

A glimpse into european political debate: is energetic transition really mandatory for everybody?

État des lieux du débat politique européen : une transition pour tous ?

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Diderot was one of the main actors in the transition to modern age and his *Lettre sur les aveugles* provides amusing insights into the construction process of a new mindset by exploring different views about how we “see” (or “frame”) reality. In every transitional process there are things we see immediately and things we don’t see because of our blind loyalty to custom. Therefore, a critical approach is essential to better understand (and to better manage) any transitional process - including the present transition towards the European “Energy Union”.

« Et toujours des écarts, me direz-vous. Oui, madame, c’est la condition de notre traité. »

Diderot, *Lettre sur les aveugles à l’usage de ceux qui voient*.

Introduction

Diderot was one of the main actors in the transition to modern age and his *Lettre sur les aveugles* provides amusing insights into the construction process of a new mindset by exploring different views about how we “see” (or “frame”) reality. In every transitional process there are things we see immediately and things we don’t see because of our blind loyalty to custom. Therefore, a critical approach is essential to better understand (and to better manage) any transitional process - including the present transition towards the European “Energy Union”.

So far, there is no clear definition of “Energy Union”; however, there is a generalized perception that :

1) The internal energy market launched almost thirty years ago with the twofold purpose of liberalizing (national) energy markets and integrating national markets into a single energy market is not yet accomplished because both liberalization and integration are incomplete.

2) New public policies (namely those related to climate change, security of supply and transportation) have considerable impact upon electricity and natural gas markets, leading to potentially disruptive phenomena.

3) New technologies - both “internal” to the energy sector (mainly related to renewable electricity generation and storage and to non-conventional oil and gas exploitation) and “external” (namely information and communication technologies) - challenge the traditional organization of energy industries.

4) It is necessary to reconcile the single energy market project with new EU and national policies, also taking into account current technological developments. These may be seen both as a threat to conventional markets and policies and as an opportunity to overcome market failures and to enable cost-effective policy implementation. The outcome of a technology-based reconciliation between energy market and energy (and energy related) policies may be designated “Energy Union”.

The successful transition towards the European “Energy Union” requires a series of important decisions with substantial economic, institutional and political impact. It is crucial that these decisions are taken within a coherent realistic framework. In his book “Thinking, fast and slow” (2011) Nobel

Prize in Economics Daniel Kahneman warns on the risk of “driving blind” in decision-making processes, echoing Diderot’s *Letter* :

“Unless there is an obvious reason to do otherwise, most of us passively accept decision problems as they are framed and therefore rarely have an opportunity to discover the extent to which our preferences are frame-bound rather than reality-bound”.

Transitions involve conflicting preferences; they are chaotic processes whose inherent ambiguity cannot be neglected. The *Lettre* in general and, in particular, the polysemic nature of the expression “*écarts*” in the above quote reflect Diderot’s awareness about this ambiguity, as pointed out by several authors. In fact, “*écart*” means both “deviation” and “digression” and both concepts are highly relevant in transitional contexts.

The following two sections of the present paper discuss how and why, respectively :

- The internal energy market deviates from the initial plan.
- New policies impose frequent and extended digressions.

The fourth section introduces the critical issue of “control flows” taking into account “*la condition de notre traité*” - i.e., the fact that although the new European Treaty includes a specific energy chapter for the first time ⁽¹⁾ it does not indicate how markets shall be coordinated. The final section provides brief recommendations.

Deviation

Thirty years ago ⁽²⁾, the European Council decided “*to achieve a single market by 1992 thereby creating a more favourable environment for stimulating enterprise, competition and trade*” and “*it called upon the Commission to draw up a detailed programme with a specific timetable*”. This programme was published in June 1985 ⁽³⁾ and the only reference to energy there relates to the necessity of including the energy sector in the Directives on public procurement by 1988 ⁽⁴⁾.

