USAID FROM THE AMERICAN PEOPLE

SARI/EI

IRADe Integrated Research and Action for Development

SOUTH ASIA REGIONAL INITIATIVE FOR ENERGY INTEGRATION (SARI/EI)

Session Background:

Capacity Building Program on South Asian Regional Power Exchange (SARPEX) Mock Exercise

7th -9th February 2017

New Delhi, India

Prepared By:

SARI/EI Project Secretariat, IRADe
Mr. S.K. Ray, Technical Specialist
Mr. Gaurav Jain, Senior Research Analyst

Consultant: KPMG
Mr. Puneet chitkara, Executive Director
Mr. Yasir Altaf, Associate Director
Ms. Suruchi Sawhney, Consultant

Contents

Session-0: Why SARPEX and it's Background

The development of a Day Ahead Spot Market (DAM) Exchange is crucial for enhancing the cross border electricity trading potential in the South Asian region particularly in the neighboring countries of Bangladesh, Bhutan, India and Nepal (BBIN). The matter has gained prominence recently with multiple stakeholders across the borders advocating the extension of the Indian Power Exchanges into their respective countries.

Tata Power Trading Company, for instance, filed a petition with the Central Electricity Regulatory Committee (CERC) in March 2015 requesting permission and access to trade power from its Dagachu Hydro Power Plant in Bhutan, on the India Energy Exchange (IEX). Similarly, having successfully concluded the medium-term PPAs of 500MW with NTPC and PTC respectively. Bangladesh has taken interest in the prospect of power purchases through Indian Exchanges by utilizing the residual capacity in its existing transmission links with India.

There are immense opportunities for import and export of power in the region. The potential arise primarily due to the prevailing demand supply scenario and the resource and demand complementarities within the region. Key drivers for cross-border trade are the capacity & consensus building programs of USAID-SARI-E, grants & loans for transmission development by ADB, regional initiatives for trade & commerce through SAARC and the consequential inter-governmental agreements. Further, the confidence gained through successful history of commercial operation of inter-governmental MoUs between India-Nepal, India-Bhutan & India-Bangladesh are meant to boost the prospects of regional trade.

One of the major limitations of the Long Term PPAs (Power Purchase Agreements) under Cross Border Trade is that the volumes under PPAs have already reached a critical mass. At this juncture, it may thus be very critical to move beyond the bilateral agreements and initiate trading through cross-border Exchanges. At present, the non-existence of a regional DAM is the key missing element for achieving efficient use of the network infrastructure and maximizing the social welfare of the individual power markets in BBIN.

The implementation of South Asian Power Exchange (SARPEX) has been delayed on account of multiple factors. Some of the perceived challenges in this regard include provisions regarding the institutional, legal, policy, market and regulatory framework essential for a Regional Spot Market development, apprehensions about price increase in the Indian Spot Market, impact on Transmission

Charges & losses in India due to cross-border power flows and Agreement on redistribution of benefits or losses accrued by the various participants –"Consumer & Producer *Surplus"*.

Robust market structures and mechanisms requisite for a DAM are already existing in India since last several years through a strong legislative and policy support. The Power Exchange for South Asian (SARPEX) thus need not be designed from ground. The market design and rules can be built upon from the existing available structures and regulatory frameworks while addressing the uniqueness, diversities and characteristics of individual countries.

Session-1: Power Sector Overview of South Asian Countries

The four markets currently under study for the purpose of SARPEX are Bangladesh, Bhutan, India and Nepal (BBIN). Bangladesh, Bhutan and Nepal (BBN) are more or less at similar stage of development in terms of legal, regulatory and infrastructural framework when compared with India. However, significant developments are underway to make way for an effective Power Exchange. This will facilitate grid stability to all regions concerned and foster economic development by providing an avenue to assure power supply and efficient resource allocation. Each country varies in terms of market development with regard to electricity laws, policies and regulations. Some key features of the power market structure in each country have been highlighted in the below section.

Bangladesh:

Bangladesh's power sector is governed by the Power Division of the Ministry of Power, Energy & Mineral Resources (MPEMR) and regulated by the Bangladesh Electricity Regulatory Commission (BERC). The legal and regulatory landscape is defined by the Electricity Act 1910 (amended in 2012), BERC Act, 2003 (amended in 2005), BERC Licensing Regulations, 2006 (amended in 2011) and the Electricity Grid Code, 2012. The sector currently doesn't have enabling regulations and provisions for Open Access (OA), which restricts participation and cross border electricity trade.

