Third Meeting of Expert Working Group

International Experiences including Asia Pacific sub-regions on Energy Connectivity

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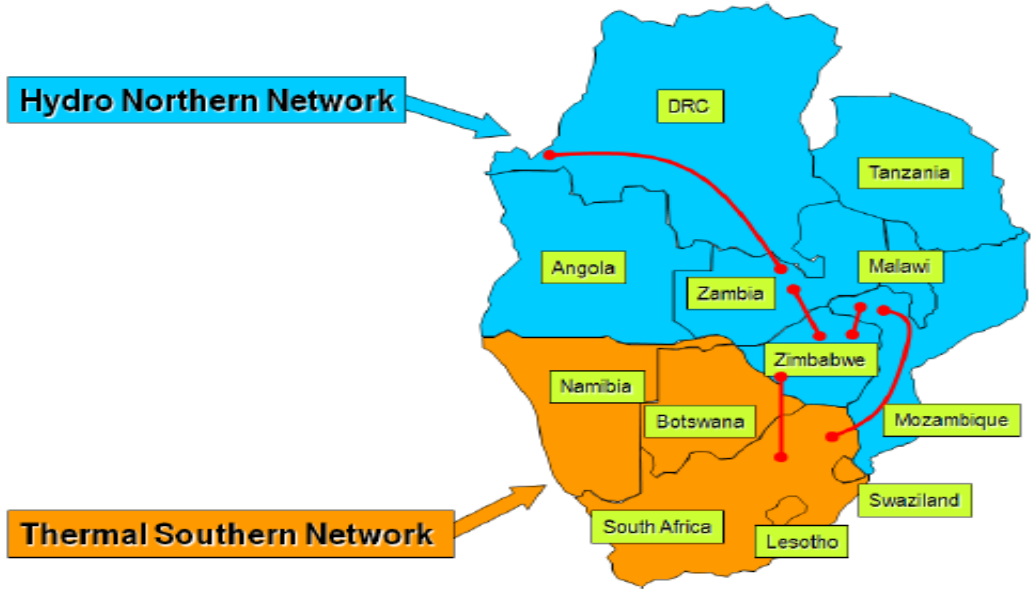
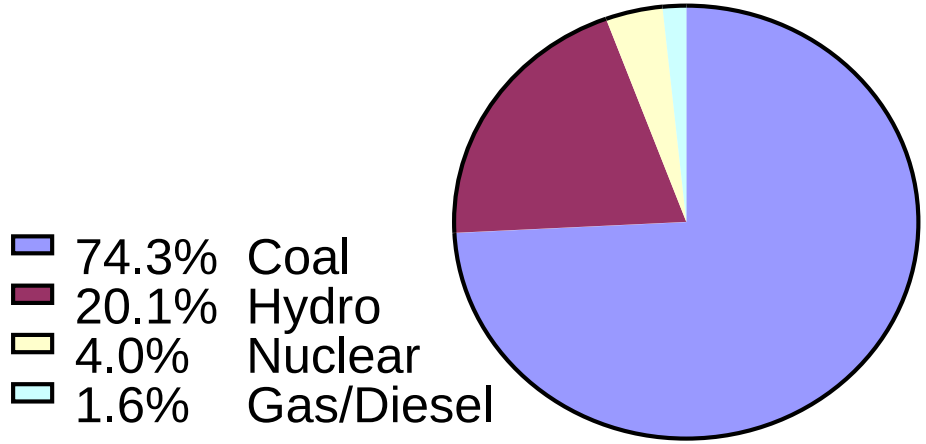
South Africa Power Pool

South African Power Pool (SAPP)- Snap Shot

Installed Capacity	58,608 MW
Available Capacity	52,589 MW
Operating Capacity	46,910 MW
Peak Demand	48,216 MW

- 12 Countries :Angola, Botswana, Democratic Republic of Congo (DRC), Lesotho, Madagascar, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Zambia, and Zimbabwe.
- Current Trade Volume : 175 GWh in June'2019
- Average Electricity growth rate 3% p.a.
  - ✓ For South Africa demand growth was 4.9% in 2007 and for whole region 4.6%.





South Africa Power Pool : Key Milestone

1992: Heads of Countries signed Treaty of SADC.

