ACWA Power Zarqa CCGT Project

Zarqa, Jordan

Updated Environmental and Social Impact Assessment

Volume 1 – Non-Technical Summary

Prepared for:

ACWA Power

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5 Capitals Environmental and Management Consulting
PO Box 119899, Sheikh Zayed Road, Dubai, UAE
Tel: +971 4 343 5955 Fax: +971 4 343 9366

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Project Manager	Max Burrow
Project Director	Ken Wade

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1 PROJECT DESCRIPTON

Table 1-1 Key Project Information

Project Title	ACWA Power Zarqa CCGT Project
Project Developer	ACWA Power
Point of Contact	Adrian Rizza (Director – Business Development) arizza@acwapower.com
Project Company	Al Zarqa Power Plant for Energy Generation (P.S.C) (م. خ. م) الكهربائية الطاقة لتوليد الزرقاء محطة شركة
EPC Contractor	SEPCO III Electric Power Construction Corporation (SEPCO III)
Operational and Maintenance Company	Central Electrical Generating Company (CEGCO)
Environmental Consultant	5 Capitals Environmental and Management Consulting (5 Capitals) Dubai – UAE
	ECO Consult Amman – Jordan
Environmental Consultant Point of Contact	Ken Wade - Director Environmental Planning Email: Ken.wade@5capitals-group.com
	Max Burrow – Senior Consultant Email: max.burrow@5capitals-group.com
	Ibrahim Masri – Senior Consultant

ACWA Power is proposing to develop a new 485MW (net) gas-fired Combined Cycle Gas Turbine (CCGT) power plant, known as the 'ACWA Power Zarqa CCGT Project' within the existing landholding of the Hussein Thermal Power Station (HTPS), located in Zarqa, Jordan.

Need for Development & Context

The HTPS was built between 1973 and 1984 and provided a net installed capacity of 321MW. The plant operated on Heavy Fuel Oil (HFO), with an allocation of 675,749 tonnes per year.

The facility is understood to have operated at an efficiency of 28% and ceased to operate in December 2015, and is since pending decommissioning under a separate contract instructed by the HTPS owner, CEGCO. The rationale for the ACWA Power Zarqa project is due to the closure of the HTPS and the continued growth in electrical demand in Jordan. Furthermore, the Project aligns itself with Jordan's Power Strategy, which focuses on:

> "…constructing a modern and reliable power system, based on large central power plants, reliable high-voltage networks, electrification of all rural areas and interconnection with neighbouring countries…"

The ACWA Power Zarqa CCGT Project has secured a land lease agreement with CEGCO (owners of the HTPS). The proposed project will be operated and maintained by the Central Electricity Generating Company (CEGCO), with the output energy being supplied to the National Electricity Power Company of Jordan (NEPCO), under a 25-year Power Purchase Agreement.

Project Objective

In short, it is the intention that the project will provide a much cleaner energy source than the previous HTPS plant and at a much improved operational efficiency (estimated at: 49.6% - LHV, net, natural gas operation); and significantly lower carbon intensity as compared to the

previous HTPS HFO plant. More generally, the flexibility of operation presented by the CCGT – being reliable for baseload operation yet suitably responsive for peaking capacity – is capable of accommodating the growth in intermittent renewables generation (such as wind and solar).

Furthermore, the Project Design accords with European Guidance on *Best Available Techniques* for Large Combustion Plants (such as CCGT), including compliance with emission thresholds as set out under European Industrial Emissions Directive (IED) (2010/75/EU. This is discussed further under Section 1.3.

1.1 Site Condition and Local Area

The proposed 'ACWA Power Zarqa CCGT Project' will be constructed on a vacant 149,992 m^2 parcel of land, adjacent to the existing decommissioned HTPS. This has the benefit of not only being an established power generating site and avoiding greenfield development, but also, utililsing the extensive infrastructure which has already been installed as part of HTPS - most significantly - the power evacuation and transmission infrastructure. The project will be separated physically and functionally from the HTPS and will be operated on a complete stand-alone.

Figure 1-1 Project Area: Regional

Satellite Image Source: Google Earth

Figure 1-2 ACWA Power Zarqa CCGT Project Site in Purple (HTPS Boundary in Yellow)

Satellite Image Source: Google Earth

Although a small section of the project site has previously been used for temporary scrap storage at the HTPS HFO plant, this was cleared in March 2016 and sold to local scrap dealers. Subsequent baseline soil studies identified some minor concentrations of heavy metal contamination in the surface soils at the proposed power block area. As part of the Project's preparation works, this area of soil is now scheduled for remediation (removal) by CEGCO, pending permit approval from the Ministry of Environment; where it will be disposed at a licensed hazardous waste landfill site (with appropriate pollution control mechanisms) regulated by the Ministry of Environment.

During 2012, it was identified that previous oil leaks from the boiler drains at the HTPS HFO plant had also resulted in a small amount of groundwater contamination. A full investigation undertaken by CEGCO in 2014/15 identified the source and extent of the contamination, which was contained within the shallow groundwater aquifer and demonstrated to have not migrated off-site. The groundwater remediation was completed in early 2016, and confirmed by independent laboratory analysis.

The project will be located in a predominantly industrial area of Zarqa to the north of the city. The area also includes other industries such as the only petrochemical refinery in Jordan, a steel fabrication plant and large wastewater treatment facility. Approximately 3km to the north is the Al Samra Power Plant that has capacity of 1,031MW

Local infrastructure and other development around the proposed project site had significantly progressed since the establishment of the petrochemical refinery and HTPS HFO plant in the 1970's. This has led to the proximal location of sensitive receptors with respect to

the site. In particular, there are residences close to the north of the proposed project site (Hashmiyeh Village) and CEGCO staff accommodation in relative proximity to the south within the HTPS landholding.

1.2 Project Design

The project will comprise one (1) power block, consisting of the following units:

- Three (3) Gas Turbine Generators (GTG).

  Gas Turbines directly combust fuel to generate electricity via the in built turbine and attached generator.

  - Equipped with Low NOx burners;
  - Each Gas Turbine will have a bypass stack for emissions during simple cycle operation (when required);
  - Equipped with Continuous Emissions Monitoring System (CEMS).

- Three (3) Heat Recovery Steam Generators (HRSG).

  HRSG's use the hot exhaust gases from the gas turbine to heat water to steam for transfer to the steam turbine.

  - Each HRSG will have a main stack for emissions during combined cycle operations;
  - Equipped with main stack and CEMS systems for air emissions monitoring;

- One (1) Steam Turbine Generator (STG).

  The steam turbine uses the steam from the HRSG to turn generate electricity in combined cycle, additional to the GTs, thereby increasing plant efficiency.

The primary fuel for the Project will be natural gas. In the event that gas is not available (or an emergency situation), Light Distillate Oil (LDO) will be used as the alternate fuel for no more than 40 days per year (960 hours), and no more than 7 days consecutively in line with the PPA. Whilst the specification in the PPA allows for the supply of LDO fuel with up to 1.2% sulphur and LDO-fired operations for up to 40 days, the scenario of exceeding 500 hours of LDO usage in a year (the threshold at which World Bank/IFC Guidelines require the use of <1% sulphur LDO) is highly improbable. It is noted that LDO currently provided by the supplier is in the 0.2-0.3% sulphur range. In the event that the 500 hours LDO-firing is exceeded,or LDO >0.9% sulphur is received, the Lenders will be notified. This is considered to be a low likelihood risk with minimum and short term adverse implications.

The HTPS will be equipped with six (6) stacks, one per GTG (3) and one per HRSG (3). The proposed height of the HRSG stack is 60 meters, whilst the height of the bypass stack is 45 meters, based on manufactures recommendation in line with the type of fuel being used. Each stack will include Continuous Emission Monitoring System (CEMS) to monitor air emissions.

Dry Air Cooled Condensers (ACC) will be used for condensation of the steam from the STG, thereby considerably reducing the projects demand for raw water. The ACCs operate on the basis of direct cooling by air only and do not result in water losses due to evaporation, or drift.

