



1. Project Data

Project ID

P113416

Project Name

EG-Wind Power Development

Country

Egypt, Arab Republic of

Practice Area(Lead)

Energy & Extractives

L/C/TF Number(s)

IBRD-79270,TF-95224,TF-96929,TF-96930

Closing Date (Original)

31-Dec-2015

Total Project Cost (USD)

182,612,935.76

Bank Approval Date

15-Jun-2010

Closing Date (Actual)

30-Jun-2019

IBRD/IDA (USD)
Grants (USD)

Original Commitment

219,750,000.00

150,490,000.00

Revised Commitment

182,612,935.76

124,823,517.33

Actual

182,612,935.76

124,823,517.33

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2. Project Objectives and Components

a. Objectives

According to the Loan Agreement (p.5) dated November 4, 2010, the project objective was “to develop the infrastructure and business models which will enable the development of wind power within the Borrower’s territory” where Borrower was defined as the Arab Republic of Egypt. The formulation of the project objective in the Project Appraisal Document (PAD) was different, but there was no material difference in the substance



of the objective: “to develop infrastructure and business models for scaling-up wind power in Egypt” (PAD, p.12).

At the first restructuring in July 2014, the project objective was revised. According to the Amendment to the Loan Agreement dated October 26, 2014, the revised project objective was “to develop business models and required transmission facilities for scaling-up wind power in Egypt, and increase transmission capacity in targeted areas.”

Despite the change in the formulation of the project objective, there is no material difference between the original objective to enable the development of wind power in the country and the first part of the revised objective to scale up wind power. The introduction of the second objective to increase transmission capacity in targeted areas and the drop in the outcome target of additional installed wind power generation capacity from 2,250 megawatt (MW) to 750MW would require a split evaluation of the achievement of the project objectives, but since the disbursement rate at the time of the restructuring was about five percent—which would result in a negligible weight for the achievement of the original objective on the outcome rating—a split evaluation will not be undertaken in this review.

The project objective will be evaluated as consisting of two sub-objectives*:

1. To develop business models and required transmission facilities for scaling-up wind power in Egypt; and
2. To increase transmission capacity in targeted areas.

* The first objective was “to scale up wind power”, which was to be achieved through the development of business models, i.e., the build-own-operate model, and the construction of critical transmission infrastructure connecting the to-be-built wind power plants in the Gulf of Suez area to the national electricity grid at the center of the country. The second objective, which was added at the first restructuring, was to increase the transmission capacity in the Nile Delta Governorates. Due to the geographical difference, the two objectives will be evaluated separately.

b. Were the project objectives/key associated outcome targets revised during implementation?
Yes

Did the Board approve the revised objectives/key associated outcome targets?
Yes

Date of Board Approval
10-Jul-2014

c. Will a split evaluation be undertaken?
No

d. Components
The project had three components:



A. Transmission Infrastructure. (*Appraisal cost: US\$342.3 million including physical and price contingencies; actual cost: US\$277 million*)

Under this component, transmission investments were to be financed to connect future wind power plants in the Gulf of Suez to the national electricity network. This component included the following investment activities:

1. Construction of a 500 kilovolt (kV) double circuit transmission line of approximately 280 kilometers (km) in length from Ras Gharib to Samallout.
2. Construction of a 500kV/220kV substation and installation of a 500kV/220kV transformer in Ras Gharib.
3. Extension of the 500kV/220kV conventional substation and installation of a 500kV/220kV transformer at Samallout.
4. Construction of a 220kV transmission line of approximately 50 km in length between Ras Gharib and Gabel El-Zait.

B. Expansion of the Wind Generation Program. (*Appraisal cost: US\$2.9 million; actual cost:US\$2.6 million*)

Under this component, the project was to finance capacity building activities to support the expansion of the wind power program:

1. Provision of legal and financial advisory services in the implementation of the competitive bidding program for Build-Own-Operate (BOO) wind power farms.
2. Management of wind power integration in the power system.
3. Environmental and social assessment of the proposed site for a BOO wind power farm in the Gulf of Suez.
4. Implementation of a knowledge management program including communications with stakeholders regarding project activities and dissemination of lessons learned.

C. Gulf of Suez BOO Wind Farm. (*Appraisal cost: US\$450 million; actual cost:US\$380 million*)

This component included the development and construction of a 250MW wind farm in the Gulf of Suez on a BOO basis following a competitive bidding process to be financed by the developer.

Revised Components

At the first restructuring in June 2014, two new sub-components were added to the Transmission Infrastructure component to utilize the US\$106 million savings occurred because of the lower than estimated cost of the 280km double circuit transmission line (A sharp decrease in aluminum and steel prices was reported as the reason for the lower investment cost in the restructuring paper (p.v). But the cost at appraisal was overestimated, which has been a recurring issue in similar energy projects in Egypt. The cost was estimated based on “historical data available in the country sectors for similar projects” but global market prices were not considered in the estimation (ICR, p.41).)



1. Extension and reinforcement of the national 220kV network along the Suez Gulf Coastal area consisting of the construction of substations in north Hurghada and El-Qusair, and the connection of these substations to the national grid.
2. Upgrading and rehabilitation of 232km of five existing 220kV transmission lines in the Nile Delta Governorates.

The estimated cost of these additional investments was US\$103.8 million.

e. Comments on Project Cost, Financing, Borrower Contribution, and Dates

Project Cost: The total project cost was originally estimated at US\$752.5 million excluding US\$43.4 million for physical and price contingencies. In June 2019, the project closed with a total cost of US\$659.6 million. The lower than estimated cost of the main transmission line (see Revised Components in the previous section) and the lower cost of the 250MW wind project, which was tendered on a BOO basis, were the main reasons for a lower actual project cost.

Financing: At appraisal, the International Bank for Reconstruction and Development loan was estimated at US\$70.0 million. At project closing in June 2019, US\$57.8 million of the IBRD loan was disbursed. At project closing all Bank funds were accounted for.

