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A New Energy
to Change Europe

A New Energy to Change Europe

Maxime Benatouil, Marc Delepouve and Jean-Claude Simon (eds.)

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Introduction

MAXIME BENATOUIL

As global temperature rise, geopolitical conflict over 'energy security' is intensifying with too many people throughout the world unable to meet basic energy needs, the question of a fair energy transition paving the way for another model of development is more crucial than ever. Among genuine progressive forces it is now crystal clear that a new fundamental contradiction has arisen in addition to that between capital and labour – the contradiction between capital and the sustainability of the planet. Everywhere, grassroots struggles around energy are gaining ground, demonstrating a strong will to overcome corporate-led attempts to co-opt certain environmental demands under the label of green capitalism. Throughout Europe as well, citizens' groups are advocating for energy democracy from production to redistribution along with a struggle against energy precariousness.

The European Commission (EC)'s strategy for an Energy Union will, to say the least, not rise to the challenge. Made public in early 2015, it has a threefold objective: to create and implement a common energy policy, to increase competitiveness, and to complete the internal market. The EC strategic framework focuses mainly on the security of energy supply and on the creation of a competitive energy market – an approach that is far too inadequate in terms of tackling energy poverty. As it stands, the Energy Union is a further step towards the commodification of energy for the benefit of the monopolies and multinational corporations.

This transform! eDossier intends to identify potential alternative avenues for political action and to provide a comprehensive analysis of what is at stake when talking about a progressive plan for Europe's energy transition. In so doing, it compiles contributions made by scientists, social activists, and trade unionists. The authors firmly believe that only such a diversity of approaches and experiences will allow for an improvement of our democracy by providing activists, progressive political actors – and basically all citizens – with a set of concrete alternative proposals for an energy transition that would meet the needs of the whole of society.

The full potential of energy transition is all too often not understood. The way it is addressed rarely reflects how it can actually be used as a means to achieve social change, on the one hand, and to reconfigure interstate relations in the direction of more

cooperation instead of competition, on the other. Moreover, in terms of ecological issues, even the scenarios presented by the Intergovernmental Panel on Climate Change (IPCC) are based on contested figures that attempt to quantify the unquantifiable, which ultimately leads to false representations of climate change. Such false representations – which underestimate the actual dangers – impede collective awareness of the gravity of the danger to humanity and therefore undermine popular mobilisation. Popular mobilisation, however, is necessary for challenging the corporate power of the Global North and of the fossil fuel companies, which bear major responsibility for environmental destruction. Misrepresentation of the reality is thus a highly political matter. An accurate description based on genuine scientific results and not watered-down assessments is a major challenge for the social movements, climate justice movements, environmental NGOs, and trade unions alike – as well as for the radical left. It is quite simply a democratic necessity.

Pointing the blame for climate change at the social elites is crucial for the radical left. The class line dividing those who caused and are responsible for it from those who suffer most from its effects has to be clearly conveyed. For instance, a comprehensive study, broken down into social classes, on the emission of greenhouse gases would be a powerful tool in the struggle against climate change, and would help bring social-justice and climate-justice movements still closer together enabling them to mobilise more massively. Things are moving in the right direction, as in the case of the European anti-fracking campaign (see the chapter by Llorenç Planaguama). While trade unions were likely to support fracking as a source of cheaper energy and, thus, a way of limiting the downward pressure on wages, closer contacts with social movements have helped raise awareness within their ranks of fracking's social and environmental costs for local communities.

Intrinsically linked to a bottom-up culture of transparent dialogue, the issue of democracy is crucial for a radical left energy transition programme – at every step of the way, from production to redistribution through re-localisation. Energy transition and democracy must go hand in hand to ensure that it benefits the largest number of citizens – and from the inclusion of as many viewpoints and experiences as possible to best tackle this collective issue. Energy use

should be considered a human right, and combatting energy poverty and precarity must become a top priority. The shift to a fairer and more democratic European energy model will require massive public investment, and this presupposes a strong political will. But thinking of another European energy model requires addressing the explosive questions of geopolitics and the security of energy supplies, as well as proposing new ways of cooperation with supplier countries neighbouring the EU. The democratisation of our energy model cannot be fully achieved without a redefinition of the very nature of trade relations with supplier countries. Cooperation as well as human, social, and environmental objectives must be the compass of any trade relations – especially those which involve energy. In the same spirit, hostile unilateral moves must be prevented if peace on

the European continent is to be preserved.

It is obvious that – when considered seriously – a comprehensive plan for an energy transition from a radical left perspective cannot ignore any of the above-mentioned issues. Only by taking them into account is there any possibility of addressing today's ecological imperatives and meeting today's social and political needs. For this reason the editorial committee of this eDossier has decided to present contributions intended to illuminate every aspect of the debate over energy transition. This publication makes no claims to exhaustiveness; rather, its aim is to support the necessary diversity of the ongoing discussions within the European progressive political sphere as well as within social movements and trade unions.

The Energy Transition Emergency - What is at Stake?

ANNE-FRÉDÉRIQUE PAUL & MARC DELEPOUVE

What kind of energy transition do we want?

A diversity of discourses on energy transition

Many different discourses advocating a change in our energy system have been voiced by various social protagonists. No wonder then that the sum of this multitude of discourses results in different, sometimes incompatible, options for an 'alternative/renewed/modified' energy system. Accordingly, a variety of 'energy transition pathways' towards these changes have been proposed.

Many discourses are mainly focused on the development of new, mostly 'renewable', energy sources. However, it is not just a matter of providing new energy sources and new means of exploitation, storage, and distribution of energy. We think that we should also deal with the questions of the quantity (produced and consumed) and quality (for people and for the earth), that is, with all the components of the energy system from the exploitation of sources to the different uses of energy.

Indeed, we feel that the first and foremost question of the energy transition is not that of its sources or the way in which they are exploited but the question

'What energy system do we want?'

Energy is central to human activity since it has the potential to expand it and make possible new human activities. Furthermore, energy, through human activity, can profoundly change individuals, society, and ecosystems. One could say that energy is at the core of all human life and activity (even though this may not always be apparent, as history has frequently shown).

In human society, energy depends on complex energy system(s): socio-technical system(s) encompassing all the protagonists, structures, networks, processes, and institutions ... that permit the supply of energy and support human activities.

What energy system do we want?

Our position is that the current energy system should be changed to one that is at once:

- ▶ responsible, promoting a just and solidary energy system;
- ▶ and socio-ecologically sustainable.

That is, an energy system that is less harmful to human beings, society, and ecosystems.

An increasing number of citizens and many public figures and institutions have also advocated this goal.

Responsibility

Responsibility is a value that is deeply connected to ethics and involves the questions:

'What is good? What is right? What should we do?'

Humanly and **socially**, one is not only responsible for one's own life, potential, choices, and actions but also for others' life and potential, whether one does or could know them personally. **Ecologically**, one is responsible for the preservation of our environment.

In practice, one ought to develop capacities (that help shape our future), weigh the options, make choices, and act in accordance with these decisions as best as one can, depending on one's knowledge, means, and capabilities.

To expand on this vision, we can cite the Declaration of Human Duties and Responsibilities (DHDR) which was proclaimed in 1998 'to commemorate the 50th anniversary of the Universal Declaration of Human Rights'. Its aim is to strengthen the implementation of human rights under the auspices of UNESCO and the UN High Commissioner for Human Rights. It sees the major challenge for the 21st century as the effective and efficient realisation of human rights for all people. It formulates duties and responsibilities so that all members of the human family can act on the basis of our interdependence.

To our mind, this definition of responsibilities should not be limited to human rights but broadened to include every human dimension: the individual, the societal, that of our shared environment, both in terms of the present and the future.

Solidarity

Solidarity is the basis that grounds 'living together':

- ▶ each person belongs to the same universal community of human beings who share our planet;
- ▶ each person belongs to this society, and each recognises the collective and is recognised by the collective, with all the moral and practical rights as well as obligations this entails.

Solidarity requires:

- ▶ **mutual recognition and acceptance** of our diversity, our values, and aspirations;
- ▶ **mutual aid** in order to develop ourselves, our society, and our environment according to our different values and aspirations.

The collective is, at the same time, dependent on and shaped by the **Commons** (in the sense that the Commons encompasses all the constructed or natural collectively managed entities). Consequently, each has to contribute to the preservation, enrichment, and accessibility of the Commons.

Furthermore, the collective:

- ▶ requires commitment and contributions according to one's means and capabilities;
- ▶ and, conversely, can be depended on by the collective to benefit from this mutual 'care'.

All states and each population can and should contribute with the richness of their diversity to the collective goal of meeting the current and future global challenges. Furthermore, those challenges call for the mobilisation of all states, every population, and each individual.

This necessary general and collective mobilisation cannot be accomplished without major interventions to reduce (ideally to level out) the highly unbalanced power relations as well as the blatant inequalities.

The earth, our common home, is undergoing increasing and irreversible anthropogenic changes that jeopardise life as we know it. We are thus at a major turning point in human history, which requires worldwide and lasting solidarity everywhere.

Framing the question

Before proposing any scheme for an energy transition, we must specify 'what the goals are' and legitimate them; and then we must ask: '*Which kind of energy system do we desire, accept (and actively promote)?*' Only then will it be possible to propose a pathway that could promote and sustain an energy transition that could lead to a 'renewed' energy system.

The first question that we must therefore address is: '*What is at stake?*', with the understanding that the answer is inherently dependent on how we conceive of the state of the world, the direction in which we think it is going, and the direction in which we want it to go.

What is at stake?

In our view (as voiced in a number of energy transition approaches), the ambitious goal of promoting a

more sustainable and less destructive energy system requires that we look at the challenges we collectively face. That is, we need to **frame** and **justify** what it at stake.

We identified seven major stakes that should be addressed individually and as a whole.

Ecosystem preservation

A growing number of people are seeing or directly experiencing the increasing **global and irrevocable changes in their environment that have deep impact on people, societies, infrastructure and nature.**¹

A wide range of unrelated analyses confirms this observation, pointing to increasing frequency, intensity, and diversification of change and damage, and a growing number of places affected.

It is true that ecosystem changes are 'normal' in the sense that, on a geological scale, ecosystems are not

¹ We will use the expression 'ecosystem **changes**' instead of the often found 'ecosystem **degradation**'. In fact, these changes are more often globally detrimental to the continuation of current human activity, health, and/or environment, in short, to humanity's future. However, the earth has undergone numerous dramatic changes, which can hardly be labelled either good or bad. Changes simply lead to different stases that can be more or less hospitable to human beings...

and never were stable; they go through phases of relative stability ('stasis' with slow and progressive changes following a relatively linear path) interspersed by periods of dramatic changes leading to very different (and unpredictable) new stases.

Historical data show that from the end of the 17th century (which corresponds to the advent of the industrial revolution), **environmental changes are accelerating while becoming increasingly diverse and extensive.**

- ▶ **The changes observed up to now have been very diverse**, involving climate, ecosystems, soils, water flows, biodiversity... indeed every ecological dimension studied so far appears to be affected.
- ▶ These changes are **already affecting human activities**, and they are **beginning to destabilise whole societies, sometimes even directly threatening human life**. The acceleration, diversification, and intensification of these systemic changes are thought even to worsen the already observed destructive effects on human beings and their societies.
- ▶ **If humans are affected by these ecosystem changes, they are also one of its main causal agents**. There is wide agreement around the idea that people and their activities (or at least the activities of certain groups of people) are a significant causal factor in these changes.²

Being highly dependent on the exploitation of fossil energy resources (ranging from coal to non-conventional hydrocarbons), **our current energy system is a significant causal factor in these changes**. Specifically, the current intensive exploitation of fossil fuels constitutes a major source of ecosystem disruption (along with being a source of pollution as well as many tensions and conflicts).

Consequently, any reflexion on energy transition should be aimed at preserving our environment by

promoting an ecologically sustainable energy system.³

In particular, we have to deal with the climate change (in Europe, as an example, almost 80% of greenhouse gas emissions have to do with the energy system⁴). For this purpose, one immediate and concrete goal is to rapidly curb (and ideally stop) the use of fossil fuel in Europe. Another important goal is to drastically reduce the energy system's waste production (radioisotopes, contaminated materials, used batteries, discarded solar panels, etc.). Finally, it is also important to limit the destructive consequences of producing certain kinds of 'renewable' energy (for instance, the ecosystem destruction due to dam construction, or the reduced soil fertility, the degradation and depletion of the water resources, and pollution resulting from the production of certain kinds of agrofuel).

The maintenance and/or improvement of health and the standard of living

Human-caused environmental change is also accompanied by two other phenomena that directly affect human health and well-being, some of which are even **life-threatening**.

- ▶ The first is the generation of **pollution** (whether chronic or acute, localised or widespread).
- ▶ The second is the **depletion and/or degradation of a wide range of 'natural resources'**⁵ (water, soil, food, raw material, land, biodiversity...) crucial for sustaining human life, activities, and societies.

In many of these changes, the energy system is widely recognised as playing a direct or indirect role, sometime a very important one (in particular through the exploitation of both fossil fuels and radioactive material).

At the same time, the energy system plays an instrumental role in the improvement of health, well-

² For this reason, the name 'anthropocene' has been proposed to define the current geological age; it would follow the 'holocene', which is marked by the global impact of the advent of agriculture, which we can trace back 10,000 years, the emergence of agriculture being the first historical human-defined geological age characterised by the worldwide impact of the human species). The anthropocene is marked by global and widespread geological changes brought about by humans and their activities. These changes are, for most scientists, a consequence of the industrial revolution and its subsequent developments.

³ A sustainable energy system in this context means an energy system that allows the preservation of ecosystem diversity and productivity, which are two key elements making up the environment, the natural resources, and the ecosystem upon which human beings and their societies depend.

⁴ According to estimates of the European Environment Agency: http://www.eea.europa.eu/fr/pressroom/newsreleases/ghg_inventory_report-fr

⁵ The importance for us relies in these 'natural resources', as well as their fragility and vulnerability, their overexploitation, degradation and depletion, and their appropriation, is most often a (direct) consequence of their status as 'natural resources, there for our benefit'. That is why we would like an acknowledged and official change of their status from that of (commodified) 'resources' to that of a **'Common'** (that is, all the natural or constructed elements that are shared and collectively managed).

being, and capacities, and it must continue to play this role, everywhere in Europe and in the world. Nevertheless, there are currently a great many people suffering from energy shortage/deprivation (whether due to a lack of availability or unaffordability), and the quality of life of these people would be improved by easier access to energy services.

Taken together, ecosystem changes, pollution and the depletion and/or degradation of nature lead to the **deterioration of everyone's health and well-being** (not to mention the direct threat to their integrity or lives) **while simultaneously reducing individual and collective capacity and prospects.**

We therefore maintain that in order to preserve and promote health and a decent standard of living a desirable energy transition should not only be **made more sustainable but also more benign** in terms of people, societies, and ecosystems.

Respecting fundamental social rights

Conceptions of health, capacity, and a decent standard of living vary from one society to another and from one person to another. However, in our view, everyone should have real access to the fulfilment of his or her basic social rights, independently of the wide range of people's aspirations, values, and beliefs. By basic social rights – in other words, **'fundamental social rights'** – we mean effective access to food, potable water, healthcare, education, transportation, and decent and sanitary housing.

The energy transition we advocate is one that makes possible adequate access⁶ to the energy system that, if all the other necessary conditions have been met, **sustainable satisfies the vital needs associated with fundamental social rights** (food, potable water, healthcare, education, transportation, and decent and sanitary housing).

For a number of countries, insufficient and unreliable energy production, difficulties of distribution, and/or

unduly high prices in terms of the people's financial means constitute major obstacles to the satisfaction of these fundamental social needs. At present, there are still an estimated 1.2 billion people deprived of electricity⁷, of which 620 million are in sub-Saharan Africa⁸.

Furthermore, with the way energy is now produced from biomass, agrofuel directly competes for resources with food production (as well as other essential agricultural production such as wood, interest molecules, etc.). This has direct and dramatic effects on the price and the sheer quantity of food available and, thus, is a factor in malnutrition. In 2015, an estimated 800 million people are still undernourished globally (even though this number has been declining since the 1990s⁹). Moreover, social and environmental problems and tensions emerge where agrofuel is produced through intensive, industrialised, and financialised agriculture that replace local practices and often resorts to land, water and workforce grabbing.

Promoting a socio-ecologically sustainable energy system

The most commonly used and cited definition for **'sustainability'** is derived from the definition of **'sustainable development'** (which is not the same thing¹⁰) formulated in the Brundtland Commission: **'the ability to make development sustainable – to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs.'**

This definition has often been associated with the iconic Venn diagram showing sustainable development at the intersection of ecology, society, and economy. The diagram was published in 2005 in the IUCN's 2005–2008 Programme¹¹ and was meant to emphasise the need to better integrate the three objectives, with action to redress the imbalance between dimensions of sustainability.

6 Access means both the **availability** (the possibility of access) and the **actual possibility** of accessing and benefiting from the energy system **when and where needed.**

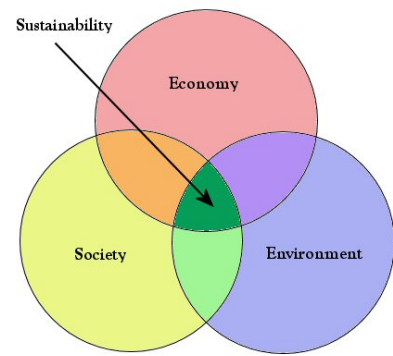
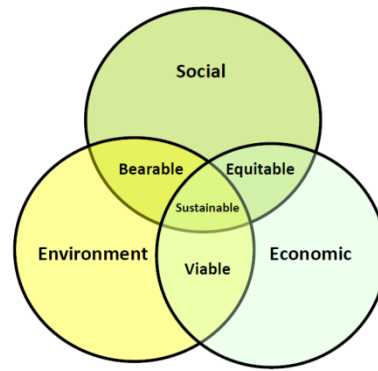
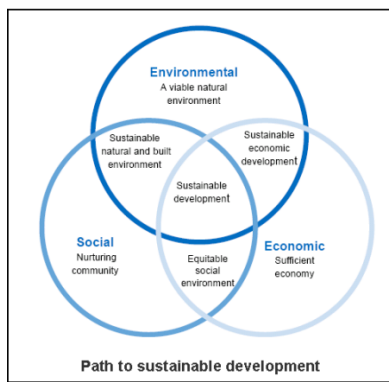
7 <http://www.banquemonde.org/fr/news/feature/2013/05/28/Global-Tracking-Framework-Puts-Numbers-to-Sustainable-Energy-Goals>

8 <http://www.developpement-durable.gouv.fr/L-Agence-internationale-de-L41647.html>

9 **Undernourishment** means that a person is not able to acquire enough food to meet his or her daily minimum dietary energy requirements over a period of one year. The FAO defines hunger as synonymous with chronic undernourishment. <http://www.fao.org/hunger/en/> and <http://www.fao.org/hunger/key-messages/en/>

10 **Sustainability** is an ideal state, while **sustainable development** is a trajectory that actually aims at bringing human activity and life closer to this ideal.

11 http://cmsdata.iucn.org/downloads/programme_english.pdf



Examples of Venn diagram illustrating sustainable development (note that the content of the circle at the top in the three different sections is different; this difference can voluntarily or involuntarily indicate or influence a specific point of view giving more importance to the item positioned above the two others)

For us, economy and finance should be no more than a component of society, a component which shapes, and at the same time is shaped by, society. More importantly, economy and finance must be no more than means at the service of people, societies, and their environment and not ends in themselves. Therefore, for us sustainability is focused on socio-ecological sustainability.

Sustainability has, according to the context and/or approach, a wide range of meaning. One way of understanding this wide range is to think of sustainability as being on an axis which is a continuum between two connected poles: the ecological perspective vs. the well-being-perspective as illustrate below.

<p style="text-align: center;">ECOLOGICAL sustainability perspective</p>		<p style="text-align: center;">WELL-BEING sustainability perspective</p>
<p style="text-align: center;">At the forefront is the ecological limits for human growth and development.</p>		<p style="text-align: center;">At the forefront is well-being and quality of life.</p>
<p>For some people, these limits can and should be scientifically objectified and there is only one way to define sustainability, which is thus an absolute notion, characterised by a set of science-based and objective indicators and measurements.</p>		<p>From this perspective, sustainability is situation- and aspirations-dependent and results from societal choices, context, circumstances, and trajectories.</p> <p>Consequently, a great many different opinions are included in this pole.</p> <p>Sustainability is a hazy and relative notion, which has a normative function (a social conception of what is good in the here and now).</p>
<p>The main goal of this perspective is ecologically sustainable development, including the webs formed by all the entities and systems on earth, everywhere and for each dimension, for the present and the future reaching beyond human beings.</p>		<p>The main goal of this perspective is psycho-social sustainable development, which includes human lives and aspirations, and health and environment in the diverse populations and societies, each with their special context, circumstances, and trajectories.</p>
<p>We think that this approach is a simplistic approach that does not take into account the complexity of the earth's system (see Part Two: The Emergency of Climate Change) as well as the deep interconnections and interdependencies between our environment, our societies, and all of human life and activity.</p>		
<p>THE ECOCENTRIC POLE</p>		<p>THE ANTHROPOCENTRIC POLE</p>
<p>SUSTAINABILITY</p>		

Our view is that one should not try to position sustainability (and thus, a sustainable energy transition) along this continuum. We prefer to conceive of these poles as forming a whole, which then underlies a much more inclusive conception of **sustainability**.

Action promoting a sustainable renovated energy system should take into account three factors that characterise sustainability (these factors are cited in most of the different (and divergent) definitions of sustainability):

- ▶ sustainability is a **complex, holistic, global, and polymorphic notion** that cannot be easily tackled, and it thus requires a great number of different viewpoints;¹²
- ▶ sustainability is a **complex social and inter-generational issue** at the core of a web diverse parties, each with their own beliefs, values, aspirations, and interests, and their own constraints, resources, and trajectories;
- ▶ sustainability **can only be achieved through strong, worldwide legitimised institutions** that, at present, do not exist or do not have the full and/or sufficient authority, power, and means to enforce action.

From this rather theoretical reflexion we conclude that:

Sustainability, when dealing with global and pressing socio-ecological issues that concern everyone, everywhere, now and for the future, **should be understood as a socio-ecological sustainability question, where ecological systems and human systems** (that is, 'natural' and 'constructed' systems) **are intrinsically inseparable**.

Furthermore, **there are no 'absolute' or 'normative' ways of determining what kinds of action promote sustainability**. For each individual case, according to the protagonists, the means, the constraints, the context, circumstances, and trajectory in which these actions are inscribed, the same questions must be raised:

'What are, according to our best knowledge, means, and abilities, the best (or least destructive) choices that we can make in order to have the most beneficial and solidary effect possible on people, societies, and ecosystems?'

Local decisions to move towards a more sustainable system call for a global vision

A proposal can be locally sustainable. However, its effects when viewed globally can have the opposite effect. An example is the net reduction of greenhouse gas emission by the West : an important aspect of this net reduction is simply the simple export of their emissions to other states with less stringent regulations and/or cheaper labour (for instance China and the other emerging national economies.)¹³ Furthermore, the moving of industrial production to such states had and still often has unintended and/or unpredictable social and/or ecological effects (whether positive or negative).

Consequently, each decision in implementing an energy transition should be analysed at both the local (or, rather, the situated level) and the global level. The global level is the paramount criterion, and every choice should be made by asking (and answering) the following question :

'Is my specific action, here and now, to the best of my knowledge, capacity, and efforts, useful for the common and collective goal of promoting a sustainable (and beneficial) energy transition?'

¹² In other words, it is not possible to define in an absolute manner what is and what is not sustainable. For each issue, according to the place, time, and circumstances, the answer can change and should be continuously adjusted according to the evolution observed, our level of understanding, and other considerations.

¹³ See, for instance, the latest report from the Intergovernmental Panel on Climate Change (IPCC).

Energy transition and socio-ecological change are inseparably linked, and, if their interrelationship is judiciously conceived, they can nurture and reinforce each other.

Socio-ecological measures to promote transition towards sustainability are more than theoretical concepts. Very practical measures can be proposed that would be useful for energy transition while having beneficial social and ecological effects. An example, among many others, would be the promotion of a more circular economy¹⁴ in which goods (material or otherwise, such as data or services which always require material and energy) are considered in the context of a global life-cycle where their design, production, uses, maintenance, renewal, and replacement, as well as their recycling and the use of recycled materials in their construction, are conceived and planned as a whole and inserted into a functioning socio-economic and ecological matrix. All these steps must be considered together and seen as a whole in a given context and aim at sustainability.

The 'life' of each good should be conceived globally from its design to the re-insertion of its components within other goods. The aim is to reduce the consumption of energy¹⁵ and material at all steps of its life-cycle. (This conception requires material should be sparingly used; the aim is to use as much recycled material as possible and to produce a truly recyclable good).

Such a move to a more inclusive way of conceiving of the 'life' of goods could prove efficient in terms of energy and ecology as well as being socially beneficial (different productive activities would be more closely connected through shared interests that would go beyond merely financial ones), positive for humanity (people would move away from a consumer attitude to a new outlook in which everyone contributes to the life of a product, in which 'green gestures' take on a much more tangible reality, and where sharing and/or renting counteracts the throwaway attitude).

We should emphasise that a true circular economy is still only a project. Although there are efforts today to promote it, in many cases it amounts to a kind of mock circular economy resulting from unjustified windfall profits while genuine attempts are impeded by the complexity of changing the whole socio-economic system.¹⁶

Conversely, social measures can also facilitate energy transition.

An example, among many others, would be a reduction of the work week to 32 or 30 hours on a European scale. This would increase the available time for activities other than jobs and allow the expansion of social nexuses, such as cultural and educational activity. This could also contribute to another form of 'development' and 'progress', one which would not result almost exclusively from the production and consumption of goods and the servicing of their financial avatars. In a nutshell, reduction of the legal work week could, if part of a whole socio-ecological transition, help reduce humanity's ecological footprint as well as promote personal and social development.¹⁷ This is still more in the realm of wishful thinking than reality. That is why we also would like to use as an illustration an actual social modification that leads to the reduction of energy consumption: the development of carpooling. Carpooling initially resulted from spontaneous commuter initiatives, which were subsequently promoted both by private entities (such as BlaBlaCar) and public ones (for example, many French regions and départements that promote free internet linkup systems, and patrolled meeting and parking sites in close proximity to communication nodes – highways, public transportation stations, etc.). Carpooling emerged as a solution to the increased price of individual mobility and increased time used in transportation; it has proved to be a new source of human interaction as well as providing an economy of energy¹⁸ (and matter), as well as contributing to pollution reduction.

