

Document of
The World Bank

Report No: ICR000126892-JO

IMPLEMENTATION COMPLETION AND RESULTS REPORT
(IDA-43920 IDA-H8170)

ON AN

IBRD PARTIAL RISK GUARANTEE

IN THE AMOUNT OF US\$45 MILLION

TO THE

HASHEMITE KINGDOM OF JORDAN

FOR AN

AMMAN EAST POWER PLANT PROJECT

April 15, 2019

Energy and Extractives Global Practice
Middle East and North Africa Region

CURRENCY EQUIVALENTS
(Exchange Rate Effective December 20, 2016)

Currency Unit = Jordanian Dinar (JD)
JD 1 = US\$1.41403
US\$1 = JD 0.707200

FISCAL YEAR
January 1 – December 31

ABBREVIATIONS AND ACRONYMS

AES	Applied Energy Services Corporation
ADSCR	Annual Debt Service Coverage Ratio
BOO	Build, Own, Operate
CAS	Country Assistance Strategy
CEGCO	Central Electricity Generating Company
CF	Capacity Factor
COD	Commercial Operations Date
CSR	Corporate Social Responsibility
DFO	Distillate Fuel Oil
DPL	Development Policy Loan
EA	Environmental Assessment
EE	Energy Efficiency
EIRR	Economic Internal Rate of Return
EMP	Environmental Management Plan
EPC	Engineer, Procure, and Construct
EMRC	Energy and Mineral Regulatory Commission
EOCL	Economic Opportunity Cost of Labor
ESIA	Environmental and Social Impact Assessment
EU	European Union
FEP	Foreign Exchange Premium
GDP	Gross Domestic Product
GoJ	Government of Jordan
HFO	Heavy Fuel Oil
HTPS	Hussain Thermal Power Station
ICR	Implementation Completion and Results Report
IMF	International Monetary Fund
IPP	Independent Power Producer
ISR	Implementation Status and Results Report
JBIC	Japan Bank for International Cooperation
JEA	Jordan Electricity Authority
JEPCO	Jordanian Electric Power Company
LACP	Land Acquisition Compensation Plan

LCOE	Levelized Cost of Electricity
LNG	Liquefied Natural Gas
M&E	Monitoring and Evaluation
MIGA	Multilateral Investment Guarantee Agency
MoEMR	Ministry of Energy and Mineral Resources
MoPIC	Ministry of Planning and International Cooperation
NEPCO	National Electric Power Company
NPV	Net Present Value
O&M	Operation and Maintenance
OPIC	Overseas Private Investment Corporation
PAD	Project Appraisal Document
PPA	Power Purchase Agreement
PPP	Public-Private Partnership
PDO	Project Development Objective
PM	Particulate Matter
PRG	Partial Risk Guarantee
PV	Photovoltaic
RAP	Resettlement Action Plan
RFP	Request for Proposals
RPF	Resettlement Policy Framework
SEPCO	Samra Electric Power Generating Company
SMBC	Sumitomo Mitsui Banking Corporation
WAJ	Water Authority of Jordan

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 ICR Team Leader: Arsh Sharma

HASHEMITE KINGDOM OF JORDAN
Amman East Power Plant Project

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A. Basic Information							
Country:	Hashemite Kingdom of Jordan		Project Name:	Amman East Power Plant Project			
Project ID:	P094306		L/C/TF Number(s):				
ICR Date:	May 2, 2019		Guarantee Number	IBRD B1230			
Lending Instrument:	IBRD Guarantee		ICR Type:	Core ICR			
Lending Instrument: Original Guarantee Amount (US\$, millions):	IBRD Guarantee, IBRD US\$45.00 million		Beneficiary of Guarantee:	AES Jordan PSC			
			Guarantee Type	PRG			
			Guarantor:	IBRD			
			Responsible Agency:	Ministry of Energy and Mineral Resources			
Revised Guarantee Amount:	IBRD US\$45.00 million		Outstanding Guarantee Amount:	US\$23.24 million			
Environmental Category:	A - Full Assessment						
Implementing Agency: Ministry of Energy and Mineral Resources							
Co-financiers and Other External Partners:	Japan Bank for International Cooperation			US\$110.00 million			
	Overseas Private Investment Corporation			US\$70.00 million			
	Sumitomo Mitsui Banking Corporation			US\$45.00 million			
	AES Oasis Ltd.			US\$45.00 million			
	Mitsui & Co. Ltd.			US\$30.00 million			

B. Key Dates				
Process	Date	Process	Original Date	Revised / Actual Date(s)
Concept Review:	06/29/2006	Restructuring(s):	Nil	Nil
Appraisal:	02/08/2007	Mid-term Review:	Nil	Nil
Guarantee Approval:	03/13/2007	Project Closing:	06/01/2011	08/27/2009
Operation Committee Approval:	02/07/2007	Guarantee Expiry	03/21/2024	03/21/2024

Guarantee Effectiveness:	03/26/2007			
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C. Ratings Summary

C.1 Performance Rating by ICR

Outcomes:	Satisfactory
Risk to Development Outcome:	Moderate
Bank Performance:	Satisfactory
Borrower Performance:	Satisfactory

C.2 Detailed Ratings of Bank and Borrower Performance (by ICR)

Bank	Ratings	Borrower	Ratings
Quality at Entry:	Satisfactory	Government:	Satisfactory
Quality of Supervision:	Satisfactory	Implementing Agency/Agencies:	Satisfactory
Overall Bank Performance:	Satisfactory	Overall Borrower Performance:	Satisfactory

C.3 Quality at Entry and Implementation Performance Indicators

Implementation Performance	Indicators	QAG Assessments (if any)	Rating
Potential Problem Project at any time (Yes/No):	No	Quality at Entry (QEA):	None
Problem Project at any time (Yes/No):	No	Quality of Supervision (QSA):	None
DO rating before Closing/Inactive status:	N/A		

D. Sector and Theme Codes

	Original	Actual
Sector Code (as % of total Bank financing)		
Non-Renewable Energy Generation	100%	100%
Theme Code (as % of total Bank financing)		
Regulation and Competition Policy	0%	0%
Public Private Partnerships	100%	100%
ICT Solutions	0%	0%

E. Bank Staff		
Positions	At ICR	At Approval
Vice President:	Hafez Ghanem	Daniela Gressani
Country Director:	Ferid Balhaj	Joseph Saba
Practice Manager:	Erik Fernstrom	Jonathan Walters
Project Team Leader:	Ferhat Esen	Rome Chavapricha
ICR Team Leader:	Arsh Sharma	n.a.
ICR Primary Author:	Arsh Sharma	n.a.

F. Results Framework Analysis

Project Development Objectives (from Project Appraisal Document)

The project's main objective is to meet the electricity needs of the country in an economically and environmentally sustainable manner to contribute to economic growth and well-being of the population of Jordan. The project would add about 370 MW of additional power to the system, help ensure the reliability of power supply, and help maintain a margin between available capacity and demand of at least 10 percent in an environmentally sustainable manner. The purpose of the PRG is to enhance competition and therefore help reduce the project's financing costs.

Revised Project Development Objectives (as approved by original approving authority) None.

(a) PDO Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years												
Cost of energy produced/sold	US¢4.3/k Wh	Above baseline	n.a	<p>Achieved. Average cost of energy supplied from Jordan's power system (average tariff purchased by the transmission company) ranged from US¢6 per kWh to US¢20 per kWh between 2008 and 2014. This was always (except 2009) higher than tariff of Amman East Power Plant project at :</p> <table> <thead> <tr> <th></th> <th>Amman East</th> <th>Avg purchase price</th> </tr> </thead> <tbody> <tr> <td>2008</td> <td>6.1</td> <td>6.4</td> </tr> <tr> <td>2009</td> <td>5.7</td> <td>5.6</td> </tr> <tr> <td>2010</td> <td>3.7</td> <td>7.4</td> </tr> </tbody> </table>		Amman East	Avg purchase price	2008	6.1	6.4	2009	5.7	5.6	2010	3.7	7.4
	Amman East	Avg purchase price														
2008	6.1	6.4														
2009	5.7	5.6														
2010	3.7	7.4														

				2011 10.6 15.8 2012 15.9 17.7 2013 12.4 17.6 2014 17.9 19.3
Emission levels; mitigation of other environmental impacts.		NO ₂ - 100 micro g/m ³ SO ₂ - 125 micro g/m ³ Particulates - 70 micro g/m ³	n.a	Achieved. (2014) NO ₂ : 53.18 micro g/m ³ SO ₂ : 18.02 micro g/m ³ Particulates : <70 micro g/m ³
Availability factor	95%	95%	n.a	Achieved. 95.91% Due to continued use of DFO in the plant instead of natural gas due to supply disruptions for an extended period, the capacity factor of the plant has been as follows: 2010 : 79.49% 2011 : 54.57% 2012 : 38.33% 2013 : 63.60% 2014 : 47.77%
A reserve margin of at least 10%	20%	>10%	n.a	Achieved. 43% in 2014

(b) Intermediate Outcome Indicator(s)

Indicator	Baseline Value	Original Target Values (from approval documents)	Formally Revised Target Values	Actual Value Achieved at Completion or Target Years
Financial close	None (no power plant)	Year1: Financial close	n.a.	Achieved. Project reached financial close in March 2007
Implementation progress	None (no power plant)	Year1: Financial close Year 2: Simple cycle plant commissioned Year 3: Combined cycle plant commissioned	n.a.	Achieved. Project commenced commercial operations in August 2009 with simple cycle and with combined cycle in 2010, all according to schedule.
Commissioning Test Results	None (no power plant)	Year 1: None Year 2: 246 MW commissioned Year 3: 370 MW commissioned	n.a.	Achieved. Project commissioned 370 MW according to schedule.
Trial Test Results	None (no power plant)	Achievement of trial results	n.a.	Achieved. Trial test results were successful.
No.	Date ISR Archived	DO	IP	
1	06/21/2007	Satisfactory	Satisfactory	
2	12/19/2008	Satisfactory	Satisfactory	
3	09/01/2010	Satisfactory	Satisfactory	

4	12/30/2010	Satisfactory	Satisfactory
5	08/09/2011	Satisfactory	Satisfactory
6	12/13/2012	Satisfactory	Satisfactory

G. Restructuring (if any)

None

1. Project Context, Development Objectives and Design

1.1 Context at Appraisal

Country and Sector Background

1. **At the time of project appraisal in 2007, Jordan was on an upward trend in macroeconomic performance despite facing regional instability and a major terms-of-trade shock.** Jordan's stabilization efforts were reflected in strong growth, narrowing fiscal deficit, and declining public and external debt mostly due to donor support and increased capital inflows. Reforms were progressing well, particularly in the areas of privatization, expenditure/budget management, and education. The Government of Jordan (or GoJ) was considering legislating a new public debt ceiling of 60 percent (down from 80 percent) as the new fiscal anchor and improving the conditions for greater public-private partnership (PPP) in infrastructure. These favorable outcomes enabled Jordan to exceed the base-case triggers¹ for 2006 in the Country Assistance Strategy (CAS).
2. **However, as highlighted in the CAS, Jordan faced significant challenges, including perceived sovereign risk and the need to sustain competitiveness given limited exchange rate flexibility and heavy dependence on international and regional capital markets.** Failure to sustain appropriate fiscal and structural reforms and attract significant non-debt creating capital inflows would have put pressure on the exchange rate, leading to a loss of stabilization gains and reemergence of adverse debt dynamics. These concerns contributed to Jordan's perceived sovereign risk and the rationale for the proposed partial risk guarantee (PRG) at the time of appraisal.
3. **By 2007, Jordan had undertaken a decade-long structural reform of its economy.** Natural gas and crude oil or petroleum products covered approximately 98 percent of Jordan's total primary energy supply in 2007, while renewable energy represented less than 1 percent. Jordan lacked domestic natural gas and conventional crude oil resources and, in 2008, imported 96 percent of its energy needs. In 2007, the total spending on energy imports was equivalent to over 10 percent of the gross domestic product (GDP). The National Energy Strategy 2007–2020 aimed to diversify the fuel mix and supply sources to reduce dependence on imports and use of oil and mitigate adverse balance of payments situations and negative environmental impacts. Besides targets for increased utilization of natural gas and energy use efficiency, the National Energy Strategy 2007–2020 set a target of 7 percent of the country's energy mix to come from renewable sources by 2015 and 10 percent by 2020—revising upward the 3 percent target for 2015 set in the National Agenda 2006–2015 published the year before aiming to diversify the fuel mix and supply sources to reduce dependence on imports and use of oil, the consequent adverse balance of

¹ The macro triggers for the base case were (a) a reduction of the general government debt-to-GDP ratio under 80 percent by end-2006 compared to end-2005 and a reduction by 2 percentage points every year thereafter; (b) central government budget deficit (before grants) be progressively reduced to below 4 percent by 2008; and (c) foreign reserves of monetary authorities remain at adequate levels for imports of goods and non-factor services (that is, between four and five months) and providing coverage for public sector debt service. In addition to the base-case macro benchmarks, for the energy sector, creation of a market-driven energy efficiency fund and finalization of the legal and contractual framework for renewable energy were included as triggers in the high-case scenario.

payments situation, and negative environmental impacts. The regulatory authority for the power sector, the Energy and Mineral Regulatory Commission (EMRC), was also set up.

4. **Jordan's power sector was financially viable with no explicit subsidies from the government budget** but benefited from the use of natural gas from Egypt at relatively favorable prices and some subsidies on petroleum products. The EMRC had initiated a comprehensive tariff review.

5. **The GoJ made significant efforts in institutional reform in the power sector by moving toward privatization and promoting PPPs in the generation, transmission, and distribution sectors.** Most of the distribution sector was already owned by the private sector and the GoJ had plans to further divest its shares in the Electricity Distribution Company and the Irbid District Electricity Company. Privatization of the Central Electricity Generating Company (CEGCO) was to be completed by 2007 and the GoJ considered privatizing the Samra Electric Power Generating Company (SEPCO) through a public offering.

6. **Since 2003, most generation plants in Jordan operated on natural gas imported from Egypt, following the 30-year Gas Purchase Agreement of 2003 with Egypt, at relatively favorable prices.** Future thermal generation, including the proposed project, was designed to predominantly use natural gas, complemented by renewable sources, such as wind, with shortfalls from internal supply met through imports from Egypt and Syria.

7. **By 2015, Jordan's economy had slowed down for the first time since 2010, mainly due to the effects of security spillovers, requiring the Government to embark on a new program of fiscal consolidation and economic growth.** Jordan grappled with addressing a number of exogenous shocks after the global financial crisis, notably the interruption of gas supply from Egypt and the massive influx of Syrian refugees that resulted in an average annual growth rate of 2.7 percent.

Project Context and Design

8. **The project was the least-cost option of meeting the country's electricity demand by bringing additional capacity of 370 MW and maintaining a prudent reserve margin.** At the time of appraisal, the peak demand for electricity on the interconnected system in Jordan was about 1,500 MW and the installed capacity was about 1,800 MW (reserve margin of about 20 percent). However, with 3.5 percent per year growth rate forecasted then, the reserve margin would have evaporated by 2010. Therefore, this project was conceived to maintain a prudent reserve margin while adding the much-needed additional capacity to the system.

9. **Private sector financing and development was supposed to help alleviate the debt burden on the Government** and assist in further improving efficiency of the sector. Based on experience and deliberation, the Government adopted the build, own, operate (BOO) model for all PPP projects (including power plants) following a competitive bidding process.

Rationale for Bank Assistance

10. **Executing this project would have helped alleviate the debt burden on the Government and provide efficiency improvement in the sector.** The project was the least-cost

option determined to meet the country's electricity demand and maintain a reserve margin of 10 percent amidst growing demand. Private sector financing was supposed to help the Government with reduction of the debt burden.

11. **PRGs and Multilateral Investment Guarantee Agency (MIGA) insurance were used to help the Government's transition from public to private finance through political risk mitigation and effective risk sharing with project sponsors and lenders.** The Request for Proposals (RFP) for the proposed project had, therefore, included a joint World Bank Group statement of in-principle support for the project. This, as well as the transparent bidding process (that satisfied the World Bank's economy and efficiency requirement), helped the Government attract competitive proposals for the project.

12. **The project was unlikely to go ahead without the World Bank Group's participation because of the private sector's perceptions of political risks, especially payment risk by the National Electric Power Company (NEPCO).** Hence, the Government requested consideration of a PRG, and Applied Energy Services Corporation (AES) Oasis Ltd and Mitsui & Co. Ltd (the sponsors or developers)² filed a Definitive Application with MIGA. The Government also sought the proposed PRG to reduce the perceived riskiness of the investment environment in Jordan, after several private sector projects failed to materialize.

1.2 Original Project Development Objectives (PDO) and Key Indicators (as approved)

13. According to the Project Appraisal Document (PAD), the PDO was “To meet the electricity needs of the country in an economically and environmentally sustainable manner to contribute to economic growth and well-being of the population of Jordan. The project would add about 370 MW of additional power to the system, help to ensure the reliability of power supply and help maintain a margin between available capacity and demand of at least 10 percent in an environmentally sustainable manner. The purpose of the PRG is to enhance competition and therefore help reduce the project’s financing costs.”

14. Annex 3 (Results Framework and Monitoring section) of the PAD gave four outcome indicators to gauge the project’s development objective of affecting overall power supply and environment (“To meet the electricity needs of the country in an economically and environmentally sustainable manner”):

- Cost of energy supply - by the power plant to be below the average cost of energy supply in Jordan (baseline value of US¢4.3 per kWh)
- Emission levels - by the power plant for NO₂, SO₂ and particulate matter (PM) to be below a specified target (details in the table 1)
- Availability factor - of the power plant to be above 95 percent
- Reserve margin - of the power system of Jordan to be greater than 10 percent

² AES Jordan PSC was a consortium of AES Oasis and Mitsui & Co. and was the project developers. They are also referred to as ‘the sponsors’ throughout the Implementation Completion and Results Report (ICR) document.

