



**ORIENTAL MINDORO ELECTRIC COOPERATIVE, INC.
(ORMECO, INC.)**

**41MW GUARANTEED DEPENDABLE
CAPACITY**

SYSTEM IMPACT STUDY

AUGUST 01, 2022

EXECUTIVE SUMMARY

Oriental Mindoro Electric Cooperative, Inc. (ORMECO, Inc.) intends to establish a 41MW Guaranteed Dependable Capacity New Power Provider, the "NPP," in Calapan City (8MW for baseload) and Roxas (30MW for load following and 3MW for peaking), Oriental Mindoro. The goal of this project is to address the increasing power demand and to ensure the stability of the Oriental Mindoro system from June 2023 to October 2030.

The outcome of a System Impact Study (SIS), which involved conducting technical evaluations to determine the NPP's impact on NAPOCOR's transmission and ORMECO's distribution systems in accordance with the Philippines Grid Code (PGC), Philippine Distribution Code (PDC), and Philippine Small Grid Guidelines (PSGG). The technical analyses performed at system peak loading conditions, both with and without the NPP, include load flow analysis; thermal and voltage assessment.

RESULTS OF SYSTEM IMPACT STUDY

Thermal Assessment: The thermal loading of the NAPOCOR transmission lines, ORMECO distribution lines, and some of the power transformers indicates that the system was overloaded prior to the entry of the NPP. Since 2019, there has been a recommendation for the reconductoring of distribution lines for feeders RX100 (R8A), CA100 (R2A), CA200 (R2B), and CA300 (R2C), the uprating of power transformers at Minolo, Naujan, Socorro, and Roxas Substations, additional capacity at Pinamalayan Substation, and the construction of new substations at San Teodoro and Mansalay. These projects were included in ORMECO, Inc.'s Multi-Year Capital Expenditure for the years 2022 to 2026.

Considering all ORMECO, Inc.'s CAPEX projects for the year 2022-2026 has been implemented, the entry of the NPP will have no significant adverse effect in the degradation of the existing system and improves security to both transmission and distribution systems. Upon implementation of the CAPEX Projects and the installation of the NPP, substation power transformers will be within the allowable percent loading of seventy percent (70%).

Voltage Assessment: There was a low voltage profile from the Municipality of Victoria to Bulalacao in Oriental Mindoro prior to the entry of the NPPs. The NPP will improve the voltage profile of the ORMECO distribution line, as well as the substations.

Considering all ORMECO, Inc.'s CAPEX projects for the year 2022-2026 has been implemented, the entry of the NPP will have no significant adverse effect in the degradation of the existing system and improves power quality to both transmission and distribution systems.

BRIEF HISTORY

ORMECO, Inc. was founded on February 16, 1973, by virtue of Republic Act No. 6038, as amended by Presidential Decrees 269 and 1645. It was a government program for rural electrification modeled after the National Rural Electric Cooperative of America (NRECA). ORMECO, Inc.'s cooperative structure is unique in that it is a non-stock and non-profit entity that provides purely service benefits to its member-consumer owners (MCO). Attending the membership seminar as one of the requirements in the application for new connection, paying Php 5.00 for membership fee, and indicating intention to avail electric service connection, one can become a co-owner of the cooperative, which entails service benefits, rights, and obligations as member-consumer owners (MCO). As an electric cooperative, the ORMECO, Inc. is under the direct supervision and control of the National Electrification Administration (NEA).

Back in the 1980s, the Province of Oriental Mindoro was served by two Electric Cooperatives, ORMECO I, which served the six (6) Municipalities in the province's northern part, and ORMECO II, which served the remaining nine (9) Municipalities in the province's southern part. On May 20, 1988, the two Cooperatives became the NEA's pilot project for merging and became just ORMECO, Inc. District 1 consists of Baco, San Teodoro, and Puerto Galera; District 2 of Calapan City; District 3 of Naujan, Victoria; District 4 of Socorro, Pola; District 5 of Pinamalayan, Gloria; District 6 of Bansud, Bongabong; and District 7 of Roxas, Mansalay, and Bulalacao. Each District has its own Director who represents it. Parallel to the merger of the two cooperatives, the management of the power

generator known as the Calapan Diesel Power Plant, as well as other generation activities, was transferred to the National Power Corporation (NPC), in accordance with the Memorandum of Agreement between NEA, NPC, and ORMECO, Inc.

