Inter-State Transmission
- 765KV/400 KV EHVAC &
+ 500 kV HVDC
(± 800 kV HVDC under implementation)
(POWERGRID)

Intra-State / Sub- Transmission
-State
- 220/132 / 66 KV

Rural Electrification
- State
- 33/11 KV

Urban Electricity Infrastructure-
Private Discoms /State Govt.

33/11 KV
PLAYERS IN THE POWER SECTOR

Generators
Central/State GENCO, IPP, Captive

CTU
Inter-State Trans. system, Open Access

STU
Intra-State Tr./Sub-tr. system

DISCOMS

Consumers
Industries, household, agriculture

System Operator

Power Exchange

Traders
Installed Capacity: 181,600 MW

Peak Demand: 122,000 MW

Peak Deficit: 8.6%
Energy Deficit: 4.8%

Per capita consumption: 800 kWh

Growth rate: 8-9% per annum
TRANSMISSION SYSTEM

- Transmission System
  - links Generating Stations to Distribution Centres
  - plays vital role in entire Electricity Supply Chain
- Crucial for the country like India – where Generation Resources and Loads are scattered
- Provides Backbone for
  - Reliable Electricity Supply
  - Electricity Market Development
POWERGRID – An Overview

POWERGRID is a Listed Company
After Follow-on Public Offer in the month of November, 2010, Public holding is about 31% and balance equity is held by Government of India.

Central Transmission Utility of the country since 1998

Navratna (Nine Gems) status since May, 2008

Carries about 51% of Country’s electric power & 100% inter-regional Power

Profit making company since inception
Operates ~87000ckm of transmission lines and 139 substations
POWERGRID – An Overview

- Managing National Grid in India on real time basis having an Installed capacity of more than 180,000 MW.

- Large pool of Experts;
  - Having a pool of over 9,845 employees catering to;
    - POWERGRID’s in-house projects.
    - Consultancy & project execution assignments of our valued clients in India & abroad.

- Provider of large Telecom Backbone;
  - 22,000 km of telecom network through Optic fibers leveraging its country wide transmission infrastructure.
### Area Of Operation

#### Development of Central Sector Transmission System
- Generation Linked schemes
- Grid Strengthening schemes
- Inter-regional links
- Inter-national links

#### Telecom
- Owns & Operate Fibre optic cable network
- Licenses – NLDO, ISP and IP-I

#### Grid Management*
- Establishment of modern Load Dispatch Centers
- Real-time Grid Operation
- Optimum scheduling & dispatch
- Energy accounting including settlements

*Grid Management is being looked after by Power System Operation Corporation Ltd, a fully owned subsidiary of POWERGRID as per GOI Directive

#### Consultancy- National & International
- Transmission
- Load Dispatch & Communication
- Distribution
- Telecom
- Capacity Building
<table>
<thead>
<tr>
<th>Category</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission Lines</td>
<td>≈ 87,100 Ckm</td>
</tr>
<tr>
<td>Transmission Capacity</td>
<td>≈ 96,355 MVA</td>
</tr>
<tr>
<td>Sub-stations</td>
<td>139 Nos.</td>
</tr>
<tr>
<td>System availability</td>
<td>&gt; 99%</td>
</tr>
<tr>
<td>Employees</td>
<td>&gt; 9,800</td>
</tr>
<tr>
<td>Established National Grid</td>
<td>IR capacity – 23,800 MW</td>
</tr>
<tr>
<td>Turnover (FY 2010-11)</td>
<td>USD 1,900 million</td>
</tr>
<tr>
<td>Net Profit (FY 2010-11)</td>
<td>USD 580 million</td>
</tr>
<tr>
<td>Net Worth</td>
<td>USD 4,760 million</td>
</tr>
<tr>
<td>Book Value per share</td>
<td>USD 1.03</td>
</tr>
<tr>
<td>Gross Assets</td>
<td>USD 11.2 billion</td>
</tr>
</tbody>
</table>
Development Of National Grid

- October 1991: East and Northeast synchronized
- March 2003: West synchronized with Central Grid
- August 2006: North synchronized with Central Grid
- Five Regional Grids: Two Frequencies
- 3.3 Million Sq. Km Area
- Present Inter-regional capacity: 22,400 MW
- By XI Plan: 28,000 MW
- Future: Country wide synchronous Grid
Use of World Class Technology in Transmission Sector

