

SAARC Dissemination Workshop for the Study on "SAARC Energy Outlook 2030"

Presentation 4: Moving towards a sustainable energy future: Opportunities and Challenges

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Afghanistan: RE Targets vs. adoption

Country	Federal RE Targets	Expected Additions by 2030
Afghanistan	350-450 MW by 2032	Biomass: 425 KTOE, Wind: 100 MW, Solar: ~580 MW

	Potential	Exploitation
 Hydro	Afghanistan has significant potential to generate hydropower. It has river catchment area of 677,900 sq km and recoverable hydro potential of more than 23,000 MW. The vast majority of this potential (~20,000 MW) is located in the northeast on the Amu Darya, Panj and Kokcha rivers	LOW
 Solar	The country has abundant solar energy. Blessed with arid terrain and with more than 300 days per year counted as sunny, there is potential to generate ~222 GW of solar power	LOW
 Wind	More than 67,000 MW can be produced through wind power in the country (estimated by MEW study), with at least 12,000 MW exploitable in the Herat province, 10,000 MW in Nimruz and 1,800 MW in Farah.	LOW
 Biomass	As per Afghanistan Renewable Energy Policy, the country has a biomass potential of 4000 MW with 91 MW of municipal solid waste, 3090 MW agriculture waste and 840 MW animal waste. An estimated 350 small biogas digesters have been installed in different parts of the country	LOW

Afghanistan: Regulatory targets and investment climate



- The National Renewable Energy Policy (ANREP) aims to mainstream renewable energy in the national energy sector planning so deploying them in different capacities and through different projects in various parts of the Country. The Policy sets a target for deploying 350-450 MW of REN capacity by 2032. The Policy will be implemented in two terms- TERM 1 (2015- 2020) will create and support an atmosphere and activities for the development and growth of REN sector particularly in the PPP mode, and TERM 2 (2021-2032) will deploy REN in full commercialization mode
- The existing official Plan (Afghanistan Power Sector Master Plan [APSMP]) for power system expansion puts a heavy focus on RE, in the form of large-scale hydro, as a source of supply



Most of the investments in the country are through donors and institutions (the likes of ADB, USAID). Some of the projects undertaken are as listed below:

- National Solidarity Program (NSP): Installation of small PV systems ranging from 20–40 W. According to the “Afghan Rural Renewable Energy Strategy” ([MIN_006]), about 103 kW of capacity in total has been installed up to now. Hybrid systems of a larger scale are under development.
- Government of New Zealand – Development of a 1 MW solar system to support an installed diesel generator in Bamyan province
- World Bank – Afghanistan Rural Solar Electrification of the provinces Bamyan and Daikundi
- The Afghan government’s rural development ministry in collaboration with the United Nations Development Programme (UNDP) and USAID has been working towards development of such micro solar power plants and mini hydel plants

Afghanistan: Barriers to RE Adoption

1	Costly hydro power	The country has an installed hydro with cumulative capacities of only ~280 MW. However, hydropower is seasonal and capacity factors of HPPs are below 40%. Factoring in operation and maintenance costs, power generation from hydro projects is costlier than imported power for Afghanistan
2	Seasonality in hydel power supply	With hydro projects not having have extensive storage, they deliver most of their output during April-October, leaving the country with a capacity shortfall during the winter months, which are also the months for peak power demand. Therefore, development of HPP would need to be backed up by adequate thermal power development for base load power generation and/or commitments from neighbouring countries for sufficient imported power during times of intermittency emanating from hydro generation.
3	Lack of water sharing agreement	All of the country's river basins are transnational and usage of water and building of dams may give rise to inter-regional water sharing disputes. Barring Iran, Afghanistan has no water-sharing agreement with any country. This has hindered development of large-scale hydropower in the country
4	Weak Distribution systems	Distribution network in the country is weak and susceptible to voltage and load fluctuations. In many cases, inter-regional transmission systems are not present. They require upgradation to accommodate intermittent RE power sources. Several RE rich regions like Nimruz do not not have any connections either with the Afghanistan network and therefore require substantial capital investments in transmission lines and substations
5	Lack of private participation	Political instability, lack of strong government has hindered private investments in the country. The private sector has been yearning for a more facilitating environment to boost investments. Partnerships with the international communities have helped spark investment, however, they are dependant on foreign funds and donors which hinder fast tracked development

