




GREATER MEKONG SYSTEM STRATEGIC PLANNING DOCUMENT

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Note: A section titled "ANNEX: Code/Document – History of Comments" is attached to each Code/Document. It provides a log of every comment and subsequent consideration taken on the Code/Document.

Table of Contents

1. Introduction	4
2. Objectives	4
3. Scope	5
4. Principles of the Strategic Planning Document	5
5. Reliability Criteria	6
6. Cost Benefit Analysis	6
7. Planning Process	7
7.1 Power Balance Statement	7
7.2 Transmission System Capability Statement	8
8. GMS Power System Modelling	9
8.1 Responsibilities	9
8.2 Modelling data	9
8.3 Planning Data Confidentiality	10
ANNEX: Strategic Planning Document – History of Comments	11

List of Figures

No table of figures entries found.

1. Introduction

- (1) The *Strategic Planning document* specifies the minimum technical and design criteria, principles and procedures:
 - a) To be used within the *GMS Synchronous Areas* in the planning and in the medium and long-term development of the *GMS Interconnected Transmission System*;
 - b) To be taken into account by GMS members on a coordinated basis, and
 - c) To specify the planning data required to be exchanged by GMS members and the *Regional Power Coordination Centre (RPCC)* to enable the *GMS Interconnected Transmission System* to be planned in accordance with the planning standards.
- (2) The *Strategic Planning document* specifies the requirements for the interchange of information between the *RPCC* and individual *TSOs*. This information is required to enable the *RPCC* and *TSOs* to take due account of:
 - a) Developments, new connection sites or the modification of existing connection sites within the *TSO's Transmission Network*; and
 - b) New or modified connections with *External Systems*

including changes in factors such as *Demand*, *Generation*, new technology, *Reliability* and environmental requirements that may also have an impact on the planning and operation of the *GMS Interconnected Transmission System*.

- (3) All parts of the *GMS Interconnected Transmission System* shall be designed so that the *Demand* for electricity can be met reliably at the lowest cost. This means that the *GMS Interconnected Transmission System* shall be planned, built and operated so that sufficient *Transmission Capacity* will be available to utilise the *Generation Capacity* and to meet the needs of customers in an economic way.
- (4) The long-term economic design of the *GMS Interconnected Transmission System* aims at a balance between investments and the cost of maintenance, operation and supply interruptions, taking into account environmental and other limitations. Flexible solutions, which take into account future uncertainties such as *Generation* limitations, new *Generation* technologies, uncertain *Load* development and technical development, should be selected.
- (5) This code is based upon EAPP planning code and EU regulation 347_2013.

2. Objectives

- (1) The objectives of the *Strategic Planning document* are to provide for:
 - a) Identification and coordination by the *RPCC* of any proposed development or reinforcement projects of common interest to ensure that the *Reliability* and security of the *GMS Interconnected Transmission System* is not compromised;

- b) Facilitate the timely implementation of projects of common interest by streamlining, coordinating more closely, and accelerating permit granting processes and by enhancing public participation;
- c) Provide rules and guidance for the reliability criteria and cost benefit analysis for projects of common interest;
- d) Cooperation between the TSOs in the planning and procurement of new *Generation Capacity* at lowest overall cost, taking into account environmental considerations; and
- e) Submission of sufficient information to enable a TSO to optimise the planning and development of its *System* including the use of available *Transmission Capacity* on the *GMS Interconnected Transmission System*.

3. Scope

- (1) The *Strategic Planning document* applies to the *RPCC* and to the *TSOs*. The *TSOs* are responsible for the collection of information from generators, *Distribution Network Operators* (DNOs) and other users connected to their *Transmission Network* and for providing any relevant information required by the *Strategic Planning document* to the *RPCC*.
- (2) Those *TSOs* with connections to *External Systems* shall ensure that the supply of data required under the *Strategic Planning document* should be contemplated in the *Interconnection Agreement* with the *External System* seeking a new or modified *Interconnection*.

