

Introduction

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For: In R. Lavergne & H. Serveille, editors of *The digital and environmental transitions*, a special issue of *Responsabilité et environnement* - n° 87 - July 2017.

At the origin of this special issue of *Responsabilité & Environnement* devoted to the digital and environmental “transitions” is the fact that these transitions, by themselves and owing to their interactions, have potentially serious implications for the environment, economy, society, techniques, etc. It is, therefore, worthwhile gauging the opportunities and risks so as to prepare the French economy and society. The editors decided to organize this issue, as part of the series *Annales des Mines*, in three parts: digital technology and the environment, each in transition; digital technology as an accelerator of the energy transition; and the digital and environment transitions in other branches of the economy than energy.¹

The environment, energy, digital technology, big data and telecommunications are all undergoing major changes fast. The possibility of these trends converging arouses enthusiasm, questions and concerns, in particular in electricity, a sector representing an ever larger share of the energy mix in the countries committed to the energy transition. A new generation of energy suppliers and related businesses (aggregation, load management, etc.) has been spawned by the conjunction of: the opening of markets, the much lower cost of wind power and photovoltaics and the rapid advances in information and communications technology (henceforth ICT) and command-and-control techniques. For the other forms of energy and in services related to the environment, digital technology is, likewise, a potential source of change, as new players and prospects have emerged.

Daniel Kaplan, the coauthor of an article in this special issue, wrote in June 2015, “*The environmental transition is able to imagine its destination but has trouble drawing a map for itself. This is the opposite of the digital transition. Each of these trends needs the other! Nonetheless, the players in these two fields too often move in separate spheres without realizing the power for change that their convergence would have.*”

The environmental transition

According to CGDD (Commissariat Général au Développement Durable), headed by Laurence Monnoyer-Smith, the aim is “*to set in coordinated motion all actors in society and sectors of the economy — beyond pioneering initiatives and the first measures already taken in certain branches (energy, agriculture...) — for addressing four major environmental issues: climate change, the accelerated loss of biodiversity, the rarefaction of resources, and the multiplication of health risks*”. The environmental transition seeks to introduce “*new ways of consuming, producing, working and living together in response to these major issues*” by using as levers: the prevention and reduction of inequality, the orientation of economic and financial instruments, and education and training. Sustainable development’s social and economic dimensions are a full part of the solutions proposed, even though priority goes to environmental problems.

¹ This article has been translated from French by Noal Mellott (Omaha Beach, France).

In February 2015, the government published, a national strategy for an environmental transition toward sustainable development.² An important part of it was, shortly after its publication, incorporated in the so-called TECV Act on the “*energy transition for green growth*”.³

The energy sector, in particular electricity, has encountered serious difficulties in Europe: the volatility of the prices or raw materials, the low price set for CO₂ quotas, negative prices, etc. Since 2000, energy firms have been reeling from a series of problems and changes: the opening of markets, the arrival of newcomers, the energy transition, etc. The package of measures that the European Commission published on 30 November 2016, *Clean Energy for All Europeans*, seeks to cope with this situation.⁴ It is to be added onto the list of other significant initiatives, such as the Digital Single Market and the European investment plan for improving employment, growth and investment in Europe.

The digital transition

For about twenty years now, in the context created by the Internet, digital technology has been changing our everyday lives and our methods for finding information. It has gradually upended vested positions in several branches of the economy, such as the retail trade, leisure activities, transportation and tourism. In fewer than ten years of existence, Airbnb, for example, has sales of one billion dollars with only 500 employees. By comparison, a conventional international chain of hotels, such as Hilton, has sales of nine billion dollars while employing 130,000 persons — it is nearly 280 times more job-intensive than Airbnb. Their stock market quotations, too, are out of proportion.

France Stratégie has analyzed the dominant issues for the coming decade. According to this “laboratory of ideas” attached to the Prime Minister’s Office, the digital transition — or revolution — will cause “*in-depth changes in our economic and social organizations [...] as production units become more fluid and distributed: the capacity for processing a swelling mass of information is going to open the way toward more personalized offers of goods and services, even in industry; collaborative work outside the conventional framework of production is going to expand; digital technology will play an important role in the environmental transition, especially in the sharing economy or the circular economy.*”⁵

² *Stratégie nationale de transition écologique vers un développement durable* (SNTEDD 2015-2020). (Abridged version available at www.developpement-durable.gouv.fr/sites/default/files/SNTEDD%20-%20En%20bref.pdf and the full version at:

www.developpement-durable.gouv.fr/sites/default/files/SNTEDD%20-%20La%20strat%C3%A9gie.pdf).

³ Act n°2015-992 of 17 August 2015 (available at:

<https://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000031044385>).

⁴ On this package, see: <https://ec.europa.eu/energy/en/news/commission-proposes-new-rules-consumer-centred-clean-energy-transition>.