1995: MOU signed for Formation of SAPP

2001:Short Term Electricity Market commenced.

2002: Establishment of Regional Electricity Regulatory Association (RERA) .

2009: DAM operation commenced.

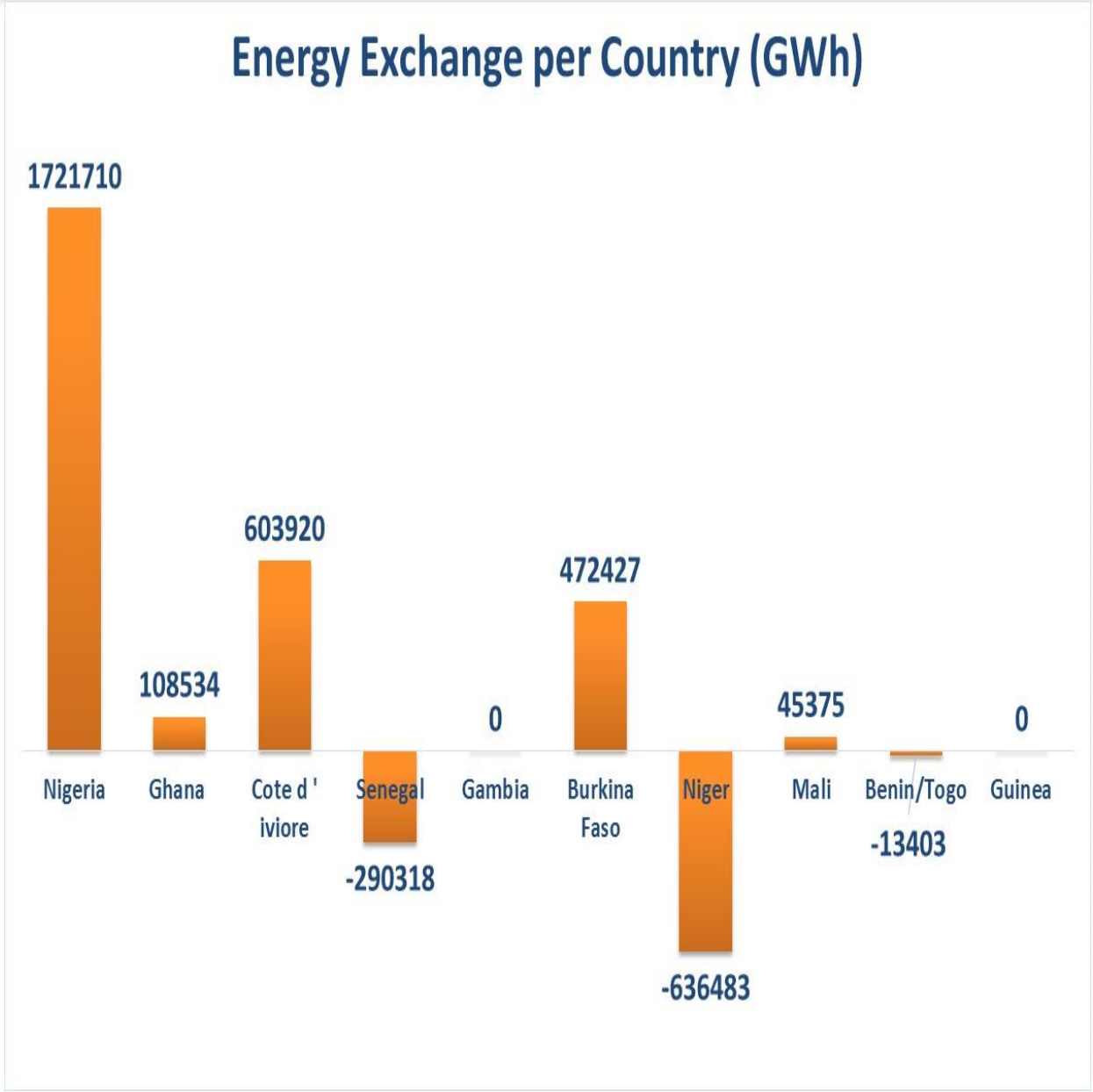
South African Power Pool (SAPP) : Key Instruments

