

ANDHRA PRADESH

CODE OF TECHNICAL INTERFACE

SECTION 1

GENERAL CODE

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1 GENERAL CODE

1.1 General Issues

1.1.1 Scope

The Code of Technical Interface is a document that defines the boundary between APTRANSCO and Users and establishes procedures for operation and development of facilities connected to the Transmission system. It lays down both the information requirements and procedures governing the relationship between APTRANSCO and Users.

The C.T.I. shall be complied with by **APTRANSCO**, in its capacity as holder of the **Transmission and Bulk Supply Licence**, and by **Generators, Distribution Companies, Suppliers** and **Bulk Power Consumers** in the course of their activities in generation, supply, and utilization of electricity and in the capacity as holders of Retail Supply Licence.

The CTI is designed to facilitate the development, operation and maintenance of an efficient, co-ordinated and economical AP State transmission system by specifying to all parties connected to that system, including **APTRANSCO**, their technical and procedural obligations. It seeks to be non-discriminatory and to ensure that interfaces are not areas of weakness in the supply chain.

The Transmission and Bulk Supply License requires **APTRANSCO** to prepare and continually maintain in force, a Grid Code (or Code of Technical Interface)

Section 18 (Part III) of the License issued by APERC to **APTRANSCO** is reproduced below:

“Section-18 Grid Code

- 18.1 Except as provided in paragraph 18.4, the Licensee shall ensure that, within six months from the issue of the Licence, there is in force at all times a Grid Code, which meets the requirements of this paragraph 18. Subject to Paragraph 18.11, the Licensee shall implement and comply with the Grid Code.
- 18.2 The Grid Code shall include:
 - (a) All material technical aspects relating to, connections to, and the operation and use of the Transmission System including the operation of electric lines and electrical plant and apparatus connected to the Transmission System in so far as relevant to the operation and use of the Transmission System including, but not limited to connections specifying the technical, design and operational criteria to be complied with Transmission System or by any Generating Company who is connected with or seeks connection with the transmission System or the Distribution System of any Supplier.
 - (b) An Operating Code, specifying the conditions under which the Licensee shall operate the Transmission System and under which Generating Companies shall operate their plant and the Suppliers shall operate their Distribution System, in so far as necessary to protect the security and quality of supply and safe operation of the Transmission System under both normal and abnormal operating conditions.
 - (c) A Planning Code, specifying the technical and design criteria and procedures to be applied by the Licensee in the planning and development of the Transmission System;
 - (d) A Scheduling and Despatch Code specifying the system for the scheduling and despatch of Generating Sets.
 - (e) Procedures relating to the co-ordination of outages for scheduled maintenance of

Generating Sets and transmission and distribution circuits;

- (f) A Metering Code, setting out requirements and procedures for metering, and
- (g) A Protection Code, setting out the requirements and co-ordination of protection systems.

18.3 The Grid Code shall:

- (a) be designed so as to permit the development, maintenance and operation of an efficient, coordinated and economical system for Transmission and Bulk supply in the state of Andhra Pradesh; and
- (b) allow the Licensee to comply with its obligations in relation to the inter–state transmission of power.

18.4 Where no Grid Code in the form provided for in this paragraph 18 is in force at the effective date of this license it shall not be considered a breach of this paragraph 18 provided that:

- (a) the Licensee shall file with the Commission a compilation of the Interim Grid Code within 60 days of the grant of this License;
- (b) the Licensee shall implement and comply with the Interim Grid Code from the date of its submission to the Commission, subject to such modifications as the Commission may direct; and
- (c) Within six months of the commencement of this License, the Licensee shall submit the comprehensive Grid Code described in Paragraph 18.2 and 18.3 for the approval of the Commission, which must be formulated by the Licensee after consultation with Suppliers, Generating Companies, Distribution Licensees, Central Transmission Utility, Regional Electricity Board and such other Persons as the Commission may direct.

18.5 The Interim Grid Code shall continue to remain in effect until such time as the Commission has approved the final Grid Code.

18.6 The Licensee shall, in consultatant with Distribution Licensees, Generating Companies, the Central Transmission Utility, the Regional Electricity Board and such other persons as the Commission may specify, review the Grid Code and its implementation from time to time. The Licensee shall also undertake such review as and when directed to do by the Commission. All the representations received during the interim period shall be considered by the Licensee.

Following any such review, the Licensee shall send to the Commission:

- (a) a report on the outcome of such review;. and
- (b) any proposed revisions to the Grid Code from time to time as the

Licensee reasonably thinks fit for the achievement of the objectives referred to in paragraph 18.2 and

- (c) all written representations or objections from suppliers arising during the consultation process.
- 18.7 All revisions to the Grid Code shall require the prior written approval of the Commission.
 - 18.8 The Commission may issue directions requiring the Licensee to revise, supplement or replace the Grid Code in such manner as may be specified in the directions, and the Licensee shall comply with any such directions.
 - 18.9 The Licensee shall make available a copy of the Grid Code in force to any person requesting it at a price not exceeding the reasonable cost of duplicating it.
 - 18.10 In preparing , implementing and complying with the Grid Code (including in respect of the scheduling of maintenance of the Transmission System), the Licensee shall not unduly discriminate against or unduly prefer:
 - (a) any one or any group of Persons or
 - (b) itself in the conduct of any business other than the Transmission Business.
 - 18.11 The Commission may issue directions relieving the Licensee or (following consultation with the Licensee) third parties of their obligations to implement or comply with the Grid Code to the extent as may be specified in the directions.”

The Code of Technical Interface is not concerned with the detailed design and operation of the Generator’s Power Stations and Supplier’s Distribution systems, provided that their overall compatibility with the needs of the Grid is assured. The responsibilities of the entities are defined and demarcated. Similarly, the CTI is not meant to be the internal operating instructions of **APTRANSCO**'s transmission system.

1.1.2 Interpretation

The meaning of certain terms (which are usually printed in bold letters and/or capitalized) used in the Code of Technical Interface (CTI) shall be in accordance with the definitions listed in Section 1.2, “Definitions” of the C.T.I..

1.1.3 Implementation and Operation of the C.T.I.

APTRANSCO has the duty to implement the Code of Technical Interface (CTI). All Users are required to comply with the CTI, which will be enforced by **APTRANSCO**. Users must provide **APTRANSCO** reasonable rights of access, service and facilities necessary to discharge its responsibilities in the User’s premises. Users shall comply with instructions issued by

APTRANSCO which are reasonably required to implement and enforce the Code.

If any User fails to comply with any provisions of the C.T.I., the User shall inform **APTRANSCO** without delay of the reason for its non-compliance. Repeated failures to comply with the C.T.I. may lead to the disconnection of the User's plant and/or facilities. The responsibility for the consequences of disconnection including payment of damages and compensation to consumers rests with the User who consistently violates the CTI.

The Operation of the C.T.I. will be reviewed regularly by the C.T.I. Review Panel in accordance with the provisions of the relevant Section of the C.T.I..

The C.T.I. contains procedures to permit equitable management of day to day technical situation in the Electricity supply system, taking into account a wide range of operational conditions likely to be encountered under both normal and abnormal circumstances, relevant both in the present conditions and future expanded system and in the present generation shortage period, as well as surplus generation period which may come in the future.

However, the C.T.I. cannot predict and address all possible operational conditions.

APTRANSCO is therefore empowered in such unforeseen circumstances to act decisively to discharge its obligations under its License. Users shall provide such reasonable cooperation and assistance as **APTRANSCO** may request in such circumstances. It is to be recognized that the **SLDC** is required to make quick decisions for remedying Grid crises and the instant judgments and decisions may contain oversight errors. Post-event corrections shall be made by **SLDC** itself, taking into consideration the feedback from various stakeholders and consumers. The Users and consumers have the right to approach the Regulator for redressing their grievances and unfairness. All parties must first comply with the spot instructions of **SLDC** and if injustice is experienced, the matter shall be represented to **SLDC**. If **SLDC** does not carry out the necessary changes in the subsequent operation, the aggrieved party may complain to the **APEREC**.

1.1.4 Code Responsibilities

In discharging its duties under the Code of Technical Interface, **APTRANSCO** has to rely on information which Users supply regarding their requirements and intentions. **APTRANSCO** shall not be held responsible for any consequences that arise from its reasonable and prudent actions on the basis of such information.

1.1.5 Confidentiality

Under the terms of the Code of Technical Interface **APTRANSCO** will receive information from Users relating to their intentions in respect of their generation or supply businesses. **APTRANSCO** shall not, other than as required by the Code of Technical Interface, disclose such information to any other person without the prior written consent of the provider of the information.