The estimated funding from other donors at appraisal and their actual contributions at project closing were as follows: (i) the Clean Technology Fund (CTF) loan, US\$149.75 million, actual US\$124.08 million; (ii) the Clean Technology Fund grant, US\$0.25 million, fully disbursed; (iii) the Public Private Infrastructure Advisory Facility (PPIAF), US\$0.5 million, fully disbursed; (iv) European Investment Bank, French Development Agency (Agence Française de Développement-AfD), Neighborhood Investment Fund (NIF), and Kreditanstalt für Wiederaufbau (KfW) joint credit, US\$70.0 million, fully disbursed; (v) KfW grant, US\$0.7million, fully disbursed; and (vi) the private wind farm investor and operator, US\$450.0 million, actual US\$380.0 million.

The IBRD and CTF loans were to finance the construction of the 500kV double circuit transmission line. The EIB, AfD, NIF, and KfW joint credit was to finance the construction and extension of the substations. The grants from CTF, PPIAF and KfW were allocated to the technical assistance activities under the second component. A private investor was to develop and construct a 250MW wind farm in the Gulf of Suez region on the BOO model.

Borrower contribution: At appraisal, the contribution of the Government of Egypt (GoE) was estimated at US\$54.8 million. At project closing, the GoE's actual contribution was US\$46.3 million. The Borrower's own funds were to finance the construction of the 220kV transmission line between Ras Gharib and Gabel El-Zait—the fourth sub-component of the first component—and contribute to the financing of the construction and extension of the substations.

Restructurings: There were two project restructurings.

- **First Restructuring (Level 1 – July 10, 2014):** The project objective was revised to reflect the addition of new transmission investments to the project scope (see sections 2.a Objective and 2.d Components above). Target values of some indicators were revised based on progress, and new indicators were added to capture the achievement of the new project activities while irrelevant



indicators were dropped: (i) The target for progress in implementing competitive bidding for the remaining wind energy program was decreased from 2,250MW to 750MW because of the revision of the procurement schedule by the Ministry of Electricity and Renewable Energy; (ii) Consequently, the target for associated greenhouse gas emission reductions decreased from 7 million tons to 2.6 million tons; (iii) "Transmission capacity for rehabilitated transmission lines doubled" was added as a new outcome level indicator; (iv) "Households benefitting from wind energy" was replaced by "direct project beneficiaries" and the target was set at about 1.46 million people, 49 percent of whom would be female; (v) Three unmeasurable and irrelevant outcome level indicators were deleted, i.e., public and private investments leveraged for transmission and first BOO wind project, total job creation in the wind industry and wind power supply chain development; and (vi) four new intermediate indicators were added to capture the implementation of the new transmission investments. Lastly, the project closing date was extended by 24 months from December 31, 2015 to December 31, 2017 to allow time for the completion of the additional transmission works and to achieve the commissioning of the wind power plant, the tendering process of which was delayed by about two years because of the increased risk perception of the investors following the political events of 2011 (Restructuring Paper, Report No: RES13247 p.vi).

- **Second Restructuring (Level 2 – December 20, 2017):** The closing date was extended by 18 months from December 31, 2017 to June 30, 2019 to allow the completion of the additional transmission investments. The procurement of the additional transmission line investments under the first component was delayed because of the weak procurement capacity of the project implementation entity, the Egyptian Electricity Transmission Company (EETC), and the indecisiveness of the EETC in identifying new investments in place of those added to the project scope at the first restructuring that were later financed by the utility using its own funds. The outcome level indicator "transmission infrastructure to evacuate 3,000MW of wind power" measured in percent of completion was replaced by "Increase in transmission infrastructure capacity to evacuate 3,000MW of wind power" measured in gigawatt (GW) to better capture the outcome achievement, and there were some minor revisions to intermediate outcome indicators, such as the change in the units from Yes/No to percentages.

Dates: The project was approved on June 15, 2010. The Loan Agreement was signed on November 4, 2010 but the loan became effective on August 14, 2011 because of delays in the parliamentary ratification process of the agreement. The Mid-Term Review was conducted in March 2016. The original closing date was December 31, 2015. In two restructurings, the closing date was extended by a total of 42 months. The project closed on June 30, 2019. The reasons for closing date extensions have been outlined in the first and second restructuring entries above.

3. Relevance of Objectives

Rationale

The project objectives are substantially relevant to the country context. In addition to proven natural gas and oil reserves, Egypt is rich in wind and solar power potential, but the share of renewable energy in the generation mix is low. According to the 2030 Egypt Vision (p.12) of the Government of Egypt, the energy goal of the country is to have "an energy sector meeting national sustainable development requirements and maximizing the efficient use of various traditional and renewable resources contributing to economic growth, competitiveness, achieving social justice, and preserving environment." In order to achieve this



development goal, the government set a target for increasing the share of renewable energy in generation to 42 percent in its Energy Sector Strategy—the Integrated Sustainable Energy Strategy to 2035. The country has the legal framework to scale up wind power and increase transmission capacity. The project objective is outcome-oriented and appropriately pitched for the development status of the country, but the project implementing entity lacks sufficient project implementation capacity. Those capacity weaknesses did become evident and led to a lowering of the project's ambition in terms of installed capacity, which in turn proved to be mismatched with the transmission line. These weaknesses also resulted in costly delays and low achievement of results related to the second objective.

At project closing, project objectives were aligned with the Bank priorities as defined in the Country Partnership Framework (CPF) 2015-2019. Under the second focus area of "Improved opportunities for private sector job creation", Objective 2.2. is defined as "improved energy generation capacity and energy efficiency." The goal of the Bank strategy is "to support the Egyptian government's effort to eliminate power outages by 2017 and to promote financial sustainability of the sector by 2019 through the increased participation of the private sector in new energy generation, including the construction of ... 5,250MW of renewable energy by the private sector" (CPF, p.31). The project objectives overlap with the shift in the Bank's focus "from conventional power generation to enhanced energy efficiency, improved transmission, and scaling up renewable energy from wind and solar power facilities, with efforts aimed at bringing in private sector capital and know-how" (CPF, p.iii).