<table>
<thead>
<tr>
<th>Year</th>
<th>Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977</td>
<td>220 kV</td>
</tr>
<tr>
<td>1990</td>
<td>400 kV</td>
</tr>
<tr>
<td>2000</td>
<td>±500 kV HVDC</td>
</tr>
<tr>
<td>2011</td>
<td>±800 kV HVDC</td>
</tr>
<tr>
<td>2012/13</td>
<td>1200 kV UHVAC</td>
</tr>
</tbody>
</table>
Pioneering Efforts in Technology

- Implementing ± 800 kV, 6,000 MW HVDC Bi-pole line of 2,000 km
- Development of 1200kV UHVAC Test Station along with a 1200kV test line indigenously as a collaborative effort with manufacturers
- Smart Grid - Wide Area Monitoring, Adaptive Islanding, Voltage Security Assessment, Dynamic Security Assessment under planning
- GPS/GIS (Global Positioning/Information System) based survey techniques
Pioneering Efforts in Technology

- SVC – Static VAR Compensator, FSC – Fixed Series Capacitors, TCSC – Thyristor Controlled Series Capacitor,
- GIS – Gas Insulated Substation,
- Substation automation and remote operation,
- high temperature endurance conductor,
- controlled switching of circuit breakers,
- Using high strength 320kN and 420kN insulators.
Operational Excellence

State-of-the-art technologies in operation & maintenance of assets to achieve high system availability

- Hotline Maintenance
- Emergency Restoration System (ERS)
- Live line washing of insulators by helicopters in heavily polluted Stretches
- Smart Grid Initiative: Two Pilot projects for NR & WR Undertaken involving Deployment of Phasor Measurement Units

Focus on preventive maintenance

- On line/ Off line monitoring of equipment
- Periodic assessment of equipment

24 substations operated remotely, many more in pipeline
Environment & Social Policy based on principles of Avoidance, Minimization and Mitigation

Specially designed high-rise towers (75m) to reduce tree cutting (Reduced from 90000 to 14739 in Rajaji National Park)

Application of Multi circuit and Compact towers to reduce corridor requirement.

Land use pattern traversed in 27000 Ckt. Km (till 1998)
- Forest: 6%
- Agricultural land: 28%
- Revenue land: 64%
- Others: 2%

Land Use Pattern (after 1998)
- Forest land: 6.76%
- Agri land: 1.35%
- Revenue land: 28%
- Other land: 67.65%

Total Forest involvement reduced from 6% to 1.35% after implementation of ESPP

Timely project implementation without any rehabilitation & resettlement disputes
Environment & Social Management

Developed through broad consultation with stakeholders to pre-empt all possible environment and social issues

Selected by The World Bank for Use of Country System (UCS)

Environment & Social Policy and Procedures (ESPP)

Certified to Social Accountability Standard (SA-8001:2008)

Conferred “Green Award 2006” by The World Bank for promoting environmental sustainability

ESPP was developed in 1998 and upgraded in 2005 & 2009
'NIL' Grid Disturbance in last seven years
Strengths of POWERGRID

- Leadership position in Indian Power transmission sector
- High operational efficiencies of resources
- Established track record in transmission system
- Strong financial position
- Experienced senior management team and competent and committed workforce
Telecom Business

Diversified into telecom business for leveraging country wide transmission infrastructure

Telecom network on transmission infrastructure is secure, rodent menace free and vandalism proof

- Telecom network established ≈22,000 Km
- Connectivity provided to all metros, major cities & towns
- Network availability > 99.9%
- Customer Base: Major Telcos, MNCs, BPOs, Govt, Corporate & Media
- Marked presence in remote areas of the country
- Highly reliable & competitive telecom services
- Co locating wireless antenna on transmission towers
• POWERGRID is undertaking Distribution and Rural Electrification projects under APDRP and RGGVY schemes
• Under APDRP, POWERGRID has already covered 177 distribution circles/towns/ schemes spread in 18 states
• Under RGGVY, POWERGRID has already electrified 38,000 villages out of targeted 74,000 villages. Released service connection to about 16 lakh BPL households (Total Project Cost: Rs. 6400 crores)
Providing consultancy services to various National & International clients in the field of transmission, grid management and telecom

