 7: Case 6 with Yigo CT online to relieve undervoltage and overload conditions in northern area.
Case 8: Case 7 with a new 6 MVAR capacitor bank installed at the Orote substation to relieve undervoltage conditions in southern area including substations in the Naval base.
Case 9: Case 8 with Manengon diesels online to relieve undervoltage condition at the Pulantat substation.
Case 10: Case 9 with additional 6 MVAR capacitor bank upgrade with 3 MVAR each at the two existing capacitor banks installed at the Andersen substation to relieve undervoltage conditions at the New Finegayan and Pott's Junction substations.
Case 11: Case 9 with a new 6 MVAR capacitor bank installed at the New Finegayan substation to relieve undervoltage conditions at the New Finegayan and Pott's Junction substations.

Voltage Violations: Violation: Voltage < 95%

Substation	kV	Case 1 (Base)	Case 2 (2016)	Case 3 (2016)	Case 4 (2026)	Case 5 (2026)	Case 6 (2026)	Case 7 (2026)	Case 8 (2026)	Case 9 (2026)	Case 10 (2026)	Case 11 (2026)	Outage description
NCS345	34.5	0.9971	0.9993	0.9994	0.9199	0.9201	0.9294	0.9372	0.9386	0.9389	0.9468	0.9742	Line Har345B1 34.5 to NCS345 34.5 Circuit 1
SRF345	34.5	0.9841	0.9676	0.9851	0.9206	0.9505	0.9506	0.951	0.9646	0.965	0.9658	0.9664	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
SRF345	34.5	0.9841	0.9676	0.9851	0.9206	0.9505	0.9506	0.9511	0.9646	0.965	0.9658	0.9664	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Oro345	34.5	0.9846	0.9685	0.9859	0.9223	0.9521	0.9523	0.9527	0.9662	0.9666	0.9674	0.968	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
Vic345	34.5	0.9846	0.9685	0.9859	0.9223	0.9521	0.9523	0.9527	0.9662	0.9666	0.9674	0.968	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
Oro345	34.5	0.9846	0.9685	0.986	0.9223	0.9521	0.9523	0.9527	0.9662	0.9666	0.9674	0.968	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Vic345	34.5	0.9846	0.9685	0.986	0.9223	0.9521	0.9523	0.9527	0.9662	0.9666	0.9674	0.968	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
CSTapX21	34.5	0.9846	0.9685	0.986	0.9223	0.9521	0.9523	0.9527	0.9662	0.9666	0.9675	0.968	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Pott345	34.5	0.9978	1	1.0001	0.9276	0.9278	0.9371	0.9448	0.9462	0.9465	0.9543	0.9764	Line Har345B1 34.5 to NCS345 34.5 Circuit 1
Uma345	34.5	0.9723	0.9624	0.9722	0.9282	0.9436	0.9439	0.9446	0.955	0.9578	0.9587	0.9593	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Pul345	34.5	0.9571	0.9516	0.9552	0.9298	0.9362	0.9364	0.9367	0.9437	0.9814	0.9816	0.9816	Line Pul345 34.5 to Bar345 34.5 Circuit 1
CldSt345	34.5	0.9909	0.9719	0.9751	0.9361	0.9394	0.9395	0.9399	0.9541	0.9547	0.9556	0.9561	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
Apr345	34.5	0.9812	0.9715	0.9812	0.9376	0.9529	0.9531	0.9538	0.9641	0.9669	0.9678	0.9684	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
CSTapX20	34.5	0.9915	0.9735	0.9766	0.9377	0.941	0.9411	0.9415	0.9557	0.9563	0.9571	0.9577	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
CldSt345	34.5	0.9926	0.9767	0.9923	0.9385	0.964	0.9641	0.9645	0.9754	0.9758	0.9766	0.9772	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
CldSt345	34.5	0.9926	0.9767	0.9923	0.9385	0.964	0.9641	0.9645	0.9754	0.9758	0.9766	0.9772	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
CSTapX20	34.5	0.9933	0.9782	0.9938	0.9401	0.9655	0.9657	0.9661	0.9769	0.9773	0.9782	0.9787	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
CSTapX20	34.5	0.9933	0.9782	0.9938	0.9401	0.9655	0.9657	0.9661	0.9769	0.9773	0.9782	0.9787	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
SRF345	34.5	0.9891	0.9775	0.9885	0.9406	0.9578	0.958	0.9586	0.9701	0.9719	0.9728	0.9734	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Oro345	34.5	0.9896	0.9784	0.9893	0.9423	0.9594	0.9596	0.9603	0.9717	0.9735	0.9744	0.975	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1

Substation	kV	Case 1 (Base)	Case 2 (2016)	Case 3 (2016)	Case 4 (2026)	Case 5 (2026)	Case 6 (2026)	Case 7 (2026)	Case 8 (2026)	Case 9 (2026)	Case 10 (2026)	Case 11 (2026)	Outage description
Vic345	34.5	0.9896	0.9784	0.9893	0.9423	0.9594	0.9596	0.9603	0.9717	0.9735	0.9744	0.975	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Tal345	34.5	0.9693	0.9638	0.9674	0.9424	0.9486	0.9488	0.9491	0.956	0.9838	0.9842	0.9842	Line Pui345 34.5 to Bar345 34.5 Circuit 1
Yig345B1	34.5	0.9806	0.9828	0.9828	0.9438	0.944	0.944	0.9813	0.9822	0.9823	0.9836	0.9863	Line Har345B1 34.5 to Yig345B1 34.5 Circuit 1
SRF345	34.5	0.9942	0.9801	0.9801	0.9439	0.944	0.9442	0.9445	0.9586	0.9593	0.9601	0.9606	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
NRamp345	34.5	NA	1.0087	1.0087	0.9448	0.9449	0.9657	0.9766	0.9775	0.9778	0.9897	0.9864	Line Ded345B1 34.5 to And345B1 34.5 Circuit 1
And345B1	34.5	1.0056	1.0086	1.0087	0.945	0.9451	0.9659	0.9768	0.9777	0.9779	0.9898	0.9866	Line Ded345B1 34.5 to And345B1 34.5 Circuit 1
Oro345	34.5	0.9947	0.9809	0.981	0.9455	0.9456	0.9458	0.9461	0.9602	0.9609	0.9617	0.9622	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
Vic345	34.5	0.9947	0.9809	0.981	0.9455	0.9456	0.9458	0.9461	0.9602	0.9609	0.9617	0.9622	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
NRamp345	34.5	NA	0.9913	0.9913	0.9467	0.9469	0.9588	0.9692	0.9704	0.9707	0.9796	0.9772	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
And345B1	34.5	0.989	0.9913	0.9913	0.9469	0.9471	0.959	0.9694	0.9706	0.9709	0.9798	0.9774	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
Ded345B1	34.5	0.9839	0.9861	0.9861	0.9482	0.9483	0.958	0.966	0.9674	0.9677	0.9753	0.9735	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
Tal345	34.5	0.9816	0.9758	0.9823	0.9493	0.9597	0.96	0.9609	0.9685	0.9753	0.9762	0.9767	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
SRF345	34.5	0.9999	0.9875	0.9964	0.9499	0.9656	0.9658	0.9662	0.9783	0.9782	0.9791	0.9797	Line Apr345 34.5 to Oro345 34.5 Circuit 1

Scenario 1: USMC Load at Finegayan -- Loading Violations

- There are no Loading violations under normal system configuration with additional DoD load for both year 2016 and 2026

- Loading violations under n-1 contingency:

Case descriptions:

Case 1: GPA projected base case load for the years 2016 and 2026 with no additional DoD load.
Case 2: Case 1 with DoD additional load for the year 2016.
Case 3: Case 2 with Piti X20 to Orote 34.5kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 4: Case 1 with DoD additional load for the year 2026.
Case 5: Case 4 with Piti X20 to Orote 34.5 kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 6: Case 5 with Harmon to Yigo 34.5 kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 7: Case 6 with Yigo CT online to relieve undervoltage and overload conditions in northern area.
Case 8: Case 7 with a new 6 MVAR capacitor bank installed at the Orote substation to relieve undervoltage conditions in southern area including substations in the Naval base.
Case 9: Case 8 with Manengon diesels online to relieve undervoltage condition at the Pulantat substation.
Case 10: Case 9 with additional 6 MVAR capacitor bank upgrade with 3 MVAR each at the two existing capacitor banks installed at the Andersen substation to relieve undervoltage conditions at the new Finegayan (NCS) and Pott's Junction substations.
Case 11: Case 9 with a new 6 MVAR capacitor bank installed at the new Finegayan (NCS) substation to relieve undervoltage conditions at the new Finegayan (NCS) and Pott's Junction substations.

