Workshop on Clean Energy Development Strategies in East Africa

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Monday 11:30 Panel Discussion
Global Experiences in Clean Energy Development

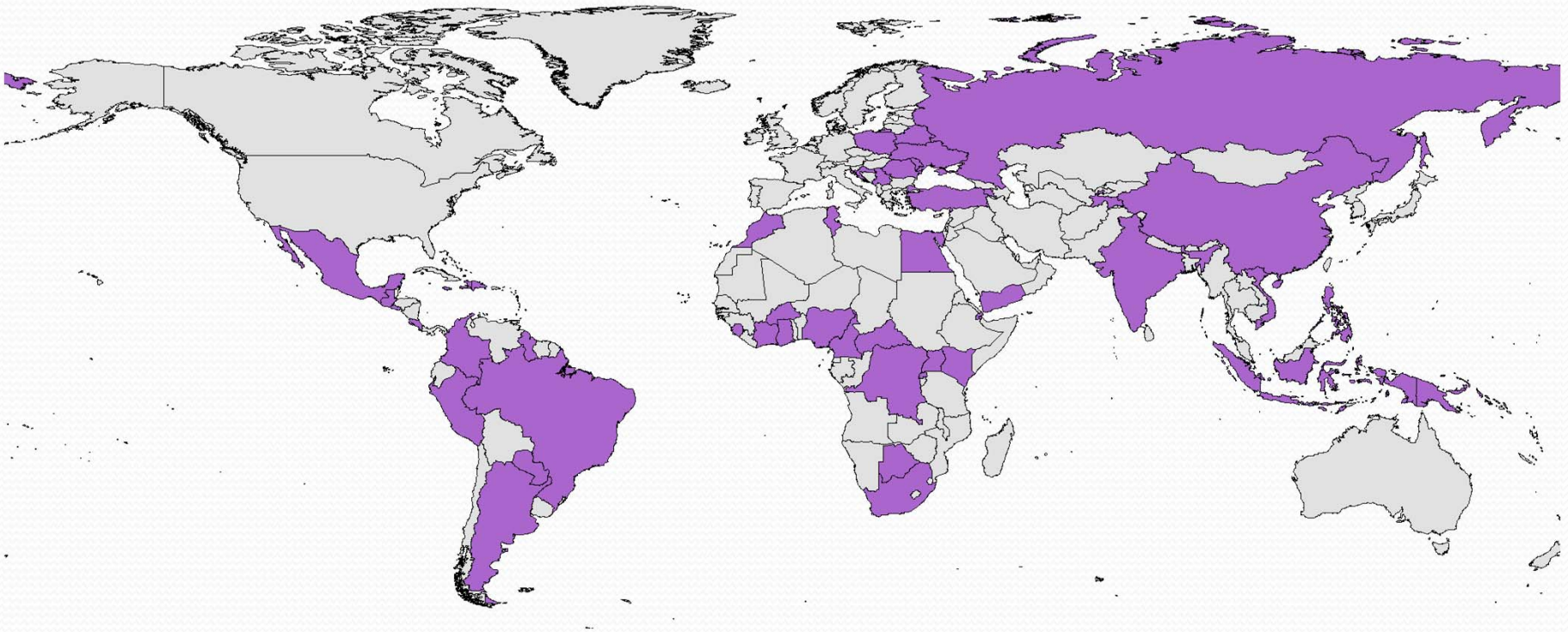
- Experience/lessons learnt
- Global
- East Asia
  - Vietnam
  - China
  - GMS regional power interconnection and trade