1.1.6 Dispute Settlement Procedures

In the event of any dispute between any Users and **APTRANSCO**, or between Users, regarding interpretation of any Clause of the Code of Technical Interface, the matter will be resolved according to procedures set up in this Code (Section 1.5). The Commission will be the final arbitrator whose decision shall be final and binding. In the event of any conflict between any provision of the Code of Technical Interface and any contract or Agreement between **APTRANSCO** and a User, the provision of the Code of Technical Interface shall prevail.

1.1.7 Communications between Licensee and Users

All communications between **APTRANSCO** and Users shall be in accordance with the provision of the relevant section of the Code of Technical Interface. Unless otherwise specifically required by the Code of Technical Interface, all communications shall be in writing, except where operation time scales require oral communication, in which case these communications shall be confirmed in writing as soon as practicable.

1.1.8 Partial Invalidity

If any provision or part of a provision of the Code of Technical Interface should become or be declared unlawful for any reason, the validity of all remaining provisions or parts of provisions of the Code of Technical Interface shall not be affected.

1.1.9 Directives

Under the provisions of the Act, the State Government may issue policy directives in certain matters. The Licensee shall promptly inform the Commission and all Users of the requirement of such directives. The Users, subject to the relevant section of the Act, shall comply with the directive.

1.2 Definition of Terms

In the **Code of Technical Interface** the following words abbreviations and expressions shall bear the following meanings:

	TERM	DEFINITION
Act		The A.P. State Electricity Reforms Act 1998
	Active Power or MW	Product of voltage and current and cosine of the phase angle between them measured in units of Watt (W) Kilowatt (kW) = 10^3 W Mega Watt (MW) = 10^6 W Giga Watt (GW) = 10^9 W Tera Watt (TW) = 10^{12} W

Active Energy	The electrical energy produced, flowing in or supplied by an electrical circuit during a time interval, being the integral with respect to time of Active Power, measured in units of watt-hours or standard multiples thereof, that is :- 1000 Wh = 1kWh = 1 unit 1000 KWh = 1MWh 1000 MWh = 1GWh = 1MU (Million units) 1000 GWh = 1 TWh = 10 ¹² Wh
A.C.	Alternating Current
Agreed Procedure	Procedure for dealing with specific situations in metering as specified in Section 5.2.3 of the Metering Code.
Alternator	The electrical machine which is driven by a prime mover and generates AC electric power. The term Generator is reserved for another meaning to avoid confusion (see def. of Generator)
Annual Hydro Plan	The plan prepared by APTRANSCO on the instructions of High Power Electricity Irrigation Coordination Committee by mid September each year relating to Water Resource Management during the period of twelve months commencing on 1st October in that year.
Apparent Power	$S = P + JQ$. Magnitude is calculated by the formula $S = \sqrt{(P^2 + Q^2)}$ expressed in units of Volt-amps (VA) or multiples like kVA, MVA
A.P. Code of Technical Interface	The set of principles and guidelines prepared by APTRANSCO in accordance with the terms of the Transmission License, as amended from time to time by the direction of the Commission, relating to the Planning, Design and Operation of the APTRANSCO System and all Users connected to it.
APERC	Andhra Pradesh Electricity Regulatory Commission. (referred to as the 'Commission')
Apparatus	All equipment in which electrical conductors are used, supported or of which they may form part.
Appendix	An Appendix to a Section of the Code of Technical Interface
APGENCO or APGC	Andhra Pradesh Generation Corporation Ltd., registered under the Companies Act and successor of APSEB in generation of power
APTRANSCO or APTC	Transmission Corporation of A.P Limited, Registered in 1999 under the Act of 1998 which is the successor to APSEB in Transmission of Electricity and other general functions like coordinating all Power Sector entities in AP State.
APTRANSCO Control Centre	A location used for the purpose of control & operation of the APTRANSCO system which, on the transfer date is at

	<u>Vidyut Soudha</u> in Hyderabad, Andhra Pradesh
APTRANSCO Data Collector	A data collecting device owned by APTRANSCO which transmits data to the Data Collection System of APTRANSCO for the purpose of compiling information
APTRANSCO Demand	The Demand on the APTRANSCO system less the output of Independent Generating Plant limited to provision by the Connection Agreement
APTRANSCO Site	A Site owned by APTRANSCO, or owned by a User but occupied by APTRANSCO, in which there is a Connection point.
APTRANSCO System	The transmission system at voltage levels of 400 kV, 220 kV, 132 kV and 66 kV. (The Distribution system shall be treated as a separate entity of the Supplier.)
APTRANSCO System Data	Data concerning the APTRANSCO System to be supplied by APTRANSCO to Users. APTRANSCO system data consists of salient features to the existing system and future system as per the perspective plan. Such data shall contain details of EHV lines (i.e. 132KV and above) and shall include the following: (a) Single line diagram of the APTRANSCO system indicating the existing lines and proposed lines (shown dotted). (b) Map of A.P showing the existing lines of the APTRANSCO system and proposed lines (dotted) preferably to scale 1Cm = 10 kM
Area of Supply	As defined in the license concerned.
Area Load Despatch Centre	One of the four stations in AP State being established under Southern Region System Coordination and Control Project, having as main functions: - Data acquisition and transfer to SLDC and supervisory control of 132 kV and 33 kV equipment.
Automatic Load Shedding	A Load shedding scheme implemented by APTRANSCO to prevent frequency collapse or other problems and to restore the balance between generation output and demand on the APTRANSCO system
Automatic Voltage Regulator (AVR)	A continuously acting automatic excitation system to control the voltage of a Generating Unit measured at the Generator Terminals
Back Supply	Supply of electricity to the APTRANSCO and for its own use
BIS	Bureau of Indian Standards.
Black start	The procedure necessary for a recovery from a Total Shutdown or Partial Shutdown.
BPTA	Bulk Power Transmission Agreement

Break-down	An occurrence relating to equipment of supply system which prevents its normal functioning
Cancelled start	A response by a Generator to an instruction from APTRANSCO canceling a previous instruction to synchronize to the APTRANSCO system
Capability	The Capability of a Generating unit, expressed in MW, to generate electricity determined at the Interconnection point (after deducting consumption of auxiliaries)
Captive Power Plant (CPP)	A Power Station which is primarily operated to meet a Captive Demand
CCGT Module	A group of Generating Units comprising one or more Gas Turbine Units and one or more Steam Units wherein the waste heat from the gas turbines is passed to the water/steam system of the steam units thereby increasing the overall efficiency of CCGT Module.
CEA	The Central Electricity Authority of India.
CCGT	Combined Cycle Gas Turbine
CCGT Unit	A Generating Unit within a CCGT Module
Central Despatch	The process of scheduling and issuing Despatch Instructions in relation to CDGUs direct to a Generating plant by APTRANSCO pursuant to the Code of Technical Interface
CERC	Central Electricity Regulatory Commission established under Electricity Regulatory Commission Act 1998 and Electricity Laws (Amendment) Act 1998 (Central Acts)
Central Sector Projects	Power Projects and Transmission Projects built and operated by Central Organisations such as National Thermal Power Corporation (NTPC), National Hydro Power Corporation (NHPC), Power Grid Corporation of India Limited (PGCIL)

Centrally Despatched Generating Unit or CDGU	A Generating Unit within a Generating Plant
Changed Status Data of a CDGU	Newly arisen factors pertaining to a CDGU and its parameters which may have a material effect on the probable output of a CDGU and which must promptly be intimated to the SLDC by the Generator concerned (Refer also "GSDP" Notice)
Civil Emergency	Any National disaster or other emergency which is declared by the State/National Government as one that is likely to disrupt Electricity supplies

Code of Technical Interface Review Panel	A standing body established by APTRANSCO to carry out the following functions. (a) Keep the Code of Technical Interface and its working under periodic review (b) Review any suggestions for amendments to the CTI at meetings of the panel held in accordance with the Panel's constitution, and (c) Give guidance in relation to the Code of Technical Interface, its implementation, performance and interpretation on the reasonable request of any User.
Commission	The A.P Electricity Regulatory Commission established pursuant to Sec.3 of the A.P. Electricity Reforms Act 1998, same as APERC.
Confirmation Statement	A daily statement prepared by a Generator and submitted to APTRANSCO in accordance with the relevant PPA.
Connected Load	Aggregate of rated capacity of all apparatus including portable apparatus in the Consumer's premises which are supplied or declared by the Consumer to be taking supply from the system. This shall be expressed in kW, kVA
Connection Agreement	An Agreement between APTRANSCO and a User setting out the terms relating to a connection to and/or use of the APTRANSCO system
Connection Conditions	Chapter of the Code of Technical Interface dealing with the condition of connection of a User's system to the APTRANSCO System.
Connection Point	A point at which a User's Plant and/or Apparatus connects to the APTRANSCO system or Inter-State Transmission system.
Connection Site	A site containing a Connection point
Consumer	Any person supplied with electrical energy by the supplier either as owner or lawful occupier and whose premises are for the time being connected to the supplier's system and includes the consumer whose power supply, notwithstanding the subsistence of agreement has been disconnected for the time being