Since the approval of the El-Tebbin Power Project in February 2006, the Bank has been active in the power sector in Egypt: The Bank financed the first solar-thermal power project and the 1,200MW Ain Sokhna power plant. But a transmission project addressing the physical off-take barrier to electricity generated by privately built and operated wind power mills was a new challenge for the Bank as a first in Egypt. Overall, given the Bank's prior involvement in energy projects in the country and global experience it gained in similar transmission and private-public-partnership projects, the project objectives were adequately challenging.

Rating

Substantial

4. Achievement of Objectives (Efficacy)

OBJECTIVE 1

Objective

To develop business models and required transmission facilities for scaling-up wind power in Egypt.

Rationale

Theory of Change for Objective 1

The project objective was to scale up wind power by building the transmission infrastructure to connect the wind power capacity to be built at the Gulf of Suez region to the national grid, while providing technical



assistance to facilitate the first 250MW private wind power plant investment on a build-operate-own (BOO) model. The project's inputs—loans and credits—were to directly lead to the achievement of the full transmission system between Ras Gharib at the Gulf of Suez and Samallout in the west. The expected outcome was the mitigation of the off-taker risk associated with power evacuation. Under the technical assistance component, the project was to provide legal and financial advisory services to the Egyptian Electricity Transmission Company (EETC) in the competitive bidding program for the first 250MW wind power project through to financial close, support the system operator to integrate wind power to the system, and conduct environmental and social assessment of the proposed site for the BOO wind farm. The mitigation of the off-taker risk associated with power evacuation and technical support were to facilitate the implementation of the first private wind farm investment and lead to similar wind farm investments up to 2,500MW by demonstrating the feasibility of this model. The causal pathways from inputs to outcomes were valid and direct, but the outcomes achieved could not be fully attributed to the project's interventions; the project did not include measures to improve the private investors' overall risk perception, such as the Bank's credit enhancement instruments. This was discussed during the first restructuring in July 2014 because of the delay in the tendering process caused by the political events between 2011 and 2014. (Restructuring Paper, Report No: RES13247 p.iv). Therefore, the construction of a full transmission system and technical support in the competitive bidding process for the first private wind power project were necessary for the achievement of the project objective, but they were not sufficient per se.

Outputs

As a result of the project activities, following outputs were achieved:

- A 500kV double circuit transmission line connecting Ras Gharib to Samallout was constructed.
- A 500kV/220kV substation was constructed and a transformer was installed at Ras Gharib.
- The 500kV/220kV substation was expanded, and a new transformer was installed.
- A 220kV transmission line between Ras Gharib and Gabel El-Zait was 90 percent constructed at project closing. The line was commissioned in November 2019.
- The project agreements for the first 250MW private wind farm to be developed on a BOO model were signed on October 31, 2017, about four years later than originally planned.
- Procedures were developed for wind power integration by the system operator.

Outcomes

The project activities resulted in the following outcomes:

- The transmission system connecting the wind farm sites at the Gulf of Suez to the national grid has a capacity, as planned, to evacuate power from up to 3,000MW installed wind power generation capacity.
- The project team confirmed that the system operator has now the capacity to integrate the intermittent electricity generated by the wind farms at the Gulf of Suez to the national grid without disruption.
- The first private wind farm investment with an estimated installed capacity of 262.5MW, against the target of 250MW, became fully operational in November 2019, five months after the extended project closing date. The target date for operation was December 2016 (Restructuring Paper, Report No: RES13247, p.16).
- A 250MW wind power plant project achieved financial close in August 2019. The wind farm is currently under construction and is expected to be operational in 2021. Additionally, a 500MW wind power plant



project being developed by the same consortium of companies that operate the first wind power plant is nearing financial close. The construction is expected to start in 2021. The revised target for “implementing remaining wind competitive bidding program” was 750MW. The project team commented that there is an additional 2,000MW of wind power project in the pipeline, but the current status of these projects is unknown.

The project successfully completed the main transmission system, which could evacuate electricity generated by up to 3,000MW installed capacity, as originally planned at appraisal. But completing the tender process of a total of 2,250MW wind power capacity, in addition to the commissioning of the first 250MW capacity, during project implementation was an ambitious target. Following the political unrest between 2011 and 2014, this target was revised to 750MW at the first restructuring. This created a mismatch between the installed transmission capacity for 3,000MW and the targeted wind power generation capacity of 1,000MW—250MW as the first capacity and 750MW as the remaining capacity. Currently, the transmission line is evacuating electricity generated by the 262.5MW wind power plant developed under the project. The second wind power plant with an installed capacity of 250MW is expected to start commercial operation in 2021. The third power plant with a 500MW installed capacity is expected to be operational within less than three years once it achieves financial close and construction starts. According to the ICR (p.13), the transmission line also evacuates power generated by the state-owned wind power plants in the region.

Overall, the project was successful in achieving the project outputs by increasing the transmission capacity and developing the first private wind power investment. But, despite the low target set at the first restructuring and the technical assistance given to the EETC to develop the BOO model, the project was, by project closure, partially successful in scaling up wind power by only addressing the electricity evacuation barrier. Due to the high-risk perception, the investors require that the EETC’s power purchase commitment should be backed by a government guarantee, i.e., off-take guarantee, which the Government of Egypt considers as a “quasi-sovereign debt” burden on government finances (ICR, p.42). The government’s concerns about issuing sovereign guarantee to back power purchase agreements create uncertainty about the medium- and long-term sustainability of the BOO model developed under the project. Additionally, there is reasonable possibility that the government would prefer electricity generated by combined-cycle-gas-turbine (CCGT) power plants that have been recently built to utilize the large gas reserves discovered in the Mediterranean. Currently, Egypt has around 20GW installed generation capacity surplus over peak demand of 30GW mostly because of the rapid increase in the CCGT capacity in recent years. However, the slow, but steady, development of wind power projects potentially reaching a total installed capacity of 1,012.5MW in the Gulf of Suez region confirms that the construction of the transmission line and the development of the BOO model will mostly likely play an important role in further scaling up wind power capacity in the country. Therefore, notwithstanding the risks related to government guarantees and the rapid increase of CCGT power plants, the efficacy of the achievement of the first objective to scale up wind power generation capacity in the region utilizing the BOO model is assessed substantial.

