



Investments; Attractiveness & Diversities In POWER INDUSTRY OF IRAN



Saeed Mohazab Torabi

Experiences

More than 30 years experience in executive management, proposing management consultancy services to different industries for more than 20 years and 15 years experience in conducting universities' courses.

• Work Experience

- Ghods Niroom Engineering Co.(GNEC), Managing Director-2015 .
- Niroom Consulting Engineers Co. (Moshaverniroom), Managing Director, 2013-2015.
- Iran Energy Efficiency Organization (IEEO), Chairman of the Board& Managing Director, 2010- 2013.
- Tehran Electrical Power Distribution Co., Chairman of the Board& Managing Director, 2007-2010.
- Yazd Regional Electric Co, Chairman of the Board & Managing Director, 2003-2007.
- Hamedan Electrical Power Distribution Co., Chairman of the Board& Managing Director, 1996-2003.
- Khorasan Regional Electric Co, Regional Manager of Torbat Jam, Sabzevar and north part of khorasan, 1987-1996.

• Educational Qualifications

- M.sc. in Industrial Engineering, Amirkabir University of Technology, Tehran, Iran.
- B.Sc. in Electrical Engineering, Abaspour University, Tehran, Iran,.



GhodsNiroo Engineering Company (GNEC)

Ghods Niroo Engineering Company (GNEC), founded in 1975, is one of the most continually operating engineering firm in Iran.

GNEC is the largest leading engineering and project management organization with the complete range of expertise and flexibility to role play as designer, architect/engineer, consultant and manager in water, power, energy and oil & gas projects. With over 1000 of staff, we provide a full range of engineering, planning, and construction management services.

By more than 40 years of experience, GNEC proved to be the most successful and known company in power generation, transmission and distribution projects.



GHODS NIROO
ENGINEERING COMPANY



Our Experiences

- ❖ More than 25,000 km of power transmission and distribution lines.
- ❖ More than 450 power substations.
- ❖ More than 40,000 MW of power plants.
- ❖ More than 60 projects in the field of dams, water transmission lines, irrigation, drainage and buildings.
- ❖ More than 1000 km of gas transmission lines and several fuel storage tanks.
- ❖ More than 20 energy projects such as renewable energy plants and energy management.

Our Services

- Surveys and Studies
- Investment consultancy
- Engineering Consultancy
- Managing of Contract
- Designing
- Engineering, Procurement and Construction

Introduction

- **In the field of energy, the world is facing with two threats:**

- ✚ Unreliable and inadequate sources of energy
- ✚ Environmental degradation and climate change

those will be a global challenge for governments and private sector that need creative and comprehensive strategy.

- **The strategy of the Islamic Republic of Iran in the field of energy efficiency policies**

- ✚ Increase for use of renewable energies
- ✚ Increase of energy efficiency

with the approach of investment in private sector



**VIEW &
Attractiveness**



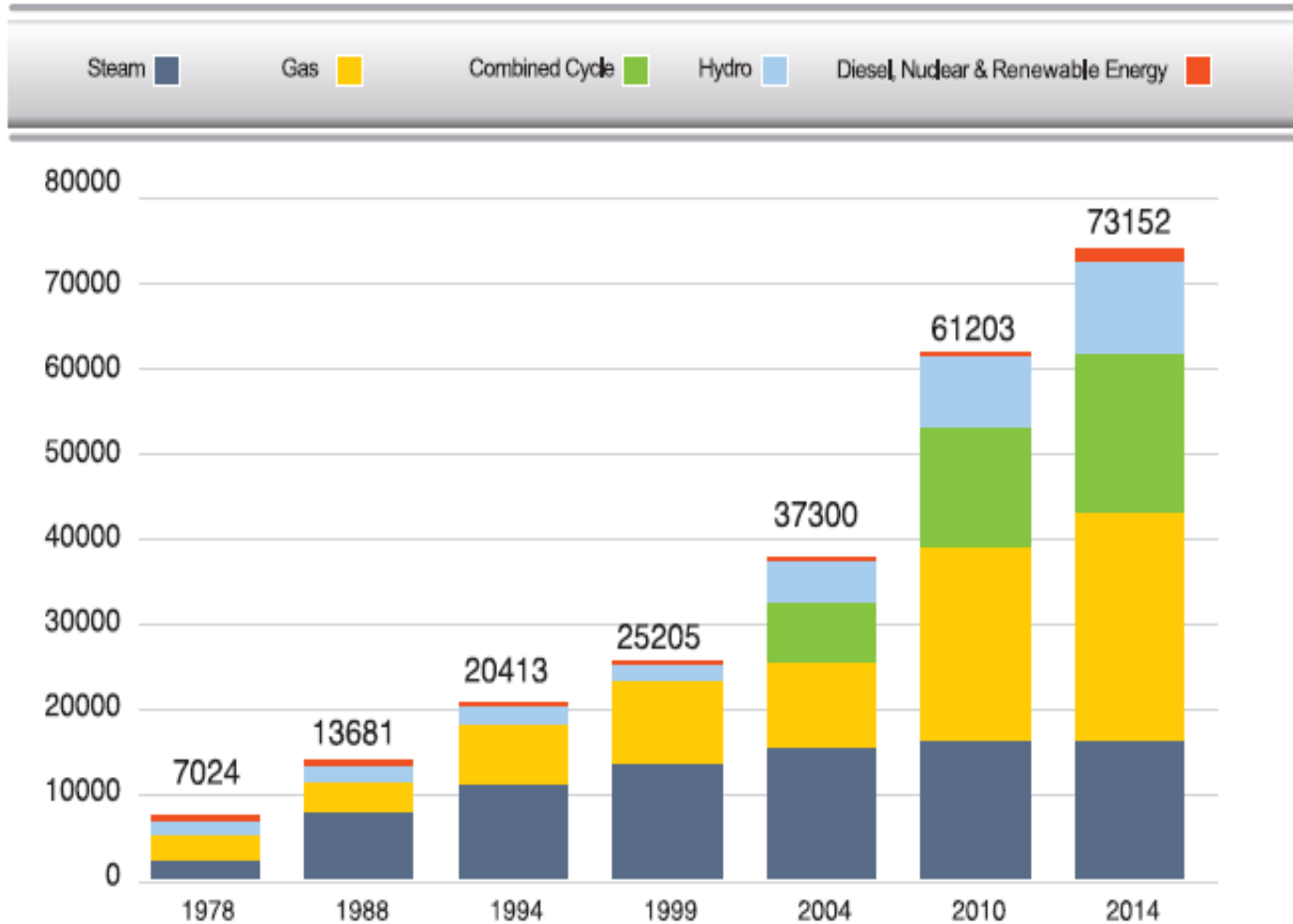
**Diversity of
investment**



Risks

(MW)

