6.3.3 Generation

The monthly power generated (GWh) of the plant from January 2020 to November 2023 is shown in Figure 6-18. The average net power generated for RBII during this period is 231 GWh per month. The power output fluctuations are associated with changes in power demand and major events.

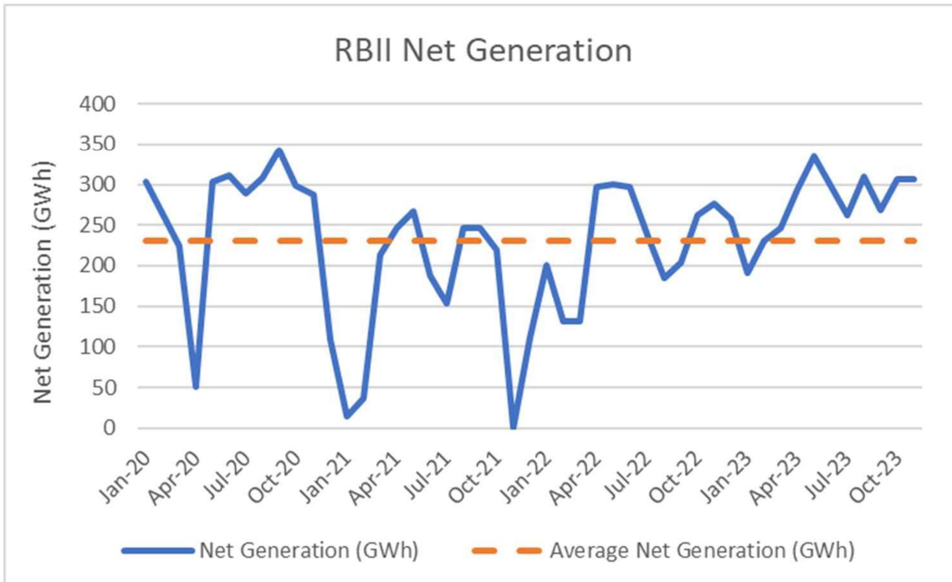

Figure 6-18: Monthly Net Power Generated for RBII from January 2020 – November 2023

6.4 Maintenance Review

The maintenance program at Rio Bravo II has been focused on the routine maintenance of the Gas Turbines. Siemens, the OEM for the turbines, provided the long-term service agreement (LTSA) services for the period of from commercial operations through 2018. In 2018, the Client terminated the contract with Siemens and hired Mitsubishi Power Systems (MPS) to provide the LTSA for the gas turbines. MPS co-developed the 501F technology with Westinghouse prior to the Siemens purchase of Westinghouse from CBS. As a co-developer, MPS has a detailed knowledge base for the equipment, however their relationship ended with the FC class turbines. Rio Bravo II is an FD class turbine and utilizes a different compressor design and various other enhancements.

Maintenance for the steam turbine and generators is provided on an ad-hoc basis with the preferred supplier at the time of execution.

6.4.1 Spare Parts Inventory

Inventory for the Rio Bravo site has some shared materials for each unit. Emergency spares and routine replacement parts are included in the warehouse. Gas Turbine spares are not part of the warehouse materials. The Client relies on the response time under the LTSA to have gas turbine parts delivered to the site within 48 hours otherwise the LTSA contractor will face a liquidated damage penalty. Hatch considers the spare parts inventory for the remaining plant except the gas turbine spares at Rio Bravo II to be reasonable to mitigate unavailability.

Two key items that have become part of the rotational spare program are the purchase of a spare gas and steam turbine generators. This program allows the equipment to be refurbished utilizing a roll-out/roll-in process that swaps the aged or failed machine with a refurbished spare. This program started due to the availability of a spare gas turbine generator during a forced outage. The Client utilized the opportunity to refurbish the damaged unit and rotate it through the fleet to correct the latent design issue with stator coil pounding. With known issues on the steam turbine generators, a spare generator has been purchased and will be utilized to roll-out/roll-in on each unit over time. This process has advantages in that repairs will be made in a controlled environment with less schedule pressure. The result should be improved outage performance and reliability.

6.4.2 *Maintenance Plan*

Figure 6-19 shows the maintenance history for the prime equipment from 2023- 2035. The F4 upgrades have extended the planned operating interval to 32,000 hours and allow for service intervals every four years.

Steam Turbine service intervals are matched with major inspections on the gas turbines.

Maintenance Schedule														
		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Rio Bravo II	CT1	BI	BI	BI	HGPI	BI	BI	BI	MI	BI	BI	BI	HGPI	BI
	CT2	BI	BI	BI	HGPI	BI	BI	BI	MI	BI	BI	BI	HGPI	BI
	STG	-	-	-	-	-	-	-	O	-	-	-	-	-

Figure 6-19: RBII Major Maintenance History

6.5 O&M Staffing

The Rio Bravo site is staffed with 16 personnel that support the overall site with administration and technical services as well as 7 COMEGO personnel that support corporate services such purchasing, IT and corporate administration.

The staffing for the RBII Unit is 28 permanent positions that are dedicated to the operations of the unit and 10 trainee positions. Operations teams are comprised of one shift lead, one operations technician and one field technician. This level of shift staffing is consistent with industry standards.

Technical and maintenance staffing consists of 5 technical leads and 5 maintenance technicians. The leads are responsible for water chemistry, mechanical systems, electrical systems, and I&C systems. These positions are replicated on all three units at Rio Bravo which is not typical for multi-unit sites. One Human Resource lead is shared between the three Rio Bravo plants. The Client has advised that staffing has been increased to ensure they have adequate coverage to improve performance. The need was identified through root cause analysis of the individual events.

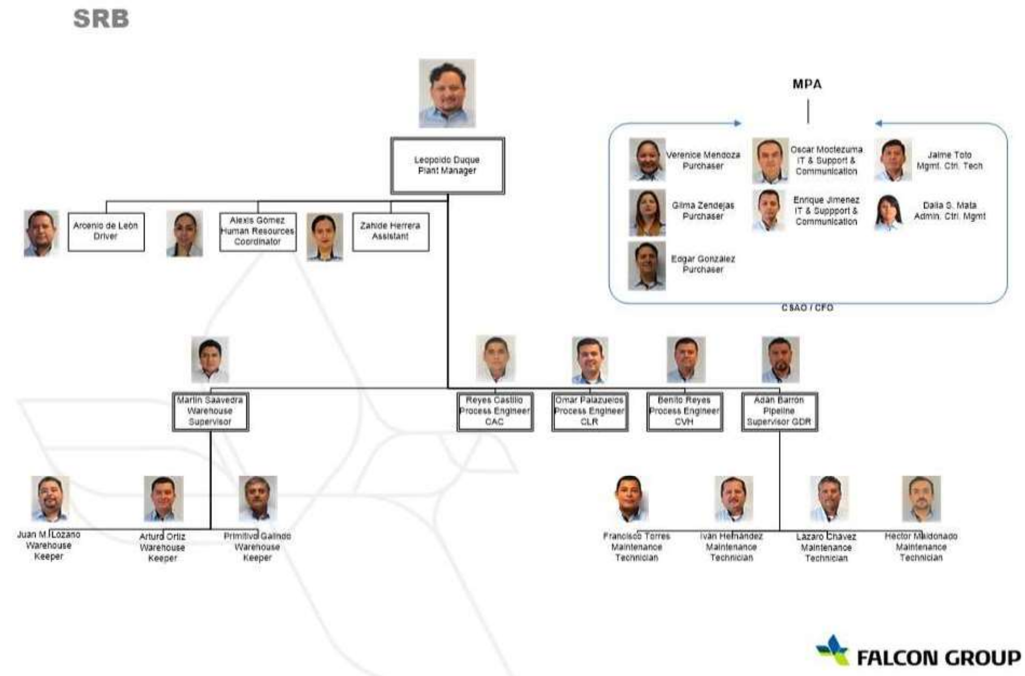

Figure 6-20: RB Site Staff

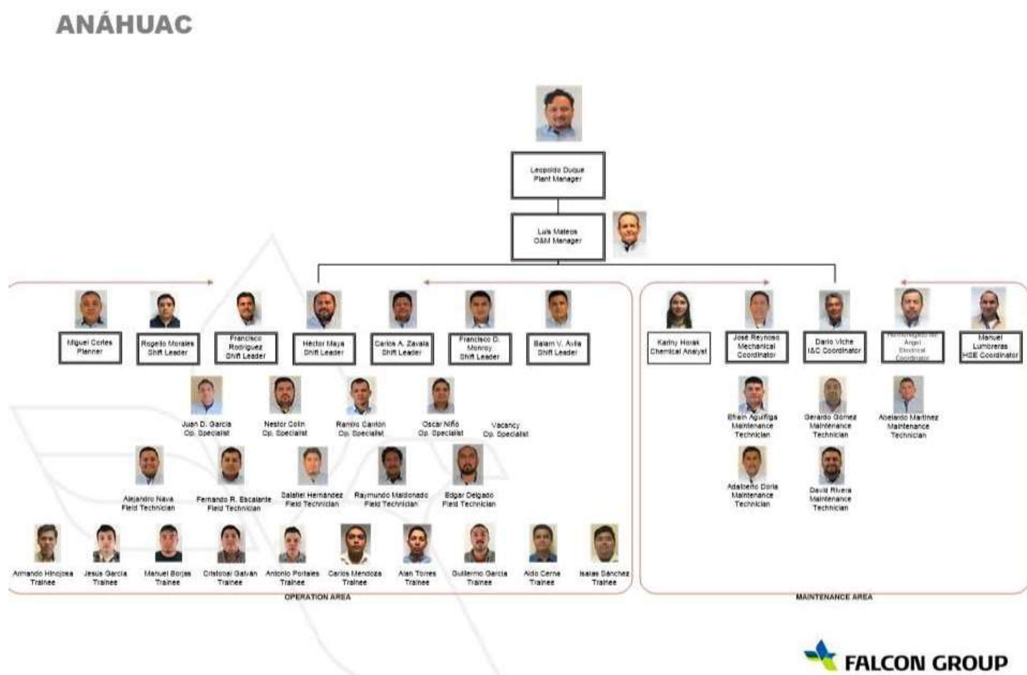

Figure 6-21: RBII Staff

6.6 Project Agreements

This section provides an overview of the asset material agreements for Rio Bravo II. The analysis is limited to providing a summary of the contract assessing the technical related aspects and providing an opinion on scope, gaps, and risks with regard to ongoing and future operations of the asset.

Table 6-8: Rio Bravo II Project Agreements Summary

Agreement	Contract End Date
Power Purchase Agreement	January 17, 2027
Long Term Service Agreement	January 17, 2027
Gas Interconnection Agreement	September 26, 2032
Fuel Supply Agreement	January 17, 2027
Water Supply Agreement	May 14, 2031

6.6.1 Power Purchase Agreement

A Power Purchase Agreement (PPA) has been entered into by Comisión Federal de Electricidad ("Commission") and Central Rio Bravo S.A de C.V. ("Producer") in November 1998. The PPA is a CFE legacy template that has been used numerous times to procure thermal generation through Independent Power Producers (IPPs) in Mexico. The term of the agreement is 25 years from the Commercial Operation Date of January 18, 2002. Capacity Guarantees in Summer Design Conditions with Base Fuel is 495 MW and 454.3 MW with alternate fuel.

The contract payments consist of two components, capacity charges and energy charges. The Fixed Capacity Charge is denominated in United States Dollars and payment for operation and maintenance is denominated in Mexican Pesos and adjusted for escalation in accordance with the terms of the PPA.

If the asset is not capable of meeting the guaranteed heat rate, the fuel cost will not fully pass through to the Commission. The asset will be penalized for not being able to meet the guaranteed heat rates by having to pay the additional cost of fuel. This can have significant financial implications. Furthermore, unavailability will reduce the Capacity Charge Payments received from the Commission.

The station is well suited to meet the requirements of the PPA throughout the operating life.

6.6.2 Contractual Service Agreement

A Long-Term Service Agreement (LTSA) exists between Central Anahuac, S.A de C.V. ("Purchaser") and Mitsubishi Power Americas, Inc. ("Supplier") for the Rio Bravo II Combined Cycle Power Plant. The Term of the contract is until January 17th, 2027. Rio Bravo II had an LTSA with Siemens which was terminated, and Rio Bravo II entered into a new LTSA with MHPS in December 2018 and the new contract supersedes the original LTSA.

LTSA ends in January 2027 and the PPA ends in January 2027. An LTSA needs to be in place for the post-PPA period. The LTSA lists guarantees for reliability, output, heat rate recovery guarantee, outage durations and response times.

Contract payments includes a fixed fee of US $150,000/Covered Unit/year and a variable fee equal to US$205/EFH (Equivalent Fired Hours). The Capacity Fee which is a fee for each MWh generated from the Facility sold by Purchaser in the Wholesale Electricity Market would involve sharing between 10% to 50% of the revenue made from selling electricity to the wholesale electricity market. Current revenue sharing has substantial financial impacts. Revenue sharing combined with forecasted dispatch will have significant financial impacts if this LTSA is renewed. The fees under the LTSA are part the maintenance costs of the plant that are recovered under the PPA through the energy charge.

