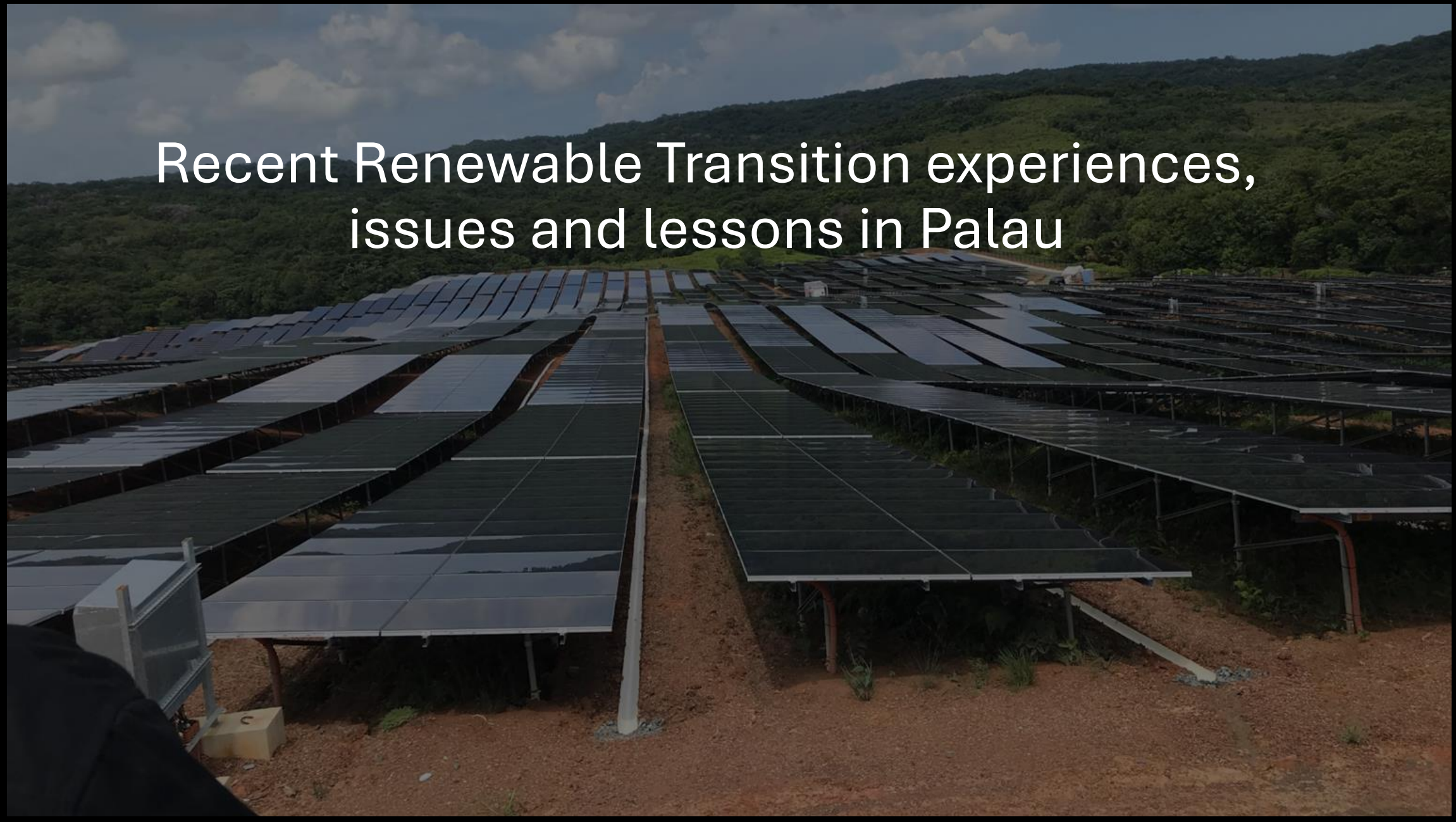


Recent Renewable Transition experiences, issues and lessons in Palau

Table of Contents

Background

- Renewable Energy Goals from Leadership:
  - 20% by 2020 – Palau Energy Policy (2010)
  - 45% by 2025 – Nationally Determined Contribuiton (2015) tied to “Paris Agreement”
  - 100% by 2032 – target announced by President Surangel during 2022 “Our Oceans Conference”

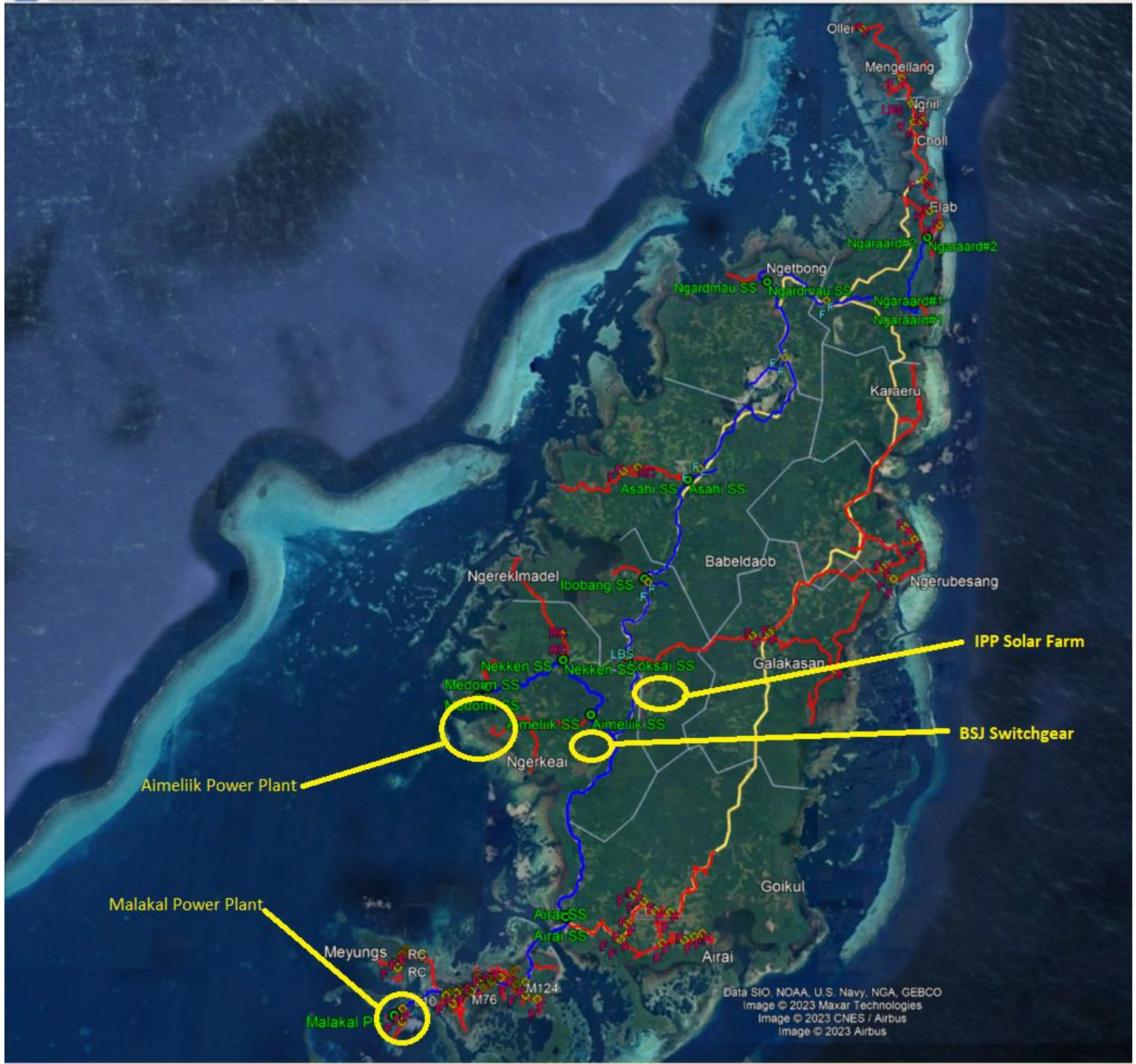
- Rooftop PV
  - DRECF(Disaster Resilient Clean Energy Financing) program started ~2022 Summer, 1st installation ~October.
    - Important to have policy. Data collection & power quality difficult to do. Recommend blanket policy now. Can enforce later as long as it already exists.
      - Ex: Large 1MW installation installed in 2023 had large and immediate impact on grid. Low-loading generators

- IPP Solar Farm (~13MW PV, ~12MWhr BESS)
  - Hurdles finding an IPP company (Solar Pacific, Juwi)
  - PPA negotiations – consultant assistance necessary (ADB & technical consultants)
  - Solar Farm (Started April 2022-Completed June2023)
  - IPP Connection Point Switchgear (Connected July 18, 2023)
  - BSJ Switchgear (BSJ01,02,03,08,09) Connected July 25, 2023)
  - Forecasts issues (customer load growth slower than anticipated, rooftop PV growth faster than anticipated)