We are aware that linking energy-efficient measures to social beneficial ones (and vice versa) is not a straightforward process; one does not necessarily imply the other. Thinking through these measures and their direct and indirect consequences, both from a situated and a global point of view, is necessary in both the short term and the long term. In these measures, very slight alterations in how, where, and when they are applied can cause major discrepancies in their final effects. However, judiciously conceived measures can prove to have major positive consequences; energy transition is not necessarily an endeavour implying only effort and sacrifice; it is also an opportunity to discover and build a path to a worthwhile life.

14 See for instance the European Commission roadmap 'Circular economy strategy' http://ec.europa.eu/smart-regulation/impact/planned_ia/docs/2015_env_065_env+_032_circular_economy_en.pdf

15 See the Strategic Energy Technology Plan (SET Plan) Towards and integrated roadmap: research & innovation challenges and needs of the EU energy system https://setis.ec.europa.eu/system/files/Towards%20an%20Integrated%20Roadmap_0.pdf

16 See 'Le pari de l'économie circulaire', Alternatives Economiques 349 (September 2015).

17 For an analysis of the gains and pitfalls of measures promoting work-time reduction, see Giorgos Kallis, Michael Kalush, Hugh O'Flynn, Jack Rossiter, and Nicholas Ashford, "'Friday off': Reducing Working Hours in Europe", Sustainability 2013, No. 5, pp. 1545-1567 (doi:10.3390/su5041545) <http://ashford.mit.edu/sites/default/files/documents/G86.%20Kallis%20et%20al.,%20Sustainability%202013,%205,%201545-1567%20pdf.pdf>

18 See for instance Paul Minett and John Pearce, 'Estimating the Energy Consumption Impact of Casual Carpooling', Energies 4, No. 1 (2011), 1pp. 26-139, <http://www.mdpi.com/1996-1073/4/1/126>.

Promoting an energy system that allows for living decently and for planning the future

As already stated, energy is at the core of human life, activity, and societies, and our dependency on energy sources and energy systems has dramatically increased since the industrial revolution.¹⁹ Consequently, any shortage of energy or dysfunction in the energy system can lead to dramatic consequences. For instance, the accidental shut down of electricity, whether temporary or intermittent, endangers the very life of people in hospitals, and necessarily effects the activity of many people as well as the economy.²⁰

There are many different, and often synergetic, causes of energy shortages or, in less acute cases, changes in energy availability. These causes are multiple, not always predictable, and not necessarily preventable. Thus many **monitoring, backup, and protection systems, as well as laws and regulations have been devised, actively enforced, and constantly improved.** Even when very carefully designed, these systems, laws, and regulations cannot provide for every (unforeseen and/or unpredictable) event, and therefore many of them have only been put in place after an observed (and analysed) dysfunction. History shows that not all the potential disruptions or malfunctioning of the energy system could not be prevented, and each time they were not prevented there was a wide range of harmful human and societal consequences.

Thus, we collectively need to design an alternative energy system that is both secure and robust: **secure** in that it is as resistant as possible to threats (whatever their origin and whether they are accidental or deliberate) and to human errors; **robust** in that it maintains its global functioning and the energy services it provides, whatever the challenges, stress, and malfunctions it may face.²¹ A secure and robust energy system is thus one which can resist any disturbance arising from either natural causes and/or human action.

This energy system must be one that everyone can depend upon, where and when needed and in the form and quantity required. The availability of energy, as well its capacity to fuel a wide range of different uses, must be ensured. **The energy system furthermore constitutes a vital collective service since** energy is essential for preparing and planning for the future, thus playing an important role in both **the individual's and the collective's capacities to project the future, and thus their hopes for betterment.**²² Consequently, any unpredictability and/or uncertainty involving such a crucial issue represents a significant source of stress, anxiety, unhappiness, and dissatisfaction.

Adjustability and adaptability are two characteristics which, though often forgotten, are crucial. An **adjustable** energy system is one that can adapt to the variations of production and consumption in order to continuously ensure different (and variable) energy services. An adjustable energy system is one that permanently accommodates changing demands and contexts. An **adaptive** energy system is one that allows for overall changes in structure and/or function in the medium and long term in order to meet future needs and deal with future constraints. It prepares and provides for future services.

More than simply providing for the sustained functioning of an energy system, it is important to promote a system that is at once:

- **more secure and robust;**
- **more reliable;**
- **readily adjustable;**
- and **adaptable.**

The challenge we are facing is overwhelming. Many people are confronted with numerous difficulties simply in providing for day-to-day needs (while some others publicly enjoy comfortable, free and, spendthrift lives). At the same time, their lives are made more difficult by the consequences of a number of global issues (air-pollution-related disabilities and diseases, climate change, ecosystem modifications, political tension, and social unrest connected to energy resources).

¹⁹ Some would say that human beings have become energy-addicted since some energy services have become psychologically and/or socially necessary even though they are constructed and not imposed needs.

²⁰ This also explains why energy system unreliability (such as in most of sub-Saharan Africa or in Bangladesh) as well as energy unaffordability for many poor people (whether in developed, emergent or developing countries) are a major impediment to one's aspiration to a 'good life' or even to decent living conditions.

²¹ Maintenance of an energy system does not exclude its being transformed: it necessarily changes (structurally or in terms of its function), but in a controlled manner in order to preserve its usefulness.

²² For us, clearly, progress is not limited to material conditions but above all denotes human and cultural development.

One way to collectively deal with these issues is to invest in deep changes in the energy system. It is thus essential to explain that the changes and effort involved, both individually and collectively, even if mainly aimed at changing the energy system, are, in fact, part of the social transformation people need to have a decent future. This may prove more mobilising than simply stating that 'we need to change the energy system'. In order to change, accept change, and be a protagonist in the process of change, one has to have a clear idea of what one will eventually be suffering from and what could be gained by taking action.

Progressing towards democracy and energy sovereignty

The project of promoting a democratic energy system in Europe must be situated within the overall project of achieving real democratic ownership of politics in Europe. This project requires Europe's economic and financial autonomy.

In this project, fossil fuel plays an important role and is a powerful lever since it currently accounts for approximately a quarter of the EU's total imports.²³ Progressively phasing out energy imports (except in cases of mutually beneficial cooperation) will reduce the need to export in order to balance the EU's budget.

In of itself, **switching to a more autonomous energy system would give the EU greater economic, financial, and political autonomy and, as a result, help it fulfil its potential to become more democratic.**

In addition, **this would undermine the power of the transnational corporations** that exploit energy sources and market energy. For both these reasons (aside from it being a step in the necessary energy transition), a strategy aiming at reducing EU's energy imports is crucial.

The project of democratic ownership of politics in Europe requires the development of an effective democratic and civic life. This goal is facilitated by the fact that renewable energy sources,²⁴ energy efficiency, and energy sobriety are, to a great extent, manageable at a regional, local, and/or individual

scale and are thus conducive to building participation, ownership, and civic control. This point is developed in the next chapter.

Reducing geopolitical tensions, practicing international solidarity, and assuming international responsibility

Geopolitical tensions and conflicts between and inside states are largely the consequences of the unequal distribution of the currently known and/or estimated exploitable petrol and gas reserves.²⁵ A move to put an end to fossil energy could lead to a significant reduction in geopolitical tensions and conflicts.

However, **changing to another energy system must not create and/or increase pressure on scarce resources** (such as indium used in some type of solar panels) **or already fragile and/or highly exploited resources** (such as soil or water used in the production of agrofuel or dam-generated electricity).

As many recent catastrophes (such as droughts, floods, fires, hurricanes, etc.) and/or longer-lasting critical situations (climate refugees, the spread of diseases and pests, crop failure...) abundantly illustrate, the conservation of **our environment and the stabilisation of our climate is a pressing need.**

Nowadays, humanity is in global peril. If the worst is not certain, a major disruption on the horizon seems more and more plausible. If our current (and accelerating) trajectory continues, it is most probable that whole territories will be devastated by extreme climatic events, leading to collective tragedies and the flight of a growing number of refugees. In such a strained and volatile context, geopolitical questions will take on new aspects and will, most certainly, have drastic urgency.

More and more entities – organisations and governments – are starting to take into account the real risk of runaway climate change which is a looming threat for humanity (as seen in a growing number of studies and in the latest IPCC Assessment Report). But at the same time, some pharaonic and reckless climate-engineering projects are receiving support, even though they risk of becoming further causes of the uncontrolled devastation of our biosphere.

²³ According to Eurostat, in 2010 the EU imported fossil fuel at the level of € 381 billion out of € 1 509 billion for total imports. http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-GI-11-001/EN/KS-GI-11-001-EN.PD, p57.

²⁴ Renewable energy sources today include solar, geothermal, ambient, wind, marine, biomass, and waste energy. Unfortunately, although the energy source itself may be renewable (which is still a questionable assumption in the case of biomass and waste), the same can rarely be said of the precise methods of exploiting them and converting them into an energy form adapted to energy use. We therefore prefer the term 'more sustainable and less harmful energy sources for people, societies, and the environment'.

²⁵ Exploitable resources' are resources whose use are at once technically, financially, and politically feasible.

The following sub-chapter, *The Emergency of Climate Change*, shows that a general mobilisation of humanity and global solidarity are required. For this, a **major shift of the basis of geopolitical strategies and practices**, towards solidarity, effective cooperation, and mutual emancipation is ever more urgent.

- ▶ From now on, therefore, **the first and foremost geopolitical principle should be solidarity** (for mutually beneficial and unifying common goals). This would be a necessary and irreversible change. The globalised capitalist economy, through free trade without regulation of goods and capital circulation, has too often proven to be an obstacle to the implementation of this principle.
- ▶ A European energy transition to a democratic energy system would be an example of an effective application of this kind of geopolitical overhaul. These new principles must apply

between the EU states and non-EU states: **the EU energy transition must integrate an active policy of cooperation, solidarity and responsibility between the EU and other territories and states.**

It is crucial that knowledge, techniques, and practices useful for energy transition be readily accessible to every state and every population of the world – and that their appropriation and transference is facilitated. Upstream, research and development, as well as education, must be re-established (see chapter 5). A worldwide fund must be established to help finance the energy transition of middle and low income countries in a way that respects local and national particularities and democratic procedures. In conclusion, Europe has the ethical duty to develop an international policy that actively promotes energy sovereignty and the security of the other territories and states of the whole world.

Mutual cooperative solidarity and energy transition

Currently, territories and states differ very widely in their energy systems, their historical and current contribution to the anthropogenic environmental and climatic changes, as well as in their financial and technical capacity to promote an energy transition. This presents Europeans with **the ethical obligation** to develop an active policy of cooperation, solidarity, and responsibility with other territories and states.

This obligation has two complementary components:

First, the EU and all countries must provide **free access** to all knowledge, techniques, and practices that can contribute to the energy transition. This implies not only an open-source policy but also structures that are instrumental for the **appropriation** and **transposition** of this knowledge according to the context, circumstances, and trajectories of the populations, territories, and states that could benefit from them. (In this kind of empowering relationship, all participants would mutually benefit from this process).

It is important to keep in mind that the appropriation of knowledge, techniques, and practices can only enrich strategies and action, which is essential in trying to shape the future. However, without action they are useless. Only actual activity will really contribute to the energy transition and the actual shaping of the energy system.

Second, the EU must promote the creation of a worldwide fund that can be accessed by those in need both **financially** and **practically** (by providing not only money but also **material and human resources**).

Here, too, it is important to bear in mind that financial resources are a necessary but insufficient lever for an energy transition: without infrastructure and the material and human resources money can buy things but certainly cannot emancipate people.

Humanity urgently needs a solidary socio-ecologically sustainable energy transition to an energy system that is at once **more responsible and more just**. In order to reach this vital collective goal, Europe's international solidarity implies an active and voluntary policy of effective cooperation and mutual emancipation. The EU has the duty to contribute, to the best of its ability and means, to the empowerment of populations, territories, and states to organise their own individual energy transition, following their own trajectory. Everyone everywhere in the world should have **the capabilities, the means, and the power to act** for the accomplishment of this collective energy transition.

Conclusion: From the issues we are facing to the way in which we deal with them

As we launch a transition to a new energy system, the energy system as a whole will change. This will require much more than just a change in technology and will entail changes in the socio-technical-ecological paradigms that it helps shape and on which it depends.

The energy system and the socio-technical-ecological system are co-evolutionary processes. Their current associated paradigms are inseparably linked,

being mutually constitutive and undergoing interactive changes.²⁶ Any change in one of these two systems will inevitably change individuals, societies, cultures, and their relationship to nature.²⁷ Therefore, our shared values and goals and what we consider to be a desirable collective future will progressively change.²⁸

As a consequence of changes to the energy and socio-ecological systems, the parameters of our collective challenge will be modified, the stakes of the energy issue will change, and the framework of the question will be modified.

In conclusion, as the transitions unfold, our very goals of a responsible, just and solidary socio-ecologically sustainable energy transition will change.

We must be aware of this and prepared to be as adaptive and flexible as possible (and also seek out opportunities for change) as well as meet our obligation to constantly provide for future (and unpredictable) changes by developing new knowledge, means, and skills.

26 For instance, climate changes and fossil energy exploitation are interconnected. This has been known since the end of the 18th century, but the clear and scientifically-grounded causal connection between them began to be seriously considered only a few decades ago; 'If the information Fourier had at his disposal did not, of course, allow him to quantify its different manifestations, the Enlightenment ended with the emergence of the concept of the 'greenhouse gas effect'. The work of the physicist-prefect was the prelude to Pouillet's work and that of the Irishman John Tyndall in 1860 on climate changes in the ice ages, and above all to the work of the Swedish scientist Svante Arrhenius, who in 1896 was the first to locate the problem in the carbon cycle and definitively related the greenhouse effect to the industrial use of fossil fuels. As it was for the Québécois physician Gautier one and a half centuries before, for Arrhenius the warming generated by fossil fuel combustion became the indicator of future security, with the explosion of humanity's economic activity guaranteeing it that it could ward off a hypothetical new ice age.' René Favier, 'Penser le changement climatique au siècle des Lumières', Denis Lamarre (ed.), *Climat et risques. Changement d'approches*, Lavoisier; Paris, 2008, pp. 9-23.

27 For instance, the major take-off and global spread of fuel consumption, notably in the sale of gasoline along with the boom in private car use and the roads and petrol stations associated with it, favoured individual mobility. It led to urban growth, greater commuting time and distances, the decline of (and disinvestment in) public transportation as well as dramatic changes in landscapes (urbanisation and the development of roads), the emergence of many kinds of pollution (including new noise and air pollution), and globally to an increase in fossil fuel consumption (not only through recourse to individual transportation but also through many other related consequences such as road maintenance, individualisation of housing, the increase in inhabited space per individual, etc.).

28 Continuing the previous example, the take-off of individual cars contributed to the development of the 'sense of freedom', which particularly is expressed in individual mobility without constraints (financial, material, or social). The return to lower-impact means of transportation (walking, bicycling, and using public transportation, etc.) is suffering from competition from electric private cars, which promises 'green transportation' but which will not reduce our total energy consumption. Private electric cars do not solve the many problems caused by individual kinds of transportations (such as town extension) while creating new problems of their own (such as the mass production of batteries and their recharging at the same time).

The Emergency of Climate Change

Scientific Knowledge, IPCC Scenarios and Representations of Climate Change

MARC DELEPOUVE

It is important to have an accurate and lucid representation of climate change, especially in establishing policies to mitigate it, which is one of the main goals of energy transition.

In what follows we will first present a picture of climate change we believe results from scientific research and its limits. Then we will present a contrasting picture of climate change, one that flows from the scenarios of the Inter-governmental Panel on Climate Change (IPCC). Finally, we will present our political conclusion.

The picture of climate change based on scientific investigation

Based on recent discoveries, there are four major lessons to draw from scientific investigations of the future of climate change:

1. current climate system change is closely intertwined with earth system change. There is strong interaction between the changes of all the components of the earth system : oceans, life, climate.
2. 'Climate change is extremely complex. Its future is a largely question that scientific knowledge cannot illuminate, because the evolution of human activities cannot be predicted, especially over several decades or a century, but also because the complexity of the earth system cannot be grasped with today's scientific knowledge.'
3. 'Today, our ability to quantify the future of climate change is very limited; most scientific knowledge lies either in the non-quantitative or not yet quantifiable realm.'
4. 'Thanks to scientific findings, humankind is aware of climate change, of its speed, of the risk of a run-away effect, and of the major threat it represents to the earth system and humanity in general.'

As we will see, these lessons are illustrated, among other things, by the cloud system, underground methane reserves (under dry ground or under the ocean floor), and by living creatures.

Clouds

The cloud system has two opposite effects on climate. One is the greenhouse effect, which is a warming effect; the other is the mirror effect, which is a cooling effect. The balance between these two effects could change with global warming, in the direction either of warming or cooling. Scientific analysis suggests that the future evolution of this balance will likely be towards warming; but today, due to insufficient scientific knowledge, it is absolutely impossible to elaborate a quantified scenario of the future evolution of this balance.

On this issue, the IPCC's Fifth Assessment Report (2013) reads in full:

» *'The quantification of cloud and convective effects in models, and of aerosol and cloud interactions, continues to be a challenge. Climate models are incorporating more of the relevant processes than at the time of AR4, but confidence in the representation of these processes remains weak. [...] [Today] model estimates of aerosol-cloud interactions and their radiative effects will carry large uncertainties.²⁹ The sign of the net radiative feedback due to all cloud types is likely positive. Uncertainty in the sign and magnitude of the cloud feedback is due primarily to continuing uncertainty in the impact of warming on low clouds.'*³⁰

Methane stocks in ocean floors

Scientific findings provide us with some information. Methane (CH₄) stocks in the ocean floor might release great quantities of methane gas into oceans and the atmosphere due to temperature increases, but we do not know when this is likely to happen or what the magnitude of it will be. This is not a secondary issue, because methane stocks in ocean floors are gigantic. According to a communication published in 2006 by the Geological and Geological Engineering Department of Laval University, seabed methane, in the form of methane hydrate, contains about twice the quantity of carbon of all known fossil fuel reserves in the world. Moreover, a methane molecule has at least 25 times the greenhouse effect of a molecule of CO₂. Therefore, releasing a small part

29 Full WG1 AR5 Report, p. 573, http://www.climatechange2013.org/images/report/WG1AR5_ALL_FINAL.pdf

30 Full WG1 AR5 Report, p. 574.

of the seabed methane could induce an important increase of greenhouse gases in the atmosphere³¹, which then could induce a temperature increase, which in turn could induce methane to be released again, and so on.

According to the Geological and Geological Engineering Department of Laval University (2006):

» *'A massive destabilisation of methane hydrates caused for example by an increase of 1 or 2° C in oceans temperatures, which is entirely compatible with current climate models, may produce a catastrophic increase in atmospheric greenhouse gas.'*³²

On this issue, the IPCC's full Fifth Assessment Report, in its complete final version, noted in connection with seabeds (excluding the Arctic Ocean):

» *'The likelihood of the future release of CH₄ from marine gas hydrates in response to sea floor warming is poorly understood. In the event of a significant release of CH₄ from hydrates in the sea floor by the end of the 21st century, it is likely that subsequent emissions to the atmosphere would be in the form of CO₂, due to CH₄ oxidation in the water column' (emphasis in original).*³³ Later, it enlarged the scope of its topic to Arctic permafrost: *'CH₄ release from marine hydrates and subsea permafrost may also occur but uncertainty is sufficient to prevent plotting emission rates here.'*³⁴

In 2010, the International Arctic Research Center (IARC)³⁵ at Fairbanks University, Alaska, published a study in the scholarly journal *Science* showing that leakage of methane stored under the 2 square million kilometres of the Arctic had already begun and stated that it *'might have in the future a dramatic effect on global warming'*. Here is an excerpt of a résumé of this study published by EurekAlert, website of the American Association for the Advancement of Science (AAAS):

» *'Releasing of methane from the Arctic is faster*

*than expected. The amounts of methane emerging from Arctic Ocean's submarine permafrost in atmosphere are an important and overlooked source of methane, and researchers say that similar but more widespread emissions could in future have a dramatic effect on global warming. [...] After more than 5,000 measures in East Siberian Sea, the researchers report that 80 % of the deeper water and more than 50 % of those close to the surface are supersaturated with methane from underlying permafrost. The sea-floor permafrost contains large amounts of carbon and experts fear that its release as methane leads to a warming of the atmosphere, creating a positive feedback loop with an even larger gas release.'*³⁶

In 2012, according to the Institut Français de Recherche pour l'Exploitation de la mer (Ifremer) :

» *'In releasing large quantities of methane, a gas with a strong greenhouse effect, the destabilisation of gas hydrates found in marine sediments could play a fundamental role in global climate change. It has in fact been noted that all periods of global warming over the last 60,000 years have been marked by high levels of atmospheric methane. Indeed, the mechanism "beginning of warm-up - thermal destabilisation of hydrates - methane release" has the effect of accelerating the warming.'*³⁷

Methane release from continental permafrost

The fifth IPCC full assessment report states:

» *'There is high confidence that reductions in [continental] permafrost extent due to warming will cause thawing of some currently frozen carbon. However, there is low confidence [due to lack of knowledge] on the magnitude of carbon losses through CO₂ and CH₄ emissions in the atmosphere.'*³⁸

An article in the CNRS' *Le Journal* of January 2015 states:

31 However, we should note the substitution of a likely large quantity of methane by CO₂ during its movement from the ocean floor to the atmosphere, except in the case of the Arctic Ocean's submarine permafrost.

32 'Les hydrates de méthane : une réserve énergétique énorme, mais une bombe écologique en puissance', 2 February 2006, <<http://www2.ggl.ulaval.ca/personnel/bourque/s3/hydrates.methane.htm>>.

33 Full WG1 AR5 Report, page 468-469

34 Full WG1 AR5 Report, p. 540.

35 Natalia Shakhova, Igor Semiletov, Anatoly Salyuk, Vladimir Yusupov, Denis Kosmach from Russian Sciences Academy (Vladivostok), and Örjan Gustafsson from Stockholm University. The authors are members of a research team of the International Arctic Research Center (IARC) of Fairbanks University (Alaska), coordinated by Natalia Shakhova..

36 <<http://www.aaas.org/news/science-methane-gas-release-arctic-permafrost-far-larger-expected>>.

37 <http://www.ifremer.fr/grands_fonds/Les-enjeux/Les-applications/Ressources-energetiques/Les-hydrates-de-gaz>.

38 Full WG1 AR5 Report, p. 468.

» *“Permafrost represents 25 per cent of the land in the Northern Hemisphere, equivalent to the size of Canada. This is the largest terrestrial carbon reservoir in the world, ahead of fossil fuel such as oil, gas, and coal, “1,700 billion tons of carbon of plant origin have accumulated since the last glaciation”, explains Florent Dominé. “This is more than twice the carbon now present in the atmosphere!”³⁹*

‘Florent Dominé points to a temperature increase of 5° to 8° C by 2100, while the worst case scenario of the Intergovernmental Panel on Climate Change (IPCC) is now at 4° C.’ Dominé adds: “All we know today is that we are facing a formidable positive reverse action and feedback loop. The more air temperature increases, the more the permafrost melts and the more greenhouse gases are released in the atmosphere, resulting in a further increase in air temperature, and so on ... “[...]’

The thermokarst ponds [...] these actual bioreactors, are at the heart of the frozen carbon releasing process. When permafrost thaws, chunks of ground break off and fall into the water, bringing nutrients and carbon to the bacteria and plankton present in the pond, which in turn change these nutrients into CO₂ (in the water layers close to the surface), and into methane (in the deeper areas of the pond that are deprived of oxygen).’

This *Le Journal* article illustrates the complex interactions and loops between climate change, release of methane, and life. More widely - increasing temperature, acidification of oceans, release of methane from permafrost or from the ocean floor, the decreasing oxygen rate of some ocean waters, and consequential change of life forms - all these are influenced by interactions in an extremely complex process of change that is far from being fully explained by scientific knowledge. Moreover, this process interacts with the scientifically unpredictable evolution of economic/social structures and of human behaviours (life style and production and consumption patterns). This evolution is all the more unpredictable that they are taking place within the unprecedented context of the environmental crisis and are likely to become an overwhelming factor in the coming decades.

Methane – the IPCC sounds the alarm

The full fifth IPCC assessment report stated:

» *“ Between the mid-1980s and the mid-2000s the atmospheric growth of CH₄ declined to nearly zero [...]. More recently since 2006, atmospheric CH₄ is observed to increase again [...]; however, it is unclear if this is a short-term fluctuation or a new regime for the CH₄ cycle [...].⁴⁰*

» *Further: ‘Of the natural sources of CH₄, emissions from thawing permafrost and CH₄ hydrates in the northern circumpolar region will become potentially important in the 21st century because they could increase dramatically due to the rapid climate warming of the Arctic and the large carbon pools stored there.’ ‘Supersaturation of dissolved CH₄ at the bottom and surface waters in the East Siberian Arctic Shelf indicate some CH₄ activity across the region [...] but it is not possible to say whether this source has always been present or is a consequence of recent Arctic changes. The ebullition of CH₄ from decomposing, thawing lake sediments in north Siberia [...] is another demonstration of the activity of this region and of its potential importance in the future [...].⁴¹*

The story of missing heat

Between 50 million BC to one million BC, the earth’s surface atmosphere cooled by approximately 15 ° C. To be precise, temperature constantly fluctuated following a cycle with an average temperature that was lowered by approximately 15 ° C. Since the nineteenth century, a new and reverse trend has occurred with an exponential temperature increase. However, in the last 16 years, the increase was considerably weaker than in the two previous decades. This question was the focus of an article published in *Nature* in January 2015. Here are excerpts from this article:

» *‘Sixteen years into the mysterious “global-warming”, scientists are piecing together an explanation.’ ‘...average atmospheric temperatures have risen little since 1998, in seeming defiance of projections of climate models and the ever-increasing emissions of greenhouse gases. [...] Climate scientists, meanwhile, know that heat must still be building up somewhere in the climate system, but they have struggled to explain where it is going, if not into the at-*

39 Laure Callioce, ‘Pérgélisol, le piège climatique’ [Permafrost, the Climate Trap], *Le Journal*, <<https://lejournal.cnrs.fr/articles/pergelisol-le-piege-climatique>>.

40 Full WG1 AR5 Report, p. 475

41 Full WG1 AR5 Report, p. 508.

mosphere. Some have begun to wonder whether there is something amiss in their models.' 'Now, as the global-warming hiatus enters its sixteenth year, scientists are at last making headway in the case of the missing heat': the oceans 'serve as giant sponges for heat'.