Pakistan: RE Targets vs. adoption

Country	Federal RE Targets	Expected RE Capacities by 2030
Pakistan	~18 GW of renewable capacity (except large hydro) by 2030	Hydro: 12.8 GW, Solar: 3.1 GW, Wind: 3.6 GW, Biomass: 2.6 GW

	Potential	Exploitation
 Hydro	As per WAPDA, Pakistan is estimated to have a cumulative hydropower potential of 60,000 MW. The Indus River Basin contains ~75% of the entire hydropower potential of the country	LOW
 Solar	Pakistan has some of the highest values of solar irradiance in the world (5.3 kWh/m²/day), with eight to nine hours of sunshine per day, ideal climatic conditions for solar power generation. Areas of high solar radiation include the Thar desert, south and southwestern parts of the country. The country has an overall 1,600 GW solar power potential	LOW
 Wind	The theoretical potential for wind power in Pakistan estimated is about 340 GW, but this estimate does not consider technical and economic constraints. The Gharo-Keti Bandar wind corridor in southern Pakistan has a theoretical potential of over 50 GW	LOW
 Biomass	The technical biomass feedstock potential is ~ 25,255 thousand tonnes/ year. An World Bank study indicates that around 26 000 tonnes of municipal waste is produced across the country every day (World Bank, 2016). Converting this waste into energy could generate up to 360 MW of power	LOW

Pakistan: Regulatory targets and investment climate



- As per NEPRA State of the Industry Report 2017, the country's targets for non conventional energy sources by 2030 are (a) Hydro: 20.6 GW (b) 2.5 GW (c) Wind: 1.6 GW. Apart from that, no federal renewable targets have been set
- Recently, as part of the Renewable Energy Policy 2019, the government in Pakistan plans to increase the share of renewable energy (wind, solar, small hydro and biomass) in total power generation to 30% by 2030. This translates to ~18 GW of RE target by 2030. In addition, there is a target of 30% large scale hydropower (more than 50 MW). The new policy, whose guiding principles have already been approved by The Cabinet Committee on Energy (CCoE) and is being reviewed by different stakeholders before formal implementation



The country has been inviting multilateral funding and expertise to set up renewable energy plants in the country. A few notable examples include:

- Introduction of Clean Energy by Solar Electricity Generation System is a special grant aid project by the Japan International Cooperation Agency (JICA) under the Coolio Earth Partnership. This project includes the installation of two 178 kW photovoltaic (PV) systems at the premises of the Planning Commission and Pakistan Engineering Council
- In southeast Pakistan, Sindh Province has initiated its' Sindh Solar Energy program (SSEP) that will see utility-scale, distributed and residential solar installed, including up to 400 MW of capacity in solar parks. The World Bank has committed US\$100m to the program

Pakistan: Barriers to RE Adoption

- 1

Constraints on grid and transmission infrastructure

Renewable energy growth in the country has been concentrated in a few geographical locations. Such large clusters need anticipatory grid planning and extensive infrastructure improvement, requiring dedicated 132 kV and 220 kV substations. However, NTDC’s limited financial resources have been creating a serious challenge to meeting the sector’s requirements. Due mainly to the limitations of public funding and the private sector’s absence from this sector, the transmission infrastructure in Pakistan remains weak.
- 2

Technical challenges and lack of experience

Government bodies and private entities do not have experience in setting up large scale RE projects. This poses project implementation challenges
- 3

Lack of government oversight

Guidelines have been framed to improve investments in the RE space by devising effective and efficient auctioning framework, setting targets. However, policy gaps remain and targets are non binding. A supporting ecosystem can help address barriers

Maldives: RE Targets vs. adoption

Country	Federal RE Targets	Expected RE Capacities by 2030
Maldives	No targets set	28 KTOE