Rating
Substantial

OBJECTIVE 2

Objective

To increase transmission capacity in targeted areas.



Rationale

Theory of Change for Objective 2

This objective was closer to the output level rather than outcome level. It was added as a second objective at the first restructuring to utilize the loan savings from the lower than estimated construction cost of the main transmission line. Two new sub-components were added under the first component: (i) The expected outputs under the first new sub-component were the construction of a substation in North Hurghada and another one in the isolated system of El Qusair, and the connection of these substations to the national grid by a total of 92 km 220kV transmission line; and (ii) under the second sub-component, the conductors of 232 km of five existing transmission lines in the Nile Delta Governorates were to be upgraded to high temperature thermal conductors to double their peak capacity. The expected outcomes were improvement in the reliability of power supply and the displacement of the expensive diesel generators in the El Qusair load center, and reduction of bottlenecks and improvement of electricity supply reliability in the regions of Alexandria, Delta, West Delta, and Canal—the Nile Delta Governorates. The causal links between project outputs and outcomes were clear, but there was no indicator defined to capture the improvement in the reliability of electricity supply in the Hurghada-El Qusair system or in the Alexandria-Canal system.

Outputs

- The transmission line from North Hurghada to El Qusair was 90 percent completed at project closing, and it was commissioned in November 2019.
- The EETC financed the purchase and installation of the conductors for four of the five transmission lines in the Nile directorates soon after the addition of these activities to the project scope at the first restructuring (Implementation Status and Results Report (ISR) 12, p.4). The ICR (p.28) reports that materials for the reinforcement of about 330km of existing 220kV lines were supplied to EETC for the transmission lines of Aswan Connection/Salwan, Selwa/El Naqra, El Nawra/Aswan and Suez 2/Badr—the last one was the fifth transmission line added to the project scope at the first restructuring. The work was to be completed by the EETC after project closing.

Outcomes

The indicator added to results framework at the first restructuring, i.e., “transmission capacity for rehabilitated transmission lines doubled”, was deleted at the second restructuring. Neither the restructuring paper nor the ICR explained why this indicator was deleted. As mentioned in the previous paragraph, four of the five transmission investments added to the project at the first restructuring were financed by the EETC using their own funds. Other existing transmission lines were identified for the installation of high thermal conductors. These conductors were delivered before project closing, but they could not be installed. The project team stated in their email dated February 1, 2021 that these conductors were installed after project closing, but there is no data to show the impact of these conductors on increasing the transmission capacity in the targeted area.

On the other hand, the commissioning of the transmission line between North Hurghada and El Qusair must have resulted in an increase in the transmission capacity since these two locations were not connected to the national grid before the project. Yet, the evidence is insufficient to conclude the achievement of this outcome.



Overall, the efficacy of the achievement of the objective to increase transmission capacity in targeted areas is rated Modest because of the incomplete project outputs at project closing and insufficient evidence for the achievement of the outcomes.

Rating
Modest

OVERALL EFFICACY

Rationale

The project facilitated the financial close of the first privately owned 262.5MW wind power plant, which became commercially operational after project closure. A second wind farm with a 250MW installed capacity is currently under-construction, and a third one with a 500MW installed capacity is expected to achieve financial close in 2021. Despite the risks related to government guarantees and the rapid increase of combined-cycle gas turbine power plants in the country that could potentially slow down the development of wind power projects, the efficacy of the achievement of the first objective to scale up wind power projects is rated Substantial, because of the impact of the project in facilitating the development of a total of 1,102.5MW wind capacity in the Gulf of Suez region. On the other hand, the efficacy of the achievement of the second objective is rated Modest. The project was successful in connecting two locations on the Gulf of Suez region to the national grid, but there was no indicator in the results framework to measure the outcome related to the project activities added at the first restructuring and to capture the achievement of the second objective.

Given the preponderance of activities that were implemented to achieve Objective 1, hence its larger number of measurable outputs and outcomes, the overall Efficacy rating is Substantial.

Overall Efficacy Rating

Substantial

5. Efficiency

Economic Analysis

At appraisal, the economic benefits of the project were assumed to be the additional energy provided to consumers that was valued at the consumers' willingness to pay and the value of avoided greenhouse gas emissions, which was taken as a range of values because of the difficulty in forecasting a single value (PAD, p.75). The capital cost of the project included the costs of the transmission investment and the technical assistance activities, excluding the cost of the 250MW wind farm to be built on a BOO model. Additionally, the operation and maintenance costs were included in the analysis. The cost of the electricity EETC was to purchase from the wind power plants—gradually increasing to a total installed generation capacity of 3,070MW—was assumed to be US\$0.08 per kWh for the first 20 years of the analysis, and US\$0.05 per kWh



thereafter; it was assumed that the construction of more efficient wind farms at the end of the 20-year operating lifetime of the original power plants would result in a decrease in the cost of electricity. The average system cost of transmission and distribution to consumers was estimated to be US\$0.015 per kWh based on the national averages (PAD, p.74). The calculations resulted in a range of economic internal rates of return (EIRR) from 2.6 percent to 21.1 percent depending on the assumptions on the elasticities of willingness to pay for electricity and the value of carbon benefits. With a carbon price at US\$13 per metric ton and an elasticity of -0.30, the project was barely viable with an EIRR of 11.2 percent. Without carbon benefits, the EIRR was calculated at 9.2 percent with -0.30 elasticity.

