Summary of Discussions
Sixth Meeting of the Planning Working Group (PWG-6) of the Regional Power Trade Coordination Committee (RPTCC)
Ho Chi Minh City, Viet Nam, 20 November 2008

1. **Objectives.** The PWG-6 meeting will revisit/ review the results and accomplishments under the regional technical assistance project (RETA) 6304 (Regional Power Trade Coordination and Development), particularly in the areas of training, database/ website development, master plan study, and studies on performance standards and transmission regulation. The meeting will also discuss the proposed next steps under the new RETA 6440: (Facilitating Regional Power Trading and Environmentally Sustainable Development of Electricity Infrastructure in the GMS), which was approved by ADB in December 2007 and funded by the Swedish International Development Cooperation Agency (Sida).

2. The PWG-6 meeting was held in Ho Chi Minh City, Viet Nam on 20 November 2008 and co-organized by the Electricity Regulatory Authority of Viet Nam (ERAV)-Ministry of Industry and Trade (MOIT) and the Asian Development Bank (ADB). It was attended by PWG nominees of the six GMS member countries, as well as by representatives of ADB, Agence Francaise de Developpement (AFD), Australian Agency for International Development (AusAid), Japan International Cooperation Agency (JICA), Mekong River Commission (MRC), RTE International, Swedish International Development Cooperation Agency (Sida), Soluziona, and World Bank (WB). Attached is the agenda and program of the meeting (Annex 1) and the list of PWG-6/ FG-7 participants (Annex 2).

3. The PWG-6 was co-chaired by Mr. Daovong Phonekeo, Deputy Director General of the Department of Electricity, Ministry of Energy and Mines, Lao PDR, and Mr. Yongping Zhai, Principal Energy Specialist, Infrastructure Division, Southeast Asia Department (SEID), ADB.

Opening Session

4. Mr. Nguyen Vu Quang, Deputy Director General, ERAV-MOIT, welcomed the participants to the meeting and thanked ADB and the development partners for the support to the development of the GMS energy sector. He emphasized the importance of the studies and activities being undertaken by the RPTCC to develop regional power trade arrangements under the purview of the Inter-Governmental Agreement on Regional Power Trade (IGA). He hoped that the discussions would yield substantive outputs and wished the meeting a complete success.

5. Mr. Yongping Zhai, SEID, ADB, welcomed the participants and thanked the host, ERAV, for the hospitality and excellent meeting arrangements. He noted that we are on the threshold of starting work on key activities that would help us realize the initial stages of regional power trade as specified in the road map. He then explained that the meeting will review the results and accomplishments under the current AFD-supported RETA, and deliberate on the proposed next steps that should be the focus/ direction under the new Sida-supported RETA.

Review of Results/ Accomplishments under RETA 6304

6. **Training Program**. Soluziona (Mr. Karacsonyi and Mr. Castrillo) reviewed the results of training program implementation under RETA 6304. He presented the various training courses implemented, and elaborated on the suggested courses that include: (i) national and regional

grid code, (ii) tariff mechanism for cross-border trading, and (iii) organization, duties and responsibilities of regulator, transmission system operator (TSO), and market operator.

7. **Discussions**. ADB took note of the proposed additional training courses and said it would assess whether some of these could be supported under subsequent technical assistance.

8. **Database and Website**. Soluziona (Mr. Castrillo) provided an overview of the recent milestones in database and website development. He explained the key features of the website (home page, forum, database access and maintenance) and the suggested user profiles for website administrator, country administrator, and private and public users. Issues and next steps included updating of data and training of country administrators, the maintenance of hardware and software, and payment of annual subscription fees.

9. **Discussions**. Mr. Zhai thanked PRC for agreeing to host the database, which is a good demonstration of GMS ownership of power trade development activities. He said the development partners (ADB, AFD, and Sida) could support the launch of the database/ website but the long-term maintenance of the system depends on the GMS countries' commitment. PRC enjoined the GMS countries to increase their interaction through the website, and to help in regularly updating the database. Viet Nam noted that there should be some indication of what information should be updated regularly. The GMS country delegations were requested to update their respective nominees for website country administrator. ADB asked Soluziona to consult the country nominees on the needed training for website maintenance and other follow-up actions.

10. Sida asked about the kind of information that could not be accessed by the public through the website. Soluziona provided examples of data with general and limited access. ADB noted the need for procedures in deciding on whether data is public or private. The WB gave suggestions on ensuring sustainability of the database, encouraging the countries to use the database and provide feedback and suggestions for improvement.

11. **Master Plan Activities**. Soluziona (Mr. Karacsonyi) gave a recap of the scope of work and the activities carried out under the indicative master plan study. He briefed on the master plan methodology, showing the input data and process used to obtain the desired outputs (optimal solutions). He gave the summary of results of sensitivity analysis and the recommendations for next steps and future improvements for the master plan exercise.

12. **Discussions**. ADB (Mr. Zhai) requested the views of GMS representatives on the relationship of their national master plans with the regional master plan. Soluziona felt that the optimal arrangement is for each country's national master plan be adjusted based on results of the GMS master plan. Viet Nam noted the differences in results of national and regional plans, in particular capacity of interconnections. Myanmar noted ongoing discussions for power exports to its GMS neighbors, which constitute the cross-border element of its power program. Lao PDR suggested strong consideration of generation prospects in the planning of cross-border lines. Thailand said the study should recommend the amount of power for cross-border trade rather than the list of generation projects that could provide the power as there are many uncertainties for the implementation of the generation projects. ADB noted that planning is complicated by changes in the viability and priority accorded by the countries to various power projects. Cambodia proposed that the consultant coordinate with power officials on the priority cross-border projects being considered in their national master plans.

13. ADB asked the countries to indicate their domestic limitations on how much power can be imported. Based on the GMS delegates' responses, the limitation ranged from 15 to 25 percent of total power supply. RTE International and Sida briefed on the various constraints and arrangements in power trade in Europe, i.e. that there exist no limitation on volumes or sources of electricity that may be traded between EU member states but that technical limitations may exist due to system security requirements by the Transmission System Operator (TSO) in each EU-member state. WB suggested that the optimization model should be owned by the GMS countries which could be applied in national planning, and in planning for GMS transmission and generation projects.

14. **Performance Standards and Transmission Regulation**. Soluziona (Mr. Del Mundo) briefed on the activities to develop performance standards (PS) and transmission tariffs, which include new activities such as determining transitory PS for countries that do not yet fulfill the regional grid code requirements, and methodology for power systems studies. Workshops were held to incorporate GMS comments, and a final report containing the following deliverables was presented: proposal for regional PS; transition arrangements; methodology for power systems studies to be performed when interconnecting two GMS systems; guidelines for design of new transmission facilities linked to PPAs; and proposal for compensation for transits. Sida requested the consultant (Soluziona) to provide its opinion on how close- or how far away- the consultant believed that a baseline was in terms of the GMS member countries adopting such baseline PS (in years or alternatively as a percentage of 100%).

15. **Discussions**. ADB (Mr. Zhai) stressed the need to discuss the next steps for the studies. Soluziona said this could include carrying out exercises using the prescribed methodology in the conduct of feasibility studies of priority projects. ADB (Mr. Humbert) said that the performance standards study results should be taken into account in preparing the key GMS transmission projects in the ADB pipeline. Lao PDR (Mr. Daovong, co-chair) requested clarification on the proposal for transition until performance standards targets are achieved.

16. Thailand noted that the consultant could guide the GMS countries in developing the standards and on the steps needed to achieve these standards. Soluziona recommended building capacity so that personnel in operation and control processes aim for the fulfillment of performance standards. Cambodia said that its developing grid code is similar to the one being proposed by the consultant, signaling its readiness to comply with performance standards. Soluziona based its assessment on Cambodia's answer to the questionnaire, in the absence of other verifiable information. Thailand inquired whether the performance standards study, as submitted, is adopted.

Closing Session

17. ADB noted that further discussion and confirmation of agreements on performance standards would be tackled in the FG meeting the following day, along with a recap of the agreed next steps for training, database/ website maintenance and master plan updating.

18. **Consideration and Adoption of Proceedings**. Mr. Zhai announced the distribution of the draft summary of proceedings for review by the participants. After the PWG members reviewed the draft summary of proceedings, and after incorporation of suggested changes, the body therefore approved the minutes of the PWG-6 meeting *ad referendum*.

19. **Summary and Closing Remarks**. Mr. Zhai thanked the participants and appreciated the participants' contributions during the extensive discussions that took place.

Summary of Discussions
Inception Meeting of RETA 6440
Ho Chi Minh City, Viet Nam, 20 November 2008

1. **Objectives.** The Inception Meeting of regional technical assistance (RETA) 6440 will present and discuss the approach, methodology, work plan and timetable, implementation organization and deliverables of RETA 6440. The meeting will also discuss the ways to advance further regional power trade by building up on the current outputs of RETA 6304 as taken up in the PWG-6 session earlier.

2. The RETA 6440 (Inception) meeting was held in Ho Chi Minh City, Viet Nam on 20 November 2008 and co-organized by the Electricity Regulatory Authority of Viet Nam (ERAV)-Ministry of Industry and Trade (MOIT) and the Asian Development Bank (ADB). It was attended by PWG nominees of the six GMS member countries, as well as by representatives of ADB, Agence Francaise de Developpement (AFD), Australian Agency for International Development (AusAid), Japan International Cooperation Agency (JICA), Mekong River Commission (MRC), RTE International, Swedish International Development Cooperation Agency (Sida), Soluziona, and World Bank (WB). Attached is the agenda and program of the meeting (Annex 1) and the list of inception workshop participants (Annex 2).

3. The meeting was co-chaired by Mr. Duy Thanh Bui, Energy Economist, Infrastructure Division, Southeast Asia Department (SEID), ADB and Mr. Daovong Phonekeo, Deputy Director General, Ministry of Energy and Mines, Lao PDR.

Opening Session

4. Mr. Duy Thanh Bui, Energy Economist, Infrastructure Division, Southeast Asia Department (SEID), ADB, welcomed the participants and thanked Sida for the valuable support provided to this RETA. He informed of the objective of the meeting is to discuss the consultant presentation and to set priority of the future activities taking into consideration the MOU-2 on the power trade road map. He noted that the consulting firm for the RETA (RTE France International), will present the proposed approach/ methodology for the RETA, and will lead in the discussions of the work plan/ timetable of the RETA and their links to RETA 6304 outputs. In refining the approach, methodology and work plan the consultant will be guided by the GMS representatives' views on the proposed approach and work plan, activities and outputs.

Inception Report of Consultant for RETA 6304

5. **Introduction**. Mr. Michel Caubet, Team Leader, RTE International gave the overview of the presentation organized as follows: background, project objectives, project organization, presentation of components 1 and 2, kick-off meeting, and evaluation of risks. He briefed on the two components of the project. As background, he discussed the challenges of the GMS electricity sector and the progress of power cooperation and integration since 1992. The key objectives of the project include, among others: review and update of the regional master plan; operationalizing the power database; demonstrating the benefit sharing mechanism; and defining an appropriate regulatory framework, among others. He described the project organization, comprising strong association of well-known international consulting firms, in partnership with national consulting firms in GMS countries. A regional project office was set up in Bangkok, and a website for the project is planned to be developed (with both public and private components).

6. **Presentation of Report- Component 1, Module 1**. RTE-EDF (Mr. Christian Viladrich) introduced the team for module 1 and explained the objective, which is to update the master plan. He discussed the various tasks planned for the module, which include: data gathering, description of power sector profiles in each GMS country, review and update of national power development programs (PDPs), common planning criteria for regional master plan, and the update of the master plan The latter comprises four critical steps, e.g., analysis of potential power trade, review of master plan, update of master plan (simulation using planning software), and recommendation of a road map. He emphasized on the need for GMS countries to actively participate and provide inputs and use the outputs.

7. **Presentation of Report- Component 1, Module 2**. RTE-Nord Pool (Mr. Terje Lysfjord) briefed on the Nordic power market and the European power market (current and future scenario). He gave an overview of the five tasks for module 2 (Assessment of benefits) and introduced the project team. He then discussed the features of the candidate international projects that could be used as benchmarks, and stressed the importance of guidelines for a methodology for assessment and sharing of benefits.

8. **Presentation of Report- Component 1, Module 3**. RTE-PPA Energy (Mr. Jonathan Hedgecock) gave the overview of module 3 (power transmission studies) which is complementary to module 1. He explained the various tasks of the module as follows: review of previous studies/ update of data, assessment of candidate transmission projects, assessment of potential for synchronous operation, HVDC versus AC interconnection options, training, and load flow studies. He stressed the importance of drawing upon local knowledge and expertise for the effort.

9. **Presentation of Report- Component 1, Module 4**. Mr. Caubet explained the various tasks under this module as follows: data collection (with country reports as output), review and assessment of current regulatory framework, review of international experiences, conceptual design of the GMS regional electricity market, and institutionalization and implementation strategy for a regional regulatory forum (RRF). Mr. Caubet indicated that this Module 4 include activities envisaged in the MOU-2 in particular: completion of the study on GMS performance standard; completion of the study on transmission regulations and completion study on metering arrangement. He mentioned that these studies were not included in the TOR however during the contract negotiation, it was agreed to include them.

10. **Work Plan and Timetable**. Mr. Caubet gave the work plan and timetable for all four modules of component 1 and discussed the specific inputs required, and outputs expected under each module. He also showed some differences between the RTE proposal and the requirement of the MOU-2 and expressed hope that the meeting will provide clear guidance toward the priority of the activities.

11. **Discussions**. ADB (Mr. Bui) requested feedback from GMS representatives on their expectations from RETA 6440, and what activities should be given emphasis. Thailand noted the differences between the RETA's TOR earlier submitted to the GMS countries and the TOR as stemmed from the consultant proposal. ADB (Mr.Bui) explained that the structure of the TOR remains the same, comprising the same components and tasks. He further explained that there is in fact some elaboration of the original TOR because while ADB inviting for bidders, ADB received a number of questions for clarification, as a result of such clarification, TOR was further elaborated. In addition, given that the TA was approved in December 2007 while the MOU was signed in March 2008 during contract negotiations with the consultant, ADB elaborated further

the TOR to reflect closer the situation. ADB (Mr. Zhai) added that presentation of the inception report to the countries at the FG/ RPTCC constitutes one way of obtaining GMS countries' feedback on and confirmation of the TOR. Thailand opined that that the Road Map in MOU-2 should be followed and the proposal of RTE seems to go beyond the MOU. This point is to be elaborated and agreed upon by the RPTCC-7.

12. Lao PDR (Mr. Daovong) suggested review of MOU-2 to determine what are achievable given the resources under the RETA 6440. Myanmar noted that we should not deviate from the milestones in MOU-2 since this was signed by Ministers of the GMS countries. Viet Nam suggested that responsibilities of each GMS member must be specified with respect to the regional master plan, to ensure GMS ownership. ADB (Mr. Zhai) suggested moving to component 2 to give GMS members the total picture for the RETA.

13. **Presentation of Report- Component 2**. RTE-CEERD (Mr. Thierry Lefevre) provided a background on environmental issues of energy development, and discussed the specific objectives of component 2 and how this component would be linked with component 1. He discussed the scope of work and TOR for component 2, showed the team of experts for the component, and explained the methodology which includes desk studies, meetings and interviews, expert surveys, workshops, on-the-job trainings and field trips. He presented the inputs and outputs under this component. Mr. Lefevre then discussed the characteristics of strategic environmental assessments (SEA), and environmental impact assessments (EIA) and highlighted their differences. He explained the SEA process and discussed the need for alternative scenarios in implementing programs, with scenarios constituting a framework for predicting the future.

14. RTE-CEERD (Mr. Richard Frankel) summarized the goals of sustainable development and the role of SEA and EIA as tools for providing environmentally friendly options at early stages of development planning. He explained the generalized EIA process flowchart and discussed the characteristics of social impact assessment (SIA) and health impact assessment (HIA) which form part of the EIA.

15. RTE (Mr. Caubet-Team Leader) reported on the outcome of the Kick-Off meeting of the project in Bangkok last 17-18 November 2008 and discussed the risk assessment (challenges, associated risks and preventive actions) for modules 1 to 4.

16. **Discussions**. ADB (Mr. Bui) welcome the RTE risk assessment at the beginning of the project remarked that the changing situation surrounding the project could heighten or mitigate these risks. Lao PDR noted that since component 2 refers more to the environment sector, he asked that the RPTCC be regularly furnished updates on the progress of this component. AFD said that work under the RETA's component 2 could be expanded to include scenario analysis that factors in environmental costs, and fully implement a SEA of the regional master plan under component 1.

17. WB recalled that the MOU-2 specified the minimum accomplishments by a certain time frame, and does not prohibit additional work that may be done, and recognized that concurrence of GMS countries is needed for additional work proposed. Sida requested that the Consultant's work plan and reporting be based on the logframe in the project document for RETA 6440 in order to ensure results based management of the contribution. Further, Sida asked whether the GMS countries have approved the logical framework of the RETA (objective, outcome and outputs) that should guide in the RETA's implementation, monitoring and evaluation. Mr. Bui requested GMS countries to reply to Sida question but there was not direct response. Mr. Bui

explained that by giving non-objection to the TA, GMS countries approved the TA and its logframe. As there was not further comment from the audience, Mr. Bui added that additional views on the RETA's approach may be raised in the FG/ RPTCC meetings the following day.

Closing Session

18. **Consideration and Adoption of Proceedings**. Mr. Bui announced the distribution of the draft summary of proceedings for review by the participants. After the body reviewed the draft summary of proceedings, and after incorporation of suggested changes, the body therefore approved the minutes of the inception meeting of RETA 6440 *ad referendum*.

19. **Summary and Closing Remarks**. Mr. Bui thanked the participants and appreciated the participants' contributions during the extensive discussions that took place.

Summary of Discussions
Seventh Meeting of the Focal Group (FG-7) and Seventh Meeting of the Regional Power Trade Coordination Committee (RPTCC-7)
Ho Chi Minh City, Viet Nam, 21 November 2008

1. **Objectives.** The FG-7 meeting will take up the power sector updates in each country, and will also review the overall results of RETA 6304 in order to determine the way forward with respect to: (i) data collection and addressing key issues in performance standards and transmission regulation; (ii) topics for subsequent training courses; (iii) enhancing database/website use and administration; and (iv) applying the master plan model (in relation to the energy strategy and country power programs).

2. The RPTCC-7 meeting will affirm the matrix of results of RETA 6304: Regional Power Trade Coordination and Development, and the proposed next steps under RETA 6440: Facilitating Regional Power Trading and Environmentally Sustainable Development of Electricity Infrastructure in the GMS, to be clarified in relation to the milestones prescribed in the MOU on the Road Map for GMS Cross-Border Power Trading.

3. The FG-7/ RPTCC-7 meetings were held in Ho Chi Minh City, Viet Nam on 21 November 2008 and co-organized by the Electricity Regulatory Authority of Viet Nam (ERAV)-Ministry of Industry and Trade (MOIT) and the Asian Development Bank (ADB). It was attended by RPTCC members of the six GMS member countries, as well as by representatives of ADB, Agence Francaise de Developpement (AFD), Australian Agency for International Development (AusAid), Japan International Cooperation Agency (JICA), Mekong River Commission (MRC), RTE International, Swedish International Development Cooperation Agency (Sida), Soluziona, and World Bank (WB). Attached is the agenda and program of the meeting (Annex 1) and the list of FG-7/ RPTCC-7 participants (Annex 2).

4. The FG-7 meeting was co-chaired by Mr. Daovong Phonekeo, Deputy Director General of the Department of Electricity, Ministry of Energy and Mines, Lao PDR, and Mr. Yongping Zhai, Principal Energy Specialist, Infrastructure Division, Southeast Asia Department (SEID), ADB.

Opening Session

5. Mr. Yongping Zhai, Principal Energy Specialist, Infrastructure Division, Southeast Asia Department (SEID), ADB, welcomed the participants and explained that the FG-7 meeting will first share updates on the progress of power generation and interconnection programs of each GMS member. The meeting will then undertake a recap of the outputs of the current RETA 6304, and deliberate on the PWG's recommendations as to the proposed next steps for priority RPTCC activities. These efforts should help to find a good fit between these proposed next steps and the other key activities being planned under the new RETA 6440, to realize the milestones in the GMS Road Map for power trading.

6. Mr. Daovong informed of the agenda of the meeting, which will commence with the country reports on the status of power development programs.

Updates on Progress of Power Development Plans and Transmission Interconnection Projects (Country Presentations, Annex 3)

7. **Cambodia**. Mr. Heng Kunleang of the Energy Development Department, Ministry of Industry, Mines and Energy (MIME) gave an overview of Cambodia's power sector (capacity, consumption), energy policy, institutional structure, electricity sector status, and the power sector strategy. He presented the updates on the country's generation and transmission development plans, detailing the projects, their location and financing sources. He noted the projects with power trade and provincial/ rural electrification components and targets.

8. **Discussion**. Sida observed high targets for rural electrification and asked whether these would be met by on-grid or off-grid projects. Cambodia clarified that the rural electrification would mostly be by on-grid and off-grid, but some would tap backbone lines for power export. Sida asked about the social and environmental requirements for private power investors. Cambodia clarified that at present only environmental impact assessment (EIA) is being used. Thailand asked about the tariff setting for IPPs. Cambodia replied that the Electricity Authority of Cambodia is responsible for this.

9. **PRC**. Mr. Zhou Anshi of the Planning Department, CSG, provided the status of CSG in 2007, showing provincial coverage, generation mix and capacity, consumption, transmission capacity, provincial west-to-east power transfer, and power exchange between regions. He explained the basis of power grid planning (e.g. demand forecast, power capacity, provincial transfers) and detailed the various international cooperation projects with neighboring countries (Viet Nam, Lao PDR, Cambodia, Thailand, and Myanmar).

10. **Discussion**. Viet Nam inquired whether new high voltage (800 kV) lines in the CSG system would affect the interconnection program with GMS neighbors. CSG informed of cross-border interconnections with Viet Nam and Lao PDR for power trade purposes, in addition to the connections between provinces within the CSG grid.

11. **Lao PDR**. Mr. Vilaysone Sourigna, of the Department of Energy Promotion and Development-MEM presented a background on power cooperation projects with GMS neighbors, discussing the status of hydropower projects for export to Thailand and Viet Nam. He showed the proposed interconnections with Thailand and Viet Nam for transfer of power from the generation projects. He showed the updated power demand forecast (2007) and target household service penetration.

12. **Discussion**. PRC inquired about the tariff setting for IPP projects. Lao PDR responded that tariffs are affected by a number of factors- project cost, financial models, government policy, financing and routing of transmission. Viet Nam inquired about the changes in the hydropower export program and Lao PDR informed of the possibility of the outputs from some projects being sold to Thailand given its higher price offer. Sida asked about the plans for unbundling power generation and transmission functions. Lao PDR said the current network is very limited (at 115 kV) and the high voltage (500 kV) lines are dedicated for power exports. ADB briefed on the status of two projects receiving ADB financing, the Bansok-Pleiku 500kV Interconnection F/S project and the Nabong-Udon Thani transmission project.

13. **Myanmar**. U Maung Maung Kyaw, of Myanmar Electric Power Enterprise (MEPE), Ministry of Electric Power No. 2 (MOEP 2), explained the developments in the institutional/ policy framework for the power sector, detailing the functions assigned to MOEP 1 and MOEP 2 and the regulatory framework. He discussed the status of electricity demand and supply, and the progress in the power development program, detailing the hydropower projects and transmission lines under construction and planned for the future. He then discussed developments in power cooperation with GMS neighbors.

14. **Discussion**. Thailand asked about transmission system construction, and Myanmar clarified that this is undertaken by MEPE and local companies. The WB asked whether there is a system dispatcher and Myanmar replied that there is one for the 230 kV system that interconnects the country, and there are plans for 500 kV links from Mandalay to Yangon. Sida asked about the domestic tariff for power from hydropower projects exporting to Yunnan, PRC. Myanmar informed that 15% of output is provided free to the government, and the rest of the power used locally is charged 2.6 US cents per kWh, the same price for power sold to Yunnan.

15. **Thailand**. Mr. Varavoot of the Electricity Generating Authority of Thailand (EGAT) provided the progress of the country's power generation (including fuel mix in 2007) and an update of the forecast energy demand, reflecting slower growth forecast for 2008-09. He showed the preliminary adjusted power development plan for 2009-2016, and the status of discussions with IPPs for coal and gas power plants, and for hydropower purchased from neighboring GMS countries.

16. **Discussion**. PRC asked about the rationale for development of coal power plants and Thailand replied that this is in support of the government policy of fuel diversification. The WB asked about preferential policies for renewable energy and Thailand informed that the Ministry of Energy pays premium, on top of the base tariff, for energy purchase from small producers using biomass, wind and solar sources. There were additional discussions on the issues of: (i) power purchase from Myanmar (Tasang) and Lao PDR (Xayaburi), and (ii) sale of power to Thailand (from Koh Kong coal, Cambodia).

17. **Viet Nam**. Mr. Nguyen Anh Tuan of Electricity of Viet Nam (EVN) provided the progress of Viet Nam's power generation and transmission development plan. He discussed the trend in demand from 2001-2007 in relation to growth in transmission capacity. He explained the status of the power system, e.g., installed capacity, transmission grid composition, rural electrification rates, and power consumption (by industry). He showed the expected schedule of hydropower projects for export from Lao PDR and Cambodia to Viet Nam, and discussed the proposed interconnection plans for these projects, which includes the proposed Lao-Cambodia-Viet Nam interconnection line.

18. **Discussion**. Myanmar inquired about the factors behind the high rural electrification rate (97%) achieved by Viet Nam and EVN attributed this to strong government policy and support and effective partnerships with ADB and the World Bank. Sida asked Thailand and Viet Nam on how they ensure environment-friendly ways of power purchase from private investors in Lao PDR and Cambodia. Viet Nam noted that the law of the exporting country is being followed. Thailand said its power purchase follows social and environmental guidelines of the exporting country as well as the laws of Thailand.

Presentation of Agence Francais de Developpement (AFD): Views on Program Achievements and Potential Future Cooperation

19. AFD (Mr. Alexis Bonnel) presented on the contributions of AFD to regional coordination in the power sector. He gave a background of the AFD group, its present portfolio and range of financing tools, and its clean energy strategy (which includes demand side issues and energy service approaches). He discussed AFD's assistance to the GMS energy sector and focused on possible support for RPTCC, beyond the funding of RETA 6304. He shared AFD's views on the substantial program's achievements, such as the Indicative Master Plan and enhanced coordination between GMS countries and development partners on regional integration of the power systems. He expressed the opinion that RPTCC could build on studies and work

undertaken so far to enter into more concrete decisions and commitments. He also highlighted the importance of the adoption by GMS countries of a Regional Master Plan, as it represents a key tool to address the enormous energy challenges of the region, and would at the same time consolidate long term visibility and economic confidence among stakeholders, including financial partners. He discussed a number of ideas which could shape possible AFD's follow-up assistance to the RPTCC, such as: (i) improving resilience of regional power system to risks/ external shocks (development of a complete Strategic Environmental Assessment (SEA) of the Master Plan in coordination with the GMS Core Environment Program/ Environment Operations Center (EOC), inclusion of demand side management and energy efficiency strategies in RPTCC activities, carbon footprint assessment and climate change vulnerability analysis of strategies and priority projects, development of methodologies to access carbon finance that could be applicable to RPTCC programs); (ii) developing cross-capitalization, training and best practice dissemination in the areas of design and implementation of policies on energy efficiency, renewable energy and energy conservation. He outlined the different financing tools that could be mobilized from AFD, including country based study funds, an AFD funded GMS project preparation facility managed by ADB, and advisory and technical assistance in support of the RPTCC work plan. The presentation is attached as Annex 4.

Sida

20. Sida (Mrs. Karin Andersson) highlighted the importance of the RPTCC activities and noted that Sida's contribution emphasizes component 2 which deals with sustainability of regional power trade development. She hoped that energy efficiency and climate change issues would be addressed by the RPTCC despite their exclusion from the scope of RETA 6440. She said the presence of the MRC and EOC is a sign of seriousness in dealing with sustainability issues in energy development. She noted that ownership of the program would be key to ensuring results from the assistance provided by development partners and encouraged transparency to enhance stakeholders' involvement in the program.

World Bank

21. WB (Mr. Jie Tang) provided an update on the World Bank's projects in support of power trade in Cambodia and Lao PDR, including the project (in cooperation with ADB) for promoting rural electrification through the transmission project from Phnom Penh to Viet Nam border. He informed of the WB's support for carbon emission reduction initiatives in partnership with the United Nations and other international organizations.

JICA

22. JICA (Mr. Kazuya Maruo) informed that after its reorganization, JICA can now provide ODA loans, technical cooperation and grants. He informed that JICA's ongoing support, which includes assistance for preparation of the master plan in Cambodia and Viet Nam, transmission link in Cambodia and Lao PDR and third country training on rural electrification in Lao PDR can also contribute to the development of GMS power trade indirectly. He briefed on JICA's activities to help realize a low carbon society based on the "co-benefit" approach under the Cool Earth Partnership.

EOC

23. The EOC (Mr. Pavit Ramachandran) briefed on the Core Environment Program (CEP), which is a multi-donor program with funding from the Governments of Sweden, The

Netherlands, and Finland. He highlighted the importance of the energy sector in addressing key environmental issues, notably in mitigating climate change effects through reduced carbon emissions from the energy sector. He looked forward to further advancing the dialogue between the energy and environment sectors and other GMS sector working groups.

MRC

24. MRC (Mr. Do Manh Hung discussed the MRC's programs which are directly linked to the energy sector, such as the Water Utilization Program, the Basin Development Program, the Environment Program and the Hydropower Program. He expressed the hope for closer cooperation between MRC and the GMS Program in energy, such as in sharing of technical inputs and assessments and in addressing hydropower development issues in relation to Mekong river flows.

RPTCC-7 Meeting

25. The RPTCC-7 meeting was co-chaired by Mr. Thein Tun, Director General, Department of Electric Power, Ministry of Electric Power No. 2, Myanmar, and Mr. Yongping Zhai, Principal Energy Specialist, Infrastructure Division, Southeast Asia Department (SEID), ADB.

Opening Session

26. Mr. Yongping Zhai, Principal Energy Specialist, Infrastructure Division, Southeast Asia Department (SEID), ADB, welcomed the participants and explained that the RPTCC-7 meeting will review and act on the recommendations of the FG, particularly on the needed next steps corresponding to the outputs of RETA 6304. The meeting should be able to deliberate on the merits and needed improvements in the work plan for RETA 6440 in the light of the milestones in the power trade road map. He noted the key messages that have arisen from the PWG/FG meetings- (i) the need to operationalize the studies we have done; and (ii) the critical role of country ownership of the studies, to ensure these are adopted for implementation. As these messages imply, there is a need to review the earlier agreement- the MOU-2 on the power trade road map- and see how we can proceed in accordance with the milestones set in the MOU-2.

27. On the energy database and website, Mr. Zhai noted that a consensus was reached to organize training of country administrators to populate and institutionalize the website and database. Soluziona was asked to propose a training program that could help make the database more useful. He suggested that future RPTCC meeting notices will be made on this website.

Review of Road Map and Milestones in MOU-2

28. **Complete the Indicative Master Plan**. Thailand opined that the updating of "the indicative master plan" is beyond the activities timeline indicated in the MOU-2. Thailand also expressed concern about updating master plan studies that may take another 18 months. He stressed that establishing links between countries should be given precedence over the need to determine generation projects for export. Viet Nam suggested completing the performance standards (PS) study first, which should be applied to developing specific projects that should be PS-compliant. The WB noted that despite the lengthy process in agreeing on the master plan, what matters is for at least two countries to agree on projects to jointly work on. ADB's view is for the consultant to revise the proposal which will operationalize the master plan study to make it useful (and not update or complete it). A useful master plan is one in which priority

projects are identified for further action, such as the conduct of feasibility studies. Lao PDR agreed on the proposal for the consultant of RETA 6440 to help in making the master plan operational. Thailand expressed that instead of spending time to update the master plan, the countries should proceed to determine the feasibility of identified cross-border lines, and proceed with the ones found viable or look for alternatives to those found not viable. ADB (Mr. Bui) drew the meeting attention to the question of whether the GMS countries are satisfied with the master plan prepared by Soluziona Mercados. Mr. Bui argued that there is a need to complete the work done by Soluziona in order to complete the regional master plan. He stressed that the discussion during the PWG meeting showed that there is a need for improvement of the work done recently.

29. **Complete the Study on Performance Standards (PS)**. On whether the report prepared under RETA 6304 could be considered complete in form, Sida noted that it may be difficult to answer this question, given the differences in country situations. Thailand noted that the consultant has proposed some indicative figures as standards, but the countries have not yet agreed on these. Soluziona explained that standards have been proposed for the countries to consider and adopt. PRC said however that while the report on the PS is comprehensive, it does not provide specific figures that should be adopted for an interconnected system. For PS and transmission regulation, PRC noted that the consultant can compare the 500 kV systems used by PRC, Thailand and Viet Nam, and look into their common features and differences for a clearer overall picture, and incorporate the most appropriate 500 kV standards for the GMS. ADB (Mr. Humbert) informed of package 3 of RETA 6440 which would support feasibility study for interconnection between Cambodia, Lao PDR and Viet Nam. This study would also look at the compatibility of the systems of these three countries with Thailand's, with the view to a later interconnection with Thailand. Thailand suggested that the timeline for adopting the performance standard is also 2010, so each country still has time to prepare a plan to install equipment to reinforce the system to meet the standards. Viet Nam stated that PS should first be applied to cross-border interconnection projects and this would be the basis for the gradual adoption of the PS throughout the national grid. There is a need to determine at this point how far the countries are from meeting the standards. ADB (Mr. Zhai) proposed to RTE France to assess the PS situation and give recommendations to achieve the objective of preparing a plan to adopt the PS by 2010. RTE France agreed to submit the assessment within six weeks (by 6 January 2009).

Scope of work under the RETA 6440

30. The meeting discussed the scope of work of the RETA 6440. Thailand expressed the view that there were substantial differences between the TOR earlier submitted to the Government and the TOR that would guide the work of the consultant for the RETA. A concern was that the consultant would be asked to deliver more than what was necessary. Thailand view is that the scope of the TA as presented by the consultant is beyond the MOU-2. ADB (Mr. Bui) again explained that the scope of work under the TA is as submitted to countries for no-objection. He repeated his explanation about the revision and elaboration of the TOR, which took place from when the TA was approved, up to contract negotiation. Mr. Bui stressed that this elaboration and revision was done in the belief that it is good for achieving the RETA goals. There was no attempt to change the RETA. The other GMS members however expressed that there were no substantial differences in the TORs submitted to the Governments and the TOR provided to the RETA consultant. PRC also noted that the TOR of the consultant provides a step in the right direction for GMS power cooperation. The milestones in the road map for GMS power trading specified in MOU-2 could provide further guidance in adjusting as necessary, the

TOR of the RETA consultant to ensure attainment of the objectives for power trade under the MOU-2.

31. ADB (Mr. Zhai) requested the RETA consultant, RTE International, to revise its work plan taking into account the milestones in the MOU-2, especially the three studies (the study on GMS performance standard; completion of the study on transmission regulations and completion study on metering arrangement.) The consultant after discussing internally assured that it will accommodate the requirements of the RPTTCC meeting. Sida expressed concern however that the task of refining the TOR under RETA 6440 was handed to the consultant rather than being decided by the RPTCC based on the outcome under RETA 6304.

32. ADB explained that the process of consultations undertaken to finalize the TOR was adequate, and the inclusion of the TOR in the agenda of the PWG/FG/RPTCC meetings constitutes a part of such consultations. However, the meeting recognized the need for closer coordination between ADB and the executing agencies in the GMS countries, especially on the matter of finalizing the TOR and scope of work of technical assistance projects.

33. **Attendance to RPTCC Meetings**. The meeting agreed that in principle, no representative outside of the GMS region, except for development partners actively involved in regional power trade development, may participate in GMS RPTCC/FG/PWG meetings. In cases where interested stakeholders from within or outside the GMS would like to attend meetings, prior consultation with the GMS countries would be obtained.

Next RPTCC Meeting

34. The meeting agreed that next year's RPTCC/FG/PWG meeting would be held in Lao PDR, subject to confirmation by the Government of Lao PDR. If there is a need to organize a separate meeting of the PWG/FG, the countries will be consulted on the hosting arrangements.

Session VI: Closing Session

35. **Synthesis of Discussions/ Agreements**. Mr. Zhai emphasized the need for the consultant to carefully assess the status of the outputs of RETA 6403 and the requirements of the MOU-2, and refine its work plan under RETA 6440 as necessary to accomplish the milestones in MOU-2. In response to Thailand's request for feedback on this assessment, Mr. Zhai informed the meeting that the consultant will be asked to report back on this assessment after 15 days. A small group may be convened as necessary to discuss this assessment.

36. **Consideration and Adoption of Proceedings**. Mr. Zhai announced the distribution of the draft summary of proceedings for review by the body. After the FG/ RPTCC members reviewed the draft summary of proceedings, and after incorporation of suggested changes, the body therefore approved the minutes of the FG-7/RPTCC-7 meeting *ad referendum*.

37. **Closing Remarks**. Mr. Zhai encouraged frank and open discussions in future meetings to realize substantive outcomes and maximize inputs from the technical knowledge and expertise of the meeting participants.

FINAL AGENDA

Greater Mekong Subregion
Regional Power Trade Coordination Committee (RPTCC)
Sixth Meeting of the Planning Working Group (PWG-6)
and Inception Meeting of RETA 6440
Ho Chi Minh City, Viet Nam, 20 November 2008

Agenda and Program

19 Nov (Wed)	Arrival of Delegates
20 Nov (Thurs)	**Day 1 (am): PWG-6 Meeting**
08:30am- 08:45am	Registration
08:45am- 09:00am	Opening Session
09:00am- 10:30am	Review of Results/ Accomplishments Under RETA 6304: Regional Power Trade Coordination and Development - Training Program - Database and Website - Master Plan Methodology/ Results - Performance Standards (Interim Standards, Interconnection Methodology) - Transmission Regulation (Data for Interconnection Studies, Design of New Transmission Facilities, Cross-Border Tariffs) - Discuss ions - Soluziona/ ADB
10:30am- 10:45am	Coffee Break
10:45am- 12:00nn	Proposed Next Steps for RETA 6 440: Facilit ating Regio nal Power Trading and Environme ntally Sustainable Development of Electricity Infrastructure in the GMS - Power Sys tem (PS) Studies (Methodology: Voltage Control Performance, Loads Flow, Dynam ic Studies, Primary Fre quency Control) - Indicative Master Plan Update/ Enhancement - Operational Rules for t he Electricit y Market (Coordination Among National S ystem Op erators [S Os], Information Exchange, Schedule/ Control of Flows, Settlement) - Details of Proposed Training Courses - Details of Study of Regional Performance Standards - Maintenance/ Sustainability of Database/ Website
12:00nn- 12:30nn	Synthesis of Discussions/ Agreements - Chair of PWG Consideration and Adoption of Proceedings Closing Remarks
12:30nn- 02:00pm	**Lunch Break**

20 Nov (Thurs)	**Day 1 (pm): Inception Meeting of RETA 6440- Facilitating Regional Power Trading and Environmental Sustainable Development of Electricity Infrastructure in the GMS**
02:00pm – 02:15pm	Opening Session
02:15pm- 03:30pm	Inception Report of Consultant for RETA 6440 (Part I) - Introduction of Consultant (RTE France) - Presentation of Inception Report - Presentation of Approach and Methodology for RETA 6440
03:30pm- 03:45pm	Coffee Break
03:45pm- 04:45pm	Inception Report of Consultant for RETA 6440 (Part II) - Presentation of Work Plan and Timetable for RETA 6440 (in relation also to the Milestones for Achieving Stage 1 of RPTOA) - Discuss ions - How the outputs of RETA 6304 and RETA 6440 will be linked; Consolidation of views/ comments of GMS representatives on proposed approach/ methodology and work plan/timetable - RTE France, Soluziona, ADB
04:45pm- 05:00pm	Closing Session Synthesis of Discussions/ Agreements Consideration and Adoption of Proceedings Closing Remarks
7:00 pm	Dinner Hosted by ADB (Venue to be announced)

Greater Mekong Subregion
7th Meeting of the Focal Group (FG-7) and
7th Meeting Regional Power Trade Coordination Committee (RPTCC-7)
Ho Chi Minh City, Viet Nam, 21 November 2008

Agenda and Program

21 Nov (Fri) **Day 2 (am): FG-7 Meeting**

08:45am – 09:00am Registration

09:00am-09:15am Opening Session

09:15am- 10:30am Country Re ports on P rogress of Power Development Plans and Transmission Interconnection Projects (10 minutes each country)

Cambodia
People's Republic of China
Lao PDR
Myanmar
Thailand
Viet Nam
- Discuss ions

10:30am- 10:45pm Coffee Break

10:45am – 11:45nn Results Under RETA 6304; Proposed Next Steps
(In Relation to the Milestones in the MOU on the Road Map for GMS Cross Border Power Trading)
- Database and Website Complete Turnover
- Recap of Training and Capacity Building
- Master Plan Component, Follow up Actions
- Performance Standards Study (and Other Related Issues)
- Transmission Regulation Study (Cross-Border Tariffs, etc.)