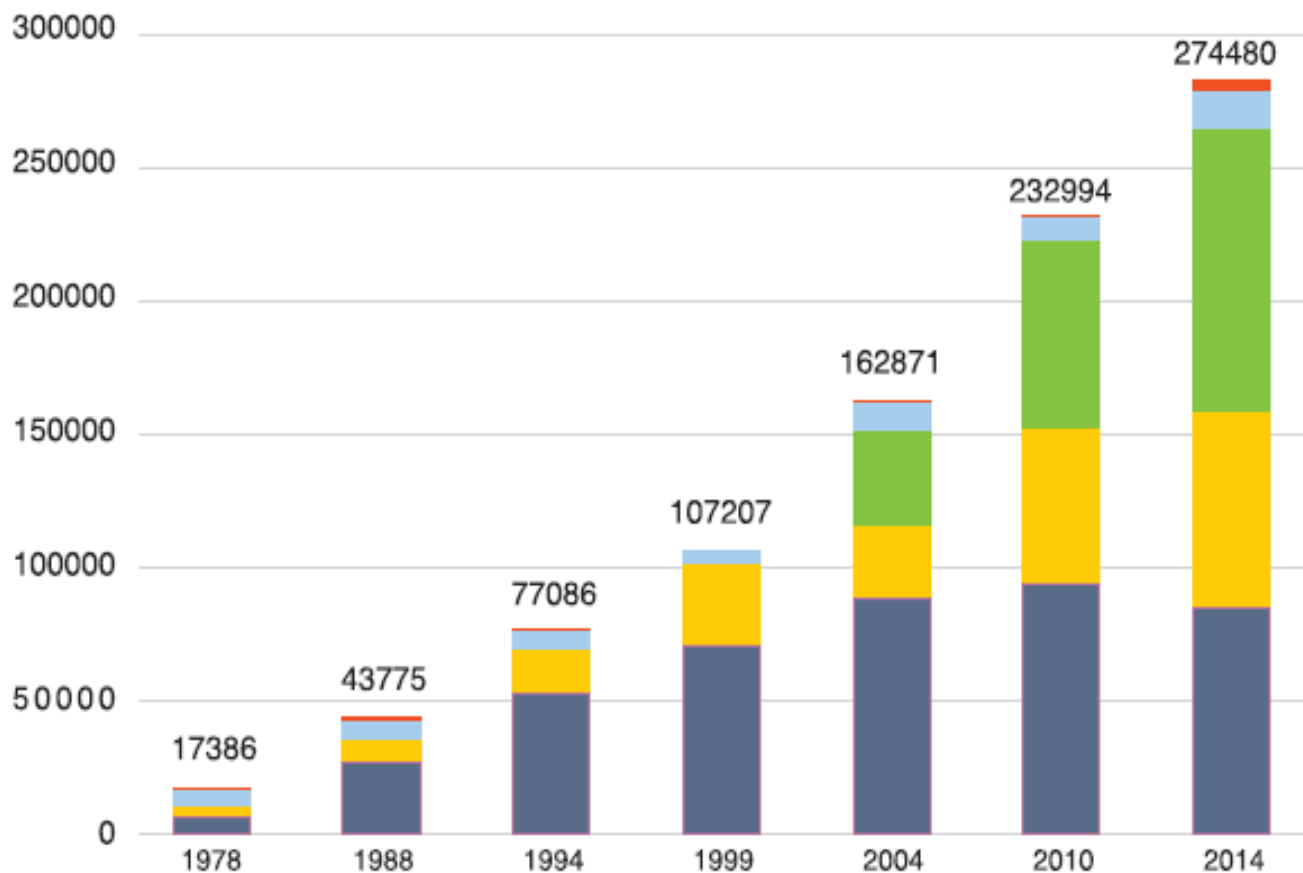
Nominal Capacity by Power Plants Types



(GWH)

Gross Power Generation by Power Plants Types

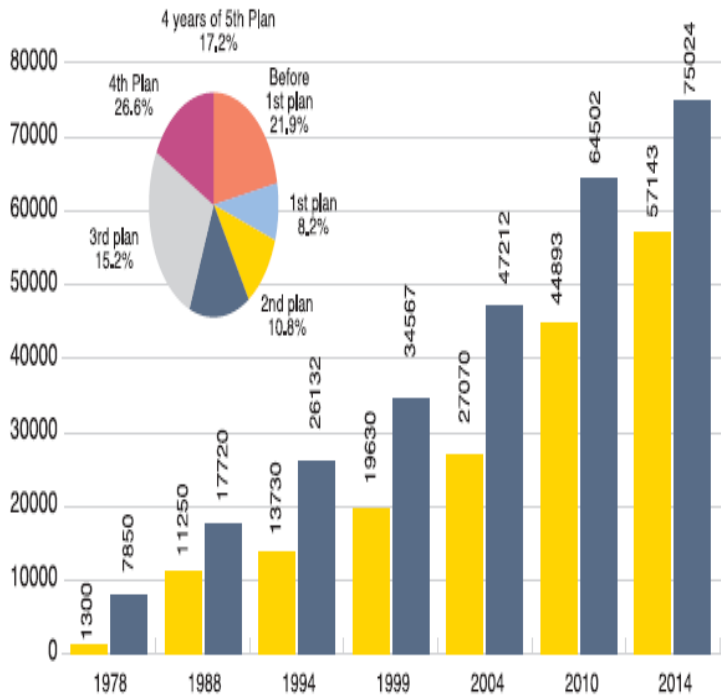
Steam ■ Gas ■ Combined Cycle ■ Hydro ■ Diesel, Nuclear & Renewable Energy ■



(MVA) **Increasing Trend of Transmission Substations Capacity**



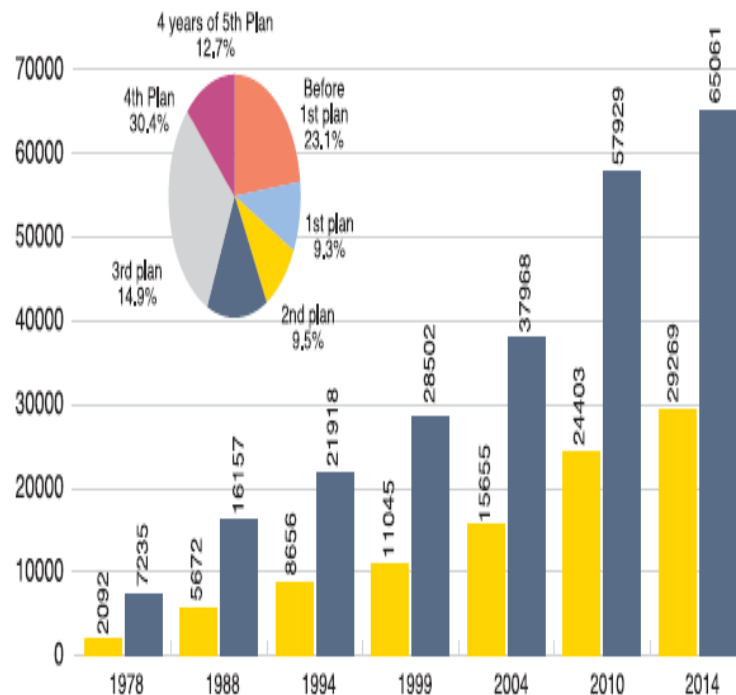
Contribution of Transmission Substations Capacity



(MVA) **Increasing Trend of Sub-Transmission Substations Capacity**



Contribution of Sub-Transmission Substations Capacity

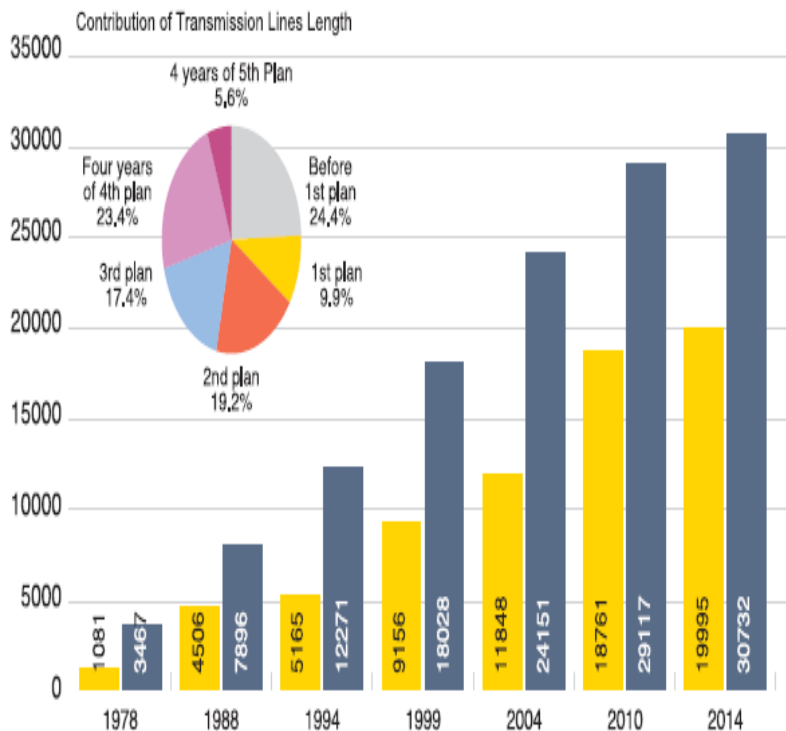


(Km Circuit)

