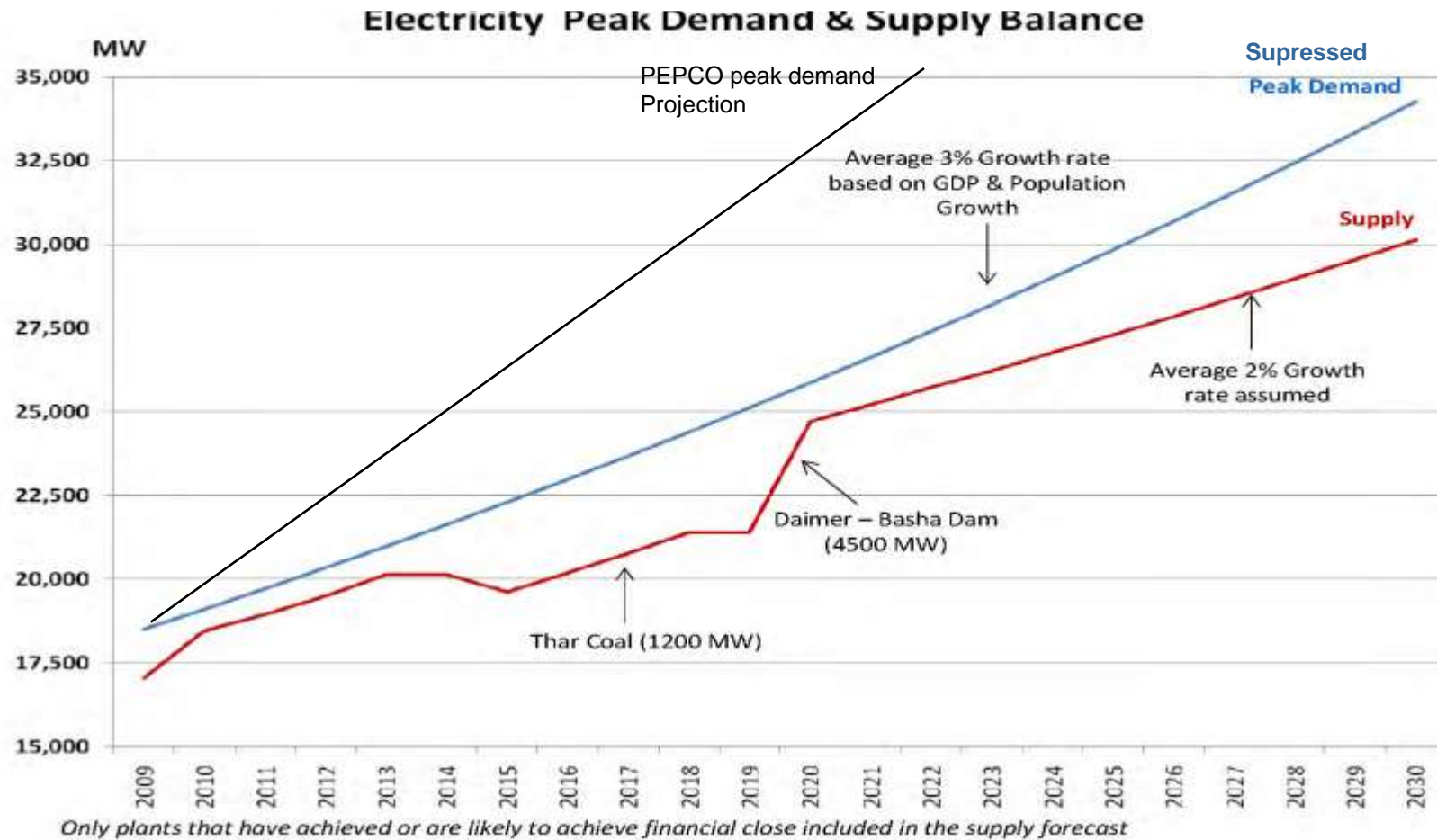


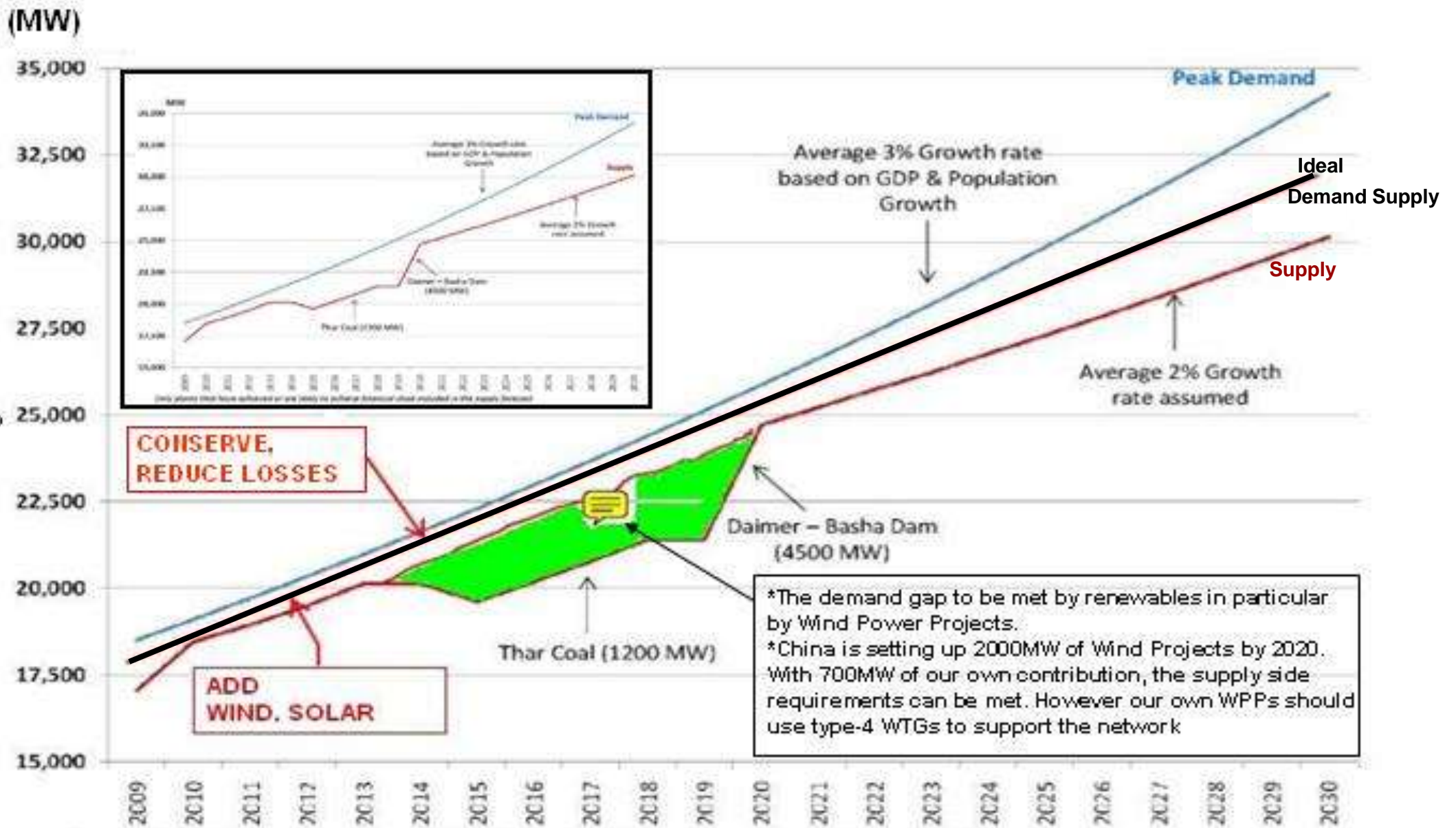
PV SOLAR

Exiting new possibilities for Pakistan



Pakistan's Power Demand & Supply Projections



