



POWERING FORWARD

**GUAM'S
CLEAN ENERGY MASTER PLAN**

Guam Chamber of Commerce
September 25, 2024
Guam Hilton Resort & Spa | Tumon Bay

JOHN M BENAVENTE, P.E.
General Manager
GUAM POWER AUTHORITY

Next Generation Traditional Energy



Ukudu Combined Cycle Power Plant

Next Generation Renewable Energy



Phase IV Renewable Energy Project

NEW CONVENTIONAL POWER GENERATION

Ukudu Power Plant 198 MW Combined Cycle

Cornerstone for Renewables



Commissioning September 2025



Dual Fuel
*Ultra-Low Sulfur
Diesel and Liquefied
Natural Gas*



**51% Thermal
Efficiency**
*GPA's most efficient
conventional plant*



**Decreases fuel oil
imports by 879,000
barrels per year**



**No thermal discharge
to the ocean**
*Utilizes treated
wastewater for boiler
and condenser
cooling*



Highly Reliable
*Includes 25MW
Energy Storage
Battery*



**Independent Power
Producer (IPP)**
*25-year Contract with
Guam Ukudu Power*

NEW CONVENTIONAL POWER GENERATION

Ukudu Power Plant 198 MW Combined Cycle

Cornerstone for Renewables



Actual accumulated progress including
Engineering, Procurement and Construction:

90.54%

(as of August 31, 2024)

Plant construction progresses steadily.

Major tasks ongoing:

- Hydrostatic testing of HRSG 2
- Rte 16 road restoration
- ULSD pipeline pigging
- Re-use water facility construction

Major work recently completed:

- Pipeline installation
- ULSD & LNG pipeline pressure testing

Commissioning may be as early as September 15, 2025

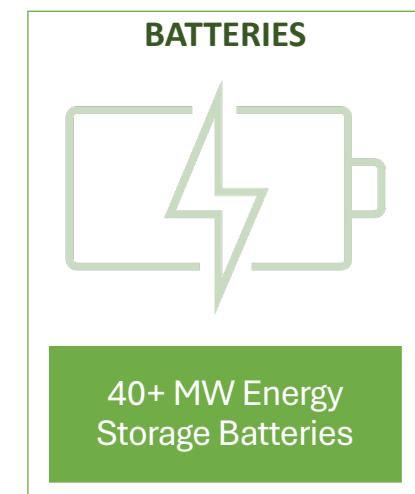
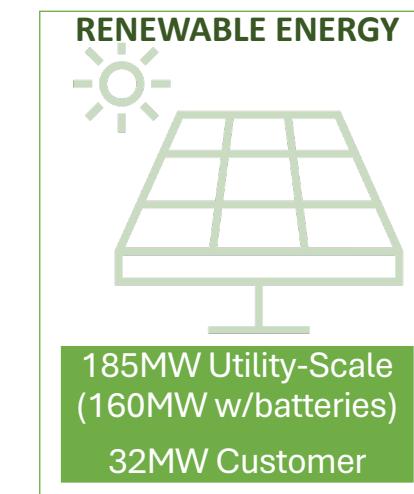
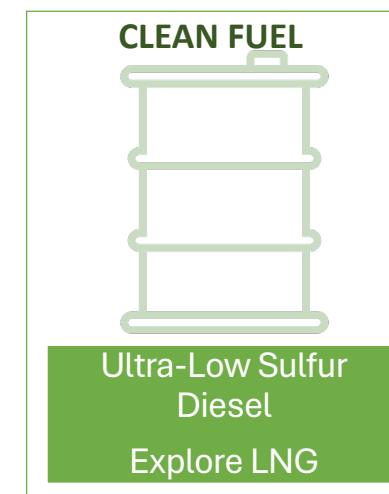
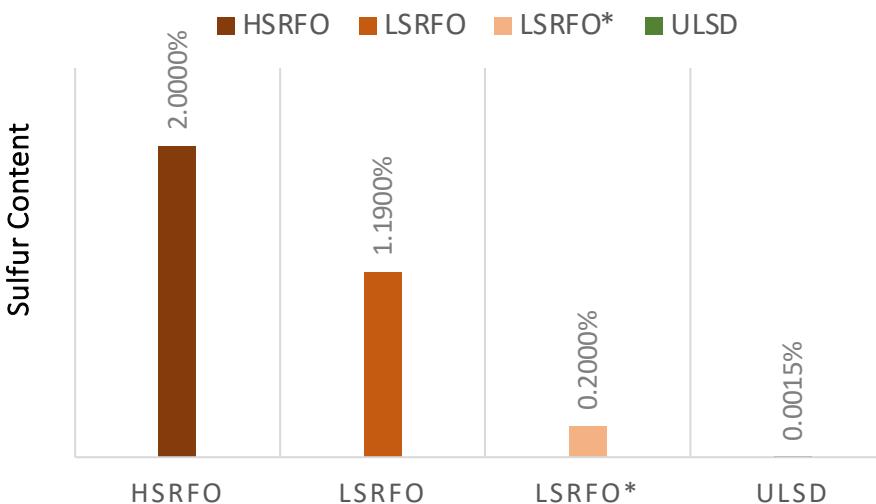
CLEAN FUEL TRANSITION

Fuel	2022												2023 - 2024												2025													
BASELOAD	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D		
Cabras 1&2	HSRFO (2.0% S)	LSRFO (1.19% S)						LSRFO Special (0.2% S)																														end
Piti 8&9	HSRFO (2.0% S)	LSRFO (1.19% S)			ULSD (0.0015% S)																																	>>>
Ukudu					ULSD Special (0.0015% S)																																	>>>
Non-Baselload								ULSD (0.0015% S)																														ULSD Sp >

3 types of fuel are currently used

2 additional fuel types with lower sulfur content have been incorporated, resulting in up to 5 different fuels as the heavy oil is phased out

All plants will use a single fuel source beginning January 2026



CONVENTIONAL ENERGY UPDATE

All power generators to run on clean ULSD fuel by 2025; Sulfur Dioxide Emissions reduced by 99% in 2023

Existing/ Future Projects	Existing	Future 2025 to 2030
	In Progress	Beyond 2030
	<ul style="list-style-type: none"> ▪ 86.4MW Baseloads on ULSD <ul style="list-style-type: none"> – Piti 8 & 9 as of Sept 16, 2022 ▪ Transitioned Cabras 1 & 2 to 0.2% S LSRFO November 2022 ▪ 160MW Intermediate Units on ULSD ▪ 40MW Peaking Units using ULSD 	<ul style="list-style-type: none"> ▪ Retire Cabras 1 & 2 NLT March 2026 ▪ Reduce use of Piti Baseload and Reserve Units ▪ Upgrade IWPS Grid to enhance resiliency and reliability ▪ Add Centralized Energy Storage Batteries to integrate more renewables
In Progress	<ul style="list-style-type: none"> ▪ 198 MW Ukudu Combined Cycle online September 2025 <ul style="list-style-type: none"> – Efficient use of ULSD – 25 MW BESS for spinning reserve included – Reduces sewage water waste stream – Reduces water draw from aquifer – Cuts oil imports by 879,000 bbl. annually 	<ul style="list-style-type: none"> ▪ New renewable baseload technologies ▪ More solar renewables ▪ Waste to Energy (10MW)