Increasing Trend of Transmission Lines Length

400 kv

230 kv

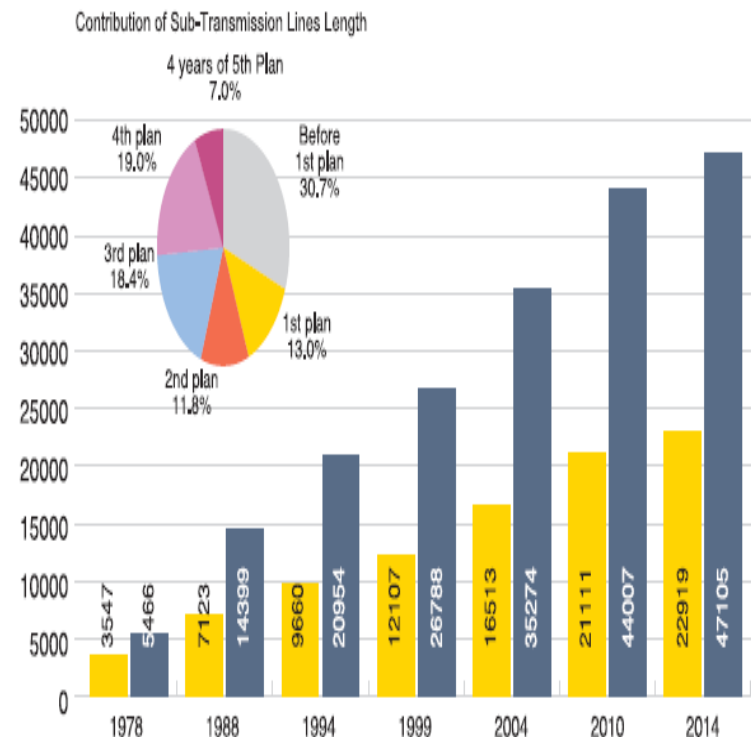


(Km Circuit)

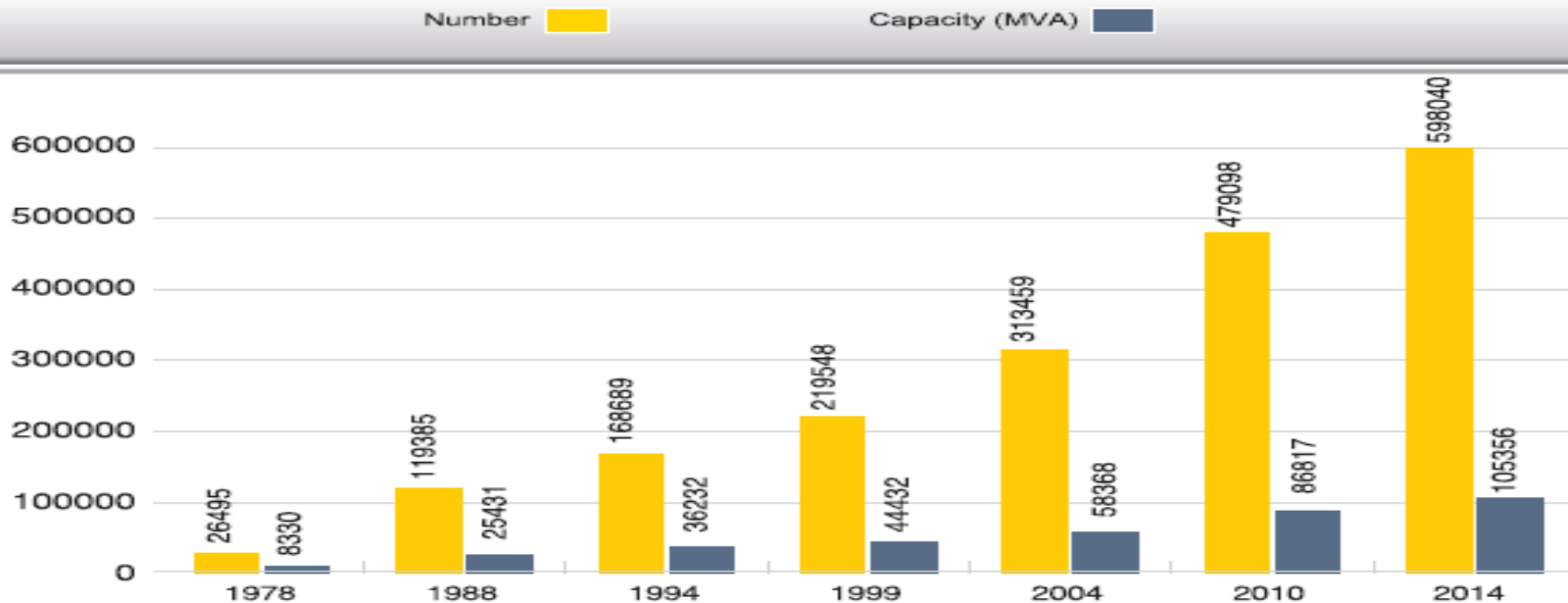
Increasing Trend of Sub-Transmission Lines Length

132 kv

63&66 kv



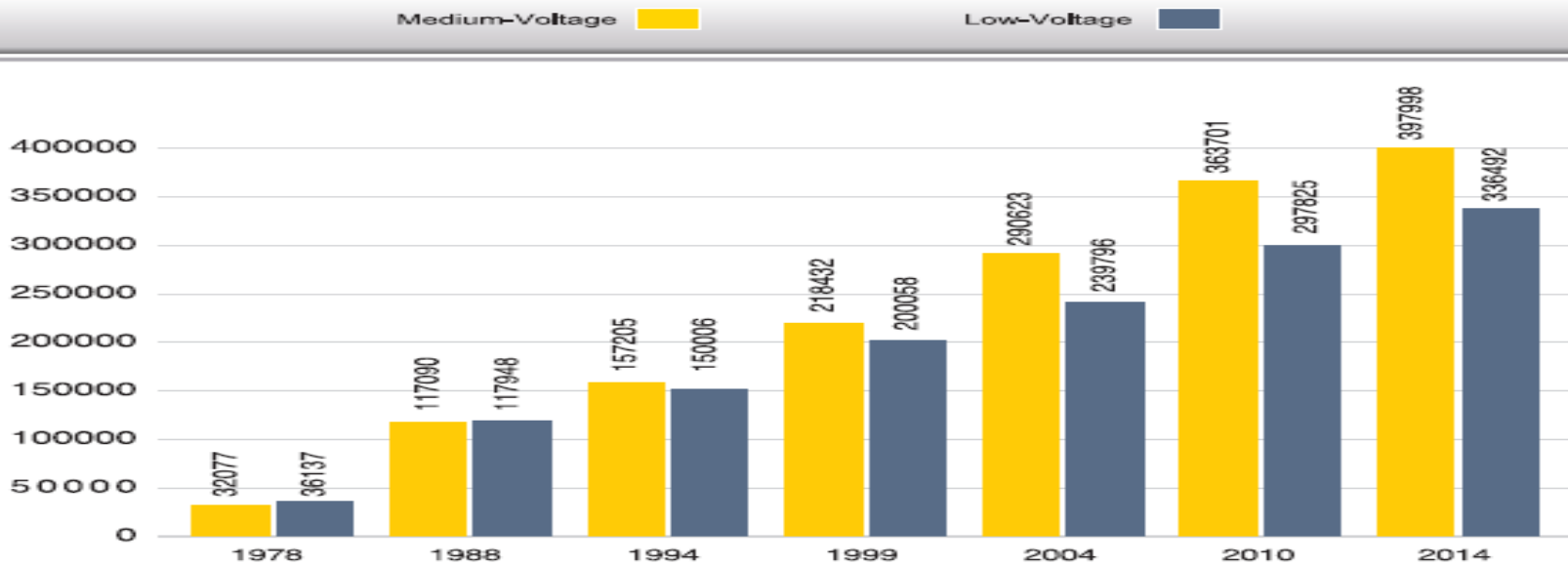
Number and Capacity of Distribution Transformers



Source: Tavanir Holding Company; Statistical report on 48 years of activities of Iran electric power industry; Dec. 2015

(Km)

