

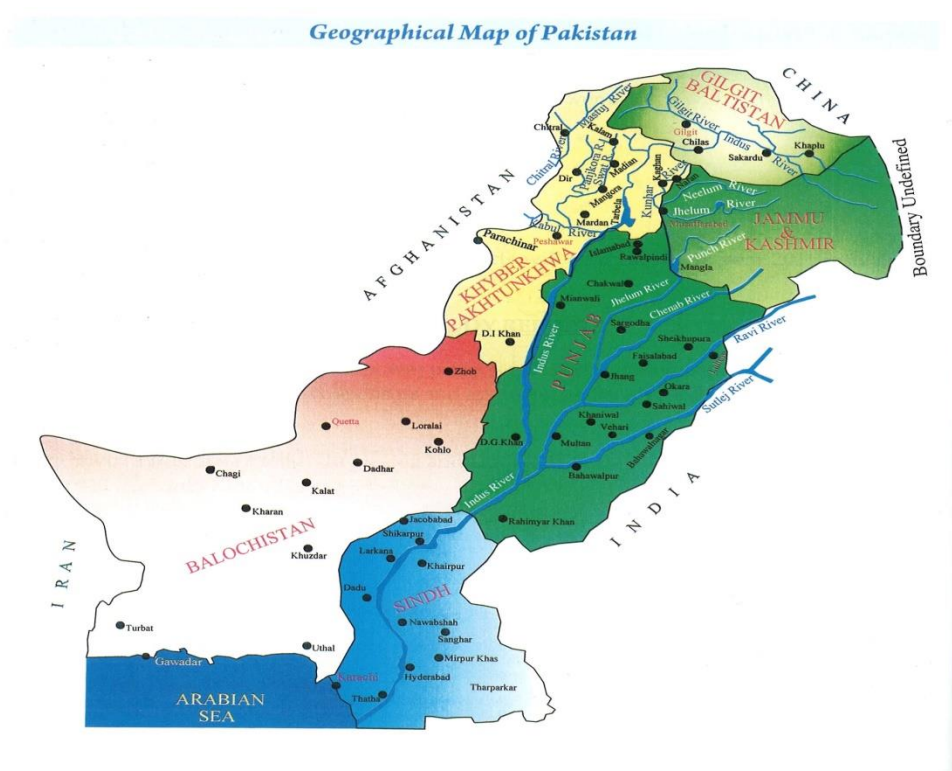


# Pakistan Energy Sector and prospects for business

Pakistan Business Day in Hamburg  
15<sup>th</sup> December 2016



## Geographical location of Pakistan

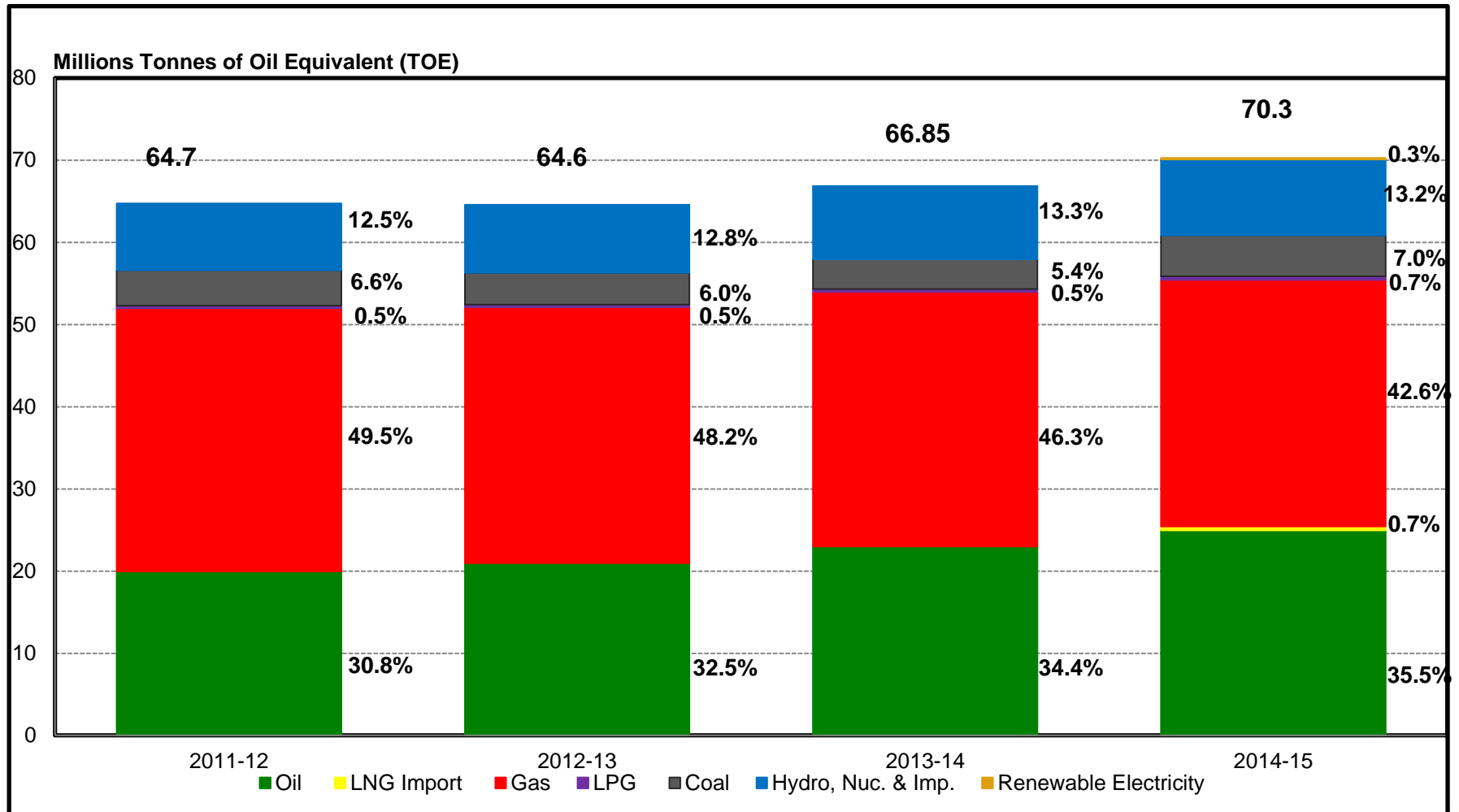


- Federation of 6 provinces and states
- Total area : 881,913 sq-km
- Population: 200 Million 6<sup>th</sup> in the world
- Electricity Shortfall: 5000 MW
- Un-electrified population 30%
- GDP Growth 4.5%



