



# Planning Code, Connection Code and Data Registration Code

By :

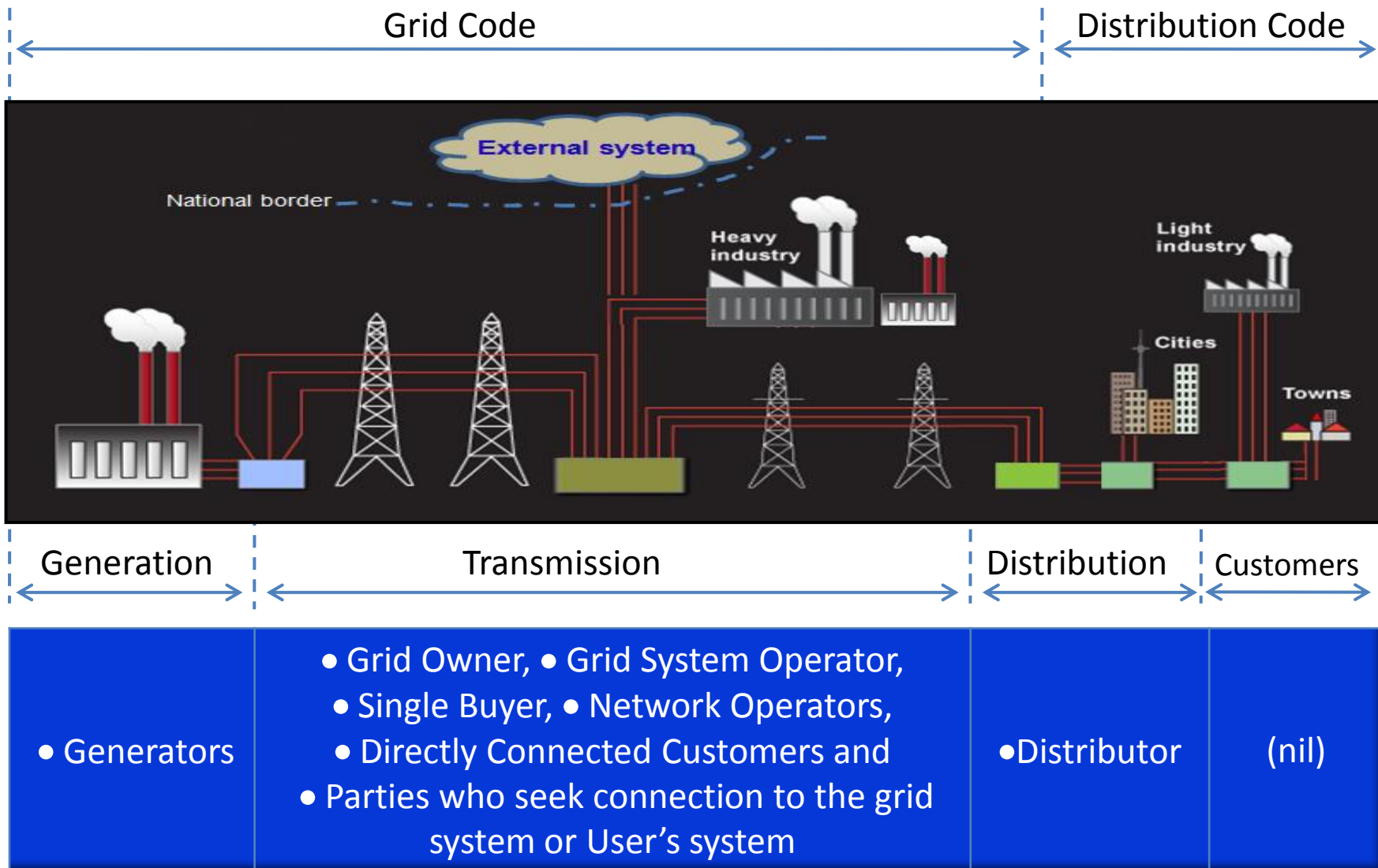
MR MOHD YUSOF BIN RAKOB

18 April 2013

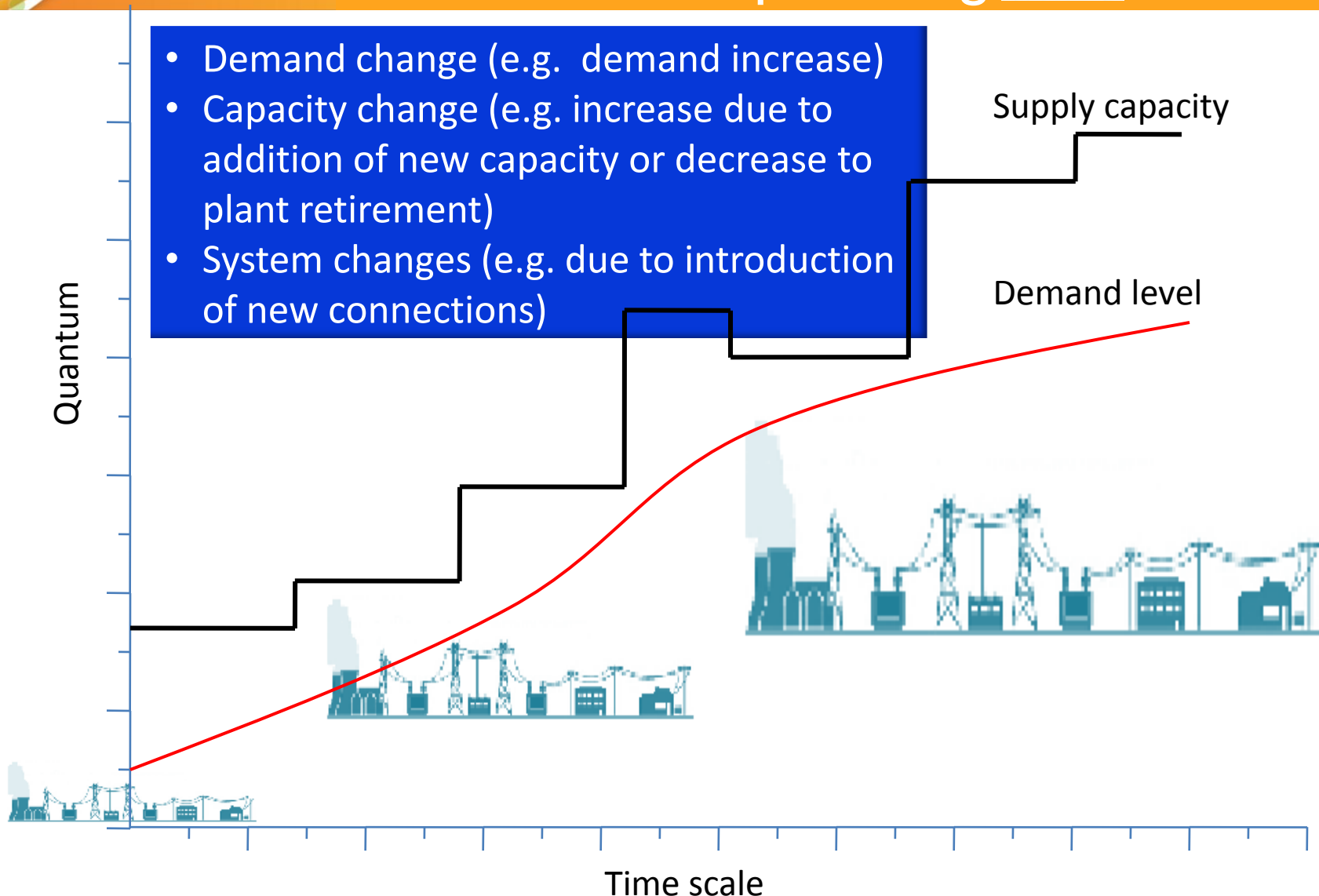