Recloser & BSJ Switchgear

Background & Construction

Palau Main Grid



Background & Construction

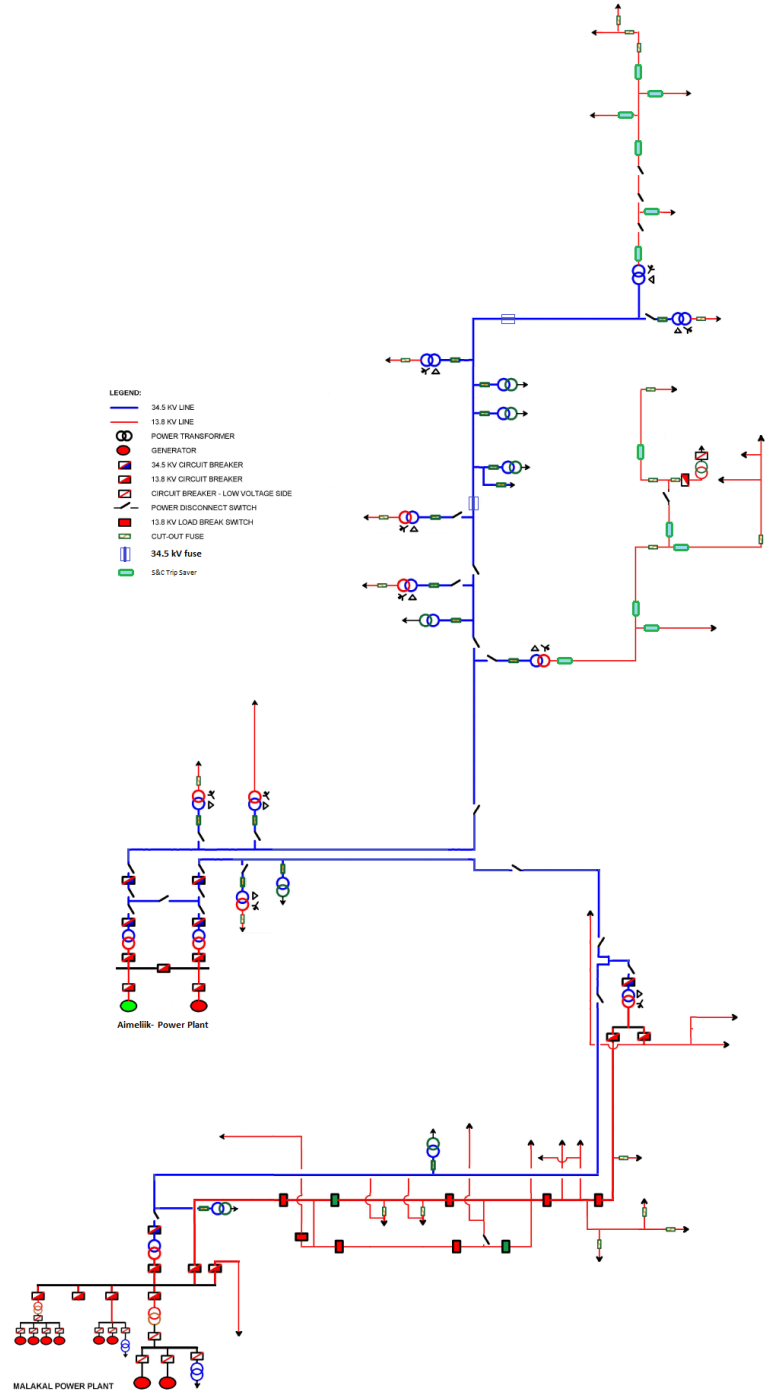
Palau Main Grid

Background & Construction

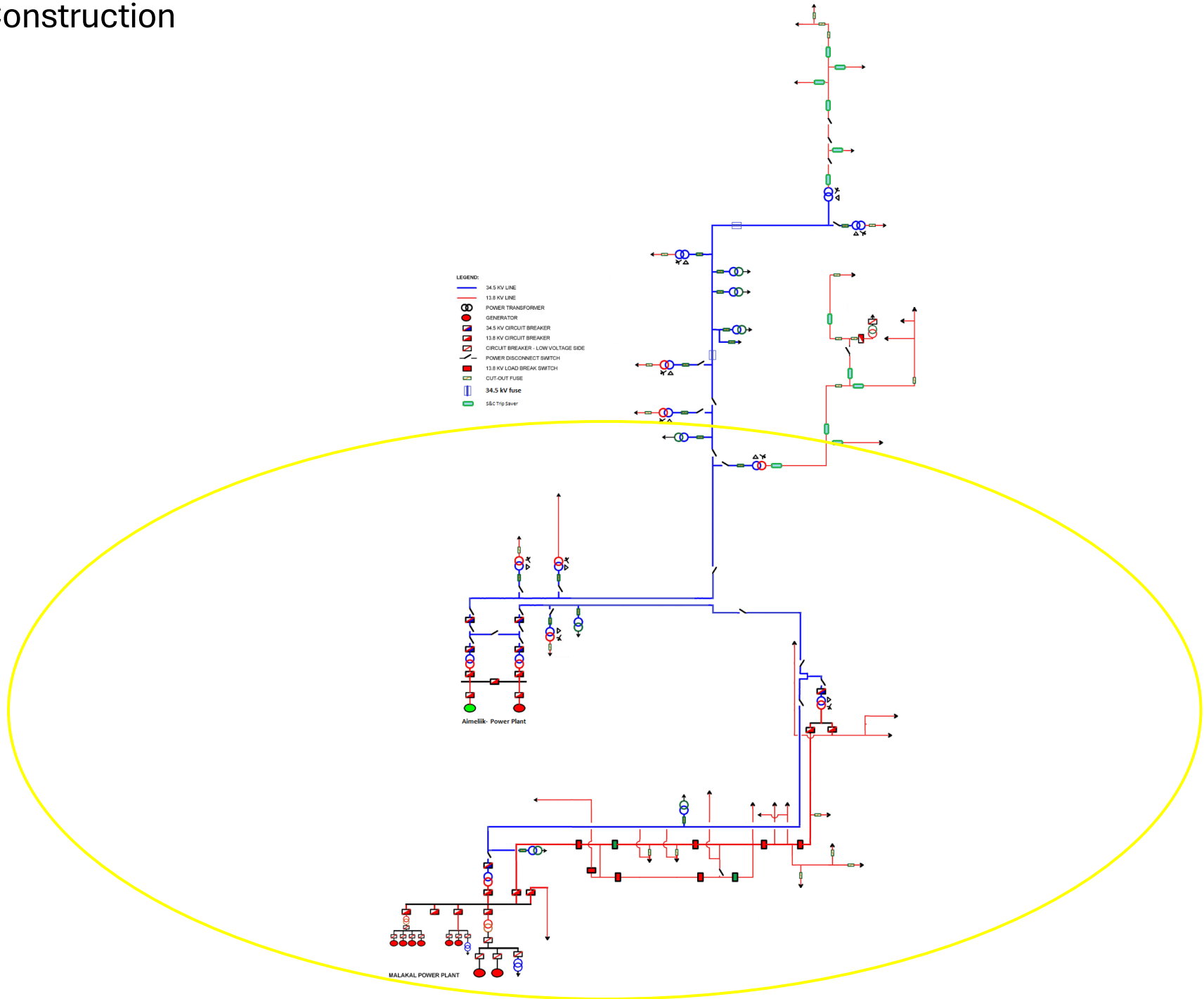
Before IPP Solar Farm

Peak Load ~13MW peak load.
Base generation 3 x 5MW diesel generators

Shout out to S&C Tripsavers

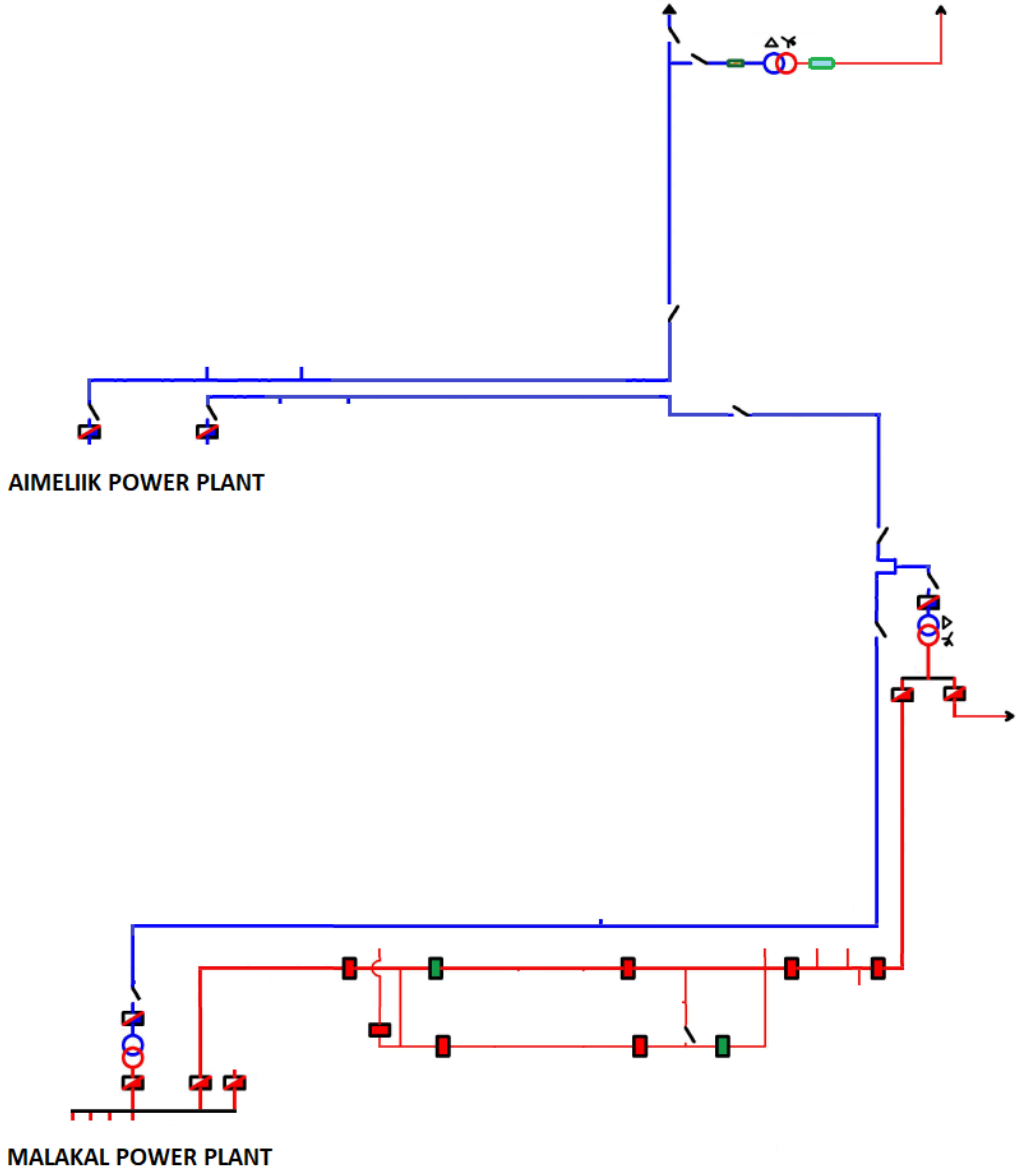


Background & Construction



Background & Construction

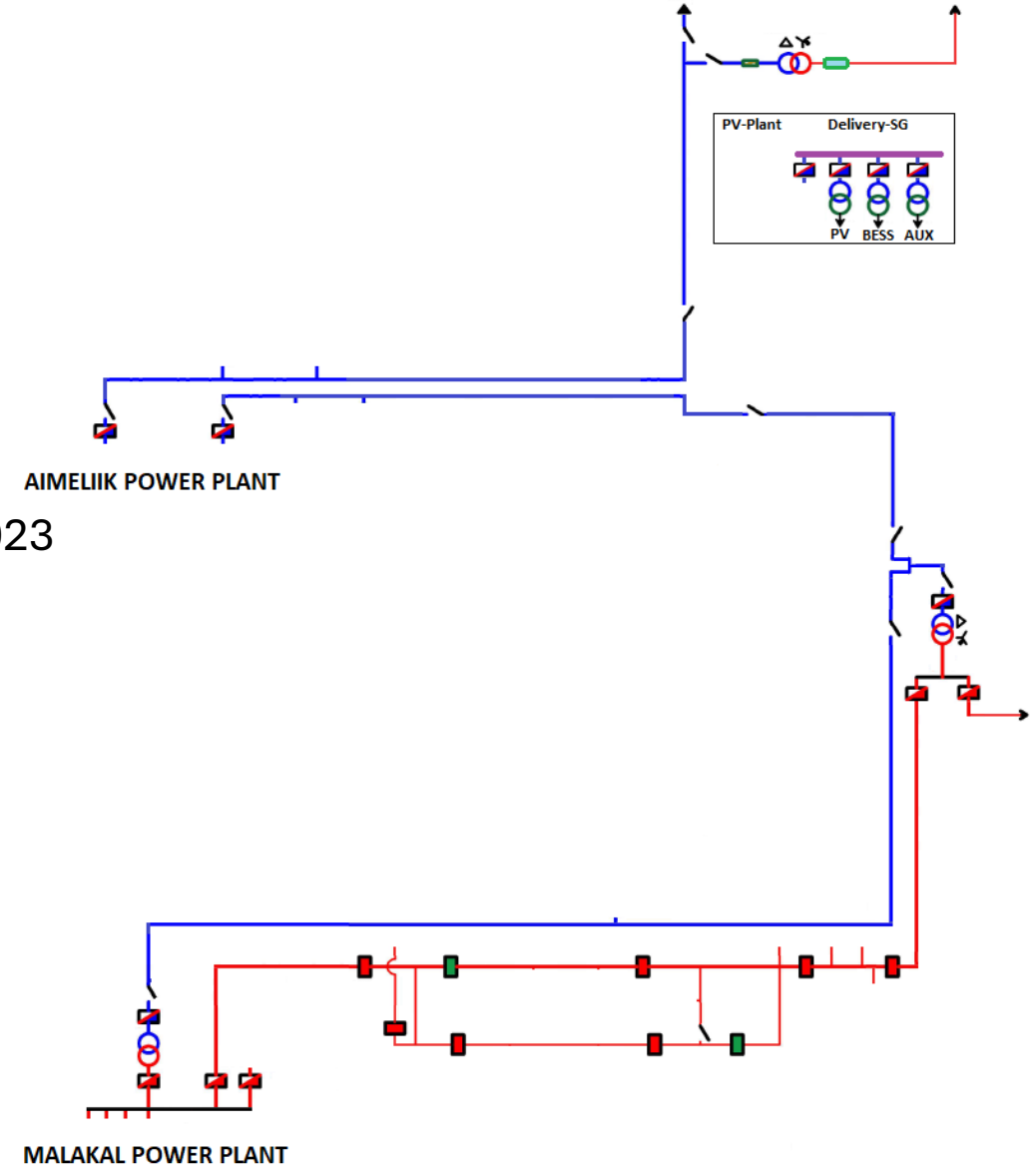
Before IPP Solar Farm



Background & Construction

Solar Farm Installation