Despite being isolated from the main island of Luzon and the Luzon Main Power Grid, ORMECO, Inc. has committed to producing some of its required distributed energy by utilizing the Province's indigenous Renewable Energy Resources. Over time, the country's electric cooperatives, particularly those affiliated with the NPC Small Power Utility Group (SPUG), focused more on power generation and cost. This was the reason why the ORMECO, Inc. management saw this as an opportunity to provide an efficient power supply in the Province. This prompted ORMECO, Inc. to construct two (2) additional hydropower plants in the municipality of San Teodoro, the Linao-Cawayan Phase 1 & 2 (Lower Cascade with 2.1MW and Upper Cascade with 2.1MW). The Lower Cascade was completed on December 29, 2011, and the Upper Cascade on October 4, 2014. This is in addition to the ORMECO, Inc.-owned 1.6MW Dulangan Mini-Hydro Power Plant, which was damaged by Typhoon "Nona" and has been out of commission since December 2015.

Following that, ORMECO, Inc. faced yearly challenges from Typhoons "Nona," "Nina," and "Usman," which resulted in the total rehabilitation of the 69kV NPC transmission line. ORMECO, Inc. made the bold decision to divide its coverage area into two (2) grids in order to pursue its mission and vision. The distribution system's North Grid encompasses the City of Calapan as well as the municipalities of Baco, San Teodoro, Puerto Galera, Naujan, and Victoria, while the South Grid encompasses the remaining municipalities of Socorro, Pola, Pinamalayan, Gloria, Bansud, Bongabong, Roxas, Mansalay, and Bulalacao.

As part of its missionary electrification program, NPC also constructs, rehabilitates and develops 69kV transmission lines in Electric Cooperative's Coverage Area, the Forty-two (42) kilometers Calapan – Bansud 69kV Transmission Line was energized and commercially operated last 08 November 2019.

SCOPE OF THE STUDY

The primary objective of the System Impact Study (SIS) is to provide an efficient, secured, and reliable power supply for Oriental Mindoro's increasing demand in the first four years of the seven-year period. The study's goal is to determine the technical feasibility of the location of a New Power Provider to be connected to the Oriental Mindoro Grid from June 2023 to October 2030 only.

I. PROPOSED CAPACITY

Upon the expiration of contract of the 22.3MW Emergency Power Supply Agreement (EPSA) in August 2023, ORMECO, Inc's operating capacity will be 38.80MW with a forecasted demand of 65.41MW. This scenario resulted in a 26.61MW power supply shortage.

Table 1 shows ORMECO's capacity requirements from 2023 to 2030, with the highest forecasted demand of 89.34MW in 2030. For the total requirement in the first four years (2023-2026) before the interconnection project, a guaranteed dependable capacity of 41MW is to be provided by the new power provider, scheduled as follows:

Table 1.1 Proposed Commercial Operation of 41MW Guaranteed Dependable Capacity of NPP

DATE	BASELOAD	LOAD-FOLLOWING	PEAKING	TOTAL
JUNE 2023		7 MW	3 MW	10 MW
AUGUST 2023		20 MW		20 MW
MARCH 2024		3 MW		3 MW
MARCH 2025	3 MW			3 MW
MARCH 2026	5 MW			5 MW
TOTAL	8 MW	30 MW	3 MW	41 MW

The proposed 30MW Load-Following will start commercial operation in June 2023 with initial dependable capacity of 7MW only and a peaking capacity of 3MW. A total of 20MW Load-Following will be required to replace the 22.3MW Emergency Power Supply Agreement (EPSA). Due to the province's increasing demand and the expiration of one of ORMECO's PSA (Ormin Power Inc. (OPI)) in 2026, an additional 3MW Load-Following will be required in 2024, followed by the 3MW and 5MW baseload in 2025 and 2026, respectively.

