

# Afghanistan Wind Energy Roadmap Panel Discussion

QLW Workshop

5 June 2012

# Agenda

- Background:  Wind energy density map
- Wind Energy Business
- Candidate Sites
- Roadmap Outline

# Country Background

- 652,252 sq km (Texas)
- 34 provinces; 28 million; 70% rural; 80% agrarian workforce
- Landlocked, Post-Conflict & Fragile
- GDP: $18 bn, Avg Growth: 9%
- 90% development & 60% recurrent budgets funded by donors
- 40% below poverty line
- ISAF Forces to GoA transition by end 2014

# Energy Sector Snapshot

- Technical, fiscal and governance deficits – nearly 25% population connected to grid, 40% system losses, transmission and distribution constraints
- Rich in non-fuel mineral resources. Modest natural gas and coal reserves. Insignificant resource exploitation to date
- Electricity law & regulator under approval process. Corporatized state power utility DABS established in 2009

# Energy Sector Snapshot

- Net energy importer with electric imports (from Iran, TAJ, TKM and UZB) representing 73% of total electric usage in 2011 and an estimated 77% in 2012. Domestic generation primarily based hydro and diesel
- Imports (532 MW), Hydro (254 MW), Thermal (252 MW)

# Energy Sector Snapshot

- Domestic generation primarily based hydro and diesel.  No non-hydro RE
- Hydro (25,000 MW), Wind (150,000 MW), Solar (6kwh/m2/day)
- Strong  support with key donors ADB, USAID, KfW, WB
- Islanded mode due to non-synchoronised power systems

# Energy Sector Snapshot

- Chinese MCC major investor in Aynak copper mine and associated coal fired power plant (400 MW) by 2016;
- Indian/Canadian consortium investing in Hajigak Iron mine and associated 800 MW coal powered power plant by 2018
- 200 MW IPP at Sheberghan gas fields under discussion

# Growth Potential

- GoA Strategic Goal: By 2015, electrify 65% households and 90% of non residential establishments in major urban areas and at least 25% of the households in rural areas
- Diversification of Supply – imports plus indigenous
- Power Foundational to Stabilization -- Equitable expansion of Access for political and COIN effect
- Afghanistan is rich in renewable energy resources and it has a strong culture of commerce and trade

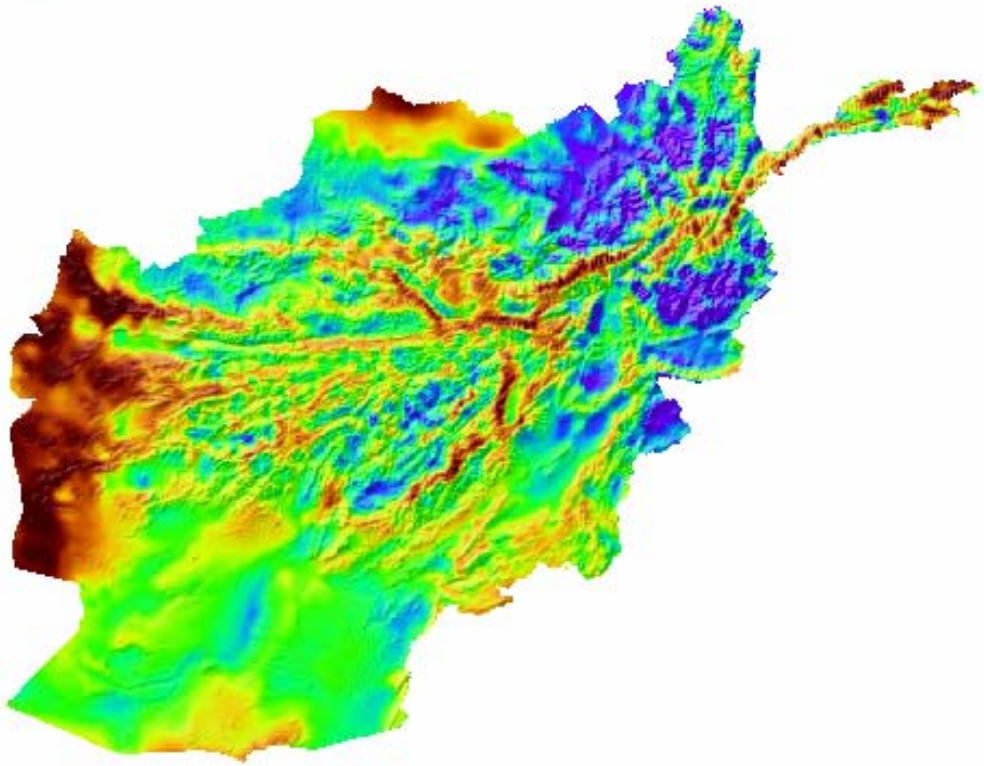
# Growth Potential

- For AFG business – Power top most priority after rule of law
- Small and micro enterprises can flourish in Afghanistan when the appropriate policies for the power sector are in place
  - Akin to the telecommunication revolution, in which microenterprises manage telephone services, locally managed power sector can be a boon
- At a small or microenterprise level, distributed power generation facilities of size less than 1MW and managed by local village or town may be feasible
  - The generation facilities can be hybrid wind, solar and batteries in order to provide reliable power for certain hours of day

