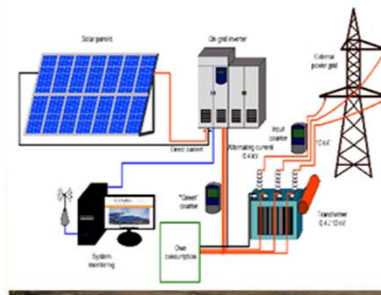
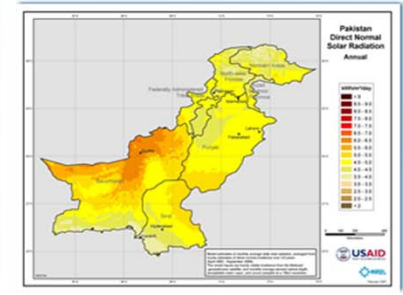


At Wind Power Plants



Webinar on “Hybrid Renewable Power Plants: Opportunities and Challenges”

Capacity	49.5 MW
Wind Turbine Model	Nordex S77,1.5- HCV
Location	Jhampir, District Thatta
Land Area	1,283 Acres
Total Wind Turbines	33
Benchmark Production	143.55 GWh per annum
Commercial Operations	May 16, 2013



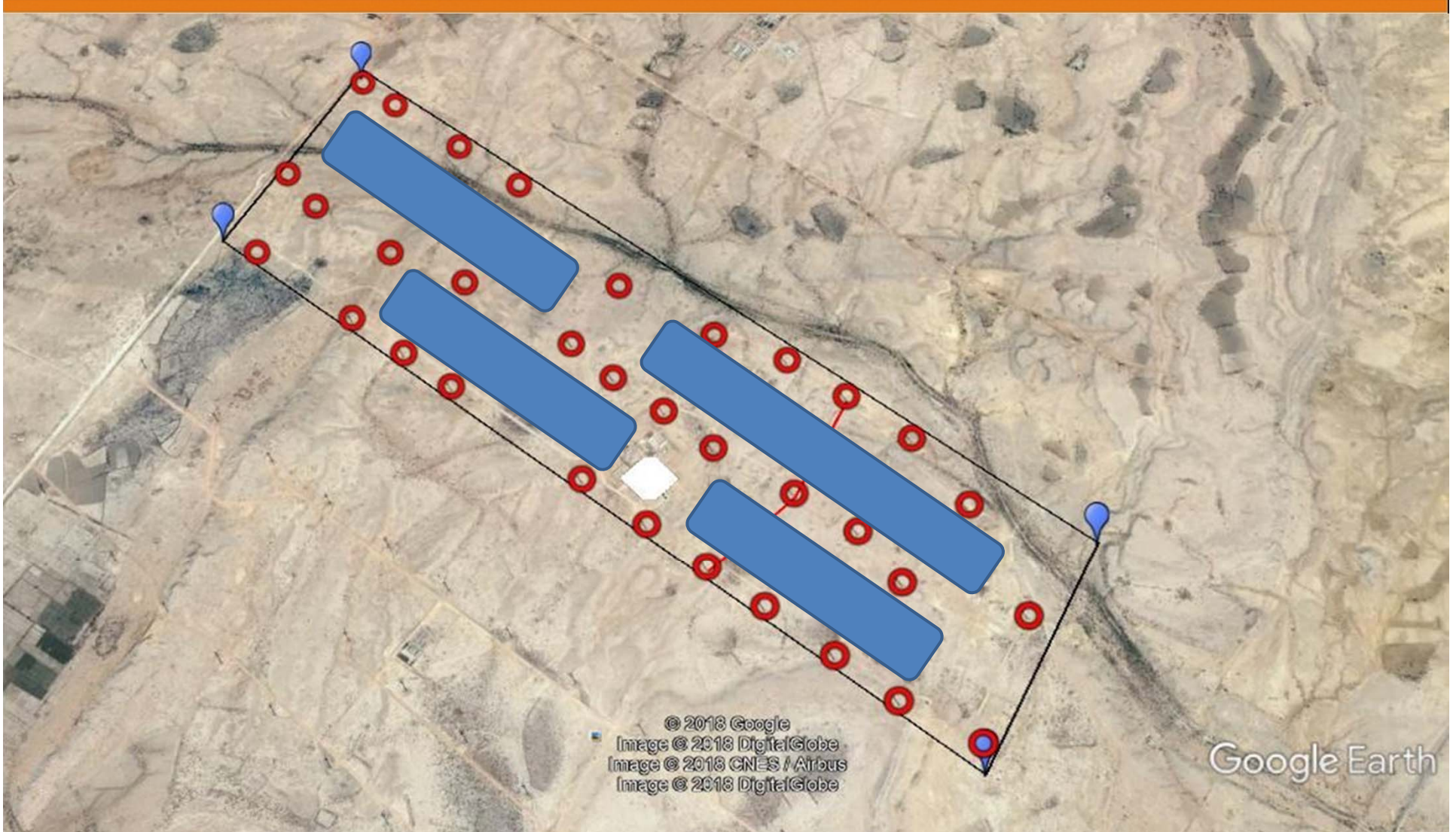