GUAM FUEL PRICES IMPACTED BY GEOGRAPHICAL & POLITICAL CONFLICTS

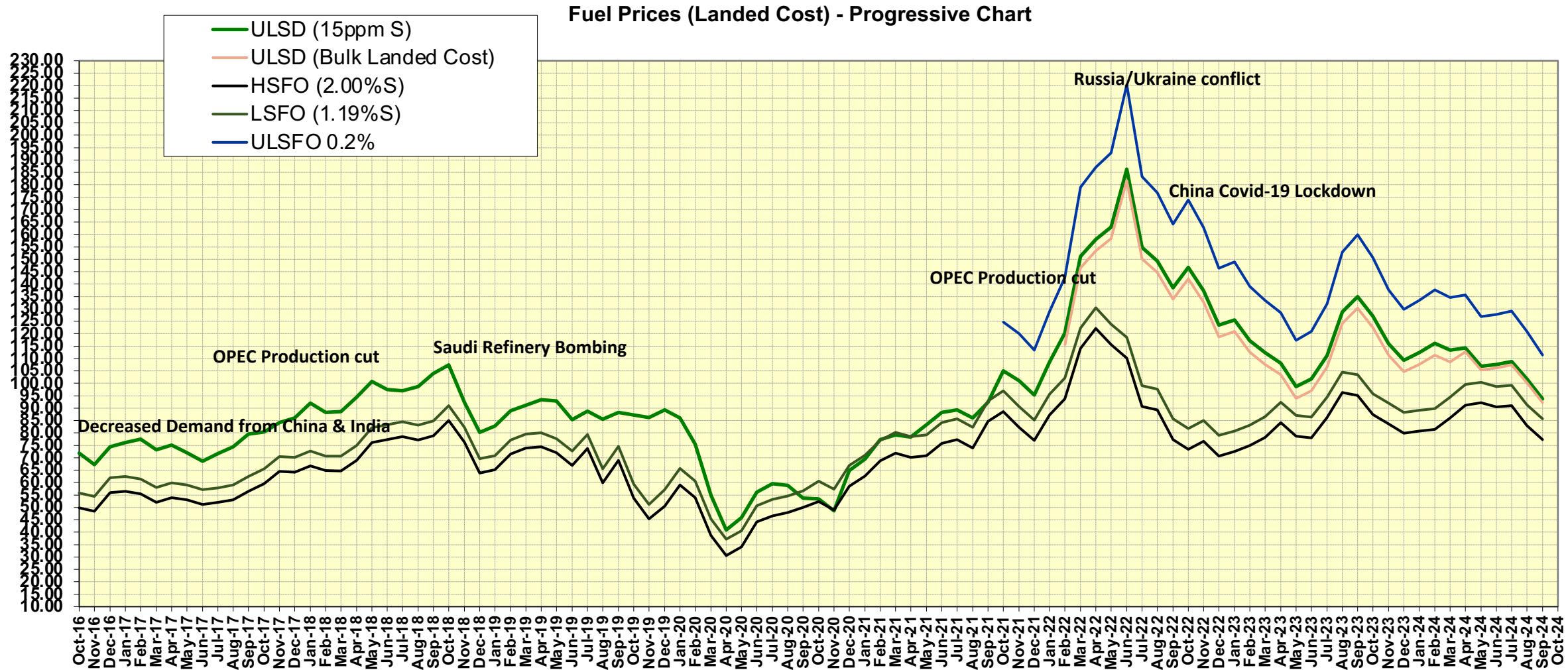
GPA Fuel Landed Cost (Per Barrel as of September 17, 2024)

ULSRFO 0.2%

\$ 111.45

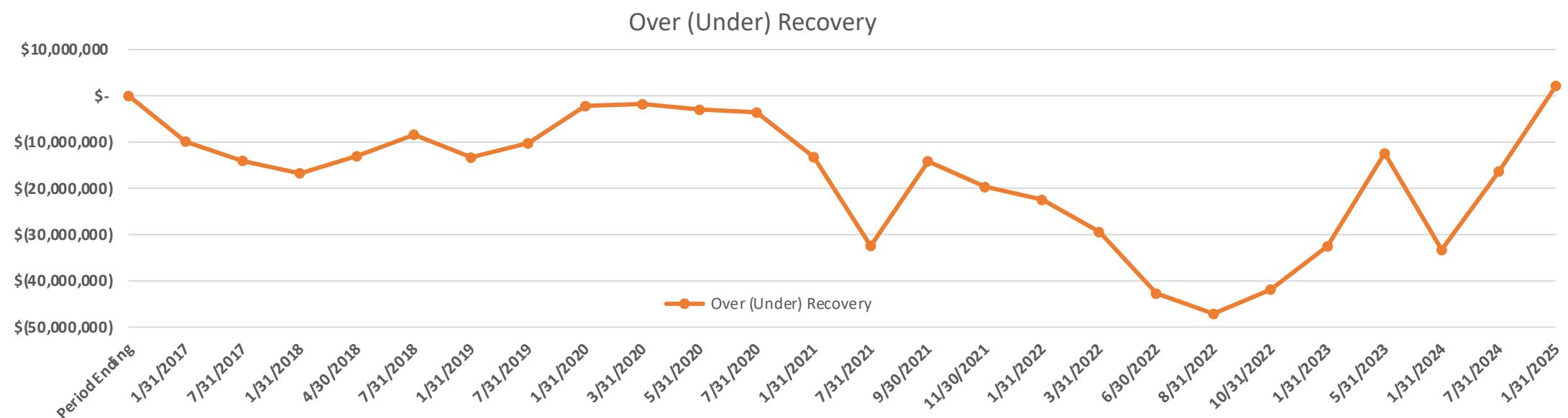
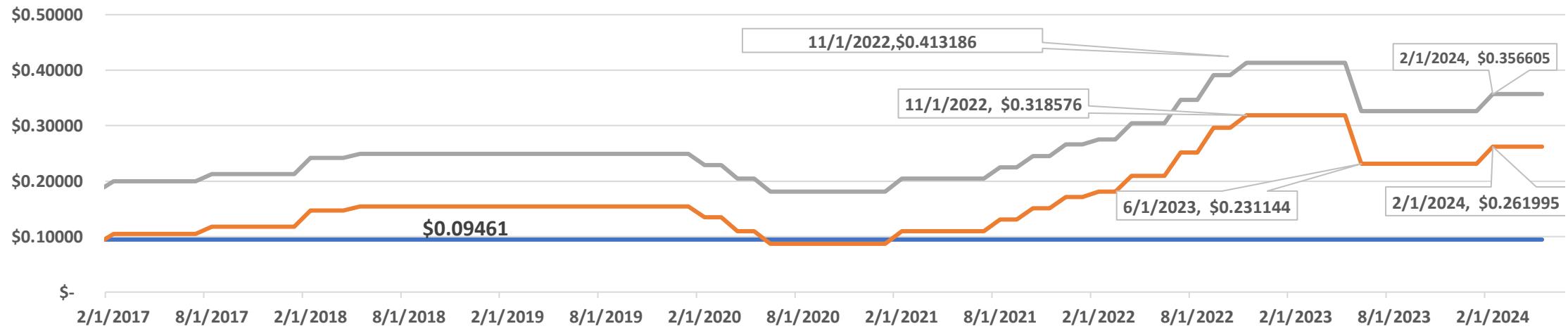
ULSD Bulk