The LTSA also include guarantee for reliability of the Covered Unit, output, and heat rate recovery after planned inspections, outage durations and response times to mobilize staff and deliver parts to the site. The terms of the LTSA are customary within the power industry and provide incentive for the service provider to exceed the performance conditions in the PPA.

The terms of the LTSA are customary within the power industry and provide incentive for the service provider to exceed the performance conditions in the PPA.

6.6.3 Fuel Supply Agreement

The Fuel Supply Agreement with Comisión Federal de Electricidad (“Purchase”) was signed on November 27, 1998, and remains effective until January 2027, which is 25 years from the plant’s COD. The fuel specified in the fuel supply agreement is Natural Gas. Provisions for the sale and delivery of diesel as an alternate fuel are specified under the Rio Bravo II fuel supply agreement. The maximum daily quantity of base fuel to be delivered by the Client at the point of delivery will be 25335 / Gcal / Day.

The fuel supply agreement is sufficient to meet the operating requirements of the Station.

6.6.4 Gas Interconnection Agreement

An gas interconnection agreement has been executed between Gasoducto del Río, S.A. de C.V. (“GDR”) AND Central Anahuac, S.A. De C.V. (“CAC”). The agreement was signed on August 1, 2003, and will remain in full force and effect until the revocation or termination of the GDR’s Gas Transportation Permit (September 26, 2032). CAC may terminate the agreement by written notice to GDR due to a Force Majeure event which persists for 12 consecutive months. The contract defines the gas interconnection point and provides the responsibilities of both parties. After the interconnection facilities are built, GDR, at its own expense, shall operate, maintain, and repair the interconnection facilities as per the contract. The gas supply agreement is sufficient to meet the operating needs of the PPA.

6.6.5 Water Supply Agreement

The agreement is between Central Anahuac, S.A. De C.V (CAC) and Comision Nacional Del Agua (“CONAGUA”) and became effective on May 14, 2021, with an effective term of 10 years. The concession is for a modification of an existing concession title, – for the capacity increase of water taken from a groundwater well. The total volume for the water agreement is 1,125,900 cubic meters per year extracted. Per the agreement, all of the extracted water is expected to be consumed and none of it is expected to be discarded as wastewater. No contract payments mentioned as this is a concession agreement to extract water.

The water supply agreement is sufficient to meet the operating requirements of the Station.

7. Rio Bravo III Power Plant

7.1 Plant Overview

Central Lomas de Real, S. A. de C.V. ("CLR"), also known as "Rio Bravo III" is located in the city Valle Hermoso which is a part of the Tamaulipas state in Mexico. The plant is located 18 meters above sea level and operates in a combined cycle mode with a 2x2x1 configuration with two gas turbines (GT), two heat recovery steam generators (HRSG) and one steam turbine. The sole fuel source for the plant is natural gas. The geographic location of the asset within Mexico can be seen in Figure 7-1, and the unit location within the site can been seen in Figure 7-2. The plant has a guaranteed summer design condition capacity of 495 MW under the power purchase agreement ("PPA") when using gas.

Figure 7-1: Rio Bravo III Location

A summary of the Rio Bravo III asset is shown in Table 7-1 below:

Table 7-1: Rio Bravo III Asset Overview

Parameter	Value
Contracted Capacity	495 MW
Location	Valle Hermoso, Tamaulipas, Mexico
Commercial Operation Date	April 1, 2004
Technology and Configuration	CCGT, 2x1
Fuel	Gas
Off taker	CFE
PPA Expiry	Mar 2029
Gas Supplier	Trafigura
FSA Expiry	April 2029

The Rio Bravo III Plant site is located in between Rio Bravo II and Rio Bravo IV as can be seen in Figure 7-2**.** The Comisión Federal de Electricidad (CFE) switchyard is located east of the plants. CFE is the state-owned electric utility of Mexico.

Figure 7-2: Rio Bravo III Site

The plant layout is shown in Figure 7-3. The two combustion turbines and HRSG's are located at the east side of the plant. The 400 kV substation is located east of the turbines. The evaporating ponds are north of the three sites.

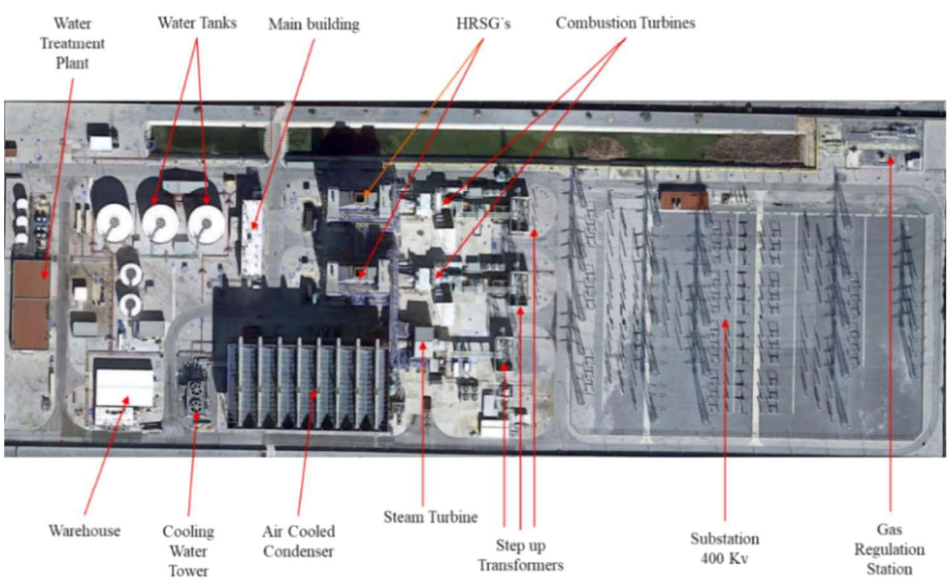

Figure 7-3: Rio Bravo III Plant Layout

7.2 Major Equipment Overview

This section covers the technology and major equipment overview of the Rio Bravo III site. It details the specific equipment and their function in the plant. The process consists of two gas turbines and a steam turbine that are each connected to a generator. These generators are connected to transformers which connects to the national grid via the 400 kV CFE substation. The low-pressure steam from the steam turbine passes through the air-cooled condensers and is returned to a HRSG. The plant is also equipped with a steam bypass system to facilitate full load simple cycle operations when the steam turbine is not available.

The site employs an air-cooled condenser, which is also equipped with a supplemental wet cooling tower that was added later to improve the system efficiency.

A summary of the major equipment at Rio Bravo III along with details of the manufacturer and model are shown in Table 7-2.

Table 7-2: Rio Bravo III Principal Equipment List

Name	Manufacturer	Model / serial number
Combustion Turbine	Siemens Westinghouse	W501FD2
CT Generator	Siemens Westinghouse	SN: 1-S-10458
CT Generator Exciter	Cutler Hammer / Westinghouse	WDR 2000
CT Transformer	Alstom (230MVA)	226410
HRSG (Boiler)	CMI Vertical Type with Burners	Lomas de Real Project 66067
Steam Turbine	Alstom (140, 31.3, 5.22 bar /	One combined HP/IP/LP
ST Generator	Alstom (208MVA)	60WY21Z-085
ST Generator Exciter	ABB	Unitrol 5000
ST Transformer	Alstom (230MVA)	226411
Air Cooled Condenser	Balcke Dürr (32 fans)	SRB Project P3043 RJ3101

7.2.1 *Gas Turbine*

The gas turbine technology used at Rio Bravo III are Siemens Westinghouse W501FD2. Both gas turbines at Rio Bravo III are of this technology. An overview of this technology and how it works is further described under Section 5.2.1.

The exhaust gases from each of the gas turbines are directed towards their respective Heat Recovery Steam Generators (HRSG) which then recovers the heat to fuel the steam turbine.

The Rio Bravo III LTSA contracts are with MPS.

The gas turbine specifications for Rio Bravo III are in Table 7-3 below. The specifications are rated using ISO standards. ISO conditions are 15°C, 60% Relative Humidity, and 101.3 kPa.

Table 7-3: Gas Turbine Specifications

Description	Quantity
ISO Rating (MW)	186.5
Pressure Ratio	16
ISO Heat Rate (kJ/kWh)	9130

Turbine Exhaust temperature (°C)	593
Fuel	Natural Gas
Rotor speed (min-1)	3600
Air flow (kg/s)	459
NOx Control	Dry low NOx combustion

The gas turbine at the Rio Bravo III site can be seen in Figure 7-4 below.

Figure 7-4: Rio Bravo III Gas Turbine

7.2.2 Heat Recover Steam Generator

The Rio Bravo III site has two triple pressure HRSGs manufactured by CMI of the vertical orientation. In 2019 CMI changed its name to John Cockerill. CMI Energy has supplied more than 550 horizontal and vertical HRSGs to combined cycle and cogeneration facilities worldwide. Hatch considers CMI to be a reputable OEM of HRSGs with a proven track record.

The vertical HRSGs at the Rio Bravo III site where the exhaust gas flows vertically over horizontal tubes. Vertical HRSGs have hotter sections located at the bottom and cooler sections at the top near the stack exit.

The HRSG’s can be further categorized into single pressure or multi pressure. In the single pressure systems, steam is generated at a single pressure level and there is one steam drum. For a triple pressure system like the one at Rio Bravo III, there are three steam drums. The HRSG has three sections: low pressure (LP), intermediate pressure (IP), and a high pressure (HP) section. The steam is later passed through a super heater to raise the temperature beyond the saturation point. The super heated steam from both HRSGs is then combined and sent to the steam turbine.

Both HRSGs at Rio Bravo III have duct firing capabilities with natural gas where supplemental firing takes place in the HRSG and has the ability to increase the power output by the steam turbine.

The technical specifications of the HRSGs at the Rio Bravo III site is listed in Table 7-4 below.

Table 7-4: Heat Recovery Steam Generator Specifications

Parameter	High Pressure	Intermediate	Low Pressure
Pressure (bara)	134.8	33.75	5.07
Temperature (°C)	565	565	291.5
Mass flow (kg/s)	52.5	61	10.15

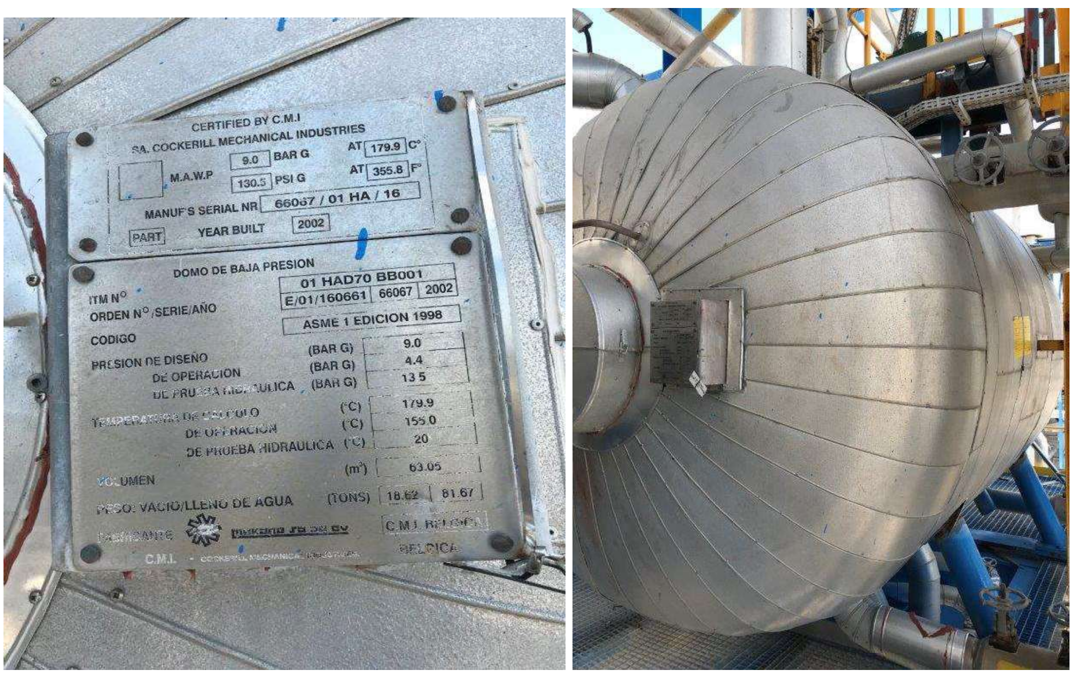

Figure 7-5: Rio Bravo III LP Drum Nameplate (Left) and Drum (Right)

7.2.3 *Steam Turbine*

The steam turbine (ST) at the Rio Bravo III site is manufactured by Alstom (now part of General Electric). Alstom designs, manufacturers, and supplies power generation equipment for a for the power generation and industrial market. Hatch considers Alstom to be a reputable OEM for the ST with a proven track record for the manufacture and supply of steam turbines.