At the first restructuring, a new economic analysis was conducted because of the addition of new transmission investment activities to the project scope to utilize the savings from lower investment cost of the transmission system than estimated at appraisal. But the benefits from these activities, although identified, could not be quantified; hence, they were not included in the analysis. On the other hand, when the energy benefits—excluding benefits from avoided greenhouse gases—were compared to the incremental capital and operating costs, the EIRR was calculated at 10.5 percent with -0.30 elasticity, which was above the 10 percent opportunity cost of capital generally applied to government investments in Egypt (Restructuring Paper, Report No: 13247, p.x)

At project completion, the same methodology was used to conduct an economic analysis. The EIRR was estimated at 35 percent, excluding the benefits from avoided greenhouse gases. The decrease in the cost of electricity purchased—US\$0.038 per kWh for the first 262.5MW wind power plant and US\$0.031 per kWh for the second 250MW wind powerplant under construction—was the main reason for this very high EIRR. Additionally, the total project cost was lower than the estimated cost at appraisal—US\$332.46 million at appraisal against US\$279.6 million at project closing—but this was because of the cancellation of about US\$37.9 million of loans as a result of the delays in the implementation of the additional transmission investments. The economic analysis did not include the unquantifiable benefits from the additional transmission investments; hence, it was conservative, but the assumption that the wind park will achieve a total installed capacity of 3,070MW in the early years of the economic analysis—despite only targeting 2,500MW (250MW+2,250MW) originally that was later revised to 1,000MW (250MW+750MW)—was overly optimistic. Currently there is only one 262.5MW capacity wind farm in operation and another 250MW capacity wind farm under construction. A third wind project with a 500MW installed capacity is expected to achieve financial close in early 2021 and be constructed in 29 months.

Therefore, it could be expected that the total installed wind capacity would reach at 1,012.5MW within three years. Assuming that there would be no further increase in the installed wind capacity, the additional economic analysis conducted by the project team resulted in an EIRR of 27 percent excluding benefits from CO2 emission reductions and 33 percent including the CO2 emission reduction benefits. Despite the mismatch between the lowered ambition of installed capacity and the transmission line, the EIRRs show that the project was economically viable mostly because of the significantly lower tariff rates at project closure than those estimated at appraisal.

Financial Analysis

At appraisal, a financial analysis was conducted based on the assumptions of the economic analysis with respect to the capital of the transmission line, the O&M cost, the purchase price of incremental power, and the system average costs of transmission and distribution. Instead of the consumers' willingness to pay for electricity that was used in economic analysis, the financial analysis used the incremental revenue from retail sales of power. Without the CTF financing, the Financial Internal Rate of Return (FIRR) was calculated at 8 percent,



higher than 6.95 percent financial cost of the Government of Egypt financing, if the carbon price was assumed to be US\$50 per metric ton. With the CTF financing, the project would be financially viable with a carbon price above US\$13 per metric ton; the NPV would be US\$169,000 with CTF-blended financing, whereas the NPV would drop to negative US\$1.8 million without CTF financing.

At the first restructuring, a new financial analysis was conducted with the same assumptions used at appraisal. Additional financial benefits were expected from reduced operation and maintenance of costs of the diesel units that were to be displaced after the connection of the isolated system of EL Qusair to the national grid. The calculations resulted in an FIRR of 6.7 percent with a carbon price of US\$30 per metric ton, and a positive NPV of US\$248,000 with a carbon price of US\$5 per metric ton under CTF-blended financing. The proposed restructuring had improved the financial viability of the project (Restructuring Paper, Report No:13247, p.xi)

At project closing, a financial analysis was not conducted. The project team commented that “financial viability was not a criterion in the original project so was not used in the ICR” because the financial analysis at appraisal showed that “it was unattractive without concessional financing and carbon credits, and even marginal with them” (Project team’s email dated February 1, 2021). Project team also reported that assuming an installed capacity at 1,000MW and an average tariff rising to US\$0.11 per kWh over seven years, the FIRR was calculated at 22 percent excluding any financial benefits from CO2 emissions reductions. Due to the low-cost of power, the project has a high financial viability.

Operational and Administrative Efficiency

The overestimation of the project cost at appraisal resulted in a large sum of savings during project implementation, which could not be utilized efficiently. The unused loans were allocated to new transmission investments in targeted areas, but some of these activities were financed by the EETC using their own funds soon after their addition to the project scope. The EETC could not identify new activities to utilize the unallocated project funds. At one point, there were talks to allocate these funds as seed capital to establish the proposed Egypt Clean Energy Fund, but this did not happen. Other transmission activities faced serious project implementation issues because of the weak procurement and contract management capacity of the project implementation unit, EETC. The contracts could only be awarded in 2018, four years after the addition of these activities to project scope. Although the project closing date was extended by 18 months to allow time for the completion of these activities, about US\$37.9 million of loans (IBRD, US\$12.2 million; CTF, 25.7million) had to be cancelled without fully achieving the expected outputs from the additional transmission investment activities. The cancelled loan amount was about 36.5 percent of the US\$103.8 million estimated cost of these activities. Lastly, the financial close and the commissioning of the private wind power investment was delayed by about five years, because of the time needed for due diligence including yearly wind assessments. The assumption at project appraisal that the wind power plant would be commissioned within three years after effectiveness was very optimistic. The plant could not achieve financial close until October 2017 and was operational in November 2019, after project closing. The political instability in Egypt between 2011 and 2014 was another reason for the delay in the financial close of the first wind power plant.

Overall, the efficiency of the project in utilizing the project’s resources and inputs to achieve results is rated Modest. Despite a mismatch between the lowered ambition of wind power supplies and the transmission line, the economic analysis for 1,000MW installed capacity resulted in high economic rates of return, i.e., 27 percent, mostly because of much lower cost of power at project closing than the power cost estimated at appraisal. The financial analysis provided by the project team also showed that the project is financially viable at a financial



internal rate of return of 22 percent because of the same reason. However, there were significant shortcomings in the operational and administrative efficiency of the project, mostly related to the implementation of transmission activities added to the project scope at the first restructuring.

Efficiency Rating

Modest

a. If available, enter the Economic Rate of Return (ERR) and/or Financial Rate of Return (FRR) at appraisal and the re-estimated value at evaluation:

	Rate Available?	Point value (%)	*Coverage/Scope (%)
Appraisal	✓	9.20	100.00 <input type="checkbox"/> Not Applicable
ICR Estimate	✓	27.00	100.00 <input type="checkbox"/> Not Applicable

* Refers to percent of total project cost for which ERR/FRR was calculated.