Table 1. 2023 to 2030 Capacity Requirements

YEAR	MONTH	BASELOAD	LOAD-FOLLOWING	OPERATING CAPACITY	DEMAND FORECASTS	UNCONTRACTED DEMAND	NPP	DEFICIT/EXCESS
2023	Jun	35.00	24.90	59.90	66.08	6.18	7.00	0.82
2023	Jul	35.00	24.80	59.80	64.02	4.22	7.00	2.78
2023	Aug	35.00	3.80	38.80	65.41	26.61	30.00	3.39
2023	Sep	35.00	2.95	37.95	65.42	27.47	30.00	2.53
2023	Oct	35.00	8.00	43.00	65.30	22.30	27.00	4.70
2023	Nov	35.00	21.65	56.65	62.54	5.89	16.20	10.31
2023	Dec	35.00	23.90	58.90	62.16	3.26	8.10	4.84
2024	Jan	35.00	23.10	58.10	56.52	-1.58	8.10	9.68
2024	Feb	35.00	19.40	54.40	58.83	4.43	8.10	3.67
2024	Mar	35.00	16.70	51.70	63.86	12.16	18.00	5.84
2024	Apr	35.00	10.20	45.20	69.15	23.95	30.00	6.05
2024	May	35.00	9.70	44.70	69.71	25.01	30.00	4.99
2024	Jun	35.00	2.60	37.60	69.32	31.72	33.00	1.28
2024	Jul	35.00	2.50	37.50	67.14	29.64	33.00	3.36
2024	Aug	35.00	3.80	38.80	68.59	29.79	33.00	3.21
2024	Sep	35.00	2.95	37.95	68.59	30.64	33.00	2.36
2024	Oct	35.00	8.00	43.00	68.45	25.45	30.00	4.55
2024	Nov	35.00	21.65	56.65	65.55	8.90	18.00	9.10
2024	Dec	35.00	23.90	58.90	65.13	6.23	9.00	2.77
2025	Jan	35.00	23.10	58.10	59.22	1.12	9.00	7.88
2025	Feb	35.00	19.40	54.40	61.62	7.22	9.00	1.78
2025	Mar	35.00	16.70	51.70	66.88	15.18	21.00	5.82
2025	Apr	35.00	10.20	45.20	72.41	27.21	33.00	5.79
2025	May	35.00	9.70	44.70	72.98	28.28	33.00	4.72
2025	Jun	35.00	2.60	37.60	72.56	34.96	36.00	1.04
2025	Jul	35.00	2.50	37.50	70.27	32.77	36.00	3.23
2025	Aug	35.00	3.80	38.80	71.77	32.97	36.00	3.03
2025	Sep	35.00	2.95	37.95	71.76	33.81	36.00	2.19
2025	Oct	35.00	8.00	43.00	71.60	28.60	33.00	4.40
2025	Nov	35.00	21.65	56.65	68.55	11.90	21.00	9.10
2025	Dec	35.00	23.90	58.90	68.11	9.21	12.00	2.79
2026	Jan	35.00	23.10	58.10	61.91	3.81	12.00	8.19
2026	Feb	35.00	19.40	54.40	64.42	10.02	12.00	1.98
2026	Mar	35.00	16.70	51.70	69.90	18.20	24.80	6.60
2026	Apr	35.00	10.20	45.20	75.67	30.47	36.00	5.53
2026	May	35.00	9.70	44.70	76.26	31.56	36.00	4.44
2026	Jun	35.00	2.60	37.60	75.80	38.20	39.00	0.80
2026	Jul	35.00	2.50	37.50	73.40	35.90	39.00	3.10
2026	Aug	35.00	3.80	38.80	74.95	36.15	39.00	2.85
2026	Sep	35.00	2.95	37.95	74.93	36.98	39.00	2.02
2026	Oct	35.00	8.00	43.00	74.75	31.75	36.00	4.25
2026	Nov	35.00	21.65	56.65	71.56	14.91	24.80	9.89
2026	Dec	28.20	23.90	52.10	71.08	18.98	16.40	2.58
2027	Jan	28.20	23.10	51.30	64.61	13.31	16.40	3.09
2027	Feb	28.20	19.40	47.60	67.21	19.61	16.40	3.21
2027	Mar	28.20	16.70	44.90	72.92	28.02	24.80	3.22
2027	Apr	28.20	10.20	38.40	78.93	40.53	36.00	4.53
2027	May	28.20	9.70	37.90	79.53	41.63	36.00	5.63
2027	Jun	28.20	2.60	30.80	79.04	48.24	39.00	9.24
2027	Jul	28.20	2.50	30.70	76.52	45.82	39.00	6.82
2027	Aug	28.20	3.80	32.00	78.13	46.13	39.00	7.13
2027	Sep	28.20	2.95	31.15	78.10	46.95	39.00	7.95
2027	Oct	28.20	8.00	36.20	77.90	41.70	36.00	5.70
2027	Nov	28.20	21.65	49.85	74.56	24.71	24.80	0.09
2027	Dec	28.20	23.90	52.10	74.06	21.96	16.40	5.56