Table 7-5: Rio Bravo III Steam Turbine Specifications

Description	Value
ST Model:	Alstom
Type:	Tandem compound, single flow high pressure reheat section, single flow Intermediate pressure and lermediate cylinder
Rated Power (MW):	187
Turbine Inlet Temperature (°C):	558
Turbine Inlet Pressure (MPaA):	12.7
Rotor Speed (min-1):	3600

Table 7-6: Rio Bravo III Steam Turbine

7.2.4 *Steam Turbine Condenser*

The cooling system at Rio Bravo III consists of an air-cooled condenser system (ACC) and supplemental condenser and wet cooling tower.

The ACC is manufactured by Balcke Dürr and consists of a 32 fan unit in a forced draft design with the fans underneath the heat exchange services. The arrangement is 8 distribution headers with 4 fan units each. An overview of the air-cooled condenser technology and how it works is further described under 5.2.4. The ACC units at Rio Bravo III site can be seen in the figure below.

A parallel cooling system exists at Rio Bravo III which consists of a condenser and corresponding cooling tower to provide additional cooling to improve steam cycle performance.

Figure 7-6: Rio Bravo III ACC on Left and Cooling Tower on Right

7.2.5 Fuel Systems

The fuel system at the Rio Bravo III site consists of receiving natural gas. Natural gas is used as fuel for the gas turbines as well as supplemental firing in the HRSGs. Rio Bravo III receives natural gas from the GDR pipeline. On site, the natural gas is cleaned to remove entrained liquids and distributed through the gas pipeline at the site.

Figure 7-7: Rio Bravo III Gas Receiving Station

7.2.6 Water Treatment System

The water treatment plant treats the raw water received from Comisión Nacional del Agua ("CONAGUA") through a groundwater supply permit. The main function of the water treatment plant is to supply make-up water to the steam cycle which requires high quality demineralized water. Maintaining high water quality is paramount to the long-term operation of the plant and to maintain equipment performance.

The water treatment process at Rio Bravo III is a three-step process. The first is an initial filtration system followed by use of reverse osmosis and electrode ionization (EDI).

Makeup water will be taken from the water storage tank and passes through an initial filtration process to remove suspended solids from the water. The service water is then fed directly to the cartridge filters by two RO feed pumps. Rio Bravo III has a two stage RO system. Water from the RO first stage second skid is stored on site before water is pumped into the second stage RO. The permeate from the RO modules are stored briefly in a RO surge tank before being pumped to the EDI system.

The EDI system uses ion exchange membranes and resins to deionize water. Rio Bravo III has a single EDI system.

Figure 7-8: Rio Bravo III Water Treatment System

7.2.7 *Electrical*

The generators at the Rio Bravo III site convert mechanical energy of the Gas Turbine and Steam Turbine to electrical energy. Generators consist of a rotor which is directly connected to the turbine shaft of either the steam or gas turbine and a stator.

The Gas Turbine generator is manufactured by Siemens-Westinghouse. The Steam Turbine generator is manufactured by Alstom. Both generators have a power factor of 0.9. The GT generator has a voltage of 13.8 kV and a rated power of 193 MVA, while the steam turbine generator has a voltage of 18 kV and a rated power of 207.8 MVA.

Table 7-7: Rio Bravo III Generator Specifications

Parameter	GT Generator	ST Generator
Model	Siemens-Westinghouse	Alstom (ABB)
Rated Power (MVA)	193	207.8
Cooling System	Hydrogen-cooled	Air-cooled
Power factor	0.9	0.90
Voltage	13.8kV	18kV

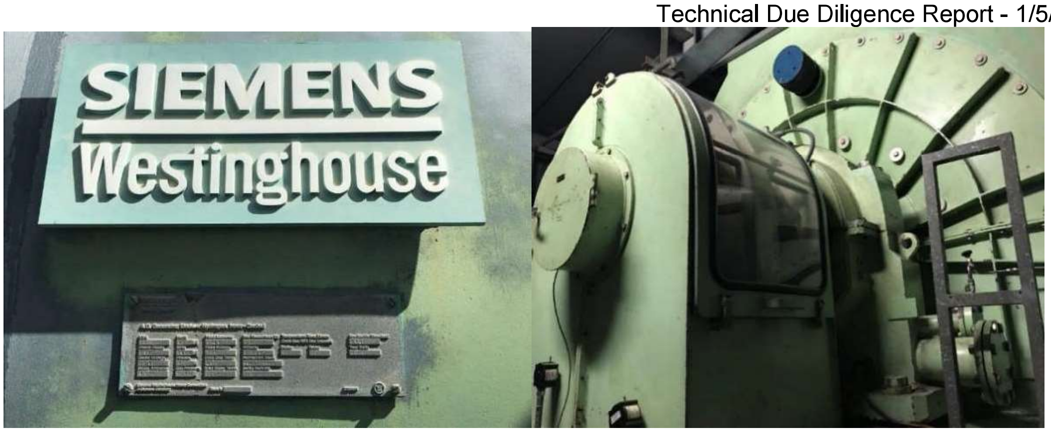

Figure 7-9: Gas Turbine Generator Nameplate on Left, Steam Turbine Generator on Right

There are three generator step-up transformers ("GSU") at the Rio Bravo III site; one for each of the gas turbine generators and one is for the steam turbine. The GSU takes the generator voltage and increases it to match transmission voltage level. All GSUs at the Rio Bravo III site are oil natural air natural ("ONAN") and oil forced air forced ("OFAF"). This means that the transformers are cooled by both natural air and oil as well as forced air and oil where the forced flow is caused by fans and motors.

All three GSUs at the Rio Bravo III site are manufactured by Alstom. The specification for the transformers on site are provided in Table 7-8 and the transformers at the Rio Bravo III site can be seen in Figure 7-10.

Table 7-8: Rio Bravo III Transformer Specification

Unit	Manufacturer	Phases	Cooling	MVA	Voltage (kV)
GT1 Main	Alstom	3	ONAF/OFAF	230	13.8/400
GT2 Main	Alstom	3	ONAF/OFAF	230	13.8/400
ST Main	Alstom	3	ONAF/OFAF	230	18.0/400

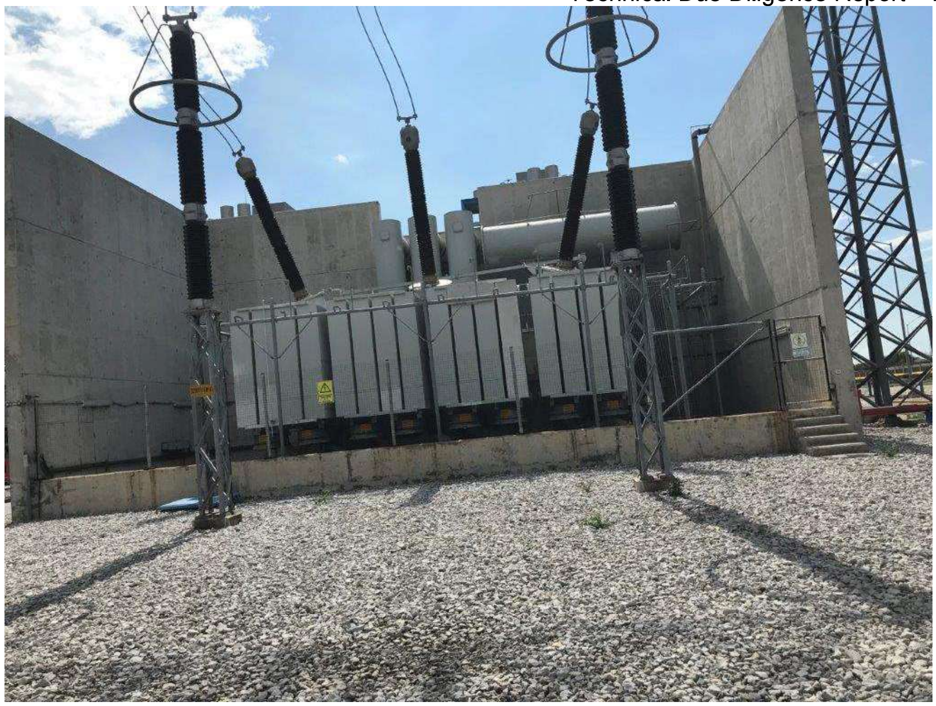

Figure 7-10: Rio Bravo III GSU

After being stepped up at the three GSUs, the power goes to the high voltage switchyard which collects the power from the gas turbine and steam turbine at 400kV. The switchyard is a 400kV air insulated switchgear ("AIS"). This power is then transmitted to a CFE substation which connects to Mexico's electricity grid. Figure 7-11 shows the switchyard at the Rio Bravo III site.

Figure 7-11: Rio Bravo III Switchyard

7.2.8 Control Systems

The Control Systems at Rio Bravo III are divided between the gas turbines, the steam turbine, and the balance of plant. The systems are as follows:

- Gas Turbines – Emerson Ovation (upgraded in 2019 from Siemens Teleperm (TXP))
- Steam Turbine – Emerson Ovation (upgraded in 2019 from Woodward Micronet)
- Balance of Plant – Emerson Ovation (upgraded in 2019 from Foxboro (Invensys))

All systems are co-located in the control room for a single operator to access all plant equipment from one location.

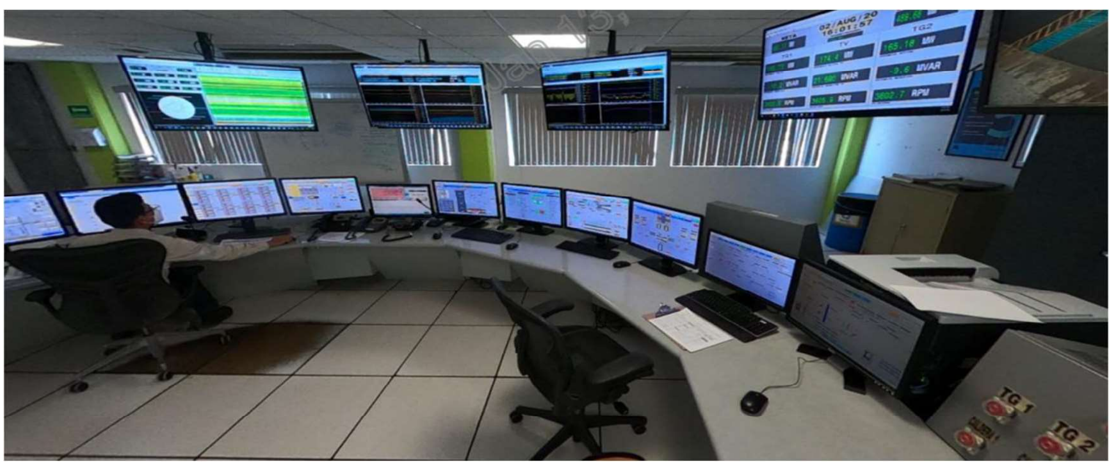

Figure 7-12: RBIII Control Room

7.3 Operations Review

7.3.1 Equivalent Unplanned Outage Factor

The monthly equivalent unplanned outage factor (EUOF) for Rio Bravo III from January 2020 to November 2023 is 2.07% as shown in Figure 7-13. Periods with higher EUOF are marked with operating or equipment issues that are highlighted in Appendix A. The performance of the asset shows that high levels of performance and low EUOF can be achieved.

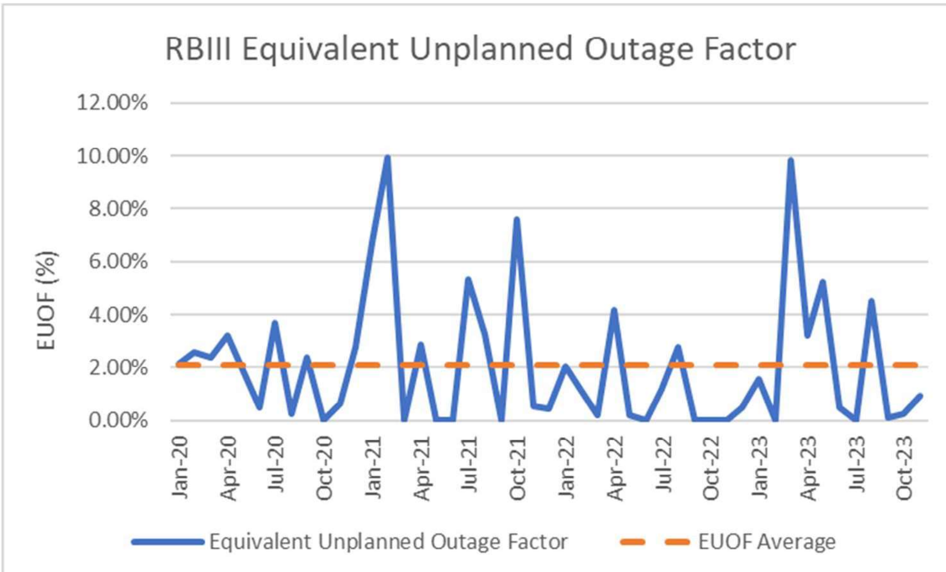

Figure 7-13: Monthly Availability for RBIII from January 2020 – November 2023

7.3.2 Heat Rate

The monthly heat rate of the plant from January 2020 to November 2023 is shown in Figure 7-14. The plant has a weighted average heat rate of 7,110 kJ/kWh during this period. The trend indicates the asset performance is improving which is attributable to the improved availability and consistent operation.

