

## Energy and territories: new breaking points and new cohesions

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### Summary

*In the context of energy depletion and climate change, Gérard Magnin, Executive Director of the Energie-Cités association, invites us to reflect on the relationship between energy and land. After showing how the two industrial revolutions have progressively destroyed the link between a territory, its economic activities and its energy resources, thus ultimately resulting in the loss of a sense of responsibility of an individual vis-à-vis the energy consumption, he proposes an analysis of different energy models implemented in European countries. Two major models emerge: the centralized model in which the expertise comes to specific institutions, bringing about the disempowerment of consumers, and the decentralized model that relies on expertise which is more widespread in a society and which gives local players a prominent place. The need to address energy and climate challenges of tomorrow calls for a profound change in our relationship to energy resources, based both on reducing energy consumption and restoring the link between territory and energy. This paradigm shift, provided that it takes form of a real breaking point, will also turn out to be an opportunity for a greater cohesion and strengthening of democracy within our societies.*

### Presentation of Energie-Cités

Energie-Cités ([www.energie-cites.eu](http://www.energie-cites.eu)), of which I am the Executive Director, is similar to a multinational, nonprofit SME, in the form of an association. Mainly based in Besançon (headquarters), Brussels, Freiburg and Paris, it has 18 employees of different nationalities. The association's activity revolves around the issue of relationship between the energy and the territory, particularly the city. It was founded in 1990, in a period where these issues were not nearly as hot as today. At that time, we used to work with 6 cities in 5 countries. Today, some 1 000 cities in 30 countries are involved in our work.

Energie-Cités is currently chaired by the mayor of the city of Heidelberg and has a board of directors comprising 11 municipalities from 11 European countries. It aims to help cities to devise their energy future that would necessarily be very different from the position they are in today. Even if we are well aware that we are heading towards a dead end for everything concerning such issues as climate order, energy vulnerability and security of supply, we still have trouble believing that it might be true.

We regularly gather at Saline to organize seminars as part of the initiative "Imagine the energy future of your city". Therefore, between November 17<sup>th</sup> and 19<sup>th</sup> this year, we are going to organize the fourth international seminar of this kind, which will focus on the theme "Different views on the city of low consumption".

## **Impact of the 1<sup>st</sup> industrial revolution on the energy/territory relationship**

It is interesting to note that Saline Royale has been created for energy reasons: depletion of forest near the source of salt has led to relocation of the facility to a new place, situated near the second largest forest of France. At that time, the relationship between a territory, its human and economic activities, as well as its energy supply, was very strong. Indeed, before the first industrial revolution, no human or economic activity could distance itself from energy resources of the natural environment in the immediate surrounding. Development of any region was extremely limited by access to energy resources. The first industrial revolution (the one of coal and steel) was a landmark in terms of providing the possibility of transporting raw materials and fuel. This has gradually enabled to produce various goods in different places and territories. Even if, like in France, steel and textile industries were rather developed in the North and East, where coal resources were located, the revolution has brought about, step by step, the first atomization of production and specialization of territories. And by the way, also at that time were developed economic theories on international trade, specialization, etc. However, these are still regions, where coal resources are located, that we consider to be deemed "rich" and more developed in terms of economy.

## **Impact of the 2<sup>nd</sup> Industrial Revolution on the energy/territory relationship**

The second industrial revolution (the one of oil, interconnected electricity and gas) has accelerated this process. It has allowed territories to overcome the energy dependence in their own environment. With this 2<sup>nd</sup> industrial revolution, the divorce between human and economic activities and sources of supply became total. It has simultaneously led to a complete loss of customers' sense of responsibility: since then, they have been ignoring the question of where the energy they use comes from. The only fact that matters now is that the energy allows different things to work properly. This lack of accountability results from the total disconnection between what we do, the energy required to do so and the environmental impact of our consumption. It is this irresponsibility, which is the cause of the situation we have today (major energy tensions are sources of geopolitical tensions and outbreaks of armed conflicts). Since the 2<sup>nd</sup> industrial revolution until recently, the precautionary management of environmental resources has no longer been a matter of survival, as it was the case in the past. We have even established a dogma, whether in the capitalist / liberal or Marxist approach, that the fact of humanity going beyond the constraints of the natural environment constitutes the "progress". Thus, there are no more limits, both individually and collectively, and no more reasons to worry about the consequences of our actions in a system that simply makes us feel less accountable.

## **Challenges of tomorrow**

We are entering a revolution that some have termed a postindustrial one, where we see the urgent need to link our activities to resources, emissions and waste. Indeed, the question is how we will govern the climate globally, that is to say, how to measure the responsibilities for each country and establish mechanisms to reduce the emissions in significant proportions. We are therefore moving towards a system of global governance of climate with distribution of ration coupons for greenhouse gas emissions and consequently for energy as well, since these are energies that are responsible for 80% of emissions. This is the principle of the Kyoto Protocol and what is going to follow as the result of negotiations held in Copenhagen in December 2009.