Figure 1-3 Illustration of Typical CCGT Plant

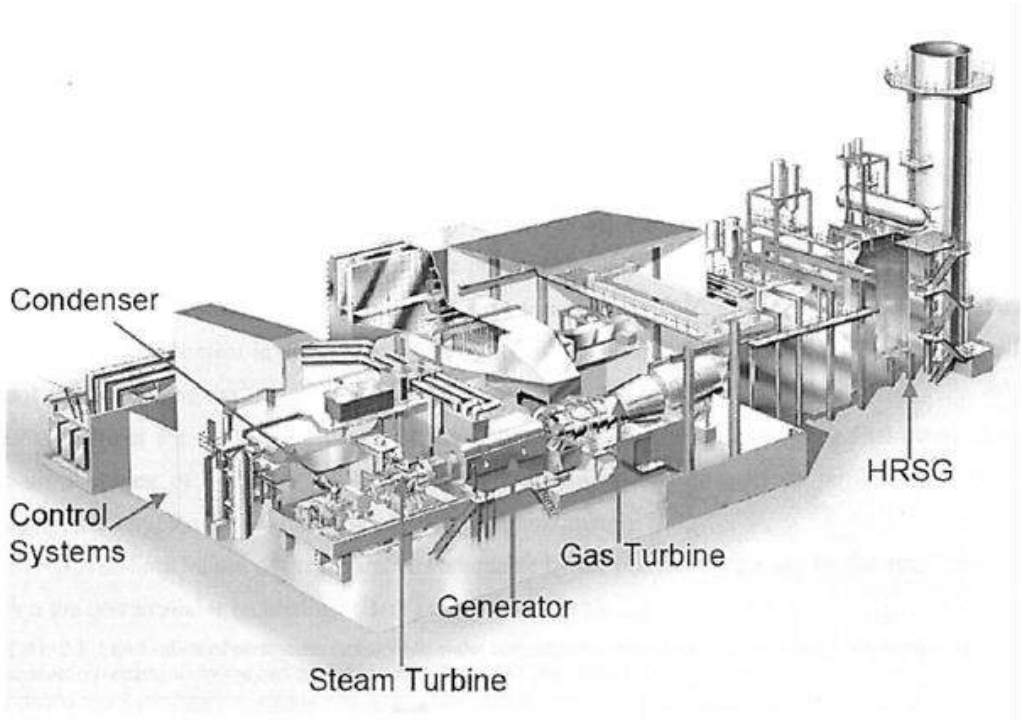


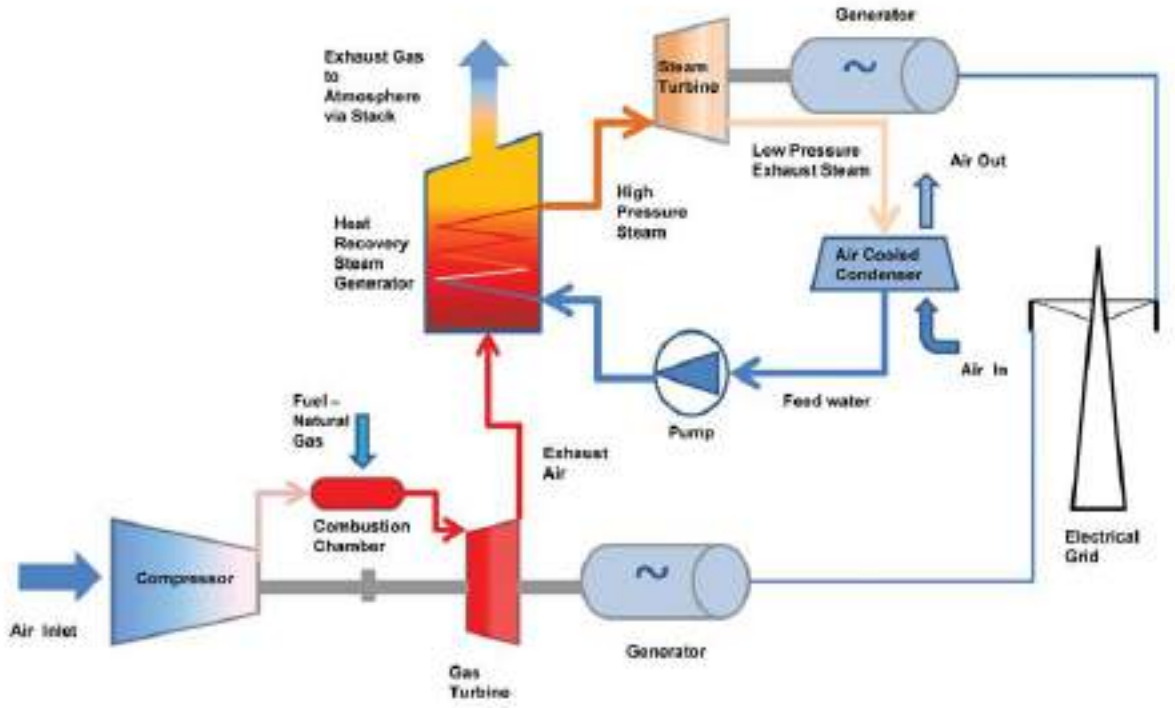
Plate 1-1 Examples of Combine Cycle Gas Turbines Plants (NOTE: Not ACWA Power Zarqa CCGT Project)

Plate 1-2 Examples of Combine Cycle Gas Turbines Plants (NOTE: Not ACWA Power Zarqa CCGT Project)

Image Rights: WSP | PB

The following diagram demonstrates the flow of the CCGT plant as it operates in combined cycle, on natural gas fuel with ACC cooling.

Figure 1-4 Example Flow of a CCGT Plant



Source: Wrexham Energy Centre

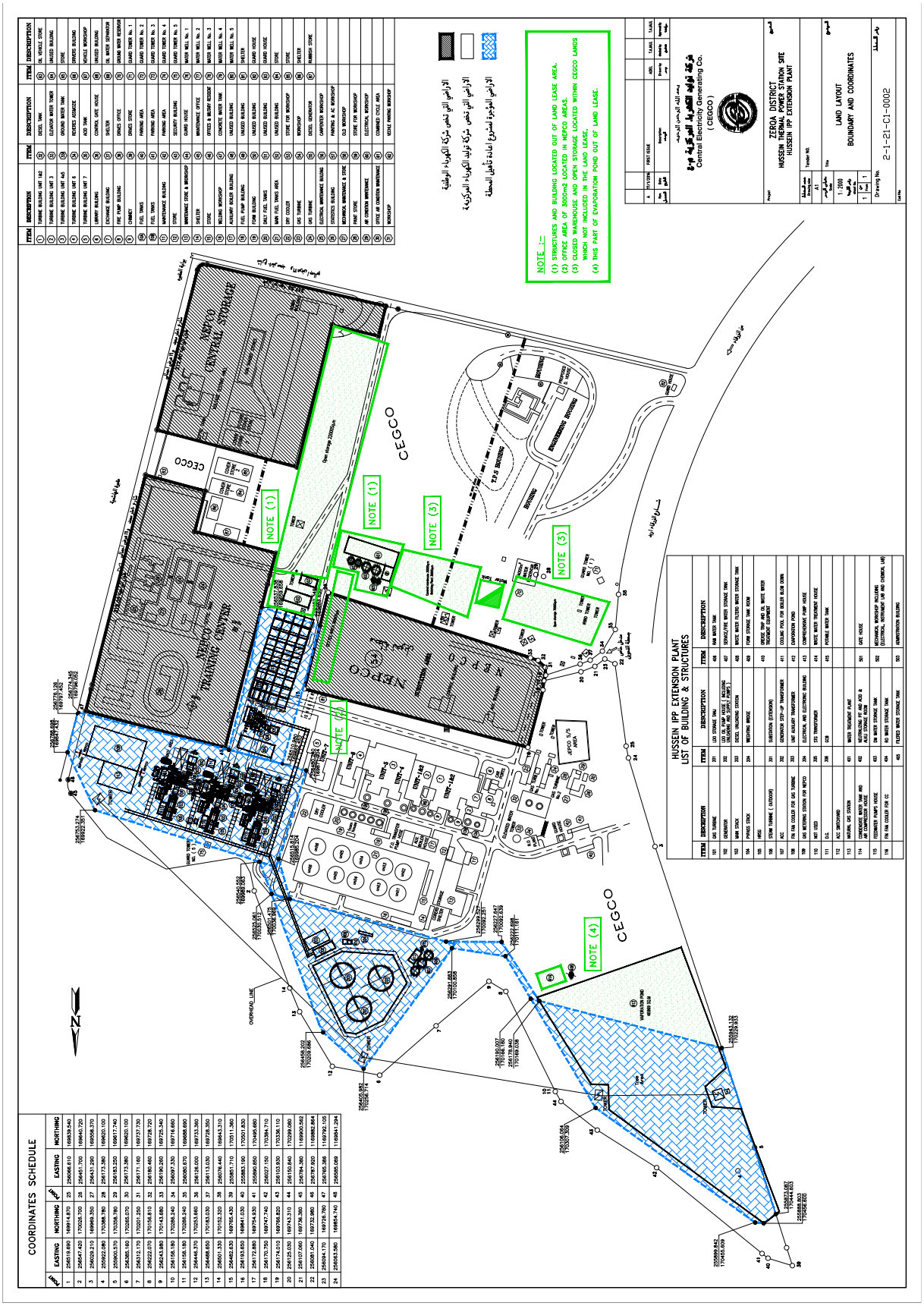
(http://www.wrexham-power.com/wrexham-energy-centre-eng.html)