\$ 92.28



HISTORIC LEAC ADJUSTMENTS

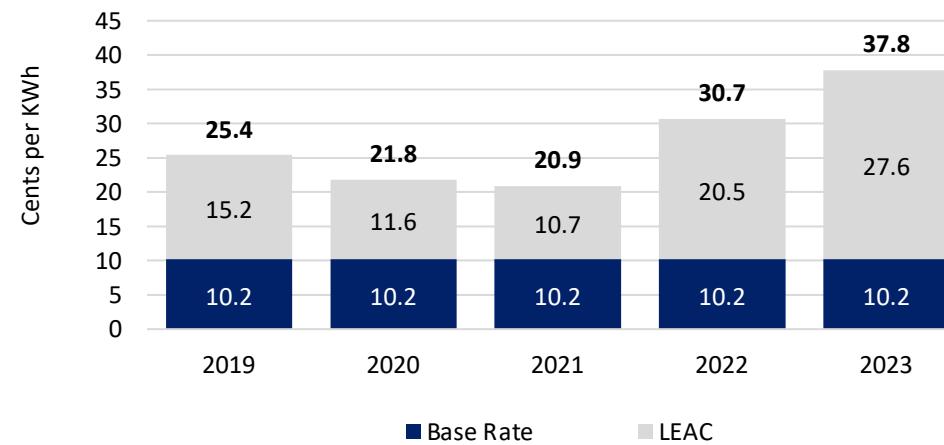
GPA recovers fuel related costs through the semi-annual Levelized Energy Adjustment Clause (LEAC) which recently has been highest in GPA history. Base rate has not changed since 2013



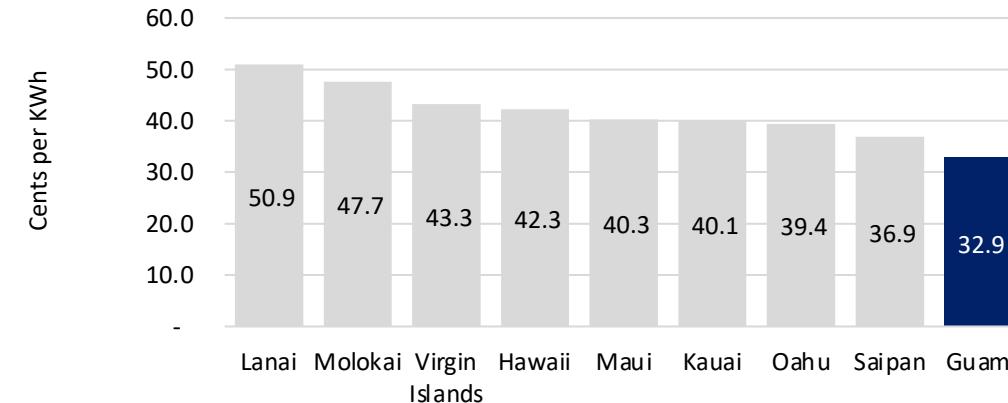
GPA RATE STRUCTURE

GPA recovers fixed costs through its Base Rate, fuel costs through the semi-annual Levelized Energy Adjustment Clause (LEAC), and any cost recovery through available surcharges

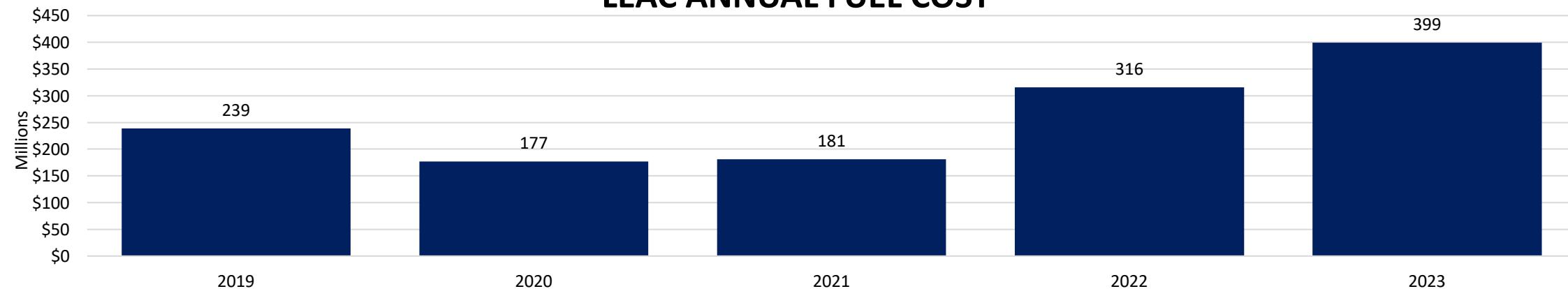
GPA System Average Rates (Fiscal Year)



Residential Rate Comparison¹



LEAC ANNUAL FUEL COST

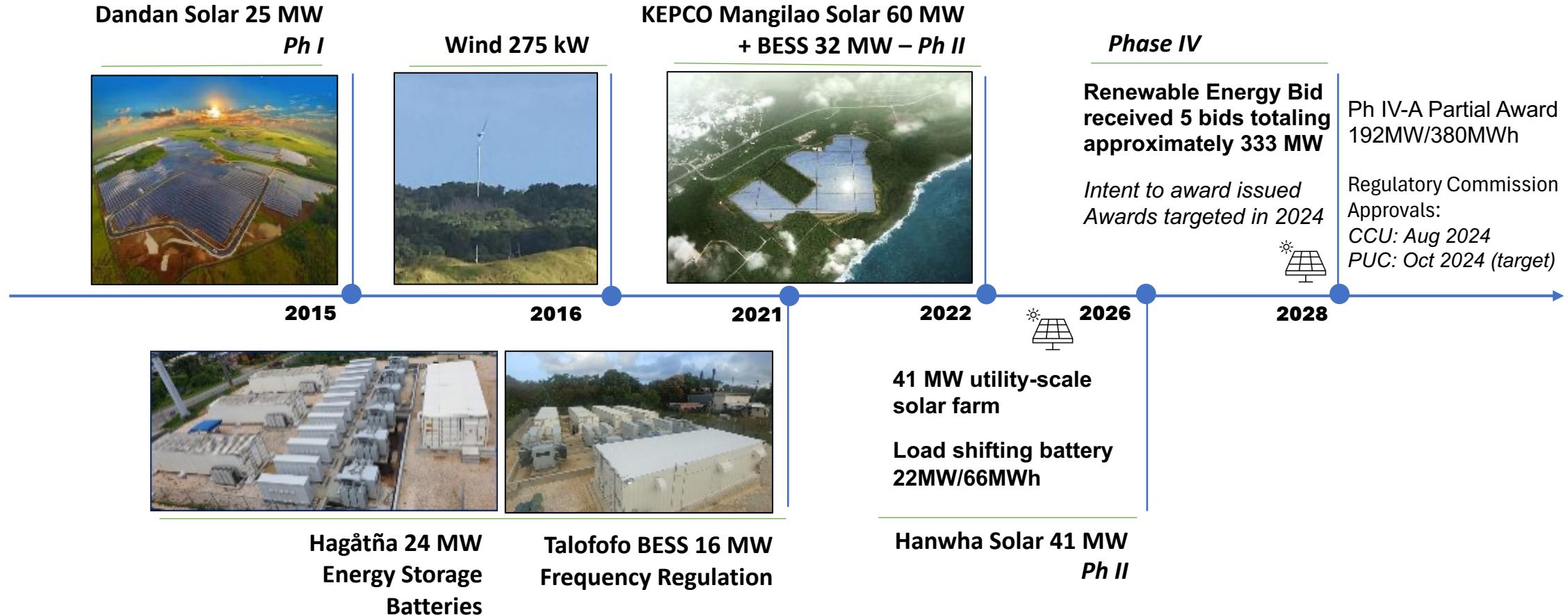


Source: Guam Power Authority

1. Rates for Guam as of December 1, 2023; Rates for Kauai, Oahu, Molokai, Lanai, Hawaii and Maui as of December 1, 2023; Rates for Saipan as of December 1, 2023; and Rates for Virgin Islands as of March 1, 2022.

