The Electric Power System

Islamic Republic of Iran
Basic facts

- **Area**: 1,648,195 km²
- **Population**: 78,311,923 (Based on 2014 Census)
- **Number of electricity consumers**: near to 31 million
- **Number of TSOs**: 16
- **Number of DSOs**: 42
- **Peak load**: 50,178MW
- **Average interruption of electricity**: 540 minute per year between 1999 to 2003 years
Global map of the grid and of its interconnections

- Interconnectors with:
  - Turkey
  - Azarbaijan
  - Turkmenistan
  - Armenia
  - Iraq
  - Afghanestan
  - Pakistan
  - Nakhjavan
Grid facts and characteristics

- The main producer of electricity in Iran is the Ministry of Power. The electricity system of Iran (production, transmission and distribution) is centralized and owned by the government. Recently, the government has started to study about the privatization in small-scale to assess its benefits and outcomes for future programmes.

- At the present, Tavanir Company is responsible for the management of 16 Regional Electric Companies, 32 Generation Management Companies, 42 Distribution Companies, Iran Power Development Co. (IPDC), Iran Organization Renewable Energy (SUNA), Iran Energy Efficiency Organization (SABA), Iran Power Plant Project Management (MAPNA) and Iran Power Plant Repairs Co., based on this arrangement all shares of aforesaid companies have been transferred to Tavanir.
Structure of electrical power system

- The Transmission Sector is responsible for maintenance, operation and development of 400 KV & 230 KV transmission lines and sub-stations as well as 132KV, 66KV and 63 KV sub-transmission lines and in each Regional Electric company there is a Dept. Under the title of Deputy of Power Transmission or Deputy for Operation which undertake the Duties of Transmission Sector.

- Development of transmission sub- transmission lines and substation in the region, the Deputy for Development & Projects of the Regional Electric Company taking advantage of collaboration of consultants and contractors, will carry out the task of network development.

- 42 Distribution Companies are working as non–governmental Companies in the county. Out of these 42 Companies some are covering a province and some are covering distribution of electricity of a city and in some cases even several of these companies are responsible for distribution of electricity such as Tehran, which has five Distribution Companies.

- The Distribution voltage level are 33KV, 20KV, 11KV
- The voltage level of consumer is 400V.
Map of the high voltage grid
Information on TSO(s)

- **Name:** Iran Power Transmission, Generation and Distribution Company (Tavanir)
- **Network length (km):** Transmission and sub-transmission are 50,215 Km and 69,304 Km respectively
- **Served area (km$^2$):** $\approx 1,648,195$ km$^2$
- **Annual transmitted energy (TWh):** $\approx 1,102,954$
- **Website:** [http://www.tavanir.org.ir/](http://www.tavanir.org.ir/)

Iranian Power System
Cooperation of TSO and DSOs

- The governmental share of Distribution Companies are in the possession of the Export Holding Company of Tavanir and from the point of view of operation are under Supervision of Regional Electric Companies.

In this direction, some activities of Distribution Companies such as: upgrading and renovation services of the Distribution Network, development of rural electrification of agricultural irrigation systems, selling department and after selling services, meter recording, administration and transportation services have been released to the private sector.
Responsibilities of TSO & DSOs

While regional electric companies (TSO) are affiliated to the Expert Holding Company of Tavanir, they are acting the same as Holding Company within the border of their managerial territory and are responsible for coordination of their affiliated companies, generation, transmission and distribution and sell and supply of electricity to all consuming sectors in their region.

The activities of Distribution Companies (DSO) are carried out under five agreement with the Regional Electric Company such as:

- Agreement for customer is service
- Agreement for planning design and supervision
- Agreement for improvement and optimization
- Agreement for development of services
Power structure of the country
Installed capacity with reference to primary resources

- Installed capacities (MW), end of 2014 year
  - Biomass
  - Coal (Steam, Combine cycle, diesel): 34,763
  - Gas: 26,386
  - Hydro power: 10,785
  - Lignite
  - Nuclear and Renewable: 1,216
  - Oil
  - Solar power
  - Wind power
  - Others
Energy production with reference to primary resources

Electricity generated (MWh), year 2014

- Biomass: -
- Coal (Steam, Combine cycle, diesel): 175,853
- Gas: 73,469
- Hydro power: 13,859
- Lignite: -
- Nuclear and Renewable: 4,695
- Oil: -
- Solar power: -
- Wind power: -
- Others: -
Development of generation capacity since 2013 to 2014

- Renewables (excluding hydro): 46 MW
- Hydro: 520 MW
- Coal (Combined Cycle): 320 MW
- Lignite: -
- Gas: 1995 MW
- Nuclear: -
Comsuption per customer groups

- Different sectors share in electricity consumption:
Location of renewable energy sources

Wind farm:
- Takestan (Qazvin Province)
- Khaf (Khorasan Province)
- Neishabor (Khorsan Province)
- Manjil (Gilan Province)
- Lotak (Sistan Blochestan Province)
- Sarein (Ardebil Province)
- Sahand (Azarbaijan Province)
- Mahshahr (Khozestan Province)
- Sofeh (Esfahan Province)
- Baba kohe (Fars Province)

Biomas:
- Mashad (Khorsan Province)
- Shiraz (Fars Province)
- Abaali (Tehran Province)
- Ray (Tehran Province)
- Kahrizak (Tehran Province)

SHPP:
- Mashad (Khorsan Province)

Solar:
- Bidgene Malard (Alborz Province)
- Darbid (Yazd Province)
- Sarkavir (Semnan Province)
- Tabriz (Azarbaijan Province)
Development of wind power
Development of photovoltaic power
RES installed capacity and production due 2013

<table>
<thead>
<tr>
<th>Power Plant</th>
<th>Company</th>
<th>Site</th>
<th>Operation Year</th>
<th>No. Units</th>
<th>Nominal Capacity(MW)</th>
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<td><strong>Total Renewable &amp; Nuclear</strong></td>
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</table>
Price development for industry consumers

Electricity Tariff

In general in present tariff of electricity is divided based on kinds of activity. For domestic, public, agricultural, industrial and mineral and other consumptions (commercial), tariffs have been determined individually.

In domestic section, regional differences have been considered in way that the country has been divided into five individual regions based on climate including a common region and four tropical regions. The tropical regions 1-3 have high temperature and great moisture that based on temperature and moisture are among 1-3 cases and tropical 4 has dry weather and high temperature.

Subsidies of Electric Energy

At present most of electricity customers have subsidies and the highest subsidy is related to agriculture sector. In 2013, the electricity cost is 621 Rials/kWh without considering cost of fuel and is 1107 Rials/kWh with considering the fuel subsidies (based on domestic prices) and the average selling price for every electricity kWh is 418.65 Rials.
Price development for households

<table>
<thead>
<tr>
<th>Tariff</th>
<th>Sale Price</th>
<th>Final Price</th>
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<tr>
<td>Residential</td>
<td>1370.3</td>
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<td>Commercial</td>
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<td>Others</td>
<td>1760.2</td>
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<td>Total</td>
<td>1107</td>
<td>418.65</td>
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Electricity market organisation
Power balance in 2014

- Generation (TWh): 276
- Consumption (TWh): 248.4
- Imports (TWh): 3.769
- Exports (TWh): 9.956
- Losses (TWh): 27.6
Energy exchanges in ....

- Commercial flows
- Physical flows
Specific aspects of the electricity market

- Market coupling
- Market splitting
- Day-ahead
- Futures
- ...