The major generators include Bangladesh Power Development Board (BPDB) and Independent Power Producers (IPPs) among others. The Power Grid Company of Bangladesh (PGCB) is responsible for transmission while distribution is under Bangladesh Power Development Board (BPDB), Dhaka Power Distribution Company (DPDC), Dhaka Electric Supply Company Ltd (DESCO), West Zone Power Distribution Company (WZPDC), Rural Electrification Board (REB) through Rural Co-operatives.

The country has an installed power capacity of ~12,000MW and dominated by gas. Bangladesh is a net importer of electricity and a large portion of its imports come from India by way of bilateral contracts. Shortage and unreliable power supply has constrained the economic growth of the country.

Bhutan:

Bhutan's Power Sector regulatory framework constitutes of the Electricity Act 2001, Grid Code Regulations 2008 and the Tariff Determination Regulation, 2007. Bhutan underwent a major

restructuring, in 2002, to separate the commercial management and ownership from the government. Since these reforms, the policy-making body on energy has been the Ministry of Economic Affairs, which includes the Department of Hydropower and Power Systems (DHPS) and Renewable Energy and Hydromet Services (REHS). The state-owned Bhutan Power Corporation (BPC) is responsible for bulk electricity transmission and distribution, while the Druk Green Power Corporation (DGPC) is in charge of generation. Bhutan Electricity Authority (BEA), as the power sector regulator, is responsible for tariff setting; technical, safety, maintaining operational standards; issuing licenses and monitoring other regulatory functions.

The country's power sector is hydro-dominated and is a leading exporter of Hydro Electricity. With a small power system of 1614 MW, Bhutan exports power to India vide bilateral agreements.

India:

With a production of 1,031 TWh, India is the third largest producer and fourth largest consumer of electricity in the world. It has fifth largest installed capacity (310 GW) in the world.

The Indian Power sector has witnessed an unprecedented growth and change in the last decade due to the enactment of Electricity Act, 2003 which promotes the concept of competitive power markets while enhancing the efficiency, economy and mobilization. The open access regulations at both inter-state and intra-state level allow for greater participation from the private and state owned generators as well as industrial consumers. While long-term power markets have historically dominated this sector, its inadequacies have led to the short-term market formation. The National Electricity Policy, 2005 envisions that 15% of power from new capacities to be contracted outside long term PPAs. It is expected that players in the electricity market will transact substantial part of power through market mechanisms.

The existing power market structure and regulation seek to facilitate power transfer from a region with surplus supply to one with a deficit both with a view of promoting efficient resource allocation and social welfare. However, the legal and regulatory framework will need to be amended to include cross-border electricity trade as a licensed activity and facilitate open access, power trading and competitive markets regulation for cross-border transactions.

Further, the government targets capacity addition of around 100 GW under the 13th Five-Year Plan (2017–22). The government is keen on promotion of hydro, renewable and gas-based projects, as well as adoption of clean coal technology. The installed capacity of renewable power reached 85 GW as on March 2016. Also, the target for renewable energy has been increased to 175 GW by 2022.

Nepal:

The Nepal Electricity Authority (NEA), a wholly government owned corporation, dominates the power sector in Nepal. It is responsible for most of its electricity generation, dispatch, transmission, distribution, and retailing. The Hydropower Development Policy 1921 and the Electricity Act 1992 has enabled private participation. Twenty three IPPs contribute 174MW of generation capacity. Six large hydro plants, aggregating to 1,335MW are either in advanced planning stages or under construction. Nepal's electricity trade is governed by the Electricity Act 2049 (1992) and the Electricity Rule 2050. However, the country's legal and regulatory framework will also need to be amended to facilitate cross-border power trade.

