The Future Electricity Mix in France - Who Will Pay?

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Major environmental, energy and economic choices

France faces five major environmental, energy and economic choices in deciding on the forms of its electricity generation and their share in the mix.

These choices involve the level of CO_2 emissions, the development of new sources of renewable energy (mainly onshore wind, offshore wind and solar photovoltaic power), energy savings, nuclear power generation and the cost to the community.

CO_2 emissions and the environment

Based on current sources of electricity generation, which are mainly nuclear (~76% of total electricity generation) and hydropower (~12%), the carbon footprint associated with electricity generation in France is among the lowest in Europe (70-80 g/kWh of CO_2 versus an average of 350 g/kWh for Europe).

Do we want to maintain this virtually "carbon-free" footprint for France's electricity generation or not?

New sources of renewable energy

If new forms of renewable energy (such as onshore wind, offshore wind and solar photovoltaic power) replace carbon-emitting sources of power generation (coal, natural gas and petroleum), they can help to further reduce CO_2 emissions.

To what extent and to what purpose do we want to develop renewable energies? Do we want to expand renewable energies within the limits of their competitiveness compared to other means of electricity generation? Or do we want to develop renewable energies to the maximum extent possible, only taking into account physical constraints such as available space?

Energy savings

Energy demand management (EDM) measures can not only avoid carbon-emitting power generation but also contribute to lowering final CO_2 emissions. One example is the replacement of traditional incandescent light bulbs by low-energy bulbs.[1]

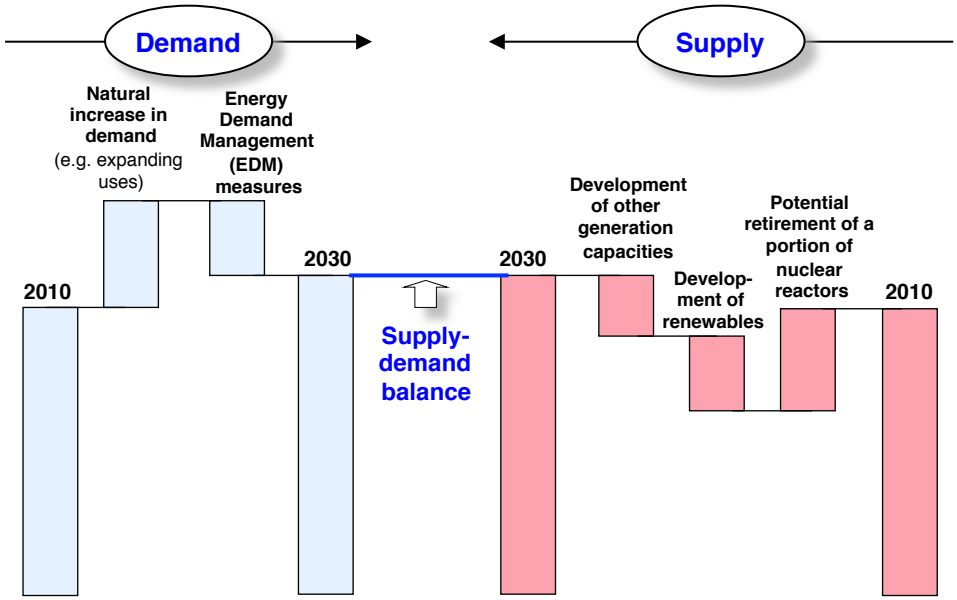
To what extent and to what purpose do we want to develop energy demand reduction (EDR) measures, such as upgrading thermal insulation in buildings and replacing traditional electrical equipment with energy-saving substitutes? Do we want to encourage only economically competitive measures, i.e. those whose cost of implementation is lower than the cost of producing the energy saved? Or do we want to proactively implement all energy-efficiency measures, regardless of cost?

[1] Replacing 60-watt incandescent bulbs with low-energy (i.e. low wattage) bulbs of 11 watts, for example, which produce the same amount of light.