Inter-Governmental MoU (IGMoU):	Signed in 1995 for formation of SAPP. SAPP agreements must be interpreted in a manner consistent with the SADC treaty, final and binding .
Inter-Utility MoU	The MoU signed in Dec'1994 helped to establish an official cooperation among SADC member states for sharing the costs and benefits of energy generation.
PPA terms/Power Trade	Currently CBET dominated by Bilateral and Short term through Exchanges. DAM, Intra Day market, Forward Physical monthly contracts and Weekly Market contracts etc.
Transmission Planning	Generation & Transmission projects of regional importance are prioritized and majority of them are developed together with Private Sector.
Interconnection Mechanism	Single Synchronous AC Power Grid, Some far places are also connected through HVDC.
Open Access to Network	Yes. Obligation to wheel except where technical problems prohibit.
Commercial imbalance settlement mechanism	Settlement as per long term bilateral trade. Currently based on hourly average power system frequency at different blocks of pool generation cost.
Regulatory Coordination	Regional Electricity Regulators Association of Southern Africa (RERA) is a formal association of independent electricity regulators to promote cooperation, transparency , efficient and sustainable development of CBET formed in 2002.
Dispute Resolution	Established Dispute Resolution Tribunal

West Africa Power Pool

West African Power Pool (WAPP)-Snap Shot

- **15 countries :Benin, Togo, Nigeria, Niger, Mali, Cote d'Ivoire, Ghana, Gambia, Sierra Leone, Liberia, Senegal, Burkina Faso, and Guinea Bissau (14 countries interconnected)**
- **22 Utilities**
- **Trade Volume : ~7 GWh**
- **10,000MW :Total available Gen. Capacity**



Source: WAPP Website

West African Power Pool : Key Milestone

1975: Treaty on Economic Community of West Africa States (ECOWAS)

2000: Intergovernmental MOU to create WAPP.

2006 :Utilities signed Article of Agreement, covering operating procedures, regulatory affairs, Dispute Resolution etc.

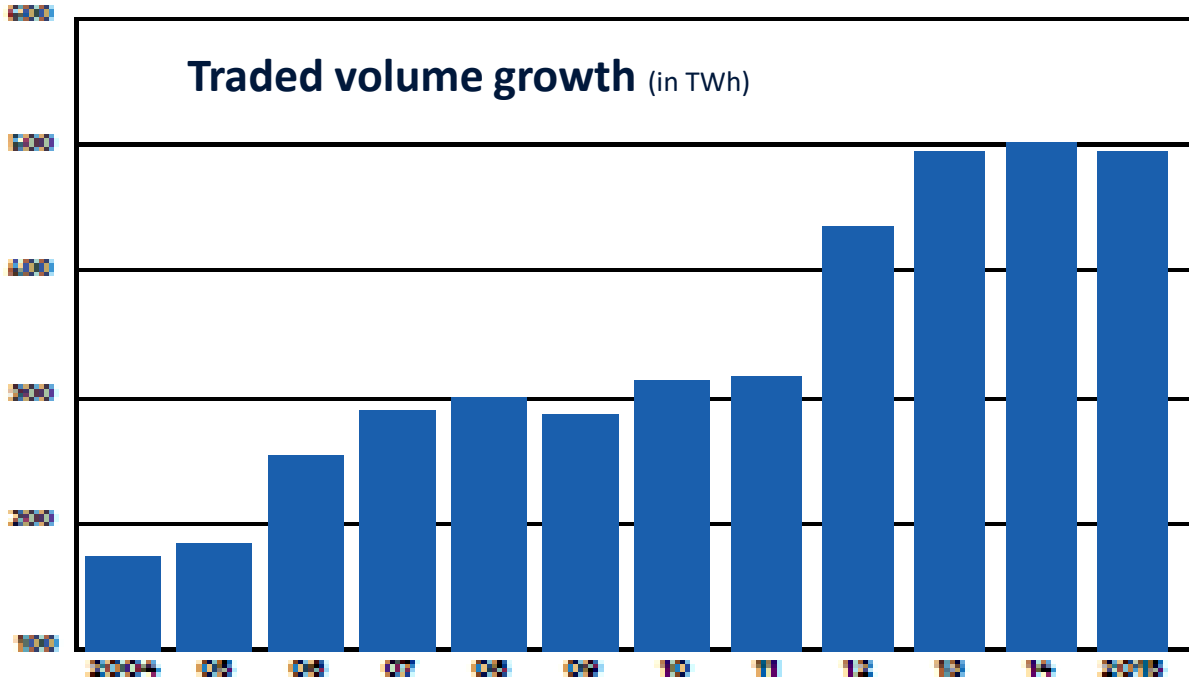
2008: Creation of ECOWAS Regional Electricity Regulatory Authority (ERERA).