Global Experiences in Clean Energy Development -East Asia Perspective

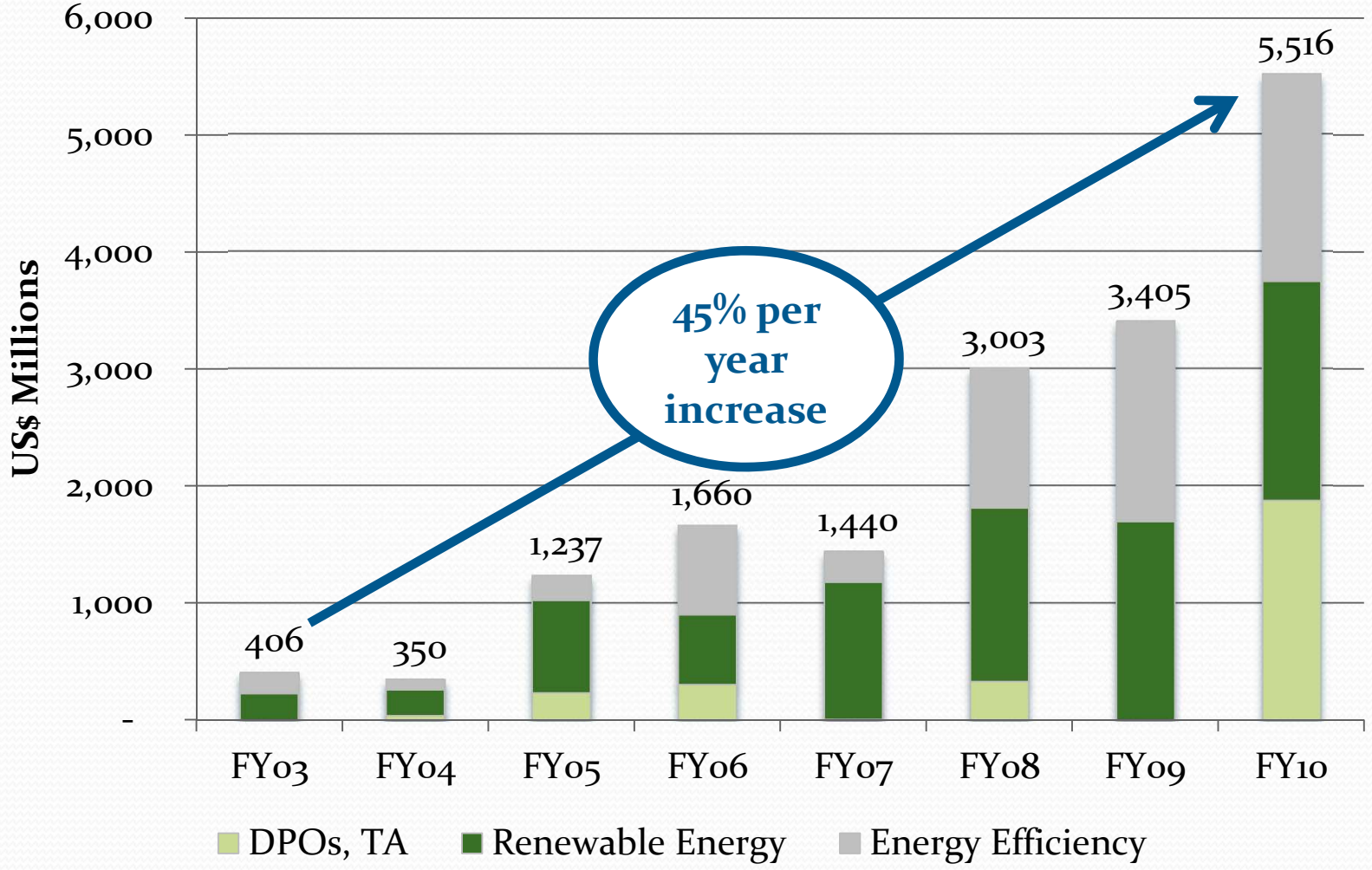
- Big picture: amid an economic downturn and slow progress in global climate change negotiations, investment in clean energy development is seen as one of the growth engines
- How:
  - Elevating the policy dialog on clean energy development to sustainable development path of the country,
  - Adhering to country demand driven approach helps to anchor the global-country linkages,
  - Aiming at scaling-up from planning to implementation,
  - Catalyzing innovation: technology, financing, development, organization, management, and social
  - Integrating urbanization factors, in particular, urban transport in clean energy development strategy.

