ireema NEWSLETTER
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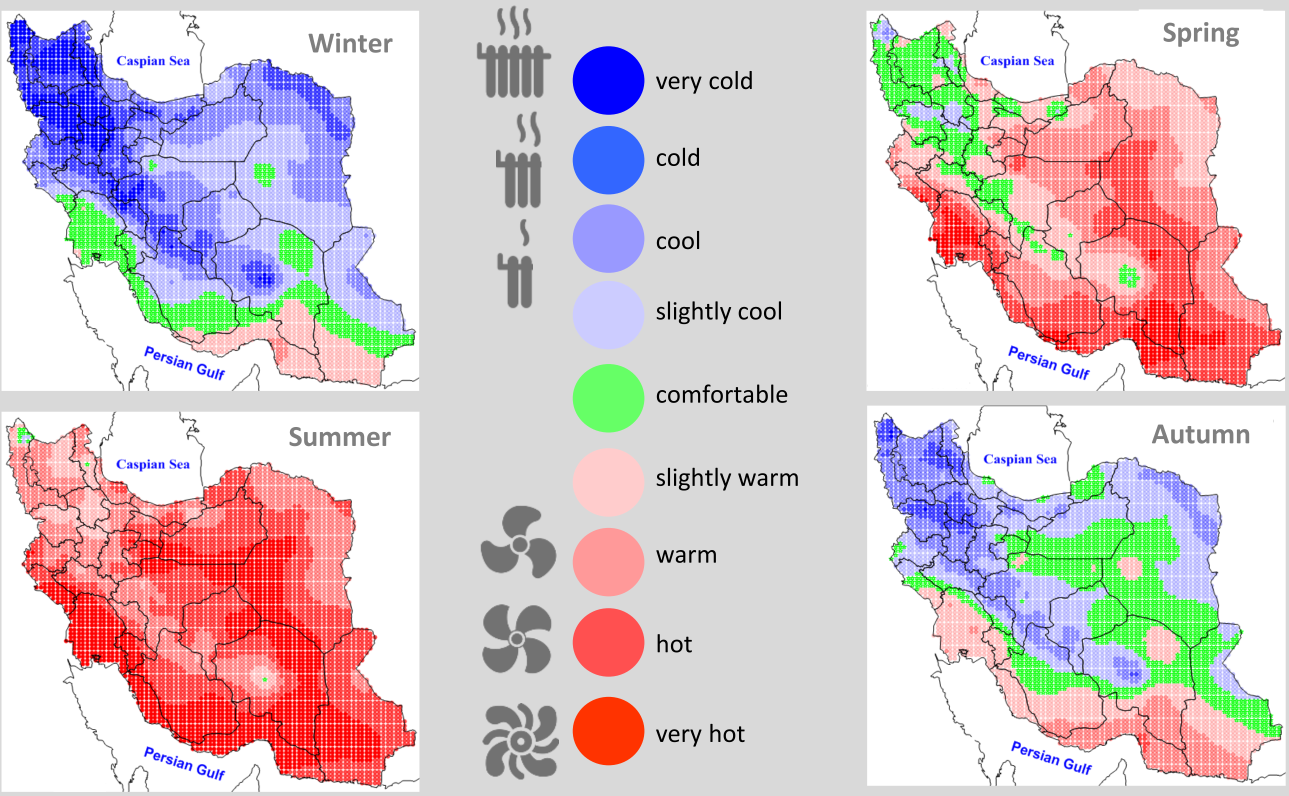
Supporting Iran in implementation of an integrated energy efficiency market

The Challenge of Peak Energy Demands in Iran

Figure 1- Climatic conditions* in Iran throughout the year



The calculations are based on a variety of atmospheric variables including average temperature, wind speed, relative humidity, cloudiness, and water vapor pressure. They were used to build a so-called PET (Physiologically Equivalent Temperature) Index that identifies different bioclimatic zones in Iran based on their thermal perception from very hot to very cold. Source: Mohammadi et al., 2018

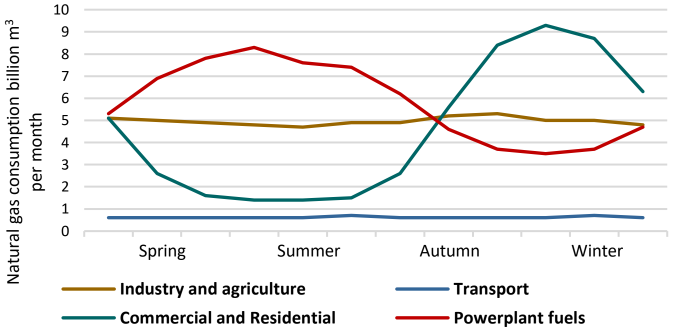
Iran is a country with a highly diverse climate. The average annual temperature in Ardabil in the northwest is 9°C, while 27°C in Bandar Abbas in the south. These temperature differences persist throughout all seasons of the year (see figure 1).