The Malaysian Grid Code Awareness Programme Funded by  
Akaun Amanah Industri Bekalan Elektrik (AAIBE)

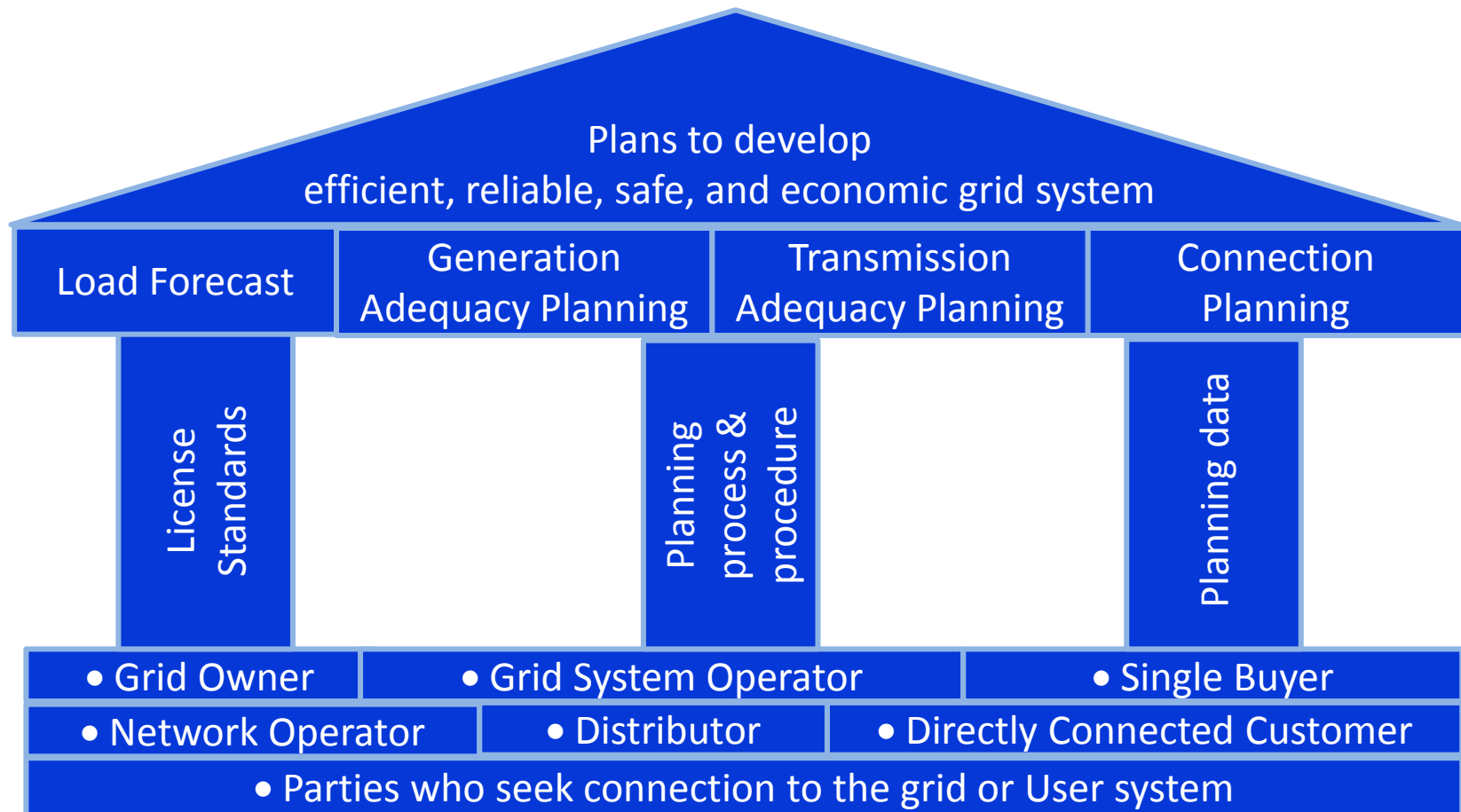
# Grid System & Parties in the Grid Code



