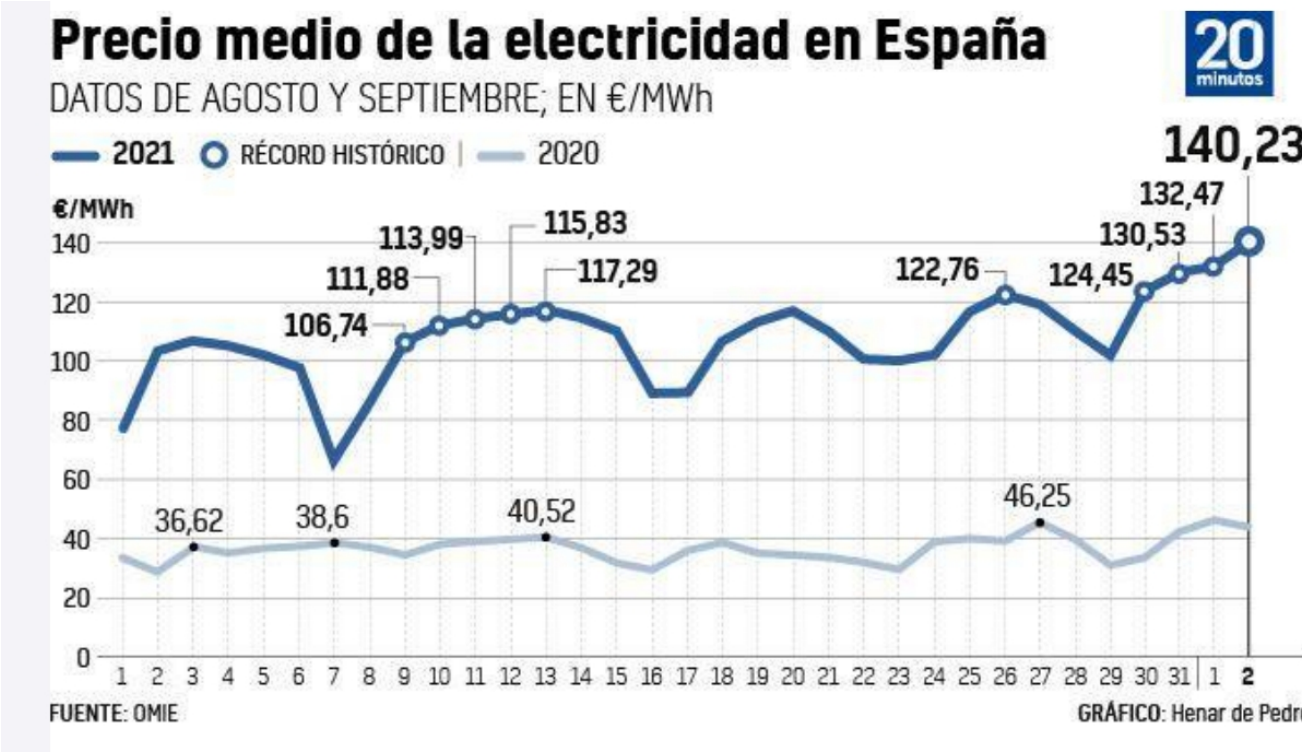

Of electricity and its models, by Juan Avilés and José Antonio Santos

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The use of electricity forms a part of our life, and its cost is a key factor for household consumption and the production of businesses; requiring large investments in the short and long term to obtain increases in capacity. Not being able to be stored, it is considered a *strategic sector*, that is, with a stable framework in general conditions and in tariff revenues (either in the "*intervened*" national model or in the "*liberalized*" international model, because its law imposes the structure of resource allocation in the long term) and consequent planning. Proof of that is that average profits on total assets of the electricity companies was 2.81% in the period 1970-1976, and 2.79% in the period 2014-2020: despite the profound change of model (from 16 companies in the sector it went to 3 large groups and 3 newly established) it barely lost two tenths.

What differentiates the models is the discretion to adapt to the global market: in one case the determination of the general sector conditions is within boarders (production capacity is national); in the other case, the general conditions are derived from the market and its marginal instrumentation to fix prices (the capacity of production is not necessarily national). The electrical sovereignty makes it possible to adapt to the

conditions of the internal market to the world market more efficiently and autonomously for the users than if they are conditioned by distant producers.

