

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

## Presentation 6: Potential of Cross Border Energy Trade for SMS

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# SAARC Energy Sector Overview: Overarching dominance of a single fuel in the energy mix of SMS has led to skewed energy profile

- Primary energy (PE) consumption pattern (by fuel mix) varies widely from one country to the other.
- India, the largest consumer of primary energy, is heavily dependent on coal (~65% of PE as on FY18). Increasing federal push and private participation towards RE adoption has been reaping benefits, however, share of RE in the final PE pie is still a meagre 1%.
- India's eastern neighbor, Bangladesh, is highly reliant on gas with more than 70% of PE consumption being met through it. High domestic gas reserves coupled with cheap fuel costs and widespread pipeline infrastructure has led to high usage of gas across all segments (industry, domestic, commercial, power plants).
- Pakistan also highly relies on gas (~48% of PE as on FY18), although growth in usage has tempered due to domestic supply constraints and rising reliance on imported LNG.
- Bhutan and Nepal are predominantly hydro based energy generators.
- Limited exploitation of renewable energy resources, increasing energy deficits and rising imports dependence have paved the way for higher cross border energy trade with SAARC and non-SAARC nations

# SAARC Present Power Sector Overview: Bhutan and India net exporters of electricity, Afghanistan and Nepal face deep deficits

| Countries   | Electricity [GWH] |                 | Surplus/ Deficit Position | Deficit/ Surplus % |
|-------------|-------------------|-----------------|---------------------------|--------------------|
|             | Gross Demand      | Domestic Supply |                           |                    |
| Afghanistan | 4,981             | 1,076           | Deficit                   | -78%               |
| Bangladesh  | 65,124            | 58,300          | Deficit                   | -10%               |
| Bhutan      | 2,094             | 7,629           | Surplus                   | 264%               |
| India*      | 1,205,266         | 1,202,099       | Deficit                   | -0.3%              |
| Maldives    | 1,405             | 1,405           | Self-Sufficient           | 0%                 |
| Nepal       | 5,071             | 2,645           | Deficit                   | -48%               |
| Pakistan    | 120,392           | 118,916         | Deficit                   | 0%                 |
| Sri Lanka   | 15,763            | 15,763          | Self-Sufficient           | 0%                 |

*\*Excluding exports to Bangladesh and Bhutan, although India has a power deficit, it is a net exporter of electricity*

- SAARC region is in a net deficit position of power supply with ~14700 GWH (0.85%) of domestic power shortage (as of FY18/CY17)
- Afghanistan and Nepal have very poor domestic power supplies, Sri Lanka and Maldives are self-sufficient

# SAARC Power Sector Profile

| Countries   | Power Sector Profile                                                                                                                                                                                                                            |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Afghanistan | <ul style="list-style-type: none"> <li>• 70% of power imported through interconnections with Central Asia</li> <li>• Proposed interconnection with Pakistan</li> </ul>                                                                          |
| Bangladesh  | <ul style="list-style-type: none"> <li>• Small power system with majority being gas based</li> <li>• Declining gas reserves puts pressure to look towards coal, oil and LNG</li> <li>• Limited RE potential</li> </ul>                          |
| Bhutan      | <ul style="list-style-type: none"> <li>• Very small power system with a surplus of &gt;200%</li> <li>• High hydro potential</li> <li>• Net exporter of power to India</li> </ul>                                                                |
| India       | <ul style="list-style-type: none"> <li>• Largest power consumer in the region</li> <li>• Heavily dependent on coal</li> <li>• Interconnections with Bhutan, Bangladesh and Nepal</li> <li>• Huge coal reserves and high RE potential</li> </ul> |
| Maldives    | <ul style="list-style-type: none"> <li>• Very small power system with high dependence on diesel</li> <li>• Limited scope of interconnection as the nation is isolated</li> </ul>                                                                |
| Nepal       | <ul style="list-style-type: none"> <li>• Small power system with underutilized hydro</li> <li>• Importer from India</li> </ul>                                                                                                                  |
| Pakistan    | <ul style="list-style-type: none"> <li>• Gas and oil dependent power generation</li> <li>• High power deficits</li> <li>• Proposed interconnection with Central Asia</li> </ul>                                                                 |
| Sri Lanka   | <ul style="list-style-type: none"> <li>• Self-sufficient in power production</li> <li>• Under development of hydro potential</li> <li>• High scope of interconnection with India</li> </ul>                                                     |

