

ALTERNATIVE ENERGY DEVELOPMENT BOARD (AEDB)

Established in May, 2003, AEDB was mandated to implement policies, programs and projects through Private Sector in the field of Alternative / Renewable Energy (ARE); assist and facilitate development and generation of ARE Technologies to achieve sustainable economic growth; encourage transfer of technology; develop an indigenous manufacturing base for ARE Technology; and promote the provision of energy services that are based on ARE resources. In May, 2010, AEDB was given the mandate to implement ARE commercial projects on its own or through joint venture or partnership with public or private entities in addition to its mandates under the ordinance.



FUNCTIONS OF AEDB

- a) To develop national strategy, policies and plans for utilization of ARE resources to achieve the targets approved by the Federal Government in consultation with the Board.
- b) To act as a forum for evaluating, monitoring, and certification of ARE projects and products.
- c) To facilitate power generation through ARE resources by:
 - i) Acting as a one window facility for establishing, promoting and facilitating alternative or renewable energy projects based on Wind, Solar, small Hydel, fuel cells, Tidal, Ocean, Biogas, Biomass etc.
 - ii) Setting up ARE pilot projects on its own or through joint venture or partnership with Public or Private entities in order to create awareness and motivation of the need to take such initiatives for the benefit of general public as well as by evaluating concepts and technologies from technical and financial perspective.
 - iii) Conducting feasibility studies and surveys to identify opportunities for power generation through ARE resources.
 - iv) Undertaking technical, financial and economic evaluation of the alternative or renewable energy proposals as well as providing assistance in filling of required licensing applications and tariff petitions to National Electric Power Regulatory Authority (NEPRA)
 - v) To implement policies, programs and projects through Private Sector in the field of ARE;
 - vi) To assist and facilitate development and generation of ARE to achieve sustainable economic growth;
 - vii) Encourage transfer of technology and develop indigenous manufacturing base for AE Technology;
 - viii) Promote provision of energy services that are based on ARE resources;
 - ix) Undertake ARE projects on commercial scale (AEDB Act, 2010).
 - x) Interacting and coordinating with the national and international agencies for promotion and development of alternative energy.
 - xi) Assisting development and implementation of plans with concerned authorities and provincial Government for off-grid electrification.

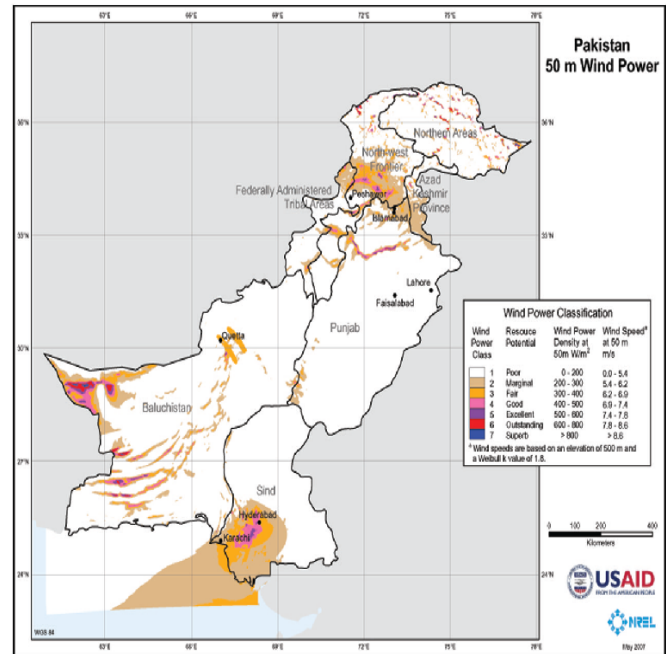
PAST ACHIEVEMENTS / ONGOING AND FUTURE PROJECTS

Wind

The wind map of Pakistan developed by National Renewable Energy Labs (USA) identifies wind with good to excellent speeds is available in many parts of the country with a total potential of about 340,000 MW. The Gharo - Ketji Bandar wind corridor, in the South of Pakistan, having an approximate potential of 50,000 MW is the most attractive to investors at this point due to good resource potential as well as its close proximity to major load centers and the national grid. Ground data for other potential areas in the country is also being gathered and verified.