Loading Violations:
Violation: Loading ≥ 100%
Warning: Loading = 90.0% to 99.9%
Monitor: Loading = 80.0% to 89.9%

Substation	Substation	kV	ck	Rated MVA	Case 1 (Base)	Case 2 (2016)	Case 3 (2016)	Case 4 (2026)	Case 5 (2026)	Case 6 (2026)	Case 7 (2026)	Case 8 (2026)	Case 9 (2026)	Case 10 (2026)	Case 11 (2026)	Outage description
Pit345	CSTapX20	34.5	1	54	0.652	0.927	0.558	1.449	0.863	0.863	0.862	0.821	0.803	0.802	0.802	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.652	0.927	0.558	1.448	0.863	0.863	0.862	0.821	0.803	0.802	0.802	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.622	0.819	0.53	1.162	0.751	0.751	0.749	0.721	0.697	0.696	0.696	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Oro345	CSTapX20	34.5	1	54	0.489	0.555	0.36	1.061	0.659	0.659	0.658	0.622	0.603	0.602	0.602	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
Oro345	CSTapX20	34.5	1	54	0.489	0.554	0.36	1.061	0.659	0.659	0.658	0.622	0.603	0.602	0.602	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Har345B1	Yig345B1	34.5	1	29	0.732	0.732	0.732	1.051	1.051	0.596	0.316	0.316	0.316	0.312	0.313	Line Ded345B1 34.5 to And345B1 34.5 Circuit 1
Har345B1	NCS345	34.5	1	29	0.535	0.535	0.535	0.987	0.987	0.882	0.692	0.692	0.692	0.678	0.682	Line Ded345B1 34.5 to And345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.399	0.612	0.388	0.978	0.622	0.622	0.622	0.588	0.588	0.587	0.588	Line Apr345 34.5 to Oro345 34.5 Circuit 1
Har345B1	Yig345B1	34.5	1	29	0.732	0.732	0.732	0.939	0.939	0.555	0.326	0.325	0.325	0.322	0.323	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
Tan345B1	Har345B1	34.5	1	54	0.544	0.546	0.546	0.906	0.906	0.906	0.651	0.651	0.651	0.651	0.65	Line Tan345B1 34.5 to Har345B3 34.5 Circuit 2
Tan345B1	Har345B3	34.5	2	54	0.544	0.545	0.545	0.906	0.906	0.906	0.651	0.651	0.651	0.651	0.65	Line Tan345B1 34.5 to Har345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.447	0.619	0.409	0.899	0.596	0.596	0.595	0.571	0.559	0.558	0.558	Line Ten345 34.5 to Tenjotap 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.405	0.592	0.384	0.896	0.584	0.584	0.583	0.559	0.539	0.539	0.539	Line Pit345 34.5 to Tenjotap 34.5 Circuit 1
Har345B1	NCS345	34.5	1	29	0.53	0.53	0.53	0.891	0.89	0.83	0.711	0.71	0.709	0.689	0.7	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
Har345B3	Mac345B1	34.5	1	54	0.736	0.746	0.744	0.889	0.886	0.867	0.786	0.783	0.749	0.744	0.744	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
Mar345B1	Pag345B1	34.5	1	29	0.635	0.631	0.631	0.873	0.873	0.805	0.634	0.635	0.637	0.628	0.629	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.416	0.594	0.39	0.873	0.577	0.577	0.577	0.552	0.51	0.51	0.51	Line Pul345 34.5 to Bar345 34.5 Circuit 1
Oro345	CSTapX21	34.5	1	54	0.383	0.535	0.535	0.839	0.838	0.838	0.837	0.796	0.777	0.776	0.776	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
Pit345	CSTapX21	34.5	1	54	0.383	0.535	0.534	0.838	0.838	0.838	0.837	0.796	0.777	0.776	0.776	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
Ded345B1	And345B1	34.5	1	42	0.557	0.556	0.556	0.836	0.836	0.836	0.451	0.45	0.451	0.449	0.455	Line Har345B1 34.5 to Yig345B1 34.5 Circuit 1
Har345B1	Yig345B1	34.5	1	29	0.615	0.615	0.615	0.835	0.834	0.497	0.288	0.287	0.287	0.282	0.286	Line Har345B1 34.5 to NCS345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.39	0.561	0.369	0.828	0.549	0.549	0.548	0.525	0.51	0.51	0.51	Line Aga345 34.5 to Bar345 34.5 Circuit 1

Substation	Substation	kV	ck	Rated MVA	Case 1 (Base)	Case 2 (2016)	Case 3 (2016)	Case 4 (2026)	Case 5 (2026)	Case 6 (2026)	Case 7 (2026)	Case 8 (2026)	Case 9 (2026)	Case 10 (2026)	Case 11 (2026)	Outage description
Pit345	CSTapX20	34.5	1	54	0.368	0.545	0.357	0.821	0.542	0.542	0.542	0.517	0.517	0.517	0.518	Line Pui345 34.5 to Tal345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.38	0.551	0.363	0.818	0.543	0.543	0.542	0.519	0.507	0.506	0.506	Line Har345B3 34.5 to Mac345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.38	0.551	0.363	0.818	0.542	0.542	0.541	0.518	0.506	0.506	0.506	Line Aga115 115.0 to Tam115B1 115.0 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.379	0.551	0.363	0.818	0.542	0.542	0.541	0.518	0.506	0.506	0.506	Line Pit115B1 115.0 to Har115B1 115.0 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.377	0.549	0.361	0.816	0.541	0.541	0.54	0.517	0.505	0.505	0.505	Line Cab115EB 115.0 to Aga115 115.0 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.377	0.549	0.361	0.816	0.541	0.541	0.54	0.517	0.505	0.505	0.505	Line Cab115EB 115.0 to Aga115 115.0 Circuit 2
Pit345	CSTapX20	34.5	1	54	0.378	0.549	0.361	0.814	0.54	0.54	0.539	0.516	0.505	0.505	0.505	Line Pit345 34.5 to Ani345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.376	0.547	0.36	0.814	0.54	0.54	0.539	0.516	0.504	0.503	0.504	Line Bar345 34.5 to GAA345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.377	0.547	0.36	0.813	0.539	0.539	0.538	0.515	0.504	0.504	0.504	Line Pit345 34.5 to Aga345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.376	0.547	0.36	0.813	0.539	0.539	0.539	0.515	0.504	0.503	0.504	Line Mac345B1 34.5 to GAA345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.375	0.546	0.359	0.813	0.539	0.539	0.538	0.515	0.503	0.503	0.503	Line Tan345B1 34.5 to Har345B3 34.5 Circuit 2
Ded345B1	And345B1	34.5	1	42	0.465	0.465	0.465	0.812	0.812	0.739	0.523	0.523	0.524	0.519	0.522	Line Har345B1 34.5 to NCS345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.375	0.546	0.359	0.812	0.539	0.538	0.538	0.514	0.503	0.503	0.503	Line Tam115B1 115.0 to Har115B1 115.0 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.375	0.546	0.359	0.812	0.538	0.538	0.538	0.514	0.503	0.503	0.503	Line GiatTap 34.5 to GIA345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.375	0.546	0.359	0.812	0.538	0.538	0.538	0.514	0.503	0.503	0.503	Line GiatTap 34.5 to Har345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.539	0.538	0.537	0.514	0.503	0.503	0.503	Line Har345B1 34.5 to NCS345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.539	0.538	0.537	0.514	0.503	0.502	0.503	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.539	0.539	0.537	0.514	0.503	0.502	0.502	Line Har345B1 34.5 to Yig345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	NA	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.502	0.503	Line And345B1 34.5 to NRamp345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	NA	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.502	0.503	Line And345B1 34.5 to NRamp345 34.5 Circuit 2
Pit345	CSTapX20	34.5	1	54	0.375	0.546	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.503	0.503	Line Tam345B1 34.5 to Tum345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.503	0.503	Line Oro345 34.5 to SRF345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.503	0.503	Line Oro345 34.5 to SRF345 34.5 Circuit 2
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.503	0.503	Line Yig345B1 34.5 to And345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.503	0.503	Line GAA345B1 34.5 to GIA345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.502	0.503	Base system (n-0)
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.502	0.503	Line Oro345 34.5 to Vic345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.502	0.503	Line Vic345 34.5 to CSTapX20 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.502	0.503	Line CldSt345 34.5 to CSTapX21 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.502	0.503	Line Aga345 34.5 to RBa345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.502	0.503	Line Aga345 34.5 to HafaTap 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.502	0.503	Line RBa345B1 34.5 to Pag345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.502	0.503	Line Mar345B1 34.5 to Pag345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.502	0.503	Line Tam345B1 34.5 to HafaTap 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.502	0.503	Line HafaTap 34.5 to SV345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.502	0.503	Line Har345B3 34.5 to Har345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.502	0.503	Line Ded345B1 34.5 to Mar345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.502	0.503	Line NCS345 34.5 to Pott345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.502	0.503	Line Pott345 34.5 to And345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.502	0.503	Line GiatTap 34.5 to Aga345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.502	0.502	0.503	Line Ded345B1 34.5 to And345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.502	0.502	Line Tum345B1 34.5 to Har345B3 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	0.502	0.502	Line Tan345B1 34.5 to Har345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.537	0.537	0.514	0.503	0.502	0.502	Line Cab115EB 115.0 to Pit115B1 115.0 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.502	0.502	0.502	Line SV345B1 34.5 to Har345B3 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.537	0.537	0.514	0.502	0.502	0.502	Line Aga345 34.5 to Tam345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.358	0.811	0.538	0.537	0.537	0.514	0.502	0.502	0.502	Line Mac345B1 34.5 to Pag345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.81	0.537	0.537	0.537	0.514	0.502	0.502	0.502	Line Ani345B1 34.5 to Aga345 34.5 Circuit 1
Har345B1	NCS345	34.5	1	29	0.481	0.482	0.482	0.807	0.806	0.806	0.612	0.611	0.609	0.593	0.603	Line Har345B1 34.5 to Yig345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.366	0.537	0.353	0.806	0.534	0.534	0.533	0.51	0.498	0.498	0.498	Line Cab345 34.5 to Pit345 34.5 Circuit 1