Raw water will be abstracted from three new boreholes to be drilled at locations adjacent to previous wells that had been used to abstract water for the HTPS (Previous HTPS wells have been capped). The 3 new boreholes will be drilled to 95m, 110m and 220m depth to the same aquifer that had been used by the HTPS. The new wells have licenses granted by the WAJ, with no limit on abstraction.

The Water Authority of Jordan (WAJ) will supply potable water under a water supply agreement. Water will be delivered via a new water line to be constructed by WAJ. Water delivered by WAJ will be used for potable water in the first instance, but will be flexible to supply plant processes if required and if within the Water Supply Agreement. The water supply agreement includes supply provision of up to 2,450m^3/week.

The plant will not discharge treated or untreated process wastewater effluents off-site. All treated wastewater effluent will either be re-used, irrigated or evaporated. Storm water will be directed to the adjacent wadi following treatment by a sediment and grease trap. The only direct untreated discharge will be sanitary and domestic wastewater which will be connected to the main sewerage line for treatment at the municipality operated Samra wastewater treatment plant.

Figure 1-5 Project Layout – General (Project in Blue, Construction Areas Green)



Associated Facilities

Natural Gas Fuel Supply Pipeline

Natural Gas will be supplied by NEPCO via a new subsurface gas pipeline connection (12-inch diameter line at a depth of between 1 to 2m below ground level) to Jordan's main gas pipeline, which is located approximately 600m to the southeast of the project boundary. Whilst the alignment is yet to be fully fixed and committed, current designs for the sub-surface gas pipeline will be constructed through land that is both public and private in ownership. The private land is located adjacent to the existing main gas pipeline is open undeveloped land with no apparent land use. The pipeline will also be located within a wadi (public land), prior to entering the project site. Walkovers of this land confirm that there are no identifiable uses of the land that may result in severance, physical and/or economic displacement. This has also been confirmed by NEPCO.

ACWA Power Zarqa will co-ordinate, support and monitor the process being undertaken by NEPCO to ensure consistency with IFC PS5 and EBRD PR5 (both relating to 'Land Acquisition and Involuntary Resettlement') when pursuing the Right of Way, including any compensation entitlements relating to the temporary construction disturbances and future maintenance. PS5 and PR5 are generally consistent with the Jordan Acquisition Law, which includes mechanisms for consultation with affected landowners and grievances (amongst other similar principles). Further, ACWA Power Zarqa will ensure that affected landowners have access to the projects grievance mechanism and are included to on-going consultation as per the SEP.

Figure 1-6 NEPCO Pipeline Spur to the ACWA Power Zarqa CCGT Project (routing in yellow)

Satellite Image Source: Google Earth

LDO Supply Pipeline

Back up fuel (LDO) will be delivered via an existing fuel oil pipeline from the adjacent petrochemical refinery. The pipeline is a total length of approximately 1,700m and is of a 6-inch diameter. The pipeline is above ground whilst within the petrochemical and proposed project boundaries. An approximate 50m section of the pipeline is sub-surface which is beneath the road to the west of the proposed project site. The LDO supply will therefore not result in any additional environmental or social aspects.

Water Supply

The Water Authority of Jordan (WAJ) will install a new water pipeline from the local main line. Construction will occur beneath existing roads. WAJ therefore may require a right of way from the road authority for the construction phase and if required for maintenance. Whilst land acquisition will not be required for this, there is the potential for temporary disruption to traffic during construction. ACWA Power will be developing a *Traffic Management Plan*, which will also be extended to include these works under collaboration with WAJ.

ACWA Power Zarqa will co-ordinate, support and monitor the process being undertaken by WAJ to ensure consistency with IFC PS5 and EBRD PR5 when pursuing the Right of Way, including any compensation entitlements relating to the temporary construction disturbances and future maintenance. PS5 and PR5 are generally consistent with the Jordan Acquisition Law, which includes mechanisms for consultation with any affected landowners and grievances (amongst other similar principles). Further, ACWA Power Zarqa will ensure that any affected landowners have access to the projects grievance mechanism and are included to on-going consultation as per the SEP.

Power Evacuation and Transmission

The evacuation of electric power generated by the Facility will be through the existing 132kV substation, owned and operated by NEPCO and located within the existing Hussein TPS landholding.

Site Access Road

A new site access has already been constructed from the plant to the existing local road to the north of the project. The access road is approximately 40m in length and crosses the existing managed wadi channel.

Please note: In line with the associated facilities described above, there is no requirement for these facilities to undergo EIA based on the categorisation of projects in Jordan as per Annex 2 & 3 of the EIA Regulation No. (37) of 2005. However, baseline and impacts have been considered within the ACWA Project Zarqa CCGT ESIA. In short, the Associated Facilities are not identified to give rise to significant adverse impacts, and furthermore, the implementation of Associated Facilities will be monitored under the Projects Monitoring Plans.

Project Alternatives

Project alternatives have been considered in the ESIA in regard to:

- No Project
- Alternative project location and layouts
- Alternative power production technologies
- Alternative fuel

- Alternative water supply
- Alternative cooling system
- Alternative emissions control
- Alternative wastewater treatment

The conclusion is that the proposed brownfield site has considerable advantages over the alternatives in terms of re-use of existing land (allocated for power facilities), close proximity to utility services and suitable technology for the available land area. The proposed ACWA Power Zarqa CCGT plant will be the most efficient CCGT plant in Jordan, as shown below with lowest HHV and LHV values for both fuel types.

Table 1-2 Efficiency Comparison of ACWA Power Zarqa vs. Recent IPP Projects in Jordan

Exiting Jordan Power Plant Guaranteed Heat Rates Comparison						
Power Plant	**Phase**	**Fuel**	**Percent of Dependable Capacity**	**Capacity (MW)**	**HHV (kJ/kWh)**	**LHV (kJ/kWh)**
Amman East	Combined Cycle	Natural Gas	100%	369.67	8,390	7,538
Al Qutrana	Combined Cycle	Natural Gas	100%	373.073	8,406	7,552
ACWA Power Zarqa	Combined Cycle	Natural Gas	100%	485	8,187	7,356
Amman East	Combined Cycle	Distillate Fuel	100%	330	8,399	7,890
Al Qutrana	Combined Cycle	Distillate Fuel	100%	330.297	8,399	7890
ACWA Power Zarqa	Combined Cycle	Distillate Fuel	100%	468	8,293	7,790

Source of data from the respective IPP PPA's

Best Available Techniques (BAT)

In line with EBRD's Environmental and Social Policy and Performance Requirements, projects that obtain EBRD finance should include measures to achieve a high level of environmental protection as a whole; by way of Best Available Techniques (BAT). In order to define BAT for various industrial sectors, include power generation, *Bat Reference Documents* (BREFs) have been developed.