Contingency Reserve	The margin of generating capacity over forecasted Demand required in the period from 24 hours ahead down to real time to cover against uncertainties in Generating plant availability, imports from external connections and against Demand forecast variations. It is provided by Generating plants not required to be synchronized but must be held available to synchronize within 10 to 15 minutes.
Contract Demand	Maximum kW or kVA agreed to be supplied by the Supplier and reflected in the agreement executed between the parties

Contracted Capacity	In relation to a CDGU, the maximum capability of the CDGU as specified in the relevant PPA. It is the net active power that can be injected by the CDGU into the Transmission System at the connection point, excluding the power consumed in the auxiliaries of the CDGU.
Control Person	A person identified as having responsibility for cross boundary safety under relevant Section.(Cross Boundary Safety) of the Code of Technical Interface
Control Phase	The phase that follows the Programming phase and starts with the issue of the Indicative Running Notification for the next schedule day and covers the period down to real time.
CTU	Central Transmission Utility. It is an organisation which owns and operates inter-state and inter-regional transmission system in the territory of India.
Data Acquisition System (DAS)	A device provided to record the sequence of operation in time, of the relays / equipment / system parameters at a location.
Data Collection System	A system operated by APTRANSCO to collect data from Generating Stations and Connection points of EHT consumers and Distribution Systems.
Delivery Point at Generating Stations	The point at which a generator transfers power and energy to the APTRANSCO system and with reference to which the transaction of power and energy between Generators and APTRANSCO are made. This normally corresponds to the interface boundary. Meters are usually connected at this point and if connected at some other point, the quantities of power and energy will be adjusted with respect to this point. Generally the delivery point corresponds to the relevant connection site.
Delivery Point of Bulk Supply	The point at which energy is delivered by APTRANSCO to a DISCOM and with reference to which the transaction between APTRANSCO and the DISCOM is made. This normally corresponds to the interface boundary. Meters are usually connected at this point, and if located at some other point, the quantities of energy and power will be adjusted with respect to this point. Generally the delivery point corresponds to the relevant connection site.
D.G.C	The part of the Distribution Code which is identified as the Distribution General Supply Code.
Disclosee	Person to whom confidential information has been disclosed because it is essential for that person to know the particular confidential information in order to fulfill his duties/obligations and statutory requirements.
Disputes Procedure	The procedure detailed in a PPA for resolving disputes between APTRANSCO and another party.
D.O.C	That portion of the Distribution Code which is identified as the Distribution Operating Code
D.P.C	That portion of the Distribution Code which is identified as the

	Distribution Planning and Connecting code.
De-Loaded	The condition in which a Generating unit has reduced or is not delivering electric power to the System to which it is synchronized and the terms “De-Loading” and “De-Load” shall be construed accordingly.
De-synchronised	The act of taking out a Generating unit from the APTRANSCO system to which it has been synchronized; like terms shall be construed accordingly.
Demand	The Demand of active power and reactive power unless otherwise stated
Demand Charges	Fixed charges payable by the Consumer at the rate fixed by the Supplier per KVA of Maximum Demand attained by the consumer’s system or 80% of Contracted Demand whichever is higher.
Demand Control	All or any of the methods of achieving a Demand reduction set out to the provisions made by APTRANSCO and procedures to be followed by APTRANSCO and Users to permit reductions in Demand
Demand Forecast	The process which specifies procedures to be followed and data to be supplied to APTRANSCO to enable APTRANSCO to forecast Demand on the APTRANSCO system through time scales ranging from Two years in advance plus the current year through to the control phase and into real time operation.
Despatch	The issue by APTRANSCO of instructions to Generating plant pursuant to Scheduling and Despatch Section(4.3) of Operation Code and the term “Despatched” shall be construed accordingly.
Despatch Instructions	An instruction by APTRANSCO to a Generator to operate a CDGU issued in accordance with Section 4.3 (Scheduling and Despatch) of Operation Code.
Detailed Panning Data	Data specified in Planning Code.
Development	A Modification relating to a User’s Plant and/or Apparatus already connected to the APTRANSCO system.
Disconnect	The act of physically separating User’s (or Customer’s) equipment from the APTRANSCO system.
Distribution Code	The document produced by Distribution Company pursuant to condition of the Electricity Supply License
Distribution Mains	Portion of main supply line owned and managed by Supplier with which the service line is or intended to be connected.
Distribution System	The Distribution System comprising electric lines and apparatus at voltage levels of 240V, 400V, 11 kV, 33 kV which as at the Transfer Date, is owned by APTRANSCO.
Distributor	A person appointed through an operating agreement for the operation of a part of the Distribution system
Earthing	A way of providing a connection between conductors and earth by an Earthing Device.
Earthing Device	A means of providing a connection between a conductor and earth being of adequate strength and capability and conforming to Indian

	Standard Code of Practice.
Earth Fault Factor	EFF at a particular location is the ratio of the highest RMS phase voltage at Power frequency in a sound phase during earth fault in other phases to the RMS phase voltage without fault.
Effective Date	The Transfer Date
Electricity Board	The erstwhile A.P. State Electricity Board
Electricity Supply Act	The Electricity Supply Act'1948 as amended up to date
Emergency Manual	Load shedding carried out at short notice or no notice for safety of personnel and equipment or when a Regulating Margin cannot otherwise be achieved.
Energy	Quantity of electrical energy measured in units equal to one Kilowatt hour (kWh) or multiples thereof such as: 1000 Wh = 1 kWh (One Unit) 1000KWh = 1 MWh 1000MWh = 1 MU (Million units) = 1 GWh
Engineer	The Executive Engineer of the Division having jurisdiction over the area of supply in which the premises to be served are located and includes any other subordinate Engineer duly authorised by him or his superior officer.
Event	An unscheduled or unplanned occurrence on a Grid including faults, incidents and breakdowns.
Event Logger (EL) or Event Recorder (ER)	A device provided to record the sequence of operations in time, of the relays/equipments at a location during an event.
Export	In respect of any party, a flow of electricity from the plant or apparatus of such party to the plant or apparatus of another party and the verb "export" and its respective tenses shall be construed accordingly.
External Interconnections	Apparatus for the transmission of Electricity to or from the APTRANSCO system into or out of a Transmission system located outside A.P.State.
Extra High Voltage or EHV	A voltage exceeding 33000 volts under normal conditions subject, however, to the percentage variation allowed by the Indian Electricity Rules, 1956 as amended up to date.
Fault Locator (FL)	A device provided at the end of a transmission line to measure / indicate the distance at which a line fault may have occurred.
Final Metering Scheme	A Tariff Metering scheme as set out in Metering Code Sub-Code 2, intended to be the permanent metering system after the FMS Date
Financial Year	Period commencing on 1st day of April and ending on 31st day of March of next year

Five Minute Reserve	That component of the Operating Reserve which is fully available within 5 minutes from the time of a frequency drop or a Despatch Instruction pursuant to Section 4.3 (Scheduling and Despatch) of Operation Code and which is sustainable for a period 24 hours.
Flexible Alternating Current Transmission (FACT)	Facilities that enable power flows on AC lines to be regulated, to control loop flows, line loadings etc.
FMS Date	In respect of Generation Metering, the date on which the Final Metering Scheme comes into effect for all Units and Relevant Connection Sites subject to such exceptions as may be agreed with the Commission after consultation in each separate case with the party which operates the Generating Unit or occupies the Relevant connection site which is subject to such exception.
Force Majeure	Has the meaning ascribed to that term in the relevant PPA
Forced Outage	An outage of a CDGU or item of Power Station equipment of which no notice can be given by the Generator to APTRANSCO.
Frequency	The number of alternating current cycles per second (expressed in Hertz or Hz) at which a System is running.
Frequency Control	The control of the frequency of the APTRANSCO System. (Practically it is the control of frequency of the Southern Grid).
Frequency Sensitive Mode	The operation of a Generating unit whereby its generation level is varied automatically to compensate for variations in the frequency of the APTRANSCO System.
Frequency Transient	An abrupt increase or decrease of 0.5 Hz or more in the frequency of the APTRANSCO System.(and therefore in the frequency of Southern Region.)
Frequency Variation Index (FVI)	<p>A performance index representing the degree of frequency variation from the nominal value of 50.00 HZ over a specified period of time</p> $FVI = 10 \times \frac{\sum_{i=1}^N (f_i - 50)^2}{N}$ <p>Where f_i = actual frequency in Hz at i the time period</p>