88% of Country Assistance/Partnership Strategies Prioritize Green Development

15% in FY00-05 → 32% in FY07 → 63% in FY09 → 88% in FY10

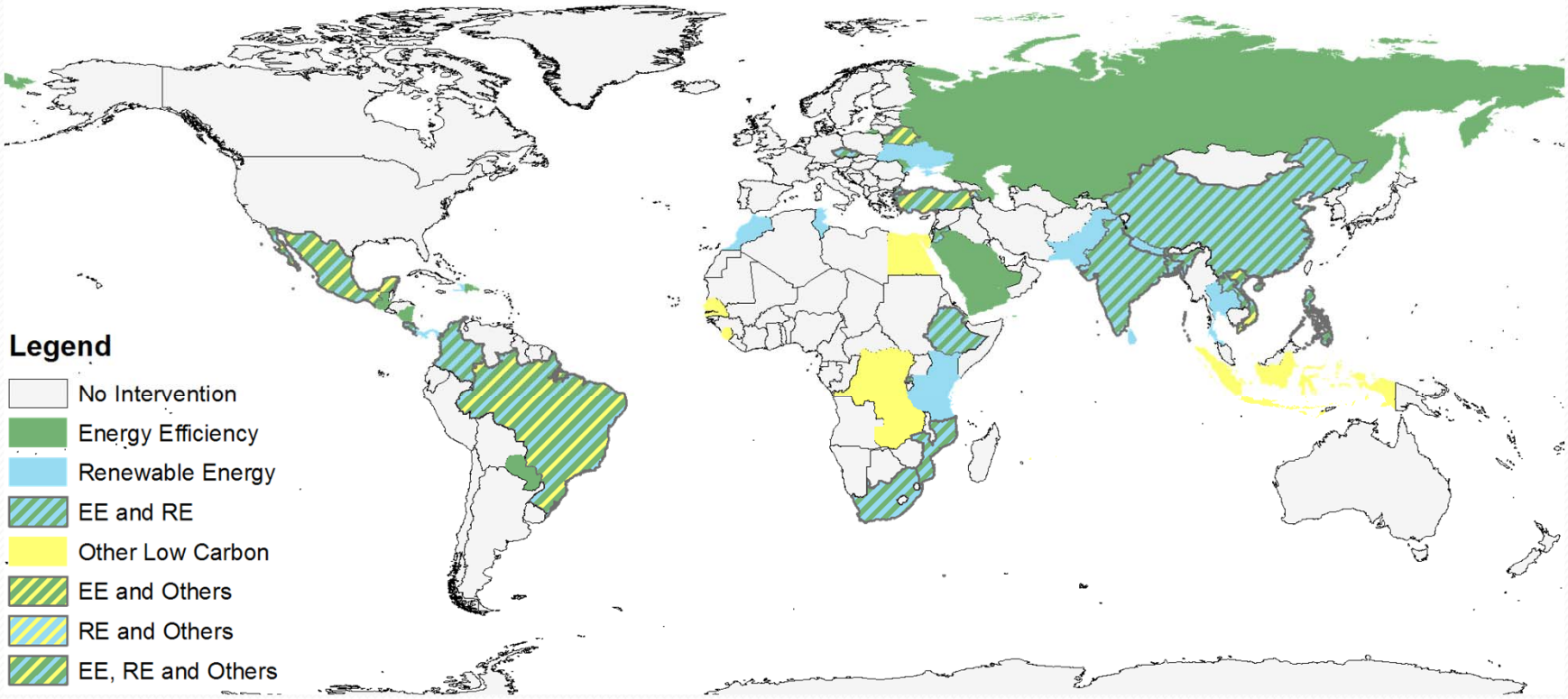


World Bank Low-Carbon Energy Lending Has Increased More Than 45% Annually

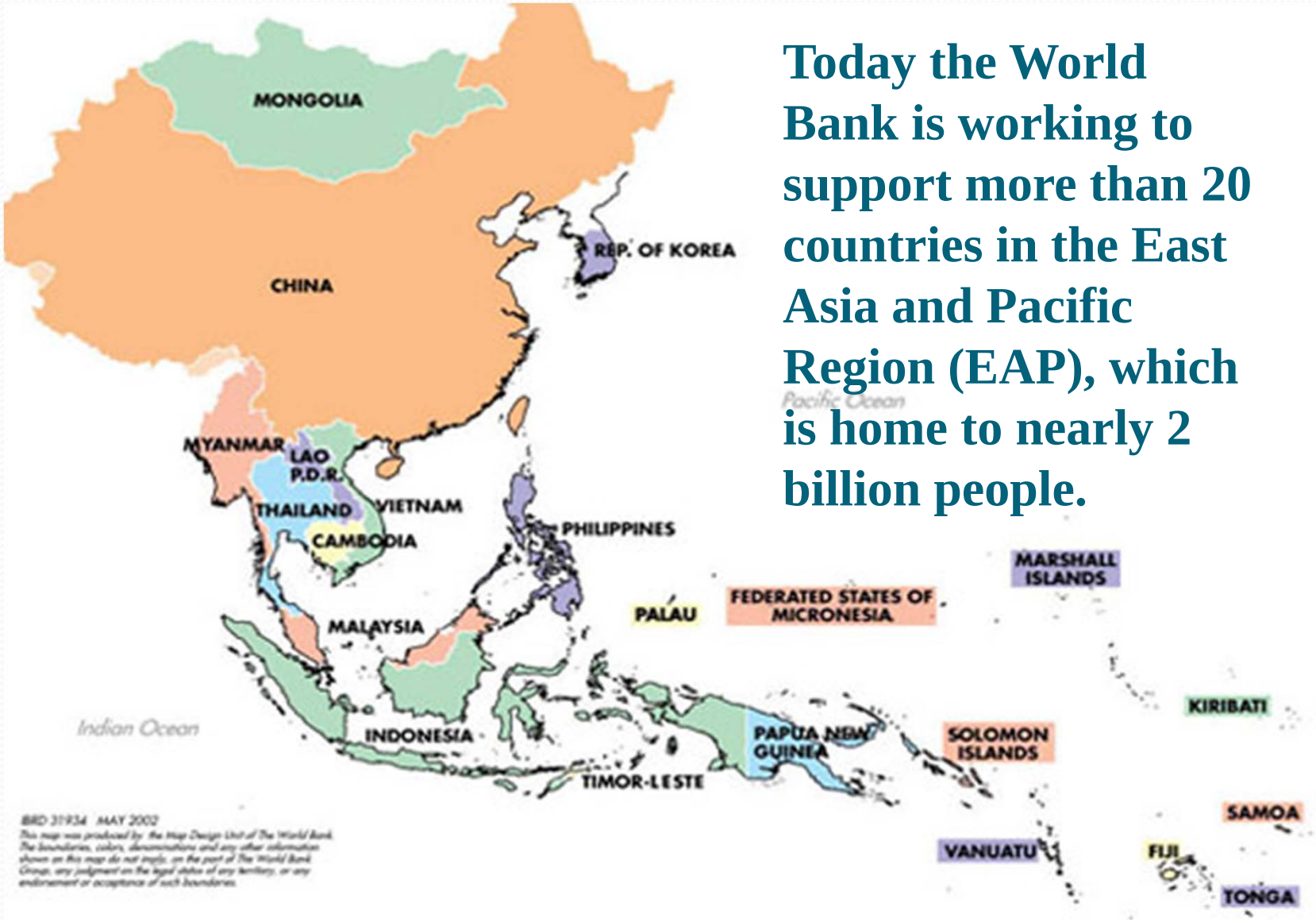


The World Bank Invested US$17bn in Low-Carbon Development from FY03-10

- US$8.0 billion Renewable Energy (RE)
- US$6.2 billion Energy Efficiency (EE)
- US$2.8 billion of DPOs, TA