The article also noted that 'none of the climate simulations carried out for the IPCC mentioned this particular hiatus at this particular time.'⁴²

Much before the end of 2014, the heat sponge function of oceans (which soak up approximately 90 per cent of the extra energy accumulated in the system because of global warming) was a known fact; but its increase over the past sixteen years was both unseen and unforeseen. IPCC models and the fifth IPCC Assessment Report released in 2014⁴³ also failed to capture this.

Several questions arise from the heat-sponge role of the oceans, representing considerable challenges for research, especially in terms of quantifiable answers. How does this surplus heat move in the ocean and where is it going? What is happening and what will happen to the warm ocean currents? To what extent and when will this heat surplus reheat and destabilise methane stocks located in the ocean floor, causing their release? Will the surplus heat accelerate the evolution of submarine eco-systems? Will it increase the risk of a speedy development of methanogenic bacteria (which played a key role during the very warm periods of the earth's climate history)?

The current climate change is closely related to the overall change of the earth system. Strong interactions, with a risk of retroactive spirals, are at work between climate change and changes affecting all components of the earth system, creating an extremely complex totality. Uncertainties about the paths followed by climate change are essential in addressing the danger they pose for humanity. Once we have grasped the scientific findings and their limits, we can represent the future of climate change taking into account what cannot be predicted and the scope of dangers and risks, and then we can hear the alarm bells all over the planet and issue a call to general mobilisation.

42 Jeff Tollefsen, 'Climate Change; The Case of the Missing Heat', <<http://www.nature.com/news/climate-change-the-case-of-the-missing-heat-1.14525>>.

43 Full WGII AR5 Report, <<https://www.ipcc.ch/report/ar5/wg2/>>.

44 See Marc Delepouve, *Une société intoxiquée par les chiffres*, Paris : Éditions L'Harmattan, 2011, chapter 3 with subchapters 3, 4, and 5.

45 For example this target is claimed by most of the French media and most of the French environmental website. We choose here one among them, just for illustration : <http://www.actu-environnement.com/ae/news/rapport-giec-2c-emissions-ges-temperatures-hausse-21395.php4>

Representation of climate change based on IPCC scenarios

Since its inception, the IPCC has published five Assessment Reports. The last and fifth in 2013–2014, the fourth in 2007. Each IPCC Assessment Report contains a full report and a summary for policy makers. Starting with its second edition in 1995, the IPCC Assessment Report has included scenarios of climate change forecast to 2100. The interpretation of these scenarios by media and politicians has a huge impact on the public representation of climate change, on the public debate, and on the reaction of people in facing climate change.

According to the interpretation adopted by most of media and politicians of scenarios from the IPCC's Fourth Assessment Report, a good target is seen as a 50 per cent reduction of greenhouse gas emissions by 2050 compared to the beginning of the 21st century. It was the famous factor 2, a magical figure well-adapted to political communication.⁴⁴

According to the interpretation adopted the same media and politicians of scenarios from the IPCC's Fifth Assessment Report, a good target would be between '40 to 70 per cent global anthropogenic GHG emissions reductions by 2050 compared to 2010'⁴⁵. This target seems less magical than factor 2, and it could even seem to be scientific as it is presented as a confidence interval. But it is not a confidence interval, a problem to which we will return.

Both evaluation reports were thus interpreted and given an objective for the year 2050. We are now 35 years from this date up to which humans could, according to these political and media interpretations, continue quietly to release greenhouse gases into the atmosphere, in smaller but still considerable quantities. However, given the likelihood of an acceleration of climate change, even the smaller quantity seems truly out of proportion.

A few words on the IPCC's Fifth Assessment Report. It contains four climate scenarios running until 2100, based on four scenarios of greenhouse gas releases created by human activities. Each one is based on

the results of a set of climate models, with between 25 and 42 such models per scenario. Concerning global mean surface temperature change, the IPCC's full Fifth Assessment Report first states:

» *the Result is “a statistical summary of the spread in the Coupled Model Intercomparison Project (CMIP) ensembles for each of the scenarios [...] model biases and model dependencies are not accounted for; the percentiles do not correspond to the assessed uncertainty [...]; and statistical spread across models cannot be interpreted in terms of calibrated language”⁴⁶.*

More generally it states:

» *“In summary, there does not exist at present a single agreed on and robust formal methodology to deliver uncertainty quantification estimates of future changes in all climate variables [...]. As a consequence, in this chapter⁴⁷, statements using the calibrated uncertainty language are a result of the expert judgement of the authors [...].⁴⁸ [...] in general, it remains an open research question to find significant connections that justify some form of weighting across the ensemble of models and to produce aggregated future projections that are significantly different from straightforward one model-one vote [...] ensemble results. Therefore, most of the analyses performed for this chapter [...] make use of all available models in the ensembles, with equal weight given to each of them unless otherwise stated.”⁴⁹*

In this case, using a simple average⁵⁰ is an aberration. But, because the IPCC does not have the knowledge necessary to perform a pertinent calculation, the method it uses is simple averaging. Added to this are the biases contained in the models. In this connection, the full edition of the fifth report acknowledges that several questions involving major future climate risks have either not been taken into account in the IPCC models or have been included only in some models.

However, in preparing the summary for policy makers, the IPCC chose not to warn readers about the biases and methodological weaknesses (or immaturity) of the models used in constructing the scenarios. By doing so, the IPCC opened the door to

unfounded political and media interpretations of these scenarios resulting in erroneous representations of climate change issues.

Conclusion

The IPCC is an intergovernmental panel, and the word **intergovernmental** is significant. IPCC Reports are both scientific and political. Reading the full IPCC Assessment Reports, one can get a representation of the future of climate change based on scientific findings with an awareness of their limits. But very few read the full reports. Only reading the IPCC summary for policy makers, one gets a false impression of climate change based on a great deal of figures and on scenarios projected to 2100 resulting from the quantification of the unquantifiable. What is more, this false representation is cold and technical and does not lead to mobilisation.

Scientific findings are sounding the alarm: the climate system is threatened by a rapid and major runaway effect. Humankind has to launch a general and solidarity-based mobilisation without further delay to avoid the risk of a huge and dramatic climate runaway or to limit its magnitude and effects as far as possible. The earth system is humanity's home. The earth system and its climate are under attack, by humanity itself. The chief responsibility for this lies with the richest and most powerful people and their transnational corporations. They are also the least threatened and do not want to see humanity's general and solidarity-based mobilisation. Such a mobilisation would threaten the system of production and consumption and generalised competition, among other things. It would threaten the foundation on which their wealth and power rest. It is clearly plausible that this is the motivation behind the mistaken representation of climate change based on IPCC scenarios and disseminated by most media and politicians.

How climate change is represented is an eminently political issue. For the political left, the social movements, and the environmental NGOs, it is important to construct their own representation of climate change based on scientific findings (including those given in the full IPCC Assessment Report) and knowing their limits, but not based on IPCC scenarios. This is a major issue. It is a democratic necessity.

46 Full WG1 AR5 Report, p. 1397.

47 Editors Note: This chapter assesses long-term projections of climate change for the end of the 21st century and beyond

48 Full WG1 AR5 Report, p. 1040.

49 Full WG1 AR5 Report, pp. 1040, 1044.

50 An average each of whose values are given equal weight.

Overview of Transition Deployment

JEAN-CLAUDE SIMON

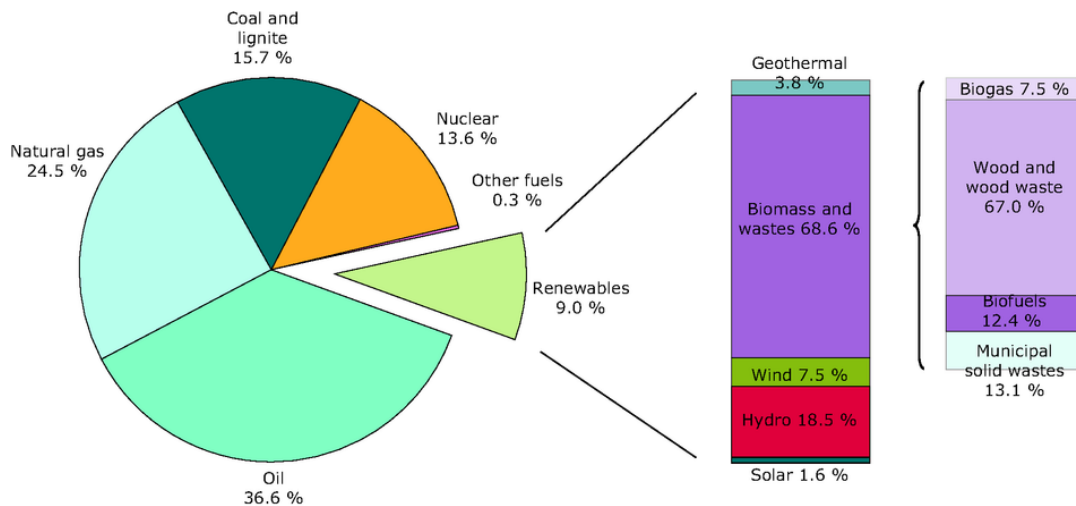
Energy transition – concept and deployment: a concise definition

Energy transition involves a major societal change, a 'new paradigm' that is driven by climate change and the challenge of containing global warming before it exceeds manageable limits. Achieving this requires a global shift to energy production derived from renewable and non-polluting sources. Let us first define the concept more fully and indicate the key areas.

Brief considerations on the new paradigm

The term 'new paradigm' is often used by economists, industrialists, and political analysts to describe

the needed transition to an ecologically friendly order with a strong social component in order to solve the climate change problem. This energy transition is thus the cornerstone of the new paradigm since it drives the ecological evolution of all productive systems in industry, agriculture, and in services. The paradigm calls for a strategic change of priorities that begins at the household or production level and scales up to the local, national, European, and global levels. The graph below presents the 2009 energy sources used in the EU 27. It thus gives a view of what the new paradigm is about in switching to renewable energy sources.

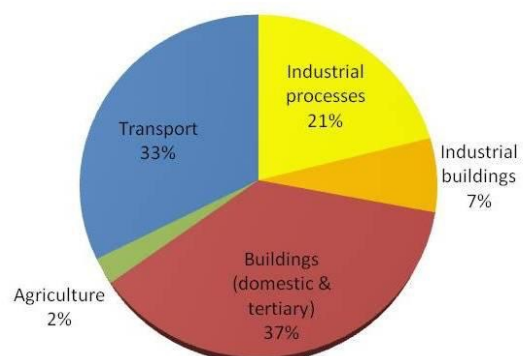


Focus areas

To reach the goal, the focus must be on energy savings and improved energy efficiency – the demand side – with a switch from fossil and nuclear energy to Renewable Energy Sources (RES) – the supply side. Such a development has been described in France by the Association négaWatt 2012 scenario 'Réussir la transition énergétique' as a 'three pillar' strategy with a 35-year objective. The time frame is essential. At the level of several other countries, as well as the EU level, several organisations or institutions have determined that the shift can indeed be effected within the next 35 years.

Let us first look at the key parameters of the topic under discussion:

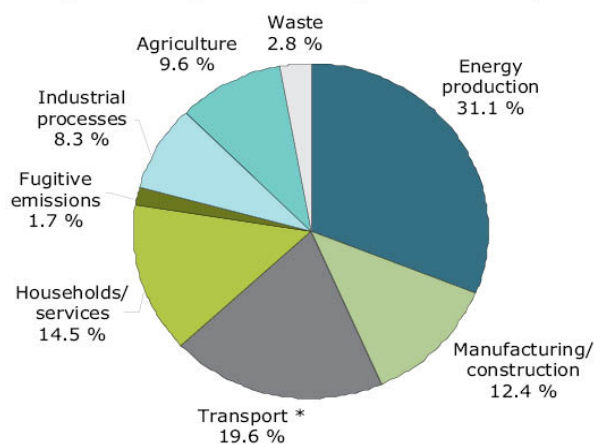
Share of total EU energy consumption



The graph above shows the EU 27's energy consumption by sector (2009). The discussion on shifting to RES in this note applies to these sectors.

The discussion also deals with CO₂ emissions that are shown by the second graph below, representing greenhouse gas emissions from various sectors.

Total greenhouse gas emissions by sector in EU-27, 2008



* Excludes international aviation and shipping (6 % of total GHG emissions)

Our purpose in this note is to first look at a number of possible directions that could drive the transition. We will look in turn at financing requirements, political directions, objectives of the transition, and entities to be established. Further below, we will look at measures that have been considered in the areas of energy consumption and production, using a number of concrete examples derived from Europe-wide and national scenarios that describe possible transitions (sources are listed in the bibliography).

A warning about using numbers and statistics is in order at this point. In its 2010 report, 'Rethinking 2050, a 100% renewable energy vision for the European Union', the European Renewable Energy Council (EREC) stated:

» *Determining a long-term vision over 40 years is, by nature a difficult task and the resulting outlook should by no means be seen as an exact prediction of what the future has in store for us... Long-term scenarios are to be considered as analytical tools for reflection, highlighting choices and opportunities, rather than predicting the future. However, looking at the energy system of tomorrow can provide valuable insights into what has to be done today to achieve the desired situation in the EU in 2050.*

We will use long-term scenarios in this sense and emphasise choices and opportunities in order to reflect on the future. In the next section we will consider a number of specific directions that could be taken to implement the energy transition.

Essential directions

'Directions' refer to the set of strategic elements that drive the implementation of the transition. In order to move forward, we must have an understanding of the transition's financing requirements, a consideration of the political decisions to frame the transition, a definition of the specific transition objectives to be realised, and a picture of the entities required to manage the process.

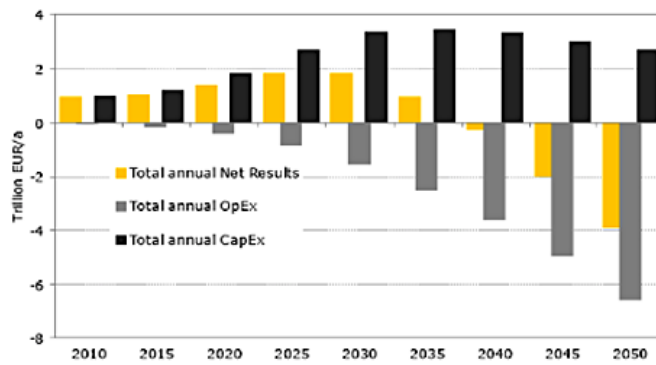
Financing needs must be addressed

FINANCING NEEDS

Total financing needs of the energy transition have been estimated by the United Nations Environmental Program as 3 per cent of the European gross domestic product, that is to say €350 to €400 billion per year for a duration of at least ten years. Given the current returns on investment required by capital and the use of discounting to evaluate long-term projects, we can assume that private initiatives will not be able to meet the need. Thus public financing will have to play a key role in the transition. It must also be born in mind that monetary creation by the European Central Bank will be required and, as noted in the 'Euro Memo 2015' published by the European Economists for an Alternative Economic Policy in Europe, there will be a need for a dedicated institution, either a European public investment bank or a European industrial agency.

Lacking these, countries will have to provide their own plans and develop the institutions to move forward. In 2010, early experiments of 'credit injections' in the bifurcation in Germany have revealed a multiplier effect of 11, in which public funding of € 600 million subsequently generated €7.5 billion of investments. Public funding therefore makes sense. Finally, while the sum of €400 billion per year may appear large, we should realise that in the past three years the European Central Bank (ECB) has released, as part of its Quantitative Easing initiative, €2.100 billion to the financial institutions; this amount is tantamount to five years of funding for the transition. It is all a matter of deciding the political priorities of financing.

In one way or another, each country will have the responsibility to establish its own strategic financing based on policy orientations and objectives, since the situation on the ground varies from one country to another.



COSTS AND SAVING

To establish an order of magnitude in terms of costs and savings (costs will vary considerably with actual plans, priorities, and goals), it is worth looking at the graphics published in the Ecofys' Energy Report, which offers a global perspective for the transition. The graph above presents investment (Capex) and operational costs or savings (Opex) with total annual net results up to 2050.

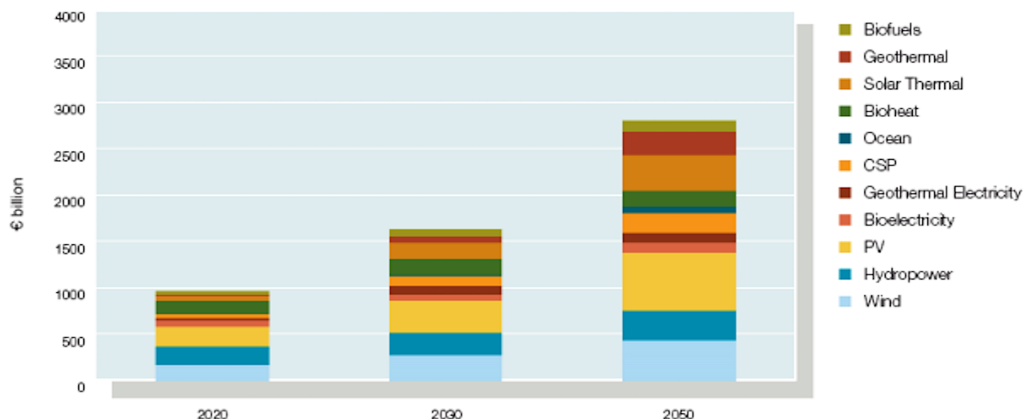
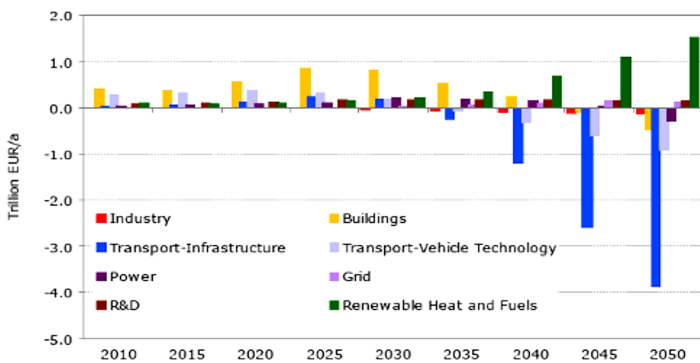
Two important conclusions can be drawn from the graph: First, in the early years, annual Capex (investment) costs are around € 1.0 trillion per year higher than Opex (savings). Capex then grows until 2035 to almost € 3.5 trillion per year, and that is when the growth of Opex accelerates. We can then see that net results turn from costs to savings by 2040. At their maximum, net costs are € 2.0 trillion per year, but turn to net savings of almost € 4.0 trillion per year in 2050, with Opex savings reaching more than € 6.5 trillion per year.

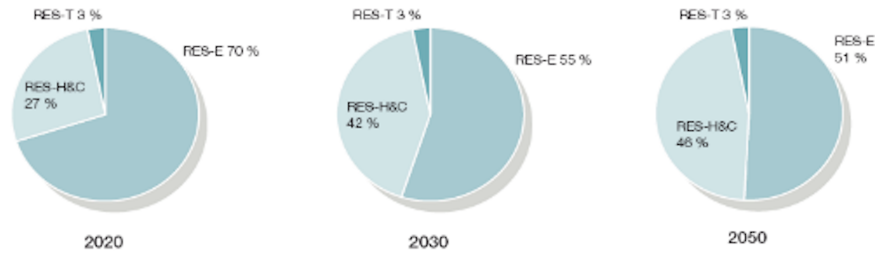
Similarly, if we look at the sectors under consideration, we see that investment in buildings will dominate total costs until 2030. In 2040, total net costs are turned to net savings, led by savings in the transport sector, covering both infrastructure and vehicle technology. These savings outweigh the steadily increasing costs for renewable heat and fuels, primarily from biomass in the later years. It should be noted that price developments have been estimated conservatively – this potentially leads to a considerable overestimation of costs for the renewable heat and fuel sector.

RENEWABLE ENERGY SOURCES INVESTMENTS

Looking for the moment only at RES and not all aspects of energy transition, when it comes to Europe, the European Renewable Energy Council (EREC) report cited above has established a view of total cumulative RES investments of €963 billion increasing to about €1,620 billion by 2030. By 2050, total cumulative investments will reach more than €2,800 billion, spread over their respective periods. The resulting average annual RES investments in the decade between 2020 and 2030 are about €162 billion and are €140 billion between 2030 and 2050.

It is important to realise that the investments made before 2020 and then up to 2030 will have an impact on later years, as a renewable energy unit installed in a given year will obviously deliver beyond the year in which it is installed. Hence, expressed in additional cumulative capital requirements, these will increase from about €660 billion in 2030 to more than €1.180 billion in 2050.





Considered by sector in the graph above, most investments in 2020 can be seen in the renewable electricity sector (70%), followed by heating and cooling (27%) and bio fuels (3%). Within the €2,800 billion total investment mentioned above, the sectoral percentages will evolve over the period to 2050; the trend reflects the increasing share of funds needed for heating and cooling. By 2030, cumulative heating and cooling investments reach 42% of total cumulative RES investments, while the renewable electricity sector represents 55% and bio fuels 3%. The cumulative bio fuels share will remain at 3% in 2050, increasing in absolute terms however from about €70 billion cumulative investments in 2030 to €110 billion by 2050. The renewable heating and cooling investment will further increase to 46%, while the renewable electricity investment will account for 51% of the total cumulative RES investments in 2050.

POLITICAL DIRECTIONS MUST BE DEFINED

From looking at alternative scenarios that have been proposed for the transition, it is clear that design and implementation must be based on and guided by structured plans in two key political areas: public policy and industrial/energy policies. These areas are defined as critical to achieving energy sovereignty. Let us look at some highlights of the available evidence.

In September 2012, the Programme Commission on Sustainable Energy and Environment of the Danish Council for Strategic Research (CEESA) published its different background reports in a book format. Background report four listed the different policy options for the transition: 'Policies for a transition to 100% renewable energy systems in Denmark before 2050'.

Stating that the transition represented 'a change from polluting energy systems that depend on depleting inputs to energy systems that depend on relatively abundant inputs and are relatively non-polluting and intermittent',⁵¹ the authors advised that to make the change real and viable, a central question

to consider is the balance between the role of the market and the role of societal planning and regulation. They concluded that this very balance needs to change to increase the role of long-term societal planning and regulation. This in turn means that new political mechanisms needed to pave the way to high-level decisions will have to be determined and implemented: 'experience has also shown that success of new green technologies are strongly dependent on state support and long-range state planning in the period of technology maturing; this should be taken into account when selecting the policy means.'⁵²

The CEESA plan contains a roadmap with specific actions that require proactive decision-making in public policies at different levels/scales. To get an impression of the contents, some of the most far-sighted policy items are listed below; covered in the examples are the areas of energy planning, public transport, building renovation, smart-energy systems, as well as taxes and subsidies. From these we better understand the far-reaching consequences of these directions:

- ▶ Establishment of a municipal energy planning procedure obliging all municipalities to establish detailed energy plans, including technical as well as policy measures:
- ▶ greater investment in improved transport, including fast train connections and improved bus and light-rail transport;
- ▶ energy labelling of all buildings, combined with graduated green taxes on buildings;
- ▶ investment subsidies for building renovation and installation of renewable energy technologies;
- ▶ the electricity, district heating, and gas grids are interconnected and all the grids must be activated on the production and consumer sides in order to activate all feasible storage options;

⁵¹ The Danish Council for Strategic Research: Programme Commission on Sustainable Energy and Environment, Policies for a transition to 100% renewable energy systems in Denmark before 2050: Coherent Energy and Environmental System Analysis Background Report Part 4, September 2012, Aalborg: Department of Development and Planning Aalborg University, 2012, p. 7.

⁵² Policies for a transition to 100% renewable energy systems, p. 26.

- ▶ economic and technological support of manufacturing industry by appropriate taxation schemes in order to promote a change from natural gas to biogas for high temperature processes.

In 2013, Greenpeace, building on earlier scenarios developed by Association négaWatt, published a document on energy transition for France that required 'building a set of policy tools for energy transition so that all forms of public investments in all sectors are geared toward renewable energy; changing the regulatory and fiscal environment ; directing savings toward investments in the green economy'.⁵³

We are beginning to see a central issue emerging here: there are market barriers to establishing RES that call for new policy decisions. CEESA established that because state planning is currently based on macroeconomic models and a version of neoclassical economic theories, it excludes the necessary promotion of long-term solutions to achieve the 2050 goal. In addition, the state has been using a discount rate of 6% for evaluating alternative energy projects while independent economists have been stating that discount rates must be between 1% and 3% for alternative energy sources to have realistic chances against 'business as usual'. In its conclusion, the report outlined the need for new long-range planning methods and calculations to secure long-term investments and for an end to short-term profitable projects such as tar-sand resources that block efficient long-term solutions based on RES: 'the current market structure makes the penetration of renewables beyond a certain point nearly impossible; hence, goals of 100% renewable energy systems of the future seem implausible with the current electricity market design'.⁵⁴

Another item to consider for defining political directions is the concept of 'market lock-in'. A market 'lock-in' is a set of institutional and other measures that favour an existing system and prevent the emergence of another. Let us take the example of the need to switch from a fossil-fuel-based energy system to a 100% RES system. This calls for a significant shift from a system with stored energy to mainly intermittent energy sources.

- ▶ The change requires the establishment of a new technical infrastructure in Europe that can coordinate the intermittent RES with the consumption side.

- ▶ Such a structure will consist of a combination of cogeneration units, heat pumps, heat storage and electric or operated vehicles.

The market lock-in consists in the entities that manage the infrastructure grid in Europe being focused on investment in larger grids in the absence of any mandate to build the new intermittency infrastructure in a similarly efficient way. Political decisions and financing are therefore needed so that specific institutions may be mandated to accomplish, and made responsible for, the technical and economic integration of intermittent RES.

An important issue that will influence the scope and scale of both financial and political decision-making will have to do with specific national needs. National situations are often very different: while France has a large capacity to generate nuclear electricity, Scandinavian countries often have little (Sweden) or no such capacity (Denmark). In turn, Germany and Denmark rely heavily on coal for the same purpose, while Poland actually produces and uses its own coal resources. Denmark, Norway, and Great Britain are producers of fossil fuels (gas and oil). It is thus obvious that decisions about the transition to RES, and its costs, will have far-reaching industrial, social, and political consequences at all levels of the affected communities.

Another essential dimension will be the articulation between the local and the national and European levels. As noted above, a large percentage of RES will come from local/regional initiatives, creating energy outputs that must be integrated into national and European grids or distribution systems. It will thus be essential to articulate European distribution planning with locally-produced energy. What is more, achieving this goal in Europe will require ending the social and fiscal competition between states and developing a balanced form of industrial development in all territories.