- Discuss ions
- Soluziona/ ADB

11:45nn- 12:10nn Presentation of Agence Francais de Developpement (AFD)
(Views on Program Achievements and Potential Future Cooperation)
- Discuss ions
- AFD/ ADB

12:10nn– 1:30pm **Lunch Break**

21 Nov (Fri) **Day 2 (pm): RPTCC-7 Meeting**

01:30pm – 01:45pm Opening Session

01:45pm- 02:30pm Presentation of Matrix of Results Under RETA 6304; Proposed Next Steps (In Relation to the Milestones in the MOU on the Road Map for GMS Cross Border Power Trading)
- Database and Website Complete Turnover

- Recap of Training and Capacity Building
- Master Plan Component, Follow up Actions
- Performance Standards Study (and Other Related Issues)
- Transmission Regulation Study (Cross-Border Tariffs, etc.)

- Discuss ions
- Soluziona/ ADB

02:30pm- 03:45pm Discussion on how to Prioritize RETA 644 0 Work to Meet the Timelines S et in the MOU on the Road Map for Impleme nting GMS Cross Border Power Trading
- GMS Countries' Comments on the Proposed Work Plan
- ADB

03:45pm- 04:00pm Coffee Break

04:00pm- 04:15pm Presentation of Summary of Recommendatio ns/ Agreements from PWG/FG Discussions
- ADB

04:15pm- 04:45pm Closing Session

Synthesis of Discussions/ Agreements in the RPTCC-7 Meeting
- RPTCC

Consideration and Adoption of Proceedings

Closing Remarks

Greater Mekong Subregion
Second Meeting of the
Subregional Energy Forum (SEF-2)
Ho Chi Minh City, Viet Nam, 22 November 2008

Agenda and Program

22 Nov (Sat) **Day 3: SEF-2 Meeting**

08:15am – 08:30am Registration

08:30am-08:45am Opening Session

08:45am – 10:15am Study to Prepare Medium Term (2008-2015) Road Map and Work Plan for Expanded Cooperation in Energy
- Presentation of Study Results/ Recommendations
- Highlights of Road Map, Proposed Projects/ Activities, Timetable
- Critical Next Steps
- Discussions and Comments of GMS countries on proposals
- Consultant/ ADB

10:15am- 10:45am Climate Change Implementation Plan (CCIP) and the Linkage with RETA 6440's Environment Work and Those of the Environment Operations Center (EOC) in Bangkok
- Coordination of CCIP Activities with EOC
- Strategic Environmental Assessment Work in Viet Nam
- ADB, EOC

10:45am- 11:00am Coffee Break

11:00am- 12:00nn Brainstorming Discussion
- Coordination Arrangements Between EOC/ Core Environment Program (CEP) Activities and RETA 6440 (especially in component 2 in finding the geographic and problematic fit between the two when selecting projects for on-the-job capacity building)
- RTE France, EOC, ADB

Application of the Work Done by EOC on Strategic Environmental Impact Assessment for RETA Training Purpose

12:00nn– 1:00pm **Lunch Break**

01:00pm- 02:00pm Country Presentations on Developments in Energy Sector (oil, gas, renewable, etc.-other than power)
Country Responses to Climate Change Issue (10 minutes each)

Cambodia
People's Republic of China
Lao PDR
Myanmar
Thailand
Viet Nam

02:00pm-02:20pm	Coordination in Rolling Out and Follow Through of the Energy Sector Strategy (ESS) (Based on Road Map, Work Plan, and Timetable for expanding energy cooperation as agreed at the first session) - RTE France, ADB
02:20pm- 02:40pm	Closing Session - Chair's Synthesis of Discussions/ Agreements in SEF-2 - - Consideration and Adoption of Proceedings - - Closing Remarks

Greater Mekong Subregion
7th Meeting of the Regional Power Trade Coordination Committee
and 2nd Meeting of the Subregional Energy Forum
20-22 November 2008
Caravelle Hotel, Ho Chi Minh City, Viet Nam

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Greater Mekong Subregion (GMS)

Seventh Meeting of the Focal Group *(FG-7)*

Cambodian Power Development Plans

Ministry of Industry, Mines and Energy

Ho Chi Minh, Viet Nam, 21 November, 2008

Overview of Power Sector

- Cambodia's power sector was rehabilitated since 1995
- EDC's Capacity output in 2007 : 194.8 MW and 1071 GWh
- Projection in 2024 : 3045.33 MW and 16244.61 GWh
- At present, only 20 % of households has access to electricity
- Annual energy consumption per capita: 103 kWh
- 22 small isolated power system
- High potential of hydro source : more than 10,000 MW

Energy Policy

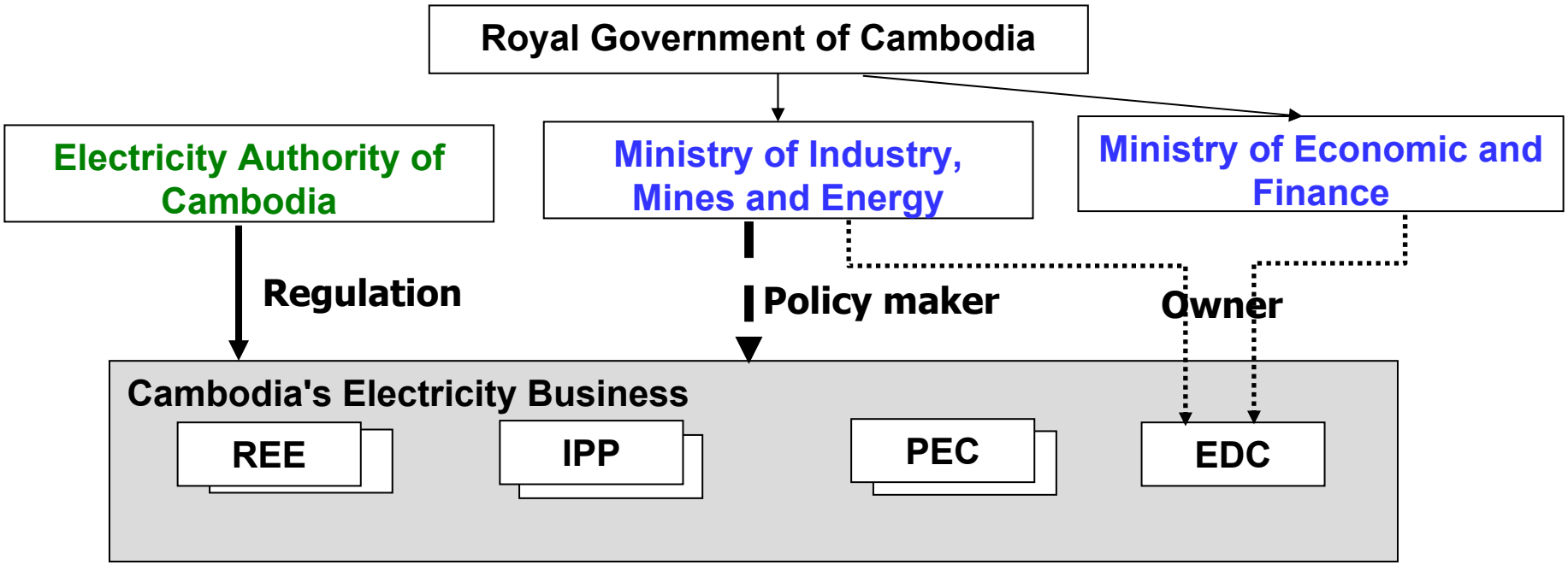
To provide an adequate supply of energy throughout Cambodia at reasonable and affordable price,

To ensure a reliable and secured electricity supply at reasonable prices, which facilitates the investments in Cambodia and developments of the national economy,

To encourage exploration and environmentally and socially acceptable development of energy resources needed for supply to all sectors of Cambodia economy,

To encourage the efficient use of energy and to minimize the detrimental environmental effects resulted from energy supply and consumption.

Current Structure of Electricity Sector



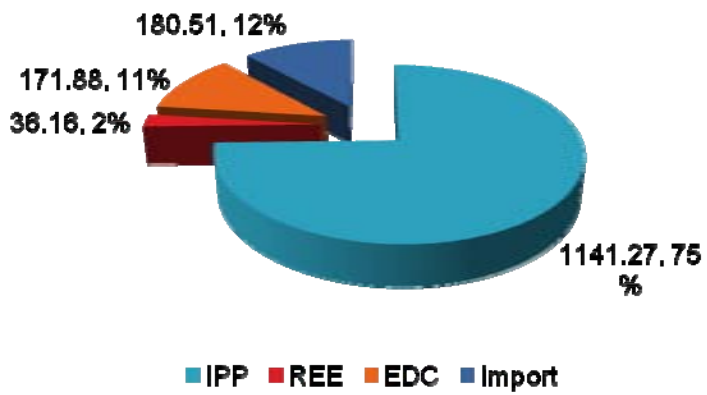
Ownership of EDC

Policy; Planning; Development; Technical standard

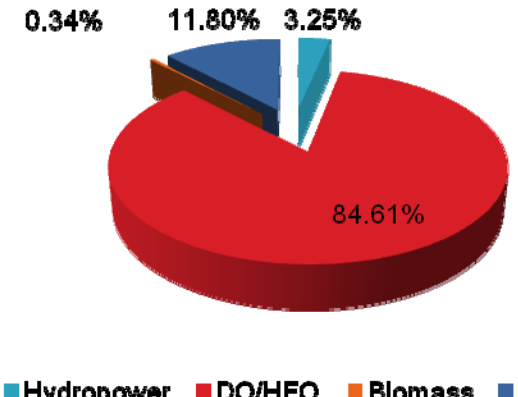
Tariff, license,finances and performance; Enforce the regulations, rules and standards

Current Electric Sector Status

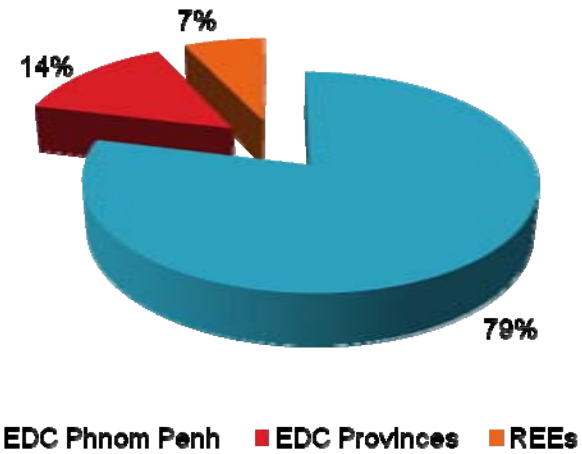
Energy Dispatched (GWh) In 2007



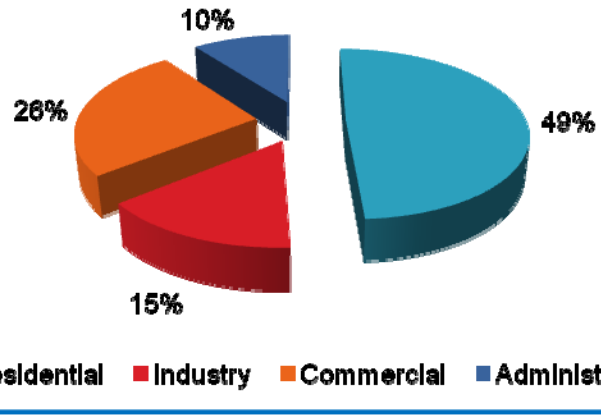
Generation by Fuel Type (GWh) In 2007



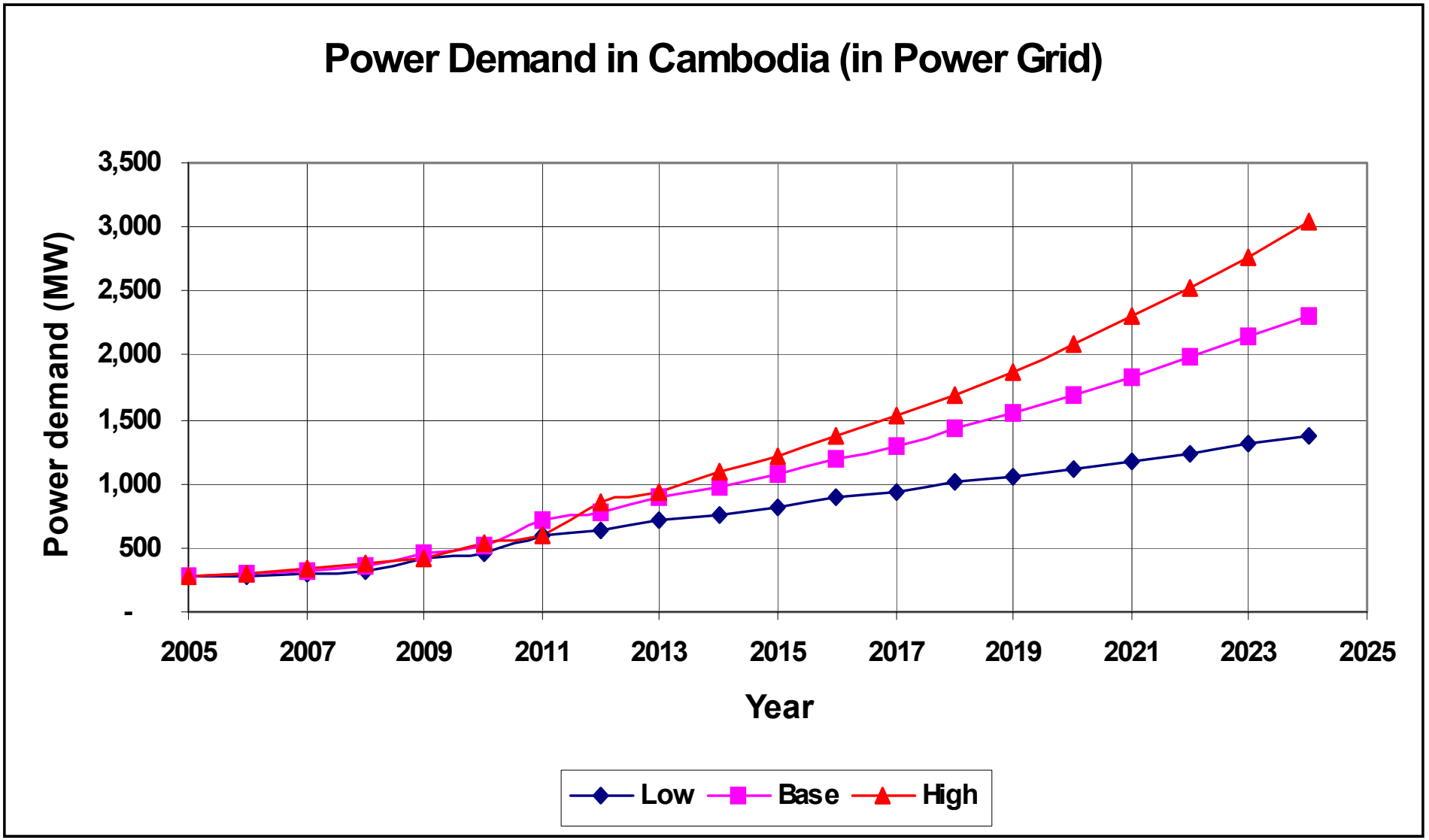
Energy Distributed by Areas



Energy Consumption by Sectors In 2007



Cambodia Power Demand



Cambodia Power Sector Strategy

Cambodia Power Strategy Components:

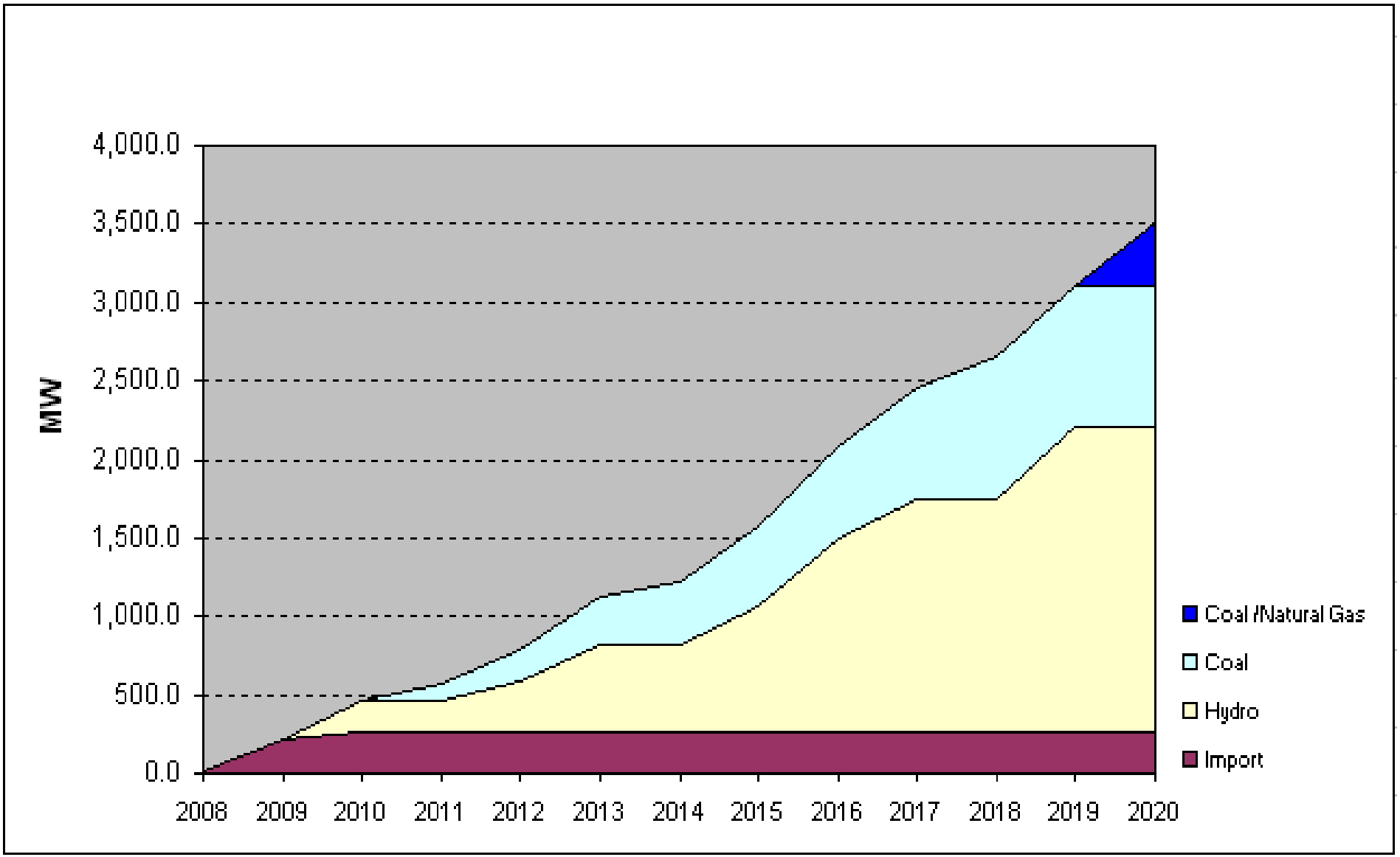
A- Development of Generation and Transmission

B- Power trade with neighboring countries

C- Provincial and Rural Electrification Program

No.	A. Generation Expansion Plan	Fuel	MW	Year	Export
1	Kirirom III Hydro power Plant	Hydro	18	2010	
2	Kamchay Hydro Power Plant	Hydro	193	2010	
3	200 MW Coal Power Plant (I) in Sihanouk Ville - Phase 1	Coal	100	2011	
4	Atay Hydro Power Plant	Hydro	110	2012	
5	200 MW Coal Power Plant (I) in Sihanouk Ville - Phase 2	Coal	100	2012	
6	700 MW Coal Power Plant (II) in Sihanouk Ville -Phase 1	Coal	100	2013	
7	Lower Stung Rusey Chhrum Hydro Power Plant	Hydro	338	2013	
8	Tatay Hydro Power Plant	Hydro	246	2013	
9	700 MW Coal Power Plant (II) in Sihanouk Ville -Phase 2	Coal	100	2014	
10	700 MW Coal Power Plant (II) in Sihanouk Ville -Phase 3	Coal	100	2015	
11	700 MW Coal Power Plant (II) in Sihanouk Ville -Phase 4	Coal	100	2016	
12	Lower Sesan II + Lower Srepok II	Hydro	420	2016	Oriented
13	Stung Chay Areng Hydro Power Plant	Hydro	108	2017	
14	700 MW Coal Power Plant (II) in Sihanouk Ville -Phase 5	Coal	100	2017	
15	700 MW Coal Power Plant (II) in Sihanouk Ville -Phase 6	Coal	200	2018	
16	Steung Treng Power Plant	Hydro	980	2018	Oriented
17	Sambor Hydro Power Plant	Hydro	2600	2019	Oriented
18	Coal Power Plant (III) or Gas Power Plant	Coal/NG	450	2020	
Lower Sesan III (375 MW), Lower Srepok III (330MW) & IV (235 MW)		Hydro			Oriented

Generation Expansion Plan
(2008 – 2020)



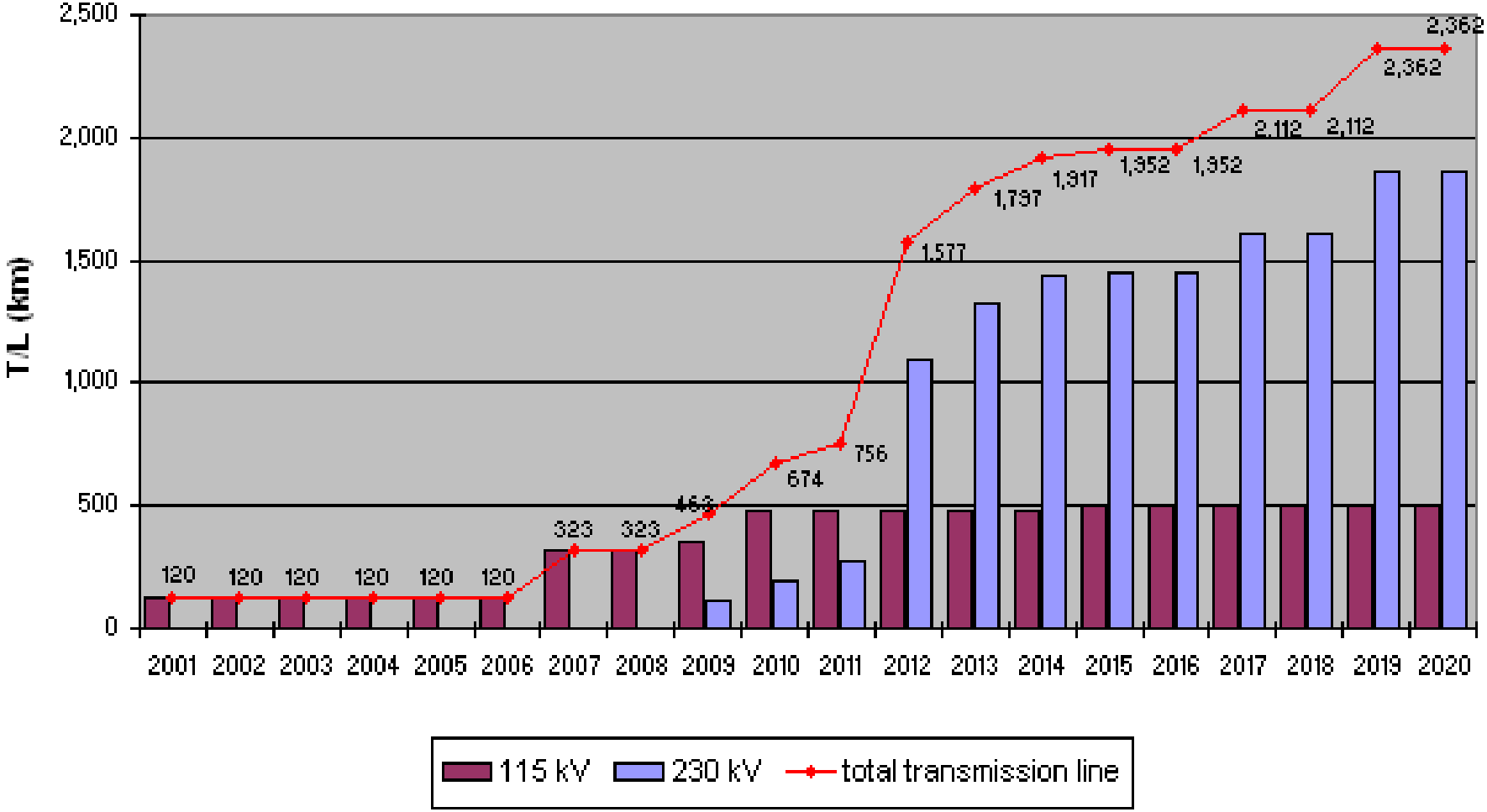
Transmission

- 115 kV BOT interconnecting with Thailand to supply Banteay Meanchey, Siem Reap and Battambang
- 115 kV Vietnam (Tai Ninh) - Kampong Cham, WB (2011)
- 115 kV Lao (Ban Hat) - Stung Treng, WB (2011)
- 230 kV Phnom Penh - Kampong Cham, WB (2011)
- 230 kV Phnom Penh Battambang via Kompong Chhnang-Pursat, BOT(2012)
- 220 kV Phnom Penh Viet Nam via Takeo ,ADB+NDF (2008)
- 230 kV Takeo – Kampot, KfW (2009)
- 230 kV Kampot – Sihanoukville , ADB+JBIC (2010)

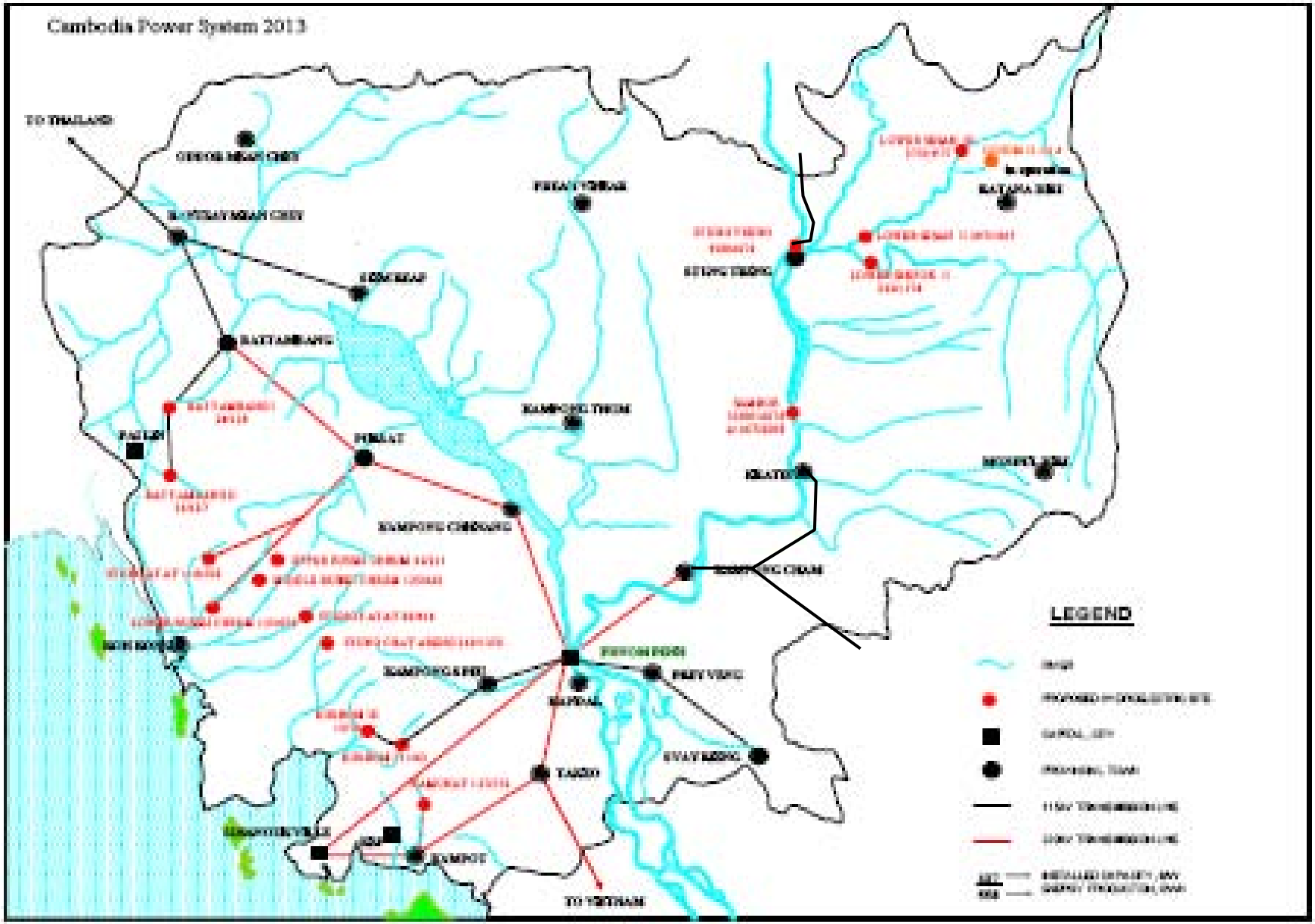
No.	Existing Transmission and Expansion Plan	Year Operation	T/L (km)
1	115 kV, Kirirom I - Phom Penh (CETIC)	2001	120
2	115 kV, Thailand - Bantey Meanchey - Siem Reap - Battambong	2007	203
3	220 kV, Phnom Penh - Takeo - Viet Nam, (construct the substation in Takeo), (ADB + NFD)	2009	110
4	115 kV, Reinforcement of transmission line and construct substation at WPP (West Phnom Penh), (WB)	2009	30
5	230 kV, Takeo - Kompot, (construct substation in Kompot), (KFW)	2010	87
6	115 kV, Steung Treng - Loa PDR, (construct substation in Steung Treng), (WB)	2011	56
7	110 kV, Kampong Cham - Viet Nam, (construct 3 substations: - Kampong Cham, - Soung, - Pongnearkreak), (WB)	2011	68
8	230 kV, Kampot - Sihanouk Ville, (construct 2 substations: - Vealrinh - Sihanouk Ville), (ADB + JBIC)	2011	82
9	230 kV, Phnom Penh - Kompong Chhnang - Pursat - Battambong, (construct 3 substations: - Kompong Chhnang, - Pursat, - Battambong), (CYC)	2012	310
10	230 kV, Pursat - Osom, (construct 1 substation in Osom Commune), (CYC)	2012	175
11	230 kV, Kampong Cham – Kratie, (CUPL)	2012	110

No.	Existing Transmission and Expansion Plan (Con.)	Year Operation	T/L (km)
12	230 kV, Kratie – Stung Treng, (India)	2012	126
13	230 kV, Phnom Penh – Kampong Cham, (CUPL)	2011	100
14	220 kV, Phnom Penh – Sihanoukville, along national road 4, (CHMC)	2013	220
15	230 kV, Phnom Penh – Neakleung – Svay Rieng, (construct 2 substations: - Neakleung, - Svay Rieng), (CHMC)	2014	120
16	230 kV, Stung Tatay Hydro – Osom substation, (CHMC)	2015	15
17	115 kV, West Phnom Penh – East Phnom Penh (construct substation GS4 at South Phnom Penh)	2015	20
18	230 kV, Reinforcement of transmission line on the existing pole, Phnom Penh – Kampong Cham (transmit power from Lower Sesan II + Lower Srepok II)	2017	100
19	230 kV, Stung Chay Areng - Osom substation (CSG)	2017	60
20	230 kV, Kampong Cham - Kampong Thom - Siem Reap, (construct 1 substation in Kampong Thom), (KTC)	2019	250
Total Transmission Line			**2,362**

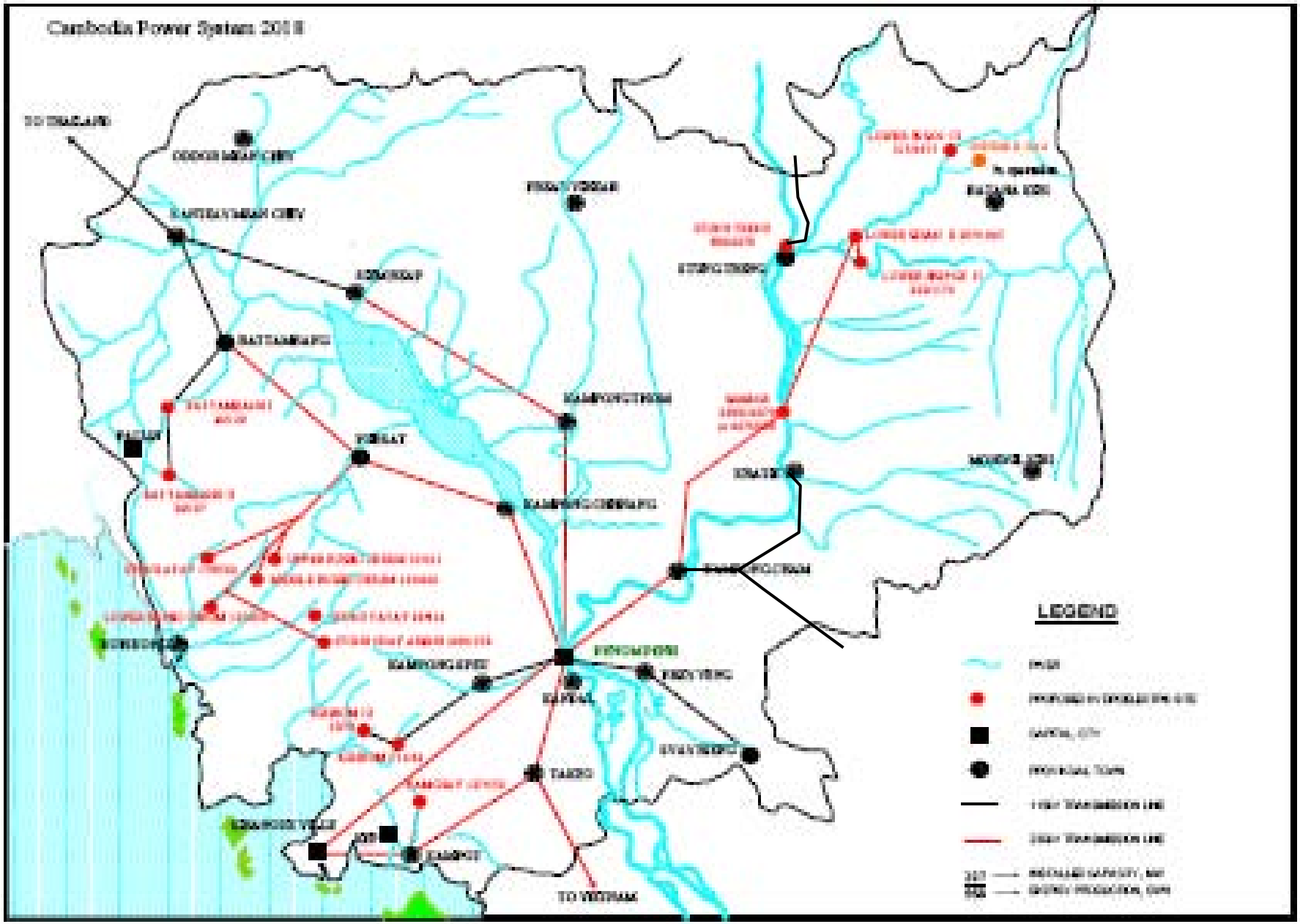
Transmission Expansion Plan (2001 – 2020)

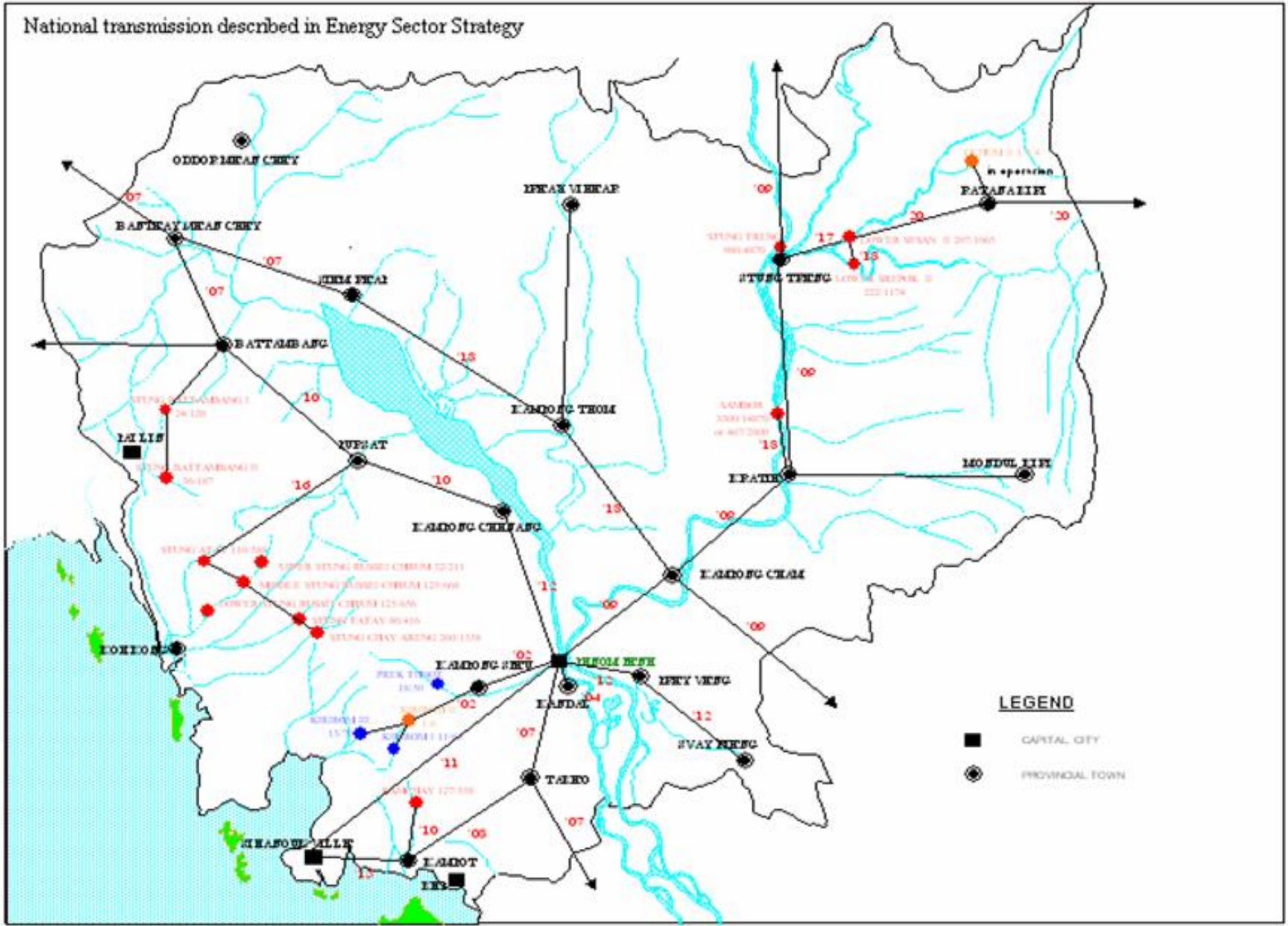


Cambodia Transmission 2013



Cambodia Transmission 2018




National transmission described in Energy Sector Strategy
LEGEND
CAPITAL CITY
PROVINCIAL TOWN

B-Power Trade

- Import from Vietnam at High voltage 220 kV with capacity of 200 MW by 2009
- Import from Thailand at 115 kV starting November 2007 to serve northern grid up to 80 MW
- Import from Vietnam to Kampong Cham Province at high voltage 115 kV with capacity of 20 MW by 2011
- Import from Lao to Stung Treng Province at 115 kV with capacity until 20 MW by 2011
- Power Interconnection at high voltage 500 kV, Lao - Cambodia – Vietnam, ADB (2018)
- 5 Cross border MV links from Vietnam and 8 from Thailand at 22 kV to serve Cambodian communities close to the border.