Wind Power Plants In Sindh Region



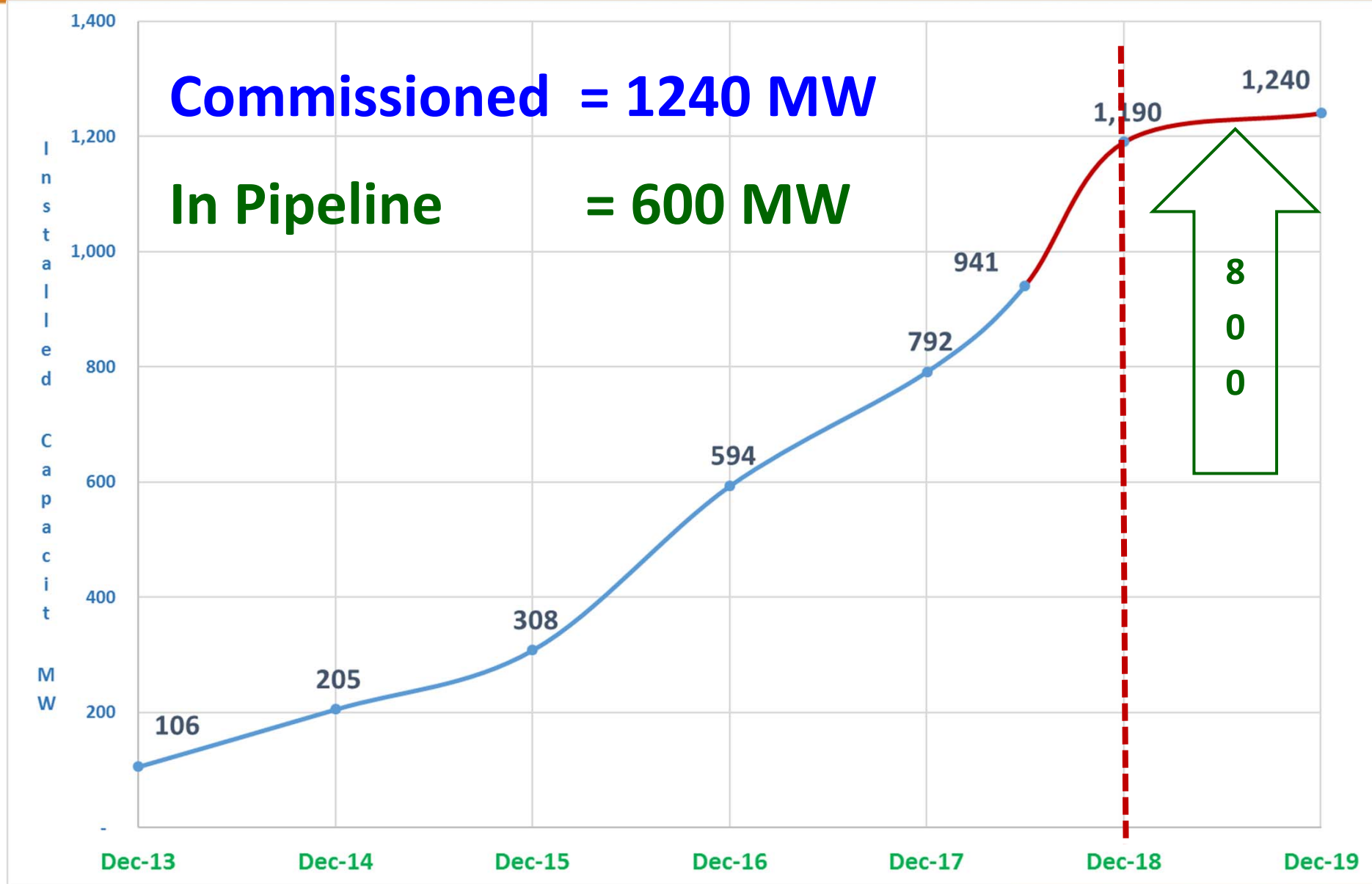
The image shows a small green seedling with two leaves growing out of a patch of dry, cracked brown soil. The seedling is positioned on the right side of the image, slightly to the right of the center. The soil is cracked in several places, forming a grid-like pattern around the seedling. The background is a solid brown color, matching the soil.

