Japan ODA Loan

Ex-Ante Evaluation (for Japanese ODA Loan)

1. Name of the Project

Country:	Republic of Tunisia
Project:	Rades Combined Cycle Power Plant Construction Project
Loan Agreement:	July 17, 2014
Loan Amount:	38,075 million yen
Borrower:	Société Tunisienne de l'Electricité et du Gaz (STEG)

2. Background and Necessity of the Project

(1) Current State and Issues in the Energy Sector in Tunisia

Following the revolution started in 2010 which sparked the Arab Spring, Tunisia experienced negative growth in 2011. However, in 2012, economic growth bounced back to 3.6%, and the IMF expects annual growth in the future of about 3%. As the domestic demand for electricity increases with rapid economic growth, the Government of Tunisia has worked actively to develop new sources of electric power. Although the government has also put effort into introducing renewable energy, at this moment, the most of its gross power generation capacity (3,496 MW) is accounted for by thermal power generation (thermal power: 97%, hydropower: 2%, wind power: 1%).

According to STEG forecasts, between 2012 and 2016, the overall demand for power in Tunisia is expected to increase at an annual average rate of 7.1%. To accommodate this rising demand for power, STEG has been proceeding with the construction of two new thermal power plants in Sousse in central Tunisia, with the aim of bringing them on line in 2014 and 2015 (see (4) below). However, even with the operation of these power plants, electricity is expected to be in short supply in the near future. Consequently, in order to eliminate this short supply of electricity, it is imperative that existing power plants be modernized and that even further new sources of power be developed. Given the urgency of this project, land within the site of the Rades Power Plant already in operation was selected by STEG as the site for this project.

(2) Development Policies for the Energy Sector in Tunisia and Priority of the Project

The Government of Tunisia listed "effective utilization of resources and conservation of the environment" as a priority sector in both its 11th Five-Year Development Plan (2007-2011) and its Five-Year Economic and Social Development Plan (2012-2016) formulated in 2011. The Rades Combined Cycle Power Plant Construction Project (hereinafter referred to as the "Project")—the aim of which is to enable high-efficiency gas combined cycle power generation in Radès on the outskirts of the capital, Tunis, using domestically produced energy with little emissions of CO_2—is consistent with the development policy of the Government of Tunisia. This Project was also mentioned as an investment program at the International Forum on Financing Development Projects for New Tunisia held in May 2012. Consequently, the priority of the Project in Tunisia is high.

(3) Japan and JICA's Policy and Operations in the Energy Sector in Tunisia

The Japanese government has listed the "sustainable development of industry" as a priority sector in its Country Assistance Program for the Republic of Tunisia (March 2013), and in this priority sector, where projects in such areas as environmental conservation and energy conservation are to be implemented. The Project is consistent with this priority sector. Examples of support provided by Japan to the electricity sector in Tunisia include the Rades Thermal Power Station Project (1982, 6,840 million yen) and the Photovoltaic Rural Electrification and Water Supply Project (2005, 1,731 million yen).

(4) Other Donors' Activities

In 2010, the European Investment Bank and the Arab Fund for Economic and Social Development provided loans of approximately 41.2 billion yen for a project to construct the Sousse Power Plant #3. In 2012, the Islamic Development Bank, the Saudi Fund for Development and the OPEC Fund for International Development provided loans of approximately 39.7 billion yen for a project to construct the Sousse Power Plant #4. In addition, in 2010, the European Investment Bank and the Islamic Development Bank provided financial aid of approximately 55.2 billion yen for a project to strengthen the power grid.

(5) Necessity of the Project

As outlined above, without the development of a new source of power, it is expected that Tunisia would face power shortages starting in 2016, and there is a high risk that there would be large-scale power outages on a nationwide scale. Following the 2011 revolution, Tunisian public became more critical towards public services. If a large-scale power outage was to occur, the social impact would be very large, and given that Tunisia is in the process of democratization, there is a risk that such a large-scale power outage could give rise to social unrest.

Thus, given that developing a new source of power has become an issue of urgency, this Project is highly necessary.

3. Project Description

(1) Project Objective

The objective of the Project is to develop power generating capacity and to achieve a stable supply of electricity by constructing a high-efficiency gas combined cycle power plant in Radès in the outskirts of the capital, Tunis, thereby contributing to sustainable economic development in Tunisia.

(2) Project Site / Target Area

Radès, Ben Arous Governorate

(3) Project Components

Construction of a gas combined cycle power plant generating in the order of 430-500 MW, and construction of related equipment

(4) Estimated Project Cost

45,828 million yen (loan amount: 38,075 million yen)

(5) Schedule

From July 2014 to April 2019 (58 months). The Project will be completed with the provisional handover of the combined cycle power plant (four months after the start of commercial operation).

(6) Project Implementation Structure

1) Borrower: Société Tunisienne de l'Electricité et du Gaz (STEG)
2) Guarantor: The Government of the Republic of Tunisia
3) Executing Agency: Société Tunisienne de l'Electricité et du Gaz (STEG)
4) Operation and Maintenance System: Société Tunisienne de l'Electricité et du Gaz (STEG)

(7) Environmental and Social Considerations, Poverty Reduction, Social Development

1) Environmental and Social Considerations

(i) Category: A

(ii) Reason for Categorization: The Project falls under the thermal power generation sector under the JICA Guidelines for Environmental and Social Considerations (promulgated in April 2010).