In 1988 the European Commission published the first document on the Internal Energy Market (IEM) ⁽⁵⁾, going much beyond mere procurement rules. In this working paper the Commission acknowledged that “*in the last 20 years there has been little progress towards a genuine common market in energy although the example of the United States or Canada shows that in those States with a federal structure a common energy market can have favourable consequences*.” According to this initial document, “*a more integrated European energy market should reduce energy costs, to the direct benefit of individual consumers but also of user industries*” and, at the same time, “*encourage the maintenance or development within the Community of healthy and prosperous energy enterprises*”, thus improving security of supply.

The Commission’s approach was based on the systematic removal of all “*obstacles to the internal energy market*” through “*the application of the provisions of the Treaties and*

secondary legislation which give the Commission its own powers to ensure competition is respected and solidarity is implemented.” Only “*if necessary and when the complementary studies have been carried out, new Commission initiatives in the specific domain of energy may be justified*”⁽⁶⁾. It soon became obvious that just removing general-purpose legal barriers would not deliver a well functioning IEM; but it also became apparent that several Member States resisted the removal of certain national monopolies and the “*necessary*” shifting of some national powers to community level.

The transition from national monopolistic regimes to partially liberalized electricity markets took more than eight years : only in 1996 the first electricity directive was approved, explicitly defining some “*common rules*” for the IEM ⁽⁷⁾ ; however, it provided transitional periods for implementation of several provisions. Seven years later, in 2003, the second electricity directive was approved together with a specific regulation on cross-border trade, enlarging the scope and improving the “*firmness*” of the common rules. A third legislative package followed in 2009. Therefore, the first deviation to be pointed out relates to timing : the 1992 deadline was not met and as recently as on the 9th of December 2014 the Council, after “*noting that the internal market should be completed by 2014*”, according to previous Council decisions, stressed “*that all efforts must be mobilized to achieve the objective of a fully functioning and connected internal energy market as a matter of urgency*” ⁽⁸⁾.

In spite of the considerable amount of existing legislation and regulation ⁽⁹⁾, as well as extensive jurisprudence, the IEM is not yet a reality because three basic issues have never been properly addressed and are not even on the political agenda ⁽¹⁰⁾. These standing problems have not been solved because there is no political will to solve them, not because of lacking awareness or insufficient ingenuity to handle them. The three missing preconditions for a functioning IEM are the following ones ⁽¹¹⁾ :

(1) Article 194 of the Treaty on the Functioning of the EU.

(2) March 29/30 1985.

(3) White Paper “Completing the Internal Market” COM (85) 310 final of 14 June 1985.

(4) Energy, as well as transport, water and telecommunications were “excluded sectors” not subject to European public procurement rules.

(5) Working Paper “The Internal Energy Market” COM(88) 238 final of 2 May 1988.

(6) *Ibidem*.

(7) Directive 96/92/EC of the European Parliament and of the Council of 19 December 1996 concerning common rules for the internal market in electricity. Official Journal L 027, 30/01/1997. It was followed by the first natural gas directive in 1998 : Directive 98/30/EC of the European Parliament and of the Council of 22 June 1998 concerning common rules for the internal market in natural gas. Official Journal L 204, 21/07/1998.

(8) http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/trans/146130.pdf

(9) Besides the three legislative packages of 1996/8, 2003 and 2009, several energy related directives and regulations have been enacted. Moreover, ten electricity and several gas network codes have been approved or are under preparation/approval, providing hundreds of pages of “common rules”.

(10) Cf. Council conclusions of 9 December 2014.

(11) Availability of physical interconnection capacity is also a precondition for market integration but this topic has never been removed from the political agenda, contrary to the other three preconditions that were mentioned at some stage but subsequently “repressed”.