# Reasons for planning



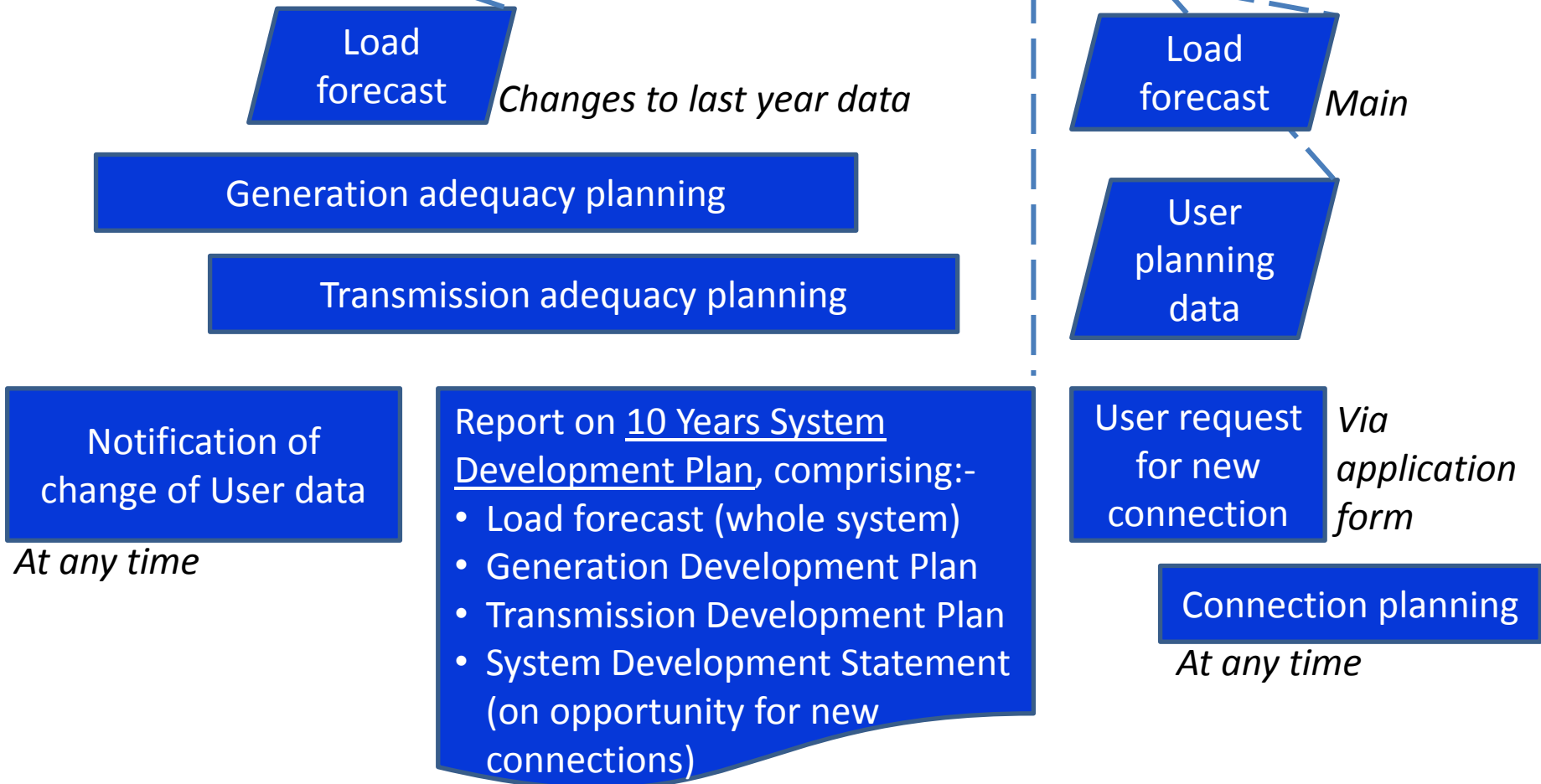
# Planning Code & its Building Blocks



# Basic Planning Cycle



## Planning calendar



# Output of Planning Process



## 1. Report on 10 Years System Development Plan, comprising :-

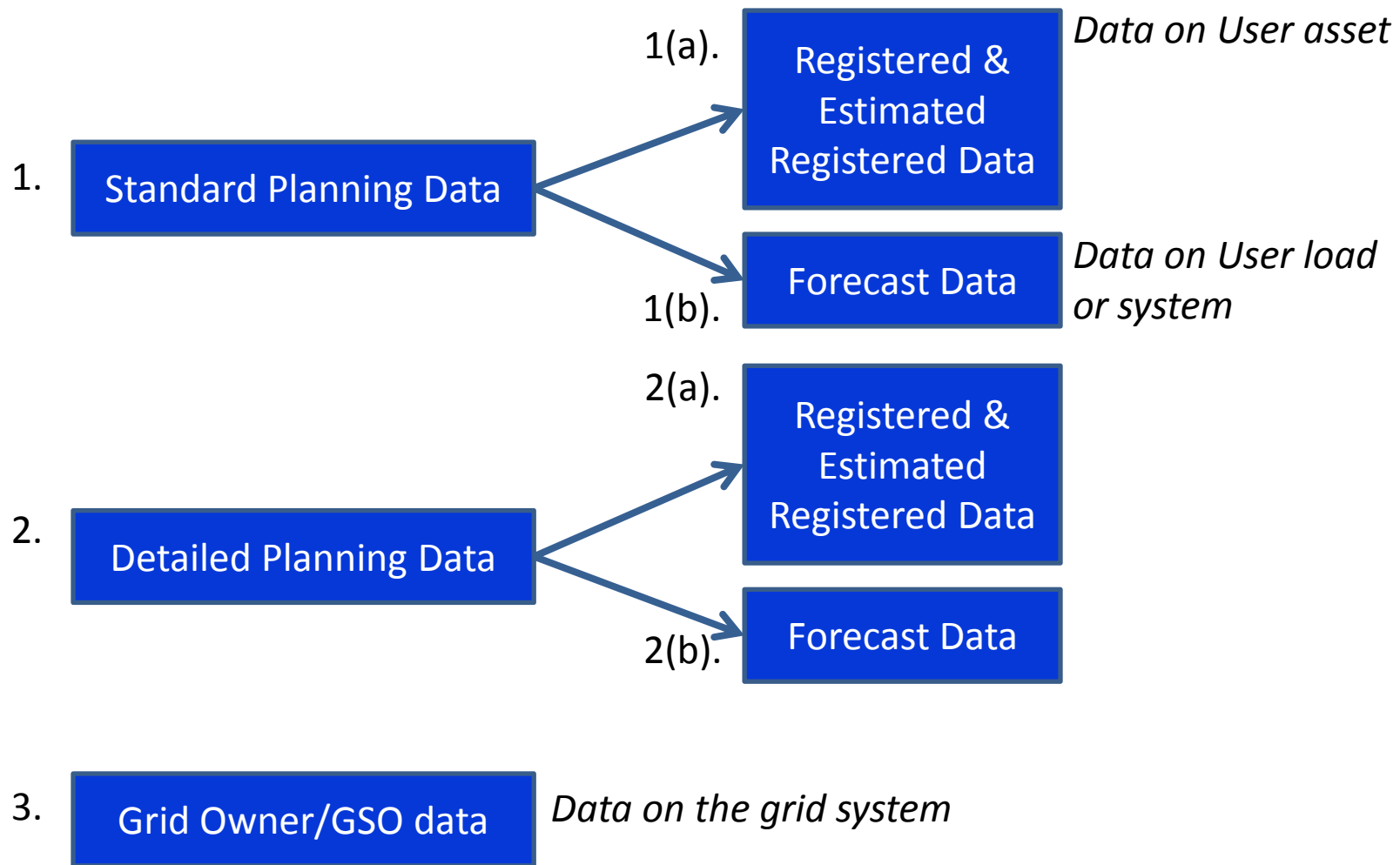
- Load forecast (whole system)
- Generation Development Plan
- Transmission Development Plan
- System Development Statement (on opportunity for new connections)

- Background to system development
- Load forecast (aggregated)
- Generation Plant capacity developments including existing and plant under construction
- Generating Plant capacity requirements for compliance with Generation Reliability Standard
- Existing and planned transmission developments including the requirements for equipment replacement and technology upgradation
- Transmission System capability including power flows, system short circuit levels and transient stability
- Transmission System performance information including frequency and voltage excursions and fault statistics
- Commentary indicating that is most suited to new connections and additional transmission capacity

## 2. User request for new connection (via application form submitted to Grid Owner)

- An offer of connection

# 3 Categories of Planning Data



# Standard Planning Data



*(Registered and Estimated Registered Data – summarised)*

No.	Types of data to be submitted	List of Users to submit	Ref in the MGC
1.	Connection point and User system data	NO, DCC, PSC, G	PCA.2
2.	Generating unit data	NO, DCC, PSC, G	PCA.3
3.	Demand (MW) and energy (kWh) data	NO, DCC, PSC, D	PCA.4
4.	Generating unit data	NO, DCC, PSC, G	PCA.5
5.	User's system data	NO, DCC, PSC, External Interconnection	PCA.6