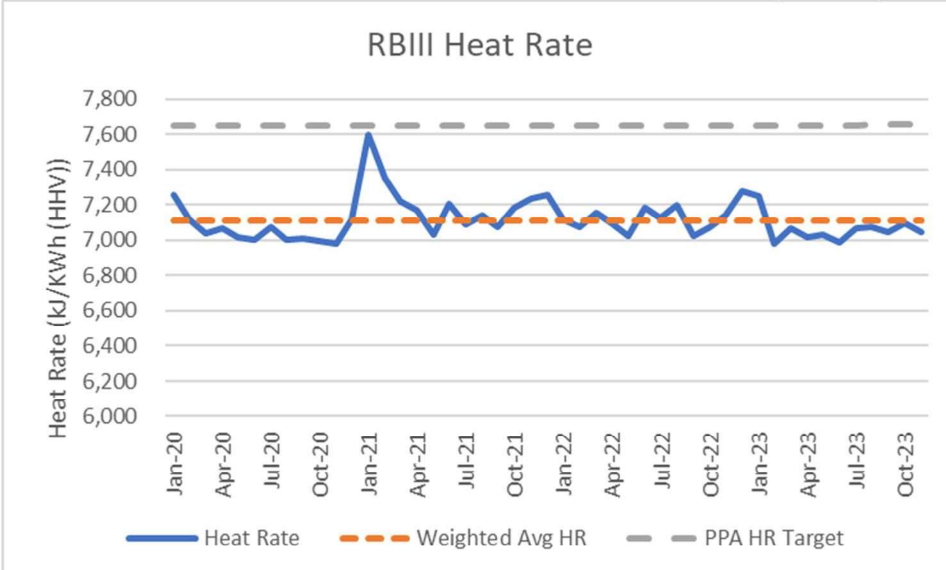

Figure 7-14: Monthly Heat Rate for RBIII from January 2020 – November 2023

7.3.3 Generation

The monthly power generated (GWh) of the plant from January 2020 to November 2023 is shown in Figure 7-15. The average net power generated for RBIII during this period is 284 GWh per month. Power output fluctuations are caused by reduced availability due to outages.

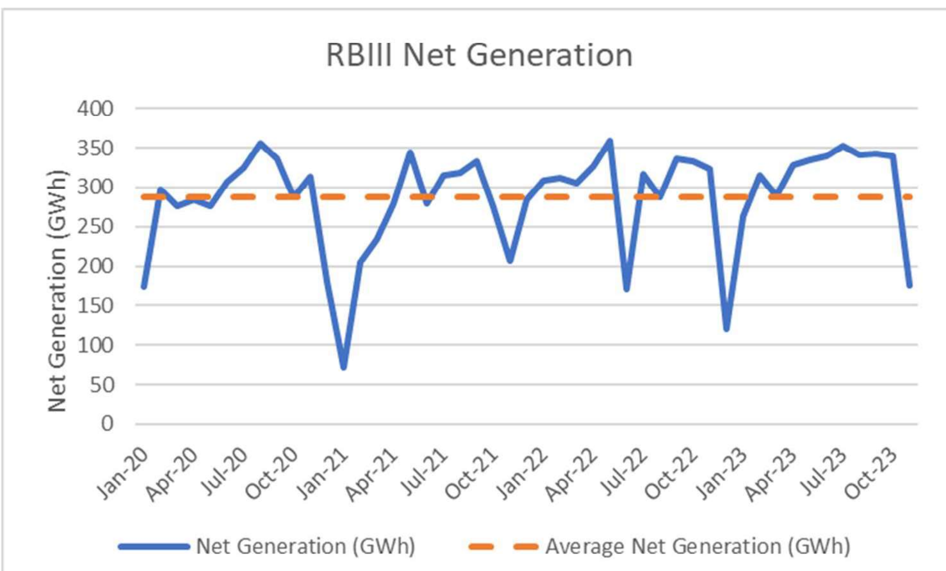

Figure 7-15: Monthly Net Power Generated for RBIII from January 2020 – November 2023

7.4 Maintenance Review

The maintenance program at Rio Bravo III has been focused on the routine maintenance of the Gas Turbines. Siemens, the OEM for the turbines, provided the long-term service agreement (LTSA) services for the period of from commercial operations through 2018. In

2018, the Client terminated the contract with Siemens and hired Mitsubishi Power Systems (MPS) to provide the LTSA for the gas turbines. MPS co-developed the 501F technology with Westinghouse prior to the Siemens purchase of Westinghouse from CBS. As a co-developer, MPS has a detailed knowledge base for the equipment, however their relationship ended with the FC class turbines. Rio Bravo III is an FD class turbine and utilizes a different compressor design and various other enhancements.

Maintenance for the steam turbine and generators is provided on an ad-hoc basis with the preferred supplier at the time of execution.

7.4.1 Spare Parts Inventory

Inventory for the Rio Bravo site has some shared materials for each unit. Emergency spares and routine replacement parts are included in the warehouse. Gas Turbine spares are not part of the warehouse materials. Hatch considers the spare parts inventory for the remaining plant except the gas turbine spares at Rio Bravo III to be reasonable to mitigate unavailability. In addition, BEMH has budgeted amounts to purchase an inventory of gas turbine spares in the CAPEX in the Financial Model for the Portfolio.

Two key items that have become part of the rotational spare program are the purchase of a spare gas and steam turbine generators. This program allows the equipment to be refurbished utilizing a roll-out/roll-in process that swaps the aged or failed machine with a refurbished spare. This program started due to the availability of a spare gas turbine generator during a forced outage. The Client utilized the opportunity to refurbish the damaged unit and rotate it through the fleet to correct the latent design issue with stator coil pounding. With known issues on the steam turbine generators, a spare generator has been purchased and will be utilized to roll-out/roll-in on each unit over time. This process has advantages in that repairs will be made in a controlled environment with less schedule pressure. The result should be improved outage performance and reliability.

7.4.2 Maintenance Plan

Figure 7-16 shows the maintenance history for the prime equipment from 2023- 2035. The F4 upgrades have extended the planned operating interval to 32,000 hours and allow for service intervals every four years.

Steam Turbine service intervals are matched with major inspections.

Maintenance Schedule														
		2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Rio Bravo III	CT1	HGPI		BI	BI	BI	MI	BI	BI	BI	HGPI	BI	BI	BI
	CT2	BI	BI	MI	BI	BI	BI	HGPI	BI	BI	BI	MI	BI	BI
	STG	-	-	-	-	-	O	-	-	-	-	-	-	O

Figure 7-16: RBIII Major Maintenance History

7.5 O&M Staffing

The Rio Bravo site is staffed with 16 personnel that support the overall site with administration and technical services as well as 7 COMEGO personnel that support corporate services such purchasing, IT and corporate administration.

The staffing for the RBIII Unit is 30 permanent positions that are dedicated to the operations of the unit. Operations teams are comprised of one shift lead, one operations technician and one field technician. This level of shift staffing is consistent with industry standards.

Technical and maintenance staffing consists of 5 technical leads and 5 maintenance technicians. The leads are responsible for water chemistry, mechanical systems, electrical systems, and I&C systems. These positions are replicated on all three units at Rio Bravo which is not typical for multi-unit sites. One Human Resources lead is shared between the three Rio Bravo plants. The Client has advised that staffing has been increased to ensure they have adequate coverage to improve performance. The need was identified through root cause analysis of the individual events.

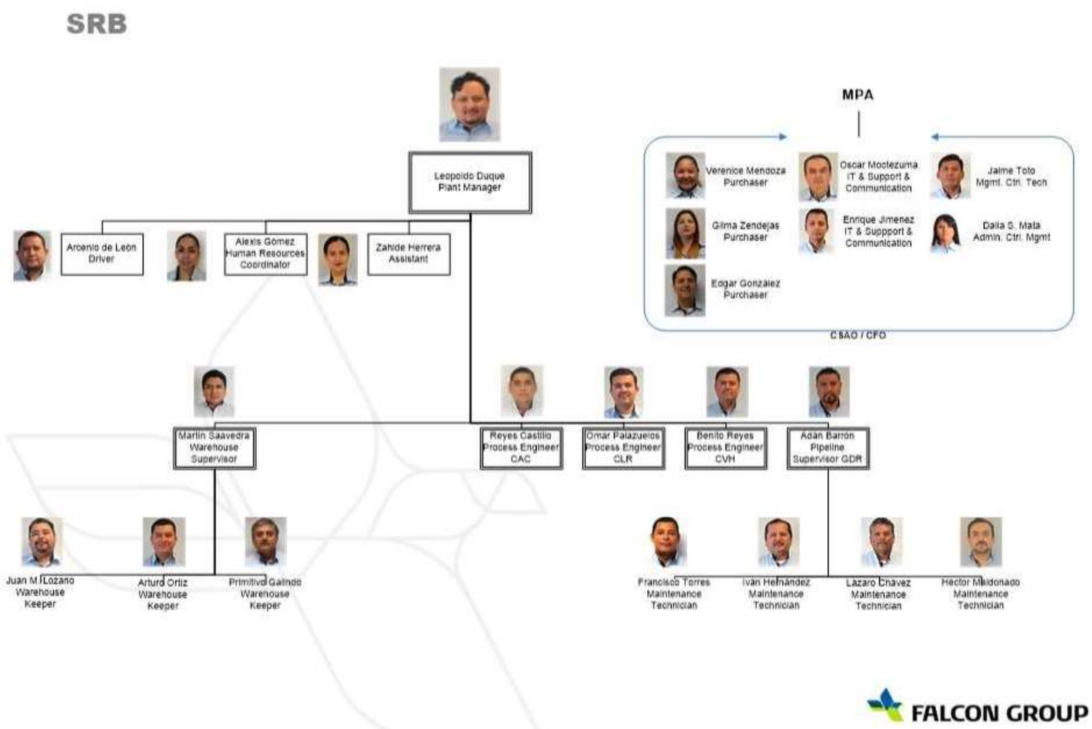

Figure 7-17: RB Site Staff

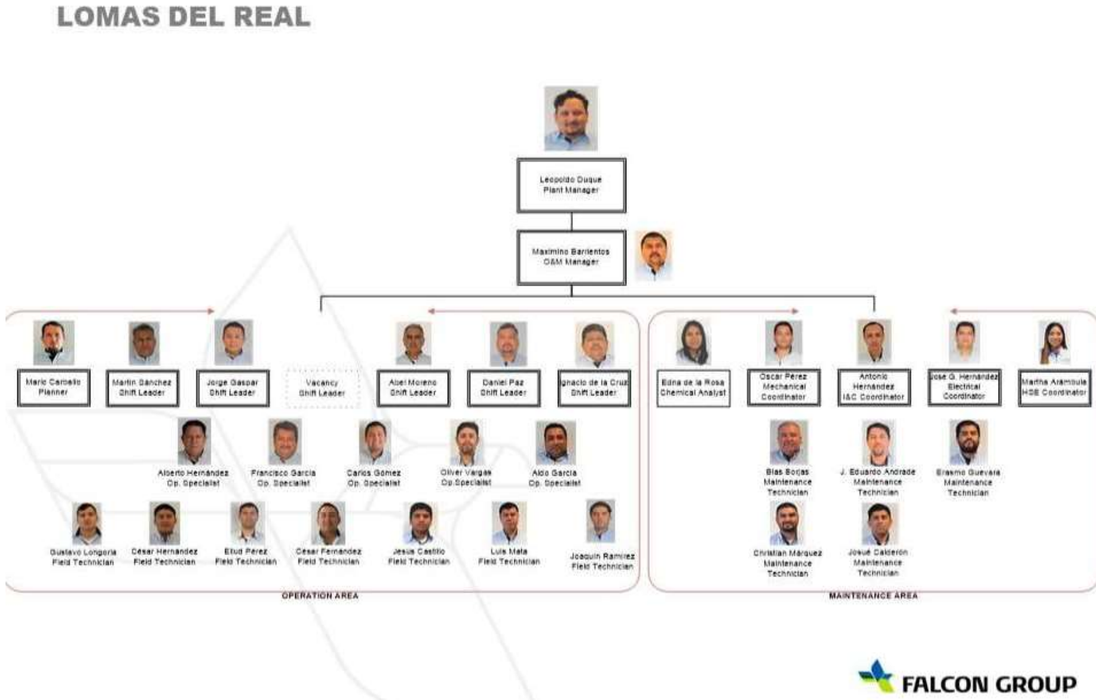

Figure 7-18: RBIII Staff

7.6 Project Agreements

This section provides an overview of the asset material agreements for Rio Bravo III. The analysis is limited to providing a summary of the contract assessing the technical related aspects and providing an opinion on scope, gaps, and risks with regard to ongoing and future operations of the asset.