15. The PAD also identified four intermediate outcome indicators to gauge the likelihood of achievement of the PDO (“The project would add about 370 MW of additional power to the system, help to ensure the reliability of power supply and help maintain a margin between available capacity and demand of at least 10 percent in an environmentally sustainable manner”).

- **Financial close date:** Achievement by the first year (2007)
- **Implementation progress:** Simple-cycle plant commissioned by Year 2 (2008) and Combined-cycle by Year 3 (2009)
- **Commissioning test results:** 246 MW commissioned by Year 2 (2008) and full 370 MW commissioned by Year 3 (2009)
- **Trial test results:** To conform to operating standards identified

16. Although the PAD did not explicitly identify an indicator to measure the achievement of the PDO pertaining to the PRG (“The purpose of the PRG is to enhance competition and therefore help reduce the project’s financing costs”). The following specific parameters were used to measure whether the PRG led to enhanced competition and helped reduce the project’s financing costs:

- **Transparent and competitive bidding undertaken (to gauge enhanced competition due to the project).** With multiple bids from private parties resulting in selection of lowest cost bid from short-listed bids meeting desired technical quality criteria
- **Further foreign investment in infrastructure.** Demonstration effect of PRG to spur future development of independent power producers (IPPs) in Jordan without additional risk mitigation

17. The project documents (PAD, Legal Agreement) did not include any indicators to measure “economic growth and well-being of the population of Jordan,” as mentioned in the PDO.

18. Baseline data, annual targets, and achievement for outcome and intermediate outcome indicators is provided in table 1.³ Refer to Table 2.1 in Annex 2 for the complete datasheet on actual results achieved annually.

Table 1. Outcome and Intermediate Indicators

Project Outcome Indicators	Baseline	Target (Annual)	Achievement
1. Cost of energy supply (power plant)	US¢4.3 per kWh	Above baseline	Achieved. Average cost of energy supplied from Jordan’s power system (average tariff purchased by the transmission company) ranged from US¢6 per kWh to US¢20 per kWh between 2008 and 2014.

³ Table 1 refers to the complete Results Framework agreements from annex 3 of the PAD (Results Framework and Arrangements for results monitoring). The Results Framework is the same as mentioned in the Legal Agreements.

Project Outcome Indicators	Baseline	Target (Annual)	Achievement																								
			<p>This was always (except 2009) higher than tariff of Amman East Power Plant project at :</p> <table> <thead> <tr> <th></th> <th>Amman East</th> <th>Avg purchase price</th> </tr> </thead> <tbody> <tr> <td>2008</td> <td>6.1</td> <td>6.4</td> </tr> <tr> <td>2009</td> <td>5.7</td> <td>5.6</td> </tr> <tr> <td>2010</td> <td>3.7</td> <td>7.4</td> </tr> <tr> <td>2011</td> <td>10.6</td> <td>15.8</td> </tr> <tr> <td>2012</td> <td>15.9</td> <td>17.7</td> </tr> <tr> <td>2013</td> <td>12.4</td> <td>17.6</td> </tr> <tr> <td>2014</td> <td>17.9</td> <td>19.3</td> </tr> </tbody> </table>		Amman East	Avg purchase price	2008	6.1	6.4	2009	5.7	5.6	2010	3.7	7.4	2011	10.6	15.8	2012	15.9	17.7	2013	12.4	17.6	2014	17.9	19.3
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2011	10.6	15.8																									
2012	15.9	17.7																									
2013	12.4	17.6																									
2014	17.9	19.3																									
2. Emission levels (power plant)	NO ₂ SO ₂ Particulates	100 micro g/m ³ 125 micro g/m ³ 70 micro g/m ³	Achieved. Below baseline levels for all years																								
3. Availability factor (power plant)	95 percent	95 percent	<p>Achieved. 95.91 percent</p> <p>However, due to continued use of DFO in the plant instead of natural gas due to supply disruptions for an extended period, the capacity factor of the plant has been as follows:</p> <p>2010 : 79.49 percent 2011 : 54.57 percent 2012 : 38.33 percent 2013 : 63.60 percent 2014 : 47.77 percent</p>																								
2. Reserve margin (power system)	20 percent	Greater than 10 percent	Achieved. Greater than 10 percent in 2009																								
Intermediate Outcome Indicators																											
1.Financial Close date	<i>None, without power plant</i>	Year1: Financial close	Achieved. Project reached financial close in March 2007.																								
2.Implementation progress	<i>None, without power plant</i>	Year1: Financial close Year 2: Simple cycle plant commissioned Year 3: Combined cycle plant commissioned	Achieved. Project commenced commercial operations in August 2009 with simple cycle and with combined cycle in 2010, all according to schedule.																								
3.Commissioning Test Results and	<i>None, without power plant</i>	Year 1: None Year 2: 246 MW commissioned Year 3: 370 MW commissioned	Achieved. Project commissioned 370 MW according to schedule.																								
4. Trial test results	<i>None, without power plant</i>	Achievement of trial results	Achieved. Trial test results were successful.																								

Note: a. Because fuel costs and fuel supply risks were borne by NEPCO according to the contractual agreements, long periods of gas supply disruptions coupled with higher DFO (backup fuel) costs did cause financial distress to NEPCO during the ‘Arab Spring’ disruptions.

DFO = Distillate Fuel Oil.

1.3 Revised PDO and Key Indicators, and Reasons/Justifications

19. The PDO was not revised, as it remained relevant throughout the project implementation.

1.4 Main Beneficiaries

20. The PAD does not explicitly identify beneficiaries of the project, but based on the PDO and design, the following are implicitly inferred as the main beneficiaries for the ICR:

- **GoJ.** The GoJ benefitted from the project as the country received additional 370 MW of least-cost power generation. The GoJ also successfully executed the first IPP in the country and set the precedent for future private sector deals in the generation sector. The GoJ was also able to build capacity in their ministries and departments related to private sector deals in the infrastructure sector.
- **Private sector (especially commercial lenders and sponsors).** According to the PRG contractual agreements (Guarantee Agreement), the beneficiaries of the PRG were the commercial lenders or the facility agent on their behalf. The PRG provides commercial lenders assurance to lend to sponsors against the risk of default on their debt by the sponsors due to nonperformance by the GoJ on their contractual agreement.
- **Sponsors (project developers - AES Jordan)** also benefitted from the PRG as they were able to raise financing for their project in Jordan at lower rates.
- At a higher level, the citizens of Jordan benefited from the project as they received reliable and sustained energy supply through increase in generating capacity.

1.5 Original Components (as approved)

21. **The project was a full guarantee operation (IBRD provided PRGs in the amount of US\$45 million for the Amman East Power Plant Project).** There were no IBRD loans or IDA credits involved in the project. Financing for the power plant was arranged by the sponsors and included direct lending to AES Jordan PSC by the Japan Bank for International Cooperation (JBIC), Overseas Private Investment Corporation (OPIC), and Sumitomo Mitsui Banking Corporation (SMBC), the latter of whom lent based on the IBRD PRG.

22. **The project consisted of one component: a 370 MW gas-fired combined-cycle power station developed, owned, and operated by AES Jordan PSC, a joint venture between AES Oasis Ltd and Mitsui & Co. Ltd.** The power station is located at Al-Manakher, 14 km east of Amman, Jordan. The fuel supply was imported natural gas from Egypt supplied through the Arab Gas Pipeline; DFO served as backup fuel for emergency operations. The combined cycle power station included two gas turbines, two steam boilers, one steam turbine generator, and all necessary auxiliary facilities, including administrative offices, plant control room, warehousing facilities, and workshops. Natural gas was supplied to the project by NEPCO with the pipeline operated by Fajr. The gas was supplied by Egypt through the Arab Gas Pipeline. The Water Authority of Jordan (WAJ) supplied cooling water to the power station.

1.6 Revised Components

23. There was no change to the project components.

1.7 Other Significant Changes

24. There were no other significant changes to the project.

2. Key Factors Affecting Implementation and Outcomes

2.1 Project Preparation, Design, and Quality at Entry

25. **This ICR finds that the project was well prepared by the World Bank during appraisal due to three main factors:** (a) the GoJ and World Bank both incorporated lessons learned from experiences on how to attract private sector investment; (b) the GoJ considered all alternatives and conducted proper due diligence before moving forward with the project; (c) the project's technical, financial, and contractual structure was appropriate (agreed by all stakeholders); and (d) the need for credit enhancement was identified before issuing the RFP for the project, and the PRG was included as an optional support for all potential bidders to consider.

26. **The GoJ learned from past failures in private sector projects in the infrastructure sector to design Jordan's first competitively awarded IPP project successfully.** The project was designed and executed against the backdrop of several unsuccessful attempts by the GoJ to involve private sector investment in the infrastructure sectors. The GoJ incorporated its lessons from previous unsuccessful attempts to attract private investment for Jordan's infrastructure. Among the key lessons incorporated was ensuring that the fuel supply arrangements and a minimum regulatory framework provided assurance to the bidders before issuing the RFP for the East Amman Power Plant. The GoJ also made sure that the project was supported by all key stakeholders in the country.

27. **Lessons from outside Jordan were incorporated in the project design, including the World Bank's worldwide experience with IPP projects,** such as the Hub and Uch IPPs in Pakistan. Those lessons included the need for (a) reforming the sector before introducing private participation and not using IPPs as a substitute for reform (sector reforms were more advanced in Jordan than they were in Pakistan in the mid-1990s), (b) ensuring that IPP development was consistent with the least-cost expansion program, (c) establishing transparent IPP solicitation and tariff setting; (d) having a commercially viable off-taker and overall electricity sector, and (e) securing an efficient and reliable fuel source.

Soundness of Background Analysis

28. **The project was technically appropriate and was in line with Jordan's least-cost expansion plan.** The tariff outlined in the PPA was competitive at US¢3.8 per kWh, much lower than the average electricity purchase cost of US¢4.3 per kWh. Combined-cycle gas turbine was the appropriate technology choice for power plant due to its versatility and dual-fuel mode operation along with the higher energy efficiency benefit of CCGT technology.

29. **The GoJ considered all possible alternatives and decided on the Amman East Power Plant Project.** Alternatives to the project were considered with regard to the source of supply (including cross-border interconnection), type and location of the power plant, but not the development model which was decided on a BOO basis based on the decision to promote competitive private generation. Alternative options were rejected based on the following criteria:

- **Other fuel supply for thermal plants.** With the availability of Egyptian natural gas in Jordan and conversion of almost all power plants that formerly used residual fuel oil or diesel to use natural gas, there were no alternative fuels considered for thermal power plants.
- **Wind and solar-thermal options.** They were considered, but solar-thermal option was rejected as it could not provide the required capacity and reliability at the time. Work was underway at the time to develop Fujeij and the Bank was involved through a GEF grant. Although the project, and the technology as a whole at that time could function as a complement but not as a substitute for Amman East Power Plant.
- **Importing power.** The cost of imported power from either Egypt or Syria was higher than that from local generation and would be higher than the tariff offered by the project. Moreover, neither of the two countries has much surplus capacity.

30. **The project's contractual structure allocated risk to parties that were best suited to absorb them.** The primary risks undertaken by the private sector participants in the project were (a) pre-construction and construction-related risks, (b) commercial and operation and maintenance (O&M) risks, and (c) the GoJ's credit risk (sovereign risk). The GoJ took on fuel supply risk and NEPCO's risks, including its take-or-pay (of energy) obligations under the project. The World Bank (IBRD) had an underlying project risk arising from nonperformance of NEPCO on the PPA and the Implementation Agreement. Finally, political force majeure was a shared risk among the GoJ, sponsors, and the World Bank (underlying risk). This contractual allocation of risk followed good practices adopted by successful PPP projects. Table 2 shows the complete allocation of risks between different parties.

Table 2. Allocation of Risks

Phases	Risks/Obligation	Sponsors and Lenders ^a	Government ^b	Risk Mitigation Package ^c
Pre-construction	Project design			
	Financing			
Construction	Cost overruns			
	Construction delays			
Operations	Implementation of EMP and RPF			
	O&M			
	Output quality specifications			
	Implementation of EMP			
	Tariffs			
	Supply of natural gas and water			
	Payments under the PPA and Implementation Agreement			
Concession term	Currency devaluation			
	Currency convertibility and transferability			
	Political force majeure			
	Changes in law			
	Natural force majeure relating to the project			
	Expropriation			

Note: EMP = Environmental Management Plan; RPF = Resettlement Policy Framework.

- a. Includes private sector insurers and Engineer, Procure, and Construct (EPC) contractors.
- b. Includes electricity consumers.
- c. IBRD and MIGA are backstopping risks associated with breach of contract by NEPCO. Although not the only triggers of the IBRD and MIGA guarantees, the following principal underlying risks to be borne by the Government under the Government Guarantee are worth highlighting: (a) failure by NEPCO to pay for energy and capacity under the PPA, (b) lack of U.S. dollars to pay contractual amounts, and (c) prolonged and catastrophic events of force majeure. As guarantor of the Government's performance, IBRD's underlying project risks (shown in grey colored cells).

31. The IBRD Guarantee coverage was appropriate—adequate to make the project bankable and yet remaining limited in coverage by covering only a portion of termination payment due by the Government to AES Jordan in the event that AES Jordan terminates the Implementation Agreement because of specific conditions defined in the Guarantee Agreement. The IBRD Guarantee did not cover breach of other NEPCO or WAJ obligations, including NEPCO or WAJ insolvency or prolonged and catastrophic events of force majeure and political violence. The project could have used more legal due diligence on gas supply agreements, the details of which could not be obtained due to a private gas supply deal between Jordan and Egypt.

32. Social and environmental factors were adequately addressed. The project fell under Environmental Category 'A' according to the World Bank's policy on Environmental Assessment (OP 4.01). The safeguard policies on Environmental Assessment (OP/BP 4.01) and Involuntary Resettlement (OP/BP 4.12) were triggered. The developer completed a comprehensive Environmental and Social Impact Assessment (ESIA) before project appraisal for the power plant, containing an Associated Infrastructure EMP for the associated infrastructure (gas pipeline and water pipeline) and the transmission line and substation. Although the project did not involve displacement of people, it involved acquisition of small sections of farmland for which an RPF in the form of a Land Acquisition Compensation Plan (LACP) was prepared. Compensation was set aside and finally made by NEPCO (post arbitration) and the process was discussed within the Bank and concluded that it was consistent with the WB guidelines. The quality of both the ESIA and RPF/LACP was satisfactory. There was no resettlement or land acquisition associated with the water pipeline as it was in the existing road corridors owned by the Government. Safeguards related to health hazards due to transmission line construction were not entirely relevant to the project and could have been avoided.

Adequacy of Government's Commitment

33. The Ministry of Planning and International Cooperation (MoPIC) coordinated with the Ministry of Energy and Mineral Resources (MoEMR) and EMRC to ensure the Government's commitment toward the project displayed through institutional reforms and adoption of transparent, competitive, and fair bidding resulting in good-quality bids, transparent selection of developers, quality project documents with bankable risk allocation and timely financial closure. NEPCO, as the off-taker and single-buyer transmission company in Jordan, had stable financial performance, albeit with declining debt-service ability. The project benefitted from well-established developers and EPC contractors, with considerable experience with similar projects worldwide.

Assessment of Risks

34. The ICR finds that, during appraisal, all risks were properly identified along with a mitigation plan. Risk allocation was consistent with the structure of the project and in line with current practices in similar projects around the world. In addition, development partners and commercial lenders, such as OPIC, JBIC, and SMBC also conducted their own due diligence and were satisfied. The following risks were identified during preparation, along with mitigation measures:

- **Gas price fluctuation and currency risk (macroeconomic risk).** The most substantial risk identified during the project design was that electricity retail tariffs may not be able to cover the cost of supply due to the effects of gas price fluctuations and currency devaluation. The risk was mitigated as long term, as a bilateral gas-supply agreement between Jordan and Egypt involved below-market rates, and the regulator (EMRC) considered gradual tariff adjustment with optional fuel adjust clause.
- **Inadequate sector reform (enabling environment risk).** A moderate risk that sector reform in Jordan is not advanced enough to create an enabling environment for private sector participation was mitigated as the power sector was restructured according to the new Electricity Law.
- **Single customer (NEPCO) risk (political risk).** The project had a moderate risk that the project may have no alternative market due to reliance on a single customer, NEPCO, wherein NEPCO may decide to stop purchasing power from it. Competitive and transparent bidding in the project led to a two-part availability tariff (capacity charge and energy charge) to ensure that the leveled cost of the project is lower than generation and import alternatives, thereby mitigating the possibility of NEPCO not purchasing power from the project.
- **Delay in construction of associated infrastructure (technical risk).** The project had a moderate risk that delays in associated infrastructure (transmission line, substation, water, and gas pipeline) will delay the project and cause the Government to pay liquidated damages to the power plant developer. NEPCO was made responsible for this construction and ensured that adequate measures such as a 120-day built-in buffer period provided breathing room to avoid such delays.
- **Power shortages due to delay (market risk).** The risk of construction delays resulting in power shortage was mitigated by the contracting of an experienced, internationally renowned EPC contractor (Doosan), who was contracted by the sponsors through a turnkey contract with built-in clauses for compensation for delays.
- **Unaffordable contingent liabilities (fiscal risk).** The International Monetary Fund (IMF)-World Bank reforms to improve the pension system and increase transparency of public expenditure management in addition to donor assistance were put in place to avoid unaffordable contingent liabilities.