A BAT Analysis for the ACWA Power Zarqa CCGT project has been prepared as a stand-alone document to the ESIA. The BAT Analysis was prepared with reference to the European Commission BREF Reference Document on BAT for Large Combustion Plants (July 2006), and the Reference Document on the application of BAT to Industrial Cooling Systems (December 2001).

Efficiency

In general, the project as a modern combined cycle plant ensures the efficient use of natural resources through heat recovery and other techniques. A notable observation however, from the BAT review is that the Project's net electrical efficiency at design stage – 49.60% - falls below the 54-58% guideline. The BAT guideline is reflective of turbine technology (F-class gas turbines) which has been prevalent for the last 10-15 years in mature and large power grid systems.

The Project will be using E-class gas turbines, which due to power demand/grid constraints in Jordan, are more favourable than F-class turbines. This is primarily due to the improved

flexibility, starting time and loading rates of E-class turbines – which in the context of Jordanian installed capacity (4,000MW), peak demand (3,000MW) and renewables (approaching 10% installed capacity) – are more favourable than F-class turbines.

Furthermore, it is noted that the Project is adopting Air Cooled Condenser (ACC) technology, which is estimated to have a negative overall impact on efficiency of approx. 1.5%.

In summary, whilst the plant's electrical efficiency is less than may be anticipated, it is considered that – in respect of local constraints and the broader BAT attributes – the Project is consider to generally meet the current BREF requirements.

Air Emissions and Noise

Besides efficiency, the use of modern and Low NOx burners will reduce emissions of NOx and CO, whilst the implementation of various noise abatement measures reduces noise levels above other typical designs (i.e. by use of steam turbine enclosures, low noise ACC fans, stack silencers etc.).

Water Demand and use of ACC's

Water demand is minimized through the re-use of treated process wastewater effluents and the use of ACC's for cooling. ACC's, a dry cooling technique, minimises water consumption compared to 'wet cooling' techniques, which evaporate water to provide cooling, or transfer heat to water; such as in cooling towers and once-through cooling systems. As water availability is an important consideration in Zarqa, the use of ACC's are suitable for the ACWA Zarqa Project. ACC's operate on a closed loop system and do not necessitate water for make-up compared to wet cooling systems, that may require up to 3,000m^3 per hour for cooling capacity.

Table 1-3 Indicative Advantages and Disadvantages: Dry Cooling vs. Wet Cooling Systems

	Advantages	Disadvantages
Wet Cooling Systems (e.g. cooling towers, once through systems)	• Good Cooling Performance • Reduced land area requirements	• High Water Demand • Requires available high volume water supply and connection facilities • Visible vapour plumes (from cooling towers) • Drift water losses to surroundings • Potential spread of water borne disease to workers and neighbouring communities in drift deposition (e.g. Legionella)
Dry Cooling Systems (e.g. Air Cooled Condensers (ACC))	• Low Water Demand • Does not require a high volume water supply • No make-up water required • No wastewater discharges	• Higher cost and higher maintenance costs • Slight reduction in plant efficiency • Typically requires more land area and additional fans for cooling capacity

1.3 Construction Phase

SEPCO III signed the projects EPC Contract in January 2016. Construction of the proposed project is expected to last 20 months in total from the EPC Contractors Notice to Proceed to the commercial operation of the combined cycle plant (1st June 2018). The construction timeline will run from 1st October 2016 (EPC, Notice to Proceed) through to the initial Commercial Operation Date (COD) on 1st December 2017, upon which the project will operate commercially in simple cycle. Construction and commissioning works by the EPC contactor will continue through to the full COD on 1st June 2018, upon which the plant will operate commercially in combined cycle.

At the peak of construction, it is anticipated that up to 1,500 workers will be employed on site (inclusive of EPC Contractor and Sub-Contractor staff). The construction laydown area will comprise several areas within the existing HTPS landholding.

An area for the EPC Contractors worker accommodation will be located off-site in an area of land close to the Al Samra power plant, approximately 3km north of the project site. The land has been leased by SEPCO III for several years to provide accommodation for their projects more generally in Jordan. The existing accommodation area is being expanded onto adjacent land to provide additional accommodation and recreational space for the approximate 200 SEPCO III staff for the ACWA Power Zarqa Project. The accommodation area will include a range of facilities, utilities and amenities, and will be prepared and managed for alignment with the IFC & EBRD guidelines for worker accommodation (August 2009).

The size of the SEPCO III accommodation plot is 16,175m^2, and the lease is currently valid until 6th May 2017, upon which time it is expected to be renewed with the land owner.

Sub-Contractor companies have not been confirmed at present, but are expected to be locally based. SEPCO III's experience of other local power projects suggests that the majority of sub-contractor staff will likely reside locally. Where sub-contractors enable require specific worker accommodation areas, they will provide facilities to a standard consistent with the IFC & EBRD Guidelines on Worker Accommodation. This will be a requirement of their sub-contractor agreements.

HSE Management during the construction phase will be controlled by the SEPCO III dedicated on-site HSE Team, which will include an Environmental & Social Manager. The SEPCO III HSE practices will be overseen by the HSE Team from ACWA Power Zarqa and will be subject to approvals and inspections from ACWA Power Corporate HSE.

1.4 Operational Phase

The operation of the project will be initially based on a 25-year Power Purchase Agreement (PPA). The operation of the plant will effectively include the generation of power from the installed units and ongoing maintenance activities associated with this generation. The key power generating activity will be conducted in combined cycle mode, under natural gas firing.

The Project will be owned by ACWA Power Zarqa. A number of existing CEGCO HTPS staff have been transferred on a voluntary basis to ACWA Power Zarqa company. For these staff,

their contracts with CEGCO have been completed to Jordanian legal requirements and they have been provided with new positions at the project company "ACWA Power Zarqa'.

The day to day operations of the project will be run by CEGCO (the O&M Company for the project), overseen by ACWA Power Zarqa. HSE Management during the operational phase will be controlled by the CEGCO's dedicated on-site HSE Team, which will include an Environmental & Social Manager. The CEGCO HSE practices will be overseen by the HSE Team from ACWA Power Zarqa and will be subject to approvals and inspections from ACWA Power Corporate HSE.

1.5 HTPS HFO Plant Decommissioning/Disassembly

The decommissioning/disassembly of the existing HTPS will be undertaken by CEGCO as a separate project unrelated to the proposed ACWA Power Zarqa project. In line with an initial decommissioning timeline provided by CEGCO, this will occur gradually between December 2016 until March 2019. This period of decommissioning will coincide with both the construction and operational phases of the proposed project.

At present, the use of the land following decommissioning is unclear and there are no specific plans for any sort of development on this land at this stage for CEGCO. In particular, there are no governmental plans available for development in the Zarqa area, and there has been no indication from NEPCO in regard to proposed future plant expansions, or additional power facilities on this land. Specifically, NEPCO have remarked in meetings that there are no plans for this land, and that future power developments have been proposed in other areas of Jordan, not the Zarqa area, due to the capacity that will be provided by the proposed CCGT plant in combination with the Al Samra plant (1,031MW). It is understood that the earliest plan NEPCO have for a new fossil fuel power plant in Jordan is for a CCGT plant in 2027 in the city of Irbid in the north of Jordan (approximately 75km from the proposed project site).

2 ESIA PROCESS

5 Capitals Environmental and Management Consulting (5 Capitals) has been commissioned by ACWA Power to undertake the Environmental Impact Assessment (EIA) process required for the approval of the Jordanian Ministry of Environment (in accordance with the "EIA Regulation No. (37) of the year 2005"), and lender ESIA requirements (as per the IFC Performance Standards and EBRD Performance Requirements).