**NO = Network Operator**

**DCC = Directly Connected Customer**

**PSC = Parties who seek new connection**

**G = Generator**

**D = Distributor**

**GO = Grid owner**



# Standard Planning Data



*(Registered and Estimated Registered Data – itemised)*

Ref	List of Data to be submitted	List of User to submit
1.	PCA.2.2.1 Single line diagram (SLD)	NO, DCC, PSC, G
2.	PCA.2.2.4 (Related to the SLD)	NO, DCC, PSC, G
3.	PCA.2.2.5 (Related to the SLD)	NO, DCC, PSC, G
4.	PCA.2.2.6 (Related to the SLD)	NO, DCC, PSC, G
5.	PCA.2.3.1 Lumped shunt susceptance of User system	NO, DCC, PSC, G
6.	PCA.2.4.1 Reactive compensation equipment	NO, DCC, PSC, G
7.	PCA.3.2.2(a) Registered capacity (MW)	NO, DCC, PSC, G
8.	PCA.3.2.2(c) System constrained capacity (MW)	NO, DCC, PSC, G
9.	PCA.3.2.2(d) Minimum stable generation (MW)	NO, DCC, PSC, G
10.	PCA.3.2.2(e) MW obtainable in excess of Registered capacity	NO, DCC, PSC, G
11.	PCA.3.2.2(f) Generating unit performance chart	NO, DCC, PSC, G
12.	PCA.3.2.2(g) CCGT units in CCGT modules	NO, DCC, PSC, G
13.	PCA.3.2.2(j) External Interconnection	Single Buyer
14.	PCA.3.2.2(k) Centrally dispatch generating units	PSC, G
15.	PCA.3.4.1 Point of connection to Transmission System	NO, DCC, PSC, G
16.	PCA.3.4.2 Generating unit excitation system	NO, DCC, PSC, G
17.	PCA.4.5(a)(i) Load transfer capability; 1 <sup>st</sup> outage – alternative connection point	NO, DCC, PSC, D
18.	PCA.4.5(a)(iii) Load transfer capability; 1 <sup>st</sup> outage – manual or automatic	NO, DCC, PSC, D
19.	PCA.4.5(b)(i) Load transfer capability; 2 <sup>nd</sup> outage – alternative connection point	NO, DCC, PSC, D
20.	PCA.4.5(b)(iii) Load transfer capability; 2 <sup>nd</sup> outage – manual or automatic	NO, DCC, PSC, D
21.	PCA.5.3.1 Generating unit parameters	NO, DCC, PSC, G
22.	PCA.6.2 Transient overvoltage assessment data	NO, DCC, PSC, G
23.	PCA.6.3 HVDC and power electronic devices	NO, DCC, PSC, External Interconnection

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# Standard Planning Data



*(Forecast Data – summarised)*

No.	Types of data to be submitted	List of Users to submit	Ref in the MGC
1.	Generating unit data	NO, DCC, PSC, G	PCA.3
2.	Demand (MW) and energy (kWh) data	NO, DCC, PSC, D	PCA.4
3.	Generating unit data	NO, DCC, PSC, G	PCA.5

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# Standard Planning Data



(Forecast Data – itemised)

Ref	List of Data to be submitted	List of User to submit
1.	PCA.3.2.2(b) Output (MW) on a monthly basis	NO, DCC, PSC, G
2.	PCA.3.2.2(h) Mode (regime) of running (of generating units)	NO, DCC, PSC, G
3.	PCA.3.2.2(i) Output (MW) profile of generating units	NO, DCC, PSC, G
4.	PCA.3.2.2(j) MW import/export via external interconnection	Single Buyer
5.	PCA.4.2.1 MW and MWh; daily load profile	NO, DCC, PSC, D
6.	PCA.4.2.3 (Related to the MW and MWh daily load profile)	NO, DCC, PSC, D
7.	PCA.4.3.1 Forecast of maximum demand MW and power factor	NO, DCC, PSC, D
8.	PCA.4.3.2 (Related to the forecast of maximum demand MW and power factor)	NO, DCC, PSC, D
9.	PCA.4.3.3 (Related to the forecast of maximum demand MW and power factor)	NO, DCC, PSC, D
10.	PCA.4.3.4 (Related to the forecast of maximum demand MW and power factor)	NO, DCC, PSC, D
11.	PCA.4.3.5 (Related to the forecast of maximum demand MW and power factor)	NO, DCC, PSC, D
12.	PCA.4.5(a)(ii) Load transfer via alternative connection point under 1 <sup>st</sup> outage	NO, DCC, PSC, D
13.	PCA.4.5(b)(ii) Load transfer via alternative connection point under 2 <sup>nd</sup> outage	NO, DCC, PSC, D
15.	PCA.5.2.1 Power station local load	NO, DCC, PSC, G
16.	PCA.5.2.2 Power station local load	NO, DCC, PSC, G

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# Detailed Planning Data

(Forecast & Registered/Estimated Registered Data - summarised)



No.	Types of data to be submitted	List of Users to submit	Ref in the MGC
1.	Generating unit connection; directly or embedded	NO, DCC, PSC, G	PCA.5.1.1, PCA.5.1.2
2.	Power station local load	NO, DCC, PSC, G	PCA.5.2
3.	Synchronous machine and associated control system data	NO, DCC, PSC, G	PCA.5.3
4.	User's protection data	NO, DCC, PSC, G	PCA.6.4
5.	Harmonic studies	NO, DCC, PSC, G	PCA.6.5
6.	Voltage assessment studies (including voltage unbalance)	NO, DCC, PSC, G	PCA.6.6
7.	Short circuit analysis	NO, DCC, PSC, G	PCA.6.7
8.	Additional data for new types of power stations and configurations	NO, DCC, PSC, G	PCA.7

