South Asian Regional Power Exchange (SARPEX) Mock Exercise

6th Project Steering Committee Meeting
8th and 9th, March, 2018

Mr. S.K. Ray,
Technical Specialist, SARI/EI, IRADe
Key Policy developments in Cross Border Trading

- Inter-Governmental Agreement between Bhutan and India on development of JV Hydropower Projects
- SAARC Inter-Governmental Framework Agreement (IGFA) on Energy Cooperation
- Power Trade Agreement (PTA) between India and Nepal
- Sub-Regional Cooperation between Bangladesh, Bhutan, India and Nepal (BBIN)
- Ministry of Power, India Guidelines on Cross Border Electricity Trade
- Center Electricity Regulatory Commission, India regulation on CBTE
- Center Electricity Regulatory Commission, India draft notification on CBTE

Dates:
- Apr, 2014
- Sep, 2014
- Nov, 2014
- Oct, 2015
- Nov, 2016
- Feb, 2017
- 2017
Objectives of SARPEX Mock Exercise

Objective:

• To ascertain the feasibility of the South Asian Regional Power Exchange (SARPEX) with Bangladesh, Bhutan, India and Nepal (BBIN) as the participants. (These are presently interconnected and other neighboring countries will be added as and when grid connectivity happens)

• To build capacity of concerned stakeholders in all participating nations

• To develop the draft set of Market Rules and Design
SARPEX- Mock Exercise activities

- Conceptualization of SARPEX
- Mode of Operation for SARPEX
- Draft Market Design and Rule
- Bidding Platform Creation
- Core team from BBIN and MAC
- Capacity Building and Bid Creation on PX platform
- Stakeholder Consultation & Draft Report Preparation
- Dissemination of results
- Countries implementation strategy

Completed activities

Ongoing Activities
1) Consumer Surplus. All the buyers whose bids were higher than MCP have been cleared. However they will get power at a price lesser than their bid price. Thus they get power at a price lesser than that they were willing to pay. This gain is called the consumer surplus and benefits all buyers on the curve OD.

2) Producer Surplus. All the sellers whose bids were lower than MCP have been cleared. However they will get power at a price higher than their bid price. Thus they get to sell their power at a price higher than that they were willing to accept. This gain is called the producer surplus and benefits all sellers on the curve OS.
Brief about SARPEX Mock Exercise

- The exercise covers the period from April’2015 to March’2016.
- 71 days were selected in this one year period to cover all kind of demand situation and various other crucial factors as per the approved Sampling methodology.
- The mock trading platform was run to generate results for all these 71 days.
- The mock trading platform was run in two modes of operation, “Unified mode” and “Sequential Mode” as explained further in this presentation.
- The market rules and design for running of the mock exercise were approved by the TF-3 members.
- The transmission losses and charges have been factored in as in case of a regular day ahead market.
- The result of the matching engine yielded the unconstrained solution.
- The result for the 71 days were extrapolated to get the result for the entire year for both the modes of operation.
- The consumer and producer surplus, quantum of power sold/bought, sale/buy price etc. for each participating Nations and the entire region were worked out in both the modes.
### Average Transmission Charges and Losses Figures for BBN used in the mock exercise

<table>
<thead>
<tr>
<th>#</th>
<th>Country</th>
<th>Transmission Charges (Rs/kWh)</th>
<th>Transmission Losses (%)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bangladesh</td>
<td>0.117</td>
<td>0.3%</td>
<td>The cross-border transmission network for India-Bangladesh has been included in the POC charges and transmission Withdrawal Charges and Losses are published for Bangladesh</td>
</tr>
<tr>
<td>2</td>
<td>Nepal</td>
<td>0.301</td>
<td>4.1%</td>
<td>The cross-border transmission network for India-Nepal has not been included in POC and therefore the transmission charges of Bihar and Cross-border line are assumed for Nepal</td>
</tr>
<tr>
<td></td>
<td>Bihar Withdrawal</td>
<td>0.257</td>
<td>1.6%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Muzzafarpur Dhalkebar Line</td>
<td>0.044</td>
<td>2.5%</td>
<td>The cross-border transmission network for India-Bhutan has been included in the POC charges and transmission Injection Charges are published by NLDC for Bhutan</td>
</tr>
<tr>
<td>3</td>
<td>Bhutan</td>
<td>0.089</td>
<td>1.1%</td>
<td></td>
</tr>
</tbody>
</table>