Table 7-9: Rio Bravo III Project Agreements Summary

Agreement	Contract End Date
Power Purchase Agreement	March 31, 2029
Long Term Service Agreement	March 31, 2029
Fuel Supply Agreement	April 1, 2029
Water Supply Agreement	May 13, 2024

7.6.1 Power Purchase Agreement

A Power Purchase Agreement (PPA) has been entered into by Comisión Federal de Electricidad ("Commission") and Central Lomas de Real S.A de C.V. ("Producer") in July 2001. The PPA is a CFE legacy template that has been used numerous times to procure thermal generation through Independent Power Producers (IPPs) in Mexico. The term of the agreement is 25 years from the Commercial Operation Date of April 1, 2004. Capacity Guarantees in Summer Design Conditions with Base Fuel is 495 MW.

The contract payments consist of two components, capacity charges and energy charges. The Fixed Capacity Charge is denominated in United States Dollars and payment for operation and maintenance is denominated in Mexican Pesos and adjusted for escalation in accordance with the terms of the PPA.

If the asset is not capable of meeting the guaranteed heat rate, the fuel cost will not fully pass through to the Commission. The asset will be penalized for not being able to meet the guaranteed heat rates by having to pay the additional cost of fuel. This can have significant financial implications. Furthermore, unavailability will reduce the Capacity Charge Payments received from the Commission.

The Station is well suited to meet the requirements of the PPA throughout the planned operating life.

7.6.2 Contractual Service Agreement

A Long-Term Service Agreement (LTSA) exists between Central Lomas de Real, S.A de C.V. ("Purchaser") and Mitsubishi Power Americas, Inc. ("Supplier") for the Rio Bravo III Combined Cycle Power Plant. The Term of the contract is until March 31st, 2029. Rio Bravo III had an LTSA with Siemens which was terminated, and Rio Bravo III entered into a new LTSA with MHPS in December 2018 and the new contract supersedes the original LTSA.

LTSA ends in March 2029 and the PPA ends in March 2029. An LTSA needs to be in place for the post-PPA period. The LTSA lists guarantees for reliability, output, heat rate recovery guarantee, outage durations and response times.

Contract payments includes a fixed fee of US $150,000/Covered Unit/year and a variable fee equal to US$205/EFH (Equivalent Fired Hours). The Capacity Fee which is a fee for each MWh generated from the Facility sold by Purchaser in the Wholesale Electricity Market would involve sharing between 10% to 50% of the revenue made from selling electricity to the wholesale electricity market. Current revenue sharing has substantial financial impacts. Revenue sharing combined with forecasted dispatch will have significant financial impacts if this LTSA is renewed.

The LTSA also include guarantee for reliability of the Covered Unit, output, and heat rate recovery after planned inspections, outage durations and response times to mobilize staff and deliver parts to the site.

The terms of the LTSA are customary within the power industry and provide incentive for the service provider to exceed the performance conditions in the PPA.

7.6.3 Fuel Supply Agreement

Agreement between Trafigura Trading LCC ("TTL") and Central Lomas del Real S.A. de C.V. Agreement related to firm transportation capacity totaling 95000 MMBtu on a pipeline operated by Tennessee Gas Pipeline LLC. The term of this agreement shall be for 6 years commencing as of April 1, 2023.

The fuel supply agreement is sufficient to meet the operating requirements of the Station.

7.6.4 Water Supply Agreement

This agreement is between Central Lomas De Real, S.A DE C.V. (CLR) and Comision Nacional Del Agua (“CONAGUA”). A permit for the withdrawing of groundwater is given for a period of 10 years from May 14, 2014 (will expire May 13, 2024). Capacity increase in 2013 of taking water from a groundwater well at the given location coordinates from 362,829 m3/year to 1,362,829 m3/year. No contract payments mentioned as this is a concession agreement to extract water.

The water supply agreement is sufficient to meet the operating requirements of the station.

8. Rio Bravo IV Power Plant

8.1 Plant Overview

Central Valle Hermoso, S. A. de C.V. ("CVH"), also known as "Rio Bravo IV" is located in the city Valle Hermoso which is a part of the Tamaulipas state in Mexico. The plant is located 18 meters above sea level and operates in a combined cycle mode with a 2x2x1 configuration with two gas turbines (GT), two heat recovery steam generators (HRSG) and one steam turbine. The sole fuel source for the plant is natural gas. The geographic location of the asset within Mexico can be seen in Figure 8-1, and the unit location within the site can been seen in Figure 8-2. The plant has a guaranteed summer design condition capacity of 500 MW under the power purchase agreement ("PPA") when using gas.

Figure 8-1: Rio Bravo IV Location

A summary of the Rio Bravo IV asset is shown in Table 8-1 below:

Table 8-1: Rio Bravo IV Asset Overview

Parameter	Value
Contracted Capacity	500 MW
Location	Valle Hermoso, Tamaulipas, México
Commercial Operation Date	April 1, 2005
Technology and Configuration	CCGT, 2x1
Fuel	Natural Gas
Off taker	CFE
PPA Expiry	Mar 2030
Gas Supplier	Trafigura
FSA Expiry	Mar 2030

The Rio Bravo IV Plant site is located beside Rio Bravo III as can be seen in Figure 8-2. The Comisión Federal de Electricidad (CFE) switchyard is located east of the plants. CFE is the state-owned electric utility of Mexico.

Figure 8-2: Rio Bravo IV Site

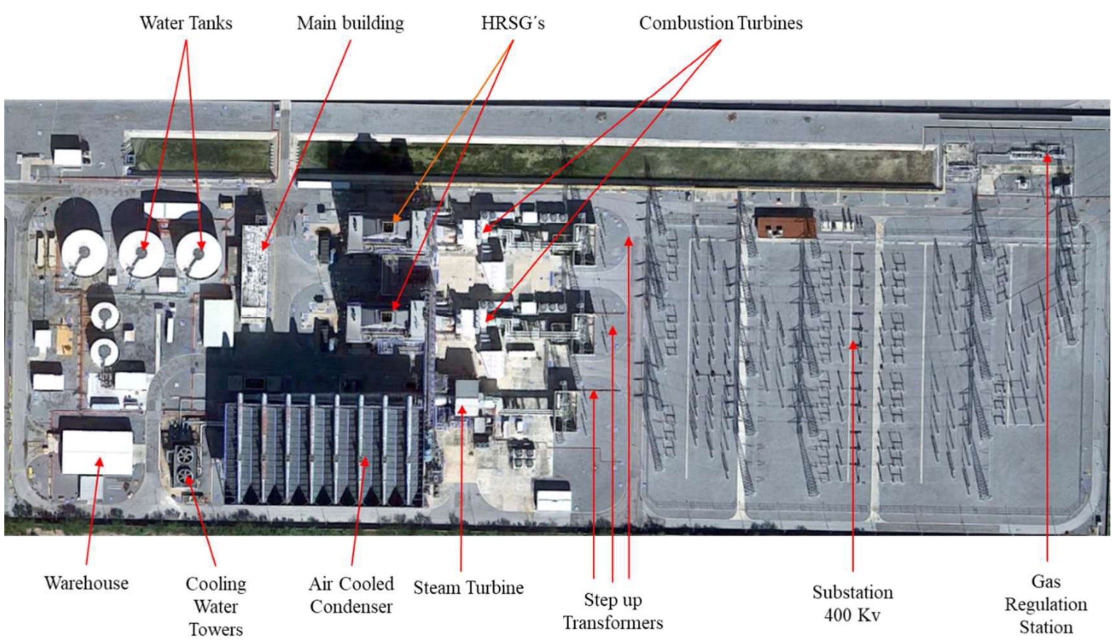

Figure 8-3: RBIV Plant Layout

The plant layout is shown in. The two combustion turbines and HRSG's are located at the east side of the plant Figure 8-3. The 400 kV substation is located east of the turbines. The secondary backup fuel is contained in the diesel tanks located on site. The evaporating ponds are north of the three sites.

8.2 Major Equipment Overview

This section covers the technology and major equipment overview of the Rio Bravo IV site. It details the specific equipment and their function in the plant. The process consists of a gas turbine and a steam turbine that are both connected to a generator. These generators are connected to transformers which connects to the national grid via the 400 kV CFE substation. The low-pressure steam from the steam turbine passes through the air-cooled condensers and is returned to a HRSG. The plant is also equipped with a steam bypass system to facilitate full load simple cycle operations when the steam turbine is not available.

The site employs an air-cooled condenser, which is also equipped with a supplemental wet cooling tower that was added later to improve the system efficiency.

Table 8-2 below highlights the principal equipment at Rio Bravo IV along with its manufacturers and model numbers.

Table 8-2: Rio Bravo IV Principal Equipment

NAME	MANUFACTURER	MODEL / SERIAL NUMBER
Combustion Turbine	Siemens Westinghouse	W501FD2
CT Generator	Siemens Westinghouse	SN: 1-S-10458
CT Generator Exciter	Cutler Hammer / Westinghouse	WDR 2000
CT Transformer	Alstom (230MVA)	226410
HRSG(Boiler)	CMI Vertical Type with Burners	Lomas de Real Project 66067
Steam Turbine	Alstom (140, 31.3, 5.22 bar /	One combined HP/IP/LP
ST Generator	Alstom (208MVA)	60WY21Z-085
ST Generator Exciter	ABB	Unitrol 5000
ST Transformer	Alstom (230MVA)	226411
Steam Aerocondenser	Balcke Dürr (32 fans)	SRB Project P3043 RJ3101

8.2.1 Gas Turbine

The gas turbine technology used at Rio Bravo IV are Siemens Westinghouse W501FD2. Both gas turbines at Rio Bravo IV are of this technology. An overview of this technology and how it works is further described under Section 5.2.1.

The exhaust gases from each of the gas turbines are directed towards their respective Heat Recovery Steam Generators (HRSG) which then recovers the heat to fuel the steam turbine.

The Rio Bravo IV LTSA contracts are with MPS.

The gas turbine specifications for Rio Bravo IV are in Table 8-3 below. The specifications are rated using ISO standards. ISO conditions are 15°C, 60% Relative Humidity, and 101.3 kPa.

Table 8-3: Rio Bravo IV Gas Turbine Specifications

Description	Quantity
ISO Rating (MW)	186.5
Pressure Ratio	16
ISO Heat Rate (kJ/kWh)	9130
Turbine Exhaust temperature (°C)	593
Fuel	Natural Gas
Rotor speed (min-1)	3600
Air flow (kg/s)	459
NOx Control	Dry low NOx combustion

Pictures of the gas turbine at the Rio Bravo IV site can be seen in Figure 8-4 below.

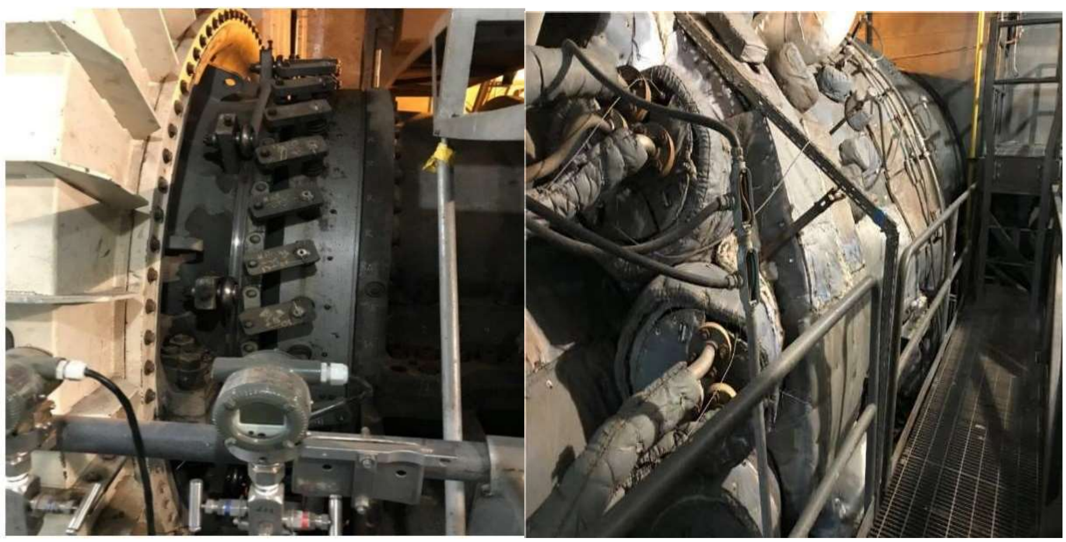

Figure 8-4: Gas Turbine at Rio Bravo IV

8.2.2 *Heat Recovery Steam Generator*

The Rio Bravo IV site has two triple pressure HRSGs manufactured by CMI of the vertical orientation. In 2019 CMI changed its name to John Cockerill. CMI Energy has supplied more than 550 horizontal and vertical HRSGs to combined cycle and cogeneration facilities worldwide. Hatch considers CMI to be a reputable OEM of HRSGs with a proven track record.