35. The ICR does want to point out that supply vulnerability should have been anticipated and mitigation measures preempted in the historically unstable neighborhood. However, this learning is from the benefit of hindsight.

2.2 Implementation

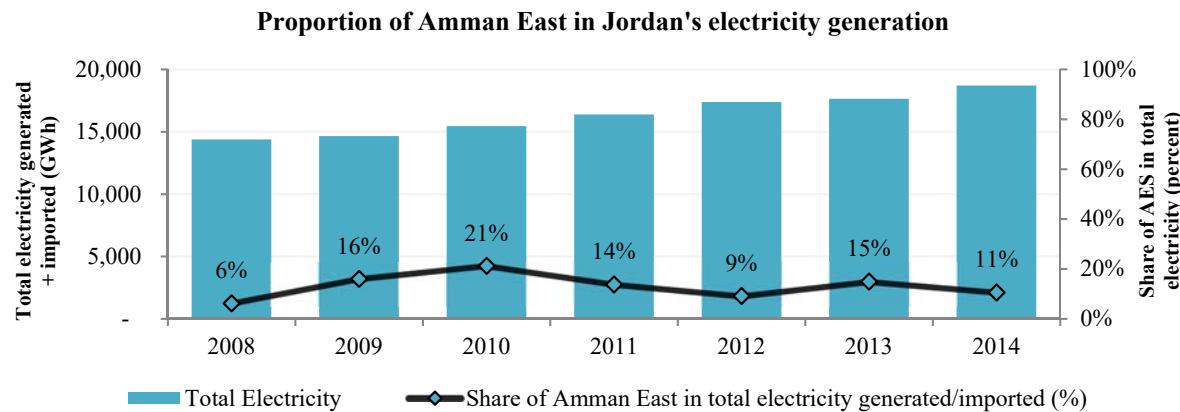
36. **The power plant achieved full commercial operation on August 27, 2009, which was only one month behind schedule.** The delay was caused by a minor technical difficulty with the steam turbine, which was resolved satisfactorily by the supplier. No construction delays were experienced in the associated infrastructure (400 kV electrical transmission system, water pipeline, and gas pipeline spur). A proposed MIGA guarantee in the amount of US\$69.75 million to cover sponsors' equity and shareholders' loans was dropped (post board approval) after the project sponsors could not reach an agreement with the project lenders on security sharing and release issues.

37. **Power plant progress was monitored satisfactorily.** A Joint Coordination Committee (participation from NEPCO and AES Jordan) monitored plant operations and progress through regular meetings. The project company has remained in compliance with the EMP—Operational Phase dated February 2007. The company continues to provide the World Bank with the annual (semiannual till 2010) environmental reports. The World Bank has also been provided with the quarterly operating reports—prepared by the company for the project lenders—that contain additional information on environmental and operational aspects of the plant.

38. **Job creation.** About 3,000 temporary jobs were created during the Amman East Power Plant construction phase. Since the operating phase, the power plant has been staffed with about 50 full-time employees.

39. **Sustainable energy supply.** During the first year of full operation, the power plant generated 3,290 million kWh of electricity, representing about 21 percent of generated electricity in Jordan. Since then, the plant has generated a substantial amount of electricity compared to the total electricity generated and imported in Jordan, as shown in the figure 2.

Figure 1. Jordan's Electricity Generation and Project's Proportion



Source: NEPCO Annual Reports (2008–2015).

40. The plant is one of the most efficient power plants in Jordan in terms of heat rate. With regard to generation cost, figure 3 compares the average cost of capacity payment for the plant (about US¢3.8 per kWh sent out to the grid) to the average bulk tariff of Jordan. Additionally, the average purchase price of energy from Amman East is lower than average purchase price incurred by NEPCO over the 2009-2014 period.

Factors that Contributed to Successful Implementation

41. **The Government's commitment (including NEPCO's honoring of contractual agreements) and lessons learned from past failures are the following:**

- The GoJ and the World Bank incorporated lessons learned from past failed deals regarding private sector involvement in Jordan's electricity generation to implement the Amman East Power Plant Project.
- Being the first IPP for Jordan, MoPIC took the lead in coordinating the efforts of all the government agencies and ministries involved (MEMR NEPCO, EMRC) from the design process till implementation. MoPIC was an effective interface between the private sector (AES Jordan and other bidders) and the ministry and utility.
- The GoJ endorsed IBRD's Guarantee (PRG) and included the guarantee in the bidding package. This was well received by the private sector and resulted in good-quality bids.
- NEPCO always made timely contractual payments despite difficult and increasing financial burden on it arising due to prolonged natural gas supply disruptions. In addition, NEPCO maintained transparent accounting procedures throughout the operations of the project.

42. **Transparent and competitive tendering process enhanced competition for the project ensuring lowering of financing costs.**

- Project developers confirmed to the ICR team that a transparent and competitive tendering process was adopted for the project and that it was one of the biggest reasons for the success of this project and future IPPs in the country.
- The GoJ-adopted process had a demonstration effect for future IPP projects as well.
- Bidding process involved an international tender with well-structured project documents and an experienced transaction adviser.

43. **IBRD's PRG support was targeted, appropriate, and limited.**

- IBRD Guarantee was limited in coverage and only covered a portion of termination payment resulting from very well-defined conditions. This package offered the private sponsors just the right amount of risk-mitigation comfort (from government nonperformance risks) to apply for the project while maintaining prudent risk sharing between all parties.

- Two of the three short-listed bidders indicated that the presence of IBRD Guarantee support was critical in their decision to bid for the project.

44. Experienced and responsible private sector parties ensured timely construction and efficient operation so far.

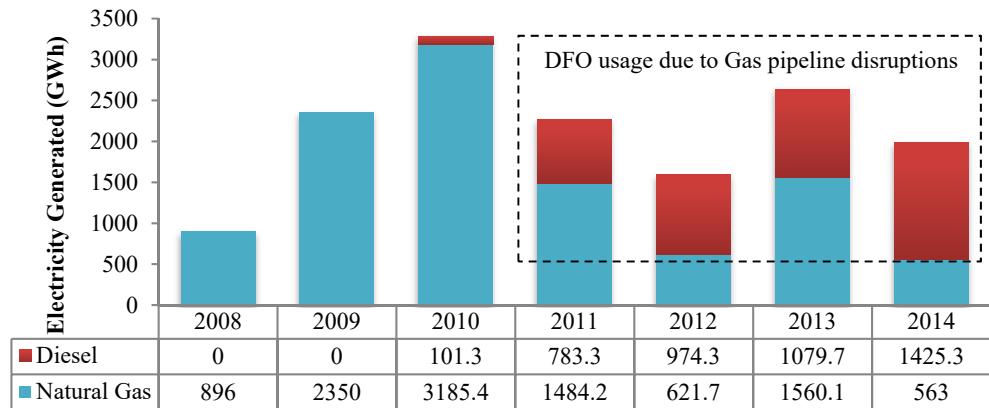
- **Project developers.** AES Jordan absorbed the necessary risks and achieved financial closure and commercial operations on time as required. The developers followed prudent financial, environmental and social, and operational reporting (being within required ranges). Availability factor of the plant was over 95 percent (as required)
- EPC contractor (Doosan) completed construction with no delays.
- Strong due diligence by the commercial and development financial institutions—SMBC, JBIC, OPIC—for the project resulting in optimized financing.
- **Timely board approval by the World Bank and no procedural delays from the GoJ.** Project effectiveness was reached within a month of Board approval—any delays from the Government, World Bank, or sponsors would have had negative effects on completing implementation on time, having a further negative cascading effect on achieving project objectives.

Challenges during Implementation

45. Natural gas supply disruptions following the 2010 Egyptian revolution caused financial and operational difficulties to NEPCO.

- (a) Geopolitical instability in the region caused multiple explosions in the Arab Gas pipeline disrupting natural gas supply for extended periods for most of 2011 and 2012. Gas supply was constrained even post-2012 till now.
- (b) Because NEPCO was responsible for fuel supply, an unforeseen large supply of backup DFO during disruptions caused additional financial distress to NEPCO, especially as DFO was more expensive than natural gas as a fuel source. Hence the risk of guarantee coverage was raised during this period to reflect the higher risk of nonpayment by NEPCO during the period of disruptions.
- (c) The plant had to run on backup DFO for extended periods. AES Jordan (sponsors) incurred higher O&M costs (consumables and spare parts) and over US\$2 million extra expenditure in swirlers to reduce higher NO_x, SO_x stack emission (higher than if natural gas or even heavy fuel oil [HFO] were used as fuel).
- (d) Thus, for these interrupted durations, the plant was run as a peaking-load plant instead of a base-load plant, as originally envisaged. The proportion of electricity generated by the plant using natural gas and DFO (diesel) as the fuel is depicted in figure 1,—to explain the effect of fuel supply disruptions on the plant operations.

Figure 2. Electricity Generated (GWh) by Fuel source by Amman East Power Plant

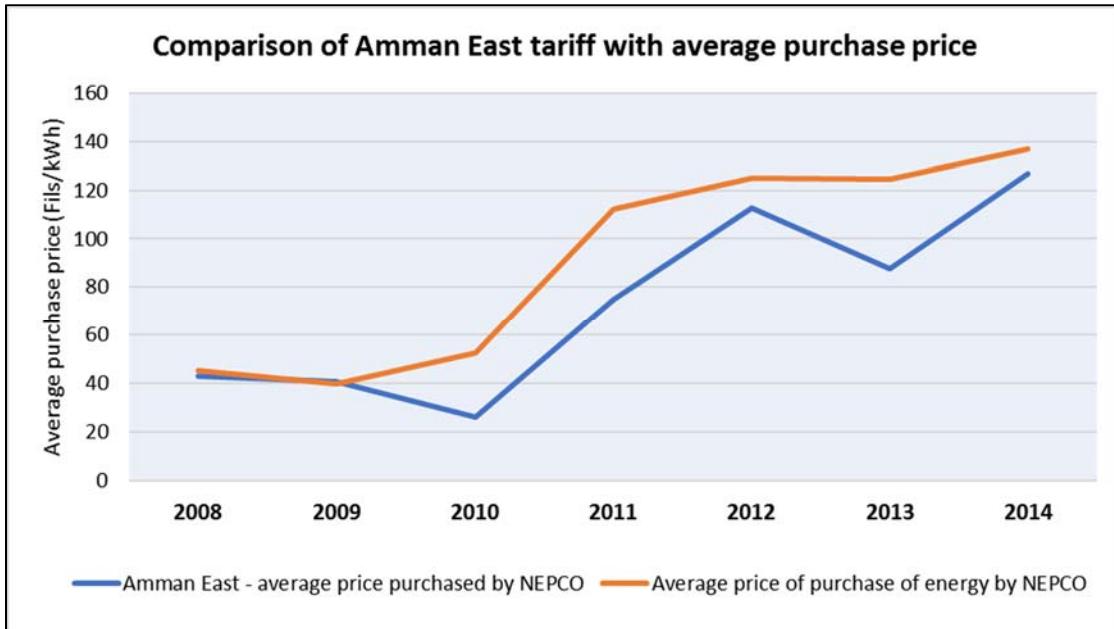


Source: NEPCO Annual Reports (2008–2015).

46. **Delay in court decisions for land purchase and access right compensation.** Establishing the actual compensation is adjudicated by the courts in Jordan and usually does not occur before the transmission system is energized. This caused long delays for compensation adding to administrative burden on courts. However, during the ICR mission, NEPCO ascertained that the last known court cases were resolved and that NEPCO had paid compensation to all remaining families.

47. **Other challenges.** The sponsors (AES Jordan) did not benefit from sales tax waiver for local goods purchased and the matter was pending from 2009 to 2015. It was finally resolved amicably between NEPCO and AES Jordan, with no pending issues.

Figure 3. Purchase Price of Energy in Jordan (Amman East vs Average purchase price)



Source: NEPCO, EMRC, Annual Reports (2008–2015).

2.3 Monitoring and Evaluation (M&E) Design, Implementation, and Utilization

M&E Design

48. The overall M&E design was Satisfactory as adequate indicators were identified to monitor progress toward PDO and the collection methods identified were adequate. However, the PDO was vaguely formulated in parts and the PDO indicators did not capture all the aspects of the PDO. Parts of the PDO such as “to contribute to economic growth and well-being of the population of Jordan” indicate the entire population of Jordan to be the primary target group that would benefit from the project interventions, which is not measured through any indicators. It also points to a broad outcome that the project reasonably cannot be held accountable to, and hence the PDO could have benefitted from tighter phrasing of objectives that correspond to the purview of the project with linked indicators. The PDO also includes a phrase on “environmentally sustainable manner” that could have been defined within the boundaries of the project scope. The project did include an indicator on monitoring air quality that could point toward the same, but no explicit reference to sustainability was made.

M&E Implementation

49. M&E implementation largely followed its original design and was satisfactory as data were collected accurately and on time using the appropriate agencies and frequency of collection. The M&E activities were separated into two phases covering project construction and project operation phases with responsibility for data collection toward PDO and intermediate indicators clearly identified. The project company carried out monitoring of project progress as intended. The project company prepared progress reports and financial statements as follows:

- Quarterly operating report (prepared and submitted satisfactorily so far)
- Semiannual Operation Environmental Impact Monitoring and Mitigation Report till implementation and annual after that (prepared and submitted satisfactorily so far)
- Audited financial statements (annual basis) and interim financial statements (quarterly and half-yearly basis) of AES Jordan PSC and AES Jordan Holdco (prepared and submitted satisfactorily so far)

50. Monitoring of environmental and social aspects was carried out by the project company (for the power plant component). NEPCO was responsible for reporting on associated infrastructure, incorporating the project ESIA.

- Annual report on the environmental and social impact of the NEPCO substation and transmission line (prepared and submitted satisfactorily, so far)

51. In addition, an independent engineer prepared the project construction monitoring reports that reviewed progresses on procurement, engineering, construction of the power plant, and associated infrastructure. A midterm review of the project was not conducted.

M&E Utilization

52. Because the scope of the project was limited to the construction and operation of the Amman East power plant, the data collected pertained to those aspects and were appropriate to inform decision making and resource allocation by the project company. Hence, M&E utilization was satisfactory. However, in the context of the associated infrastructure, the ESIA recommended an annual health check for sample residents of a nearby village where the new transmission line passes as a requirement to be carried out by NEPCO but did not provide detailed guidance on sample selection, obtaining baseline data, and further execution. NEPCO thus agreed to monitor any health-related complaints instead of the annual health check.

2.4 Safeguard and Fiduciary Compliance

53. **Environmental and social safeguards.** The applicable safeguard policies for the Amman East Power Plant Project were OP 4.01: Environmental Assessment and OP 4.12: Involuntary Resettlement. The project complied satisfactorily with the World Bank policy and procedural requirements pertaining to applicable safeguards.

54. **Institutional setup.** The responsibility for implementing the mitigation measures for the power plant was with AES Jordan PSC, while NEPCO was responsible for the transmission line, substation, and gas pipeline aspects. There was no resettlement or land acquisition associated with the natural gas pipeline as well as the water pipeline. Construction of the NEPCO substation and the 400 kV transmission line resulted in the triggering of the abovementioned safeguard policies. NEPCO was responsible for assessment of compensation for land acquisition. AES Jordan PSC was responsible for implementation of the EMP aspects. AES Jordan PSC and NEPCO coordinated with other entities within Jordan, including MEMR, WAJ, and Fajr appropriately. Overall coordination of project activities over the project life was handled by the Joint Coordinating Committee, comprising AES Jordan PSC and NEPCO staff, as provided for in the PPA.

55. In summary, the project addressed the five key concerns raised during the consultation process:

- The transmission line was routed to avoid, as much as possible, the small area with human settlement.
- Compensation was paid for loss of land use at market rates (court decided rates in this case and the judicial process took much longer than anticipated with administrative burden).
- Employment was offered to local residents.
- Emission levels were monitored and managed to meet Jordanian and World Bank standards.
- Relevant authorities were consulted for removal of any archaeological findings.

56. Also, a full-fledged ESIA report was developed by following the requirements for a Category A project. The evaluation report on the sponsor confirmed that the project and associated infrastructure (gas and water pipelines) would not create an unacceptable impact on the environment, in isolation, or with potential future developments within the projects sphere of influence. The quarterly operating reports, covering the following aspects of environmental assessment have been received and monitored by the World Bank since commencement of the power plant operation and have been found to be compliant with Jordanian and World Bank standards. For details on the compliance and progress related to environmental and social safeguards, refer to table 2.2 in annex 2.

57. In conclusion, the construction and operation of the proposed Amman East IPP Project and its associated infrastructure is considered to be environmentally acceptable. The safeguards aspects were also rated Satisfactory in every Implementation Status and Results Report (ISR), without deviation. In addition, all the key issues from the World Bank guidelines for new thermal power stations (1998) were addressed.

Procurement

58. The World Bank reviewed the evaluation report and found the evaluation to be in accordance with the RFP and supported the recommendation of AES Consortium as the first-ranked sponsor for the Amman East Power Plant. Furthermore, the World Bank found that the procurement process followed the provisions of paragraph 3.16 of the Procurement Guidelines, on which basis the World Bank could guarantee loans for the project made by other lenders. The MoEMR, as the project implementing agency, was responsible for selecting the bidder for building, owning, and operating the power station. The MoEMR, conducted international competitive bidding for the project.