2028	Jan	28.20	23.10	51.30	67.30	16.00	16.40	0.40
2028	Feb	28.20	19.40	47.60	70.01	22.41	16.40	6.01
2028	Mar	28.20	16.70	44.90	75.94	31.04	24.80	6.24
2028	Apr	28.20	10.20	38.40	82.19	43.79	36.00	7.79
2028	May	28.20	9.70	37.90	82.80	44.90	36.00	8.90
2028	Jun	28.20	2.60	30.80	82.28	51.48	39.00	12.48
2028	Jul	28.20	2.50	30.70	79.65	48.95	39.00	9.95
2028	Aug	28.20	3.80	32.00	81.31	49.31	39.00	10.31
2028	Sep	28.20	2.95	31.15	81.27	50.12	39.00	11.12
2028	Oct	28.20	8.00	36.20	81.05	44.85	36.00	8.85
2028	Nov	28.20	21.65	49.85	77.57	27.72	24.80	2.92
2028	Dec	28.20	23.90	52.10	77.03	24.93	16.40	8.53
2029	Jan	28.20	23.10	51.30	69.99	18.69	16.40	2.29
2029	Feb	28.20	19.40	47.60	72.80	25.20	16.40	8.80
2029	Mar	28.20	16.70	44.90	78.96	34.06	24.80	9.26
2029	Apr	28.20	10.20	38.40	85.44	47.04	36.00	11.04
2029	May	28.20	9.70	37.90	86.07	48.17	36.00	12.17
2029	Jun	28.20	2.60	30.80	85.52	54.72	39.00	15.72
2029	Jul	28.20	2.50	30.70	82.78	52.08	39.00	13.08
2029	Aug	28.20	3.80	32.00	84.50	52.50	39.00	13.50
2029	Sep	28.20	2.95	31.15	84.44	53.29	39.00	14.29
2029	Oct	28.20	8.00	36.20	84.20	48.00	36.00	12.00
2029	Nov	28.20	21.65	49.85	80.57	30.72	24.80	5.92
2029	Dec	28.20	23.90	52.10	80.01	27.91	16.40	11.51
2030	Jan	28.20	23.10	51.30	72.69	21.39	16.40	4.99
2030	Feb	28.20	19.40	47.60	75.59	27.99	16.40	11.59
2030	Mar	28.20	16.70	44.90	81.99	37.09	24.80	12.29
2030	Apr	28.20	10.20	38.40	88.70	50.30	36.00	14.30
2030	May	28.20	9.70	37.90	89.34	51.44	36.00	15.44
2030	Jun	28.20	2.60	30.80	88.76	57.96	39.00	18.96
2030	Jul	28.20	2.50	30.70	85.90	55.20	39.00	16.20
2030	Aug	28.20	3.80	32.00	87.68	55.68	39.00	16.68
2030	Sep	28.20	2.95	31.15	87.61	56.46	39.00	17.46
2030	Oct	28.20	8.00	36.20	87.35	51.15	36.00	15.15

Table 2 and Table 3 show the load flow analysis result on thermal and voltage assessment that was used as the basis to determine the technical feasibility of the NPP's location.