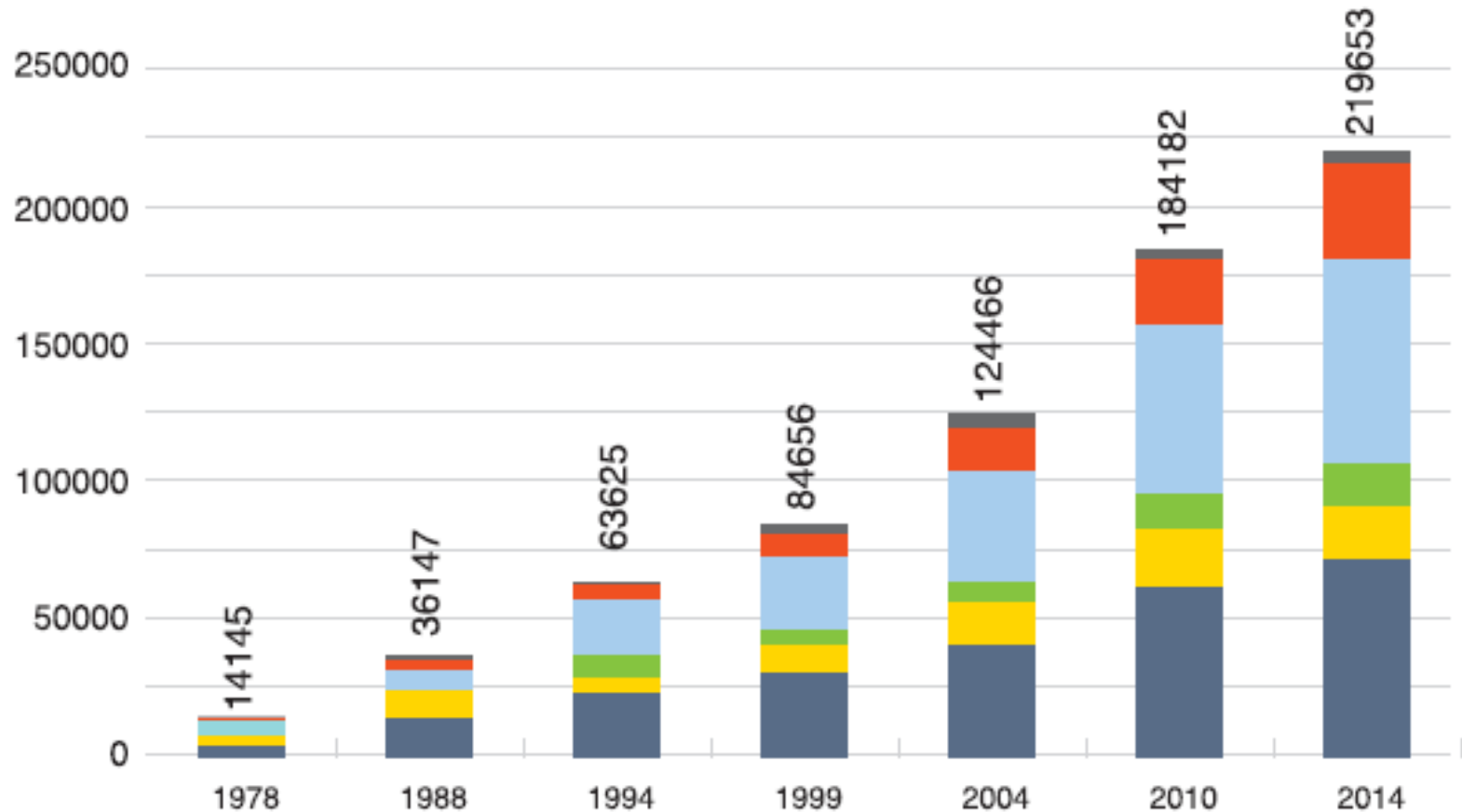
Length of LV/MV Distribution Lines



(GWH)

Electricity Sale to Various Consuming Sectors

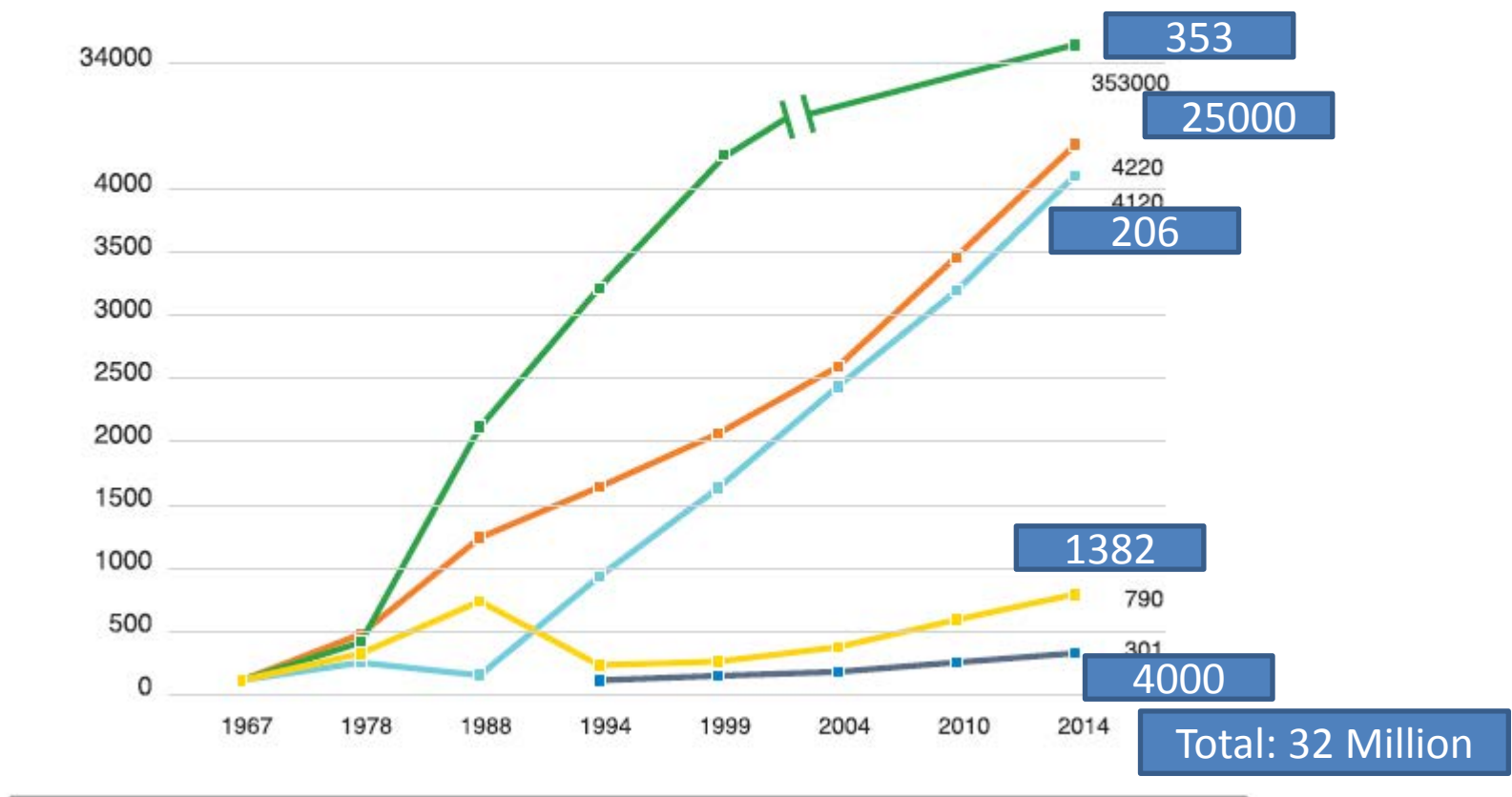
Residential Public Services Others Industrial Agricultural Street Lighting



Unusual reduction of consumption in public sector is due to the separation of commercial sector from it.

Source: Tavanir Holding Company; Statistical report on 48 years of activities of Iran electric power industry; Dec. 2015