The country's installed hydro capacity is roughly 787MW, which is less than half of its demand. Owing to growing demand and unreliable power supply, Nepal currently imports Electricity from India. However the country has potential to eventually export hydroelectricity as well. The framework for cross-border trading in BBIN has been in place for over a decade now due to earlier inter-governmental agreements or understanding. However, the agreements are bilateral and mutually agreed by the countries in their sovereign capacities. Unlike in bilateral trades, with Exchanges, it is not possible to mutually agree or negotiate the terms and conditions. Hence, enabling provisions and framework need to be designed to implement cross-border DAM on SARPEX.

Session-2: Cross Border Electricity Trade

One of the recent developments envisaging the need for cross-border electricity cooperation is that the Ministry of Power, Government of India, in consultation with Ministry of External Affairs has issued the "Guidelines on Cross Border Trade of Electricity". The objectives of these guidelines are the following:

a) Facilitate cross border trade of electricity between India and neighboring countries;
b) Promote transparency, consistency and predictability in regulatory approaches across jurisdictions and minimise perceptions of regulatory risks;
c) Meet the demand of the participating countries by utilising the available resources in the region;
d) Reliable grid operation and transmission of electricity across the borders;
e) Evolve a dynamic and robust electricity infrastructure for cross border transactions.

According to these guidelines, the Ministry of Power, Government of India shall designate an Authority (Designated Authority) for facilitating the process of approval and laying down the procedure for cross border transaction and trade in electricity. For the purpose of any trade on the Indian Power Exchange(s), any Participating entity, with approval from the Designated Authority after complying with the relevant regulations of CERC, shall be eligible for cross border trade of electricity through Indian Power Exchanges under the categories of Term Ahead Contracts, Intra Day Contracts/ Contingency Contracts as defined in the PMR. 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.

Though the bilateral contracts under CBET are already taking place among the BBIN nations, the recent MOP guidelines presents opportunities for initiating the trading through the India Power exchange(s). This is essentially because the bilateral approach is cumbersome when used for balancing the day-to-day variations in demand. Bilateral contracts are flexible, in that they can be customized to the requirements of the trading parties as opposed to standardized products. However, their flexibility comes at a price since negotiating and writing contracts is time consuming and expensive.

Currently, bilateral contracting is predominantly existent in the form of long, medium and short-term PPAs. However, bilateral trading arrangements also have their limitations as listed below:

- Ineffective in balancing the day-to-day variations in demand since do allow for real-time demand and supply changes.
- While flexible, since it can be customized to specific trading arrangements, it is an expensive process since it involves negotiating and writing contracts.
- It doesn't explicitly coordinate all concerned markets i.e. reserve market, ancillary market etc.
- Price determination isn't market driven and the buyer is usually the price taker.

Power exchanges offer a fair, transparent and neutral platform resulting in the discovery of efficient price of electricity. The prices have not only brought up the "time of delivery" aspect (peak, day and night hours) but also the "locational" component of electricity.

Session-3: Introduction to Power Exchanges

Power Exchanges are typically considered the marketplaces where a third party (the exchange) facilitates power trade between buyer and sellers. The exchanges are governed by their own rules (approved by the regulator) and guarantee payment or delivery. Some of the well-known Exchanges in other parts of the World include Nord Pool, APX, EEX etc. Exchanges typically pre-dominate electricity trading in developed nations such as Europe, UK and USA.

Trading on an Exchange is voluntary; however participants choose the quantity of energy they wish to trade on an Exchange. Also, an Exchange doesn't collect large amounts of data on generators and computes an optimal dispatch but it tend to allow generators to signal these parameters indirectly through the energy prices they bid.

Typically, Exchanges in coordination with the system operator (SO) integrate the energy, transmission, and ancillary services markets. Based on submitted bids and operating constraints, the entire system is optimized day-ahead and/or hour ahead to determine tentative schedules that include specific dispatch instructions regarding unit commitments and ramping, and then again in real-time on a continuing basis.

Indian Power System is a highly meshed network and power flows between the areas may result in loop flows. The transfer capability between areas is strongly interdependent and transfer capabilities cannot be considered in isolation between any two areas. A hierarchical model with National, Regional and State Load Despatch Centres is mandated for System Operation. This has facilitated the implementation of pan-India National level Power Exchanges and India progressed fast in the development of Electricity Market in a short span of four years - from an almost no organized market situation prior to 2004 to implementation of Indian Power Exchange (IEX) in 2008, and eventually multiple Power exchanges with inception of Power Exchange India Limited (PXIL).