Private Sector has been triggered to invest in Wind Power. Currently, 48 projects of around 3,200 MW are under process. Government of Sindh has leased around 26,000 acres of land for 18 projects with a cumulative capacity of 906 MW which are at various stages of development. A brief account of the projects is as follows:

- **Under construction: 156 MW**
- **Financial Closure (expected) during 2012: 200 MW**
- **Financial Closure by 2013: 550 MW**



Solar

Pakistan has immense solar resources, suitable for both Photovoltaic (PV) and Thermal i.e., Concentrated Solar Power (CSP) applications. The Annual Direct Normal Solar Radiation (which indicates the potential for CSP) is in the range of 7 to 7.5 kWh/m²/day in many parts of Balochistan and between 6.5 to 7 kWh/m²/day in other parts of Balochistan; 5 to 5.5 kWh/m²/day in Southern Punjab and Northern Sindh and around 4.5 to 5 kWh/m²/day in rest of Pakistan. The Annual Flat Plate Tilted at Latitude Solar Radiation is in the range of 7 to 7.5 kWh/m²/day in most of Balochistan; 6 to 6.5 kWh/m²/day in most of Sindh, Southern Punjab and Gilgit-Baltistan and in the range of 5.5 to 6 kWh/m²/day in rest of the country.



There are more than 40,000 villages which are so far from the grid that it becomes costly and uneconomical to extend the grid to these locations. These villages are prime candidates for village electrification using renewable energy, for which the Government has launched Rural Electrification Program (REP), using Solar Home Systems (SHS).

260,000 electricity operated agriculture water pumps (tube-wells) currently have a sanctioned load of over 2,500 MW, and another 850,000 Diesel Water Pumps consume 72,000 TOE of Diesel annually. They offer an opportunity to be replaced with Solar Powered Efficient Pumps.

Pakistan has over 500,000 Street Lights with a sanctioned load of over 400 MW. Most of these Street Lights are based on 80W, 125W and 250W Sodium Lights. They offer opportunities to be replaced with Efficient Solar Lighting.

Piped natural gas is available to only 22% of the population. About one third of the gas in domestic sector is used in space heating and water heating. The Government is encouraging use of Solar Water Heaters and Geothermal Heat Pumps in domestic and industrial sectors. This provides a big market for investors as well.

Eight Solar powered projects with an aggregate capacity of 96 MW are at various stages of development under the Lol issued to them.

Off Grid

- Under **Solar Village Electrification Programme** 3000 Solar Home Systems have been installed in 49 villages of district Tharparkar, Sindh. Another 51 villages in Sindh and 300 villages in Balochistan are approved for electrification using solar energy and will be implemented on release of funds.
- Under the **Parliamentarian Sponsored Village Electrification Programme**, 32 feasibilities have been prepared and submitted for approval and release of funds. Funds for 3 schemes have so far been released under PWP-II and the schemes are being implemented.
- **Pilot Programme for Conversion of Electric / Diesel driven Tube-wells / Dug-wells with Solar Energy** has been initiated, under World Bank assistance to study the technical, financial and social viability of conversion. On successful implementation of the pilot, the World Bank will consider multimillion dollar loan for up-scaling the national programme.
- Following the Government policy of duty / tax exemption, import / installation of equipment for Solar technology has increased manifold. Following is the detail of Import of Solar Technology:
- 750 units of solar water pumping systems have also been imported in the country. These water pumping systems are installed for community drinking and agriculture purpose all over Pakistan.

Other initiatives

- A PC-I for installation for 1 x 50 MW Solar Thermal power plant awaits approval after which the project will be presented to donors for funding.
- A PC-1 for **Installation of 4000 Solar Tube –wells** at a cost of Rs. 12.57 Billion has been recommended by CDWP for approval of the ECNEC.