C-Provincial and Rural Electrification

- Completion rehabilitation of 8 provincial towns supported by ADB ($18.6 mil.) and AFD (€3.75 mil.),
- Grid extension & Rural Elect. Program: WB SDR27.9 mil., GEF $5.75 mil.
- Renewable energy master plan study and 2 micro hydro development by JICA
- Rural Electrification target:

  - 100% of villages has access to electricity services by 2020

  - 70% of rural population has access to quality electricity services by 2030
- Rural Electrification Fund to subsidize part of rural electrification projects.

End of Presentation

Thank you for your attention.

中国南方电网
CHINA SOUTHERN POWER GRID

Update For CSG Power Grid Planning & GMS Cooperation Projects

China Southern Power Grid Co., LTD

November, 2008

Contents ：

- ✓ Status of CSG in 2007
- ✓ Power Grid Planning
- ✓ GMS Cooperation Projects

Status of CSG in 2007

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CHINA SOUTHERN POWER GRID

CSG： Status in 2007

Area：
1,000,000km²

GDP 4.5 Trillion Yuan
RMB 17.6% of China

Population：
236 Million
17.8% of China

CSG : Status in 2007

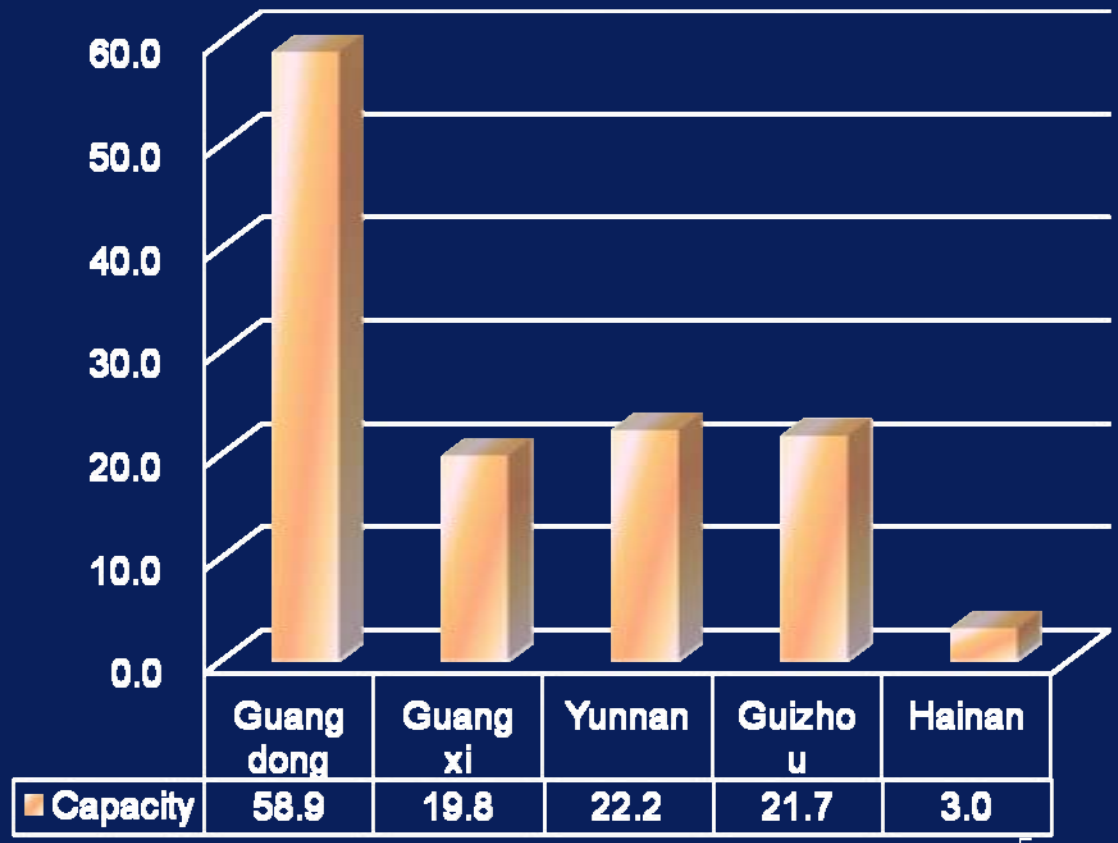
Total Capacity: 128GW ▲ 16.7%

Hydro : 38.6GW

Thermal: 83.0GW

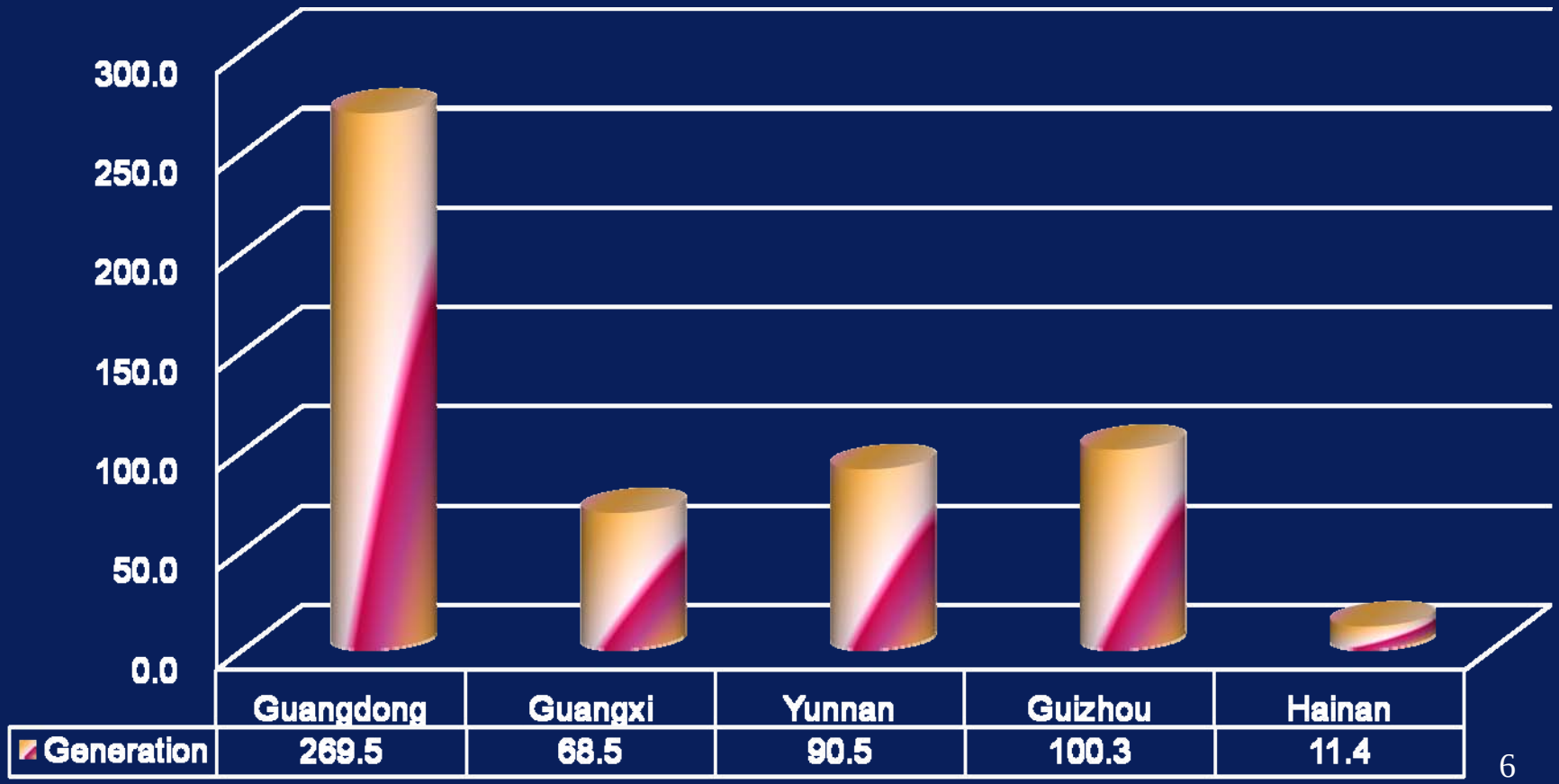
Nuclear: 3.78GW

Renewables : 0.30GW



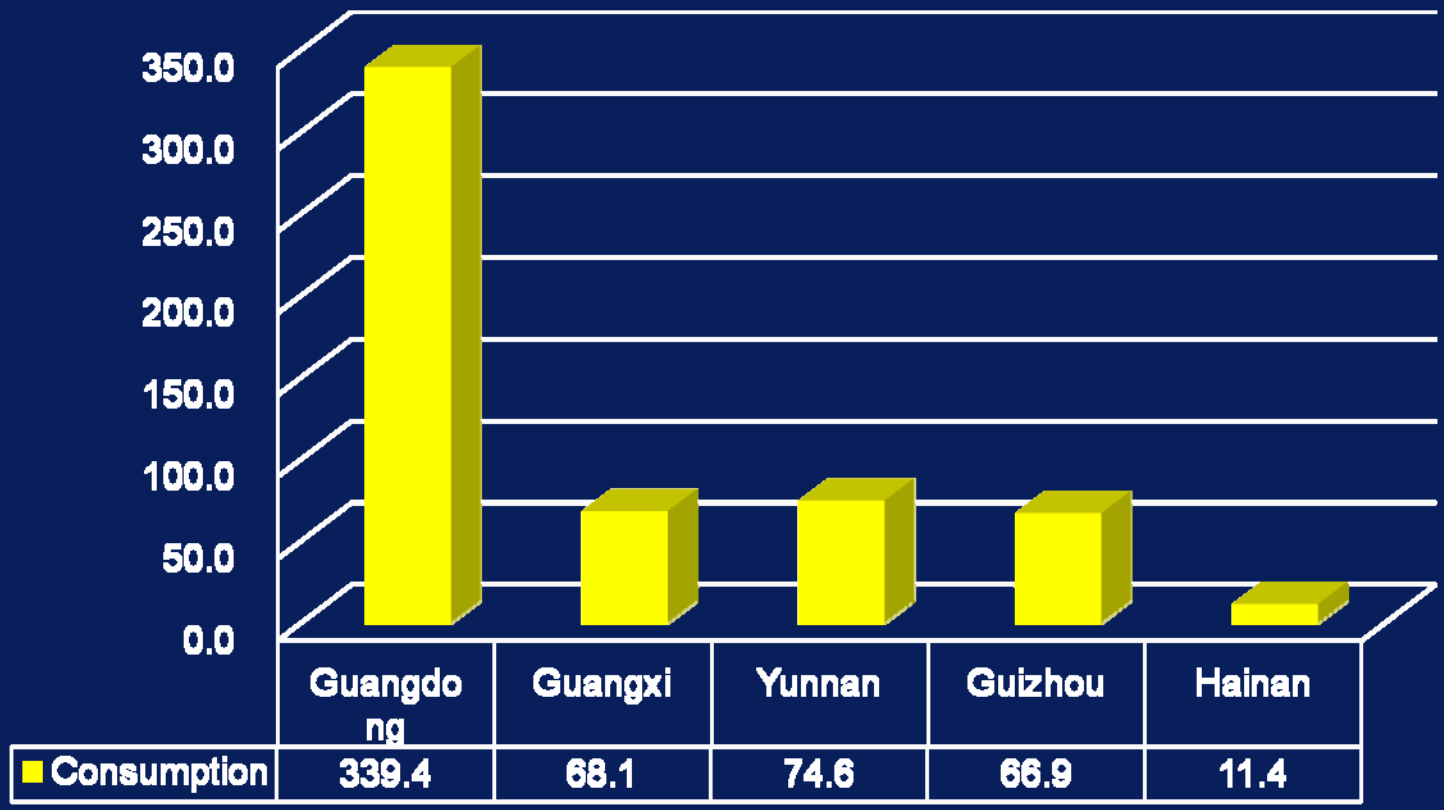
CSG : Status in 2007

Generation: 553 TWh ▲ 14.6%



CSG : Status in 2007

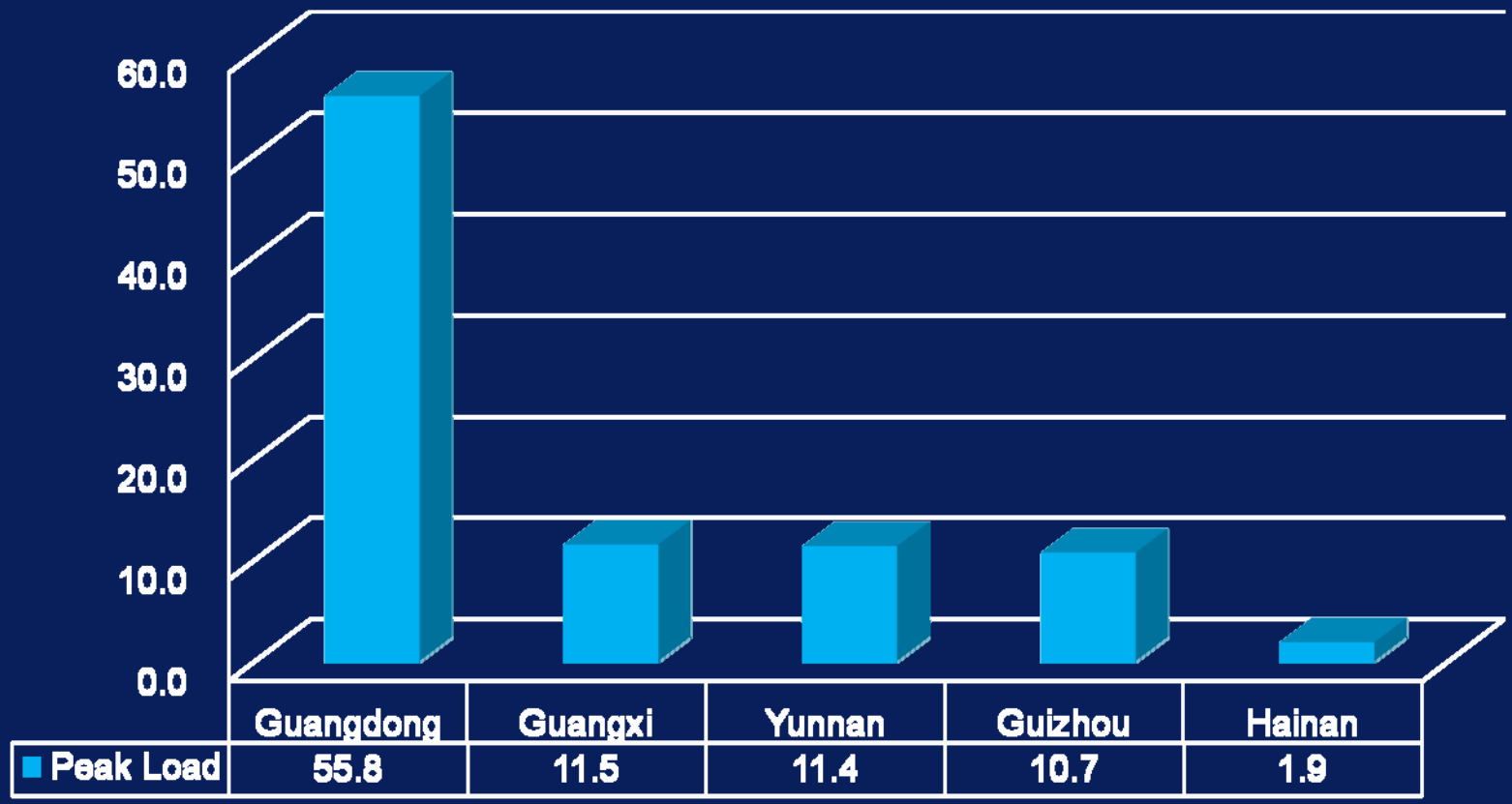
Consumption: 564TWh ▲ 14.3%



	Guangdong	Guangxi	Yunnan	Guizhou	Hainan
Consumption	339.4	68.1	74.6	66.9	11.4

CSG : Status in 2007

Peak Load: 87GW ▲ 10.5%



CSG : Status in 2007

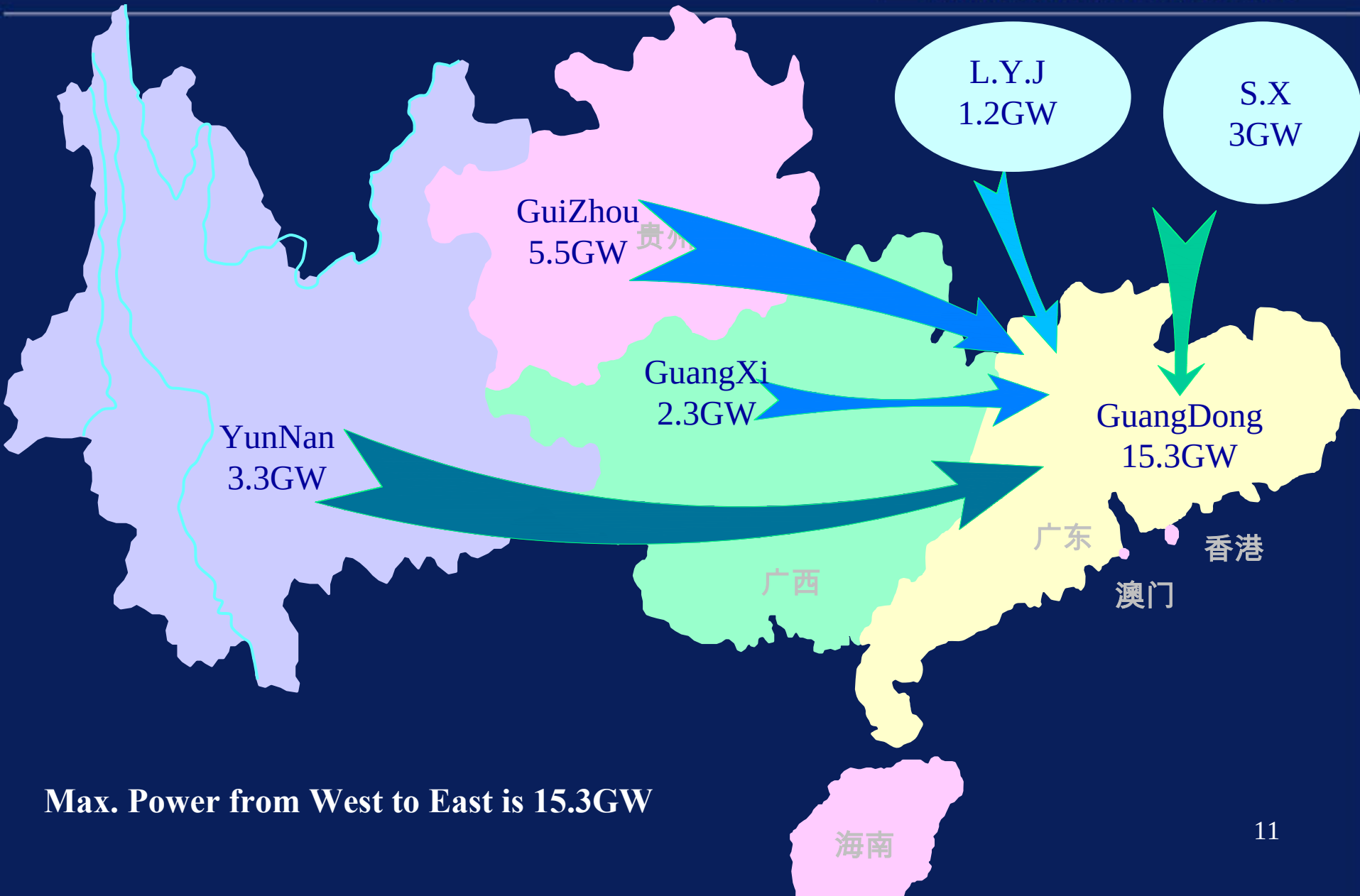
Capacity of 500kV Transformers	**83 GVA**
Capacity of 220kV Transformers	**135 GVA**
Capacity of HVDC	**7.8 GW**

CSG： Status in 2007

Length of 500kV Transmission Lines 22,000 km

Length of 220kV Transmission Lines 38,000 km

Length of HVDC Transmission Line 3,000 km



Max. Power from West to East is 15.3GW

CSG : Status in 2007

Power exchange between regions

Hongkong	4.04TWh
Macau	1.69TWh
Chongqing	3.97TWh
Hunan	4.30TWh
Vietnam	2.83TWh

Power Grid Planning

Demand Forecast from 2006 to 2010

- ✓ GDP Increase rate 9% ~ 10%/per year
- ✓ Consumption 682TWh in 2010 Increase rate 9.4%/pear year
- ✓ Peak load 114GW in 2010 Increase rate 10.4% /pear year

	2000	2005	2010	2001-05	2006-10
Consumption (TWh)	230.2	434.7	681.5	13.4%	9.4%
Peak (GW)	37.89	69.59	114.03	12.9%	10.4%

Increased Capacity of Power (2006-2010)

Hydro		28,400MW
Thermal		49,900MW
	Coal	42,200MW
	Gas	7,700MW
Nuclear		1,000MW
Total		79,300MW
Turn off		6,100MW
Net Increase		73,200MW

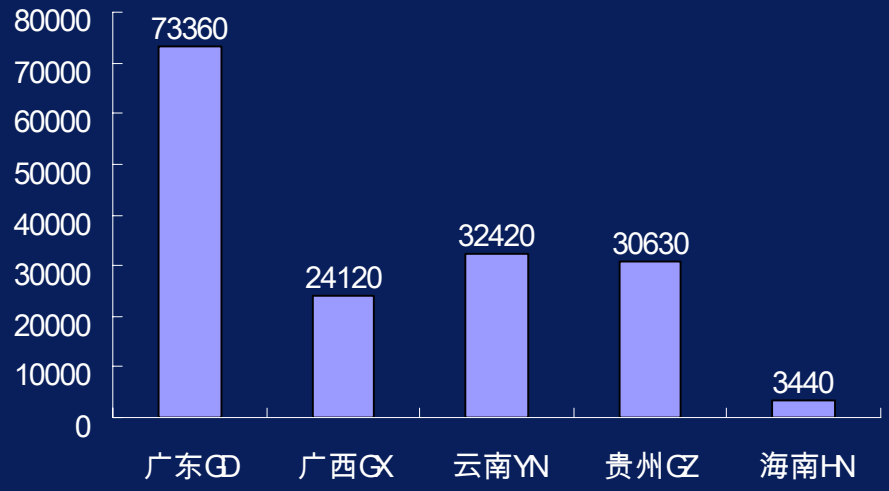
Capacity of Power in 2010

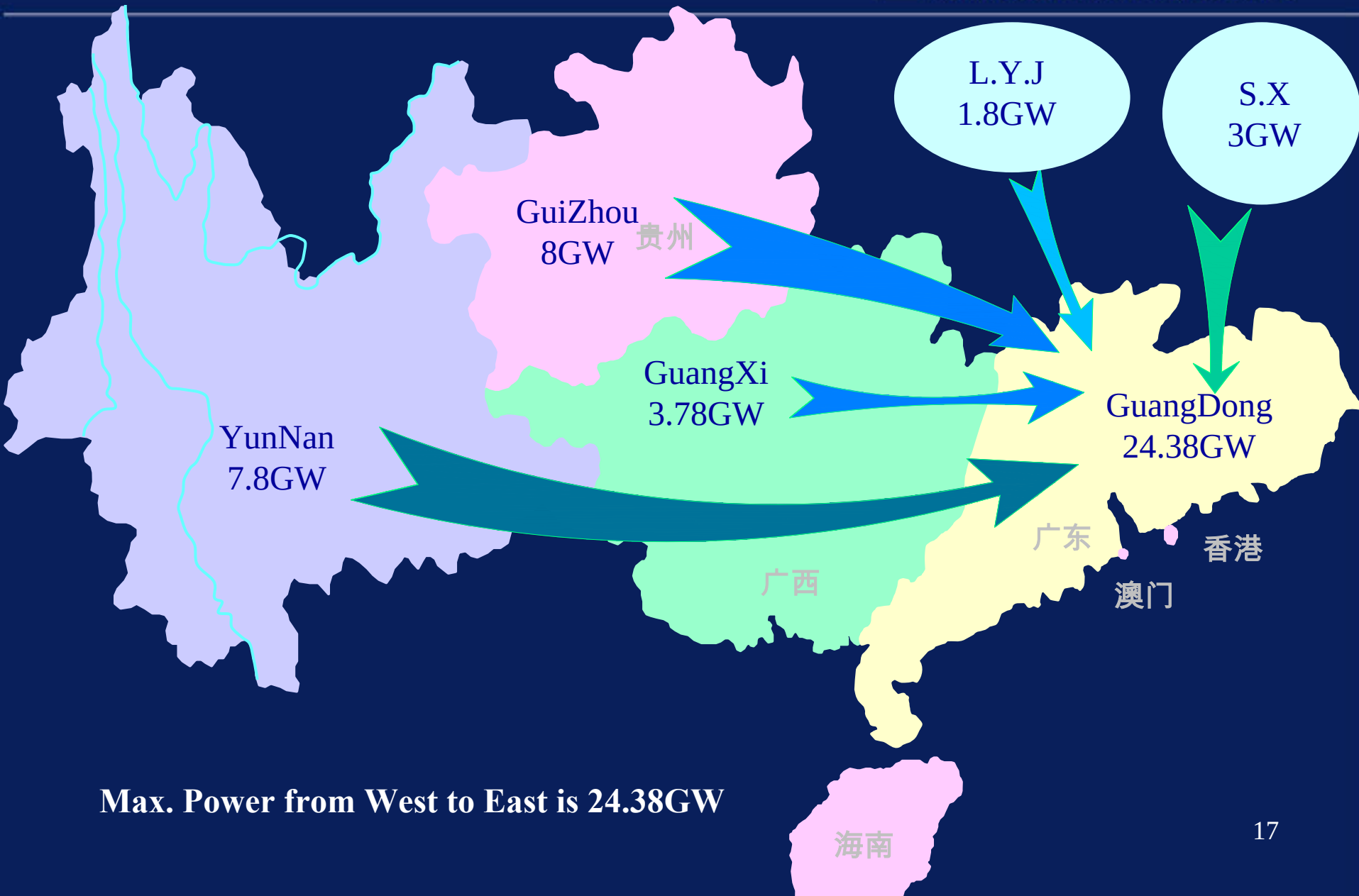
Total Capacity: **164,000 MW**

Hydro : **59,390 MW**

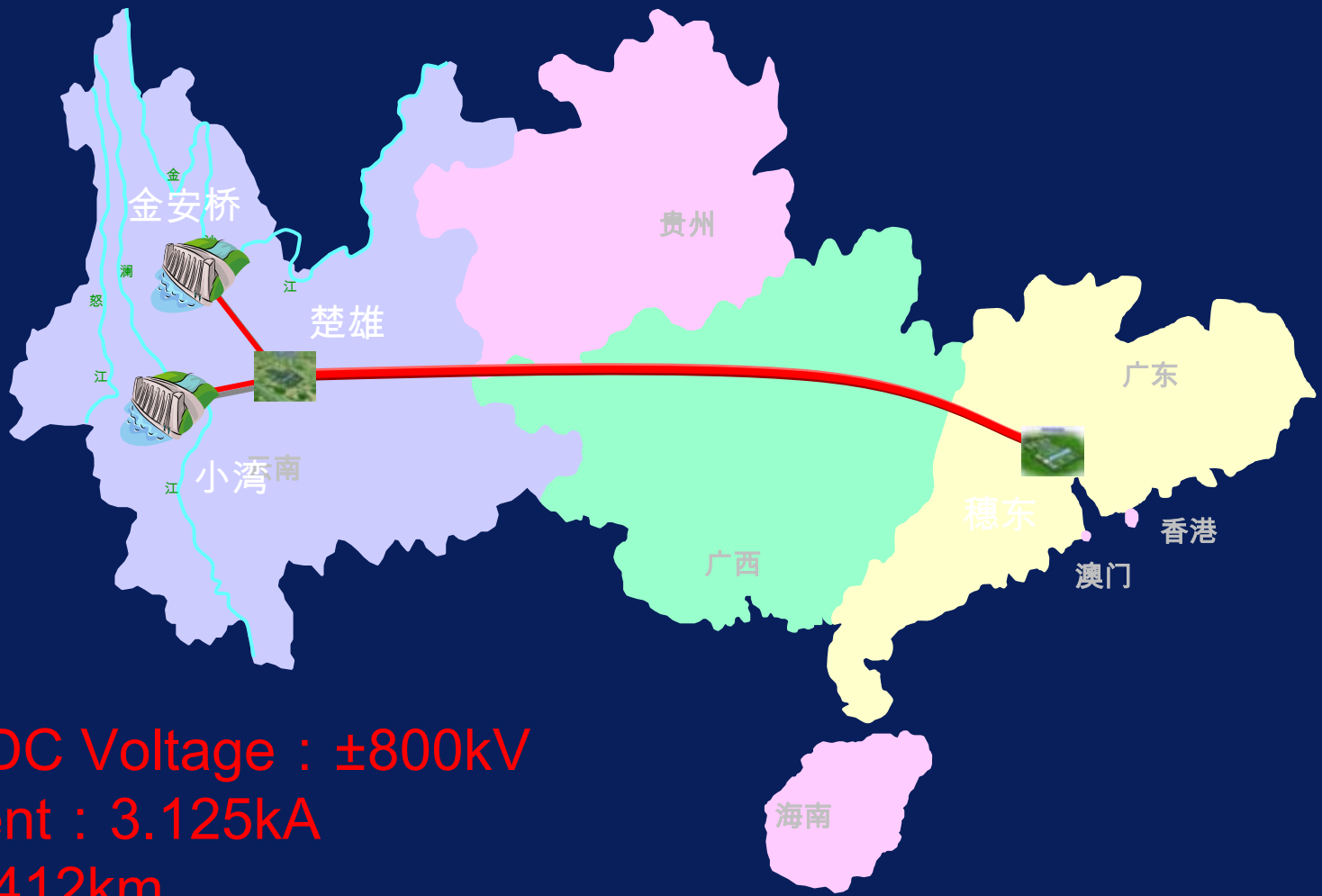
Thermal: **99,800 MW**

Nuclear: **4,780 MW**





Max. Power from West to East is 24.38GW



UHVDC Voltage：±800kV
Current：3.125kA
T/L:1412km
Capability:5GW

Chuxiong UHVDC substation

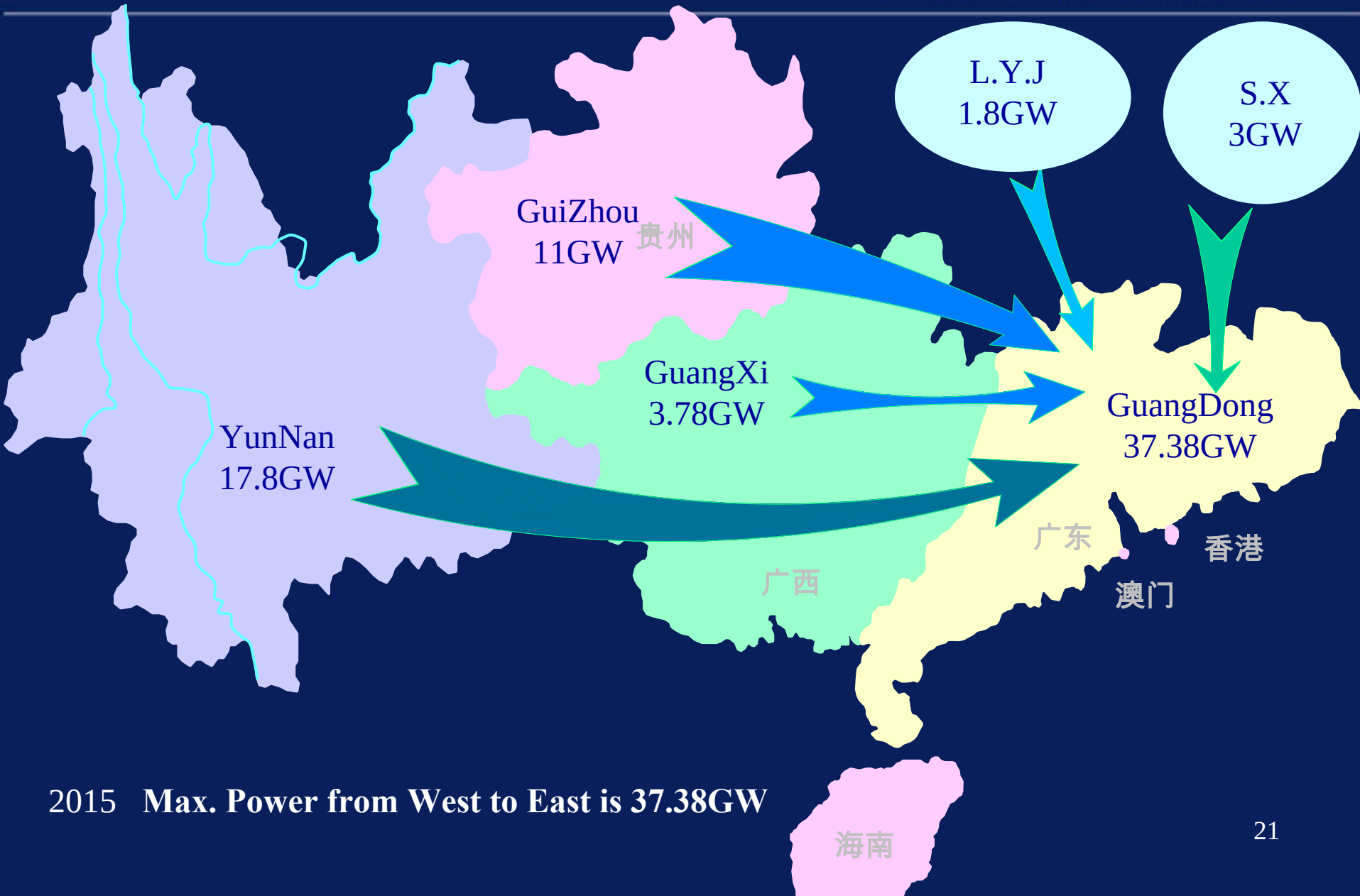
中国南方电网
CHINA SOUTHERN POWER GRID

Area：0.3km^2

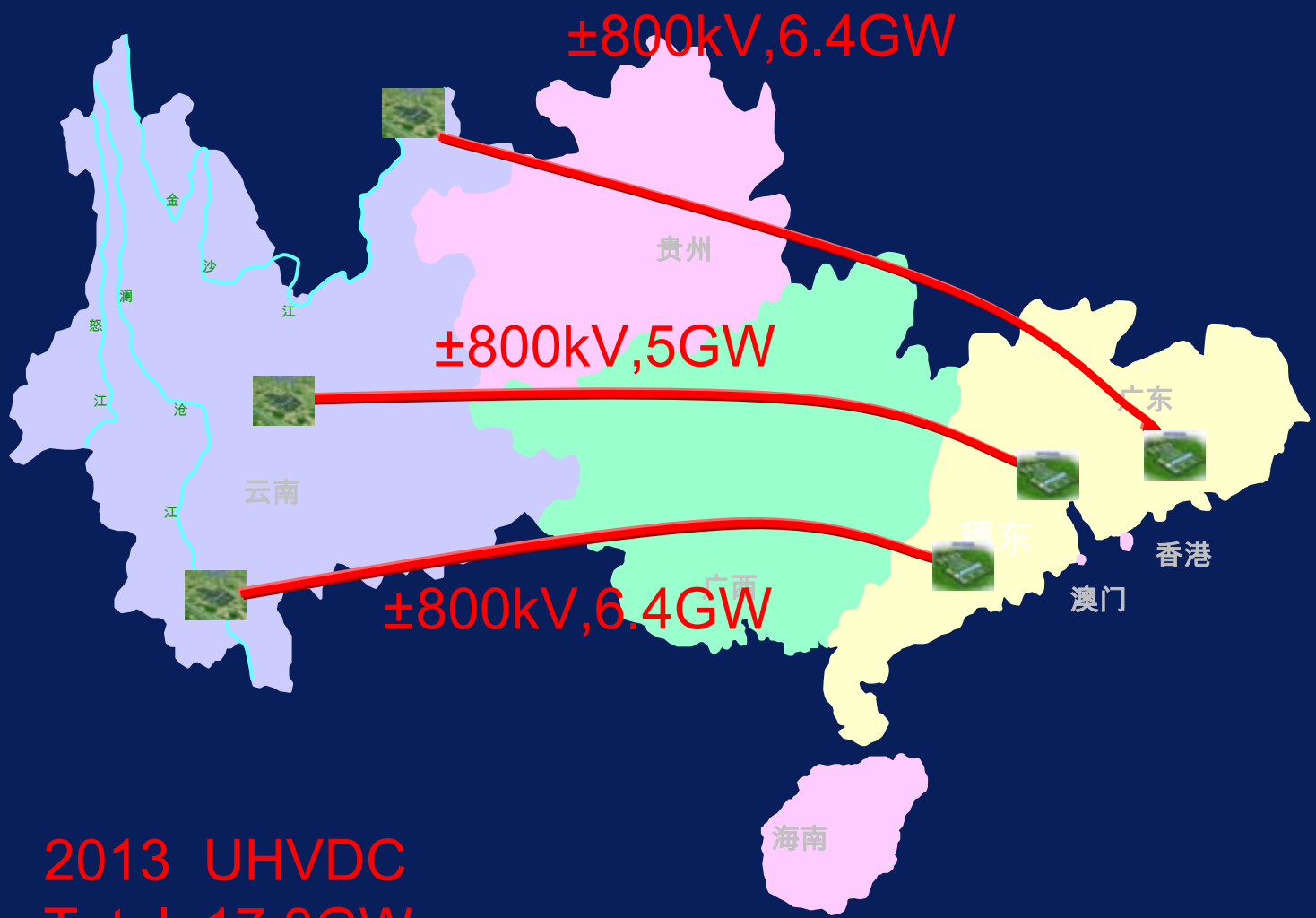
Shuidong UHVDC substation

中国南方电网
CHINA SOUTHERN POWER GRID

Area：0.3km^2



2015 **Max. Power from West to East is 37.38GW**



2013 UHVDC
Total :17.8GW

中国南方电网
CHINA SOUTHERN POWER GRID

sea cable
HVDC Voltage：500kV
T/L:31km
Capability:600MW

GMS Cooperation Projects

International Cooperation Projects

- ☆ Sino-Vietnam Cooperation
- ☆ Sino-Laos Cooperation
- ☆ Sino-Cambodia Cooperation
- ☆ Sino-Thailand Cooperation
- ☆ Sino-Myanmar Cooperation

Sino-Vietnam Cooperation

1. Power Supply to Vietnam

3 220kV + 4 110kV lines

Total by the end of Sep 2008: 5.9 TWh

2. 500kV Interconnection Project

Feasibility Study is under progression

3. Vinh Tan 1 BOT Coal-fired Power Plant Project (2×600MW)

Under negotiation

Sino-Laos Cooperation

1. Laos' Master Plan on Electric Power Industry

Finished by the end of 2007 and submitted to laos on Jan.16, 2008.