At the height of marginal determination of prices is the current Spanish model, which applies the price at which the last demand is met to the entire supply, rather than a weighted average of the prices of the different sources of generation to total consumption; above all, at this stage, in which the supposedly climatic voluntarism distorts the sources of generation of productive capacity and distorts reality.

The international model “sustainable ecologist” (forecasts until 2050)

The model “sustainable ecologist” defended by the Agencia Internacional de la Energía (AEI), has its origin in the book “*The Population Bomb*” (1968) by Paul Ehrlich; in “***Rockefeller Report of The Commission on Population Growth and The American Future***” (1972) by Bernard Berelson; and “*Crisis de la democracia*” (1975) by Crozier, Huntington and Watanabe, which calls for filling the deficiency of democracies through a global state built on the foundations of the UN, and in publications of the Club of Rome, such as “*Los Límites del crecimiento*” (1972). After a pause won by the opposing influence of Herman Kahn and his Hudson Institute (in which Miguel Echegaray collaborated, among others), those of the Club of Rome return to the charge with "*Mas allá de los límites del crecimiento*" (1992), "*Los límites del crecimiento: 30 años despues*" (2004) and "*Limites à la croissance (dans un monde fini)*" (2012) by Meadows and Randers. There are missing names that would make the list (e.g. Maurice Strong with his *Protocolo de Kyoto)* of the Malthusian model (loving the earth and lording one's neighbor) as opposed to the Christian model.

According to their theories, the activity of an excessive humanity provokes gas emissions which accumulate in the form of atmospheric layers, which affects the climate (they do not know well if it is “warming” or “changing). Their solution is to drastically alter human behaviors even though, according to Shindell, “*to lower the earth’s temperature by 1.5 degrees, carbon emissions must be reduced by 40% in the next 12 years*.” This is how the objective is set for “net zero emissions” of CO2 in 2050 (limiting SO2 sulphurs, PM2.5 ash, and NOx nitrogens) that will be achieved by *returning to technologies* that seemed to exceed (now called "renewables" because they come from the sun, water, wood and wind), but that require a large investment per MWh of production.

In their misodemia, they recommend reducing air traffic and saving rail transport to alleviate the effect of NOx or nitrogens; its recipe is a *step backwards in the technological development* of recent decades and alter the homogeneous and complementary vision with the other related technologies. Thus, air limitation should be contrary only to jet propulsion; and, for suitable distances (2-hour journeys), promote the *return to propeller engines* that compete with rail transport. Or maintain turbine flights for *collective aviation* (enough passengers to be less polluting) and severely punish the taxation of preferential flight of aircraft with privileged but very polluting speeds (Phantom type).

In their omniscience, they consider that the climate change debate is "over" and that the more than 31,000 American scientists who have signed the "*The Global Warming Petition Project*" are “denialists”*,* where it reads that: "*There is no convincing scientific*

evidence that the human emission of carbon dioxide and other greenhouse gases is causing or will cause in the near future the warming of the Earth's climate; on the contrary, there is substantial scientific evidence that increased atmospheric carbon dioxide produces beneficial effects on the environment of animals and plants." This aspect of chlorophilic function and photosynthesis implies *that what is missing is forest mass rather than excess carbon dioxide CO2.*

Their policy is to risk catastrophic predictions if their guidelines are not followed; then, when the announced apocalypse was not fulfilled on the announced date, they set another new deadline for earth's destruction (with identical scientific guarantees of error, because the climate is a multifactorial issue and not only of the human factor looked at with antipathy, but its science does not accept this multifactorial reality of the problem, if there is one). What they do get are subsidies for the like-minded (trillions of dollars) and they favor industrial destruction and population control. Their *crab progressivism* goes backwards, in stages to the final goal (which only a few know).

The "sustainable environmentalist" model suppresses coal, oil and fossil fuels (due to their emissions of CO2, NOx, SO2, PM 2.5 and other gases such as sprays) and aims to eliminate nuclear energy in the medium term, when the viable replacement conditions for the whole are met. Meanwhile, they subsidize renewables (wind, solar and others) to the fullest with the aim of reaching at least 50% of the total by 2050. The price is determined marginally (last unit incorporated) and transport and distribution costs plus non-recoverable taxes and fees are added (in Spain almost 40%); together with the above, it represents a qualitative leap to the rise in national prices.