4. Principles of the Strategic Planning Document

- (1) These principles apply to the overall planning of the *GMS Interconnected Transmission System*. The planning principles are concerned with planning of the *Interconnection* between *TSO Transmission Networks*, connections with *External Systems* and with those facilities within *TSO Transmission Networks* which have, or could have, an impact on the *Reliability* of the *GMS Interconnected Transmission System*.
- (2) The principles should also be applied in the planning of *TSO Transmission Networks* to ensure that the *Reliability* criteria can be met. The principles, however, do not apply to local supply *Reliability* and other local considerations which are the subject of national Grid Codes or equivalent documents.
- (3) The *Reliability* level for the *GMS Interconnected Transmission System* is defined by a set of minimum criteria in this *Strategic Planning Document* together with the performance characteristics and requirements set out in the *Connection Codes*, which must both be met when designing developments, expansions and reinforcements of both *GMS Interconnected Transmission System* and *TSO Transmission Networks*. The criteria are based on a balance between the probability of *Contingencies* and their consequences.

- (4) Reliable *Transmission Capacity* can be achieved by specifying standards for primary, protection and auxiliary equipment as well as by ensuring *Reserve Capacity* and other operational resources as set out in the Operations Codes.

5. Reliability Criteria

- (1) All *Main Plants* of the *GMS Interconnected Transmission System* shall operate within normal *Capacity* ratings, thermal loading and voltage limits under steady-state conditions as set out in the Connection Conditions. The *GMS Interconnected Transmission System* shall be able to supply all *Loads* within the emergency limits for bus voltages and plant and apparatus loadings during the outage of any line or transformer (*(N-1) Criterion*).
- (2) The security and *Reliability* of the *GMS Interconnected Transmission System* shall not be compromised by the loss of any single *Power System* element such as Generating Unit, *Transmission* circuit, section of busbar, transformer or reactive compensation equipment.
- (3) The loss of a single element shall not cause:
- a) Any violation of the normal operational limits such as voltage, *System Frequency* or plant and apparatus loading, which would jeopardise the safety and *Reliability* of the *GMS Interconnected Transmission System* or would cause overloading of plant or apparatus;
 - b) *Islanding* of any part of the *GMS Interconnected Transmission System*;
 - c) Loss of *Stability* of the *GMS Interconnected Transmission System*; or
 - d) Cascading outages of other elements as a result of exceeding *Operational Security Limits* as set out in Operational Security and Operational Planning & Scheduling Codes.
- (4) These criteria are not applicable to areas connected by radial lines to a *TSO Transmission Network* where loss of *Load* and any local *Generation* may be acceptable.
- (5) The *(N-1) Criterion* may be assured within the *TSO's Transmission Network* with the support of another interconnected *TSO Transmission Network*, subject to the prior agreement of the respective *TSOs*.
- (6) The planning criteria for dynamic security are defined such that the *GMS Interconnected Transmission System* shall remain stable following a single *Contingency*. The *GMS Interconnected Transmission System* may be able to remain stable in some cases following a *Fault* without the outage of any *Transmission* element by a successful auto-reclosing. If the attempt of auto-reclosing fails, the *Fault* shall be cleared by tripping the faulted element.

6. Cost Benefit Analysis

- (1) The *RPCC* shall develop and submit to *GMS* members the methodology, including on network and market (or least cost) modelling, for a harmonised energy system-wide cost-benefit analysis at *GMS* level for projects of common interest.

- (2) The methodology shall identify and rank projects of common interest which shall meet the following general criteria:
- a) The project is necessary for at least one of the energy infrastructure priority corridors and areas;
 - b) The potential overall benefits of the project, assessed according to the respective specific criteria in the methodology, outweigh its costs, including in the longer term; and
 - c) The project meets any of the following criteria:
 - i. It involves at least two *GMS* members by directly crossing the border of two or more *GMS* members; or
 - ii. It is located on the territory of one *GMS Member* and has a significant cross-border impact.
- (3) The *RPCC* shall publish to *GMS* members the approved Cost Benefit Analysis methodology.