	N= number of measurements over the specified period of time
Full Load	Maximum net electrical output of a Generating Unit after Auxiliaries, measured at the Interconnection point.
Generating Plant	A Power Station subject to Central Despatch
Generator Data Collector	A data collecting device owned by a Generator available to transmit data directly to the relevant Generator and dedicated at all times to such transmission of data to such Generator.
Generating Scheduling and Despatch Parameters	Information provided by Generator to APTRANSCO pursuant to the relevant section of the PPA and Section 4.3 of the Code of Technical Interface to enable APTRANSCO to formulate the generation schedule and dispatch instructions. Such information shall comprise the capacity and availability of all generating units and any special factors that may affect the output of the CDGU
Generating Unit	Any Apparatus which produces electrical energy including a CCGT Unit.
Generation Schedule	A statement prepared by APTRANSCO detailing the generation schedule of each CDGU for a Schedule Day (00 to 24 Hrs) and issued by 1600 hrs on the previous day with the object of maintaining quality and security of supply (with adequate margin if available) taking into account inter-state transfers, the output of central generating stations, IPPs , JVCs and CPPs.
Generator	A person or agency who generates electricity and who is subject to the Code of Technical Interface either pursuant to any agreement with APTRANSCO or otherwise.
Generator Reactive Performance Chart (Capability Curve)	A diagram which shows the MW and MVAR Capability limits within which a CDGU is expected to operate under steady state conditions in the manner prescribed by the manufacturer of the alternator. The diagram shall indicate the output under different power factors.
Generator Terminals	The stator terminals of an alternator.
Good Utility Practice	Any of the practices, methods and acts engaged in or approved by a significant portion of the electric utility industry during the relevant time period which could have been expected to accomplish the desired results at a reasonable cost consistent with good business practices, reliability, safety and with expedition.

Governor Droop	In relation to the operation of the Governor of a Generating Unit, the percentage drop in APTRANSCO system frequency which would cause the Generating Unit under free governor action to change its output from zero to full load.
Grid Code	Synonym of the Code of Technical Interface.

Grid Entry Point	A point at which a Generating Unit or an External Interconnection connects to the APTRANSCO system
Grid Exit point	A point at which electricity may be delivered from the APTRANSCO system to a customer or to a Distribution System.
GSDP Notice	A notification by a Generator to APTRANSCO of any change in the GSDP values of any of its CDGUs previously notified by the Generator in its last GSDP Notice (a) given by 10.00 hours on the day before the relevant Schedule Day in accordance with Section 4.3.4.1 of Operation Code in respect of revised values of which the generator is then aware of. (b) given after 10.00 hours on the day before the relevant Schedule Day in accordance with Section 4.3.4.1 of Operation Code in respect of revised values of which the generator subsequently becomes aware of.
High Voltage or HV	Voltage exceeding 650 Volts.
Hot Standby	In relation to a Generating Unit, a condition of readiness of the Generating Unit's boiler to enable the Generating Unit to be synchronized to the APTRANSCO System and attain an instructed output in a specified time scale.
HV Apparatus	High Voltage electrical circuits forming part of a System
Hydro Station	A Hydro-electric Power Station.
IEGC	Indian Electricity Grid Code, a document developed by the Central Transmission Utility and approved by the Central Electricity Regulatory Commission which lays down procedures for operation and development of Regional Grids and the relationship between various constituents and users of each Regional Grid and the relationship between the Regional Electricity Board/RLDC and the constituents in the Region and which primarily deals with ISTS and ISGS and incidentally with the State Systems.
Import	In respect of any party, a flow of electricity to the Plant or Apparatus of such Party from the Plant or Apparatus of another Party and the verb "import" and its respective tenses shall be construed accordingly.
Implementing Safety Coordinator	A person nominated by APTRANSCO and/or a User to be responsible for the co-ordination of safe working procedures at a connection point when cross boundary work is carried out which necessitates the provision of safety precautions on HV Apparatus. An Implementing Safety Coordinator may be responsible for more than one connection point.
Independent Generating Plant	A Power Station which is not subject to Central Despatch.
Independent Power Producer (IPP)	A generating company not owned /controlled by the Central/State Government.

Indicative Running Notification (IRN)	A notification issued by APTRANSCO informing the CDGUs the period and the loading for which the CDGUs may schedule their units during the following scheduled day. The Generator may confirm or seek modification immediately.
In-Situ test	A test or calibration made on a meter, CT or PT in its normally located place, with respect to physical mounting, and where it normally functions.
Interconnection Point	In relation to a CDGU or generating station the point at which the CDGU or generating station is connected to the APTRANSCO system and at which Energy is delivered to APTRANSCO, as specified in the relevant PPA.
Interconnections	The electric lines, plant or apparatus and meters for the transfer of electricity to or from the APTRANSCO Transmission System include into or out of the transmission system of the Power Grid Corporation of India (PGCIL) or neighboring States.
Interested Party	In relation to Metering of Generator Circuits at any Relevant Connection Site of a Generating unit, the Generator which operates such Generating unit; in relation to Substation metering, APTRANSCO are the interested parties.
Inter-State Generating Station (ISGS)	A Central /MPP/ other generating station in which two or more than two States have a share and whose scheduling is to be coordinated by RLDC.
Inter-State Transmission System (ISTS)	Any system for the conveyance of energy by means of a main transmission line from the territory of one State to another State and includes: <ul style="list-style-type: none"> (i) The transmission system to convey energy across the territory of an intervening State as well as the system for conveyance of energy within a State, which is incidental to such inter-state transmission of energy. (ii) The system for transmission of energy within the territory of a State built, owned, operated, maintained or controlled by the Central Transmission Utility or by any person/ agency under the supervision and control of the Central Transmission Utility.

Interim Metering Scheme	In respect of Generation Metering, a Tariff Metering scheme as set out in the Metering Code, Sub-Code 1, which takes effect from the Effective Date in relation to Generating Units and Relevant Connection Sites, commissioned on or prior to such date, until the Final Metering Scheme comes into effect.
Intertripping	A method of tripping a circuit breaker on receipt of a signal initiated

	from protection at another location
Isolating Device	A switching device which when in the open position provides an isolation distance. It shall be possible to observe the isolation distance.
Isolation	The disconnection of any HV Apparatus from the remainder of the System in which the HV Apparatus is isolated by approved means such that electricity cannot pass through the Apparatus and the Apparatus is de-energised. The state of isolation must be capable of observation.
Joint System Incident	An event occurring anywhere on the Total System which has or may have a serious and widespread effect on a User System or on the APTRANSCO system or may result in cross-boundary consequences.
JVC	Joint Venture Company, it is a company in which both Government and a private party hold substantial stocks.
KVA	Kilovolt Ampere
LCP	Line Clear Permit
License	A License granted under the Act for the purpose specified
Licensee	Licensee or License Holder is a person or Corporation to whom a License or Authorisation is issued by the AP State Government or, under Section 15 of AP Electricity Reform Act 1998, by the AP Electricity Regulatory Commission for carrying out transmission, bulk supply or retail supply of electrical energy in AP State, or a territory inside AP State for a given period.
License Standards	The standards set out or referred to in the Transmission License
Load	The Active and Reactive Power, as the context requires, generated, transmitted or distributed and all like terms shall be construed accordingly.
Load Factor	Ratio of total number of units consumed during a given period to the total number of units that could have been consumed, had the contract demand/maximum demand been maintained throughout the same period. It is usually expressed as a percentage.
Load Management Arrangements	Agreement between certain large Users and APTRANSCO for Users to reduce their Demand at certain times of the year having been given an advance notice of this requirement by APTRANSCO.
Load Price	That element of the Generation prices for a CDGU (expressed in Rupees/hour of operation of the CDGU) which relates to the operation of the CDGU at no load but which is applicable for all loads of output of the CDGU.
Local Safety Instructions	The combined sets of safety instructions supplied by a User to APTRANSCO and by APTRANSCO to a User which provide necessary information pertaining to safety precautions and safe working procedures such as, but not limited to, isolation and earthing, on its side of the connection point at each connection site. The timing of the issue of the safety instructions shall be as stated in the connection agreement.
Loss of Load	The probability of not being able to meet the peak load of