The vertical HRSGs at the Rio Bravo IV site where the exhaust gas flows vertically over horizontal tubes. Vertical HRSGs have hotter sections located at the bottom and cooler sections at the top near the stack exit.

The HRSG's can be further categorized into single pressure or multi pressure. For a triple pressure system like the one at Rio Bravo IV, there are three steam drums. The HRSG has three sections: low pressure (LP), intermediate pressure (IP), and a high pressure (HP) section. The steam is later passed through a super heater to raise the temperature beyond the saturation point. The super heated steam from both HRSGs is then combined and sent to a single steam turbine.

Both HRSGs at Rio Bravo IV have duct firing capabilities with natural gas where supplemental firing takes place in the HRSG and has the ability to increase the power output by the steam turbine.

The technical specifications of the HRSGs at the Rio Bravo IV site is listed in

Table 8-4 below.

Table 8-4: Heat Recovery Steam Generator Specifications

Parameter	High Pressure	Intermediate Pressure	Low Pressure
Pressure (bara)	134.8	33.75	5.07
Temperature (°C)	565	565	291.5
Mass flow (kg/s)	52.5	61	10.15

Figure 8-5: HRSG at Rio Bravo IV

8.2.3 *Steam Turbine*

The steam turbine (ST) at the Rio Bravo IV site is manufactured by Alstom (now part of General Electric). Alstom designs, manufacturers, and supplies power generation equipment for a for the power generation and industrial market. Hatch considers Alstom to be a reputable OEM for the ST with a proven track record for the manufacture and supply of steam turbines.

Table 8-5: Rio Bravo IV Steam Turbine Specification

Description	Value
ST Model:	Alstom
Type:	Tandem compound, single flow high pressure reheat section, single flow IP and IP cylinder
Rated Power (MW):	187
Turbine Inlet Temperature (°C):	558
Turbine Inlet Pressure (MPaA):	12.7
Rotor Speed (min-1):	3600

Figure 8-6: Rio Bravo IV Steam Turbine

8.2.4 *Steam Turbine Condenser*

The cooling system at Rio Bravo IV consists of an air-cooled condenser system (ACC) and supplemental condenser and wet cooling tower.

The ACC is manufactured by Balcke Dürr and consists of a 32-fan unit in a forced draft design with the fans underneath the heat exchange services. The arrangement is 8 distribution headers with 4 fan units each. An overview of the air-cooled condenser technology and how it works is further described under Section 5.2.4. The ACC units at Rio Bravo IV site can be seen in the figure below.

A parallel cooling system exists at Rio Bravo IV which consists of a condenser and corresponding cooling tower to provide additional cooling to improve steam cycle performance.

Pictures of the cooling system at the Rio Bravo IV site can be seen in Figure 8-7 and Figure 8-8 below.

Figure 8-7: Rio Bravo IV Air Cooled Condenser

Figure 8-8: Rio Bravo IV Cooling Towers

8.2.5 Fuel Systems

The fuel system at the Rio Bravo IV site consists of receiving natural gas. Natural gas is used as fuel for the gas turbines as well as supplemental firing in the HRSGs. Rio Bravo IV receives natural gas from the GDR pipeline. On site, the natural gas is cleaned to remove entrained liquids and distributed through the gas pipeline at the site.

Figure 8-9: Gas Receiving Station at Rio Bravo IV

8.2.6 Water Treatment System

The water treatment plant treats the raw water received from Comisión Nacional del Agua ("CONAGUA") through a groundwater supply permit. The main function of the water treatment plant is to supply make-up water to the steam cycle which requires high quality demineralized water. Maintaining high water quality is paramount to the long-term operation of the plant and to maintain equipment performance.

The water treatment process at Rio Bravo IV is a three-step process. The first is an initial filtration system followed by use of reverse osmosis and electrode ionization (EDI).

Makeup water will be taken from the water storage tank and passes through an initial filtration process to remove suspended solids from the water. The service water is then fed directly to the cartridge filters by two RO feed pumps. Rio Bravo IV has a two stage RO system. Water from the RO first stage second skid is stored on site before water is pumped into the second stage RO. The permeate from the RO modules are stored briefly in a RO surge tank before being pumped to the EDI system.

The EDI system uses ion exchange membranes and resins to deionize water. Rio Bravo IV has a single EDI system.

Figure 8-10: Water Treatment System at Rio Bravo IV

8.2.7 *Electrical*

The generators at the Rio Bravo IV site converts mechanical energy of the Gas Turbine and Steam Turbine to electrical energy. Generators consist of a rotor which is directly connected to the turbine shaft of either the steam or gas turbine and a stator.

The Gas Turbine generator is manufactured by Siemens-Westinghouse. The Steam Turbine generator is manufactured by Alstom. Both generators have a power factor of 0.9. The GT generator has a voltage of 13.8 kV and a rated power of 193 MVA, while the steam turbine generator has a voltage of 18 kV and a rated power of 207.8 MVA.

Table 8-6: Rio Bravo IV Generator Specifications

Parameter	GT Generator	ST Generator
Model	Siemens-Westinghouse	Alstom (ABB)
Rated Power (MVA)	193	207.8
Cooling System	Hydrogen-cooled	Air-cooled
Power factor	0.9	0.9
Voltage	13.8kV	18kV

Figure 8-11: Gas Turbine Generator at Rio Bravo IV

Figure 8-12: Steam Generator at Rio Bravo IV

There are three generator step-up transformers (“GSU”) at the Rio Bravo IV site; one for each of the gas turbine generators and one is for the steam turbine. The GSU takes the generator voltage and raises it to match transmission voltage. All GSUs at the Rio Bravo IV site are oil natural air natural (“ONAN”) and oil forced air forced (“OFAF”). This means that the transformers are cooled by both natural air and oil as well as forced air and oil where the forced flow is caused by fans and motors.

All three GSUs at the Rio Bravo IV site are manufactured by Alstom. The specification for the transformers on site are provided in Table 8-7 and the transformers at the Rio Bravo IV site can be seen in Figure 8-13.

Table 8-7: Rio Bravo IV Transformer Specification

Unit	Manufacturer	Phases	Cooling	MVA	Voltage (kV)
GT1 Main	Alstom	3	ONAF/OFAF	230	13.8/400
GT2 Main	Alstom	3	ONAF/OFAF	230	13.8/400
ST Main	Alstom	3	ONAF/OFAF	230	18.0/400

Figure 8-13: Rio Bravo IV GSU

After being stepped up at the three GSUs, the power goes to the high voltage switchyard which collects the power from the gas turbine and steam turbine at 400kV. The switchyard is a 400kV air insulated switchgear ("AIS"). This power is then transmitted to a CFE substation which connects to Mexico's electricity grid. Figure 8-14 shows the switchyard at the Rio Bravo IV site.

Figure 8-14: 400kV Switchyard at Rio Bravo IV

8.2.8 *Control Systems*

The Control Systems at Rio Bravo IV are divided between the gas turbines, the steam turbine, and the balance of plant. The systems are as follows:

- Gas Turbines – Emerson Ovation (upgraded in 2020 from Siemens Teleperm (TXP))
- Steam Turbine – Emerson Ovation (upgraded in 2020 from Woodward Micronet)
- Balance of Plant – Emerson Ovation (upgraded in 2020 from Foxboro (Invensys))

All systems are co-located in the control room for a single operator to access all plant equipment from one location.

No photo of the RBIV Control Room was available.

8.3 Operations Review

8.3.1 *Equivalent Unplanned Outage Factor*

The monthly equivalent unplanned outage factor (EUOF) for Rio Bravo IV from January 2020 to November 2023 is shown in Figure 8-15.The average EUOF for this period is 5.88%. The EUOF trend is increasing in recent months due to some equipment issues that are actively being addressed by the Client and are highlighted in Appendix A.

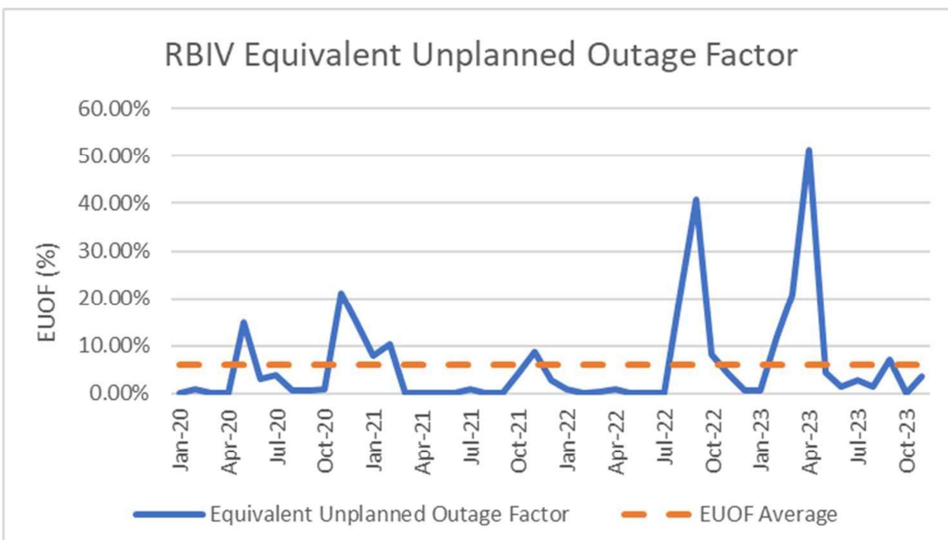

Figure 8-15: Monthly Availability for RBIV from January 2020 to November 2023

8.3.2 *Heat Rate*

The monthly heat rate of the plant from January 2020 to November 2023 is shown in Figure 7-14. The plant has a weighted average heat rate of 7,092 kJ/kWh during this period. The spike in September 2022 was due to a forced outage on the unit.

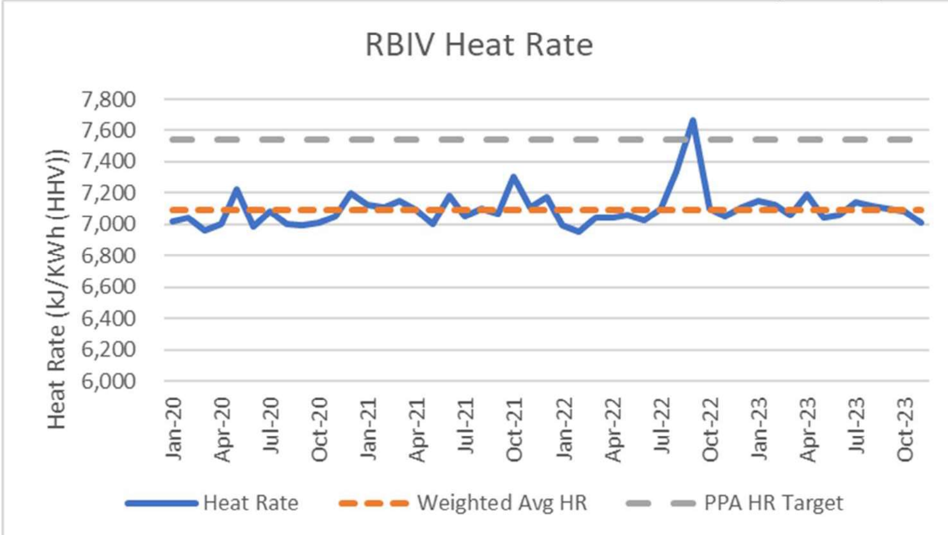

Figure 8-16: Monthly Heat Rate for RBIV from January 2020 - November 2023

8.3.3 *Generation*

The monthly power generated (GWh) of the plant from January 2020 to November 2023 is shown in Figure 8-17. The average net power generated for RBIV during this period is 292 GWh per month. Power output fluctuations are caused by reduced availability due to outages and changes in demand.