⁵ www.strategie.gouv.fr/presse/communiqués-de-presse/tirer-parti-de-revolution-numerique-20172027

Interactions between the digital and environmental transitions

Digital technology has already made many contributions to protecting the environment. We need but mention our ever more detailed knowledge thanks to data-processing, metrology, simulations, etc. More contributions are expected from new research programs in ecology and given several trends in society. Developing new digital applications and techniques creates considerable opportunities for jobs and value creation.

In the short or middle run, digital technology will facilitate the energy transition by improving the efficiency of installations, equipment (for consumption and for production) and systems. Its upsurge alters relations between energy suppliers and their customers. It has come at just the right time to synch with the development of wind power and photovoltaics so as to better load electricity from these sources onto the grid and to cope with the intermittence of renewable sources of energy. In transportation, digital technology is needed, for example, to manage the stations for recharging the batteries of electric vehicles. In all sectors of the economy, this technology is introducing new products and services (*e.g.*, smart electricity meters) or concepts that affect the relations between customers and utility companies: smart grids, smart cities, open data, real-time management of demand, new business models, artificial intelligence, robots, connected devices, etc.

For the long run, some pundits have imagined an Internet approach to energy. The role of current grids would be radically altered owing to blockchains, crowdfunding, “local loops”, etc. For the time being, the distributed uploading of electricity to the grid concerns a small segment of motivated customers. We will probably have to wait about ten years to see whether such solutions will have been widely adopted.

At the SFEN’s last meeting,⁶ Xavier Ursat, vice-president of this organization of professionals in the nuclear power industry and research, declared, *“The digital transformation is one of the fundamental levers for improving cooperation in French industry and making it more competitive. The nuclear power industry, with 2500 firms and 220,000 wage-earners, is the third national industry following aeronautics and automobiles.”* He mentioned as an example a tool *“designed in record time, in 2016, that is going to be used to digitize all tests of the EPR reactor in Flamanville”*.

The decentralization of energy policy in behalf of regional and even local authorities is a key trend in France’s energy transition. Emerging from a national debate on this transition in 2013, it figures in the aforementioned TECV Act. The promises of digital technology are stimulating this trend. The circular economy, the sharing economy (car-sharing and -pooling, etc.) and crowdsourcing (for producing data useful to urban management) are a few examples of how digital technology adds to value and helps solve regional or local problems in behalf of the environmental and energy transitions. But how far can we go in this direction without jeopardizing the security of our energy supply and without imposing heavy costs on society?

⁶ The website of the Société Française de l’Énergie Nucléaire: <http://www.sfen.org/en>.

Risks and opportunities

Promoting digital technology in the fields of energy and the environment might seem schizophrenic. This technology is a factor of growth for the GDP. But this growth tends to increase CO₂ emissions worldwide and, consequently, thwarts the energy transition. As Morgane Créach and Fabrice Flipo, two authors of articles in this special issue, have explained, digital devices have a voracious appetite for energy and raw materials. Digital technology is a factor of disruption. Along with the productivity of resources, decentralization, the circular economy, etc., it will have the aim of reducing both CO₂ emissions and the demand for energy and natural resources without any detriment to our well-being. Green growth tries to surmount these contradictions. The TECV Act's first article defines it as *"a mode of economic development that respects the environment, is both sober and efficient in energy and the consumption of resources and carbon, is socially inclusive, bolsters the potential of innovation and makes firms competitive"*.

In the fields of energy and the environment, as in other branches of the economy, digital technology has created risks and fears with regard to cybercrime, cyberterrorism, threats against the confidentiality of data, lost jobs, doubts about public services (how to regulate fares or set preferential rates for certain groups), the upending of long established socioeconomic equilibria, etc. However it also opens prospects for stimulating the economy and creating jobs thanks to gains in competitiveness and agility. Public authorities, whether national or European, are trying to benefit from these opportunities, especially in industry. In April 2016, the European Commission adopted a strategy for *"digitizing European industry"*, which relies on national programs such as: Industry of the Future (France), Industry 4.0 (Germany, Austria, Italy), Smart Industry (Netherlands, Sweden), and Connected Industry 4.0 (Spain).

The stakeholders in both transitions

A major issue related to competition and the development of a French offer of goods and services adapted to a digital society is the distribution among stakeholders of the value derived from big data, whence questions about open data and data-sharing among firms. Investments are necessary to develop, acquire and maintain skills. Expertise and technological services are needed, as are EU and national industrial policies for sustaining this trend. As pointed out in the articles on energy by Laurent Michel, Sylvain Moreau and Michel Derdevet, the legal framework has evolved significantly in matters of "big data" and "public data services".

Many start-ups have lined up along the border between the environment and digital technology. The big utility companies now realize the importance of these start-ups, as do public authorities, evidence of this being the GreenTech Verte program (at the initiative of the French ministry in charge of the environment). Fintech, another example, can be used to detect opportunities in the environmental field or to finance the development of renewables.

Without overlooking the risks, digital technology represents an opportunity for green growth in all fields related to the environment and energy. It can help protect the environment, improve the management of resources and boost struggling businesses.

This special issue should enable readers to gauge the scope of the changes arising out of the two transitions now under way.