2.5 Post-completion Operation/Next Phase

Power Plant Progress

59. **The Amman East power plant completed six years of full commercial operations.** By the end of August 2015, the plant completed six years of operation using DFO as the primary fuel on an extended basis without any major operational issues. Since 2015, after two new IPPs came online (IPP3 and IPP4), the plant was kept in reserve shutdown but has returned to be a base load plant with the availability of liquefied natural gas (LNG) since June 2016.

60. The plant has installed a fogging system (the fogging system helps increase plant output by 35–40 MW and reduce NO_x by 10 ppm for each gas turbine) that has had a positive impact on the plant's operation, financial, and environmental performance. A long-pending issue where the project company could not fully benefit from the provision of sales tax waivers on goods and services purchased in Jordan for use by the power plant has been resolved.

61. **The operational phase of the EMP is ongoing with no material issues identified.** Annual environmental reports were provided to the World Bank along with quarterly operating reports containing additional information on environmental and social aspects of the plant. NO_x and SO_x emission levels have been generally within World Bank and Jordanian limit (except in April and June 2012—due to a sand storm). AES Jordan (sponsors) have replaced swirlers for the

gas turbines at a cost of about US\$2 million to be compliant with NO_x emission due to extended operation on DFO.

62. NEPCO's payment of capacity charge has been punctual but its accumulated losses may present a future risk. The mixing of commercial functions (the single buyer and the fuel supplier) and the system service functions (wholesale market, dispatch, and transmission system operations) combined with total liabilities of over US\$7.4 billion (due to use of expensive DFO, instead of cheaper natural gas from Egypt as feedstock for power generation) creates a difficult financial situation for NEPCO. NEPCO also had a net loss of over US\$1.5 billion, during 2014, further adding to future risk. However, NEPCO has been making capacity charge payments to the company on time and has never defaulted on its payments. The low global oil prices combined with the transition of Jordan's fuel supply toward LNG (to substitute DFO) and operational profit of NEPCO during a few months of 2015 helped keep the future outlook optimistic. NEPCO is now (July 2018) breaking-even (tariffs are cost covering) and an automatic tariff adjustment mechanism ensures that tariffs remain cost reflective, even as fuel prices continue to fluctuate.

63. Project company self-initiated community relation activities. No major complaints related to the project were received till date. The project company also placed complaint boxes in the village and in front of the power plant to get feedback. The project company voluntarily undertook various activities for the community in the village of Al-Manakher. It sponsored two university students each year under its scholarship program and contributed toward general maintenance for the village mosque and school. It reached out to local schools and village administration in the areas of fire and safety trainings, donations of information technology equipment, Internet connections, children's playground, and so on. The project company also installed solar photovoltaic (PV) home systems for 100 households, distributed 100 solar water heaters, hosted a one-day free medical camp, and conducted a blood donation campaign.

Associated Infrastructure

64. Fourteen 14 portions of land were expropriated for construction of the Amman East 400/132/33 kV substation with a total area of 174,494 m². In addition, about 4,500 m² of land from the Ministry of Finance (Government land) was leased. Nearly 95 percent of this land was unoccupied, while the remaining 5 percent, although classified as agricultural, was desert with no agricultural use. The portions of land were expropriated according to the law of Acquisition in Jordan and Prime Minister Decisions (No.255) on May 1, 2006, and (No.1409) on July 6, 2006. There were no houses or buildings or any structures on these lands when they were expropriated. The concerned committees of acquisition, according to Jordanian acquisition law, put the following prices for these portions of land (according to their location, shape, topography, location regarding roads and type of these roads, and so on):

- Portions (27 and 26) - JD 10 per m²
- Portions (24, 25, 22, and 23) - JD 8 per m²
- Portions (31, 39, 37, 38, 94, 95, 96, and 114) - JD 6 per m²

65. The owners of these pieces of lands did not accept these prices and went to the concerned courts to get fair compensation. They got higher compensation with prices of JD 18–25 per m² for these portions of land. Claimants from portions of land with numbers 22, 25, 27, 39, 94, 95, 96, and 114 were completely compensated according to prices settled from the courts (whether by negotiation or directly by implementing the court decisions). The rest took much longer to get compensated due to delay in court decisions. According to NEPCO, by 2015, all the affected parties had been paid due compensation. NEPCO has, to date, found no material environment- and social-related issue pertaining to the associated infrastructure.

Next Steps

66. **NEPCO and the project company will continue reporting.** NEPCO will continue to submit to the World Bank annual operation phase reports on the environmental and social impact of substation and transmission line. The project company will continue to submit annual Operation Environmental Impact Monitoring and Mitigation Report and audited financial statements (annual basis) and interim financial statements (quarterly and half-yearly basis) of AES Jordan PSC and AES Jordan Holdco. It will also copy the World Bank on quarterly operating reports. The World Bank will continue to monitor guarantee coverage and exposure and critical legal covenants.

67. **The implementation of the overall reforms in the energy sector has been strong.** Substantial reforms supported by World Bank's programmatic Development Policy Loan (DPL) have been implemented by the Government and are already showing positive results, as reflected in an improved financial and operational performance of the electricity sector. NEPCO's electricity tariff reached cost-recovery levels in the last quarter of 2015 due to increases in NEPCO's revenues and a reduction in the cost of electricity. The increase in revenues was achieved because of three tariff adjustments implemented by the EMRC between 2013 and 2015. The cost reduction is the result of the sharp decline in oil prices combined with the successful operation of the LNG terminal in Aqaba (starting in July 2015) and the recent commissioning of several new renewable energy plants replacing the reliance on more expensive and polluting diesel and HFO in power generation. However, remaining challenges include the sustained implementation of energy diversification policies, the sustained cost recovery from electricity tariffs in face of vulnerability to oil price fluctuations, and the management of NEPCO's accumulated commercial loans and advances from the Ministry of Finance of more than JD 4.9 billion (by 2016).

3. Assessment of Outcomes

68. At the time of approval for the Amman East Power Plant Project, no World Bank policy on Guarantee ICRs existed. This was updated in December 2005 with OP/BP 14.25. According to this guideline, ICRs for guarantee projects were required to be initiated two years after the commercial operations date (COD). Therefore, work on the ICR for this project should have commenced in August 2011. This was not initiated then because of the absence of policy guidance. The long period of World Bank supervision presented the opportunity to evaluate the overall impact of the guarantee on the project over a much longer period than would otherwise have been the case, however, with some data collection challenges.

3.1 Relevance of Objectives, Design, and Implementation

69. ***The relevance is rated high.*** The project's main objective was "to meet the electricity needs of the country in an economically and environmentally sustainable manner to contribute to economic growth and well-being of the population of Jordan. The project would add about 370 MW of additional power to the system, help to ensure the reliability of power supply and help maintain a margin between available capacity and demand of at least 10 percent in an environmentally sustainable manner. The purpose of the PRG is to enhance competition and therefore help reduce the project's financing costs." This objective, relevant at the time of project design, is still highly relevant from the point of the GoJ's new Executive Development Program for 2011–2013 and World Bank's Country Partnership Framework for the period FY12–15 as Jordan still intends to

- Diversify its sources of supply by importing natural gas from Egypt, despite long interruptions recently (PDO reference: meet electricity needs economically);
- Have a 10 percent target for renewable energy by 2020 (PDO reference: meet electricity needs in an environmentally sustainable manner); and
- Secure energy supply and diversify energy sources and encourage the private sector to enter into partnerships to undertake major development projects, particularly in the fields of energy, water, transportation, and industrial zones (PDO reference: enhance competition and therefore help reduce the project's financing costs).

70. However, the phrasing of the PDO could have been improved to either not include aspects that were probably too broad and beyond the scope of the project, such as "to contribute to economic growth and well-being of the population of Jordan"

71. The design arrangement of the project was relevant and technically appropriate. The project's design relied upon the cost-effective gas-fired combined-cycle technology power plant that was built, owned, and operated by the private sector. This was the least-cost design option for Jordan and its relevance is demonstrated by the lower-than-average cost of energy supplied from this plant (details in figure 3). The PRG structure for the project primarily focused on the payment risk of NEPCO and was highly instrumental in facilitating the necessary investments in the project and paving the way for future successful IPP deals (total four IPPs in Jordan with more being planned).

72. The project was aligned with the GoJ's and World Bank's priorities and had tangible and measurable outcome indicators. The project objective was aligned with the GoJ's and World Bank's priorities (CAS for FY2006–2010), which outlined the need to reform the energy sector and mentioned PPP guarantee projects being at the core of the Government's agenda. Tangible and measurable project outcome indicators, relevant to the project components were attached to the objectives. Success of the PRG was measured through achieving competitive bids and reduced financing cost—both relevant and achieved during the design of the project.

73. The project was implemented by AES, a global power company through a reputed EPC contractor (Doosan), which had vast experience in constructing large power plants in many

different countries. Such implementation by a reputed private sector entity using international skills both in construction and development was also relevant to deliver the project on time and in terms of knowledge transfer and technical know-how.

74. Additionally, the project received the highest honor in the ‘Fast Start’ category in 2015 from the Combined Cycle Journal, the independent voice of the gas-turbine-based generation sector of America’s electricity industry. The Amman East Power Plant Project was honored for its contribution to the industry with the ‘startup cost reduction project’ award.

3.2 Achievement of Project Development Objectives

75. The progress toward achievement of the PDO is rated Satisfactory as evidenced by the satisfactory ratings of the implementation performance, especially the Summary Development Objective Rating, pointing to satisfactory achievement of the PDO. All the ratings (apart from a brief negative change in reporting ratings, due to NEPCO’s financial reporting standards, and corrected quickly) have been consistently Satisfactory.

76. The PDO included a phrase “to contribute to economic growth and well-being of the population of Jordan.” Because no indicators were included to measure this aspect of the PDO, no measurement in relation to achievement of this aspect of PDO was made.

77. Achievement of the key outcome indicators, over the course of project operations, their extent of achievement, and their link back to the PDO are explored in table 3.

Table 3. PDO Indicators’ Achievement

Indicator	Achievement and Extent	Link to World Bank Intervention
Project Outcome Indicator	PRG: Enhance competition Achieved. The project was the first successful IPP in Jordan selected through a competitive bidding process. The sponsors opted for the PRG cover for better lending terms. AES Jordan also reported that the World Bank’s presence was instrumental in stakeholder management. First successful IPP had a demonstration effect as it led to 3 more IPPs in the country.	World Bank Guarantees (PRG) in the form of the risk mitigation package helped in achievement of the PDO: The purpose of the PRG is to enhance competition and therefore help reduce the project’s financing costs.
	Cost of energy supply Achieved. Average cost of energy supplied from Jordan’s power system (average tariff purchased by the transmission company) ranged from US¢6 per kWh to US¢20 per kWh between 2008 and 2014. This was always higher than the generation cost of Amman East operating on natural gas (refer to figure 3). Thus, the project is one of the least-cost sources ^a for NEPCO for electricity purchase).	Through commissioning and operation of the plant in time, and with cost-effective and efficient operations, providing increased capacity in Jordanian system with acceptable emission levels, the project contributed directly in achievement of PDO: meet the electricity needs of Jordan in an economically and environmentally sustainable manner to contribute to economic growth and well-being of the population of Jordan.
	Reserve margin Achieved. The nominal power generation system reserve margin increased to about 10 percent (target) in 2009 (year of	

Indicator	Achievement and Extent	Link to World Bank Intervention
Intermediate Outcome indicator	commencement of full operations) from 6 percent in end-2007. NEPCO ensured sufficient reserve margin (>10 percent till 2015).	
	Emission levels Achieved. Based on the quarterly operating reports prepared by AES Jordan for company lenders, the plant has complied with Jordan's and the World Bank's requirements since commencement of operations. The project company also replaced swirlers for gas turbines at a cost of about US\$2million to be compliant with NO _x emission due to extended operation on DFO.	
	Availability factor Achieved. Project had availability factor > 95 percent since COD.	
Intermediate Outcome indicator	Financial Close date Achieved. Project reached financial close in March 2007	The Amman East Power Plant was fully operational and generated 370 MW of electricity by August 2009 as was envisaged. This plant added much needed capacity to the Jordanian system at lower price, without delays—achievement of PDO: meet the electricity needs of Jordan economically.
	Implementation progress Achieved. Project commenced commercial operations in August 2009 with simple cycle and with combined cycle in 2010, all according to schedule.	
	Commissioning results Achieved. Project commissioned 370 MW according to schedule.	
	Trial test results Achieved. Trial test results were successful.	

Note: a. Because fuel costs and fuel supply risks were borne by NEPCO according to contractual agreements, long periods of gas supply disruptions coupled with higher DFO (backup fuel) costs did cause financial distress to NEPCO during the ‘Arab Spring’ disruptions.

3.3 Efficiency

Rating: High

Economic and Financial Analysis

78. Overall, the economic and financial analysis demonstrated that the project efficiently achieved its objectives—to meet the electricity needs of the country in an economically and environmentally sustainable manner to contribute to economic growth and well-being of the population of Jordan. The economic and financial analysis showed robust results and justified the private sector project in general. In the first counterfactual scenario, where the existing power plants would have increased generation to fill the gap in the absence of the Amman East Power Plant, the estimated economic net present value (NPV) was JD 339 million in 2007 prices (US\$478 million) at 5 percent discount rate, which was an equivalent of 3 percent of GDP in 2007 and 2 percent of GDP in 2015 in Jordan. The estimated economic internal rate of return (EIRR) was 29 percent. An estimated levelized economic cost, that is, the present value of all investment and operating costs in economic prices over the present value of energy sent out from the plant, was JD 0.06 per kWh (US\$0.08 per kWh).

79. The amount of avoided emissions of carbon dioxide equivalent (CO₂e), that is, greenhouse gases, including CO₂, NO₂ and CH₄, as well as SO₂, NO_x, and PM were significant. Within the economic NPV of JD 339 million, the main economic benefits were from fuel and other power supply-related benefits. Fuel cost savings were mainly because in the counterfactual scenarios, more HFO and DFO would have been used.

80. The distributional impacts of the externalities among the stakeholders showed that labor, in particular, the AES IPP labor, including one female office manager,⁴ benefited the most due to the net increase in wages compared to the counterfactual. This AES IPP labor benefit was because most of the workers were assumed to be skilled workers and, in Jordan, the private sector pays higher for higher-level jobs than in the public sector.⁵ The GoJ benefited due to the increased tax revenues and social security contributions from the AES IPP, with some loss from foreign exchange premium (FEP) and fuel subsidies before the GoJ removed the fuel subsidies in 2012.⁶ The temporary construction workers, including 15 to 20 female laborers among 3,000 employed, for the Amman East Power Plant, lost because, in general, the public sector in Jordan pays higher and provides more benefits for low-level labor than the private sector. However, it is much harder to get a public sector job. Nevertheless, these temporary local construction workers benefited because drawing on data from 2010, analysis of poverty by occupation of household head showed that the poverty rates were highest among workers in the construction, service, agricultural, and transport industries.⁷

81. Local communities in the Amman East Power Plant areas (Al-Manakhar) benefited from the corporate social responsibility (CSR) efforts of the AES IPP. For example, the AES IPP sponsored six university students, including four women and two men, and the AES IPP installed solar PV panels for 100 houses and distributed 100 solar water heaters, benefitting about 110 women among the total beneficiaries, which reduced the energy costs of these households, potentially helping, especially women, manage household expenditures (although no evidence-based expenditure data were available), and small carbon footprints. Many of the AES IPP CSR initiatives were targeted at women in the local community.⁸

82. The second counterfactual scenario assumed where the Amman East Power Plant would have been a public sector project due to the unavailability of the foreign private sector investment.

⁴ For a general discussion on employment opportunities for women in Jordan, see: Brodmann, Stefanie, Irene Jillson, and Nahla Hassan. 2014. "Social Insurance Reform in Jordan: Awareness and Perceptions of Employment Opportunities for Women." Social Protection and Labor Discussion Paper Number 1402. World Bank, Washington, DC; Stave, Svein Erik, and Maha, Kattaa. 2015. "Labour Force and Unemployment Trends among Jordanians, Syrians, and Egyptians in Jordan 2010–2014." Analytical Paper. International Labour Organization and Fafo Institute for Applied International Studies; ILO (International Labor Organization). 2010. A Comparison of Public and Private Sector Earnings in Jordan. Professor Christopher Dougherty London School of Economics.; ILO (International Labor Organization). 2013. "Decent Work Country Profile: Hashemite Kingdom of Jordan/International Labour Office." Geneva: ILO; ILO (International Labor Organization). 2010. "Pay Equity in Jordan." Policy Brief 9.

⁵ ILO (International Labor Organization). 2010. "A Comparison of Public and Private Sector Earnings in Jordan." Professor Christopher Dougherty London School of Economics.; ILO (International Labor Organization). 2013. "Decent Work Country Profile: Hashemite Kingdom of Jordan/International Labour Office." Geneva: ILO.

⁶ International Monetary Fund (IMF). 2014. Jordan Selected Issues. June 2014.

⁷ ILO (International Labor Organization). 2013. "Decent Work Country Profile: Hashemite Kingdom of Jordan/International Labour Office." Geneva: ILO.

⁸ Although this is not included in the economic analysis due to lack of data, the CSR efforts also included general maintenance for a village mosque, general maintenance for a village school, hosting a one-day free medical camp, a blood donation campaign, and households' demonstration of tips for home safety and best practices.