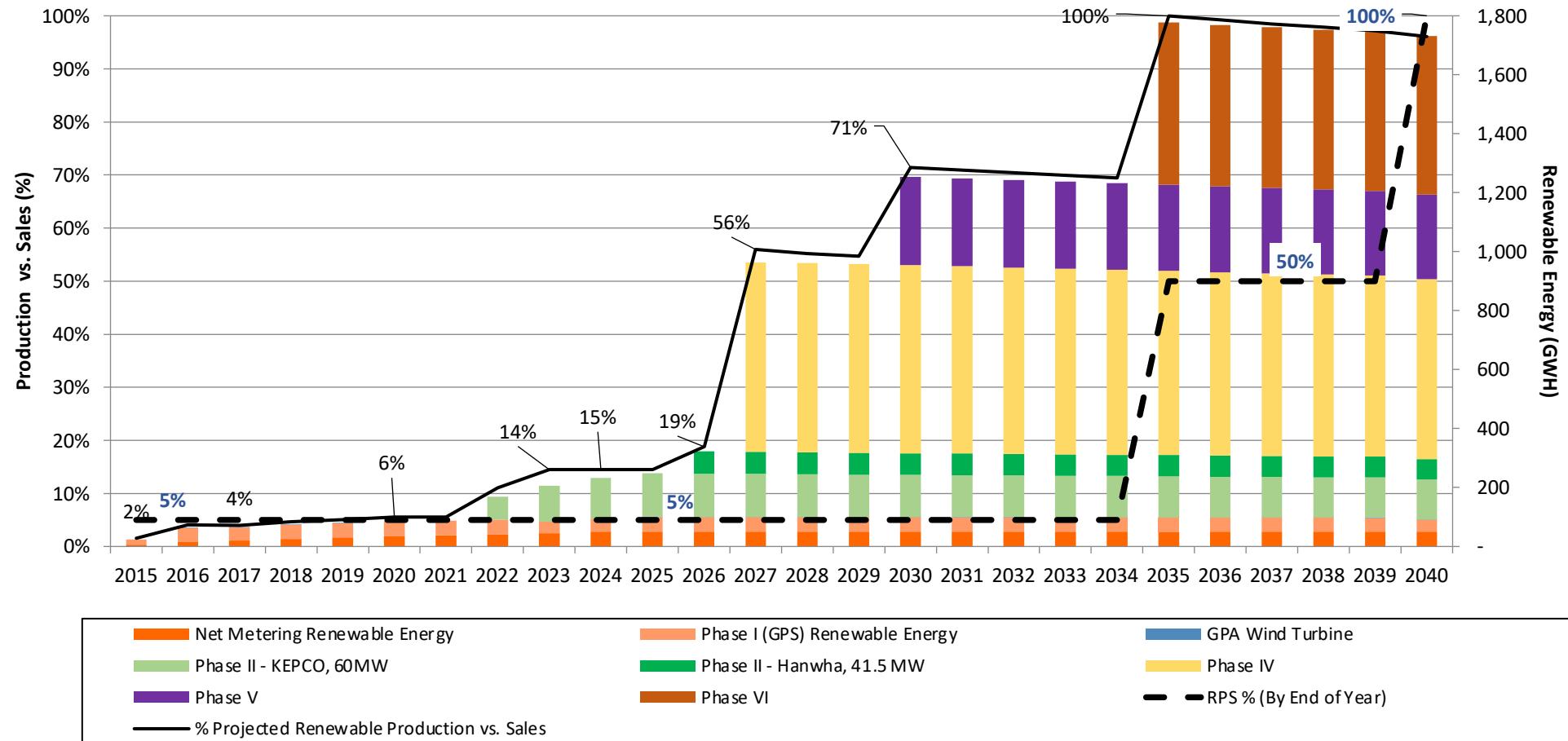
NEW RENEWABLE ENERGY GENERATION

Fossil-free living with the power of solar and wind



JOURNEY TO 100% RENEWABLE ENERGY GOAL

Renewable Portfolio Standards (RPS) Tracking Projection thru 2040 (as of 04/05/24)



SIGNIFICANT PROGRESS IN ENERGY GENERATION, SHIFTING, & CAPACITY

	Contract Type	Capacity (MW)		
		July 2024	July 2026	July 2028
PRIMARY GENERATION	Cabras 1&2	Owned	84	Retired
	Piti 8&9	Owned	86.4	86.4
	Piti 7	Owned	40	40
	Macheche CT	Owned	20	20
	Yigo CT	Owned	20	20
	Dededo 1&2 CT	Owned	40	40
	Diesel Units (4MW)	Owned	33	40
	Yigo Diesels (1MW)	Owned	8	Retired
	Aggreko Temp Diesels (0.8MW)	Temporary Svc	20	-
	Tenjo Annex Diesels (1MW)	Owned	-	20
RENEWABLE GENERATION	Ukudu Power Plant	IPP (25 Yrs)	-	198
	Total Primary Capacity		351.4	464.4
	Dandan Solar	PPA (11 Yrs)	25	25
	Mangilao Solar	PPA (23 Yrs)	60	60
	Wind Turbine	Owned	0.3	0.3
	Phase II/Hanwha Contract*	PPA (25 Yrs)	-	41
Phase IV Bid – Potential Award*	Phase IV Bid – Potential Award*	PPA (25 Yrs)	-	330
	Total Renewable Capacity		85.3	126.3
	Total ESS Shifting Capacity		4	26
ESS SHIFTING	Dandan ESS Shifting		4	4
	Phase II/Hanwha ESS Shifting*	PPA (25 Yrs)	-	22
	Phase IV Bid – ESS Shifting*	PPA (25 Yrs)	-	150
TOTAL PRIMARY & ESS SHIFTING CAPACITY		355.4	490.4	640.4
Projected Peak Demand		260	270	289
% Reserves		36.7%	81.6%	127.9%
Est. Capacity Available for Growth		(11.6)	66.4	205.4

* Phase II Hanwha contract & Phase IV bid proposals include solar PV with ESS shifting capabilities. For illustrative purposes, the solar PV and ESS shifting capacity are shown separately here.