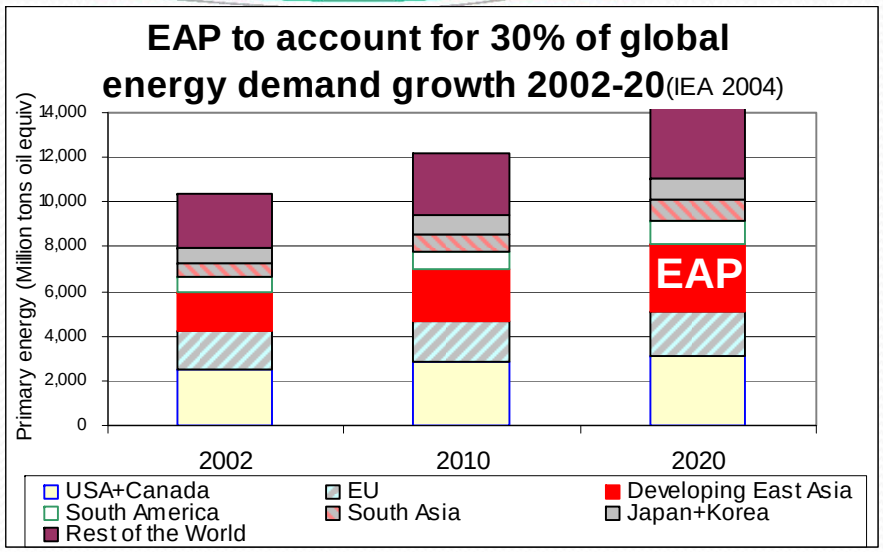
East Asia and Pacific Region

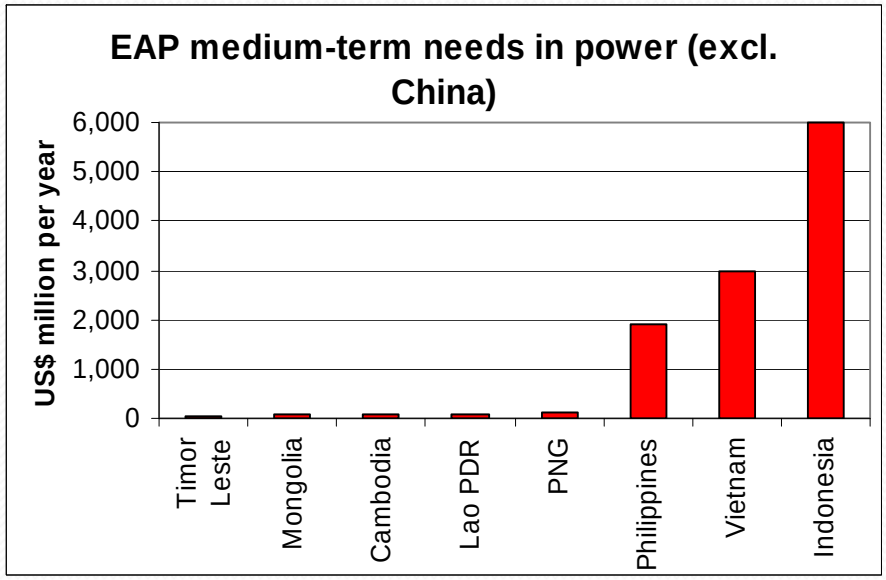


Today the World Bank is working to support more than 20 countries in the East Asia and Pacific Region (EAP), which is home to nearly 2 billion people.

Strategic Context

The EAP region has the fastest energy demand growth among all regions in the world
Coal to account for nearly half of primary energy → environmental impacts
Oil imports to rise → security concerns