Wind Power Plants in Sindh Region:

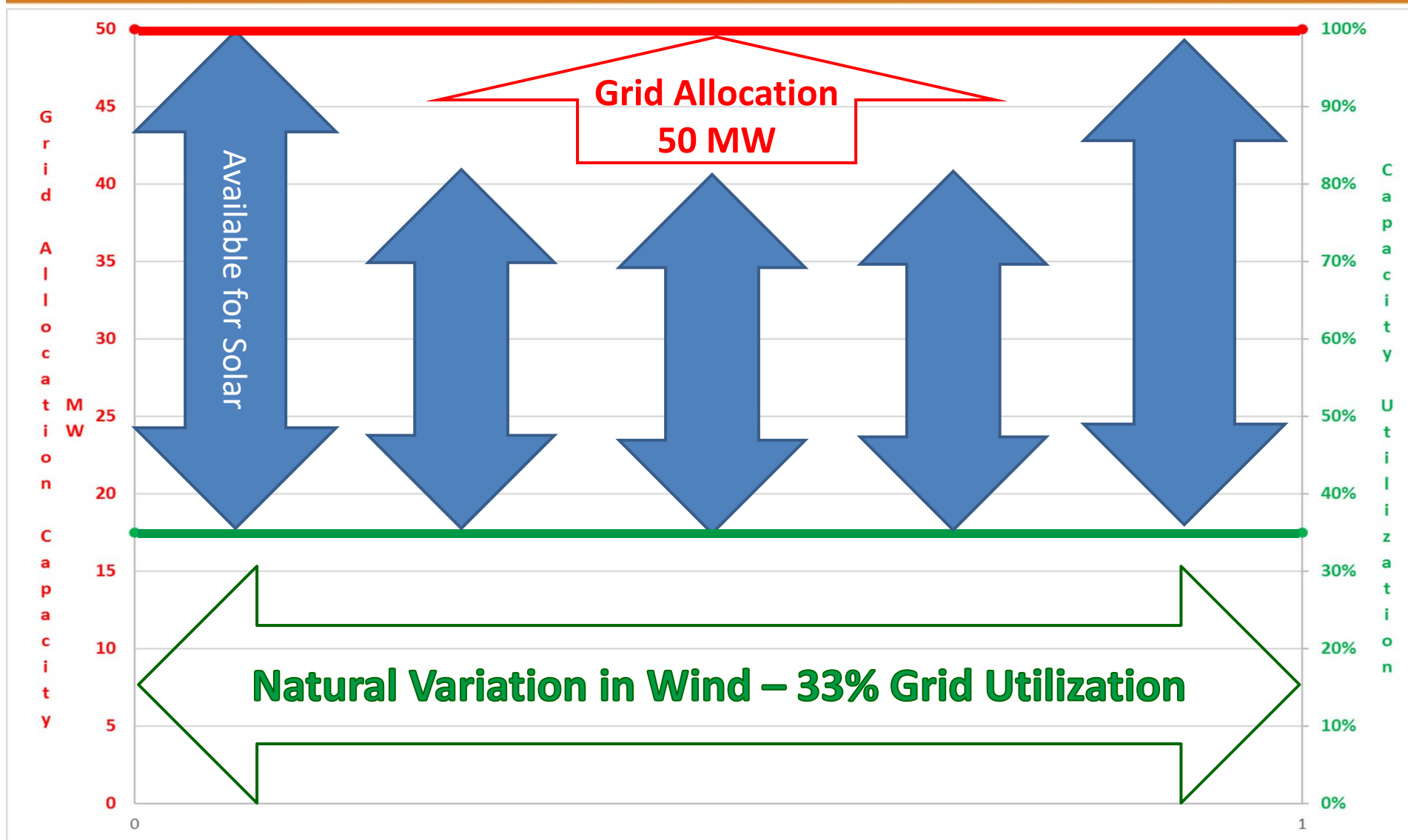
- TAPAL
- YUNUS
- HARTFORD
- TENAGA
- MASTER
- SAPPHIRE
- FWEL - I
- METRO
- FWEL - II
- HYDRO CHINA
- ZAFAR
- GUL AHMED
- UNITED ENERGY
- FFCEL
- ZORLU
- TGF
- TB 3
- TB 2
- HAWA
- JHAMPIR
- SACHAL
- TB 1
- TGS
- TGT