# Energy Situation

## PRIMARY ENERGY SUPPLIES BY SOURCE



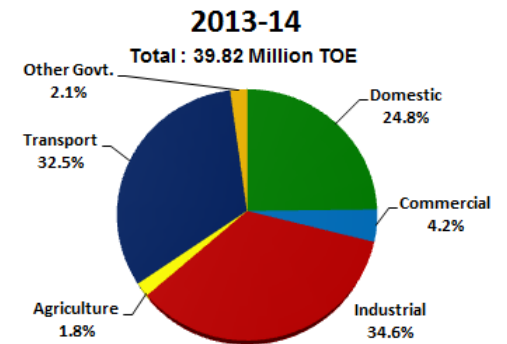
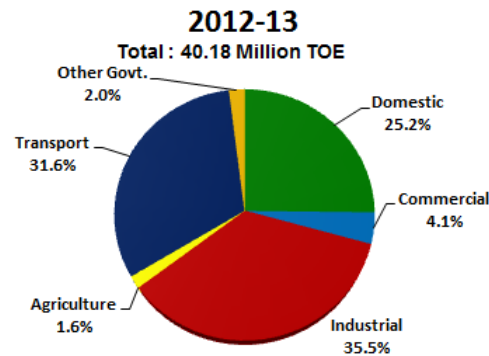
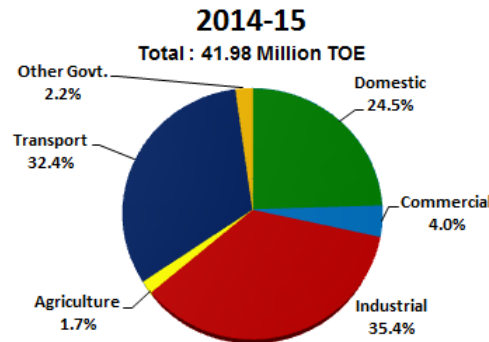
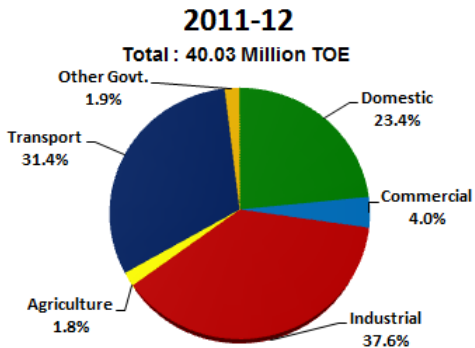
Source: Pakistan Energy Year Book 2015 published by Hydrocarbon Development Institute of Pakistan (HDIP), Ministry of Petroleum & Natural Resources, Government of Pakistan



# Energy Situation...cont.

## ENERGY CONSUMPTION BY SECTOR

(Excluding fuels consumed in thermal power generation)

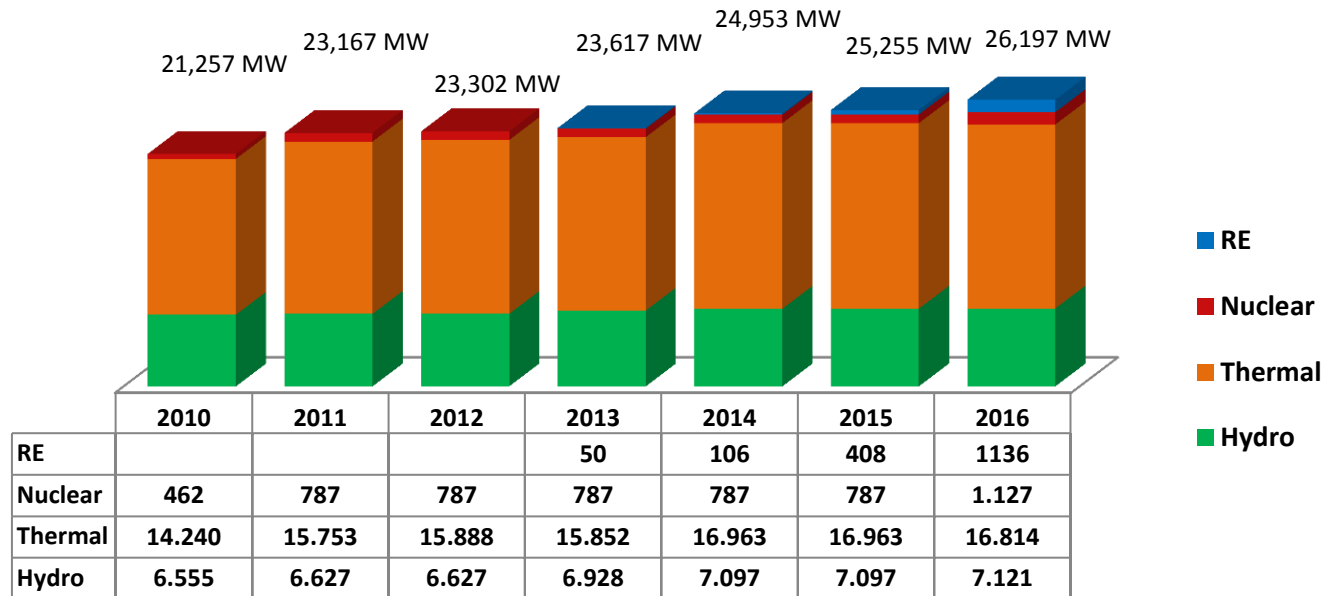


Source: Pakistan Energy Year Book 2015 Published by Hydrocarbon Development Institute of Pakistan (HDIP), Ministry of Petroleum & Natural Resources, Government of Pakistan