PHASE IV RENEWABLE ENERGY BID DISCUSSION

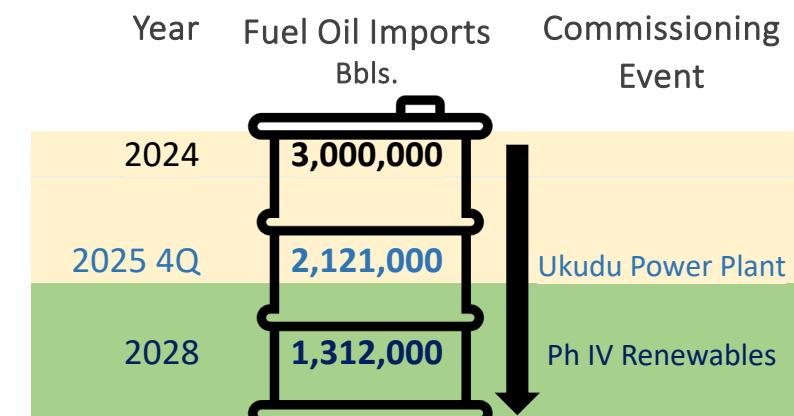
PROPOSALS SUBMITTED IN RESPONSE TO THE PHASE IV RENEWABLE ENERGY BID TOTALS 333.6MW

ACHIEVING THE RENEWABLE PORTFOLIO STANDARD MANDATE

- GPA IS MANDATED TO ACHIEVE 50% RENEWABLES BY 2035.** If all proponents are awarded, GPA will achieve the RPS mandate by 2028.
- The award of the proposals provide clear benefits for GPA and its ratepayers.** The government procurement process is burdensome and time-consuming. The current bid is nearing two years since announcement. Delaying awards will negatively impact ratepayer costs.

REDUCING GUAM'S ENERGY COSTS & CARBON FOOTPRINT

- ULSD fuel oil prices will continue to rise and fluctuate** because it is a global commodity significantly impacted by global events. Every historic global and/or political event resulted in the slope of fuel prices maintaining an upward price trend.
- The price of ULSD prices has reached \$150+ per barrel within the past two years, soaring to \$186/Bbl. in 2022.
- While GPA cannot control global fuel prices, efforts to reduce its fuel consumption significantly benefits ratepayers.**
 - The commissioning of the Ukudu Power Plant and Phase IV Renewables will reduce GPA fuel imports by ~56%.
 - The impact of global events, the perennial nemesis of GPA ratepayers, will have been reduced more than half.
 - This paradigm shift in Guam energy generation and fuel sources will continue further as GPA continues to pursue renewables beyond 50%**



PHASE IV RENEWABLES BID DISCUSSION *CONTINUED:*

ACHIEVING OVERALL VALUE & AFFORDABILITY

- **The award of the Phase IV proposals will provide an excellent hedge against high ULSD fuel prices.**
 - GPA has used fuel oil hedging in past years to no success despite the assistance of hedging consultants.
 - GPA sets the annual escalator at no more than 1%, making these renewable energy contracts an excellent hedge. This condition protects ratepayers from having to see LEAC reach the high 20¢/kWh and into the 30¢/kWh range as it recently did.
- **GPA power purchase agreements add value to large tracts of land which are otherwise difficult to develop.**
 - As GPA enters more renewable energy contracts, the prices of large land tracts will likely increase because of their added value for energy production. However, large tracts with varying terrain and topography requiring substantial grading to install solar components will drive land and contract prices higher.
 - The award of the Phase IV proposals are time sensitive as proponents have limited land option contracts. Failure to issue timely awards jeopardize the feasibility and costs of these projects if the proponent's land options expire.
- **T&D infrastructure upgrades, although initially costly, improves the grid and prepares it for expansion.**
 - Limitations of existing transmission infrastructure are constraining low-cost utility-scale project sites.
 - Upgrades to 115 kV lines are becoming the norm and could cost upwards of \$0.02/kWh to install. As more higher voltage transmission lines are added into the grid, more and more renewables at lesser price could be added without additional expenses.
- **Energy Storage Systems (ESS) are required to shift daytime solar energy to non-daylight hours.**
 - ESS capable of 50% shifting increases renewable energy project pricing by about \$0.07/kWh, while a 100% shifting requirement would nearly be double this amount.
 - The Phase IV bid required 50% energy shifting and a price cap of \$0.179/kWh.

IMPROVING ENERGY RELIABILITY, RESILIENCY, & READINESS

- **Energy Storage Systems provide reserve capacity to meet peak loads and future load growth.**
 - ESS provides reserve capacity, allowing GPA to reduce conventional reserve units and reduce cost.
 - DoD has noted their potential growth will raise their power requirements to 100+MW, compared to about 42MW in 2024.
 - Capacity to serve other growth areas, such as data centers, electric vehicles, island housing, etc., could be met by the ESS capabilities delivered by Phase IV projects.
- **Responding to the INDOPACOM threats and conflicts requires GPA ramp up its resiliency and reliability capacities.**
 - Having 50% of all the island's energy serve by renewables by 2028 is significant progress towards achieving resiliency.
 - The reduction of energy from conventional plants increases our inventory capacity from 90 days to several months to sustain energy sustainability.

Note: On December 29, 2023, GPA issued to all proponents Notices of Intent to Award subject to their agreement and compliance with the system impact study infrastructure requirements (to be conducted for their technical proposals) with no change in bid price and further subject to CCU and PUC approvals.

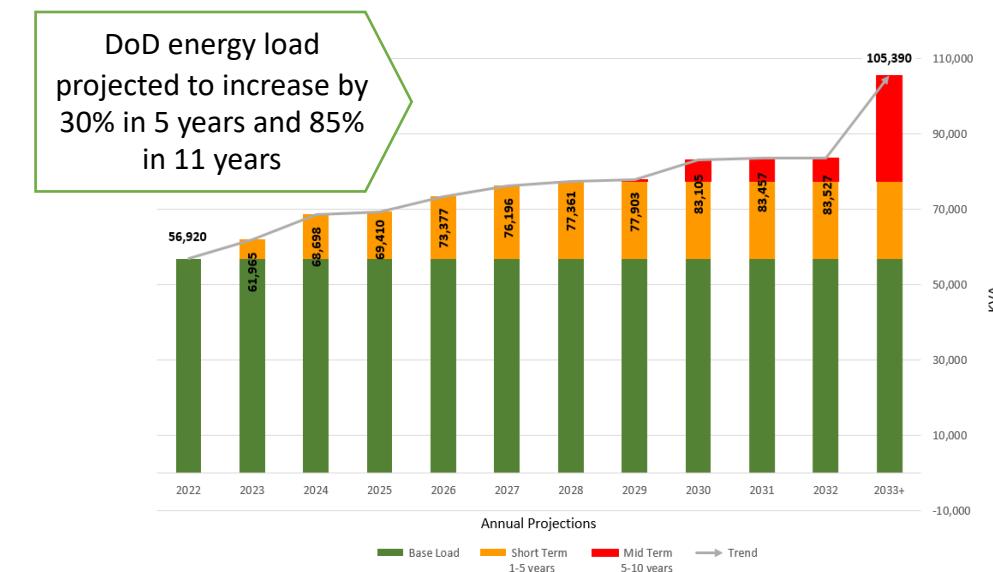
PHASE IV RENEWABLES PROVIDE CAPACITY FOR GROWTH

	WITHOUT PHASE IV	WITH PHASE IV
Ukudu Power Plant	198	198
Piti 8&9	86	86
Piti 7	31	31
Macheche CT	20	20
Yigo CT	20	20
Dededo CTs	40	40
Tenjo Diesels	20	20
Manenggon Diesels	8	8
Talofofo Diesels	8	8
Yigo Diesels Replacement (online 2026)	20	20
Total Conventional Capacity:	451	451
Renewables + Shifting ESS	22	195
TOTAL CAPACITY:	473	646
Reserve Requirement	146	146
Load Capacity	327	500
Projected Demand 2028 – 2% Growth	289	289
Capacity for Growth in 2028:	38	211
Additional Military Demand by 2033	44	44
Additional Demand 2033 – 2% Growth	30	30
Projected 2033 Total Growth – 2% Growth	74	74
Capacity for Growth in 2028	38	211
BALANCE FOR GROWTH/UNIT RETIREMENTS:	(36)	137

Phase IV Projects with ESS capacity provides capacity to meet economic growth and customer demands for greater energy reliability and resiliency.