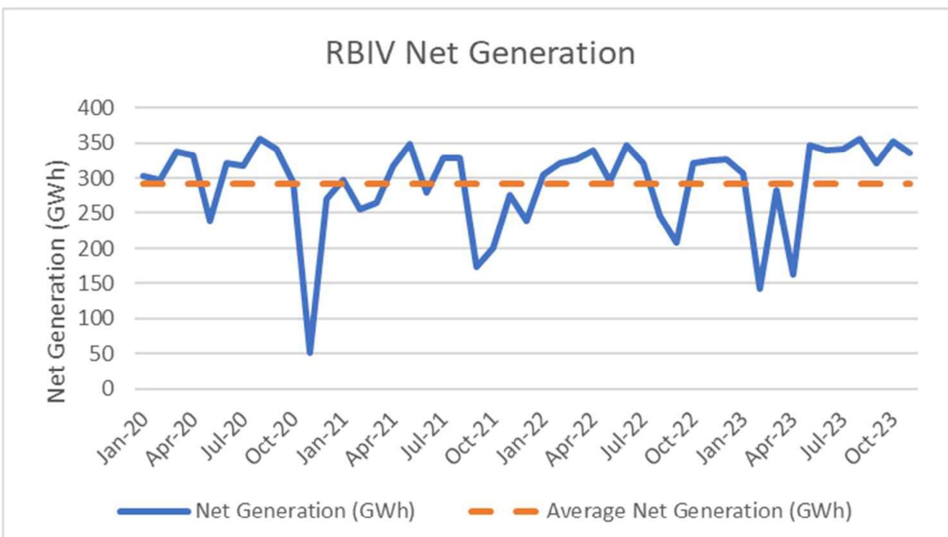

Figure 8-17: Monthly Net Power Generation for RBIV from January 2020 – November 2023

8.4 Maintenance Review

The maintenance program at Rio Bravo IV has been focused on the routine maintenance of the Gas Turbines. Siemens, the OEM for the turbines, provided the long-term service agreement (LTSA) services for the period of from commercial operations through 2018. In 2018, the Client terminated the contract with Siemens and hired Mitsubishi Power Systems

(MPS) to provide the LTSA for the gas turbines. MPS co-developed the 501F technology with Westinghouse prior to the Siemens purchase of Westinghouse from CBS. As a co-developer, MPS has a detailed knowledge base for the equipment, however their relationship ended with the FC class turbines. Rio Bravo IV is an FD class turbine and utilizes a different compressor design and various other enhancements.

Maintenance for the steam turbine and generators is provided on an ad-hoc basis with the preferred supplier at the time of execution.

8.4.1 *Spare Parts Inventory*

Inventory for the Rio Bravo site has some shared materials for each unit. Emergency spares and routine replacement parts are included in the warehouse. Gas Turbine spares are not part of the warehouse materials. The Client relies on the response time under the LTSA to have gas turbine parts delivered to the site within 48 hours otherwise the LTSA contractor will face a liquidated damage penalty. Hatch considers the spare parts inventory for the remaining plant except the gas turbine spares at Rio Bravo IV to be reasonable to mitigate unavailability. In addition, BEMH has budgeted amounts to purchase an inventory of gas turbine spares in the CAPEX in the Financial Model for the Portfolio.

Two key items that have become part of the rotational spare program are the purchase of a spare gas and steam turbine generators. This program allows the equipment to be refurbished utilizing a roll-out/roll-in process that swaps the aged or failed machine with a refurbished spare. This program started due to the availability of a spare gas turbine generator during a forced outage. The Client utilized the opportunity to refurbish the damaged unit and rotate it through the fleet to correct the latent design issue with stator coil pounding. With known issues on the steam turbine generators, a spare generator has been purchased and will be utilized to roll-out/roll-in on each unit over time. This process has advantages in that repairs will be made in a controlled environment with less schedule pressure. The result should be improved outage performance and reliability.

8.4.2 *Maintenance Plan*

Figure 8-18 shows the maintenance history for the prime equipment from 2023- 2035. The F4 upgrades have extended the planned operating interval to 32,000 hours and allow for service intervals every four years.

Steam Turbine service intervals are matched with major inspections to ensure the steam turbine outage window does not extend an otherwise short inspection of the gas turbine.

Maintenance Schedule														
		2023	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	**2031**	**2032**	**2033**	**2034**	**2035**
Rio Bravo IV	**CT1**	BI	BI	MI	BI	BI	BI	HGPI	BI	BI	BI	MI	BI	BI
	CT2	BI	BI	MI	BI	BI	BI	HGPI	BI	BI	BI	MI	BI	BI
	STG	-	-	O	-	-	-	-	-	-	-	O	-	-

Figure 8-18: RBIV Major Maintenance History

8.5 O&M Staffing

The Rio Bravo site is staffed with 16 personnel that support the overall site with administration and technical services as well as 7 COMEGO personnel that support corporate services such purchasing, IT and corporate administration.

The staffing for the RBIV Unit is 28 permanent positions that are dedicated to the operations of the unit, and 1 trainee. Operations teams are comprised of one shift lead, one operations technician and one field technician. This level of shift staffing is consistent with industry standards.

Technical and maintenance staffing consists of 5 technical leads and 5 maintenance technicians. The leads are responsible for water chemistry, mechanical systems, electrical systems, and I&C systems. These positions are replicated on all three units at Rio Bravo which is not typical for multi-unit sites. One Human Resources lead is shared between the Rio Bravo plants. The Client has advised that staffing has been increased to ensure they have adequate coverage to improve performance. The need was identified through root cause analysis of the individual events.

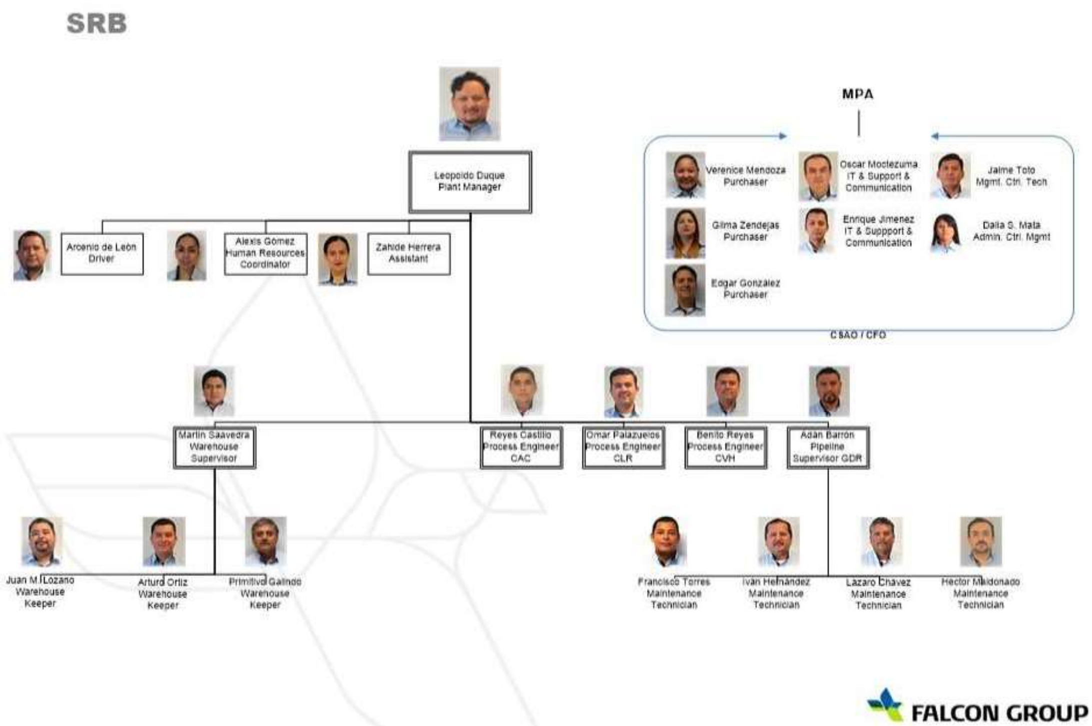

Figure 8-19: RB Site Staff

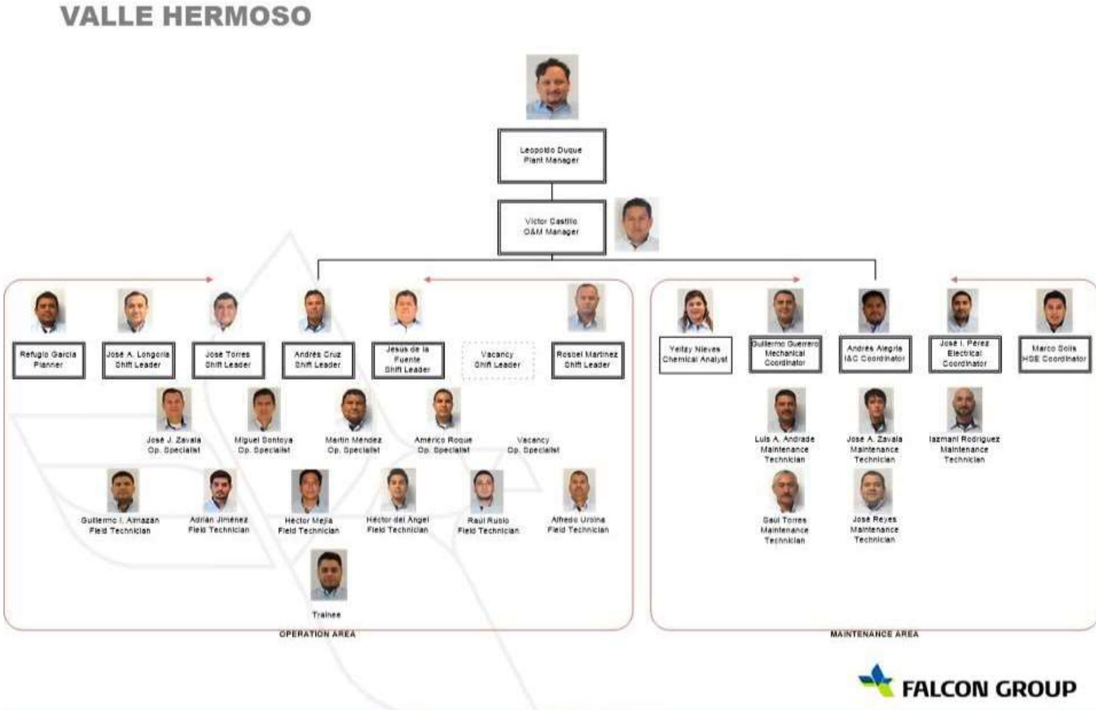

Figure 8-20: RBIV Staff

8.6 Project Agreements

This section provides an overview of the asset material agreements for Rio Bravo IV. The analysis is limited to providing a summary of the contract assessing the technical related aspects and providing an opinion on scope, gaps, and risks with regard to ongoing and future operations of the asset.

Table 8-8: Rio Bravo IV Project Agreements Summary

Agreement	Contract End Date
Power Purchase Agreement	April 1, 2030
Long Term Service Agreement	March 31, 2030
Fuel Supply Agreement	April 1, 2030
Water Supply Agreement	May 19, 2023

8.6.1 Power Purchase Agreement

A Power Purchase Agreement (PPA) has been entered into by Comisión Federal de Electricidad (“Commission”) and Central Valle Hermosol S.A de C.V. (“Producer”) in July 2001. he PPA is a CFE legacy template that has been used numerous times to procure thermal generation through Independent Power Producers (IPPs) in Mexico. The term of the agreement is 25 years from the Commercial Operation Date of April 1, 2005. Capacity Guarantees in Summer Design Conditions with Base Fuel is 500 MW.

The contract payments consist of two components, capacity charges and energy charges. The Fixed Capacity Charge is denominated in United States Dollars and payment for operation and maintenance is denominated in Mexican Pesos and adjusted for escalation in accordance with the terms of the PPA.

If the asset is not capable of meeting the guaranteed heat rate, the fuel cost will not fully pass through to the Commission. The asset will be penalized for not being able to meet the guaranteed heat rates by having to pay the additional cost of fuel. This can have significant financial implications. Furthermore, unavailability will reduce the Capacity Charge Payments received from the Commission.

The station is well suited to meet the requirements of the PPA throughout the operating life.

8.6.2 *Contractual Service Agreement*

A Long-Term Service Agreement (LTSA) exists between Central Valle Hermosol, S.A de C.V. ("Purchaser") and Mitsubishi Power Americas Inc. ("Supplier") for the Rio Bravo IV Combined Cycle Power Plant. The Term of the contract is until March 31st, 2030. Rio Bravo IV had an LTSA with Siemens which was terminated, and Rio Bravo IV entered into a new LTSA with MHPS in December 2018 and the new contract supersedes the original LTSA.

LTSA ends in March 2029 and the PPA ends in March 2029. An LTSA needs to be in place for the post-PPA period. The LTSA lists guarantees for reliability, output, heat rate recovery guarantee, outage durations and response times.

Contract payments includes a fixed fee of US $150,000/Covered Unit/year and a variable fee equal to US$205/EFH (Equivalent Fired Hours). The Capacity Fee which is a fee for each MWh generated from the Facility sold by Purchaser in the Wholesale Electricity Market would involve sharing between 10% to 50% of the revenue made from selling electricity to the wholesale electricity market. Current revenue sharing has substantial financial impacts. Revenue sharing combined with forecasted dispatch will have significant financial impacts if this LTSA is renewed.

The LTSA also include guarantee for reliability of the Covered Unit, output, and heat rate recovery after planned inspections, outage durations and response times to mobilize staff and deliver parts to the site.

The terms of the LTSA are customary within the power industry and provide incentive for the service provider to exceed the performance conditions in the PPA.