6. Outcome

The project's objective is substantially relevant, when the project design's inadequate assessment of weak institutional and implementing capacity is taken into account. The project's success was substantial in achieving the first objective to scale up wind power in the country against the revised lower target for installed generation capacity. The achievement of the second objective to increase transmission capacity in targeted areas was modest because of the incompleteness of project activities at project closing and insufficient evidence for the achievement of the outcomes. Overall, the efficacy of the achievement of the project objectives is rated Substantial. The efficiency is rated Modest, because of significant shortcomings in the operational and administrative efficiency of the project, mostly related to the transmission investments added to the project scope at the first restructuring. Overall, the Outcome of the project is rated Moderately Satisfactory.

a. Outcome Rating

Moderately Satisfactory

7. Risk to Development Outcome

Insufficient development of the wind power plants in the Gulf of Suez area may result in the underutilization of the transmission line built under the project. At appraisal, there was sufficient demand from private investors to develop wind power plants in the region, which necessitated the construction of a transmission line with a capacity to evacuate power from 3,000MW installed capacity. Following the political events of 2011 and 2014, there was a sharp decline in the interest of private investors to develop wind power projects. In addition to the 262.5MW wind power plant developed under the project,



another 250MW private wind farm investment achieved financial close in August 2019 and it is expected to begin commercial operation in 2021. Some other investors have been in talks with the Egyptian authorities, but the current status of these talks is unknown. On the other, the transmission line should act as a backbone of the national grid system in the West-East direction and it should be expected to contribute to the stability of the system by allowing the evacuation of power from other existing government owned wind power plants.

Insufficient maintenance of the transmission line in the long run may result in the deterioration of the transmission service. The transmission line follows the El Sheikh Fadl-Ras Gharib Road but passes mostly through the desert. The line is expected to have a lifetime of 40 years, but harsh desert conditions, such as sandstorms, can adversely affect the transmission line. The EETC has been expanding the transmission network in the country in parallel to the increase in the installed generation capacity thanks mostly to the development of combined-cycle gas turbine power plants. A worsening in the financial viability of the EETC may result in insufficient maintenance of the transmission network, including the one built under this project.

8. Assessment of Bank Performance

a. Quality-at-Entry

The strategic relevance of the project was high. By constructing a transmission line, the project was to address one of the critical barriers to the development of wind power plants, and by technical assistance; it was to facilitate the financial close of the first private wind power plant investment in the country. As presented in the ICR, the theory of change was well articulated but had the significant shortcoming that it did not address the off-take guarantee, which delayed the financial close of the first privately owned wind power plant project for five years in the wake of the political events between 2011 and 2014. The results framework did not fully capture the theory of change and the monitoring and evaluation arrangements included redundant indicators (See section 9. M&E Design, Implementation, & Utilization below). The technical aspects of the project were adequate, but potential risks, such as delays in the processing of necessary approvals for the Nile crossing, were not identified at appraisal. Despite the experience gained in other energy projects in Egypt, the original cost of the transmission component was overestimated in this project, too. This resulted in a large amount of savings, which could not be efficiently utilized. Major risks were adequately identified, including the underutilization of the transmission line because of the slow development of the wind projects. This risk materialized, because it was overly optimistic to expect the achievement of the financial close of the first private wind power project in three years and the development of 2,250MW additional capacity in five years, regardless of the political events that took place between 2011 and 2014. The EETC's limited experience with the Bank's procurement methods was rated as a moderate risk for project implementation, but EETC's weak project management capacity resulted in project implementation delays and insufficient monitoring of the environmental and social safeguards. Absence of a dedicated project team under the project implementation unit was a significant shortcoming, which resulted in delays in the procurement and monitoring of contracts of the transmission investments added to the project scope at the first restructuring.



Quality-at-Entry Rating

Moderately Satisfactory

b. Quality of supervision

Supervision missions, which were held approximately every six months, produced 19 Implementation Status and Results Reports (ISRs). The ISRs were detailed and candid in reporting the issues related to project implementation and the achievement of the project objective (ISR 11, p.6 and ISR 13, p.6). The project team closely supervised project implementation and offered solutions to improve the performance of the project. For example, the project team initiated talks with the authorities for the use of the Bank's credit enhancement instruments to improve the overall risk profile of the first private wind power investment, but the Government of Egypt decided to use its sovereign guarantee rather than the Bank's credit enhancement instruments. There were shortcomings in the project's team focus on the sustainability of the business model to scale up wind power in the country; the off-take guarantee has remained as a barrier to the development of additional wind power plants in the region. Following the Mid-Term Review in March 2016, the project performance improved because of the project team's closer supervision and the firm stance against the extension of the project closing date unless there was tangible progress in project implementation (ISR 14, p.14). Milestones were agreed to ensure that all contracts were awarded before certain dates, and monthly meetings were introduced with the EETC management to review progress with regard to the agreed milestones. The project team closely monitored the safeguard aspects of the project, too. The shortcomings in the implementation of safeguards, such as insufficient monitoring of the implementation of the Resettlement Action Plan and the Environmental and Social Management Plan, were flagged to the EETC during missions (ISR 12, p.7). Starting from October 2015, the project implementation unit was required to submit monthly safeguards implementation reports. The project team's supervision of the project activities to be financed with the loan savings was adequate; despite the project team's efforts to improve the implementation of these activities, some transmission investments could not be completed by project closure and about US\$38.0 million of project savings had to be cancelled because of the loan withdrawal validity expiration. The weak project implementation capacity of the EETC was the main reason for poor project implementation, but there is insufficient evidence to validate the project team's enabling role in improving the EETC's project implementation capacity.

The Quality of Supervision is rated Moderately Satisfactory because of insufficient focus on the sustainability of the business model, shortcomings in the supervision of the project activities added to the project scope to utilize the loan savings, and insufficient evidence to validate the project team's enabling role in improving the EETC's capacity.