5 Capitals has partnered with ECO Consult who are a registered environmental consultant in Jordan.

The ESIA process has used a best practice methodology to assess environmental parameters outlined in the Environmental Scoping Report approved by the MoE in Jordan and discussed with EBRD and IFC over conference calls and site meetings.

Consultation at the scoping stage had been undertaken with various identified stakeholders to confirm the scope of the ESIA, prior to scoping approval from the MoE. Prior to this issue of this Updated ESIA, the project has received approval from the Jordanian Ministry of Environment.

The ESIA includes the following key aspects:

- Baseline Assessment (surveys, site observations, secondary data, consultation)

- Impact Assessment & Significance (Construction, Commissioning, Operation, Cumulative)
- Mitigation
- Residual Impact Significance

In addition, the ESIA has been developed to materially comply with the European Union EIA Directive, including an Alternatives Analysis and consultation.

3 SUMMARY ASSESSMENT OF ENVIRONMENTAL PARAMETERS

Air Quality

Baseline

The proposed project location in a predominantly industrial area of Zarqa has several evident point, diffuse and mobile source emissions. Notable points sources of air emissions include the petrochemical refinery in Zarqa owned by the Jordanian Petrochemical Refinery Company Ltd, as well as two facilities for steel fabrication. The existing Hussein TPS is now closed and is no longer an emissions source to the local air shed. The Samra Power Plant is located approximately 3km to the north of the project.

Despite the local emission sources, the results from short-term continuous and longer-term monitoring activities indicate that the air shed is not degraded in regard to the national Jordanian ambient air quality standards, for all parameters applicable to hydrocarbon combustion. Compliance with IFC and EU IED guidelines/standards is also evident despite noticeable concentrations of sulphur dioxide in the airshed.

Key Construction Impacts

The key construction impacts relate to dust dispersion from earthworks and vehicle movements on un-paved surfaces, as well as emissions from vehicles and construction plant. Minor impacts may be evident from VOC storage and odour from wastewater temporary storage on –site and at accommodation area.

Key Operational Impacts

Greenhouse Gases

The proposed project is expected to generate the following greenhouse gas emissions:

Table 3-1 Projects Predicted Greenhouse Gas Emissions

CO2 emission:

Sl. No.	Fuel	CO2 emission (tonnes per hour)	Operating hour per year	CO2 emission (tonnes per year)
1	Natural gas	194.13	7860	**1,296,979**
2	Liquid fuel	270.38	900	**206,840**
			8760	**1,503,819**

The above calculation is with 85% plant load factor

Electricity production:

Sl. No.	Fuel	Net output (MW)	Operating hour per year	Total per annum (MW hr)
1	Natural gas	485	7860	**3,240,285**
2	Liquid fuel	468	900	**358,020**
			8760	**3,598,305**

Natural Gas				
1	Flue gas flow rate	1283.93	t/h	For gas firing considering the degradation factor
2	% weight of CO2 in flue gas	5.04	%	
	CO2 emission	64.71	t/hr	For 1 GTG
3	CO2 emission	194.13	t/hr	For 3 GTG
4	Plant net output	488.8	MW	As per EPC Guarantee value
5	Plant gross output	505.6	MW	
		397	g/kWh	Net
6	CO2 emission	**384**	g/kWh	Gross

Note: Derived via stoichiometric calculation for natural gas firing.

Table 3-2 Greenhouse Gas Emission Intensity Comparison

Scenario	Carbon Intensity (gCO_2/kWh)
Average Carbon Intensity for Electricity Generation Using Natural Gas, Jordan Source: IFC CEET Tool (09/01/2013) – via - CO2 Emissions from Fuel Combustion Highlights (2012 Edition), © OECD/IEA, Paris, 2012, page 111-122.	573
World Bank Group Thermal Power (2008) Recommendations Target for New CCGT Ref: Table 4, Typical CO2 Emissions Performance of New thermal Power Plants: Efficiency (% Gross, LHV), pp. 8, (World Bank Group, 2008)	396

In comparison to the table above, the project is expected to be well below the current carbon intensity of energy projects in Jordan (on Natural Gas). The comparison of predicted CO_2/kWh vs. World Bank Group recommended carbon intensity rates, indicates very similar values for new CCGT plants.

Air Emissions

The proposed projects design guarantees (from EPC Contract) ensure compliance with the air emission standards specified by Jordan (as per: JS 1189-2006) and the IFC EHS guidelines for Thermal Power Plants (Combustion Turbines: Non-Degraded Airsheds). In regard to the European Commission's Industrial Emission Directive standards, the project is compliant for gas fired operations.

Table 3-3 Project Emission Guarantees vs Emission Standards/Guidelines

Fuel		Natural Gas (Main Fuel)	LDO (back up)	Jordanian Emission Standard[1]	EU IED Emission Standard[2]		IFC EHS Emission Guideline[3]	
Loading		100%	100%		NG	LDO	NG	LDO
Main (HRSG) Stack	Unit	mg/Nm^3	mg/Nm^3	mg/Nm^3	mg/Nm^3		mg/Nm^3	
	NO_x as NO_2	25	74	1,500	50	50	51	152
	PM_{10}	50	50	-	-	-	-	50
	CO	15	20	-	100	100	-	-
	SO_2	-	Not included	6,500	-	-	-	*
Bypass Stack	NO_x as NO_2	25	74	1,500	50	50	51	152
	PM_{10}	50	50	-	-	-	-	50
	CO	15	20	-	100	100	-	-
	SO_2	-	Not included	6,500	-	-	-	*

** Based on S content in fuel (<1% S for NDA)*

The potential impact of the proposed facility on local air quality has been assessed using Breeze AERMOD7. For normal operation utilising natural gas in combined cycle mode, the modelling study predicts that ground-level pollutant concentrations of NO_2 and CO at sensitive receptors will be well within all applicable air quality standards of Jordan, the IFC and EU, even with the cumulative effects of the existing airshed concentrations. For natural-gas fired, single cycle operation, the predicted impacts are reduced further due to enhanced dispersion; primarily due to the exit temperature of the plume.

Operation of the project under LDO would only occur in emergency situations. For both combined cycle and simple cycle operation using LDO, the predicted NO_2, CO and PM_{10} concentrations are compliant at all modelled receptor locations, including when considering the cumulative impacts of the background concentrations (in line with Jordanian, WHO, and EU standards/guidelines).

However, the air modelling, which utilised an LDO sulphur content of 1%, (significantly greater than that currently being supplied: 0.2-0.3%) identified that cumulative sulphur dioxide concentrations (362.60µg/Nm^3) marginally breach of the EU 1 Hour threshold (350µg/Nm^3). It should be noted that the EU standards allow a breach of this standard up to 24 times per year. There are several further mitigating factors to consider in assessing the significance of this risk, including:

- LDO-firing will only be under emergency conditions, and as such, will be limited (envisaged to be significantly below 500 hours annually).
- Firing of LDO fuel with a sulphur content of 0.9% would achieved compliance with the sulphur dioxide thresholds under all operational conditions and modelling periods, inclusive of the background air shed concentrations.

[1] JS 1189-2006 – Maximum Allowable Limits of Pollutants from Stationary Sources
[2] European Union, Directive 2010/75/EU on Industrial Emissions (24th November 2010), Annex V Technical Provisions Relating to Combustion plants
[3] IFC EHS Guidelines: Thermal Power Plants (19th December 2008), Table 6 (B) Emission Guidelines for Combustion Turbine

- At present, LDO supplied to other power plant is of a 0.2-0.3% sulphur content.

Based on the improbable use of LDO fuel for more than 500 hours per year, it is highly unlikely that the EU standard will be breached. Further it should be noted that the Jordanian standards are met under all scenarios.

Depending on the S content of the fuel being delivered there are some conditions where the modelled receptor locations would receive more than a 25% process contribution of the most stringent air quality standards from the proposed plant, primarily due to the proximity of receptors to the project. In general, there are few situations where the process contribution of SO2 would be >25% as per the Jordanian ambient standards. Such situations may occur during combined cycle operation where ≥0.4% S LDO is fired, as per the modelling results.