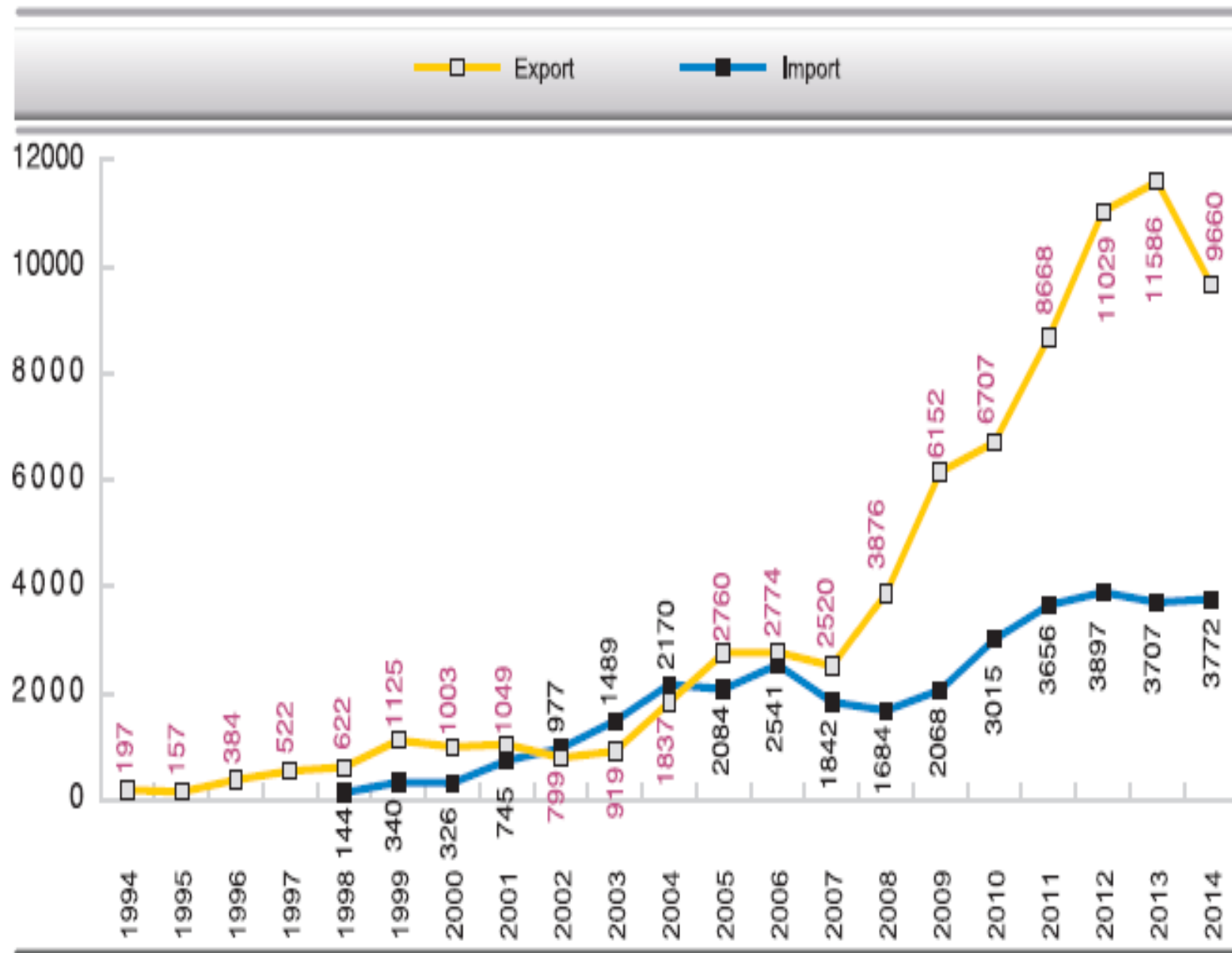
(1967=100 Base Year) **Increasing Index of Number of Customers by Tariff**



Source: Tavanir Holding Company; Statistical report on 48 years of activities of Iran electric power industry; Dec. 2015

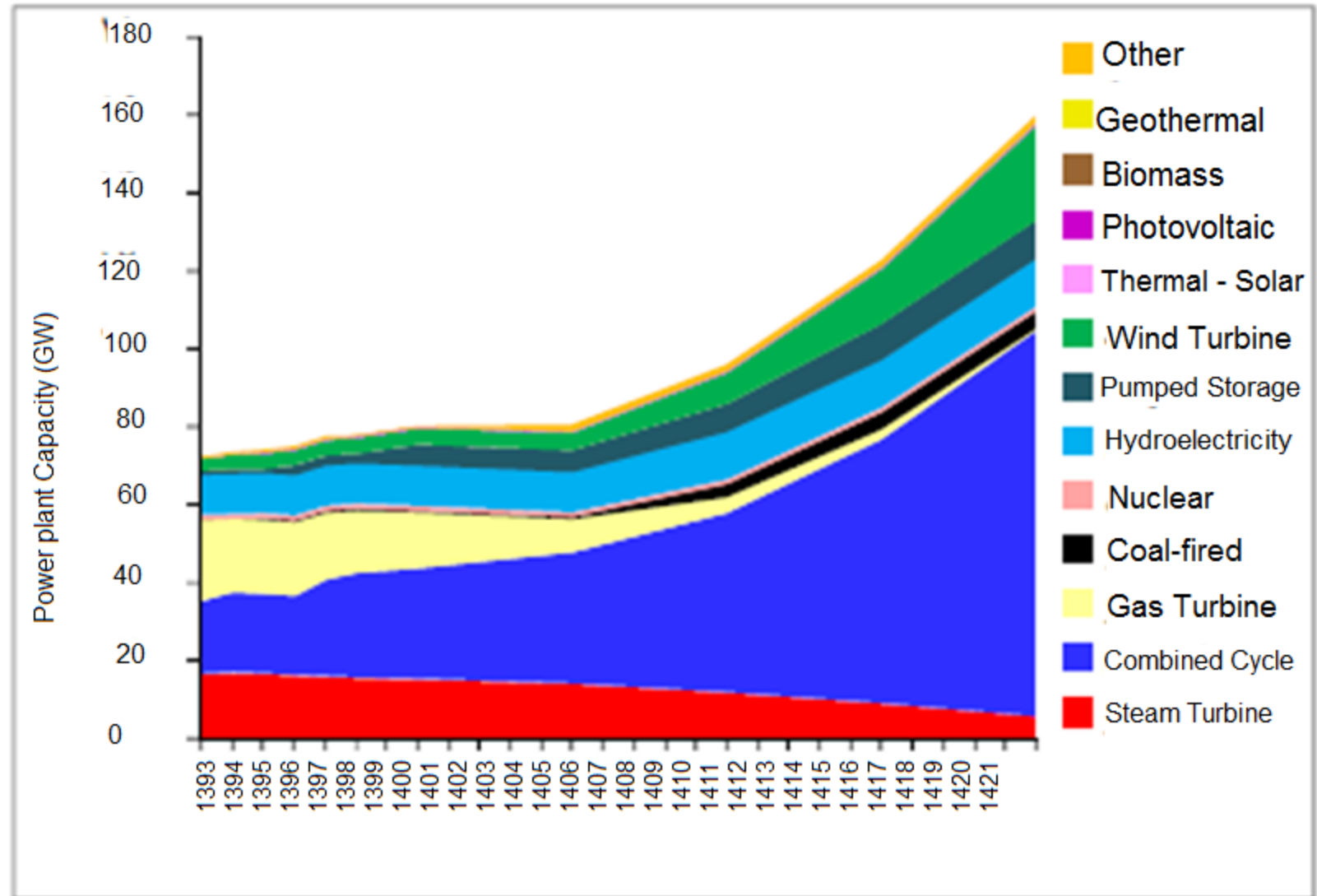
(GWH)