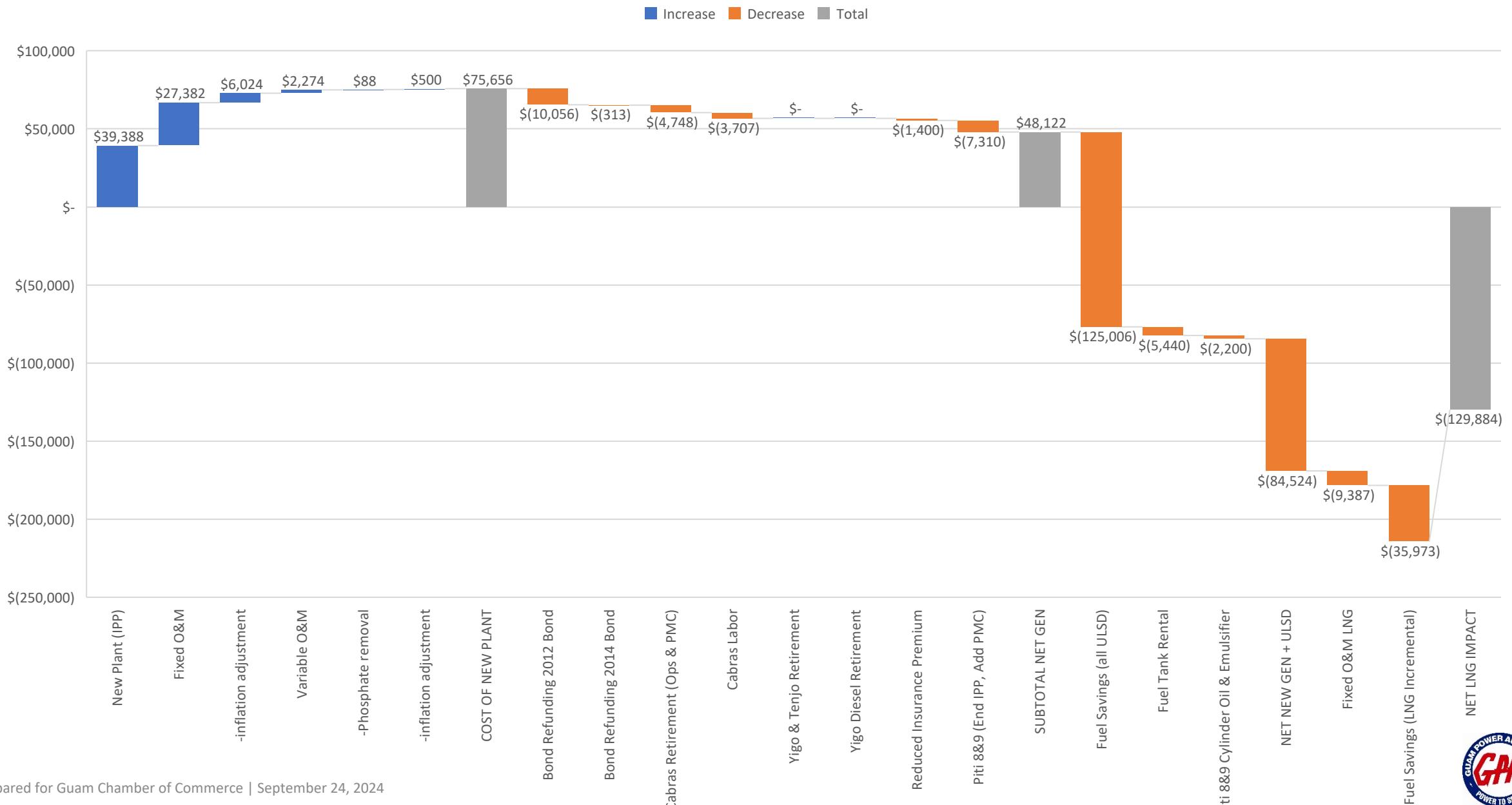
CONSIDERATIONS:

- Without adequate load capacity,
 - Retirement of older units not recommended
 - Load-shedding is possible
- Current reserve units will be 35 years old by 2028
- Military demand may ramp up quickly to address regional threats. The Phase IV projects provide capacity to GPA to meet concurrent customer needs.



PROJECTED COSTS & SAVINGS WITH UKUDU POWER PLANT COMMISSIONING

New Generation



LEAC VARIANCE WITHOUT & WITH PH IV RENEWABLES @ VARIOUS FUEL PRICES

ULSD FUEL PRICE/BARREL	2024	2026	2027	2028	2029	2030
\$100/Bbl. Without Phase IV	\$ 0.1856	\$ 0.1237	\$ 0.1236	\$ 0.1254	\$ 0.1268	\$ 0.1277
\$100/Bbl. With Phase IV	\$ 0.1856	\$ 0.1237	\$ 0.1236	\$ 0.1323	\$ 0.1439	\$ 0.1448
<i>Variance</i>				(\$ 0.1323)	(\$ 0.0171)	(\$0.0171)
\$120/Bbl. Without Phase IV	\$ 0.2197	\$ 0.1442	\$ 0.1443	\$ 0.1466	\$ 0.1483	\$ 0.1496
\$120/Bbl. With Phase IV	\$ 0.2197	\$ 0.1442	\$ 0.1443	\$ 0.1484	\$ 0.1547	\$ 0.1563
<i>Variance</i>				(\$ 0.0018)	(\$ 0.0064)	(\$ 0.0067)
\$150/Bbl. Without Phase IV	\$ 0.2710	\$ 0.1750	\$ 0.1752	\$ 0.1783	\$ 0.1806	\$ 0.1824
\$150/Bbl. With Phase IV	\$ 0.2710	\$ 0.1750	\$ 0.1752	\$ 0.1726	\$ 0.1709	\$ 0.1737
<i>Variance</i>				\$ 0.0057	\$ 0.0097	\$ 0.0087
\$175/Bbl. Without Phase IV	\$ 0.3137	\$ 0.2006	\$ 0.2010	\$ 0.2047	\$ 0.2075	\$ 0.2098
\$175/Bbl. With Phase IV	\$ 0.3137	\$ 0.2006	\$ 0.2010	\$ 0.1928	\$ 0.1844	\$ 0.1881
<i>Variance</i>				\$ 0.0119	\$ 0.0231	\$ 0.0217
\$200/Bbl. Without Phase IV	\$ 0.3564	\$ 0.2262	\$ 0.2268	\$ 0.2311	\$ 0.2364	\$ 0.2371
\$200/Bbl. With Phase IV	\$ 0.3564	\$ 0.2262	\$ 0.2268	\$ 0.2130	\$ 0.1979	\$ 0.2026
<i>Variance</i>				\$ 0.0181	\$ 0.0385	\$ 0.0345