8.6.3 *Fuel Supply Agreement*

Agreement between Trafigura Trading LCC ("TTL") and Central Valle Hermoso S.A. de C.V. Agreement related to firm transportation capacity totaling 95000 MMBtu on a pipeline operated by Tennessee Gas Pipeline LLC. Under this agreement TGP will provide Transportation Services to CVH to deliver firm quantities of natural gas at point of delivery. The term of this agreement shall be for 8 years from June 2022 to March 2030.

The fuel supply agreement is sufficient to meet the operating requirements of the Station.

8.6.4 Water Supply Agreement

Agreement between Central Valle Hermoso S.A. de C.V. (CVH) and Comision Nacional Del Agua ("CONAGUA"). Term of the contract is 10 years dated May 20th, 2013. The concession is for the capacity increase of water taking and infrastructure upgrades of an existing groundwater well. The capacity increase is from 50,000 to 1,000,000 m3/year from the groundwater well at the stated location coordinates. No contract payments mentioned as this is a concession agreement to extract water.

The water supply agreement is sufficient to meet the operating requirements of the station.

9. Altamira II Power Plant

9.1 Plant Overview

Electricidad Aguila de Altamira, S. de R.L de C.V. ("EAA"), also known as "Altamira II" is located in the city Altamira which is a part of the Tamaulipas state in Mexico. The plant is located 100 meters above sea level and operates in a combined cycle mode with a 2x2x1 configuration with two gas turbines (GT), two heat recovery steam generators (HRSG) and one steam turbine. The geographic location of the asset within Mexico can be seen in Figure 9-1. The plant has a guaranteed summer design condition capacity of 495 MW under the power purchase agreement ("PPA") when using gas. The plant has dual fuel capabilities with natural gas as its primary fuel and diesel oil as the alternate fuel.

Figure 9-1: Altamira II Location

A summary of the Altamira II asset is shown in Table 9-1 below:

Table 9-1: Altamira II Asset Overview

Parameter	Value
Contracted Capacity	495 MW
Location	Altamira, Tamaulipas, México
Commercial Operation Date	May 1, 2002
Technology and Configuration	CCGT, 2x1
Fuel	Natural Gas/Diesel
Off taker	CFE
PPA Expiry	April 30 2027
Gas Supplier	PEMEX
FSA Expiry	May 2027

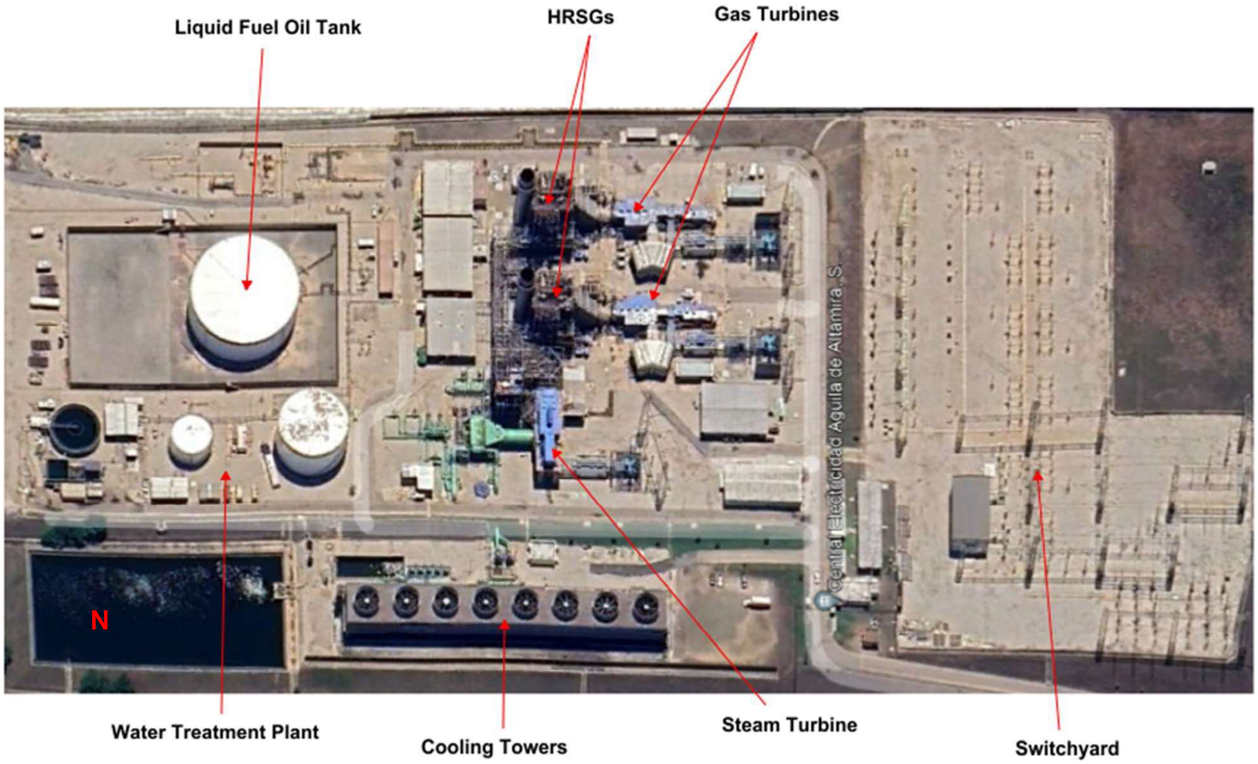

Figure 9-2: Altamira II Site Lay-out

The plant layout is shown in Figure 9-2. The two combustion turbines and HRSG's are located at the south side of the plant. The 400 kV substation is located south of the turbines. The secondary backup fuel is contained in the diesel tanks located on site.

9.2 Major Equipment Overview

This section covers the technology and major equipment overview of the Altamira II site. It details the specific equipment and their function in the plant. The process consists of two gas turbines and a steam turbine, all connected to a generator. These generators are connected to transformers which connects to the national grid via the 400 kV CFE substation. The low-pressure steam from the steam turbine passes through the air-cooled condensers and is returned to a HRSG. The plant is also equipped with a steam bypass system to facilitate full load simple cycle operations when the steam turbine is not available.

For cooling, the site utilizes a water-cooled condenser which acts as the principal heat sink for the steam cycle. The plant is capable of firing both natural gas and diesel as the back up fuel.

Table 9-2 below lists the main equipment at the Altamira II power plant.

Table 9-2: Altamira II Principal Equipment List

Equipment	Manufacturer	Model
Gas Turbine	Mitsubishi Heavy Industries, LTD	M501F
Gas Turbine Generator	Mitsubishi Electric Co, LTD	MB
HRSG	Cerrey Mexico	Horizontal, Natural Circulation
Steam Turbine	Mitsubishi Heavy Industries, LTD	TC2F
Steam Turbine Generator	Mitsubishi Electric Co, LTD	MB
Cooling Tower	Marley SPX	Closed Circuit

9.2.1 Gas Turbine

The gas turbine technology used at Altamira II are Mitsubishi Heavy Industries, LTD M501F. Both gas turbines at Altamira II are of this technology. The gas turbines at Altamira II have F4 components installed during the recent major inspection in 2020 extending the maintenance interval and increasing the capacity of the units.

These CTs were originally developed under Westinghouse. In 1998, Siemens acquired the Westinghouse Power Generation Business Unit and MHI pursued the M501 technologies thereafter on its own.

The exhaust gases from each of the gas turbines are directed towards their respective Heat Recovery Steam Generators (HRSG) which then recovers the heat to fuel the steam turbine.

The Altamira II LTSA contracts are with Mitsubishi Power Americas Inc.

The gas turbine specifications for Altamira II are in Table 9-3 below. The specifications are rated using ISO standards. ISO conditions are 15°C, 60% Relative Humidity, and 101.3 kPa.

Table 9-3: Altamira II Gas Turbine Specifications

Description	Quantity
ISO Rating (MW)	185.4
Pressure Ratio	16
Turbine Inlet Temperature (°C)	1350
ISO Heat Rate (kJ/kWh)	9738
Turbine Exhaust temperature (°C)	607
Fuel Natural	Natural Gas and Distillate Fuel oil
Rotor speed (min-1)	3600
Air flow (kg/s)	453
NOx Control	Dry low NOx combustion

Figure 9-3: Altamira II Gas Turbine Exterior View with HRSG on Left and Air Intake on Right

9.2.2 Heat Recover Steam Generator

The HRSGs for the Altamira II plant are designed and constructed by Cerrey, a Mexico based HRSGs design, manufacturing, and installation company. The company is a subsidiary of the Grupo Hermes, a Mexican industrial conglomerate.

Heat Recovery Steam Generators (HRSGs) are used to recover waste heat from the exhaust of gas turbines (GTs) to produce steam. The steam generated can be used for process heating (cogeneration), the production of power in a steam turbine (combined cycle), or both. At the Altamira II site, the steam generated by the HRSG is fed to a steam turbine in combined cycle configuration.

The Altamira II site has a horizontal HRSG where the exhaust gas flows horizontally over vertical tubes. The HRSG at Altamira II is a triple pressure system with three steam drums. The HRSG has three sections: low pressure (LP), intermediate pressure (IP), and a high pressure (HP) section. The steam is later passed through a super heater to raise the temperature beyond the saturation point.

Table 9-4: Heat Recovery Steam Generator Specifications

Parameter	High Pressure	Intermediate	Low Pressure
Pressure (bara)	147.2	35.5	5.07
Temperature (°C)	540	568	291.5
Mass flow (kg/s)	55.8	10	7.77

Figure 9-4: HRSG at Altamira II

9.2.3 *Steam Turbine*

The steam turbine (ST) at the Altamira II site is manufactured by Mitsubishi Heavy Industries (MHI) MHI designs, manufacturers, and supplies power generation equipment for a for the power generation and industrial market. Hatch considers MHI to be a reputable OEM for the ST with a proven track record for the manufacture and supply of steam turbines.

Table 9-5: Altamira II Steam Turbine Specification

Description	Value
ST Model:	MHI-TC2F
Type:	Condensing and reheat ST. Tandem compound,
Rated Power (MW):	191
Turbine Inlet Temperature (°C):	538
Turbine Inlet Pressure (MPaA):	12.82
Rotor Speed (min-1):	3600

Figure 9-5: Steam Turbine Generator at Altamira II

9.2.4 *Steam Turbine Condenser*

The main cooling system at Altamira II is a condenser cooling system that consists of a water-cooled condenser and a draft cooling tower. The process for the cooling system begins with the steam exiting the steam turbine which then condenses into condensate in the condenser. The cooling for the condenser is provided by the cooling tower in a separate loop.

The Altamira II Cooling Tower is an inline 8 cell mechanical draft design manufactured by the US based Marley SPX.

Figure 9-6: Condenser on Left and Cooling Tower on Right

9.2.5 *Fuel Systems*

The Altamira II facility uses natural gas as the primary fuel. Natural gas is provided to the Altamira II gas yard from a PEMEX pipeline, the gas connection point is 2 km north of the site. The Natural gas is received at site and is cleaned up to remove entrained liquids. The gas then is reduced in pressure and is distributed to the gas turbines by a gas distribution piping system on site.

Figure 9-7: Gas Receiving Station at Altamira II

Altamira II was designed as per the PPA requirement to operate on backup diesel fuel which is stored in a 21,000 cubic meter tank located on the North end of the site. Diesel is delivered to site via trucking and is the responsibility of Altamira II. Given the high salt water and chlorides in the ambient in Altamira II, continuous monitoring for corrosion and painting program is recommended to maintain the diesel tanks.

Figure 9-8: On-site Diesel Storage at Altamira II

9.2.6 Water Treatment System

The Altamira II power plant receives its raw water from Comisión Nacional del Agua ("CONAGUA") through a Water Supply Permit between Altamira II and CONAGUA.

The water treatment system in Altamira II has four stages of treatment which includes the clarifier, initial filtration, reverse osmosis, and mixed bed.

The Clarifier is an open settling tank used for the continuous removal of solids mainly as a result of sedimentation. Then it passes through the initial filtration where the raw water from the clarifier is then filtered using three parallel filtrations skids. The filtered water is then stored in an onsite intermediary tank. Then Reverse osmosis ("RO") takes place where filtered water from the intermediary tank is then pumped into the RO system to remove ions, unwanted molecules, and relatively larger particles that were not filtered in the first stage. Altamira II is equipped with a single stage RO system made of four RO units operating in parallel. The last step involves a Mixed Bed ("MB") where water from the pre-treated water tank is then pumped to the MB system. Altamira II has two MB systems operating in parallel.

Figure 9-9: Altamira II Water Treatment System

9.2.7 Electrical

The generators at the Altamira site converts mechanical energy of the Gas Turbine and Steam Turbine to electrical energy. The generators at the Altamira II site converts mechanical energy of the Gas Turbine and Steam Turbine to electrical energy. Generators consist of a rotor which is directly connected to the turbine shaft of either the steam or gas turbine and a stator.

The generator specifications are provided in Table 9-6.