In this new context, one can wonder if the "progress" nowadays is not the ability of a mankind to reconcile with resources of the environment and to find the tools that allow us to become

responsible again as individuals, as territory, or as enterprises vis-à-vis our energy supply and environmental impact of our activities.

From the Kyoto Protocol to the requirement for local communities to implement energy-climate plans, there are many examples that illustrate this new direction. The total irresponsibility is now being replaced by a growing responsibility.

### **The question of how to organize societies in their relation to energy**

Faced with these questions, reactions of particular countries differ from one to another, since the organization of society and the one of energy are ultimately intertwined. Historically, there are three zones in Europe:

- One zone that extends from the UK and Ireland to Greece via France, Italy and Spain, where energy systems have been centralized. As for the energy system, I understand the electric system, because even if the electricity makes only for 20% of the final consumption, the electric system drives the whole energy system of a country. In this zone, cities have virtually no power, no recognized competence to ensure the energy supply in their territory.
- Another zone, stretching from Scandinavia to Austria through Germany, Switzerland, etc. It is composed of federal countries with strong local power, where the energy system has a very high dose of decentralization. In this zone, it is the responsibility of cities to ensure the energy supply in their territory.
- The area of Eastern Europe, where countries used to mix a highly centralized system from the point of view of energy, with decentralized production systems within cities. The countries in this area will progressively resemble the countries of the second zone.

We can classify European countries into two groups (centralized countries strongly influenced by Catholicism and decentralized countries with a rather Protestant tradition) and thus illustrate the coincidence between the organization of a society and the organization of an energy system.

In France, about 80% of electricity (or 17% of final energy consumption) is nuclear, which implies the centralized system. In Denmark, 63% of electricity comes from cogeneration plants (installations that allow to use the heat produced during processing of a fuel into electricity and thus to utilize almost 100% of energy instead of 34%) and 16% from the wind. In Denmark, nearly 80% of electricity (equivalent to production of nuclear origin in France) is produced in a decentralized manner. These examples illustrate the two opposite patterns, which can be found in Europe. In between, there is a wide spectrum of different situations.

### **The place of expertise in centralized and decentralized model**

In a decentralized model, municipalities play an important role insofar as they found themselves entrusted with the responsibility to supply energy to their city, which, inter alia, might also imply the production based on their territory. As the consequence, expertise in the field of energy is better distributed throughout the country. On the contrary, in centralized countries, the expertise is centralized within national companies specialized in energy issues. Such better distribution of energy experts in decentralized systems also explains the fact that Austria holds the record for the number of solar collectors per capita. Similarly, in Switzerland, there is no single year without at least one vote on some energy issue. It should be noted that in France, the electronuclear program decided in February 1974, at no time has been submitted to parliament. And even if today, the parliament deals every day with amendments

to wind power regulations, the very core of energy issues – nuclear power – remains somewhat outside the system.

### **Towards the new paradigm**

As new technologies arrive, our energy paradigm is now going through a major change. Our traditional French system of producing, transporting and distributing the energy has many benefits but has eventually overshadowed the issue of consumption and its determinants. So we built poorly insulated houses, we organized cities and suburban areas independently of any consideration of energy, developed cities using the concentric zone model, etc. Generally speaking, the consumer systems have been designed independently of their impact on energy.

The approach which is more focused on the consumption is in the process of being born today and is reflected in the construction of low-energy, zero-energy and positive energy buildings, and other measures. This approach relies on the fact that nobody desires energy as a final good. Instead, we need comfort, heating, we need to move, produce, operate different devices etc. and energy is a means through which we can achieve these goals. The aim is not to consume energy for itself, but to try to satisfy a given function by consuming the least amount of energy possible. New technologies allow us to meet this challenge. From the moment when we aim at the lowest consumption possible, the use of renewable resources to meet our energy needs is becoming an economically acceptable solution. So we are moving from the system of vertical production / transmission / distribution / consumption to a system integrating consumption and production. This new paradigm represents a real breaking point. Some theorize that the 3<sup>rd</sup> industrial revolution consists on the paradigm shift that enables the switch from top down networks to bottom-up networks, thus giving people a complete sense of responsibility in terms of their consumption and supply within the territory they inhabit.

### **Two examples of innovation**

From the moment when we place ourselves in this new paradigm (taking use of the immediate environment to satisfy our energy needs), many innovations are emerging. Here are two examples:

- The city of Heerlen in the Netherlands, originally built to exploit the coal mines, developed the Minewater Project to supply energy from old mines in order to heat a part of the city. Inaugurated last year, the project helped to revive these old mines.
- In 1995, the city of Växjö in Sweden has set a target of no more use of fossil fuels by 2010. This decision led to a search for new opportunities to satisfy energy needs of the city. Today, this city of 80 000 is heated in 84% by renewable energy. The same relates to 57% of electricity.

The territories have a great interest in keeping the money invested in energy inside their region with the purpose of supporting the local economic system. Indeed, the energy choice of a territory is not only a choice of energy but also a choice of further development.