- Figure 1 -

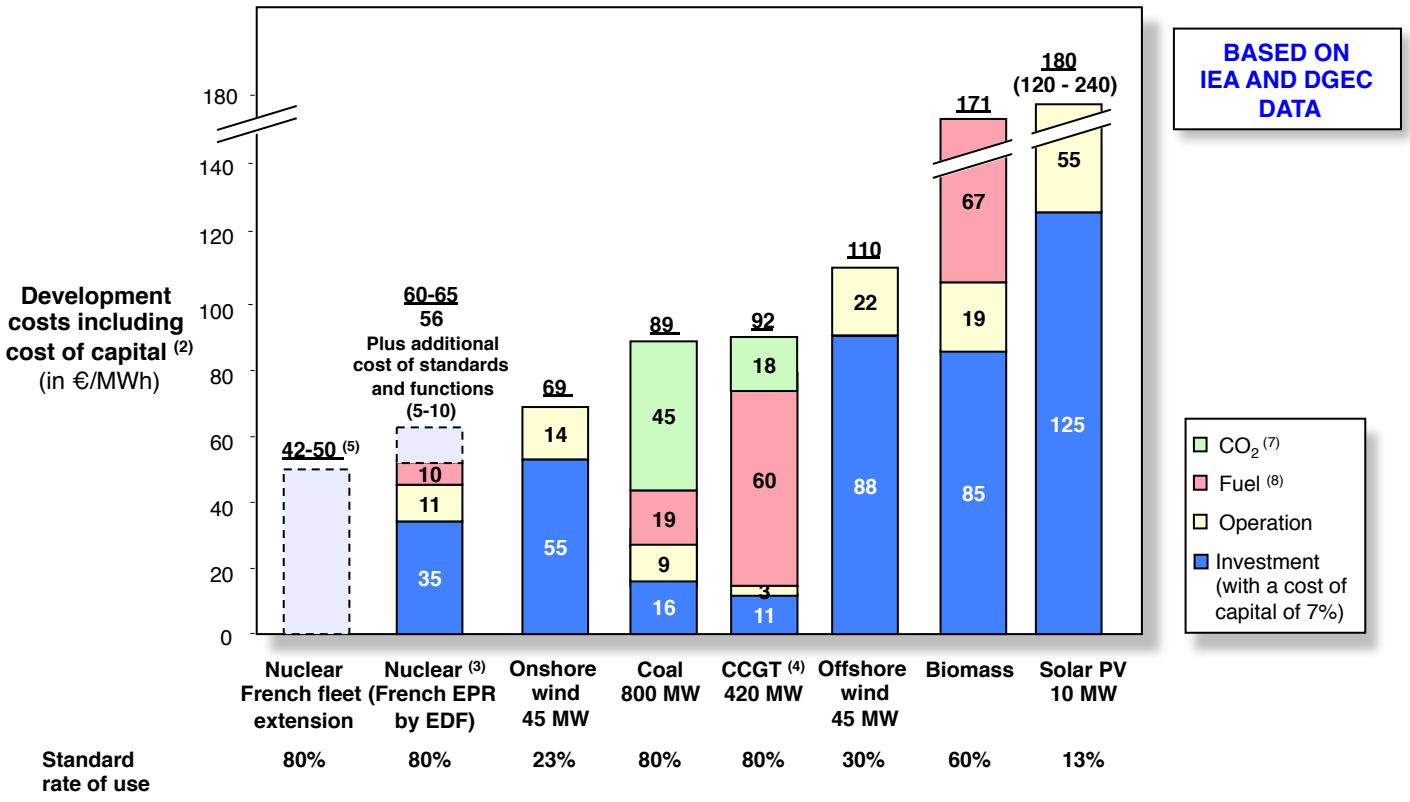
Supply-Demand Balance

ILLUSTRATION



- Figure 2 -

Competitiveness of Electricity Generation Sources -
2030 – Data in euros at constant 2010 levels