<b>NO = Network Operator</b>	<b>DCC = Directly Connected Customer</b>	<b>PSC = Parties who seek new connection</b>	<b>G = Generator</b>	<b>D = Distributor</b>	<b>GO = Grid owner</b>
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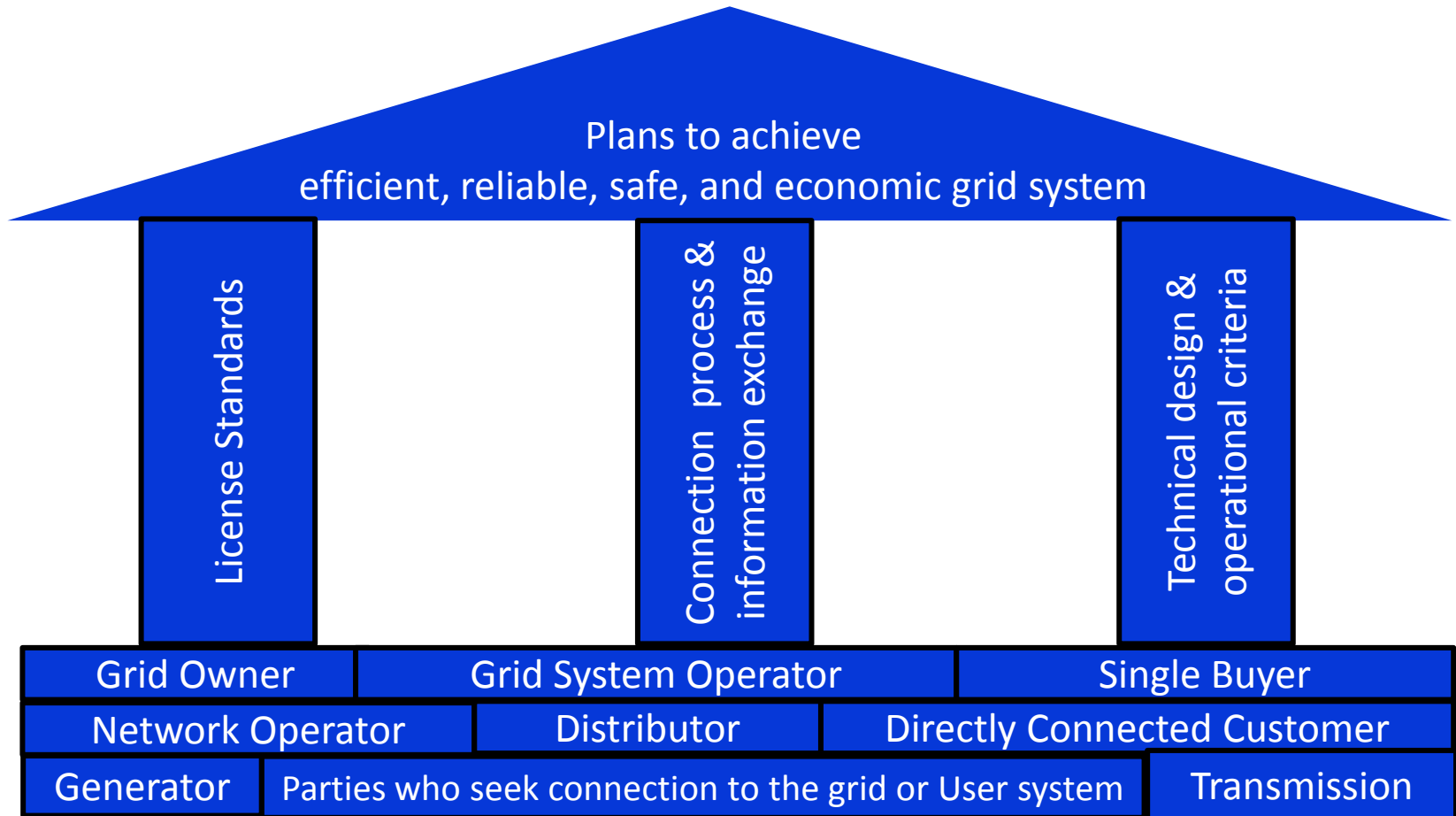
# Grid Owner/GSO Data

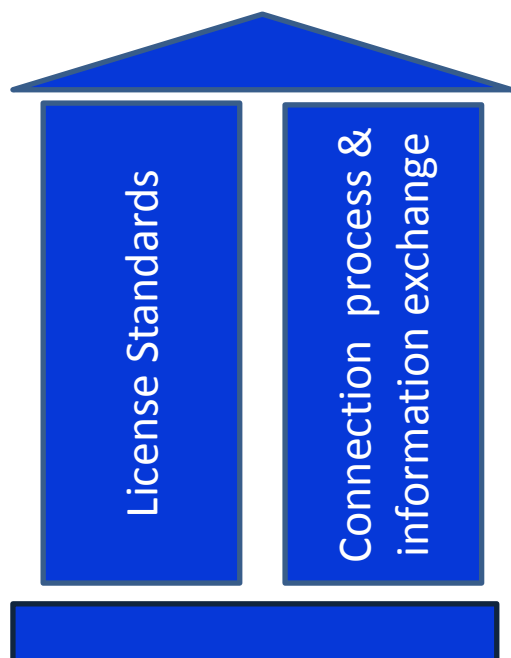


*(summarised)*

No.	Types of data to be submitted	Ref in the MGC
1.	Single point of connection to User system	PCA.8.1
2.	Multiple points of connection to User system	PCA.8.2
3.	Data items on system operating conditions (e.g. symmetrical 3 phase short circuit current, source impedance, pre-fault voltage, etc)	PCA.8.3
4.	Typical single line diagram for connection – Generation spur connection	Planning Data Requirement Part 3 – Appendix B
5.	Typical single line diagram for connection – Generation loop-in-loop-out connection	Planning Data Requirement Part 3 – Appendix B
6.	Typical single line diagram for connection – Generation network connection	Planning Data Requirement Part 3 – Appendix B