**Modified Buy Bid Price** = Bid Price – (Transmission Charges) / (1 - % Losses)

**Modified Sell Bid Price** = (Bid Price/ (1- % Losses)) + Transmission Charges

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The bids submitted by BBN were adjusted by the above transmission charges and losses to reflect the true cost of power purchased or sold on the Exchange
Key Assumptions - SARPEX Mock Exercise

- The mock exercise was based on unconstrained market clearing principles i.e. determination of MCP and MCV without taking into account the impact of transmission congestion. The maximum bids were restricted to 300 MW buy by Bangladesh, 350 MW buy by Nepal and 265 MW sell by Bhutan.

- The Transmission charges and losses as applicable under the current bilateral trade with BBN were assumed for the Mock Exercise as explained in the next slide. The grid operating charges and exchange transaction are not assumed in the Mock Exercise, since these charges are very small (~0.03 INR/kWh).

- The bids of Nepal and Bhutan were prepared and uploaded by the core team. The bids of Bangladesh were prepared by IRADe and KPMG based on the data submitted by them. The Indian were extracted as below.
The Two Modes of Operation for SARPEX

**UNIFIED MODE**

INDIA & BBN
- Sale Bids
- Purchase Bids

Simple Bid Matching

Unfulfilled Bids Elimination

No

Yes

Solution

Optimization Process

Final Unconstrained Solution

**SEQUENTIAL MODE**

INDIA-ONLY MARKET
- Sale Bids
- Purchase Bids

Simple Bid Matching

Unfulfilled Bids Elimination

No

Yes

Solution

Unconstrained Solution

Sequential Market

BBN

Un-cleared Bids from India

Yes

No

Solution

Optimization Process

Unconstrained Solution

BBN

Unfulfilled Bids Elimination

Yes

No
Web portal for SARPEX Mock Exercise Link

http://mocksarpex.eu.ai

Web Portal has, among other the following:-

- All documents related to SARPEX mock Exercise.
- Provision for submission of bids and viewing of results
- The access to the above is password protected. Rest of the sections are open to all.
- FAQ
- Various presentations related to SARPEX Mock Exercise
- Details of Stakeholder Consultations.
- Details of past and planned events
- Contact details.
- A link for submission of queries.
# Core Team Members

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name</th>
<th>Country</th>
<th>Designation</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mr. Mohammad Hossain,</td>
<td>Bangladesh</td>
<td>Director General</td>
<td>Power Cell</td>
</tr>
<tr>
<td>2</td>
<td>Mr. Shiekh Faezul Amin -</td>
<td>Bangladesh</td>
<td>JS (Dev)</td>
<td>Power Division</td>
</tr>
<tr>
<td>3</td>
<td>Mr. Golam Kibria</td>
<td>Bangladesh</td>
<td>Director IPP 1</td>
<td>Bangladesh Power Development Board (BPDB)</td>
</tr>
<tr>
<td>4</td>
<td>Md. Nuruzzaman</td>
<td>Bangladesh</td>
<td>SE (Plg)</td>
<td>Power Grid Corporation of Bangladesh (PGCB)</td>
</tr>
<tr>
<td>5</td>
<td>Mr. Karma Namgyel</td>
<td>Bhutan</td>
<td>Chief Engineer, DHPS</td>
<td>Ministry of Economic Affairs</td>
</tr>
<tr>
<td>6</td>
<td>Mr. Denkar</td>
<td>Bhutan</td>
<td>Engineer, DHPS</td>
<td>Ministry of Economic Affairs</td>
</tr>
<tr>
<td>7</td>
<td>Mr. Ugyen Chophel</td>
<td>Bhutan</td>
<td>Engineer, DHPS</td>
<td>Ministry of Economic Affairs</td>
</tr>
<tr>
<td>8</td>
<td>Mr. Nima Tshering</td>
<td>Bhutan</td>
<td>Bhutan Power System Operator (BPSO)</td>
<td>Bhutan Power Corporation (BPC)</td>
</tr>
<tr>
<td>9</td>
<td>Mr. Anil Rajbhandary</td>
<td>Nepal</td>
<td>Director</td>
<td>Nepal Electricity Authority (NEA)</td>
</tr>
<tr>
<td>10</td>
<td>Mr. Nutan Prakash Sharma</td>
<td>Nepal</td>
<td>Senior Divisional Engineer</td>
<td>Department of Electricity Development, NEA</td>
</tr>
<tr>
<td>11</td>
<td>Mr. Tej Krishna Shrestha</td>
<td>Nepal</td>
<td>Asst. Manager, Power Trade</td>
<td>NEA</td>
</tr>
<tr>
<td>12</td>
<td>Mr. Narendra Shrestha</td>
<td>Nepal</td>
<td>Assistant Manager</td>
<td>Load Dispatch Centre, NEA</td>
</tr>
</tbody>
</table>
Role Of Market Advisory Committee.