Scenario 2: USMC Load at AAFB -- Voltage Violations

- There are no Voltage violations under normal system configuration with additional DoD load for both year 2016 and 2026

- Voltage violations under n-1 contingency:

Case descriptions:

Case 1: GPA projected base case load for the years 2016 and 2026 with no additional DoD load.
Case 2: Case 1 with DoD additional load for the year 2016.
Case 3: Case 2 with Piti X20 to Orote 34.5kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 4: Case 1 with DoD additional load for the year 2026.
Case 5: Case 4 with Piti X20 to Orote 34.5 kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 6: Case 5 with Harmon to Yigo 34.5 kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 7: Case 6 with Yigo CT online to relieve undervoltage and overload conditions in northern area.
Case 8: Case 7 with a new 6 MVAR capacitor bank installed at the Orote substation to relieve undervoltage conditions in southern area including substations in the Naval base.
Case 9: Case 8 with Manengon diesels online to relieve undervoltage condition at the Pulantat substation.

Voltage Violations: Violation: Voltage < 95%

Substation	kV	Case 1 (Base)	Case 2 (2016)	Case 3 (2016)	Case 4 (2026)	Case 5 (2026)	Case 6 (2026)	Case 7 (2026)	Case 8 (2026)	Case 9 (2026)	Outage description
SRF345	34.5	0.9841	0.9676	0.9851	0.9202	0.9501	0.9503	0.951	0.9645	0.965	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
SRF345	34.5	0.9841	0.9676	0.9851	0.9203	0.9501	0.9503	0.951	0.9645	0.965	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Oro345	34.5	0.9846	0.9685	0.9859	0.9219	0.9517	0.952	0.9526	0.9661	0.9666	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
Vic345	34.5	0.9846	0.9685	0.9859	0.9219	0.9517	0.952	0.9526	0.9661	0.9666	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
Oro345	34.5	0.9846	0.9685	0.986	0.922	0.9518	0.952	0.9526	0.9662	0.9666	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Vic345	34.5	0.9846	0.9685	0.986	0.922	0.9518	0.952	0.9526	0.9662	0.9666	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
CSTapX21	34.5	0.9846	0.9685	0.986	0.922	0.9518	0.952	0.9526	0.9662	0.9666	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
NRamp345	34.5	NA	1.0087	1.0087	0.9226	0.9227	0.9465	0.9629	0.9638	0.964	Line Ded345B1 34.5 to And345B1 34.5 Circuit 1
And345B1	34.5	1.0056	1.0086	1.0087	0.9246	0.9248	0.9485	0.9649	0.9658	0.966	Line Ded345B1 34.5 to And345B1 34.5 Circuit 1
Uma345	34.5	0.9723	0.9624	0.9722	0.9278	0.9433	0.9435	0.9445	0.9549	0.9578	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Pul345	34.5	0.9571	0.9516	0.9552	0.9296	0.9359	0.9361	0.9366	0.9436	0.9813	Line Pul345 34.5 to Bar345 34.5 Circuit 1
NRamp345	34.5	NA	0.9913	0.9913	0.9328	0.9329	0.9461	0.9587	0.9602	0.9605	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
Yig345B1	34.5	0.9806	0.9828	0.9828	0.9333	0.9334	0.9334	0.9766	0.9777	0.9777	Line Har345B1 34.5 to Yig345B1 34.5 Circuit 1
And345B1	34.5	0.989	0.9913	0.9913	0.9348	0.935	0.9481	0.9607	0.9622	0.9625	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
CldSt345	34.5	0.9909	0.9719	0.9751	0.9357	0.939	0.9392	0.9399	0.954	0.9547	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
Yig345B1	34.5	0.999	1.0017	1.0018	0.9365	0.9366	0.9658	0.9839	0.9848	0.9849	Line Ded345B1 34.5 to And345B1 34.5 Circuit 1
Apr345	34.5	0.9812	0.9715	0.9812	0.9372	0.9525	0.9528	0.9537	0.964	0.9669	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
CSTapX20	34.5	0.9915	0.9735	0.9766	0.9374	0.9406	0.9408	0.9415	0.9556	0.9563	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
CldSt345	34.5	0.9926	0.9767	0.9923	0.9381	0.9636	0.9638	0.9645	0.9753	0.9758	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
CldSt345	34.5	0.9926	0.9767	0.9923	0.9381	0.9636	0.9638	0.9645	0.9753	0.9758	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
Ded345B1	34.5	0.9839	0.9861	0.9861	0.9383	0.9385	0.9491	0.9591	0.9608	0.9611	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
CSTapX20	34.5	0.9933	0.9782	0.9938	0.9397	0.9652	0.9654	0.966	0.9768	0.9773	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
CSTapX20	34.5	0.9933	0.9782	0.9938	0.9397	0.9652	0.9654	0.966	0.9768	0.9773	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1

Substation	kV	Case 1 (Base)	Case 2 (2016)	Case 3 (2016)	Case 4 (2026)	Case 5 (2026)	Case 6 (2026)	Case 7 (2026)	Case 8 (2026)	Case 9 (2026)	Outage description
SRF345	34.5	0.9891	0.9775	0.9885	0.9403	0.9575	0.9577	0.9586	0.97	0.9719	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Oro345	34.5	0.9896	0.9784	0.9893	0.9419	0.9591	0.9593	0.9602	0.9716	0.9735	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Vic345	34.5	0.9896	0.9784	0.9893	0.9419	0.9591	0.9593	0.9602	0.9716	0.9735	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Tal345	34.5	0.9693	0.9638	0.9674	0.9421	0.9484	0.9486	0.9491	0.9559	0.9838	Line Pul345 34.5 to Bar345 34.5 Circuit 1
SRF345	34.5	0.9942	0.9801	0.9801	0.9435	0.9436	0.9438	0.9445	0.9585	0.9592	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
Yig345B1	34.5	0.9873	0.9894	0.9895	0.9447	0.9448	0.9653	0.9817	0.9828	0.9831	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
Oro345	34.5	0.9947	0.9809	0.981	0.9452	0.9453	0.9455	0.9462	0.9602	0.9608	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
Vic345	34.5	0.9947	0.9809	0.981	0.9452	0.9453	0.9455	0.9462	0.9602	0.9608	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
Mar345B1	34.5	0.9861	0.9881	0.9882	0.9463	0.9464	0.9552	0.9647	0.9665	0.9668	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
NRamp345	34.5	NA	0.999	0.999	0.9487	0.9489	0.9489	0.9741	0.9756	0.9756	Line Har345B1 34.5 to Yig345B1 34.5 Circuit 1
Tal345	34.5	0.9816	0.9758	0.9823	0.9488	0.9592	0.9595	0.9607	0.9684	0.9753	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
SRF345	34.5	0.9999	0.9875	0.9964	0.9495	0.9653	0.9655	0.9661	0.9782	0.9782	Line Apr345 34.5 to Oro345 34.5 Circuit 1

Scenario 2: USMC Load at AAFB -- Loading Violations

- There are no Loading violations under normal system configuration with additional DoD load for both year 2016 and 2026

- Loading violations under n-1 contingency:

Case descriptions:

Case 1: GPA projected base case load for the years 2016 and 2026 with no additional DoD load.
Case 2: Case 1 with DoD additional load for the year 2016.
Case 3: Case 2 with Piti X20 to Orote 34.5kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 4: Case 1 with DoD additional load for the year 2026.
Case 5: Case 4 with Piti X20 to Orote 34.5 kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 6: Case 5 with Harmon to Yigo 34.5 kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 7: Case 6 with Yigo CT online to relieve undervoltage and overload conditions in northern area.
Case 8: Case 7 with a new 6 MVAR capacitor bank installed at the Orote substation to relieve undervoltage conditions in southern area including substations in the Naval base.
Case 9: Case 8 with Manengon diesels online to relieve undervoltage condition at the Pulantat substation.