- Tight operational coordination of energy systems at EU level

Without proper operational coordination at EU level transmission assets remain underutilized and the risk of further blackouts and gas supply disruptions increases. Modern information and communication technologies can provide cost-effective optimization of physical flows throughout European energy systems, as well as increased reliability. These technologies have not been deployed yet because their adoption would induce new governance models, reducing the large autonomy system operators enjoy under the current loose operational coordination scheme and incidentally increasing their liability⁽¹²⁾. From the economic and technical viewpoints tight operational coordination is the *conditio sine qua non* for efficient markets in any network industry. However, in political weighing scales, the highly visible symbolic capital of national system operators is usually more valued than the invisible “costs of non-Europe”.

- Common market design

EU legislation never provided a blueprint for the organization of electricity and natural gas markets - neither at national nor at EU level. Therefore, different national and regional markets emerged with diverse - sometimes even incompatible - rules. The bottom-up process of market coupling - still underway - mitigates efficiency losses but does not correspond to the original idea of jointly developing a “single market”. With time, this bottom-up process might have unified energy markets, de facto embodying and consolidating the single market; the trouble is that technology and policy moved too fast compared to the market coupling speed, leaving this unfinished work as an example of architecture *all'antica*, a Romanticist flirt with the Ruinenwert concept (see next section for explanation).

- Regulation at EU level

The Agency for the Cooperation of Energy Regulators⁽¹³⁾ provides a forum for cooperation but does not possess the powers needed to regulate the IEM. Imagining that the IEM can exist without EU regulation or fancying a metaphysical system of “regulation without regulator” is just an expensive self-deceiving strategy to elude some inevitable and inevitably hard political and institutional questions. The EU is indeed a delicate set of checks and balances and overregulation at EU level should be averted but for the moment the EU side of the balance is empty. As Montaigne suggested : “*Quand l'un des plateaux de la balance est vide, je laisse osciller l'autre en y mettant les songes creux d'une vieille femme*”⁽¹⁴⁾.

A second important deviation relates to prices. As clearly stated in the 1988 Commission's working paper, the main goal of the IEM was to “*reduce energy costs to the direct benefit of individual consumers but also of user industries*”. However, energy costs supported by consumers in the EU depend to a large extent on prices of imported energy products, whose evolution is beyond EU control⁽¹⁵⁾. In 1988 inflation adjusted oil price was about \$30, more or less the same as in 1996, when the first electricity directive was approved. Fortunately for consumers and for the Commission, inflation adjusted oil prices reached an all-time low in 1998. However, ten years later, in June 2008, oil prices were at the all time

monthly high in real inflation adjusted terms. Since then, yearly inflation adjusted oil prices have always been about three times as high as before energy liberalization started in Europe (except in 2009, when it was only \$59)⁽¹⁶⁾. Natural gas prices increases have been even sharper and electricity prices have also increased since liberalization started, mirroring both the rise of primary energy prices and the growing costs of energy policies.

Ceteris paribus, competition in electricity and natural gas markets, combined with regulation of their respective networks, may yield lower retail energy prices than unregulated monopolies; unfortunately for consumers, many other things have not been held constant in world energy markets and this possibility had not been timely and properly communicated to them. The promise of lower energy prices did not materialize, and it could not materialize because in energy industries “all other things” tend to be different.

Digression

In 2007, after several years of political debate, the UE recognized that “*Given that energy production and use are the main sources for greenhouse gas emissions, an integrated approach to climate and energy policy is needed*”⁽¹⁷⁾ in order to limit the global average temperature increase to not more than 2° C above pre-industrial levels. According to the Council, “*Integration should be achieved in a mutually supportive way.*”

This “integrated approach”, based on the pioneering work of some Member States, led to several directives and regulations with considerable impact upon energy markets, especially as regards the development of electricity from renewable energy sources. In the period between 2000 and 2013 net electricity generation growth in the EU was almost entirely based on wind (105 GW), solar (80 GW) and gas (103 GW), while fuel oil, coal and nuclear net installed capacities decreased by, respectively, 24 GW, 19 GW and 13 GW⁽¹⁸⁾.

