I. Project Context

Country Context

Macroeconomic policies and reforms introduced in the last ten years have resulted in vigorous economic growth in Turkey. The country recovered from the 2009 recession quickly, with a GDP growth of about 9.0 percent in 2010 and 8.5 percent in 2011. The strong growth was facilitated by rapid credit growth and high capital inflows supported by global liquidity and healthy Turkish balance sheets. Going forward, Turkey is likely to be able to realize growth rates about five percent per annum in the medium term. This growth path is predicated on continued progress on Turkey’s unfinished structural reform agenda. Key structural strengths, primarily its resilient banking sector, dynamic private sector, and favorable public and external debt dynamics mitigate risks to the economy and suggest a favorable medium-term outlook for Turkey’s growth performance. Contingent on future progress in the structural reform agenda and strong macroeconomic and fiscal management, Turkey is likely to be able to realize its growth potential.

Sectoral and institutional Context

Sector and Institutional Context
Securing sufficient and reliable energy to a growing economy in an environmentally sustainable manner has been and remains the main energy policy concern for the Turkish Government. Future demand growth is projected to be around 4.5 to 5.0 percent per annum, which could lead to supply shortages if generation investments fall behind load growth. To diversify the sources of energy supply in face of high dependence on imported oil and gas, Turkey is improving the security of energy supply by ambitious projects to increase domestic energy production, including through indigenous renewable energy generation from wind and hydro resources.

A major milestone for the development of the wind energy was Renewable Energy Law (Law No.5346) passed in 2005. Under this law, wind power plants qualify for Renewable Energy Resources Certificates (RERC) which enables them to benefit from a feed-in tariff of a minimum of 7.3 USD cent per kWh. An amendment in 2010 provided feed-in-tariffs up to 11 USD cent per kWh to reward the use of locally produced equipment.

Wind power capacity has gradually expanded since early 2000s and Turkey has ambitious plans for its future development. A Strategy Paper prepared by the Government of Turkey in 2009 ambitiously aims for 20,000 MW of installed wind capacity by 2023. This would amount to about 25-30% of the projected peak demand in 2023. Total wind capacity that has been licensed reached 11,000 MW by third quarter of 2013 of which about one-fourth (2,700 MW) is currently operational.

Turkey has been a party to the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol since 2004 and 2009, respectively. The National Climate Change Strategy (NCCS) approved by the High Planning Council in May 2010 and under implementation through a National Climate Change Action Plan aims to fully integrate climate change-related objectives into its development policies, encompassing disseminating energy efficiency, developing clean and renewable energy resources, actively participating in the efforts to tackle climate change, and providing its citizens with a high quality of life and welfare with low-carbon intensity.

Turkey has made important progress in reforming the power sector, with advisory and investment lending support from the Bank. The originally vertically-integrated state-owned electricity monopoly (TEK) was split into two state-owned companies: a generation and transmission company (TEAS) and a distribution company (TEDAS). Electricity market liberalization was launched and progressively implemented under the Electricity Market Law of 2001 (Law No. 4628). As per the 2001 Law, TEAS was split into three companies: the Turkish Electricity Transmission Corporation (TEIAS), the Turkish Electricity Trading and Contracting Corporation (TETAS) and the Electricity Generating Corporation (EUAS). It also established the Electricity Market Regulatory Agency (EMRA) as an independent regulatory authority which provides generating licenses and sets tariffs. The Law also laid the basis for the establishment of a wholesale electricity market and gradual opening of the retail electricity market.

A synchronous 400 kV interconnection with the European electricity grid is in the final testing phase, with limited commercial operation with Bulgaria and Greece already allowed. After the full commercial operation starts, Turkey will also become a member of the European Network of Transmission System Operators for Electricity (ENTSO-E). An asynchronous direct current (DC) interconnection between Turkey and Georgia is now under testing. TEIAŞ is also studying DC interconnections with Iran and Syria.
Key Sectoral and Institutional Issues:

Although Government of Turkey has set an ambitious target of developing 20,000 MW of wind energy capacity by 2023, at the present rate only about 400-500 MW of wind energy is likely to be added each year, as against about 1600-1700 MW needed to achieve the goal of 20,000 MW by 2023. To enhance the rate of addition of wind energy, the key barriers that inhibit faster development of wind energy in Turkey need to be addressed. These are as follows:

a) Need for upfront transmission investments hinders the development of WPPs

In Turkey, existing and most potential WPP sites are located in relatively rural areas where local electricity demand is generally low. Any available network assets in these areas were originally built to meet the low consumer demand. Therefore, existing overhead lines (OHLs) are thin and substations do not have large transformer capacity. Also, power flows on conventional transmission networks are analogous, so to speak, to flows from a large trunk to small twigs. On the contrary, remotely located WPPs pour produced power from a twig to the trunk. Therefore, when considering rapid WPP penetration, it is necessary to address not only high power flows but also their reverse direction – often necessitating new transmission infrastructure.