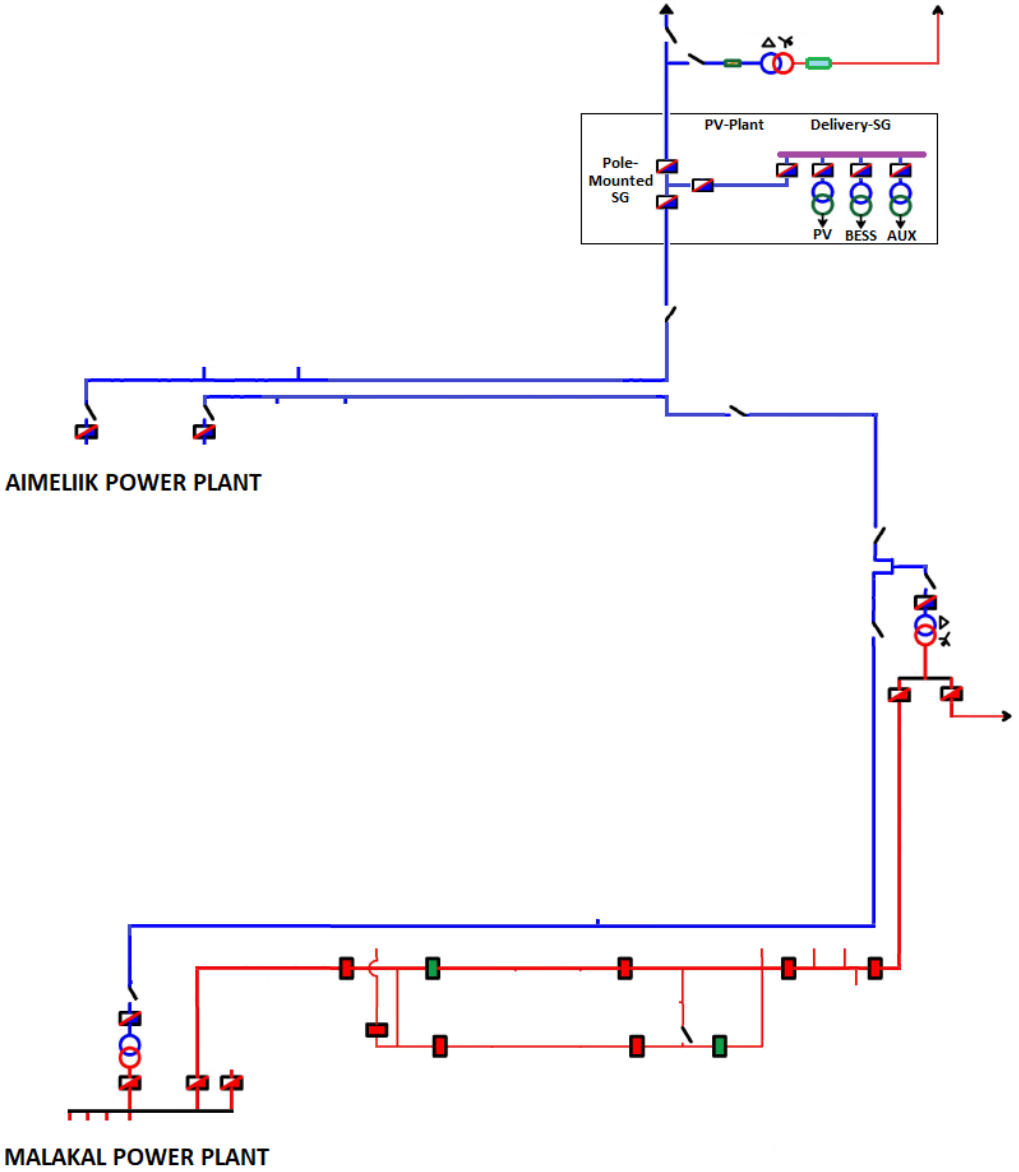
10 months
Start April 2022, completed June 2023



Background & Construction

IPP Connection to Grid

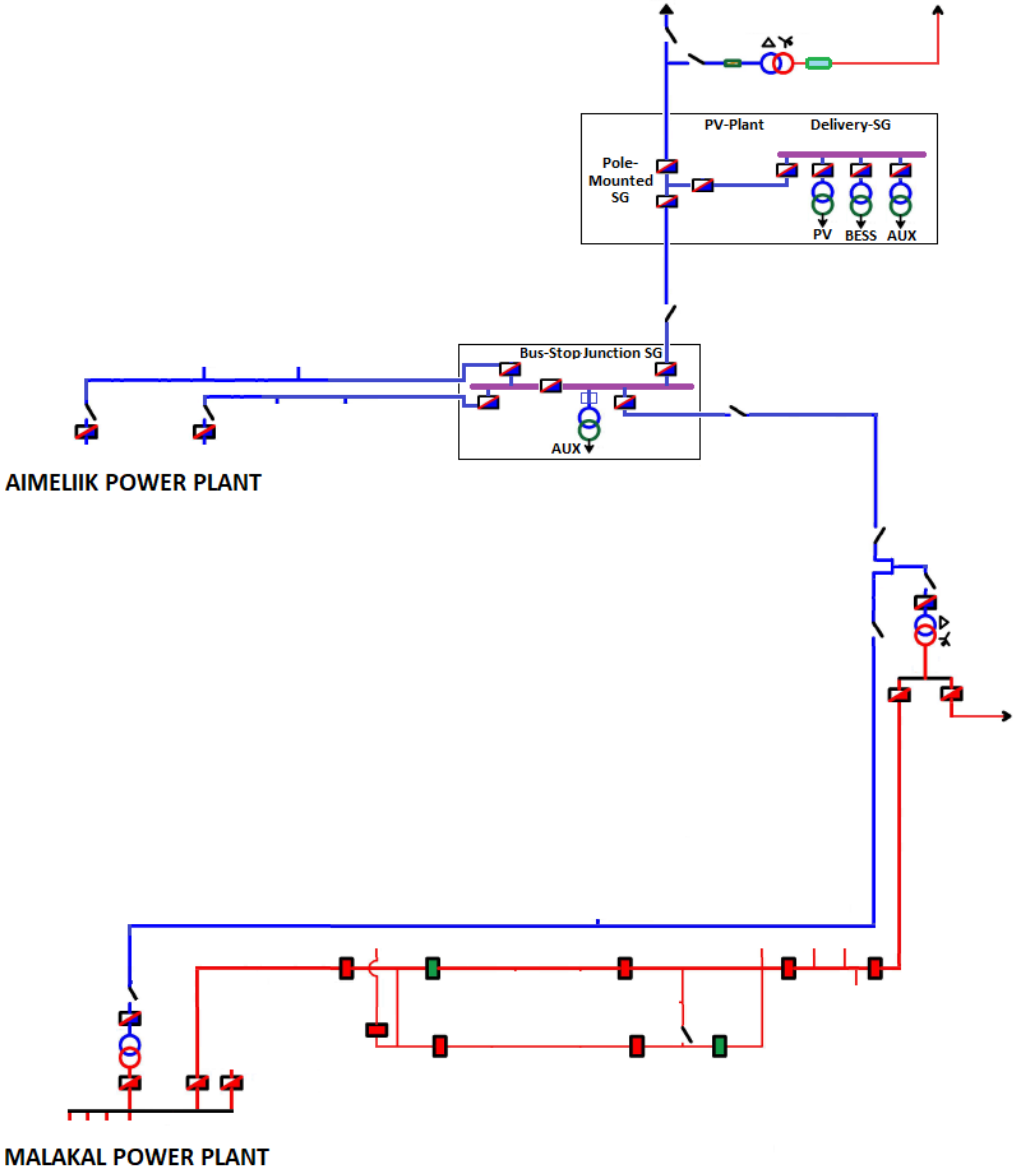
Noja Recloser
July 18, 2023
Limited to 1MW injection
Bypass switches



Background & Construction

BSJ Switchgear Installation

July 25 Connected



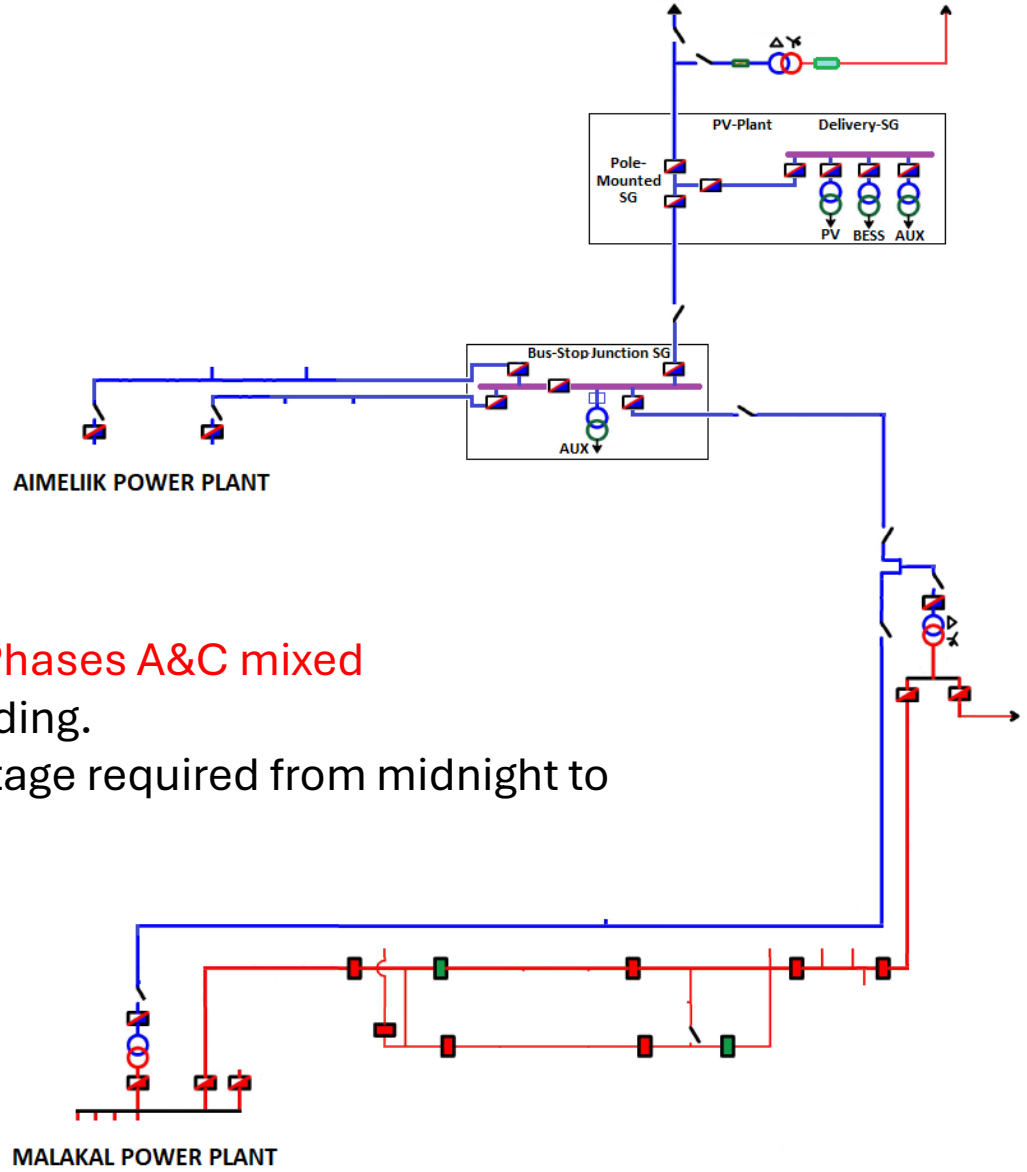
Background & Construction

BSJ Switchgear Installation

July 25 Connected

Phase labels, miscommunication, Phases A&C mixed
Damaged HVAC system capital building.
No bypass switches, emergency outage required from midnight to 2am.