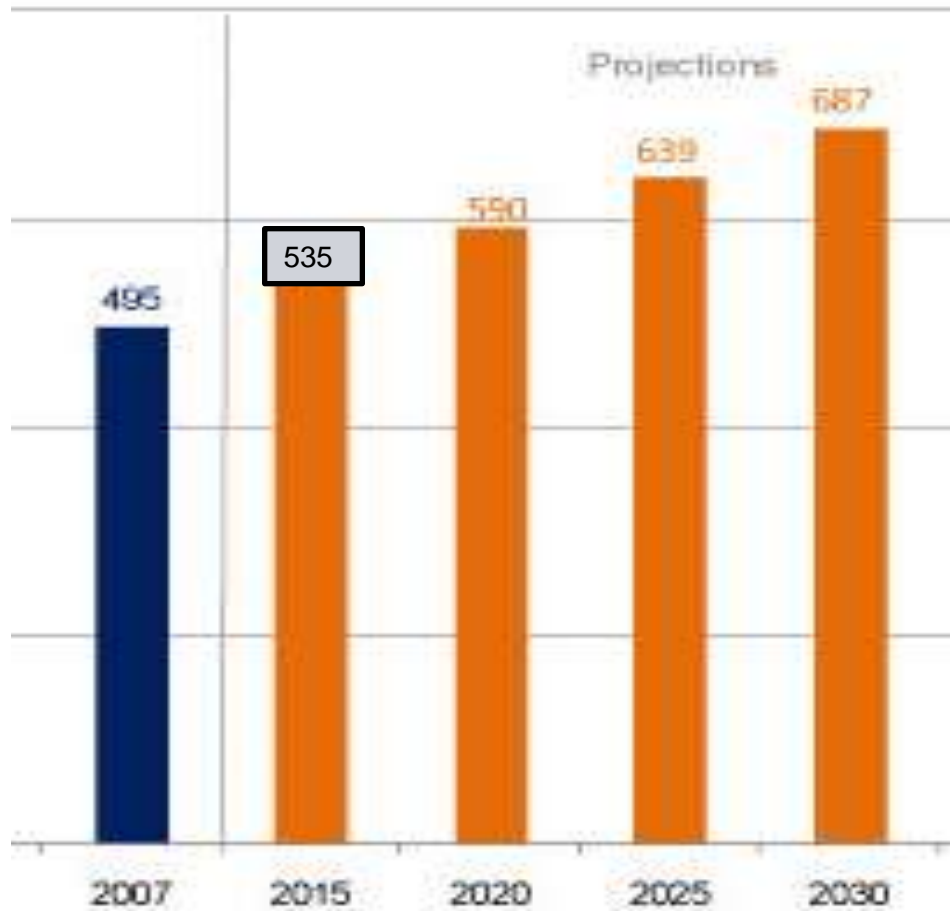


Pakistan's Power Demand & Supply Projections

Inset Source: Creating Value Through Investment – a presentation by Mr. Khalid Mansoor of Engro Powergen

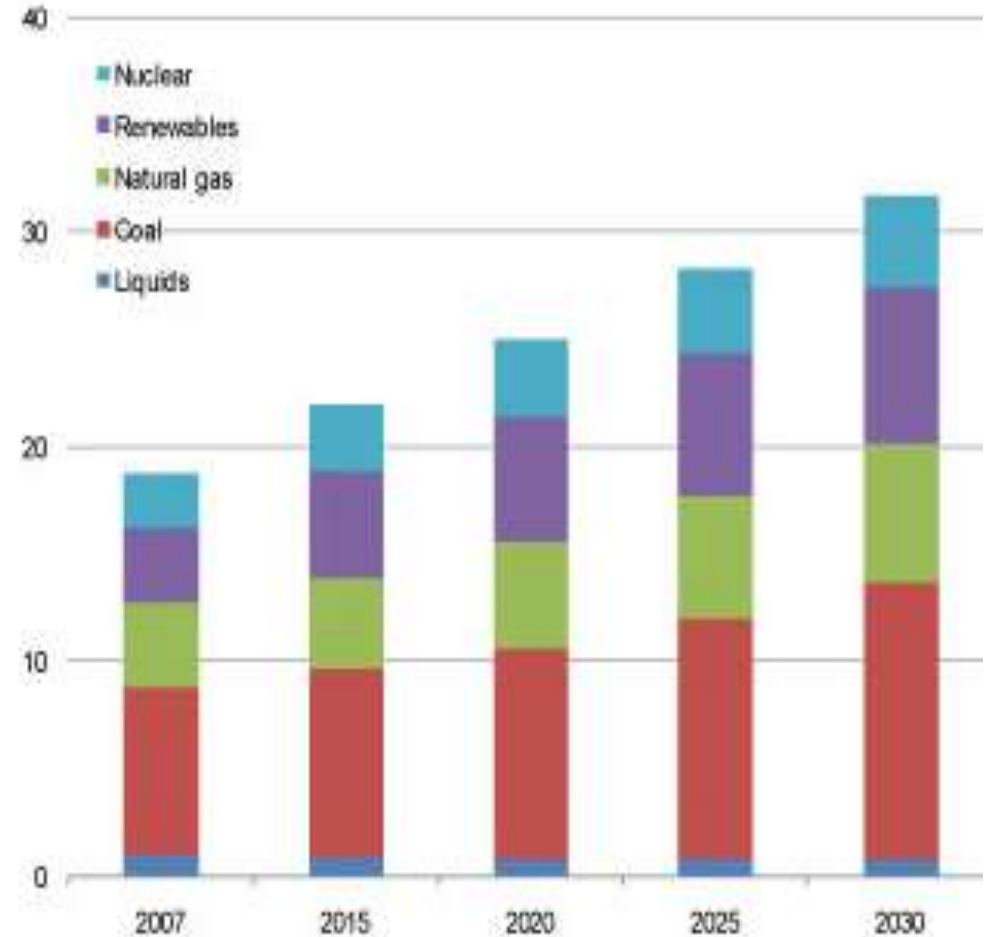
World Energy Consumption

Quadrillion BTU



World Electricity Generation

trillion kilowatthours



Renewable Energy Resources for Electricity Generation

Pakistan Current total:

Installed Capacity: 21,000MW

Max Generation: 15,000MW

Pakistan Renewable Potential

Planned Realization (till 2030):

Hydel: 50,000MW

Hydel: 30,000MW

Wind: 346,000MW

Wind: 3500MW

Solar: 1,200,000MW

Solar: 1000MW

Europe has started the project “DESERTEC” to produce 100,000MW (15% of total European demand) from Solar & Wind by 2050

A quick review

Hydel (Major problem: politics)

Potential: 50,000MW

Planned: 30,000MW

Expected Total Cost = 30 bn USD

Wind (Major problem: infrastructure)

Potential: 346,000MW

Planned: 3,500MW

Expected Total Cost = 10 bn USD

Solar (Major problem: initial cost)

Potential: 1,200,000MW

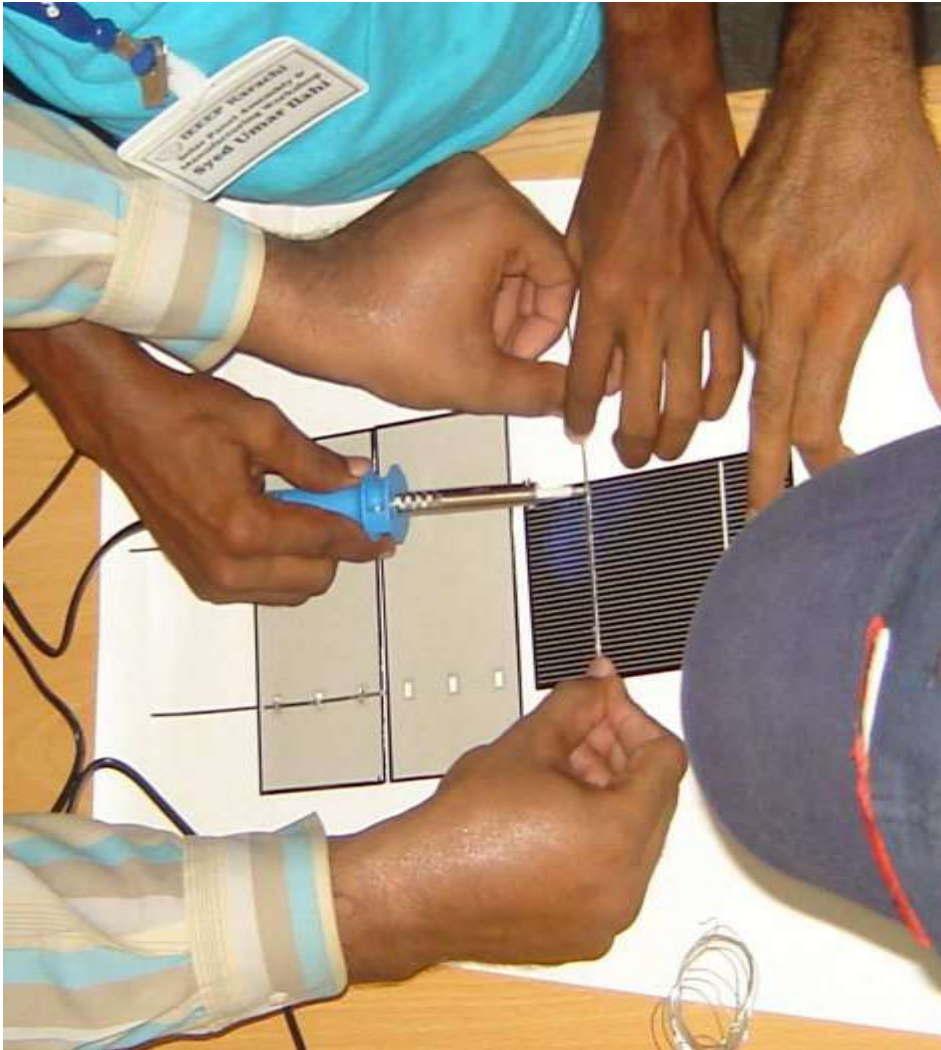
Planned: 1,000MW

Expected Total Cost = 5 bn USD

PROPOSAL: Indigenized PV Solar systems for:

- 1) Domestic purpose both urban and rural (lights and fans)
- 2) Transportation within the city limits (solar cars)

Soldering ribbon to PV cell



Testing voltage & current output



Soldered strings on paper preparation for encapsulation



Pouring silicone to encapsulate



Two completed 60W panels



PV array (6X60W) installed



No Comments

IEEEEP Newsletter

Volume 18, No. 1

December 2009

EDITORS NOTE

We as consumers are made believe that the present energy crisis in our country is because we have failed to build large dams. This argument is particularly held in favor of building Kalabagh and other large dams. But we need to look at the other side of the picture as well and think out of the box.

