Amid tensions over energy prices and production, how do electricity consumption data describe household and enterprise behaviour?

High-frequency monitoring of household and business electricity consumption, based on Enedis and RTE (Electricity Transmission Network) data, provides useful information for assessing the economic situation in Q4 2022, marked by the uncertainties associated with energy.

In the manufacturing industry, excluding the coke and refined petroleum products branch, affected as it is by occasional strikes, consumption by industrial sites connected directly to RTE, adjusted for seasonal variations, fell by 13% in October compared to its average over Q3 2022. During November, the decline intensified, to -16%. While this lower consumption may be partly the result of energy savings with no impact on production, it may also reflect a decline in industrial activity.

In October and November, household electricity consumption, adjusted for seasonal variations, looks set to be down 17% compared to the Q3 2022 average. Temperatures were particularly mild in October and November, which probably accounts for about half of this decline. The other half could be the result of changes in behaviour linked to price increases (past or anticipated), and with instructions on energy-saving.

As a result of the fall in domestic demand, the electricity trade balance, which was strongly negative during the summer, picked up temporarily in October and November, according to data published daily by RTE.

Production and consumption were affected by many exogenous factors in Q4, such as strikes in refineries, the continuing unavailability of a large proportion of the country's nuclear plants, geopolitical tensions that kept energy prices at relatively high levels, and mild temperatures in October and November. Given this context, daily data were used to monitor electricity consumption by businesses and households. In fact, in some industrial branches, electricity consumption by businesses has proved to be fairly well correlated to activity[1], while for households, the available electricity consumption data give a good understanding of this field in the context of national accounting.

Electricity consumption in the manufacturing industry, excluding the manufacture of coke and refined petroleum products, was down 13% in October and 16% in November, compared to Q3

To monitor companies' electricity consumption, data on the daily withdrawal of electricity from sites connected directly to RTE were used. RTE is the electricity transmission system operator for high voltages above fifty kilovolts. Thus structurally, the 460 sites connected directly to the network have a high electricity consumption: in sectors where the number of companies connected to the network is high, their electricity consumption is sufficiently representative of that of all the companies in the branch. It can then demonstrate a strong correlation with production in this branch. This correlation is highest in the manufacturing industry[2], and in particular in the sectors of the manufacture of coke and refined petroleum products, manufacture of transport equipment and "other industrial branches" (metallurgy, chemicals, textiles, etc.).

In the "manufacture of coke and refined petroleum products" branch, by monitoring the electricity consumption of companies connected to RTE it is possible to analyse the decline in activity in the sector and the effect of the strikes that touched most of the refineries. In October, electricity consumption[3] by the businesses concerned was 46% down on the average consumption in Q3 2022. This substantial downturn is related to the considerable decline in production in the branch for this same month (industrial production index down 48% compared to the Q3 average). During November, electricity consumption rebounded, reflecting a gradual return to normal activity (►**Figure 1**). Assuming a return to normal in December, all in all, production in the manufacture of coke and refined petroleum products branch is expected to be down considerably across all of Q4 (-23% forecast compared to Q3, or a contribution of -1.2 points to the 2.2% drop in industrial production forecast in Q4).

In the rest of manufacturing industry, electricity consumption by companies connected to RTE also appeared to be well down in October and November: -13% in October[4] then -16% in November, compared to the Q3 2022 average. Consumption declined significantly in the manufacture of transport equipment (-7% in October then -6% in November, compared to the Q3 average) also in "other industrial branches" (-9% in October then -16% in November).

In these two branches, the drop in electricity consumption by companies connected to RTE seems to be too great to be the result only of energy-saving behaviour, without any effect on production. In October, production did indeed decline significantly in the manufacture of transport equipment (-1.5% compared to the average

in Q3) and in "other industrial branches" (-1.0%). Part of this downturn in production can no doubt be interpreted as a consequence of the increase in energy prices which companies in this sector are coping with, especially in "other industrial branches", which include some sectors that consume large amounts of energy.