Further analysis indicates that with an LDO fuel content of 0.9% Sulphur compliance would be achieved at the modelled receptors under all operational conditions and modelling periods, inclusive of the background air shed concentrations.

VOC Emissions & Odour

Emissions from Volatile Organic Compounds (VOC's) may occur where there is inadequate transfer or storage of liquid fuels, solvents, paints and other volatile substances. Due to the inclusion of LDO tanks and process wastewater treatment facilities on-site, there is the potential for impacts relating to odour that may result from poor management such facilities.

Mitigation Measures

Mitigation during construction will be handled through the application of best practice techniques. For operation, the project will include emissions abatement from Low NOx burners. The project is compliant to all applicable emission standards as such will not and incorporate further emissions abatement at the point of combustion or post combustion. Use of LDO fuel will be used in emergency situations only.

Whilst the residual risk in relation to air impacts is low, further monitoring and verification will be provided via Continuous Emissions Monitoring System (CEMS), that will be calibrated annually to ensure that the plant performance is accurately monitored.

Noise and Vibration

Baseline

Local noise emanates from several key sources including the petrochemical refinery, vehicle movements, and local commerce. The consistently noisiest location locally in the project area is close to the highway to the west of the proposed project site close to the entrance of the adjacent refinery. The local residential area of Hashimyeh to the north of the project also observes higher noise levels, primarily due to the continuous humming and flare noises from the refinery. This is common across the residential area due to the unblocked nature of the intervening land between the petrochemical refinery.

At the project site itself noise levels are generally just within the limit of compliance with the WHO noise guidelines and are within the Jordanian noise limits. Off-site locations such as the residential areas of Hashimyeh, are under influence of noise from the highway and the

nearby refinery, with noise levels slightly exceeding the WHO noise guidelines for both day and night time periods.

A specific study for vibration was not undertaken as detailed in the Environmental Scoping Report. However, no noticeable vibrations were encountered during the site visits from any activities.

Key Construction Impacts

Temporary and short duration increases in the noise and vibration levels will be generated via a range of processes and propagated locally. Pertinent construction activities in relation to noise and vibration are likely to include earthworks, piling, site levelling, laying of concrete, installation of services, etc.

Key Operational Impacts

The operation of proposed plant will include the use of heavy equipment throughout the power production process. Such processes have the potential to emit high levels of noise, which are likely to be continuous and sustained during daily activities, due to the 24-hour operation of the plant. The main sources of noise are likely to be emitted from the Gas Turbines, HRSG's, Steam Turbines and ACC fans.

The project design already incorporates a significant amount of noise abatement including equipment silencers, enclosures (e.g. for steam turbines), low noise ACC fans and stack silencers.

Noise levels have been modelled to be within the required standards for daytime (Jordanian and IFC EHS Guidelines) at all modelled receptors. At night, there is compliance with all Jordanian standards, however several off-site residential receptors, including the CEGCO accommodation area may be exposed to noise levels in excess of the WHO night-time noise guidelines.

As a first point of compliance, the project noise emissions have been assessed against the night-time limit of 45dB(A). Comparison against this threshold, which for the purposes of framing the discussion can be considered 'worst case', identify approximately 350 structures in breach of the 45dB(A) night-time limit.

However, World Bank Group/IFC EHS guidelines advise that where existing ambient noise levels already exceed thresholds, the Project should not result in an increase of more than 3dB(A) over existing ambient noise. The ESIA noise model, based on recently collected baseline data, indicates that 6 residences may exceed this 3dB(A) noise threshold during night time operation.

This impact should be considered in the context that the site has a long history of power generation, and since the construction of the former HFO plant, the surrounding Al Zarqa has developed in close proximity. The ACWA Power Zarqa project has utilised noise mitigating techniques, and the primary cause of these exceedances is considered to be driven by proximity to receptors.

Mitigation Measures

In the first instance, the following actions will be taken by the project:

(1) **Additional Ambient Noise Monitoring**
Building on the current ambient noise monitoring data, impact assessment and mitigation, it is proposed to undertake follow-up ambient noise monitoring, pre-construction, as an additional verification exercise.

(2) **Updated Noise Monitoring Report**
Upon completion of the follow-up ambient noise monitoring, a written report shall be prepared to confirm whether any amendments / refinement of the proposed mitigation is necessary. Based on the current information, it is anticipated that a minimum of six (6 no.) properties may be exposed to night-time noise impacts in breach of World Bank Group guidelines. Where exceedances of thresholds are anticipated, the project shall provide a preferred technically and commercially viable solution for mitigation – if demonstrated to be required by operational monitoring (see below).

(3) **Operational Noise Monitoring**
Written methodologies for Operational Noise Monitoring shall be developed for Lender review and approval, prior to implementation. The duration and scale of operational monitoring, together with the frequency of reporting, shall be commensurate with the findings of the Updated Noise Monitoring Report (2) and subject to approval by the Lenders.

More generally, mitigation during construction will generally follow best practices, with the noisiest works being undertaken during weekday daytimes. Where significant noises are expected the EPC will notify the local community in this regard.

All equipment has been specified by the manufacturer to a maximum of 85dB(A) at 1m, this includes in-built mitigation referenced above. The EPC Contractor has confirmed that a noise barrier could be installed at the project perimeter, specifically on the northern boundary of the power block area. The Noise barrier may be up to 10m in height and will have a sound insulation quantity of up to 25dB(A), but at least 10dB(A) as a minimum.

Soil, Geology and Groundwater

Baseline

Soil

Areas of the proposed site have historically been used for the temporary storage of waste and scrap material, from operation and maintenance at the existing Hussein TPS. These areas have since been cleared. Soil analysis has been undertaken several times over the past 4 years. The most recent analysis from March 2016 indicated that site soils are uncontaminated but have noticeable concentrations. The area of the proposed power block, which has had the most recent scrap storage exceeds the Dutch soil standards 'Intervention Values' several heavy metals.

Please note: the area of minor heavy metal contamination is in the process of remediation by CEGCO, pending official acceptance of waste disposal permit from the Ministry of Environment. All waste will be disposed of at a hazardous waste landfill licensed and regulated by the Ministry of Environment, which includes appropriate pollution control mechanisms.

Groundwater Quality

It was identified in 2012 that two of the wells at the Hussein TPS were pumping a small volume of oil, which indicated contamination of the groundwater, source from the original HTPS HFO plants boiler drains. Further to remediation works, laboratory analysis in 2016 has returned results that are less than detectable for hydrocarbons; indicating that the remediation has been successful.

Geology

Geology underlying the site is consistent with the surrounding local geology, and is not of any particular geological value, or subject to any geological designations.

Key Construction Impacts

Where construction processes involving hazardous materials, fuels and liquids (including wastes) can interact with soils, there is the potential for contamination to occur. Area of the site with exceeding heavy metal concentrations may also result in cross contamination if these are not managed properly.

Key Operational Impacts

Impacts to soils and groundwater from hazardous materials, fuels, liquids and wastes are generally limited due to the hard standing nature of the site and mitigation provision for storage of such materials. The drilling of 3 new wells may result in a pollution pathway.

Mitigation Measures

Best practices for the storage, handling and transportation of materials, fuels and liquids will be implemented for construction and operation. The wells will be lined to ensure that impacts relating to a new pollution pathway are minimised.

Water and Wastewater Management

Baseline

The WAJ is responsible for the provision of water locally. The HTPS abstracted well water within the upper aquifer layers for approximately 40 years until the wells were capped at the end of operation. There do not appear to the be any other groundwater wells in the immediate vicinity of the project site. A hydrogeology study was prepared in 2012 that identified gradual groundwater depletion locally due to the HTPS abstraction (which has since closed and stopped abstracting groundwater), but also replensihment of groundwater due to the As-Samra wastewater treatment facility.

The As-Samra wastewater treatment facility, the largest wastewater treatment facility in Jordan is located approximately 5km north east of the proposed site, which serves populations of Greater Amman and the Zarqa areas.