**M.U.
Margin**

Probability (LOLP)	APTRANSCO system due to planned or forced outage of Generating units.
Low Frequency Relay or Under Frequency Relay	An electrical measuring relay intended to operate when the frequency falls below predetermined value.
Low Voltage or LV	A voltage below 250 volts under normal conditions subject, however to the percentage variation allowed by the I.E.Rules 1956.
	Million Units of Energy (10^6 kWh)
	An appropriate Operational Planning margin, set by APTRANSCO, of generating capacity over that required to meet APTRANSCO Demand.
Maximum Demand	In respect of any Settlement Period, four times the largest number of Kilowatt hours supplied and taken during any continuous fifteen minute period (calculated from either the commencement or the middle of an hour).
Mega Power Project (MPP)	A generating station of an IPP having two or more States as beneficiaries.
Merit Order	A priority order of CDGUs compiled by APTRANSCO pursuant to Schedule and Despatch Section (4.3), generally in ascending order of cost of energy and taking into account the PPAs, flood water utilisation at hydel stations, conservation of fuel and lowest cost consideration for APTRANSCO.
Metering	Tariff Metering in respect of energy transfer from Generating Stations to the Grid and from the Grid to Distribution Systems and operational metering at Generating Stations and EHT Sub-Stations for operational purposes.
Metering Code	That part of the Code of Technical Interface identified as the Metering Code and dealing with Interface Metering.
Metering Committee	The Committee in the relevant form established in accordance with 5.15
Minimum Demand Regulation	That margin of Active Power sufficient to provide a regulating margin for adequate frequency control.

MVA

Minimum Generation	The minimum output which a Generating Unit can generate continuously. This parameter is registered with APTRANSCO as GSDP.
Monthly Contribution Schedule	For Independent Generating Plants which cannot be despatched the Generator shall furnish a monthly schedule of contribution of power to the APTRANSCO system.
	Mega Volt Ampere = 1000 kVA
National Grid	The entire inter-connected electric power network of the country,

	which would evolve after inter connection of Regional Grids.
Non-Tariff Consumer	A Consumer who purchases electricity under the terms of a special agreement and who is subject to Code of Technical Interface either by virtue of a License or pursuant to an agreement with APTRANSCO, or otherwise.
Notice to Synchronize	A Despatch instruction given by APTRANSCO to a Generator requiring a CDGU to synchronize to the APTRANSCO system
Notified Area	Scheduled areas within which the Distribution Company/Corporation or Supplier is licensed to distribute and sell electricity.
NTPC	National Thermal Power Corporation
Operating Margin	Extra generation capacity comprising Contingency Reserve and Operating Reserve, that is required in a system to cover uncertainties in plant availability, variation in Demand forecast, loss of external connections, loss of Generation, weakness of APTRANSCO system and other factors so that the system is operated within the specifications and standards of the License. (APTRANSCO will issue timely instructions to Generators to hold the required reserves).
Operating Reserve	The additional output from the Generating plant and/or the reduction in Demand which is available to respond/contribute to containing and correcting any APTRANSCO system frequency deviation to an acceptable level in the event of a loss of generation, or a loss of import from an External Interconnection, or mismatch between generating output and Demand.
Operational Boundary	The boundary between the systems of any two entities in the total system or network. It divides the responsibilities and facilities between the Corporations and defines jurisdiction.
Operational Metering	Meters and associated equipment including metering and protection equipment installed by or on behalf of APTRANSCO for: i) Operational and System control purposes ii) Monitoring Power stations in order to check the output of generating units or any part thereof, excluding any tariff metering and generator circuits.

Operational Planning	The process carried out by APTRANSCO which involves planning through various time scales, the matching of Generating Capacity with forecasted APTRANSCO Demand, together with a reserve of generation, to provide a suitable system margin, taking into account the output of Independent Generating Plant and External Interconnections, in order to maintain the security and integrity of the APTRANSCO system
Operational Planing Phase	In respect of Grid Operation and Generation despatching the period between the fourth week from real time to the end of year II.

	Other User's Network	A system of a co-generator having a network of its own connected to the transmission system of APTRANSCO.
Outage		In relation to a CDGU, a total or partial reduction in Availability due to failure or maintenance of the CDGU or its auxiliary system; or an interruption in supply of fuel. In relation to APTRANSCO system, the removal of any part of the APTRANSCO system due to breakdown or maintenance.
Outage Notice		A notice submitted by a Generator under the relevant clause of the Operating Code notifying APTRANSCO of an unplanned outage or a notice issued by APTRANSCO to a DISCOM, notifying the DISCOM of an unplanned outage of APTRANSCO's system/equipment which affects the supply to the DISCOM's System.
	Outage Programme	The programme of outages prepared by APTRANSCO under Operation Code.
Output		The actual output at the Interconnection point of a CDGU derived from data measured pursuant to the Metering Code.
	Overall Accuracy	The combined accuracy of meters and instrument transformers whose secondary circuits feed the meters.
	Ownership Diagram	A Diagram containing numbering and nomenclature prepared for each connection site indicating the ownership of plant and apparatus by each Corporation.
Part Load		Condition of a Generating Unit which is loaded but is not running at its declared availability.
	Partial Shutdown	The condition of a complete loss of generation in a separate part of the total system with no electricity supply available from any other part of the total system or external interconnection. (That part of the total system which cannot begin to function again without APTRANSCO direction relating to a Black Start). Planned outage is also applied to the outage of any part of APTRANSCO, system which may affect supply to any DISCOM's system of which APTRANSCO intimates the DISCOM one year ahead.
Party		Any person, company, organisation, authority, firm or association subject to the provisions of the Code of Technical Interface
Planned Outage		An Outage in relation to a CDGU or items of Power Station Equipment which has been planned and agreed with APTRANSCO in advance of the year in which it is to be taken. Planned outage also means the outage of any part of APTRANSCO's System which may affect supply to a DISCOM's System which is intimated by APTRANSCO to the DISCOM one year ahead.
Power Factor		Ratio of active power (kW) to apparent power (kVA)
	Power Grid (or PGCIL)	The Power Grid Corporation of India Limited
	Power Purchase Agreement or PPA	The Agreement entered into between a Generator and APTRANSCO pursuant to which APTRANSCO amongst other matters, agrees to purchase from the Generator the capacity of its Generating Units.

Power Station	An installation comprising one or more Generating units (even where sited separately) owned and/or controlled by the same Generator, which may reasonably be considered as being managed as one Power Station.
Power Station Equipment	Items of plant in a Power Station which are integral to the operation of a CDGU, but which are not used exclusively in the operation of such CDGU, the outage of which will, or is likely to reduce the output or availability of a CDGU.
Power System Stabilizers (PSS)	A device into which is fed data of speed, frequency and power and which controls the output of the exciter of an alternator such that power oscillations of the synchronous machines are dampened.
Primary Response	The automatic response of the Governor of a generation unit to APTRANSCO system frequency changes over a time period of 0 to 30 seconds, from the time of frequency changes and fully available by 30 seconds and sustainable for up to 3 minutes.
Programming Phase	The period between the Operational Planning Phase and the Control Phase, i.e, reckoning from real time, the period from the issue of IRN to the end of the Fourth week
Protected Customer	A Customer in relation to whom, in accordance with guidelines prepared by APTRANSCO and approved by the Commission, Load Shedding shall, so far as possible, not be exercised.
Protection	Provisions for detecting abnormal conditions on a System and initiating fault clearance and activating alarms and indications.
Prudent Utility Practice	<p>Those practices, methods, techniques and standards as changed from time to time, that are generally accepted internationally for use in electric utility industries taking into account conditions in India and commonly used in prudent electric utility engineering and operations to design, engineer, construct, test, operate and maintain equipment lawfully, safely, efficiently and economically as applicable to power stations and substations of the size, service and type of project; and which practices, methods, standards and acts shall be adjusted, to the extent necessary in order:</p> <ol style="list-style-type: none"> 1) to conform to operation and maintenance guidelines recommended by the equipment manufacturers and suppliers to the project and according to the guidelines given in the IS code of practice for such equipment. 2) to ensure compliance with the Indian Electricity Act and Rules and all other Acts and Laws 3) to take into account the site location, including without limitation, the climatic, hydrological and other environmental or general conditions thereof. 4) to conform to energy conservation and 5) to conform to General Safety Standards.
Reactive Power or MVar	The product of voltage and current and the sine of the phase angle between them measured in units of volt-amperes reactive (Var) and