Loading Violations:
- Violation: Loading ≥ 100%
- Warning: Loading = 90.0% to 99.9%
- Monitor: Loading = 80.0% to 89.9%

Substation	Substation	kV	ck	Rated MVA	Case 1 (Base)	Case 2 (2016)	Case 3 (2016)	Case 4 (2026)	Case 5 (2026)	Case 6 (2026)	Case 7 (2026)	Case 8 (2026)	Case 9 (2026)	Outage description
Pit345	CSTapX20	34.5	1	54	0.652	0.927	0.558	1.449	0.864	0.863	0.862	0.821	0.803	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.652	0.927	0.558	1.449	0.864	0.863	0.862	0.821	0.803	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.622	0.819	0.53	1.163	0.752	0.751	0.749	0.721	0.697	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Har345B1	Yig345B1	34.5	1	29	0.732	0.732	0.732	1.161	1.161	0.656	0.371	0.371	0.371	Line Ded345B1 34.5 to And345B1 34.5 Circuit 1
Oro345	CSTapX20	34.5	1	54	0.489	0.555	0.36	1.062	0.66	0.659	0.658	0.622	0.603	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
Oro345	CSTapX20	34.5	1	54	0.489	0.554	0.36	1.062	0.66	0.659	0.658	0.622	0.603	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Har345B1	Yig345B1	34.5	1	29	0.732	0.732	0.732	1.009	1.008	0.594	0.363	0.362	0.362	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.399	0.612	0.388	0.979	0.622	0.622	0.622	0.588	0.588	Line Apr345 34.5 to Oro345 34.5 Circuit 1
Mar345B1	Pag345B1	34.5	1	29	0.635	0.631	0.631	0.949	0.949	0.874	0.699	0.699	0.701	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
Ded345B1	And345B1	34.5	1	42	0.557	0.556	0.556	0.929	0.929	0.929	0.534	0.533	0.534	Line Har345B1 34.5 to Yig345B1 34.5 Circuit 1
Har345B1	NCS345	34.5	1	29	0.535	0.535	0.535	0.911	0.91	0.801	0.601	0.601	0.601	Line Ded345B1 34.5 to And345B1 34.5 Circuit 1
Har345B3	Mac345B1	34.5	1	54	0.736	0.746	0.744	0.91	0.907	0.886	0.804	0.8	0.766	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
Tan345B1	Har345B1	34.5	1	54	0.544	0.546	0.546	0.906	0.906	0.906	0.651	0.651	0.651	Line Tan345B1 34.5 to Har345B3 34.5 Circuit 2
Tan345B1	Har345B3	34.5	2	54	0.544	0.545	0.545	0.906	0.906	0.906	0.651	0.651	0.651	Line Tan345B1 34.5 to Har345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.447	0.619	0.409	0.9	0.597	0.596	0.595	0.571	0.559	Line Ten345 34.5 to Tenjotap 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.405	0.592	0.384	0.896	0.584	0.584	0.583	0.559	0.539	Line Pit345 34.5 to Tenjotap 34.5 Circuit 1
NCS345	Pott345	34.5	1	29	0.512	0.513	0.513	0.881	0.881	0.773	0.573	0.573	0.573	Line Ded345B1 34.5 to And345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.416	0.594	0.39	0.873	0.577	0.577	0.577	0.553	0.51	Line Pul345 34.5 to Bar345 34.5 Circuit 1
Pott345	And345B1	34.5	1	29	0.492	0.493	0.493	0.852	0.852	0.747	0.546	0.546	0.546	Line Ded345B1 34.5 to And345B1 34.5 Circuit 1
Oro345	CSTapX21	34.5	1	54	0.383	0.535	0.535	0.839	0.838	0.838	0.837	0.796	0.777	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
Pit345	CSTapX21	34.5	1	54	0.383	0.535	0.534	0.839	0.838	0.838	0.837	0.796	0.777	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
Har345B3	Ded345B1	34.5	1	54	0.591	0.591	0.591	0.833	0.833	0.833	0.606	0.606	0.605	Line Har345B1 34.5 to Yig345B1 34.5 Circuit 1
Har345B1	Yig345B1	34.5	1	29	0.615	0.615	0.615	0.832	0.832	0.496	0.286	0.286	0.285	Line Har345B1 34.5 to NCS345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.39	0.561	0.369	0.828	0.549	0.549	0.548	0.525	0.51	Line Aga345 34.5 to Bar345 34.5 Circuit 1
Har345B1	Yig345B1	34.5	1	29	0.607	0.607	0.607	0.822	0.822	0.49	0.281	0.281	0.28	Line NCS345 34.5 to Pott345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.368	0.545	0.357	0.821	0.542	0.542	0.542	0.517	0.517	Line Pul345 34.5 to Tal345 34.5 Circuit 1

Substation	Substation	kV	ck	Rated MVA	Case 1 (Base)	Case 2 (2016)	Case 3 (2016)	Case 4 (2026)	Case 5 (2026)	Case 6 (2026)	Case 7 (2026)	Case 8 (2026)	Case 9 (2026)	Outage description
Pit345	CSTapX20	34.5	1	54	0.38	0.551	0.363	0.819	0.543	0.543	0.542	0.519	0.507	Line Har345B3 34.5 to Mac345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.38	0.551	0.363	0.818	0.543	0.542	0.541	0.518	0.506	Line Aga115 115.0 to Tam115B1 115.0 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.379	0.551	0.363	0.818	0.543	0.542	0.541	0.518	0.506	Line Pit115B1 115.0 to Har115B1 115.0 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.377	0.549	0.361	0.816	0.541	0.541	0.54	0.517	0.505	Line Cab115EB 115.0 to Aga115 115.0 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.377	0.549	0.361	0.816	0.541	0.541	0.54	0.517	0.505	Line Cab115EB 115.0 to Aga115 115.0 Circuit 2
Pit345	CSTapX20	34.5	1	54	0.378	0.549	0.361	0.815	0.54	0.54	0.539	0.516	0.505	Line Pit345 34.5 to Ani345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.376	0.547	0.36	0.815	0.54	0.54	0.539	0.516	0.504	Line Bar345 34.5 to GAA345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.377	0.547	0.36	0.813	0.539	0.539	0.538	0.515	0.504	Line Pit345 34.5 to Aga345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.376	0.547	0.36	0.813	0.539	0.539	0.538	0.515	0.504	Line Mac345B1 34.5 to GAA345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.375	0.546	0.359	0.813	0.539	0.539	0.538	0.515	0.504	Line Tan345B1 34.5 to Har345B3 34.5 Circuit 2
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.813	0.539	0.539	0.537	0.514	0.503	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.813	0.539	0.539	0.537	0.514	0.503	Line Har345B1 34.5 to Yig345B1 34.5 Circuit 1
Har345B1	Yig345B1	34.5	1	29	0.599	0.6	0.6	0.813	0.813	0.484	0.275	0.275	0.274	Line Pott345 34.5 to And345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.375	0.546	0.359	0.812	0.539	0.539	0.538	0.514	0.503	Line Tam115B1 115.0 to Har115B1 115.0 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.375	0.546	0.359	0.812	0.539	0.538	0.538	0.514	0.503	Line GiatTap 34.5 to GIA345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.375	0.546	0.359	0.812	0.539	0.538	0.538	0.514	0.503	Line GiatTap 34.5 to Har345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.539	0.538	0.537	0.514	0.503	Line Har345B1 34.5 to NCS345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.375	0.546	0.359	0.812	0.538	0.538	0.537	0.514	0.503	Line Tam345B1 34.5 to Tum345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.538	0.538	0.537	0.514	0.503	Line Oro345 34.5 to SRF345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.538	0.538	0.537	0.514	0.503	Line Oro345 34.5 to SRF345 34.5 Circuit 2
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.538	0.538	0.537	0.514	0.503	Line Aga345 34.5 to RBa345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.538	0.538	0.537	0.514	0.503	Line NCS345 34.5 to Pott345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.538	0.538	0.537	0.514	0.503	Line Pott345 34.5 to And345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.538	0.538	0.537	0.514	0.503	Line GAA345B1 34.5 to GIA345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.538	0.538	0.537	0.514	0.502	Line Ded345B1 34.5 to And345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.538	0.514	0.503	Line Yig345B1 34.5 to And345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	NA	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Line And345B1 34.5 to NRamp345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	NA	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Line And345B1 34.5 to NRamp345 34.5 Circuit 2
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Base system (n-0)
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Line Cab115EB 115.0 to Pit115B1 115.0 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Line Oro345 34.5 to Vic345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Line Vic345 34.5 to CSTapX20 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Line CidSt345 34.5 to CSTapX21 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Line Aga345 34.5 to Tam345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Line Aga345 34.5 to HafaTap 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Line RBa345B1 34.5 to Pag345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Line Mar345B1 34.5 to Pag345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Line Tam345B1 34.5 to HafaTap 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Line HafaTap 34.5 to SV345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Line Tum345B1 34.5 to Har345B3 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Line SV345B1 34.5 to Har345B3 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Line Tan345B1 34.5 to Har345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Line Har345B3 34.5 to Har345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Line Ded345B1 34.5 to Mar345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Line GiatTap 34.5 to Aga345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.358	0.811	0.538	0.538	0.537	0.514	0.503	Line Mac345B1 34.5 to Pag345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.502	Line Ani345B1 34.5 to Aga345 34.5 Circuit 1
Ded345B1	And345B1	34.5	1	42	0.465	0.465	0.465	0.807	0.807	0.735	0.519	0.519	0.52	Line Har345B1 34.5 to NCS345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.366	0.537	0.353	0.806	0.534	0.534	0.533	0.51	0.498	Line Cab345 34.5 to Pit345 34.5 Circuit 1
Yig345B1	And345B1	34.5	1	29	0.265	0.269	0.269	0.571	0.571	0.646	0.818	0.816	0.816	Line Ded345B1 34.5 to And345B1 34.5 Circuit 1