Regarding the acceptance of the international model (data from the Nuclear Forum and AIE)

The publications of the AIE, ecologists (Greenpeace), and academics without borders are categorically opposed to the use of fossil fuels (for emission of gasses and perishable character) as well as nuclear, due to the misfortune that any failure (Chernobyl, Fukushima) in such concentrated facilities entails. Governments follow them closely, but unevenly apply their rules about substitution of fossils and nuclear, as well as the reduction of gas emissions; the reason why the Agenda 2021 converted into the Agenda 2030 and has been delayed until the Agenda 2050.

In a quick summary, it is observed that:

*__Germany__ in 2011, under pressure of the "greens" and Greenpeace, decrees complete abandonment of nuclear in 2022, to be "carbon neutral" (equal emissions and removals of CO2) by adoption of renewable technologies, and sets in 2035 the end of transportation with gasoline or diesel. The figure of emissions of CO2 in 2018 is already 31% lower than the figure from 1990. According to Engdahl, "*this policy has meant moving from one of the cheapest and most reliable systems of electricity production and distribution to one of the most expensive and insecure in the world; energy-intensive industries have had to close or relocate their plants because wing and solar costs are 7 to 9 times higher than gas*."

Given its scarcity of solar hours, Germany's production is concentrated in 30,000 wind turbines, whose action produces new contaminations (death of birds and human health

problems due to constant noise and subsonic noise), in addition to the serious problem of waste when the turbines reach their obsolescence. In the solar, magnifying glass effects in the form of lightning concentration (infrared, ultraviolet and 25 other types) alter by radiation the human skin and the base ground. And in lithium batteries, their "real footprint" (considered with their mining and production) exceeds that of diesel; and the network of battery charging terminals will need a new reliable electricity network.

Apart from definitively breaking the model of nuclear collaboration (EDF-EOn) with France and that the tax necessary to finance this idea will only aggravate the situation, they have adopted the preventive measure (received this time without the "green" environmental protest) of agreeing with Russia (Gazprom through Nordstream) the necessary gas supplies.

*__Spain__ has obtained 66% of its production with non-CO2 omitting sources, and has lowered its CO2 emissions to almost 36M of Tm (from 75M of Tm in 2017); the situation in 2018 is 15.5% higher than the level of emissions in 1990. Currently, after Garoña closed, it has 7 nuclear power plants and none under construction, planned, or proposed.

*__Europe__ emits 11% of the total global CO2, and is expected to lower this percentage to 7% in 2040. Currently, Europe has 92 nuclear power plants, plus 2 in construction, 3 planned, and 7 proposed (Poland 6 and Romania 1).

*The __USA__ emits 14% of the total global CO2 and is expected to lower this percentage to 10% in 2040. Currently, the USA has 96 nuclear power plants, plus 2 in construction, 3 planned, and 18 proposed. Also, the __UK__ has 15 nuclear power plants, plus 1 in construction, 3 planned, and 6 proposed.

*__Japan__ emits 3% of the total global CO2, and is expected to lower this percentage to 2% in 2040. Currently, Japan has 37 nuclear power plants, plus 2 in construction, 1 planned, and 8 proposed.

*__Russia__ emits 5% of the total global CO2, and is expected to lower this percentage to 4.4% in 2040. Currently, Russia has 38 nuclear power plants, plus 3 in construction, 21 planned, and 23 proposed.

*__Communist China__ emits 29.3% of the total global CO2, and is expected to stay at this percentage in 2040. Currently, Communist China has 48 nuclear power plants, plus 10 in construction, 43 planned, and 170 proposed, whose cost is half of the power plants in the developed world (which have much greater guarantees).

*__India__ emits 7% of the total global CO2, and is expected to increase this percentage to 10% in 2040. Currently, India has 22 nuclear power plants, plus 7 in construction, 14 planned, and 28 proposed, at a cost similar to the power plants of China.

*__Southeast Asia__ emits 5% of the total global CO2, and is expected to increase this percentage to 7% in 2040. Its breakdown of nuclear power plants and plans are not known, but it follows the pattern of other eastern countries.

*In summary, the approximate gas emissions in 2019 and by economic areas are 59% in the East (China, India, Russia, the Middle East, Japan, and Southeast Asia), 28% in the West (USA, South Africa, Europe and Brazil), and 13% in the rest of the world.

- From the above data it can be concluded that:

***Europe** (with the exception of Poland) exactly follows the provisions of the international model AIE, although France remains in its national nuclear specialization because it has no other policy and **Spain** would like to be able to afford to fall fully into this international policy (or that of the French EDF at least).