2. Nam Tha 1 Hydro-Electric Power Project (3×56MW)

Under Negotiation

3. Nam Ou Hydropower Station Project (about 1000MW)

Initiated by Sinohydro Corporation

4. Northern Grid Construction Project

Under Construction

Sino-Cambodia Cooperation

1. Sambor Hydro-Electric Power Project (2600MW)

Finished the FS and submitted it to Cambodia.

Sino-Thailand Cooperation

1. China-Laos-Thailand 500kV Transmission Project

Suspended.

Sino-Myanmar Cooperation

1. Ta Sang Hydro-Electric Power Plant Project (10×711MW)

Signed Frame Agreement to develop in Thalwan River

2. Development of the Myanmar Northern Hydropower Projects (the total is about 1680MW)

Initiated by China Power Investment Corporation

Thank You !

Power Development Plans & Transmission Interconnection Projects
Lao PDR

Presented by Mr. Vilaysone Sourigna
Department of Energy Promotion & Development
Ministry of Energy & Mines

Back ground

- 22 December 2007 signed the MOU with Thailand

Lao PDR will export electricity to Thailand 7000 MW

-14 March 2008 signed the Minutes of Meeting between Minister of Ministry of Energy & Mines of Lao PDR and Minister of Ministry of Industry & Trade of SR. Vietnam

Lao PDR will export electricity to Vietnam 5000 MW

Export to Thailand

No	Name of Project	Contr. Capacity
1	Nam Theun 2	920MW
2	Nam Ngum 2	597MW
3	Nam Bak 1	80MW
4	Theun Hinboun Exp	220MW
5	Nam Ngum 3	440MW
6	Nam Theun 1	523MW
7	Nam Ngiep 1	260MW
8	Hongsa Lignite	1570MW
9	Nam Ou	843MW
10	Donsahong	300MW
11	Sepian Xenamnoi	390MW
12	Sekong 4	300MW
13	Nam Kong 1	150MW
14	Xayabouli/Pak Beng	1000MW
		7893 MW

Export to Vietnam

No	Name of Project	Installed Capacity MW
1	Sekaman 0&1	323
2	Sekaman 2 (a, b)	164
3	Sekaman 3	250
4	Sekaman 4 (a, b)	170
5*	Nam Kong 1	150
6	Nam Kong 2	60
7	Nam Kong 3	30
8	Dak E meule	185
9	Sekong 3 (Up. & Low.)	250
10*	Sekong 4	300
11*	Sekong 5	400
12	Nam Ngum 4A & 4B	150
13	Nam Xam (1,2,3 and 4)	750
14	Nam Mo	110
15	Nam Kan (Nam Mo 1)	66
16	Nam Et (1,2,3)	450
17	Nam Neun	65
18	Nam Peun	64
19	Xexou	95
20	Luangprabang (Mekong)	1410
		5442

Electricity Demand Forecast (PDP 2007)

Year	**2006**	**2010**	**2015**	**2020**
Energy Consumption (GWH)	1727	3493	7009	8549
Peak load (MW)	349	648	1216	1486


Nam Ou- Thailand
Hongsa-Thailand
Pak Beng-Thailand
Xayabouli-Khonken
Nabong-Oudon
Luangphabang -Xam Neua-Nho Quan/Thanh Hoa
Ban Sok-Oubon
Ban Sok - Pleiku
Ban Sok – Stung Treng-Tay Ninh

500kv Transmission Line Facilities

1. Nabong (Laos) - Oudon (Thailand)
2. Indochina facilities :
   - Ban Sok (Laos) - Pleiku(Vietnam)
   - Ban Sok-Stung Treng(Cambodia)-Tay Ninh(Vietnam)
3. Ban Sok (Laos) - Oubon (Thailand)
4. Hongsa (Laos) - Thailand
5. Nam Ou (Laos) - Thailand
6. Luangphabang (Laos) - Nho Quan or Than Hoa Vietnam
7. Xayabouli (Laos) – Khon Ken (Thailand)
8. Pakbeng (Laos)-Thailand

Khop Chai
Thank you

Country Report
on
Progress of Power Development Plans and Transmission Interconnection Projects

MYANMAR

Ho Chi Minh City, Viet Nam
21.11.2008

Contents

(1) Developments in Institutional / Policy Framework for Electricity Sector

Ministry of Industry

Electricity Supply Board (E.S.B)
Oct, 1951

Electric Power Corporation (E.P.C)
16th Mar, 1972

Ministry of Industry-I
1st April, 1975

Ministry of Industry-II
1st April, 1975

Electric Power Corporation (E.P.C)

Ministry of Energy (MOE)
12th April, 1985

Electric Power Corporation (E.P.C)

Myanma Electric Power Enterprise (M.E.P.E) 1st April, 1989

Ministry of Electric Power (M.O.E.P)
15th Nov, 1997

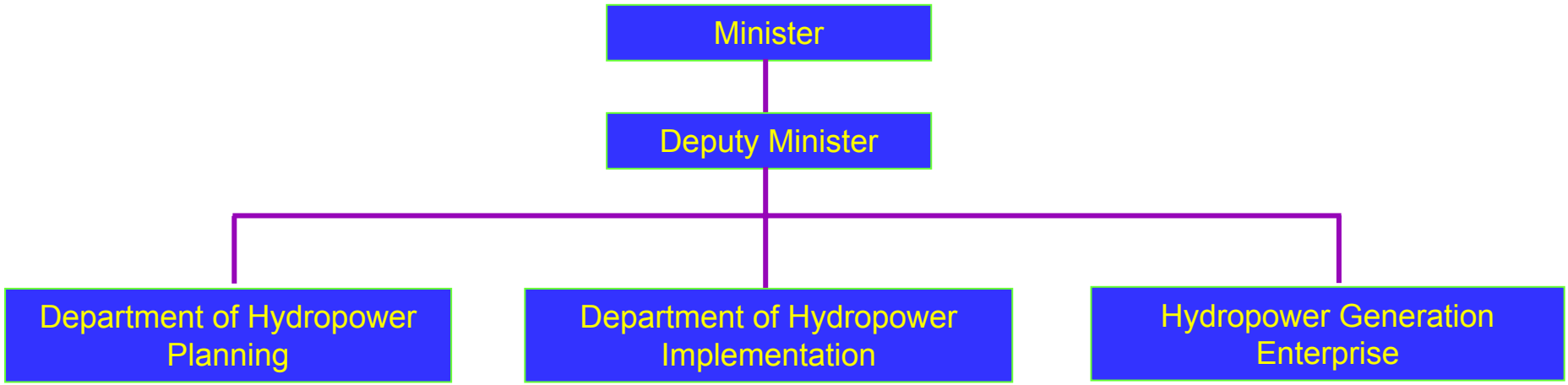
In ord er to effectively carry out to fulfill the electricity requireme nt for the economic development, nation-bui lding a nd multi-se ctor development tasks, the Ministry of El ectric Power has been reorganiz ed as two Ministries viz Ministry of Electric Pow er No.1 and Ministry of Electric Po wer No.2 on 15 May, 2006.

Ministry of Electric Power-I (M.O.E.P-I)

Ministry of Electric Power-II (M.O.E.P-II)

(1) Developments in Institutional / Policy Framework for Electricity Sector(Cont:)

Organization Chart for Ministry of Electric Power No. (1)



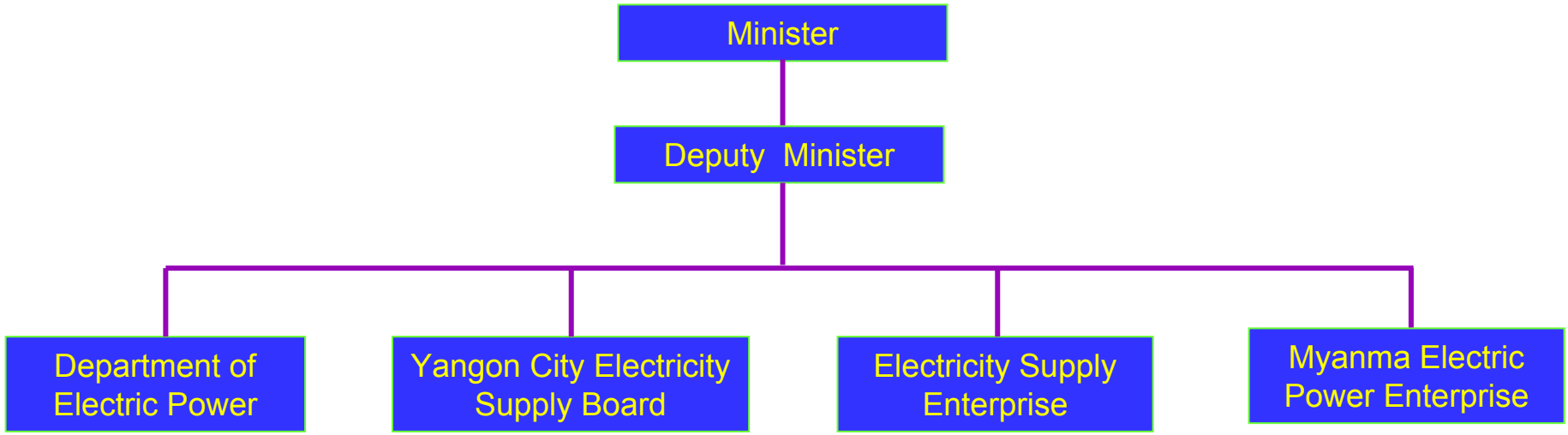
- Projects & Generation Planning
- Economics Planning
- General Administration

- Administration
- Planning & Works
- Material Planning
- Finance
- Machinery
- Electrical & Mechanical Installation
- Construction 1
- Construction 2
- . . .
- . . .
- Construction 7
- Investigation
- Design & Technology
- Maintenance

- Engineering Division
- Material Planning
- Finance
- Administration

(1) Developments in Institutional / Policy Framework for Electricity Sector(Cont:)

Organization Chart for Ministry of Electric Power No. (2)



- Projects & Power Generation Planning
- Power System Strategic Planning
- Economic Planning
- General Administration & Human Resources Planning

- Engineering
- Material Planning
- Administration
- Finance

- Engineering
- General Services
- Material Planning
- Administration
- Finance

- Power Transmission Projects
- Power System
- Thermal Power
- Material Planning
- Administration
- Finance

(1) Developments in Institutional / Policy Framework for Electricity Sector(Cont:)

Responsibilities for Ministry of Electric Power No.1

- Development of new hydroelectric power projects.
- Operation and maintenance of existing hydroelectric power stations and coal fired thermal power station.
- Selling the electricity to the Ministry of Electric Power No.2

Responsibilities for Ministry of Electric Power No.2

- Planning and implementation of transmission lines and sub-stations compliance with the generation plan of both ministries
- Operation and maintenance of gas turbines, combined cycles and thermal power stations.
- Purchasing the electricity from the Ministry of Electric Power No.1
- Planning and implementation of distribution system and selling the electricity to the end users

(1) Developments in Institutional / Policy Framework for Electricity Sector(Cont:)

Regulatory Frame Work

As electricity business has been subsidized by the government long ago, Ministry of Electric Power No.1 and No.2 in accordance with the guidance of the government take the responsibilities of regulator.

Challenges in REGULATION

- Policy of Myanmar Power Sector is changing gradually towards privatization
- Regulation for new system is not ready yet and a lot of regulatory challenges ahead
- Opportunity to learn experiences of other ASEAN countries on regulatory issues

Private Sector Participation

Local investors are allowed to participate in the scheme of Independent Power Producer (IPP) for medium hydropower projects

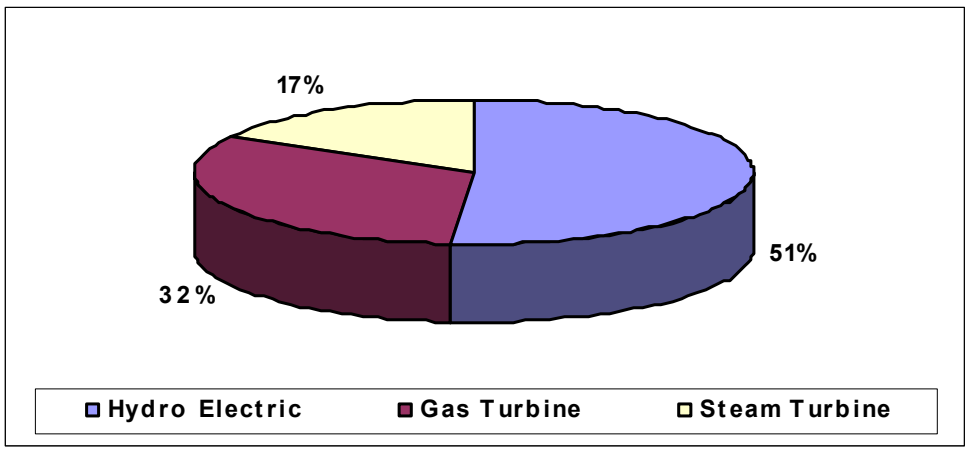
- ✓ The MOU on Thaukyegat(2) Hydropower Project (120 MW) was signed between MOEP(1) and Asia World Company Limited on 2nd May 2008.
- ✓ The MOU on Baluchaung No.(3) Hydropower Project (48 MW) was signed between MOEP(1) and High Tech Concrete Technology Company Limited on 2nd May 2008.

Contents

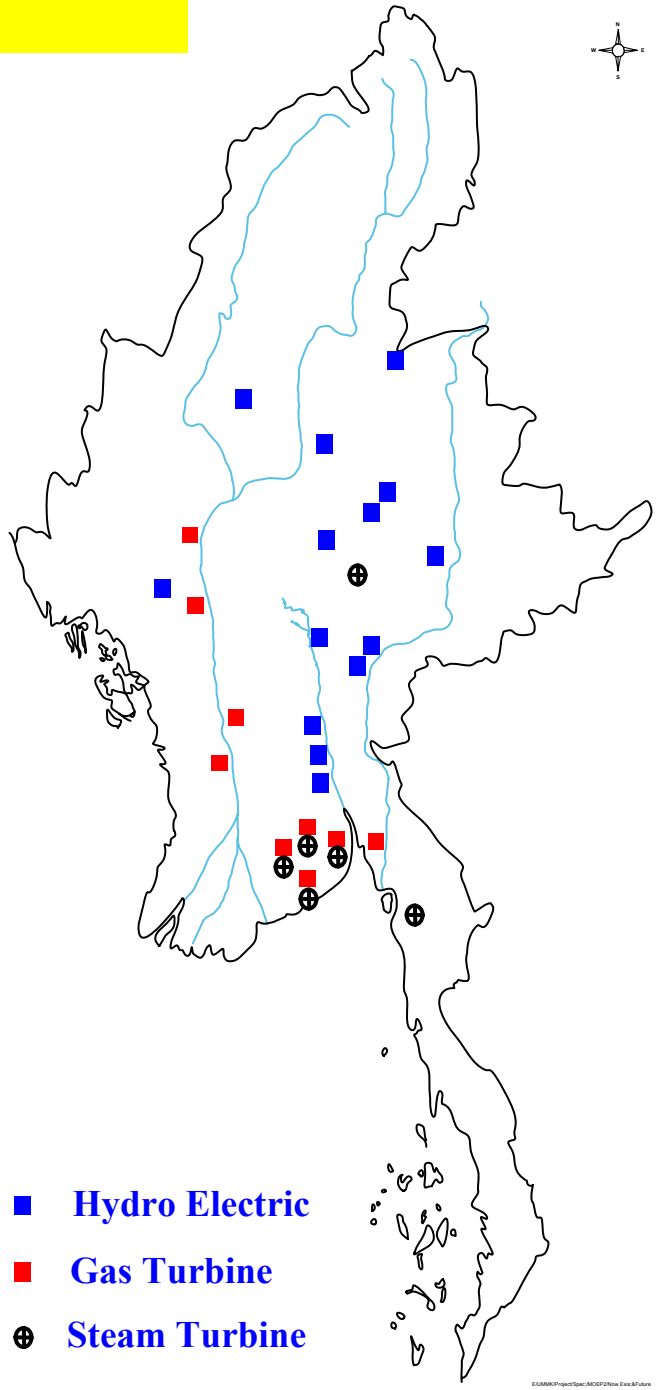
(2) Status of Electricity Demand and Supply

Installed Capacity for National Grid System

Sr	Type	Nos. of PS	Installed (MW)
1	Hydro Electric	14	885.0
2	Gas Turbine	9	549.9
3	Steam Turbine	6	285.0
Total		29	1719.9



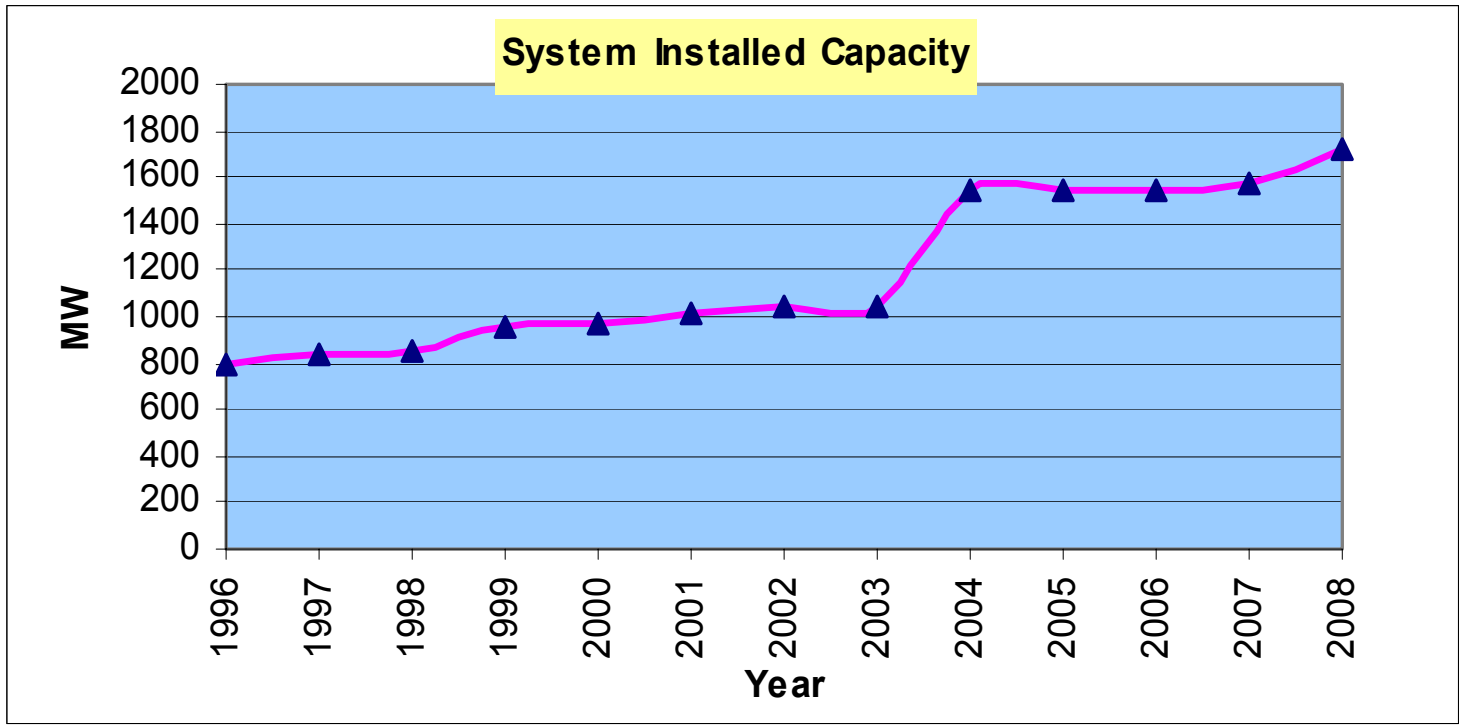
1	MOEP-I	15	1005.0
2	MOEP-II	14	714.9
Total		29	1719.9



(2) Status of Electricity Demand and Supply (Cont:)

System Installed Capacity

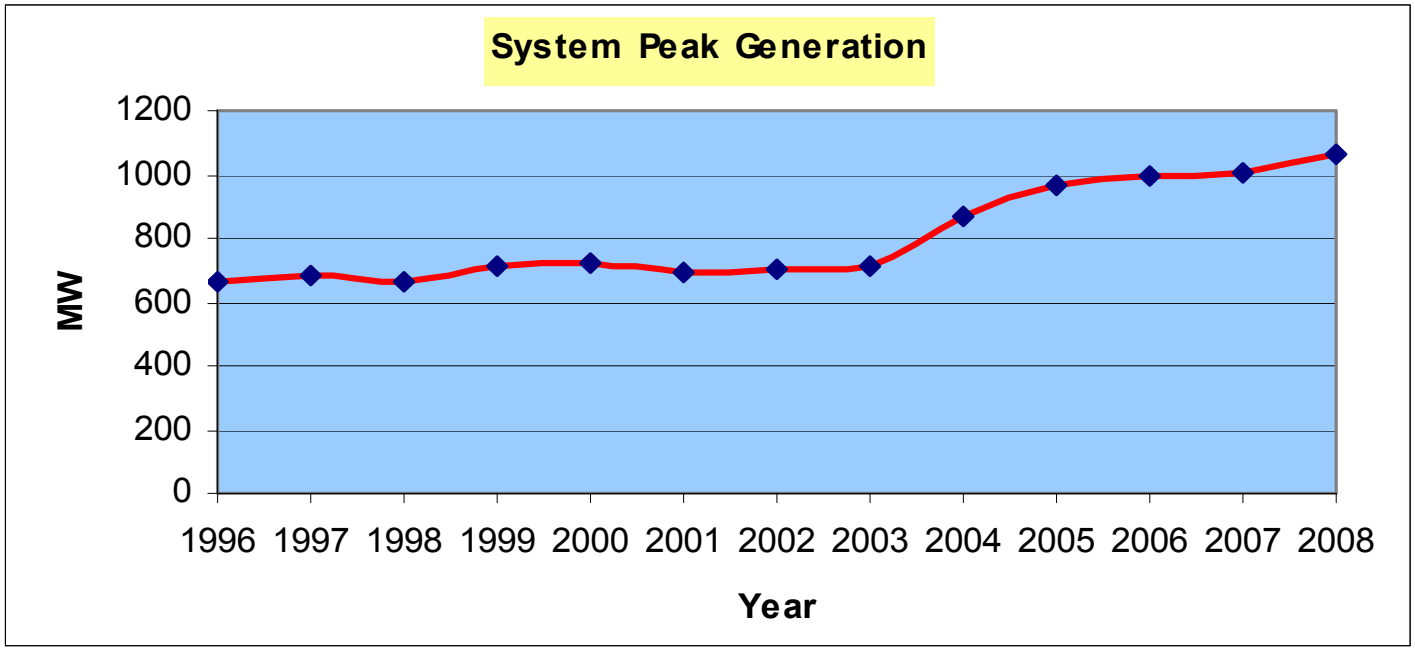
Year	MW
1996	800.4
1997	835.4
1998	847.4
1999	956.0
2000	976.0
2001	1008.5
2002	1038.5
2003	1038.5
2004	1546.9
2005	1546.9
2006	1546.9
2007	1571.9
2008	1719.9



(2) Status of Electricity Demand and Supply (Cont:)

System Peak Generation

Year	MW
1996	660.8
1997	682.6
1998	665.2
1999	715.5
2000	721.1
2001	692.5
2002	701.2
2003	708.3
2004	864.0
2005	966.4
2006	995.7
2007	1005.0
2008	1061.2



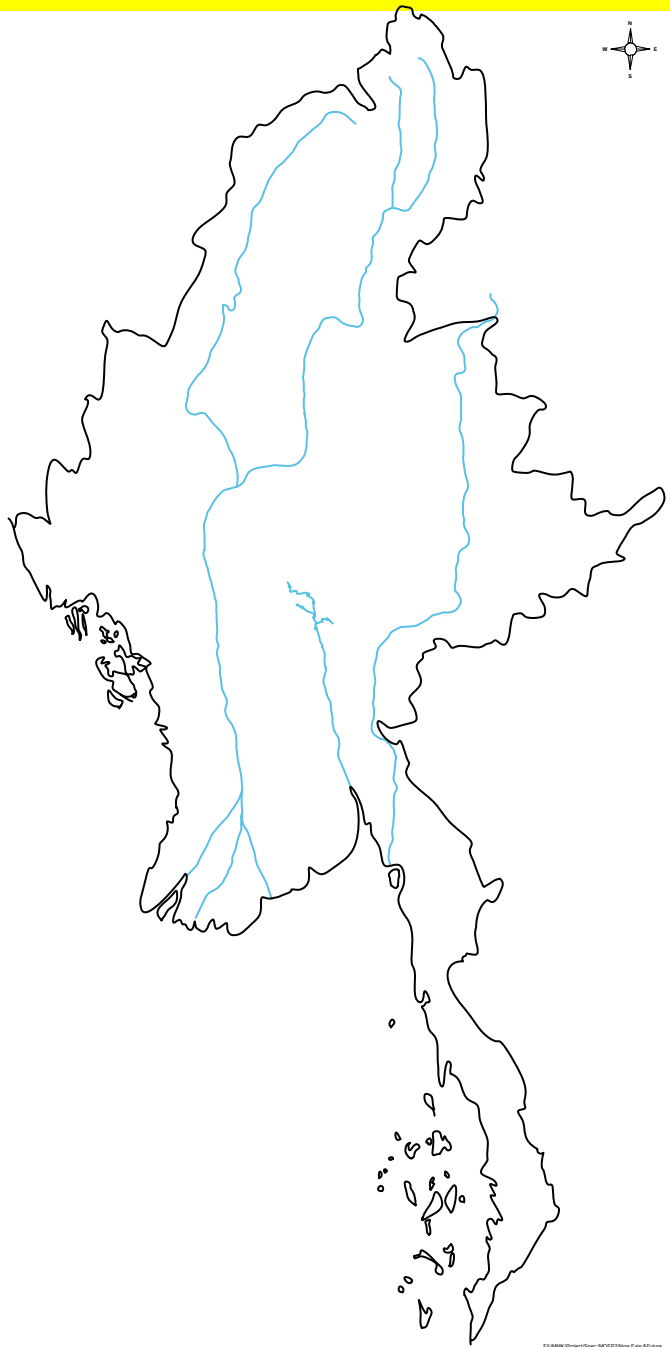
Contents

(3) Progress in Power Development Program

Power Stations

	Nos. of Power Station	Installed (MW)
Existing	29	1,719.9
Under Construction	29	19,413.8
Future	14	13,971.5
Total	72	35,105.2

There is no Under Construction Project and Future Plan for new Gas Turbine and Steam Turbine.



(3) Progress in Power Development Program (Cont:)

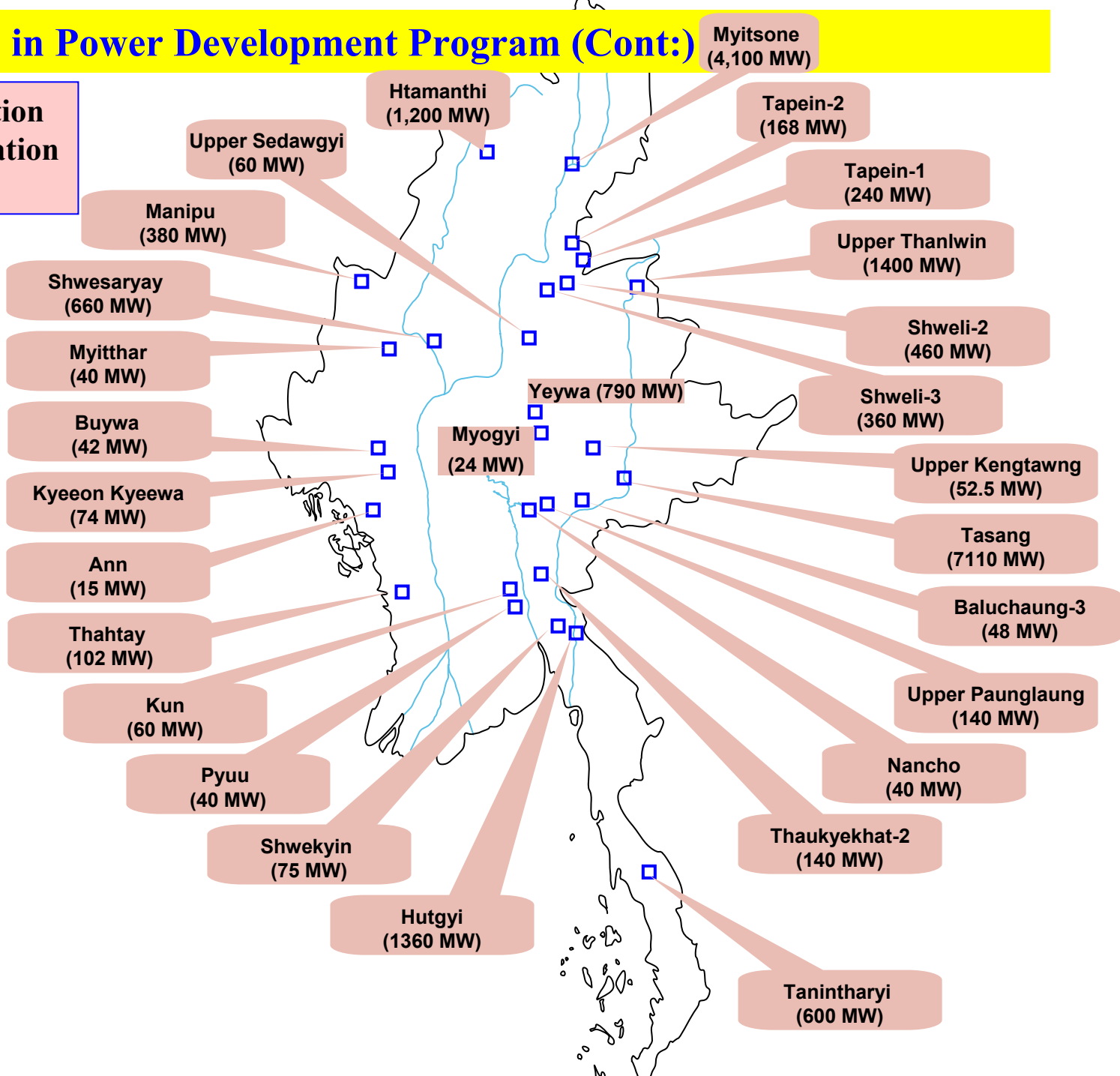
Under Construction Hydro Electric Power Projects			
Sr.	Project Name	Capacity (MW)	Remark
1	Kun	60	70%
2	Phyu	40	70%
3	Shwekyin	75	65%
4	Kyeeon Kyeewa	74	66.2%
5	Myithar	40	24.5%
6	Thahtay	102	6%
7	Upper Keng Tawng	52.5	-
8	Buu Ywa (Lower)	42	12.5%
9	Upper Sedaw Gyi	60	1.8%
10	Myogyi	24	46%
11	Yeywa	790	67%
12	Upper Paung Laung	140	27%
13	Ann	15	5%
14	Thaukyegat-2	140	Asia World, BOO
15	Anyarpya	9.3	-

(3) Progress in Power Development Program (Cont:)

Under Construction Hydro Electric Power Projects			
Sr.	Project Name	Capacity (MW)	Remark
16	Yarzagyo	4	22.1%
17	Tamanthi	1200	9%, NHPC MoU
18	Tasang	7110	Pre Construction
19	Nancho	40	26%
20	Hutgyi	1360	Under FS
21	Ayeyarwaddy Myitsone	4100	CPI
22	Ta Pein-1	240	DUHD
23	Ta Pein-2	168	DUHD
24	Shweli-2	460	YUPD
25	Shweli-3	360	YUPD
26	Upper Thanlwin	1400	Hanergy Holding Group Ltd
27	Shwe Sar Yay	660	NHPC
28	Tanintharyi	600	Italian-Thai
29	Baluchaung-3	48	High Tech Concrete Co.,
Total		19,413.8	

(3) Progress in Power Development Program (Cont:)

Under Construction Hydro Power Station Projects

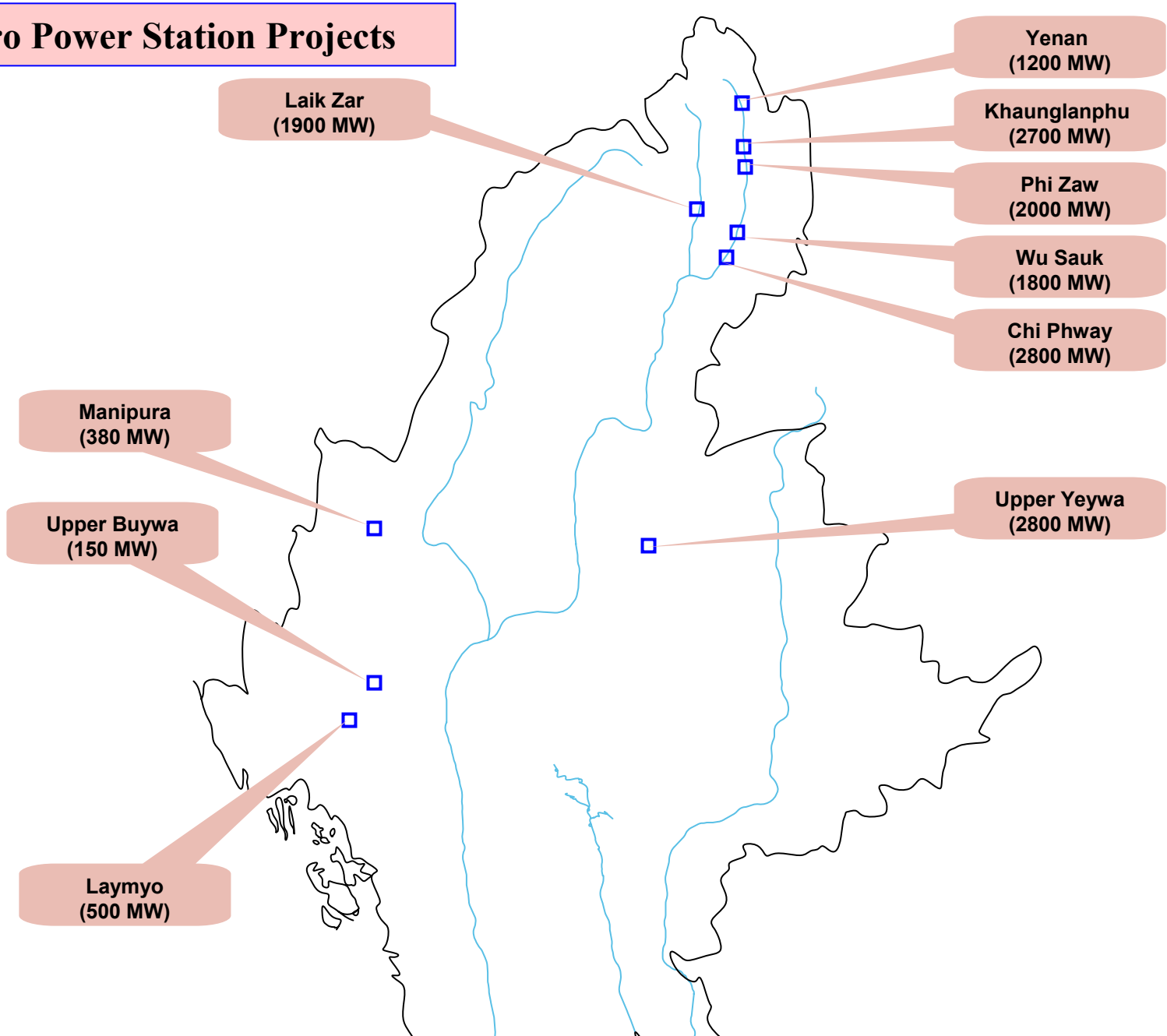


(3) Progress in Power Development Program (Cont:)

Future Hydro Power Station Projects		
Sr.	Project Name	Capacity (MW)
1	Yenan	1200
2	Khaung Lan Phu	2700
3	Phi Zaw	2000
4	Wu Sauk	1800
5	Chi Phway	2800
6	Laik Zar	1900
7	Sai Din	76.5
8	Bilin	280
9	Dayine Chaung	25
10	Tha Kyet	20
11	Lay Myo	500
12	Manipura	380
13	Upper Buywa	150
14	Upper Yeywa	140
Total		13,971.5

(3) Progress in Power Development Program (Cont:)

Future Hydro Power Station Projects



(3) Progress in Power Development Program (Cont:)

Transmission Lines

Existing		
kV	Nos. of Lines	Miles
230	20	1186
132	27	1206
66	70	1515
Total	117	3907

Under Construction		
kV	Nos. of Lines	Miles
230	15	599.15
132	6	98.67
66	2	52.74
Total	23	750.56

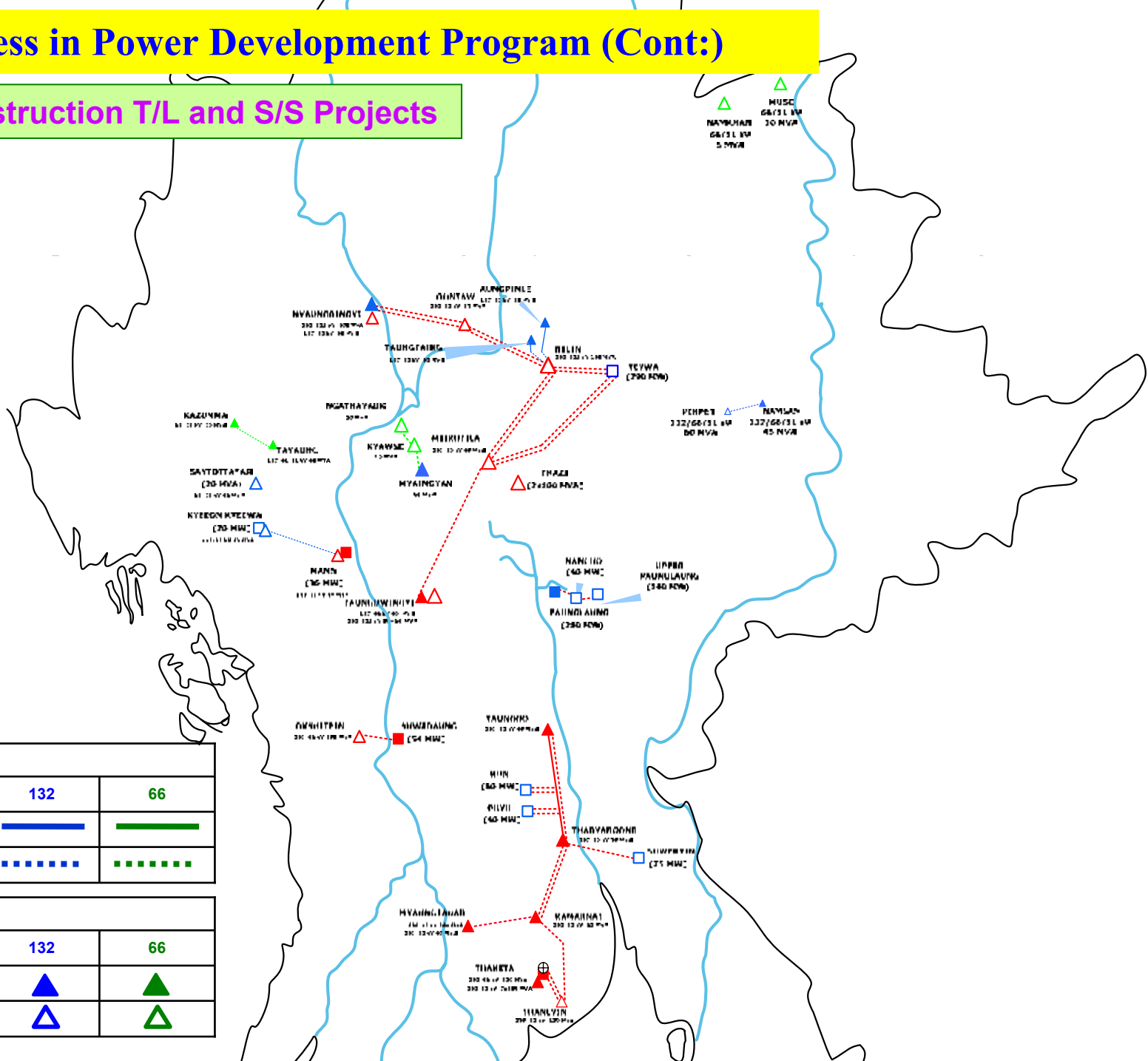
Substations

Existing		
kV	Nos. of S/S	MVA
230	23	2108
132	25	1013
66	52	939
Total	100	4060

Under Construction		
kV	Nos. of S/S	MVA
230	8	865.0
132	2	135.0
66	5	62.5
Total	15	1062.5