No synchroscope



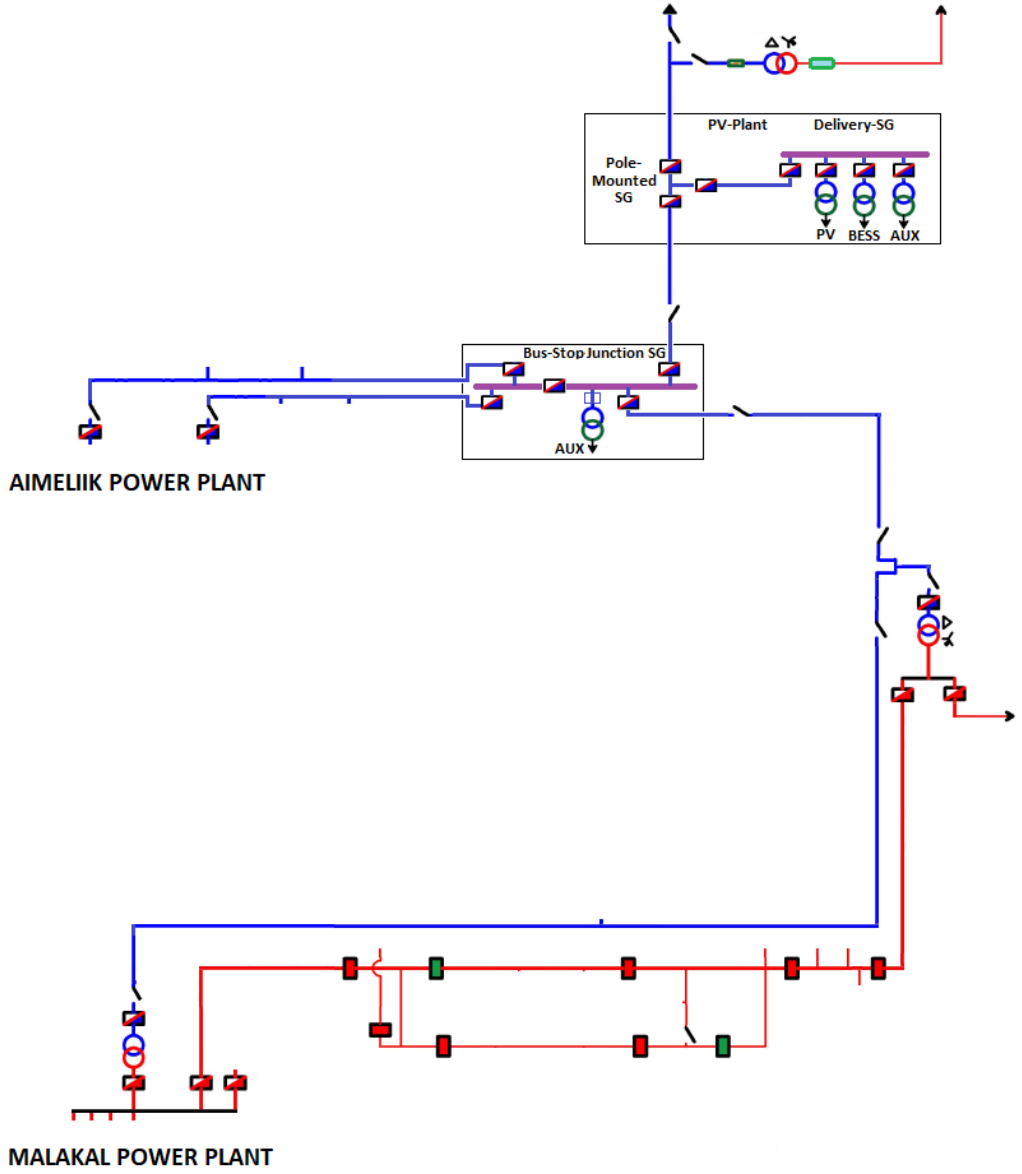
PV Solar Integration

PV Solar Integration

Post Installation . Steady Increase of PV injection.

- July 25, 2023
- Increased injection; observing Ramp Rate (MGC adjustments)
  - July 18 1MW
  - Aug 26 2MW
  - Sept 14 4MW
  - Oct 12 6MW (low loading gens)
  - Oct 22 **Off 1 DG** (2 gen operation)
  - Nov Regular 2 gen operation
  - Dec **Reliability Test**

- Ramp Rate of PV injection primary concern
- Communications simple – messaging/whatsapp
- Manual operation



PV Solar Integration

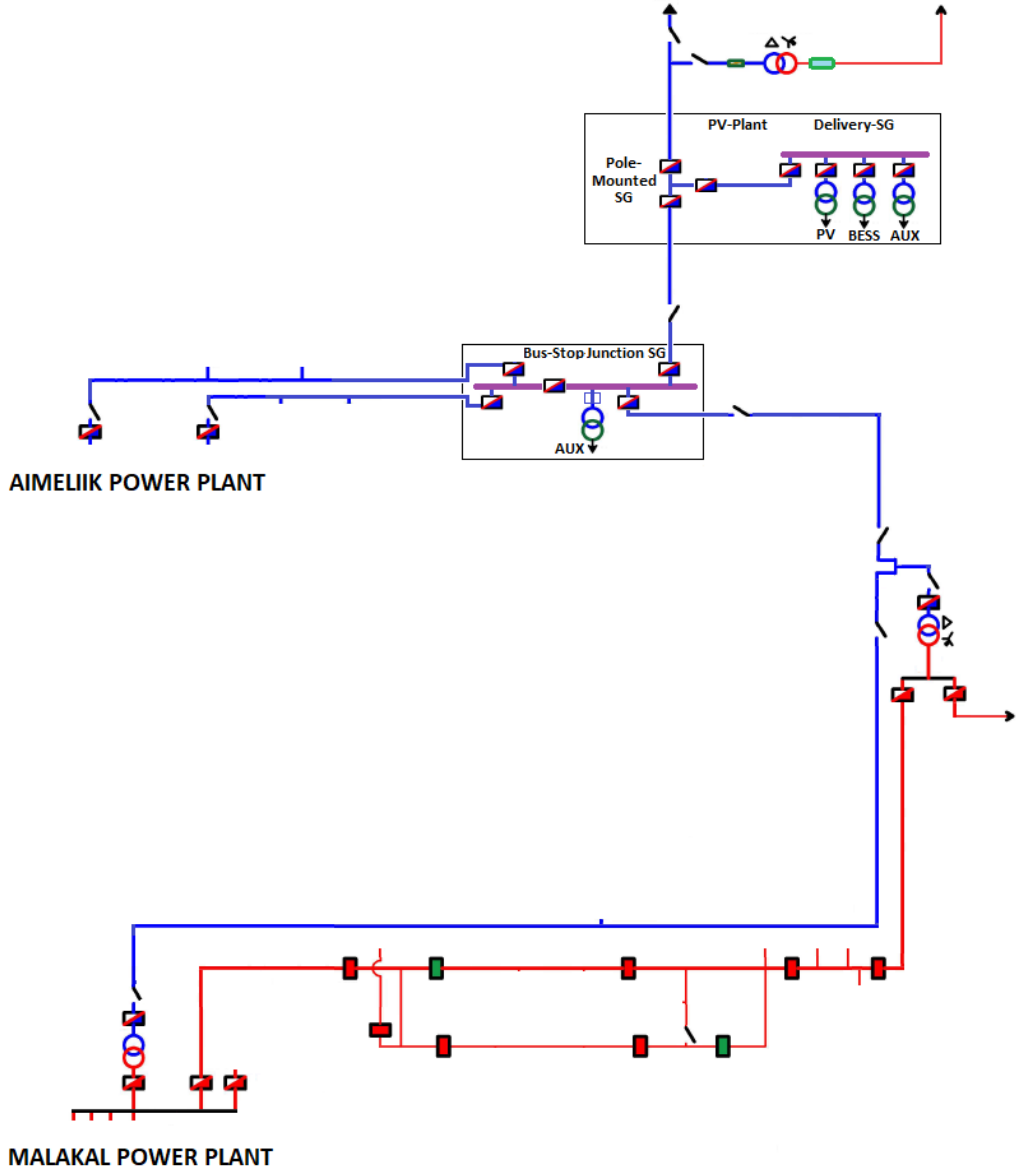
Past initial Installation Phase

Jan – Improved MGC, turning off 2 DG (1 DG op)
Feb – more 1 gen op. Voltage regulation issues. 1st clue Gen Batt
Mar – large 1 gen op (high PV injection). Power outages.
Apr – Reduced injection. Split Grid recovery.
May – Reduced injection. Lost 2 major gensets. 1 for 76 days.
June – Limited injection. Split Grid. Fuel loss.
July – Gen batt replaced. Grid reconnected. Increased injection
Aug – Cautious injection. 2 gen operation min

Island wide power outages reduced PV Injection.