# ELECTRICITY INSTALLED CAPACITY BY TYPE

## PEPCO and KEL (Public and Private)

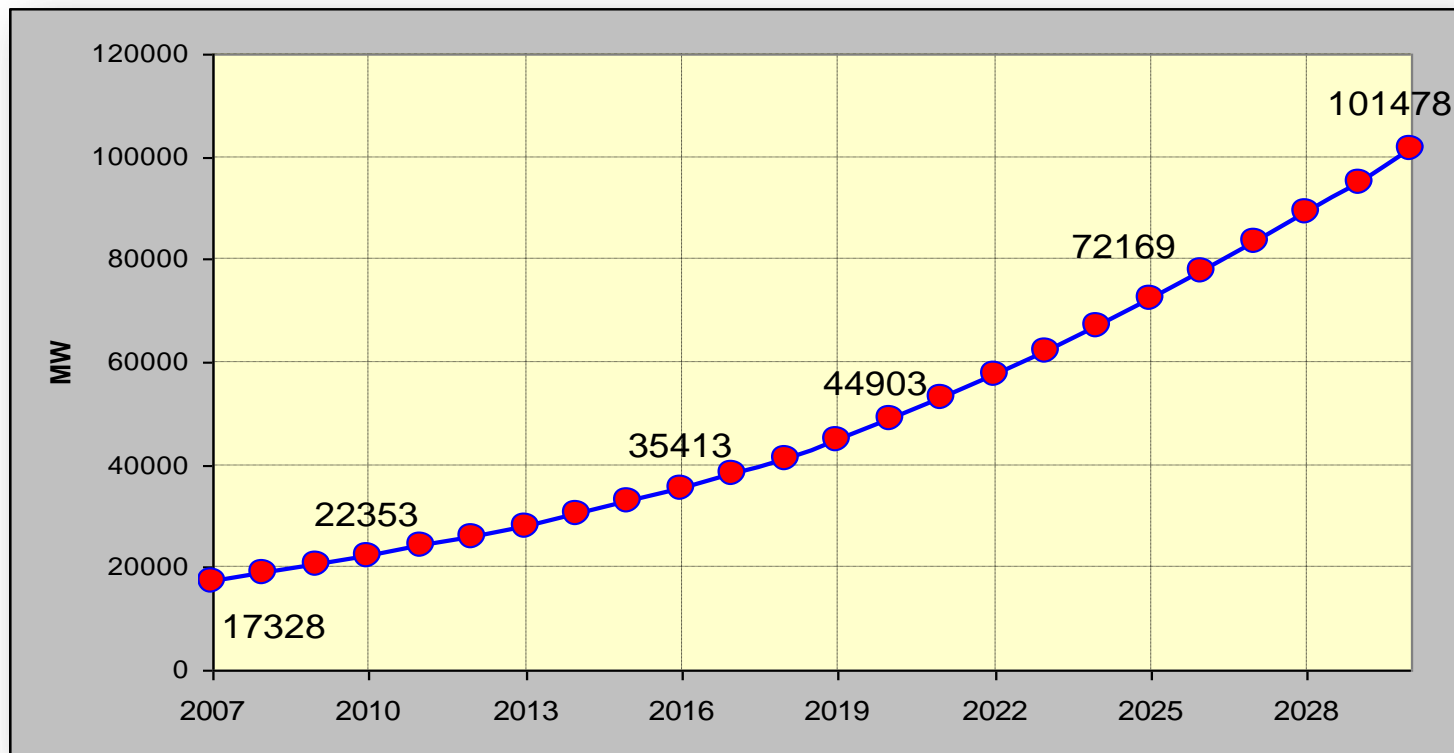


Source: CPPA, AEDB and NEPRA

\* Total Capacity as on 24<sup>th</sup> October 2016, It is an in house data collection effort  
 \*\*1136 MW capacity of RE, Reference: AEDB (Alternative Energy Development Board)