The above-mentioned 'EuroMemo 2015' document, has already discussed the need for a Europe-wide investment plan driven by public policies to support the rise of new environmentally sustainable, knowledge-intensive, high-skill, and high-wage economic activities; in turn these activities will be articulated with initiatives for the sustainable development of local economies and a spatial relocation of production drawing on RES energy sources. This will be a fundamental challenge for the success of the energy transition.

⁵³ Greenpeace France: Scénario de transition énergétique, 2013.

⁵⁴ Policies for a transition to 100% renewable energy systems in Denmark before 2050. December 2012. p. 42.

OBJECTIVES MUST BE CLEARLY IDENTIFIED

The French Greenpeace/négaWatt scenarios proposed four far-reaching objectives:

- ▶ large-scale development of RES for electricity (at least 90% by 2050) and exit from nuclear energy by 2035; this will require a comprehensive plan for the implementation of the scheme in various areas such as the electricity grid, industry, transport, and agriculture as well as the development of technical know-how.
- ▶ capture and control of energy demand patterns leading to a lowering of consumption by 35% in 2030;
- ▶ a large-scale programme of building renovation and the setting of new norms for equipment;
- ▶ the removal of all hindrances that slow down the transition, such as the tax breaks given to air travel companies.

The objectives of CEESA are also clearly formulated: the objective of the project is to develop scenarios for a future energy system with a 100 per cent penetration of renewable energy technologies by 2050. The plan further identifies four connected work packages covering future electric power systems, renewable energy in transportation, market development, and public regulation as well as the environmental assessment of energy scenarios. All macro-economic developments have been based on official forecasts from the Ministry of Finance.

Costing of the objectives has to be integrated into the scenarios with the best available estimates, given that realisation in the future will necessarily vary. Thus, as we have said, for its French programme Greenpeace estimated the total investment necessary for the production of electricity and heat at €670 billion (€166bn for heat and €504bn for electricity). However, because of savings resulting from the phase-out of fossil sources purchasing, the actual cost is lowered to €525 billion.

The case of nuclear power is important to consider since, in terms of market lock-in, it provides an excellent example of the need for long-term coordination of a number of industrial and energy policy decisions at the national level for the shift from nuclear to RES to occur.

The Greenpeace scenario developed in France proposes a structured three-phase shutdown to exit

nuclear power production. The scenario takes into account a maximum 40-year life span for each installation:

- ▶ from now to 2020, closing of 20 reactors with a combined 18GW production to be undertaken in parallel with energy savings and the installation of new facilities based on RES (wind, solar, and gas direct/cogeneration);
- ▶ from 2020 to 2034, closing of 32 additional reactors with a combined 37 GW production compensated by new sources as above plus an accelerated biomass programme;
- ▶ the last six remaining reactors will be closed at the latest in 2034.

Over the entire period to 2050 the total production of electricity will decrease from (TWh) 538 to 494 with a complete phase out of nuclear by 2035. Fossil fuel (excluding gas) will go from 32 to 1, fossil gas from 24 to 3 and renewables from 72 to 491.

ENTITIES MUST BE ESTABLISHED TO MANAGE THE ENERGY TRANSITION

As noted previously by Transform in its study 'Towards Europe's productive transformation – an emergency', the transition will require a process of articulating and coordinating the different scaling requirements, ranging from the local to the global, of the process; the process will also require ongoing democratic assessments according to different priorities or objectives defined by people.⁵⁵ The democratic management of the transition, in the form of 'local and citizen decision-making' will thus be an essential activity in order for the transition to be anchored in local territories and produce local benefits. In addition, it will be necessary to mobilise public institutions, elected officials, and state and regional authorities in the design and running of renewable energy projects.

It will be important to develop and rely on 'local public services for energy' at the municipal level to make sure that needs are properly identified and responded to. Cooperation between several municipalities will also be essential so that the 'commons', that is, the energy public networks, are accountable to the citizens rather than being centralised. New grids will have to be developed, for example to provide local or district heating, with direct citizen participation in their design and running.

In sum, it is obvious that all levels in existing institu-

⁵⁵ <<http://www.transform-network.net/publications/publications-2015/news/detail/Publications/towards-europes-productive-transformation-an-emergency.html>>.

tions (local, district, regional, national, European, and also international) will be needed as 'engines' of the energy transition. Participatory democracy will be essential in defining plans to reduce energy consumption, to develop renewable sources, and to make sure that the right measures are in place to address climate change.

CONCLUSIONS: ESSENTIAL DIRECTIONS FOR THE ENERGY TRANSITION

Our set of limited examples allows us to draw some relevant conclusions:

- ▶ As a new developmental paradigm, the energy transition to RES rests on a set of political, financial, and social directions backed by new technological breakthroughs.
- ▶ The transition requires fundamental industrial-policy directions with strong democratic inputs.
- ▶ The transition can only succeed with strong inter-linkages being built between the local, regional, national, and European levels.
- ▶ The market cannot lead the transition either in the financial or technological areas, and its resources will have to be harnessed and directed according to democratic priorities.
- ▶ All commitments are both long-term and urgent since further delays will exacerbate the problem, especially in key areas such as the phasing out of nuclear power.

Having established an understanding of the key directions that are necessary for the transition to be realised, let us now focus on the main measures that will have to be put into place.

Essential measures

As of 2015, there is still no comparative study documenting the energy transitions proposed by European countries. In fact, the latest EU reports are notoriously short on specifics, so we must rely on existing documents released over the past few years for usable information. As noted above, several countries have developed national plans. In 2013, the French government initiated a national debate on energy transition, resulting in the publication of four 'trajectories' or paths with a number of scenarios (Étude des 4 trajectoires du DNTE). The most ecologically comprehensive and socially progressive of these trajectories was the 'Sobriety' initiative (SOB) that included scenarios by négaWatt, Greepeace, WWFm and Global Chance. This section draws extensively on the proposed measures, which are of a practical nature, as well as on the Danish CEESA and

the European Renewable Energy Council (EREC) reports mentioned above.

Measures concerning consumption policies

RENOVATING BUILDINGS: ENERGY SAVINGS AND JOB CREATION

The transition must be part of a policy of urban renewal based on updating the existing housing/commercial stock and improving the energy efficiency of heating, cooling, cooking, and other equipment used in buildings. As an example, the French 'Sobriety' trajectory proposes renovating 83 per cent of existing residential buildings built before 1975 by 2050 in order to lower demand. The target level is to reach 50 kWh/m² per square metre per year in terms of heating ('class A' rating in the primary energy use efficiency scale).

According to a study done by négaWatt, the total investment for housing would be approximately €30 billion and for commercial buildings €13 billion. The employment impact is significant with 585,000 new jobs created. In terms of economic impact, we must also take into account additional VAT income and the multiplier effect resulting from the new jobs.

In addition, the renovation programme will require considerable R&D effort as well as new vocational training and the development of new products built from recyclable or bio-sourced materials.

For residential units, the 2050 energy demand will be half of the 2005 demand. A similar programme for the office/commercial sector (renovation of 93% of buildings) will also lower demand by 50%. The Danish CEESA report has analysed the issue of renovation and energy reduction and concluded that current market conditions make it impossible to move forward and reach the goals before 2050. It has proposed short- and long-range policy measures that include municipal and regional planning, establishing an energy conservation fund financed by companies selling fossil fuels and district heating organisations, a financial reform offering very low interest rates on 30-year loans combined with investment subsidies for home owners, and mandatory 'energy labelling' of all buildings combined with graduated green taxes.

Similarly, SOB in France notes that building renovation cannot occur via tax reduction and recommends the adoption of specific laws to drive the process. In terms of new buildings and equipment, new norms will be introduced throughout the period.

CHANGING TRANSPORTATION: LESS POLLUTION

The strategy to switch transportation from cars to

other modes (bicycles, gas motorcycles, public transport, collective taxis, and shared car transport, among others) is essential to reduce CO2 emissions; according to the SOB scenario mentioned above, the goal is to eliminate engines relying on fossil energy by 2050 and to replace them by engines relying on gas obtained from renewable sources (75 per cent) or electric engines using similar sources (25 per cent).

The shift described in the scenario will require proactive public policy measures in order to reduce road transport by about 40 per cent, increase rail freight by 300 per cent and river freight by 150 per cent. For the transition, négaWatt in France and CEESA in Denmark have proposed the levying of a new tax on lorries above 3.5 tons on the model of the existing Swiss road freight tax. The funds would be used to finance public transportation and to prepare road transportation for the shift to 'renewable gas vehicles'. In all scenarios, case developers agree that none of the changes will occur without significant market and tax regulation of total transportation reforms. CEESA proposes to introduce a system that makes it uneconomical to drive with only one person in a car where there are public transportation possibilities. SOB proposes measures to increase the number of car passengers per vehicle via the organisation of mobility services such as shared cars, joint commuting, and collective taxis.

All case developers advocate measures to lower the energy usage of transportation across the board. For example, the 2050 energy demand for transport in the SOB trajectory will be 66 per cent lower than in 2005.

LOWERING DEMAND IN INDUSTRY

As with housing and commercial spaces, the SOB proposal is to cut demand in half by 2050 by increasing the efficiency of operations in all sectors and key industrial processes, by relocating activities to produce locally, and by adapting production to consumer requirements.

In addition, heat created by a number of processes will be captured and 'recycled' according to local needs. This can be supplemented by applications of the concept of best available technologies (BAT). The purpose of BAT is to strengthen development towards more efficient processes.

Specific measures also include two new developments. First, the introduction of different energy taxes through which the tax level becomes variable and follows the energy content of the fuel; second the development of two-way 'smart grids' in order to accelerate communication between producers

and consumers and to make sure producers of clean energy are acknowledged.

It must also be noted at this point that researchers in industrial policy are focusing on new developments that could have a dramatic impact on industrial energy savings. The first is the elaboration of circular economy models (also known as industrial ecology) based on connecting different industrial agents within a given territory and creating cooperation chains in which certain outputs are used as inputs by others (such as waste turned into biogas or steel mill waste to make concrete) instead of being wasted. This is a major breakthrough towards a new economic model, as some resources can be shared and some investments have to be co-financed. The second is the elaboration of a 'functionality-based economy' using models that associate, for example, multiple resources in public transportation that connect with individualised mobility systems such as short-term renting of cars or bicycles. The energy savings are derived from socialising mobility services that previously existed on a strictly individual basis.

MOVING TOWARDS SUSTAINABLE AGRICULTURE: REDUCING GREENHOUSE GASES

Agriculture is a sector that uses relatively little energy but has considerable impact on climate change due to the release of greenhouse gases.

From a societal viewpoint, the SOB trajectory offers far-reaching scenarios as it calls for changes in behaviour that are likely to be notoriously difficult to achieve.

The combined sobriety scenarios call for substantial changes in food habits in order to lower the energy resources used in production. It focuses on the need to rebalance diets in favour of vegetable proteins by cutting meat intake by 50%, reducing the use of milk-based products, and increasing the intake of fruit, vegetables, cereals, and pulses (lentils, beans, etc.). The goal is to switch to a 65 per cent level of vegetable proteins by 2050 (versus 28 per cent today).

In terms of agricultural production, the 2050 goal is to achieve a balance of 50 per cent organic production and 50 per cent 'integrated' production'. Integrated production, often also called 'small scale agriculture' as defined by the 2014 UNEP Year Book means that specific geographical territories would focus on mixed and alternated production to reduce the use of chemical fertilisers by 75%. Similar measures are to be taken for the raising of animals on a local basis with the production of biogas socialised to minimise waste. Overall, the energy efficiency of agriculture will double.

Measures concerning energy production

CEESA and EREC both offer a good picture of the measures that need to be introduced in the energy supply system in order to achieve 100 per cent production from RES. CEESA relies on a massive introduction of onshore and offshore wind power and biomass. Approximately 40 per cent of total primary energy production will be covered by intermittent resources such as wind power, thermal, solar, and photovoltaic. A large portion making up another 40 per cent will be supplied by biomass consisting of straw, wood, and energy crops. Finally, waste will make a small contribution, as it will have a role in the production of hydrogen (see below). Let us look at a number of key measures in the production of electricity, the treatment of biomass for gas production, and the development of a hydrogen network.

ELECTRICITY

The CEESA report recommends measures to ease the establishment of wind farms and connect them to the grid via the creation of the intermittency infrastructure. These include updating the legal rules for establishing cooperative farms, giving ownership priority to organisations that have cogeneration and/or heat pump/heat storage systems with the required capacities to integrate wind power, and creating favourable conditions for municipalities to own their own wind farms.

In terms of photovoltaic, the total installed capacity had increased by about 40 per cent in 2010, even

though the total solar radiation is about 1000 W/m² or half of the influx in Southern Europe. It is expected to continue, especially for small installations of private households. There is now an indirect state subsidy through which a private household may cover its electricity needs by its own PV installation and export the surplus to the grid via its electricity metre running backwards. This means that the private household is paid a tariff for its export to the grid corresponding to the household electricity price including all taxes. Current studies now show that it is possible to install enough PV capacity on buildings to cover half of Denmark's present electricity consumption.

In the SOB scenarios for France, the demand for electricity will be 38 per cent lower by 2050, enabling production to come almost entirely from RES. In addition, surpluses will be used to produce methane that can be injected into the gas networks (starting in 2021). This will require a smart grid system so that the supply-demand balance can be verified on an hourly basis.

Switching to a European perspective, this means that production will have to come from new capacities. EREC cited the need to install such new capacity to replace ageing plants; approximately 330 GW of new power capacity needs to be built by 2020, representing about 42 per cent of the current EU capacity. The table below shows the role of renewable electricity (RES-E) in the new scheme (in GW).

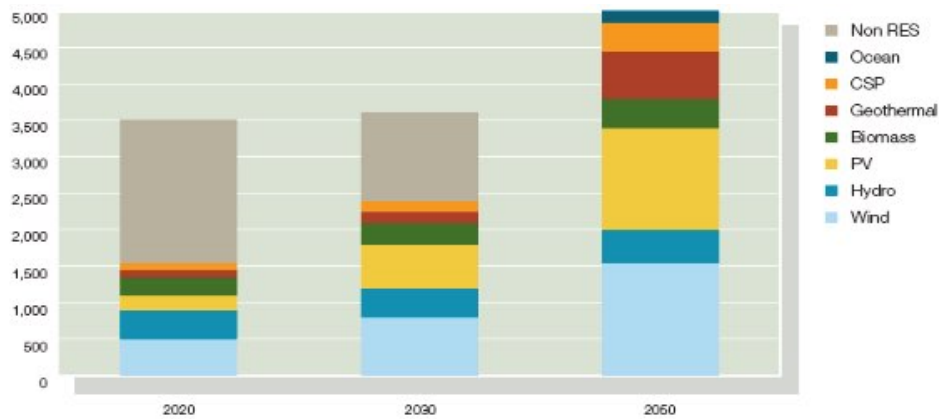
	2007	2020	2030	2050
Wind	56	180	288,5	462
Hydro	102	120	148	194
PV	4.9	150	397	962
Biomass	20.5	50	58	100
Geothermal	1.4	4	21.7	77
CSP	0.011	15	43.4	96
Ocean	-	2.5	8.6	65
Total RES-E capacity (GW)	185	521.5	965.2	1,956

We can see from the graph above that the trend towards a steep increase of RES-E installed capacity continues after 2030 leading to almost 2,000 GW of RES-E-installed capacity by 2050.

Across Europe, EREC estimates that by 2020 the largest contribution to RES-E will come from wind, hydropower, and biomass. By 2030, this picture

changes slightly and wind will be closely followed by PV and hydropower.

In the graph below describing total RES outputs, wind and PV continue being the largest contributors up to 2050, but geothermal electricity will see the biggest increase in relative terms between 2030 and 2050 (+254%).



While the increase of concentrated solar power (CSP) and ocean energy will remain moderate, both technologies will see a significant increase towards 2050, accounting for about 8 per cent and 3.2 per cent respectively of the EU's total electricity production.

BIOMASS

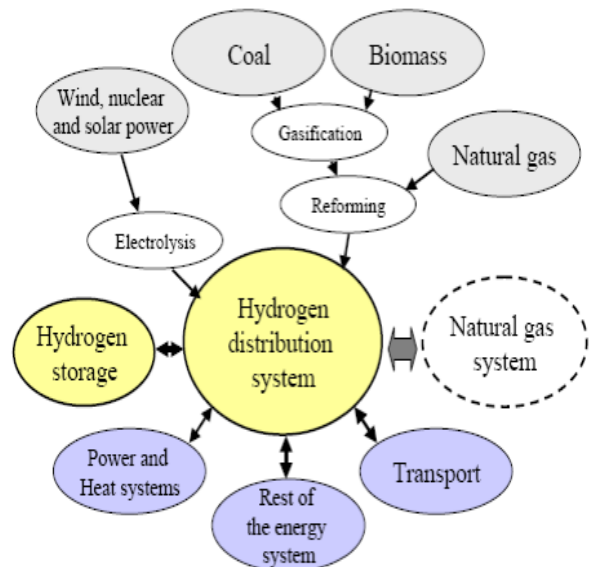
Biomass will be a fundamental source of energy for the gas networks and transport as fossil fuels (petroleum and natural gas) are eliminated. The CEESA report considers biogas production based on the following main sources: animal manure, sewage treatment plants, landfills, and cleaning of organic industrial waste streams. Developments will require investments in new production facilities, considering that today only about 4 per cent of animal manure is used for that purpose. The potential is strong as biogas is a significant resource for the mitigation of CO₂ emissions, especially when it is used to replace natural gas in local co-generation plants in a system with a high coverage by wind and solar power.

A set of urgent measures comprises first of all the adoption of a comprehensive plan for the inclusion of the biogas potential in the overall energy system; second, 'demonstration projects' with different systems of transmission lines from biogas plants to the primary consumers need to be developed.

Over the longer term, new types of supplementary organic materials should be developed for biogas production, including the possibility of algae production. Similarly, the SOB trajectory recommends a programme of 'farm-based' methane production via the installation of production units shared by different farms in order to avoid concentration and the development of 'factory-farms'.

HYDROGEN AND ENERGY SYSTEMS

Hydrogen is not a primary energy source such as coal and oil. It is an energy carrier in line with the power grid and district heating networks, and therefore other sources of energy have to be converted to produce hydrogen (see graph). The main reason why



serious consideration has to be given to hydrogen use is twofold. First, different kinds of biomass can be liquefied or gasified and reformed into hydrogen, which can then be used in a large number of different applications, including transport, power generation (central or dispersed), and industrial processes. Second, the end-use of hydrogen has a very low environmental impact, having no emissions of greenhouse gases or other pollutants. Seen over the total life cycle, the environmental impact of hydrogen depends on how it is produced. In fact, its greatest advantage is that if renewable sources such as wind and solar power are utilised, then hydrogen-based systems are considered to be among the most environmentally benign systems known today. It is thus important to consider hydrogen as a long-term option, since it could provide the link between renewable energy and the transport sector, making biomass, solar, and wind available as a source of fuel in modes of transportation that are heavily dependent on the supply of oil. If this is to be done, research and development has to be prioritised now to focus on efficient production, co-electrolyser technology, as well as the transport and dispersion of hydrogen, since a comprehensive infrastructure will have to be developed for distribution.

Conclusion: employment, economic benefits, the cost of doing nothing, and a way forward

Citizen involvement and employment

Based on European and French research, Philippe Quirion in his study of the Scénario Négawatt for the Centre International de Recherche sur l'Environnement et le Développement has estimated that across the RES sector 335,000 jobs will be created between 2012 and 2030 in France, essentially in biomass, wind, solar electricity, and solar-heating initiatives. The trend will continue until 2050, especially since wind and solar electricity equipment with a life cycle of 20 to 30 years will have to be renewed.

Altogether, in the EU the total number of new jobs created as against the total number of jobs destroyed by the transition is positive. Out of 3 million jobs in the affected sectors, new job creations will exceed job destruction by 138,000 in 2020, 178,000 in 2025, and 105,000 in 2030.

Similarly, the EREC report projected that by the end of 2009 the renewable energy industry employed over 550,000 people in the EU. In terms of reaching RES targets in 2050, the employment estimate for 2020 is 2.7 million people and about 4.4 million by 2030. By 2050 it will exceed the 6 million mark at 6.1 million. From a societal perspective, a key benefit will also consist of high-quality employment in a sector using a variety of technologies.

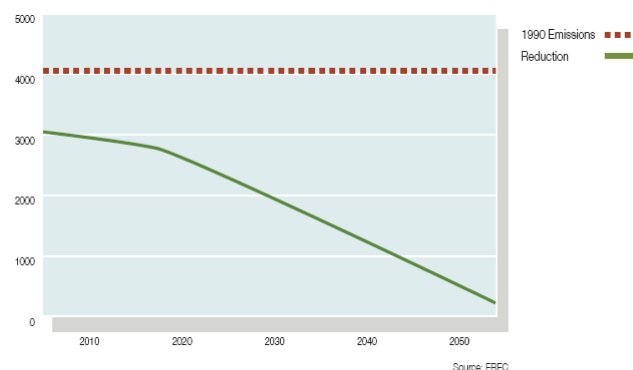
As noted, the transition will require a process of articulating and coordinating the different scaling requirements of the process (from the local to the global levels); the process will also require ongoing democratic assessments according to different priorities and objectives defined by people (see above).

A view of the economic benefits

The EREC report puts special emphasis on the security of energy supply, and also on energy sovereignty. It notes that the transition to RES could solve the current problem of EU import dependency, which has increased from 45 per cent in 1997 to about 55 per cent in 2008. According to the European Commission, energy imports represent an estimated €350 billion. This is equal to about €700 annually for each EU citizen (based on 2008 oil prices).

In addition, one must take into account the externalised costs of fossil fuels that are paid by consumers and the tax payers, often the same individuals. These costs such as air and ground water pollution and subsequent health costs are far in excess of the market price that is paid for each barrel of purchased

oil. In addition, the disruption and partial destruction of the natural environment is considerable, especially in the case of bituminous sand excavation, and those costs, too, are not included in the price. The report actually points to the need to change calculations so that the 'real costs' in the future are judged in relation to the environmental and social 'qualities' of the service provided, including these externalised costs resulting from the use of fossil or nuclear energy systems. This will considerably alter the actual price.



In terms of environmental benefits, the transition to RES can result in a gradual 90 per cent reduction of CO₂ in 2050 against the 1990 figures (see graph above). According to the EREC report the total investment in RES to reach the 2050 goal will be around €2,800 billion. When taking into account the avoided fossil fuel costs, the economic benefit of the transition would reach €2,090 billion in 2050. In addition, there are some human costs which cannot be economically quantified. There is thus no doubt that higher upfront investment does indeed pay off in the long run, and for society at large.

	LOSSES 2010, BLN PPP CORRECTED USD	LOSSES 2010, % OF GDP	NET LOSSES, % OF GDP 2010	NET LOSSES, % OF GDP 2030
Climate	696	0.9%	0.8%	2.1%
Carbon	542	0.7%	0.7%	1.2%
World	1,238	1.7%	1.6%	3.2%

The cost of doing nothing

With the release of DARA's Climate Vulnerability Monitor in 2012, a reassessment of the human and economic costs of the climate crisis, new findings showed that climate change has already held back global development and represented a significant cost to the world economy. In addition, it was revealed that inaction on climate change could be considered a leading global cause of death.

The present carbon-intensive energy system and related activities is linked to an estimated 4.5 million deaths each year due to air pollution, hazardous occupations, and cancer. Continuing today's pattern of energy use, together with climate change, will likely result in 6 million deaths per year by 2030, close to 700,000 of which would be due to climate change.

Of all these losses, it is the world's poorest communities within lower and middle-income countries that are most exposed. Losses of income among these groups are already extreme. The world's principal objectives for poverty reduction, the Millennium Development Goals, are therefore under comprehensive pressure in particular as a result of climate change. The entire world is already affected by these comprehensive concerns: 250 million people face the pressure of a rise in sea level; 30 million people are affected by more extreme weather, especially flooding; 25 million people are affected by permafrost thawing; and 5 million people are threatened by desertification. The pressures that these combined stresses put on affected communities are immense and force or stimulate the migration of populations. The nature of the climate change impact due to excessive use of fossil fuel is well documented; we basically know what form it will take. As we approach the plus 1.5-degree mark there will be failing crop yields in many areas, particularly in the global south. In terms of water, we have already witnessed the melting of glaciers in mountain regions; the next step, as we reach the plus two-degree mark will be severe water shortages in many areas affecting especially the Mediterranean and Southern African countries. The extreme weather events will continue, at increasing intensity as we go beyond plus one degree (we are today at +.85); this means storms, forest fires, drought, flooding, and heat waves. Today, the eco-systems are under threat, and extensive damage will continue if nothing is done, resulting in a rising number of species extinctions in many parts of the world. Altogether, as the earth reaches the plus two-degree threshold there will be an increasing risk of dangerous and unpredictable feedbacks and of abrupt, large-scale shifts in the climate system.

As mentioned above, poor people in the global south will suffer the most. The real cost is actually a planetary emergency, with increasing urban pollution and the acidification of land and water across the globe. It is not just the cost of doing nothing, but also the cost of doing too little too late. With the present unsatisfactory evolution, the economic impact of China's air pollution rose from \$22 billion in 1975 to

\$112 billion in 2005. All this has been addressed in the Stern Review, a 700 page report developed for the British Government and coordinated by Nicholas Stern in 2006. According to the Review, without action, the overall costs of climate change will be equivalent to losing at least 5% of global gross domestic product (GDP) each year, now and forever. With a wider range of risks and impacts this percentage could increase to 20% of GDP or more, which could be indefinitely.

The causes are well known: renewable energy use is not growing fast enough to appreciably slow down the rise in fossil fuel use. The growth in renewable energy merely supplements the use of fossil fuels, which continue to increase at an alarming rate. More than 50 per cent of new energy demand is being met by coal according to UNEP. In addition, fossil fuel corporations are using far riskier energy extraction methods to reach highly polluting fuels such as tar oil and natural gas through hydraulic fracturing and surface coal mining. Their new activities are now endangering entire ecosystems.

The way forward

As a final word, let us state that the transition to RES by 2050 is necessary, realisable, and urgent. But the current regulatory and market-based approaches to promote renewable energy and energy conservation are totally inadequate, as are measures to develop other low carbon technologies. According to the latest International Energy Agency reports, if all government commitments to clean energy were met, and all proposed plans were actually implemented, by 2035 renewable energy will stand at just 16 per cent of all energy consumed globally.