PROJECTED CUSTOMER BILLING ILLUSTRATIONS WITH & WITHOUT PH IV

ULSD \$120 / BARREL Calculated at 1,000 kWh/mo. usage	CURRENT BILL	WITH UKUDU		NO PHASE IV		WITH PHASE IV RENEWABLES		VARIANCE
		2024	2026	2029	2029	2029	2029	
SCHEDULE R	\$ 359.52	\$ 260.35	\$ 264.45	\$ 266.55	\$ 266.55	\$ 266.55	\$ 266.55	\$ 2.10
SCHEDULE G (Single Phase)	\$ 1,927.92	\$ 1,456.85	\$ 1,477.35	\$ 1,509.35	\$ 1,509.35	\$ 1,509.35	\$ 1,509.35	\$ 32.00
SCHEDULE G (Three Phase)	\$ 1,928.87	\$ 1,457.98	\$ 1,478.48	\$ 1,510.48	\$ 1,510.48	\$ 1,510.48	\$ 1,510.48	\$ 32.00
SCHEDULE J (Single Phase)	\$ 8,847.00	\$ 6,333.09	\$ 6,435.59	\$ 6,595.59	\$ 6,595.59	\$ 6,595.59	\$ 6,595.59	\$ 160.00
SCHEDULE J (Three Phase)	\$ 40,603.31	\$ 28,643.86	\$ 29,124.38	\$ 29,874.46	\$ 29,874.46	\$ 29,874.46	\$ 29,874.46	\$ 750.08
SCHEDULE P	\$ 40,238.91	\$ 30,913.62	\$ 31,329.36	\$ 31,978.32	\$ 31,978.32	\$ 31,978.32	\$ 31,978.32	\$ 648.96
SCHEDULE L	\$ 234,678.28	\$ 172,955.18	\$ 175,555.40	\$ 179,614.28	\$ 179,614.28	\$ 179,614.28	\$ 179,614.28	\$ 4,058.88

ULSD \$150 / BARREL Calculated at 1,000 kWh/mo. usage	CURRENT BILL	WITH UKUDU		NO PHASE IV		WITH PHASE IV RENEWABLES		VARIANCE
		2024	2026	2029	2029	2029	2029	
SCHEDULE R	\$ 359.52	\$ 291.15	\$ 296.75	\$ 282.75	\$ 282.75	\$ 282.75	\$ 282.75	\$ (14.00)
SCHEDULE G (Single Phase)	\$ 1,927.72	\$ 1,610.85	\$ 1,638.85	\$ 1,590.35	\$ 1,590.35	\$ 1,590.35	\$ 1,590.35	\$ (48.50)
SCHEDULE G (Three Phase)	\$ 1,928.87	\$ 1,611.98	\$ 1,639.98	\$ 1,591.48	\$ 1,591.48	\$ 1,591.48	\$ 1,591.48	\$ (48.50)
SCHEDULE J (Single Phase)	\$ 8,847.00	\$ 7,103.09	\$ 7,243.09	\$ 7,000.59	\$ 7,000.59	\$ 7,000.59	\$ 7,000.59	\$ (242.50)
SCHEDULE J (Three Phase)	\$ 40,603.31	\$ 32,253.62	\$ 32,909.94	\$ 31,773.10	\$ 31,773.10	\$ 31,773.10	\$ 31,773.10	\$ (1,136.84)
SCHEDULE P	\$ 40,238.91	\$ 34,036.74	\$ 34,604.58	\$ 33,621.00	\$ 33,621.00	\$ 33,621.00	\$ 33,621.00	\$ (983.58)
SCHEDULE L	\$ 234,678.28	\$ 192,488.54	\$ 196,040.06	\$ 189,888.32	\$ 189,888.32	\$ 189,888.32	\$ 189,888.32	\$ (6,151.74)

SUMMARY OF PHASE IV RENEWABLE ENERGY PROJECT

GPA RECOMMENDS TO AWARD ALL PHASE IV RENEWABLE BIDDERS (MS IFB-012-23) WHO COMPLY WITH SYSTEM IMPACT STUDY INFRASTRUCTURE REQUIREMENT WITHOUT A CHANGE IN BID PRICE

PH IV-A

Initial Awards

- Two of the five qualified proponents have substantially completed the System Impact Studies and contract negotiations with GPA. The parties are prepared to proceed to the award phase of the procurement process.
 - The 2 proposals total 192MW solar PV with 97MW/380MWh ESS capacity.
 - The lengthy procurement process stresses proponents' ability to maintain price validity, increasing the time sensitivity to award.
 - On August 27, 2024, the CCU authorized GPA to seek PUC approval to proceed with an initial award to proponents KEPCO/EWP/Samsung and Core Tech Solar. Together, 192MW solar PV Plant with 97MW/380MWh ESS capacity will be awarded.

PH IV-B

Remaining Awards

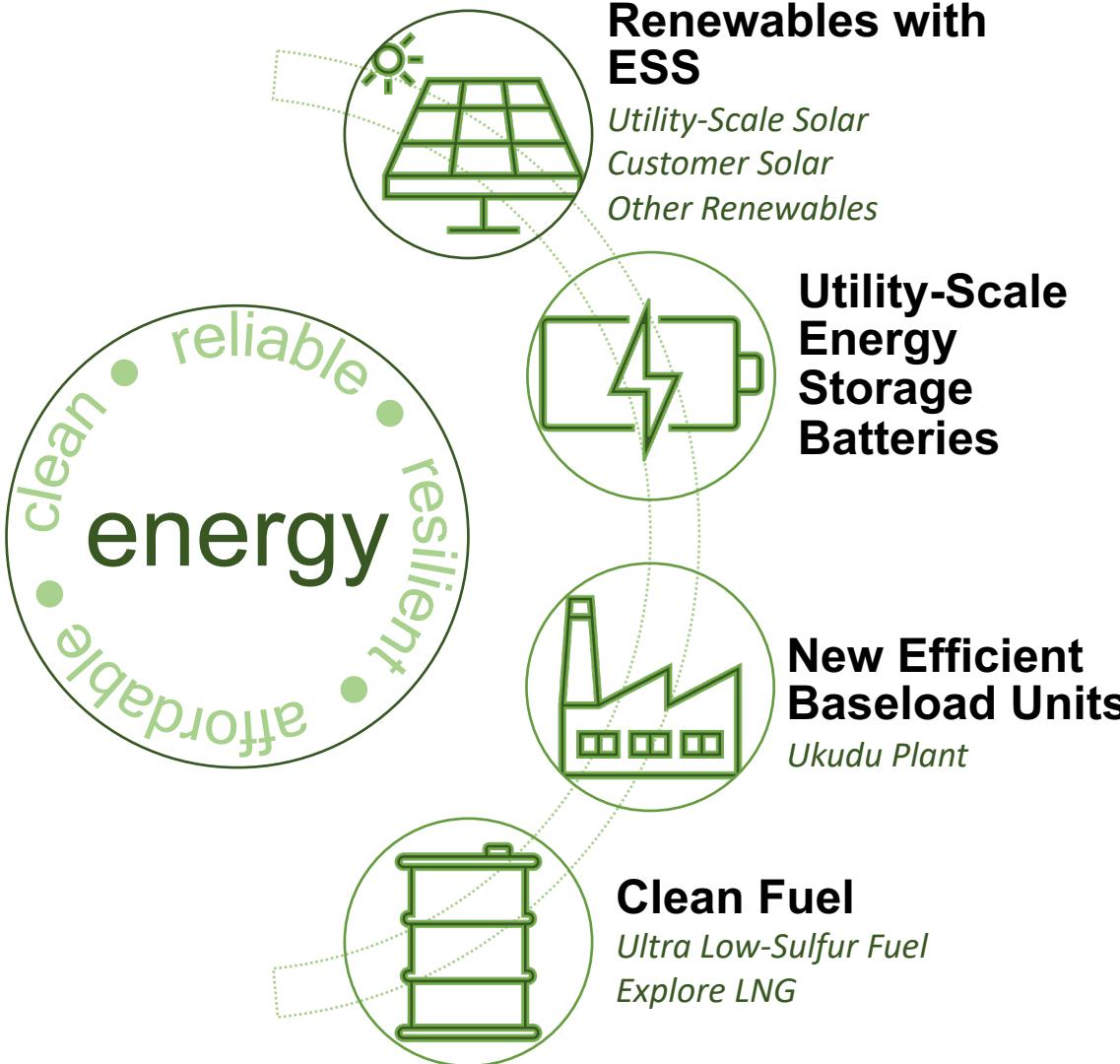
- GPA will recommend the CCU and PUC approve the award to the remaining proponents upon completion of the SIS and contract negotiations.