Exchanged Electricity with Neighboring Countries

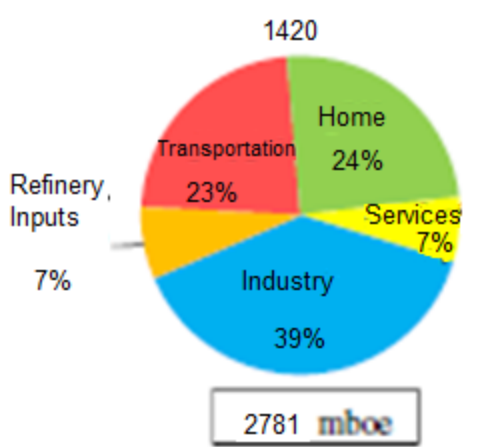
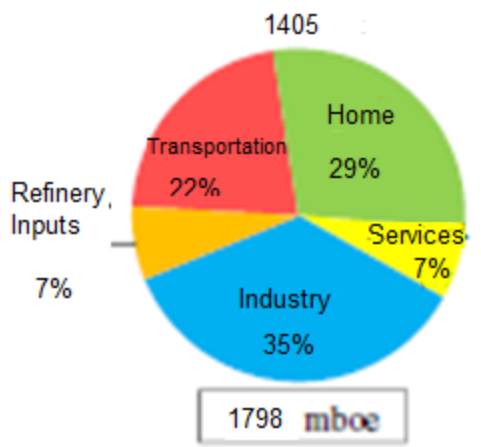
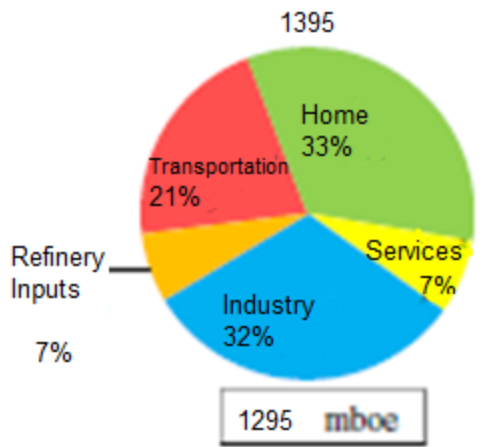
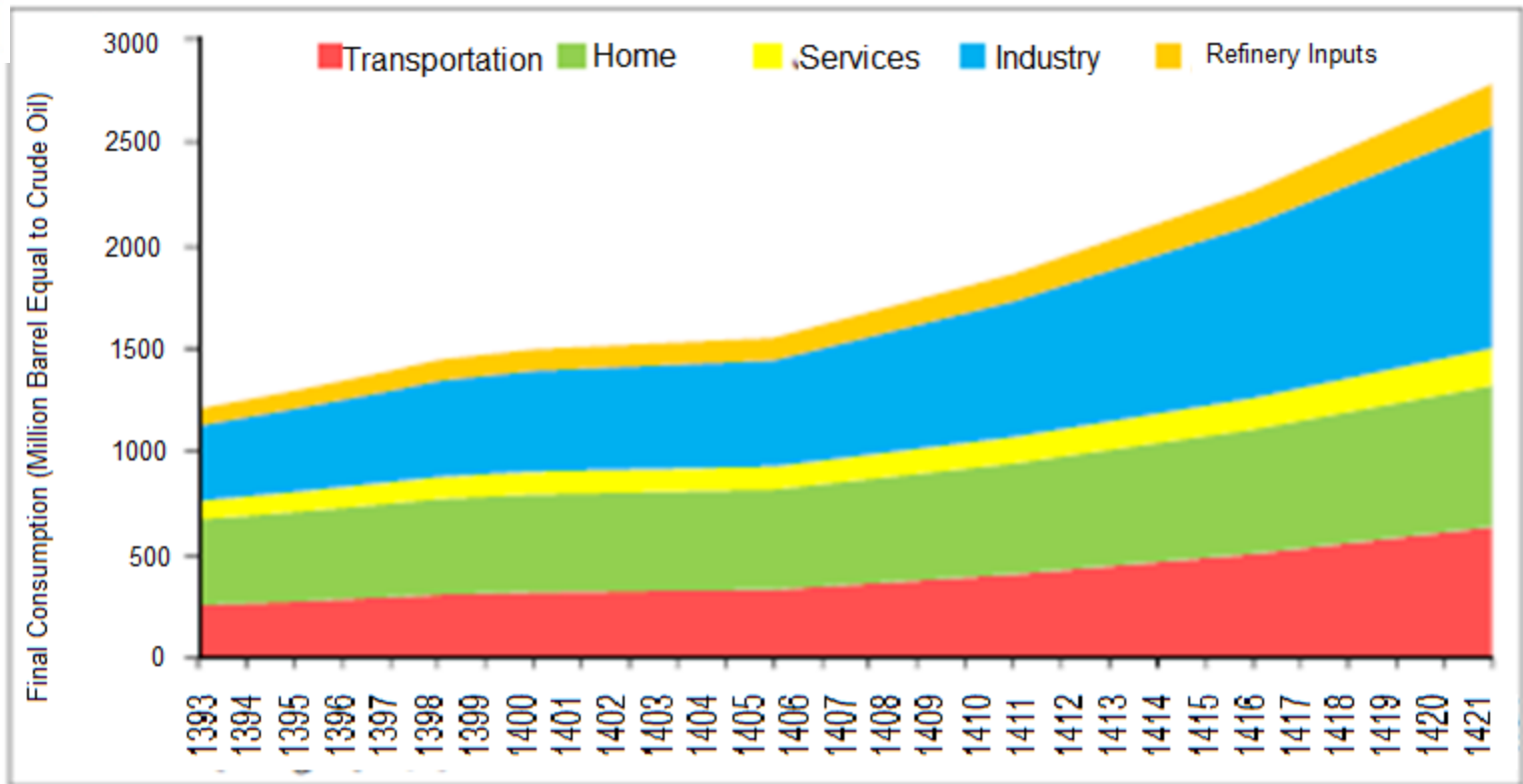


Source: Tavanir Holding Company; Statistical report on 48 years of activities of Iran electric power industry; Dec. 2015

long-term Plan for Power Development of the Country



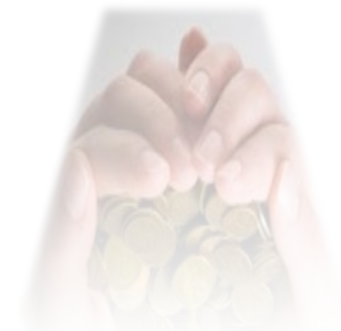
Source: Tavanir Holding Company; Statistical report on 48 years of activities of Iran electric power industry; Dec. 2015



Energy Consumption in Different Sectors

Attractiveness

- Demand Growth
 - Size of market; Accessibility to consumers (Inside & Outside)
 - Basic resource of other industries development
 - Trend of demand growth
- Electricity sales mechanism
 - Guaranteed sale to the government
 - Energy exchange
 - Direct sale
 - Export



Attractiveness

- Cost of projects
 - Accessibility to facilities and resources
 - Human resources
 - Local manufacturers
 - Logistic facilities , ...
- Supportive regulations
 - Energy Conversion Agreement
 - Efficiency improvement law (**Act 12**)
 - Bank Guarantees of financing



Plans intended by Ministry of Energy

- Increase in productivity and efficiency for supply chain of water and electricity.
- construction of combined cycle power plants, CCHP ,CHP and small-scale generators
- The development of usage of renewable energies.
- loss reduction in water and electricity transmission and distribution utilities.
- Improvement of water quality and water salinity prevention projects
- Dam construction, water and sewage projects
- Control and optimal utilization of domestic, common and boundary waters.
- Collection and sanitation projects
- Guaranty of buying or selling water to investors in all cases, including drinking water and sanitation, industry, agriculture and irrigation
- Optimization and savings in water and electricity consumption
- Increasing the share of electricity exports and technical and engineering services

Suggested Plans

- ❖ Increasing thermal efficiency in generation of electricity by completion of steam phase into combined cycle power plants
- ❖ Development of generators for simultaneous generation of electricity , small-scale heating and cooling (CCHP and CHP)
- ❖ Development of renewable energy by installing wind power plants
- ❖ Energy loss reduction and modification of consumption patterns by installing smart meters (AMI)
- ❖ Implementation of economic energy supply for villages
- ❖ Power supply for agricultural diesel wells
- ❖ Energy consumption optimization (50% power consumption reduction plan for office subscribers, mosques and schools)

Sample of National projects for Decreasing Fuel Consumption

No.	project title	Annual saving of fuel	Duration of return on investment (investor perspective) base on gas saving (20 cents)
2	Development of small-scale CHP And CCHP generators	3300 Million Meter Cube	Gas saving (20 cents) for a period of 3 years
3	Energy Consumption optimization by modifying the lighting system	1800 Million Meter Cube	Gas saving (20 cents) for a period of 2/5 years
4	Increase production efficiency by replacing old power plants	2200 Million Meter Cube	Gas saving (20 cents) for a period of 3 years
5	Increase production efficiency with the rehabilitation of steam power plants	5300 Million Meter Cube	Gas saving (20 cents) for a period of 3/5 years
6	Development of renewable energy by installing wind power plant	1900 Million Meter Cube	Saving gas (20 cents) for a period of 2 years
7	Efficiency by replacing old air conditioners	950 Million Meter Cube	Saving gas (20 cents) for a period of 4 years
8	Electrification of agricultural wells without electricity	3300 Million Meter Cube	Diesel gasoline fuel savings of gas (40.18 cents) for a period of 3/2 years
9	Reduction of energy losses up to 5%	2700 Million Meter Cube	Saving gas (20 cents) for a period of 3/2 years
10	Development of renewable energy with solar energy	650 Million Meter Cube	Saving gas (20 cents) for a period of 3/5 years

Risks

- Time to market
- Local facilities & resources
- Technology compatibility
- Agreements conditions
- Alignment with country development plan



Iran potentials of renewable energy

Solar (Photovoltaic)