The EU commitment to cut greenhouse gas emissions was strengthened in 2009 when the Council decided “*to reduce greenhouse gas emissions by 80-95 % by 2050 compared to 1990 levels*”⁽¹⁹⁾. As noted by the Council in 2011, this “*will require a revolution in energy systems, which must start now*”⁽²⁰⁾.

(12) For instance, the big blackouts of 2003 and 2006 affected millions of consumers and hundreds of generators in several countries but no system operator had been held accountable for these damages.

(13) Established by Regulation (EC) No 713/2009 of the European Parliament and of the Council of 13 July 2009.

(14) Montaigne, *Essais*, III, 8.

(15) The EU represents only 6 % of total world energy production and 13 % of world final energy consumption - cf. EU: *Energy in Figures Pocket-book 2014*.

(16) http://inflationdata.com/Inflation/Inflation_Rate/Historical_Oil_Prices_Table.asp

(17) European Council conclusions, 8/9 March 2007.

(18) http://www.ewea.org/fileadmin/files/library/publications/statistics/EWEA_Annual_Statistics_2013.pdf

(19) European Council conclusions, 29/30 October 2009.

(20) European Council conclusions, 4 February 2011.

Given the scale of the EU challenge, the energy “*revolution*” cannot be limited to the supply-side, increasing the use of renewable sources. The revolution must encompass the demand-side, namely buildings and transportation, where respectively 40 % and 32 % of EU final energy is consumed ⁽²¹⁾. The necessary demand-side transformations include :

- a) fuel switching - in particular electrification of the transport sector within the framework of new, sustainable mobility concepts;
- b) holistic management of gas, electricity, heating and cooling supply;
- c) active demand participation, in particular in electricity markets, through aggregators, new market players and innovative business models exploiting both economic and energy efficiency.

Up to now the “*integrated approach to climate and energy policy*” was successful in integrating objectives and targets under a single political umbrella, but it failed in integrating operational tools. In particular, the disruptive impact of several policies and targets upon existing markets was not duly taken into account *ex ante* - it was acknowledged only after policies were implemented and macroscopic consequences could not be overlooked anymore. For many years, most policy makers and academics ignored the need to redesign energy markets, either because they believed that the EU Emissions Trading System (a system for trading greenhouse gas emission allowances) would harmoniously interact with preexistent electricity and natural gas markets, or because they thought that energy markets would automatically adapt to the boundary conditions imposed by the new policies. Unfortunately, none of these hypothesis turned out to be true and integration of policy and market tools must be accomplished *ex post*.

Today, more than twenty years after the missed deadline of December 31, 1992, “completing the IEM” cannot have the same meaning as previously foreseen. Originally, efficient energy markets were expected to deliver competitive prices and customer choice, additionally enhancing security of supply and providing suitable environmental protection. In the meantime, technologies and public policies have changed significantly and energy markets are expected to deliver not only competitive prices but also a decisive contribution to the development of a “low-carbon” economy.

Electricity markets in the EU were initially designed under the assumption of supply-side competition among thermal generators; renewable generation was either residual or, in the case of hydropower plants, largely amortized. It is illogical to expect that design to be fit under a completely different set of assumptions, namely competition including both supply-side and demand-side (comprising new demand such as electric vehicles and prosumers) and more than 80 % of generation based on renewable sources.

The more renewable generation increases, demand is enabled to actively participate in markets and new actors emerge (storage, electric vehicles, micro-grids, etc.), the more existing

electricity markets look like a dysfunctional building. The combined forces of policy and technology are reshaping the energy landscape to such a degree that “traditional” EU energy markets already look like relics of the past. At this stage, either the old building is quickly and painstakingly refurbished or it will collapse. It is not certain that when it will eventually collapse, it will leave behind aesthetically pleasing ruins.

The control flow problem

From the technical point of view, several alternative roads may lead to the 2050 greenhouse gas emissions target. Each technical path presents different uncertainties, difficulties and potential benefits; demands different market structures and needs different governance. Different paths require different actions by system operators, traditional undertakings, market agents and regulators, through and after transition.