➢ Advice on the design of the pilot market.
➢ Advice on the draft set of market rules for the pilot market.
➢ Reviewing of the pilot market activities and give suggestion as and when required.
➢ To facilitate stakeholder consultation and advocacy of the Mock exercise in the respective Nation.
➢ To give guidance to the implementation team and the core team.

### Market Advisory Committee

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name</th>
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<th>Designation</th>
<th>Organization</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Mr. Anil Razdan</td>
<td>India</td>
<td>Ex- Secretary</td>
<td>Earlier from Ministry of Power</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gol</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Mr. Hans-Arild Bredesen</td>
<td>Norway</td>
<td>CEO</td>
<td>Nord Pool Consulting</td>
</tr>
<tr>
<td>3</td>
<td>Mr. Peter Jogersen</td>
<td>Denmark</td>
<td>Vice President</td>
<td>Energinet</td>
</tr>
<tr>
<td>4</td>
<td>Mr. Musara Beta</td>
<td>South Africa</td>
<td>Chief Market Analyst</td>
<td>South African Power Pool</td>
</tr>
</tbody>
</table>

### Mentors

<table>
<thead>
<tr>
<th>S.No</th>
<th>Name</th>
<th>Country</th>
<th>Designation</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dr. Kirit Parikh</td>
<td>India</td>
<td>Chairman</td>
<td>IRADe</td>
</tr>
<tr>
<td>2</td>
<td>Dr. Jyoti Parikh</td>
<td>India</td>
<td>Executive Director</td>
<td>IRADe</td>
</tr>
</tbody>
</table>
Consultations and Disseminations – India

- **Meeting with Joint Secretary, Deputy Secretary and others in Ministry Of Power in India on 26th Feb’2018**

- **Central Electricity Authority**: One-to-one meetings in Central Electricity Authority (CEA) with Principal Chief Engineer, Chief Engineer and Director etc. and with Member Power System who is the Designated Authority as per the MoP India Notification for Cross Border Electricity Trade.

- **POSOCO**: The SARPEX mock exercise stakeholder consultation was held at POSOCO. The same was attended by CEO POSOCO and other high level officers. Mr Soonee, earlier CEO POSOCO and current Advisor.

- **Central Electricity Regulatory Commission**: One-to-one meetings in Central Electricity Regulatory Commission (CERC) with Members and other senior officials of CERC. Submission to CERC draft notification were presented to CERC. The same are also available on CERC website.

- Meeting with other senior officials like MD& CEO of IEX and MD of TPTCL.
The Stakeholder Consultation on SARPEX Mock Exercise for covering various aspects of SARPEX exercise objective, mode of operations, power exchange operation and participation in the context of the SARPEX mock exercise was held on 11th and 12th April 2017.