	standard multiples thereof i.e 1000 VAr. = 1kVAr 1000 KVAR = 1MVAR
Reactive Energy	the integral with respect to time of the Reactive Power measured in units of volt ampere hours reactive or standard multiples thereof, that is: 1000 VARh = 1 kVARh 1000 k VARh = 1 MVARh
Recorder	An apparatus that stores a series of instantaneous readings at different times and interval and records the data obtained through a direct internal or external connection, feeding all such data into an instrument that allows such internal data to be retrieved at a future point in time.
Regional Grid	The entire synchronously connected electric power network of the Region, comprising ISTS, ISGS and intra-State systems (India is divided into various Regions each Region comprising a few contiguous states)
Regional Load Despatch Centre	The centre so designated for a specified region where the operation of the power system in that Region and the integration of the power system with other Regions and areas inside or outside India are coordinated.
Registered Capacity	The normal maximum Capability of a Generating Unit (expressed in MW)
Registrant	the party referred to as such in the Metering Code who is responsible for a particular Metering.
Regulating Margin	The margin of generating capacity over Demand which is required in order to maintain Frequency Control.
Relevant Connection Site	A site which includes a point of connection of a Power Station or a DISCOM's distribution system or a customer to the APTRANSCO Transmission system. Generally corresponds to Delivery Point or Metering Point

Requesting Safety Coordinator	The Safety Coordinator who has responsibility for the HV apparatus on which work is to be done
Rotational Load Shedding or Rota Load Shedding	Planned Disconnection of Customers on rotational basis during periods when there is a significant shortfall of generation required to meet the total demand.
Safety Coordinator	The person responsible for safe work practices in cross boundary work. This includes the Implementing Safety Coordinators and the Requesting Safety Coordinator
Safety Management	The procedure adopted by APTRANSCO, a Distribution Company

**SCADA
Scheduling**

	or a User to ensure the safe operation of its system and the safety of personnel required to work on that system.
Safety Precautions	Methods and procedures adopted to ensure safety and avoid danger when working in hazardous environment. In relation to working on HV apparatus, this entails but is not limited to Isolation and/or Earthing.
Safety Procedures	The procedures specified within a safety management system.
	See “Supervisory Control and Data Acquisition”
	The process of compiling a Generating schedule as set out by the SLDC, and the term “scheduled” and like terms shall be construed accordingly.
Secondary Response	The automatic governor response to Frequency transients which is fully available within 30 seconds from the time the Frequency transient occurs and maintained for at least 30 minutes
Settlement Period	In relation to metering, any period of 15 minutes commencing on the hour or half hour or quarter hour
Settlement Values	Values of Active Energy and Reactive Energy delivered and the maximum demand occurring over a settlement period, as recorded by metering required by and operating in accordance with the Metering Code, or as estimated or submitted in accordance with the Metering Code. Settlement values are identified by the time at the end of the relevant settlement period
Shut Down	The condition of a Generating Unit where it is at rest or on barring gear.
Significant Incident	<p>An event with a significant effect on either the APTRANSCO system or a User’s system and usually entails one or more of the following operational effects:</p> <ul style="list-style-type: none"> • Tripping of plant and/ or apparatus manually or automatically • Voltage outside statutory limits • System frequency outside statutory limits • System instability • System overload <p>Whether an event has a significant effect on a system is determined by the entity (APTRANSCO or User) that owns that system.</p>
Site Responsibility Schedule	<p>For connection to the APTRANSCO system for which a connection agreement is required, a schedule prepared by APTRANSCO pursuant to the relevant connection agreement which shall state for each item of plant and apparatus at the connection site:-</p> <ol style="list-style-type: none"> 1) Ownership of the Plant/Apparatus 2) Responsibility for control of the Plant/Apparatus 3) Responsibility for operation of the Plant/Apparatus 4) Responsibility for maintenance of the Plant/Apparatus and 5) Responsibility for all matters relating to the safety of any person at

SLDC

	the connection site.
Site Common Diagram	Drawings prepared for each connection point, which incorporates layout drawings, electrical layout drawing, common protection/ control drawings and common service drawings.
	State Load Despatch Centre situated at Hyderabad. The SLDC is responsible for system control and load despatch on real time basis round the clock for the State of Andhra Pradesh.
Southern Region System Coordination and Control Project	A unified computerised facility for carrying out advanced system operational functions for the power system in the Southern Region (including SCADA and EMS functions) and comprising SRLDC (Bangalore), SLDC of all constituent States and ALDCS in each State as main stations.
Spinning Reserve	Unloaded generating capacity, which is synchronized to the system and is ready to provide increased generation at short notice pursuant to Despatch Instruction or instantaneously and automatically in response to Frequency drop.
Spinning Reserve Capability	The ability of a CDGU to provide Spinning Reserve as specified in the relevant PPA
Spinning Reserve Capability Schedule	A schedule supplied to APTRANSCO in accordance with the Planning Code, listing all CDGU's of a Generator and setting out the reserve required at each MW output of each CDGU
SREB	The Southern Regional Electricity Board
SRLDC	The Southern Regional Load Despatch Centre
Standing Instructions	An instruction for the Despatch of a CDGU notified to a Generator in advance by APTRANSCO, whereby when the specified circumstances arise (which will be capable of being known by the Generator), the Generator will take the specified action as though a valid Despatch Instruction had been issued by APTRANSCO.
Standard Metering	The Metering System that as a whole and all its component parts conform to the relevant Indian Standards and the Metering Code.

Start date (outage)	The date on which a planned outage is to begin
Start time (outage)	The time at which a planned outage is to begin
Start-up	The action of bringing a Generating unit from shut down to the speed required by the Generating unit to enable it to be synchronized to the APTRANSCO system.
Start-up Price	That element of the Generation Prices for a CDGU which relates to the start-up of the CDGU.
State	The State of Andhra Pradesh
State Government	Government of Andhra Pradesh State.
Static Var.	An electrical facility designed for the purpose of generating or

	Compensator (SVC)	absorbing reactive power.
	Statutory Requirements for Frequency Control	In accordance with the stipulation under Rule.55 of the Indian Electricity Rules 1956 the Frequency of supply of alternating current shall not vary by more than 3 percent from the declared frequency which is 50Hz.
STU		State Transmission Utility. An Organisation which owns and operates the Transmission System of the State.
Substation		An assembly of equipment including any necessary housing for the conversion, transformation, switching or control of electrical power.
Subsystem		Part of a System which by itself constitutes a system such as a type of equipment in a generating plant
	Supervisory Control and Data Acquisition or SCADA	A real time control and monitoring system in which the control and data collection functions are carried out from a central station through a communications system. System data is monitored and fed back to the central terminal continually, based on which control instructions are issued to all parts the system. The communication system can be telephone lines, radio, microwave or any other means of communication.
Supplier		A person authorised to supply electricity to a consumer under a License issued by the Commission pursuant to the Act. A Distribution Division under APTRANSCO drawing power from a Grid substation shall be treated as Supplier until the Distribution is privatised or corporatised
	Synchronized	The condition where an incoming Generating unit or system is connected to another system so that the frequencies and phase relationships of that Generating Unit or System, as the case may be and the system to which it is connected are identical and the terms “Synchronize” and “Synchronization” shall be construed accordingly.