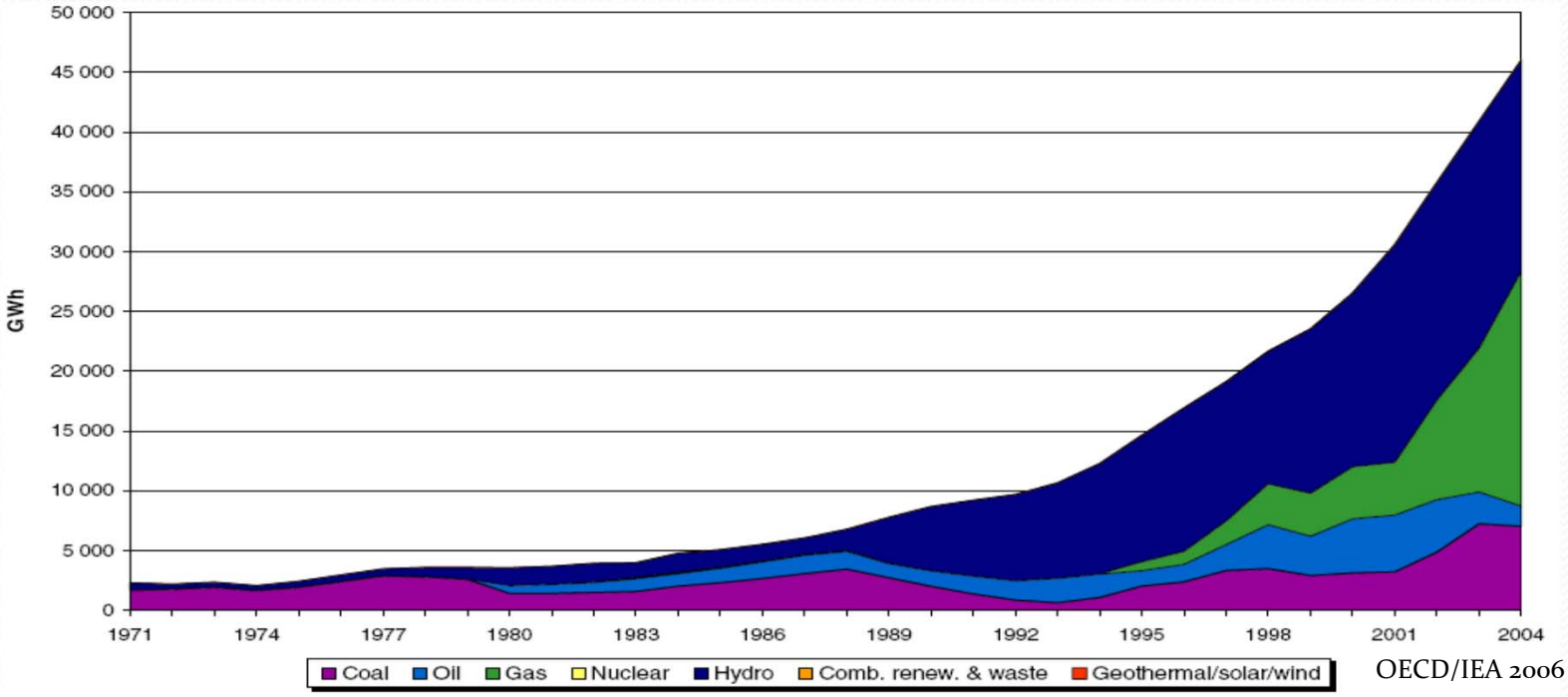


Power needs are rising in the EAP, and not only in China

Power generation is dominated by coal (~75%); oil (~10%); gas (~10%); rest is renewables + nuclear

Vietnam: a Successful Decade (1996-2006):

Rapid System Growth

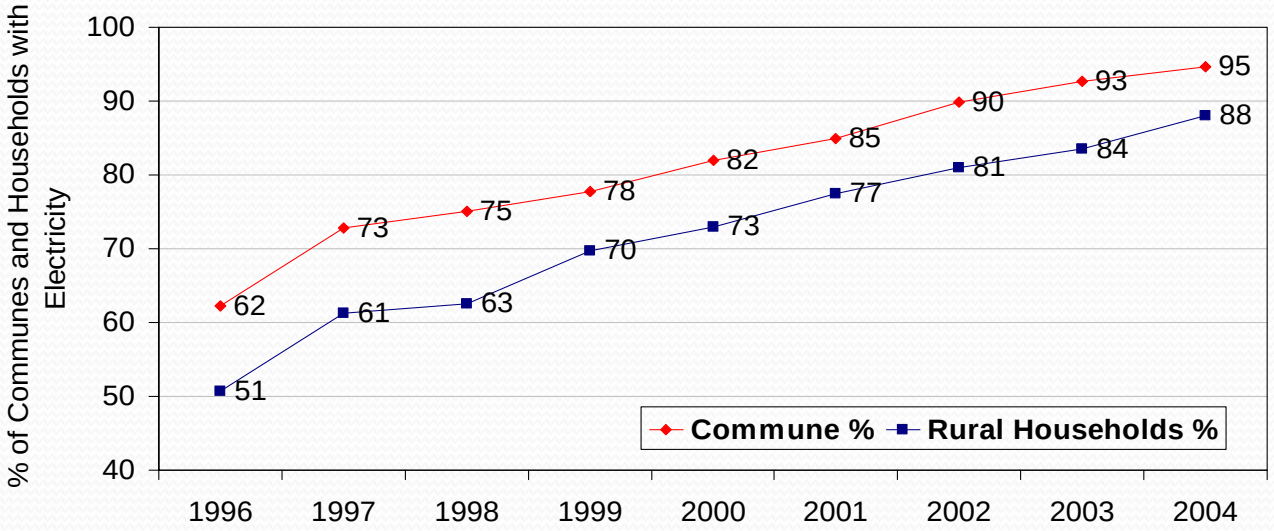


OECD/IEA 2006

- Electricity generation grew from 17TWh in 1996 to 46TWh in 2004 (13% annual growth rate)
  - Provided critical support to Vietnam's economic growth
- Rapid ascendance of gas: 42% of electricity production in 2004 versus less than 5% in 1996

Vietnam: a Successful Decade (1996-2006):

Successful Rural Electrification



- **Rural household access rates increased from 51% in 1996 to 91% in 2005**
  - Key success factors include: national prioritization, effective planning, and coordinated financing and implementation by central and local government and beneficiary households together
  - Bank played a major role (0.56 million households electrified, 5% of rural population)
- **Sustained impact on improving living standards and poverty reduction**
  - 51% agree very strongly that life has improved after electrification, 30% say income has increased
  - Average daily study time of children increased by 50 minutes after electrification

Vietnam: a Successful Decade (1996-2006):

Major Reform Accomplishments

- Commercialization
  - Power industry (EVN) transformed from government department to an independent, commercially-oriented corporation
- Tariff policy
  - On average, the tariff today cover costs
  - Sophisticated, if imperfect, tariff structure with rates varying by voltage level and consumer type, and based on time-of-day consumption (for major customers)
- Electricity Law (2004)
  - Established the foundation for unbundling the industry, developing a power market and protecting the rights of all players
- Separate electricity sector regulator
  - Electricity Regulator of Vietnam established in early 2006 in accordance with the Electricity Law
- Private sector involvement
  - Private investment in generation launched
  - International competitive bidding for IPP BOT projects launched, with the Bank's Phu My 2.2 (720MW) gas-fired plant as a model

Vietnam: Current Challenges (next 5 years)

- Meeting rapid demand growth
  - Businesses rank poor electricity supply as one of two biggest infrastructure constraints, and one of top four of all constraints – ICA 2006
  - Shortages of about 10% of capacity in 2005, again in 2007
  - High energy intensity (power demand 14% vs.GDP growth 8%), need to pinpoint causes of high intensity
  - Need to deliver power to newly electrified and newly industrializing areas
- Mobilizing required financing
  - About US$4 billion/year needed between 2006 and 2010 (compared to Us$5.5 billion over entire 2001-2005 period)
  - 70% for new generation capacity
- Sustaining reform to meet electricity demand at least economic cost
  - Developing a power market
  - Reducing burden of state in financing
  - Expanding private sector investment
- Completing the rural electrification agenda (the last 10%)
  - Need to improve quality of supply and move to 100% electrification
  - Further strengthening of local distribution utilities – commercialization and corporatization