Mr. Dinesh Kumar Ghimire, Joint Secretary, Ministry of Energy, Nepal delivered the key note address and mentioned about the Nepal’s long term plan for mitigating energy deficit.

Dr. Kirit Parikh, Chairman, IRADe has given special address and mentioned the SARPEX objective and relevance in the cross border electricity trade.

More than 30 participants from various organization has participated in the Workshop.

The one to one meeting has been conducted in Ministry of Energy, Nepal Electricity Authority (NEA) and Load Dispatch Centre etc. to discuss the concept of SARPEX and its relevance for Nepal.
The stakeholder consultation on SARPEX Mock Exercise for Bhutan Stakeholders covering various aspects of SARPEX exercise objective, mode of operations, power exchange operation and participation in the context of the SARPEX mock exercise was held on 29th-30th July 2017.

Keynote address has been delivered by Mr. Sonam P Wangdi Director General, DHPS, MoEA Bhutan and more than 20 participants from different organization has participated in the Workshop.

The one to one meeting has been conducted in the Ministry of Economic Affairs (MoEA) with Mr Dasho Yeshi Wangdi and others, Druk Green Power Corporation (DGPC), Bhutan Power Corporation (BPC), Druk Holding & Investment etc.
Bangladesh Stakeholder Consultation

• The stakeholder consultation on SARPEX Mock Exercise for Bangladesh Stakeholders covering various aspects of SARPEX exercise objective, mode of operations, power exchange operation and participation in the SARPEX mock exercise was held on 9th-10th August 2017.

• Keynote address has been delivered by Mr. Mohammad Hossain, Director General, Power Cell, Bangladesh

• More than 30 participants from different organization has participated in the Workshop.

• The one to one meeting has been conducted with the minister of power Mr Ahmad Kaikaus and other officials in the Ministry of Mineral and Energy Resource, Bangladesh Electricity Regulatory Commission, Bangladesh Power Development Board, Dhaka Power Distribution Company.
Sri-Lanka Stakeholder Consultation

• The stakeholder consultation on SARPEX Mock Exercise in Sri- Lanka covering various aspects of SARPEX exercise objective, mode of operations, power exchange operation and participation in the SARPEX mock exercise was held on 9th-10th January 2018.

• Keynote address has been delivered by Dr. B.M.C. Batagoda, Secretary to the Ministry of Power & Energy, Sri Lanka

• More than 30 participants from different organization has participated in the Workshop from Ministry of Power, Lanka Electricity Company, PUCSL etc.
Results for BBIN
## Total Yearly Surplus in the 3 Modes for FY’16

<table>
<thead>
<tr>
<th>Mode</th>
<th>Surplus (Rs Billion)</th>
<th>Additional Surplus Generated Over India Only Mode (Rs Billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>India Only</td>
<td>313.53</td>
<td></td>
</tr>
<tr>
<td>Unified</td>
<td>323.63</td>
<td>10.1</td>
</tr>
<tr>
<td>Sequential</td>
<td>323.24</td>
<td>9.71</td>
</tr>
</tbody>
</table>

The surplus in the two modes of Operation for SARPEX are practically the same on a Regional basis.

The difference is negligible given that the Mock Exercise only simulates the possible behavior of all bidders in the DAM on SARPEX through inputs that are accurate to a reasonable degree of accuracy.
## Total Market Clearing Volume in the 3 Modes for FY’16

<table>
<thead>
<tr>
<th>Mode</th>
<th>Total Yearly Market Clearing Volume (in MUs)</th>
<th>Incremental Volume India-Only Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>India-Only</td>
<td>36219</td>
<td>-</td>
</tr>
<tr>
<td>Unified</td>
<td>38137</td>
<td>1918</td>
</tr>
<tr>
<td>Sequential</td>
<td>38769</td>
<td>2550</td>
</tr>
</tbody>
</table>

The figures for Unified and Sequential Mode include the existing DAM operations in India, referred as India-Only Mode.