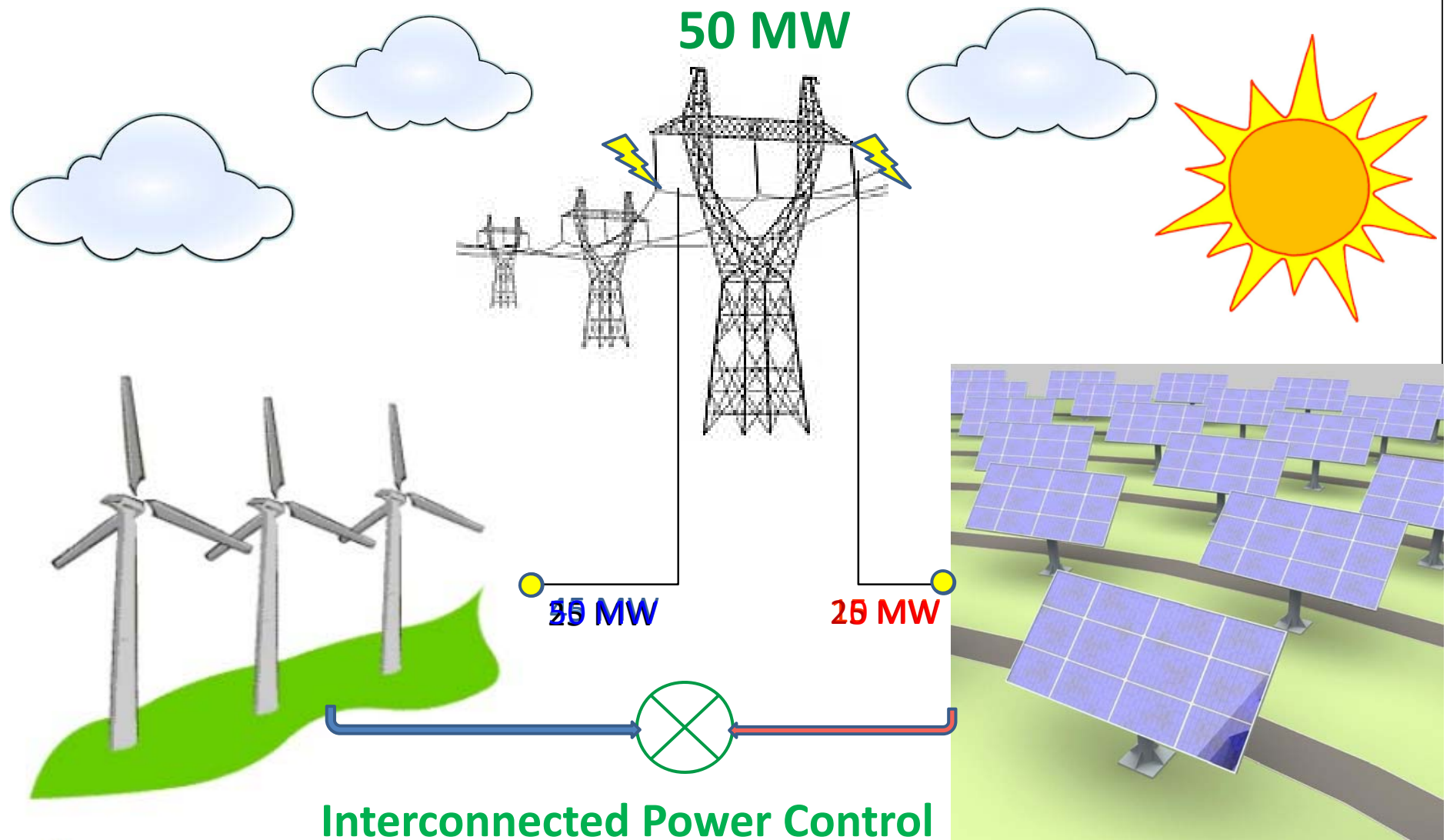
Unutilized Spaces Available within Wind Farm



- Sindh wind corridor realizable capacity - over ~10 GW
- Tariff lowered to 6.7 – 7 \$c/kWh – comparable to any technology
- Potential for Local industry growth
 - Tower manufacturing,
 - Blade and nacelle assembly
 - Services sector
 - Allied component supplies
- **However, Grid Evacuation Capacity is limiting factor**
- Grid enhancement projects underway - New Projects expected as and when new allocations are available