***USA, United Kingdom** and **Japan,** follow the recommendations of the AIE with interest, but from afar, and on specific issues, since they maintain a national policy.

***Russia, India, Communist China** and **Southeast Asia,** oblivious to the pressures of the "greens" and Greenpeace, ignore the recommendations of the AIE and maintain national policies, highly polluting and of little security; e.g. China pollutes more than the US and Europe combined. Its acceptance of the AIE isonomy is "half-hearted".

Spain, with the national model of electric sovereignty

To organize production activity of electric energy with a solid base, Spain established the Plan de Electricidad 1954-1963, the Plan Eléctrico Nacional 1972-1981, the Plan Energético Nacional, or PEN 1972-1981 and, in response to the oil crisis (6-X-1973), the PEN 1975-1985, and the PEN 1978-1987. All of them insist on the need to favor Spanish energy autonomy due to the strategic nature of avoiding external energy dependence given the uncertainty and scarcity of the world supply for the economy and households, for which a favorable framework of self-financing is established.

In short, once the direct energy of water, sun and wind has been discarded due to its low productivity (which then resumes between 1990-2020), the traditional model maintains hydraulics (swamps of the 1940s-1960s), coal (development between 1960-1980 despite its cost, for the benefits for regions in need) and nuclear energy (development between 1975-1990) to replace the sources that demand foreign exchange (oil and natural gas, which develop between 1985-2020), waiting for conditions that do not imply a loss of foreign currency.

Prices are set by "unified tariff-caps" and an OFILE (Energy Liquidation Office) is used to compensate producers or consumers as the case may be.

Source: PEN 1975-1985 and own elaboration.

Spain, with the international ecological model of electricity import

With PEN 1983-1992 and the more recent PEN 1991-2000 there was a change of model in the field of ideas that will later be the international model of the AIE: optimize the protection of the environment, diversify the electricity production and reduce costs to be equal in their conditions to those of the European model with their marginal prices. However, after three decades of approaching the international model, the relevant data of the Spanish market in 2020 are:

1.- As for the utilization of capacity in Spain

*__nuclear__ at 22.2% (with installed capacity of 6.4% of the total, and average operation of 7,834 hours -the annual maximum is 8,260- therefore 95% of the possible total);

***wind power** at 21.8% (installed capacity of 24.7% of the total and only 2,013 hours; which is only 26% of the hours of nuclear use);

***combined cycle** at 17.5% (installed capacity of 23.8% of the total and 1,675 hours);

***hydraulic** at 12.1% (installed capacity of 15.5% of the total and 1,788 hours); or 21% with mini-hydraulics;

***cogeneration** at 10.7% (installed capacity of 5.1% of the total and 4,785 hours);

***solar photovoltaic** at 6.1% (installed capacity of 10.5% of the total and 1,322 hours, which is 17% of nuclear use);

***solar thermal** at 1.8% (installed capacity of 2.1% of the total and 1,970 hours, which is 25% of nuclear use);

***coal** at 2% (with installed capacity of 5.2% of the total and 876 hours);

***other renewables** at 1.7% and others of a residual nature that add up to 3.8%.

*Deducting the consumption in pumping and added the imports, the **demand adds up to 249,819 GWh**. And deducting the losses in transport and distribution (9.3% of demand), **final consumption was 226,464 GWh.**

- From the above data it can be concluded that**:**

*only nuclear and cogeneration generate at full capacity, while the other sources produce below their capacity; and 75.4% comes from nuclear, combined cycle, hydraulics, mini-hydraulics and cogeneration;

*renewables generate 24.6% of the total (which does not permit voluntarily due to scarce and discontinuous use, difficult connection with the general grid, high costs per KWh produced and difficult to increase in quantity given its natural limit -duration and intensity of winds, productive hours of sunshine-); including mini-hydraulics here only obscures the analysis;

*coal is already almost entirely imported;

*and transport losses are almost double the 5% average for France.

2.- Regarding the prospects of Spanish electricity activity until 2050.

*__Nuclear__: the age of Spanish nuclear power plants is around 30 years with intensive use (90%);
its useful life ends by 2040 with no replacement reactor under construction, planned or proposed. Therefore, nuclear will be reduced over time and there will be a gap of 22% in the total generation by 2040.