It will require a fundamental new societal paradigm based on cooperation throughout Europe and the rest of the world to achieve both energy savings and a productive transformation of the economy. Long-term investments will be necessary, combined with strong political will and a democratic transformation of daily decision-making, in order to maximise citizens' inputs and participation in the process in all territories. Strategic decisions will be needed to transform the political economy with strong inputs in the area of democratic planning for the transition.

Switching to RES over a period of 35 years is overall a project with far reaching consequences and one that is central to the concept of a people-oriented political economy; while it contains many 'technical fixes', its success does not reside in the technical area alone, but mostly in the societal willingness to mobilise the public and the means to make it hap-

pen. An energy transition can only occur if there is a decisive shift in power towards workers, communities, and the public, in other words, energy democracy. To succeed, what is needed is a transfer of resources, capital, and infrastructure from private hands to a democratically controlled public sector based on community and worker control practices.

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Democracy and Social Movements: Grassroots Perspectives

- ▶ *Climate change* has started producing its effects. Business can no longer go as usual – and if so, a 4°C increase is to be expected by 2100. This increase would have **disastrous consequences** on already economically fragile populations from the Global South, driving millions of (climate) refugees from their homes. **Energy transition is inevitable**. But a question remains open: which kind of transition will be implemented? A transition that will make sure that fossil-fuel corporate groups keep making profits or a transition that will benefit to and meet the **needs of the majority**?
- ▶ **Energy democracy** should be considered for what it really is: a means and an end to achieve an energy system capable of addressing social needs and putting **an end to energy poverty**. Who better than consumers know what they need? Therefore, why shouldn't they have a say in the sources of energy localities they use? Concrete experiences where **citizens are involved** in every step of the way, from production to distribution, turn out to be efficient, fair and empowering. Democracy is the corner stone of a genuinely **progressive energy transition**. It is the best way – if not the only one – to simultaneously fight against bureaucratic red tape and the further commodification of energy.

Principles of a Democratic Energy Transition

ANNE-FRÉDÉRIQUE PAUL & MARC DELEPOUVE

What is an energy transition and why should we discuss how to accomplish one?

The current energy transition: a very specific transition that calls for an unprecedented approach

A transition is a **progressive phenomenon**. It can be viewed globally, but one observes **each individual element affected, their context and circumstances, the differences of speed in their development, and/or extent of changes**, which can sometimes be very great. An energy transition is one that has this dual characteristic because there are many different individual cases involving numerous and diverse actors. However, the current energy transition that we are discussing here is one that will **irreversibly affect everybody though in different ways**.

The energy transition we call for is also one to which **everyone should contribute in accordance with their means, for a shared collective goal**, one based on **mutual responsibility** for each and every person, now and in the future, here and everywhere.

Furthermore, a quick survey of previous energy transitions (the most dramatic being the transition from human and animal energies to wood and peat energies, then to coal energy, and then to petrol, gas, and nuclear energies⁵⁶) show how essentially different the current energy transition is. This transition has not begun with a breakthrough in energy production. Indeed, the previous energy transitions were **triggered by the emergence of the exploitation and generalisation of a new and more available energy source** that was at the same time:

- ▶ cheaper and thus more affordable to a wider range of 'consumers';
- ▶ more abundant – the abundance and the wider availability of the energy is a dynamic process, resulting from the interaction of geological, environmental, technological and, economic factors (which explains why the resource itself may not be as uniformly distributed as coal was during the first industrial revolution);

- ▶ more 'powerful' (i.e., energy dense) and more efficient (i.e., with greater energy efficiency);
- ▶ more flexible, especially through being storable and transportable, and thus adapted to the mobility of goods, persons, and information;
- ▶ conducive to the expansion and diversification of energy supplied to the end-users as well as of the services provided by its consumption;
- ▶ instrumental for the development of new energy services (that could play an important role in the socio-environmental system, such as the automobile does) in a dynamic and rapid manner;
- ▶ often a factor in lessening the environmental impact of other energy sources while creating new environmental impacts that were more often unpredicted and/or unobserved.

A brief analysis of the previous energy transitions show that:

- ▶ they were 'serendipitous' energy transitions, which occurred through happy coincidences, leading to the spread of an abundant energy form and the subsequent rise of (new) energy services, which are at the same time more intensive, diverse, and (potentially) available and affordable ;
- ▶ **they took place most frequently in a context and at time when new problems, limitations, or tensions emerged** (for instance, the limitations of oils available either from plants or from whales, in particular for lighting, was a problem that was obviated by the emergence of petrol);
- ▶ **they are highly 'path-dependant'** in the sense that they are the result of complex interactions between multiples factors, while, at the same time, they are also highly constrained by the past (the socio-environmental system and the socio-cultural context);
- ▶ they were influenced by, and in turn influenced, a wide range of socio-environmental conditions: they are at the same time the product of

⁵⁶ A broad overview can be had from the following books in Vaclav Smil, *Energy Transitions: History, Requirements, Prospects*, Santa Barbara CA : Praeger Publishers, 2010 ; Christoph Bonneuil and Jean-Baptiste Fressoz, *L'événement anthropocène: La Terre, l'histoire et nous*, Paris : Le Seuil, 2014; Roger Fouquet, 'The slow search for solutions: Lessons from historical energy transitions by sector and service', *Energy Policy* 38,11 (November 2010), pp. 6586–6596; or; Roger Fouquet and Peter Pearson (eds); *Energy Policy* 50 Special Section: Past and Prospective Energy Transitions – Insights from History (November 2012), pp. 1–7.

socio-environmental systems and the barriers and catalysts of a new and modified social environment;

- ▶ their effects were profound, lasting, and irreversible; thus they have huge impact on humans and their society; however, these effects are unpredictable, variable, and most often unfathomable at the beginning.

Each of these energy transitions was followed by major and irreversible changes both at the individual level (affecting our health, our lives, our standard of living, as well as our expectations and potentialities) and at the collective level (affecting our socio-economical organisation, our environment, and, more globally, the whole of our socio-ecological systems).

By contrast, the current energy transition, much discussed today but still embryonic, is completely different from previous transitions since it is both:

- ▶ **one that we want to carefully plan, having in mind a number of goals and associated stakes** (see chapter 1);
- ▶ **and one that is subjected to a number of constraints** (to name but a few: the problems posed by the recourse to either fossil or fissile energy sources, the climate crisis, growing health and environmental problems, the availability of energy services to each individual...).

Thus, to take any action that could prove effective in promoting an 'intended' energy transition, we should ask ourselves two fundamental questions:

- ▶ how should we proceed?
- ▶ and who should be involved?

A very specific and original process is called for in promoting and achieving a goal-oriented energy transition

Our current energy transition is a major and pressing socio-environmental issue in whose context:

- ▶ **important and irreversible choices must be made;**
- ▶ **and actions must be rapidly carried out** (see the article by Jean-Claude Simon in this section, Part 2).

Swiftly made decisions and rapidly undertaken action are needed if we want to prepare, mitigate, or, better still, prevent the major and disruptive foreseeable social and environmental damage (some of which has already begun) if our energy system remains on its current path – 'business as usual' or 'slight adjustments' will not work.

We insist that this urgent and major energetic system transformation requires a process that specifically promotes a 'desired' energy transition by and for everybody. That is why we are **convinced that a democratic energetic transition is essential**.⁵⁷

In the last part of this chapter, we will propose the basis of **an ideal process** to promote the energy transition. Some would call it utopian, and we agree: it will probably never exist, but it should be understood as a model towards which we should move and that we think would prove the most efficient.

This ideal process has the following characteristics:

1. It must be a **democratic, legitimate, integrative, and participatory** process.

It must respect the democratic ideal that each person who wants a truly participatory process is integrated.

Not only must it be open, it must also promote and facilitate the integration and participation of every person. Thus, at the same time, it is necessary to develop **individual and collective empowerment and create and sustain conditions that allow each person to participate** (not only on paper but in practice).

2. It must be a **multi-dimensional** process that combines:

- all the dimensions of the energy system and its socio-ecological context;
- **short- and long-term planning**, including both immediate actions that have direct effects while allowing (and facilitating) future actions;
- **individual and global planning**, allowing a diversity of individual transitions, which taken together contribute to the global transition.

⁵⁷ Some of our arguments converge with and/or are inspired, for example, by some concepts developed in Dominique Bourg and Kerry H. Whiteside, *Vers une démocratie écologique citoyen, le savant et le politique*, Paris: Le Seuil, 2010 ; and by Carolyn M. Hendriks, 'Policy design without democracy? Making democratic sense of transition management' *Policy Sciences* 42 (2009), pp. 341-368.

3. It must be a **pragmatic and efficient** process.

It must be **relevant** and **applicable** and it must allow for continuous **assessments** and **adjustments**. Thus this process needs an ongoing reflective and prospective monitoring.

4. And, finally, it must be a **humble** process.

We must admit that we cannot know everything, that we cannot predict everything (if such a thing could ever be possible). It follows that we have to prepare for the uncertainties and promote a culture of flexibility and agility in order to adapt to the current development of the transition. It also follows that we must keep on developing new knowledge, competences, and tools that could prove useful.

Consequently, we have the responsibility (and challenge) to develop a **process that not only allows us to act**, here and now, but also to **promote an ‘auspicious’ environment**, rich in potentials that could prove useful in an unpredictable future.

Why should it be a democratic process?

We strongly advocate for a democratic process because we firmly believe this is the kind of process most likely to succeed in promoting and achieving an energy transition that would be simultaneously be effected by everyone and be for everyone and would meet the goals set. This opinion is based on three central considerations laid out below.

First, a democratic process is one that is well adapted to dealing with a **complicated and global issue**.

1. Devising an energy transition needs **taking into account all the stakes**. It is important to avoid the pitfall of fragmenting the issue into different items, even though each one would prove easier to tackle in isolation.

As a result of a western mainstream ‘techno-scientific’ culture of governance, the main tendency today is to fragment a question, each sub-question being tackled as a single entity that can be dealt with by a specific panel of ‘experts’ in a more scientifically grounded manner. We can add that this tendency is accompanied by the practice of summarising any question in terms of numeric indicators, which are supposed to translate a complex, diverse, and changing reality into a couple of easily computed (and comparable) numbers through reduction and aggregation.

In these cases, the legitimacy of such proposals resides in a pseudo-objectivity backed by ‘top-notch’ scientists and experts⁵⁸ and by numeric indicators (numerals being seen as ‘objective elements’). The diversity of the individual contexts and trajectories and people’s values and aspira-

tions are discarded as being too relative, too unsubstantial, and/or too subjective to contribute to a proposal.

Alas, such lofty and reductionist approaches inevitably lead to a list of independent theoretical propositions (which apply to constructed indicators and objects, not to realities and people’s values and aspirations), propositions that are often contradictory, sometimes leading to outcomes opposed to the global aim and, unfortunately, sometime more adapted to a constructed model than to the actual reality.

Furthermore, such a practice, even with its appealing qualities of apparent efficiency and scientificity, is the surest way to erase the global outlook so needed for dealing with such complicated and global issues.

2. Secondly, we want to promote an **unprecedented energy transition**, one **aiming at broad collective and long-term objectives** (a ‘goal-oriented energy transition’), based on **values of responsibility, justice, solidarity, and socio-ecological sustainability**.

It follows that the past energy transitions cannot furnish models as to how to bring about the energy transition (and even for how to design a goal-oriented energy transition). However, it is self-evident (though the evidence needs voicing) that the past can help us in avoiding pitfalls and in designing realistic goals in accordance with our values. Lessons from the past should always be carefully kept in mind.

⁵⁸ We would like to emphasise that we are far from discarding the importance of techno-scientific and expert contributions (on this, see chapter 5, part 2), but we believe that they should contribute to and not lead the thinking/framing procedure (in accordance with Churchill’s point that ‘science should be on tap, not on top’, meaning that scientists have a duty to inform politics, but they have no special insights beyond that, and must allow politicians to formulate policy based on social, economic, and ethical principles). Science, technologies and expert advice bring essential contribution in three major areas: a) ways of knowing the world, b) ways of being in the world, c) ways of changing the world.

3. Finally, this goal-oriented process has the **double challenge of allowing each and everybody (provided they are willing) to contribute both to its elaboration and to its implementation.** A challenge seldom faced in our top-down culture of collective planning.

Secondly, a democratic process is, by essence, a process **with and for everybody**, that allows us to deal with an issue with which **everybody is concerned.**

1. Indeed, **everyone will be affected and everyone can contribute;** thus, everyone has a right to (constructively) express themselves.

Furthermore, **everyone has the duty to promote and ensure while, at the same time, benefitting from mutual solidarity,** implying both the responsibility to contribute according to one's own means and capabilities and the right to benefit according to one's own needs.

2. Correlatively, and as already stated, **everybody's participation is necessary** in the elaboration and the monitoring of the process because there are a **multitude of ways of framing the same issue** and thus to voice different goals and stakes. Indeed, it is essential to stress that any single issue is perceived from a wide variety of viewpoints, each affected as much by **legitimate values and perspectives** as by a **plethora of singular contexts, circumstances, and trajectories.**

An **integration** (which is quite different from the sum) of these different perspectives is necessary in order to think globally of this issue and its stakes and determine which collective goals are desirable and, hopefully, realistic.

3. Furthermore, everybody's (willing and constructive) participation is required for both the elaboration and the implementation of the process since **a diversity of competences** are needed at each step of the process, ranging from institutionalised techno-scientific knowledge to often discarded 'folk wisdom', and this includes competences linked to individual creativity, collective ingenuity, and the memory of historical, empirical, and institutional contexts.

Indeed, in dealing with such a complicated and global issue, affecting everyone in their lives, potentials, and aspirations, it would be a fundamental error to have sole recourse (as too often

occurs) to the contribution of scientists and experts (even in a truly inter-disciplinary and reflective way) and/or to 'authoritative' public or media figures (with or without a couple of 'open, participatory', public hearings, which are often mere tokens of good will rather than consultations to be actually valued and taken into account).

4. Finally, **everyone interprets and analyses the issue in a different way** in accordance with different cultural values, aspirations, and ways of life but also depending on different disciplinary perspectives, institutional interests, economic priorities, stakeholder negotiations, power relations, etc.⁵⁹ We collectively have the duty to hear all these interpretations and analysis; they need to be taken account because we need to mobilise the greatest number of willing contributors and because we know that everyone will be affected.

Thirdly, a democratic process is a **very effective way to mobilise and promote a sense of accomplishment and well-being**, which are all important in these uncertain and daunting times.

1. Indeed, **a global mobilisation is needed**, but without clear gains for sustaining the energy transition most people (already facing huge day-to-day challenges) will not be motivated to take part in it (especially since the rewards lie in the future and not very visible, more involve the collective than individual level, and since the project is daunting and implies undergoing major changes).

This is why it is important to **identify and clearly state the individual and social positive consequences that can be expected.** These positive outcomes should be stressed at least as much (if not more) than the deleterious socio-ecological consequences of doing nothing (which is the current trend in communication tending to a doom-and-gloom predictions if things go on as now).

It is also important to realise the impact of the **feeling of accomplishment and well-being** that can result from active participation in the designing and/or implementation of a goal-oriented, desirable energy transition. Indeed, some people may be motivated by a perspective of gains, but an even more powerful, and longer-lasting, motivation is to have a goal, a conscious feeling of accomplishment and well-being.

Taking part in a democratic process allows for

⁵⁹ These issues, such as the energy system itself as well as an energy transition, are all 'boundary objects' that leave much room for interpretation since they owe more to values and aspirations than to empirical facts.

both personal empowerment and active participation for ambitious personal and collective goals. Thus, participation is a reward in itself, a motivation and **a source of accomplishment** even if all the prospective 'gains' are not met.

2. Finally, returning to the roots of democracy, the final (and perhaps foremost) motivation is to promote conditions in which **each person feels that she or he is a member of society and that the society fully recognises her/him**.

This allows for the development of the fundamental **feeling of 'belonging'** (feeling that one has a place in society and that this place is recognised and uncontested by the society).

Correlatively, the development of a feeling of belonging is paramount in **promoting one's investment in the 'Common'** (all the natural or constructed entities that are shared and collectively managed⁶⁰) **and in a democratic process that allows the identification, preservation and promotion of the Common**.

It is therefore important to stress the advantages of participating in a democratic process, which, through swift and pragmatic decisions and actions, aims to deal with our current socio-ecological energy crisis while promoting individual and collective gains.

⁶⁰ We are referring here to one of the multiple definitions of 'the Common', one inspired by Pierre Dardot and Christian Laval that we think is the most comprehensive and unifying definition available; see Pierre Dardot and Christian Laval, *Commun; essai sur la révolution au XXI^e siècle*, Paris: La Découverte, 2014.

A new form of knowledge production, diffusion and usage is needed⁶¹

Joint problem-solving calls for an new form of the production of knowledge and of practices

The energy issue is one that needs 'joint problem-solving' approaches that involve the framing and formulation of an issue and the designing of strategies and processes to deal with it. Socio-ecological issues, such as the energy transition, are especially in need of these approaches since they are complex, global, and collective.

Joint problem-solving approaches have two fundamental characteristics that set them apart from other type of human activities:

▶ they are **goal-oriented**:

- these activities are firmly grounded in reality as they aim at **tackling present issues and problems** (and not only at enriching the debates around these issues and problems, wherever they may occur) and thus they not only enrich our knowledge but also **propose practical and effective action and contexts to deal with them**;
- they also aim at preparing for the future: **developing projects and ways to promote a 'desired and desirable future'** (orienting the future around specific and consciously chosen trajectories) as well as **expanding our potentials and possibilities** (not narrowing the future but widening it);

▶ they are **inclusive and integrative activities**:

- they call for the **integration of the most diverse and representative perspectives, knowledge, and practices possible** (here integration means not just the interconnection of data but also the emergence of new data);
- they **produce original and useable knowledge and practices**, and they **design effective and realistic strategies and processes** (their productions are original and, whatever their form, are far more than the sum of their parts);
- the issue being complex, this production works on two levels: the first level involves the production of a **wide range of proposals that are each insufficient but contribute to the whole**; the second level involves the production of a **global framework and overall strategy that ensure that each action is contributing to the final goal and nothing is left out**.

An inclusive, integrative and, situated activity

Dealing with such issues from a single perspective or with a limited set of competences and knowledge is inappropriate. The juxtaposition (or, better, the summation) of contributions is insufficient. Complex issues, and even more those that are global and collective, necessitate **the actual integration of all available perspectives, knowledge, and practices**, that is, the **inclusion of as diverse and representative a collection as possible**.

The final product, whatever form it takes, is necessarily original since this activity:

- **integrates different types of knowledge and practices** (the interconnection of existing elements),
- **co-produces new forms of knowledge and practices** (the emergence of new elements); and
- **has direct effects upon the socio-ecological system** (it is an 'interventionist' activity).

Crucially, the knowledge and practices produced should not only be grounded theoretically but above all be **deeply rooted in reality, in all its diversity and complexity**, since this activity is oriented towards the goal of tackling an issue and/or problem. This is essential especially for socio-ecological issues and problems, in order:

- **to envision not only their global and collective dimension but also the singularity of each individual context, circumstance, and trajectory** (situated instances);
- **and to situate the activity in and for humanity, our societies, and environments**, as well as to make proposals **for now and for the future**.

Finally, these activities should also support another important function in dealing with our socio-ecological challenges. This must also have a **reflectivity and analyse**:

⁶¹ These concepts are in great measure inspired by Ângela Guimarães Pereira and Silvio Funtowicz, 'Knowledge Representation and Mediation for Transdisciplinary Frameworks: Tools to Inform Debates, Dialogues & Integration', *International Journal of Transdisciplinary Research*, 1,1 (2006), pp. 34-50.

- the modalities of the **production of integrative knowledge and practices** ('internally-oriented reflexivity' as regards the activity itself in terms of asking: Is it efficient? Is it pertinent? Are we still on the right track and is the framing and goal still correct?, etc.);
- **the actual exploitation of the latter in real situations** ('externally-oriented reflexivity' in terms of the actual effects of this activity: Is it positively contributing to the goal? Is it sufficient? What are its effects upon human beings, societies, and our environment?, etc.)

The need for an extended peer-community for this new form of activities

Joint problem-solving needs the emergence of '**extended peer-communities**', which emerge and are shaped around the collective project of dealing with the issue and problems in question. These extended peer-communities are thus at the same time the product and the active force of joint problem-solving. These are **collectives aiming at a common goal**.

Members of such 'extended peer communities' are legitimate in the meaning that each member can offer something and each will learn something. Both the individual and the collective will benefit from such an activity, which, at the same time, produces new and necessary ways of dealing with our socio-ecological challenges.

These peer-communities are composed of (voluntary) **members that are the ones that make and develop contributions that are as diverse and complementary as possible**. That is why the **composition of this community is one that can only grow** as the activity continues.

They are peer communities since all have the same status: **it is not what the members are or represent** (either in the community or outside of it) **but what they actually contribute and do** (they contribution to the community and the collective problem-solving activity).

They are also a peer-communities since **each member recognises his/her belonging to the community** (and thus his/her motivation to usefully contribute to the common goal) **and each member is recognised by the community** (and thus respected as a contributing member, whatever part that member plays).

Notice that although **mutual respect and trust** in each other is fundamental, this does not imply that no rules obtain.

Finally, such a community needs to develop '**convivial conditions**' that allow for organisation, communication, and exchanges between the members of the collective but also between the collective and society (since we are dealing with a goal-oriented activity in and for society).

From community production to the actual tackling of issues and problems – and back again

Joint problem-solving aims not only at framing and formulating issues and problems but also at proposing ways of dealing with them. This activity would be futile if the propositions were not diffused and in practice made available to individuals, collectives, and institutions.

That is why extended peer-communities are work in and for society: their productions must be at the same time:

- **relevant**: contributions and useful for those people for whom it is relevant in certain times and places (here and now) while contributing to the global goal (which is sometimes hard to envision when one is deeply immersed in a single issue struggle) for now or the future (similarly hard to envision);
- **realistic**: efficient, applicable, and practical;
- and **useful for those people for whom it is relevant in certain times and places**: appropriable and transposable by the actors, according to the single, situated context, circumstance, and trajectory.

As already mentioned, dealing with socio-ecological challenges is highly dependent on individual contexts, circumstances, and trajectories (situated instances). Thus it is essential not only to integrate and produce relevant and applicable knowledge and practices but also to allow their appropriation by each person where and when they become useful and pertinent, which calls for **empowering conditions** that each could benefit people and to which each could contribute. Indeed, knowledge and practices **must be actually mastered and used in the various contexts and circumstances that are encountered**. Furthermore, if not already applied in a given situation, then actors should learn these practices and knowledge and adapt them to their actual circumstances, activities, and goals.

This contextual appropriation needs the development of **facilitating conditions** through:

- **mutual empowerment** among the members of the community
- **in situ 'buddy practice'**: 'compagnonnage' relying on networks for on-the-job transmission of knowledge and identities;
- and, when needed, **transposition to the individual situation and goal**.

Through appropriation and transposition, new knowledge and practices, new processes, and strategies will inevitably emerge. They will enrich the wealth of both society and the extended peer-community. This virtuous circle allows for the **continuous improvement of both**:

- the **joint-problem solving activities** (a permanent move towards improving the original proposals);
- **and the individuals and collectives involved** (enrichment, empowerment, and emancipation of everyone involved).

In a nutshell

To summarise, the energy issue, as with many socio-ecological issues, needs the contribution of 'extended extend peer-communities' that permit a new way of tackling these complex and vital issues.

These communities:

- ▶ **are dynamic and self-shaping collectives resulting from the cooperation of all the voluntary individuals who can make useful contributions to the questions dealt with:**
 - each question tackled contributes to the emergence of an extended peer-community whose members can permanently be enriched;
 - each individual can/should collaborate in a number of these communities, which must interact in a web-like fashion in order to enrich and strengthen all the collectives and thus tackle all the questions in a global socio-ecological framework;
- ▶ **each member benefits has equal status and is equally and recognised by his/her peers;**
 - commitment, humility, respect, and responsibility are key values.

These communities are necessary conditions:

- ▶ **for the production of new knowledge, practices, and ways of working together for a common goal,**
 - integrating not only scientific data but all the relevant data;
 - emerging from new forms of knowledge and practices;
- ▶ **for pertinent and socially-situated evaluations** of these new type of production and ways of collective and cooperative activity for a common goal
 - which require the emergence of new forms of assessments to analyse these novel types of production and of modes of production;
- ▶ **the appropriation and *in situ* transposition of these new ways of working in, by, and for society and of production, and of our environment** (that is, the effective and operational application, according to each case, its context and its circumstances and its trajectory);
 - these collective processes at the same time enrich the modalities and the wealth of knowledge and procedures to which we can potentially have recourse, as well as the individuals who participate, the collective (through their activities), and society (by dint of the transposition).

All of these functions need facilitating conditions:

- ▶ which must be **voluntarily developed, maintained, and enriched;**
- ▶ and **whose accessibility must be insured.**

The three advantages of democratic procedure

To summarise the lengthy (and we hope not too unpalatable) presentation, we shall try to outline the advantages of a democratic procedure in three complementary points:

▶ A democratic procedure is a **normative procedure**:

Democracy is a value we believe in and which we want to promote;⁶² and, up to now, we consider it is the best (or at least not the worst) system of social governance system so far adopted.

▶ A democratic procedure is an **instrumental procedure**:

It is probably one of the more efficient procedures for both the framing and the continuous

implementation of socio-ecological transitions.

It is also the procedure that provides enough flexibility to accommodate the different individual contexts, circumstances, and trajectories while aiming at a single collective and global goal (we could say that it allows for 'individual inconsistencies but global unity').

▶ A democratic procedure is a **substantive procedure**:

It is probably one of the more powerful collective approaches to promoting effective commitment to the achievement of 'better individual and collective outcomes' during both the designing and the implementation of a strategy.

It is also the procedure that allows for individual and collective empowerment and ongoing development of what has been achieved.

From 'energy system transitions' proposal to the decision process

The two 'pillars' of an 'ideal' democratic process

This proposition is based on two fundamental values:

1. The first value is our **individual and collective responsibilities regarding all the social and ecological issues**.

- This value implies the meaning of solidarity in which everyone shares our collective responsibility and has the duty to contribute according to his/her means and capabilities.
- This value also implies that everyone has the right to benefit from mutual support and a shared environment.

2. The second value is that the energy system belongs to the **Common** (as stated above, here we do not mean the 'Common' meaning 'common goods' but 'the system composed of each and every entity, collectively shared and managed', whether 'natural' or 'constructed').

- This value implies that the energy transition should lead to deep political changes with a '**commonification of the energy system**'.