# Power Demand Forecast



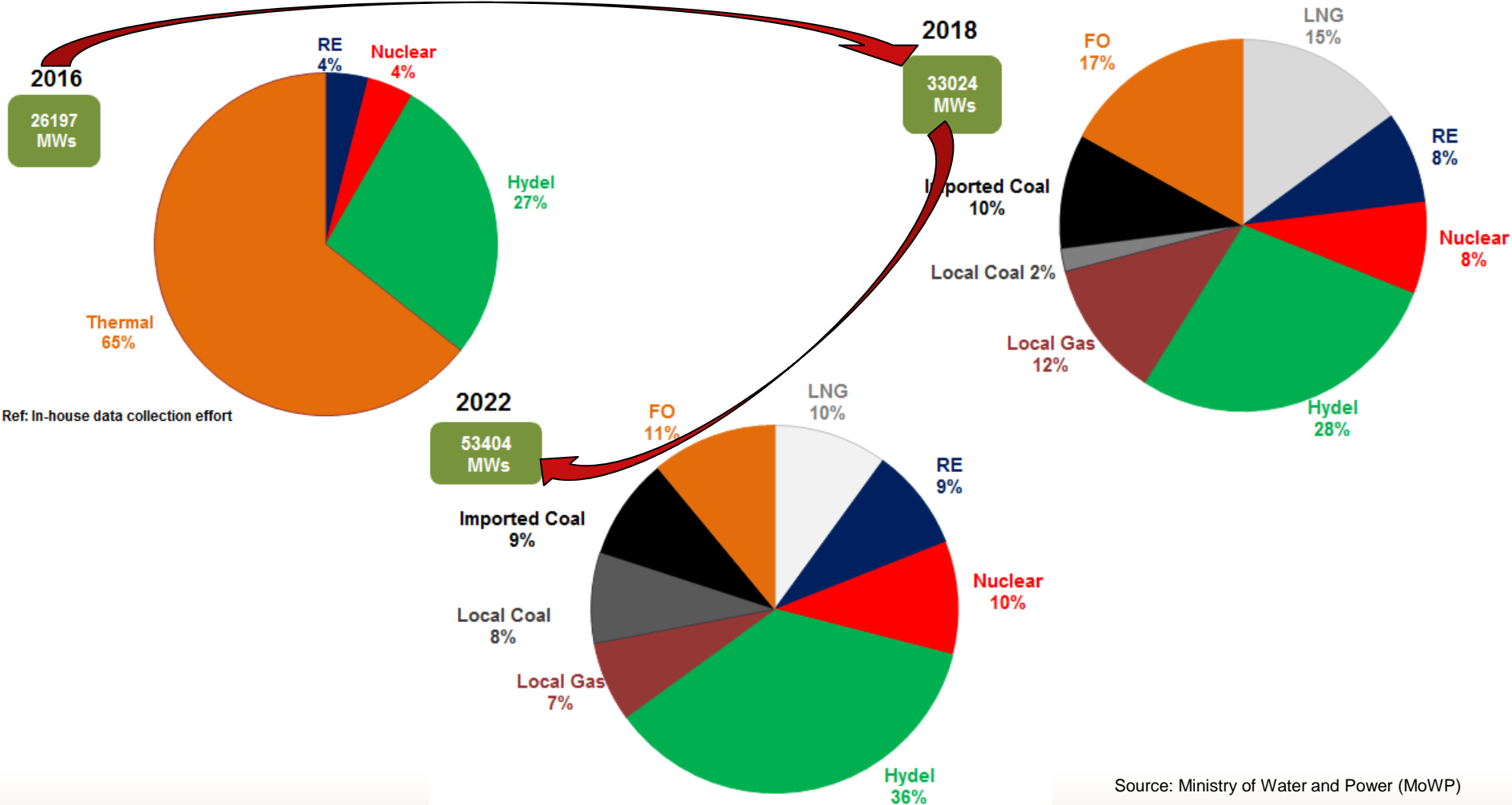
Source: CPPA, AEDB and NEPRA

**\*\*1136 MW capacity of RE, Reference: AEDB (Alternative Energy Development Board)**



# Power Sector of Pakistan...cont.

## Electricity Generation Mix Projections



Ref: In-house data collection effort

Source: Ministry of Water and Power (MoWP)