# SAARC POL Overview: All nations except India in deficit position for POL

| Countries    | POL ('000 tonnes) |                 | Surplus/ Deficit Position | Deficit/ Surplus % |
|--------------|-------------------|-----------------|---------------------------|--------------------|
|              | Gross Demand      | Domestic Supply |                           |                    |
| Afghanistan* | 2,019             | 0               | Deficit                   | -100%              |
| Bangladesh*  | 6,384             | 1,166           | Deficit                   | -82%               |
| Bhutan       | 158               | 0               | Deficit                   | -100%              |
| India        | 204,922           | 252,839         | Surplus                   | 23%                |
| Maldives     | 561               | 0               | Deficit                   | -100%              |
| Nepal        | 2307              | 0               | Deficit                   | -100%              |
| Pakistan     | 29037             | 10,741          | Deficit                   | -63%               |
| Sri Lanka    | 5168              | 1867            | Deficit                   | -64%               |

\*Excluding LPG  
All data as of FY18/CY17

# SAARC Trade with SAARC Member States (SMS)

# Prevalent cross border SAARC electricity trade

Electricity trade presently happens between Bhutan-India (1450 MW), India-Bangladesh (600 MW) and India-Nepal (300 MW)

## BHUTAN-INDIA

- Under inter-governmental agreement between the two countries, India has developed hydropower plants of cumulative capacity 1416 MW (Tala- 1020 MW, Chukka- 336 MW, Kurichi- 60 MW)
- Punatsangchhu-1 (1200 MW, expected commissioning by 2022) and Punatsangchhu-II (1020 MW) are being developed by India with 30% grant and 70% interest. As per the terms and conditions of the project, all excess power generated will be exported to India

## INDIA-BANGLADESH

- Cross Border Electricity Trade (CBET) has increased between India and Bangladesh with the commissioning of 500 MW of capacity through 400 KV back-to-back HVDC link with West Bengal.
- Subsequently, 100 MW of power transfer from Tripura in India to Comilla in Bangladesh was commissioned from Feb, 2016. An additional 500 MW capacity on the existing interconnection is slated to be completed in FY19

## INDIA-NEPAL

- Power exchange between Nepal and India begun in 1971 from the Indian side exporting 5 MW of power to its neighbor
- Power exports to Nepal has gone up from 790 GWH in FY13 to 2175 GWH in FY17 led by the commissioning of a 400 kV transmission line in 2016 from Dhalkebar in Nepal to Muzzafarnagar in India
- The present capacity of 80 MW is proposed to be enhanced to 1000 MW

Estimated Power Trade Volumes within SMS in FY18/CY2017

| Country Pair      | Power Traded (in GWH) |
|-------------------|-----------------------|
| Bhutan -India     | 5306                  |
| India-Bhutan      | 84                    |
| India-Nepal       | 2175                  |
| India- Bangladesh | 4625                  |
| TOTAL >>          | 12190                 |

# SAARC POL Trade: India-Bhutan and India-Sri Lanka constitute major quantum of SMS POL Trade

- **Bhutan** presently imports 100% of its POL requirement from India. Bhutan doesn't have any POL based midstream infrastructure in terms of refineries and pipelines. POL products are directly imported from India and are distributed through road tankers. Small and medium sized tankers with a carrying capacity of 9-12 Kiloliters are utilized due to mountainous terrain and narrow roads. These tankers are used by distributors for the transportation of fuel from their regional depots, where the imported product is stored, to the retail outlets across the country
- In case of **Nepal**, 100% of POL products are also directly imported from India and are distributed through road tankers
- India currently exports some diesel to **Bangladesh** via rail route with a total distance of 510km
- **Sri Lanka** imports ~45%-50% of its diesel requirement from India
- All other countries import their POL requirements from regions beyond SAARC

Estimated POL Trade Volumes within SMS in FY18/CY17

| Country Pair      | POL Traded (in '000 tons) |
|-------------------|---------------------------|
| India-Bhutan      | 160                       |
| India-Nepal       | 2307                      |
| India-Bangladesh* | 453                       |
| India-Sri Lanka*  | 1056                      |