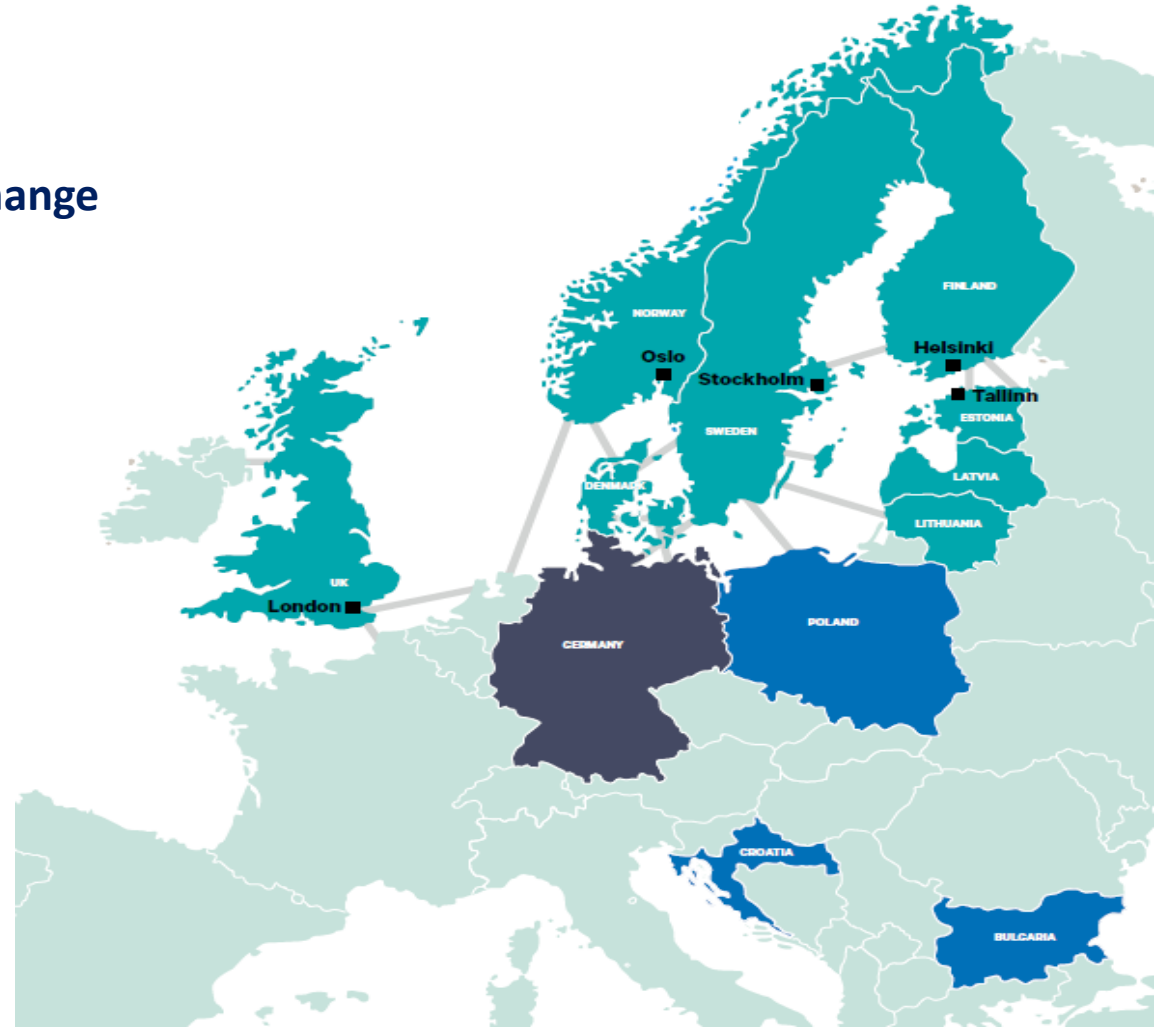
West African Power Pool (WAPP) : Key Instruments