The additional volume over India only mode gives the **volume of the Cross Border DAM** which is 1997 Mus in case of Unified mode and 2549 Mus in case of sequential mode. **Roughly 6-7 Mus per day (Unconstrained Volume)**
Weighted Average Market Clearing Price in the 3 Modes for FY’16

<table>
<thead>
<tr>
<th>Mode</th>
<th>Monthly Weighted Average Market Clearing Price (in Rs/MWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>India-Only</td>
<td>2745</td>
</tr>
<tr>
<td>Unified</td>
<td>2910</td>
</tr>
<tr>
<td>Sequential</td>
<td>3269</td>
</tr>
</tbody>
</table>

The market clearing volume for the respective mode is used as weight for computing the above figures.
Surplus accrued to each nation (including the surplus of Indian DAM) for FY’16 Billion INR

<table>
<thead>
<tr>
<th></th>
<th>Regional Surplus</th>
<th>Surplus Gain to Bangladesh</th>
<th>Surplus Gain to Nepal</th>
<th>Surplus Gain to Bhutan</th>
<th>Surplus Gain to India</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unified</td>
<td>323.63</td>
<td>8.85</td>
<td>0.7</td>
<td>0.3</td>
<td>313.78</td>
</tr>
<tr>
<td>Sequential</td>
<td>323.24</td>
<td>8.23</td>
<td>0.63</td>
<td>0.42</td>
<td>313.96</td>
</tr>
</tbody>
</table>

The Surplus of India – only market is 313.53 Billion which is included in the above for the Region and the India.
Additional Surplus accrued to each nation on SARPEX (over the surplus of Indian DAM) for FY’16 in Billion INR

<table>
<thead>
<tr>
<th></th>
<th>Regional Surplus</th>
<th>Surplus Gain to Bangladesh</th>
<th>Surplus Gain to Nepal</th>
<th>Surplus Gain to Bhutan</th>
<th>Surplus Gain to India</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unified</td>
<td>10.1</td>
<td>8.85 (87.6%)</td>
<td>0.7 (6.93%)</td>
<td>0.3 (2.97%)</td>
<td>0.25 (2.48%)</td>
</tr>
<tr>
<td>Sequential</td>
<td>9.71</td>
<td>8.23 (81.4%)</td>
<td>0.63 (6.24%)</td>
<td>0.42 (4.16%)</td>
<td>0.43 (4.26%)</td>
</tr>
</tbody>
</table>

Bangladesh gained the highest Consumer Surplus of INR 8.85 Billion and INR 8.23 Billion in Unified and Sequential Mode respectively since the cost of electricity displaced by Exchange was highest at INR 10,000/MWh. This is much higher than those in the other Nations.
<table>
<thead>
<tr>
<th></th>
<th>India</th>
<th>Bangladesh</th>
<th>Nepal</th>
<th>Bhutan</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>India-Only</strong></td>
<td>36219</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>36219</td>
</tr>
<tr>
<td><strong>Unified</strong></td>
<td>35406</td>
<td>2011</td>
<td>719</td>
<td>0.09</td>
<td>38136</td>
</tr>
<tr>
<td>(Increase/</td>
<td>(-812*)</td>
<td></td>
<td></td>
<td></td>
<td>(1997*)</td>
</tr>
<tr>
<td>Decrease*)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sequential</strong></td>
<td>36219</td>
<td>1920</td>
<td>630</td>
<td>0.04</td>
<td>38769</td>
</tr>
<tr>
<td>(Increase/</td>
<td>(0*)</td>
<td></td>
<td></td>
<td></td>
<td>(2550*)</td>
</tr>
<tr>
<td>Decrease*)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The volume bought by India actually reduces in the Unified mode. This is because the bids from Bangladesh and Nepal displace the bids of low cost Indian buyers.

*The figures for Unified and Sequential Mode including the existing DAM operations in India.