Each Member State has the “*right to determine the conditions for exploiting its energy resources, its choice between different energy sources and the general structure of its energy supply*” ⁽²²⁾; hence, different national paths, fostering different technological options, may coexist. Although full harmonization was not and is not a precondition for a well-functioning European electricity market, full consistency is : each path must be intrinsically consistent and consistent with the IEM and the IEM itself must be consistent (see section 2 above).

Technologies offer enough resourcefulness and the Lisbon Treaty offers enough latitude to imagine different transitional paths towards 2050. This latitude may be a useful basis for flexibility, facilitating the transition to low-carbon energy systems, or the root of harmful inconsistency : “*c’est la condition de notre traité*”.

In the past, when the costs of collecting, transmitting, processing and storing information were prohibitively high, energy systems were only partially observable and partially controllable. Therefore, planning and operation of energy systems was - and still is - based on many so-called “educated guesses”, combining a few analytical tools with statistics, practical experience and engineering judgment. Optimization of investment costs, operational costs or reliability suffered from the lack of complete information. This information deficit was a problem also for traders and suppliers whose knowledge about the actual behavior of their respective end-user clients was approximated and could not interact with them in real-time.

Modern information and communication technologies enable full monitoring and full control of energy systems in a cost effective way. Therefore, old hierarchical, centralized control systems based on many guesses may be easily replaced by decentralized, cooperative control systems based on real-time information. Nowadays, individual appliances

(21) European Commission, “EU Energy Markets in 2014”.

(22) Article 194 of the Treaty on the Functioning of the EU.

may be remotely controlled, not only in factories, but also in households, offices and all kinds of consumption centers. Moreover, in terms of information and control flows, appliances may be effortlessly aggregated according to ownership, type, geographical location or any other criterion, thus enabling the introduction of innovative business models and more sophisticated optimization algorithms.

In the meantime, distributed generation became very popular in many areas where some energy consumers are simultaneously electricity producers or even combined heat and power producers. Sales of electric drive vehicles are also growing very fast and represented 3,5 % of total vehicle sales in the USA in 2014⁽²³⁾. In Europe figures are lower but in 2014 sales of battery electric cars increased 60 % compared to the previous year⁽²⁴⁾. Distributed generation, as well as charging of electric vehicles, are usually monitored and remotely controlled.

Coming from a long period of “information deficit” it seems that the energy industry is now entering a period of “information surplus” and concerns about “big data” management have surfaced. However, the main challenge is not how to handle so much data but how to guarantee that energy systems will be “under control” - i.e. how to ensure system integrity and reliability while allowing market participants as much freedom as possible; in other words, how to avoid that multiple, parallel uses of a large amount of data exposes the system to hazardous conflict or latency situations.

Control and communication devices are the same all over the world, but the way they are applied to energy systems (i.e., how they are interconnected and how information and control flows are organized) may differ, thus enabling implementation of different market structures, contractual arrangements and control strategies. The following picture describes several physical layers of electricity systems, from the single appliance to the interconnected European very-high voltage network.

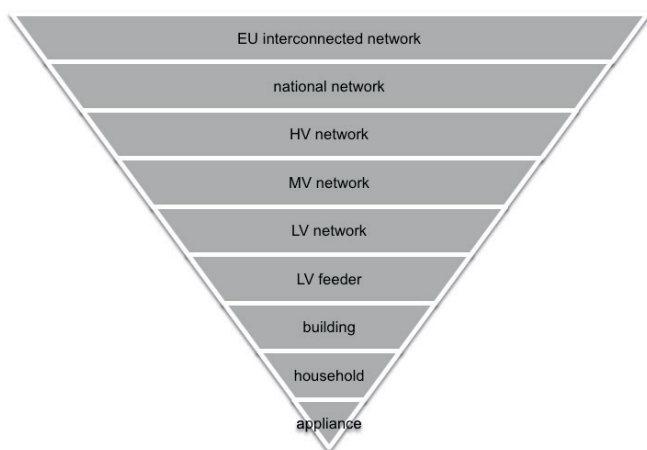


Figure 1 : Physical layers of electricity systems.