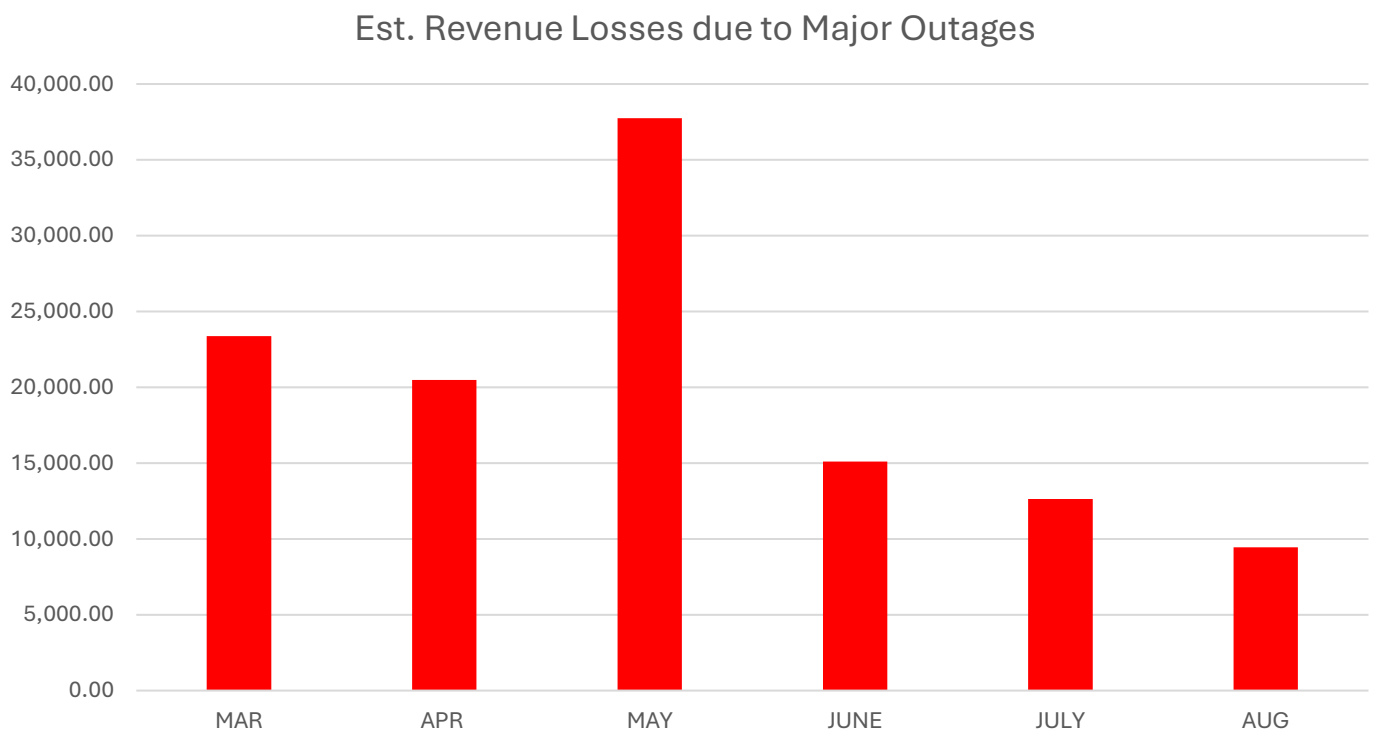
- -Switchgear network unfamiliar (internal capacity building)
- -Equipment failure
  - -HV Breakers, protection relays
  - -Genset
  - -Genset control panel

Protection Relays & SCADA key to troubleshooting



MONTHTLY REVENUE LOSS ESTIMATES SINCE MARCH:

MAR	**$23,384.2**,
APR	**$20,478.4**,
MAY	**$37,745**,
JUNE	**$15,105.8**
JULY	**$12,639.44**
AUG	**$9,440.01**
Total:	**$119,096.55**



DECEMBER 2023 – Reliability Test

Energy Received

RAMP RATES

0	6	Wed	53.70	18.48	MWh	**72.19**		6,066			8			1,600	55.52	51.95	8	3	0
1	7	Thu	50.55	19.70	MWh	**70.25**		6,572			10			2,000	58.43	54.22	34	10	**2**
2	8	Fri	**49.78**	14.75	MWh	**64.53**		6,914			9			1,800	58.40	56.38	26	15	0
3	9	Sat	34.39	**27.12**	MWh	**61.51**		5,787			7.5			1,500	57.75	54.05	15	10	**1**
4	10	Sun	38.08	**21.83**	MWh	59.92		6,573			6	2		1,400	58.27	54.94	19	12	**1**
5	11	Mon	42.98	13.25	MWh	56.23		7,825			5	2		1,200	63.43	63.05	31	20	**4**
6	12	Tue	**44.89**	14.54	MWh	59.43		6,241			9			1,800	57.83	54.67	18	6	**1**
7	13	Wed	**45.62**	14.06	MWh	59.68		6,736			9			1,800	61.44	57.93	32	26	**4**
8	14	Thu	41.79	0.84	MWh	42.63		7,474			2	2		400	60.49	56.96	13	5	0
9	15	Fri	6.31	-1.11	MWh	5.20		2,014			0			0	58.15	54.04	0	0	0
10	16	Sat	32.60	18.81	MWh	51.41		4,758			8			1,600	58.15	54.04	7	1	0
11	17	Sun	22.63	4.72	MWh	27.34		5,714			5	2		1,200	59.99	59.70	6	2	0
12	18	Mon	17.58	**26.17**	MWh	43.75		3,552			0			0	60.91	58.10	12	1	0
13	19	Tue	39.91	**27.80**	MWh	**67.70**		6,949			5	1.5		1,150	63.43	62.53	17	9	**1**
14	20	Wed	33.24	**23.15**	MWh	56.39		6,381			4			800	58.99	53.90	8	2	0
15	21	Thu	28.23	**23.83**	MWh	52.06		6,033			5			1,000	62.97	60.17	11	3	0
16	22	Fri	28.47	**30.83**	MWh	59.30		5,340			5			1,000	62.84	61.42	20	6	0
17	23	Sat	15.14	**28.01**	MWh	43.15		2,887			0			0	55.50	52.60	3	0	0
18	24	Sun	19.12	**32.02**	MWh	51.13		3,779			0			0	55.41	50.99	5	0	0
19	25	Mon	12.42	**42.77**	MWh	55.19		2,434			0			0	53.73	50.44	2	0	0
20	26	Tue	40.70	17.00	MWh	57.69		7,531			5			1,000	59.65	56.42	14	10	**1**
21	27	Wed	25.49	**20.74**	MWh	46.22		6,228			0			0	58.24	52.58	4	1	0

FEBRUARY

Post RT		BBA05	CURTAILMENT		Total E		Max kW	DG OPERATION (hrs)						DG gallons saved	Ave DG LOADING		800kW Minor	1300kW Medium	3200kW Large
Feb-24		ENERGY	Calculated	GeoScada				3.4DG	3DG	2.4DG	2DG	1.4DG	1 DG		6-6pm	8-3:30pm			
1	Thu	38	14	20	58		7,761				4		2.5	1,800	60.24	57.85	8	1	0
2	Fri	52	10	14	66		8,068				3.5		5	2,700	59.57	56.95	11	1	0
3	Sat	35	21	30	65		7,021				3.6		3.6	2,160	58.03	56.91	16	3	0
4	Sun	26	28	40	66		6,717				1		2.5	1,200	57.55	55.70	9	2	0
5	Mon	24	1	15	39		6,442				3.6		0	720	63.32	62.50	1	0	0
6	Tue	21	14	18	39		4,577				4.5		0	900	60.28	58.99	0	0	0
7	Wed	30	26	37	67		5,098				5.3		0	1,060	57.61	56.02	2	1	0
8	Thu	19	42	60	79		5,264				2		0	400	58.36	56.82	5	0	0
9	Fri	32	12	17	49		5,276				4.25		0	850	59.33	56.78	3	1	0
10	Sat	28	20	28	56		4,210				8.3		0	1,660	58.27	56.91	1	0	0
11	Sun	34	27	38	72		6,878				0.75		6.5	2,750	55.92	55.52	11	1	0
12	Mon	45	15	21	65		8,476				3		4	2,200	59.73	57.93	11	1	0
13	Tue	35	30	42	76		9,295				5.6		2	1,920	62.02	60.64	9	2	0
14	Wed	42	29	41	83		7,705				5.1		2.7	2,100	58.29	56.78	5	2	0
15	Thu	51	36	40	91		8,801				4.5		2.25	1,800	58.09	55.31	10	2	0
16	Fri	58		26	84		8,467				2		5.5	2,600	58.44	55.64	9	1	0
17	Sat	34		35	69		7,239				2.5		2.3	1,420	58.80	55.65	10	0	0
18	Sun	42		32	74		7,683				2.5		2.5	1,500	59.28	56.91	12	3	0
19	Mon	36		34	70		11,330				3.5		0.85	1,040	61.81	59.46	17	4	0
20	Tues	25		35	60		6,125				3.18		0	636	61.20	59.90	3	0	0
21	Wed	54		27	81		8,426				3		4.75	2,500	59.70	56.77	12	0	0
22	Thu	49		29	78		8,386				1.78		3	1,556	59.97	56.02	9	0	0
23	Fri	52		20	72		8,545				2		4.78	2,312	60.14	56.97	8	0	0
24	Sat	51		43	94		7,471				0.72		7.62	3,192	57.14	53.11	5	1	0
25	Sun	30		19	49		4,590				6.9		0	1,380	59.28	57.37	2	1	0
26	Mon	50		25	75		8,618				4.9		2.81	2,104	60.86	59.18	12	0	0
27	Tues	42		23	65		5,871				7.9		0	1,580	61.30	57.32	4	1	0
28	Wed	23		48	71		5,579				3.58		0	716	65.06	62.04	2	0	0
29	Thr	33		26	58		5,817				6.05		0	1,210	60.23	57.24	4	1	0
		1090.48	880.54	Total MWh	67.97		4210	0.0	0.0	0.0	109.5	0.0	65.2	47,966	55.92	53.11			
	Ave->	38	above	per IPP Calc	AVE		11330	Total hrs	Total hrs	Total hrs	Total hrs	Total hrs	Total hrs	Total Gallons	65.06	62.50			
							Min/Max							Estimated 200ga/D	Min/Max	Min/Max			

2024 MARCH

	Day#	Post RT		BBA05	CURTAILMENT		Total E	Max kW	DG OPERATION (hrs)						DG gallons saved	Ave DG LOADING		800kW Minor	1300kW Medium	3200kW Large
	Continued	Mar-24		ENERGY	Calculated	GeoScada			3.4DG	3DG	2.4DG	2DG	1.4DG	1 DG		6-6pm	8-3:30pm			
	65	1	Fri	39	16	23	62	5,856				8.7		0	1,740	62.00	57.27	5	0	0
	66	2	Sat	45	16	23	68	7,208				3.5		4.8	2,620	56.17	54.32	11	0	0
	67	3	Sun	43		21	64	7,268				2.2		5.4	2,606	57.38	54.70	7	0	0
	68	4	Mon	52		23	75	9,563				3.8		3.4	2,116	61.05	58.43	11	3	0
1)OUTAGE	69	5	Tue	50		24	75	8,195				2.5		4.5	2,300	59.19	56.03	14	1	1
	70	6	Wed	57		27	84	9,231				1.7		6.0	2,740	57.75	54.41	2	0	0
	71	7	Thu	60		37	97	8,479				0.6		7.7	3,192	55.87	52.82	6	0	0
2)3)Outag	72	8	Fri	68		26	94	10,036				0.3		7.9	3,223	56.44	52.08	3	1	0
4)Outa	73	9	Sat	14		44	58	6,735				1.9	?	2.0	1,170	57.75	52.10	3	3	3
	74	10	Sun	39		30	69	7,375				2.2		4.3	2,160	58.63	56.43	4	0	0
	75	11	Mon	44		30	74	10,329				3.8		2.8	1,862	60.64	58.45	8	2	1
	76	12	Tue	36		28	63	5,482				6.4		0	1,280	59.07	56.88	0	0	0
	77	13	Wed	39		39	78	5,508				8.0		0	1,600	60.71	57.95	3	0	0
5)Outage	78	14	Thu	43		28	71	8,160				1.9	3.8	1.9	1,516	60.54	58.41	7	1	0
	79	15	Fri	49		34	83	7,471				6.6		1.1	1,760	57.84	53.56	3	1	0
6)Outa	80	16	Sat	9		54	63	6,449				0.1		1.2		4.90	-35.16	5	4	4
	81	17	Sun	39		19	58	6,276				2.0	5.47	0	947	59.74	56.28	1	0	0
	82	18	Mon	52		26	78	7,728				1.8	6	0	956	60.15	57.45	0	0	0
	83	19	Tues	44		9	53	8,256				3.2		2.8	1,750	59.88	56.56	2	1	0
	84	20	Wed	43		30	72	9,337				5.9		1.6	1,814	56.23	52.86	4	2	0
7)Outage	85	21	Thu	52		22	74	8,541				1.9		5.1	2,402	57.16	54.89	8	2	0
	86	22	Fri	50		38	89	7,990				2.7		6.3	3,044	59.61	55.79	8	0	0
	87	23	Sat	26		41	67	7,056				8		0	1,600	56.52	55.90	2	0	0
8)Outage	88	24	Sun	33		31	63	7,439				2.2	3.7	0.8	1,130	58.05	56.29	4	1	0
	89	25	Mon	50		25	75	9,964				4.7		3.1	2,180			7	1	0
	90	26	Tues	45		29	74	6,519				7.9		0	1,580	61.20	57.38	2	0	0
	91	27	Wed	44		25	70	6,579				7.9		0	1,580	62.04	59.53	1	0	0
	92	28	Thu	49		23	72	9,100				2.3	4.1	0.6	1,090	60.09	56.92	4	1	0
9)Outage	93	29	Fri	32		33	65	9,045				2.4		2.4	1,440	57.69	53.62	4	3	1
	94	30	Sat	29		49	78	4,295				8.7		0	1,740	57.56	56.02	1	0	0
	95	31	Sun	49		38	87	7,931				4.9		5.3	3,092	57.22	55.14	10	3	0
				1326.70	926.60	Total MWh	72.69	4295	0.0	0.0	0.0	120.4	23.1	80.8	58,230	4.90	-35.16			
			Ave->	43	above	per IPP Calc	AVE	10329	Total hrs	Total hrs	Total hrs	Total hrs	Total hrs	Total hrs	Total Gallons	62.04	59.53			
								Min/Max							Estimated 200ga/D	Min/Max	Min/Max			