7. Planning Process

- (1) The horizon for the planning of the *GMS Interconnected Transmission System* extends over ten (10) years. The process has two elements:
- a) A forecast, the Power Balance Statement, by *TSOs* for each *TSO Transmission Network*, of their expected *Demand* and *Generation* over the planning horizon. This forecast will define the requirements for *Generation* support from the *GMS Interconnected Transmission System* for individual *TSO Transmission Networks*; and
 - b) An assessment, the Transmission System Capability Statement, by *RPCC* and *TSOs* of the capability of the *GMS Interconnected Transmission System* to support the required energy flows across both *TSO Transmission Networks* and cross-border *Interconnections*.
- (2) The *RPCC* shall rank projects according to the approved Cost Benefit Analysis methodology and publish results to *GMS* members.

7.1 Power Balance Statement

- (3) *TSOs* will prepare and submit to the *RPCC* the *Power Balance Statement*. This report will be submitted by 30 September annually showing in respect of the ten (10) succeeding calendar years:
- a) The projection of the seasonal maximum and minimum *Demand* for electricity in each *TSO Transmission Network* and the corresponding energy requirements for each year across the study period. These forecasts will correspond to certain reference dates to be defined by the *RPCC*;
 - b) The amount and nature of *Generation Capacity* currently available to meet the *Demand* and any anticipated restrictions in the production of energy;

- c) The amount of *Generation Capacity* it expects will be required to ensure that operating margins are achieved;
 - d) Details of plans for building additional *Generating Sets* including upgrades of existing *Generation Capacity*;
 - e) The amount and nature of *Demand* to be met by other GMS member countries using *Transmission Capacity* available on the *GMS Interconnected Transmission System*; and
 - f) The power transfers anticipated with *External Systems*.
- (4) The difference between available generating *Capacity* and *Demand* at the reference dates is called the Remaining Capacity and is calculated under normal climatic conditions. This Remaining Capacity represents the reserves available which can be used to cover *Demand* above forecast or *Generating Set* outages greater than expected. The Remaining Capacity can be positive, indicating export potential, or negative, where the lack of *Capacity* signals a need for imports.
- (5) The *RPCC* shall produce a Power Balance Statement for the *GMS Interconnected Transmission System* based on the individual *TSOs*' Power Balance Statements.

7.2 Transmission System Capability Statement

- (6) Once the Power Balance Statement has identified the ability of each *TSO* to cover its internal *Demand* with the available *TSO Generation Capacity*, a *Transmission* adequacy assessment shall be carried out by each *TSO* in conjunction with the *RPCC*. This assessment will determine the capability of the *TSO Transmission Network* to support the required energy flows across both the *TSO Transmission Network* and cross-border connections.
- (7) Based on the *Transmission* adequacy assessment carried out by each *TSO*, the *RPCC* will produce a *Transmission System Capability Statement* for the *GMS Interconnected Transmission System*. This *Transmission System Capability Statement* is focused on the cross-border connections and those *TSO's Transmission Networks* which have a direct effect on the cross-border exchanges.
- (8) In producing the *Transmission System Capability Statement*, the *RPCC* shall consider various scenarios for interchanges, *Demands* and *Generation*. Sensitivity analysis shall be carried out taking into account such parameters as hydrological conditions and fuel price variations.
- (9) The *RPCC* may also consider the use of *Remedial Action* schemes, in which automatic control equipment disconnects or otherwise controls *Generation*, *Demand* or network elements other than for *Faults*. Such *Remedial Action* schemes are used to enhance *Transmission Capacity* at the expense of *Reliability* and may only be used following specific agreement between the *RPCC* and the affected *TSO*.
- (10) The *RPCC* will determine the form and content of the *Transmission System Capability Statement* to be issued each year and shall publish it.