AEDB worked on concept in 2016-17, found it workable



Resource Assessment

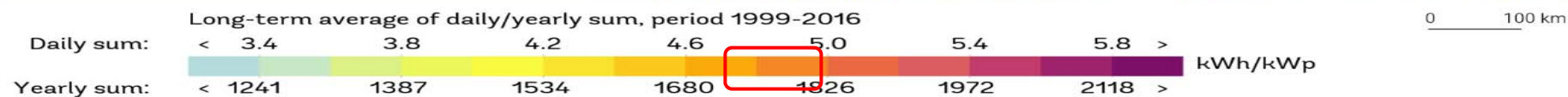
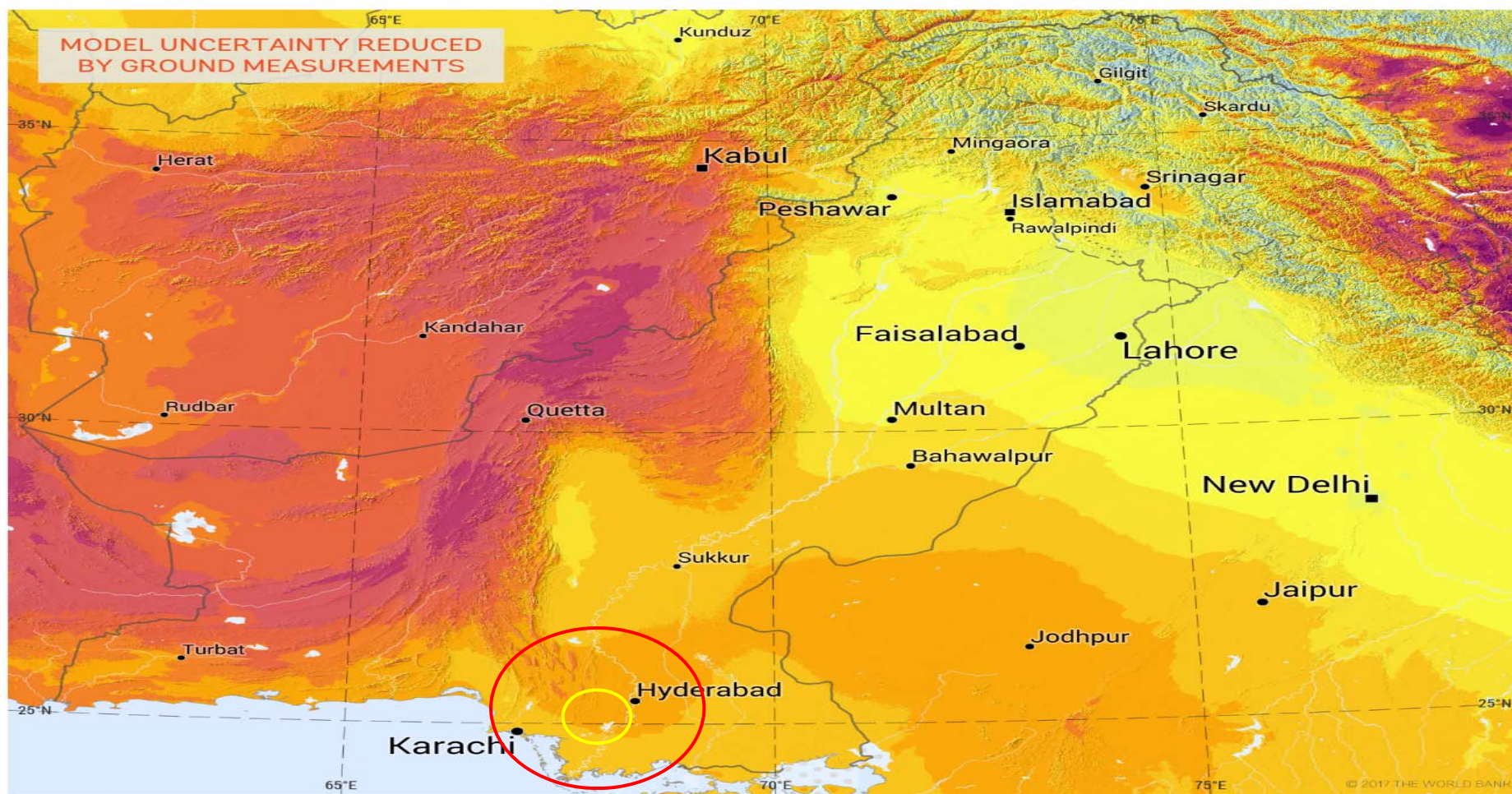
SOLAR RESOURCE MAP PHOTOVOLTAIC POWER POTENTIAL