\*Diesel only

# SAARC Power Outlook: India, Bhutan, Nepal, Sri Lanka to be power surplus by 2030, SMS net power deficit to narrow to 0.4% of total demand

| Countries   | FY24/ CY23   |                       | Deficit/Surplus | FY30/ CY30   |                       | Deficit/Surplus |
|-------------|--------------|-----------------------|-----------------|--------------|-----------------------|-----------------|
|             | Demand (GWH) | Domestic Supply (GWH) |                 | Demand (GWH) | Domestic Supply (GWH) |                 |
| Afghanistan | 7,428        | 5,466                 | -26%            | 11,028       | 7,473                 | -32%            |
| Bangladesh  | 91,093       | 79,825                | -12%            | 123,941      | 101,212               | -18%            |
| Bhutan      | 3,000        | 22,173                | 639%            | 6,257        | 25,049                | 300%            |
| India*      | 1,769,609    | 1,776,224             | 0%              | 2,449,070    | 2,444,781             | 0%              |
| Maldives    | 2046         | 2046                  | 0%              | 3172         | 3172                  | 0%              |
| Nepal       | 8,489        | 8,234                 | -3%             | 14,656       | 14,716                | 0%              |
| Pakistan    | 151,583      | 150,301               | -1%             | 191,828      | 190,781               | -1%             |
| Sri Lanka   | 20,996       | 22,303                | 6%              | 28,188       | 29,366                | 4%              |

## AVENUES TO IMPROVE POWER TRADE WITHIN SMS

- 1

Through increased inter connectivity of power systems by setting up inter-country transmission lines, continuity in supply can be ensured, thereby reducing deficits and ensuring supply in case of contingencies
- 2

In cases where loads of one country are in close proximity with generation facilities of a neighboring country as compared to its own generation facilities, power evacuation will be easier and more economical for inter-country trade. Such arrangements may be further expedited in case of India-Bangladesh, India-Nepal, India-Nepal, India-Pakistan, Nepal-Bhutan
- 3

The interconnected nations within the region may set up a cross-border power exchange, whereby generators/ consumers of one country may seamlessly sell/ buy power in short-term or long term basis

# SAARC POL Outlook: Only India expected to reach surplus position, others to lag

The trade balance for Diesel in 2030, the single largest POL product based on consumption in SAARC Member States, comes out to be negative with net surplus only in India

| '000 tonnes               | Petroleum product demand | Domestic production of POL | Deficit/surplus |
|---------------------------|--------------------------|----------------------------|-----------------|
| Afghanistan               | 4,673                    | 4,132                      | -541            |
| Bangladesh (excludes LPG) | 13,435                   | 11,250                     | -2,185          |
| Bhutan                    | 381                      | 0                          | -381            |
| India                     | 316,119                  | 348,475                    | 32,356          |
| Maldives                  | 1,121                    | 0                          | -1,121          |
| Nepal                     | 5,982                    | 0                          | -5,982          |
| Pakistan (excludes LPG)   | 50,735                   | 24,617                     | -26,118         |
| Sri Lanka                 | 7,844                    | 5,976                      | -1,868          |
| Net deficit in the region |                          |                            | -5840           |

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## UPCOMING INVESTMENTS IN POL

- 1

Sri Lanka is discussing a 100,000 bpd refinery in partnership with Indian Oil Corp.
- 2

Nepal Oil Corporation (NOC) and Indian Oil Corporation (IOCL) in Joint venture are laying a 69 km long, 2 million tonnes, cross country POL product pipeline from Motihari in Bihar to Amlekhgunj in Nepal at an estimated cost of \$48 million.
- 3

India is also planning to build a product pipeline of 136km from India’s Numaligarh refinery (NRL) to Bangladesh. Once the pipeline comes into operation, NRL can supply diesel to Bangladesh in a swap arrangement with the West Coast Refinery