With multiple WPPs planned in most locations, transmission investments have to be optimized for evacuation of power from all planned WPPs. However, new transmission infrastructure must be made available with the commissioning of the very first WPP. The high upfront transmission investments needed to cater to evacuation of power from all planned WPPs impede wind power development by imposing a disproportionately heavy investment burden on transmission facilities related to the initial few WPPs.

b) Limitations of existing load dispatch and control systems

At present, Turkey has 2700 MW of installed wind energy capacity which is about 4% of installed power generation capacity and 2.5% of electricity generated in the country. Targeted wind capacity of 20,000 MW by 2023 would account for 20% of installed generation capacity and about 10-12% of energy generation in Turkey. This would amount to about 25-30% of the projected peak demand in 2023. Figure-2 shows how the projected shared of wind energy in Turkey in 2023 compares with the share of wind energy in some of the leading countries today.

Since wind energy is less predictable and is usually treated as a negative load for the purposes of load dispatch, countries with large wind energy capacity rely on robust load dispatch and control systems for managing fluctuations in wind energy generation through rapid response from other generation capacities. Compared to high wind energy countries, the load dispatch and control system facilities in Turkey face the following limitations at present:

   (i) SCADA system needs upgrade: TEIAS operates the National Control Center (with Emergency Control Center as a back-up) and other regional centers since mid-1980s. The SCADA system was installed some years back and is not aligned with the advanced systems needed for high share of wind in generation mix.

   (ii) Gaps in installation of RTUs: TEIAS has been installing Remote Terminal Units (RTUs) to all 380kV substations and power plants since 1980s. However, RTUs have not been installed in
many rural 154kV substations which are hubs of sub-transmission network and are often the main interface with WPPs.

(iii) Old RTUs are slow and obsolete: Many old RTUs which were installed in mid-1980s are still being used. However, such old RTUs are slow and do not have many common and high speed functions required in current Smart Grid Technology protocol.

(iv) Wind Prediction Capabilities are not integrated: Grid operation and wind energy utilization can be improved through better prediction of wind and sharing of information with generators as well as load dispatch centers. Efforts are underway to collate and analyze data from wind masts at various WPP locations. There is a need to strengthen these efforts and integrate them with smart-grid systems.

(v) Need to strengthen other components of grid management system: Apart from the limitations, the grid management system needs strengthening of numerical protection relays for better protection, as well as shunt reactors for control of reactive power.

As a result, it is expected that rapid addition of wind energy to the Turkey’s national grid would impose difficulties for grid operator in managing smooth operation of the grid.

c) Limited transmission links vis-à-vis geographic location of wind energy resources

Wind energy potential in Turkey that is technologically and economically viable is estimated to be around 48,000 MW, according to MENR’s General Directorate of Renewable Energy. The locations with the highest wind energy potential are in the Aegean, Marmara, and the eastern part of the Mediterranean region. The key load center for electricity in this part of Turkey is around the city of Istanbul in the Thrace area , which also links Turkey to other European countries. This area has significant wind energy potential. However, most of the other energy resources including thermal, hydropower and a large part of wind energy resources are located in the Anatolian part of Turkey. Therefore, connections between Thrace and Anatolia are critically important for the development and effective functioning of power systems in Turkey.

The Thrace and Anatolian regions have several transmission links on the eastern side through the Bosphorus strait. However, going forward, transmission links would be needed across the Dardanelles strait as well. This is particularly important as the planned WPP sites are located on the eastern side of Marmara and Aegean regions closer to the Dardanelles strait. The first transmission connection on the Dardanelles strait would be the 1000 MW Lapseki-Sutluce Submarine Power Cable-1 which is being implemented under the APL-6 project. The contract has been awarded in September 2013 and it is expected to be completed by end-2014. However, this first link is already planned for loading to capacity and additional links would be needed to cater to the planned wind energy development in the Marmara and Aegean regions.

d) Inadequacy of existing transmission network to meet the growing demand of electricity

According to the “Ten Year Capacity Projection Report” prepared by TEIAS, electricity sector in Turkey is expected to grow at nearly 4.5 to 5% per annum. This means that the peak supply will increase from 38 GW in 2012 to about 65-72 GW levels by 2023. Transmission systems, including lines, substations and their transformers, need to be continuously strengthened to respond to the increasing requirements of higher electricity consumption and increased supply from newly constructed power plants including wind and conventional thermal power plants. Further, with increasing flow of power, it is important to continuously strengthen the grid network to ensure
reliability and security, as well as to reduce losses from excessive loading.

c) Market and Regulatory Aspects

The licensing regime for wind power plants is based on the new Electricity Market License Regulation of November 2013 as per new Electricity Market Law of March 2013. Transmission capacity for grid connection for regions and provinces is announced by TEIAS for the next five and ten years based on the wind potential map of regions prepared by MENR. Licenses are awarded through competitive bidding for grid-connection, subject to techno-economic approval from TEIAS and General Directorate of Renewable Energy of MENR.