		<u>Potential</u>	<u>Exploitation</u>
	Hydro	There is no major hydro potential in the country	NA
	Solar	The country has a solar potential of ~43.5 GW with the majority concentrated in the Greater Male region	LOW
	Wind	Considering only onshore wind capabilities, the country has an estimated wind potential of ~100 MW. While Greater Male has wind potential of 20 MW, islands in the Malé Atoll 5-12 km away from the islands of Greater Malé and have a cumulative wind potential of 80 MW	LOW
	Biomass	As per the SREP Report, 2-5 MW of biomass potential exists in Maldives owing to limited land mass and the low fertility of its coral soils	LOW

Maldives: Regulatory targets and investment climate



- State Electric Company Limited (STELCO), the country's main utility, aims of meeting 30% of daytime peak demand on each island
- The Renewable Energy Framework (REM) plan also proposes a shift to wind, batteries and biomass to complement solar power, while retaining existing diesel generators for reserve power. However, no specific targets have been given



- Although there has been multilateral funding towards improving power sector and energy security in the island nation, investments towards RE development has been small
- The Asian Development Bank (ADB) has been a significant contributor to the power sector of the Maldives, extending four loans totalling over \$30 million and seven technical assistance projects totalling \$1.7 million
- The World Bank has provided Maldives with support in developing its energy sector regulatory framework while ADB has provided support on capacity building on grid codes and tariff mechanisms

Maldives: Barriers to RE Adoption

1 Lack of adequate landmass

Due to limited land availability, large scale RE plants are difficult to be set up. Despite having high biomass potential, constrained land usage hinders adoption. for biomass based power generation to take shape in Maldives, large quantities of biomass may be required to be imported, possibly from other countries in South Asia. it will be a challenging task for Maldives to import biomass and ensure long term biomass fuel contracting to mitigate the price volatility

Land availability limits the deployment potential for established low-cost renewable energy technologies like PV and onshore wind

2 Technical challenges

Islands beyond Greater Male have large solar and wind potential. However, setting up PV or wind installations in those areas would require undersea electrical cables. This can be technologically challenging and financially prohibitive

3 Lack of regulatory policies

Although the government of Maldives recognises the importance of RE benefits, regulatory frameworks and policies are not completely clear. There is a lack of policy targets for different RE technologies while tariff structures are missing. As a result initial pilot projects for RE projects in the Maldives have met with mixed success

Nepal: RE Targets vs. adoption

Country	Federal RE Targets	Expected RE Capacities by 2030
Nepal	No overall RE targets set, 10,000 MW of hydro target by 2020	Hydro: 4.3 GW, Solar: 125 MW, Wind: <10 MW, Biomass: 11.6 MTOE

	Potential	Exploitation
 Hydro	As per UNDP assessment, the total technical potential of hydropower is 45 GW from which 42 GW is economically realisable. At a capacity factor of 60 percent, those dams would generate 221,451 GWH.	MEDIUM
 Solar	As per UNDP assessment, the total technical potential of solar power is 2.1 GW. At a capacity factor of 17 percent, these solar facilities can generate 3,127 GWH.	LOW
 Biomass	Owing to high deforestation rates, and Over-exploitation of wood resources, the Biomass Energy Strategy (BEST) intends to bring down biomass usage and develop sustainable methods of biomass usage	HIGH

Nepal: Barriers to RE Adoption

1 Reports of unfriendly investment climate

International investment is key for renewable energy development at large scale. However, in some cases, international investors complained of non-cooperation. A Korean company has been struggling to get started and a few Norwegian companies have left the country due to unfriendly investment environment.

2 Lack of basic power access

As much as 30% of the country's population still do not have access to electricity. It is due to lack of transmission infrastructure owing to high mountainous terrain. This necessitates the requirement mini and micro grids, solar housing systems to improve access in far flung areas. In such a scenario, large-scale grid-tied RE technology is not suitable and conducive

3 Deep-rooted hydro-dominant electricity policy

Although the Alternative Energy Promotion Centre intends to make all RE based energy (solar, wind, biomass) mainstream, necessary subsidies and government support is not channelized adequately. Nepal continues to expedite additional hydro projects that already has an established market.

Thank You