Wind

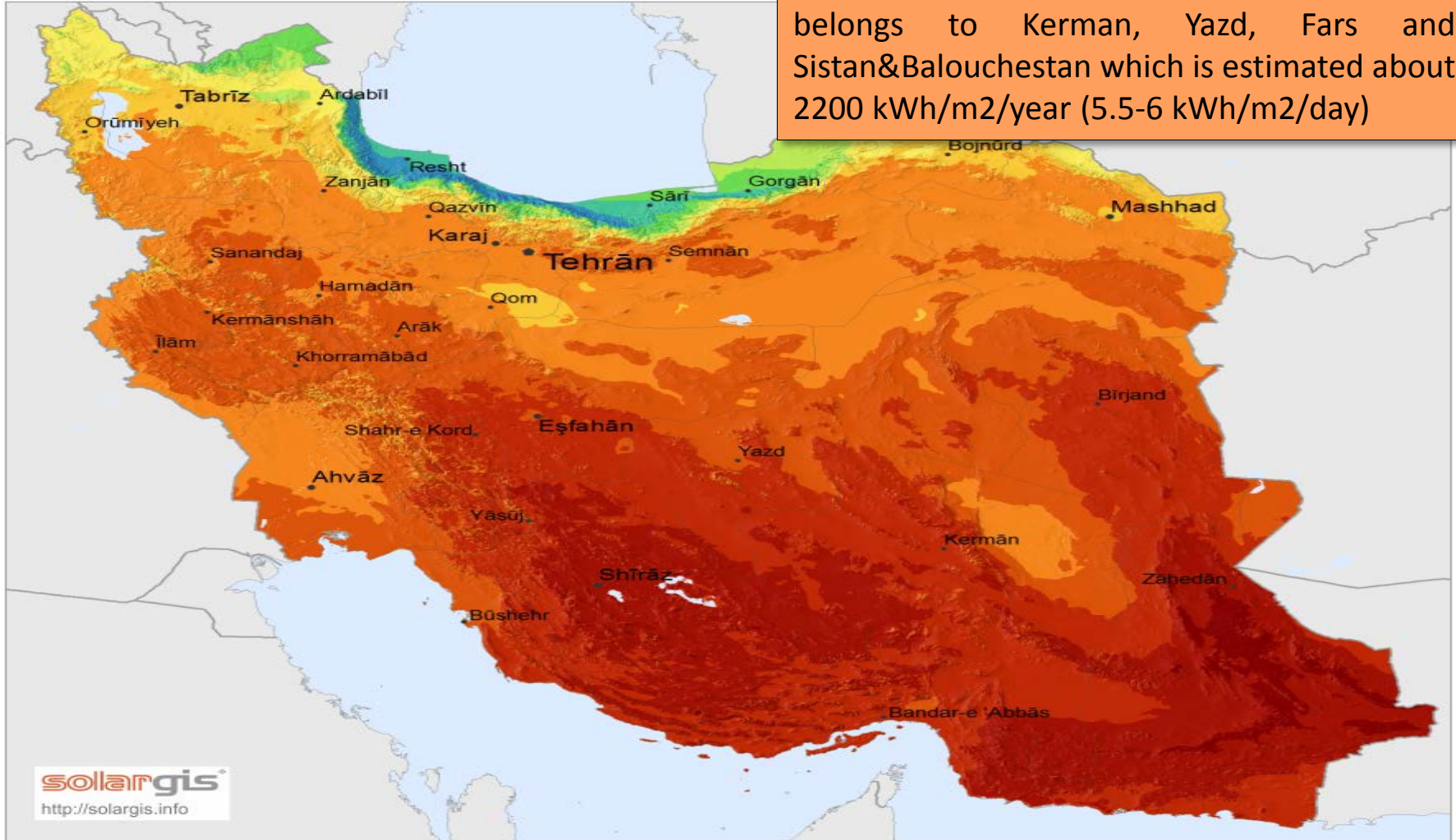
Waste to energy

**GHODS NIROO
ENGINEERING COMPANY (GNEC)**

Iran Solar energy potential (photovoltaic)

According to Solar photovoltaic atlas, the minimum amount of irradiation belongs to the Northern provinces of Iran which is estimated about 1200 kWh/m²/year (2.8-3 kWh/m²/day) and the maximum amount belongs to Kerman, Yazd, Fars and Sistan&Balouchestan which is estimated about 2200 kWh/m²/year (5.5-6 kWh/m²/day)

Global Horizontal Irradiation

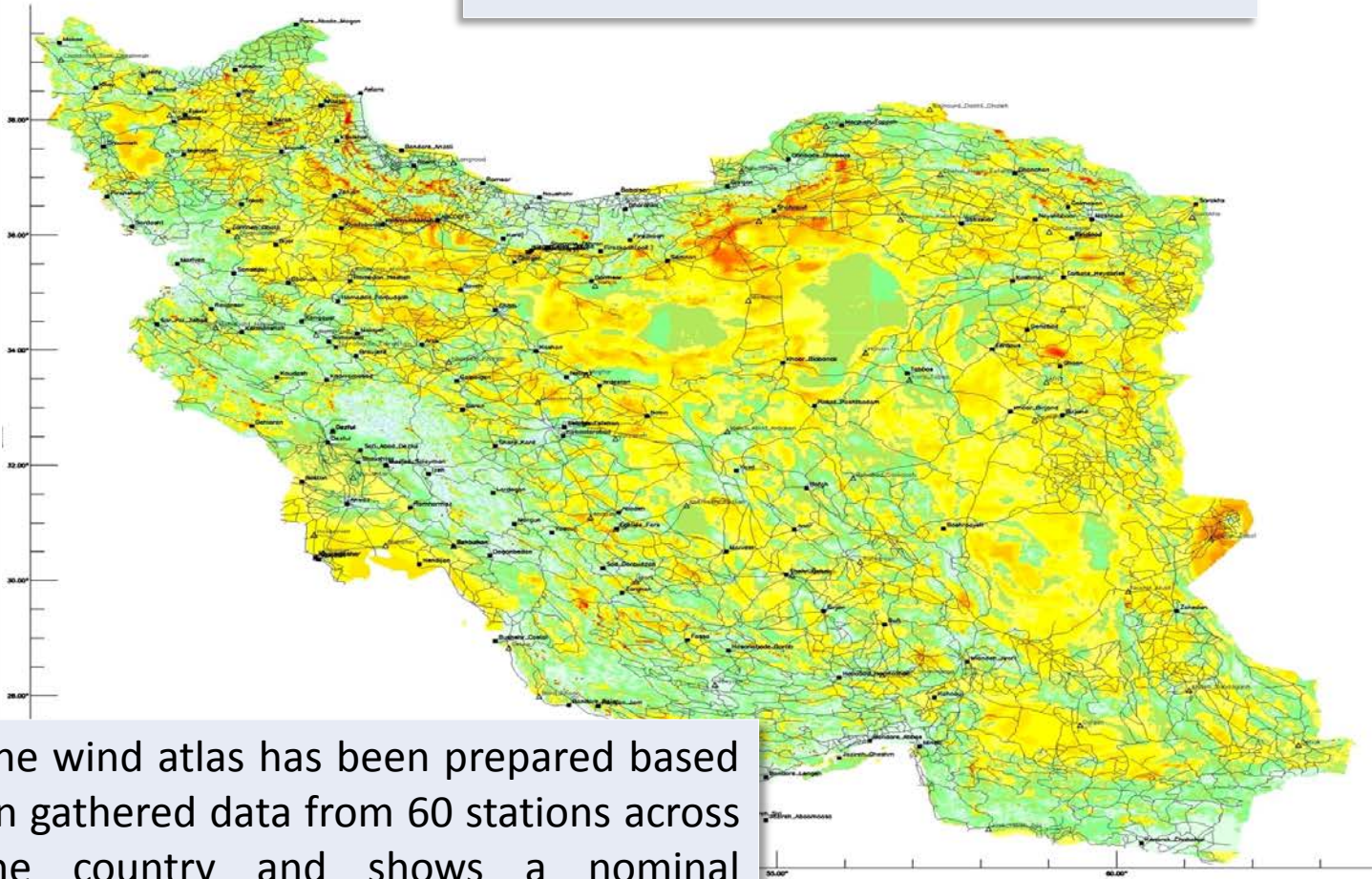


Average annual sum (1999-2011)



0 100 200 km

Iran Wind map potential (80 m)



Wind velocity in m/s



Renewable Energy Organisation of Iran (SUNA)
Yadegar-e-Emam high way, Poonak-e-Bakhtary Ave.,
Dadman Blvd. Shahrak Ghids
P.O. Box: 14665-1169 Tehran-Iran



Moshanir Power Engineering Consultants
No. 37, Vanak Sq, Khoddarni Ave.
Tehran 1994753486 Iran P.O. Box: 19395-4691