(3) Progress in Power Development Program (Cont:)

Under Construction T/L and S/S Projects

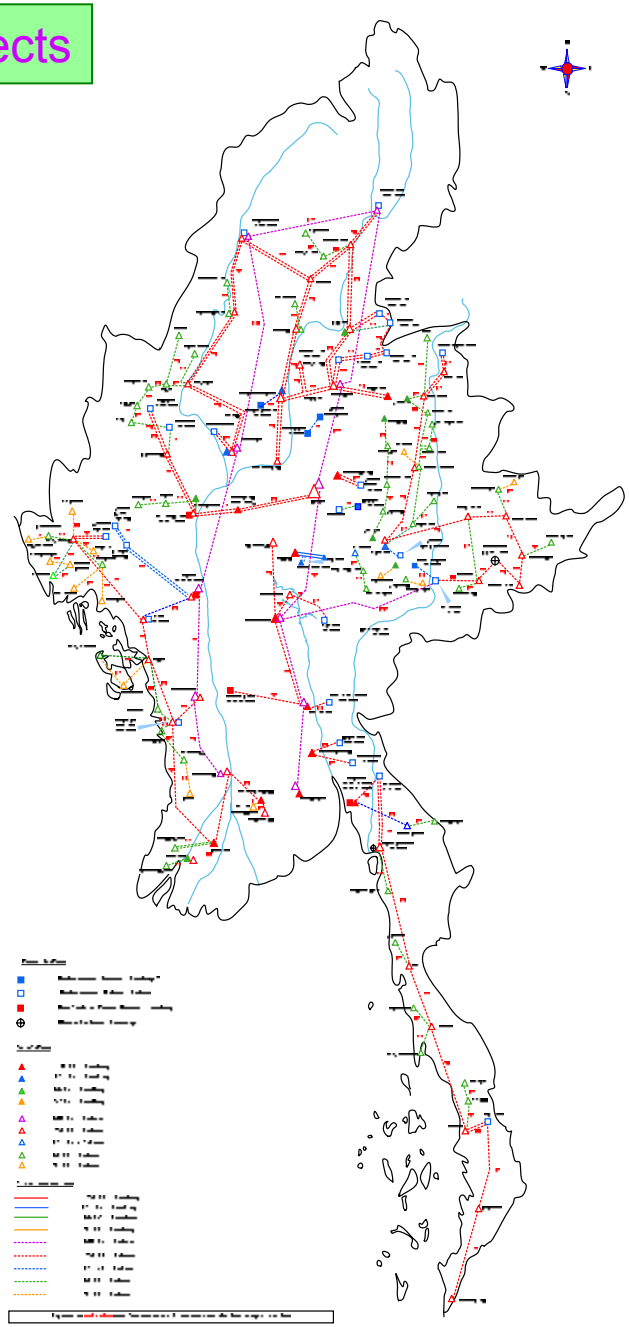


Transmission Line			
kV	230	132	66
Existing			
Under Con:			

Sub Stations			
kV	230	132	66
Existing	▲	▲	▲
Under Con:	△	△	△

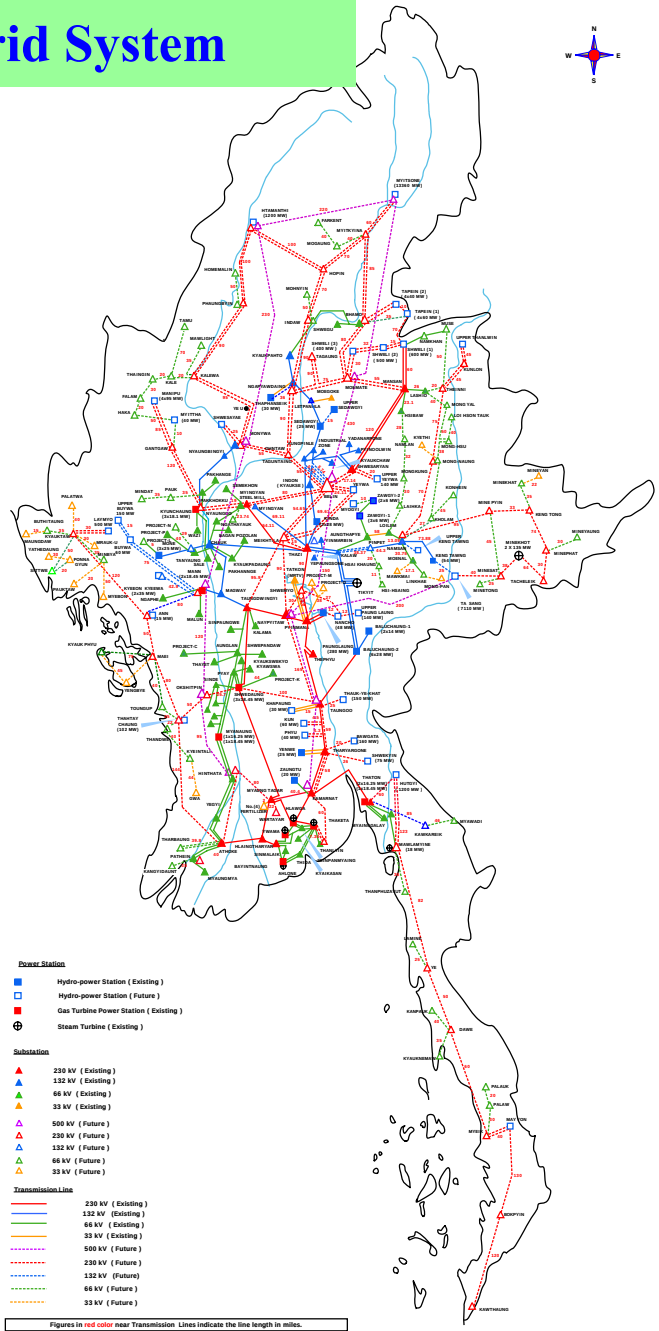
(3) Progress in Power Development Program (Cont:)

Future T/L & S/S Projects



(3) Progress in Power Development Program (Cont:)

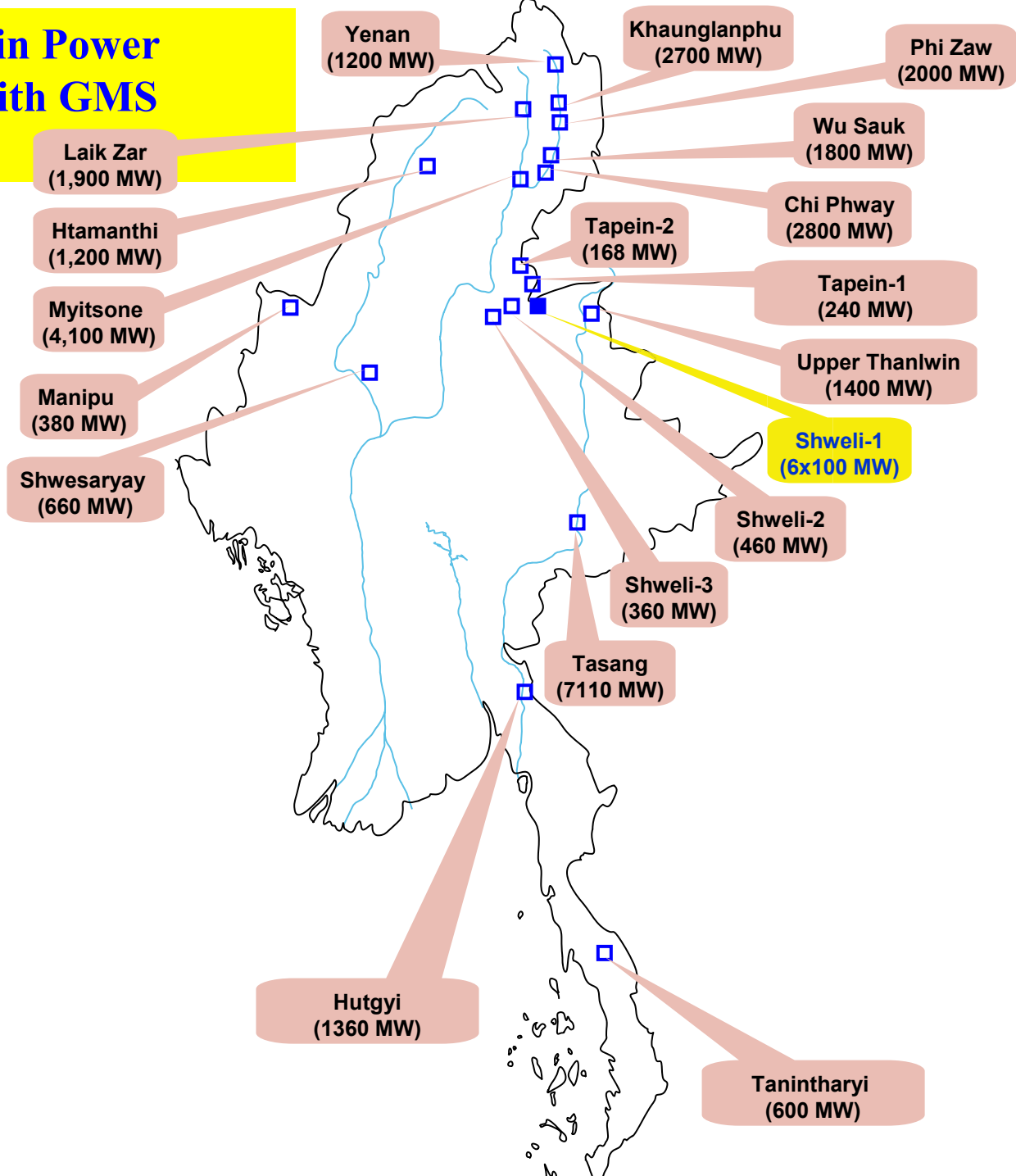
Future National Grid System



Contents

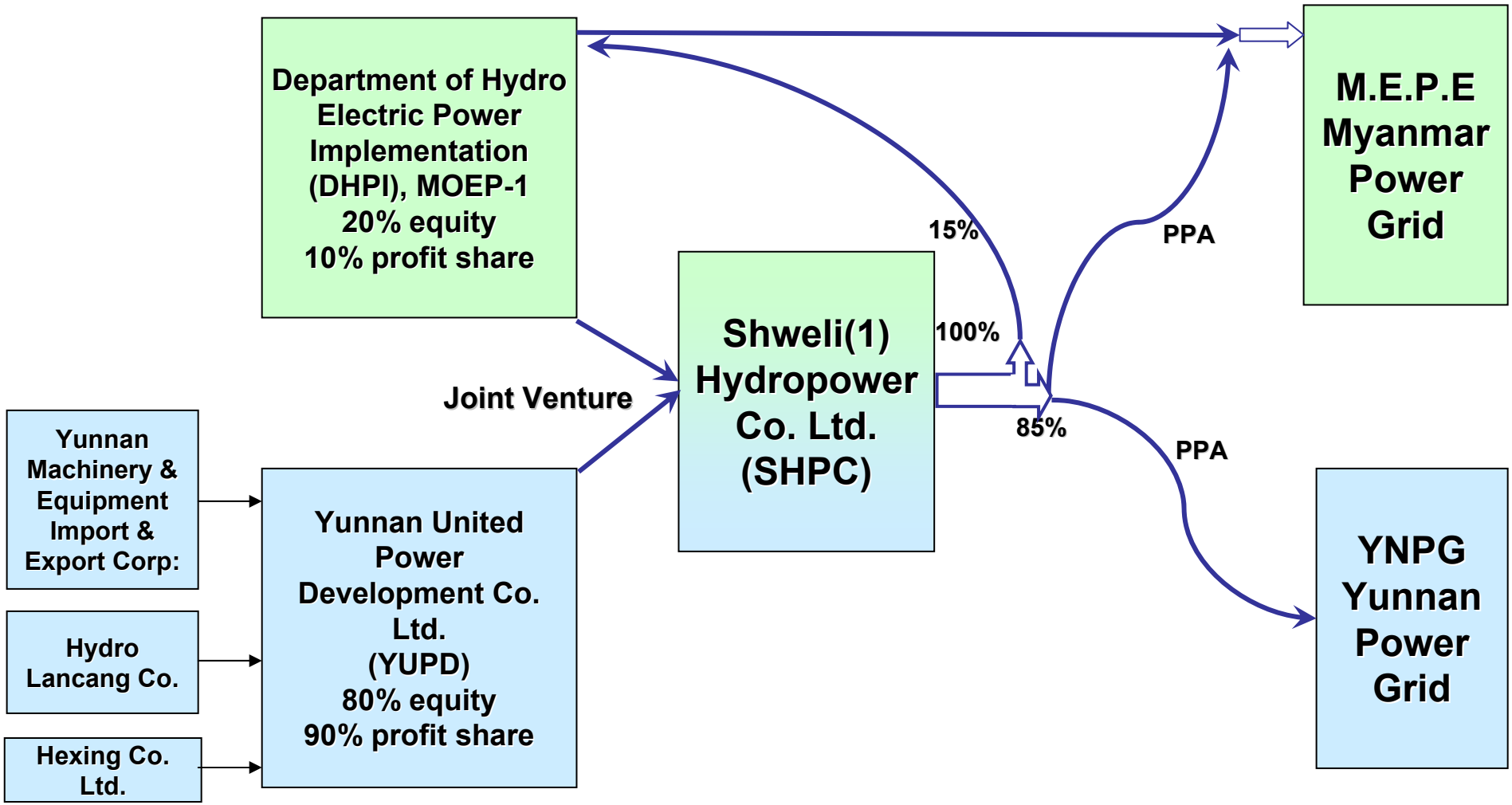
(4) Developments in Power Cooperation with GMS Neighbors

Hydro Power Station Projects to Cooperate with other countries



(4) Developments in Power Cooperation with GMS Neighbors (Cont:)

Shweli(1) Hydropower Co. Ltd. (SHPC)



(4) Developments in Power Cooperation with GMS Neighbors (Cont:)

Shwe Li Power Station	: 100 MW x 6 Nos.
No.(1) Machine	: 75 MW
No.(2) Machine	: 100 MW
No.(3) Machine	: 100 MW

Commercial Operation between MOEP-2 and YUPD start at 5 th, November 2008.

At the moment Myanmar use only free energy 15%.

PPA between MOEP-2 and YUPD is under negotiation. Myanmar shall be entitled to purchase up to 300 MW.

For Cross Border, 72 Hour Test Run successfully finished at (23.10.2008).

Cross Border Commercial Operation does not start yet.

Planned to start the Cross Border Commercial Operation with 100 MW.

“Cooperation for a Better World”

THANK YOU

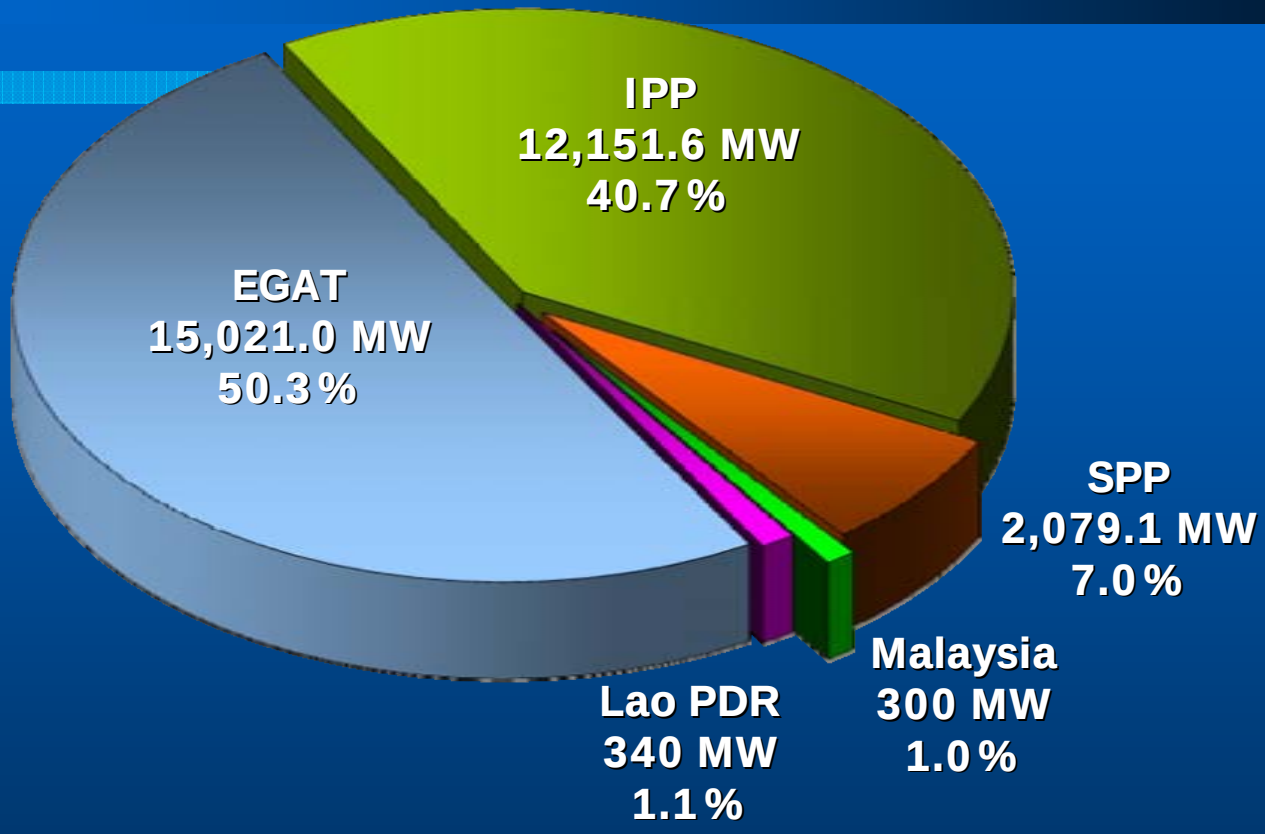
Updated Status of Thailand Power System

The 7th GMS Focal Group (FG) Meeting
Vietnam, 21st November 2008

Present Status

Total Installed Capacity by Power Producers

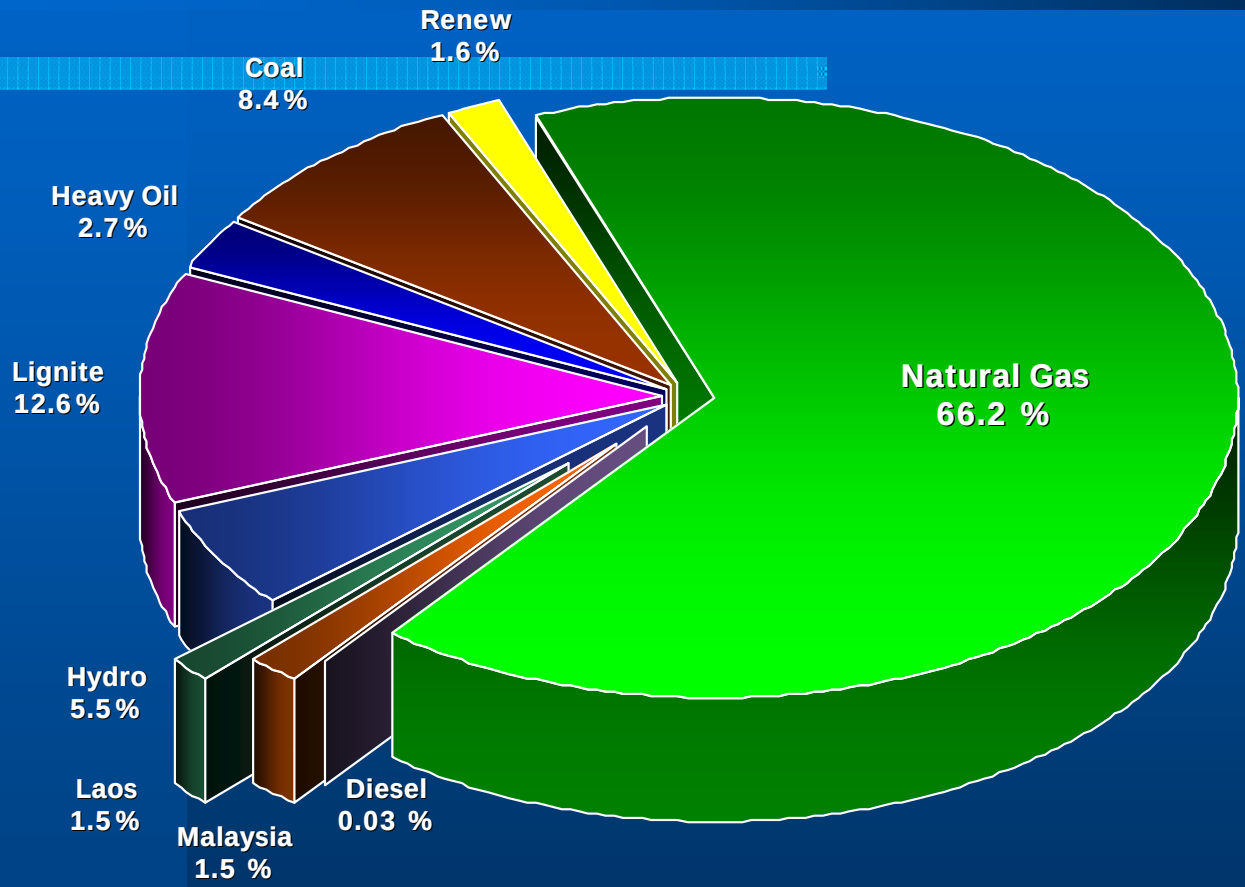
(As of October 2008)



Total Install Capacity as October 2008 **29,891.7 MW**

Peak Demand on 21 April 2008 **22,568.2 MW**

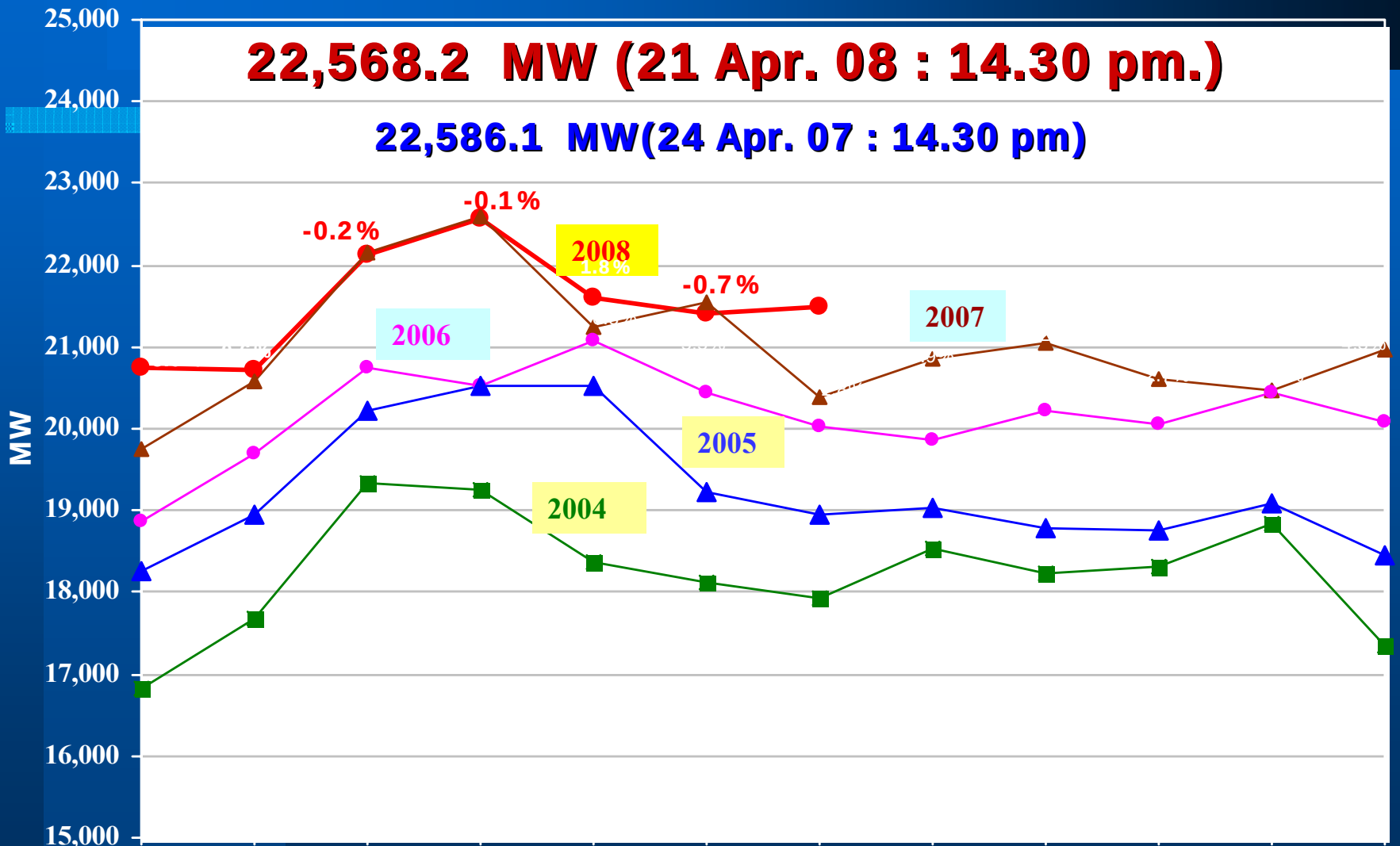
Thailand Fuel Mix for Power Generation in 2007



Total Energy Generation = **146,925 GWh**
(Included Power Purchased)

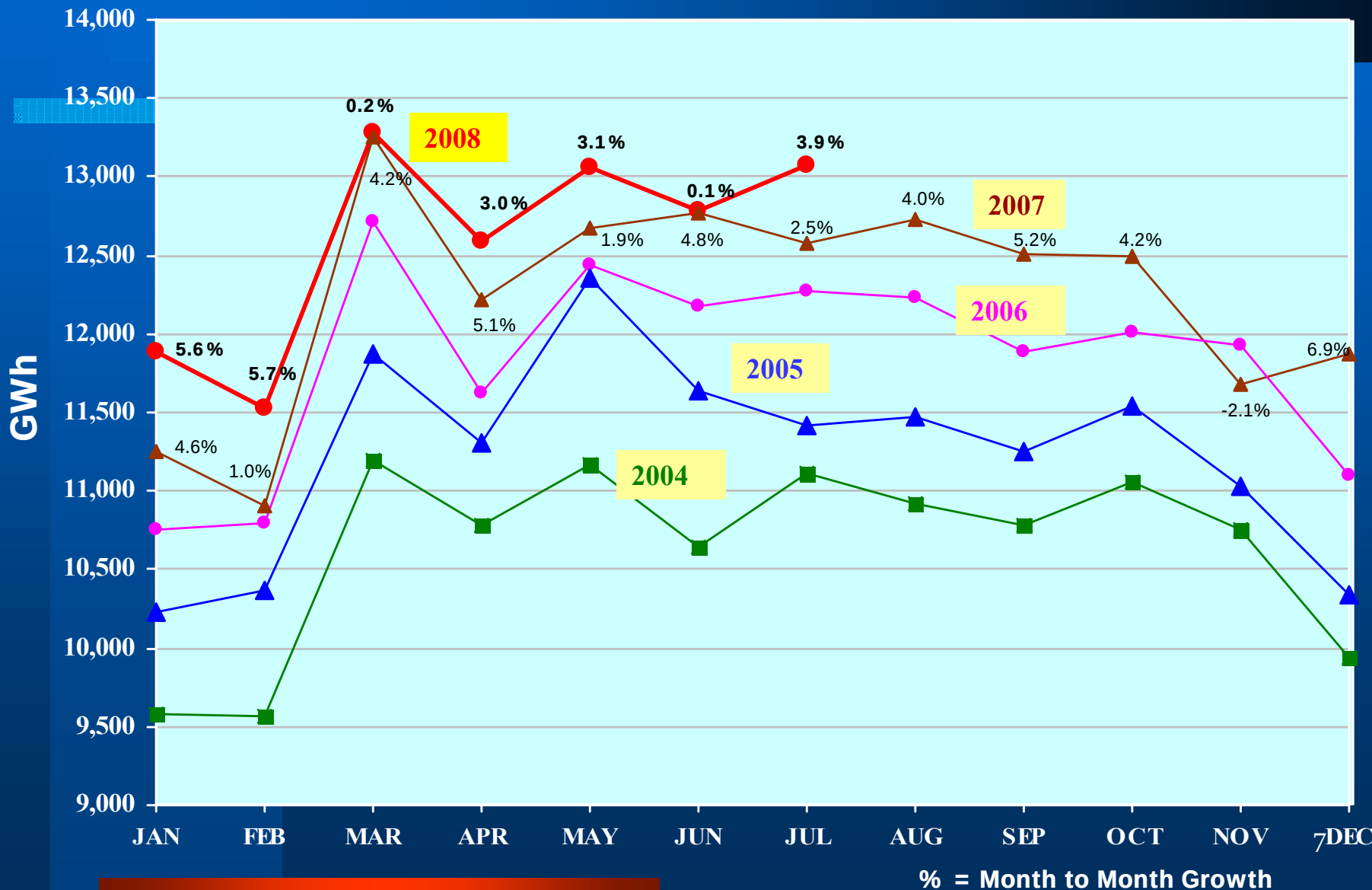
Updated Future Aspects

Statistical Record of Monthly Peak Power Demand



% = Month to Month Growth

Statistical Record of Monthly Energy Demand



สถิติความต้องการไฟฟ้ารายเดือน

Unit: GWh

Energy Demand	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1–25 ส.ค.
2007	11,256	10,904	13,256	12,223	12,668	12,768	12,577	12,723	12,505	12,500	11,679	11,867	10,226
2008	11,881	11,529	13,288	12,592	13,058	12,785	13,071						10,445
% Growth	5.56	5.73	0.24	3.02	3.07	0.13	3.92						2.14

Unit: GWh

Acc. Energy Demand	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	1–25 AUG
2007	11,256	22,159	35,416	47,638	60,307	73,075	85,652	98,375	110,880	123,380	135,059	146,925	95,878
2008	11,881	23,410	36,698	49,290	62,348	75,132	88,203						98,647
% Growth	5.56	5.64	3.62	3.47	3.38	2.82	2.98						2.89

Approximate Growth of 2008 over 2007 = 2.9%

Preliminary Assumption for the Revision of Demand Forecast

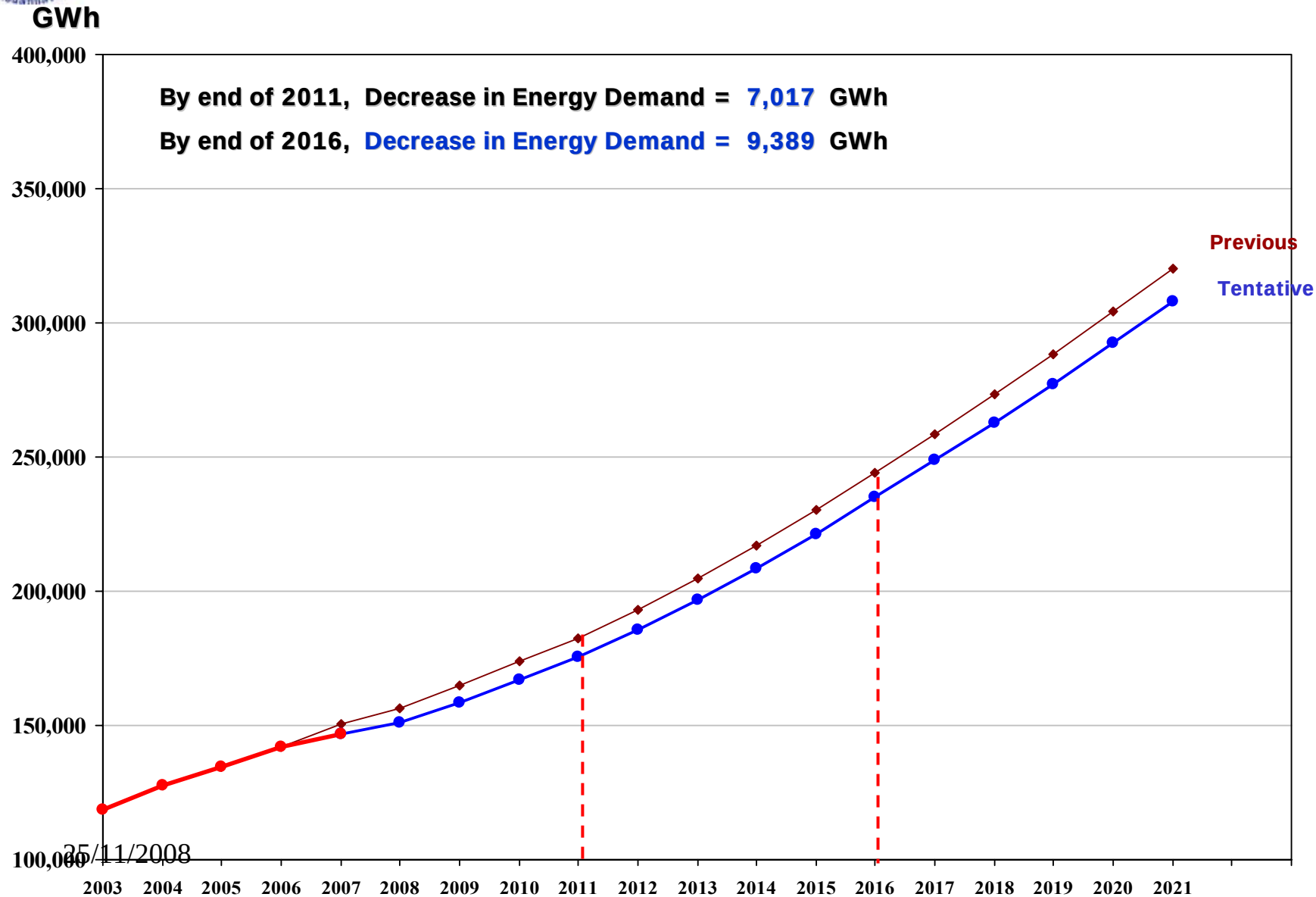
Tentative Forecast of August 2008

1. Energy Growth Rate
   - 2008 = 2.9 %
   - 2009 = 4.8 %
   - 2010 - 2021 Same Growth Rate as Previous Forecast

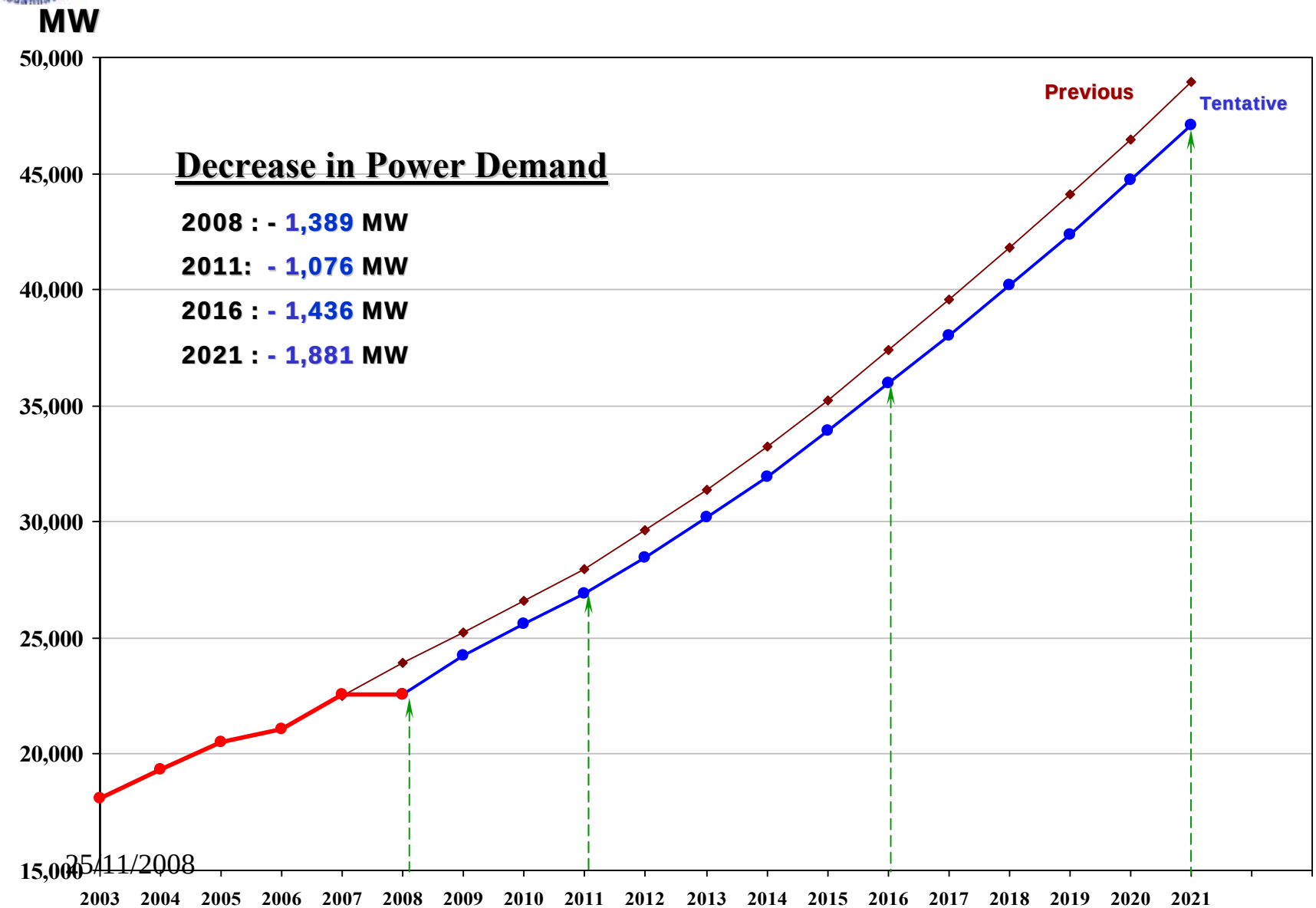
2. Peak Power Demand
   - Use Actual Demand of 2008 = 22,568.2 MW as initial point