Promoting an energy transition

Before presenting the process, we want to stress the fact that **any transition is a phenomenon that takes times**: it is a permanent process and never completely finished since an energy system is not a stable entity. On the contrary, it is a very dynamic process. Thus the goals will never be reached, but approached as closely as possible.

Furthermore, **a global transition happens in many places and has different rates of speed and forms** according to the times and places, the contexts, circumstances (including the current local energy system), and actors and persons affected.

This is not in contradiction with the fact that **all**

these changes, even though following different trajectories, contribute to a single global aim, with identical stakes and respecting the same values.

It follows that an energy transition aimed at a just and sustainable energy system based on collective responsibilities and solidarity is a **permanent process**. Setting a collective goal for the development of the Common does not preclude the fact that **flexibility is needed: flexibility during the whole process of change** but also **flexibility in the individual trajectories**. Indeed, if the total combination of all the individual trajectories is set, each individual trajectory is individual, presenting a diversity of paths, even allowing for some paths partially straying from

⁶² Even though a brief review of what is being said, written, or enacted shows that 'democracy' itself is a boundary concept that has a great variety of meanings and assumes many different and contrasting forms.

the collective goal due to imposed constraints resulting from some individual particularities. If the global path is established, each individual trajectory has its specificities.

Finally, **one cannot 'design' a transition**: changes will happen, but it is impossible to predict what every action will entail.⁶³ Thus one can only **facilitate a transition, orient it towards the set goals**, and 'nudge' its trajectory.

Thus a **permanent system designed to promote a desired energy transition** is necessarily a continuous system that not only launches the energy transition but also, and more importantly, follows it and makes any amendment to the decision deemed appropriate.

The different instances and phases of the proposed process

The framing procedure mobilises the citizens and:

- ▶ delineates the issue, clarifying what is at stake;
- ▶ identifies, analyses, and synthesises the wider aspects of information;
- ▶ advances a set of proposals, with their foreseeable direct and indirect consequences and including as comprehensive as possible a comparison of them;
- ▶ and, eventually, communicates the diversity of opinions.

It must also be stressed that this framing procedure must deal with the energy transition with **reflectivity**.

- ▶ This procedure must first be **reflective** and take into account the bias and errors. Humility is called for, and science and technologies cannot provide all the 'scientifically sound' answers and solutions.
- ▶ Far from being simply reflective, this procedure

must also be **inclusive**. This inclusiveness is twofold: as already stated, it must take into account the divergent framing of the issue but at the same time it must **take into account and shape the energy system and its socio-ecological 'environment'**, as aptly pointed out by Andy Stirling.⁶⁴

This inclusiveness is essential for dealing with issues about entities (such as the energy system), which are both constitutive and dependant on their 'environment'. Change to one will change the other, permanently altering the issue itself. One can say that **the issue is 'labile'**, some would even say **'volatile'**, always changing with sudden and unpredictable major transformations/mutations.

This inclusiveness is also essential for dealing with issues about complex constructed entities, for which the issue is as much dependant on the representations of the reality as on the reality itself. The framing of the issue results from a multiplicity of social values and aspirations that are themselves diverse and variable. One can say that **the issue is 'contingent and constructed'**.

This procedure is clearly a permanent one: its function is to launch the transition but is also – and this is probably its most important function – to follow, assess, and eventually amend the designed process that promotes the energy transition

Furthermore, this should be the procedure that is the 'leading' authority: this is the only structure that can at the same time:

- ▶ have a global view of the transition, which involves different individual trajectories all converging on the same goal, with the same stakes and based on the same values;
- ▶ has the capacity to make global proposals that

⁶³ This is quite analogous to the situation of anything that is new (for example, an invention) in a system, which can, or also may not, induce important changes to the current system. This 'transformation' of the system, in this case triggered by the wilful introduction of a novelty is called an 'innovation'. But if an invention can be wilfully designed and introduced in the society, its effects on both the population, the society, and the environment are in great part unpredictable.

⁶⁴ Andy Stirling, chapter 'Precaution, Foresight and Sustainability: Reflection and Reflexivity in the Governance of Technology', Jan-Peter Voß, Dierk Bauknecht, and René Kemp (eds), *Reflexive Governance for Sustainable Development*, Cheltenham, Glos., UK: Edward Elgar, 2006, pp. 225–272. 'Reflexivity (or reflexiveness) goes beyond the 'deep serious consideration of reflection. Dictionary definitions here yield the sense that attention "turns back on itself" (OED, 1989). By the mirror analogy, reflexivity involves recognition that "the subject itself forms a large part of the object" – as a matter of "self-awareness" (Giddens, 1976:17) or "self reflection" (Bohmann, 1996). Reflexivity thus requires attention not just to the "representation" of the object to the subject, but also to the way in which the 6 attributes of the subject help constitute the representations of the object and how these representations themselves can help recondition the subject. In other words, we face a recursive loop, in which it is recognized that representations are contingent on a multiplicity of subjective perspectives, and that these subjective perspectives are themselves reconstituted by processes of representation. As a result, any associated interventions are also simultaneously contingent on, and themselves help condition, a series of divergent but equally valid possible subjective representations.'

are pragmatic and reflective, since it is an instance that, hopefully, has the better global and long-term view (which includes the memory of the past and the vision of a desirable future);

- ▶ help the decision-making procedure to reinforce and exercise its legitimate authority since the decision is based on this 'improved contribution'.

The decision-making procedure is fully exercised by the legitimate politic authority:

- ▶ which **implements, supports (and sometime redirects)** a specific agreed-upon and desirable energy system transition;
- ▶ and which **aims at specifics goals** and is **guided by shared underlying values**.

The decision procedure defines the implementation phase and is remobilised each time decisions are needed (for instance, adjustments of the ongoing procedure, promotion of goal-oriented research, etc.). Indeed, as in the case of the thinking procedure, the decision-making procedure is necessarily a **continuous process**. It is also the only procedure in which decisions can be made that can legitimately alter individual trajectories and ensure that the globality of the contributions leads to the same collective goal.

The whole procedure is one that aims at a single 'collective strategic goal' while allowing for 'single inconsistencies' (meaning that single measures, depending on the context, circumstance, and trajectory in question, can be widely different in each case). Thus the decision-making procedure must be **prioritised above all others**, and its **legitimacy unquestioned** in order to have the full, and accepted, authority to orient the individual choices and trajectories.⁶⁵

⁶⁵ Note that the framing procedure does not necessarily require reaching a consensus (especially not a weak consensus that results from the smallest common denominators among contrasting values and diverging interests). Far from it, the framing procedure should provide a set of alternative (and eventually inconsistent) strategies, perspectives and possibilities, including their different arguments. The responsibility of making choices lies with the decision-making procedure, which is the only one that has the legitimacy to make choices and ensure their applications.

Furthermore, the development of contrasting proposals and the subsequent effort to aggregate them in a single 'collective strategic goal' is a condition that ensures the strategy adopted:

- will include a diversity of sub-strategies – a variety of measures could prove much more **effective and robust** in tackling the whole issue, especially when dealing with different contexts, circumstances, and trajectories and with a high degree of uncertainty and variability ('not putting all one's eggs in one basket');
- will have a high level of **agility**; having thought of different possible measures is important in facing particular (unforeseen) developments ('do not have blinkers on and trudge on in an inappropriately preordained track');
- will have a high level of **flexibility**; having thought of different possible measures is also important in giving up one specific strategy when proven unpractical or unsuitable ('no need to get bogged down by a wrong decision').

The continuous implementation phase:

- ▶ effectively launch and support the process;
- ▶ ensure continuous monitoring, evaluation, and forecasting of the process and the changes induced;
- ▶ proceed to the decided adjustment when decided/needed.

The implementation phase:

- ▶ is where the responsibility lies of **making and integrating the permanent monitoring, evaluation, and forecasting** that has been done in order to ensure that the whole process is working properly (indeed, as the transition actually unfolds, changes will have to be made to our strategies and actions in order to keep aiming at the set goals and to respect the underlying values);
- ▶ is where the responsibility lies of **designing proposals for adjustments**;
- ▶ is where the responsibility lies of **providing for the potential needs of the foreseeable near and far future**; thus it must work in close association with the thinking procedure.

For all the reasons laid out, we feel stress the fact the implementation phase, beside its active function in promoting and assessing the energy transition, has the function of **preparing the future** by continuously mobilising and/or promoting the development of (new) knowledge, resources, competences, etc. for future and probably unexpected developments.

Promotion of a facilitative and supportive environment

The whole process needs the promotion of **facilitative conditions**, which aim to help people, institutions, and legal entities contribute to and live with the energy transition. Numerous conditions can be enumerated, including material, legal, social, and other changes.

In the case of the energy transition, these conditions must include **changes that at the same time will affect the energy system and its place in our societies**. These changes include in particular:

- ▶ changes of the system and its place in the socio-ecological context: we will have to make changes to the components of the energy system and their interactions but also the interactions between the energy system itself and its socio-ecological context;⁶⁶
- ▶ changes of the dispositions: not only do we have to change the energy system and its context, but we also have to change the regulations and control procedures, the deciding authorities, the actors' roles and missions, etc.;

Complementarily, changing the system and the way it works can, in itself, create facilitative conditions (and/or 'facilitated' conditions, more conducive to the changes). However, facilitative conditions are insufficient when dealing with such global and interdependent issues. We also need to promote **SUPPORTIVE CONDITIONS** that help each person to live and to contribute to the transition

Supportive conditions would greatly benefit a variety of **personal and collective empowerment approaches** developed with and for the various social actors (which belong either to the energy system or to its wider context), and for every person, group, organisation, or institution (that will all be directly and/or indirectly affected).

These empowering procedures are instrumental in all the phases of the process leading a goal-oriented energy transition. They can profoundly affect the individual and collectives representations and values, raise the awareness of individual and collective responsibilities, and thus prove crucial for a successful process, leading to desirable changes, benefiting everyone.

The empowering procedures aim to help persons, groups, organisations, and institutions to develop:

- ▶ the **awareness** to the energy issue and its relation to other topical and crucial issues;
- ▶ the **understanding** of and the **sensitisation** to these issues and the motivation to act;
- ▶ the effective **acceptance** that changes will happen (whether we act or not), and that it would be preferable to try and orient these changes, to which we will be subject to in the worst case

scenario, or, preferably, which we can influence to prevent, reduce, compensate, or accommodate the deleterious effect of our current energy trajectory;

Indeed, the energy transition implies changes that will (hopefully mostly) be intentional but also (inevitably sometimes) unintended, (hopefully largely) desired, and (sometime) suffered; changes which will radically affect everyone's values, activities, way of life, range of choices, potentialities, opportunities, etc. along with the societies and ecosystems. Thus it is important to develop the **will** and the **capacity** to change and to act, along with the effective **possibility and legitimacy** to do it.

The empowering procedures will inevitably affect:

- ▶ the entities (natural and legal persons, groups, organisations, and institutions) involved in the energy and the socio-ecological transition;
- ▶ all the structures and phases that are involved, in particular the thinking process that is continuously remobilised during the implementation phase, but also the political systems along with our perceived, accepted, and assumed responsibilities.

As a consequence, the empowering processes contribute to the meaningful engagement not only in changing the system, but also in accepting the implications of these changes for ourselves, others, and the ecosystem (that is to say, to take responsibility) and in working together to live together, here and now, but also everywhere and at all times (that is, to develop the all-important sense of solidarity and of belonging).

⁶⁶ Since the energy system both shapes and is shaped by the socio-ecological context, it follows that any change in one will affect the other.

Conclusion: behind the energy transition

Even though we are deeply conscious that the process presented here, being an ideal one, can essentially never be fully achieved, we are convinced that aiming at it clearly indicate that the undertaking of this 'collective journey' towards a shared future is essential for staying actively mobilised for the ultimate goal collectively set. This is **a never-ending journey** that we are undertaking together, a one-way trip to an unreachable goal that expands as we approach it.

This is why we must **permanently improve the trajectory of this energy transition** towards one which promotes an energy system that is **more just, more solidary, and more sustainable**, a task for which **we bear individual and collective responsibility**.

On the practical side, we believe that such a process appears to be the only that can deal with such global and complex issues, where uncertainties and unknowns are numerous, in which the stakes are high, in which values and interests are disputed, and perspectives are multiple while mobilisation and commitment are urgent.

Such a process is also one that can more readily lead to pragmatic and effective measures and their reflective analysis, which is necessary for its continuous adjustment. It is also one that allows more flexibility and adjustments to the diversity of context and circumstances, values and lifestyles, while aiming at one single collective goal.

It is also a process that can ensure the necessary individual and collective perception, comprehension, concern, motivation, and mobilisation to change and to act. Everyone's commitment is a necessary condition for making such a transition possible.

Finally, through its democratic dimension and the promotion of empowerment, including the development of the capacity, the power, and the legitimacy to act while developing a sense of solidarity and responsibilities, this process can only have positive effects for both world citizenship and democracy itself.

Citizens Initiatives

JEAN-CLAUDE SIMON

Citizens' initiatives for energy transition: definition of terms

What is a 'citizens' initiative' for energy transition? In most cases, it is an event or a process or a series of events to achieve a specific result, and it occurs when citizens take matters into their own hands to 'make things happen' so that some aspects of the transition are realised.

Citizens intervene as social agents to make things happen as individuals, as members of associations, economic organisations, or trade unions when they feel a need to make a difference and decide that concrete action is needed to achieve their goal. Our purpose in this note is to provide an overview of these activities.

Let us now look at what this means by focussing on European developments. As the topic is vast, we shall concentrate on cooperatives and energy democracy projects at the local level and the implications of trade-union and social financing activities. Cooperatives illustrate what is happening in terms of renewable energy production outside of the centrally organised, capital-intensive oligopolies; energy democracy projects illustrate various forms of citizens' initiatives that provide connections across different ecological projects; trade-union initiatives illustrate concerns and development at the point of production; and last but not least social financing activities show a way forward for projects to be developed outside the institutionalised circuits of capital.



Citizens' cooperatives

By the beginning of 2015, more than 2,400 renewable energy cooperatives (REScoops) had been created in Europe with hundreds of thousands of members. Their main activity is to invest in their own production, distribution, and/or supply of renewable energy, according to the principles of the International Cooperative Alliance (ICA). As part of the EU's Intelligent Energy Europe programme, a report on REScoops was released in March 2015 highlighting the initiatives citizens are taking at the local level. The purpose of this report, 'REScoop 20-20-20', is to

show what is being done to recapture and develop a common good: renewable energy sources, energy transition, and the democratisation of the energy market.

The REScoops approach: cooperation and democracy

As stated in the report, the main purpose of the cooperatives is to build a more efficient system where energy is generated near the location where it is consumed, in only the amounts that are needed, and at the right time. It is thus a switch from a top-down system of capital-intensive companies to a network of producers/consumers: 'Citizens now have a choice: either passively undergo the energy transition, or unite and actively take this transition into their own hands. At all levels can support this sustainable choice with policies, information and appropriate measures. REScoops are ideal tools for citizens to take control of the energy transition so that the new energy system is democratic, or in other words, cooperative' (p.36).

Focusing on the demand side

One of the key abilities of REScoops is to first define the demand and then to adapt its production capabilities to it. Located at Prato allo Stelvio near Bolzano in northern Italy, the E-Werk Prad is a coop that produces and distributes electricity and heat for around 1,200 members. It produces electricity from hydro-power (four plants), wind power (two turbines), solar power (80 PV plants), and biomass (in a bio gas plant using sewage, manure, and waste from fruit farming). It owns a district heating network that uses two wood chip boilers, a pellet boiler, four cogeneration modules, and two heat pumps; it also transports the heat from the biomass installation.

In order to improve its production and energy mix, and with most consumers also being members, E-Werk Prad has recently launch an innovative smart-grid project to organise the demand side in order to dovetail production with the members' needs. This is part of an overall approach to balance the different power sources and the increased use of PV panels. The intent is to combine energy storage and intelligent load management (the smart grid). Various forms of energy storage are being combined, and a control network has been built. The system includes energy storage flywheels for short-term load balancing, a pumped storage power plant, biogas storage, and accumulators in electric vehicles. The new con-

trol network consists of decentralised controllers connected to a central control system. Control algorithms ensure that peak loads are minimised and avoided. Congestion management keeps the energy flows optimised throughout the day.

Operating according to key principles

At the end of 2013, REScoop.eu was formally founded as the Federation of Groups and Citizen for Renewable Energy in Europe. It developed four key principles for the continued growth of the energy supply of the future:



Cooperatives and municipalities are natural partners, since they share the same stakeholders: the citizens. REScoop Ecopower (BE) provided an owning for Eeklo with charging stations for electric bicycles on a renovated village square using third party financing. (Ecopower)

- ▶ Keep the **common goods in the hands of citizens**: wind, solar, hydro, biomass, and geothermal energy are natural resources. They in fact belong to no one and are in principle available to all. They are common goods. From the perspective of social justice, attention must be paid to the way in which decentralised renewable energy sources are managed; they should be allocated on the basis of social-economic criteria.
- ▶ Keep **production in the hands of citizens**: with direct participation of local residents, the 'shareholder' is also the user of the services being invested in, and decisions are taken democratically according to a 'one person-one vote' principle. In that sense, a wind turbine, for example, is perceived as a system that delivers renewable energy to as many citizens as possible.
- ▶ Keep the **transmission and distribution networks in the hands of citizens**: These activities must not be given to private hands; since the network is a monopoly activity, it must serve users without any form of discrimination and at actual cost. Management of the grid can be left to public companies, provided they are demo-

cratically controlled by consumers. In many cases, the network could also be directly managed under the ownership of the citizens and users themselves.

- ▶ **Spread the REScoop movement across Europe**: the energy market is incapable of dealing properly with the climate problem and is unable to offer a transparent price to small consumers. Thus, it is important that energy cooperatives maintain their autonomy and their independence from the market. The model of how citizens can use REScoops to control the energy future is not one of competition but of cooperation. We must move from a centralised, oligopolistic energy system to one that is decentralised and above all democratically controlled and operated

Energy democracy projects

In addition to cooperatives, a number of new projects have included other dimensions besides the basic focus on the cooperative production of energy. In a study published in May 2014, Energy Democracy in Europe, the Rosa Luxemburg Stiftung offered a definition of energy democracy built on three pillars:

- ▶ **Democratisation and participation**: The greatest number of people directly affected by a project should have as much power of initiative and decision-making as possible.
- ▶ **Property**: New forms of municipal or sometimes semi-state ownership and collective private ownership, often in the form of cooperatives, for added value production and employment. Unlike fossil-fuel-run plants, with plants run on RES there is no constant outflow to pay for imported fuel. Capital thus stays in the region and can be employed for other purposes. Publicly owned RE production is in this sense always a plus for local added value production. In addition, the expansion of renewables has so far created over one million employment opportunities in the EU.
- ▶ **Ecology and sufficiency**: The logic of meeting needs is completely different from the logic of profit maximisation; focusing on the former can be the path to reducing total energy consumption and simultaneously ending energy and fuel poverty.

Searching for 'best practices' based on the three pillars, the authors of the study selected 12 cases that met the criteria located in Germany, Spain, Wales, France, Scotland, Hungary, Italy, and Belgium. An outline of their results is worth considering with

these three examples illustrating socio-ecological strategy, land distribution, and collaborative financing:

▶ In the case of **Ungersheim**, a former mining town in the Alsace region, the goal was to implement a local socio-ecological energy transition; the first dimensions were energy autonomy and food sufficiency, and the third freedom of thought. The transition was based on a process of permanent ecological learning and improvement; a council consisting of 50 citizens relying on inputs from the 'génie collectif' of the municipality met to put together proposals and develop projects. The achievements were:

- solar heating of the town's swimming pool;
- a wood-fired heating grid;
- small PV systems on the rooftops of public buildings;
- solar farm on a mining slag heap (providing energy for all 3,000 residents);
- purchase of eight hectares of land to grow organic food mainly for the school canteen;
- launch of 'Cooperative Multicarte' to act as the umbrella organisation linking the numerous local ecology projects and help develop new ones.

In subsequent developments, Ungersheim invested the revenues generated by its local energy transition to support organic and extensive forms of agriculture, launch an organic brewery, install more PV systems, and develop eco-tourism. Potash mining, previously the town's main economic activity, has now been successfully replaced. All profits are re-invested by the municipality and new ideas are constantly put into practice.

▶ In 2002, the 98 inhabitants of the small Scottish Island of **Gigha** decided to use changes in property laws, based on a newly established right of preemption at preferential prices, to collectively buy back their island from an absentee owner. To finance the £ 1 million purchase, the island launched a wind farm and in December 2004 connected three small 225kW turbines to the grid. Profits from the sale of electricity go to repay loans for the land and to finance the refurbishment of the buildings located on the island. As a result of the rebuilding programme, the number of residents doubled between 2002 and 2013, reversing a decline dating back to the 1950s.

▶ The project **Retenergie** developed in the region of

Piedmont as of 2007 under the name **Solare Collettivo** resulted from a decision by a group of 13 friends and activists to jointly invest in a set of PV panels. By 2013, Retenergie had 600 members from various northern and central Italian provinces. The business model rests on two different types of membership: consumption members pay a deposit of at least €50 and can then buy green energy from the collective, while investment members receive green energy as well, but they make a deposit of ten shares (€500). The funds are used to build new installations and these investment members then receive a share of the profits. A further financing instrument takes the form of 'ethical investments', loans that members can opt to grant to the collective, with a 2% interest rate over two years. In all, the collective has been able to raise €800.000 for new projects.

The basis for all activities is an ethical code and a biannual general assembly to which all members are invited. In addition, the members are organised in regional groups that propose projects; to ensure a permanent connection, each of the nine regional groups is represented on the board. The ethical code determines that collaboration is only possible with ethical or green banks; it formulates the goals of greater energy efficiency, installing only small or medium-size installations and always reviewing their ecological impact, which means not building on otherwise arable land.

Trade unions and energy democracy

The role of trade unions in citizens' initiatives is important, because trade union members from industry or transport are 'point of production' specialists in addition to being residents of communities. They experience the current socio-environmental crisis both at home and at the work place.

In late 2012, following a three-day round table with six global union federations convened by the Cornell Global Labor Institute in partnership with the Rosa Luxemburg Stiftung-NYC under the heading 'Trade Unions for Energy Democracy', the participants proposed a way forward for energy democracy entitled **Resist, Reclaim and Restructure**. The report, entitled *Resist, Reclaim, Restructure: Unions and the Struggle for Energy Democracy*, published in 2013 is highly relevant for our understanding of citizens' involvement in the energy transition. The point of departure is by now well known: 'An energy transition to a sustainable renewable-based, low carbon system that meets essential social and environmental priorities needs to occur. But it is simply not taking

place' (p. 1). 'And it is not going to take place unless there is a radical change in direction, one driven by unions, social movements, and others who want to see a truly sustainable future' (p. 16). So what is to be done?

» *We need jobs, but not ones based on increasing our reliance on Tar Sands oil. There is no shortage of water and sewage pipelines that need to be fixed or replaced, bridges and tunnels that are in need of emergency repair, transportation infrastructure that needs to be renewed and developed.*

We therefore call for major "New Deal" type public investments in infrastructure modernization and repair, energy conservation and climate protection as a means of putting people to work and laying the foundations of a green and sustainable economic future for the United States.

– Joint Statement by Amalgamated Transit Union and Transport Workers Union opposing the Keystone XL Pipeline

► **Resist:** There are several ways to resist the agenda of the large fossil fuel companies and their political allies. The first way, policy resistance, as in opposing the capitalist privatisation of energy, calls for developing one or multiple alliances with a number of social movements with the same viewpoint. It is defined by the unions as 'movement building' and requires the engagement of environmental groups. It can also take the form of 'obstructing the trade in extreme energy' (p. 33) – such as the tar sands extraction – and requires calls for the mobilisation of several unions in multiple locations, as was done by those organisations opposing the Keystone XL pipe line from Alberta to Texas. This allows the union to articulate alternative ways to create jobs as illustrated by the declaration from the Transit Union and Transport Workers Union (p. 34). Again, in such a case, the unions cannot be left on their own, but must also build alliances in the society at large with social movements or political organisations with similar view points, often across borders.

There is also the possibility to develop specific actions in the area of workplace resistance as when unions join with others to fight aggressively for good paying union jobs through the development of low-carbon infrastructure, like repairing roads rather than building new ones, expanding public transport routes, and pursuing serious energy conservation.

► **Reclaim:** The first action to be considered is the development of efforts to reverse capitalist

privatisation and to create new models of democratic control and 'public sector systems of provision' (p. 38). In fact, unions and their allies have been quite successful in reversing the privatisation of basic services like water and sanitation. A similar trend is now developing in the energy sector and is achieving results in Argentina, Bolivia, and Germany. Between 2007 and 2013, 44 new local, public utilities have been set up in Germany and more than 100 concessions for energy distribution networks and service delivery have returned to public hands. In a number of major cities such as Hamburg, Stuttgart, Bielefeld, Bremen, Frankfurt, and Berlin there are now campaigns and referendum initiatives for the municipalisation of energy used by households. Unions are involved in all of them.

As public ownership does not guarantee energy democracy, a number of unions are now calling for a complete reorientation of existing public companies, a redefinition of the political economy of energy around truly sustainable principles, and a new set of priorities. Some unions are calling it the 're-socialising' of entities that were once privatised or have stayed in public hands but are using 'marketised' models and management practices.

► **Restructure:** This is where the proposals contained in the points above come together as a strategic view of the future is developed: 'A truly sustainable and democratically controlled energy system will require the restructuring of power generation and distribution as well as major change in other sectors such as agriculture, waste management, and buildings and construction' (p. 43). In this context, the unions see their role as being a key force in the development of a decentralised power generation model, as this provides a major opportunity for them to serve both the needs of members and working class people for jobs, and to participate in the creation of a society that puts social and environmental needs before profits and accumulation.

This, however, will be a difficult task, since the union federations are well aware that many of their local organisations and their millions of members work in the currently centralised and fossil-based system. Thus, a transition to a decentralised approach will require key political decisions to make the complex restructuring attractive to union members, requiring training,

support, and careful attention to the social conditions of the transition. This has been defined as a 'just transition' by unions looking into issues related to green jobs. As stated in the ILO-UNEP report Green Jobs Initiative - Working Towards Sustainable Development (2012): ' In his epic work the Great Transformation, Karl Polanyi described how in the century or more leading to World War II, governments provided the structures and policies to support and shape a modern market economy. At the same time, those governments needed to mitigate the harsh so-

cial effects of unregulated and uncontrolled economic practices. The next transformation will actually be greater still in the sense that it will need to be much faster, more global, and altogether more equitable than anything yet seen in human history' ⁶⁷ The only way to realise this new 'Great Transformation', and do so in a way that is equitable and truly sustainable, is within a democratic framework, through public financing, and with high levels of international cooperation and the sharing of knowledge and expertise.