WORLD BANK GROUP
THE WORLD BANK IFC International Finance Corporation

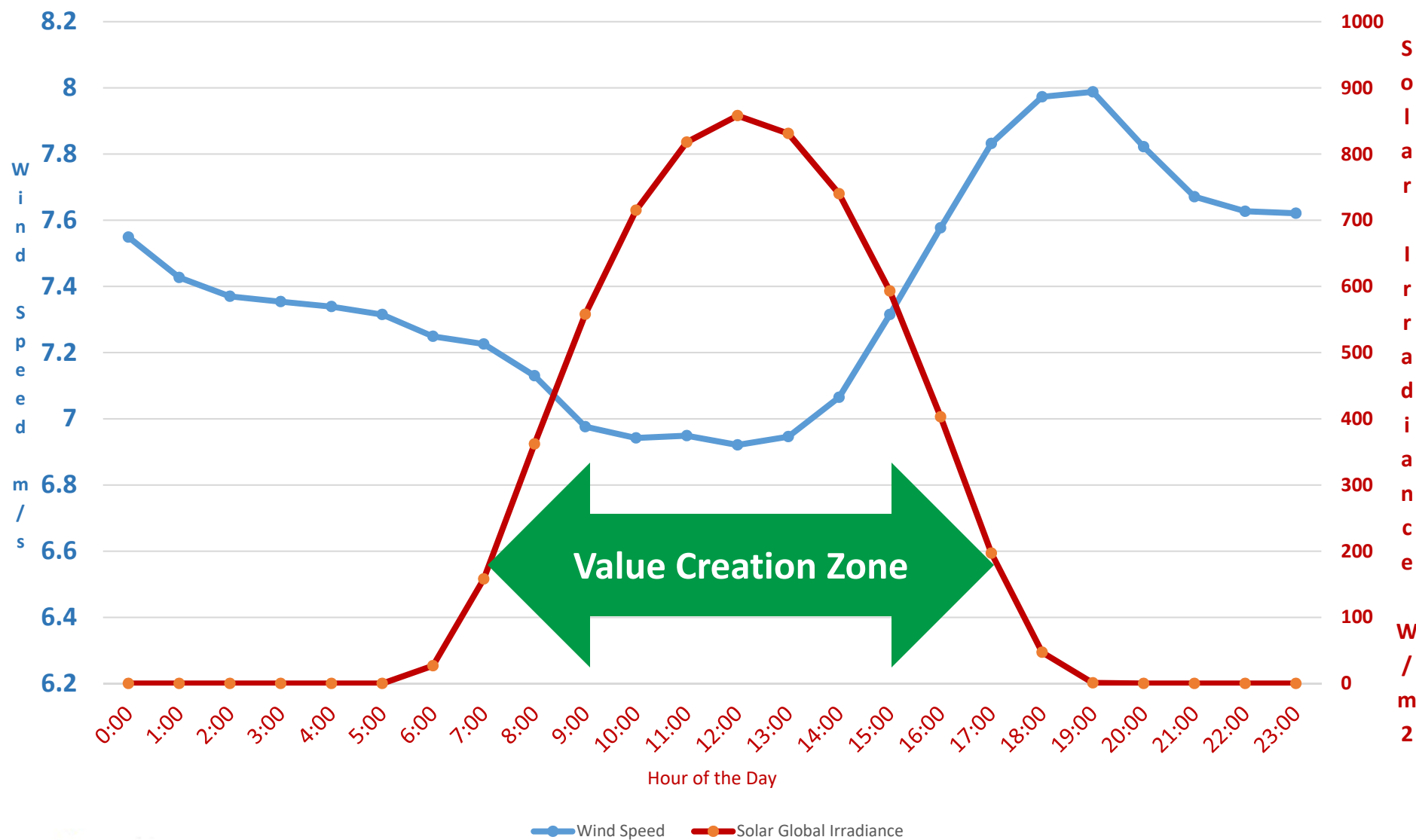
ESMAP
Energy Sector Management Assistance Program