Key challenge: to manage demand growth and reform simultaneously

WB Strategic Repositioning in Vietnam Energy Sector

- Engagement in generation (70% of total investment)
  - Gas - removing barriers to private investment (eg. PRG/MIGA)
  - Hydro (30 medium-size projects under development) - lending, improving environmental/social sustainability
  - Clean coal technology
- Scaling-up clean energy investment
  - Renewable
  - Energy efficiency and demand management
- Regional integration (GMS)
  - High voltage transmission interconnection
  - Cross border investment in generation and promoting power trade
- Emerging motorization will require increased focus on urban transport

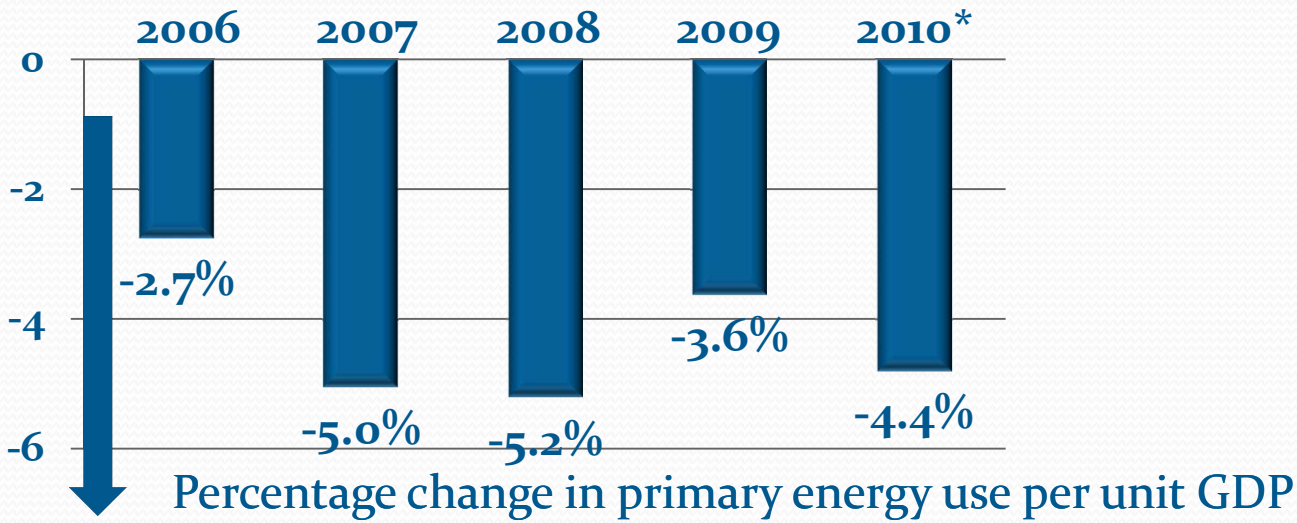
Responding to client's demand for financing power generation could best anchor a transition to IBRD

China – Undertaking one of the most ambitious mitigation campaigns

China's target of 20% energy intensity reduction 2006-2010: would reduce 1.5 billion tons CO_2, five times the EU Kyoto commitment

- Allocation of **provincial targets**
- Agreements with **Top 1000 industrial enterprises**
- Industrial, building, appliances, and vehicle **standards**

Results to date: Energy Intensity reduced by 15.6% from 2006-2009



Source (2006-9): National Development and Reform Commission (2010)

*Required to meet 20% five year target.