The electric power produced in Pakistan is provided majorly by Wapda. The remaining power is supplied by the KESC, nuclear and IPPs. The power crises are not only due to shortage but poor transmission capability is also aggravating the scenario.

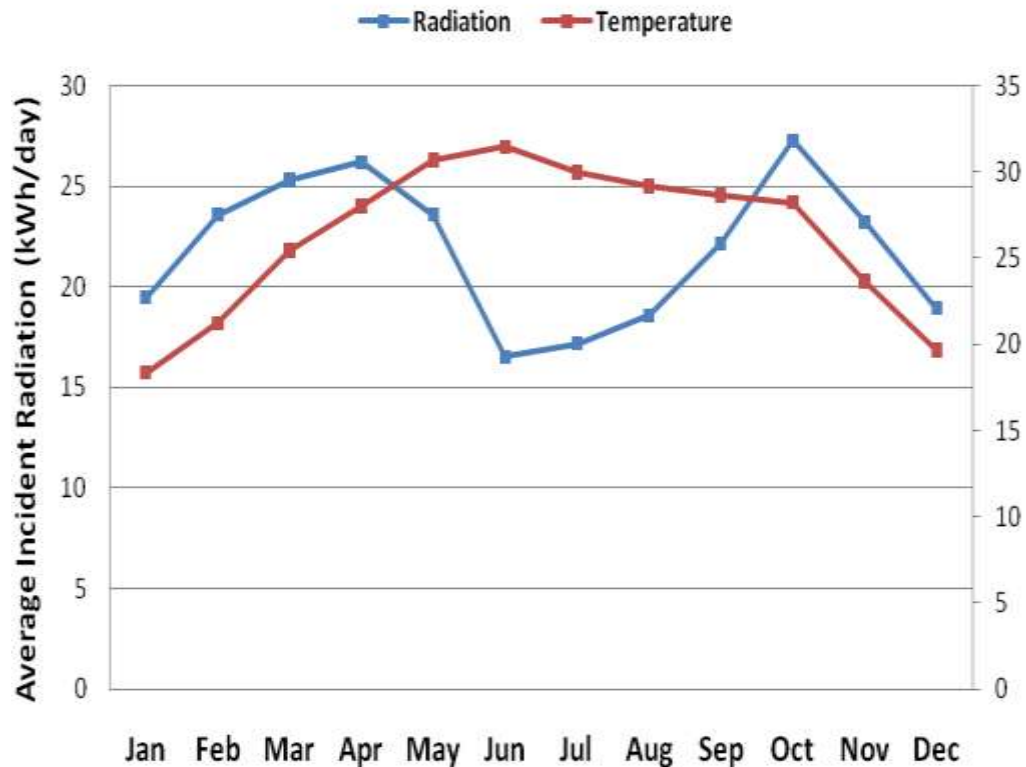
Our country needs a quantum jump to fight the energy crises and reduce the load-shedding in future. Is Large Dams the only solution?