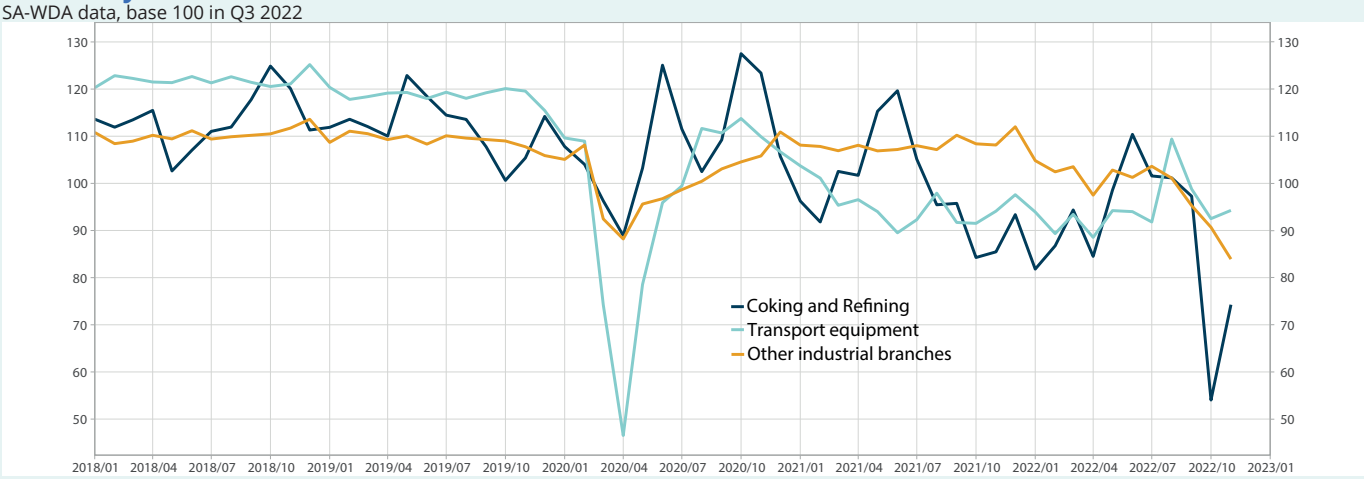
In the manufacture of transport equipment and in "other industrial branches", monthly electricity consumption, as measured from the RTE withdrawal data, is particularly well correlated to their production index (►**Figure 2**). This suggests that in November, production is expected to remain well below its Q3 level (-2.8% in "other industrial branches"). Assuming that in December, production in these two branches retains its November level (in line with activity penalised by energy prices), production would then be in decline across the whole of Q4, by 1.0% for the production of transport equipment and 1.6% in "other industrial branches", compared to Q3. These two branches are therefore likely to account for a little less than one point in the drop in industrial production forecast in Q4.

The mild temperatures in October and November do not fully explain the drop in household electricity consumption

In October, electricity consumption by households within the meaning of national accounting declined by 14% compared to the average observed in Q3. Using daily residential electricity consumption data supplied by Enedis[5], the leading distributor of electricity in France, households' overall electricity consumption could be estimated for November. These data[6] suggest that the drop in consumption is likely to continue significantly into November[7], at 20% below the Q3 2022 average.

►1. Monthly electricity consumption by industrial companies connected directly to RTE, by branch of activity

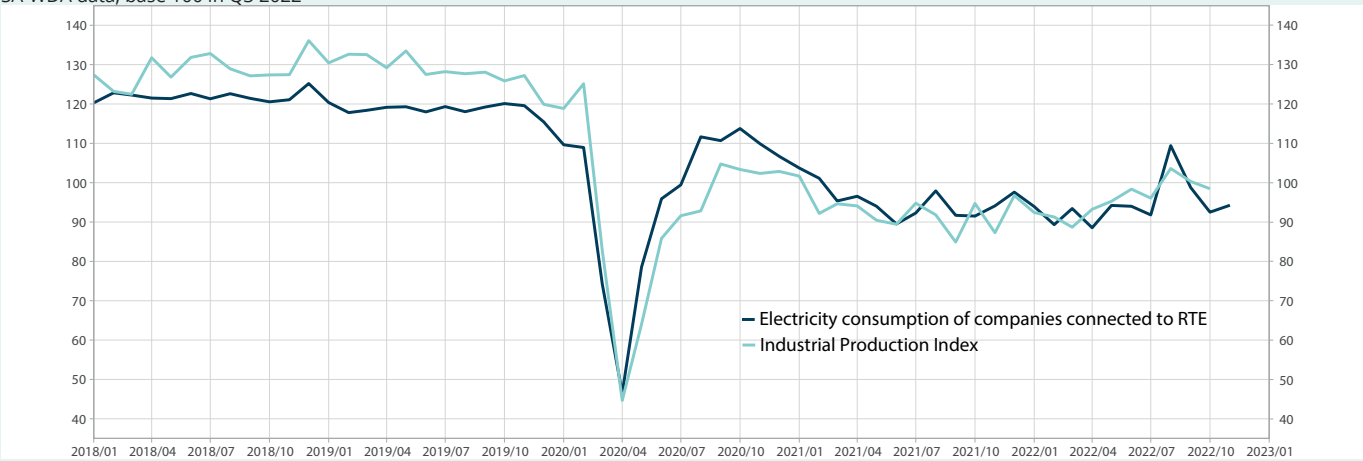
SA-WDA data, base 100 in Q3 2022



Last point: Novembre 2022.
* "Other industrial branches" include the textile, wood, cardboard, printing, chemicals, rubber and plastics industries and the manufacture of mineral and metallurgical products.
How to read it: within the "Coke and refined petroleum" branch, the electricity consumption of companies connected directly to the RTE network declined significantly in October 2022, dropping by 46% compared to the average consumption in 2018 and 2019.
Source: RTE, INSEE calculations