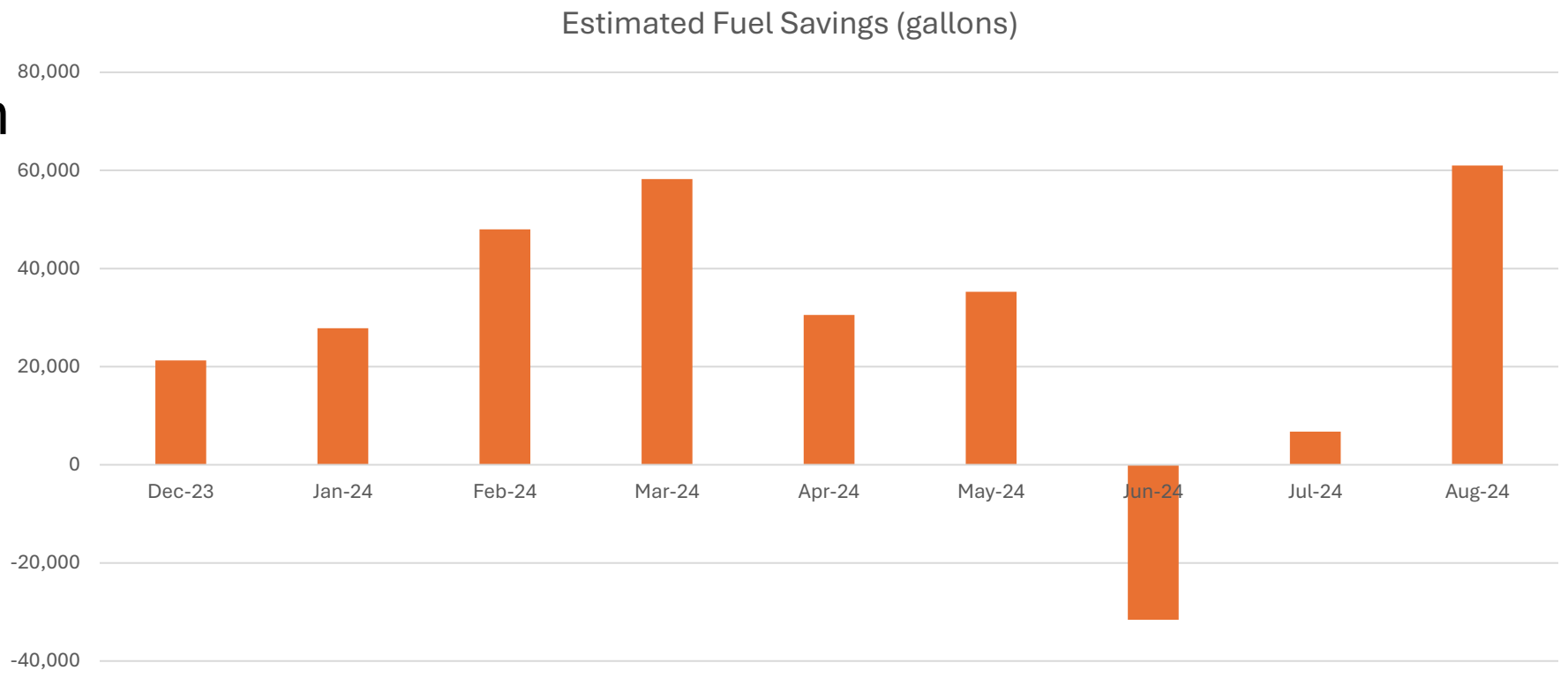
2024 JUNE

Operating		Day#	Post RT		BBA05	CURTAILMENT		Total E	Max kW	DG OPERATION (hrs)						DG gallons saved	
SPLIT GRID		Continued	Jun-24		ENERGY	Calculated	GeoScada		Geoscada	3.4DG	3DG	2.4DG	2DG	1.4DG	1 DG		6
Due to Multiple outages																-savings with 3.4DG	
From May28? to June 2		157	1	Sat	25		50	75	3,499	16.66	0	7.33	0	0	0	-933	
Then again from June 2		158	2	Sun	21		28	48	3,518	18.53	0	5.47	0	0	0	-1,306	
		159	3	Mon	22		37	59	4,916	20.45	0	3.55	0	0	0	-1,690	
		160	4	Tue	31		41	72	4,757	17.43	0	6.57	0	0	0	-1,086	
		161	5	Wed	24		21	46	4,089	20.6	0	3.4	0	0	0	-1,720	
		162	6	Thu	29		31	60	3,338	16.39	0	7.62	0	0	0	-877	
		163	7	Fri	31		48	80	3,795	15.92	0	8.08	0	0	0	-784	
		164	8	Sat	25		50	75	3,198	16.93	0	7.07	0	0	0	-986	
Clear APP Comms Faul		165	9	Sun	7		4	12	1,752	24	0	0	0	0	0	-2,400	
		166	10	Mon	29		49	78	4,099	16.35	0	7.65	0	0	0	-870	
		167	11	Tues	21		13	34	3,510	19.17	0	4.83	0	0	0	-1,434	
		168	12	Wed	28		43	71	3,994	16.85	0	7.15	0	0	0	-970	
		169	13	Thu	32		31	63	3,717	16.55	0	7.45	0	0	0	-910	
		170	14	Fri	30		22	52	4,019	16.96	0	7.03	0	0	0	-993	
		171	15	Sat	27		53	80	3,415	16.38	0	7.62	0	0	0	-876	
20:33	1)Outage	172	16	Sun	27		49	75	3,617	16.24	0	7.77	0	0	0	-847	
		173	17	Mon	27		15	42	4,831	18.97	0	5.03	0	0	0	-1,394	
		174	18	Tues	24		41	65	4,062	19	0	5	0	0	0	-1,400	
12:53	2)Outage.	175	19	Wed	27		34	61	4,001	15.9	0	8.1	0	0	0	-780	
		176	20	Thu	21		30	51	3,510	18.4	0	5.6	0	0	0	-1,280	
		177	21	Fri	18		22	40	3,890	19.49	0	4.52	0	0	0	-1,497	
GRID RECONNECT		178	22	Sat	41		17	58	6,669	14	3.05	0.23	0	6.72	0	303	
		179	23	Sun	34		40	74	5,361	5.7	10.7	0	7.6	0	0	950	
8:49	3)Outage	180	24	Mon	31		33	64	9,101	8	8.52	6.67	0.7	0.02	0.26	116	
1:00	4)Outage	181	25	Tues	19		12	31	4,010	20.45	0	3.55	0	0	0	-1,690	
2:51,3:15	5)Outages	182	26	Wed	22		17	39	5,045	19.28	0	4.72	0	0	0	-1,456	
21:00	6)Outage.	183	27	Thrs	30		45	75	3,655	16.58	0	7.42	0	0	0	-916	
	small outa	184	28	Fri	30		39	69	4,089	17.26	0	6.73	0	0	0	-1,053	
	Scheduled	185	29	Sat	20		7	27	3,457	19.52	0	4.48	0	0	0	-1,504	
		186	30	Sun	19		35	54	3,200	18.38	0	5.62	0	0	0	-1,276	
					774.95	956.09	Total MWh	57.70	1752	516.3	22.3	166.3	8.3	6.7	0.3	-31,559	
				Ave->	26	above	per IPP Calc	AVE	9101	Total hrs	Total hrs	Total hrs	Total hrs	Total hrs	Total hrs	Total Gallons	
							32	<-Ave	Min/Max							Estimated 200ga/D	
					Total E			Total E							0.0087		6
				Ave Energy	58 1,731		MWh	1,731									
				Curtailment & Energy Ratios	45%	55%											