Very hot summers and very cold winters cause peaks in energy demand, which lead to shortages in energy supply. While the most extreme peaks are usually observed in the summer months when cooling demand is high, winters can be challenging for energy providers as well. In winter 2020, for example, not only did the Iranian National Gas Company (NIGC) urge the Iranian households to consume less natural gas, but also TAVANIR – the Iran Power Generation, Transmission, and Distribution Company – called on the Iranian population to consume less electricity.

Peak Demand of Natural Gas Caused by the Residential and Commercial Sector

The consumption of natural gas by the industrial, agricultural, and transport sector is almost constant throughout the year (see figure 2). The consumption of households and powerplants, on the other hand, varies between seasons. The commercial and residential natural gas consumption is low during summer and high during the cold season since natural gas is used for heating. Natural gas consumption by powerplants shows the opposite pattern: to flatten the overall demand for natural gas during the cold season, powerplants switch to oil and diesel as fuels for power generation*. These consumption patterns burden the energy supply system in Iran. On average, daily natural gas production accounts for 800 million m^3 in Iran (last published in 2019). In the coldest days of January 2020, the residential natural gas consumption alone recorded 600 million m^3 per day. So, 75 % of the daily natural gas production was consumed by the residential sector alone, inevitably leading to supply shortages in the other sectors*.

Figure 2- Monthly consumption of natural gas in different sectors in Iran, 2017°



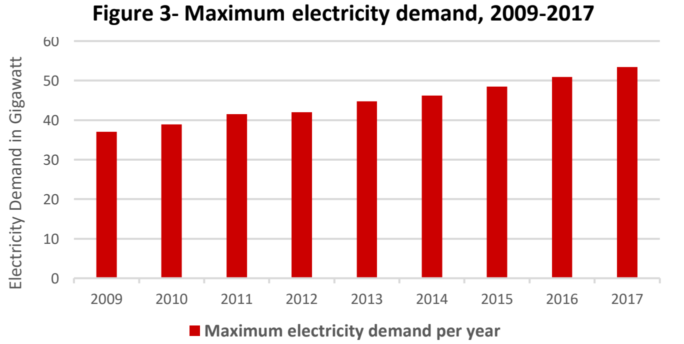
°Based on Persian year 1396: 21/03/2017 to 20/03/2018

Source: Calculated based on NIGC, Energy Balance, IGMC (Iran Grid Management Company) data

Gap between Electricity Demand and Production Leads to Blackouts

While the demand for natural gas peaks in winter, the demand for electricity peaks in the summer when it is mainly used for cooling. A jump in electricity demand due to a heat-wave can lead to a gap between actual power generation and demand, forcing the grid-operator to impose power blackouts strategically. The problem is aggravated by the fact that the average temperature in Iran is rising, which leads to increasing peaks of energy demand. Figure 3 shows that the maximum energy demand has been rising constantly in recent years. Dealing with peaks in energy demand is, therefore, becoming more and more a pressing problem.

Figure 3- Maximum electricity demand, 2009-2017



Source of data: National Energy Balance (2017)

Tackling the Energy Peak Demand Challenge

While energy supply shortages have various adverse effects on the economy, peak energy demands can also harm the environment. In winter, when heating demand by the residential sector is highest, the supply of natural gas to powerplants and big industries is cut. Instead, power plants combust less clean fuels such as diesel and mazut. These fuels have a high content of air pollutants – nitrogen, sulfur, and other particulates – which cause various lethal respiratory diseases. Further, combusting diesel and mazut emits more carbon dioxide and hence intensify global warming.

Tackling peak energy demands is, therefore, not only an economic but also an environmental challenge. One option to deal with it is to increase energy production. But increasing total capacity only to meet the peak demand during a few months of the year requires huge capital costs and can hardly be justified as an economically viable solution. Instead, the energy peak demand challenge should be met without installing new capacities but with increasing the efficiency in energy production, transmission, and distribution. Moreover, setting proper incentives on the demand side is a promising approach. Increasing energy prices, reducing energy subsidies, incentivizing consumers to "flatten" their energy consumption with smart metering and scheduled prices, and reducing the overall energy consumption through investments in energy efficiency are possible adjustments for reducing the maximum energy consumption.

TAVANIR is attempting to shift demand by paying its costumers a compensation for not-consumed kilowatt-hours during peak times.* Although this reduces the energy peak demand, it does not necessarily contribute to reducing the overall energy consumption. Customers may simply consume the same amount of energy – only at a different point in time. In contrast, replacing low-efficiency technologies with more efficient ones could result in a much lower overall energy consumption – not only during peak times. Investing in energy efficiency is accordingly more effective in tackling the challenge of short-term energy supply shortages sustainably.

Read More:

Mohammadi, B., et al., Spatial Distribution of Thermal Stresses in Iran Based on PET and UTCI Indices, applied ecology and environmental research, 16(5):5423-5445, 2018

Iran Energy Balance, 2017

http://energy.isti.ir/index.aspx?fkeyid=&siteid=17&pageid=21200&siteid=17

https://www.tehrantimes.com/news/436178/Iran-electricity-issue-should-we-expect-blackouts-again

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