	Synchronous compensation	The operation of rotating synchronous Apparatus for the specific purpose of either the generation or absorption of Reactive Power.
System Test		A Test carried out by a User or APTRANSCO which involves simulating conditions or the controlled application of irregular, unusual or extreme conditions on the User’s system or the APTRANSCO system which may affect the Total System.
Tariff Customer		A person who requires a supply of electricity and is supplied by a supplier on general terms and conditions which are applicable to all customers belonging to that particular category.
Tariff Metering		The entire system of measurement of active and reactive energy or relating to a Relevant Connection Site, comprising meters, associated current and voltage transformers, metering protection equipment including alarms, electrical circuitry, their associated data collectors

	(including Generator data collectors) and wiring and other devices or any part thereof. Based on these measurements, the energy supplying entity raises bills payable by the energy receiving entity.
Test Panel	A panel made up of representatives of APTRANSCO, Generators and DISCOMs as detailed in the Operating Code, which is responsible for various matters including consideration of proposed system tests and preparation of a Test Programme.
Test Programme	A programme prepared by APTRANSCO for conducting tests on the system which will include. (a) Procedures to be adopted for carrying out the system test including the switching sequence and proposed timings of the sequence. (b) The manner in which the system test is to be maintained. (c) List of members of staff who will be involved in carrying out the system test including those who will be responsible for safety at the connection site/Power station and (d) Other matters that APTRANSCO considers appropriate including matters suggested by Users and identified by APTRANSCO.
Test Proposer	The entity or authority who first proposes the system test.
Testing	Testing carried out by APTRANSCO pursuant to System Tests of CDGUs and User's Equipment and the term "Test" shall be construed accordingly.
Tolerance	The allowable deviation from despatch instructions such that at the end of the Monitoring Period, if the Generator has achieved each Despatch instruction for the period within the relevant tolerance limits as per provisions in the PPA, the CDGU will be deemed to have complied with each Despatch instruction.
Total Shutdown	The condition of complete loss of generation in the total system with no electricity supply from any External Interconnection. The total system will not begin to function again without APTRANSCO's directions relating to Black Start.
Total System	Together, the APTRANSCO system and all other User systems in A.P State.
Transfer Date	The date notified by the Government of A.P under Section 23(b) of the Act
Transmission System	The system consisting of EHV lines owned and/or operated by APTRANSCO for the purposes of the transmission of electricity from a Power Station to a Substation or to another Power Station or between Substations or to or from any External Interconnection including any plant and Apparatus and meters owned or used by APTRANSCO in connection with the transmission of electricity.
Under Frequency Relay or Low Frequency relay	An electric measuring relay intended to operate when its characteristic quantity (frequency) decreases below the relay setting by decrease in frequency.
Unit Load	A device which regulates the generation level when the Generating Unit

	Controller	is operating in a Frequency Sensitive Mode to ensure (so far as possible) that it does not exceed or fall short of previously set limits.
User		Person or entity that uses the APTRANSCO system. More specific definitions are identified in each Section of the Code of Technical Interface. Examples: A Generator whose generating unit is connected to the APTRANSCO's system and a DISCOM whose distribution system is connected to, and receives power from, the APTRANSCO's system.
User System		Any System owned or operated by a User including Generating Units, Distribution Systems and Customer equipment together with plant and/or Apparatus connecting them to the APTRANSCO system
Utility		Any person or entity engaged in the generation, transmission, sale, distribution or supply, as the case may be of energy.
Var		A single unit of Reactive Power (Volt-ampere reactive)
	Virtual Metering Point	An effective point of measurement, that may or may not be physically locatable, where active energy or reactive energy deemed to have been transferred through the point is derived from an algorithmic manipulation of the active energy and reactive energy data of one or more metering points. The phrases "Virtual measurement point", "real metering point" and "real measurement point" are to be construed accordingly.
Warning	Notice	A notice issued by APTRANSCO to a Generator informing the Generator that it has failed to comply with Despatch instructions

- All the expressions used herein but not specifically defined shall have the same meaning as defined in the I.E Act, 1910, Electricity Supply Act, 1948 and the rules framed there under and if the said Act, Rules and Codes are silent, the expressions shall have the same meaning assigned to them in the General Clause Act, 1877 or in the absence thereof, the meaning as commonly understood in the Electricity Supply Industry and current Electrical Engineering practices.

1.3 Management of the Code of Technical Interface (CTI)

1.3.1 Introduction

Under the terms of the A. P. Transmission and Bulk Supply License, The Licensee (APTRANSCO) is required to implement and comply with the CTI and periodically review the same and its implementation.

For the above purpose a **CTI Review Panel** comprising representatives of all Users of the Transmission System shall be established.

Except under conditions described in the next paragraph, no revision or modification of the CTI may be made without being discussed at the **CTI Review Panel** meeting and approved by the Andhra Pradesh Electricity Regulatory Commission (APERC).

In an unusual situation where normal day to day operation is not possible without revision of some clauses of CTI., a provisional revision may be implemented before approval of **APERC** is received, but only after discussion at a special Review Panel Meeting convened on emergency basis. The **APERC** should promptly be intimated about the provisional revision by recorded means of communication.

The **APERC** may issue directions requiring **APTRANSCO** to revise the CTI in such a manner as may be specified in those directions, and **APTRANSCO** shall promptly comply with any such directions.

The document defines the procedure to be followed by **APTRANSCO** in maintaining the CTI and also in pursuing any change.

1.3.2 Objective

The objective of this procedure is to define the method of managing the CTI., submitting and pursuing of any proposed change to the CTI and the responsibility of all Users to effect that change.

1.3.3 Responsibilities

APTRANSCO will be responsible for managing and servicing the CTI., for discharging its obligations under the License. **APTRANSCO** shall establish and service the requirements of the CTI Review Panel in accordance with provisions of the relevant sections of the Code.

1.3.4 C.T.I. Review Panel

APTRANSCO will inform all Users of the names and addresses of the Panel Chairman and Member Secretary at least seven days before the first Panel meeting and shall inform Users in writing of any subsequent changes.

Each User shall inform the Panel Member Secretary of the names and designations of their Panel Representatives not less than 3 days before the first Panel meeting and shall inform the Panel Member Secretary in writing of any subsequent change.

The Panel shall be chaired by **APTRANSCO** and shall consist of the following members:

- Chairman to be nominated by **APTRANSCO**
- Member Secretary to be nominated by **APTRANSCO**
- One Member from **APGENCO** to represent all Hydel Stations
- One Member from **APGENCO** to represent all Thermal Stations
- One Member from **N.T.P.C.**

- One Member from **PGCIL**.
- One Member from **SRLDC** (Southern Regional Load Dispatch Centre)
- One Member to represent all Joint Venture Companies
- One Member from each Distribution Companies
- One Member to represent all private IPPs
- One Member to represent all Captive Power Plants
- One Member to represent all EHT Consumers
- The Chairman of the Metering Committee is an Ex-Officio Member of the Panel.

The Chairman of the Protection Committee is an Ex-Officio Member of the Panel and shall attend the Panel meeting whenever protection matters are discussed.

The Panel shall invite the Chairman of each of the Standing Committees concerned with particular items of the Agenda. The Chairman of a Standing Committee may delegate a representative to take part in the discussion.

The Panel may invite representatives from Consultants, CEA, Central Electricity Regulatory Commission or, at their discretion, any other Organization such as Railways, Telecom Department, Indian Standards Organization, Financing Institutions or academic / technical institutions, to attend the Panel Meeting as observers or non-voting Members, depending on the Agenda.

The rules to be followed by the Panel in conducting its business shall be formulated by the Panel itself and shall be approved by the **APERC**. The Panel will meet at least once in three months.

The functions of the Panel are as follows:

1. To keep CTI and its workings under continuous scrutiny and review.
1. To analyze any major Grid disturbances soon after the occurrence, and evolve any consequent revision to the CTI.
2. To consider all requests for amendment to the CTI which are proposed by the Users.
3. To publish recommendations for changes to the CTI together with the reasons for the changes and any objections, if applicable.
4. To issue guidance on the interpretations and implementation of the CTI
5. To examine problems raised by Users.
6. To prepare operating instructions

APTRANSCO may hold sub-meetings with a User to discuss individual requirements and with a group of Users to prepare proposals for the Panel meeting. The Panel may set up sub-committees for detailed study of related problems.

1.3.5 CTI Review and Revisions

The Member Secretary shall present all proposed revisions of the CTI to the Panel for its consideration.

APTRANSCO shall send the following reports to the Commission at the conclusion of each review meeting of the Panel.

1. A report on the outcome of such review.
2. Any proposed revisions to the CTI as **APTRANSCO** reasonably thinks necessary for achievement of the objectives referred to in the relevant paragraph of the Transmission & Bulk Supply License.
3. All written representations or objections from Users raised during the review.

All revisions to the CTI shall require approval of the Commission. **APTRANSCO** shall publish revisions to the CTI., once approved by the **APERC**.

APTRANSCO shall present proposals to the **APERC** to allow relaxation, where Users have difficulties in meeting the CTI.

Every change from the previous Version shall be clearly marked in the margin. In addition, a revision sheet shall be placed at the front of the Revised Version noting the number of every changed sub-section, together with a brief statement of change.

APTRANSCO shall keep an up-to-date list of the recipients and locations of all serviced copies of the CTI.

1.4 Communications Between Entities

The Communications existing on the date of issue of approved CTI are the minimum requirements of communications and shall be maintained by the respective corporations in good working condition. The additional communication facilities as prescribed in the following paragraphs shall be established within a period of five years from the date of issue of approved version of the CTI.

1.4.1 Head Office Communications

The following communications are to be established between **APTRANSCO**'s Registered office and Business Head Quarters and each Generating station.