*__Natural gas:__ in the period its weight will be reduced from the current 18%, due to price increases linked to the exhaustion of its availability.

*__Oil:__ with main use for transport and a current weight of 40% of the total, it will decrease due to the replacement of electric motors and other reasons similar to those of gas.

*__Coal:__ if in 2020 its use is already purely residual because it is a natural pollutant, at the end of the new period it will have disappeared as a source of electricity generation.

These are three energy sources whose contribution has to be replaced (80% of the total).

*__Hydraulics:__ being the only reliable green energy to replace nuclear and fossil energies that are suppressed, it should be intensified to the maximum (there are no forecasts of new jumps, only some mini-hydraulics).

*__Renewables:__ the forecast for wind and solar photovoltaic and thermal is that they will go from the current 14% to more than 50% in 2050; with the production and pollution limitations already mentioned and its low productivity does not seem to be an accurate forecast.

*__Imports:__ *the balance of electricity generation in 2050 can only come from French or Moroccan energy imports, with the consequent dependence on quantities and prices for all Spanish companies and households.*

3.- Regarding the current Spanish situation in the energy sector.

The isonomy of our demostes follows the global pleonexia: a servile follow-up to Brussels (to the ideas of the AIE) that is reflected in the prohibitive levels of electricity prices for households and companies and in the international model of import (that they invent and work) or *liquidation by demolition* of the national model.

*The market is balanced at the prohibitive prices indicated only by the *import of energy:* French nuclear (EDF has 59 plants, with surplus over local demand), and the start of imports of Moroccan polluting production and Algerian natural gas (Tarifa and Medgaz gas pipelines).

Without going any further*, all the investment made in renewable technologies (not including taxation) is equivalent to 4 nuclear reactors of 1,500 MWh;* the respective productivity is so different that we renounce to unravel a political, technical and economic error so patent. If anything, a Gulliver of 1500 MWh capacity does not equate to 500 Lilliputians with 3 MWh (by difference in operating hours, rigidity of renewable supply from a natural level and because nuclear pulls national research and science in search of nuclear fusion and hydrogen).

Although the nuclear cost in Europe is the highest in the world due to safety requirements ($6,600/MWh, higher than the 5,500 in the US and 2,200 in Communist China) these 4 plants (new or purchased from EDF for their useful life) would balance the situation.

*Another simple way to balance the electricity market and its prices would be to recover coal-fired thermal generation, recently suppressed for reasons of national emergency. For the same emergency reasons, coal thermal generation can be recovered in plants that have adequate anti-pollution conditions (desulphurization, denitrification and others) and selecting international coal (for its sulfur, volatile, humidity and other grades) for its activity.

With this measure, production can be increased between 20 and 30% of the national total; and, as these are plants that have been recently decommissioned, they would be incorporated, for similar reasons of national emergency, as *a new generation* to the electricity market (with a residual value of approximately 10% of the cost of a new plant and whose useful life, with the protective anti-pollution and derived measures, can be extended in another 20 years of full operation to about 5,000 hours per year) and could even constitute a new National Company of Electricity to pilot this project.

The price of the MWh produced would return to the level of previous years: unpleasant to the beneficiary renewables, but solving the needs of households and companies.

*The lack of a national political criterion for the electricity sector threatens the future of electricity production supply and *encourages speculative operations.* Thus:
- the transfer to ENEL of Endesa (that "jewel in the crown" that would have been more logical, in economic and strategic terms by Spain towards Europe, that would have absorbed the Italian instead of its obscure transfer without exercising the gold share);
- the transfer to EDP of Hidro Cantábrico (which is now from the Chinese Tres Gargantas), both to national detriment;
- to them we must add the strange opa in progress to the Catalan Naturgy (2021).

The picture is more clouded if one considers the relocation of Iberdrola as the largest Basque company (perhaps as a premium for Lemóniz) and the distribution of Repsol (what remains of the old Campsa) between Basques and Catalans.

And the picture becomes darker when seeing party members access the management of the boards of directors for the sole merit of the "revolving doors" (the sad case of the Savings Banks is an ominous precedent that flies over as an example of the limitation of the *illustrated* model).

Sources:

A.E.I. "Net Zero By 2050".
Nuclear Forum, Energy Reports 2021, 2020, 2019, 2018, 2017, 2016.
Chemical Engineering, Reports 1977, 1980, 1990, 1994.
P.E.N. 1975-1985.