PHASE IV renewable projects provide a ***significant hedge against perennially rising fuel prices*** resulting in recent \$0.31/kWh LEAC. Ukudu and Ph IV projects will keep LEAC below \$0.20/kWh despite rising fuel prices.

The combination of efficient conventional energy and energy shifting renewable energy capacity provides ***reliability and resiliency for Guam ratepayers.***

The added capacity from Ph IV is allows GPA to ***meet future demand growth, retire units as needed, and achieve the 50% renewable portfolio mandate*** ahead of schedule.

GOAL: SUSTAINED CLEAN, RELIABLE, RESILIENT, AFFORDABLE ENERGY



2028 PROJECTED ACHIEVEMENTS



56%

Minimum renewable energy generation

1.69 million barrels less imported oil*



COMPLIANCE

Consent Decree

All USEPA Air and Water Quality Standards

99% REDUCED SO₂ EMISSIONS



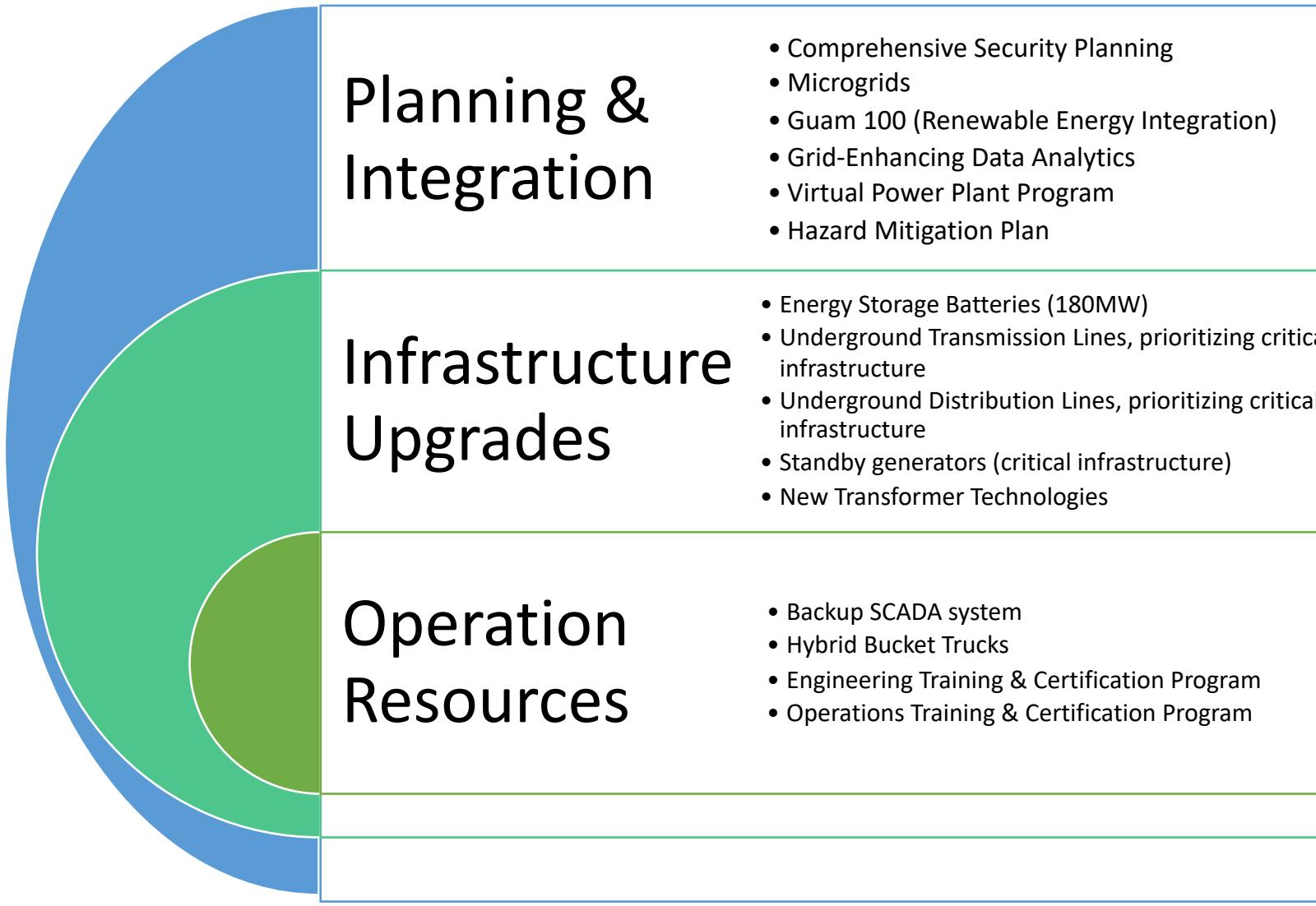
1.6 million gallons per day less wastewater outfall



LOWER STABILIZED BILLS

Est. \$0.1237 LEAC @ \$100/bbl. ULSD coupled with 56% renewable energy gives ratepayers sustainable, affordable rates

*annual basis



Awards To Date: ~ \$20M
Pending Proposals: ~\$7B

GPA's efforts to secure grants for planning, upgrades, and resources significantly reduces the impact on ratepayers.

Federal Grant Programs	Partners
<ul style="list-style-type: none"> • DOE • DOI • FEMA • EPA • DOD 	<ul style="list-style-type: none"> • University of Guam • Guam Energy Office • Guam Community College • National Labs (NREL, ANL, LBNL, PNNL) • American Public Power Association