Inter-country MoU, Treaties, Agreements:	ECOWAS Ministers of Energy adopted an inter-governmental MoU on the establishment of WAPP in 2000. The MoU set forth the mutual obligations of the Parties and created an oversight, coordination, and administrative apparatus.
PPA Terms	Long term Bilateral/ Trilateral, since 1970. Many PPAs have been renegotiated or replaced with short term contracts.
Interconnection	Single Synchronous AC Power Grid. All countries follow same frequency. Some far away places are also connected by HVDC.
Transmission Planning/Infrastructure:	In 1999, ECOWAS Master Plan for the Generation and Transmission of Electrical Energy was developed, focuses on Hydro and Transmission Network.
Open Access to Network :	Yes. The Energy Protocol of ECOWAS has specific provisions related to non-discriminatory OA conditions for trade in energy to ensure reliable cross-border energy transit flows.
Regulatory Coordination :	The ECOWAS Regional Electricity Regulatory Authority (ERERA) to ensure regulations and to give support to national regulators.
Dispute Resolution :	Mutual Settlement as per PPA. ERERA also empowered to settle disputes.

Nordic Pool

- World's First international commodity of exchange for Electric Power
- Hydro Power covers half of Nordic region needs
- Total Trade : 512TWh (2017)
- Close to 370 companies from 18 countries trade on the power exchange





Source : Nord Pool Annual Report 2015

Nord Pool : Key Milestone

1991:Norwegian parliament's decided to deregulate the market for trading of electrical energy

1996 : Nord Pool commenced its operation (A joint Norwegian-Swedish power exchange)

1998: Nordic TSOs took over the leadership role

2000:NORDEL governance structure transformed – Legally binding agreement among TSOs(Fully integrated)

Nordic Pool : Key Instruments

Inter-country MOU, Treaties, Agreements	The inter-Nordic Transmission System Operation Agreement (TSOA) signed in the year 2000, defines framework on Security standards, Congestion management etc.
Power Trade/PPA Terms	Physical (spot market) and Financial (Price hedging & risk management)- for future forward options. DAM, Intraday – Continuous 24 x7 a week, 1 hour prior to delivery. All Contracts are standardized in confirmative with Nordic OTC and bilateral market rate.
Regulatory Coordination	Nord REG- Nordic Energy Regulator – to promote legal and institutional framework. With deeper energy integration across Europe.
Transmission Planning/Infrastructure	Transmission planning is done by Planning Committee; objective is smooth functioning, efficient utilization, consistent with environmental system. Master Plan at regional level .
Mechanism of interconnection .	AC Inter-connection. HVDC link are also in place.
Open Access to Network	Yes. All networks are for third-party open access.
Transmission Pricing/Wheeling Charges and Transit	The point of Connection Tariff is used. Distance between seller and buyer – no significance.
Commercial Mechanism to Settle Imbalances	Settlement procedure for long term bilateral agreement governed by conditions attached to such markets. Common imbalance settlement is therefore a prerequisite for a common end user market

Experiences and Leanings of South Asia Region

South Asia Region Experience : Key highlights

- ✓ 1985- South Asia Association of Regional Cooperation (SAARC) was created to promote economic growth, welfare of people, social progress and cultural development etc.
- ✓ SAARC comprises of eight member states.
- ✓ 1987 : Secretariat of Association was set up in Kathmandu, Nepal.
- ✓ 2000 :Process of Regional energy cooperation began with the formation of Technical Committee.
- ✓ 2004: SAARC summit proposed concept of concept of Energy Ring
- ✓ 2006: SAARC energy center was established at Islamabad, Pakistan
- ✓ 2014:Intergovernmental framework agreement (IGFA) on Energy Cooperation was signed between the member countries.

South Asia Association of Regional Cooperation: Key Milestone

1985:SAARC was created for the economic growth, social, welfare of the people.

2000 : Process of regional cooperation in energy sector began with formation of Technical committee on energy.

2004: SAARC summit proposed concept of an Energy Ring.

SAARC energy centre was established in 2006.

2014: Agreement on SAARC framework on energy cooperation and grid interconnectivity was signed.