The main benefit would be the extra funding that the foreign private sector investment would bring to Jordan to increase power supply. This would enable the GoJ to spend that equivalent amount of the foreign investment in other social welfare activities, such as public health, education, and persons with disabilities and other vulnerabilities, where the private sector may not be able to invest without the Government's support. Accordingly, the distributional impacts of externalities showed that the public at large in Jordan benefited the most due to the freed-up public expenditure instead of the foreign private sector investment. Because the private sector IPP pays more than the public sector, the GoJ received more social security contributions and a marginal income tax as most of the workers are exempted from paying income. The IPP workers, both male and female, benefited from the net wage increase than the counterfactual scenario. However, the construction workers, both male and female, lost because the public sector would have paid more for the low-skilled workers, but as discussed earlier, they tended to be poor and thus, would have been better off than unemployed.

83. The financial analysis showed the financial viability of the IPP with a sufficient annual debt service coverage ratio (ADSCR) and an illustrative financial internal rate of return of 8 percent with an NPV of JD 7 million discounted at a rate of return on equity of 5 percent real and a levelized AES cost JD 0.003 per kWh or US\$0.004 per kWh.

84. **Efficacy is rated Substantial.** The project objectives were ambitious but measurable through the outcome indicators. All indicators related to project design and commissioning were achieved on time and within budget. All indicators pertaining to operational performance and impact of operations were achieved and pose low risk for future performance. The World Bank Guarantee (PRG) objective to bring private sector involvement in the power generation sector was also fully achieved.

Assessment of the Guarantee in Support of the Project

85. **The project would probably not have been bankable without World Bank PRG (and other international financial institution) support.** During the project design, it was established that Jordan had an unproven track record in attracting large-scale private investments in the power generation sector. The commercial lenders saw Jordan as a risky destination for investment with perceived sovereign risks (the risk that a government could default on its debt [sovereign debt] or other obligations. This risk is generally associated with investing in a particular country or providing funds to its government). Hence for the project to reach fruition, the commercial bank lenders to the project saw the World Bank's role as critical in providing relief to the private sector (through risk-mitigation measures). Additionally, the lenders also found comfort in the presence of other international financial institutions, bilateral donors, and export credit agencies. The World Bank's role was also essential to ensure that the potential adverse environmental impacts of the project were fully addressed.

86. **PRG lowered the overall cost of financing.** AES Jordan Holdco (project company) agreed that the presence of the World Bank Guarantees helped improve their terms of financing (details of which are private information privy only to the project company and their lenders). The lack of guarantees may have resulted in a higher PPA price, which would otherwise have been passed on to NEPCO/electricity consumers.

87. **PRG ensured right participation.** Internationally renowned investors with significant experience in power project development and operations were involved with the Amman East Power Plant Project, in part due to the risk mitigation that the PRG provided. Coupled with one of the largest and most experienced sponsors and EPC contractors, the project went through a rigorous due diligence, sound design, and efficient operations process. Most importantly, the Government was also committed to the success of the project since the beginning. The contractual structure helped NEPCO honor its payment obligations to AES despite a severe deterioration of the sector finances and power supply crisis.

88. **The World Bank Guarantees (PRGs), in a limited but significant way, also contributed to the sector reform dialogue** by helping establish an enabling and sustainable framework for private power projects and by raising the awareness of the stakeholders in the Government toward the need for sector reform.

89. **Key issues or events that may arise in the future could lead to a potential call on the guarantee.** The overall guarantee risk was considered substantial at the time of the last supervision mission (2012) due to the likelihood of continuing input gas supply interruptions causing NEPCO's financial situation to worsen and potentially result in NEPCO defaulting on PPA payments, thus leading to a call on the guarantee. However, given that (a) NEPCO has always made PPA payments on time despite its financial situation and (b) NEPCO's financial situation has improved (lower losses and current account deficit than anticipated, projected cost recovery in 2018) due to savings on lower oil prices and Jordan's transition to LNG as primary fuel, the risk of a potential call of the guarantee is diminished. However, since the project still has. Hence, the remaining risk of a call on the PRG should be moderate.

90. The PRG's remaining exposure amounts to about US\$28.238 million out of the original US\$45 million. The principal risks that could lead to a call on the PRG are discussed in table 4.

Table 4. Guarantee Coverage Risk Ratings and Justification

Guarantee Coverage Risk Ratings	2007	2008	2010	2011	2012	Now	Justification
Overall risk rating	M	M	M	S	S	M	NEPCO's historical performance, improving financial situation, over 6 years of stable plant operations, higher energy security in Jordan.
Forex convertibility and transferability	M	M	M	M	M	M	NEPCO has always made punctual monthly PPA payments on the 10th of each month. The payments are made in U.S. dollars based on a fixed exchange rate according to the invoice calculation formula.
Payment obligation of Government/agency	S	S	S	S	S	S	NEPCO's historical performance even during long periods of gas supply disruptions has been prudent.
Input supply obligation of Government/agency	M	M	M	M	M	M	A mature, more autonomous regulator. Low oil prices reduce tariff burden currently and in the near future.
Regulatory undertaking of Government/agency	S	S	S	S	S	S	Stable political regime in Jordan.
Political force majeure	M	M	M	M	M	M	
Change in law	M	M	M	M	M	M	

Guarantee Coverage Risk Ratings	2007	2008	2010	2011	2012	Now	Justification
Natural force majeure events of Government/agency	M	M	M	M	M	M	Low likelihood of such events.
Enforcement of security	M	M	M	M	M	M	

3.4 Justification of Overall Outcome Rating

Rating: Satisfactory

91. The overall outcome of the project is rated Satisfactory for the following main reasons:

- (a) **Relevance of the PDOs, design, and implementation is high.**
- (b) **Efficiency is rated High based on the economic and financial analysis** that demonstrated robust results and justified the private sector project against the counterfactuals. **Efficacy is also rated Substantial** as at the time of evaluation, the project had fully achieved the ambitious project outcomes and the outcomes have been desirable and relevant for Jordan.
- (c) **Summary development objective rating and overall implementation progress** has consistently been rated Satisfactory throughout the life cycle of the project (measured through ISRs and Aide Memoires)

3.5 Overarching Themes, Other Outcomes, and Impacts

Not applicable.

3.6 Summary of Findings of Beneficiary Survey and/or Stakeholder Workshops

Not applicable.

4. Assessment of Risk to Development Outcome

Rating: Moderate

92. Table 5 details the evaluation and rating of risks, at the time of writing the ICR, that development outcomes will not be maintained or realized.

Table 5. Risk to Development Outcome

Risk	Rating	Evaluation
Electricity retail tariffs may not be able to cover the cost of supply due to gas price fluctuations and currency devaluation.	Moderate	<p>Geopolitical events (Arab Spring) caused long periods of gas supply disruptions in Jordan adding financial and operational pressure on NEPCO, as it bears the fuel cost and fuel delivery risk.</p> <p>To reduce such external supply shocks, Jordan has invested in energy security and fuel diversification measures, such as inaugurating an LNG terminal at the port of Aqaba to enable LNG imports and developing renewable energy capacity.</p>

Risk	Rating	Evaluation
		Jordanian currency is pegged to the U.S. dollar and is stable with similar outlook.
Inadequate sector reform risks resulting in lack of enabling environment for private sector participation	Negligible to Low	Jordan has embarked on a successful IPP program in generation. Enabling environment for private sector participation exists in Jordan.
Single customer risk (NEPCO) resulting in no alternative market for the project	Moderate	NEPCO has never missed a PPA payment and a collaborative working relationship exists between AES Jordan and NEPCO. The risk, although substantial on its own, is moderate due to the past prudent performance of NEPCO for over 6 years.
Delays in construction risk of associated infrastructure	Negligible to Low	Construction of the associated infrastructure was completed on time. Risk no longer exists.
Construction delays by the project company resulting in power shortages	Negligible to Low	EPC contractor completed construction on time resulting in timely financial close. Risk no longer exists.
Potentially unaffordable contingent liabilities in the system	Moderate	According to the latest IMF mission, contingent liability risks to the public sector are expected to be contained. With continued technical assistance from the World Bank, the recently adopted public investment decisions process, which follows best practice, should be made fully operational.
Call on the World Bank PRG due to nonpayment of NEPCO or due to political force majeure	Moderate	Low probability of currency devaluation, gradual fiscal consolidation combined with prudent monetary policy and good performance on financial reforms (according to the IMF). With the unlikely scenario of political instability, strong payment record of NEPCO even during gas supply disruptions and since natural force majeure would not result in termination of PPA—risk of call on the World Bank Guarantee is Moderate.

5. Assessment of Bank and Borrower Performance

5.1 Bank Performance

(a) Bank Performance in Ensuring Quality at Entry

Rating: Satisfactory

93. The World Bank's performance rating in ensuring quality at entry is governed by the following dimensions:

- The World Bank identified the project consistent with the GoJ and World Bank priorities, got the GoJ on board with the right instrument (PRG) to bring private investment in (through IPPs), facilitated preparation by incorporating lessons learned, and ensured a competitive and transparent bidding process. The World Bank also ensured coordination between the government entities and the private sector (sponsors, lenders).
- The World Bank ensured that the PDO was relevant, and had most outcome indicators that were measurable and relevant although the phrasing of the PDO could have been improved to either not include aspects that were probably too broad. Although the PDO was ambitious, its achievement (related to the power plant) was still largely within the scope of the implementing authorities.

- The World Bank clearly laid out the critical risks and controversial aspects of the project along with comprehensive mitigation measures. The World Bank ensured rigorous Environmental Category ‘A’ assessment and had a robust Resettlement Action Plan (RAP) in place along with an M&E framework with proper reporting and monitoring.
- The PRG, by design, only covered a portion of termination payment resulting from very well-defined conditions. This package offered the private sponsors just the right amount of risk-mitigation comfort (from government nonperformance risks) to apply for the project while maintaining prudent risk sharing between all parties.
- The World Bank conducted an economic analysis that supported the project being part of the least-cost expansion plan for the power sector, conducted a financial analysis to see the project’s impact on the sector, and identified risks and mitigation measures.

(b) Quality of Supervision

Rating: Satisfactory

94. The World Bank’s performance rating is governed by the following dimensions:

- The World Bank carried out the annual supervision missions in 2009, 2010, 2011, and a final supervision mission in November 2012 (on the third anniversary of commercial operations of Amman East) checking on the power plant’s progress post full commercial operations. Aide Memoires were submitted after every mission (spanning power plant operations, associated infrastructure, critical issues, gas supply and NEPCO’s financial situation, and pending issues). ISRs were generated regularly to report on PDO achievements, critical issues, and risks, including risk of a call on the World Bank PRG.
- The World Bank obtained and reviewed quarterly reports on plant operations, annual reports on environmental and social safeguard issues, and compensation related to involuntary settlement. The World Bank took up unresolved issues (sales tax) and other concerns (delay in compensation) with the Government proactively.
- The World Bank closely monitored NEPCO’s financial situation and also structured future interventions related to it. The World Bank also provided technical assistance support to Jordan related to energy security and fuel diversification options toward renewable sources, stemming from gas supply constraints during the ‘Arab Spring’.

(c) Justification of Rating for Overall Bank Performance

Rating: Satisfactory

95. The World Bank’s performance at entry was rated Satisfactory and the World Bank’s performance during supervision was also rated Satisfactory. Hence, the overall performance of the World Bank is rated Satisfactory.

5.2 Borrower Performance

(a) Government Performance

Rating: Satisfactory

96. The Government's performance in ensuring project implementation and its role in the broader sector and country operations and initiatives is governed by the following dimensions:

- **The Government endorsed a new concept and demonstrated commitment and intent.** The GoJ, in its attempt to open the power generation to the private sector adopted a BOO framework, learned from past failed deals, included PRG as a risk-mitigation option in the bid package, and conducted a transparent and competitive bid process.
- **The GoJ coordinated efforts and had a good relationship with stakeholders.** During the design stage, MoPIC had a nodal role in coordinating all the ministries and NEPCO's efforts toward timely financial close and execution.
- **The GoJ provided adequate support to the World Bank** in relation to the project's design, implementation, and supervision activities.

(b) Implementing Agency or Agencies Performance

Rating: Satisfactory

NEPCO

- **NEPCO completed the construction of all transmission-related associated infrastructure on time.** NEPCO set up a joint committee with the project company and held quarterly meetings to ensure project coordination. In talks with the ICR team, the project company expressed satisfaction with NEPCO's performance throughout the project life.
- **NEPCO ensured timely progress and honored contractual obligations.** NEPCO has always made timely PPA payments (10th of each month), with no disputes. NEPCO also ensured adequate fuel (DFO) supply to the project during long gas supply disruption periods despite the ensuing huge financial distress. NEPCO always maintained transparent accounting of its finances with the World Bank and the public. Although it was delayed due to arbitration, compensation to all displaced landowners was provided. Another long-delayed issue of sales tax waiver between the project company and NEPCO has now been resolved. NEPCO has also, to date, found no material environment and social-related issue pertaining to the associated infrastructure.

AES Jordan PSC

- (a) AES Jordan absorbed the necessary (commercial risks during pre-construction, construction stages) risks and achieved financial close and commercial operations on time. The developers followed prudent financial, environmental and social, and operational reporting. According to the performance indicators, the project was one

of the most cost-effective generators in the country with a availability factor over 95percent. The project company ensured compliance with all contractual agreements, including emission requirements (especially NO_x levels) despite operating on backup fuel for extended periods between 2010 and 2015, by investing additional US\$2 million on swirlers. NEPCO has maintained that the project company has operated the plant very efficiently and that they have no issues with their performance so far.

- (b) AES Jordan undertook substantial self-initiated voluntary activities for the betterment of nearby villages and communities. AES is also a sponsor for the third IPP in Jordan.

(c) Justification of Rating for Overall Borrower Performance

Rating: **Satisfactory**

97. The implementing agency's performance is rated as Satisfactory as the performance of both implementing agencies is rated Satisfactory.

6. Lessons Learned

98. **Strong government commitment and support needed for success.** The Government showed real intent to attract private sector in power generation, included PRG in the pre-bid package (signaling intent), conducted competitive and transparent bidding, and completed the construction of associated infrastructure on time to ensure timely COD. In addition, sector reforms were implemented in Jordan, though at a slow pace.

99. **Geopolitical factors can undermine even a well-designed project.** The disruption of gas supply from Egypt due to the Arab revolution could not have been predicted. Continued long-term disruptions put Jordan's whole plan of transitioning from a HFO-reliant country to a gas-reliant one, with regard to fuel, in jeopardy. Despite the 30-year agreement between the two governments, supply vulnerability should have been anticipated in the historically unstable neighborhood.

100. **In the right context, the World Bank Guarantees are an important tool to mobilize private sector financing and improve overall sustainability of the project.** Before the Amman East Power Plant Project, Jordan had limited access to international funding in power projects because of its perceived political risk. Several private sector deals in the power generation sector failed to materialize due to a variety of factors, including the GoJ's perceived risk of nonperformance. The IBRD PRG played a significant role in attracting commercial funding for the project by making the risk profile acceptable to a wider group of lenders, given the constraints faced by the country during the project preparation time. It is on record that the project might not have materialized without the risk mitigation that the World Bank provided. Given the World Bank's recent focus on Maximizing Finance for Development (MFD) – instruments like the guarantees can be an important tool to attract private financing in countries that have relatively robust macro-fiscal and sectoral ecosystems.

7. Comments on Issues Raised by Borrower/Implementing Agencies/Partners

(a) Borrower/implementing agencies

Not applicable

(b) Co-financiers

Not applicable

(c) Other partners and stakeholders

Not applicable

Annex 1. Project Costs and Financing

(a) Project Cost by Component (in US\$, Million equivalent)

—	Project Cost (during Board)	Project Cost (At Financial Closing)
Capital costs	246	246
Initial reserves	30	30
Financing costs/development	24	24

(b) Financing

Description	As Approved	At Financial Closing	Actual/Latest Estimate
JBIC	110	110	110
OPIC	70	70	70
SMBC	45	45	45
AES Oasis Ltd	45	45	45
Mitsui & Co. Ltd	30	30	30

Annex 2. Outputs by Component

1. The Amman East Power Plant Project had one component (a 370 MW gas-fired combined-cycle power station to be developed, owned, and operated by a private sector project company). The output indicators under the project related to financial close date, implementation progress, and commissioning test and trial run results. Progress on the outputs, as well as detailed project outcomes and intermediate project outcomes are present in table 2.1.