NEWS & VIEWS

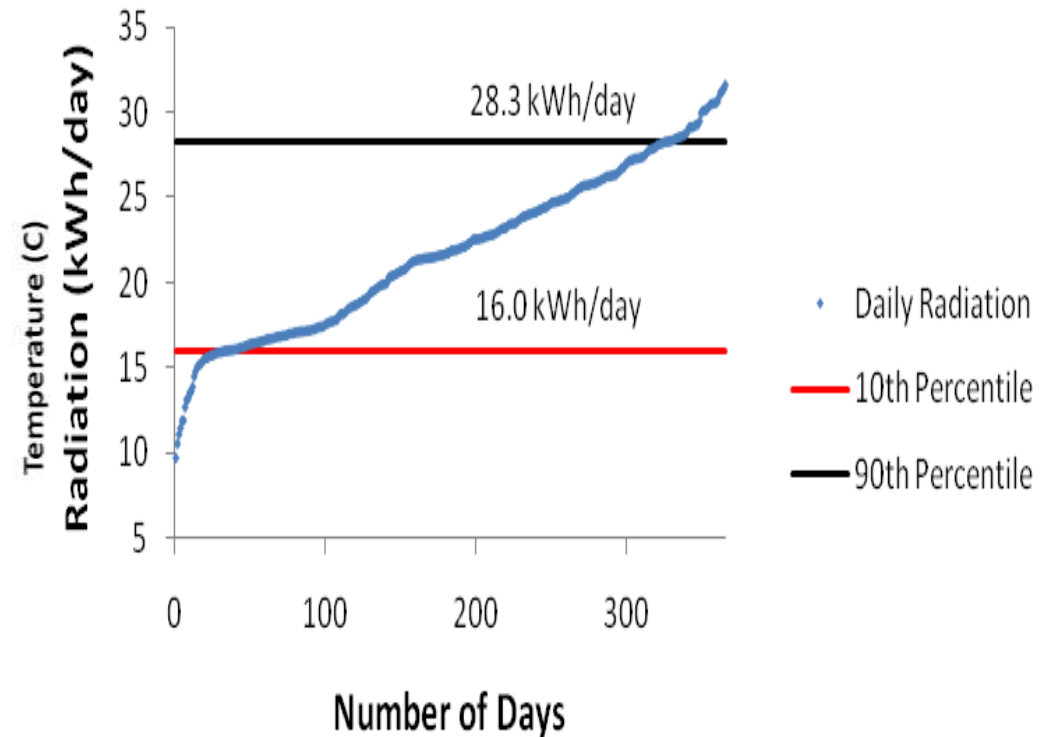
In order to fight power failures, Engr. Irfan Ahmed - Member IEEEEP Karachi Centre has switched to alternate energy resources at his residence by installing Solar Panels. As a result he has received a notice from KESC regarding reduced billing caused.