2024 AUGUST

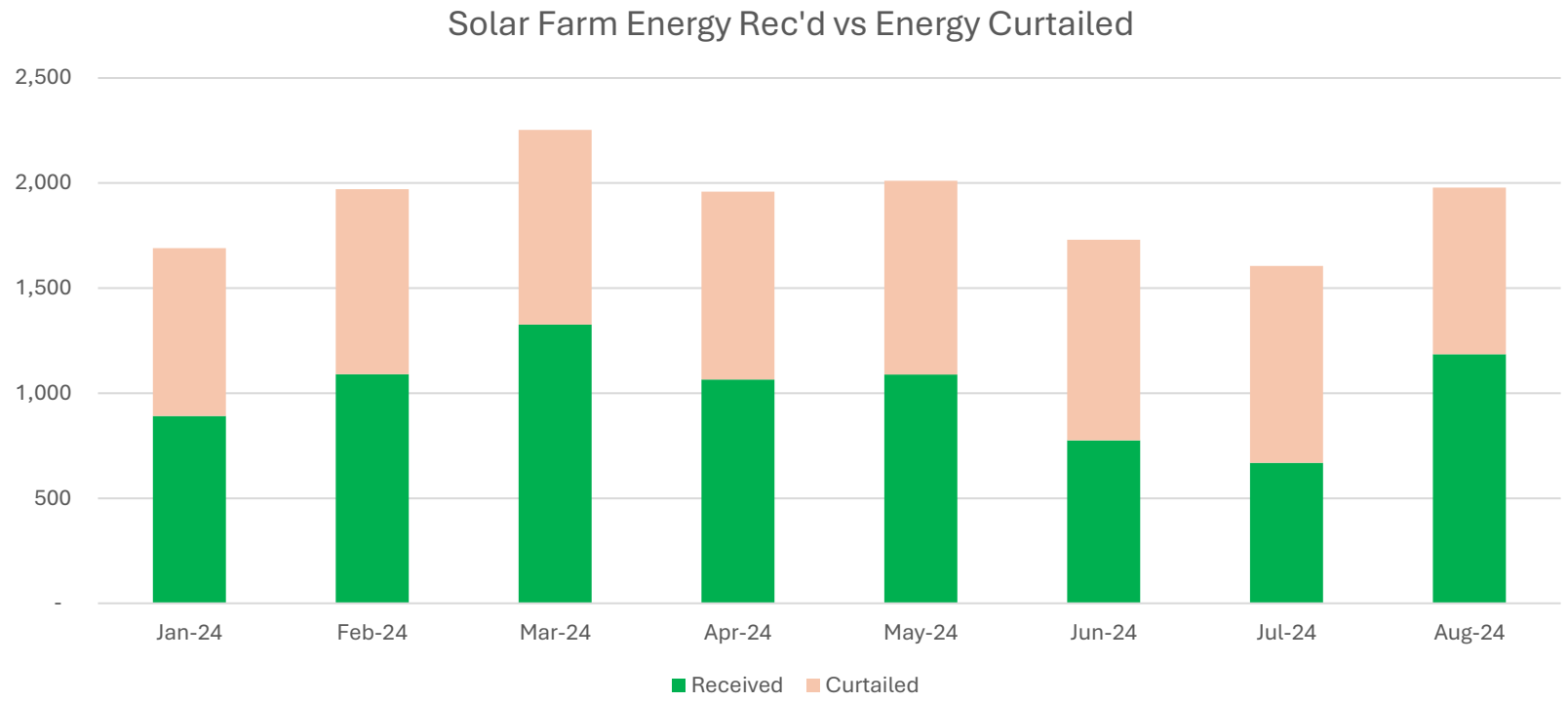
		Day#	Post RT		BBA05	CURTAILMENT		Total E	Tot_PVe	Max kW			DG OPERATION (hrs)				Est. diesel saved
		Continued	Aug-24		ENERGY	Calculated	GeoScada			Geoscada	3.4DG	3DG	2.4DG	2DG	1.4DG	1 DG	
		218	1	Thu	36		30	66	65	4,748	0.15	7.93	**9.83**	6.23	0	0	2,214
		219	2	Fri	39		49	**87**	**79**	4,880	0.07	8.13	**8.57**	7.23	0	0	2,296
		220	3	Sat	34		33	67	67	4,554	0.25	8.00	**8.64**	7.12	0	0	2,263
		221	4	Sun	31		22	53	54	3,722	0	7.98	**8.22**	7.8	0	0	2,382
		222	5	Mon	39		39	**78**	**76**	**5,249**	0.15	8.26	**8.23**	7.35	0	0	2,278
		223	6	Tues	**44**		16	60	58	**5,660**	6.15	2.13	**8.17**	7.55	0	0	1,712
		224	7	Wed	**43**		38	**81**	**85**	4,951	0.12	7.82	**8.48**	7.58	0	0	2,352
		225	8	Thu	26		3	30	31	3,077	0.18	7.8	**16.02**	0	0	0	1,584
		226	9	Fri	33		35	68	69	4,496	0.07	7.78	**10.41**	5.73	0	0	2,180
		227	10	Sat	**52**		35	**87**	**79**	**6,440**	0.78	4.01	**13.21**	0	6.42	0	2,848
		228	11	Sun	30		25	55	58	**5,042**	5.49	1.68	**14.29**	2.55	0	0	1,390
		229	12	Mon	27		19	46	49	**5,072**	5.25	4.48	**14.27**	0	0	0	902
		230	13	Tues	**41**		24	65	64	**5,555**	0.78	7.95	**9.75**	5.52	0	0	2,001
		231	14	Wed	**47**		19	66	65	**6,912**	3.29	4.13	**9.18**	7.4	0	0	2,069
11:53	1)Outage	232	15	Thu	31		16	47	48	**8,639**	0.50	7.87	**14.15**	0	1.43	0.05	1,743
		233	16	Fri	38		25	63	67	**5,892**	7.56	0.54	**9.18**	6.72	0	0	1,506
		234	17	Sat	**45**		19	64	57	**6,987**	8.20	0	**9.63**	0.58	5.58	0	1,654
Scheduled Outage Aira		235	18	Sun	30		23	53	59	4,425	0.18	8.77	**9.99**	5.72	0	0	2,125
3:59	2)Outag	236	19	Mon	**48**		16	64	60	**6,373**	0.08	8.75	**6.12**	6.48	2.57	0	2,543
		237	20	Tues	**48**		31	**79**	**87**	**6,646**	0.05	8.16	**9.15**	6.63	0	0	2,236
		238	21	Wed	**47**		17	64	61	**6,578**	0.60	7.37	**7.87**	7.89	0	0	2,305
		239	22	Thrs	**42**		28	**71**	67	**6,041**	0.10	7.90	**9.65**	6.35	0	0	2,225
13:17	3)Outage	240	23	Fri	32		29	62	69	**5,480**	0.51	7.53	**15.65**	0	0	0	1,589
		241	24	Sat	34		33	67	68	4,589	0.10	7.27	**10.12**	6.52	0	0	2,306
		242	25	Sun	33		33	66	66	4,028	0.08	6.78	**12.14**	5	0	0	2,206
5:08 & 10:30	4)5)Outag	243	26	Mon	38		33	**71**	**70**	**6,069**	6.69	0.53	**14.66**	1.72	0.07	0.04	1,175
		244	27	Tues	**42**		28	**71**	69	**5,848**	6.73	0.00	**14.91**	2.37	0	0	1,292
21:44	6)Outage	245	28	Wed	**47**		37	**84**	**85**	**5,788**	3.63	1.97	**10.93**	7.47	0	0	2,224
		246	29	Thu	**44**		23	67	66	**6,088**	0	7.55	**11.98**	4.47	0	0	2,092
		247	30	Fri	33		6	39	33	**5,785**	8.52	3.93	**11.55**	4.03	0	0	1,109
		248	31	Sat	28		6	34	38	3,997	0.17	7.53	**10.42**	5.88	0	0	2,201
					1186.01	791.77	Total MWh	63.80	63.55	3077	66.43	180.53	**335.37**	149.89	16.37	0.09	**61,001**
				Ave->	38	above	per IPP Calc	AVE	AVE	**8639**	Total hrs	Total hrs	Total hrs	Total hrs	Total hrs	Total hrs	Total Gallons
							26	<-Ave		Min/Max							Estimated 200ga/D
					Total E			Total E	Total E							0	
					1,978		MWh	1,978	1,970								
			Curtailment & Energy Ratios		60%	40%											

- 2024 January to August IPP Injection
  - Est Fuel Savings



	Dec-23	Jan-24	Feb-24	Mar-24	Apr-24	May-24	Jun-24	Jul-24	Aug-24
Total E (kWh)		1,411	1,971	2,253	1,959	2,012	1,731	1,605	1,978
Energy Rc'd (kWh)	778	891	1,090	1,327	1,065	1,089	775	669	1,186
Energy Curtailed(kWh)		800	881	927	894	923	956	936	792
Max Power Injected(kW)	7,825	8,495	11,330	10,329	11,702	11,467	9,101	8,190	8,639
Est. Fuel Savings(gallons)	21,250	27,823	47,966	58,230	30,566	35,264	-31,559	6,779	61,001
Days shut down 2 DGs		7	18	22	5	9	1	1	0
%Energy rec'd		53	55	59	54	54	45	42	60
% Energy curtailed		47	45	41	46	46	55	58	40

- 2024 January to August IPP Injection
  - Energy Received
  - Energy Curtailed



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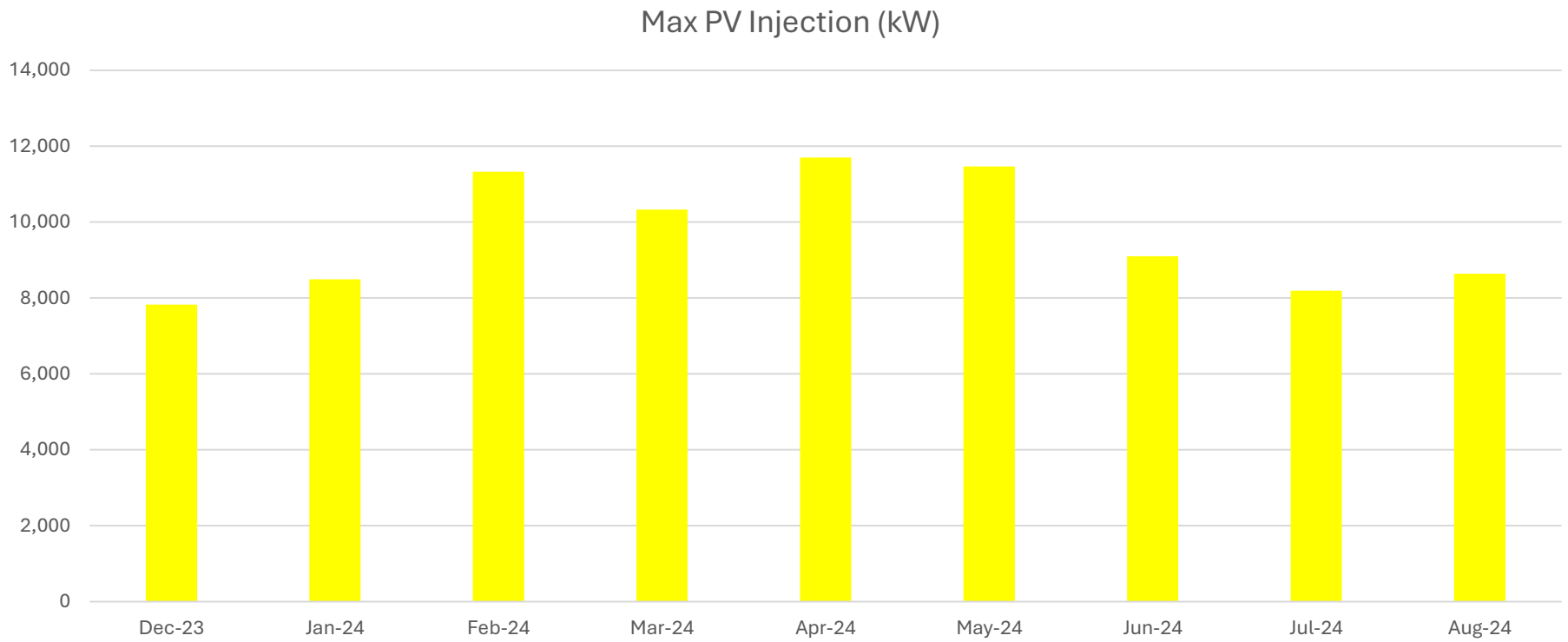
- 2024 January to August IPP Injection
  - Max power injected