Scenario 3: USMC Load at Barrigada -- Voltage Violations

- There are no Voltage violations under normal system configuration with additional DoD load for both year 2016 and 2026

- Voltage violations under n-1 contingency:

Case descriptions:

Case 1: GPA projected base case load for the years 2016 and 2026 with no additional DoD load.
Case 2: Case 1 with DoD additional load for the year 2016.
Case 3: Case 2 with Piti X20 to Orote 34.5kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 4: Case 1 with DoD additional load for the year 2026.
Case 5: Case 4 with Piti X20 to Orote 34.5 kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 6: Case 5 with Harmon to Yigo 34.5 kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 7: Case 6 with Yigo CT online to relieve undervoltage and overload conditions in northern area.
Case 8: Case 7 with a new 6 MVAR capacitor bank installed at the Orote substation to relieve undervoltage conditions in southern area including substations in the Naval base.
Case 9: Case 8 with Manengon diesels online to relieve undervoltage condition at the Pulantat substation.

Voltage Violations: Violation: Voltage < 95%

Substation	kV	Case 1 (Base)	Case 2 (2016)	Case 3 (2016)	Case 4 (2026)	Case 5 (2026)	Case 6 (2026)	Case 7 (2026)	Case 8 (2026)	Case 9 (2026)	Outage description
SRF345	34.5	0.9841	0.9676	0.9851	0.9198	0.9499	0.9501	0.9505	0.9641	0.9645	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
SRF345	34.5	0.9841	0.9676	0.9851	0.9199	0.9499	0.9501	0.9505	0.9641	0.9645	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Oro345	34.5	0.9846	0.9685	0.9859	0.9215	0.9516	0.9517	0.9521	0.9657	0.9661	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
Vic345	34.5	0.9846	0.9685	0.9859	0.9215	0.9516	0.9517	0.9521	0.9657	0.9661	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
Oro345	34.5	0.9846	0.9685	0.986	0.9216	0.9516	0.9518	0.9521	0.9657	0.9661	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Vic345	34.5	0.9846	0.9685	0.986	0.9216	0.9516	0.9518	0.9521	0.9657	0.9661	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
CSTapX21	34.5	0.9846	0.9685	0.986	0.9216	0.9516	0.9518	0.9521	0.9657	0.9661	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Uma345	34.5	0.9723	0.9624	0.9722	0.9268	0.9424	0.9426	0.9433	0.954	0.9563	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Pul345	34.5	0.9571	0.9516	0.9552	0.9296	0.936	0.9361	0.9365	0.9435	0.9773	Line Pul345 34.5 to Bar345 34.5 Circuit 1
CldSt345	34.5	0.9909	0.9719	0.9751	0.9354	0.9387	0.9389	0.9394	0.9536	0.9541	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
Apr345	34.5	0.9812	0.9715	0.9812	0.9363	0.9516	0.9519	0.9526	0.9632	0.9654	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
CSTapX20	34.5	0.9915	0.9735	0.9766	0.937	0.9403	0.9405	0.941	0.9552	0.9557	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
CldSt345	34.5	0.9926	0.9767	0.9923	0.9378	0.9635	0.9637	0.964	0.9749	0.9753	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
CldSt345	34.5	0.9926	0.9767	0.9923	0.9378	0.9635	0.9637	0.9641	0.9749	0.9753	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
CSTapX20	34.5	0.9933	0.9782	0.9938	0.9394	0.965	0.9652	0.9656	0.9764	0.9769	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
CSTapX20	34.5	0.9933	0.9782	0.9938	0.9394	0.965	0.9652	0.9656	0.9764	0.9769	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
SRF345	34.5	0.9891	0.9775	0.9885	0.9398	0.9571	0.9572	0.9579	0.9695	0.9711	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Oro345	34.5	0.9896	0.9784	0.9893	0.9414	0.9587	0.9589	0.9595	0.9711	0.9727	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Vic345	34.5	0.9896	0.9784	0.9893	0.9414	0.9587	0.9589	0.9595	0.9711	0.9727	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Tal345	34.5	0.9693	0.9638	0.9674	0.9421	0.9484	0.9485	0.9489	0.9558	0.9812	Line Pul345 34.5 to Bar345 34.5 Circuit 1
SRF345	34.5	0.9942	0.9801	0.9801	0.9432	0.9433	0.9435	0.944	0.9581	0.9586	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
Oro345	34.5	0.9947	0.9809	0.981	0.9449	0.945	0.9452	0.9457	0.9598	0.9602	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
Vic345	34.5	0.9947	0.9809	0.981	0.9449	0.945	0.9452	0.9457	0.9598	0.9602	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1

Substation	kV	Case 1 (Base)	Case 2 (2016)	Case 3 (2016)	Case 4 (2026)	Case 5 (2026)	Case 6 (2026)	Case 7 (2026)	Case 8 (2026)	Case 9 (2026)	Outage description
Tal345	34.5	0.9816	0.9758	0.9823	0.9466	0.9572	0.9575	0.9585	0.9666	0.9724	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
SRF345	34.5	0.9999	0.9875	0.9964	0.9495	0.9653	0.9655	0.9659	0.9781	0.9779	Line Apr345 34.5 to Oro345 34.5 Circuit 1
Uma345	34.5	0.9889	0.9803	0.9894	0.9498	0.9658	0.966	0.9664	0.9748	0.9752	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Uma345	34.5	0.9889	0.9803	0.9894	0.9498	0.9658	0.966	0.9664	0.9748	0.9752	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
Ylg345B1	34.5	0.9806	0.9828	0.9828	0.9498	0.95	0.95	0.9869	0.9879	0.9879	Line Har345B1 34.5 to Ylg345B1 34.5 Circuit 1

Scenario 3: USMC Load at Barrigada -- Loading Violations

- There are no Loading violations under normal system configuration with additional DoD load for both year 2016 and 2026

- Loading violations under n-1 contingency:

Case descriptions:

Case 1: GPA projected base case load for the years 2016 and 2026 with no additional DoD load.
Case 2: Case 1 with DoD additional load for the year 2016.
Case 3: Case 2 with Piti X20 to Orote 34.5kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 4: Case 1 with DoD additional load for the year 2026.
Case 5: Case 4 with Piti X20 to Orote 34.5 kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 6: Case 5 with Harmon to Yigo 34.5 kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 7: Case 6 with Yigo CT online to relieve undervoltage and overload conditions in northern area.
Case 8: Case 7 with a new 6 MVAR capacitor bank installed at the Orote substation to relieve undervoltage conditions in southern area including substations in the Naval base.
Case 9: Case 8 with Manengon diesels online to relieve undervoltage condition at the Pulantat substation.

Loading Violations:
- Violation: Loading ≥ 100%
- Warning: Loading = 90.0% to 99.9%
- Monitor: Loading = 80.0% to 89.9%