Case Study: Karachi

Average Daily Incident Radiation and Temperature as a Function of Month

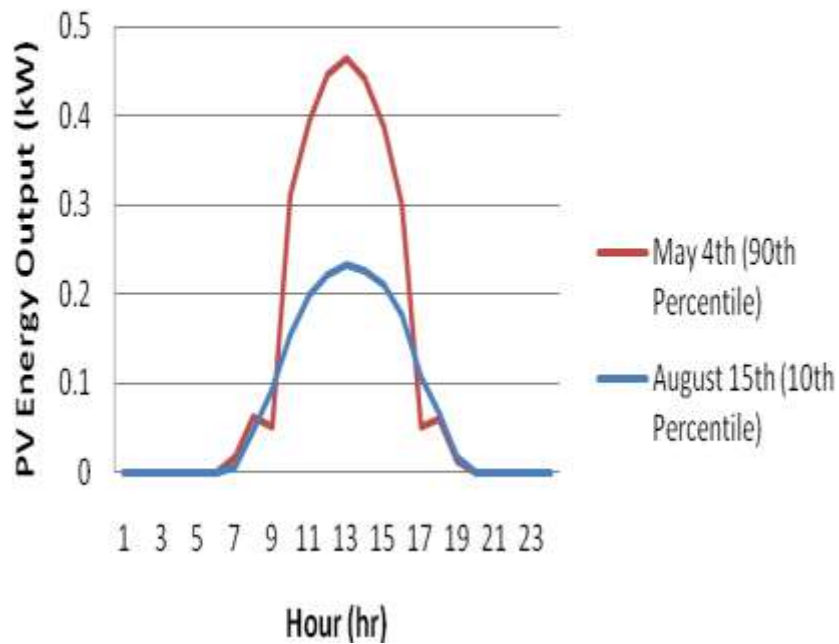


Daily Incident Radiation Data Sorted from Lowest to Highest Magnitude

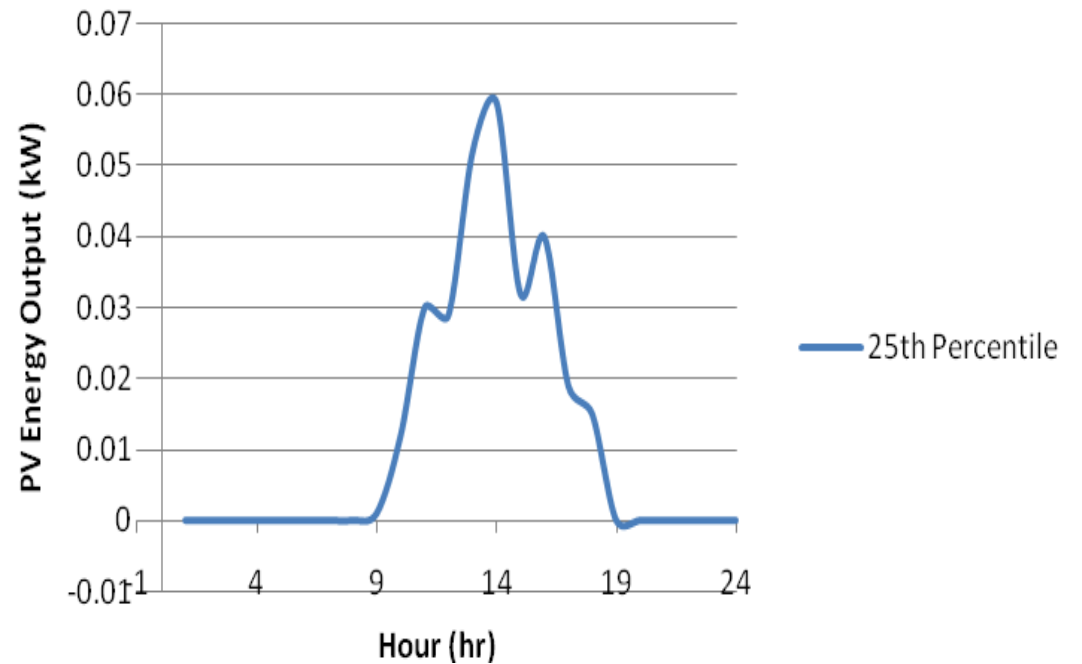


Case Study: Karachi

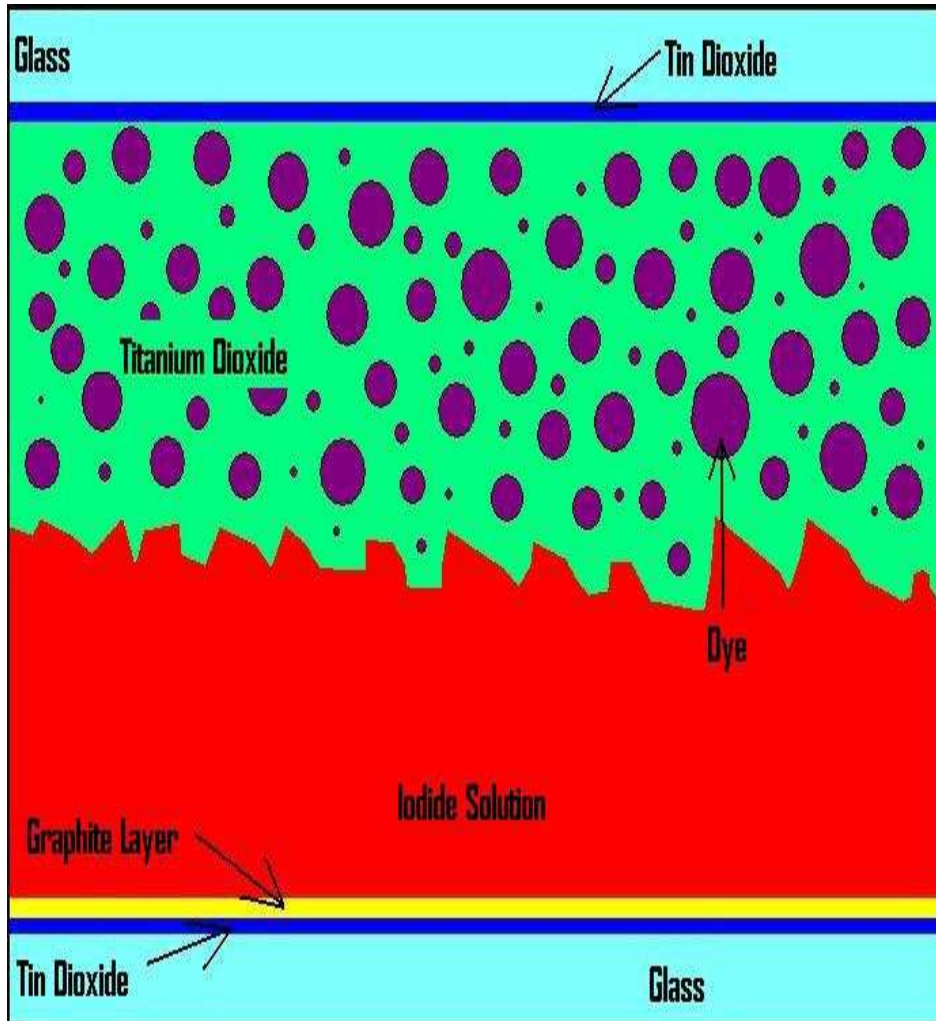
Modeled Hourly PV Output for May 4th and August 15th



Modelled PV Energy Output for Jan 16th



Dye Sensitized Solar Cells (DSSC) - Construction



Dye-sensitized solar cells are innovative solar cells that mimic photosynthesis in plants.

These cells have a lot of potential because they can be made and manufactured with low-cost materials. Unlike traditional solar cells, dye-sensitized cells can work effectively in low light conditions and are less susceptible to losing energy to heat.