China – Committed to Reduce Carbon Intensity by 40-45% 2005-2020

- **Setting targets for energy intensity reduction and non-fossil fuel**

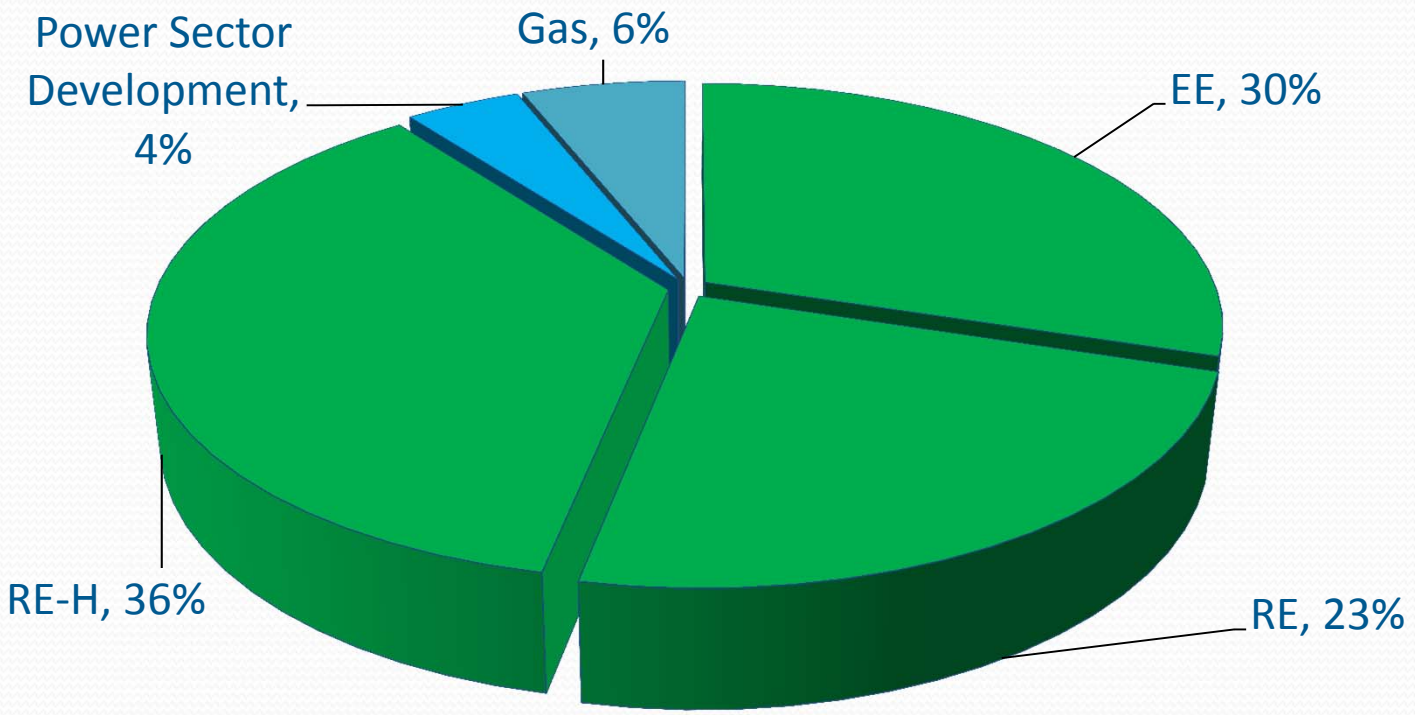
- **Improving efficiency of coal fired power plants:**
  - Improving efficiency of coal-fired power plants: by15% over the past decade
    - Closing small-scale inefficient coal plants
    - Installing most efficient technologies (supercritical & ultra-supercritical) in new coal power plants
  - Accelerating R&D on carbon capture and storage

- **Introducing market-based mechanisms:**
  - Scaling up ESCOs as a market-based mechanism of delivery models (beginning already more than a decade ago)
  - Providing guarantees to ESCOs
  - Mainstreaming energy efficiency lending in the banking sector

Renewable Energy Development, hand in hand with Economic Growth

- Passage of renewable energy law and implementation regulation,
- Market approach, feed-in tariff (solar, small hydro), competitive bidding for right (concession) to develop windpower sites,
- Testing centers and training (university course) for capacity building,
- Have built up renewable energy industry from small workshops to large scale manufacturing corporations in less than 30 years, as an organic part of over economic growth.

Green Energy Dominates the World Bank China Energy Portfolio (1999-2009)



- IBRD, GEF, Carbon Finance – US$1.6 billion
- 90% renewable and energy efficiency, US$1.4 billion

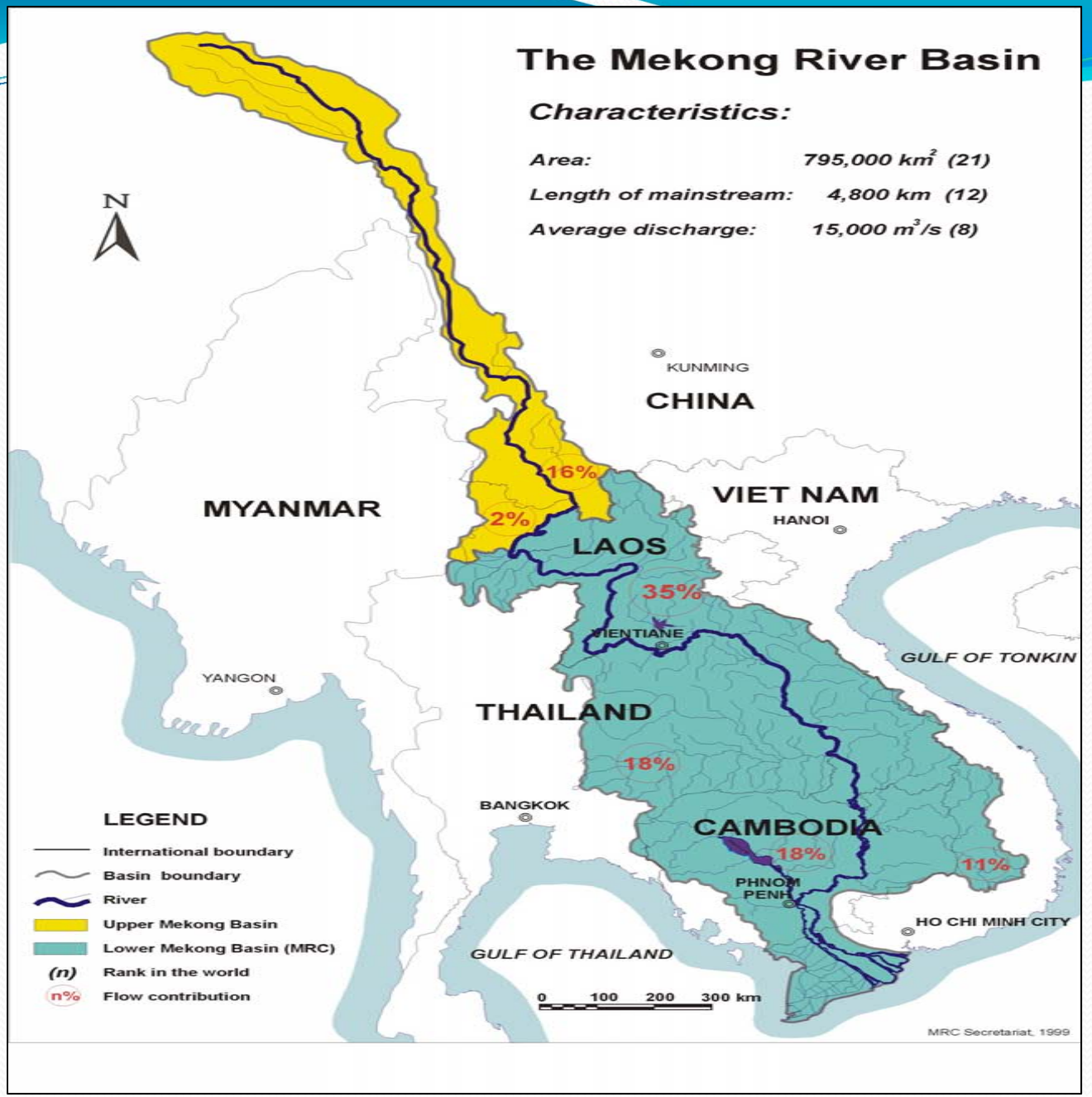
China-WB partnership in green low-carbon development