3. Load Factor = Previous Forecast

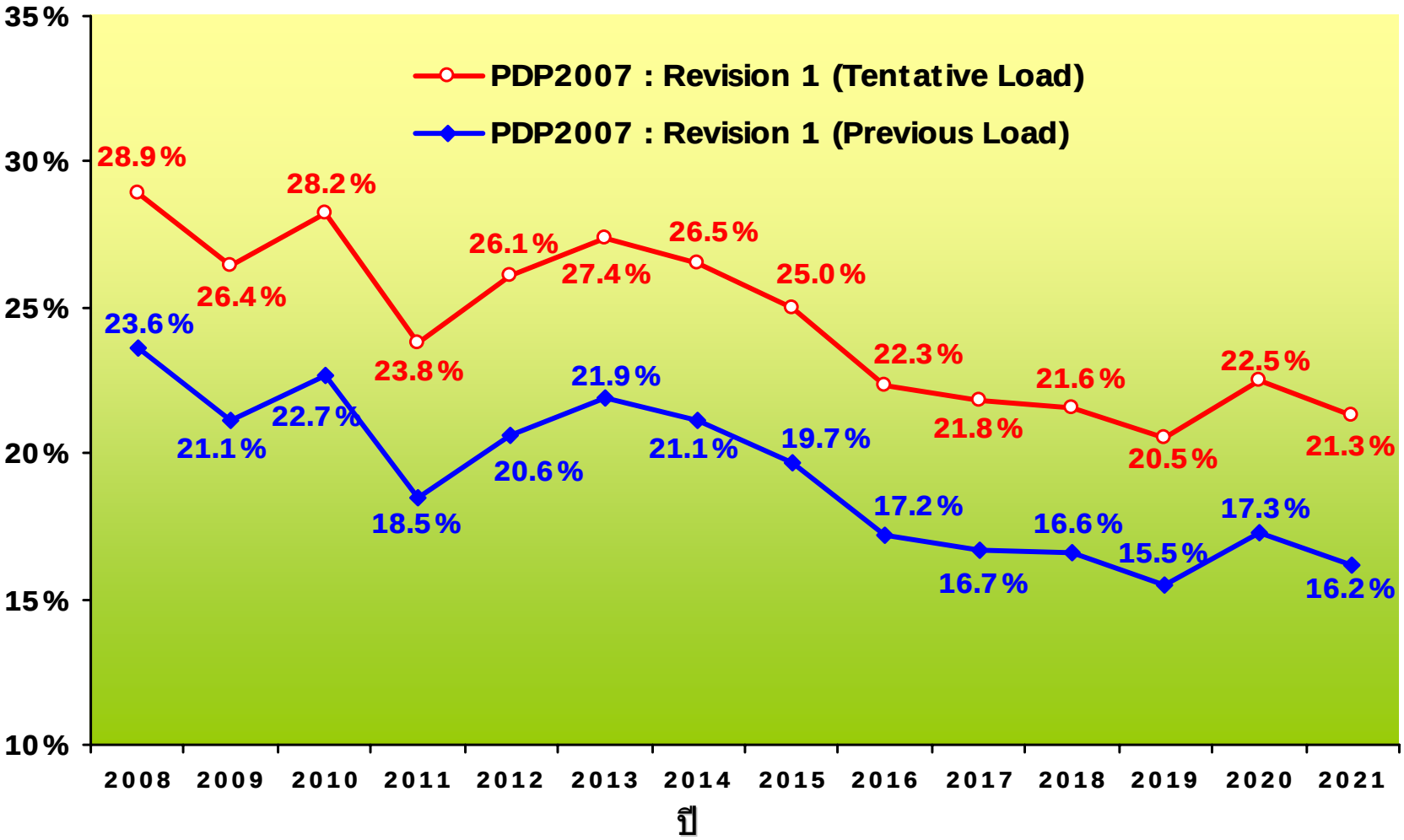
Tentative Energy Demand Forecast



Tentative Peak Power Demand Forecast



System Reserve Margin



Power Development Plan (2009 - 2013)

Year	PDP2007_Rev1 (Jan 08)		Expected Revision	
	Project Name	MW	Project Name	MW
2009	EGAT's SB CC # 3	715		
	EGAT's BPK CC # 5	719		
	PP (Nam Theun 2)	920		
2010	SPP	225		
	RPS	33		
	EGAT's NB CC # 1	685		
2011	SPP	25	IPP Coal (Gheco)	660
	PP (Nam Ngum 2)	596		
2012	SPP	245		
	IPP Coal (Gheco)	660		
	IPP Gas (Siam Energy) # 1	800	IPP Gas (Siam Energy) # 1-2	2x800
	EGAT's WN CC # 4	700	IPP Coal (NPS) # 1-2	2x135
	PP (Theum Hin Boun)	220		
2013	SPP	200		
	IPP Gas (Siam Energy) # 2	800		
	IPP Coal (NPS) # 1-4	4x135	IPP Coal (NPS) # 3-4	2x135
	EGAT's BPK CC # 6	700	**To be replaced with Chana # 2 (2018)**	
	PP (Hong Sa # 1)	490	**Power purchased from neighboring countries**	450
	PP (Nam Ngum 3)	440		

Power Development Plan (2014- 2016)

Year	PDP2007_Rev1 (Jan 08)		Expected Revision	
	Project Name	MW	Project Name	MW
2014	SPP	200	IPP Gas (Power Gen.) # 1-2	2x800
	PP (Hong Sa # 2-3)	2x490		
	PP (Nam Theun 1)	523	**Power purchased from neighboring countries**	450
	PP (Nam Ou # 1)	200		
	PP (Nam Ngiep)	261		
2015	SPP	210		
	IPP Gas (Power Gen.) # 1-2	2x800		
	PP (Nam Ou # 2)	843	**Power purchased from neighboring countries**	450
	EGAT's Coal # 1	700		
2016	SPP	200		
	EGAT's Coal # 2-3	2x700	**Power purchased from neighboring countries**	500

On-going Projects

- **Nam Theun 2** Project 920 MW :
  - PPA November 2003
  - Project will be completed in November 2009
- **Nam Ngum 2** Project 615 MW :
  - PPA May 2006
  - Project will be completed in December 2010

On-going Projects (Continued)

- **Theun Hinboun (Expansion) Project 220 MW :**
  - **PPA December 2007**
  - **Project will be completed in March 2012**

Electricity Generating Authority of Thailand

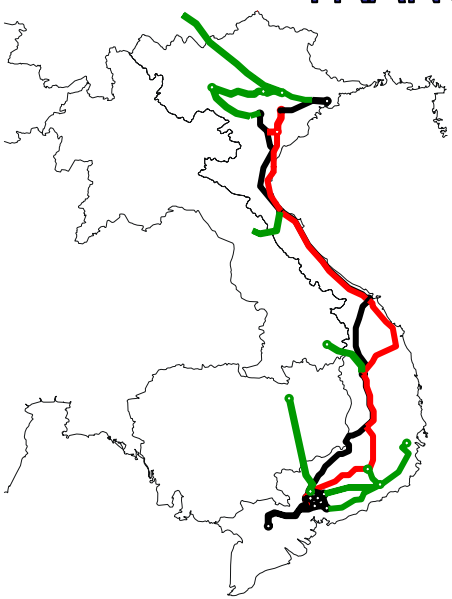
Bangkruai, Nonthaburi 11130
Tel. +66 (0) 24630000
Fax. +66 (0) 24364831
http://www.egat.co.th

GREATER MEKONG SUBREGION ADB

Regional Power Trade Coordination Committee (RPTCC)

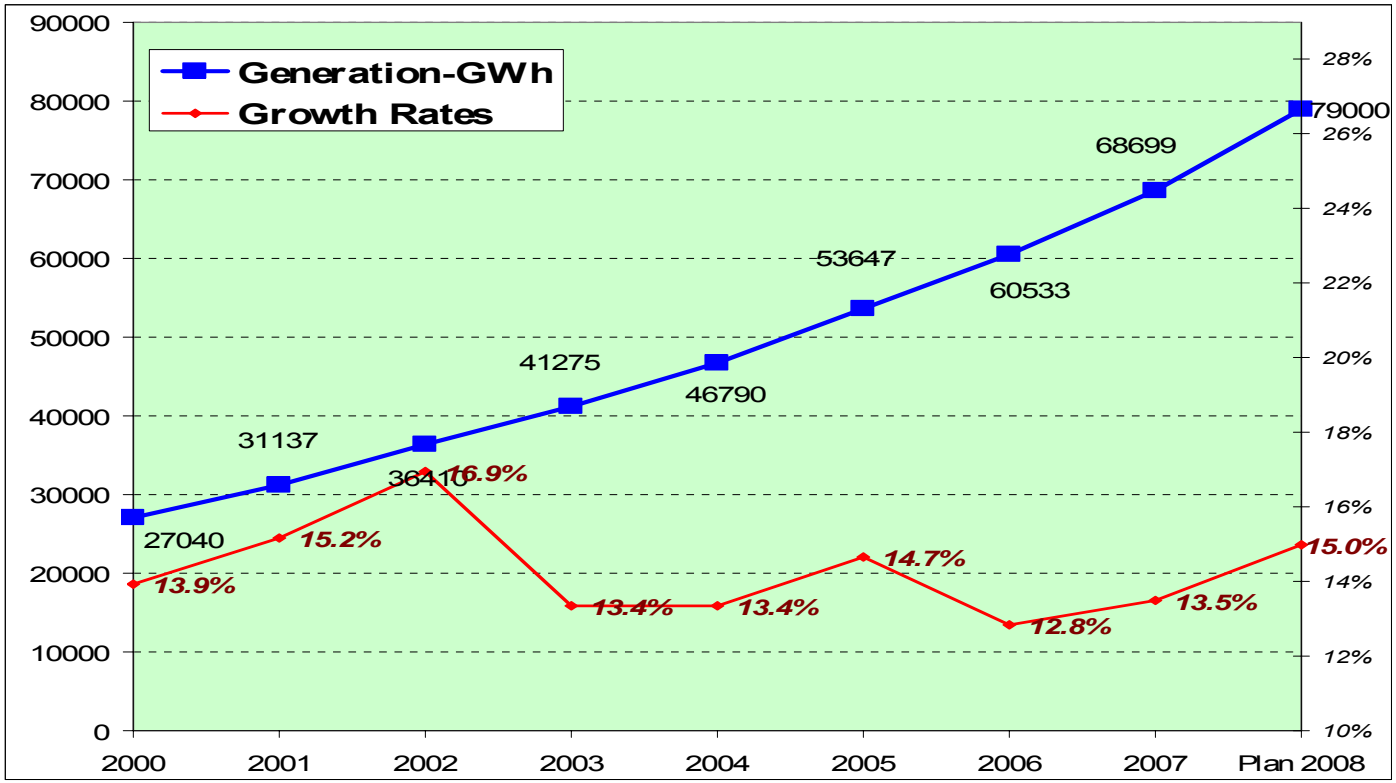
SIXTH MEETING OF THE PLANNING WORKING GROUP (PWG - 6)

PROGRESS OF VIETNAM POWER DEVELOPMENT PLAN AND TRANSMISSION INTERCONNECTION PROJECT



HO CHI MINH CITY, VIETNAM, 21th NOVEMBER 2008

Power Generation



Annual Growth rate (2001-2007):

- Generation output: 14.1%
- Energy sale: 14.5%
- Peak demand: 12.2%
- Installed Capacity 11.7%

- EVN power plant projects:

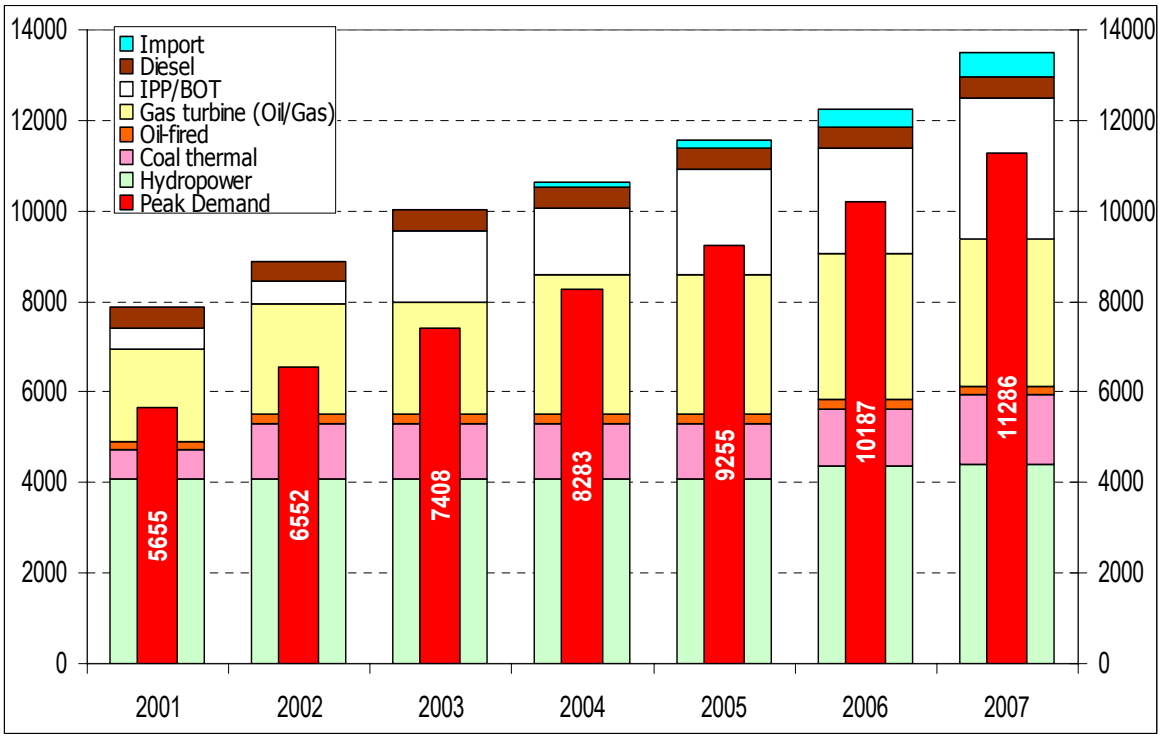
+ 33 pprojects under construction

+ 7 projects being prepared for construction startED FROM 2009-2010

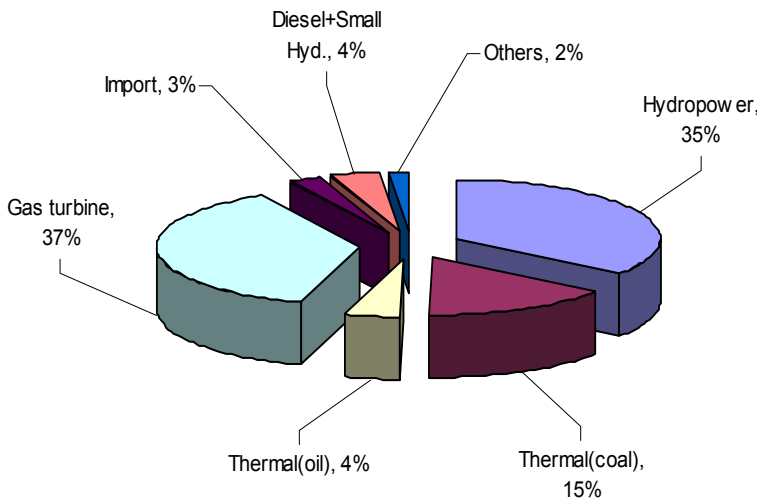
Status of power system

- ✓Total installed capacity of Power Plants as of 2007: **13512 MW**
- ✓Peak Demand Oct. 2008: **11605 MW**
- ✓ ***Till now the new additional capacity of 883 MW; Total est imated new capacit y in 2008: 1738 MW***

Installed capacity vs. Peak demand 2001 - 2007



Installed capacity breakdown - 2007



TRANSMISSION grid & RURAL ELECTRIFICATION

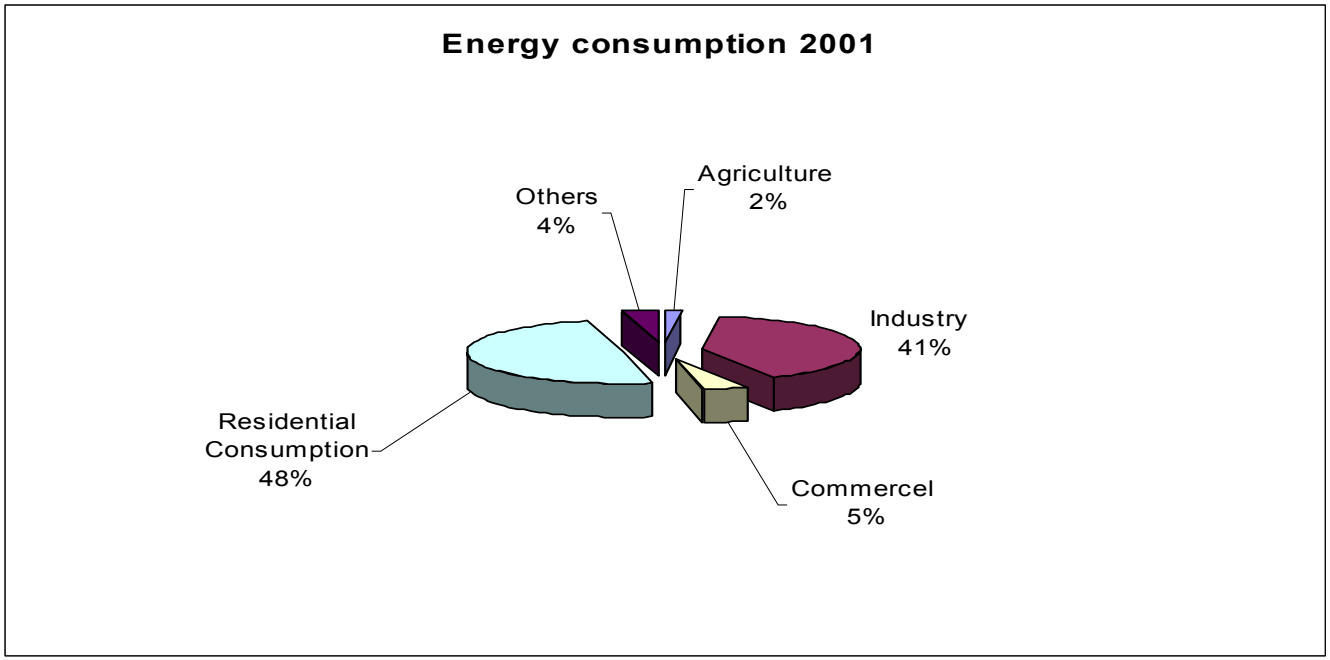
By the end of 2007

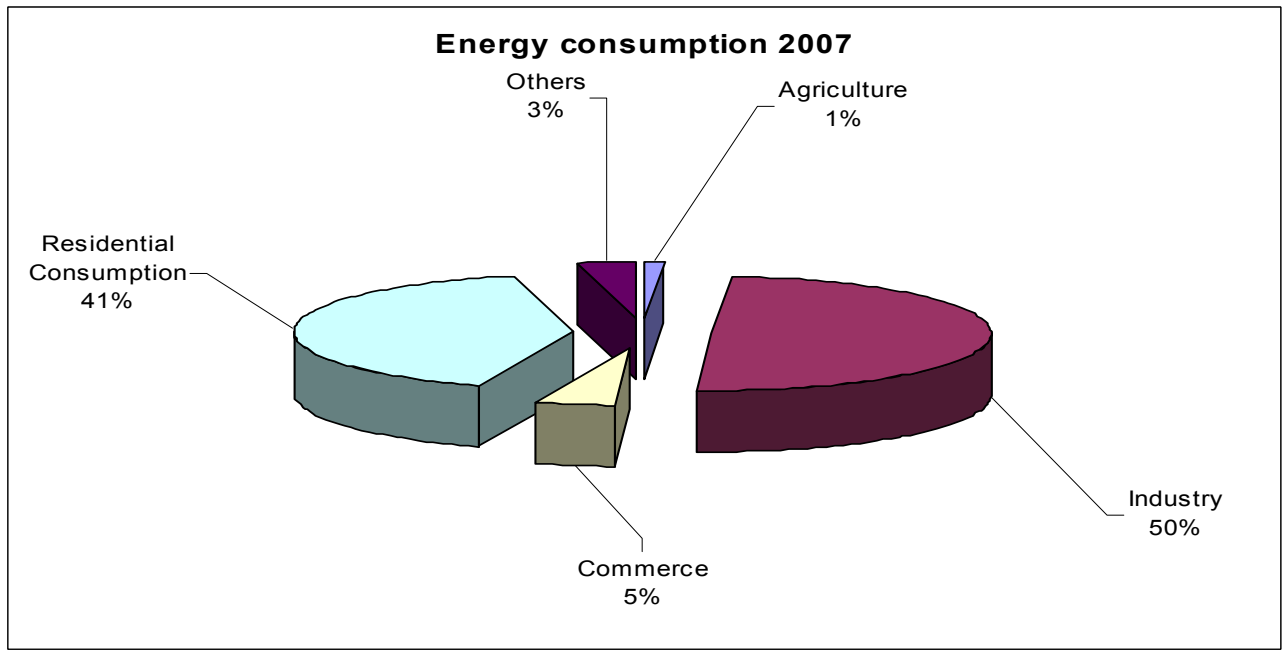
	Lines	Substations
500 KV	3.286 km	7.050 MVA
220 KV	6.490 km	17.500 MVA
110 KV	11,400 km	22,200 MVA

RURAL ELECTRIFICATION (3/2008)

Province	100%
District	100%
Village	97.2%
Rural HHs	93.6%

Power consumption period 2001-2007





expected schedule of Hydropower Projects in lao pdr

	Name of Projects	Capac. MW	Commissioned	Developers	Remarks
1	Xe kaman 3	250	2010	EDL-VietLao PJS	Under Contr.
2	Xe kaman 1	290	2012-2013	VietLao PJS	Preparing for start construction
3	Luong PhaBang	1410	2015-2016	Lao-PVN-Song Da Co	F/S on-going; Connection plan has been submitted to MOIT (VN) & MEM (Laos)
4	Xe kaman 4&4A	74+69	2013	Lao & VietLao PJS	Pre-F/S on-going
5	Xe Kong 3 upper	152	2014-2015	VietLao PJS	PreF/S on-going
6	Xe Kong 3 down	96	2014-2015	VietLao PJS	PreF/S on-going
7-9	Nam Et 1,2,3	420	*TBD*	EVN-Sovico	Planning
10	Nam Mo	105	2012	VN developer	PreF/S
11	Nam Kan	66	*TBD*	EVN-...	PreF/S on-going
12	Nam Kong 2	70	2014	EVN-Cavico	Planning
13	Xe Xou	60	2013	EVN-Cavico	Planning
14	Xe kaman 2&2A	100+64	2015	VN developer	PreF/S on-going
15	Dak E Meul Upper	23	2014-2015	Lao & VietLao PJS	Planning
16	Dak E Meul Mid	115	2014-2015	Lao & VietLao PJS	Planning
17	Xe kaman Xanxay	32	2012	Lao & VietLao PJS	Planning
18	SeKong 4	300	*TBD*	Region Oil & Others	F/S on-going
19	SeKong 5	400	*TBD*	Region Oil & Others	F/S on-going
20	Nam Kong 1	100	*TBD*	Region Oil & Others	F/S on-going
21-23	HPPs in Nam Xam river	700	*TBD*	Vinashin & Others	Planning
	Total	**4896**			

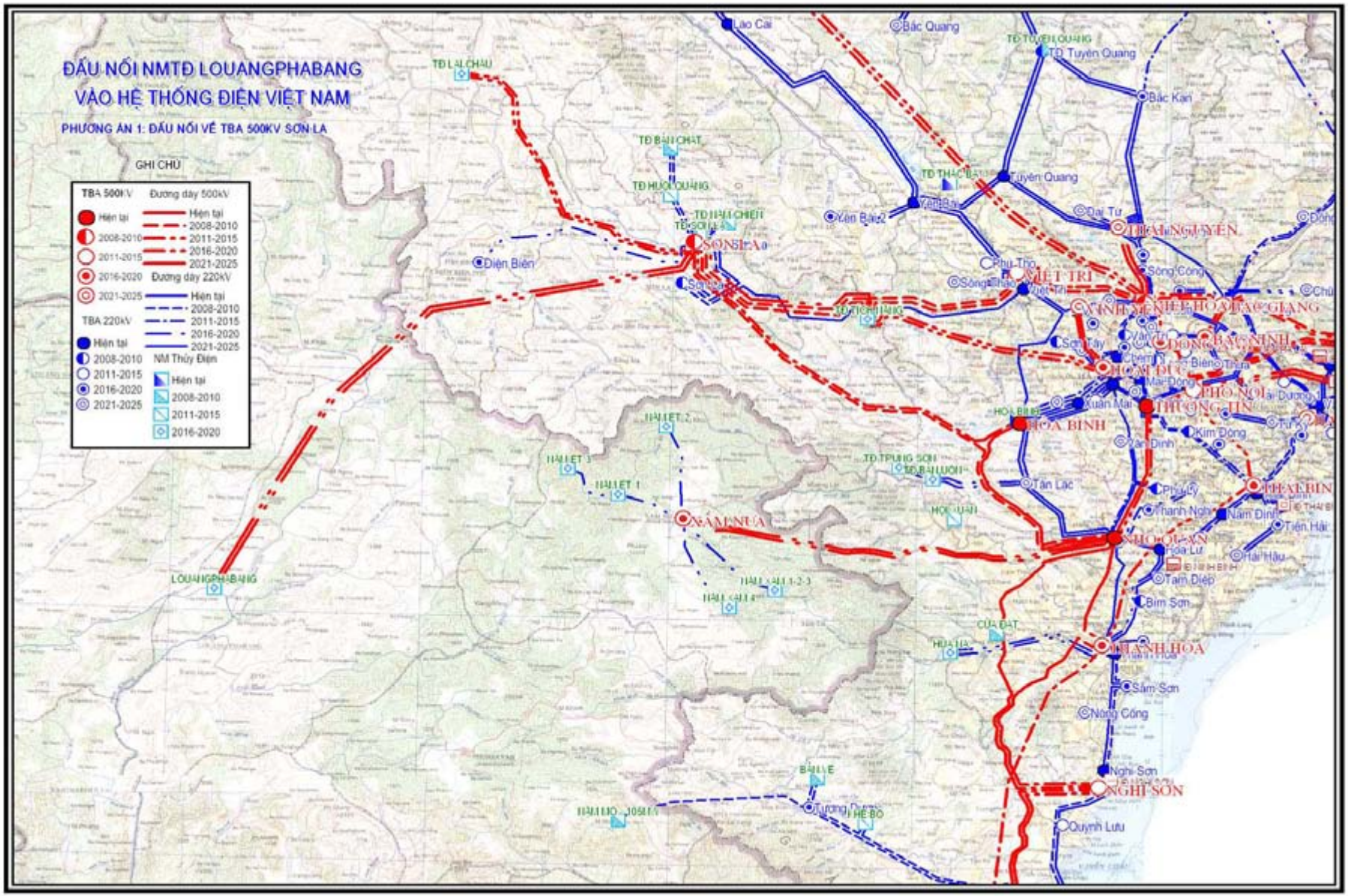
expected schedule of Hydropower Projects in cambodia

	Name of Projects	Capac. MW	Commissioned	Developers	Remarks
1	SeSan 1	90	2012-2013	EVNI-Cambodia PJS	F/S ongoing; Connection plan has been submitted to MOIT (VN) & MIME (Cambodia)
2	Low Sesan 2	420	2013-2014	EVNI-Cambodia PJS	
3	Low Sesan 3	180	2015-2016		Planning
4	Prekliang	128	2015-2016		Planning
5	SamBor	467	2018-2019		Planning
6	Lower Srepok HPPs	~300MW	TBD		Planning
	Total	**1685**			

progress of transmission / interconnection planning

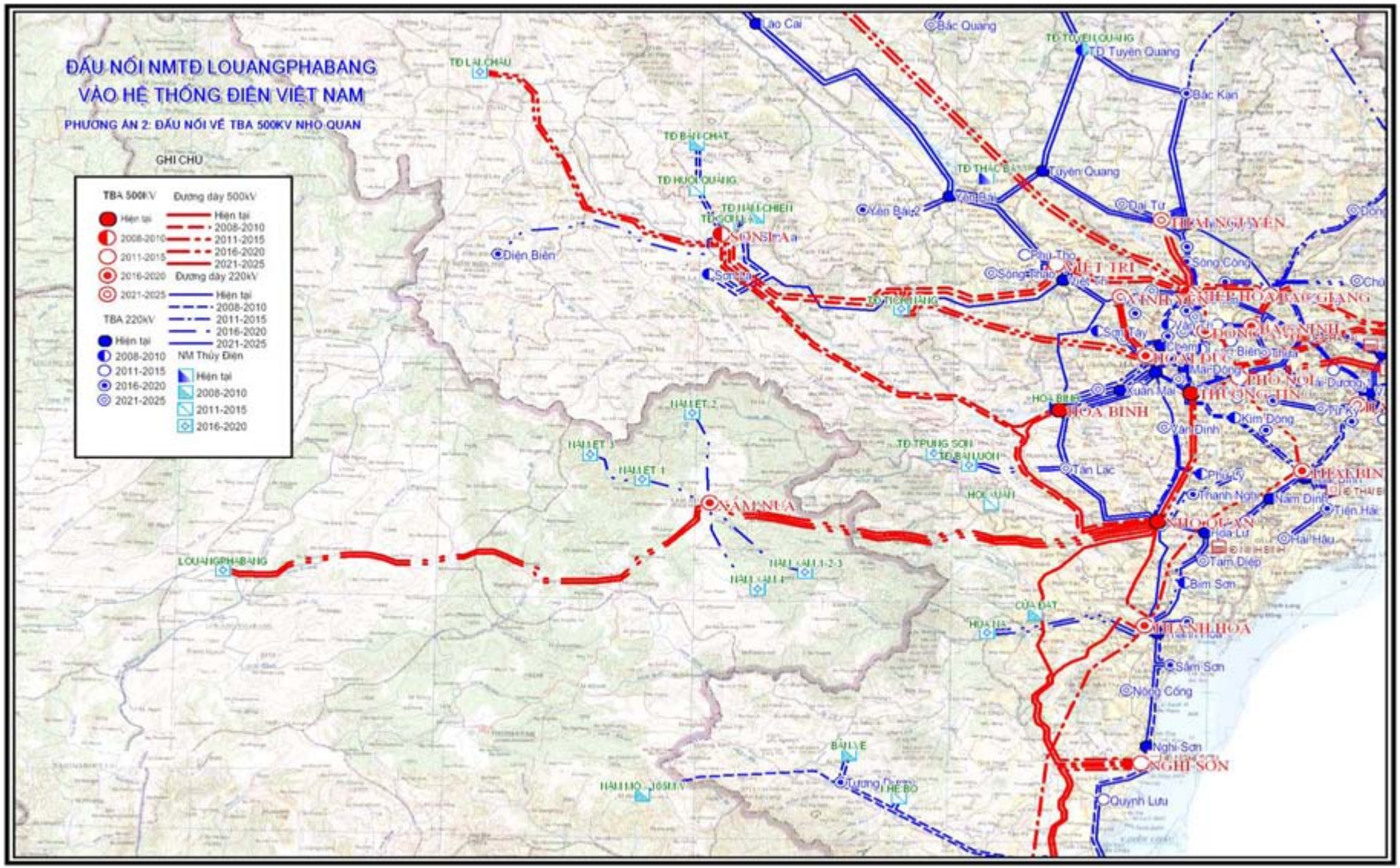
HPPs in the north of lao pdr - connection plan

option 1



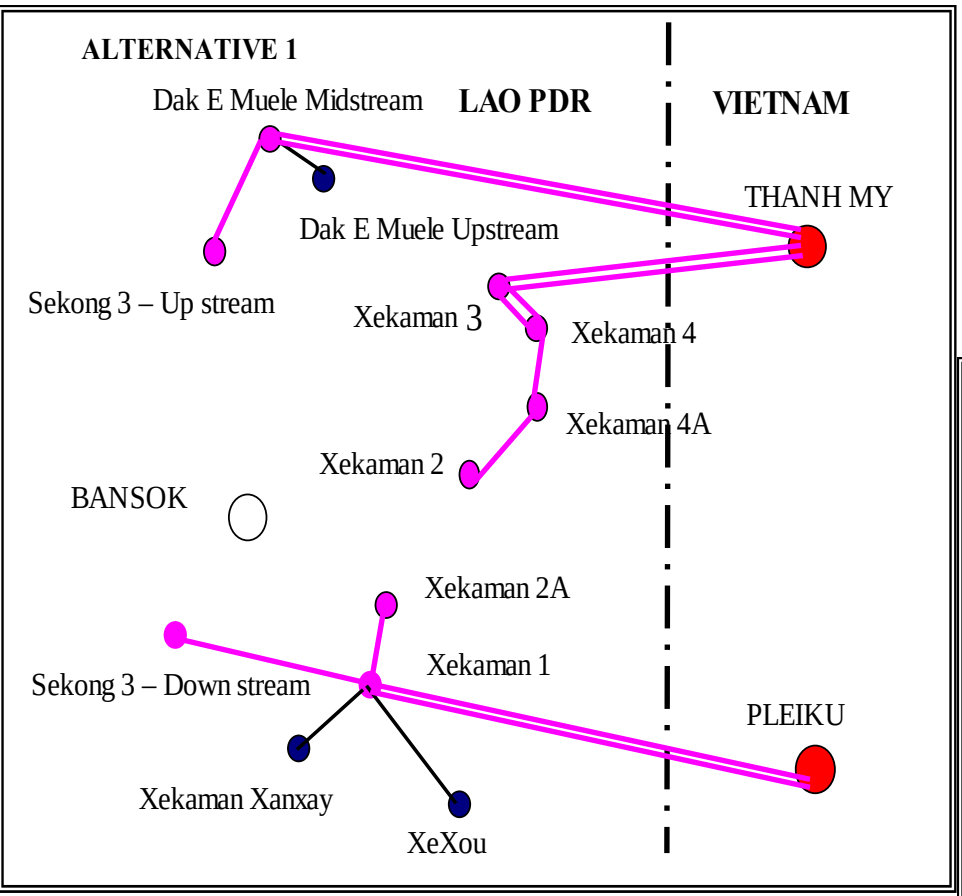
HPPs in the north of lao pdr - connection plan

option 2 (proposed)