**On International Front**

Provided consultancy services in Afghanistan, United Arab Emirates (UAE), Kenya, Nigeria, Bangladesh, Sri Lanka, Bhutan and Nepal

In Offing: Kenya, Myanmar, Oman, construction of New Substations at Doshi and charikar in Afghanistan received in Nov. 11, Uganda and Ethiopia
Afghanistan (Project Cost USD 86.4 Million)

- Turnkey execution of 220 kV D/C Transmission Line Kabul to Phul e–Khumri
- Transmission line completed in 38 months, 4 months ahead of schedule
- 220/110/20 kV Substation at Kabul
- Provided O&M training to DABS (Afghanistan) Engineers in POWERGRID premises.

UAE (Project Cost USD 383 Million)

- Engineering Consultancy Services for construction of 2 Nos. 400 kV GIS Substations and associated Transmission Lines for DEWA
- Completion schedule – July 2013
Major International Assignments

Nigeria
- Review and Updating of Telecommunication and Substation Automation Systems.

Bangladesh (Estimated Project Cost USD 40 million)
- Consultancy for Indo-Bangladesh Interconnection for Bangladesh portion i.e. construction of 1 x 500 MW HVDC back to back station at Bheramara (Bangladesh) and associated transmission lines.

Bhutan
- Consultancy for construction of 200 Km. 400kV Transmission Line for evaluation of power from Punatsangchu-I HEP (Estimated Project Cost USD 63.8 Million); Completion schedule: April, 2013
- Consultancy for Construction of National Load Despatch Centre
- Laying of OPGW on existing Tr. Lines in Bhutan
Major International Assignments

Nepal

- DPR for proposed Indo-Nepal Interconnection.
- Consulting Services for “Detailed Feasibility studies and ESIA of TA3-DHALKEBAR-SAKARI 400 kV Transmission Line Project”
- Consultancy Services to Nepal Electricity Authority for Transmission System Master Plan and cross border trading with India

Sri Lanka (Estimated Project Cost USD 770 Million)

- Preparation of Feasibility Report for interconnection between Sri Lanka and India electrical grid through under sea cable links, establishment of 1000 MW HVDC back to back station and +400kV HVDC OHL is under progress
International Collaborations

• Recent Collaborations with Utilities
  – Signed MoU with KETRACO for Joint Development of Kenya Transmission System and Capacity Building Services
  -Signed MOU with EEPCO on 21.11.2011 for Joint Development of Transmission Projects in Ethiopia
  – Signed MoU with Gulf Cooperation Council Interconnection Authority (GCCIA), which comprises of six gulf countries in the area of Operation and Maintenance of HVDC systems and capacity building
Africa

• Pursuing opportunities in Ethiopia, Kenya, Uganda, Nigeria, Tanzania
• Already served Clients like KETRACO, Kenya and PHCN, Nigeria
International Business as on date

• Total Assignments: 36 nos.
• Completed: 22 nos.
• Ongoing: 14 nos.
• Project costs: approx USD 2 billion
• Consultancy Fee: approx USD 45 million
Areas of cooperation in Transmission Sector

• For Development of Transmission Sector in Africa
  - Conceptualizing, implementing, operating and maintaining electrical grid interconnections
  - Operation and Maintenance (O&M) of transmission system
  - HVDC Technology
  - 765kV and above technologies
    • 1200kV UHV technology is first of its kind in the world
  - Real time operation of National Grid and Load dispatch services
    • Maintaining one of the largest synchronous national grid in the world
  - Asset acquisition & Management
  - Equity participation through Joint Ventures, Public Private Partnership and other strategic alliances
Areas of cooperation in Transmission Sector

- POWERGRID uniquely positioned for Engineering Consultancy Services (end to end)
  - Turnkey Execution of transmission projects
  - Transmission System Master Plan
  - Feasibility Reports/Detailed Project Reports
  - Pre-Award Engineering activities
  - Post-Award Engineering activities
  - Project Management & Construction Supervision
  - Quality assurance and Inspection
  - Testing and Commissioning
  - Telecom
  - Establishment of National Load Dispatch Centers
  - Assistance in Regulatory issues
  - Capacity Building