

Using the lever of innovation for a successful energy transition

Jérôme Schmitt,

director of Innovation and Energy Efficiency in the branch Gas, Renewables and Power at Total

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

Abstract:

From one major source of energy to the next, the energy industry has always been undergoing changes, now at a buoyant rhythm. Classical business models sometimes have trouble keeping apace. The United Nations Climate Change Conference, COP 21, is not irrelevant, nor the accelerated use of digital technology in our societies, the rapidly falling costs of energy from renewables or natural gas's increased competitiveness with coal. Customer expectations are evolving too, as consumers set more store on use than ownership. As consumers, we do not pay any less attention to prices, but we are reckoning more with our uses of energy and with the societal and environmental impact of our actions. Digital technology and artificial intelligence will help us foresee changes and steer a course. Thanks to leapfrogging, major technological solutions are now available (sometimes in simplified versions) on all continents. Some major players in energy will manage to adjust and turn restrictions into opportunities. Initially salesmen or promoters of big projects, they must now design packaged solutions for customers (private persons or firms) who are demanding an optimization of their consumption. More customer-oriented business models will take account of the efficiency and optimization of energy sources and product life-cycles. They will react better to lower costs and technological trends. All these changes provide fertile soil for innovation. To profit from these opportunities, Total has not stopped evolving...

By nature, the energy industry is cyclical, but the significant decrease in the price of oil between 2014 and 2016 came as a surprise.¹ The rapid advances made in producing shale gas in the United States caught the markets off guard, as did the spectacular growth of energy from renewable sources (as impressive as the lower costs of producing them) or the pump-priming for the marketing of electric vehicles. Despite its modified state of equilibrium, the industry has globally managed to remain profitable and grow, thus demonstrating its resilience once again.

But the new paradigms force us to envision the future differently, especially since other driving forces are emerging:

— One driving force is the effect of acceleration owing to the roll-out of digital technology, now in China and soon, very likely, in India and Africa. These “continents” stand out as laboratories for corroborating Moore’s law. When these markets accept a new product, far-reaching changes are set off that affect the product’s competitive advantage and the speed of its adoption elsewhere around the world. This often flouts predictions.

— Another driving force springs from customers. A key factor in their decision-making, along with prices, is now their experience as users. Centralized, top-down models with mostly passive customers are no longer as popular as they used to be. Customers more often want to be able to understand, choose and control their consumption by using simple, accessible tools. Some even want to produce and sell energy themselves, peer-to-peer. Customers are looking

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

for security, comfort and, too, responsible solutions. Energy is gradually becoming part of a broadly packaged offer. Designing these increasingly complicated, integrated offers is a source of differentiation and value creation.

In most industries, value navigates from the start to the end of the production process, or vice-versa. In energy, value creation has moved downstream, much closer to customers. It is, therefore, not surprising to observe a proliferation of innovations in business and technology that start from demand and cross over to the supply side. Let me cite as example the transmission and distribution of electricity. Given the rapid growth of production from decentralized renewables, the “last-mile” grid manager is becoming a manager of production capacities. Loading electric vehicle batteries is also going to shift the question of optimization downstream in the chain. These new conditions in activities that used to be top-heavy and centralized are opening potential sources of value creation.

Designing new packaged offers and making innovations closer to customers imply being able to anticipate consumer needs and customize our responses to them. Rapid advances in digital technology and decreasing costs (in particular of digital devices and applications for measuring consumption and for remote control) now allow for new business cases, most of them profitable. They also enable new players — different, agile, often closer to software development than to energy — to capture a major part of the value chain by collecting, controlling and processing data. Customers help design these new offers through the information they provide. Managing or processing this information — the data of all sorts that are often more than data merely on consumption — sometimes yields more value than the services sold to customers.

Among the levers useful for successfully coping with this new situation, three stand out:

- change our approach, which used to be oriented upstream in the chain of value toward products, by reorienting it downstream toward solutions;
- have a positive approach for taking up tomorrow’s challenges in our activities and business offers; and
- resolutely design innovations as close as possible to customers.

Total has been working on all these fronts for several years now. The signature and ratification of the Paris Climate Agreement has provided an opportunity for drawing attention to this work.