Modern information and communication technologies, if properly applied and complemented by appropriate software, enable the autonomous control of each individual layer. This possibility raises three basic questions :

- a) How to ensure control at each level?

Within each layer, different control policies can be implemented, from a highly centralized approach, more or less replicating at each level the current national master/slave hierarchical structure, down to a fully decentralized structure.

- b) How to define the functional interfaces between layers?

In order to ensure effective coordination of the whole system it is necessary to exchange information between layers and to establish clear communication and control procedures. Protocols must be implemented both for normal and for abnormal operational conditions.

- c) Who is the “controller of the controllers” and “controller of last resort”?

“Control of energy systems” does not consist of just one function - it includes a large array of functions and variables associated with different physical resources. In the past, provision of the necessary “system services” was limited to a relatively number of resources, mainly concentrated at the higher levels, as shown in the following figure.

Control Function Layer	1	2	.	.	.	n
EU interconnected network						
National network						
.						
.						
.						
.						
.						
Appliance						

Figure 2 : Assignment of control functions to different physical levels – today.

New technologies, both internal to energy systems (e.g. storage, fuel cells, wind and photovoltaic electricity generation) and external (namely information and communication technologies), enable the provision of system services by lower levels, thus expanding the control space, as illustrated in the next figure.

Control Function Layer	1	2	.	.	.	n
EU interconnected network						
.						
.						
.						
.						
.						
.						
Appliance						

Figure 3 : Assignment of control functions to different physical levels – tomorrow.

(23) <http://electricdrive.org/index.php?ht=d/sp/i/20952/pid/20952>
 (24) http://www.avere-france.org/Site/Article/?article_id=5985&from_espace_adherent=0

If not properly managed, the multiplication and superposition of control loops may create stability and security problems. Therefore, decision-making and coordination roles must be (re)assigned in order to ensure that the whole system remains stable in spite of the multiplication of new types of transactions related both to the supply of “energy” (commodity and service) to end-users and to the supply of “system services”.

A clear definition of roles and control flows is a pre-condition for a successful and orderly transition towards low-carbon energy systems. Policy-makers and regulators should be aware that :

- a) Whatever technological path they select or incentivize, a “control flow” question immediately arises that needs to be answered;
- b) Snubbing this basic question on the grounds of its “technicality” will lead to a catastrophic combination of delays and over costs.

At the onset of liberalization the “parallel flow” problem, i.e. the fact that between a generator and a customer electricity flows through all lines connecting them and not only along the shortest path between the two points, was considered by incumbent utilities an insurmountable obstacle. However, conceptually and practically this problem could be easily solved and solutions were quickly implemented, enabling free trade both within and across national borders. The “control flow” problem

electricity systems face nowadays is much more complex and requires much more sophisticated solutions.

For the use of those who see (and decide)

Technology is not the silver bullet killing all market efficiency problems and all policy implementation difficulties but if properly applied it enables the use of novel market-based mechanisms and incentives in order to achieve a growing number of public policy goals within the regulatory framework of liberalized energy markets.

Policy and regulatory innovation is needed to boost the adoption of technological innovation, thus enabling markets to progress and policies to be cost-effectively implemented. Identifying and optimizing the potential benefits resulting from the application of information and communication technologies to energy systems and energy markets, as well as anticipating and handling potential troubles (in particular the “control flow” problem described in the previous section) is the big challenge faced nowadays by energy industry and energy regulation alike.

Furthermore, the transition to low-carbon energy systems and the construction of the “Energy Union” will be faster, smoother and less costly if the three open questions that have prevented the full achievement of the IEM (see section 2 above) are explicitly addressed and consistent, clear answers are provided at last.