Table 2. Present Thermal Loading of Power Transformer

POWER TRANSFORMER	PERCENT LOADING
5MVA NAUJAN	115% / 115%
5MVA VICTORIA	75% / 75%
NPC 20 MVA	83% / 83%
NPC 30 MVA	40% / 40%
10 MVA PINAMALAYAN	41% / 41%
20 MVA PHESI	15% / 15%
MHEC	33% / 33%
Tran DMCI-0013	7% / 7%
10 MVA MINOLO	41% / 41%
10 MVA BANSUD	28% / 28%
Tran DMCI-0012	42% / 42%
5MVA SOCORRO	54% / 54%
Tran LCMHPP Lower to Switch bay	45% / 45%
Tran IMHPP 006	66% / 66%
Tran LCMHPP Lower 007	55% / 55%
Tran ORMIN-0022	24% / 24%
Tran ORMIN-0023	46% / 46%
5MVA ROXAS	146% / 58%

Table 3. Thermal Loading of Uprated Power Transformer

POWER TRANSFORMER	PERCENT LOADING
10MVA NAUJAN	51% / 51%
10 MVA CMHPP	13% / 10%
5000KVA VICTORIA	85% / 85%
67/13.2 kv 20 MVA NPC	94% / 94%
67/13.2 kv 30 MVA NPC	48% / 48%
67/13.2 kv 25 MVA MHEC	14% / 14%
13.8 kv/4.16 15 MVA MHEC	23% / 23%
67/13.2 kv 20 MVA DMCI	40% / 40%
67/13.2 kv 10 MVA	43% / 43%
67/13.2 kv 20 MVA DMCI	46% / 46%
10MVA PINAMALAYAN	44% / 44%
67/13.2 kv 5 MVA	58% / 58%
10 MVA Bansud	51% / 51%
5 MVA PINAMALAYAN 2023	34% / 34%
13.2 kv/ 69 KV 10 MVA IMHPP	22% / 22%
13.2 kv/4.16 10 MVA ORMIN	12% / 12%
13.2 kv/4.16 10 MVA ORMIN	46% / 46%
13.8/0.480 kv 10 MVA ROXAS	30% / 30%
67/13.2 kv 5 MVA NPC MANSALAY	45% / 45%
13.2 kv/4.16 2 MVA LCMHPP UPPER	30% / 30%

II. Proposed Location

Eight (8) scenarios were simulated to determine the most feasible location based on the load flow analysis on voltage assessment.

Table 4. Voltage Assessment of Proposed Additional Capacity per Location

FEEDERS	OPENING CAPACITY CT (PF)	IF-31MWPINAMALAYAN	IF-31MWOLARAN	IF-31MWRCKAS	IF-31MWOLARAN	IF-31MWPANGLI	IF-31MWOLARAN	IF-31MWPINAMALAYAN	IF-31MWRCKAS
		PK-31MWPINAMALAYAN EL-31MWOLARAN	PK-31MWOLARAN EL-31MWPINAMALAYAN	PK-31MWRCKAS EL-31MWOLARAN	PK-31MWOLARAN EL-31MWRCKAS	PK-31MWPANGLI EL-31MWOLARAN	PK-31MWOLARAN EL-31MWPANGLI	PK-31MWPINAMALAYAN EL-31MWRCKAS	PK-31MWRCKAS EL-31MWPINAMALAYAN
Feeders for VICTORIAS V100	218.81	226.52	222.21	228.89	222.31	222.1	221.12	221.31	221.68
Feeders for VALBANS									
NA001	225.31	230.01	228.26	229.74	228.33	222.59	221.29	228.08	226.64
NA002	225.3	230.03	228.25	229.72	228.35	222.78	221.28	227	226.16
Feeders for OLARAN									
CA001	225.85	225.7	225.7	225.89	225.7	228.76	225.7	232.46	221.71
CA002A	225.21	225.26	225.26	225.25	225.26	228.75	225.25	232.44	221.7
CA002B	225.67	225.71	225.71	225.7	225.7	228.75	225.71	232.44	221.7
CA001	225.22	225.26	225.26	225.25	225.26	228.75	225.25	232.44	221.7
CA002	225.67	225.71	225.71	225.7	225.71	228.89	225.71	225.68	225.68
CA003	228.55	230.27	230.44	229.26	230.44	225.24	230.44	225.24	225.24
CA004	224.28	226.59	227.15	226.59	227.15	225.7	227.14	225.7	225.7
Feeders for MINCLOSS									
PS001	227.05	227.1	227.1	227.09	227.1	220.76	227.09	223.96	228.57
PS002	227.08	227.13	227.13	227.12	227.13	226.96	227.12	224.31	228.31
Feeders for SOCCRO									
SO001	214.22	228.25	228.16	228.46	220.4	227.09	228.21	227.09	227.09
Feeders for PINAMALAYAN									
PI100	212.25	229.42	218.4	226.6	228.7	227.11	217.05	227.12	227.11
PI200	213.85	230.95	220.97	225.15	221.77	221.19	218.63	228.25	227.88
Feeders for BANGLISS									
BS001	212.15	229.41	219.35	220.09	228.12	220.65	218.09	221.68	221.14
BS002	211.63	228.85	218.81	226.12	220.89	222.21	217.55	232.21	220.67
Feeders for ROXAS									
RO001	219.33	225.7	216.57	228.85	223.21	219.88	215.31	223.32	228.17
RO002	219.32	226.69	216.57	229.65	223.2	219.69	215.3	223.31	228.17
Feeders for MANSALAYAN									
MA001	219.89	227.05	216.98	228.38	223.27	220.27	215.85	222.48	228.86
MA002	219.88	227.05	216.98	228.38	223.27	220.27	215.85	222.48	228.86