# Wind Speed Map

## Afghanistan
## Wind Map at 80m

3TIER
www.3tier.com

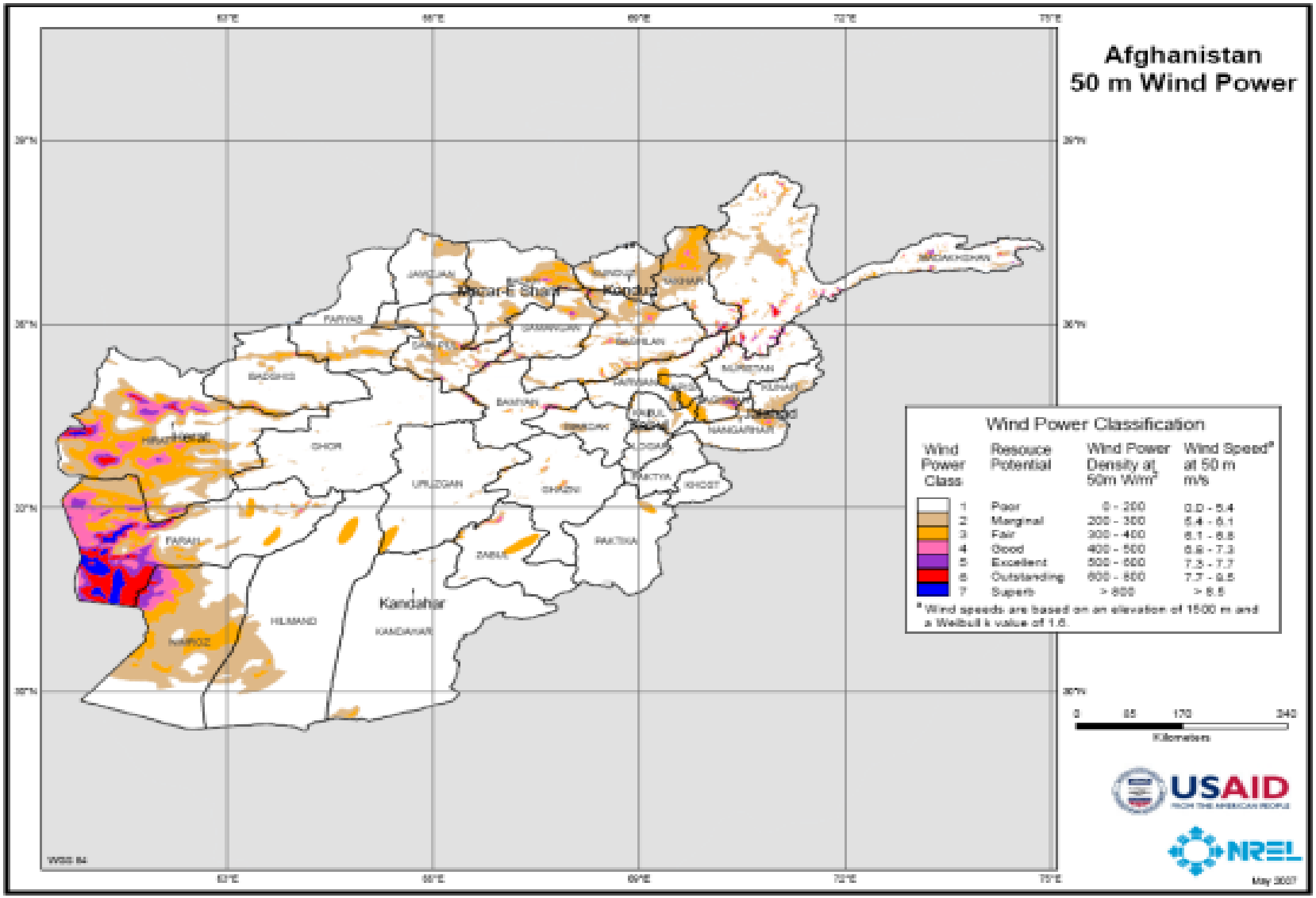


5km Wind Map at 80m

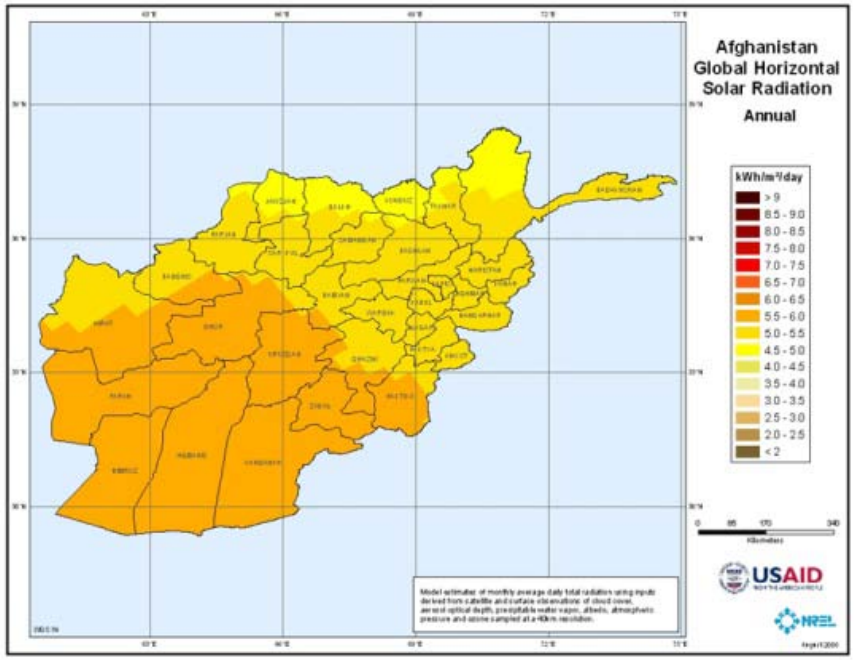
Wind speed

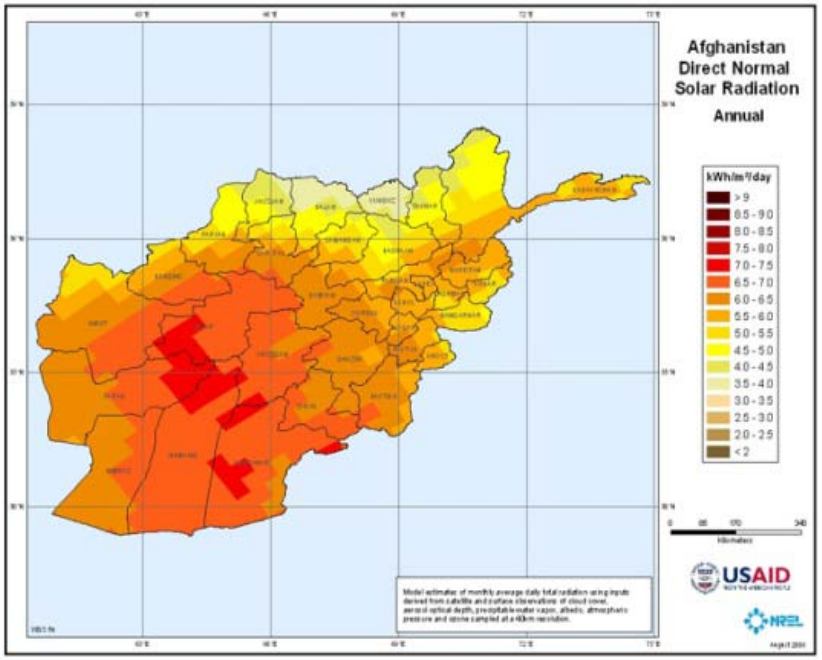
3 5 7 m/s

# Wind speed in Afghanistan (50 m height)



# Solar Power Potential



# Status of Solar Power in AFG

- 300 days of sunshine – Currently there are no large scale solar power plants in operation or in planning which could contribute to the on-grid electricity supply.
- There are several small scale off-grid PV projects in operation, construction and in planning. Current installed capacity in Afghanistan is some 6.7 MW.
- Some Ongoing Projects include:
  - NSP - Installation of small PV Systems ranging from 20 - 40W
  - 103kW of capacity in total have been installed up to now
  - Hybrid systems of a larger scale are in development
  - Government of New Zealand - Development of a 1 MW solar system to support an installed diesel generator in the province Bamyan
  - World Bank - Afghanistan Rural Solar Electrification Bamyan and Daikundi provinces

# Other RE Options - Biomass & Geothermal

- As per “Afghan Rural Renewable Energy Strategy”, currently 85% of Afghan energy demand is met by biomass. This biomass is mainly used for heating and cooking. In addition there are minor small biogas to heat projects in south AFG. Potential exists for decentralized generation
- There is no study dealing with biomass or its potential in Afghanistan in particular.
- A 2004 study “Geothermal Energy in AFG: Prospects and Potentials” confirms some potential for power generation along Hindu Kush. Possible power plant could range from 5 to 20 MW of installed capacity.
- However, there is no detailed investigation of the potential available nor are there are any ongoing projects. Certain conditions have to be investigated in terms of depth, temperature and chemistry to operate geothermal facilities economically.
- Currently not feasible for distributed generation.