(1) Includes (non-productive) construction periods; (2) After-tax nominal WACC; (3) Excluding decommissioning and waste treatment costs; excluding "first-in-series" effect; (4) With efficiency of 57%, excluding development cost of gas networks; (5) €42/MWh in 2012 with potential increase to €50/MWh in 2030; (6) Uranium at $70/pound, gas at $14/MMBtu (€34/MWh), oil at $150/barrel, coal at $100/t; (7) CO_2 at €50/t; Note: Based on the assumption of 5% annual global growth and 1.5% annual growth in France, expressed in current currency.
Sources: IEA, DGEC (French General Directorate for Energy and Climate), Union Française de l'Electricité (UFE), and Estin & Co analyses and estimates.

Nuclear power generation

France's nuclear generation fleet consists of 58 power reactors, mainly built in the 1980s. By 2030, the majority of these reactors (about 45 of the existing 58) will have reached the end of their 40-year life span. An option exists to extend their operating life by 10 to 20 years.

Do we want to extend the operating life of our nuclear power plants by another 10 to 20 years? Or proceed with the early retirement of all or a portion of the power reactors reaching the end of their 40 years, to limit the "nuclear risk?"

Cost to the community

The cost of electricity in France is currently among the lowest in Europe (the price paid by residential users is 35% lower, on average, than in other European countries).

Do we want to continue to sustainably minimize the cost of electricity generation for the community (the state, electricity producers, residential users and energy-intensive companies[2])?

We need to make choices. We can't have it all.

It is not possible to combine the most "ambitious" choices in each of the above areas: low CO_2 emissions, strong renewable energy growth, strong development of demand-management measures, early retirement of nuclear reactors and low cost to the community.

We need to make choices.

These choices must achieve a balance between electricity supply and demand (see Figure 1). They must also factor in the economic competitiveness of the various forms of electricity generation (see Figure 2).

What are the possible options, and what will the economic and environmental costs be?

As an illustration, three coherent options are possible for 2030 (see Figure 3).

Option 1: Development of renewables (as per "Grenelle" laws) + nuclear life extension + competitive energy demand management (EDM)

This option would result in moderate public investment[3] (€117 billion over 20 years), a price[4] of €50-55 per kWh and a low CO_2 footprint for electricity generation (17 Mt in 2030, versus 34 Mt in 2010).

Option 2: Strong development of renewables + 50% of nuclear plants extended + competitive energy demand management (EDM)

This option would result in public overinvestment[3] (€165 billion over 20 years), a price[4] of €75-80 per kWh (45% higher than Option 1) and a larger CO_2 footprint for electricity generation (44 Mt in 2030).

Option 3: Very strong development of renewables + no nuclear life extension + competitive energy demand management (EDM)

This option would result in very significant public overinvestment[3] (€209 billion over 20 years), a price[4] of €90-95 per kWh (75% higher than Option 1) and a significantly larger CO_2 footprint for electricity generation (103 Mt in 2030).

Who can pay the economic cost?

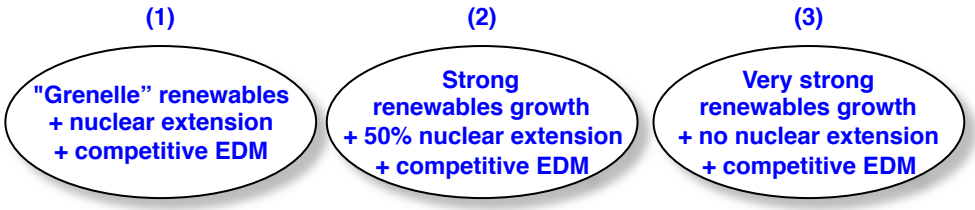
In the current state of affairs, economic players do not have the means to finance options involving overinvestment (involving the proactive development of renewables and/or EDM measures or the non-optimized early retirement of existing nuclear power reactors).