* The figure in the bracket represents the change in purchase volume over India-Only Mode.
### Volumes sold by each nation on SARPEX for FY’16 (UCV)

**In MUs**

<table>
<thead>
<tr>
<th></th>
<th>India</th>
<th>Bangladesh</th>
<th>Nepal</th>
<th>Bhutan</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>India-Only</strong></td>
<td>36219</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>36219</td>
</tr>
<tr>
<td><strong>Unified</strong></td>
<td>37715 (1496*)</td>
<td>-</td>
<td>10</td>
<td>412</td>
<td>38137</td>
</tr>
<tr>
<td><strong>Sequential</strong></td>
<td>38342 (2123*)</td>
<td>-</td>
<td>10</td>
<td>427</td>
<td>38779</td>
</tr>
</tbody>
</table>

The figures for Unified and Sequential Mode include the existing DAM operations in India.

*The figure in the bracket represents the change in purchase volume over India-Only Mode.*

The volume sold by India is higher in Sequential mode by about 50%. This is because the bids from Bangladesh and Nepal DO NOT displace the bids of low cost Indian buyers as was the case in Unified mode.

*The figures for Unified and Sequential Mode include the existing DAM operations in India.*
Annual Weighted Average Buy Price for each nation on SARPEX for FY’16 UMP

<table>
<thead>
<tr>
<th></th>
<th>India</th>
<th>Bangladesh</th>
<th>Nepal</th>
<th>Bhutan</th>
</tr>
</thead>
<tbody>
<tr>
<td>India-Only</td>
<td>2745</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Unified</td>
<td>2919</td>
<td>2938</td>
<td>2893</td>
<td>3751*</td>
</tr>
<tr>
<td>Sequential</td>
<td>2745</td>
<td>3099</td>
<td>2881</td>
<td>3438*</td>
</tr>
</tbody>
</table>

* The prices represent the Unconstrained MCP, weights have been computed using the cleared buy volume of each nation

* Bhutan is predominantly seller on the Exchange
## Annual Weighted Average Sell Price for each nation

<table>
<thead>
<tr>
<th></th>
<th>India</th>
<th>Bangladesh</th>
<th>Nepal</th>
<th>Bhutan</th>
</tr>
</thead>
<tbody>
<tr>
<td>India-Only</td>
<td>2745</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Unified</td>
<td>2918</td>
<td>-</td>
<td>2000</td>
<td>2983</td>
</tr>
<tr>
<td>Sequential</td>
<td>2965</td>
<td>-</td>
<td>3000</td>
<td>3339</td>
</tr>
</tbody>
</table>

*The prices in the sequential mode represent the weighted average price accrued to sellers from the sale of power in the residual market.*

*Nepal is predominantly a buyer in the Exchange.*
## Total Cost incurred by buyers from each nation in FY’16

<table>
<thead>
<tr>
<th></th>
<th>India</th>
<th>Bangladesh</th>
<th>Nepal</th>
<th>Bhutan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>India-Only</strong></td>
<td>99.4</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Unified</strong></td>
<td>103.32</td>
<td>5.90</td>
<td>2.08</td>
<td>0.0003</td>
</tr>
<tr>
<td><strong>Sequential</strong></td>
<td>99.4</td>
<td>5.95</td>
<td>1.81</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

The figures for Unified and Sequential Mode include the existing DAM operations in India.
Total Revenue earned by sellers from each nation in FY’16

<table>
<thead>
<tr>
<th></th>
<th>India</th>
<th>Bangladesh</th>
<th>Nepal</th>
<th>Bhutan</th>
</tr>
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<tbody>
<tr>
<td>India-Only</td>
<td>99.4</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Unified</td>
<td>110.05</td>
<td>-</td>
<td>0.02</td>
<td>1.22</td>
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<tr>
<td>Sequential</td>
<td>105.71</td>
<td>-</td>
<td>0.03</td>
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</table>

*The figures for Sequential Mode include the revenue from the sale of power in domestic (India Only) and residual market (BBN)*
Purchase Bids for Bangladesh for a typical day in each month

- **Price (Rs/MWh)**
- **Quantity (MWh)**
Purchase Bids for Nepal for a typical day in each month