8. GMS Power System Modelling

- (1) In order to produce the *GMS Transmission System Capability Statement*, it will be necessary to carry out system analysis, including steady-state and dynamic simulations of the *GMS Interconnected Transmission System*. This system analysis is required in order to assess the *Reliability* of the *GMS Interconnected Transmission System* to meet the forecast *Demand* and determine the need for system enhancements or reinforcements.
- (2) These system studies will be carried out by both the *RPCC* and the *TSOs* and shall be performed using a common set of principles and a common database. To achieve this, the *RPCC* shall establish a set of common objectives for the development and submission of system data for *GMS Power System* modelling. The data shall include sufficient detail to ensure that system *Contingencies*, steady-state, transient and dynamic analyses can be simulated.
- (3) System planning studies generally involve studies of the system from three (3) years to ten (10) years ahead. They identify deficient areas in the *Transmission Network* and *Generation* systems and solutions are proposed which may include facility additions, upgrades, or other modifications. Studies are performed for all projected seasonal periods. *Generation* output in the study case is based on the principles of economic dispatch. The combination of *Demand* and *Capacity* studied is a snapshot of projected *GMS Interconnected Transmission System* conditions and therefore subject to a degree of uncertainty. Additional studies may need to be performed to evaluate off-peak periods and study specific outages of *Transmission* and *Generation* facilities.

8.1 Responsibilities

- (4) The *RPCC* in conjunction with the *TSOs* shall identify the scope and specify the data required for *Reliability* analyses and the procedures for data reporting.
- (5) These requirements and procedures should be periodically reviewed, documented and published for the *GMS Interconnected Transmission System* at least every five (5) years.
- (6) Each *TSO* shall provide accurate and appropriate equipment characteristics and *Power System* data for modelling and simulation purposes as required by the *RPCC*.

8.2 Modelling data

- (7) The modelling data required for system studies is set out in the Operational Planning & Scheduling Code. Notwithstanding this requirement the modelling data shall also include:
 - a) The *Demand* in each of the *TSO's Transmission Networks* for the period under study. The distribution of *Demand* across the nodes shall be consistent with the period under study;
 - b) *Generation* indicative of the conditions under study. *Generation* in individual *TSO Systems* shall be based on that system's economic dispatch with base load units, hydrological factors, pumped storage and distributed *Generation* given proper consideration;
 - c) Evaluation of *Transmission Network* capability in individual *TSO Systems*;

- d) Interchange with *External Systems* modelled as *Demand* or *Generation* as the case may be in individual *TSO Systems*. Equivalents of the *External Systems* shall be used if studies other than load flow are being carried out;
 - e) Timing of new facilities and outage schedules for existing facilities in individual *TSO Systems* and *GMS Interconnected Transmission System*; and
 - f) A list of *Contingencies* to be considered during programme execution agreed between *TSOs* and the *RPCC*.
- (8) The *RPCC* shall be responsible for the coordination and production of the *GMS Interconnected Transmission System* models and shall define the software to be used for studies.
- (9) *TSOs* are responsible for the production of models of their own *Transmission Networks* and they may determine the software to be used. If the software is different from that in use by the *RPCC* then appropriate data format conversion shall be carried out. The data shall be the latest version available unless a specific version of the data is requested and in all cases the data must be complete.
- (10) The *RPCC* shall perform data verification to ensure correct *TSO* model conversion, that the system configuration is maintained and that the parameters for all lines, transformers, and reactors are properly converted. The *RPCC* shall maintain a database of all problems encountered during data conversion and the solutions found.

8.3 Planning Data Confidentiality

- (11) *TSOs* and *GMS* members shall enter into relevant confidentiality agreements with the *RPCC*, upon request.
- (12) The *RPCC* shall ensure the confidential treatment of the data received, by themselves and by any party carrying out analytical work for them on the basis of those data.

ANNEX: Strategic Planning Document – History of Comments

#	Country	Reference section in the document	Country Comment	Consultants Review and Recommendation	Country Acceptance
1.					
2.					