Some of the key features of Indian Exchanges include:

- Transparent, neutral and efficient electronic platform for trading of power
- Simultaneous power trading and transmission clearance
- Voluntary Participation where it is the decision of the market participant to choose the market place for buying or selling electricity

- Anonymous trading where both the sellers and the buyers place bids on the electronic platform independent of each other and no negotiation is involved in the process and the identity of the player (buyer or seller) is not known to the other participants

- Double Sided auction, in which both the buyers and the sellers place bids and offers simultaneously during the bidding session

- Price Discovery through Social Welfare Maximization. According to this principle, the algorithm of price discovery ensures that the welfare of all the market participants is maximized simultaneously. In other words, neither the buyer nor the seller receives any preferential treatment over the other

- Uniform Pricing Rule i.e. the Power Exchange declares a single price called the Market Clearing Price (MCP) or Area Clearing Price (ACP) in a market.

Lastly, the contracts traded on the Indian Power Exchanges are standardized contracts, terms and conditions of which are well known upfront to all the market players, thus reducing the transaction costs. These Products include Day Ahead, Day Ahead Contingency, Any Day, Intra Day and Weekly Contracts. The Indian Power Exchanges are also assisting in accelerating deployment of renewable energy by enabling transactions in Renewable Energy Certificates (REC).

Session-4: Key Processes in Power Exchange

SARPEX, like other exchanges around the world, need to be governed by a certain set of rules and laws to govern the organization and its processes. These laws and rules are meant to facilitate the trading process on the exchange in a streamlined manner and to avert any disruptions. These rules and laws are formulated keeping in mind the benefit of all stakeholders involved and are decided upon by the mutual consent of all stakeholders viz.: Electricity Markets Regulator, Market Participants, Exchange Management and all others associated with the Exchange and are binding on the behalf of all the aforementioned stakeholders.

This section deals with the basic framework of Laws and Business Rules for SARPEX, whose purpose is to manage the Exchange, monitor and regulate the activities of its members and stakeholders and all other members associated with the Exchange in any form. The following laws and rules are imperative to the Exchange's governance:

- Bidding Platform: The Bidding Platform is a trading system consisting of three major elements which work in tandem for execution of trading sessions on the Exchange. The three major features – User, Workstation and Connectivity are discussed in relation to operating guidelines and the rules that govern participation on the Exchange

- Membership: "Membership of the Exchange" entitles the Members holding the "Membership" to trade and clear electricity on the Exchange, by the means of sale or purchase, on their behalf as well as for their clients who are non-members, subject to the kind of Membership held. Membership is discussed in terms of qualification requisites, membership types, fees and documentation

- Settlement Guarantee Fund: With a view of minimizing the Exchange's exposure to default risk, a Settlement Guarantee Fund (SGF) is formed. The sole purpose of this Fund is to cater to payment risk management across all the Exchange's segments

- Clearing and Settlement: The Clearing and Settlement process is meant to settle the financial obligations of the Members. It is a very robust process involving a number of elements working in tandem to execute the process which is entirely done electronically

- Margins and Deposits: The Exchange's participants make deposits for various purposes which are binding. The types of deposits are discussed below: 1) Initial Security Deposit – The initial deposit paid by the Member or its Client to participate on the exchange. 2) Additional

Security Deposit – The Exchange will compute the minimum margin each bidder needs to hold in his/her settlement account before placing a bid. This margin is computed on a daily basis and is contingent on the size of the bid and decided on by the Exchange i.e. the margin can be set at par, on average or above the bid value. 3) Special Margin – Any enhanced risk may prompt the Exchange to levy additional margins to cover the risk exposure

This session also discusses the operating timelines of an Exchange, Bidding and clearing activities. The timelines for each operational activity in a DAM of an Exchange is specified in a chronological sequence. This is critical for a seamless information exchange and coordination between the various players involved in an Exchange.