Based on the result of the foregoing, Alternatives 1 through 8 connected at 69kV Transmission lines improve the voltage profile and stability of the whole system, with the exception of Alternatives 2 and 6, which are 30MW Load Following and 3MW Peaking located in Calapan City with 8MW Baseload located in either Pinamalayan or Bansud.

Table 5. Technical Analysis.

ALTERNATIVES	LOCATIONS			RESULT
1	LF - 30MW PINAMALAYAN	PK 3 MW PINAMALAYAN	BL - 8MW CALAPAN	TECHNICALLY FEASIBLE
2	LF - 30MW CALAPAN	PK 3 MW CALAPAN	BL - 8MW PINAMALAYAN	NOT FEASIBLE
3	LF - 30MW ROXAS	PK 3 MW ROXAS	BL - 8MW CALAPAN	TECHNICALLY FEASIBLE
4	LF - 30MW CALAPAN	PK 3 MW CALAPAN	BL - 8MW ROXAS	TECHNICALLY FEASIBLE
5	LF - 30MW BANSUD	PK 3 MW BANSUD	BL - 8MW CALAPAN	TECHNICALLY FEASIBLE
6	LF - 30MW CALAPAN	PK 3 MW CALAPAN	BL - 8MW BANSUD	NOT FEASIBLE
7	LF - 30 MW PINAMALAYAN	PK - 3MW - PINAMALAYAN	BL - 8MW ROXAS	TECHNICALLY FEASIBLE
8	LF - 30MW ROXAS	PK 3 MW ROXAS	BL - 8MW PINAMALAYAN	TECHNICALLY FEASIBLE

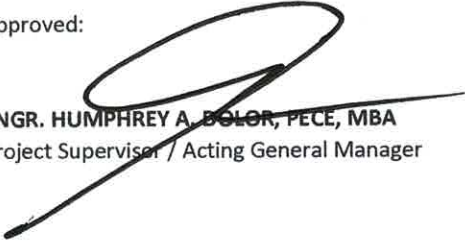
SUMMARY AND CONCLUSION

Based on the results of the load flow analysis; thermal and voltage assessments, and consideration of the percentage of demand growth in the province of Oriental Mindoro, expiration of the PSA with Ormin Power Inc. (OPI), and expiration of the 22.3MW Emergency Power Supply Agreement on August 2023, the technical assessment team recommends that the 41MW guaranteed dependable capacity NPP must be located only in Calapan City, with 8MW Baseload, and Roxas, 30MW Load-Following and 3MW Peaking.

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