Table 2.1. Project Outcome and Intermediate Outcome Indicators and Results

Project Outcome Indicators	Baseline	Target (Annual)	2009 (target)	2010	2011	2012	2013	2014																								
1. Cost of energy supply (power plant)	US¢4.3 per kWh	Above baseline	US¢6/k Wh	US¢5.8/k Wh	US¢7 .6 /kWh	US¢16/k Wh	US¢18/k Wh	US¢20/k Wh																								
			Achieved. Average cost of energy supplied from Jordan's power system (average tariff purchased by the transmission company) ranged from US¢6 per kWh to US¢20 per kWh between 2008 and 2014. This was always (except 2009) higher than tariff of Amman East Power Plant project at:																													
			<table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33.33%;"></th> <th style="width: 33.33%; text-align: center;">Amman East</th> <th style="width: 33.33%; text-align: center;">Avg purchase price</th> </tr> </thead> <tbody> <tr> <td>2008</td> <td style="text-align: center;">6.1</td> <td style="text-align: center;">6.4</td> </tr> <tr> <td>2009</td> <td style="text-align: center;">5.7</td> <td style="text-align: center;">5.6</td> </tr> <tr> <td>2010</td> <td style="text-align: center;">3.7</td> <td style="text-align: center;">7.4</td> </tr> <tr> <td>2011</td> <td style="text-align: center;">10.6</td> <td style="text-align: center;">15.8</td> </tr> <tr> <td>2012</td> <td style="text-align: center;">15.9</td> <td style="text-align: center;">17.7</td> </tr> <tr> <td>2013</td> <td style="text-align: center;">12.4</td> <td style="text-align: center;">17.6</td> </tr> <tr> <td>2014</td> <td style="text-align: center;">17.9</td> <td style="text-align: center;">19.3</td> </tr> </tbody> </table>							Amman East	Avg purchase price	2008	6.1	6.4	2009	5.7	5.6	2010	3.7	7.4	2011	10.6	15.8	2012	15.9	17.7	2013	12.4	17.6	2014	17.9	19.3
	Amman East	Avg purchase price																														
2008	6.1	6.4																														
2009	5.7	5.6																														
2010	3.7	7.4																														
2011	10.6	15.8																														
2012	15.9	17.7																														
2013	12.4	17.6																														
2014	17.9	19.3																														
2. Emission levels (power plant)	NO ₂ SO ₂ Particulates	100 micro g/m ³ 125 micro g/m ³ 70 micro g/m ³	Below baseline levels	27.47 micro g/m ³ 2.98 micro g/m ³ <70 micro g/m ³	39.70 micro g/m ³ 23.92 micro g/m ³ <70 micro g/m ³	40.75 micro g/m ³ 49.21 micro g/m ³ <70 micro g/m ³	39.20 micro g/m ³ 22.36 micro g/m ³ <70 micro g/m ³	53.18 micro g/m ³ 18.02 micro g/m ³ <70 micro g/m ³																								
			Particulate levels went above target values in 2009 due to a sandstorm in Jordan, unrelated to the plant operations.																													
3. Availability factor (power plant)	95 percent	95 percent	95.91 percent	95.91 percent	95.91 percent	95.91 percent	95.91 percent	95.91 percent																								
			Due to continued use of DFO in the plant instead of natural gas due to supply disruptions for an extended period, the capacity factor of the plant has been as follows: 2010: 79.49 percent 2011: 54.57 percent 2012: 38.33 percent 2013: 63.60 percent 2014: 47.77 percent																													

Project Outcome Indicators	Baseline	Target (Annual)	2009 (target)	2010	2011	2012	2013	2014
2. Reserve margin (power system)	20 percent	Greater than 10 percent	18 percent	23 percent	29 percent	24 percent	11 percent	43 percent
Intermediate Outcome Indicators								
1.Financial Close date	<i>None, without power plant</i>	Year1: Financial close	Achieved. Project reached financial close in March 2007					
2.Implementation progress	<i>None, without power plant</i>	Year1: Financial close Year 2: Simple cycle plant commissioned Year 3: Combined cycle plant commissioned	Achieved. Project commenced commercial operations in August 2009 with simple cycle and with combined cycle in 2010, all according to schedule.					
3.Commissioning Test Results and	<i>None, without power plant</i>	Year 1: None Year 2: 246MW commissioned Year 3: 370 MW commissioned	Achieved. Project commissioned 370 MW according to schedule.					
4. Trial test results	<i>None, without power plant</i>	Achievement of trial results	Achieved. Trial test results were successful.					

Note: a. Because fuel costs and fuel supply risks were borne by NEPCO according to contractual agreements, long periods of gas supply disruptions coupled with higher DFO (backup fuel) costs did cause financial distress to NEPCO during the ‘Arab Spring’ disruptions.

2. A full-fledged ESIA report was developed by following the requirements for a Category ‘A’ project. The evaluation report on the sponsor confirmed that the project and associated infrastructure (gas and water pipelines) would not create an unacceptable impact on the environment, in isolation, or with potential future developments within the project’s sphere of influence. Quarterly operating reports covering the following aspects of environmental assessment have been received and monitored by the World Bank since COD and have been found to be compliant with Jordanian and World Bank standards. Details of safeguards-related concerns, their compliance, and progress are listed in table 2.2.

Table 2.2. Safeguard issues and Compliance

Safeguards and Related Concerns		Compliance and Progress
OP 4.01: Environmental Assessment	<i>Air quality</i>	Use of hybrid dry low NO _x burners to ensure that NOx levels in accordance with World Bank and Jordanian requirements, with continuous monitoring for NO _x , SO _x , O ₂ , and CO ₂ levels. Addition of swirlers at extra US\$2 million cost to further comply with NO _x level requirements. Stack height of 45 m and stack gas temperature of 120°C to ensure good dispersion.
	<i>Water quality and soils</i>	Measures in place to prevent potential leakage of storage tanks, floods and dispose waste and hazardous substances. Regular monitoring in place.
	<i>Noise</i>	Measures in place to reduce noise from plant machinery with regular monitoring.
	<i>Ecology</i>	Measures in place to monitor removal of natural vegetation, industrial waste, to avoid disturbance or destruction to wildlife, birds, and plants with satisfactory monitoring.
	<i>Visual impact</i>	Measures in place to provide high standard of visual amenity, directional lighting to minimize light pollution and screening for local receptors with satisfactory monitoring.
	<i>Traffic and infrastructure</i>	Measures in place for plant operation traffic, vehicle emissions, and traffic management with satisfactory monitoring.
	<i>Socioeconomics</i>	Worker rights (Labor law No. 51, 2002) are complied with and monitored. Measures in place for drinking water, hygiene, communications, and complaints with proper monitoring.
	<i>Safety</i>	Measures in place for community (trespassing, construction material), health (during plant operation and transport), and general safety (fire, equipment, first aid, and so on) with satisfactory monitoring.
OP 4.12 and Annex A: Involuntary Resettlement	<p>Project complies. The power plant is located on land that is leased from the Government for 25 years. A NEPCO task force, comprising members from various departments, prepared a RAP, in form of an LACP. The document was reviewed comprehensively and found to be acceptable.</p> <p>As of October 2012, NEPCO had paid approximately JD 3.9 million for substation land compensation and JD 1.3 million for transmission line access rights. Seven land owners had been awaiting court decision for compensation. Time taken for compensation was in line with prior experience. As of 2016, all issues related to compensation were resolved and there are no pending issues.</p>	
Disclosure of Information Policy	<p>Project complies. The project has allowed for full and proper public disclosure to Government ministries/agencies, nongovernmental organizations, and members of the general public in the ESIA process for the proposed Amman East IPP Project. It has been found that the Amman East IPP has been fully compliant with the relevant Jordanian and World Bank standards and requirements.</p>	

Annex 3. Economic and Financial Analysis

A. Economic Analysis

1. An ex post economic analysis of the Jordan Amman East Power Plant Project updated the ex ante economic analysis at project appraisal. Major updates were the following: the appraisal analysis covered US\$276 million or 92 percent of the total project cost of US\$300 million (page 35, pages 45–46 of the PAD). This ex post analysis covered US\$292 million or 100 percent of an estimated total project cost of US\$292 million. The ex ante analysis assessed an NPV to NEPCO and used an average tariff as a proxy for economic benefits. This ex post analysis assessed an NPV to the society, that is, economic NPV which was further disaggregated into a financial NPV and externalities or stakeholder impacts NPV with distribution analysis (for example, tax impact, net labor benefits, and so on), using a cost-benefit analysis comparing with actual and counterfactual scenarios (with or without project).⁹ The stakeholder analysis identified which particular segments of society reap the benefits and which ones, if any, lose from the implementation of the plant. The stakeholder analysis of any project builds on the following relationship:

$$P_e = P_f + \sum_{i=1} E_i,$$

where P_e is the economic value of an input or output;

P_f is the financial value of the same variable; and

$\sum E_i$ is the sum of all the externalities that make the economic value different from the financial value of the item.

2. In other words, the economic value of an item can be expressed as the sum of its financial price plus the value of externalities, such as taxes, tariffs, consumer/producer surplus. On the basis of this identity, the following relationship also holds, if a common discount rate is applied, which in this case 5 percent discount rate according to the new World Bank policy:

$$NPV_e^{EOCK} = NPV_f^{EOCK} + PV^{EOCK} \left(\sum Ext_i \right),$$

where NPV_e^{EOCK} is the net present value of the net economic benefits;

NPV_f^{EOCK} is the net present value of the financial net cashflow; and

$PV^{EOCK} \left(\sum Ext_i \right)$ is the sum of the present value of all the externalities generated by the project.

3. This ex post analysis assumed two counterfactual scenarios, which address the project's main objective to meet the electricity needs of the country in an economically and environmentally sustainable manner to contribute to economic growth and well-being of the population of Jordan.

4. The first counterfactual scenario reflects that regardless of financing sources of whether public or private financing, what would have happened if the Amman East Power Plant project did

⁹ For methodologies, see, for example, World Bank, 1996. Handbook on Economic Analysis of Investment Operations, by P. Belli, J. Anderson, H. Barnum, J. Dixon and J. Tan, World Bank, Operations Policy Department; Asian Development Bank. 1997. Guidelines for the Economic Analysis of Projects; World Bank, 2008. Program on Cost-Benefit Analysis on Economic Analysis/Project Appraisal. World Bank, Washington DC, USA, April 21 – 25, 2008.

not exist. In this counterfactual scenario, the existing power plants, including those that operated with more expensive and polluting HFO and DFO, would have increased power generation to compensate the power generation that was expected from the Amman East IPP, to avoid power shortage. This reflects evidence that during the natural gas import disruption from Egypt in 2010–2015, the GoJ did not allow power shortage and instead promoted power plants in Jordan to use more expensive DFO and HFO.¹⁰ Alternative options to import electricity from Egypt, Syria, and/or other countries were limited and expensive. Accordingly, this ex ante analysis assessed the cost-benefit of potential fuel saving and associated environmental externalities (for example, environment, including CO₂, CH₄, NO₂, NO_x, SO₂, PM) and other externalities (subsidies, taxes, social security contribution, and so on) and labor, including gender-differentiated costs/benefits.

5. The second counterfactual scenario reflects what would have happened if no IPP had been interested in the Amman East Power Plant Project and the foreign private sector financing had been unavailable. This scenario was associated with what would have happened if no IBRD guarantee had been available. There was another gas combined cycle gas turbine power plant (Samra power) of SEPCO that was developed before Amman East IPP. Samra was supposed to be an IPP, but because the project development as an IPP was not successful, the GoJ decided to develop it as a public sector project. Based on this Samra power project's actual example of what happened when an IPP model did not move forward at the time, one counterfactual scenario would be that the East Amman Power Project would have been financed by the GoJ. In this counterfactual scenario, insufficient data and evidence to analyze and compare the performance between private and public power plants in Jordan were available. The technical performance of the power plant would have not have been significantly different between actual and counterfactual scenarios (that is, IPP versus quasi State Owned Enterprise) as evidenced by available data comparisons of SEPCO, CEGCO, and Amman East AES IPP, but non-technical performance and strategies would have been different. One of the likely differences would be the salary and benefits of the employee because, in Jordan, the public sector pays more for employee at lower-level jobs than the private sector, pays less for employees at higher-level jobs than the private sector, and provides more employee benefits than the private sector.¹¹ This ex post analysis examined this employment cost-benefit and associated externalities (for example, tax and social security contribution). The most benefit would have been the increased public sector expenditure for social welfare spending, because the GoJ would not have the need to finance the East Amman Power Plant Project.

6. This ex post analysis estimated economic values, such as FEP, shadow wage rate using a supply price approach,¹² and so on and converted financial values to economic values accordingly. The ex ante analysis used a discount rate of 10 percent. Following the new World Bank policy, this ex post analysis used 5 percent discount rate. As much as possible and when available, actual

¹⁰ For example, this limited electricity import was noted in the PAD (page 8) and NEPCO Annual Report 2012 (pages 12–13) and an electricity import from Syria stopped from 2012. NEPCO's Annual Reports during 2007–2014 showed that purchase prices of electricity import from Egypt and Syria were higher than those of SEPCO, CEGCO, and Amman East AES IPP when these domestic power plants used natural gas imported from Egypt. However, during the disruption of natural gas import from Egypt in 2011, when the natural gas import price increased and the domestic power plants increased use of DFOs and HFOs, the electricity import price from Egypt was sometimes cheaper than domestic power plant electricity prices.

¹¹ ILO (International Labor Organization). 2010. A Comparison of Public and Private Sector Earnings in Jordan. Professor Christopher Dougherty London School of Economics. Geneva: ILO.

¹² For methodologies, see, for example, Jenkins, G., and A. Klevchuk. 2006. "Appraisal of El-Kureimat Combined Cycle Power Plant"; Jenkins G. P, C. Y. K Kuo, and A.C. Harberger, 2011. "Cost-Benefit Analysis for Investment Decisions: Chapter 12 (The Economic Opportunity Cost of Labor)." Discussion Papers 2011–2012, JDI Executive Programs.

data were used for 2007–2015 from annual reports and financial statements of AES Jordan, NEPCO, SEPCO, CEGCO, MoEMR, and EMRC. When actual data were not available, estimates were made from secondary data for 2007–2015 and also the projections up to the end of the project period in 2027 were estimated. Major parameters and assumptions used for economic and financial analysis are presented in table 3.1.

Table 3.1. Major Parameters and Assumptions

AES Generation capacity factor (CF) after 2016	80%	Economic life (years) - straight-line depreciation, salvage value assumed to be zero:								
AES Annual reduction of CF after 2016	1%			Amman East Power Station and Office:						
AES Auxiliary consumption and loss (%) after 2015	2%			Civil works				40		
AES Natural Gas BTU/kWh after 2016, No diesel generation	7,888		Gas turbine generator			25				
AES Operating water expenses used SEPCO after 2009 average 2007–2009 JD 2007 prices	0.00002		Steam turbine generator			40				
AES transported water used SEPCO after 2009 average 2007–2009 JD 2007 prices	0.0001		Heat recovery steam generator			40				
AES replacement	7,827	BTU/kWh		Switchyard 40						
EPC, maintenance, generation supplies, and consumables financing ratio: Local 23%, foreign 77%			Water treatment plant			40				
			Main equipment is gas turbine (4 GTs and 1 ST); hence 25 years assumed							
			Other office equipment, computers, vehicles, leasehold equipment, and so on. 5							
AES Operating and Administrative Costs from 2016 used average of 2010–2015						Associated Infrastructures:				
AES Major Maintenance (US\$ 2012 price) 2020, 2025	18,000,000			Transmission line			30			
				Natural gas pipeline			25			
				Water pipeline			70			
Illustrative Purpose AES Interest Rate used OPIC's 5.94% (4.44% plus 1.5% spread) (US\$)										
Commitment charge (%)	0%			The O&M costs of associated infrastructures, such as electricity transmission and distribution, natural gas transportation and water transportation, use, and consumption were estimated but due to lack of data, assumed to be similar between the actual and counterfactual scenarios and hence these costs were off set between the scenarios.						
Start of Grace Period		2,008								
Grace Period		2								
Start of repayment		2,010								

Number of annual repayments		17																																
Last repayment		2,026																																
Total Debt (USD)		224,937,901																																
Economic and Financial Discount Rates		5%																																
Water Pipeline O&M/Pipeline costs	0.01	(major maintenance every 5 years double the costs)	0.01	<i>Source:</i> San Diego Government, USA, Section 5 Full-Scale Facility Estimated Costs.																														
Natural Gas O&M /Pipeline costs	0.01	(major maintenance every 5 year double the cost)	0.02	<i>Source:</i> Chyong, C. K., P. Noel, and D. M. Reiner. 2010. "The Economics of Nord Stream Pipeline System."																														
LNG import 2015 price USD/MMBTU (Shell contract estimates)	9.14	The price of the LNG under the signed contracts is indexed to oil prices	LNG tax rate from February 2016												16%																			
Egypt Netback Value of Natural Gas Exports, derived from: LNG Price (US\$/GJ) = 0.1567 × Crude Oil Price (US\$/bbl) + 0.79		<i>Source:</i> Jenkins, G., and A. Klevchuk. 2006. "Appraisal of El-Kureimat Combined Cycle Power Plant."																																
Processing cost in 2007 US\$ prices	3.53	Shipping cost not available																																
Natural gas financial prices US\$2.225/MMBTU for 2007–2011 and after 2012 US\$5/MMBTU (nominal prices)		<i>Source:</i> http://impatientbedouin.com/egypt-and-jordan-is-it-really-all-resolved/																																
Financial prices of DFO and HFO based on annual reports of CEGCO and MoEMR and their websites. Economic prices of DFO based on 130% of average crude oil prices from World Bank and IMF commodity data (130% was used in Promotion of a Wind Power Market ICR 2016, not necessarily followed DFO but was a better proxy). HFO was international prices based on National Institute of Statistics and Economic Studies http://www.insee.fr/en/bases-de-donnees/bsweb/serie.asp?idbank=001642883																																		
Economic Opportunity Cost of Labor (EOCL) Conversion Factor (CF)			EOCL CF/AES IPP wage	AES replacement (counterfactual) only engineer and technician will be expanded to generate more power				EOCL CF/Public wage																										
2015–2027			0.881	0.976				1.011																										
2014			0.883	0.978				1.013																										

2012–2013		0.885	0.980													1.006
2007–2011		0.892	0.987													1.021
Tuition fee (JD)	4,500		http://www.gju.edu.jo/content/tuition-and-fees-4819 ; http://www.philadelphia.edu.jo/tuition-and-fees													
Solar water heater or home system (JD)	200	Each														
Emissions																
CO ₂ JD/ton	7.09	CO ₂ US\$/ton	10		Conservative value, based on the World Bank Carbon Pricing Watch 2016											
CH ₄ global warming potential (GWP) for 100 years 21; NO ₂ GWP for 100 years 310					Source: http://unfccc.int/ghg_data/items/3825.php .											
	CO ₂ kg /TJ	CH4 kg/TJ	NO ₂ kg/TJ	SO ₂ g/GJ	NO _x g/GJ	PM, g/GJ	<i>Sources:</i> ESMAP Model for Electricity Technology Assessments (META); 2006 IPCC Guidelines for National Greenhouse Gas Inventories.									
Diesel	74,100	3.0	0.6	271.2	144.6	4.6										
HFO	77,400	0.8	0.3	231.0	195.0	16.0										
Natural Gas	56,100	1.0	0.1	0.7	93.3	0.1										
LNG	64,200	3.0	0.6	0.7	93.3	0.1										
NO _x Environmental and Social Impacts	JD/ton in 2007 prices	Premature respiratory		Adult chronic morbidity	Acute morbidity	Material soilings	Visibility reduction	Total								
	898	70%		10%	5%	10%	5%	100%								
Conservative value, compared to other estimates, for example, in ESMAP Model for Electricity Technology Assessments (META), estimated from using methodology in Asian Development Bank.(1996). Economic Evaluation of Environmental Impacts, A Work Book.																
PM environmental damage JD 2007 prices		1,588	<i>Source:</i> Lowest of value of India among USA, India, Romania from ESMAP Model for Electricity Technology Assessments (META)													
SO ₂ environmental damage JD 2007 prices		85														
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021–2027 (annual same%)	
FEP (%)	6	5	6	7	6	7	7	8	9	10	10	11	12	10%	8	

Note: BTU = British Thermal Unit.

