



ENERGY STORAGE: Overview, Issues and challenges in the IRAN



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Energy production and supply in Iran in 2018 (12).

Sector	Million barrels of oil equivalent
Production	3405.03
Import	29.54
Export and Storage	1020
Gas and gas-liquid Injection	163.70
Internal and operational and other consumption	214.33
Energy Loss during energy production and distribution	573.2
Final energy supply	1463.34

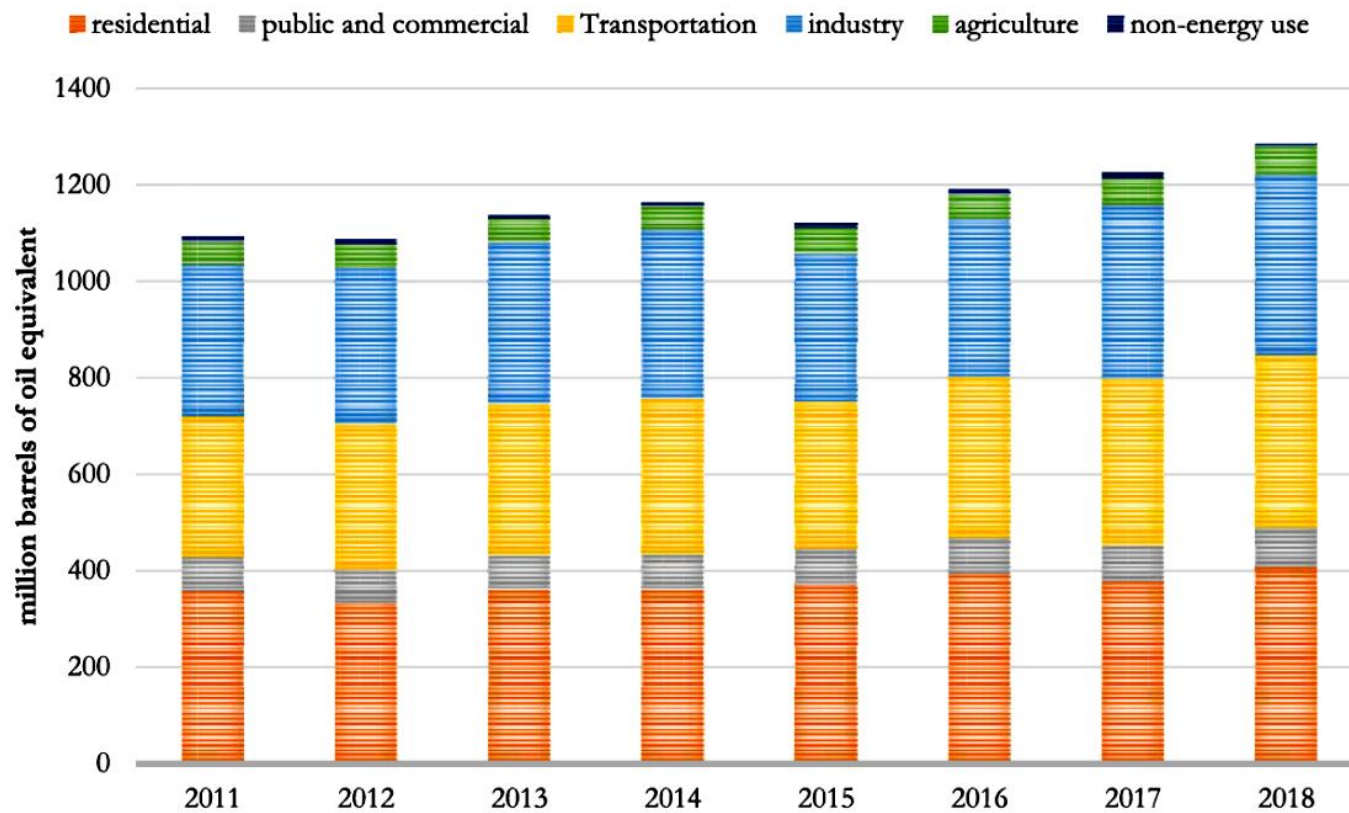


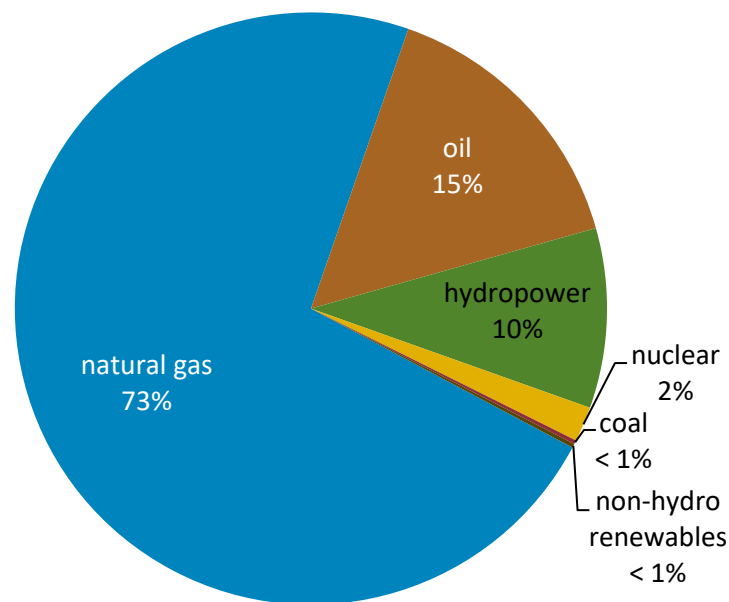
Fig. 2. Total amount of different sectors in final energy consumption (sectors' share trends can be interpreted visually) (12).



