



SARPEX Pilot Market



Anil Rajbhandary, NEA
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Energy Resources of the BBIN sub Region



Bangladesh

- Oil – insignificant
- Coal – moderate
- Natural gas – significant but depleting
- Hydropower potential – insignificant

Bhutan

- Hydropower potential – significant
 - far exceeds the likely demand due to smaller power system and economy

Energy Resources of the BBIN sub Region



India

- ❧ Oil - significant
- ❧ Coal - significant but of low quality
 - ❧ high ash content & low calorific value
- ❧ Natural gas – significant
- ❧ Hydropower potential - significant
- ❧ Inadequate to meet rapidly growing energy requirement

Nepal

- ❧ Coal – negligible
- ❧ Hydropower potential – significant
 - ❧ far exceeds the likely demand due to smaller power system and economy

Installed Capacity in the BBIN sub Region



Bangladesh

Present total installed capacity : 13,151 MW

- ❧ Coal – 250 MW (1.9 %)
- ❧ Gas – 8,256 MW (62.8 %)
- ❧ Hydro - 230 MW (1.7 %)
- ❧ Furnace Oil - 2,787 MW (21.2 %)
- ❧ Diesel - 1,028 MW (7.8 %)
- ❧ Import - 600 MW (4.6 %)

Bhutan

Present total hydro installed capacity : 1,606 MW

Installed Capacity in the BBIN sub Region



India

Likely total installed capacity by 2021-22 : 523,389 MW

- ☞ Coal – 248,513 MW (48 %)
- ☞ Gas – 29,968 MW (6 %)
- ☞ Hydro - 59,828 MW (11 %)
- ☞ Nuclear - 10,080 MW (2 %)
- ☞ Renewables - 175,000 MW (33 %)

Nepal

Present total installed capacity : 960.6 MW

- ☞ Hydro – 907.2 MW (95 %)
- ☞ Diesel – 53.4 MW (5 %)

Cross Border Grid Connectivity



India – Nepal :

400 kV D/C Dhalkebar – Muzzafarpur

☞ to be initially charged at 220 kV

☞ presently operated at 132 kV level

Some 11, 33 and 132 kV links

India – Bhutan :

☞ Interconnections upto 400 kV exist

☞ 400 kV D/C Punatsangchu – I HEP (Bhutan) – Alipurduar (India)

India – Bangladesh :

☞ 400 kV D/C Bahrampur (India) – Bheramara (Bangladesh) with 500 MW HVDC back-to-back link at Bheramara

☞ 400 kV D/C Surjyamaninagar (Bangladesh) – Comilla (India)

Prospect for Power Trade in the BBIN sub Region



- ❧ Region endowed with coal, gas and water resources
- ❧ Seasonal characteristics of supply from hydro dominated power system:
 - ❧ Reduced generation capability during the winter (dry) season
 - ❧ Increased generation capability during the summer (wet) season
- ❧ Seasonal characteristics of power demand :
 - ❧ System Peak during winter and lower demand during summer in Nepal
 - ❧ System Peak during summer and lower demand during winter in India
- ❧ Geographical proximity of the load centers

Benefits of Power Trade in the BBIN sub Region



- ☞ Diversity in energy resources and seasonality in power supply/demand could complement the power system of one country by the other
- ☞ Improve reliability of the power system
- ☞ Lower reserve margin and therefore lower capital investment
- ☞ Lower operating cost by operating the power system in the most optimum way
- ☞ Capture economy of scale by constructing large hydropower projects for the larger integrated power system
- ☞ The end result is the supply of electricity to the consumer that is adequate, reliable and affordable



PTA Between Nepal and India

- ☞ On 21 October, 2014; Nepal and India signed an Agreement on Electric Power Trade, Cross-border Transmission Interconnection and Grid Connectivity
 - ☞ non-discriminatory access to the cross-border interconnections
 - ☞ speed up interconnection planning and construction
 - ☞ policy harmonization for the realization of cross-border interconnections, grid connectivity and power trade

SAARC Framework Agreement



- ❦ The SAARC member states, on 27 November, 2014; signed the SAARC Framework Agreement for Energy Cooperation (Electricity):
 - ❦ enable cross-border trade of electricity on voluntary basis
 - ❦ plan cross-border grid interconnections
 - ❦ non-discriminatory access to the respective transmission grids

Guidelines on Cross Border Trade of Electricity-Gol



Para 2.1(a): Facilitate cross border trade of electricity between India and neighbouring countries;

Para 5.2.1: Considering that electricity trade shall be involving issues of strategic, national and economic importance, participating entities (Participating Entity(ies)) complying with following conditions shall be eligible to participate in cross border trade of electricity after obtaining one-time approval from the Designated Authority:

- a) Import of electricity by Indian entities from Generation projects located outside India and owned or funded by Government of India or by Indian Public Sector Units or by private companies with 51% or more Indian entity (entities) ownership;

Guidelines ...