# Policies and Legal Framework in RE - Sector.

## First RE Policy – (Wind, Small Hydro and Solar)

- ❑ Approved in 2006 and valid till 2018
- ❑ Biomass/Bagasse framework was added in 2013
  - Grid provision is the responsibility of the purchaser
  - Guaranteed Electricity purchase
  - Protection against political risk & change in law
  - Return on investment is between 17%
  - Feed-in-Tariff for solar PV, wind, small hydro and bagasse based power projects
  - No Custom Duties and Zero Sales Tax on import of Equipment
  - No Income Tax / withholding tax / turnover tax
  - Convertibility of PKR into USD

### Net-metering Regulations 2015

- Allows development of small scale RE distributed generation up to 1 MW from solar PV and wind energy projects or own consumption
- Access is exported to the national grid and receive power from the grid when needed
- Monthly bill is settled on net-consumption

### Other power generation policies – 2013 and 2015





# Renewable Energy Potential in Pakistan

- **Hydropower**

Documented potential : More than 60,000 MW including large Hydros (source PPIB, MoW&P)

- **Solar PV**

Pakistan receives one of the best solar - irradiation in the world  
The average solar irradiation is 5-7kWh/m<sup>2</sup>/day

- **Wind Power**

Total wind power potential : over 300,000 MW (Source NREL-USAID study)

- **Solar Thermal**

The average solar irradiation is 5-7kW/m<sup>2</sup>/day  
It can produce 1000s of MW Solar Concentrated Power (CSP)...exact figure is not yet documented