Other key processes related to buying/selling on the Exchange include:

- Scheduling: The procedures for open access for the exchange(s) are laid down by CERC Open Access Regulations under Collective Transactions. Collective Transaction means a set of transactions discovered in power exchange through anonymous, simultaneous competitive bidding by buyers and sellers. As per the current procedures followed in India, when a State utility or an intra-State entity proposes to participate in trading through a power exchange, it shall obtain a “no objection” or a prior standing clearance from the State Load Dispatch Centre in such form as may be prescribed in the detailed procedure, specifying the MW up to which the entity may submit a buy or sell bid in a power exchange. In case the infrastructure required for energy metering and time block wise accounting already exists, and required transmission capacity in the State network is available, the State Load Dispatch Centre shall accord its concurrence or ‘no objection’ or standing clearance, as the case may be, within three working days of receipt of the application. In case SLDC decides not to give concurrence or “no objection” or standing clearance as the case may be, the same is communicated to the applicant in writing, giving the reason for refusal within the above stipulated period of 3 days

- Transmission Corridor Allocation: the entities embedded in the CTU Network do not need any clearance from respective Regional Load Despatch Centres (RLDCs) while submitting the application to the exchange. This is because any congestion in the CTU Network on account of transactions on the exchange is handled by the system operator, also known as National Load Despatch Centre (NLDC). The details for Scheduling request for Collective Transaction is submitted by exchange (s) to the NLDC. The NLDC shall then inform the exchange(s) about the period of congestion and the available limit for scheduling of Collective Transaction

after taking the clearance from respective RLDCs. In the end, the final (constrained) market clearing prices are determined by the Exchange(s)

These constrained volumes are determined through a phenomenon called “Market Splitting”. It is a mechanism adopted by most of the Exchange(s) in which the market is split in the event of transmission congestion, into predetermined (by system operator) bid areas or zones. These bid areas are cleared individually at their respective area prices based upon the demand and supply in individual bid areas and using the available transmission corridor capacity between them

- Treatment of Transmission Charges and Losses: In India, CERC has released Sharing of Inter-State Transmission Charges and Losses Regulations, 2010 for determining the transmission charges and losses for all the generating/demand entities of the country. Under these regulations, based on the Yearly Transmission Charges of ISTS Transmission Licensees and transmission losses in the ISTS network, the Point of Connection charges and Loss Allocation Factors are computed for all DICs: (a) Using load-flow based methods; and (b) based on the Point of Connection charging method

- Deviation Settlement Mechanism: In India, CERC has released Deviation Settlement Mechanism and related matters Regulations, 2014 for determining Unscheduled Interchange (UI) charges. These regulations are applicable to sellers and buyers involved in the transactions facilitated through short-term open access or medium-term open access or long-term access in inter-State transmission of electricity

Session-5: Market Design and Rules for SARPEX

A key aspect of a good market design is to address market limitations or failures, making the choice of design contingent on the market constraints which tend to prevail on both the demand and supply side. Power Exchanges use the Market Clearing mechanism to determine an efficient price and volume to clear the market. This mechanism uses an algorithm that aggregates bids and arrives at a Market Clearing Price (MCP) and Market Clearing Volume (MCV).

India's prior experience in establishing Power Exchanges and comparatively robust power trade regulations make it an ideal location for SARPEX. Further the market clearing in the DAM of SARPEX is proposed to be structured in a manner that there is a minimal impact on Social Welfare Maximization and its distribution between the consumers and producers. Thus, while conforming to the other design objectives of SARPEX, the following two modes of market clearing are evaluated:

1) Unified Mode: In this case, the bids from both the Indian participants and BBN would be cleared simultaneously on the Exchange. In other words, BBN will have a single Unconstrained Market Clearing Price for both India and BBN. In doing so, the key features of the DAM as prevalent in the Indian Exchanges today would remain unaltered for Indian entities. But, the frameworks will need to be developed for integrating BBN and India.

2) Residual Mode: In this case, the bids from the Indian participants and BBN countries will be cleared in a sequential manner. The Indian domestic exchange will be influenced in limited manner due to other participating countries.