PSTN Telephone (Listed)
PSTN Telephone (Unlisted)
FAX on DoT Telephone
FAX on Wide band Telecom network

APTRANSCO Head Quarters shall have wide band Optical Fiber/Digital Microwave network communication with all Generating Stations of 50 MW installed capacity and higher, 400

kVSSs, 220 kVSSs and Inter System Power Exchange Stations connected to PLCC at nodal points. All EHT sub-stations shall also have DoT telephones as backup communication.

1.4.2 Communication Between SLDC and Sub-LDC

The following communications are to be established between SLDC and Sub-LDC offices:

4-Synchronous Data channels for computer to computer linkage.

4-Voice channels on administrative network.

4-Voice channels on Express network.

All the above channels shall be connected on Wide Band network communication system i.e., either Optical Fiber or Digital Microwave.

1.4.3 Communication Between SLDC & Generating Stations.

The following communications are to be established between SLDC and Generating Stations:

Express channel to Generating Stations either directly or through EPAX of Sub-LDC connected on Wide Band Network/PLCC.

One administrative channel to a Generating station through EPAX of Sub-LDC.

DoT Telephone in all Generating stations and Sub-stations.

SLDC shall have Hot Line connection with all generating stations of 200 MW capacity and higher on the Wide Band/Digital network.

1.4.4 Communication Between Remote Terminal Unit Location And Sub-LDC

The following communications are to be established between Remote Terminal Unit locations and Sub-LDC offices:

Data	Asynchronous Data channel to Sub-LDC connecting the RTU at each EHT SS to the computer at the respective Sub-LDC.
Voice on Admin Dialing Network	Admin. Voice channel to Sub-LDC generally routed through EPAX at intermediate Substations (not more than two or three PLCC lines)
Voice on Express Dialing Network	One Express voice channel single PLCC hop between RTU location and Sub-LDC with back to

back connections at intermediate stations terminated on EPAXs at either end.
 Alternate routes to Sub-LDC via., neighboring PLCC nodes for redundancy wherever possible
 All RTU locations and Sub-LDCs shall have PSTN telephones as backup for Voice

PSTN Telephone

1.4.5 *Communication Between Corporate offices of DISCOMs / District Head Quarters*

The following communications are to be established between Corporate offices of DISCOMs and District Headquarters, either on PLCC or WIDE-BAND communications:

Administrative Channel to Sub-LDC
 Express Channel to sub-LDC
 Express channel to SLDC
 Administrative Channel to SLDC

APTRANSCO Headquarters shall have INTERNET connection. Major EHT consumers having a demand of 30 MW or more or having captive power plant that can be connected to the Grid, shall have suitable radio communication to the connected **APTRANSCO** substation and DoT/PSTN phone for voice communication as back-up.

Mini Generating Stations of capacity less than 30 MW shall have VHF wireless communication with the connected **APTRANSCO** substations.

1.4.6 *Communication Between EHT Substations*

Wide band Network connected between EHT substations shall also cater to Data and Voice Communication with PLCC as backup. EHT substations not on Wide-Band network shall have PLCC, PSTN Telephones for Voice / FAX requirements.

1.4.7 *Communication between EHT Substations and 33 kV SS*

Point-to-Multipoint Radio Communication systems shall be provided from each EHT Substation (Master Station) to all 33 kVSSs (Outstations). Master stations shall be interfaced to the Broad Band Telecom Network at the nearest node. PSTN Telephones shall also be connected at all 33 kV Substations as backup.

1.4.8 *Communication For Emergency & Disaster Management (Voice, Data and MIS) Inter / Intra Entities*

VSAT based Satellite Communication shall be provided at all Generating Stations, 220 kV Substations, Intersystem Power Exchange Points and nodal 132 kV Substations among and within the entities for Voice, Data throughout and MIS requirements as backup and for emergency and disaster management.

1.4.9 Written Confirmation

all oral or telephonic communications between different entities must be confirmed in writing within a reasonable period.

1.4.10 Communication between SLDC and SRLDC. As required by SRLDC.

1.5 Disputes

1.5.1 Disputes regarding interpretation of C.T.I:

The provisional Agreement between the Corporations having different interpretations is to be followed till a ruling is issued by the CTI Review Panel. If one or both parties are not satisfied with the ruling of the Panel the matter shall be referred to APERC whose decision is final.

1.5.2 Dispute pertaining to issues not covered by CTI:

The issue shall be discussed by the executives of the corporations who shall arrive at an Agreement. If an Agreement cannot be reached the executives shall formulate a provisional working arrangement and then refer the issues to the CTI Review Panel even if the issue is not covered by the C.T.I. The ruling issued by the CTI Review Panel shall supercede the provisional agreement and shall be implemented, by all parties. If any party is not satisfied by the ruling of the CTI Review Panel the matter shall be referred to the APERC. The decision of APERC shall be final and binding.

1.5.3 Continuity of Functioning of Corporations:

Immediately after a dispute arises the entities shall discuss and arrive at an agreement. If an agreement cannot be reached the corporations shall, after deliberations, formulate a provisional working arrangement which shall be implemented till a valid ruling is issued by an appropriate authority / arbitrator. The objective of this procedure is that no dispute should stall the daily operations of any Corporation.

1.6 Unforeseen Circumstances:

In situations not addressed by any clause of the Code of Technical Interface, **APTRANSCO** shall convene an emergency meeting with all affected entities to formulate a solution and the actions to be taken in the circumstance by the various entities. If no agreement can be reached, **APTRANSCO** shall provisionally determine the action to be taken after giving consideration to the views expressed by other corporations. **APTRANSCO** shall, as soon as possible, refer the matter to the CTI Review Panel whose decision shall prevail over the provisional determination of **APTRANSCO**. If any entity appeals to **APERC** over the decision of the Panel, the decision of

APERC shall supersede the decision of the Panel. The normal operations of any Corporation should never be disrupted by any situation or dispute. The majority decision of the meeting of entities or the considered determination of **APTRANSCO** shall be implemented unless and until the CTI Review Panel issues a different ruling; and the ruling of the Panel shall be in force unless and until a different decision is issued by **APERC** (if the issue is referred to **APERC**). The decision of **APERC** is ultimate and shall be implemented by all corporations.

1.7 Equipment owned by Third party:

References in the CTI to Plant/Apparatus/Equipment shall include the Plant/ Apparatus/equipment owned by a third party but used by a User/**APTRANSCO** under any agreement with the third party.

1.8 System Control:

Where a User's system is, by agreement, under the control of **APTRANSCO**, then for the purposes of coordination, communication and operational schedules, **APTRANSCO** may treat that User's system, as part of **APTRANSCO**'s system, but, as between **APTRANSCO** and Users, it shall remain to be treated as the User's system.

1.9 Emergency Periods:

In periods of emergency like fuel shortage, war, national calamities and abnormal law and order situations the State Government or Government of India may issue certain directions, restrictions, controls and orders, and if these orders contradict any provisions of the CTI those provisions, paragraphs or clauses of the CTI shall be treated as temporarily suspended so as to facilitate implementation of the Government's orders as long as the emergency lasts.

1.10 Precedence of Indian Electricity Grid Code:

This CTI is prepared such that it is consistent with the IEGC. However if any clause of the AP CTI (AP Grid Code) contradicts the provision of the IEGC during a real situation, the IEGC takes precedence. It is open to **APTRANSCO** to obtain from CERC exemption from any provision of IEGC in favour of a clause of AP CTI where the issue pertains solely to the internal system of A.P (considering the present, future, direct and indirect impacts) and does not impact the Southern Regional Grid or the system any of the other constituents of the Southern Regional Grid.

1.11 Availability Based Tariff and other Commercial Aspects:

In para 1.8 of the Indian Electricity Grid Code the rate to be charged for reactive energy exchange is stipulated. Complementary Commercial Mechanisms are also provided in the IEGC.

These tariff rates and procedures apply to APTRANSCO only for the drawals from ISGS. For the drawals/injections from/ to other States the tariff as agreed mutually will apply. Similarly for the active and reactive energy transfers between Users and APTRANSCO within A. P. State the tariffs approved by APERC will apply.

1.12 Information in the first Version of APCTI

Some paras are included for information to facilitate smooth implementation of the APCTI in the post-unbundling scenario. They may be deleted in subsequent revisions. Under para 4.6.2 tables 4.1, 4.2 and 4.3 can be deleted in subsequent revisions because maintenance of updated Regional lines and ISGS entitlements is the internal matter of APTRANSCO.