### **The role of new technologies**

The new paradigm we are entering is made possible by the emergence of new technologies. It also signifies a one-way path with no return to past times. It implies finding a responsible attitude towards resources and emissions by relying on technologies available today, that make it possible to bring back the common sense of responsibility. If these new technologies (based on the use of wind, sun, etc) cannot completely replace other energy sources, they can make up for it by reducing our total consumption.

## **The principle of energy subsidiarity**

The principle of subsidiarity can be defined as the act of finding the solution closest to a problem that has to be resolved. Therefore, the energy subsidiarity consists on finding the solution closest to a place where we consume. The aim is to consume as little as possible and to satisfy our needs to a maximum extent, using the resources of our environment. If the top-down system involves mainly specialists from the energy world, in the new bottom-up system players are mainly from other sectors, and these are architects, plumbers, masons, etc. Whoever sets up the insulation does not consider himself as an energy specialist, but contributes more to the energy system than he thinks. Similarly, an urban planner still thinks nowadays that he is not a major actor in the energy system, while he contributes to a level of energy consumption of a territory more than anyone else.

Introduction of the new system thus entails a movement of energy experts towards professions not directly linked with the energy, and the movement of specialized technicians towards citizens. It is a system where democracy plays a more prominent role than technocracy. This breaking point is thus accompanied by a new form of cohesion with the establishment of a more democratic system in which we must all learn to share scarce resources and limited capacities.

## **Questions and answers**

➤ **In your opinion, is the principle of energy subsidiarity adapted to large megacities?**

I have absolutely no idea how megacities are going to bail out. Regarding the relatively large cities, the question on the use of space must be asked. Many of them are now in the process of reviewing the roofs and facades that may be vegetated or accommodate solar collectors. We have in the world the sufficient number of buildings that are so ugly, that the installation of photovoltaic panels on their rooftops would not really change a thing.

It is difficult to assess the percentage of autonomy that those cities can achieve, however it is clear that many possible resources have not yet been exploited: droppings can provide large amounts of methane; greater attention should be paid to waste management and geothermal resources, etc. It seems that the main obstacle to significant increase of the share of energy that can be met by local resources is that the idea of looking for opportunities around you has completely disappeared during the previous period.

The problem is even more dramatic in the case of food. For example, the Paris region produces itself only 1% of food consumed within the territory. Half of CO<sub>2</sub> emissions from the French household come from the energy content of goods and from the delivery thereof to a store where people do their shopping. This results from the system of extreme specialization, where the production of goods is being outsourced. This is why, we hear more and more about taking use of suburban areas in order to produce food in a closer proximity to a place where it is going to be consumed.

➤ **Don't you think that economic investments, necessary to introduce this new paradigm, make for a real deterrent factor?**

This would be an obstacle if we didn't take into account the future reduction of consumption. To provide you with the example - we consume in the temperate part of Europe between 100 and 350 kWh per m<sup>2</sup> per year to heat our apartments. In Germany, it was shown that the

“passive” construction standard, which consumes about 15 kWh/m<sup>2</sup>/year for heating, can be achieved with an incremental investment of about 5%. The experience shows that you don’t have to pay a lot of money to do something well, you just have to realize it at the very start.

It is obvious that such changes have to be encouraged by supporting prices. Any energy has ever been developed with no public support. The price evolution curves should intersect: the upward curve for the fossil and fissile material production and the downward curve for the renewable energy. At some point they will cross, for example, in the case of wind and nuclear energy.

We have global objectives - those that have been fixed by the IPCC (division by 4 of greenhouse gas emissions in industrialized countries). These objectives necessarily induce a substantial reduction of our consumption and increased share of renewable energy. Let’s place ourselves in 25 or 30 years from now and ask ourselves about the kind of city that will meet those criteria. On this basis, let’s just look at our current situation in order to measure the gap and define the strategy of how we are going to build this city of the future.

➤ **In the case of electric vehicles, the energy / carbon balance is not always favorable with regard to views on the amount of energy it takes to recycle batteries. Regarding photovoltaics, it is said that the energy needed to produce them is greater than the energy they will be able to compensate during their lifetime. How would you take into account this general problem?**

On average, after 5 years to 7 years, a photovoltaic panel recovers the amount of energy needed for its manufacture. No technology is without waste! The question is under which conditions these wastes can be treated and whether they are reversible.

The electric vehicle seems to be a non-solution with regard to greenhouse gas emissions. A study by ADEME (French Environment and Energy Management Agency) shows that CO<sub>2</sub> emissions from cars are on average around 160 g / km, 126 for small urban compact, and some are below 100. Then, if we make the CO<sub>2</sub> balance of electric vehicles, taking into account the energy mix of Europe, we find that it amounts to 141 g / km, which is the same level as in the case of Peugeot 407 petrol. What is presented as the solution that will rid the world of automobiles from the constraint of greenhouse gas emissions does not seem to go towards this direction.