# Case for Wind Power

- AFG has fewer load centres – population dispersed across hinterland justifying development of integrated grid long term investment. Nearly 75% population without grid
- AFG Rural Energy Strategy states 158 GW potential – primarily in SW AFG
- Currently there is almost no wind turbine in operation. Only the Panjshir province small wind farm operates 10 wind turbines with 10 kW each.
- Decentralised units with comparable small capacities can be applied to existing diesel generation assets to substitute diesel.

# Case for Wind Power

- Furthermore, hybrid solutions in combination with diesel, PV and batteries are promising options to supply electricity for rural electrification or for small grids
- Poorest provinces connected to diesel generators paying upto 50 cents/kwh
- Challenges - political, infrastructure, institutional,
- Role of Public sector vs private sector
- Importance of energy for poverty reduction in 75% off grid populace
- Use of Cell towers for wind measurements?

# Candidate Wind Energy Sites

| Candidate Site Name | Cost of Energy Range (50 m HH, US Cents) | Mean CF Cost of Energy (50 m HH, US Cents) | Cost of Energy Rank |
|---|---|---|---|
| Herat N1 | 8.9 - 20.9 | 12.0 | 1 |
| Herat N2 | 9.3 - 22.0 | 12.6 | 2 |
| Jalalabad N1 | 9.3 - 22.2 | 12.8 | 3 |
| Herat N3 | 9.4 - 22.4 | 12.8 | 4 |
| Kabul NE1 | 9.9 - 23.7 | 13.5 | 5 |
| Jalalabad N2 | 10.9 - 26.5 | 15.0 | 6 |
| Herat S2 | 11.4 - 28.1 | 15.8 | 7 |
| Kabul Suburb S1 | 11.5 - 28.2 | 15.9 | 8 |
| Herat E2 | 12.3 - 30.5 | 17.1 | 9 |
| Kabul SE1 | 12.8 - 31.9 | 17.9 | 10 |
| Mazar-e-sharif E2 | 12.9 - 32.2 | 18.0 | 11 |
| Herat E1 | 13.5 - 33.7 | 18.8 | 12 |
| Mazar-e-sharif E1 | 13.7 - 34.4 | 19.2 | 13 |
| Herat S1 | 14.4 - 36.3 | 20.2 | 14 |
| Mazar-e-sharif W1 | 15.0 - 38.0 | 21.1 | 15 |
| Herat SW2 | 15.4 - 39.1 | 21.7 | 16 |
| Mazar-e-sharif W4 | 16.7 - 42.8 | 23.6 | 17 |
| Herat SW1 | 20.4 - 52.9 | 29.0 | 18 |
| Kabul SW1 | 25.0 - 65.7 | 35.7 | 19 |
| Mazar-e-sharif W2 | 26.7 - 70.5 | 38.3 | 20 |
| Mazar-e-sharif W3 | 27.3 - 72.2 | 39.2 | 21 |
| Herat SW1 (Addition) | 27.6 - 72.9 | 39.6 | 22 |

**Source: ADB TA 7168 Phase I**

# Elements of Wind Energy Roadmap

| Tasks | Priority (1-5) | Timeline in years |
|---|---|---|
| Develop enabling policies & tariff | 3 | |
| Assess wind resource | 1 | |
| Develop human capacity | 2 | |
| Set firm targets for wind installations | 1 | |
| Develop local supply chain | 4 | |
| Develop grid access & integration standards | 5 | |
| Develop siting guidelines and standards | 1 | |
| Build institutions and interagency cooperation | 2 | |
| Develop plan of engagement with community | 2 | |
| Develop capability in local financial institutions to fund wind projects | 4 | |

# Proposed Road Map -- Discussion and Next Steps

| Resource Assessment | Technical | Regulatory | Financing | Capacity Building |
|---|---|---|---|---|
| Develop generation targets | How to facilitate interconnection with grid in long term | How to incentivize private sector | GoA to pilot success stories for private sector to replicate | Development of local manufacturing capability |
| Collect wind data at priority sites | Lessons learnt from existing projects | FiT rules for off-grid areas | Encourage donors to pilot through grant funding | Training on O&M |
| Facilitate public private partnerships | Co2 & avoided fuel costs | Guidelines for community run projects | Encourage local banks for project financing | Set timelines for implementation of wind projects |

# Possible Intervention by ADB

- Conduct an updated wind resource mapping of priority sites
- Mobilize other donors active in AFG power sector
- Mobilize Afghanistan Infrastructure Trust Fund for pilot projects
- Supplement with new Energy MFF to be processed in 2013