- **Price (Rs/MWh)**
- **Quantity (MWh)**
Sell Bids for Bhutan for a typical day in each month

- Price (Rs/MWh)
- Quantity (MWh)
Key Takeaways from SARPEX Mock Exercise For SAR

❖ All nations gain significantly from the trade in the DAM on SARPEX. The difference in the regional surplus between the two modes is insignificant in comparison to the gain accrued to each nation. Thus, the two modes of Operation for SARPEX are practically the same especially considering that the Mock Exercise “simulates” the possible behavior of all bidders in the DAM on SARPEX through inputs (bids) that can be estimated or extracted with a reasonable degree of accuracy only. Slide – 19, 22 and 23.

❖ The total surplus generated by the Regional Market id about INR 10 Billion (Rs 100 Crs) which is significant. Slide – 19

❖ Clearly, the DAM on a regional exchange is desirable and improves the socio-economic welfare of all participating nations.

❖ The sequential market provides for a level playing field for all nation with each having the right to use their own cheaper power first and also the right to use their own national assets like transmission lines for their domestic market first

❖ The Surplus Gain in a year to BBIN is far higher than the YTC of the transmission line indicating that relatively small investments in transmission lines may yield surprisingly huge dividends in terms of increased economic gains and social welfare. Thus, there is also a clear case for having more Cross Border Interconnections. There of enough power available for trading and in whatever manner these trades takes place, transmission lines are required.
**Important Links**

- **SARPEX Web Portal** [http://mocksarpex.eu.ai](http://mocksarpex.eu.ai)

- **SARPEX Road- Map** [https://sari-energy.org/publications-list/sarpex-road-map/](https://sari-energy.org/publications-list/sarpex-road-map/)


- **CEA Draft Conduct of Business Rules** - Comments invited from all stakeholders of power sector & general public by 31st December 2017. [http://www.cea.nic.in/cbte_pspa2.html](http://www.cea.nic.in/cbte_pspa2.html)


- **IRADe’s comment on CERC draft regulation submitted to CERC.** [http://www.cercind.gov.in/2017/draft_reg/CB/IRADe.pdf](http://www.cercind.gov.in/2017/draft_reg/CB/IRADe.pdf)

- **IRADe’s Supplementary Submission on CERC draft regulation** [http://www.cercind.gov.in/2017/draft_reg/CB/IRADe_ss.pdf](http://www.cercind.gov.in/2017/draft_reg/CB/IRADe_ss.pdf)
THANK YOU

For more details please contact:-
1) S. K. Ray Technical Specialist, IRADE skray@irade.org ,+91 9971792136/ 9892306485
Annexure
SARPEX  Web Portal and its Applications
SARPEX Web Portal - Home Page

SARPEX : MOCK EXERCISE - ABOUT

ABOUT SARPEX : MOCK EXERCISE

THE CONCEPT  ABOUT US  MEET THE PEOPLE

SARPEX CONCEPT

The proposed South Asian Regional Power Exchange (SARPEX) aims to provide the following benefits:
- Cross Border Electricity Trade (CBET) that maximizes the social welfare and efficiency through market determined prices.
- Deficit/Surplus power can be bought/sold on a real time basis to optimise resource allocation.

Further the Ministry of Power (MoP), India recently launched its cross-border power trade guidelines allowing South Asian Countries (SAC) to participate on the Indian Power Exchanges for Term Ahead and Intra Day Contracts/Contingency contracts subject to certain conditions. This makes the concept of SARPEX much more of a reality.
Users can upload their bids by clicking here and choosing the excel file containing bids.

Users can choose a date for which they are uploading the bids.

Submit Bids Here!
Step 1: Choose Date, Month and Year you want to submit the bid file for.
Step 2: Upload the bids file in xlsx format.
Step 3: Confirm the bids submission and wait for success message.

Select date:
Select month:
Select year:

* Please ensure that data is entered properly in the excel template before submission!
Users can choose a date and see results for the corresponding date.

Results are shown for unified and Sequential Mode.
SARPEX Web Portal – Contact Administrator Page