# Connection Code & its Building Blocks





1. License Standards, Connection process & information exchange are (similar) as that described under the Planning Code
2. Process of connection commences with submission of application form seeking for connection by Users to Grid Owner
3. At the same time, Users submit Planning Data and Detailed Planning Data of Registered Data or Estimated Registered Data and Forecast Data, as appropriate.
4. Grid Owner will conduct technical design and implementation studies in relation with the User request.
5. Single Buyer will make an offer for connection.
6. Provisions relating to connection to the Transmission System will be contained in a relevant Agreement with the User.

# Technical design & operational criteria



Technical design & operational criteria

No.	Criteria	Ref in the MGC
1.	Requirement for User's connection to enable the Transmission System to comply performance standards (e.g. grid frequency and voltage variation, voltage waveform quality, etc.)	CC6.2
2.	Requirement of User plants/apparatus at connection point (e.g. ratings, BIL, protection, etc.)	CC6.3
3.	Requirement of User generating units (e.g. power factor, dynamic response, black start, etc.)	CC6.4, Connection Code Appendix 3
4.	Requirement for Distributor, Network Operators and Directly Connected Customers	CC6.5
5.	Requirement of communication plants and apparatus	CC6.6
6.	Requirement of site related conditions (e.g. responsibility for safety, site responsibility schedules, operation and gas zone diagrams, site common drawings, access, etc.)	CC7, Connection Code Appendix 1, & Appendix 2



# CC6.4 Requirement of User generating units



No.	Requirements of generating units	Ref in the MGC
1.	Rated power output, power factor, short circuit ratio (SCR) and MW output vs frequency and voltage variations.	CC6.4.2
2.	Black start capability	CC6.4.3
3.	Fast acting generating unit automatic control system (i.e. governor controller, excitation system and power system stabiliser)	CC6.4.4
4.	Automatic Generation Control (AGC) and load following capability	CC6.4.5
5.	Limit on dispatch inaccuracy	CC6.4.6
6.	Unbalance loading capability	CC6.4.7
7.	Neutral earthing	CC6.4.8
8.	Off nominal frequency operation capability and frequency sensitive relays	CC6.4.9
9.	House load operation capability	CC6.4.10

## CC6.4 Requirement of User generating units



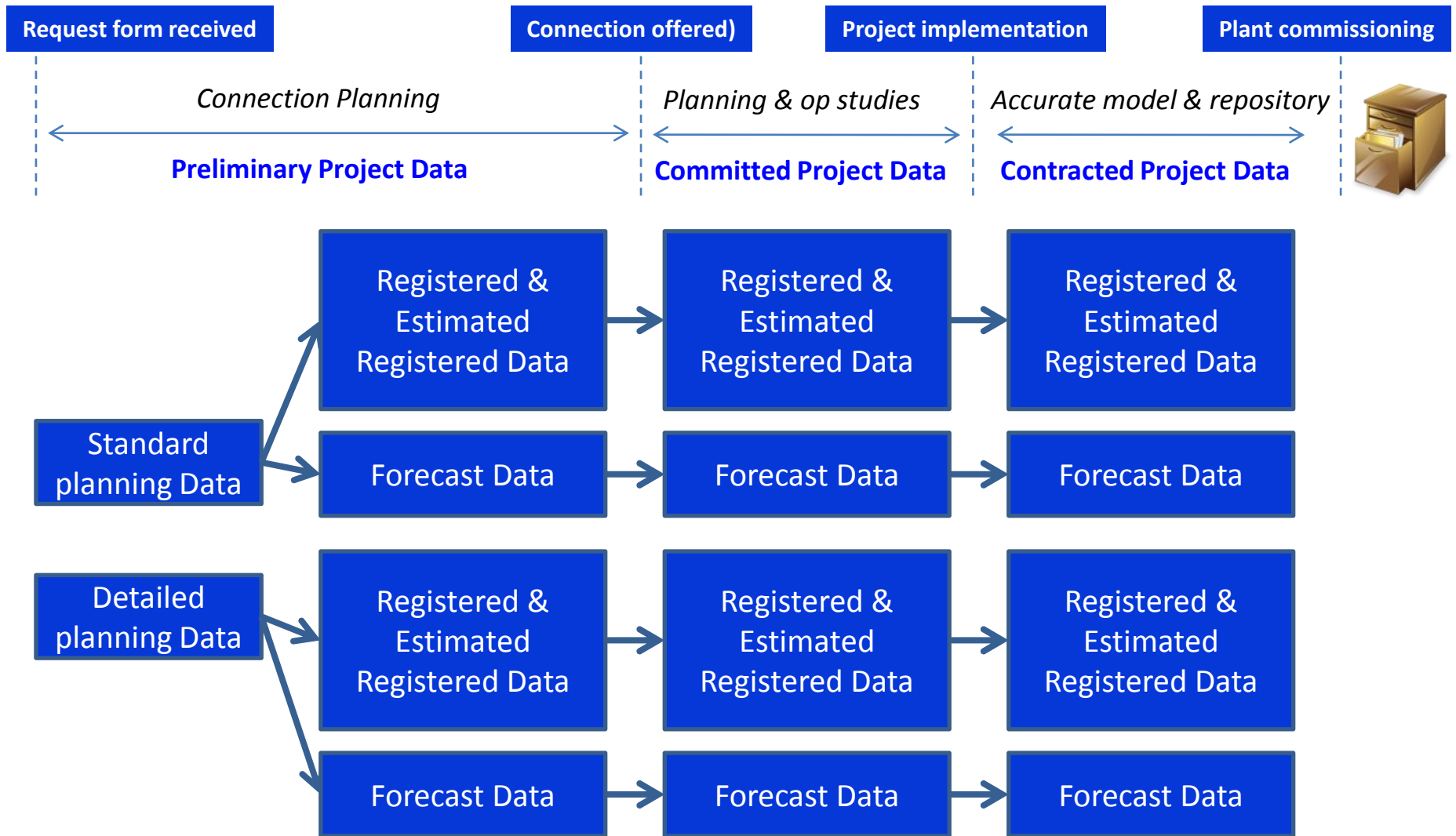
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No.	Requirements of generating units	Ref in the MGC
10.	Unit start capability (for start/stop operation)	CC6.4.11
11.	Dispatch ramp rate	CC6.4.12
12.	Primary and standby fuel stock	CC6.4.13
13.	On-line fuel changeover capability	CC6.4.14
14.	Loss of AC supply withstand capability	CC6.4.15
15.	Operation monitoring equipment	CC6.4.16
16.	Special provisions (for hydro and induction generating units)	CC6.4.17
17.	Tests to prove compliance	CC6.4.18