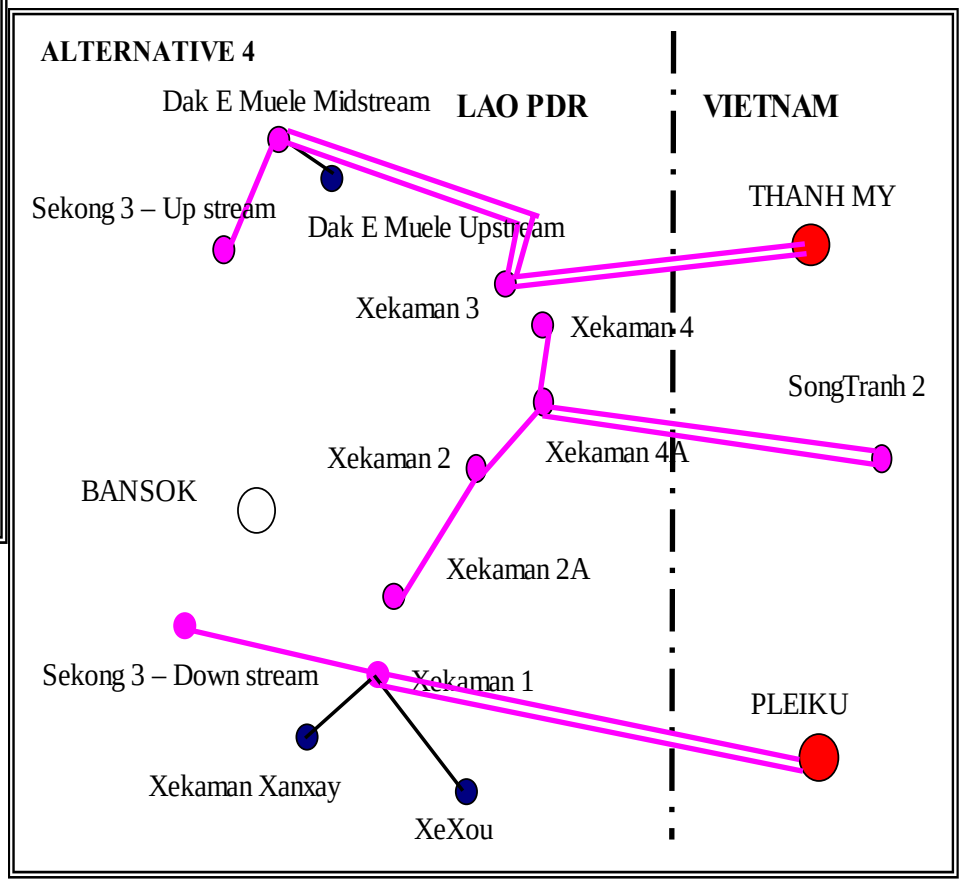
HPPs in the south of lao pdr - connection plan

option 1



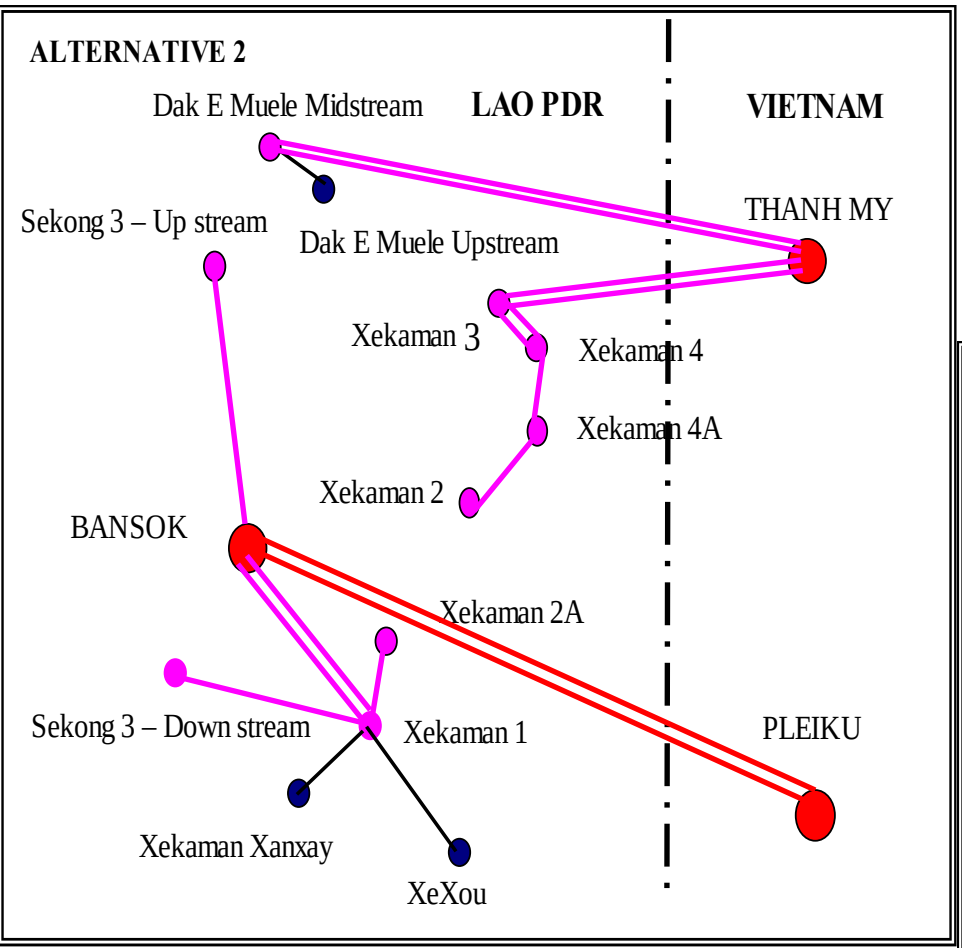
the alternatives of 220kv connection

option 2



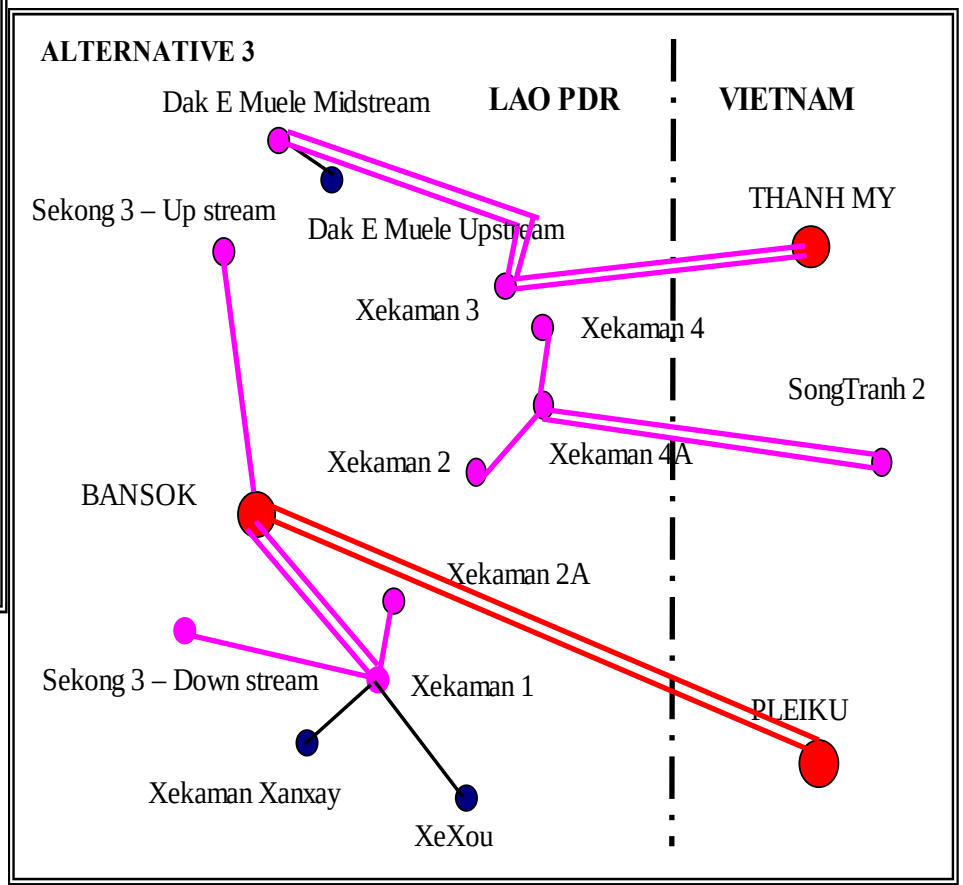
HPPs in the south of lao pdr - connection plan

option 3



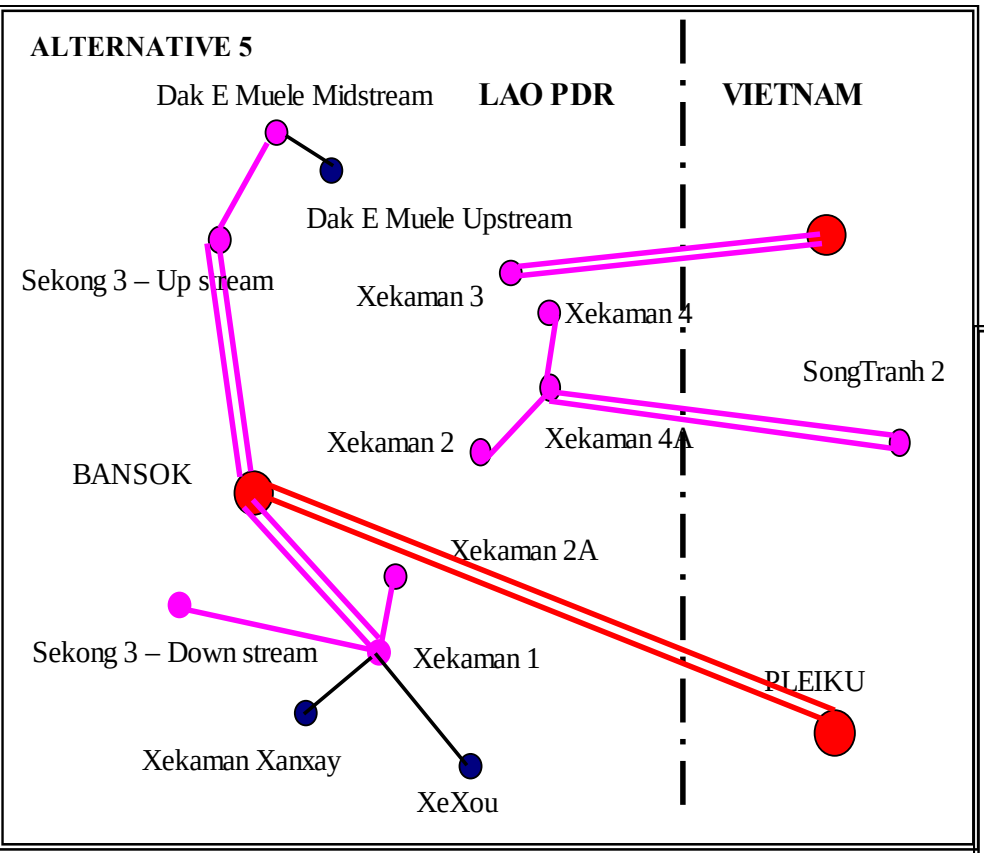
the alternatives of 500 + 220kv connection

option 4



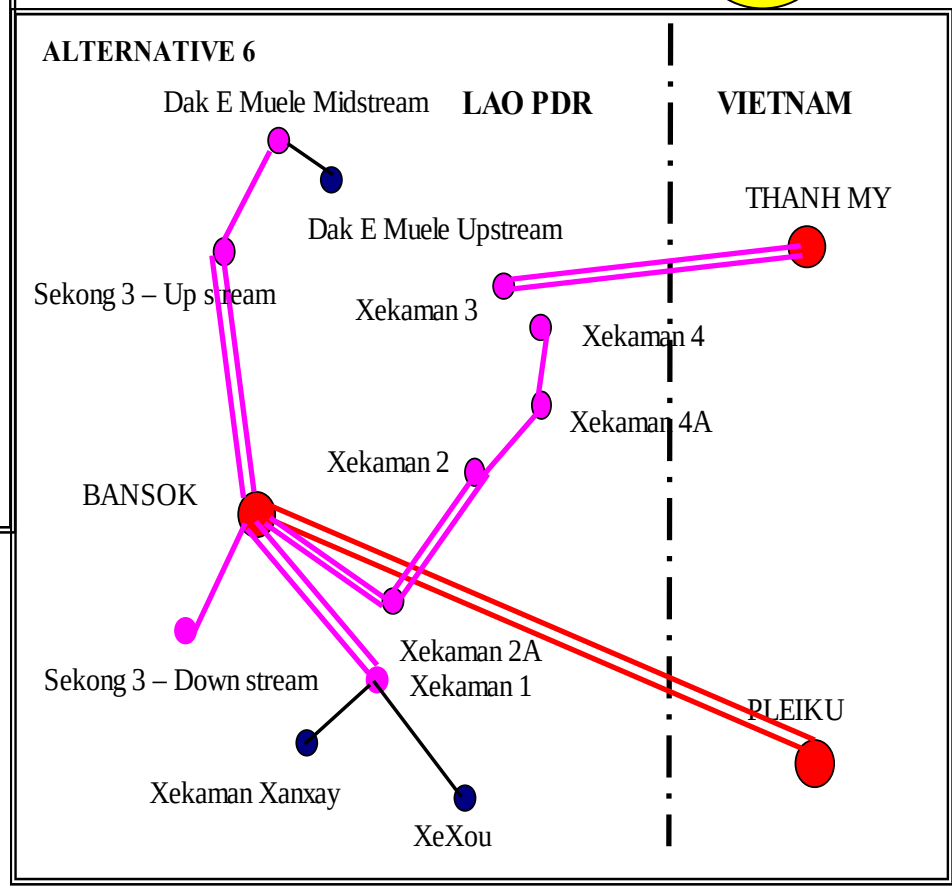
HPPs in the south of lao pdr - connection plan

option 5



the alternatives of 500 + 220kv connection

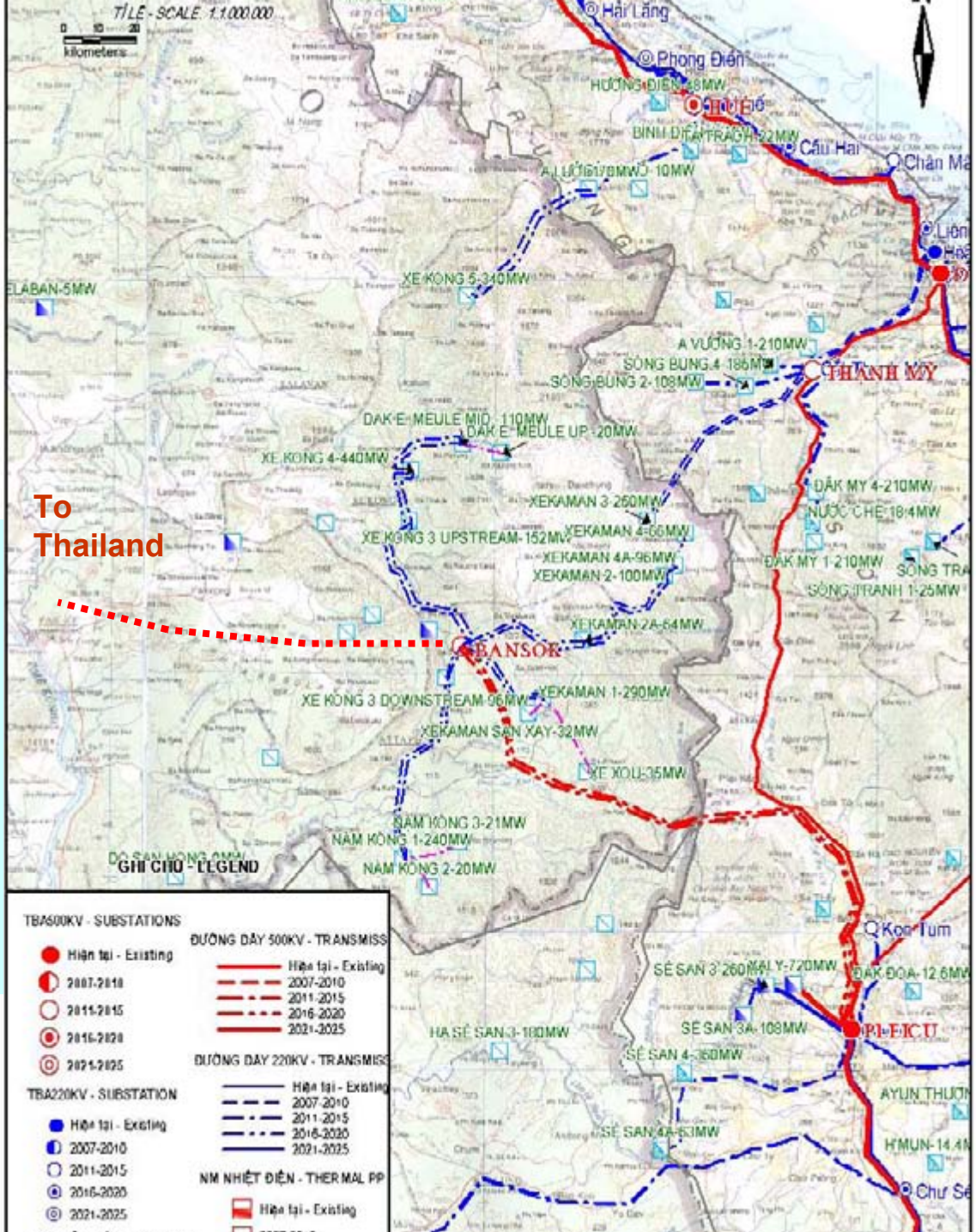
option 6 (proposed)



HPPs in the south of lao pdr - connection plan

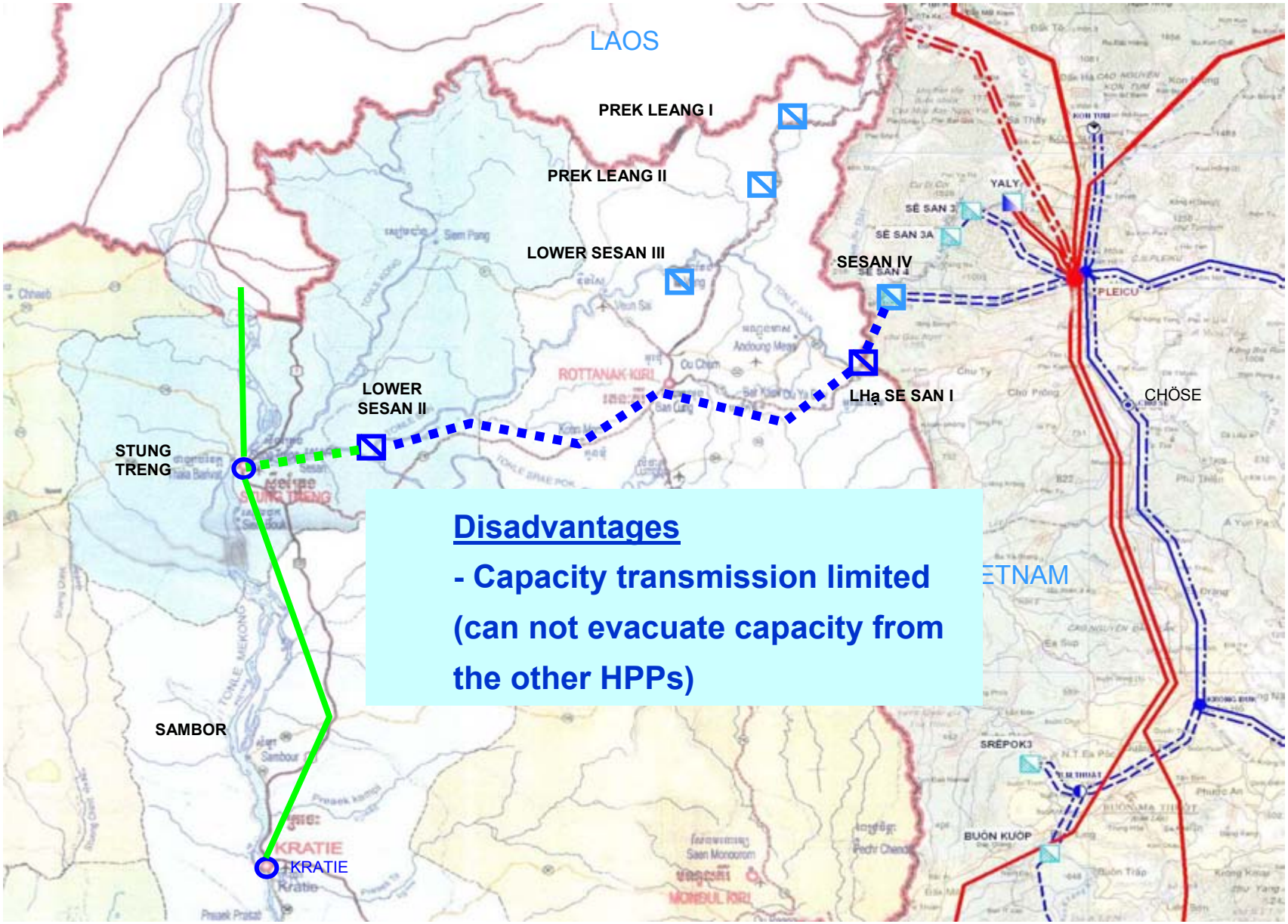
option 6 (proposed)

- A Transmission JSC to be setup by VN & Laos to develop/operate the section from 500kV Bansok S/S to Viet-Lao Border
- 500kV line section from border to Pleiku S/S to be constructed by EVN



HPPs in cambodia - connection plan

connection plan of low se san i & low se san ii (proposed)

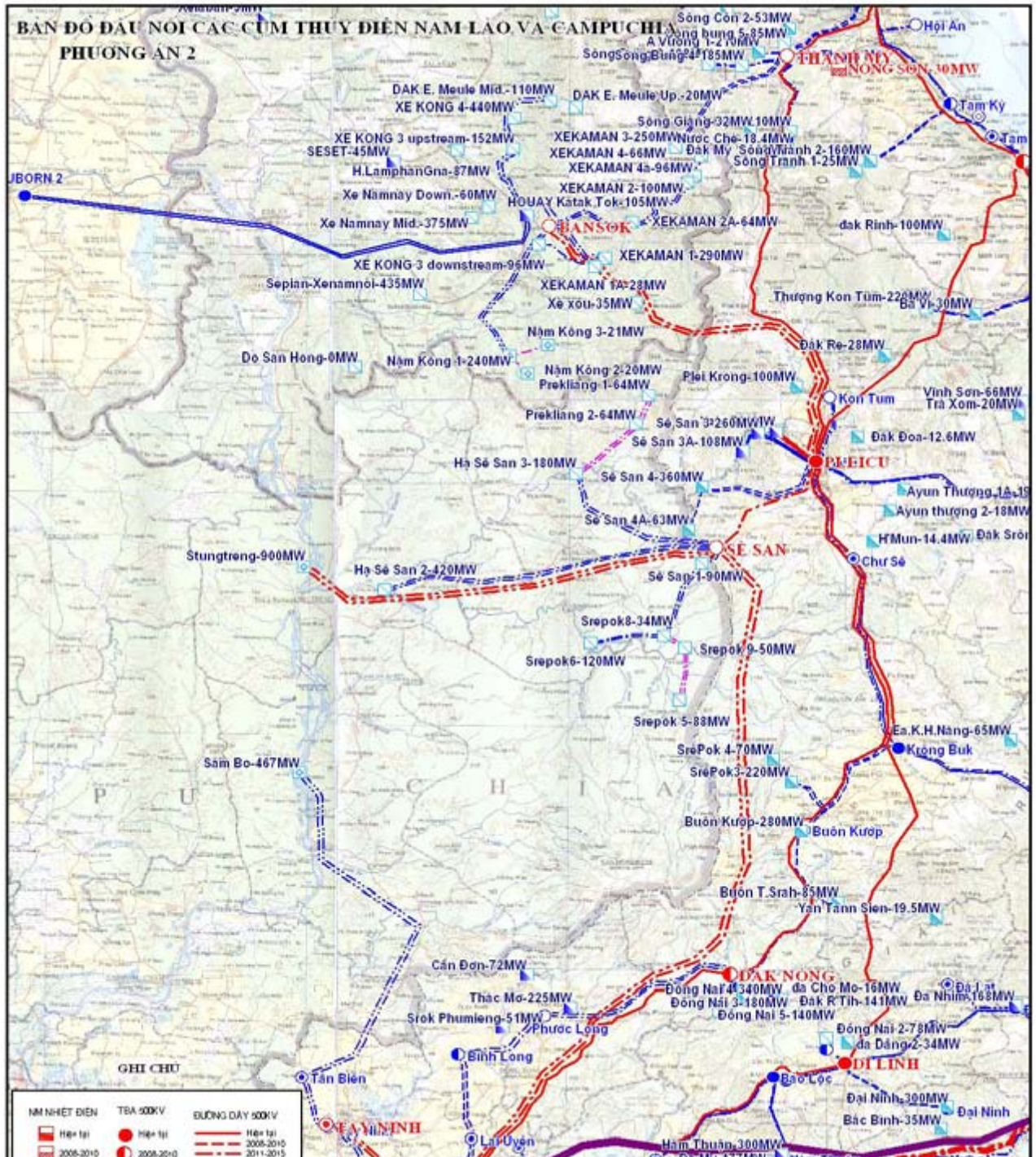


VN-Lao-cambodia - connection plan

option 1

VN-Lao-cambodia - connection plan

option 2



Thank you

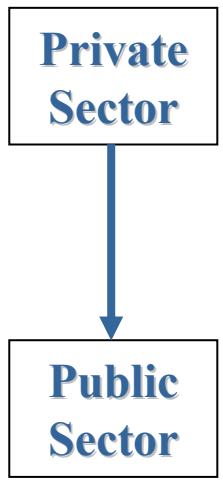
GMS Regional Coordination in the Power Sector Contributions from AFD

RPTCC 7, November 21, 2008
Ho Chi Minh City, Vietnam

Alexis BONNEL
Head, Infrastructure and Environment Division
Agence Française de Développement

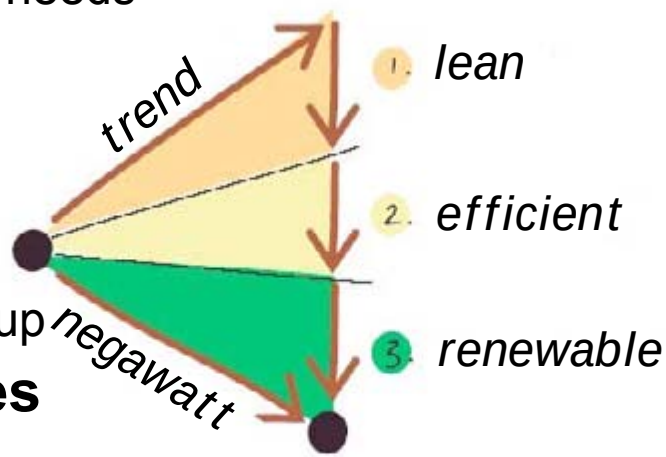
Who are we ? AfD Group

- **French ODA Agency: Public Co & Bank**
  - AfD
  - PROPARCO : financing of the private sector
  - French GEF secretariat
- **Present in 80+ countries**
- **USD 3 billion of ODA committed in 2007**
  3,5 billion in 2008
  - Energy agenda ~ 40%
  - Asia ~ 25%
- **Wide range of financing tools**
  - Equity financing
  - Private sector loans
  - Partial risk guarantees, loan guarantees
  - Guarantees on loans in local currency
  - Non sovereign loans
    (concessional or market conditions)
  - Sovereign loans
    (from very concessional to market conditions)
  - Grants (projects, study funds)
- **Untied aid**



AFD (C)lean Energy Strategy

- **3 constraints impose new energy strategies, in developed + developing economies**
  - World (re)discovering energy market tensions and high prices / fossil energy shortage
  - Climate change + growing local impacts
  - Energy security and long term sustainability needs
- **Change energy (not climate) « *(C)lean and sustainable* »**
  - Demand side management
  - Energy efficiency
  - Renewable energy diversification & scaling up
- **Market essentially driven by oil prices providing wrong signals ?**
  - "Business as usual" approach not sustainable
  - Additional incentives needed => role for policy makers, development partners, … & RPTCC, dealing with 250 GW of new capacity in coming 25 years



AFD in the GMS energy sector

- **Project preparation financing**
  - **PPTA on grant basis**
    - through Country based study funds
    - through specific GMS Project Preparation Fund located within AdB
- **Investment financing**
  - **Sovereign or non sovereign soft loans**
  - **Private sector financing : loans, equity, guarantee schemes (PROPARCO)**
- **Specific support to the development of Regional Coordination**
  - **Technical assistance**
  - **Additional grant financing from French GEF if related to environmental issues**

AFD support to RPTCC

- **1 M EUR grant committed in 2005**
- **Regional Technical Assistance (RETA 6304) managed by AdB**
- **Scope of RETA 6304 :**
  - Regional performance standards
  - Interconnection methodology
  - Transmission regulation
  - Database and website
  - Regional master plan
  - Training & capacity building

Views on program achievements

- **Quality of studies, triggering methodological debates among GMS countries & development partners**
- **Good coordination between GMS countries AdB and other development partners**
- **More concrete decisions / commitments from GMS countries still to come**
- **Importance of a regularly updated & validated Regional Master Plan**
  - Predictability & long term visibility on prioritized investments key to consolidate economic confidence among stakeholders
  - Key tool to support stronger policy making needed to address huge energy challenges to come

Future collaboration ?

- **Based on RPTCC development matrix & RETA 6440**
- **Improve resilience of regional power system to risks and external shocks (1/2)**
  - Broaden scope of economic analysis of RPTCC activities
    - "Business as usual" approaches may generate short term gains, but might increase medium-long term risk exposure
    - Fully developed SEA approach applied to regional planning can still lead to short term gains while reinforcing medium-long term resilience
  - Develop economic/planning methodologies that better factor :
    - depletion of fossil energy resources
    - environmental externalities (local & global)
    - shortage of financing resources to carry out investments?
    - consistent with scale of GMS and long term economic/social/environmental objective of GMS integration

Future collaboration ?

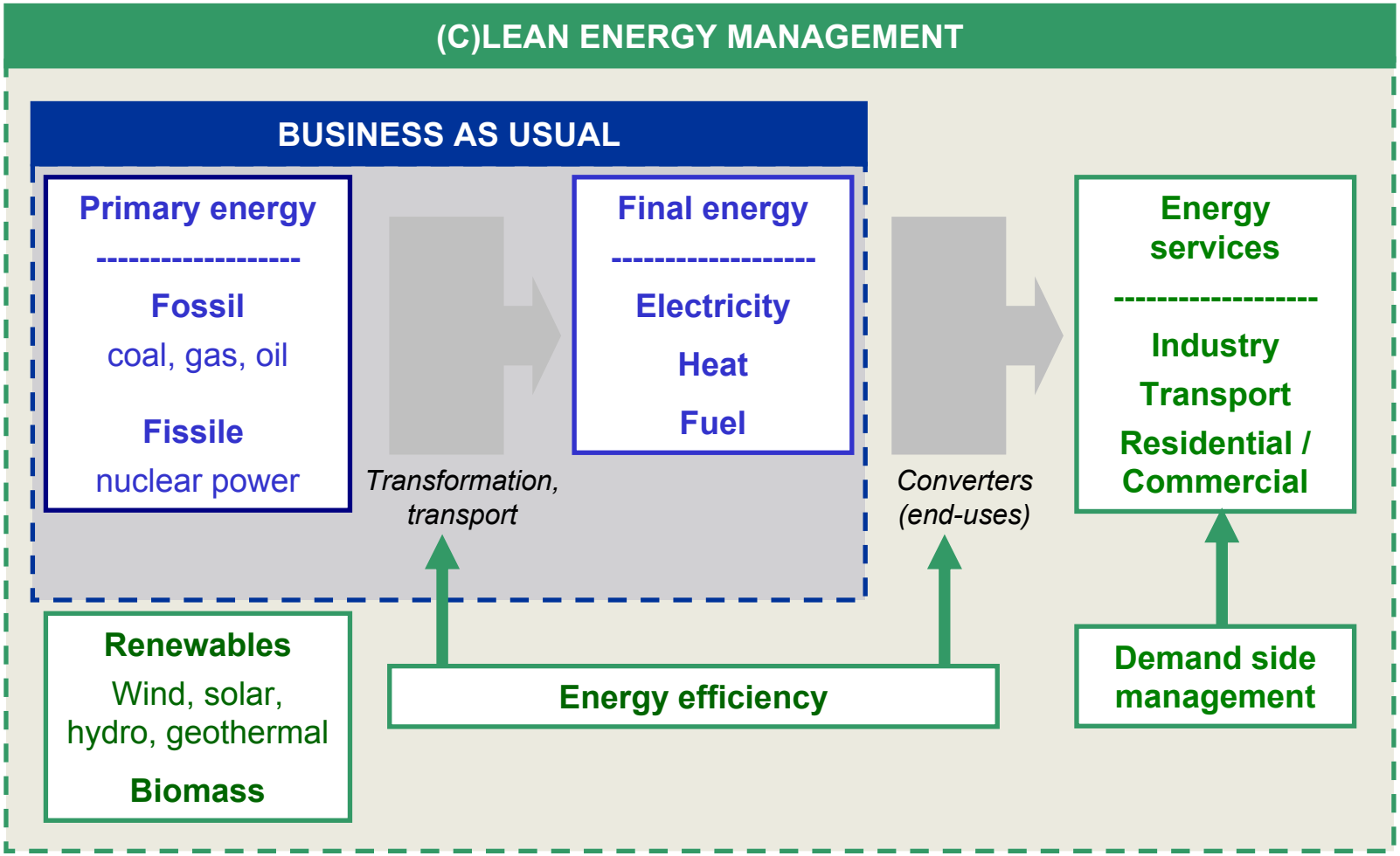
- **Improve resilience of regional power system to risks and external shocks (2/2)**
  - Include Demand Side Management / Energy Efficiency in Regional Master Plan
    - key to reinforce resilience
    - huge sensitivity to demand scenarios
    - financial crisis = additional reason to address demand side issues
  - Assess Carbon Footprint of different regional power trade development scenarios / of projects
  - Look at possible methodologies to access Carbon Finance ? (AICD study : GHG emissions avoided through interconnections in Africa ~ total impact of all CdM projects in continent ~ 40 M tCO2eq)
  - Adaptation : carry out Climate Change Vulnerability Analysis (e.g.: evolution of hydro flows ? sensitivity on Master Plan)
  - Link with Subregional Energy Forum/Environment Operations Center

Future collaboration ?

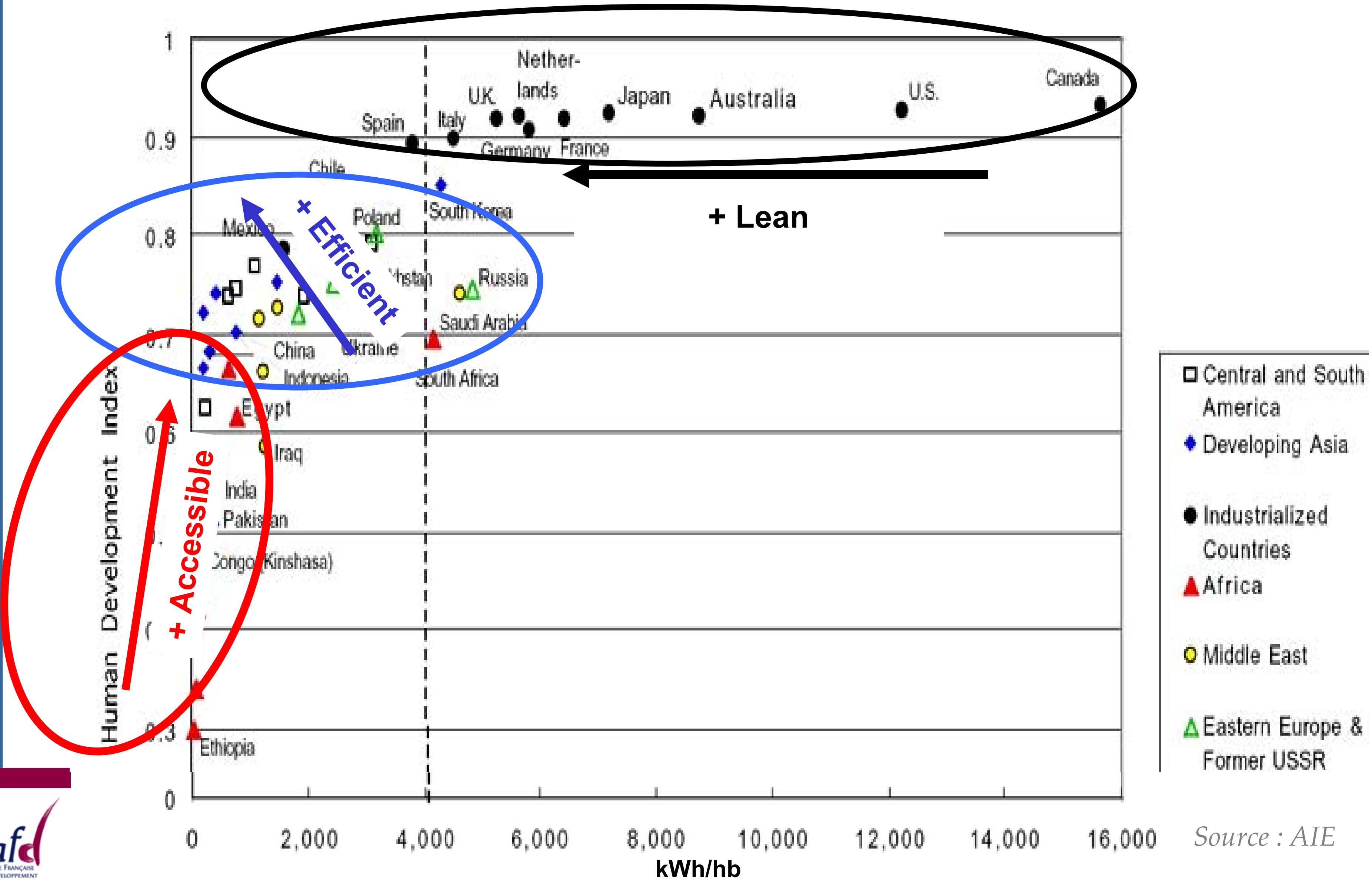
- **Build on RPTCC's achievements to further develop cross-capitalization and best practice dissemination among GMS members**

- **Training/capitalization : topics not yet addressed by RPTCC ?**
  - Renewable energy
  - Demand side management and energy efficiency
    Regional power coordination = not only about coordinating supply, also demand side issues
  - Importance of Regional "nega-Watt" generation

(C)lean Energy : an “energy service” approach



Human development index & Electricity consumption per capita



Source : AIE

afd Agence Française de Développement

Financing resources for RPTCC

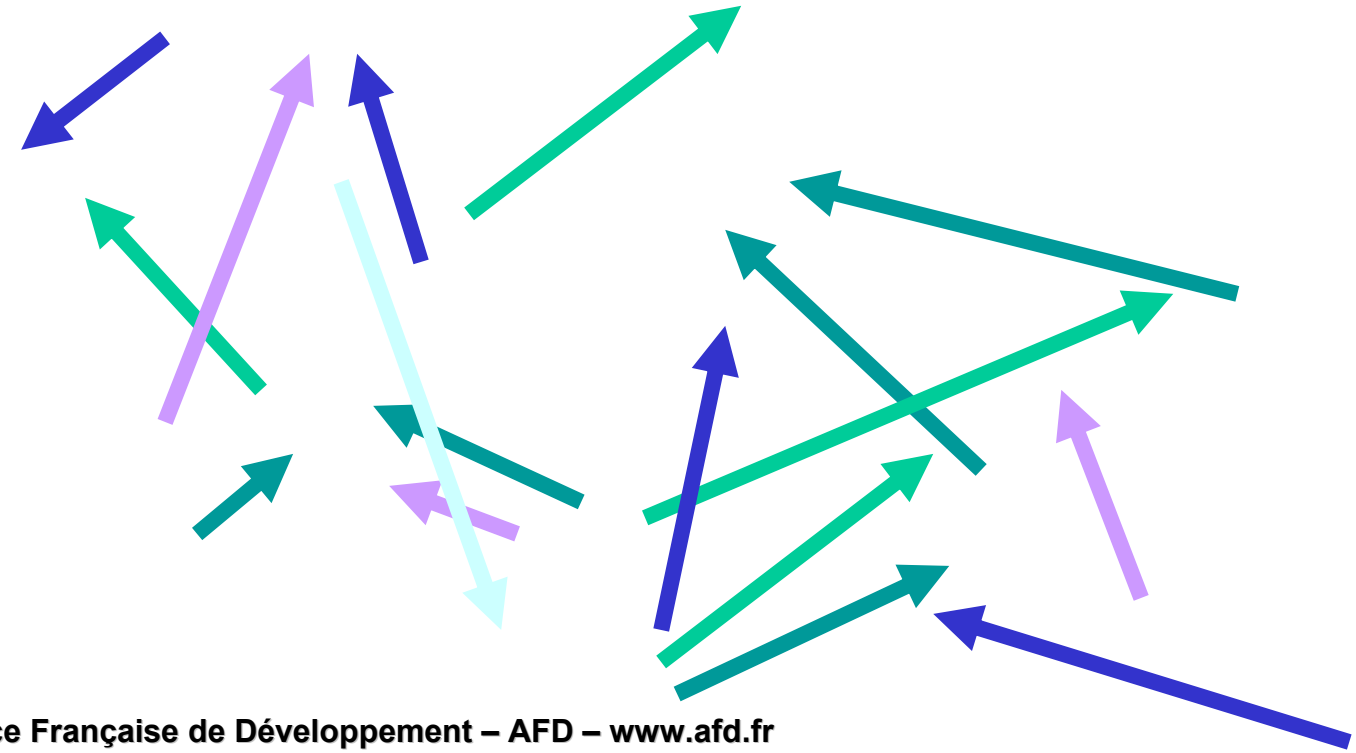
Feasibility studies

- Country based study funds
- GMS Project Preparation Fund

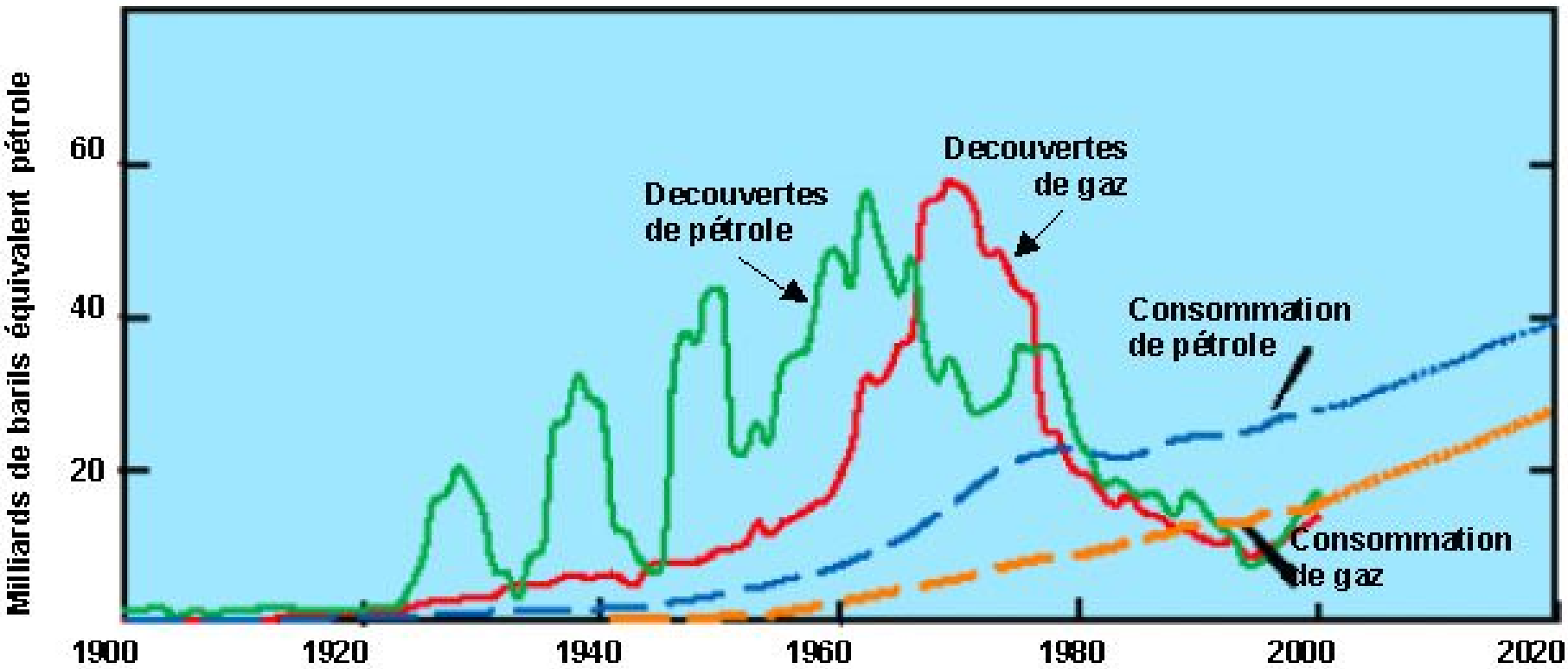
Advisory Technical Assistance

- Direct grant financing of specific activities, complementing RETA 6440
  - e.g. Regional workshop on energy efficiency / demand side management / renewable energy scaling up ?
- Submit proposal to French GEF on further inclusion of environmental issues at regional planning level (SEA)
  - e.g. reinforce links between Components 2 & 1 under RETA 6440 ?
- New RETA ? Depending on needs beyond RETA 6440