# **SAARC Trade outside SAARC Member States (SMS)**

# Prevailing Energy Trade: Afghanistan, Maldives, Nepal major recipients of trade outside SMS

- Afghanistan imports electricity from Central Asian Republics (CAR) of Tajikistan, Uzbekistan and Turkmenistan. Pakistan also imports ~0.4% of its power requirement from Iran
- All gas imports are sourced from nations beyond SAARC as none of the nations are surplus in gas production. Currently, there is no inter-regional gas pipelines
- Coal demand in all countries far surpass domestic production in all SAARC countries. India is the 2<sup>nd</sup> largest importer of coal in the world (after China). Pakistan, Bangladesh and Sri Lanka source coal from several countries like Indonesia, China, Australia and South Africa
- Most of the POL imports for SAARC nations (except Bhutan and Nepal) is sourced from regions beyond SAARC. UAE, Iran, Kuwait, Singapore are the major exporters of crude and POL to the SAARC region

# Afghanistan has strong Cross Border Infrastructure for power with CAR, all SMS reliant on Middle East for Crude

## POWER TRADE

- After a decade long war with Taliban, Afghanistan's power systems was almost non-existent. Through funding from ADB and Government of India, transmission lines of more than 3600 km have been set up from neighboring Uzbekistan to Kabul in Afghanistan, thereby bringing power to the capital city. The transmission lines traverse through inhospitable terrain of Hindu Kush, towering more than 3800 meters above sea level. The Emergency Infrastructure Rehabilitation and Reconstruction Project— Power Component has been completed at an investment cost of ~\$40 million. This included setting up of switching stations and double circuit 220 kV transmission lines from Uzbekistan border and hinterlands of Afghanistan. Completion of this project in 2007 enabled power to be imported from Uzbekistan and supplied to major load centers, including Kabul.
- The Regional Power Transmission Interconnection Project, set up at an investment cost of \$109.5 million, allowed power to be transmitted from Tajikistan to Afghanistan by construction of a 220 kV interconnection between the Afghan and Tajik power grids. Under a 20 year power purchase agreement, 500 GWH is being imported annually from Tajikistan through this line.

## CRUDE AND POL TRADE

All countries have set up ports to manage imports of crude and POL from other countries. Afghanistan, being a landlocked country, imports POL products through road transport from its neighboring nations mainly Turkmenistan, Uzbekistan and Russia. It has 7 major land ports that facilitate import and storage of petroleum products of which Herat, Nimrooz and Andkhai form the major ones.

# Energy Trade Outlook and Upcoming Investments

## CASA 1000 PROJECT

The CASA 1000 project, supported by the World Bank, intends to set up an electricity transmission system between Kyrgyz Republic, Tajikistan, Afghanistan and Pakistan, spanning 477 km. The project is expected to come up in 2019 at an investment of \$1.16 billion. Power would be supplied through hydropower plants in Kyrgyzstan and Tajikistan with a 1300 MW AC-DC convertor station in Tajikistan and another 1300 MW DC-AC convertor station in Pakistan

## TAP-500 LINE

Turkmenistan, Afghanistan and Pakistan have entered into a tripartite agreement to set up TAP- 500 line (500 denoting 500 kV) with Turkmenistan expected to make available 3500 MW of excess power by 2020 to be transmitted through the line.

## TAPI GAS PIPELINE

The Turkmenistan, Afghanistan, Pakistan and India (TAPI) gas pipeline has begun construction and is expected to pump 33 billion cubic meters of natural gas from Turkmenistan's Galkynysh gas fields by 2022. The 1840 km pipeline will bring easy access of gas deprived nations (especially India) to gas rich Turkmenistan.

# Energy Trade Outlook and Upcoming Investments

|                           |                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| IRAN PAKISTAN PIPELINE    | The Iran-Pakistan gas pipeline is expected to come up in the next 2-3 years with Iran completing laying of the pipeline on its side of the project                                                                                                                                                                                                                                                        |
| COAL IMPORTS              | Coal will continue to be used in SAARC countries owing to low prices and easy availability. India, Bangladesh and Pakistan have significant coal deposits and domestic production will ramp up in the future. Coal based power plants will continue to grow in Bangladesh, Pakistan, India and Sri Lanka whereas rise in industrial usage will improve coal requirement in Afghanistan, Nepal and Bhutan. |
| NEW LNG AND POL TERMINALS | To facilitate additional POL imports, all SAARC nations have been investing heavily in building and augmenting terminals to unload imported crude and finished petroleum products.                                                                                                                                                                                                                        |

# Thank You