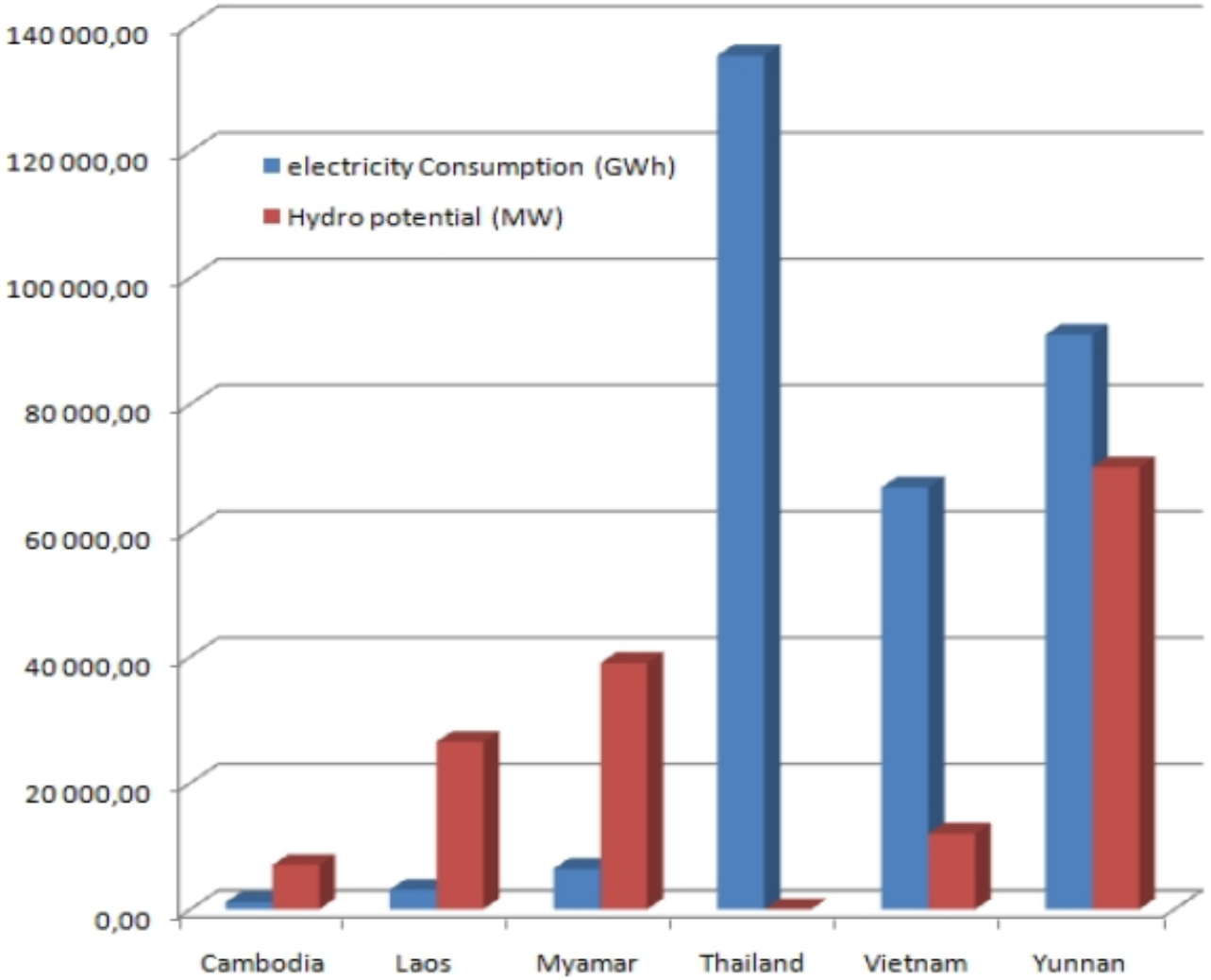
South Asia Region Experience : Key highlights