Thank you …

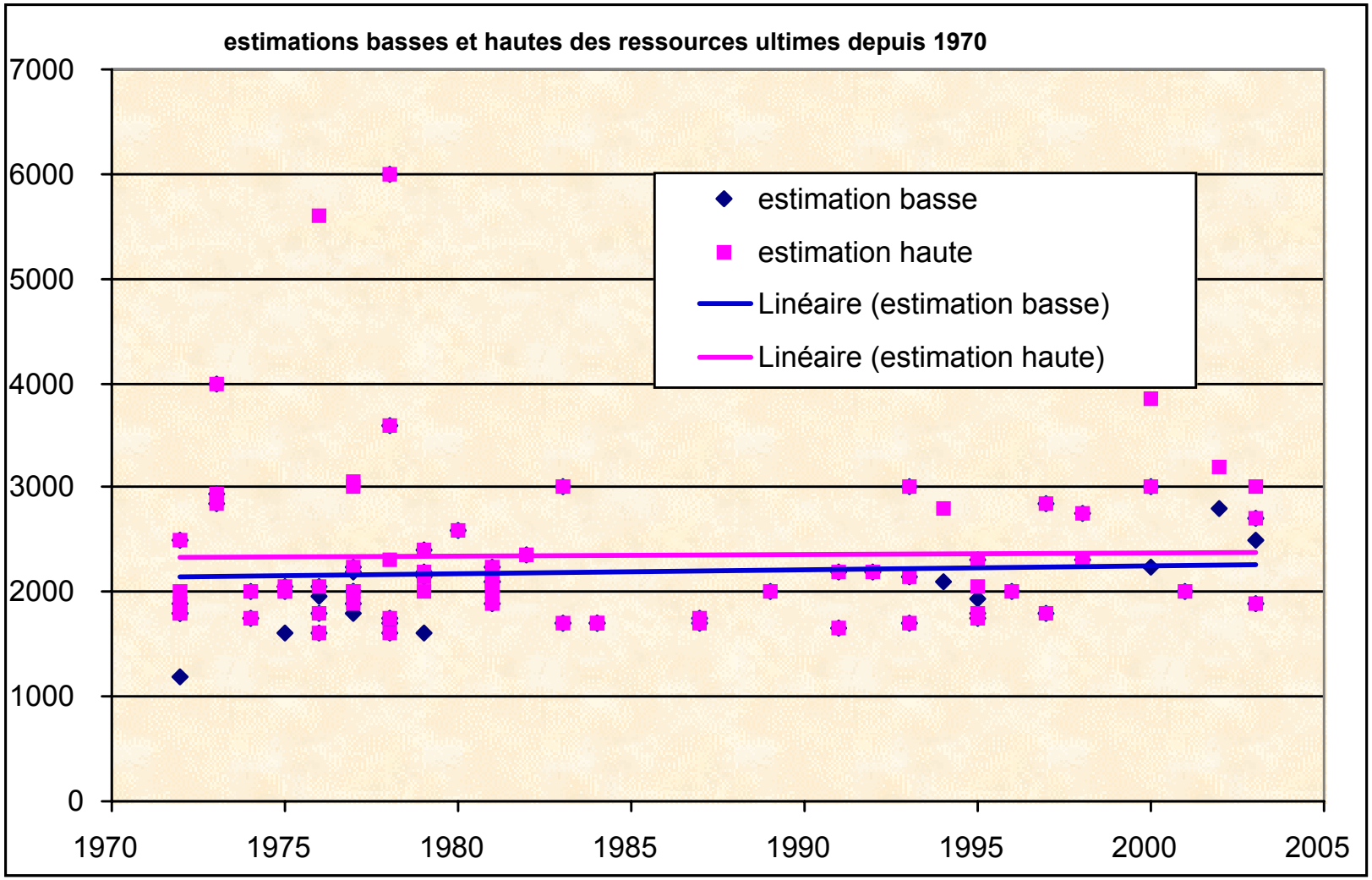


Fossil energy depletion



Source : Exxon Mobil, 2002

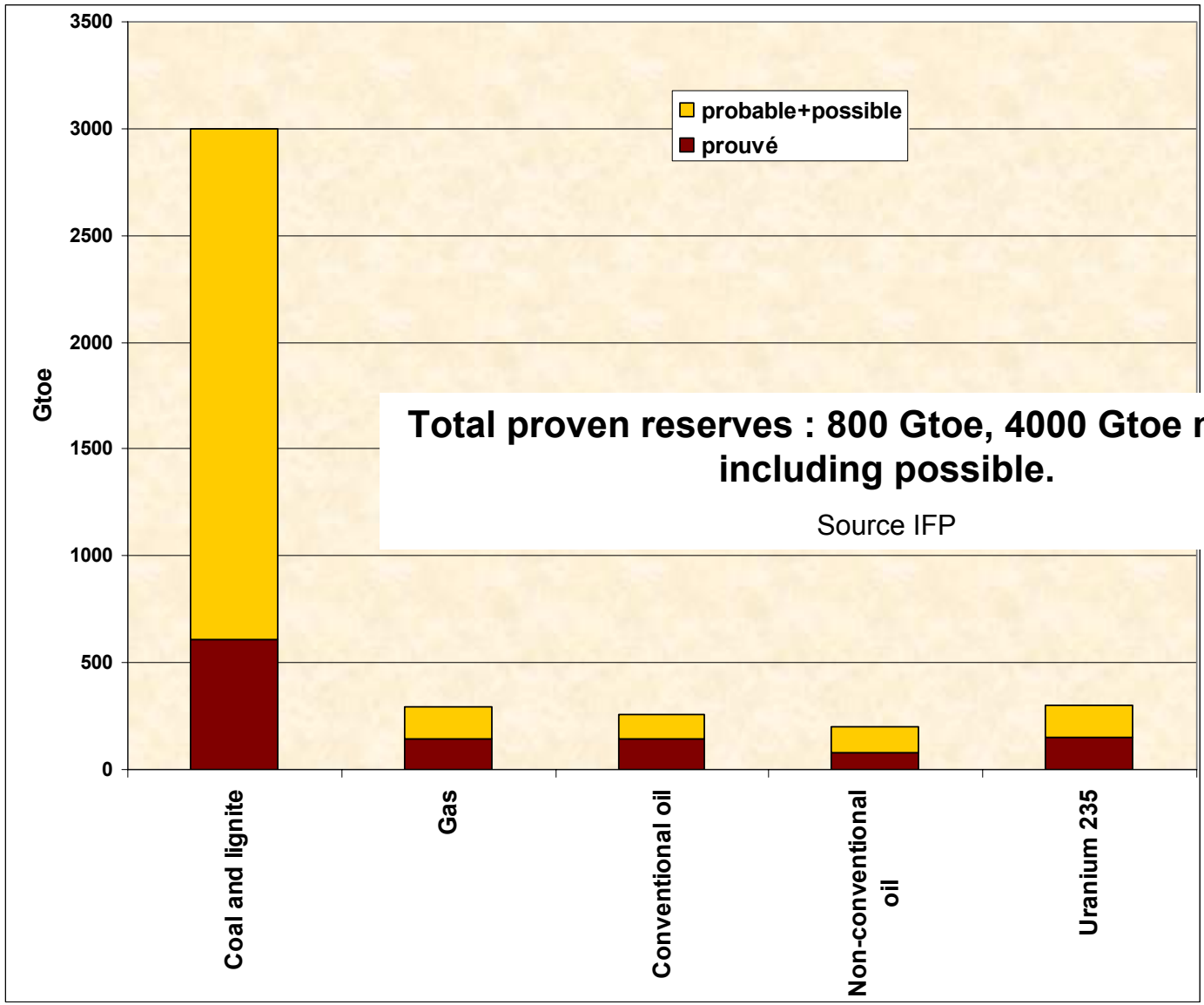
Fossil energy depletion



Source : J-M. Jancovici 2008

Fossil energy depletion

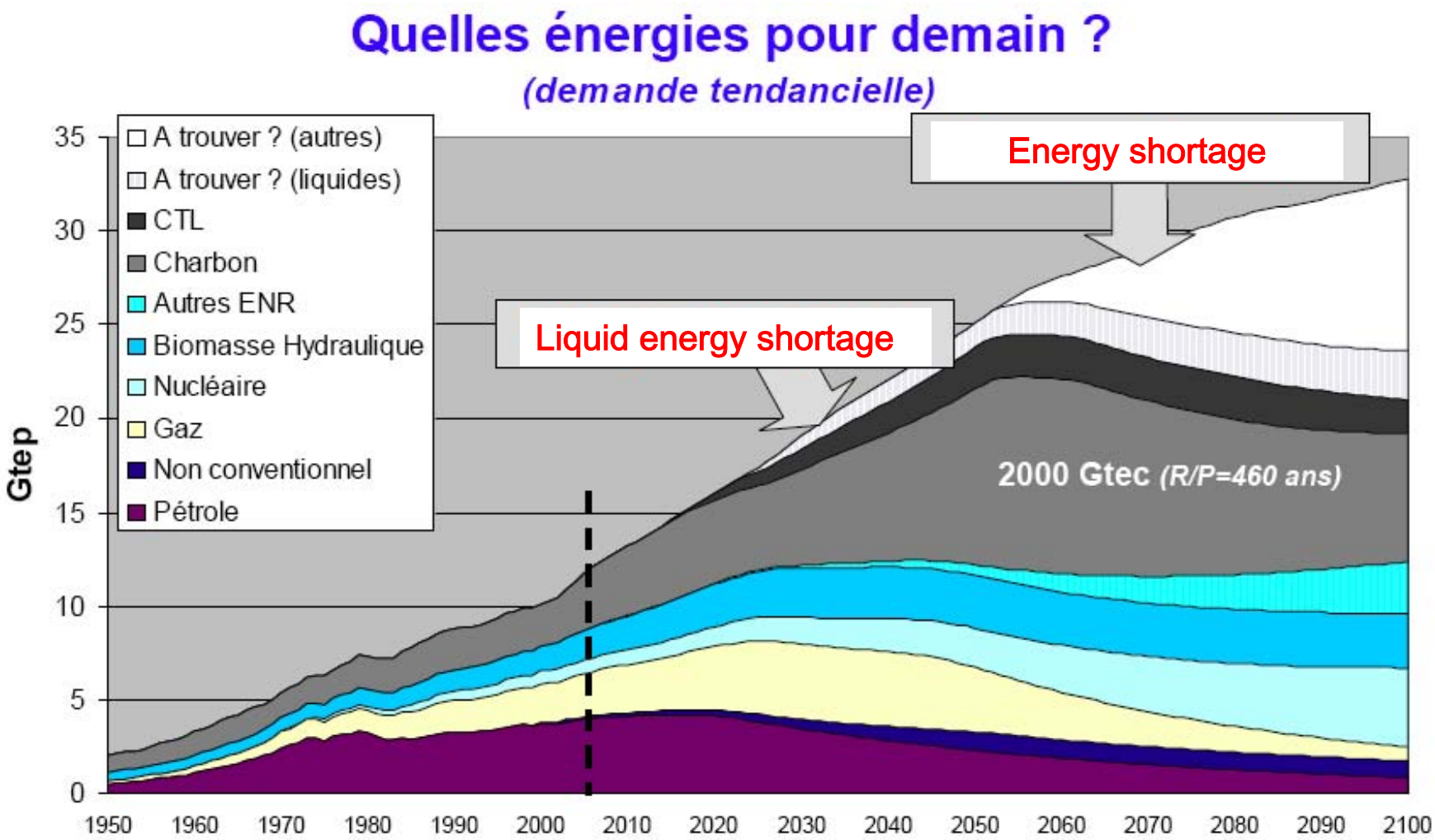
1 Gtoe = 1 billion tons equivalent oil. Annual world energy consumption in 2005 was of about 10 Gtep



Total proven reserves : 800 Gtoe, 4000 Gtoe maximum including possible.

Source IFP

Fossil fuel depletion

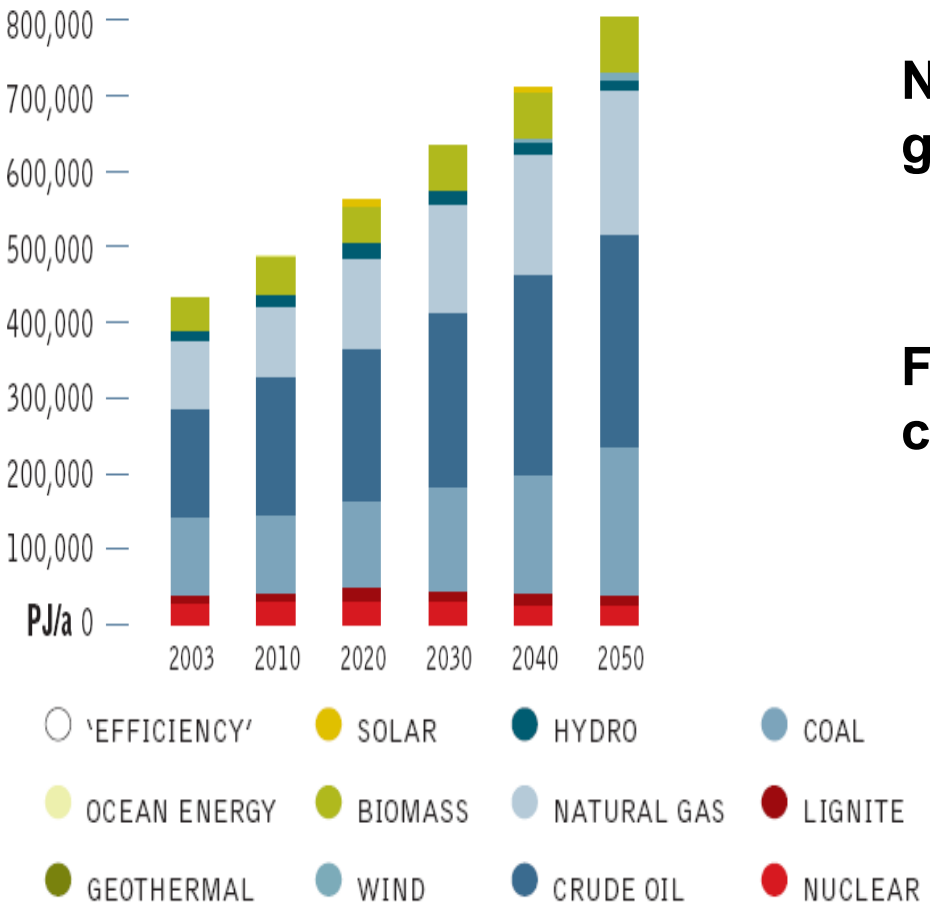


Source : Bernard Rogeaux, EDF, décembre 2007

Change energy, not climate

Primary energy consumption

Scenario *Business as usual*



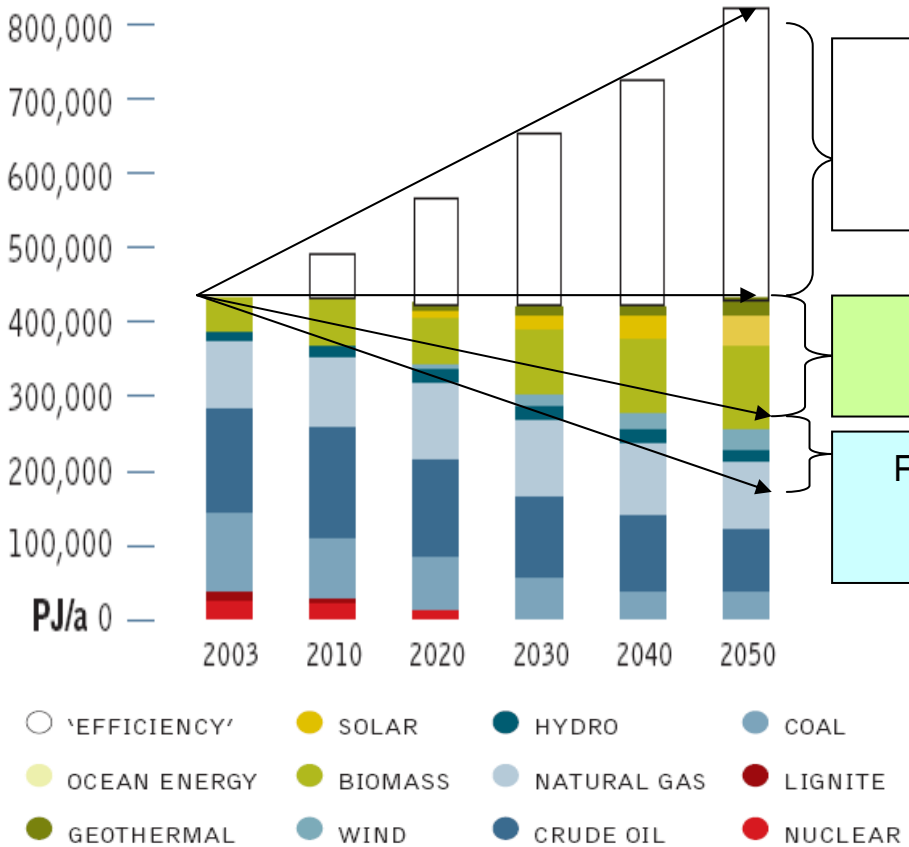
Not enough energy resources for growth

Fossil resources too abundant for climate change

Source : IEA

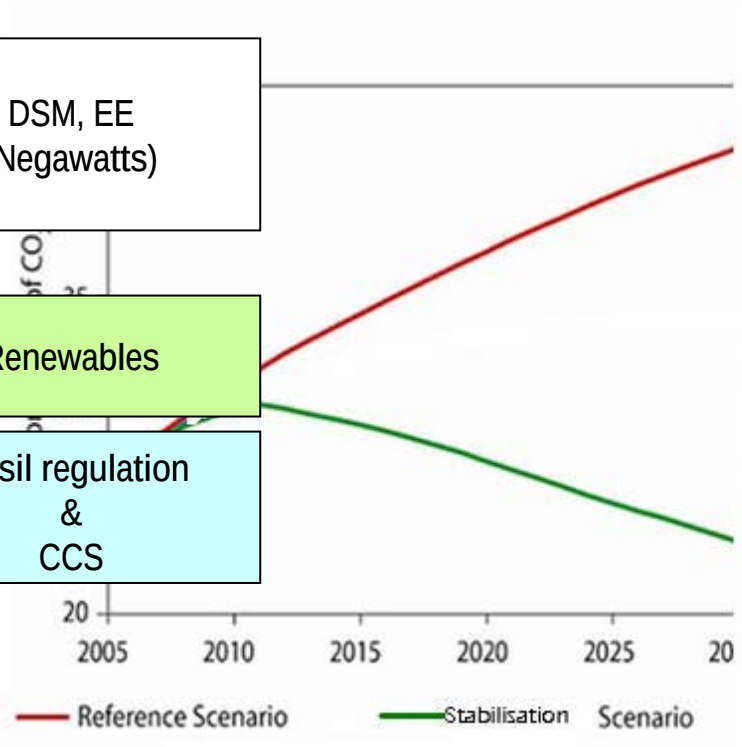
« Decarbonizing » energy consumption

Developement of global primary energy consumption under the [r]evolution scenario



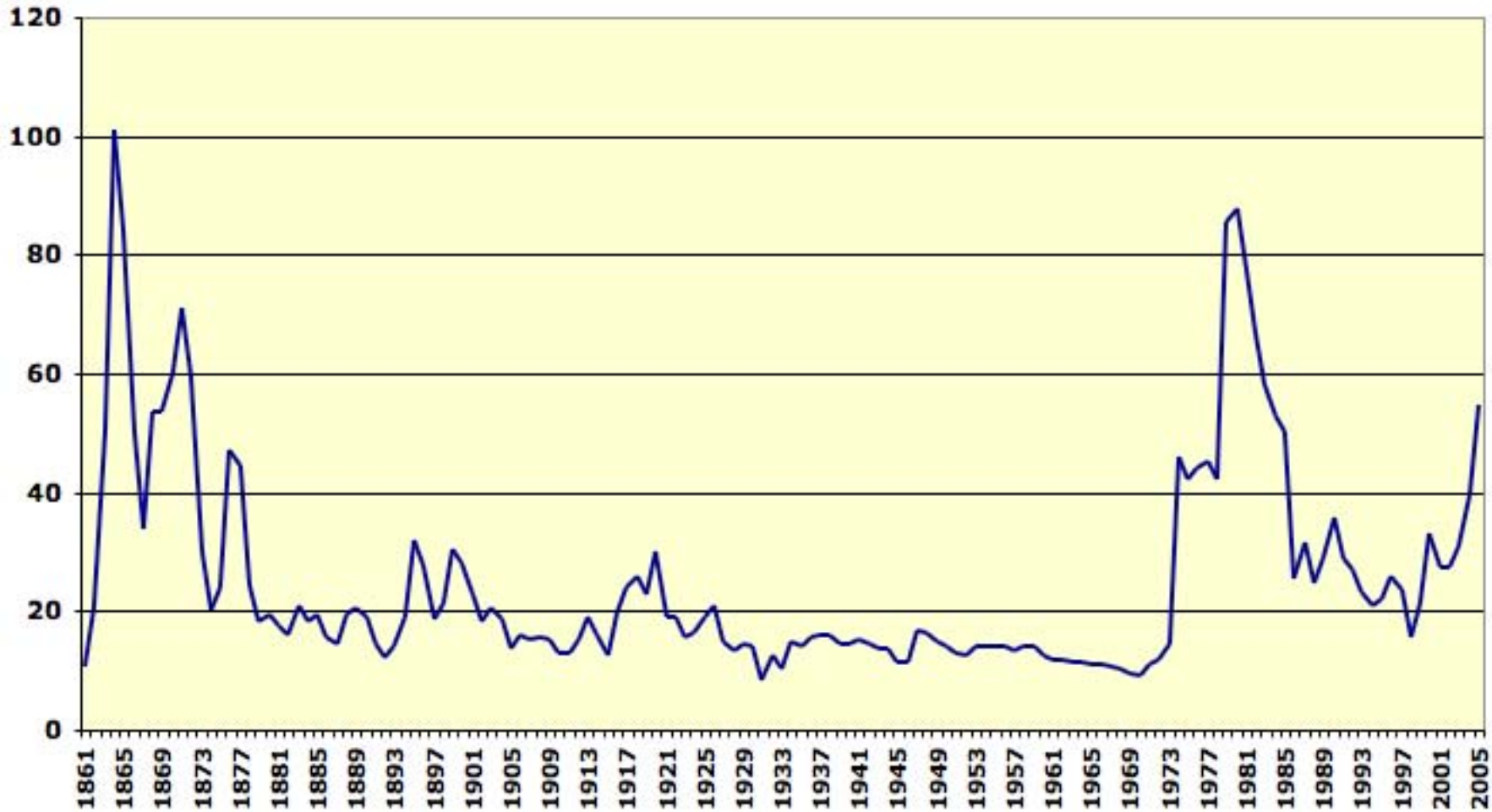
Source : Greenpeace

Energy-related CO2 emissions in the 450 Stabilisation case

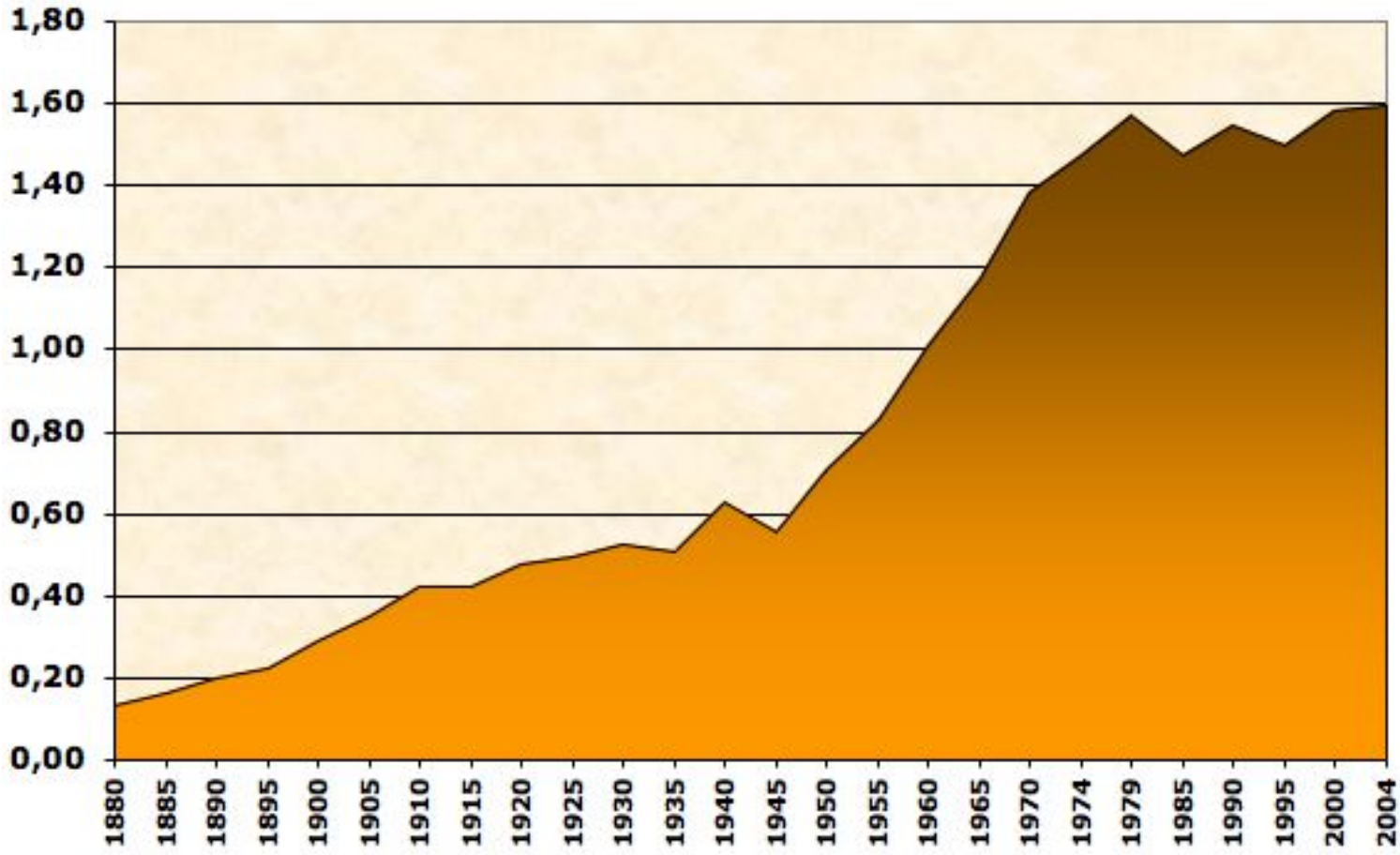


Source : OCDE

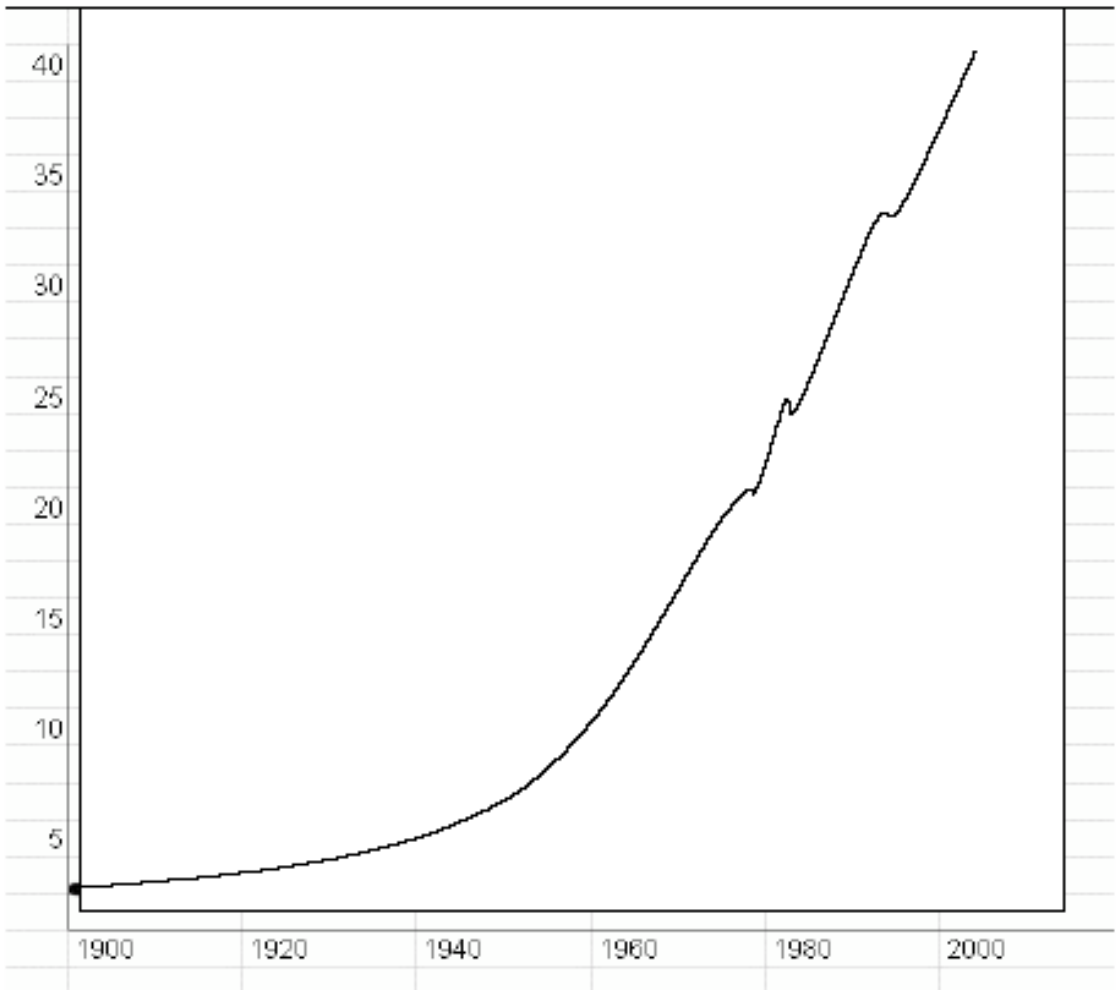
Oil price (constant 2004 US$)



Energy consumption / capita (tep/person) ….. X 10



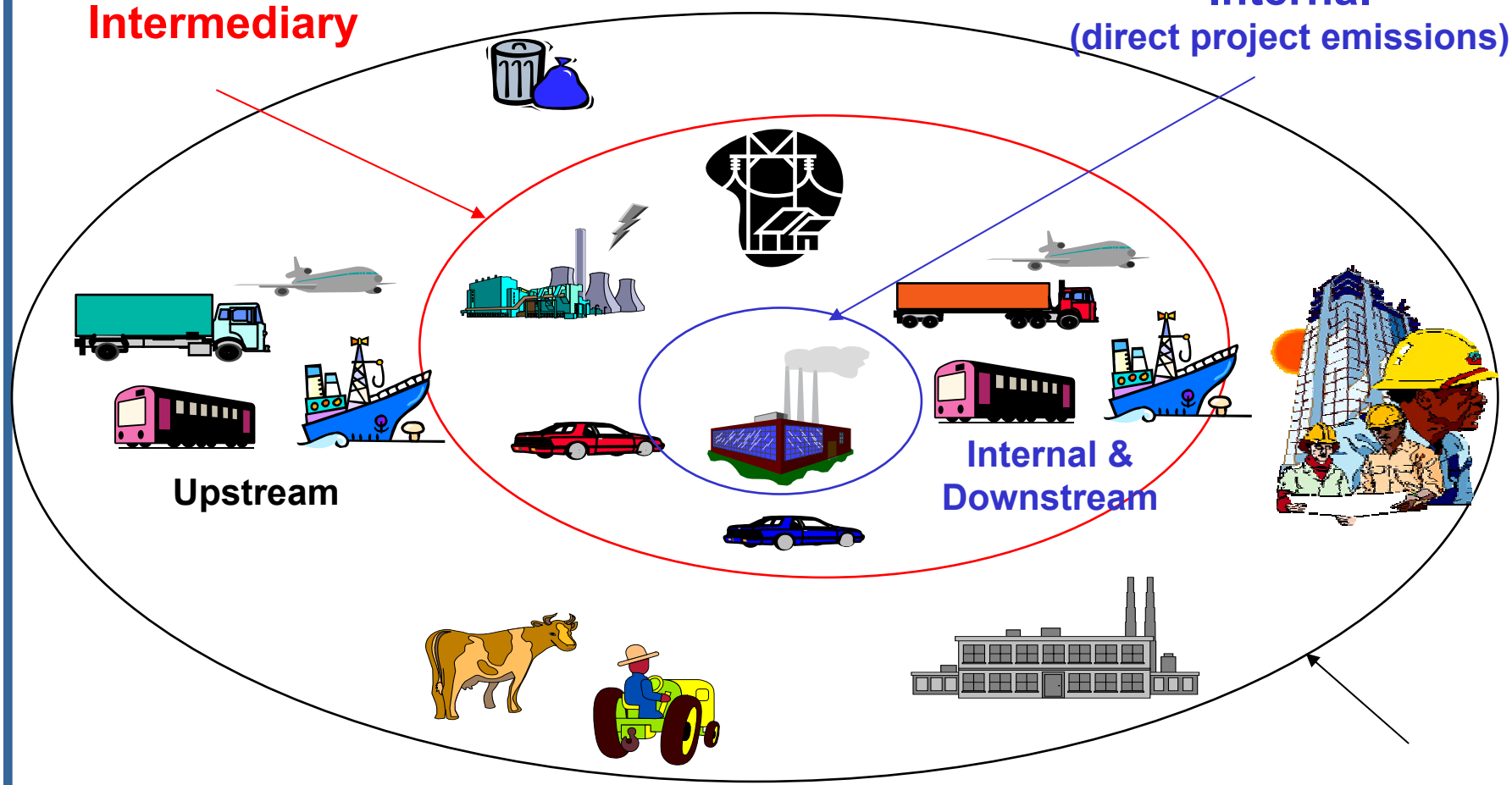
vs. World GDP



Implications on development models ?

- **Growth not sustainable since industrial revolution**
  - Under-tariffication of goods and services
  - Many externalities not accounted for (there is no “free ride”)
    - local and global environment
    - finitude of natural resources
      - ✓ non renewable or on extremely long cycles
      - ✓ demographic explosion + explosion of per capita demand
  - Cost of inaction on climate = 20% of world GDP by 2200
    Cost of action = 1 to 3% of world GDP (Stern report)
- **Climate = opportunity for sustainable growth**
  - Technical, economic social and natural capital
  - Revisit economic models : “negative” discount rate on natural capital stock
  - Demand side management = condition of future economic development in a context of scarce and costly resources

Measuring carbon footprint



Le Bilan Carbone ® de l'AFD

Dans le cadre de ses engagements en faveur du développement durable, et de la lutte contre le changement climatique, l'AFD s'est dotée de deux outils simplifiés d'analyse des émissions de gaz à effet de serre des projets de développement et de la vulnérabilité de ces derniers face aux effets des changements climatiques. L'objectif est de permettre aux responsables des projets financés par l'AFD d'analyser le contenu en carbone et d'enrichir le concept des projets par une prise en compte du changement climatique.

Le premier outil permet aux personnes qui instruisent des projets de développement de quantifier l'ordre de grandeur des émissions des projets durant les phases d'investissement et de fonctionnement. Pour la plupart des projets, le calcul pourra être fait avec quelques données de base (de 5 à 10) saisies dans des menus déroulants pour faciliter le travail. Un manuel guide l'utilisateur de ce tableur Excel adossé à une base de données adaptée. Cette évaluation donne un premier ordre de grandeur des émissions de $CO_{2\,eq}$ des projets, permettant de poursuivre l'analyse sur les possibilités de réduction de ces émissions si cela est pertinent (comparer les

Transport ferré

Titre, pays et numéro du projet

Emissions C actualisées cumulées		**kgeC par euro**
Emissions CO2 actualisées cumulées		**kgeCO2 par euro**

Hypothèses sur l'évolution du projet

Durée du projet		ans
Taux de croissance annuel moyen des émissions		
Taux d'actualisation		

Financement AFD

Financement AFD (global actualisé)		millions d'euros
Représentant		du coût total

Calcul des émissions

> Emissions de mise en place du projet : combustibles fossiles utilisés pour le génie civil

Construction du réseau : combustibles fossiles des engis de chantier

Combustible	Conso (tonnes)	kg équ. C par tonne avec amont	kg équ. C par tonne sans amont	Conso (kW.h)	kg équ. C par kWh avec amont	kg équ. C par kWh sans amont	Conso (tep)	kg équ. C par tep avec amont	kg équ. C par tep sans amont	Conso (litres)	kg équ. C par litre avec amont	kg équ. C par litre sans amont	t équ. C sans amont	t équ. C avec amont
Gazole		951	859		0,082	0,074		951	859		0,80	0,73	0	0
Supercarburant (ARS, SP95, SP98)		1 025	876		0,084	0,072		978	836		0,77	0,66	0	0
Fioul lourd		968	851		0,087	0,077		1 016	893		0,97	0,85	0	0
												Total	0	0

> Emissions de mise en place du projet : matériaux de construction utilisés

Construction du réseau : Métaux

	tonnes utilisées	equ. C par tonne	supplément pour const.	t équ. carbone
Aluminium recyclé 100%		670		0
Acier ou fer blanc neuf		870		0
Zinc		800		0
			Total	0

Construction : matériaux de construction

	Tonnes utilisées	kg équ. C par tonne	supplément pour const.	t équ. carbone
Ciment		235		0
Grave ciment préfissurée		14		0
Grave ciment		14		0
Bois d'œuvre (si replanté)		-500		0
			Total	0

> Emissions de fonctionnement : combustibles fossiles consommés par les locomotives

Traction : combustibles consommés

Combustible	Conso (tonnes)	kg équ. C par tonne avec amont	kg équ. C par tonne sans amont	Conso (kW.h)	kg équ. C par kWh avec amont	kg équ. C par kWh sans amont	Conso (tep)	kg équ. C par tep avec amont	kg équ. C par tep sans amont	Conso (litres)	kg équ. C par litre avec amont	kg équ. C par litre sans amont	t équ. C sans amont	t équ. C avec amont
Houille (PCS>23 865 kJ/kg)		728	674		0,101	0,093		1 169	1 082				0	0
Lignite (PCS<17 435 kJ/kg)		501	464		0,106	0,098		1 237	1 145				0	0
Gazole		951	859		0,082	0,074		951	859		0,80	0,73	0	0
Fioul lourd		968	851		0,087	0,077		1 016	893		0,97	0,85	0	0
												Total	0	0

> Emissions de fonctionnement : électricité de réseau

Electricité de réseau comptabilisation directe

Pays de consommation de l'électricité	Conso (kW.h)	kg équ. C par kWh	t équ. carbone
Afrique du Sud		0,229	0
Angola		0,102	
Jordanie		0,202	
Senegal		0,234	0
Vietnam		0,116	0
		Total	0

Pertes en ligne de l'électricité

	Rappel kWh	Kg équivalent carbone	Taux de déperdition	t équ. carbone
Consommation	0	0	10%	0
			Total	0

Récapitulatif

Agence Française de Développement

Prise en compte de la contrainte énergie-climat dans les projets financés
Analyse de la vulnérabilité

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