SOLARGIS



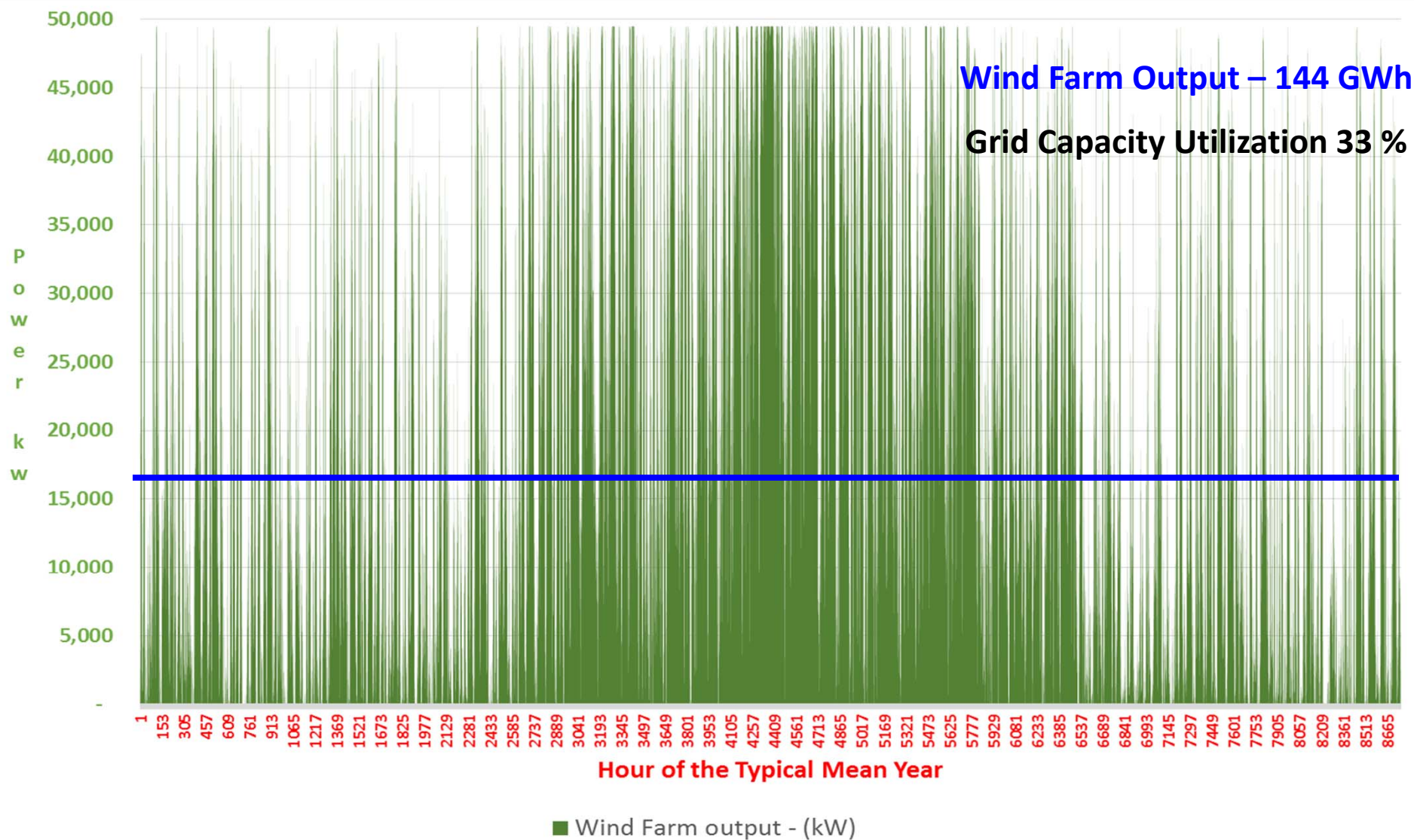
This map is published by the World Bank Group, funded by ESMAP, and prepared by Solargis. For more information and terms of use, please visit <http://globalsolaratlas.info>.