7. Table 3.2 presents the summary of the results using the first counterfactual in 2007 prices. The estimated economic NPV was JD 339 million (US\$478 million) at 5 percent discount rate, which was an equivalent of 3 percent of GDP in 2007 and 2 percent of GDP in 2015 in Jordan. The estimated EIRR was 29 percent. While the scope and methodologies were different, the NPV and EIRR compared with the appraisal results of the NPV of US\$62 million and EIRR of 14 percent at 10 percent discount rate. Because this ICR analysis used the 5 percent discount rate following the new World Bank policy, to be more comparable with the appraisal that used 10 percent discount rate, the ICR's result using the 10 percent discount rate was US\$273 million (JD 194 million). An estimated leveled economic cost, that is, the present value of all investment and operating costs in economic prices over the present value of energy sent out from the plant, was JD 0.06 per kWh (US\$0.08 per kWh).

Table 3.2. Summary Results Using the First Counterfactual (JD 2007 prices)

Economic NPV: JD 339 million (US\$478 million)		EIRR: 29 percent			
Levelized economic cost: JD 0.06 per kWh (US\$0.08 per kWh)					
Jordan 2007 GDP		JD 12 billion	Jordan 2015 GDP		JD 19 billion
Economic NPV percent of GDP		3			2
Avoided CO ₂ e ton		Avoided SO ₂ ton	Avoided NOx ton		Avoided PM ton
7 (million)		14 (thousand)	5 (thousand)		600
CO ₂ e NPV (JD, million)		NO _x NPV (JD, million)	SO ₂ NPV (JD, million)		PM NPV (JD, million)
42		4	1		1
NOx Environmental and Social Impacts (million JD)					
Premature respiratory	Adult chronic morbidity	Acute morbidity	Material soilings	Visibility reduction	Total
70 percent	10 percent	5 percent	10 percent	5 percent	100 percent
2.7	0.4	0.2	0.4	0.2	3.9
Distribution of Impacts (JD, million)			Financial NPV	Externalities NPV	Economic NPV
Total			540.8	(201.9)	338.9
Amman East IPP investment cost			(149.1)	(5.8)	(154.9)
Fuel cost for power generation			408.1	(198.6)	209.5
Amman East IPP construction male labor cost			(2.6)	(0.6)	(3.2)
Amman East IPP construction female labor cost			(0.015)	(0.004)	(0.019)
Amman East IPP male labor cost			(21.2)	2.5	(18.8)
Amman East IPP female labor cost			(0.4)	0.1	(0.4)
Other power plants' labor cost			11.7	(0.2)	11.5
Donation to male local communities near Amman East IPP (university tuitions and solar home systems and water heaters)			(0.03)	—	(0.03)
Donation to female local communities near Amman East IPP (university tuitions and solar home systems and water heaters)			(0.05)	—	(0.05)
Other power supply costs (O&M, administrations, and so on)			294.4	0.9	295.2

Stakeholder distributional impacts (JD, million)					
		Jordan Governments/public at large	Male labor	Female labor	Egyptian Government/p ublic at large
	Externalities NPV	Taxes, subsidies, FEP, social security contributions			Natural gas subsidy
Total	(201.88)	(6.14)	0.003	0.02	(195.76)
Amman East IPP investment cost	(5.82)	(5.82)	—	—	—
Fuel Cost for power generation	(198.63)	(2.87)	—	—	(195.76)
Amman East IPP construction male labor cost	(0.64)	—	(0.64)	—	—
Amman East IPP construction female labor cost	(0.00)	—	—	(0.004)	—
Amman East IPP male labor cost	2.45	1.43	1.03	—	—
Amman East IPP female labor cost	0.05	0.03	—	0.02	—
Other power plants' labor cost	(0.16)	0.23	(0.38)	—	—
Donation to male local communities near Amman East IPP (university tuitions and solar home systems and water heaters)	—	—	—	—	—
Donation to female local communities near Amman East IPP (university tuitions and solar home systems and water heaters)	—	—	—	—	—
Other power supply costs (O&M, administrations, and so on)	0.86	0.86	—	—	—

8. The amount of avoided emissions of carbon dioxide equivalent (CO₂e), that is, greenhouse gases, including CO₂, NO₂, and CH₄, as well as SO₂, NO_x, and PM were significant. Table 3.2 shows the indicative avoided damage costs of these emission, including social and environmental damages of NO_x. Because these damage costs were subject to valuations methodologies, these damage costs were illustrative only. There were no detailed information on emission controls of each power plant such as selective catalytic reduction, flue-gas desulfurization, electrostatic precipitator, and so on, and sufficient actual emissions dispersion, dose and response data, and so on, were not available. Hence, these emission results were only to illustrate relative differences in the amount of emissions based on the fuel consumptions between the actual and counterfactual scenarios. As such, these environmental externalities were not included in the economic NPV of JD 337 and EIRR of 29 percent but including these environmental externalities would result in an NPV of US\$385 million with an EIRR of 33 percent.

9. Within the economic NPV of JD 339 million, the main economic benefits were from the fuel and other power supply related benefits. Fuel cost savings were mainly because in the counterfactual scenarios, more HFO and DFO were used, especially before SEPCO increased its capacity with natural gas and before the natural gas import disruption from Egypt in 2010 (when

both actual and counterfactual scenarios increased the use of diesel fuel). In particular, Hussain thermal power stations (HTPSs) used HFO and DFO, predominantly HFO. These HTPSs were old, understood to have operated at an efficiency of 28 percent, and ceased to operate in December 2015, pending decommissioning under a separate contract instructed by the owner, CEGCO. In 2016, ACWA Power proposed to develop a new 485 MW (net) gas-fired combined cycle gas turbine power plant, known as the ‘ACWA Power Zarqa Combined Cycle Gas Turbine Project’ within the existing landholding of the HTPS, located in Zarqa, Jordan. The ACWA Power Zarqa Project was developed due to the closure of the HTPS and the continued growth in electrical demand in Jordan.¹³ Because in the second counterfactual, these existing power plants would have operated at a higher capacity factor, outflows costs (operation and investing activities) per unit, that is, kWh, were reduced accordingly, based on an estimated proportional decrease in levelized costs using simple screening curves of each type of power plant. In 2010, the domestic available capacity would not have been able to meet the peak demand in the absence of the AES East Amman IPP, with the deficit of an estimated 129 MW for 17 GWh at the peak demand, which was estimated from the 2010 load duration curve. Although Egypt had limited available import capacity, this gap in peak demand was relatively small and was assumed to be imported from Egypt in the counterfactual scenario. The benefits of other power plants’ labor costs meant that the actual scenario did not need to increase the labor costs in the other existing plants but needed to pay for the labor in the AES IPP operation and construction (shown as negative in table 3.2). The local communities in the Amman East Power Plant areas (Al-Manakhar) benefited from the CSR efforts of the AES IPP. For example, the AES IPP sponsored six university students including four females and two males, installed solar PV for 100 houses, and distributed 100 solar water heaters, benefitting about 110 women of the total beneficiaries, which reduced the energy costs of these households, potentially helping, especially, women manage household expenditures (although no evidence-based expenditure data were available), and small carbon footprints. Many of the AES IPP CSR initiatives were targeted at women in the local community.¹⁴

10. The distributional impacts of the externalities among the stakeholders showed that labor, in particular, the AES IPP labor, including one female office manager, benefited the most due to the net increase in wages compared to counterfactual. This AES IPP labor benefit was because most of the workers were assumed to be skilled workers and in Jordan the private sector pays higher for the higher-level jobs than in the public sector.¹⁵ The GoJ benefited due to the increased social security contributions and marginal tax revenue increases, with some loss from FEP and fuel subsidies before the GoJ removed the fuel subsidies in 2012.¹⁶ The Egyptian Government was the largest loser because under the actual scenario, more imported natural gas was used until the natural gas import disruption from Egypt than the counterfactual and the import prices of natural gas from Egypt was heavily subsidized. According to a 2013 report, Egypt exported gas to Jordan at US\$5 per million BTU and at the same time, Egypt imported gas for over US\$10 per

¹³ Source: 5 Capitals Environmental and Management Consulting. 2016. Updated Environmental and Social Impact Assessment - Volume 1. July 2016.

¹⁴ Although not included in the economic analysis due to lack of data, the CSR efforts also included general maintenance for a village mosque, general maintenance for a village school, hosting a one-day free medical camp, blood donation campaign, and households’ demonstration of tips for home safety and best practices.

¹⁵ ILO (International Labor Organization). 2010. A Comparison of Public and Private Sector Earnings in Jordan. Professor Christopher Dougherty London School of Economics;

ILO. (International Labor Organization). 2013. “Decent Work Country Profile: Hashemite Kingdom of Jordan / International Labour Office.” Geneva: ILO.

¹⁶ International Monetary Fund (IMF). 2014. Jordan Selected Issues. June 2014.

million BTU.¹⁷ Until the new natural gas import prices from Egypt became effective in 2012, Amman received gas at prices less than half the international rate, which Jordan relied for over 80 percent of its electricity generation needs.¹⁸ The temporary construction workers, including 15 to 20 female laborers¹⁹ among 3,000 employed, for the Amman East Power Plant, lost because, in general, the public sector pays higher and provides more benefits for the low-level labor than the private sector, that is, AES IPP. Nevertheless, these temporary local construction workers were benefited because drawing on data from 2010, analysis of poverty by occupation of household head showed that poverty rates were highest among workers in the construction, service, agricultural, and transport industries.²⁰

11. The AES IPP maintains equal job opportunity in its policies and eases the way for women to get their chance in recruitment and training. Three women were trained in AES in 2016 to qualify them for their career path or graduation. All people in both genders are compensated according to a grading system where the compensation depends on the job description and work experience and competences. Women receive 10 weeks leave of absence for maternity and one hour leave for babysitting after the maternity leave. The AES IPP has been addressing gender equality and equity of the labor and other issues as noted in their CSR efforts.²¹

12. The sensitivity and risk analysis was carried out with a Monte Carlo risk simulation over 10,000 trials with the help of Crystal Ball software as summarized in table 3.3. The sensitivities of changes in crude oil prices, heat rate of the Amman East Power Plant after 2016, annual reduction of capacity factor of the Amman East Power Plant after 2016, and the capacity expansions cost of the other power plants after 2016 in the counterfactual scenario to the results were assessed. The sensitivity indicator is a ratio of the percentage change in the NPV to the percentage change in a selected variable. A high value for the indicator indicates project sensitivity to the variable. Switching value is the percentage change in a variable for the project's decision to change: for the NPV to become zero or the EIRR to fall to the cutoff rate. Because HFO and DFO have been historically following crude oil prices and Jordan's contract prices with Shell of LNG prices were indexed to the oil prices used in this analysis, the changes in crude oil prices may affect the results. The switching value of the crude oil price was 2.05, which meant that for an NPV to be 0, the annual crude oil price would need to be 2.05 times of the values used in this analysis. Accordingly,

¹⁷ Source: <http://platformlondon.org/2013/04/01/egypt-to-keep-exporting-gas-to-jordan-despite-energy-crisis-searching-for-imports/>.

¹⁸ Source: <http://mideastenvironment.apps01.yorku.ca/2011/10/as-egyptian-gas-supplies-stall-jordan-turns-to-iraq-jordan-times/>.

¹⁹ They were around 15 to 20 women directly involved in construction operations, employed in various positions, such as administration, finance, procurement and supply chain, human resources, engineering, and quality.

²⁰ ILO (International Labor Organization). 2013. "Decent Work Country Profile: Hashemite Kingdom of Jordan / International Labour Office." Geneva: ILO.

²¹ For a general discussion on employment opportunities for women in Jordan, see, Stefanie Brodmann, Irene Jillson, and Nahla Hassan. June 2014. "Social Insurance Reform in Jordan: Awareness and Perceptions of Employment Opportunities for Women." Social Protection and Labor" Discussion Paper Number 1402. World Bank, Washington, DC;

Stave, SveinErick, and Maha, Kattaa. 2015. Labour Force and Unemployment Trends among Jordanians, Syrians, and Egyptians in Jordan 2010–2014. Analytical Paper. International Labour Organization and Fafo Institute for Applied International Studies; ILO (International Labor Organization). 2010. A Comparison of Public and Private Sector Earnings in Jordan. Professor Christopher Dougherty London School of Economics.;

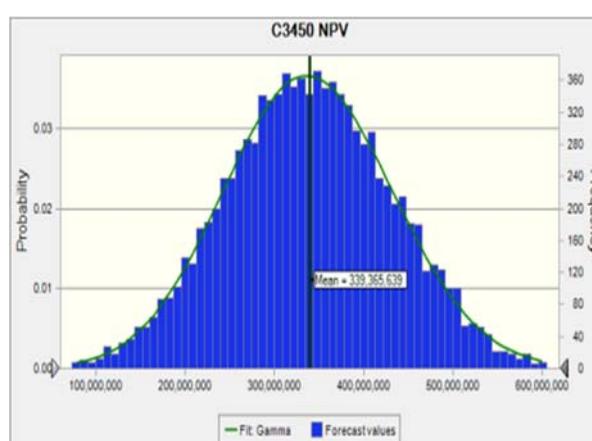
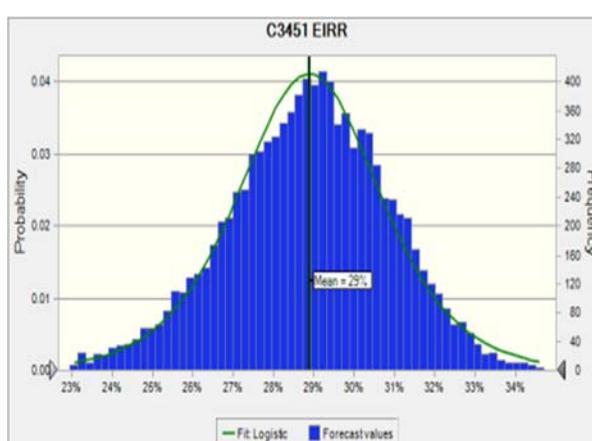
ILO (International Labor Organization). 2013. "Decent Work Country Profile: Hashemite Kingdom of Jordan / International Labour Office." Geneva: ILO;

ILO (International Labor Organization). 2010. "Pay Equity in Jordan." Policy Brief 9;

ILO (International Labor Organization). 2010. A Comparison of Public and Private Sector Earnings in Jordan. Professor Christopher Dougherty London School of Economics..

the sensitivity indicator of crude oil prices was -0.95 . The heat rate changes of the Amman East Power IPP were quite sensitive to the result, as the switching value is $11,989$ BTU per kWh against the base case of $7,888$ BTU per kWh and the sensitivity indicator is -1.92 . The annual reduction of the capacity factor of the Amman East Power Plant showed a switching value of 49 percent, which would be unlikely to happen and its sensitivity indicator was as low as -0.01 . The capacity expansion cost of the other existing plants in the counterfactual scenario showed a switching value of -0.47 , meaning that the investment activities in the outflow costs per kWh would have to be 47 percent less than the base case for the NPV to be 0 and its sensitivity indicator showed 0.68 . Even in the actual scenario, SEPCO had higher outflow costs (operation and investment activities) per kWh during the observed period of this Amman East Power Plant Project, due to SEPCO's high investment activities for capacity expansion.

Table 3.3. Sensitivity and Risk Analysis Using the First Counterfactual (JD 2007 prices)

	Crude Oil Prices	Heat Rate of AES IPP (after 2016)	Annual Reduction of CF of AES IPP (after 2016)	Capacity Expansion Cost Indexed to Outflow Cost (the other power plants after 2016 in the counterfactual scenario)
Switching value	2.05	11,989	49 percent	-0.47
Sensitivity indicator	(0.95)	(1.92)	(0.01)	0.68
Illustration of Changes in Values				
	Base case	Crude oil price 50 percent increase/year	Heat rate increase 40 percent	Annual reduction of CF 5 percent
EIRR	29 percent	15 percent	24 percent	29 percent
NPV (JD, millions)	339	178	78	307
Monte Carlo Analysis Results				
NPV  EIRR 				

13. The results of integrated risk analysis with the 10,000 Monte Carlo risk simulations, including all four valuables in the sensitivity analysis (crude oil prices, heat rate, annual reduction of capacity factor of the Amman East Power Plant in the actual scenario, and the capacity expansions cost of the other power plants in the counterfactual scenario), showed both the certainty of the NPV to be more than 0 was 100 percent and the certainty of EIRR to be more than 5 percent was 99.98 percent. The sensitivity of the NPV showed that the heat rate had the highest contribution to the variance at -79 percent, the capacity expansion was the second at 18 percent, the oil prices was the third at 2 percent, and the annual reduction in capacity factor had 1 percent contribution. On the other hand, the sensitivity of the EIRR showed that oil prices had the highest contribution to the variance at 57 percent, heat rate was the second at 34 percent, the capacity expansion had the third at 10 percent, and the capacity factor had the negligible contribution of 0.2 percent.