Though, the final option that may be adopted will be decided jointly by the countries themselves. Nevertheless, a rigorous analysis backed by market simulations will be undertaken to recommend the most appropriate mode of market clearing. The other aspects concerning the market architecture and auction design etc. for SARPEX are summarised in the Table below:

Design Aspect	Options			
Market Type	Energy	Transmission	Unit	PJM
	☑			
	Ascending	Descending	First Price	Second Price/Vickery

Auction Type			☑	
Bidding Format	Single-sided	Double-sided	Sealed	Open
		☑	☑	
Market Clearing Algorithm	Step-wise approach	Piece-wise approach		
	☑			
Pricing Rules			Uniform	Pay as Bid
			☑	
Matching Rules	Step-wise approach	Piece-wise approach		
	☑			
Settlement Systems	Single	Multi		
		☑		

Session-6: Proposed features of SARPEX

In view of enabling day-ahead cross-border electricity trade on a power exchange, there is a need to specify market design and rules from an operational perspective. The purpose of this session is to provide a functional description of the key processes such as scheduling, deviation settlement, payment of transmission charges and losses etc. in accordance to the procedural rules of the electricity markets for BBIN. Currently, the electricity markets in these countries are organised differently in various jurisdictions, and hence these rules tend to differ markedly. Further, because of the lack of storability of electricity, the procedures and regulations governing a cross-border power exchange could become fairly complex. Thus, the objective is to propose a market design for SARPEX that causes minimum disruptions to the independent electricity markets of all the Member Countries and the existing bilateral agreements between them. In this regard, the following features have been proposed:

- Formation of Separate Bid Areas: Separate bid-areas may be formed for Nepal, Bhutan and Bangladesh, in addition to the existing bid areas for India

- Transmission Capacity Allocation: In the current context, the highest priority is accorded to the Long Term PPAs, followed by Medium Term and Short Term bilateral contracts in BBIN. In case of India, where the power exchange(s) are currently operational, the residual transmission capacity is allocated to the Day-ahead Market on the exchange, after accounting for all the above mentioned transactions. In the interim arrangement where any deviation from the current procedures might be time-consuming, it is proposed that existing respective mechanism for allocation of transmission corridor in country shall be made applicable for the Day-ahead transactions on SARPEX.

- Scheduling: With intent to cause least disruption to the existing trade mechanisms between BBIN, it is proposed that delivery points as defined under the bilateral agreements shall remain same for the Day-ahead trade on SARPEX. In other words, all ‘buy’ and ‘sell’ bids cleared on SARPEX will be scheduled at the International Periphery. Also, it shall be the responsibility of the nodal agency to furnish the schedule of drawl and injection to the concerned authorities on both the sides of International Periphery on day-ahead basis. Further, the cases where there are multiple interconnections between the Member Countries, the nodal agency shall be scheduled separately at each interconnection.

- Deviation Settlement: The existing mechanisms, if any, of deviation settlement for all the countries s shall be applicable for SARPEX and be paid by the nodal agency, to the respective authorities, on behalf of all market participants. Further, it shall be the responsibility of the nodal agency to furnish the actual injection of each participant to the concerned authorities on both the sides of International Periphery on weekly basis, along with the actual ex-bus generation/drawl by each participant.

- Treatment of Transmission Charges and Losses: The settlement of transmission charges and losses shall be done in accordance with the existing regulations applicable in BBIN. The payments of the transmission charges and losses shall be made through the nodal agency to the concerned authorities on both the sides of the International Periphery

Session-7: Bidding Strategy for Day-Ahead Market- Key Considerations for Bidding

The key objective of any DISCOM or a Load Serving Entity is that the cost of serving its consumers is minimized while maintaining it's operating profitably and supplying power reliably to consumers. Typically, the DISCOMS all over the world achieve this through a portfolio of contracts with suppliers including long term, medium term and short term in nature. Since hedging the entire supply to meet the daily or medium to long term demand may not be cost effective, the utilities also rely on Power Exchanges to net off their buy and sale positions in the DAM of Power Exchange.

A whole host of factors determine a DISCOMS decision to take power purchase / sale decisions in the DAM of a Power Exchange. Some of the key factors that need to be taken into cognizance by DISCOMS for its power sale or purchase decision on the DAM of an Exchange may be summarised as under:

- Expected electricity demand for each time block of the day
- Supply Availability for each time block of the day from its existing Long, Medium and Short Term PPAs on a Day Ahead Basis
- Forecast and availability of supply from the Renewable Sources of Generation and its must run nature
- Fixed and Variable costs of all the tied-up supply through various PPAs
- Minimum off-take guarantee / penalties for less or higher than committed off-take from any of the PPAs, the technical characteristics of power plant including ramping up and down, minimum up time and down time etc.