Storm water runoff from within the local catchment is directly by overland flow to a wadi that located immediately to the north of the proposed project boundary. Potential Impacts

Key Construction Impacts

The key uses of water during the construction and commissioning phases are expected to be for personal consumption, domestic use, dust control, civil works (e.g. lubrication) and commissioning for hydro testing and steam cleaning.

Wastewater generation during the construction and commissioning phases will include the following key streams:

- Sanitary and Domestic Wastewater;
- Commissioning Wastewater (hydro testing & Steam Cleaning);
- Storm water;

Flooding at the site is not an issue, and is not expected to change as a result of construction activities.

Key Operational Impacts

Groundwater will be the primary source of process water for the project. Abstraction is estimated at 160,000m^3 per annum, which is less than half of the annual abstraction previously taken by the HTPS. Abstraction is not expected to result in groundwater depletion issues due to the long-term reduction in abstractions. Furthermore, there are no other known third party users in the immediate local area who may be impacted.

Potable water will be sourced from the incoming water pipeline provided as an associated facility by the WAJ, under a water supply agreement of 2,450m^3/week.

Storm water runoff will be directed off-site to the adjacent wadi following treatment at a sediment and grease trap.

Contaminated storm water (e.g. water from bunds and oily processes), as well as oily wastewater and process water will be treated on-sit and re-use, irrigated or evaporated. The project will operate on a zero-liquid discharge basis for process wastewater streams.

Sanitary and domestic wastewater will be directed to the local sewerage network off-site for treatment at the municipality operated As-Samra WWTP.

Mitigation

The project is implementing various BAT to reduce water consumption and project water demand in general (i.e. use of ACC, re-use of water etc.).

The plant will not discharge treated or untreated process wastewater effluents off-site. In this instance, process wastewater will be treated for re-use, evaporation, or irrigation.

Solid and Hazardous Wastes

Baseline

Solid waste in Jordan is managed by the local municipalities in accordance with the "Municipalities Law No.13 of 2007" - this includes the collection of solid waste, transportation, and final disposal to landfills. Hazardous waste is managed and regulated by Ministry of

Environment. Waste is transferred to designated lined landfills by MoE approved private companies.

Key Construction Impacts

The majority of waste generated during the construction phase will be inert and non-hazardous. Small quantities of hazardous waste will be generated.

Key Operational Impacts

In general, few wastes will be generated during the operation of the power plant. Some of these will be direct products resulting from the operation and maintenance of the facilities, whilst other wastes will be the by-products of primary waste treatment processes, for example the sludge that results from wastewater treatment, and from administration/office wastes.

Mitigation Measures

The mitigation measures provided refer to both hazardous and non-hazardous wastes. A site specific Waste Management Plan will need to be included as part of the Construction and Operational environmental and Social Management Plans respectively.

Hazardous waste will be disposed at licensed hazardous waste landfills regulated by the Ministry of Environment, which include mechanisms for pollution prevention consistent with the IFC EHS Guidelines for waste management facilities.

Ecology and Biodiversity

Baseline

The proposed site is located within a fenced area of the existing HTPS HFO plant. There are no designated sites within 30km of the project. The on-site ecology is representative of frequently disturbed ground with common pioneer species for the local area. In addition, several species which are associated with iron rich soils are also found on the site. Within the site there is evidence of feral dogs. It was notable that the site supports various species of insects including butterflies, beetles, grasshoppers etc.

A managed wadi is located immediately north of the project boundary and is subject to overflows from a buried wastewater pipeline that follows it channel. The wadi is typically dry and supports common grasses.

Key Construction Impacts

Due to the managed lands on-site and the low baseline sensitivity, the impacts during construction will be minor, relating to the removal of on-site vegetation.

Key Operational Impacts

Significant operational impacts are not expected to occur to ecology during operation.

Mitigation Measures

Uncontaminated topsoil will be stored for re-use in informal landscaped areas. Tree and vegetation planting on landscaped areas of the site should use native species.

Social & Economic

Baseline

The project is a timely replacement for the existing HTPS HFO plant that ceased operations in December 2015. The local area of the HTPS grew due to industries in the area. The landholding at the includes several CEGCO support services that serve the operational and maintenance of CEGCO assets. These include the transportation department, central stores, warehouses, laboratories, NEPCO training centre (on CEGCO land) and some CEGCO worker accommodation (for CEGCO HTPS employees).

CEGCO plays an interactive with the local community within Hashimyah, Zarqa and throughout Jordan generally, with initiatives and support for the local community.

Key Construction Impacts

The construction of the proposed expansion project will generate a number of jobs for construction workers and skilled labourers locally. Positive impacts will therefore occur as a result of increased local employment, dissemination of skills to the local workforce and purchase of local good and services to stimulate the local economy.

Besides workers sourced locally, a number of staff from external areas may be required; particularly for specialist and skilled positions. The majority of SEPCO III's EPC staff will be expatriates from China (amounting to approximately 200 staff), which will result in an amount of population influx to the local area.

Key Operational Impacts

The completion of the proposed CCGT project will result in the secure provision and increased capacity of electrical energy to the population of Jordan. This will include a cleaner generation process and subsequently fewer environmental impacts relating to local air quality, noise, use of resources and wastewater compared to the original HTPS HFO plant.

The operational phase of the project will require an amount of staff in order to effectively manage the day-to-day operations and maintenance of the power plant. There will be a demand for both skilled and unskilled labour, as well as specialist positions for technical staff.

Mitigation

Mitigation for both construction and operation include measures that favour local employment and ensure appropriate compliance to International Labour Organisation Laws.

It is confirmed that the ACWA Power overarching HR Policy will be the basis for all HR policies to be implemented for the project. This ensures compliance to all ILO conventions and will ensure compliance to local Jordanian regulations.

A grievance mechanism will be implemented so that internal (staff) and external grievances (local stakeholders) can be received and followed up. This is outlined in the projects Stakeholder Engagement Plan (SEP).

Traffic & Transport

Baseline

The key local roads around the project site include Highway 25 to the west of the HTPS and the local road to the north of the HTPS which will provide direct access to the proposed project entrance.

Observations of the local roads during the site visits have identified a general poor condition of the roads, with uneven surfacing, potholes, unmarked speed humps, as well as many unsigned exits and junctions. The vehicle flows on the roads appeared to be busy, but not congested during observation periods. Vehicles in the local area included multiple fuel trucks which are associated with the adjacent petrochemical refinery.

Key Construction Impacts

Two aspects of transport during construction can potentially generate impacts: The transport of the workforce and the transport of equipment and materials to the site. It is estimated that up to 100 HGV will enter and depart the site per day during peak periods, along with minibuses to shuttle workers and private cars for certain staff and specialist contractors. This will result in a noticeable impacts of vehicles along the local road north of the HTPS site.

Where materials and equipment are shipped, they will go via Aqaba port, and will then require road hauling to the site via the national highway network. All vehicles will eventually need to use Highway 25 and the local access road to the immediate north of the project site.

The WAJ installation of the water pipeline may result in some temporary disruption to road users, as the pipeline will be installed beneath the road surface.

Key Operational Impacts

Project related vehicles movements will revert back to similar flows experienced during the operation of the original Hussein TPS, which closed in December 2015. Mitigation Measures

Mitigation Measures

In general, good practices will be implemented to stagger shifts, deliveries and removal from the construction site. A traffic management plan will be developed to outline necessary routes for travel to avoid sensitivities and to outline any traffic management required.

The project will also ensure that formal *Access and Traffic Safety Plans* are in place and agreed with the relevant authorities to include: Traffic Safety plan and Public Access Management plan which uses gates on access roads during the construction period only to ensure public safety. This will include (as far as reasonably practicable) the proposed water pipeline works by WAJ and gas fuel supply pipeline by NEPCO.

Cultural Heritage and Archaeology

Baseline

Jordan has a wide range of archaeological sites of significance. Zarqa Governorate has a long heritage including the occupation by different civilisations dating back to the bronze age. Whilst undertaking the various site visits, no general signs or visual evidence of

cultural/archaeological features have been identified or there is no knowledge of such sites from personnel, or from the scoping consultation exercise. A search on the MEGA-Jordan website identifies an unknown feature within the HTPS landholding, but approximately 300m from the project site.