Hydro

The total hydro-power resource in the country has been estimated at over 50,000 MW. Most of the resources lie in the North of the country, which offers sites for large scale (100 MW to 7,000 MW) power projects. Smaller (less than 50 MW) sites are available throughout the country.

The following projects are at various stages of development:

- 9 small hydro power projects with an aggregate capacity of 110.24 MW, under the REDSIP programme are being implemented by AEDB through provincial governments which are at various stages of development:



- With the assistance of Global Environment Facility (GEF), a Micro Hydro Project titled, 'Productive Use of Renewable Energy (PURE)' has been launched in Chitral, Gilgit and Skardu, where more than 90 micro hydro power units are being installed in collaboration and partnership with AKRSP.

Waste to Energy

Pakistan produces huge amount of municipal waste (Karachi 9,000 tons / day and other cities about 2,000 to 6,000 tons / day) and agriculture waste in the form of Bagasse, Cotton Sticks and Rice Husk. Converting this waste to energy can generate up to 3,000 MW of power. Pakistan offers lucrative opportunities in this sector in which a number of projects are already under preparation.

The following studies are at various stages:

UNDP Study

A study carried out by UNDP estimates that around 20 million households in the country are not connected to Piped Natural Gas and around 05 million of them have appropriate potential to benefit from Domestic Biogas Plants.

05-10 MW Waste to Energy Study for Karachi.

A Waste to Energy Study, funded by USTDA is being carried out for Karachi to generate 05-10 MW power. The study is being carried out by an American consulting firm.

Biomass to Energy (Sugar Industry Projects).

There are 85 sugar mills in Pakistan, possessing cumulative potential to generate up to 3000 MW of power through bagasse, an industrial waste produced during the process of sugar manufacturing. AEDB has taken an initiative to introduce and promote Biomass to Energy technology to the sugar industry. In this connection, a visit of local sugar industrialists to USA was arranged to introduce the latest biomass co-generation technologies and sugar mill industry practices as efficient methods for energy conservation, pollution reduction as well as cost effective options for placing additional generating capacity on the electric power grid. As a result of AEDB's efforts, many sugar mills have initiated biomass to energy projects, which are as below:

- 27 MW of Biomass / Waste to Energy plant operational at Al-Moiz Industries, D. I. Khan;
- 7 MW of Biogas / Waste to Energy project operational at Shakarganj Sugar Mills, Jhang;
- 14 New Waste to Energy Projects (213 MW) awarded Generation License by NEPRA;

Study for Biomass / Waste-to-Energy Projects in 20 cities of Pakistan

AEDB has initiated a World Bank funded project for carrying out detailed study for Biomass / Waste-to-Energy projects in 20 cities of Pakistan. Technical proposals have been evaluated & Consultant for the project has been selected. However, Contract Agreement is yet to be signed.

Geothermal Energy

Pakistan also possesses a good regime for Geothermal energy. Many hot water springs, some generating surface water temperature up to 83 °C lie in the North of Pakistan. Geothermal sites have also been identified in Balochistan and Sindh. Although detailed surveys have not been conducted, it is estimated that over 5,000 MW of Geothermal resources can be commercially tapped in the short run. The geothermal fields in Pakistan have not been adequately explored, exploited or developed yet. AEDB has initiated a project for identification and exploration of potential geothermal sites all over Pakistan for utilization of geothermal energy.

During this project several studies were undertaken:

- Remote sensing studies;

- Geothermal Geology;
- Geothermal Hydrogeology;
- Hydro geochemical studies;
- Geophysical Studies;
- Preliminary study on technical, Economical and Market Aspects of Geothermal utilization possibilities and detailed feasibility studies for geothermal energy utilization

Geothermal energy can be utilized for generation of electricity, District cooling, fish farming, mineral recovery, dry ice Carbon Dioxide production and desalination etc. Potential geothermal energy sites are identified at Sehwan in Sindh.

Geothermal power can be used for power production by pumping hot geothermal water from source rock to the surface and producing steam through heat exchangers to subsequently run steam turbine for electricity generation.