For each block of time, the DISCOM's key objective is to balance its demand supply position. In case, the demand is expected to be less than the supply and the market clearing price is expected to be higher than its PPA price, the DISCOM may opt to sell the surplus power for that block in the market. On the other hand, when the demand in any block is higher than its PPA levels, the DISCOM may opt to buy power from the market. The price bid for purchases depends upon its financial condition and could be estimated from the historical price levels observed in the time block of interest and the

market liquidity. Additionally, if the market clearing prices in certain blocks is expected to be lower, the DISCOM may replace some its costlier supplies by purchases at a lower price from the Exchange.

Merchant Plants typically bid at or very close to their marginal cost in order to get cleared in the market. However, when the liquidity in market is lesser, plants may seek to maximise profitability by bidding at a relatively higher price than their marginal cost. However, in such cases, the plants may run the risk of not getting cleared in the market. The bidding strategy in such cases should be based on prudent estimates of expected demand, marginal cost of other generators, their bidding behaviour, operating and regulatory constraints, transmission availability etc.

Session-8: Guidelines for Bid Preparation for SARPEX

The aim of this session is to familiarise the participants with the criteria and infrastructure required for participating on SARPEX and acquaint them with computations of sale/purchase quantum and price bids using illustrative examples.

Currently in India, any Individual or a Firm who is an electricity generator, trader or consumer interested in participating on the Exchange has to associate with the Exchange through a Membership. Further, on the front of technical requirements of qualification, the Member must have 1) Standing clearance from SLDC and 2) Availability Based Tariff Meter facility.

Once the Day-Ahead Market on SARPEX becomes operational, it could operate in either of Unified or Residual Mode. In either of modes, the basic pre-requisites for participation remain unchanged. For example, all parties interested in participating on SARPEX will have to become a Member on the Exchange through either of then-decided categories of Membership. The Relevant/Designated Authority may be appointed to authorize an Eligible/ Obligated/ Voluntary Entity to become a Client of any other Member in accordance with requirements as may be prescribed by the Exchange. Further, all trades on SARPEX are proposed to be executed at the inter-regional periphery of the Indian grid while the operational control of the transmission system of Member Countries falls within the jurisdiction of the respective countries. Therefore, a "No Objection Certification" (NOC) will be required from interested participants in each Member Country for allowing access up to the inter-regional periphery of the Indian Grid.

Some of the other infrastructural requirements for participating on the SARPEX include:

- Workstation to access the Automated Trading Facility, along with the Telecom Connectivity
- Trained Manpower for placing bids on daily basis
- Information Collection System to collect all the data required to ascertain the quantum and price bids for sale/purchase of power
- System and Procedures for implementing all trades generated through SARPEX

About SARI/EI

Over the past decade, USAID's South Asia Regional Initiative/Energy (SARI/E) has been advocating energy cooperation in South Asia via regional energy integration and cross-border electricity trade in eight South Asian countries (Afghanistan, Bangladesh, Bhutan, India, Pakistan, Nepal, Sri Lanka and the Maldives). This fourth and the final phase, titled South Asia Regional Initiative for Energy Integration (SARI/EI), was launched in 2012 and is implemented in partnership with Integrated Research and Action for Development (IRADe) through a cooperative agreement with USAID. SARI/EI addresses policy, legal and regulatory issues related to cross-border electricity trade in the region, promote transmission interconnections and works toward establishing a regional market exchange for electricity.

About USAID

The United States Agency for International Development (USAID) is an independent government agency that provides economic, development, and humanitarian assistance around the world in support of the foreign policy goals of the United States. USAID's mission is to advance broadbased economic growth, democracy, and human progress in developing countries and emerging economies. To do so, it is partnering with governments and other actors, making innovative use of science, technology, and human capital to bring the most profound results to a greatest number of people.

About IRADe

IRADe is a fully autonomous advanced research institute, which aims to conduct research and policy analysis and connect various stakeholders including government, non-governmental organizations (NGOs), corporations, and academic and financial institutions. Its research covers many areas such as energy and power systems, urban development, climate change and environment, poverty alleviation and gender, food security and agriculture, as well as the policies that affect these areas.