(iii) Environmental Permit: An environmental impact assessment (EIA) report for the Project was approved by the Agence Nationale de Protection de l'Environnement in February 2014.

(iv) Anti-Pollution Measures: Regarding air quality, water quality and noise during construction, any impacts will be mitigated by taking such measures as sprinkling water, installing settling tanks, using low-noise machinery and limiting work to during the day. Regarding air quality, water quality and noise after start of operation, it is expected that Tunisian emissions standards will be met such as by adopting a method of combustion with low NOx emissions, installing a wastewater treatment facility and installing low-noise equipment. Furthermore, at the meetings with stakeholders, concerns were raised over the effects caused by the spread of airborne pollutants and thermal discharge. In response, STEG gained the understanding of stakeholders by explaining that, even considering the cumulative effect of existing and new facilities, the emissions standards for air and water quality would not be exceeded. Participants have not voiced any notable objection to the Project.

(v) Natural Environment: Chikly Island (cultural heritage and waterfowl reserve) is located 6 km to the west, and Bou-Kornine Natinal Park (reserve for Barbary sheep) is located 8 km to the southeast of the area targeted by the Project. Despite this, it has been confirmed that any dispersal of airborne pollutants to these protected areas would be limited, and therefore, the Project is likely to have minimal adverse impact on the atmospheric environment around any protected areas.

(vi) Social Environment: Since the Project involves the construction of a power plant within the grounds of existing STEG facilities, it does not involve land acquisition or resident relocation.

(vii) Other/Monitoring: During construction, the contractor will monitor water quality, noise and other factors, and then, once the plant is brought into service, STEG will monitor air quality, water quality, noise and other factors.

2) Promotion of Poverty Reduction: None in particular

3) Promotion of Social Development (gender perspective, measures for infectious diseases including HIV/AIDS, participatory development, consideration for the person with disability, etc.): None in particular

(8) Cooperation with Other Donors: None in particular

(9) Other Important Issues: None in particular

4. Targeted Outcomes

(1) Quantitative Effects

1) Performance Indicators

Indicator	Baseline value (2013)	Target value (2020) [2 years after project completion]
Operation indicators		
Gross maximum output (MW)	N/A	430 (ISO standards)
Plant load factor (%)	N/A	70.0
Availability factor (%)	N/A	90.0
Auxiliary power ratio (%)	N/A	3.0
Gross thermal efficiency (%)	N/A	57.0
Outage frequency (due to human error) (times/year)	N/A	0
Outage frequency (due to machine	N/A	2

trouble) (times/year)		
Outage frequency (planned outage) (times/year)	N/A	20
Effect indicators		
Gross maximum output (MW)	N/A	430 (ISO standards)
Net power output (GWh/year)	N/A	2,637

2) Internal Rate of Return

Based on the following assumptions, the economic internal rate of return (EIRR) for the Project has been calculated at 21.77%, and the financial internal rate of return (FIRR) at 7.33%.

[EIRR]

Cost: Project costs (excluding taxes), management and maintenance costs (fuel and other)

Benefits: Increase in power supply, reduction in natural gas consumption, reduction in CO_2 emissions

Project life: 25 years

[FIRR]

Cost: Project costs, management and maintenance costs

Benefits: Revenue from selling electricity

Project life: 25 years

3) Greenhouse gas reductions: Approximately 630,000 t (CO_2 equivalent) per year

(2) Qualitative Effects

Contribution to sustainable economic development at the national level.

5. External Factors and Risk Control

None in particular

6. Results of Evaluations and Lessons Learned from Past Projects

(1) Evaluation Results of Similar Projects

The ex-post evaluations of the Rades Thermal Power Station Project previously implemented in Tunisia and of the Ulaanbaatar Thermal Power Plant No.4 Optimization Project in Mongolia point out that, in projects involving the power generation, due consideration needs to be given to securing and training maintenance personnel, and where necessary, assistance should be given for non-physical aspects.

(2) Lessons for the Project

Since its founding in 1962, STEG has been engaged in the construction and maintenance

of power plants. It is improving its capacity, by accumulation of knowledge and experience. It has been confirmed at the time of appraisal that personnel have adequately high technical competence, such as providing technical support to neighboring countries through STEG International Services (STEG-IS) since 2006. Furthermore, it has been confirmed that by securing personnel needed for operation and maintenance in the Project, and by the main contractor entering into a long-term service agreement (six years) in addition to having operational, maintenance and management training incorporated within the main contract for the Project, the stable operation of the power plant is guaranteed.

Given this, it can be concluded that STEG has responded appropriately to the lessons learned from similar projects.

7. Plan for Future Evaluation

(1) Indicators to be Used

1) Gross maximum output (MW)
2) Plant load factor (%)
3) Availability factor (%)
4) Auxiliary power ratio (%)
5) Gross thermal efficiency (%)
6) Outage frequency (due to human error) (times/year)
7) Outage frequency (due to machine trouble) (times/year)
8) Outage frequency (planned outage) (times/year)
9) Net power output (GWh/year)
10) Economic internal rate of return (EIRR)
11) Financial internal rate of return (FIRR)
12) Reduction of greenhouse gas emissions (t) (CO_2 equivalent)

(2) Timing

Two years after project completion