Although the International Energy Agency’s goal to limit global warming to 2°C at most leaves much room for fossil fuels during the coming decades, the incorporation of climate-related issues in Total’s long-term strategy has come naturally. Breaking with coal, preferring petroleum projects with a low break-even point (since not all of them will be developed), stepping up the place of natural gas in our holdings, increasing our leadership in renewables and low-carbon businesses in general... these decisions have all seemed self-evident.

Total’s executive committee has set a clear goal for the Group: to become the “Major of responsible energy”. It thus decided in 2016 to set up, alongside the Group’s traditional activities (exploration-production, refining-chemistry, marketing & services), the segment “gas renewables and power” (henceforth, GRP). This segment covers historical business activities in natural gas and electricity and a more recent business, renewables. Renewables are well anchored in the Group via Total Solar, SunPower and Saft (for energy storage). GRP also has the ambition of preparing the Group for new low-carbon activities. At the top of this list of activities is energy efficiency, one of the three principal means, closely related to using digital technology, for limiting global warming to 2°C. Projects in the pipeline at GRP have to do with capturing, stocking and using CO₂ (or potentially hydrogen), and with “distributed” energy, a field where our capacity for innovation will prove decisive.

FIVE ARRANGEMENTS, each built on innovations, are serving this ambition to move toward low-carbon activities. The synergy between them is noteworthy.

- The **FIRST** ensues from Total Group's decision to stake out a position in energy efficiency. A key axis for development during the next twenty years is to help customers optimize their energy consumption and reduce their greenhouse gas emissions, and to assist them in choosing among the best energy sources. This represents a significant opportunity. The service market in energy efficiency is growing by 8%-10% per year — a substantial rate for a market estimated at several hundreds of billions of dollars. At present, Total is but one among other players on this market, where several other firms are busy (in energy, in the maintenance, distribution and construction of equipment and in software or telecommunications). For Total however, major issues have been clarified thanks to BHC Energy (in France) and Tenag (in Germany).

In energy as in other branches of the economy, customer expectations are turning more toward the provision of services over time and away from a one-shot purchase of a product. Customers are more often asking for packaged solutions that include financing, storage, information technology, hardware, monitoring, remote control, the pick of the best energy sources, etc.

Total has decided to be a player on this market and make offers to its customers for using energy responsibly. This means promoting “hybrid” solutions that lessen the environmental footprint and optimizing how energy is put to use on the customer's premises by controlling consumption and shifting the energy mix toward renewables. To stand out from other players, we will rely on: our thorough understanding of the issues, the worldwide scale of our activities, our access to energy markets, our capacity for impartially making the best pick of both energy sources and equipment, and our ability to find, stimulate and finance the best innovations.

- The **SECOND** arrangement at the service of our low-carbon goal is to develop new activities so that our customers, businesses as well as individuals, can capture, stock or use CO₂ or trade emission permits. This will take on full meaning once we have helped them reduce their consumption and greenhouse gas emissions thanks to the first arrangement (energy efficiency). We will then be able to help them optimize their energy mix by providing the best pick of energy sources, whether of natural gas, renewables or hybrid solutions. We are staking out a leading position for proposing large-scale commercial programs. The Group's intensive commitment to R&D should represent nearly 10% of its ordinary budget in the coming years.

- The **THIRD** arrangement fits in with the first two: it involves Total Energy Ventures (TEV), one of the most active corporate ventures in the energy sector. TEV selectively invests in the start-ups that hold the most promise for Total Group. We have already invested more than \$160 million in approximately thirty start-ups working on energy efficiency and management: storage, access, the recycling of CO₂, etc.

TEV's role is to make profit-earning investments, of course, but also to explore, map and understand the ecosystem of start-ups, to share this knowledge with all innovators in the Group and to stimulate in-house emulation. At the start of 2017, TEV received the Cleantech Group's award of corporate investor of the year, evidence of the quality of its holdings. TEV has invested in start-ups considered to be on the cutting edge of the optimization of consumption and the management of flexibility. These start-ups open the eyes and minds of our own work teams. TEV has also acted via independent investment funds to gain a hold on activities on the Total Group's borderline, activities farther removed in space or time or laden with risks too complicated or uncertain for a single party to bear. A noteworthy example is the Oil and Gas Climate Initiative (OGCI), an investment fund grouping ten of the planet's biggest players in natural gas and petroleum, who have pledged to respond together to climate-related issues. Total is a founding member of this organization. Endowed with one billion dollars, OGCI intends to invest over a ten-year period in technology for capturing, storing and using CO₂, for reducing methane emissions, and for improving energy efficiency. Set up at the end of 2016, the OGCI is on the point of making its first investments, which will provide definite evidence of our orientation.