Glass- Transparent layer

Tin dioxide- Conductive layer

Titanium dioxide- Holds dye in place

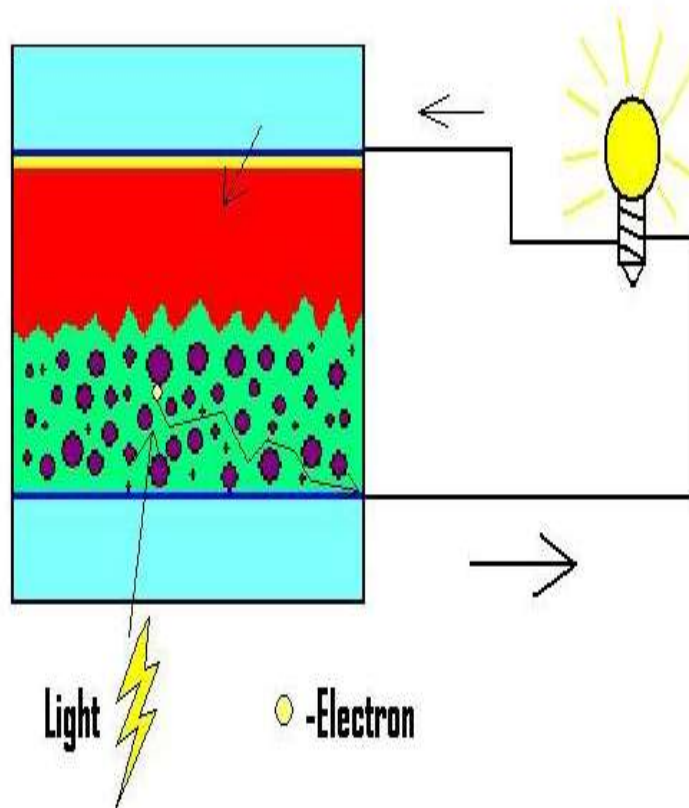
Dye- Collects light and produces excited electrons to cause a current in the cell

Iodide electrolyte- Source for electron replacement

Graphite layer- Facilitates electron donation to the electrolyte

Dye Sensitized Solar Cells (DSSC) - Operation

Electron Transfer Process



DSSC produce electricity through electron transfer. Sunlight passes through the conductive glass electrode. (See Diagram) The dye absorbs the photons of light and one of the electrons in the dye goes from a ground state to an excited state. This is referred to as photoexcitation.

The excited electron jumps to the titanium dioxide layer and diffuses across the film. The electron then reaches the conductive electrode, travels through the wire, and reaches the counter electrode.

The dye molecule, having lost an electron to the titanium dioxide, is now oxidized, which means it has one less electron than before.

The dye wants to recover its initial state so it must obtain an electron. It obtains this electron from the iodine electrolyte and the dye goes back to ground state. This causes the iodine to become oxidized. When the original lost electron reaches the counter electrode, it gives the electron back to the electrolyte.

Dye Sensitized Solar Cells (DSSC) - future

Positives:

- 1) Low cost (5 to 7 times less than crystalline silicon cells)
- 2) Manufacturing at room temperature
- 3) Manufacturing with simple machines (silk screen printing)
- 4) Robust and flexible
- 5) Effectively operational at low lights

Negatives:

- 1) Currently efficiencies are low (around 7%, max. achieved in lab:11%)
- 2) Dye stability and significant life increase of the cells yet to be achieved

DSSCs have gone into commercial production

Future of Energy

Electric/Solar Cars

In the next 10 years, we should have atleast 20% locally manufactured Solar vehicles running to reduce oil import bill and achieve sustainable economy .

- The Picture shows a working model of a solar powered car with fuel cell that separates water into hydrogen and oxygen and runs on the resulting energy.
- Requires just 250ml of distilled water.



اپنی ہستی سے ہو جو بچھ ہو
آگہی گر نہیں غفلت ہی سہی

Thank
You

Misconceptions

1) Solar Energy is expensive

- Current prices are less than 20 US cents per kWh for on grid systems which are very close to wind energy and better than rental power.

2) We cannot beat China

- It may be true for products due to economy of scale. Technically solar systems are simple and local services are much cheaper. In systems and services local entities have always an upper hand. Legislative support is however required.

3) Off grid solar systems have insignificant contribution

-

Three major reasons for misplanning

- 1) **Missing out of box thinking** (while there is nothing in the box)
 - Fear of the unknown
 - Being in comfort zone

- 2) **Missing entrepreneurship** (we have managers, not leaders)
 - Culture of dependence on others
 - Lack of support from public sector

- 3) **Missing practicality in approach**
 - Lack of proper education
 - Mindset