Key Construction Impacts

For the reasons outlined in the baseline, it is considered unlikely that potential impacts of cultural or archaeological value will occur during the construction phase. However, there is always the chance of uncovering unknown artefacts.

Key Operational Impacts

It is not considered that any significant impacts upon archaeological or cultural resources will occur during the operational phase, as this phase of the project will not include further earthworks.

Mitigation

The EPC contractor will implement a *Chance Find Procedure,* which is also a standard requirements by the JOrdanisn Department of Antiquities as required by the "Antiquities Law No. 21 for 1988 and its amendments No. 23 for 2004".

Training and awareness programmes will be provided to ensure that construction staff and labourers are aware of the procedures relating to the Archaeological Watching Brief will any artefacts or anthropogenic finds be uncovered.

The Project Chance Find Procedure shall be shared with NEPCO for implementation during the gas pipeline works.

Landscape & Visual

Baseline

The area of the proposed project site is located within the existing HTPS landholding in the industrialised area to the north of the city of Zarqa. The proposed project will be located at the lowest point of the HTPS site and is at one of the lowest points in the surrounding area, which will be overlooked by some properties to the north.

Key Construction Impacts

Temporary impacts relating to the construction phase will mostly affect the residential areas to the north. Movement of vehicles, dust, laydown areas, and the various construction activities and processes will be directly visible. However, the existing solid perimeter wall will help to minimise the visual impact.

There may be a requirement for additional lighting at night particularly for security purposes.

Key Operational Impacts

The proposed power plant will ultimately not result in a significant change to the existing industrialised and commercial landscape in North Zarqa. A key aspect of the proposed plant will likely be the inclusion of additional lighting at night.

Mitigation

Several best practices will be implemented to reduce general landscape and visual impacts. Specific measures to avoid light spill will also be implemented.

Community, Health Safety & Security

Key Construction Impacts

Public risks during construction have the potential to result in isolated incidents, if not controlled (e.g. large scale oil spills, spontaneous combustion of fuels, dust, fire etc.). The construction phase may present an unwanted opportunity for local communities to access the site, in terms of trespassing, with associated health and safety risks.

Due to the close proximity of works with external communities and the dense nature of the project site and accommodation, there is potential for disease to spread internally and externally.

The project constitutes a facility of national importance and will employ armed security personnel through the construction period.

Key Operational Impacts

The project will carry several risks that could result in impacts to public safety where such impacts are transferred or received outside of the project site. Such impacts may relate to fire, VOC fumes, explosions, spills of back up fuels, un-warranted releases of wastewater, exposure to hazardous as well as, environmental impacts (e.g. excessive noise, air emissions, dust etc.) and security concerns of trespassers.

Mitigation

Risks to public safety will be appropriately addressed and prepared in the construction and operational phase 'Emergency Preparedness and Response Plan' and training.

During construction SEPCO III have outlined measures to identify, prevent and control internal and external exposure to diseases, which will be organised via the sites dedicated health team (including Doctor, Nurse and First Aiders)

For construction, SEPCO III have engaged a private security company, who will provide 24*7 armed security control across the site and at gatehouses. CEGCO will provide their own project armed security during operations. Security arrangements be guided by UN Code of conducts for law enforcement officials and UN basic principles on the use of Force and Firearms by law enforcement officials. Both SEPCO III and CEGCO have/will prepare a *Security Risk Assessment* and *Security Plan* for the construction and operational phases of the Project to ensure employee, contractor and public safety as well as to avoid trespassing incidents, theft and malicious damage.

In addition, security personnel will receive internal training in regard to grievances, reporting such grievances and dialogue with any members of the local community.

Labour and Working Conditions

Key Impacts (Construction and Operation)

Common activities undertaken during construction such as the movement of heavy machinery, excavation, handling of chemicals works undertaken at height etc. can all introduce significant risk to the health and safety for the associated work force.

Unless effective systems are properly designed and implemented, worker conditions could be poor, particularly related to site services and accommodation.

Mitigation

The overarching ACWA Power HR Policy will provide the basis upon which the projects HR Policy will be developed (to be adopted by ACWA Power Zarqa, SEPCO III in their construction HR policy and CECGO's O&M operational policy). The HR Policies will ensure alignment with Jordanian Labour Law and will comply to ILO standards to avoid instances of discrimination, inequality, forced labour and child labour as a minimum.

The EPC Contractor and O&M Company will implement robust and comprehensive occupational health and safety policies, plans and teams to monitor activities. This will include training of staff and permits to work.

A grievance mechanism will be implemented at both the construction and operational phases to receive and follow up on worker grievances.

4 MONITORING

Volume 3 of the ESIA (Outline ESMMP) includes a framework for monitoring during the construction and operational phases. This framework recommends specific monitoring activities to be undertaken for the various environmental parameters outlined previously.

The project will be subject to periodic independent monitoring as per the requirements of the lenders. The independent audits will cover on-site activities as well as reviews of ESMMP's and compliance documentation that has been recorded form regular monitoring activities by the EPC Contractor and O&M Company on-site.

This will ensure quarterly auditing and annual (minimum) auditing for the construction and operational phases respectively, with reporting to the lenders.

5 CONCLUSIONS

Following the implementation of the design based and additional recommended mitigation & management measures, there are no residual impacts of a major significance.

An observation of note is in respect to the identified heavy metal contamination on one area of the site (proposed power block area), which is undergoing surface/topsoil remediation and disposal at a licensed hazardous waste facility, pending permits from MoE; where it will be disposed at a licensed hazardous waste landfill site (with appropriate pollution control mechanisms) regulated by the Ministry of Environment.

In regard to predicted operational noise, it is expected that (in the event that further mitigation is required) the proposed noise barrier mitigation will be sufficient to reduce the increase of noise levels at nearby residence to less than 3dB(A) above ambient levels during operation.

In the event that natural gas is not available, Light Distillate Oil (LDO) will be used as the alternate fuel for no more than 40 days per year (960 hours), and no more than 7 days consecutively in line with the PPA. Whilst the specification in the PPA allows for use of LDO fuel for up to 40 days, the scenario of exceeding 500 hours of LDO usage in a year is highly improbable. The PPA indicates that back-up LDO fuel may be supplied with a sulphur content up to 1.2%, as a worst case. It is understood that current LDO fuel supplied to IPP's in Jordan has a sulphur content below 1%. It is expected that the sulphur content of supplied LDO fuel will be lower than 1%, this would align with the IFC EHS Guideline SO_2 requirements for Non-Degraded Air sheds (if operation of such fuel is required for over 500 hours per annum).

Under such a scenario the emissions dispersion modelling indicates that short term concentrations of SO_2 on LDO firing may be significant and may result in a potential cumulative exceedance of the EU ambient standards (for the 1-hour averaging period). The probability of such a situation to occur is considered very low as this would require a number of circumstances to occur simultaneously (i.e. Use of back up fuel, Sulphur content on LDO fuel to be above a certain percentage, worst case meteorological conditions to occur etc.) All SO_2 ambient concentrations are modelled to be compliant with the Jordanian ambient standards. If there is a situation whereby SO_2 concentrations are elevated, the Lenders and Authorities will be notified with the aim of mitigating this through operational change, or use of lower sulphur fuel.

Besides the measures included above, the project will implement any further actions as stated in the Environmental & Social Action Plan (ESAP) as a condition of project finance by EBRD and IFC.

6 ESIA AVAILABILITY & CONTACT INFORMATION

The full Environmental & Social Impact Assessment (ESIA) and Stakeholder Engagement Plan (SEP) in Arabic and English languages is available at the ACWA Power website:

www.acwapower.com

Should further information regarding the project be desired, requests for information should be directed to:

Mr Mehmet Yildiz (Project director)

ACWA Power Zarqa – Project Company,

ACWA Power Zarqa CCGT Power Plant Project,

P.O.Box 633,

13110, Zarqa,

Jordan

MYildiz@acwapower.com

+962 7900 965 28