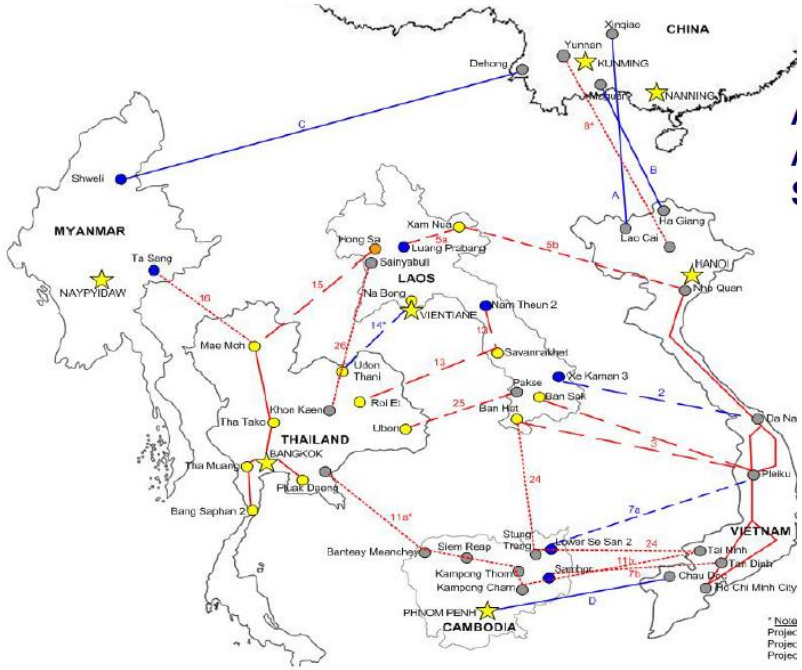
- ✓ Currently Electricity Trade is between Eastern Region of the South Asia viz. between India-Nepal, India-Bhutan, India-Bangladesh.
- ✓ Current form of trade between South Asian countries is Bilateral- Long and Medium term. Multi-lateral and Trade of electricity on Exchanges is yet to commence.
- ✓ Transmission Planning & System Operations: Jointly/Bilateral.
- ✓ Interconnection Mechanism: Both AC and HVDC both
- ✓ Open Access: In India only
- ✓ Imbalance Settlement Mechanism: In India only
- ✓ Dispute Resolution – SAARC arbitration council as per SAARC framework agreement. Presently, Arbitration in Third country viz. Singapore arbitration.

Experience & Learnings of Greater Mekong Sub-region

International Experience: Greater Mekong Sub-region (GMS)

- **Total Six countries: Cambodia, the People's Republic of China (PRC), Lao People's Democratic Republic (Lao PDR), Myanmar, Thailand and Vietnam**
- **The hydro-resources are located in Laos, Cambodia and Myanmar**
- **The demand markets are in China, Thailand and Vietnam**





- **Lao : 25.6 GW of hydro potential mostly located in the North/Central region. (IC 4168 MW: 2016)**
- **Export market : Thailand, Vietnam, China.**

- **Myanmar : 28 GW of hydro projects potential**
- **Export market : Thailand, China for both power & Natural gas**

- **Cambodia : 2.6 GW of hydro projects potential**
- **Export market : Thailand, Vietnam.**

Source: RETA No 6440 - GMS Master Plan Study 2008-2010

Greater Mekong Sub-region : Key Milestone

April 1995:Electric Power Forum created

Jan 2000: GMS ministers endorsed policy statement on Regional Power Trade.

Nov 2002:Inter Governmental Agreement signed to establish RPTCC

July, 2005:MoU on guidelines to implement Regional Power Trade & operating agreement (RPTOA)

March, 2008:MoU for Implementation of road map for GMS CBPT was signed

Greater Mekong Sub-region (GMS) :Key Instruments

Inter-Country MOU, Treaties, Agreements	The intergovernmental agreement signed in year 2000, provided a framework to implement the Policy Statement on Regional Energy Trade in the GMS.
MoU on the Overall Framework of Regional Trade	MoU on guidelines for the implementation of the Regional Power Trade Operating Agreement (RPTOA) helped to promote efficient development of power trade to aid economic growth was signed in 2005.
PPA Terms and Open Access	Dominated by bilateral negotiated long term contracts Presently Bilateral and open access has been recognized through strategy documents .
Transmission Planning/Infrastructure	The Planning Working Group (PWG) was established to fulfil the functions of the operational and system planning working groups, identified in the draft RPTOA . Master Plan at the regional level.
Interconnection Mechanism	Single Synchronous AC Power Grid. All the countries follow same operating codes (regional grid codes) to ensure system stability.
Commercial Mechanism to Settle Imbalances	Settlement procedure for long term bilateral : governed by such agreements .
Sustainable Development of Energy Trade and Provision for Projects Committed to Trade	The 15th GMS Ministerial Meeting during 2009, adopted a roadmap for expanded cooperation in the energy sector of the GMS taking into account the need for improved energy security, better utilization of Resources in the region.
Dispute Resolution	As per PPA, Experts and International Arbitration.