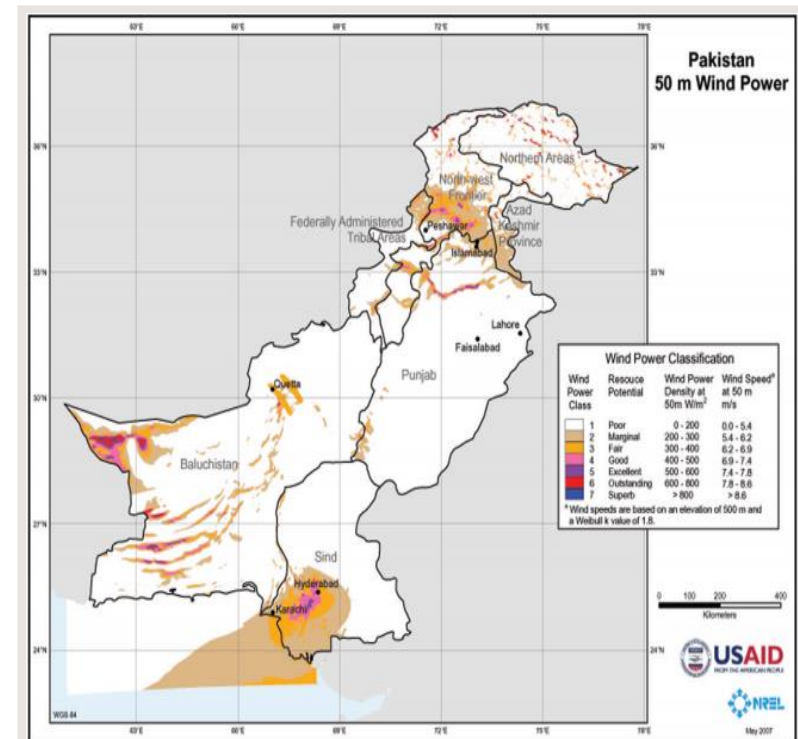
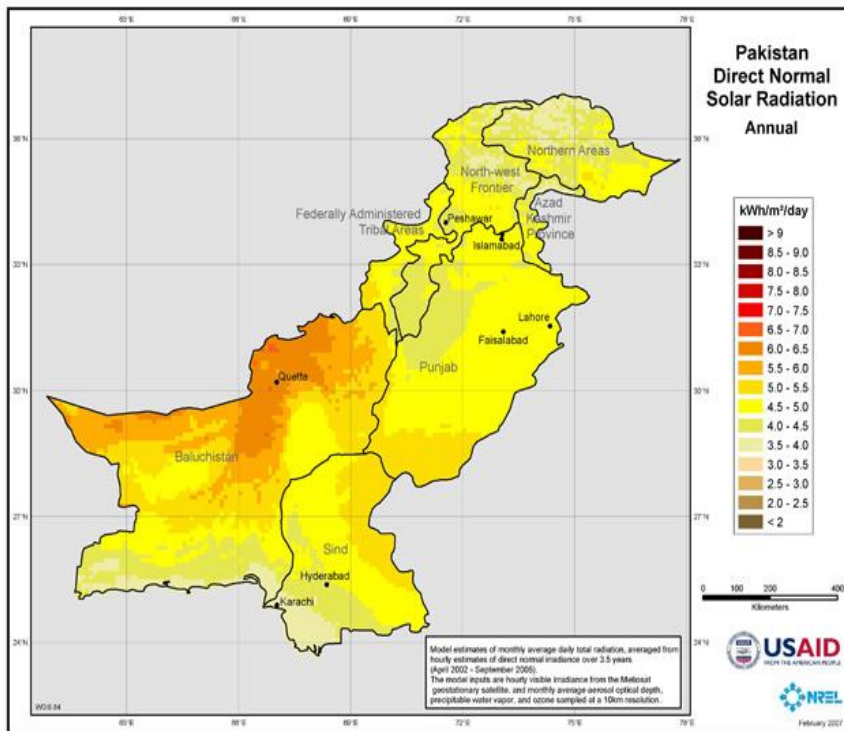
- **Biomass for Commercial power generation**

A potential of about 3000 MW exist for utility scale power generation  
(according World Bank ESMAP study-2016)

- **Other options e.g. Geothermal energy are not yet documented**



# Solar and wind energy maps of Pakistan





## RE- Potential in Off-grid application

**Substantial rural population has no access to the grid, and the population that does have access to the grid is struggling with power cuts and supply shortages”**

- **According to the World Energy Outlook (2016) statistics 51 Million people in Pakistan lives without access to electricity and 105 Million people (56% of total population) have traditional use of biomass for cooking purposes.**
- **32,889 Rural Villages cannot be connected to the grid technically and economically are not feasible.**

Source: <http://www.pakistantoday.com.pk/2015/10/20/news/power-outages-of-up-to-10-hours-imposed-again/>



## RE- Projects (operational and in pipeline)

### 1. Wind Projects

I.	Operational	590.5 MW
II.	Under Construction	298 MW
III.	Pipeline Projects	864 MW

### 2. Solar PV

I.	Operational	400 MW
II.	Pipeline Projects	1775.52 MW (LOIs issued by AEDB & DoE Punjab)

### 3. Biomass/Bagasse

I.	Operational	145.4 MW
II.	Pipeline projects	387 MW

Source: AEDB



## Energy Conservation Potential in Pakistan

- According to the National Energy Conservation Authority (NECA)/ previously (ENERCON), annual energy savings of up to 25 percent are possible in all sectors, which equates to approximately \$3 billion per year in energy imports.
- The most suited EE options of all sectors in terms of technological measures are co-generation, compressor, heat recovery, heat transfer, lights, meters, motors, power factor, process control measures, and maintenance of steam distribution system.
- For RE developments, photovoltaic (PV), solar water heater (SWH), and wind energy are considered to be the most feasible options on the local industrial scene.