14. Table 3.4. shows a summary of results using the second counterfactual scenario. The main benefit would be the extra funding that the foreign private sector investment would bring to Jordan to increase power supply. This enabled the GoJ to spend that equivalent amount of the foreign investment in other social welfare activities such as public health, education, and persons with disabilities and other vulnerabilities, and so on, where the private sector may not be able to invest without the Government's support. Accordingly, the distributional impacts of externalities showed that the public at large in Jordan benefited the most due to the freed up public expenditure instead of the foreign private sector investment. Because the private sector IPP pays more than the public sector, the GoJ received more social security contributions and a marginal income tax as most of the workers are exempted from paying income tax. The IPP's workers, both male and female, benefited from the net wage increase than the counterfactual scenario because the private sector tends to pay higher for a high-level job than the public sector.²² The temporary construction workers, both male and female, had no changes in benefits and costs between the actual and counterfactual scenarios because they were informal workers and it was assumed that they not paying tax or social security. But these construction workers, both male and female, lost because the public sector, in the counterfactual scenario, would have paid more for these low-level workers than the private sector IPP.²³

Table 3.4. Summary Results Using the Second Counterfactual (JD 2007 prices)

	Financial NPV	Externalities NPV	Economic NPV
Total	132.4	7.2	139.6
Amman East IPP male labor cost	(2.4)	2.7	0.3
Amman East IPP female labor cost	(0.0)	0.1	0.0
Amman East IPP Construction male labor cost	1.3	(1.3)	—

²² ILO (International Labor Organization). 2010. A Comparison of Public and Private Sector Earnings in Jordan. Professor Christopher Dougherty London School of Economics;

ILO (International Labor Organization). 2013. "Decent Work Country Profile: Hashemite Kingdom of Jordan / International Labour Office." Geneva: ILO.

²³ ILO (International Labor Organization). 2010. A Comparison of Public and Private Sector Earnings in Jordan. Professor Christopher Dougherty London School of Economics;

ILO. (International Labor Organization). 2013. "Decent Work Country Profile: Hashemite Kingdom of Jordan / International Labour Office." Geneva: ILO.

	Financial NPV	Externalities NPV	Economic NPV	
Amman East IPP Construction female labor cost	0.01	(0.01)	—	
Public investment	133.6	5.7	139.3	
Stakeholder Distributional Impacts				
	Externalities NPV	Jordan Governments/public at large	Male Labor	Female Labor
		Taxes and social security contributions		
Total	7.17	7.30	(0.15)	0.02
Male Amman East IPP Labor Cost	2.71	1.57	1.13	—
Female Amman East IPP Labor Cost	0.06	0.03	—	0.02
Male Amman East IPP Construction Labor Cost	(1.28)	—	(1.28)	—
Female Amman East IPP Construction Labor Cost	(0.01)	—	—	(0.01)
Public investment	5.70	5.70	—	—

15. The assessment of the performance of Amman East Power Plant between the private sector actual scenario and the public sector scenario was not conducted because of lack of information. The performance of power companies varies in technical, financial, and organizational strategies. For example, table 3.4 illustrates the outflow costs, O&M costs (without fuel costs and investment activities costs), and installed capacity of power generation plants of the AES IPP, SEPCO, and CEGCO. Both the AES IPP and SEPCO had low O&M costs. In particular, the AES IPP had positive O&M costs partly because it received a finance lease payment from NEPCO. The investment activities affected the total outflow costs because SEPCO has high investment costs due to expansion of capacity, while the AES IPP has no increase. CEGCO also barely had investment costs and was shutting down old power plants while a new one was being planned, as noted earlier.

Table 3.5. Outflows without Fuel Costs and Capacity Comparisons among AES IPP, SEPCO, and CEGCO

Outflows Comparisons (nominal JD)	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average Shares (%)
AES Operation/kWh sold		0.016	0.004	(0.0037)	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	2.4
AES Investment/kWh sold		0.083	0.008	0.0038	(0.007)	(0.001)	(0.001)	(0.001)	(0.001)	97.6
AES total		0.099	0.012	0.0001	(0.010)	(0.004)	(0.004)	(0.004)	(0.004)	100.0
SEPCO Operation/kWh sold	0.001	0.007	(0.002)	(0.001)	0.020	0.006	0.001	0.002	0.005	20.7
SEPCO Investment/kWh sold	0.020	0.007	0.020	0.054	0.002	0.000	0.030	0.013	0.001	79.3
SEPCO total	0.020	0.014	0.017	0.053	0.022	0.006	0.032	0.015	0.006	100.0
CEGCO Operation/kWh sold	0.02	0.03	0.02	0.05	0.11	0.13	0.14	0.12		99.9
CEGCO Investment/kWh sold	0.0002	0.0001	0.0002	(0.0002)	(0.0001)	0.0000	0.0001	0.0001		0.1
CEGCO total	0.02	0.03	0.02	0.05	0.11	0.13	0.14	0.12		100.0
Capacity Comparisons	2007	2008	2009	2010	2011	2012	2013	2014	2015	
AES nominal installed capacity	—	247	370	370	370	370	370	370	370	
SEPGCO nominal installed capacity	400	500	500	885	885	885	1,031	1,031	1,175	
CEGCO available capacity	1,747	1,747	1,706	1,706	1,687	1,687	1,687	1,392	—	—

B. Financial Analysis

16. The ex ante financial analysis of the Amman East AES IPP was not available in the PAD. Based on the financial statements of the AES IPP, an ADSCR was estimated, which showed the financial viability of the Amman East AES IPP from 2010 when the loan repayment started up to 2015, as presented in table 3.6.

Table 3.6. ADSCR of AES Amman East IPP

2010	2011	2012	2013	2014	2015
0.47	2.41	1.38	1.73	1.09	1.18

17. Insufficient information was available to conduct further financial analysis. However, as an owner's perspective, an illustrative loan schedule was established with main assumptions noted in table 3.1, which resulted in a financial internal rate of return of 8 percent with an financial NPV of JD 7 million at a discounted at a rate of return on equity of 5 percent real and a leveled AES cost of JD 0.003 per kWh or US\$0.004 per kWh, which is presented in table 3.7.

Table 3.7. Illustrative Owner's Perspective Financial Analysis

Financial NPV, (real JD) @ Return on Equity	5 percent	7 million	Leveled AES cost, real (JD/kWh)	0.003	(US\$0.004per kWh)
financial internal rate of return	8 percent				

18. The economic and financial analysis indicated the financial viability of the East Amman Power Project and the justification of the private sector project, as long as the current power purchase arrangement is financially sustainable for NEPCO, such as fuel supply and finance lease arrangement.

19. The PAD included the financial analysis of the past and future projection of the entire electricity sector, which was beyond the Amman East AES IPP's influence. Hence, this ICR does not provide the sector-level financial analysis. The main change was the natural gas supply import disruption and prices from Egypt, as discussed in the economic analysis. In 2013, NEPCO renewed the contract of electric power exchange with the Egyptian Electricity Transmission Company within the limits available on the Egyptian side, with an expected amount of electricity imported from the Egyptian side in 2013 to be about 722 GWh, but the actual amount was 381 GWh. In 2013, the increase in oil prices raised the production cost of the generated electrical energy due to the increased dependency on DFO and HFO for operating the generating units in Jordan due to the shortage in the imported quantities of natural gas from Egypt.

20. IMF's Standby Arrangement with the use of an IMF Extended Fund Facility for 2016–2019 would, among others, support policies for electricity tariff sustainability in line with the policy program supported by the World Bank programmatic DPL. The IMF and the World Bank support measures to manage NEPCO's debt to improve the electricity sector's financial and operational performance. NEPCO's electricity tariff reached cost-recovery levels in late 2015, due to increases in NEPCO's revenues (because of three tariff adjustments implemented by the EMRC between 2013 and 2015) and a reduction in the cost of electricity. The cost reduction is the result

of the sharp decline in oil prices combined with the successful operation of the LNG terminal in Aqaba started in 2015, and the commissioning of several new renewable energy plants replacing the reliance on more expensive and polluting DFO and HFO in power. However, the remaining challenges include the sustained implementation of energy diversification policies and the sustainability of the electricity tariff cost recovery due to the country's vulnerability to oil price fluctuations and the management of NEPCO's debt of more than JD 5.2 billion accumulated since 2011.²⁴

21. In conclusion, the economic and financial analysis showed the robust result and justified the private sector project in general. However, the results are relatively sensitive to the efficiency of power plants (that is, heat rate) and oil prices to which the LNG, DFO, and HFO were indexed. The private sector's tendency to pay more for workers with higher-level jobs benefited the IPP labor, including one female office manager, and increased the Government revenues from their social security contribution. The temporary construction workers, including both male and female, were not paid as much as if they had worked for the public sector project, but nonetheless it helped alleviate unemployment and contributed to reduction of poverty as construction workers tended to be poor. Emission reductions of CO₂e, PM, SO₂, and NO_x resulted in the positive impacts on environment and health. However, the economic cost of natural gas import from Egypt at subsidized prices was significant, while these have been replaced by the LNG sold at market prices. The AES IPP made efforts for gender equality and equity, such as their CSR efforts that targeted female employment benefits and training. Overall, the economic and financial analysis demonstrated that the project has efficiently achieved its objectives to meet the electricity needs of the country in an economically and environmentally sustainable manner to contribute to economic growth and well-being of the population of Jordan.

²⁴ World Bank. 2016. Draft Program Document. Jordan Second Programmatic Energy and Water Sector Reforms Development Policy Loan.

Annex 4. Bank Lending and Implementation Support/Supervision Processes

(a) Task Team members

Name	Title	Role	Unit	Location
Ferhat Esen	Senior Energy Specialist	Team Leader (ADM Responsible)	GEE05	Washington, DC, United States
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Rome Chavapracha	Senior Energy Specialist	Team Leader	GEE02	Yangon, Myanmar
Vladislav Vucetic	Lead Energy Specialist	Team Leader (ADM Responsible)	GEE01	Washington, DC, United States
Reynold Duncan	Lead Energy Specialist	Team Member	GEE08	Washington, DC, United States
Jad Raji Mazahreh	Sr Financial Management Specialist	Financial Management Specialist	GGO23	Amman, Jordan
Ada Karina Izaguirre Alvarado Bradley	Senior Infrastructure Specialist	Team Member	GEEFS	Washington, DC, United States
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Angeline Mani	Language Program Assistant	Team Member	GEE05	Washington, DC, United States
Banu Setlur	Senior Environmental Specialist	Team Member	GEN05	Washington, DC, United States
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Ghada Abdel Rahman Shaqour	Consultant	Team Member	GSU05	Baghdad, Iraq
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Maya Abi Karam	Senior Counsel	Team Member	LEGAM	Washington, DC, United States
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Name	Title	Role	Unit	Location
Scott Sinclair	—	Team Member	AFTG2	Washington, DC, United States
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(b) Staff Time and Cost

Stage of Project Cycle		Staff Time and Cost	
		No. of Staff Weeks	Cost in US\$ (Including Travel and Consultant Costs)
Lending	FY05	3.17	17,596.86
	FY06	9.87	62,841.18
	FY07	25.76	160,190.02
	Total	38.80	240,628.06
Supervision/ICR	FY07	6.01	33,605.25
	FY08	8.29	64,279.55
	FY09	7.55	32,752.79
	FY10	6.89	26,441.34
	FY11	6.76	39,739.43
	FY12	8.38	45,251.14
	FY13	7.99	46,138.99
	FY14	6.09	45,227.97
	FY15	4.65	8,582.98
	FY16	3.38	10,719.13
Total		65.99	352,738.57

Annex 5: List of Project Preparation Activities Undertaken by the World Bank team

1. All the key commercial agreements were in place at the time of appraisal. The World Bank reviewed the agreements between the GoJ, AES Jordan PSC, NEPCO, and all other parties and found them acceptable and appropriate.

2. The World Bank team had regular missions (every six months during preparation phase) and yearly during supervision phase to review the following activities:

- **Preparation phase.** Monitoring the construction of the power plant and associated infrastructure with site visits, ensuring compliance with the covenants in the Project Agreement and Guarantee Agreement, and reviewing all social and safeguard issues for compliance
- **Supervision phase.** Monitoring disbursement of loans, ensuring continued compliance with environmental and social safeguards, and engaging in solving pending issues (local sales tax waiver)

3. The World Bank team also reviewed the following agreements corresponding to the project and established compliance technically, operationally, financially, and legally:

- **Commercial bank facility agreement** between AES Jordan PSC and the commercial lenders
- **Common Terms Agreement** among AES Jordan PSC, JBIC, OPIC, and the commercial lenders
- **Connection agreement** between AES Jordan PSC and NEPCO

Direct Agreements

- EPC contract between AES Jordan PSC and Doosan Heavy Industries and Construction Co. Ltd
- Equity contributions agreement among the sponsors and JBIC, OPIC, and the commercial lenders
- Government guarantee between the GoJ and AES Jordan PSC
- Guarantee agreement between IBRD and SMBC, as agent for the commercial lenders
- Implementation agreement between the Government and AES Jordan PSC.
- Indemnity agreement between Jordan and IBRD
- Insurance policies between AES Jordan PSC and various insurance providers

- Intercreditor agreement among JBIC, OPIC, the commercial lenders, and the Intercreditor agent
- JBIC facility agreement between AES Jordan PSC and JBIC
- Land lease agreement between the GoJ and AES leases the real property at Almanakher to AES Jordan PSC Jordan PSC for the life of the project
- OPIC facility agreement between AES Jordan PSC and OPIC
- Power purchase agreement between NEPCO and AES Jordan PSC
- Project agreement between IBRD and AES Jordan PSC
- Shareholder agreement among AES Oasis Ltd, Mitsui & Co. Ltd, AES Jordan Holdco Ltd, and AES Jordan PSC
- Technical services agreement between AES Jordan PSC and AES Oasis Ltd
- Transfer restrictions agreement among AES Corporation, AES Oasis Ltd, Mitsui & Co. Ltd, AES Jordan Holdco Ltd, AES Jordan PSC, and lenders
- Water supply agreement between WAJ and AES Jordan PSC

Annex 6. Stakeholder Workshop Report and Results

Not applicable.

Annex 7. Summary of Borrower's ICR and/or Comments on Draft ICR

ICR by AES Jordan

1. The IBRD guarantee which came into effect in 2007 between SMBC Europe Ltd. and the World Bank served as political and financial risk for the implementation of Amman East Power Plant Project.
2. When the project was initiated, the IPP concept was new for the Government. AES Jordan entered the Jordan electricity sector when the concept of IPP was new for the Government. The Amman East Power Plant Project contributed tremendously toward stability of the country's electricity sector. The plant is considered one of the most efficient power plants in Jordan's electricity system. The plant produced 10 MW, which was considered as beneficial for the Government.
3. Since 2009, up till today, the plant has maintained a high record of performance and safety. Moreover, the plant achieved international recognition and awards for the first time in the country.
4. The Amman East Power Plant Project had a rigid CSR program which helped local communities improve their lives by improving community schools, hosting medical camps, and installing solar systems which helped them reduce their electricity bills and carbon footprint.
5. The World Bank also contributed to the provision of health and safety standards as reference and benchmark during all plant operations. And these are used as guidelines for the country to develop its own standards.
6. Various challenges were faced during project development and construction, which include IPP integration into existing monopoly, logistics support, and infrastructure.
7. After the successful story of the Amman East Power Plant Project, Jordan is attracting more investments in the power sector; three power plants were built as IPPs and more than 16 companies are building renewable energy (solar PV and wind) plants.

Annex 8. Comments of Co-financiers and Other Partners/Stakeholders

Not applicable.

Annex 9. List of Supporting Documents

Title	Date	Ref. No.
Country Assistance Strategy	December 20, 2002	Report No. 25228- JO
Country Assistance Strategy Progress Report FY2006–2010	March 11,2009	Report No. 47518- 50
Country Assistance Strategy FY2006–2010	April 6, 2006	Report No. 35665- JO
Country Partnership Strategy Progress Report FY2012– 2015	June 23, 2014	Report No. 87054- JO
Environmental and Social Impact Assessment	2007	
Resettlement Action Plan	2007	
Country Partnership Strategy FY2012–2015	February 1, 2012	Report No. 58114- JO
Implementation Completion and Results Report Guidelines	July 22, 2014	
Updated Master Strategy of Energy Sector in Jordan for the Period (2007–2020)	December 2007	
Jordan National Vision and Strategy 2025		
Aide Memoires for the Project's Supervision Missions	Multiple	Multiple
World Bank. Project Implementation Status Reports (ISRs)	Multiple	Multiple
EMRC Annual Reports	Multiple	Multiple
AES Jordan Annual and Quarterly reports	Multiple	Multiple
AES Annual report	Multiple	Multiple
NEPCO Annual Reports	Multiple	Multiple
Project Appraisal Document	2007	
Supervision documents - Environmental and Social	Multiple	Multiple