Substation	Substation	kV	ck	Rated MVA	Case 1 (Base)	Case 2 (2016)	Case 3 (2016)	Case 4 (2026)	Case 5 (2026)	Case 6 (2026)	Case 7 (2026)	Case 8 (2026)	Case 9 (2026)	Outage description
Pit345	CSTapX20	34.5	1	54	0.652	0.927	0.558	1.454	0.866	0.866	0.865	0.824	0.806	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.652	0.927	0.558	1.454	0.866	0.866	0.865	0.824	0.806	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.622	0.819	0.53	1.168	0.755	0.755	0.753	0.725	0.701	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Oro345	CSTapX20	34.5	1	54	0.489	0.555	0.36	1.067	0.662	0.662	0.661	0.625	0.606	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
Oro345	CSTapX20	34.5	1	54	0.489	0.554	0.36	1.067	0.662	0.662	0.661	0.625	0.606	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Har345B1	Yig345B1	34.5	1	29	0.732	0.732	0.732	0.983	0.983	0.558	0.28	0.28	0.28	Line Ded345B1 34.5 to And345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.399	0.612	0.388	0.979	0.622	0.622	0.622	0.589	0.589	Line Apr345 34.5 to Oro345 34.5 Circuit 1
Har345B3	Mac345B1	34.5	1	54	0.736	0.746	0.744	0.934	0.931	0.913	0.833	0.829	0.796	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
Tan345B1	Har345B3	34.5	2	54	0.544	0.545	0.545	0.906	0.906	0.906	0.651	0.651	0.651	Line Tan345B1 34.5 to Har345B1 34.5 Circuit 1
Tan345B1	Har345B1	34.5	1	54	0.544	0.546	0.546	0.905	0.905	0.905	0.651	0.65	0.65	Line Tan345B1 34.5 to Har345B3 34.5 Circuit 2
Har345B1	Yig345B1	34.5	1	29	0.732	0.732	0.732	0.905	0.905	0.535	0.306	0.306	0.305	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.447	0.619	0.409	0.903	0.598	0.598	0.597	0.573	0.561	Line Ten345 34.5 to Tenjotap 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.405	0.592	0.384	0.9	0.587	0.587	0.586	0.562	0.542	Line Pit345 34.5 to Tenjotap 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.416	0.594	0.39	0.873	0.577	0.577	0.577	0.553	0.511	Line Pul345 34.5 to Bar345 34.5 Circuit 1
Har345B3	Mac345B1	34.5	1	54	0.693	0.704	0.701	0.872	0.866	0.867	0.835	0.831	0.762	Line Aga345 34.5 to Bar345 34.5 Circuit 1
Oro345	CSTapX21	34.5	1	54	0.383	0.535	0.535	0.842	0.841	0.841	0.84	0.799	0.78	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
Pit345	CSTapX21	34.5	1	54	0.383	0.535	0.534	0.842	0.841	0.841	0.84	0.799	0.78	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.39	0.561	0.369	0.834	0.553	0.553	0.552	0.528	0.514	Line Aga345 34.5 to Bar345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	NA	NA	NA	0.822	0.545	0.545	0.545	0.522	0.509	Line NBar345 34.5 to GAA345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.38	0.551	0.363	0.822	0.545	0.545	0.544	0.521	0.509	Line Har345B3 34.5 to Mac345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.368	0.545	0.357	0.821	0.542	0.542	0.542	0.517	0.517	Line Pul345 34.5 to Tal345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.379	0.551	0.363	0.821	0.544	0.544	0.543	0.52	0.508	Line Pit115B1 115.0 to Har115B1 115.0 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.38	0.551	0.363	0.82	0.544	0.544	0.543	0.52	0.508	Line Aga115 115.0 to Tam115B1 115.0 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.377	0.549	0.361	0.819	0.543	0.543	0.542	0.519	0.507	Line Cab115EB 115.0 to Aga115 115.0 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.377	0.549	0.361	0.819	0.543	0.543	0.542	0.519	0.507	Line Cab115EB 115.0 to Aga115 115.0 Circuit 2

Substation	Substation	kV	ck	Rated MVA	Case 1 (Base)	Case 2 (2016)	Case 3 (2016)	Case 4 (2026)	Case 5 (2026)	Case 6 (2026)	Case 7 (2026)	Case 8 (2026)	Case 9 (2026)	Outage description
Pit345	CSTapX20	34.5	1	54	0.378	0.549	0.361	0.817	0.542	0.542	0.541	0.518	0.507	Line Pit345 34.5 to Ani345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.376	0.547	0.36	0.817	0.542	0.542	0.541	0.518	0.507	Line Mac345B1 34.5 to GAA345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.377	0.547	0.36	0.816	0.541	0.541	0.54	0.517	0.506	Line Pit345 34.5 to Aga345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.375	0.546	0.359	0.816	0.541	0.541	0.54	0.517	0.506	Line Tan345B1 34.5 to Har345B3 34.5 Circuit 2
Pit345	CSTapX20	34.5	1	54	0.375	0.546	0.359	0.815	0.54	0.54	0.54	0.516	0.505	Line GiatTap 34.5 to GIA345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.375	0.546	0.359	0.815	0.54	0.54	0.54	0.516	0.505	Line GiatTap 34.5 to Har345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.375	0.546	0.359	0.815	0.54	0.54	0.539	0.516	0.505	Line Tam115B1 115.0 to Har115B1 115.0 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.815	0.54	0.54	0.539	0.516	0.505	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.815	0.54	0.54	0.539	0.515	0.505	Line Har345B1 34.5 to Yig345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.375	0.546	0.359	0.814	0.54	0.54	0.539	0.516	0.505	Line Tam345B1 34.5 to Tum345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.54	0.54	0.539	0.516	0.505	Line Oro345 34.5 to SRF345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.54	0.54	0.539	0.516	0.505	Line Oro345 34.5 to SRF345 34.5 Circuit 2
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.54	0.54	0.539	0.516	0.505	Line Aga345 34.5 to RBa345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.54	0.54	0.539	0.516	0.505	Line RBa345B1 34.5 to Pag345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.54	0.54	0.539	0.516	0.505	Line Tam345B1 34.5 to HafaTap 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.54	0.54	0.539	0.516	0.505	Line HafaTap 34.5 to SV345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.54	0.54	0.539	0.516	0.505	Line Ded345B1 34.5 to And345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.54	0.54	0.539	0.516	0.505	Line Har345B1 34.5 to NCS345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.54	0.54	0.539	0.516	0.505	Line NCS345 34.5 to Pott345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.54	0.54	0.539	0.516	0.505	Line Pott345 34.5 to And345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.54	0.54	0.539	0.516	0.505	Line GAA345B1 34.5 to GIA345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.539	0.54	0.539	0.516	0.505	Line Yig345B1 34.5 to And345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	NA	0.545	0.359	0.814	0.54	0.539	0.539	0.516	0.505	Line And345B1 34.5 to NRamp345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	NA	0.545	0.359	0.814	0.54	0.539	0.539	0.516	0.505	Line And345B1 34.5 to NRamp345 34.5 Circuit 2
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.539	0.539	0.539	0.516	0.505	Base system (n-0)
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.539	0.539	0.539	0.516	0.505	Line Oro345 34.5 to Vic345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.539	0.539	0.539	0.516	0.505	Line Vic345 34.5 to CSTapX20 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.539	0.539	0.539	0.516	0.505	Line CldSt345 34.5 to CSTapX21 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.539	0.539	0.539	0.516	0.505	Line Aga345 34.5 to HafaTap 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.539	0.539	0.539	0.516	0.505	Line Mar345B1 34.5 to Pag345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.539	0.539	0.539	0.516	0.505	Line Tum345B1 34.5 to Har345B3 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.539	0.539	0.539	0.516	0.505	Line Tan345B1 34.5 to Har345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.539	0.539	0.539	0.516	0.505	Line Har345B3 34.5 to Har345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.539	0.539	0.539	0.516	0.505	Line Ded345B1 34.5 to Mar345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.539	0.539	0.539	0.516	0.505	Line GiatTap 34.5 to Aga345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.539	0.539	0.539	0.515	0.505	Line Cab115EB 115.0 to Pit115B1 115.0 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.814	0.539	0.539	0.539	0.515	0.505	Line SV345B1 34.5 to Har345B3 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.358	0.814	0.539	0.539	0.539	0.515	0.505	Line Mac345B1 34.5 to Pag345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	NA	NA	NA	0.814	0.54	0.54	0.539	0.516	0.504	Line Bar345 34.5 to NBar345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.813	0.539	0.539	0.539	0.515	0.505	Line Aga345 34.5 to Tam345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.813	0.539	0.539	0.539	0.515	0.505	Line Ani345B1 34.5 to Aga345 34.5 Circuit 1
Mar345B1	Pag345B1	34.5	1	29	0.635	0.631	0.631	0.812	0.812	0.747	0.576	0.577	0.579	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.366	0.537	0.353	0.809	0.536	0.536	0.535	0.512	0.5	Line Cab345 34.5 to Pit345 34.5 Circuit 1
Oro345	CSTapX21	34.5	1	54	0.436	0.542	0.451	0.802	0.664	0.664	0.662	0.636	0.614	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Pit345	CSTapX21	34.5	1	54	0.436	0.542	0.451	0.802	0.664	0.663	0.662	0.636	0.614	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1

Scenario 4: USMC Load at Radio Barrigada -- Voltage Violations

- There are no Voltage violations under normal system configuration with additional DoD load for both year 2016 and 2026

- Voltage violations under n-1 contingency:

Case descriptions:

Case 1: GPA projected base case load for the years 2016 and 2026 with no additional DoD load.
Case 2: Case 1 with DoD additional load for the year 2016.
Case 3: Case 2 with Piti X20 to Orote 34.5kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 4: Case 1 with DoD additional load for the year 2026.
Case 5: Case 4 with Piti X20 to Orote 34.5 kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 6: Case 5 with Harmon to Yigo 34.5 kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 7: Case 6 with Yigo CT online to relieve undervoltage and overload conditions in northern area.
Case 8: Case 7 with a new 6 MVAR capacitor bank installed at the Orote substation to relieve undervoltage conditions in southern area including substations in the Naval base.
Case 9: Case 8 with Manengon diesels online to relieve undervoltage condition at the Pulantat substation.