- b) Import of electricity by Indian entities from projects having 100% equity by Indian entity and/ or the Government / Government owned or controlled company(ies) of neighbouring country.
- c) Import of electricity by Indian entities from licensed traders of neighbouring countries having more than 51% Indian entity(ies) ownership, from the source as indicated in para 5.2.1(a) and 5.2.1(b) above.
- d) Export of electricity by distribution licensees / Public Sector Undertakings (PSUs), if surplus capacity is available and certified by the concerned distribution licensee or the PSU as the case may be.

Guidelines -Trade through Indian Power Exchanges



Para 7.1: Any Participating entity, with approval from the Designated Authority under para 5.2.1, after complying with the relevant regulations of CERC, shall be eligible for cross border trade of electricity through Indian Power Exchange(s) under the categories of Term Ahead Contracts, Intra Day Contracts/ Contingency Contracts as defined in the Power Market Regulations of CERC.

Provided that other entities shall be eligible to participate in the Indian Power Exchange(s) through the eligible licensees under the aforesaid Regulations of CERC.

Para 7.2: Further, the quantum of electricity that can be traded under cross border trade for electricity in Indian Power Exchanges shall be prescribed from time to time by the Designated Authority.

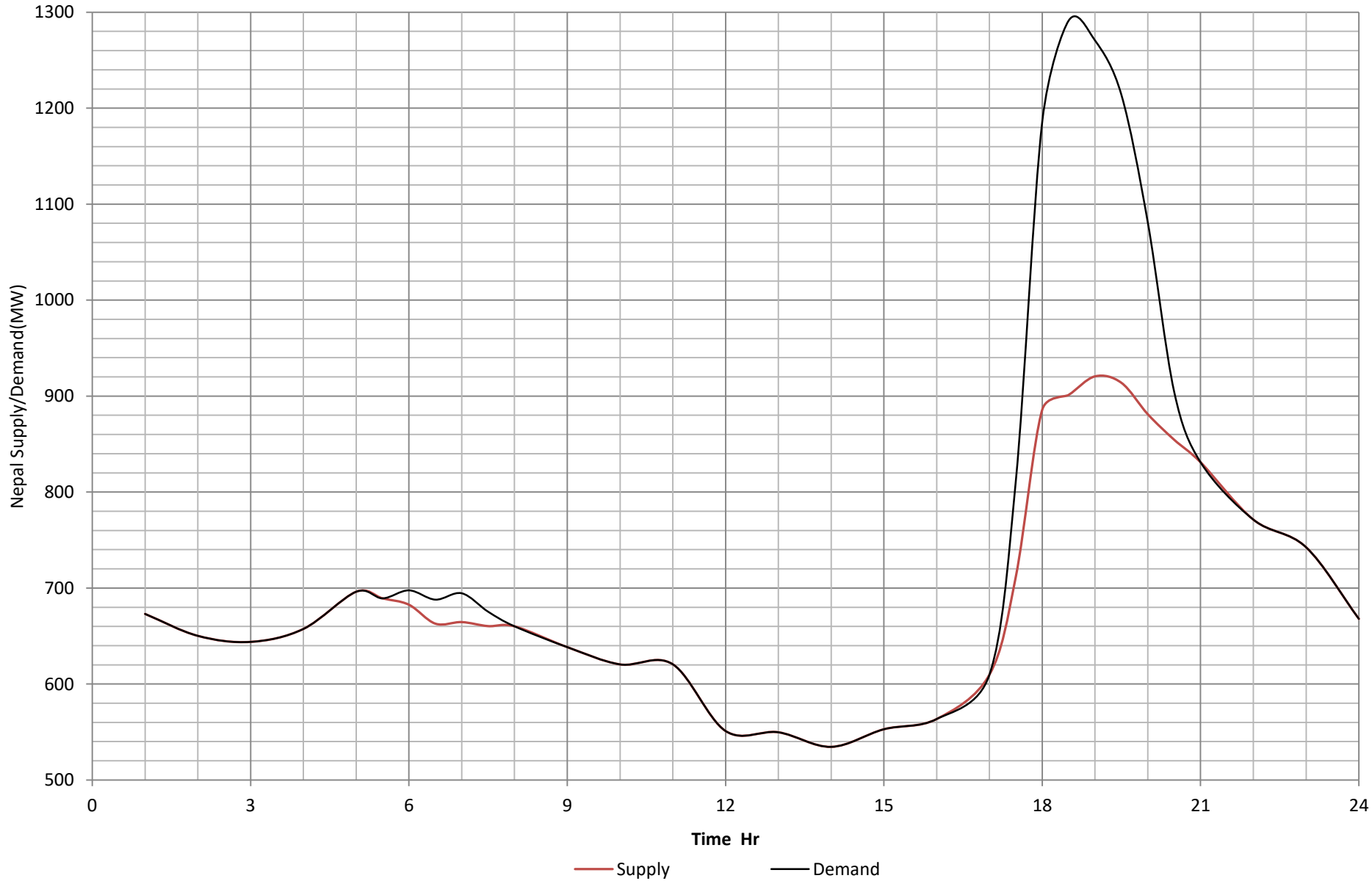
Para 7.3: Cross border trade for electricity can be extended to other categories of contracts based on review by Ministry of Power in consultation with CERC.