International Experience: Brief status of Regulatory Association

Region	EUROPE	Greater Mekong Sub-region (GMS)	Western Africa	Southern Africa
Name of Institution	Agency for Cooperation of Energy Regulators (ACER)	Regional Power Trade Coordination Committee(RPTCC)	ECOWAS Regional Electricity Regulatory Authority (ERERA)	Regional Electricity Regulators Association of SA(RERA)
Geographical area	28 - Countries Community body for integration of EU markets in electricity and natural gas	6 –Countries Responsible for establishment of Greater Mekong Sub-region (GMS) regional power market.	14- Countries Independent electricity regulator in Western Africa	13- Countries Association of electricity regulators, for politico-economic integration of SADC states
Organization Structure	Director supported by Working and Expert Groups. Director- Manages and represents Agency. Board of Regulators, Administrative Board, Board of Appeal. Five Departments- Director office, Admin, Electricity, Gas & Market Monitoring	Two Groups: The Focal Group(FW)- Coordination & implementation activities. The Planning Working Group(PWG)- Identify priority connection, standards etc. FG and PWG representative of Govt. utilities	Regulatory Council supported by a pool of experts. Council supported by Technical unit & HR/Admin/Finance. Regulatory Council- Three members headed by Chairman & two members. Fixed term of 5 years.	RERA reports to SADC Directorate of Infrastructure Services. Governed by Regulatory Council consists of three members. Technical unit-deals with Regulatory activities ; HR, Admin and Finance unit.

International Experiences: key focus areas of electricity regulatory forums/Associations

Area	ACER	RPTCC	ERERA	RERA
key focus areas	Foster cooperation among National Regulatory Agencies (NRAs), Ensure market integration, Harmonisation of regulatory frameworks, Issues non-binding opinions to NRAs	Basic rules for bilateral trading, Overall policy on day-to-day management of power trade	Regulations of Cross Border Electricity exchange, Monitor regional market; Assist NRs on capacity building & technical issues.	Regulatory Guidelines, Regulatory cooperation, Capacity building & information sharing on Cross Border Electricity Exchanges
	System operation framework, frame guidelines , Harmonisation of transmission tariff Structures	Establish short, medium, long term initiatives for Cross border Energy Exchanges	Tariff setting methodology for regional power pool	Transmission pricing, operating agreements, Balancing market operations; Ancillary services
	System operation, connectivity, capacity allocation, network codes	Identify steps for expansion	Technical regulation of regional power pooling, effective DR methods	Grid codes Procedures
Funding Support	EU	Multilateral support, WB/ADB support	Member states	Multilateral support, USAID

International Experience : Key Learnings for Regional Connectivity

- ✓ Political Commitment in the form of Inter- Governmental Agreement/ Treaties /MOUs on Energy Cooperation and Grid Integration/creating Power Pool
- ✓ Need to create Council of Ministers/ Standing committee/Technical committee/Working group etc. for successful implementation of Agreement for enhancing energy cooperation
- ✓ Creating effective Regional Institutions/association of Regulators for coordination/harmonization of policies/regulations/standards
- ✓ Creating effective Regional Institutions/association of Transmission Utilities/System Operators for coordinated transmission planning, grid code harmonization, operation of the interconnected system
- ✓ Developing common set of regulations/policies/standards for grid interconnectivity and for unified Power Market such as Open Access framework, tariff mechanism, transit fee mechanism, Commercial framework for power exchanges, scheduling, Payment security mechanism, model PPA, imbalance settlement mechanism
- ✓ Developing Regional Investment friendly framework. In South Africa power Pool, Generation & Transmission projects of regional importance are prioritized and majority of them are developed together with Private sector
- ✓ Dispute Resolution mechanism. Setting up Dispute settlement tribunal, Arbitration process etc.

THANK YOU