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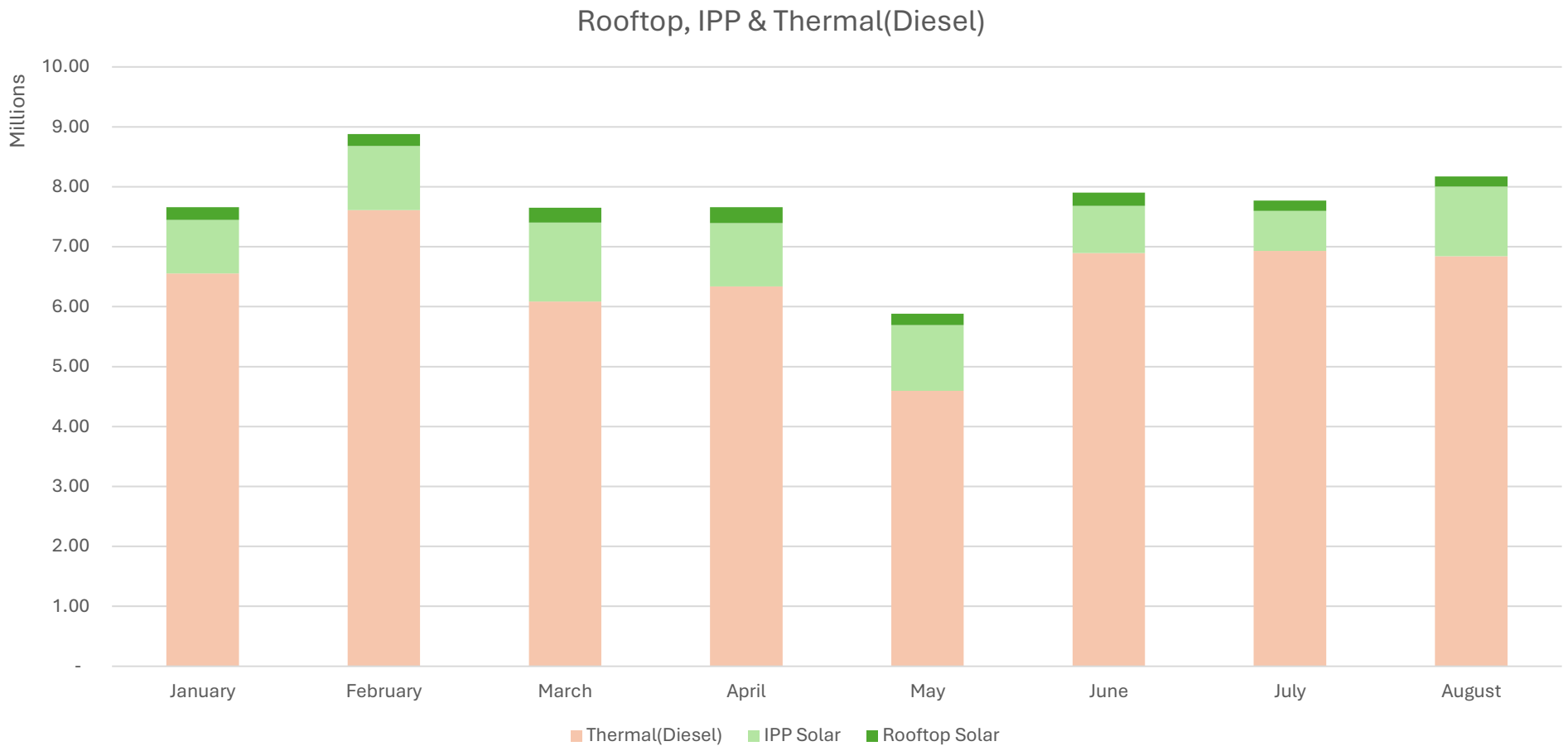
- 2024 January to August Rooftop PV, IPP & Diesel Generation energy comparison



Rooftop Solar	3%	2%	3%	3%	3%	3%	2%	2%
IPP Solar	12%	12%	17%	14%	19%	10%	9%	14%
Thermal(Diesel)	86%	86%	80%	83%	78%	87%	89%	84%

Moving Forward

- Some Existing Challenges
  - Limited PV Injection, High curtailment; (Fault Current) issues. Protection grading (ex: BSJ03)
    - Protection Study (in progress)
    - BESS (in progress)
    - Synch condenser/flywheel (under consideration)
  - Data Recording & Event Logging (Internal capacity building)
  - Modelling (some progress)

- Upgrade in progress (34.5kV transmission line east coast)

- Prioritization Plan/ Planning

Moving Forward

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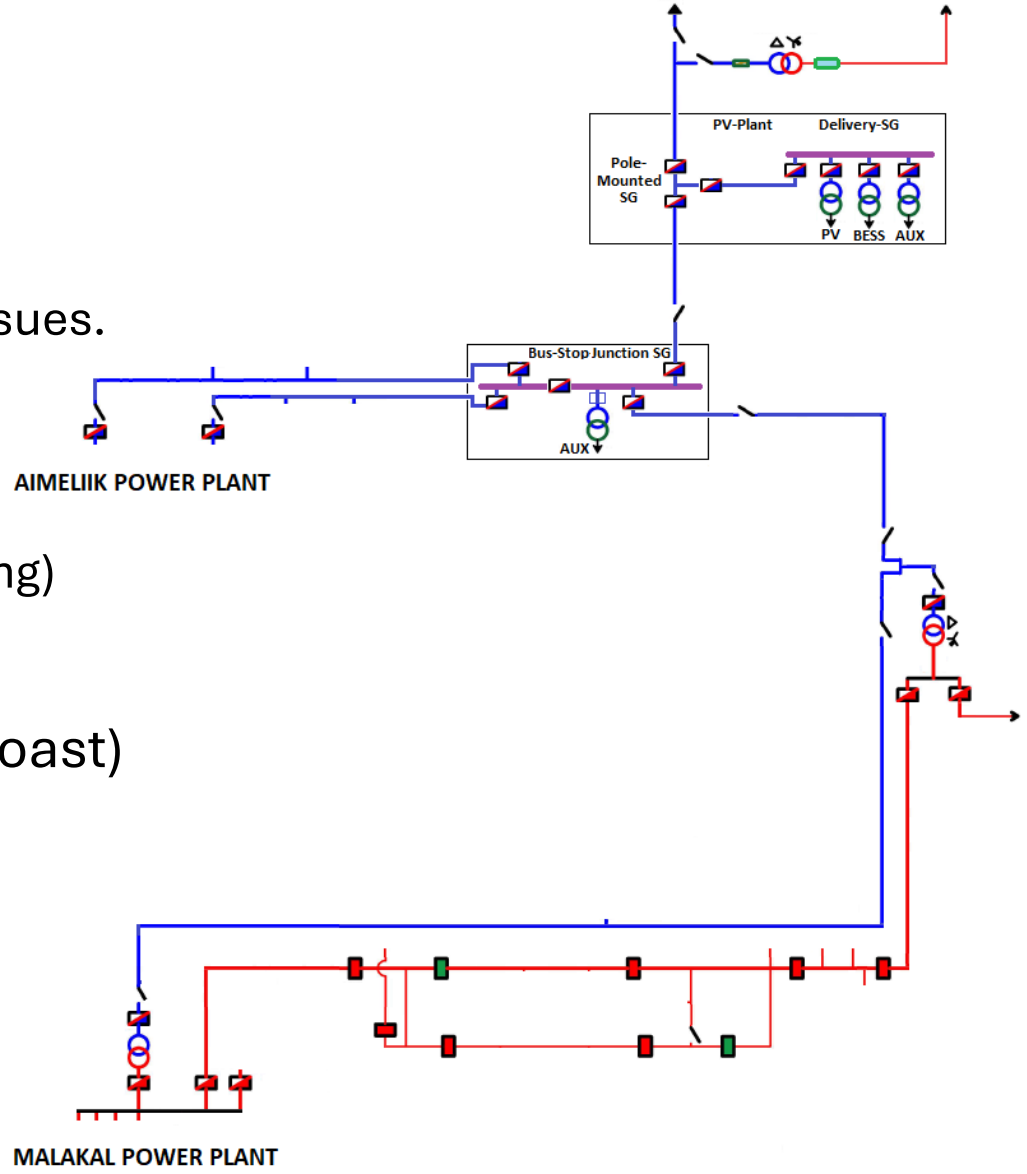
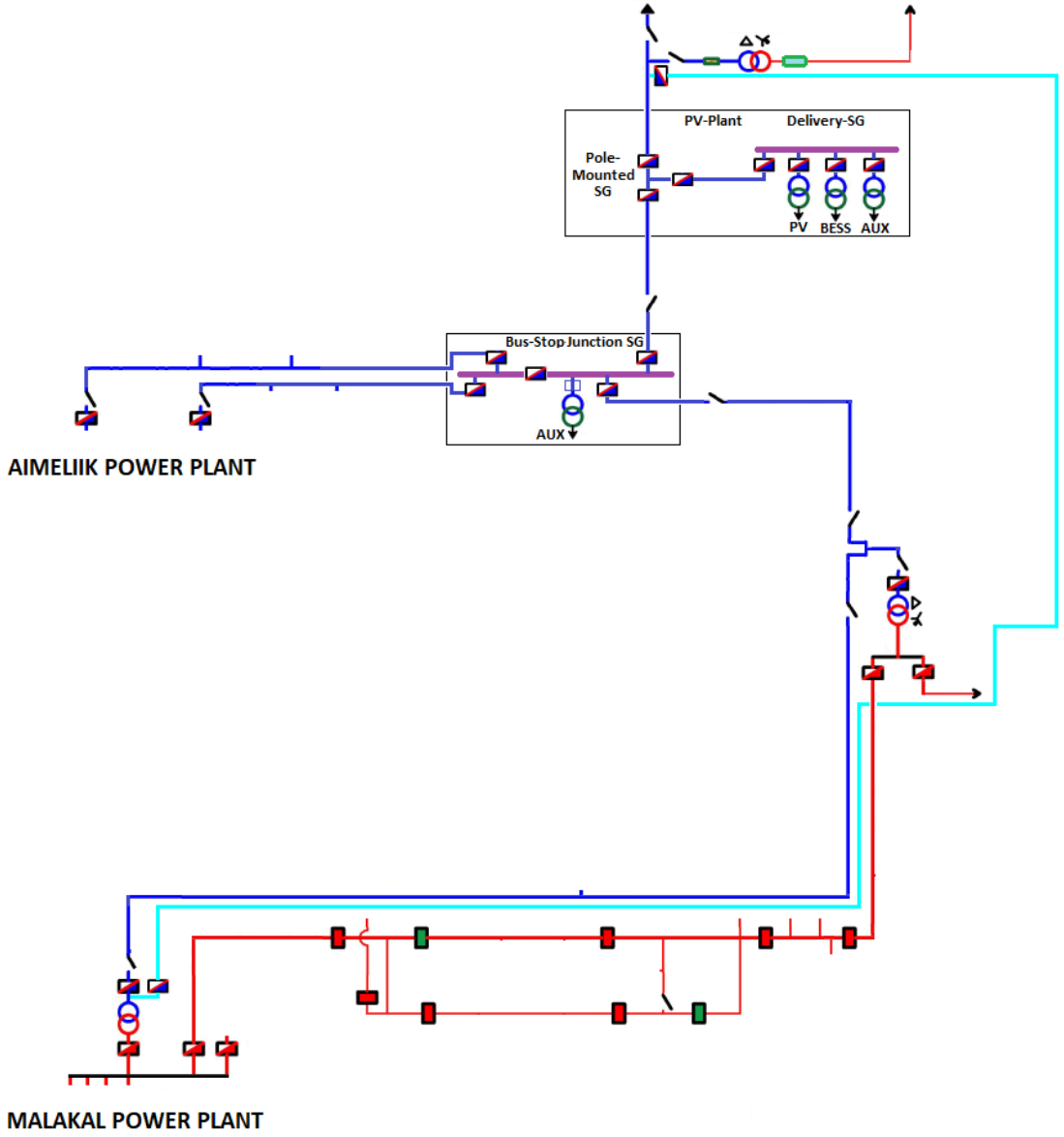


Moving Forward

New 34.5kV transmission East Coast

Currently under construction, to be completed next year.

-Increases Network reliability & flexibility



Lessons: Cost of higher Renewables

- Renewables add more complication. Requires capacity building internally & with outside experts
- Expert assistance during critical stages invaluable (PPA negotiation, construction, reliability tests, operations..).
- Cost of repairing grid for higher robustness
  - Existing Grid vulnerabilities can be magnified (replacing protection relays, breakers)
- Record keeping/ logging critical (unfortunately deficient)
- Public and Leadership awareness and accurate understanding for support
  - public outreach, townhalls(food), publications, personnel, outreach,
- Curtailment cost pressure
  - Costs rise with each outage and grid transition
- Policy, Grid Codes

Malo ‘Aupito

Mesulang