# Data Registration Code (DRC)



## Classification of Data (DRC4)



# Data Registration Code (DRC)



## Schedules of Data to be Registered (DRC7)



Schedule (ref in MGC)	Data Register
SCHEDULE 1	GENERATING UNIT (OR CCGT Module) TECHNICAL DATA. Comprising Generating Unit fixed electrical parameters.
SCHEDULE 2	GENERATION PLANNING PARAMETERS AND AVAILABILITY DATA. Comprising the Generating Plant parameters required for Operational Planning studies and certain data required under SDC1.
SCHEDULE 3	GENERATING PLANT OUTAGE PROGRAMMES, OUTPUT USABLE AND INFLEXIBILITY INFORMATION. Comprising generation outage planning, Output Usable and inflexibility information at timescales down to the daily Availability Declaration. Also contract information where External Interconnections are involved.
SCHEDULE 4	EMBEDDED GENERATING PLANT OUTPUT FORECASTS. Output predictions for Power Stations not subject to Central Dispatch.
SCHEDULE 5	USER'S SYSTEM DATA. Comprising electrical parameters relating to Plant and Apparatus connected to the Transmission System.

# Data Registration Code (DRC)



*Continued*

## Schedules of Data to be Registered (DRC7)

Schedule (ref in MGC)	Data Register
SCHEDULE 6	USER'S OUTAGE INFORMATION. Comprising the information required by GSO for outages on the Users System, including outages at Power Stations other than outages of Centrally Dispatched Generating Units.
SCHEDULE 7	LOAD CHARACTERISTICS. Comprising the estimated parameters of load groups in respect of, for example, harmonic content and response to frequency.
SCHEDULE 8	POWER TRANSFERS FROM EXTERNALLY INTERCONNECTED PARTIES TO THE SINGLE BUYER AND GSO. Comprising Power transfer schedules on a daily basis.
SCHEDULE 9	DATA SUPPLIED BY THE GRID OWNER AND GSO TO USERS.
SCHEDULE 10	USER'S DEMAND PROFILES AND ACTIVE ENERGY DATA Comprising information relating to the User's total Demand and Active Energy taken from the Transmission System.

# Data Registration Code (DRC)



## Schedules of Data to be Registered (DRC7)

*Continued*

Schedule (ref in MGC)	Data Register
SCHEDULE 11	CONNECTION POINT DATA Comprising information relating to Demand, demand transfer capability and a summary of Customer generation connected to the Connection Point or Grid Supply Point.
SCHEDULE 12	DEMAND CONTROL DATA Comprising information related to Demand Control.
SCHEDULE 13	FAULT INFEED DATA FROM USERS Comprising information relating to the Short Circuit contribution to the Transmission System from Users other than Generators.
SCHEDULE 14	FAULT INFEED DATA Comprising information relating to the Short Circuit contribution to the Transmission System from Generators.

# Data Registration Code (DRC)



## Schedules of Data to be Registered (DRC7)

*Continued*

*Schedules arranged by Users are as follows:*

Users	Schedules
Power Producers with Generating Plant	Schedules 1, 2, 3, 9, 14
Power Producers with Embedded Generating Plant	Schedules 1, 3, 4, 9
All Users connected directly to the Transmission System	Schedules 5, 6, 9
All Users connected directly to the Transmission System other than Power Producers	Schedules 10, 11, 13
All Users connected directly to the Transmission System with Demand	Schedules 7, 9
Externally Interconnected Parties Schedule	Schedules 8
All Network Operators	Schedule 12



# THANK YOU



**The Malaysian Grid Code Awareness Programme Funded by  
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