A fitting final word in our short survey of the issue of trade unions and energy democracy goes to the International Trade Union Confederation (ITUC) in their contribution to the 20th Conference of the parties to the UNFCCC (December 2014, Lima, Peru)⁶⁸. The wording is explicit enough:

Trade unions consider fundamental that:

- ▶ **Just Transition:** The new UN agreement honours the commitment made by Parties in COP17 on the importance of ensuring a "Just Transition which will create decent work, good quality jobs in the transition towards a low emission and climate-resilient society." We welcomed the support for Just Transition principles in the Global Commission on the Economy & Climate as well as ongoing work on the ILO. A strong message to the working people in the UNFCCC is key to show government's commitment to fight climate change in a socially-sound manner.

We suggest the following wording:

Parties commit to accompany their climate policies and actions with the promotion of decent work opportunities arising from a low-emission society as well as with a strategy aimed at ensuring a Just Transition for workers, contributing to protecting them in times of hardship, strengthening social dialogue, securing their rights, growing new sectors and promoting prosperity and sustainable development.

- ▶ **Parties should support the introduction of this commitment in the section of the Durban Platform for Enhanced Action (ADP) draft negotiating text that confirms the commitment to 2°C. In doing so it gives a signal to all Parties on how to implement their climate policies in a worker-friendly way.**
- ▶ In preparing their "contributions" for the post-2020 period, governments are encouraged to introduce data on employment impacts of climate measures (both, positive in terms of job creation, as well as the identification of sectors which will need support in the transition.)
- ▶ Social Protection policies are brought to the centre of climate action. Income security, unemployment benefits, child care and maternity protection, health care and pensions, including for people with disabilities, and respect for human rights, including internationally recognized labour rights, are critical for ensuring the sustainability of climate policies. This must be reflected in the new agreement.

⁶⁷ Green jobs Initiative. Working towards sustainable development. Published by International Institute for Labour Studies, ILO. pp.309-310, <http://www.unep.org/PDF/UNEPGreenjobs_report08.pdf>.

⁶⁸ International Trade Union Confederation (ITUC). Workers & Climate Change. Contribution to the 20th Conference of the Parties to the UNFCCC, 1-12 December, 2014 -Lima, Peru

Finance and solidarity

These two terms might seem at first sight mutually exclusive, especially since the issue is investment in new productive capabilities. But recent developments show that this is not necessarily true: let us look at a specific case that reconciles the two terms.

The origins of these developments go back to 1978 when a new association, Nouvelle Économie Fraternelle (NEF) was created in France with the explicit goal of promoting cooperation in the economy. As the association grew, it began to collaborate closely with the Gemeinschaftsbank für Leihen und Schenken (GLS) in Germany whose purpose is to support social and ecological development projects. The cooperation resulted in the financing of several projects in the area of bio-dynamic agriculture. Following the French banking reform law of 1984, the NEF launched a cooperative bank opened to all members called the Société financière de la NEF (also known as Finance Éthique). Its first 'banking product', the Compte Épargne Insertion, was a shared term deposit account devoted to local development and social housing.

The focus of Finance Éthique today is first and foremost to support the local development of a sustainable economy at the service of human needs and to finance projects and people involved in the social and ecological transition. Today it is the only bank to publish complete accounts of its financial activities. Its most recent activities have been in the area of energy efficiency, RES, and the development of short-chain distribution (direct sales from producers to users). It has also developed close links with the Institute for Social Banking (ISB), which offers courses and research in socially responsible finance. The ISB is based in Germany and only allows organisations connected with specific social banking activities to become members

Thus GLS is a member, as are the Banca Popolare Etica in Italy, the Merkur network in Denmark, and Sweden's Ekobanken. The ISB also publishes position papers to support community-based financing and offers a certificate in socially responsible finance at its educational training centre at the Alanus Werkhaus near Bonn.⁶⁹

The projects that 'finance and solidarity' practices

are able to support via Finance Éthique are as follows:

- ▶ In 2013, the town of Voreppe located near Grenoble wanted to set up a district heating network combining biomass (wood) and solar-heated water. The intent of the new network was to provide heat for municipal buildings, social housing, and a number of small buildings. As an exemplary project supporting the switch away from fossil fuels, it received subsidies from the Ademe state agency and partial financing from the European Bank for Financing. Finance Éthique provided the remaining €1 million to get the project going.
- ▶ The municipality of Vaulx-en-Velin that is part of the Greater Lyons urban community decided to establish the infrastructure necessary to undertake the ecological renovation of several schools. Finance Éthique provided the needed funds.
- ▶ In 2014, the 'Shared Energies' cooperative in Alsace had just completed and was running two PV installations located on roofs. In addition, it wanted to add another PV installation on the roof of a coop member's house. Finance Éthique provided the needed € 13,000 for the installation to be completed.

The cooperative structure chosen by NEF to develop its financial activities promotes democratic management and equality; Each coop member has one vote regardless of the number of social shares that she or he has purchased. NEF also promotes assemblies as well as regional and local meetings so that members collectively decide the strategic choices; it is also using internet-based 'sharing platforms' so that members providing funds and those involved in projects actually share views and information.

In addition to its banking activities, NEF has also developed citizen-based finance programmes that bring together people interested in contributing directly to activities of ecological and social transition. Worthy of note is the programme Foncière Terre de Liens, which finances land purchases for sustainable farming, and Cocagne Investissement, which provides jobs for unemployed youth via the development of bio-dynamic gardens.

69 Institute for Social Banking, Education and Research, Our definition of social banking, <http://www.social-banking.org/uploads/media/ISB_Social_Banking_Definition_English_110614.pdf>.

Conclusion: the red threads of citizens' initiatives

It is by now obvious that there is no such thing as a typical citizen initiative in energy transition. However, we can discern a number of 'red threads' that run through the examples we have been looking at. One such thread is the decision made by the involved citizens to be active and direct actors of changes in their communities; they have taken matters into their own hands and will not let go. The second thread is the strong focus on cooperation and solidarity, in complete opposition to capitalism's culture of competition. In fact, we see that such projects can actually grow and prosper in the interstices of capitalism in order to create the embryos of a new economic order. The third thread is the ability of these citizens as actors of change to develop new tools that insulate the new practices of managing common goods from predatory entities. This reflects the deep-seated need to develop an economy that does not threaten people or nature; it is a good omen for the future.

This is not to say that the transition will be made by citizens' initiatives alone. As we have seen previously, strategic choices of political economy will have to be made if it is to happen. But citizens' initiatives are an essential part of the new model for managing energy projects, and they are an essential form of praxis for people to take matters into their own hands.

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European Social Movements and the Resistance against Fracking

LLORENÇ PLANAGUAMA

Introduction

» *“...but, I believe that we also have the obligation to take some of the things we are thinking about and present them in a more comprehensible fashion to a wider public. We should think about how people will read this and how they will draw their own conclusions. I don't believe that those of us that work in universities know the world any better than anybody else. When I work with social groups I notice that they know what they want and that they are better at getting it than I am. It's not my job to tell them what to do – I wouldn't dream of doing that for a second! But perhaps I can be useful when they want to know how what they are doing is related to what is occurring in capitalist societies. Or what the relationship is between what they are doing and the struggle against capitalism. If they want to reflect on this relationship, we can sit down together and try and understand what they are doing in terms of wider-ranging questions and practices. I believe that in the universities we try to develop a panorama about how economies work, or how politics can be applied in practice. And at times, this is useful for political organizations and social movements. Thus, I feel that it is necessary to create spaces in the universities for progressive ideas and establish closer links with social organizations so that we can learn from them and they from us regarding how to carry out the political struggle.”*

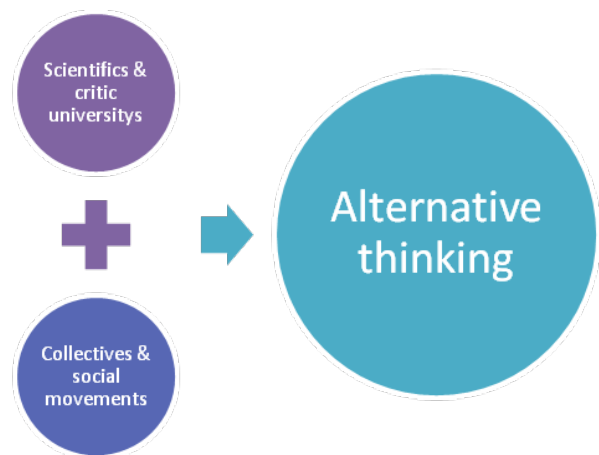
– Interview with David Harvey (2014)

Source: Elsa Bouletes; magazine “Contretemps”

Harvey gives an everyday view of the alliance between social movements and science that is characteristic of the socio-environmental conflict that is taking place at the end of the 20th and beginning of the 21st century. “Sit down together and try to understand”. This situation has been repeated hundreds of times over the last 25 years – local people, social activists, ecologists, experts and intellectuals have sat down at the same table to debate, exchange ideas and generate new ways of doing things that will benefit the common good and social majorities.

Modernity and technical progress have turned our societies into complex structures and knowledge of

how our world works has become an essential and strategic need. Socio-environmental movements not only question unfettered development models but also act as outlets for alternative proposals regarding how the world should be run if we are to ensure an adequate standard of living for all on an inhabitable planet.



We must go further and, as Harvey says, revolutionary scientists and experts must also make the links that connect all the resistance to this uncontrolled development model more patent, and help understand how things work, the capitalist socio-economic system based on continuous growth and expansion, and the accumulation of capital in just a few hands. Beyond the capital-labour contradiction appears the contradiction between capital and the land – or even between capital and the planet – in which the natural environment is seen as a simple resource to be used to feed the motor driving an irrational model that gives priority to the accumulation of wealth by a few over the common good.

In this dialogue between science and social movements the inputs come from both sides. Scientists provide activists with knowledge on which to base their criticisms and struggles, as well as rational and possible alternatives. Likewise, popular mobilizations act as transmission belts that convert critical knowledge into a specific political programme that can act in a particular territory. These movements also help experts understand what social demands should be transformed into lines of scientific investigation and

how we can improve our democracies by popularizing the ability to take decisions on complex subjects.

Thus, we believe that the socio-environmental conflict has helped democratize our societies. Knowledgeable popular pressure groups have arisen that are made up of people who are worried about the future of their immediate surroundings. These people are no longer willing to allow social and political elites to decide what – supposedly – is good for local people.

Even so, the influence that these new social groups have is still unconsolidated and dependent on the local context, and the powers-that-be work to reduce their influence (local autonomy is questioned when town councils are overruled by governments at higher administrative levels).

Nevertheless, and beyond the simple profit motives that are behind the promotion of so many questionable projects, we are witnessing a clash between different ways of seeing the world. Despite the fact that more and more people are now aware that the uncontrolled velocity that our civilization has attained could lead to a total collapse, the majority of people still believe in the myths of progress and unlimited growth.

Even so, the dominant oligarchies still link their development projects that have such high environmental and social costs to increased material well-being and the creation of employment.

Thus, it is very important that, when we think of social alliances, we pay special attention to the trade unions. Their views on the politics of unchecked growth are an essential part of the struggle given that they have tens of thousands of members in workplaces. Winning the battle of ideas on this particular stage will be fundamental. Social movements and political organizations must opt for constructive dialogue with the unions involved in the struggle. We must give priority to the alternative proposals that include as a non-negotiable condition the need for 'fair change' in which workers will not have to pay the price of any transformation towards a more rational socio-ecological model.

These new realities will also affect current scientific models. Science will have to leave the supposed neutrality of its ivory towers and bring science and learning to society and, in doing so, improve our democracies.

A paradigm of all these reflections is the fracking conflict. The alliance between science and social movements, clear talking and the vast fund of know-

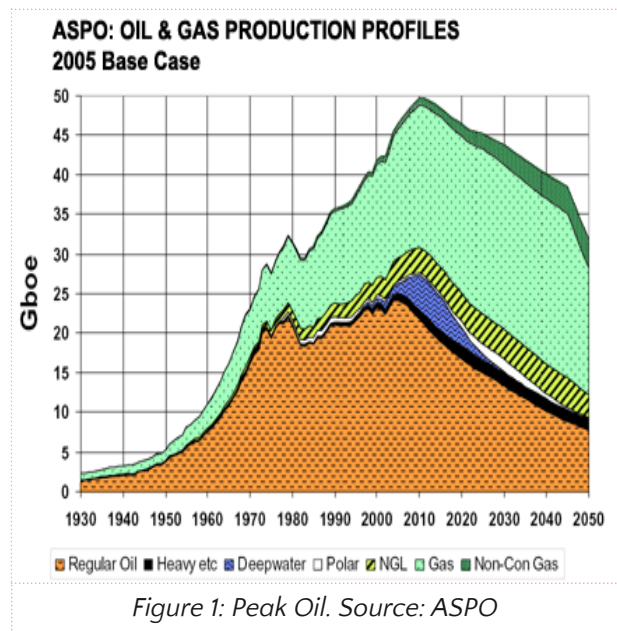
ledge that experts have provided the local people who are up in arms about the impact of this aggressive extractive practice have helped make more people more aware of what is going on. Even at local level, political groups that are ideologically in favour of greater development have come out decidedly against fracking. This dialogue has enabled us to go even further and incorporate the values of a new energy culture into our societies.

Yet, it is not enough to simply oppose abusive extractions in our local areas since we must also work towards a new social model based on efficient alternative energy sources that will substitute fossil fuels. We must leave this blind dependence on oil and other fossil fuels that we have had for 150 years and move towards a type of society that has much more respect for our planet.

Fracking: the background

Energy crisis

The use of fracking is a direct consequence of the exhaustion of the conventional oil reserves that have been exploited since the 19th century. Since 1920s, these fossil fuels have enabled industrial society to grow as they permit the expansion of transport systems and the access to cheap and efficient energy resources.



Currently, it is calculated that easy-to-extract oil – that is, the cheapest oil – is running out, a situation that has led to price rises that have made techniques such as fracking economically viable despite the large financial investment required and the low energetic return (i.e. the difference between the energy used during the extraction process and that derived from the extracted oil).

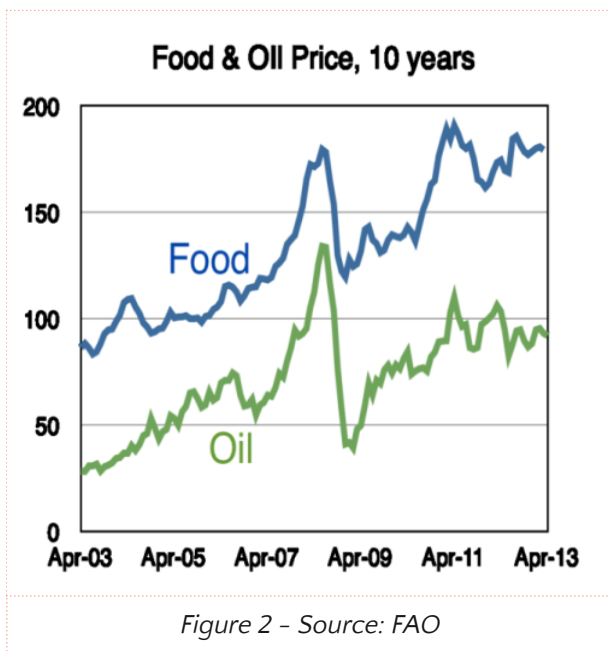


Figure 2 – Source: FAO

The upsurge in fracking is further proof that we are reaching the limits of our planet’s geological and ecological resources. The capitalist logic of profits and the fact that there is no need to reflect any ecological impact in a company’s financial statements mean that serious social and environmental damage is inflicted on various parts of our planet. There is an urgent need to change the current model and substitute it with one that is environmentally and socially more just. Nevertheless, the direction that this systematic crisis is heading would seem to suggest that fracking is not the way forward – indeed, the reverse is true and the struggle to extract the few natural resources that the planet has left (above all, oil) is merely enabling a rich elite to perpetuate itself and provoking conflicts throughout the planet. Those who have monopolized the world’s riches are happy to see 99% of the world’s population living in poverty, only consuming a small part of the planet’s ever-shrinking resources; this is preferable to doing what is really necessary, i.e., socialize the world’s resources to begin to decelerate growth and to use the remaining resources in a more sustainable and equitable fashion.

Oil dependence and capitalist speculation

The current neo-liberal phase of capitalism is based on the ability of capital to make huge profits selling illusions and impossible projects rather than worthwhile ideas that could actually be fulfilled. These illusions are generated unethically by playing with the needs of a particular region or territory – for example, the need for jobs or improved energy supplies. Fracking forms part of this process and could one day become one of the most dangerous of all fictions created by this economic model, since its

implementation will postpone the taking of important energy-related decisions.

Currently, there are hundreds of potential fracking concessions scattered throughout Europe and the planet as a whole. This technique is highly aggressive and guarantees no more than poor energy returns. These concessions are usually awarded despite strong local opposition to the potential threat to a region and its ways of life. Many analyses have already described why we have reached this impasse regarding the extraction of fossil fuels, which can be summarized as follows: we are at the end of a cycle due to an energy crisis provoked by the rise in fossil fuel prices (above all, oil) caused, in turn, by the exhaustion of easily extractable – and, thus, profitable – deposits.

If these potential concessions for fossil fuel exploration were geologically viable, the problem would be to decide whether or not to award such licences based on socio-environmental criteria and with the participation of local people. Yet, today’s neo-liberalism does not bear current realities in mind since they do not generate profits and so projects are sold whether or not they are viable, and money is made via deceit (i.e. speculation) that give rise to false expectations. The organization of a large-scale spectacle is thus commonplace even when it is known in advance that the project will not be viable. This fiction aims to convince other people, private investors and investment funds to assume the risk (profit for a few, risk for many). These economic bubbles are complicit with the credit rating companies who, in the case of fracking, qualify fracking concession packets for companies as a good risk without studying whether they are geologically viable or not. This process is inherently risky, just like the sub-primes in the crisis of 2008.

Thus, it is essential to study fully whether projects are possible or are just fictions; and if they are false, then they should be denounced and a law created that penalizes legally these purely speculative projects.

Nevertheless, what is truly important is to find alternatives to current models. As an alternative to fracking, we should be looking to renewable energy sources, the socialization of energy and the creation of an energetically much more efficient society (i.e. collective transport, cooperative housing, etc.). Thus, we must incorporate scientific culture into anti-fracking social movements so that protests can wield arguments against speculation and promote alternative projects.

Hydrocarbon geology in Europe

Not all of Europe is geologically appropriate for the existence of oil and gas reserves or even for reserves whose exploitation is economically viable (above all, gas).

In an article in *Nature* in February 2013, Dave Hughes explained that shale gas is not economically viable; indeed, it is a simple case of “a financial bubble orchestrated by Wall Street”, in the words of Deborah Rogers from the Energy Policy Forum. What about oil in only slightly porous rock? This type of deposit has not been found in Europe, where only shale gas is talked about. This is because there are fewer deposits of this type and they are more expensive to exploit given the associated geological and social realities. What is known as shale oil is only marginally profitable and, unlike shale gas, the majority of whose deposits are economically unviable, it can generate moderate profits in a few cases where deposits contain liquids that will make commercial exploitation worthwhile. Nevertheless, the perspect-

ives for shale oil production are poorer than for shale gas and even the International Energy Agency recognises that production of shale oil will always be at best marginal.

To date, shale oil resources have only been extracted by fracking in the USA due to the strength of its economy, the grants that the industry have been awarded and limitless stock-market speculation. Such a system would be far from viable in Europe.

Increasingly distant from the decadence of this type of exploitation in the USA, lobbies in Europe still blindly talk of the profits to be made. Meanwhile, dozens of groups of local anti-fracking activists, ever better prepared and coordinated, are mobilizing to try and stop the awarding of exploration licences. The battle is becoming entrenched but it is clear that there will be no winners and the most likely outcome is that everyone loses – unless, that is, common sense prevails in the search for a true alternative energy policies.

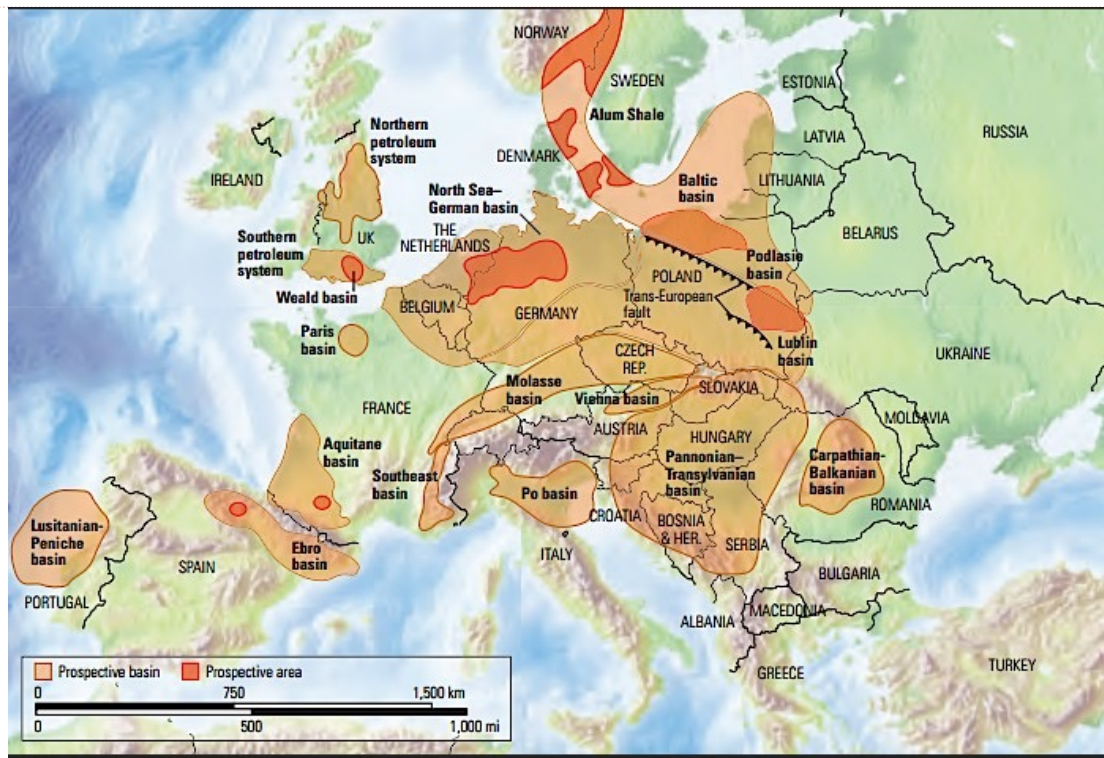
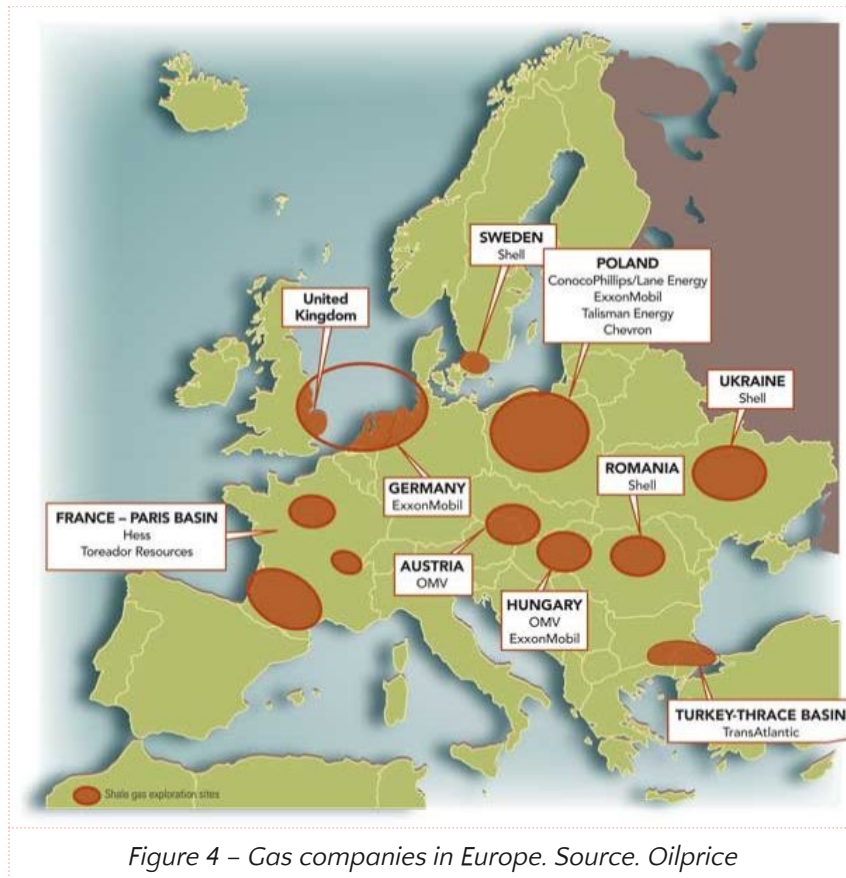


Figure 3 – Deposits of oil and natural gas in Europe. Source. *Overview of Fracking*



Hydrocarbon exploitation

To date, fossil fuel extraction has involved the exploitation of ‘conventional’ hydrocarbons (oil or gas); however, modern fracturing techniques aim to extract ‘non-conventional’ hydrocarbons. The difference between these two types of fuels is pertinent: ‘conventional’ hydrocarbons are stored in porous or permeable subterranean reservoirs out of which the oil or gas will flow to the surface if the reservoir is breached or perforated. This ‘ease’ of extraction means that the exploitation of hydrocarbons up to the present has been focused almost exclusively on extracting ‘conventional’ reserves where the fuel is stored in the pores or open spaces between the rocks.