Quality of Supervision Rating

Moderately Satisfactory

Overall Bank Performance Rating

Moderately Satisfactory

9. M&E Design, Implementation, & Utilization



a. M&E Design

The project objective was not clearly defined. The development of business models and required transmission facilities were a means to achieve the project objective to scale up wind power in Egypt. But because of the way the project development objective was formulated, they could be easily mistaken as the objectives of the project. Although the project had a simple design consisting of the construction of a full transmission system to evacuate wind power from the Gulf of Suez and technical assistance to support the first private investment in wind power on the BOO model, the results framework did not fully capture the theory of change; it was deficient in terms of not having addressed important issues related to the off-take guarantee that had direct implications for risk perception by private investors.. The achievement of some expected outcomes, such as total job creation in the wind industry, wind power supply chain development, and public and private investments leverages for transmission, were not supported by the project activities and not measurable. The two indicators, i.e., “transmission infrastructure to evacuate 3,000MW of wind power” and “financial close of first private sector investment in wind power,” were adequate to capture the contribution of the project’s activities and outputs toward achieving the expected outcomes of availability of transmission capacity and the implementation of the BOO model; the indicator of “percentage progress in implementing remaining wind competitive program” encompassed the achievement of the project objective to scale up wind power. These indicators were relevant and measurable. But the expectation that the competitive tendering of an additional 1,250MW wind power capacity would be completed within four years of project implementation was overly optimistic. The intermediate outcome indicators were adequate to monitor the progress in project implementation, but they were not included in the “Arrangements for results monitoring” table on page 40 of the PAD.

b. M&E Implementation

The M&E design was simplified at the first restructuring; the original indicators to measure the outcomes that were not supported by the project activities were deleted. The target value of the indicator measuring progress in implementing remaining wind competitive bidding program was revised from 2,250MW to 750MW considering the political situation in the country following the events between 2011 and 2014. New intermediate outcome indicators were introduced to capture the implementation progress of the transmission line investments that were added to the project scope at the same restructuring. Since the EETC financed some of these activities from its funds, the outcome level indicator of “transmission capacity for rehabilitated transmission lines doubled” was deleted at the second restructuring. As the project team stated the EETC’s decision on which new investment activities would be financed by the project was delayed because of poor project management; therefore, no new intermediate outcome indicator could be introduced to the results framework during project implementation to monitor those activities, the completion of which was delayed beyond project closure. The indicators related to the implementation progress of the main transmission line connecting the Gharib Suez wind park area to the national grid and the transmission lines along the Suez Canal were adequately measured, but there were delays in the submission of quarterly project progress reports (ISR 10, p.7).

c. M&E Utilization

M&E findings were communicated to the authorities and the Bank’s project team, but sometimes with delay. Based on these findings, the project team proactively intervened to overcome the barriers to achieve the project objective; in the wake of the political unrest between 2011 and 2014, the project team offered World Bank guarantees to improve the overall risk profile of the first 250MW wind project.



The project team also closely monitored the implementation of the additional transmission investments in the west of the country utilizing the M&E system. Nevertheless, these activities could not be completed before project closure because of the EETC's poor project management. The M&E data were used to provide evidence for the achievement of the first project objective, but the data were insufficient to provide evidence for the achievement of the second objective.

Overall, the M&E quality is rated Modest. The original target for installed generation capacity was ambitious and the M&E system had significant shortcomings in assessing the achievement of the second objective.

M&E Quality Rating

Modest

10. Other Issues

a. Safeguards

The project was classified as Category B under Environmental Assessment (OP/BP 4.01) and triggered Involuntary Settlement (OP/BP 4.12).

Environmental Assessment (OP/BP 4.01): An Environmental and Social Impact Assessment (ESIA) was undertaken at appraisal. The project was expected to have construction related minimal environmental and health and safety impacts. The mitigation measures were adequately defined (PAD, pp.29-30). Additionally, the ESIA indicated that the transmission line could have an adverse impact on the migration routes of migratory birds if the project resulted in the destruction of vegetation near tower footings or substations. A potential collision of birds with the transmission line was not expected, but diverters/flappers were to be installed on the transmission line. The ESIA was disclosed on March 28, 2010 in country and April 23, 2010 on the Bank's InfoShop. After the addition of two new sub-components at the first restructuring, the ESIA was updated and disclosed in country and on InfoShop on June 11, 2014.

During project implementation, there were instances of non-compliance with occupational health and safety requirements of the environmental safeguard policy. The project implementation entity, the Egyptian Electricity Transmission Company (EETC), lacking sufficient capacity to monitor the construction sites, hired an independent environmental consultancy firm, but with delay, to monitor the contractors' compliance with the safeguard policy (ICR, p.19). The Bank's safeguards team supported EETC, too. These efforts resulted in gradual improvements at project sites in complying with the environmental safeguard policy, such as adequate and acceptable environmental, health and safety measures, insurance coverage for all workers, and workers' code of conduct to minimize potential misconducts that could adversely impact the health and safety of the communities.

The project did not comply with the requirement of installing bird diverters/flappers. At project closing, this equipment was at the procurement stage. The bird migration surveys, which had to be conducted at certain time of the year, was the main reason for delay in the procurement of the bird diverters/flappers (ICR, p.40).



The environmental consultancy firm hired by the EETC will carry out post-construction monitoring for the following two migration seasons to confirm compliance with this safeguard policy.

Involuntary Resettlement (OP/BP 4.12): Because of the installation of transmission towers, the project was expected to acquire land in the form of 20 x 20 m areas for 11 percent of the transmission route that passed through cultivated land; hence, the project triggered this safeguard (PAD, pp.108-109). A Resettlement Policy Framework (RPF) was prepared and disclosed on March 28, 2010 in country and April 23, 2010 on the Bank's InfoShop. A Resettlement Action Plan (RAP) was to be prepared during project implementation when the exact extent of land acquisition would be known. After the addition of two new sub-components at the first restructuring, the RPF was updated and disclosed in country and on InfoShop on June 11, 2014. A grievance mechanism was disclosed at appraisal, but the grievance committee was formed only in February 2015, i.e., near the time of the original project closing date of December 2015.