Voltage Violations: Violation: Voltage < 95%

Substation	kV	Case 1 (Base)	Case 2 (2016)	Case 3 (2016)	Case 4 (2026)	Case 5 (2026)	Case 6 (2026)	Case 7 (2026)	Case 8 (2026)	Case 9 (2026)	Outage description
SRF345	34.5	0.9841	0.9676	0.9851	0.9196	0.9495	0.9497	0.9503	0.9638	0.964	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
SRF345	34.5	0.9841	0.9676	0.9851	0.9197	0.9495	0.9497	0.9503	0.9638	0.964	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Oro345	34.5	0.9846	0.9685	0.9859	0.9213	0.9512	0.9513	0.9519	0.9654	0.9656	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
Vic345	34.5	0.9846	0.9685	0.9859	0.9213	0.9512	0.9513	0.9519	0.9654	0.9656	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
Oro345	34.5	0.9846	0.9685	0.986	0.9214	0.9512	0.9513	0.9519	0.9654	0.9656	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Vic345	34.5	0.9846	0.9685	0.986	0.9214	0.9512	0.9513	0.9519	0.9654	0.9656	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
CSTapX21	34.5	0.9846	0.9685	0.986	0.9214	0.9512	0.9513	0.9519	0.9654	0.9656	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Uma345	34.5	0.9723	0.9624	0.9722	0.927	0.9425	0.9427	0.9436	0.954	0.9561	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Pul345	34.5	0.9571	0.9516	0.9552	0.9289	0.9353	0.9355	0.9359	0.9429	0.9771	Line Pul345 34.5 to Bar345 34.5 Circuit 1
CldSt345	34.5	0.9909	0.9719	0.9751	0.9351	0.9384	0.9386	0.9392	0.9534	0.9536	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
Apr345	34.5	0.9812	0.9715	0.9812	0.9364	0.9518	0.952	0.9529	0.9632	0.9652	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
CSTapX20	34.5	0.9915	0.9735	0.9766	0.9368	0.94	0.9402	0.9408	0.9549	0.9552	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
CldSt345	34.5	0.9926	0.9767	0.9923	0.9375	0.963	0.9632	0.9637	0.9746	0.9748	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
CldSt345	34.5	0.9926	0.9767	0.9923	0.9375	0.963	0.9632	0.9637	0.9746	0.9748	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
CSTapX20	34.5	0.9933	0.9782	0.9938	0.9391	0.9646	0.9648	0.9653	0.9761	0.9763	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
CSTapX20	34.5	0.9933	0.9782	0.9938	0.9391	0.9646	0.9648	0.9653	0.9761	0.9764	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
SRF345	34.5	0.9891	0.9775	0.9885	0.9395	0.9568	0.957	0.9578	0.9692	0.9707	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Oro345	34.5	0.9896	0.9784	0.9893	0.9412	0.9584	0.9586	0.9594	0.9708	0.9723	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Vic345	34.5	0.9896	0.9784	0.9893	0.9412	0.9584	0.9586	0.9594	0.9708	0.9723	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Tal345	34.5	0.9693	0.9638	0.9674	0.9415	0.9478	0.948	0.9483	0.9553	0.9809	Line Pul345 34.5 to Bar345 34.5 Circuit 1
SRF345	34.5	0.9942	0.9801	0.9801	0.9429	0.943	0.9432	0.9438	0.9579	0.9582	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
Oro345	34.5	0.9947	0.9809	0.981	0.9446	0.9447	0.9448	0.9454	0.9595	0.9598	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
Vic345	34.5	0.9947	0.9809	0.981	0.9446	0.9447	0.9448	0.9454	0.9595	0.9598	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1

Substation	kV	Case 1 (Base)	Case 2 (2016)	Case 3 (2016)	Case 4 (2026)	Case 5 (2026)	Case 6 (2026)	Case 7 (2026)	Case 8 (2026)	Case 9 (2026)	Outage description
Tal345	34.5	0.9816	0.9758	0.9823	0.948	0.9584	0.9587	0.9597	0.9674	0.9727	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Yig345B1	34.5	0.9806	0.9828	0.9828	0.9485	0.9487	0.9487	0.9861	0.987	0.987	Line Har345B1 34.5 to Yig345B1 34.5 Circuit 1
SRF345	34.5	0.9999	0.9875	0.9964	0.9489	0.9647	0.9648	0.9654	0.9775	0.9772	Line Apr345 34.5 to Oro345 34.5 Circuit 1
Uma345	34.5	0.9889	0.9803	0.9894	0.9498	0.9657	0.9658	0.9663	0.9747	0.9749	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Uma345	34.5	0.9889	0.9803	0.9894	0.9498	0.9657	0.9658	0.9663	0.9747	0.9749	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
SRF345	34.5	0.996	0.9847	0.9901	0.95	0.959	0.9592	0.9599	0.9713	0.9717	Line Cab345 34.5 to Pit345 34.5 Circuit 1

Scenario 4: USMC Load at Radio Barrigada -- Loading Violations

- There are no Loading violations under normal system configuration with additional DoD load for both year 2016 and 2026

- Loading violations under n-1 contingency:

Case descriptions:

Case 1: GPA projected base case load for the years 2016 and 2026 with no additional DoD load.
Case 2: Case 1 with DoD additional load for the year 2016.
Case 3: Case 2 with Piti X20 to Orote 34.5kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 4: Case 1 with DoD additional load for the year 2026.
Case 5: Case 4 with Piti X20 to Orote 34.5 kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 6: Case 5 with Harmon to Yigo 34.5 kV overhead transmission line upgrade from 4/0 CU to 927 kcmil AL.
Case 7: Case 6 with Yigo CT online to relieve undervoltage and overload conditions in northern area.
Case 8: Case 7 with a new 6 MVAR capacitor bank installed at the Orote substation to relieve undervoltage conditions in southern area including substations in the Naval base.
Case 9: Case 8 with Manengon diesels online to relieve undervoltage condition at the Pulantat substation.

Loading Violations:
- Violation: Loading ≥ 100%
- Warning: Loading = 90.0% to 99.9%
- Monitor: Loading = 80.0% to 89.9%

Substation	Substation	kV	ck	Rated MVA	Case 1 (Base)	Case 2 (2016)	Case 3 (2016)	Case 4 (2026)	Case 5 (2026)	Case 6 (2026)	Case 7 (2026)	Case 8 (2026)	Case 9 (2026)	Outage description
Pit345	CSTapX20	34.5	1	54	0.652	0.927	0.558	1.45	0.864	0.864	0.863	0.822	0.804	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.652	0.927	0.558	1.45	0.864	0.864	0.862	0.822	0.804	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.622	0.819	0.53	1.164	0.752	0.752	0.75	0.722	0.699	Line Apr345 34.5 to Tenjotap 34.5 Circuit 1
Oro345	CSTapX20	34.5	1	54	0.489	0.555	0.36	1.062	0.66	0.66	0.659	0.622	0.604	Line Oro345 34.5 to CSTapX21 34.5 Circuit 1
Oro345	CSTapX20	34.5	1	54	0.489	0.554	0.36	1.062	0.66	0.66	0.659	0.622	0.603	Line Pit345 34.5 to CSTapX21 34.5 Circuit 1
Har345B1	Yig345B1	34.5	1	29	0.732	0.732	0.732	0.983	0.983	0.558	0.28	0.28	0.28	Line Ded345B1 34.5 to And345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.399	0.612	0.388	0.98	0.623	0.623	0.622	0.589	0.589	Line Apr345 34.5 to Oro345 34.5 Circuit 1
Har345B1	Yig345B1	34.5	1	29	0.732	0.732	0.732	0.921	0.921	0.544	0.315	0.315	0.314	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
Har345B3	Mac345B1	34.5	1	54	0.736	0.746	0.744	0.914	0.911	0.891	0.811	0.808	0.775	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
Tan345B1	Har345B3	34.5	2	54	0.544	0.545	0.545	0.906	0.906	0.906	0.651	0.651	0.651	Line Tan345B1 34.5 to Har345B1 34.5 Circuit 1
Tan345B1	Har345B1	34.5	1	54	0.544	0.546	0.546	0.905	0.905	0.905	0.651	0.65	0.65	Line Tan345B1 34.5 to Har345B3 34.5 Circuit 2
Pit345	CSTapX20	34.5	1	54	0.447	0.619	0.409	0.901	0.597	0.597	0.596	0.572	0.56	Line Ten345 34.5 to Tenjotap 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.405	0.592	0.384	0.897	0.584	0.584	0.583	0.559	0.54	Line Pit345 34.5 to Tenjotap 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.416	0.594	0.39	0.874	0.577	0.577	0.577	0.553	0.511	Line Pul345 34.5 to Bar345 34.5 Circuit 1
Oro345	CSTapX21	34.5	1	54	0.383	0.535	0.535	0.839	0.839	0.838	0.837	0.796	0.778	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
Pit345	CSTapX21	34.5	1	54	0.383	0.535	0.534	0.839	0.839	0.838	0.837	0.796	0.778	Line Pit345 34.5 to CSTapX20 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.39	0.561	0.369	0.827	0.549	0.549	0.548	0.525	0.511	Line Aga345 34.5 to Bar345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.368	0.545	0.357	0.821	0.542	0.542	0.542	0.518	0.518	Line Pul345 34.5 to Tal345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.38	0.551	0.363	0.82	0.544	0.543	0.542	0.519	0.508	Line Har345B3 34.5 to Mac345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.379	0.551	0.363	0.818	0.543	0.543	0.542	0.518	0.507	Line Pit115B1 115.0 to Har115B1 115.0 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.38	0.551	0.363	0.818	0.543	0.542	0.541	0.518	0.507	Line Aga115 115.0 to Tam115B1 115.0 Circuit 1