Supply Demand Scenario - Nepal



- ❁ In the next two years, with the commissioning of number of Hydro Projects
 - ❁ Power Deficit Likely to be eliminated during the wet season
 - ❁ But likely to persist in the dry season
- ❁ By 2019 -20
 - ❁ Likely to become surplus in energy terms
 - ❁ Need for Import to meet Peak Demand during Dry Season
 - ❁ Seasonality of hydro power generation
 - ❁ Comparatively higher load

System Load Curve of Peak Load Day (October 30, 2016) Sunday



Mock Exercise for SARPEX Pilot Market



- ❖ Objective: To ascertain the feasibility of the South Asian Regional Power Exchange (SARPEX) with Bangladesh, Bhutan India and Nepal as the key participants.
- ❖ Simulating the Day-Ahead Market (DAM) on SARPEX
- ❖ Through sampling exercise, a total of 70 days were selected that represent the overall demand – supply dynamics and characteristics of all the countries for the study period April, 2015 – March, 2016

Roles and Responsibilities of the Core Team



- ❧ Data collection (Daily energy demand and peak load for the period April 2015 to March 2016)
- ❧ Hourly load data collection for the sampled 70 days for the Mock Exercise
- ❧ To understand the need and benefits of SARPEX to Nepal Power System
- ❧ To discuss about the mode of operation of SARPEX
 - ❧ Unified
 - ❧ Residual

Learning from Capacity Building Program - DAM



- ❦ Delivery for next day
- ❦ Price discovery: closed, double sided auction for each 15 min time block for the following day, intersection of aggregated sale and purchase curves defines Market Clearing Price (MCP)
- ❦ DAM (Day ahead Market) trading process:
 - 10:00 am to 12:00 pm: Bids for 15 min each or block bids can be placed
 - 12:00 am to 1:00 pm: MCP and MCV calculated
 - 1:00 pm to 2:00 pm: Corridor availability verified
 - 3:00 pm: final ACV and ACP (area clearing volume and price) calculated. Market splits if congestion
 - 5:30 pm: collective transaction confirmation by NLDC
 - 6:00 pm: Final schedule sent to RLDC for incorporation

Learning from CBP – Bidding Strategy



- ❦ Merit Order Dispatch Schedule to be prepared based on Variable Cost and Exchange Price
- ❦ Base Load: must run ROR plants and long term 'take or pay' contractual plants
- ❦ Shoulder Load/Peak Load/Forecast Deviation:
 - ❦ PROR Plants, Bilateral Contracts and other available market options.

Activities undertaken by the core team



- ❖ Understanding the strategy of bidding, bid formation for 5th April 2015 was made and submitted / uploaded to SARPEX web portal during capacity building program.
- ❖ Bids of all sampled days are formed and submitted to SARPEX web portal.

Relevance of the Mock Exercise



- ❦ Gaining idea on bidding sell / buy in SARPEX when there is surplus / deficit in generation.
- ❦ SARPEX could provide an opportunity for sale of surplus energy that is available during wet season and during off peak hours.
- ❦ Round the clock take or pay imports: during line outages associated to these import points, SARPEX could be a platform to sell unused energy from these contracts.
- ❦ By Getting cheap energy from SARPEX during off peak hours, PROR/Storage Plants can be offloaded so as to store water. In turn these plants can be loaded when the System demands the most.



Thank You !

anil_rajbhandary@hotmail.com