- The **FOURTH** arrangement requires thinking in different terms: frugal, local innovations in activities related to the access to energy. This fourth, small and agile, choice might come as a surprise when juxtaposed with the preceding three; but it is coherent with them. In 2010, Total designed an offer for selecting, fostering and commercializing solar solutions for individuals — the billion people in the world, mainly Africa, without access to electricity. By mid-2017, we had already sold in 35 countries more than two million products for mobile telephones (lighting or battery chargers) and for basic uses that have improved the everyday lives of more than ten million people. The objective for 2020 is to reach out to 25 million Africans by offering them ever more powerful, operational solutions.

An “innovation business” has arisen around Total’s historical objective of delivering clean energy to as many people as possible. Why? Because in energy (as successfully happened in telephony and banking services), Africa might accomplish the feat of leapfrogging toward a massive, profitable adoption (perhaps faster than some OECD countries) of tomorrow’s technology and business models. This might happen in (decentralized) solar energy and the use and storage of energy on a large scale by individuals. Decentralization in the energy sector should, paradoxically, proceed faster and farther owing to a confluence of several factors: rapid urbanization; strong population growth; the rise of the middle classes; the difficulty of financing, developing and maintaining a centralized infrastructure for producing and transporting energy on a large scale in Africa; and, not to forget, the lack of solid regulations. The widespread adoption of digital technology (in particular, the possibility of making payments via mobile telephones) has already lifted obstacles to the monitoring of consumption data, the performance and remote maintenance of electronic devices, the security of payments and the optimization of customer relations.

Some of Africa’s weaknesses might ultimately be factors that accelerate innovation and progress while creating profitable business opportunities, which could then be deployed on a large scale. Two conditions have been met for Africa to, once again, astonish us. First of all, frugal solutions might emerge that, simple but necessarily robust, are sources of business opportunities for agile entrepreneurs. Secondly, Africa is fascinating as a seedbed for startups and as a vantage point for observing changes of scale in business activities.

- The **FIFTH** arrangement involves stimulating innovation inside Total Group. At the first Innovathon organized in-house in 2017, fifty projects were proposed for improving the customer experience. Five of them were selected by a jury and a vote of 1300 employees. More work was put into them during a 48-hour period with the help of coaches, who brought a methodology and advice for making prototypes and business plans. A jury, whose members (not all of them Total employees) then selected the best two projects for mentoring: the one by our in-house incubator and the other by a partner, Techstars, an “accelerator” that provides mentoring and seed funding. The aim is to boost the spirit of innovation inside Total Group and invent new offers, closer to customers (a critical issue).

These five arrangements converge to an astonishing degree. Our activities tomorrow might make a pronounced turn toward a circular economy. Business relations will be designed around a full offer of services. They will be ever more turned toward (and interconnected with) customers who are ever less passive. We will be accompanying customers from their expectations to the optimization of their demands for minimizing, using and managing the wastes produced (CO₂, heat, etc.) or for trading emission permits. This calls for selecting, monitoring, controlling and sharing the customer’s energy sources and the associated means.

The first step — essential to success — is to be aware of the changes to be made and take them into account, to modify our organization by placing ourselves in marching order, and to persuade ourselves that our ability to change will come from the clarity and strength of our long-term ambitions and from their coherence with what society expects of us.

The second step implies open-mindedness, conveying a sense of innovation to our work teams and inspiring confidence in all stakeholders so that they make proposals, test new solutions and foster new businesses. This depends on our capacity for admitting that we do not exercise full control, for questioning ourselves and for being humble and welcoming toward all.

The third step is reflected in the allocation of means and the granting of a margin of maneuver. This is all the more complicated insofar as these new activities are often culturally remote from Total Group's historical activities. This step is being made.

The difference between players on the energy market will not stem from financial, industrial or technological factors alone. It will very likely hinge on agility, impulses, eagerness, meanings and the feeling of being useful experienced by all those who will be leading this transformation. It will also come from the pioneering spirit, which Total's executive committee has ranked among the Group's values, and, therefore, from the firm's capacity for backing the spirit of initiative. It will also depend on being open to diversity and newness.