►2. Industrial production and electricity consumption by companies connected to RTE, in the manufacture of transport equipment

SA-WDA data, base 100 in Q3 2022



Last point: November 2022 for electricity consumption, October 2022 for production.
How to read it: in October 2022, electricity consumption by companies in the "transport equipment" sector connected directly to RTE was 7.5% below the Q3 2022 average.
Source: RTE, INSEE, INSEE calculations

This sharp reduction in household electricity consumption came at a time when weather conditions were particularly mild in October and November. By adjusting electricity consumption for variations in the outside temperature (►**Figure 3**), we estimate that in October, 8 percentage points of the 14% decline were probably linked to the favourable weather conditions that month. In November, this contribution is expected to have risen to 9 points (out of 20).

Without the effect of weather conditions, household consumption in October and November would therefore have been 6% and 10% respectively below the average level for Q3 2022. This decline can no doubt be associated with changes in behaviour, due to previous and anticipated increases in electricity prices, uncertainties linked to the energy supply chain, also public encouragement to save energy.

If we assume that in December, weather conditions return to normal[8] but that behavioural effects are maintained, household electricity consumption would decrease by 14% over the whole of Q4. Assuming that household gas consumption falls in the same proportions, their consumption in the "energy, water, waste treatment" branch would fall by around 11% in Q4. This substantial decline would affect total household consumption by around 0.5 points.

The electricity trade balance depends both on production and domestic demand

The drop in electricity consumption by companies and households in Q4 has implications for foreign trade in electricity. RTE data on cross-border electricity[9] trading suggest an upturn in the electricity trade balance, which has been in deficit since March 2022 (more electricity imported than exported). This balance therefore returned to surplus once again in November (►**Figure 4**).

Maintenance work in the nuclear plants affected electricity production from February 2022 onwards, which led to an increase in electricity imports to satisfy domestic demand. At this point the electricity trade balance tumbled, remaining in deficit between March and October 2022. The return to a surplus balance in November, after a sizeable reduction in the deficit in October, is probably linked to a reduction in imports of electricity at the start of Q4, in line with the fall in demand for electricity by households and companies and despite a context where electricity production was still reduced because of the maintenance operations being carried out in the nuclear power plants. Assuming that domestic demand picks up more quickly than production capacities at the very end of the year, the electricity trade balance is likely to decline once again. ●

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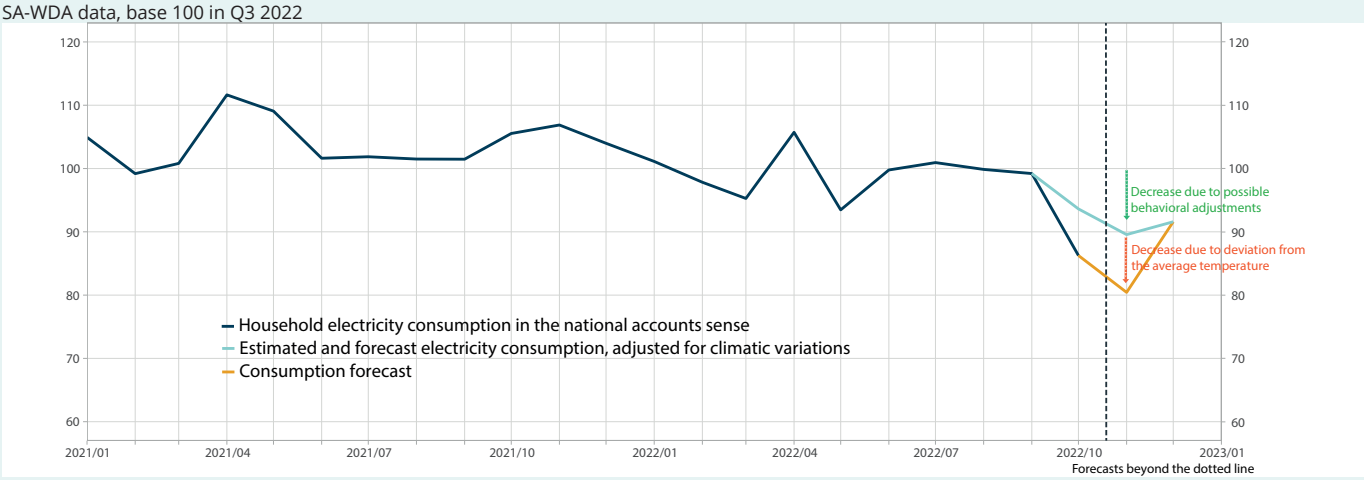
►3. Monthly electricity consumption by households, with and without adjustment for climate variations for October and November