Diurnal Pattern of Solar and Wind Resource at FFCEL Plantsite, Jhampir

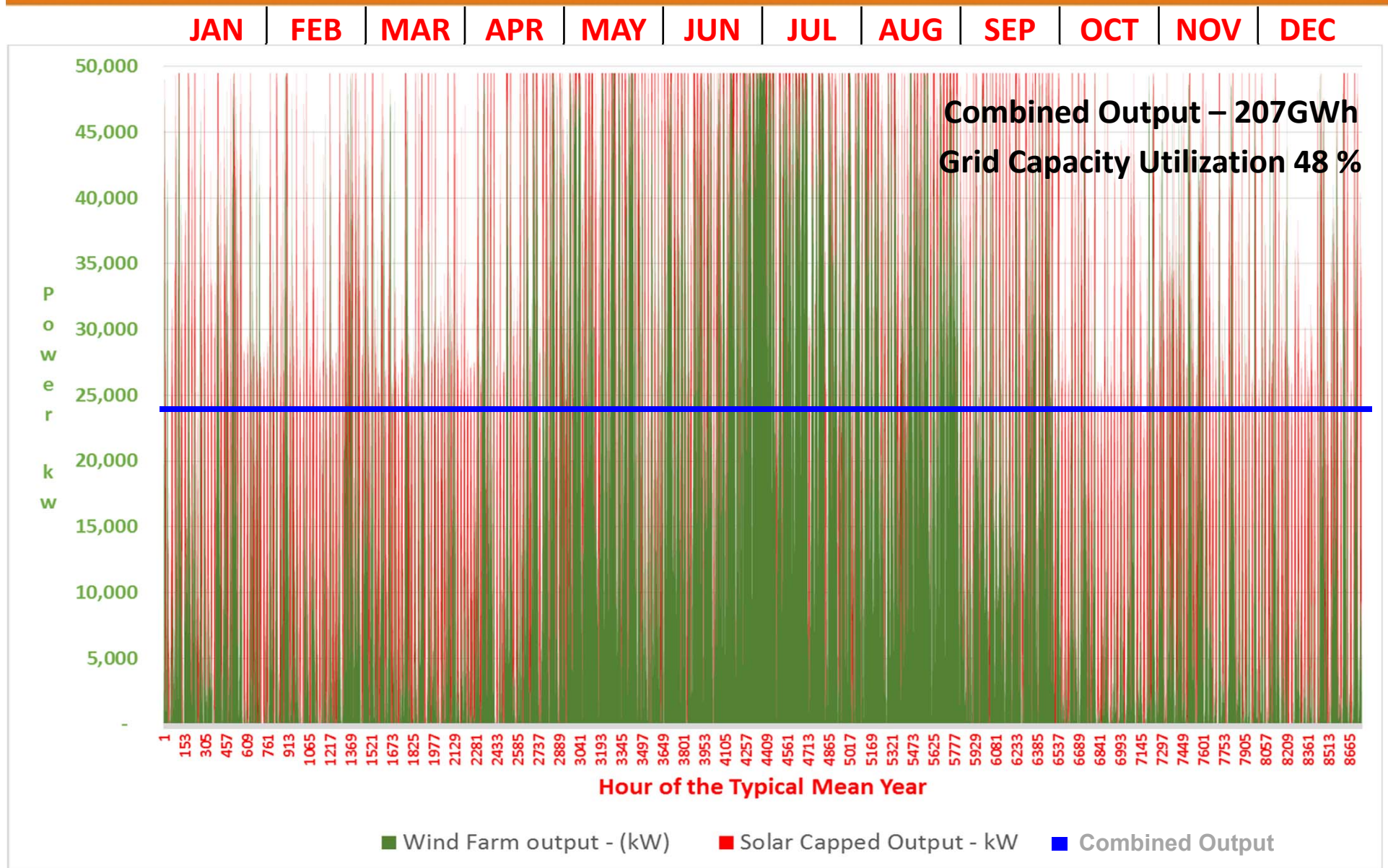


Wind Farm Annual Production

JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC



Combined Annual Production



Conclusion of Study

- Pattern of wind & solar resources is conducive for hybrid
- Hybrid Solar assist in smoothing variations in Wind output
- 25 – 40 MW Solar Plant for 50 MW Wind Plant Possible
- ~ 600 MW Solar PV Plants can be installed by next year
- Increased grid utilization factor – from 33% to 48%
- No additional grid infrastructure enhancement needed
- Reduction in overall per unit O&M cost of grid
- Addition of electricity at tariffs lower to overall basket price
- Addition of battery storage viability expected in 2 – 3 years



M/s Hero Future Energies on April 13, 2018 inaugurated a 28.5 MW Solar PV Plant at its 50 MW Wind Power Plant in Karnataka, India under similar Grid Restriction Arrangement

- Concept has been approved in principle by AEDB and has issued LOIs to interested investors
- FFC has submitted its Feasibility study to AEDB which is under review for approval
- Suitable Upfront tariff for such hybrid Solar PV Projects shall provide stimuli for quick deployment as;
 - No new grid planning / grid development needed
 - Quick installation within 8 – 10 months possible

Thank you