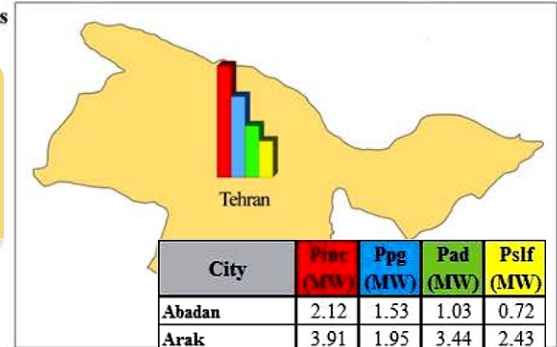
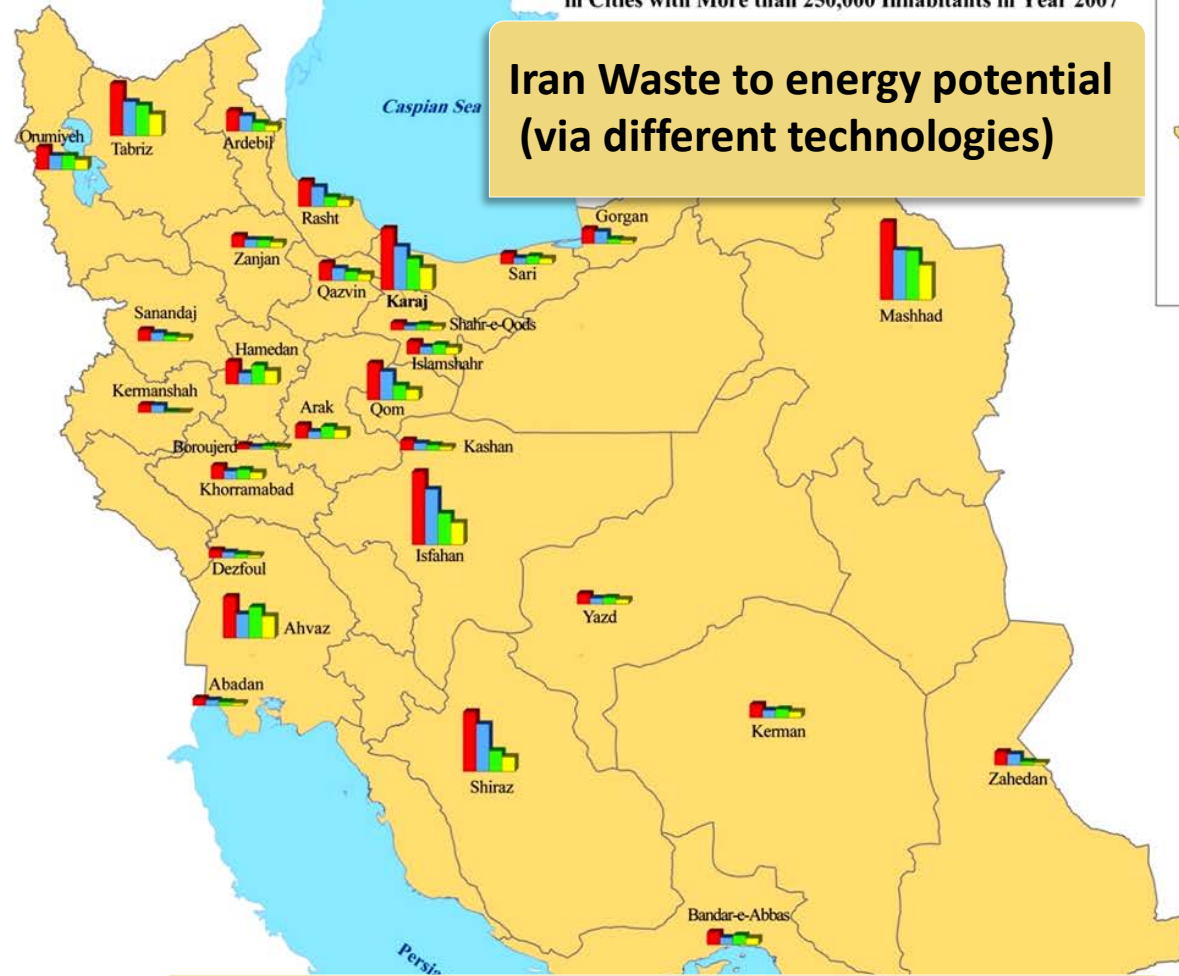


Lahmeyer International GmbH
Friedberger Str. 173
D-61118 Bad Vilbel, Germany

The wind atlas has been prepared based on gathered data from 60 stations across the country and shows a nominal capacity of about 60,000 MW; But based on forecasts made, the country's economically recoverable wind energy is estimated about 18,000 MW.

Maximum Potential for Different Waste to Energy Technologies
in Cities with More than 250,000 Inhabitants in Year 2007

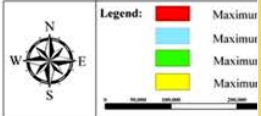
Iran Waste to energy potential (via different technologies)



City	Inc (MW)	Ppg (MW)	Pad (MW)	Pslf (MW)
Abadan	2.12	1.53	1.03	0.72
Arak	3.91	1.95	3.44	2.43
Ardabil	5.95	4.48	2.42	1.71
Orumiyeh	6.5	4.03	4.06	2.86
Islamshahr	3.64	2.08	2.74	1.93
Isfahan	21.16	16.02	9.06	6.39
Ahvaz	12	6.9	8.99	6.34
Boroujerd	1.23	0.68	0.94	0.66
Bandar-e-Abbas	3.62	2.02	2.68	1.89
Tabriz	15.11	9.85	8.83	6.22
Tehran	110.8	80.27	51.04	35.99
Khorramabad	3.89	2.31	2.73	1.93
Dezfoul	2.2	1.59	1.07	0.75
Rasht	7.42	5.7	2.79	1.97
Zahedan	3.81	3.15	1	0.71
Zanjan	3.41	2.19	2.12	1.49
Sari	3.05	1.73	2.26	1.59
Sanandaj	3.2	2.33	1.49	1.05
Shahr-e-Qods	2.09	1.19	1.57	1.11
Shiraz	17.29	13.72	5.98	4.22
Qazvin	5.11	3.58	2.63	1.85
Qom	10.64	8.22	4.21	2.97
Kashan	2.92	2.05	1.52	1.07
Karaj	17.78	12.58	9.07	6.4
Kerman	3.85	2.14	2.46	1.73
Kermanshah	2.25	2.09	0.3	0.21
Gorgan	4.22	3.45	1.26	0.89
Mashhad	22.6	14.43	14.26	10.05
Hamedan	6.56	3.21	5.47	3.86
Yazd	2.98	1.66	1.9	1.34
Total	311.28	217.15	159.31	112.34

The maximum potential of municipal solid waste (MSW) via different waste to energy technologies in cities with more than 250,000 inhabitants in year 2007 in Iran:

Potential via incineration: 311 MW; Potential via pyrolysis-gasification: 217 MW; Potential via anaerobic digestion: 159 MW and Potential via sanitary landfill: 112 MW



Tariff for different renewable energy sections

No.	Type of Technology	Power purchase agreement (PPA) Tariff	
		Rial/kWh	US Cent/kWh
1	Biomass- Landfill	2900	8.29
	Biomass- Anaerobic digester	3150	9.00
	Biomass- Incineration	5870	16.77
2	Wind farm (> 50 MW)	4060	11.60
	Wind farm (=< 50 MW)	4970	14.20
	Wind farm (=< 1 MW)	5930	16.94
3	Solar farm (>10 MW)	5600	16.00
	Solar farm (=< 10 MW)	6750	19.29
	Solar farm (=< 100 kW)	8730	24.94
	Solar farm (=< 20 kW)	9770	27.91
4	Geothermal (including drilling&equipment)	5770	16.49
5	Expansion turbine	1800	5.14
6	Loss recovery in industrial processes	3050	8.71
7	Hydropower (=< 10 MW)	3700	10.57
8	Other renewable energy fields	4873	13.92

Power purchase agreement (PPA) conditions

- ❖ PPA covers 20 years considering annual adjustment formula
- ❖ Tariffs will be multiplied by 0.7, from the beginning of 10th (except for wind farms)
- ❖ For wind farms:
 - capacity factor $\geq 40\%$, (tariff * 0.4) from the beginning of 10th year
 - capacity factor $< 20\%$, (tariff * 1.0) from the beginning of 10th year
 - capacity factor $> 20\%$ AND $< 40\%$, tariff will be multiplied by proportionate correction factor from the beginning of 10th year
- ❖ Power plants which are connected to 20&33 kV lines will receive a 148 Rial/kWh plus
- ❖ Tariff will grow up to 15% proportionally according to the weight of domestic production amount of technologies.
- ❖ The notified tariff will be valid for power plants which start operating phase after 18 months of signing PPA at maximum. (For geothermal and biomass power plants this period will be 27 months).



**Thanks for your
attention**

We are ready to cooperate and provide any support and facilities for any kind of investment In Iran energy industry.

Website: www.ghods-niroo.com

Email address: info@ghods-niroo.com

smohazabtorabi@ghods-niroo.com

mohazab433@gmail.com