Substation	Substation	kV	ck	Rated MVA	Case 1 (Base)	Case 2 (2016)	Case 3 (2016)	Case 4 (2026)	Case 5 (2026)	Case 6 (2026)	Case 7 (2026)	Case 8 (2026)	Case 9 (2026)	Outage description
Pit345	CSTapX20	34.5	1	54	0.377	0.549	0.361	0.816	0.541	0.541	0.54	0.517	0.506	Line Cab115EB 115.0 to Aga115 115.0 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.377	0.549	0.361	0.816	0.541	0.541	0.54	0.517	0.506	Line Cab115EB 115.0 to Aga115 115.0 Circuit 2
Pit345	CSTapX20	34.5	1	54	0.376	0.547	0.36	0.816	0.541	0.541	0.54	0.517	0.505	Line Bar345 34.5 to GAA345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.378	0.549	0.361	0.815	0.541	0.541	0.54	0.517	0.506	Line Pit345 34.5 to Ani345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.376	0.547	0.36	0.814	0.54	0.54	0.539	0.516	0.505	Line Mac345B1 34.5 to GAA345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.377	0.547	0.36	0.814	0.54	0.539	0.539	0.516	0.505	Line Pit345 34.5 to Aga345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.375	0.546	0.359	0.814	0.54	0.539	0.539	0.515	0.505	Line Tan345B1 34.5 to Har345B3 34.5 Circuit 2
Pit345	CSTapX20	34.5	1	54	0.375	0.546	0.359	0.813	0.539	0.539	0.538	0.515	0.504	Line Tam115B1 115.0 to Har115B1 115.0 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.375	0.546	0.359	0.813	0.539	0.539	0.538	0.515	0.504	Line GiatTap 34.5 to GIA345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.375	0.546	0.359	0.813	0.539	0.539	0.538	0.515	0.504	Line GiatTap 34.5 to Har345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.813	0.539	0.539	0.537	0.514	0.504	Line Har345B3 34.5 to Ded345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.813	0.539	0.539	0.537	0.514	0.504	Line Har345B1 34.5 to Ylg345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.539	0.538	0.538	0.515	0.504	Line GAA345B1 34.5 to GIA345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.375	0.546	0.359	0.812	0.539	0.538	0.538	0.514	0.504	Line Tam345B1 34.5 to Tum345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.538	0.538	0.538	0.514	0.504	Line Oro345 34.5 to SRF345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.538	0.538	0.538	0.514	0.504	Line Oro345 34.5 to SRF345 34.5 Circuit 2
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.539	0.538	0.537	0.514	0.504	Line Har345B1 34.5 to NCS345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.539	0.538	0.537	0.514	0.504	Line NCS345 34.5 to Pott345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	NA	0.545	0.359	0.812	0.538	0.538	0.537	0.514	0.504	Line And345B1 34.5 to NRamp345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	NA	0.545	0.359	0.812	0.538	0.538	0.537	0.514	0.504	Line And345B1 34.5 to NRamp345 34.5 Circuit 2
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.538	0.538	0.537	0.514	0.504	Line Aga345 34.5 to RBa345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.538	0.538	0.537	0.514	0.504	Line RBa345B1 34.5 to Pag345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.538	0.538	0.537	0.514	0.504	Line Tam345B1 34.5 to HafaTap 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.538	0.538	0.537	0.514	0.504	Line HafaTap 34.5 to SV345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.538	0.538	0.537	0.514	0.504	Line Ded345B1 34.5 to And345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.812	0.538	0.538	0.537	0.514	0.504	Line Pott345 34.5 to And345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.538	0.514	0.504	Line Ylg345B1 34.5 to And345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.504	Base system (n-0)
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.504	Line Cab115EB 115.0 to Pit115B1 115.0 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.504	Line Oro345 34.5 to Vic345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.504	Line Vic345 34.5 to CSTapX20 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.504	Line CidSt345 34.5 to CSTapX21 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.504	Line Aga345 34.5 to Tam345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.504	Line Aga345 34.5 to HafaTap 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.504	Line Mar345B1 34.5 to Pag345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.504	Line Tum345B1 34.5 to Har345B3 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.504	Line Tan345B1 34.5 to Har345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.504	Line Har345B3 34.5 to Har345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.504	Line Ded345B1 34.5 to Mar345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.504	Line GiatTap 34.5 to Aga345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Line Ani345B1 34.5 to Aga345 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.359	0.811	0.538	0.538	0.537	0.514	0.503	Line SV345B1 34.5 to Har345B3 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.374	0.545	0.358	0.811	0.538	0.538	0.537	0.514	0.503	Line Mac345B1 34.5 to Pag345B1 34.5 Circuit 1
Pit345	CSTapX20	34.5	1	54	0.366	0.537	0.353	0.807	0.535	0.534	0.534	0.51	0.499	Line Cab345 34.5 to Pit345 34.5 Circuit 1
Har345B3	Mac345B1	34.5	1	54	0.693	0.704	0.701	0.8	0.795	0.796	0.764	0.76	0.693	Line Aga345 34.5 to Bar345 34.5 Circuit 1

Attachment C

Presentation to the Guam Legislature

On the DoD DSEIS

June 2, 2014

Joaquin C. Flores, P.E., General Manager

DSEIS

CCU and GPA remains committed to the notion that:

Civilian ratepayers should be shielded from direct and indirect cost impacts resulting from the proposed buildup.

DoD remains a GPA customer.

DSEIS Reduces Cantonment Size from 20 MW to 5.7 MW

- No impact to Generation requirements
- Identifies fewer T&D related upgrades from 2010 FEIS
- Unclear about other DoD growth that may or may not be related to Marine Relocation

2010 FEIS vs 2014 DSEIS

	2010 FEIS	2013 Coordination Meetings	2014 DSEIS
Scope	Navy, Air Force, & Marines	Navy, Air Force, & Marines	Marines
Load	70 MW	52.6 MW	5.7 MW
Timing	2010 - 2019	2016 - 2026	2020 - 2026
Generation Upgrades	Recondition 5 existing GPA permitted facilities to provide peaking power/reserve capacity	Silent	Silent
T&D Upgrades	22 Distinct Projects (Estimated at $122M)	6 to 10 Distinct Projects (Estimated at $26M to $35M)	2 to 3 Distinct Projects (Estimated at $13.6M to $14.6M)

Going Forward

GPA must ensure

- DoD growth is considered in the final SEIS
- All T&D projects related to Military Buildup are properly funded ($26M to $35M)
- Generation facilities are able to support additional Military Buildup Load

THERE IS ENOUGH POWER GENERATION CAPACITY

GPA Generation Capacity: 526 MW

Current Peak: 242 MW

Excess Generation Capacity: = 284 MW

GPA & DOD agree there is sufficient baseload generation capacity to support the reduced military build up

GPA Securing More Reliable and Efficient Generation

- Legislature has approved GPA to secure bond funds for Liquefied Natural Gas (LNG) Initial Start Up
- Estimated Timeline for new LNG Plant is 2022
- LNG Plants will provide increased efficiency and reduce operating expenses

Military Build Up Must Consider GPA's Needs for

Available Lands for Generation Expansion

- Marbo CT Area
- Old Piti Power Plants

Joint Easements for Pipelines

Proper Cost Allocation for Maintenance of Assets

Generation Challenges

Legislation to Increase GPA's Renewable Portfolio

Intermittency of Renewable Energy from the following sources needs to be mitigated

- Solar/Wind Independent Power Producers
- Distributed Solar Photovoltaic
- Distributed Wind Turbines

Transmission & Distribution

- T&D System Upgrades and new T&D Infrastructure needed to mitigate direct, indirect, and induced impacts of Build Up
- DOD remains a transmission level customer of GPA
- Agreement needs to be reached between DoD & GPA regarding T&D projects (transmission lines and substations) directly related to Marine Relocation as well as other DoD Military Build Up activities
- Other cost requirements to resolve:
  - Program Management Office (PMO), Environmental Studies and Archaeological Services

Summary

DOD/US Govt. should pay for its impact, direct and indirect.

- Projects listed in the DSEIS address only the Marine Relocation. Other projects are necessary to address military load growth overall. We need to determine exactly which projects will be funded by the DoD to ensure GPA is in a position to support the Military Build Up.

Ensure "One Guam", "Green Guam" and "the buildup cannot be a burden to the people of Guam" is followed

If funded in a sufficient and timely manner, the "preferred solutions" as summarized in the FEIS (2010) or the alternative solutions proposed in the current DSEIS are achievable and can provide benefits for existing and future utility customers.

Si Yu'os Ma'ase