[2] Companies operating in the steelmaking and aluminium smelting industries, for example.
[3] Investments in electricity generation facilities.
[4] Price based on production only (on the basis of average cost of development of facilities), including the value of exports.

- Figure 3 -

Examples of Possible Options and Economic and Environmental Costs

Simplified view



Generation capacity 2030 (GW)				
Nuclear		66	41	16
Renewables	**Onshore wind**	22	25	30
	Other (1)	16	25	33
Gas (CCGT)		9	17	32
2010-2030 investments in generation capacities (€ billions)		117	165	209
Price based on production (2) (€/kWh)		50-55	75-80	90-95
CO_2 footprint of electricity generation (Mt)		17	44	103

(1) Offshore wind and photovoltaic power; (2) Price based on production only (on the basis of average cost of development of the facilities), including value of any exports

Sources: Union Française de l'Electricité (UFE), and Estin & Co analyses and estimates.

- With an annual budget deficit of about €90 billion in 2011 (for revenue of €270 billion, i.e. a deficit accounting for 33% of revenue), the French state does not have the financial flexibility needed.
- Electricity producers will be limited in their capacity to invest, if electricity prices continue to be regulated and remain low.
- As for residential users, if electricity prices are increased to finance overinvestment, their purchasing power will shrink (by €200-500 per year, with Options 2 or 3). Meanwhile, their purchasing power is already being challenged by current and future economic difficulties.
- If electricity prices are increased to finance overinvestment, energy-intensive companies will become less competitive (losing 2-8 points of EBIT margin, averaging 8% of revenue). Meanwhile, margins are already being squeezed by the current trend toward overcapacity (as demand shifts from developed markets to emerging markets, due to rapid growth mainly in China and emerging Asian economies).

Conclusion – What should we do?

Scenario 1 – Optimized "carbon-free" strategy

The strategy is to develop a "carbon-free" electricity system emitting very low amounts of CO_2, by promoting competitive EDM measures, optimally extending the lives of nuclear power reactors and developing competitive sources of renewable energy (for example, onshore wind power rather than offshore wind or solar photovoltaic power).

In this scenario, investments and prices remain moderate and the CO_2 footprint of electricity generation stays low.

Scenario 2 – "Energy transition"

The strategy is to develop renewable energies and/or EDM measures without considering economic competitiveness and to retire existing nuclear power reactors without optimizing their life span.

In this scenario, funds must be reallocated to finance the overinvestment.

- If the state continues to keep regulated electricity prices low, it must find other sources of financing the investment, by generating more savings and/or more revenue in areas other than electricity. (Any future government will be required to identify these areas, if this option is chosen.)
- If electricity prices are increased to finance investments, energy-intensive companies must find new drivers of competitiveness, such as better-performing technologies or reduced labor costs. (Will this further increase the risk of industrial relocation?)
- Likewise, if electricity prices are increased to finance investments, residential users will have to redirect their spending: fewer computers, smartphones and tablets; shorter vacations to destinations closer to home; and less expensive, less frequent recreational and cultural activities. (Is public opinion ready for this?)

In this case, other ways to reduce CO_2 will also have to be found, because the CO_2 footprint of electricity generation will increase: less fossil fuel-based transportation (road and air), less fossil-fired heating (gas and oil) and less industrial production.

The other alternative is to give up our CO_2 emission-reduction ambitions.

After all, other than setting an example, the decisions made by European states at a national level will have little impact on the global carbon footprint—the only one that really counts from an environmental perspective—if fast-growing emerging market economies (led by China) do not share the effort.

Like any business, France's government and community need to make choices. We can't have it all for France's future electricity mix in 2030. We need to set priorities, understand what the financial impact will be and decide who will pay.

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Estin & Co is an international strategy consultancy based in Paris, London, Geneva and Shanghai. The firm assists the boards of major European, North American and Asian groups in their growth strategies, and private equity funds in analyzing and improving the value of their investments.

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