- **The partnership covers a broad range of activities from planning to implementation to knowledge dissemination**
- **Joint studies on carbon emissions and low carbon development paths completed two decades ago using trust funds**
- **The green GDP growth and investment become a central part of China's 5 year economic development plan**
- **Now into new frontiers such as**
  - Green energy for **low-carbon cities**
  - **Off-shore wind**
  - **Energy storage and carbon capture and storage**

Global Experience in Clean Energy Development – Regional Approach

- Regional Programs make sense (East Africa's Regional Clean Energy Program, WB's lighting Africa program), regional power interconnection (East Africa Power Pool), market size and resource complementarity (hydro, geothermal, gas)

- Great Mekong Sub-region (GMS) power interconnection and trade experience
  - phased development
  - Mutual benefit, in particular, to smaller countries (Vietnam, Cambodia, and Laos) for rural electrification


The Mekong River Basin
Characteristics:
Area: 795,000 km² (21)
Length of mainstream: 4,800 km (12)
Average discharge: 15,000 m³/s (8)
N
KUNMING
CHINA
MYANMAR
VIET NAM
HANOI
LAOS
VIENTIANE
YANGON
THAILAND
BANGKOK
CAMBODIA
PHNOM PENH
HO CHI MINH CITY
GULF OF TONKIN
GULF OF THAILAND
16%
2%
35%
18%
18%
11%
LEGEND
International boundary
Basin boundary
River
Upper Mekong Basin
Lower Mekong Basin (MRC)
(n) Rank in the world
n% Flow contribution
0 100 200 300 km
MRC Secretariat, 1999

Development Vision for GMS Power Trade

- There is consensus that, while a full-fledged GMS power market could be 10-15 years away, transmission interconnection and regional (export oriented) generation capacity need to be built up gradually, starting on a bilateral basis.

- Evolution of the GMS Power Trade has been agreed in **four stages of development**, to be implemented gradually, ultimately achieving a competitive market:
  - Limited benefits sharing →Benefits sharing → Limited competition →Full competition

- Each stage would have its own technical and commercial operating agreement for implementation and operation of regional power trade, **Regional Power Trade Operating Agreement (PTOA).**

- **Stage 1: (a) Increase regional interconnection capacity; (b) harmonize performance standards; (c) synchronize grids at high voltage level**

WB Strategy for GMS Power Trade

A) Policy / Institutional Support

- **Advice and technical assistance to RPTCC (series of focussed policy notes planned for 2008/09)**
- **Encouraging participants to put in place a permanent institutional arrangement for a sustained evolution of regional electricity market**.
- **Supporting power sector development of member countries**
- **Providing key technical inputs** towards:
  - Efforts to support regionally coordinated planning;
  - Feasibility study for bulk power transfers between countries.

B) Investment Support

- Developing regional / export oriented power generation projects.
- Developing cross-border interconnections and PPAs.
- In-country grid infrastructure to support regional power trade;
- Design and implementation of load dispatch centers (LDCs) to facilitate countries' participation in regional power trade.

- The Bank exploring possibilities of co-financing with other international and regional financial institutions, bilateral agencies, and commercial banks.

Implementing WB Strategy for GMS Power Trade

- WB is currently providing investment support (US$33.5m, including IDA regional funds) to finance:
  - Two cross-border transmission lines between Cambodia and Western Viet Nam, and Southern Laos and Northern Cambodia;
  - A transmission link in Lao PDR that would interconnect Thailand, Laos and Cambodia in southern Lao PDR around 2010; and
  - A modern load dispatch center in Lao PDR to facilitate the country's participation in regional power trade.

- A feasibility study for a 500 kV transmission interconnection between China and Viet Nam
- Regional Master Plan studies will identify new regional interconnections to gain mutual economic and technical benefits.

- Future investment opportunities:
  - Increased interest by Thailand and Viet Nam in developing hydropower projects in other GMS countries.
  - Interest also on coal-fired plants in Lao PDR for export to Thailand
  - Interest from China Southern Grid to develop trading and generation in other GMS countries
  - Super-critical coal-fired BOT proposed in Viet Nam.

Global Experience in Clean Energy Development – Africa Prospect

- Africa is in a good position to leapfrog some stages of development to avoid locking the continent into an energy intensive growth path- telecommunication experience