Acquiring the license also requires approval of the pre-feasibility study, decision regarding the environmental impact assessment and agreement with TEIAS regarding the renewable energy contribution fee. Wind developers need to get permits from nearly fifteen institutions such as Ministry of Defense, Ministry of Forestry and Water Affairs, and Ministry of Environment and Urbanization. Simplification of the licensing processes can boost wind energy installation by reducing the time lag between licensing and implementation of projects.

In addition, planning needs to be undertaken on a cumulative basis rather than for individual projects – especially for integrated transmission development as well as integrated environmental impact assessment for multiple wind energy sites located in the same area.

II. Proposed Development Objectives

The PDO is “To assist Turkey in meeting its increased power demand by strengthening the transmission system and facilitating large-scale renewable energy generation”.

The GEO is “To avoid Green House Gas (GHG) emissions from fossil fuel based power through greater integration of renewable energy sources based generation in Turkey”.

III. Project Description

Component Name
Component-1: Upfront development of transmission infrastructure to facilitate faster development of WPPs
Comments (optional)
This component would develop three 380kV 500 MVA highly digitalized sub-stations with associated grid connection structures for evacuation of wind power in the provinces of Can, Izmir and Hamitabat.

Component Name
Component-2: Smart-grid investments to strengthen grid operation and management in face of higher wind energy generation
Comments (optional)
This involves SCADA system upgrade, Renewable Energy Resource Operator Desk, Remote Terminal Unit (RTU) installation, Digital Protection Relay deployment and Shunt Reactor installation.

Component Name
Component-3: Lapseki-Sutluce 380 kV Submarine Power Cable to better inter-connect wind energy locations with other parts of Turkey
Comments (optional)
As the second double-circuit submarine cable route having 4.35 km length across the Dardanelles strait, this cable will connect Anatolian side and Thrace side of Turkey with a capacity of 2 GW.

Component Name
Component-4: Strengthening of Transmission Networks to cater to growing demand and supply of electricity in Turkey

Comments (optional)
This component will cater the investment needs for 380 kV bulk-transmission and 154 kV sub-transmission network expansions to meet rapidly increasing demand and supply.

IV. Financing (in USD Million)

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<tr>
<th></th>
<th>Amount</th>
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<tr>
<td>Total Project Cost</td>
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V. Implementation
The project will be implemented by TEIAS in its roles as the electricity transmission system owner and operator, and as the electricity market operator. TEIAS is currently implementing the ongoing ECSEE APL 6 project, which is rated as satisfactory (as of January 2014). TEIAS is familiar with the Bank policies and guidelines, in terms of procurement, financial management and safeguards. Project implementation will be carried out by the following units within TEIAS:

a) The Project Coordination Unit (PCU) within the Research, Planning and Coordination Department of TEIAS oversees and coordinates the World Bank projects.

b) Three operating departments will be responsible for procurement and implementation for this project. These are the:

i. Substation Department (for substations, underground and submarine cables),
ii. Communications and Information Systems Department (for SCADA and Smartgrid), and
iii. Operations Department (for shunt reactor and numerical relay).

c) The finance department is responsible for financial and disbursement reporting to the PCU, the timely completion of audits and implementing the plans to address issues related to achieving a comprehensive audit opinion of TEIAS.

VI. Safeguard Policies (including public consultation)

<table>
<thead>
<tr>
<th>Safeguard Policies Triggered by the Project</th>
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<tbody>
<tr>
<td>Environmental Assessment OP/BP 4.01</td>
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<td>Involuntary Resettlement OP/BP 4.12</td>
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</table>
In accordance with World Bank environmental policies and procedures (OP/BP/GP 4.01) the project has been assigned “Category B”, as the types of potential impacts are limited and should be relatively easy to assess and mitigate through careful selection of sites and good construction practices. Since the exact footprints of the sub-projects are not determined yet, an environmental management framework (EMF) has been prepared by TEIAS to provide guidance for screening, assessing, conducting consultations, reporting and monitoring practices.

OP 4.12 is triggered for this project as land acquisition is expected during implementation. However, social impacts of the proposed list of investments (substations and transmission lines) are not expected to be significant. Small sizes of land will be expropriated for the substations and transmission line poles, and long term easements will not limit use of land significantly for transmission lines. Since the exact locations of the proposed list of investments are not known at this time, a Land Acquisition Policy Framework has been prepared. An advanced draft of the LAPF has been disclosed on TEIAS's website and the World Bank's Infoshop.

VII. Contact point

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