Iran's electricity generation capacity by fuel

- Subsidies of energy systems: near to 50 b\$ annually – 1st in the world.
(powerplants: 33% , households: 24% , industries: 21% , transportation: 15%)
- price of households electricity: near to 0.35 \$cent / kwh
- Price of households gas: near to 0.7 \$cent / m3
- Availability to electricity: 100% of urban population and near to 99.7% of rural population
- Availability to Gas: near to 97% of total population
- Energy intensity: near to 0.33 – 3 times more than global average

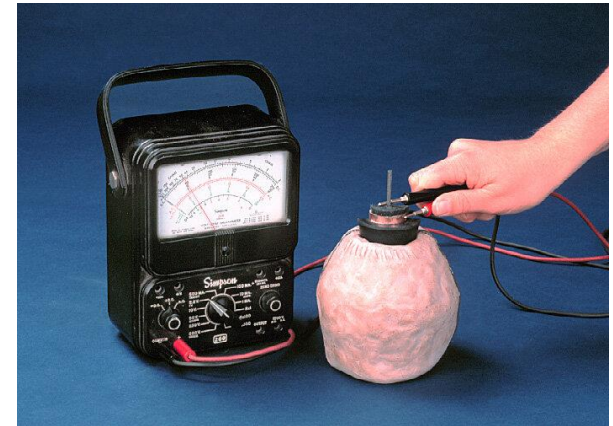
Total installed capacity: 90GW





The first battery in history (Parthian Battery)

In 1936, while constructing a railway near Baghdad (once part of Iran's mighty Parthian Empire), workers stumbled upon what appeared to be an ancient battery, now famously known as the Parthian Battery. Originating from the era of Iran's Parthian empire, this artifact, estimated to be around 2,000 years old, consists of a clay jar filled with a vinegar solution, housing an iron rod encased by a copper cylinder. Remarkably, this configuration generates approximately 1.1 to 2.0 volts of electricity.





Loss of profits due to power outage in various industries

POWER OUTAGE

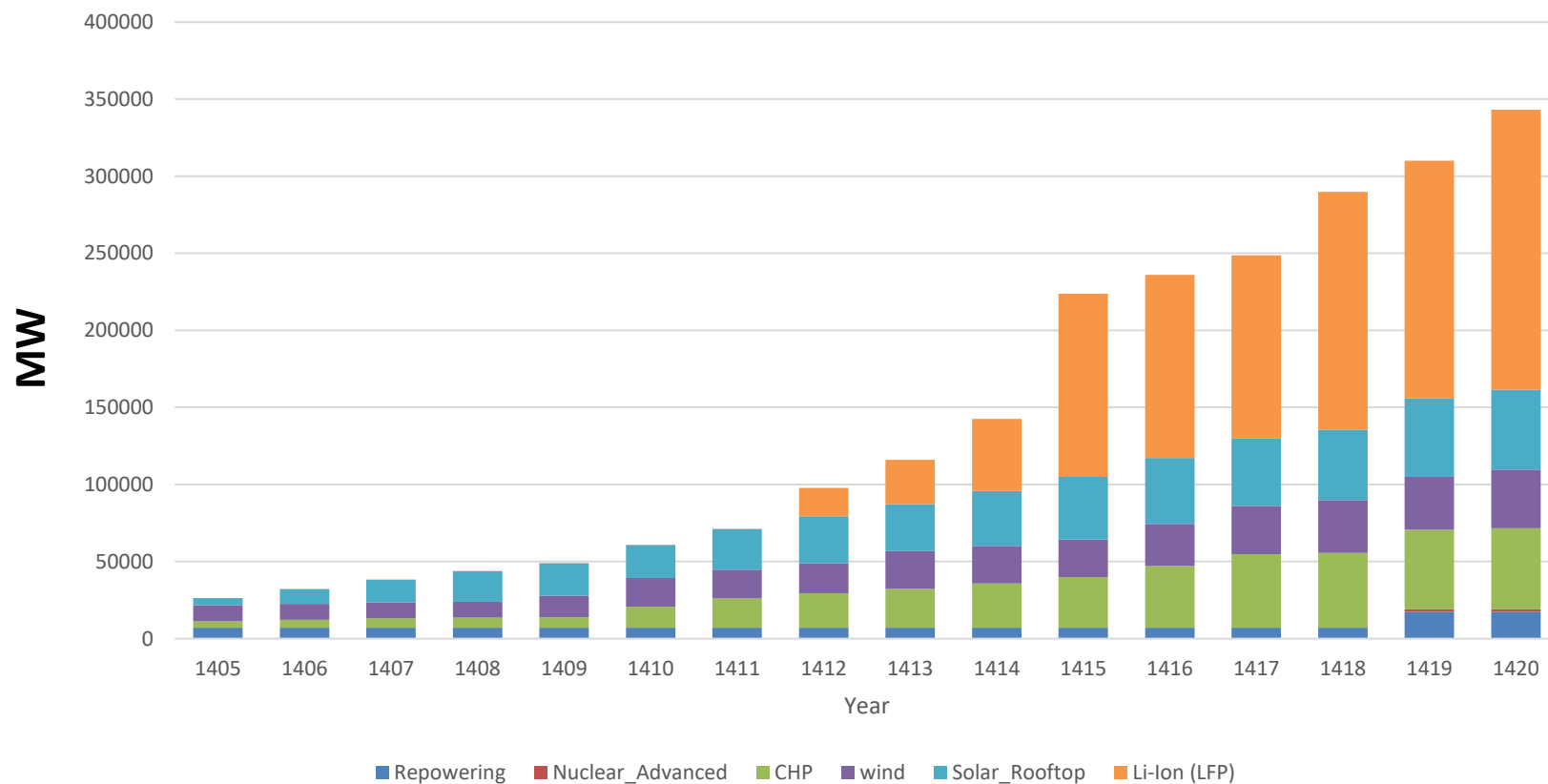
For Example:

Steel industry	1.2 \$
cement industry	0.2 \$





Expandable capacity of investment in different technologies



Battery Industrial Capability in Iran





Lead-acid battery manufacturer in Iran

24 companies producing lead-acid batteries (automotive and industrial) in Iran produce 18 million batteries per year with a nominal capacity



Saba Battery

سیاهان باتری
SEPAHAN BATTERY

انرژی برای زندگی



آکو باتری
ACO BATTERY



VISTA
ELECTRIC RAYKA



Li- Ion battery manufacturer in Iran

In Iran, Saba battery company operates as the only company in West Asia in the production of lithium batteries. Also, several Iranian companies are active in the field of lithium battery packaging. These companies produce in various applications, including electric vehicles, consumer electronics and various industries.



MAPNA Group Company as the parent company, along with various specialized subsidiaries and affiliates involved in the engineering, construction and development of thermal power plants, renewable energy plants, power and thermal cogeneration facilities, cogeneration facilities and water desalination, engineering, implementation and development of oil and gas projects on land and sea, engineering and construction of rail transportation projects.



Battery Energy Storage System

MANPNA home energy storage



Mana Mehr Energy Nasim

A supplier and contractor of all engineering, procurement, supply and complete implementation (EPC) of a renewable power plant (wind and solar) with the aim of providing high quality solutions, competitive prices in a suitable time frame.

Working on solar energy storage



Noursan Energy Aria



- Noursun Energy company has been driven forward by pioneers in the solar industry. They started their activities in the 2011s as the Noursun Energy solar initiative. The management and their employees now have over two decades of practical experience in the photovoltaic industry.



Siah Bisheh Pumped Storage Power Plant

- **Siah Bisheh Pumped Storage Power Plant**, also known as Siah Bisheh Power Plant, is a hydroelectric power plant located in the foothills of the Alborz mountain range and adjacent to the Siah Bisheh Trust, located 48 km (30 mi) of Chalus in Mazandaran province, 125 km north of Tehran .
- This pump-storage power plant generates electricity when energy demand is high, and it is a power plant.
- It is a peak that provides the necessary energy for Tehran (located 60 kilometers (37 miles) south of it during peak consumption times. The plant has a production capacity of 1,040 MW (1,390,000 hp) and a pumping capacity of 940 MW (1,260,000 hp).



Economic-Environmental Modeling of Energy Storage Application in Electricity Industry

Iran experience

Regarding the economic- environmental benefits of using energy storage in the electricity industry, an investigation on the application of electrical network's energy storage with the aim of minimizing losses, environmental pollution, and system fuel costs.

In this regard, three scenarios have been designed under the multi-objective particle swarm optimization (PSO) algorithm,

which

in **scenario number 1**, network consumption load is provided only by diesel generators.

In **scenario number 2**, the renewable energy sources of wind and solar are added to the network,

and in **scenario number 3** further diesel generator and wind turbine and solar panels, energy storages are added to the network, and the PSO algorithm for optimal placement of the storage devices is performed.

The results show that the most efficient result for the designed purposes can be achieved by solving the model under scenario number 3.

Accordingly, the amount of network losses, fuel costs, and pollution in motion from the first scenario (base scenario) to the third scenario shows a decrease of **432 kW**, **13.7 thousand dollars**, and **75 kg**, respectively.

These results can help to optimum usage of energy storage devices in order to improve sustainability and network security, losses decreasing, and pollution decreasing in the electricity industry.



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*Thank you
for your
attention*