At project closing, the project was in compliance with the Involuntary Resettlement safeguard policy. The payments for land acquisition and compensation for damaged crops were adequately processed. The Grievance Committee received 126 complaints, mostly in the form of inquiry about the payment amounts and how rates were determined (ISR 19, p.2). On the other hand, the absence of the implementation reports of the Resettlement Action Plan and the Environmental and Social Management Plan remained as a key challenge. The Bank's project team flagged this shortcoming to the EETC during missions (ISR 12, p.7).

b. Fiduciary Compliance

Financial Management

The project implementation entity, the EETC, had no previous experience in implementing Bank-financed projects. Therefore, it was agreed to establish a financial management unit within the project implementation unit (PAD, p.28). The unit was to have the overall responsibility for recording, budgeting, bank reporting requirements, and handling the loan disbursement arrangements. Interim financial statements and annual project audits were submitted on time (ICR, p.21). The ICR did not report whether the project audits were qualified or not. There were no issues of corruption or misuse of funds associated with the project. At project closing, all project funds were accounted for.

Procurement

The project followed the Bank guidelines in procurement; the implementation of international competitive bidding contributed to a lower than estimated construction cost for the main transmission line. On the other hand, the low project management capacity of the EETC resulted in significant procurement delays. As a result, the transmission activities added to the project scope at the first restructuring could not be fully completed by project closing. Procurement activities could only be concluded on April 26, 2019, two months before the project closing date (ISR, No:19, p.2). The departments that were responsible for design, planning and supervision activities did not directly report to the PIU; this resulted in delays in the scope, identification, and preparation of the bidding documents, in addition to ineffective contract supervision (ICR, p.23).



c. Unintended impacts (Positive or Negative)

None.

d. Other

None.

11. Ratings

Ratings	ICR	IEG	Reason for Disagreements/Comment
Outcome	Satisfactory	Moderately Satisfactory	The relevance of objectives is rated Substantial. The project's success was rated Substantial in scaling up wind power generation capacity against the revised low target. The achievement of the second objective to increase the transmission capacity in targeted areas is rated Modest due to insufficient evidence. Overall efficacy of the project is rated Substantial. Efficiency is rated Modest because of significant shortcomings in the operational and administrative efficiency of the project, mostly related to the implementation of the transmission activities added to the project scope at the first restructuring. According to the Bank guidance (p.38), the Outcome is rated Moderately Satisfactory.
Bank Performance	Satisfactory	Moderately Satisfactory	The quality at entry is rated Moderately Satisfactory because there were moderate shortcomings, such as overestimation of the cost of the transmission line, overly optimistic development schedule of the wind power plants, absence of a dedicated project



			management unit, and inadequate identification of risks. The Quality of Supervision is rated Moderately Satisfactory because of insufficient focus on the sustainability of the business model, shortcomings in the supervision of the project activities added to the project scope to utilize the loan savings, and insufficient evidence to validate the project team's enabling role in improving the EETC's capacity.
Quality of M&E	Substantial	Modest	The original target for installed generation capacity was ambitious and the M&E system had significant shortcomings in assessing the achievement of the second objective.
Quality of ICR	---	Modest	

12. Lessons

This review has drawn three lessons incorporating material from the lessons listed on page 21 of the ICR.

Overestimated project costs can lead to large amount of savings that can adversely affect the overall project implementation and project efficiency. Because of the lower actual cost of the 280 km double circuit transmission line than the cost estimated at appraisal, US\$106 million was saved. To utilize these savings, additional transmission activities were added to the project, but the project implementation agency, i.e., EETC, financed parts of these additional activities through its own funds. Later, the EETC could not identify new activities to be funded by these savings. The project team suggested direct contracting method to utilize the funds before project closing and also informed the EETC that early cancellation of funds would have been considered (ISR 17, p.4). At project closure, US\$37.9 million of the loans (IBRD, US\$12.2 million; CTF, 25.7million) had to be cancelled without fully achieving the expected outputs from the additional transmission investment activities. The overestimation of project costs has been a recurring issue in similar energy projects in Egypt.

Ambitious project development schedules that seek to involve the private sector on a new model, such as build-operate-and-own (BOO), can put the achievement of the project objective at risk. The project had a very ambitious schedule for the development of the first 250MW wind power plant project by a private investor on the BOO model; it was expected that the first power plant would start commercial operation within three years. The financial close of the remaining 2,250MW capacity was expected within five years of project implementation. Such investments require longer time for detailed technical, contractual and commercial assessments to



achieve bankability for project financing. The political events between 2011 and 2014 had an adverse impact on the development of these wind power projects, but even without this force majeure, the project schedule was very ambitious. The financial close of the first wind power investment was achieved during project implementation, but the start of the commercial operation of the power plant was delayed beyond project closing.

Absence of a dedicated project team can result in poor project management if the project implementation entity does not have sufficient project implementation capacity. The project implementation unit (PIU) within the EETC did not have adequate and experienced staff. The turnover of the heads of the PIU was frequent. Some project activities were undertaken by departments not reporting to the PIU. These led to poor project management that manifested itself in delays in the preparation of bidding documents and ineffective contract supervision. The Bank's project team's efforts to remedy the situation was partially successful. As a result, some project activities to be financed by the savings could not be completed before project closing.

13. Assessment Recommended?

Yes

Please Explain

An assessment is recommended because of the following reasons: (i) Excessive cost-overestimation in recent energy projects in Egypt and large amount of savings on the grounds of using international competitive bidding; (ii) the additionality of the Bank in promoting build-operate-own model to scale up renewable energy and the sustainability of this business model; and (iii) overall development impact of recently Bank-financed energy projects in Egypt.

14. Comments on Quality of ICR

The ICR provided a comprehensive overview of the project. The narrative was candid and internally consistent. Economic analysis was comparable to the analysis conducted at appraisal, but a financial analysis was not conducted at project closing. The evidence was mostly at the output level and it was insufficient to support the reported achievement of the second objective. The analysis of the outcomes of the additional activities financed by loan savings was inadequate. The ISRs and Aide Memoires included detailed information about these activities, but these were not reported in the ICR. The discussion of Bank Performance did not follow the Bank guidance; it was descriptive rather than evaluative. The discussion of safeguards was insufficient, too; the ISRs included more information about the issues related to the implementation of safeguard policies. The information about the financial management of the project was not adequate. The discussion in the Lessons and Recommendations section was useful and based on the experience gained during project implementation, but it was more in the form of findings, rather than lessons.



a. Quality of ICR Rating
Modest