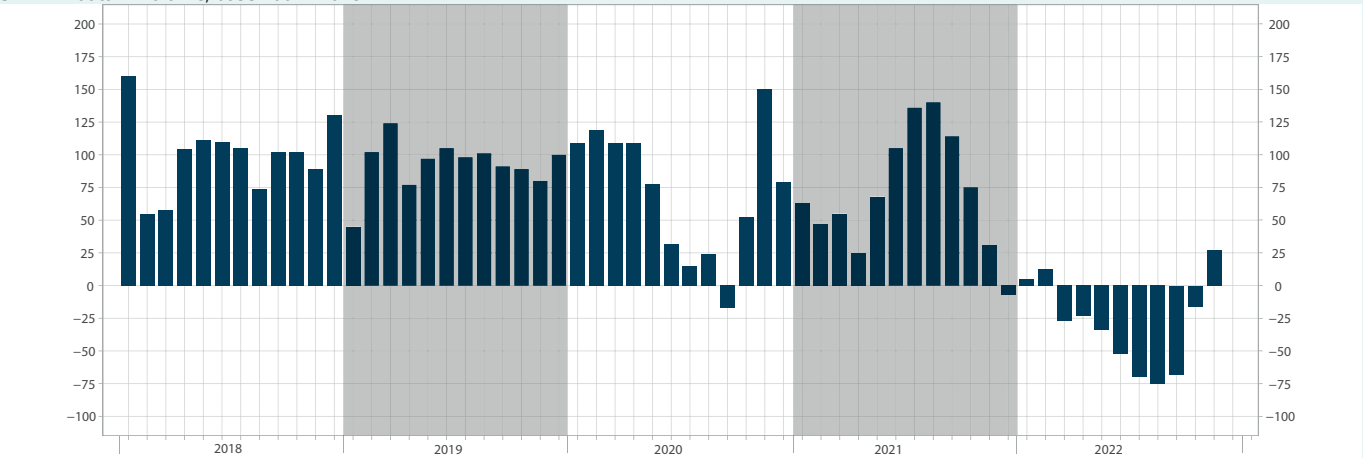
SA-WDA data, base 100 in Q3 2022



Last point: October 2022 for consumption data in the national accounts sense; December 2022 for forecasts.
Note: in November 2022, electricity consumption by households would appear to have been 20% lower than its Q3 2022 average. Of this 20% decline, 9 points would seem to be due to the mild temperatures in November.
Source: INSEE, Enedis, INSEE calculations

►4. Monthly electricity foreign trade balance

SA-WDA data in volume, base 100 in 2018



Last point: November 2022.
How to read it: in October 2022, there would appear to be a deficit in the electricity trade balance, at a value of -16, which corresponds to a drop of 116% compared to its 2018 average; imports would thus appear to be greater than exports. In November 2022, there would seem to be a surplus in the electricity trade balance, at a value of 27, which corresponds to a drop of 73% compared to its 2018 average; imports would thus appear to be less than exports.
Source: RTE, INSEE calculations

Notes

1 *Economic outlook* March 2021, "Can electricity consumption by businesses help improve forecasts of activity, especially in a period of crisis?"
2 The correlation considered here is calculated in each branch between monthly variations in the industrial production index and in electricity consumption (SA-WDA) by companies connected directly to RTE, between January 2018 and September 2022.
3 All the changes mentioned are adjusted for seasonal variations and working days, including those presented later on household consumption.
4 This estimate is produced by weighting the decline in electricity consumption in the different branches according to their weight in industrial production.
5 ***https://db.nomics.world/ENEDIS/ELECTRICITY_BALANCE/Profiled_residential_consumption.FRA.PROFILED_RESIDENTIAL_CONSUMPTION.ALL.ALL.D***
6 After adjustment for seasonal variations and working days.
7 Estimate based on data covering the first 25 days of the month.
8 Based on temperatures observed over the period 2016-2019.
9 RTE publishes on a daily basis the balance of electricity-trading schedules between Metropolitan France excluding Corsica and the six countries with which it is intercon-nected: Germany, Belgium, Spain, Italy, the United Kingdom and Switzerland (***https://www.rte-france.com/eco2mix/les-echanges-commerciaux-aux-frontieres***). These data trace the balances of imports and exports instantly, for a quarter of an hour and a given trading partner. By aggregating these balances into a monthly frequency, the electricity trade balance can be estimated in real time. ●