## Pakistan Germany Renewable Energy Forum (PGREF)

The Pakistan-German Renewable Energy Forum (PGREF) is a cooperation initiative between the Governments of the Islamic Republic of Pakistan and the Federal Republic of Germany supported by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ, German International Cooperation) on behalf of the German Federal Ministry for Economic Cooperation & Development (BMZ).

### Objective

The main aim is to create a network between the two countries' respective industries, public sectors and innovation networks in the Renewable Energy (RE) and Energy Efficiency (EE) field.

It is meant to involve and link-up the private sector more than GIZ or the governments on their own can hope to achieve.



## Financial Schemes for Investment in RE

**State Bank of Pakistan (SBP) announced for the first Re-financing Scheme for RE projects in mid-2016**

- **Projects from 4 kW to 1 MW  
@ 2% to Commercial bank and 6% for the developers for 10 years**
- **Project Financing from 1 MW to 50 MW  
@ 2% to Commercial bank and 6% for the developers for 12 years with 2 years construction period.**



## Benefits of RE and EE for Pakistan

- **Development and RE and EE sources** ( is not the question anymore).
- **Energy for Economic Growth** (Closing the gap between import and export)
- **Energy Security** (not depending others for supply)
- **Jobs and industrial competitiveness**
- **Climate change** (Reduction in CO2 emission-Global benefit) and improved investment opportunities in the country





## Other mega pipeline projects – Projects

- 3.75 million tons of LNG would be imported annually from Qatar on a government-to-government basis which would meet close to 20 per cent energy requirements of Pakistan (agreement signed on 10<sup>th</sup> Feb'16)
- 3.2 Bcfd Turkmenistan–Afghanistan–Pakistan–India (TAPI) Gas Pipeline Project (at Planning Stage)
- 1752 MWp Solar PV Power Projects (at different development stages).
- 750 MMcfd Iran-Pakistan (IP) gas pipeline project (at planning and implementation stage)
- 1000 MW Central Asia-South Asia Electricity Transmission Interconnection(CASA-1000) Project (at planning stage)
- Study for Master Plan of 6,600 MW Pakistan Power at Gaddani, Balochistan ( at planning stage) – Coal Projects
- 1320 MW Coal Fired Power Project, Sahiwal (Construction Phase: ref DoE Punjab)
- 2640 MW Coal Fired Power Projects at Rahim Yar Khan and Muzaffargarh (feasibility study phase, reference DoE Punjab)
- Installation of new Coal fired Power Plants having capacity 2x660 MW, at Jamshoro (under construction)
- Construction of 132 KV New Substations, Conversion of 66 KV to 132 KV Sub-station and Associated T/Ls, Extension and Augmentation Sub-projects, (PESCO) source: MoW&P.
- Refurbishment and Up-gradation of Generating Units of Mangla Power Station – additional 644 GWh will be generated financed by (USAID)
- 4320 MW Installed Capacity Dasu Hydropower Project, expected completion date (March, 2019)
- 1400 MW Terbella Dam Extension under construction, expected to be completed by Dec. 2017.
- 940 MW Neelum Jehlum Hydropower Project under construction, expected to be completed by Dec 2017.
- Development of 4500 MW – multi purpose Basha Hydropower Project (Planning stage)



## Potential Business Areas for German Companies

### Equipment and Machinery Supply

- Hydropower Plants (Electromechanical equipment, control devices etc. )
- Wind projects
- Solar Projects
- Textile Industry (energy efficient machinery)
- Power lines etc.

### Innovative Technology Applications

- HVDC power lines
- Smart grid concepts and applications
- Smart power meters
- Weather forecasting for RE etc.

### Technical consulting and support services

- Techno-economic feasibilities
- Grid Studies
- Developing Tender Documents and Process
- O&M Procedures and Protocols incl. Testing and Commissioning

### EPC Services

- JV in EPC Contract in all fields
- Participation of German companies adds value to the Projects



As a federal enterprise, GIZ supports the German Government in achieving its objectives in the field of international cooperation for sustainable development.

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