The ‘non-conventional’ hydrocarbons encompass a large and heterogeneous group of hydrocarbon deposits that include: (a) gas hydrates also known as clathrates that are generated and stored in deep marine sediments deposited on the seabed; (b) oil

sands, or sand with bitumen (a mix of heavy hydrocarbons) that fills the pores; (c) coal bed methane (CBM), natural gas, methane, associated with coal seams. The gas is retained in fractures and, essentially, absorbed in the rock matrix (coal); (d) tight gas: natural gas retained in very compact rocks, sandstones or limestones, with very low permeability; and (e) shale oil and shale gas (the object of this report), hydrocarbons stored in lutites and other rocks. These types of lithologies represent the mother rock of the hydrocarbons: rocks with very fine grains, rich in organic material and with very low porosity and permeability. In other words, shale oil and shale gas are hydrocarbons, gas or oil, that are stored in the mother rock in which they were generated. Shale oil and, above all, shale gas are non-conventional types of hydrocarbon deposits whose exploration/production has undergone a boom in recent years, a fact that has generated considerable media attention. The world’s gas reserves associated with these

Schematic geology of natural gas resources

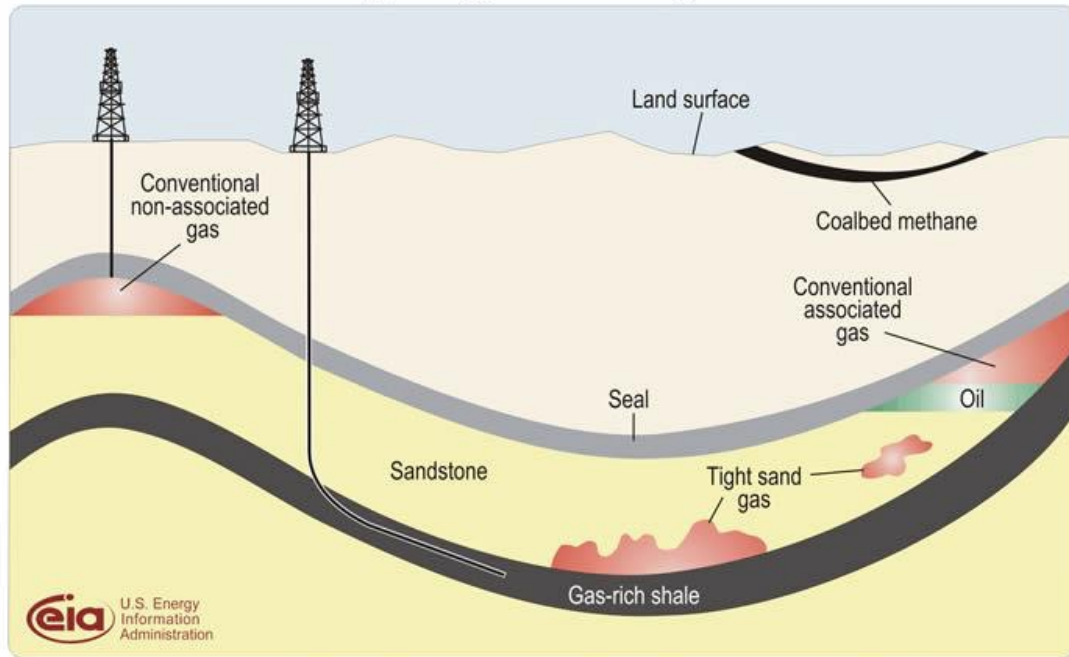


Figure 5 – Schematic geology of natural gas sources. Source, EIA (Energy Information Administration)

Fracking

Hydraulic fracturing entails the drilling of a vertical shaft down to the normally permeable target rock layer. The perforation consists of a steel pipe, covered in cement to protect the surrounding groundwater from the chemicals that are added to extract the oil.

When the shaft reaches the rock layer that stores the hydrocarbons, the perforation then continues in a horizontal direction through the target bedrock. This well can run for anything between 1 and 3 km. Explosives are used to create small fractures and then thousands of tonnes of water, mixed with sand and chemicals, are injected at very high pressure. This high-pressure mix fractures the rock and liberates the gas it harbours, which then returns, together with the water, sand and chemicals, to the surface (a return of 15–80% of the total injected fluid).

The well is fractured in 8–12 stages, which means that the shaft is subject to great pressure with the consequent risk of damaging its cement housing. The chemicals that are added to the water include benzenes, xylenes and cyanides, in total up to 500 different products, some of which are known carcinogens and mutagens. Many of these chemical substances have not even been classified and so the risks that their use implies is totally unknown.

The return fluid also brings with it to the surface oth-

er substances that may be present in the target rock layers. These rocks often contain heavy metals (mercury, lead), as well as radon, radium and uranium, all radioactive elements that would also be brought to the surface. This return fluid is stored in decantation pools. All in all, fracking is a technique that, despite recent improvements, cannot be fully controlled or guaranteed as safe since there is no way of knowing in advance how the rocks to be exploited will react.

This technique is technologically very advanced but implies a series of high environmental and social risks:

- a) Danger of contamination of the groundwater due to the use of chemical products. A part (20%) of these chemicals will not return and will be left in the subsoil. This could lead to contamination of the deep and superficial groundwater if the perforation shafts are not properly installed.
- b) Over-exploitation of the groundwater given that this technique uses a lot of water. Injections of 12,000–24,000 m³ are habitual and equivalent to 12–24 Olympic swimming pools.
- c) Traffic and noise associated with heavy industry. These exploitations are essentially heavy industrial installations, which implies an intense transit of heavy vehicles in rural areas with consequent negative affects on local quality of life and health.

d) Impact on the landscape due to the large size of these installations, which occupy a surface area greater than a football pitch. In a rural area, this will have a serious impact on the landscape and be a visual blot on the landscape that will be multiplied throughout the exploited territory.

e) Small earth tremors provoked by the injection and extraction of water if there are fault systems in the area.

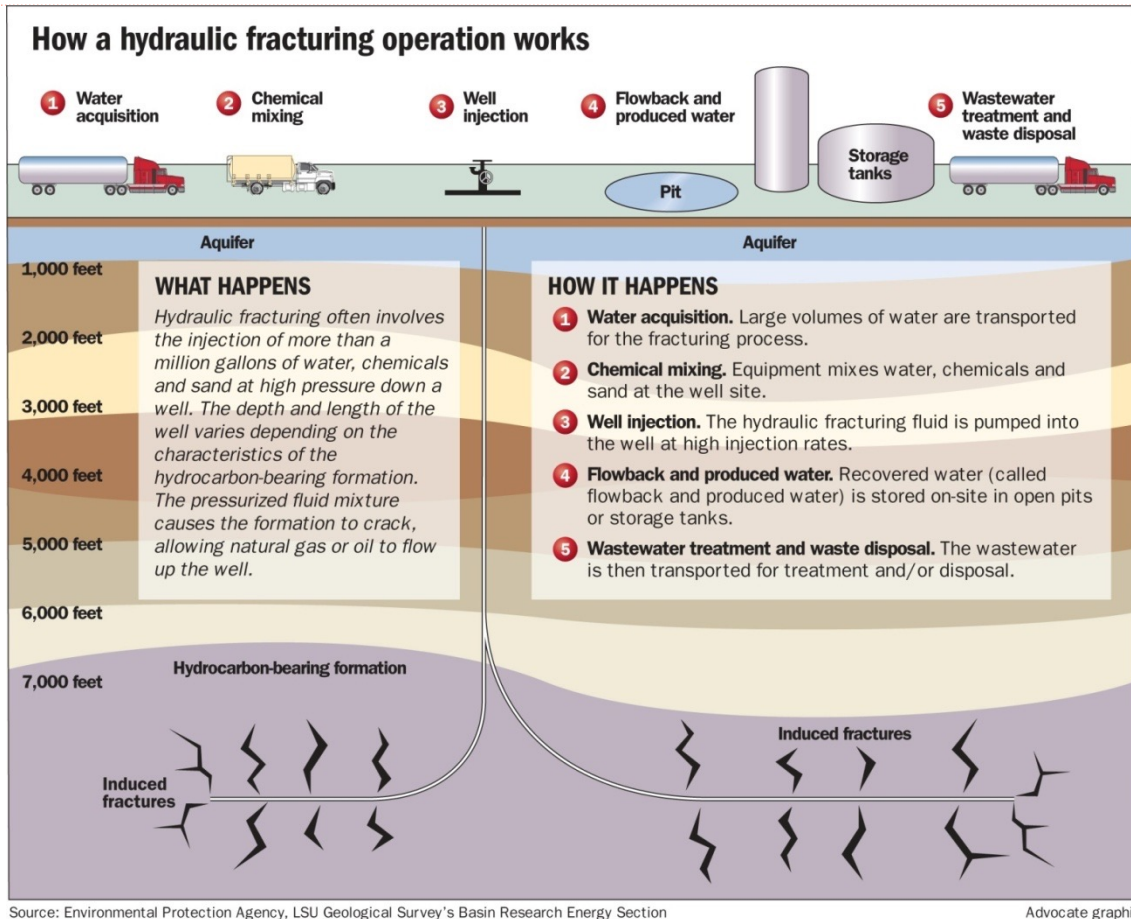
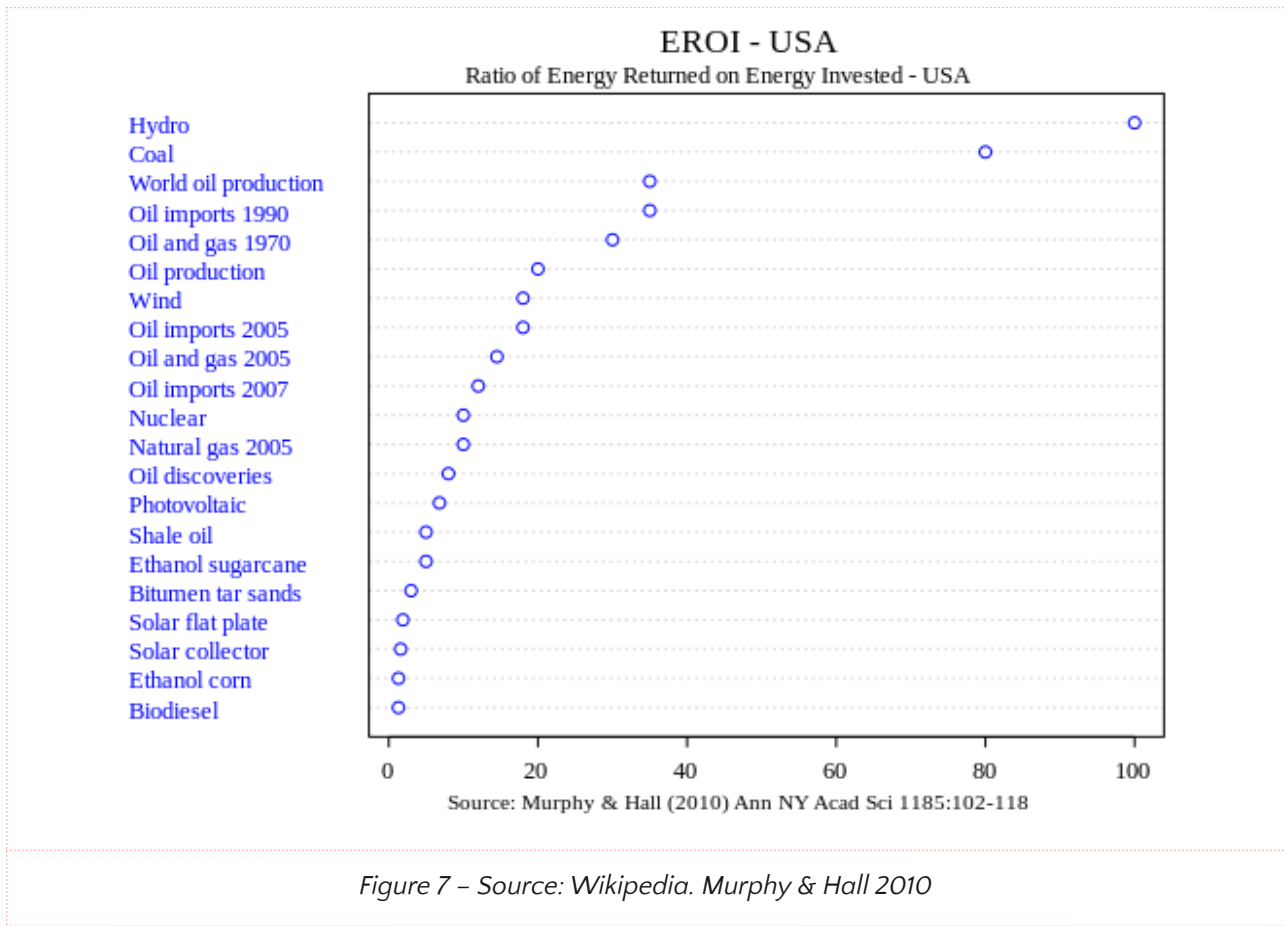


Figure 6 – Environmental impact the Fracking. Source: Environmental Protection Agency. Geological Survey

The EROEI of different sources

For any given energy source, the EROEI is the quantity of energy returned in relation to the amount of energy expended to obtain that energy. In order to obtain energy from a particular source, amongst other factors, it is necessary to (a) build and operate machines to search for the energy; and, in some

cases, (b) perforate rocks, (c) process the extracted material before they are refined or purified, and (d) prepare the terrain and construct infrastructures for their subsequent use. A good energy source is one that, aside from other properties, can be exploited on a large scale without causing serious environmental impact, which thus will have a high EROEI.



Fracking conflicts in Europe

Poland

Over the last five years 25 perforations have been made in Poland using fracking techniques and so there are many places where we will have to fight. One of the companies involved in exploiting fossil fuels is Chevron. It seems that pressure from anti-fracking platforms has been successful and that the local governments have taken sides with the activists. This is one of the reasons why the national government has revoked some of the licences. However, the situation will become more complex in 2015 since the Polish government aims to pass a new law on hydrocarbons that will foment hydrocarbon exploitation and effectively provide carte blanche for investors. It is a very dangerous law because it empowers a representative of central government to take decisions at local scale without allowing local communities to have a say. Local regulations will no longer have any teeth or any function.

Bulgaria

Fewer fracking licences have been issued in Bulgaria than in Poland but local anti-fracking activists must not drop their guards. In 2011, the national government awarded a perforation licence to Chevron that will enable it to carry out extractions in NE Bulgaria,

an area with a great richness of hydric resources and underground lakes. Popular protests began almost immediately and a number of people began to work to avoid the destruction of part of this natural area. In 2011, a platform was set up to begin an awareness-raising programme. There were few protestors initially but after a few months activists were able to convoke a demonstration that was a success throughout the whole country. Even people living abroad such as students have joined the struggle.

Greece

There is no real threat from fracking Greece at the moment, although there is an area near the Turkish border where the possibility of awarding a licence is being studied.

England

The United Kingdom is one of the most worrying cases since dozens of licences for extracting minerals using fracking techniques have been awarded to a number of different companies by David Cameron's government. According to Cameron, this type of extraction will enable the country to reduce its energetic dependence on other countries and create employment. Many licences have been handed out and the number could grow if the Conservative government approves all the applications that have been

made. Over half of Great Britain (64% according to the British government) harbours important mineral deposits in the subsoil. The most important natural shale gas deposits are in the centre-west of the country at a depth of one kilometre.

The government is favourable to non-conventional extraction methods and the fight is very difficult. The government claims that fracking is well regulated but the truth is that legislation on the question is being toned down. For example, the waste generated by predatory fracking will not have to be removed from the local area and perforations will be permitted in protected areas and/or natural parks.

Scotland

Scotland has also been the subject of applications for fracking licences. There are fewer difficulties for anti-fracking campaigners than in England, although there are areas in which a number of companies are interested in drilling to extract fossil fuels using fracking. "To win over local opinion, these companies have said that they will ensure that 2% of the profits made in an area will be given to local businesses", explains a Scottish activist, making it very clear on which side of the question s/he stands. The people of Scotland say "Extractions are not viable. There are few resources in this area. There is no sense in allowing companies to drill there. We need sustainable development and cannot continue growing without limit".

The possibility that fracking would be permitted in the region has mobilized a number of groups of people. One of the successes of their fight is to have persuaded the Scottish government to protect an area of 2 km² in which fracking activities will never be able to be carried out. The aim of these collectives is to hold popular votes and thus let local people give their opinions. A territory must have participative planning in which local communities can choose what elements – tangible and intangible – must be protected at all costs. Thus, Community Charters have been drawn up, which represent a true declaration of intentions, to which local councils and communities can adhere if they wish. It is not just a question of energy but of local democracy. These activists are carrying out awareness-raising tasks aimed at getting the maximum number of people actively involved, and at putting pressure on the Scottish executive to make it more aware of the need to protect the territory.

Romania

Like other countries, Romania depends on gas imported from Russia for its energy supplies. Neverthe-

less, its dependence is somewhat less than neighbouring countries as it has its own energy resources, above all in the Black Sea region. Yet, this has not prevented the Romanian government in recent months from awarding a number of fracking licences to companies such as Chevron.

In light of the real danger of the spread of fracking in this country, activists have begun to mobilize. It has not been easy to get people involved and during the first activities few people were present. Nevertheless, bit-by-bit the work of environmental groups is beginning to bear its fruits.

The affected people and towns live off agriculture and will be seriously affected if the companies that aim to carry out fracking extractions contaminate the subsoil. Scientists have helped activists in transmitting important technical knowledge to society in general.

Catalonia

The intention to carry out prospection in rural areas of central Catalonia, the Ebro valley and along the Mediterranean coast was announced in 2012. At that point, we had no idea of what the word 'fracking' meant but once we found out and realized just what impact it could have on our country and population we decided to start mobilizing.

Thus, the anti-hydraulic fracking movement Plataforma Paremós El Fracking was born in 2012. Its initial strategy was to attempt to forge alliances with local groups and local institutional representatives. The pressure finally paid off and the Catalan government banned all extractions of this type in the country.

However, our celebrations only lasted a little while since the Spanish government appealed to the Spanish Constitutional Tribunal (TC), claiming that the Catalan government had gone beyond its legal prerogatives. The TC temporarily suspended the Catalan law banning fracking whilst it debated a more definitive position. Finally, the TC has accepted the Catalan government's posture and, after the lifting of its temporary suspension, the Catalan law is back on the statute books.

The main media sources are clearly influenced by the energy lobby and the Spanish government has attempted to bribe certain town councils into accepting fracking within their municipal boundaries.

France

There is no danger from fracking in France since on 13 July 2011 the French government passed a law that prohibited this type of extractive activity throughout the whole of the country.

The law was greatly celebrated by activists and hit the companies that had previously been awarded perforation licences hard. One of these, the Texan company Schuepbach, who had been awarded licences to explore in Nant (Aveyron) and Villeneuve-de-Berg (Ardèche), decided to take this change in legislation to the French high court. However, in record time, the French Supreme Court resolved the four appeals that had been presented in favour of the French government.

The highest French court decided that the government had acted correctly when implementing a moratorium on fracking. In this way, all previously awarded prospection licences that implied the use of fracking technology were automatically revoked.

Denmark

The Danish government has awarded a number of licences permitting perforations, which has caused a wave of protests. The French company Total (which is also active in the UK) is one of the companies that aims to extract shale gas using hydraulic fracturing, specifically on the Jutland peninsula in northern Denmark. The protest actions include the establishment of a camp near one of the prospection sites, where anti-fracking platforms have been set up and protests organized throughout the country. As well, the activists have created a press department that will enable them to be present in the local media and therefore increase the number of people they reach.

Germany

A number of multinational companies are interested in investigating and exploiting some of the reserves that exist in northern Germany. However, the Germany government does not seem very willing to allow them. The government has said that it will defend above all the environment and underground water supplies, and that any law passed will be very restrictive regarding the use of hydraulic fracturing. It is likely that one of the limitations that will be imposed will be on the depth: fracking will only be possible in areas where deposits lie at over 3,000 m below the surface. This clause has irritated some of the companies that want to invest in the country since they claim that the largest reserves are 1,000–2,000 m below the surface. Fracking will be prohibited in sensitive regions such as protected areas and/or natural parks, and areas where there are aquifers that supply cities with drinking water. The new law has provoked some protests by certain sectors and opposition politicians in some of the country's federal *Länder*.

Valencia (Castellón)

For the time being only one company – Montero Energy, a subsidiary of the Canadian company R2 Energy – has taken any interest in possible fossil fuel reserves in the Valencian Autonomous Region. The regional government has not opposed the Canadian company's proposal (as is to be expected) and has no intention of preventing explorations. Nevertheless, the possibility that fracking may be permitted has created a serious outcry.

The most affected area is the province of Castellón, where Montero Energy wants to carry out a number of explorations to determine whether or not there are sufficient reserves in the subsoil. The affected territory covers 200,000 ha in 41 municipalities, in which the company aims to obtain exclusive rights to undertake exploratory drilling.

Local activists have mobilized and have created a platform to coordinate the struggle. At the moment they are organizing information sessions in the affected towns and have sent a petition to the European Parliament.

Switzerland

Fracking did not reach Switzerland until 2013 but soon set the alarm bells ringing in environmentalist circles. During the following year, a number of companies came to the country with the aim of being granted licences by regional governments (in Switzerland the authority over the subsoil lies with regional and not central government) to begin explorations. Businesses immediately began to negotiate with local officials. But local people in affected areas got together and sent a number of petitions to the regional authorities. The most important request is that the administrations protect the water in the subsoil, a measure that would halt all prospections and explorations.

Cantabria

Cantabria stands out as the first autonomous community in Spain to ban fracking activities. After a series of demonstrations, in April 2013 the regional parliament approved unanimously to prohibit hydraulic fracturing. However, as happened subsequently in Catalonia, the joy did not last long. The Spanish government appealed to the Spanish Constitutional Tribunal (TC) claiming that the Cantabrian regional government had encroached on the competencies of central government. The TC passed sentence a year later on 24 June 2014, declaring that the regional government's law was unconstitutional and that energy policy – including gas extraction – depended on central government.

The Tribunal did, however, leave the door open to local regulations in Cantabria that would take into account 'the singularity of the territory'. Taking into account the way forward suggested by the different people, the region is currently debating a new law that will establish specific protection areas.

CEE Bankwatch Network

The public institutions that participate in the funding of companies that are involved in fracking in Europe or in the EU Neighbourhood include the European Investment Bank (EIB)⁷⁰ and the European Bank for Reconstruction and Development (the EBRD)⁷¹. The EBRD is run by neo-liberal sympathisers and, via the concession of credits to multinational companies working in the fossil fuel extraction sector, are facilitating the spread like an oil stain of hydraulic fracturing throughout Europe and the Neighbourhood countries.

To change this situation, greater control is needed over these entities and a limit must be put on the amount of fossil fuel extraction that they can finance. Another important task is to make public how the European Bank for Reconstruction and Development awards credits to companies in a very unaccountable fashion to avoid both any public outcry and any calls for these public banks to act for the general good and not just for private interests.

The situation in North Africa

It is very difficult to identify all the operators that are working in gas extraction in Algeria (one such company is Repsol), and it is possible that some companies are using hydraulic fracturing without any type of licence. Algeria is one of the world's principal gas producers and exports 68% of its production, almost exclusively (90% of its total exports) to European Union countries.

Like Algeria and Morocco, Tunisia is an ideal area for experimenting with fracking since there is no effective environmental legislation and businesses are very secretive about how they operate. These countries' governments need the funds that fossil fuel extraction can provide and are happy to open doors to foreign investors by offering all kinds of fiscal advantages to multinationals. These companies will then take all of their profits produced by the activity

out of the country. One of the areas most affected by fracking is southern Tunisia, an area where extraction has traditionally been carried out and for where the government has been awarding licences since 2012.

In Tunisia it is known that some companies are conducting fracking operations illegally. It is essential that the lorries and machinery that go to extraction areas be monitored in order to discover what kind of techniques are being used.

Problems for local communities

Democracy – no communities are consulted (anywhere in Europe)

The administration that decides on fracking must be rooted in the 21st and not the 20th century and so when it comes to awarding licences it must act transparently and encourage participation, and avoid acting in an opaque and/or authoritarian fashion. Thus, the following criteria must be fulfilled when decisions have to be made: (a) transparency: new digital technology ensures that all documentation generated by official reports can be published on the Internet; (b) communication of and response to social demands: experts and mediators must be available to visit the territory to explain and listen to local reaction to projects, and must act in a transparent fashion, be knowledgeable about the subject and be committed to their task; (c) technical evaluation of the project: the administration must seek expert evaluation based on data and facts of technical aspects of the project and the company involved.

The rural economy in danger

Hydraulic fracturing is not compatible with other economic activities such as agriculture and tourism and so it is essential to analyse whether the loss of income in these sectors will be compensated for by the profits from the mining activity.

In certain countries there are regions that appreciate that their principal attraction is the peace and quiet they offer and their landscapes. Thus, they restrict certain types of harmful economic activity that will damage the quality of their regions. Most of the fracking concessions are in areas that can boast tranquillity as a one of their principal attractions.

70 For EIB loans: a) to ENI (<http://www.eib.org/projects/loans/2013/20130018.htm>) and b) OMV/ETAP: <http://www.eib.org/projects/loans/2012/20120053.htm> by the EIB

71 For EBRD loans to a) Petroceltic International (<http://www.ebrd.com/work-with-us/projects/psd/petroceltic-international.html>) b) Condor Petroleum (<http://www.ebrd.com/work-with-us/projects/psd/falcon-loan.html>) c) OMV Petrom (<http://www.ebrd.com/work-with-us/projects/psd/falcon-loan.html>) d) Serinus Energy (<http://www.ebrd.com/work-with-us/projects/psd/serinus-energy.html>) and e) PetrolInvest S.A. (<http://www.ebrd.com/work-with-us/projects/psd/project-western-oil.html>)

Saving peaceful places

The quality of calm experienced in places with mainly natural features and activities, free from disturbance from man-made disturbances, should not be underestimated.

Europe needs to promote policies that will defend the right of people to live in a healthy environment and so the protection of the environment in which people live should be declared as of public interest. As well, we should flee from the anthropocentric view of rights and accept that nature too has rights, whose observance can be demanded by any person, people, community or nationality. One of the rights

of nature is the application of “precaution and restriction measures in all the activities that can lead to the extinction of species, the destruction of ecosystems or the permanent alteration of natural cycles”. Hydraulic fracturing must be subject to these considerations – and not just because some of the concessions currently being mooted lie within areas that are part of the Natura 2000 network of protected areas.

The defence of intangible values such as silence is important in a society in which the health of local inhabitants and the environment should be a priority. We will create unhealthy societies if we fail to conserve these values.

Toward a Responsible Research

MARC DELEPOUVE & ANNE-FRÉDÉRIQUE PAUL

In the view of some, thanks to research, technological innovation, and markets, humanity will be able to move beyond the environmental crisis; the forward march towards technological progress has become ineluctable and, because of its articulation with markets and companies, constantly increases well-being as well as the quality of life on earth. Others believe that research and technology have become sources of destruction of both well-being and the quality of life and even actual threats to humanity's survival; it is therefore necessary to slow down and perhaps even to put a stop to research, especially its technological component. This point of view has been gaining ground since the dropping of atom bombs over Hiroshima and Nagasaki on 6 and 9 August 1945 and the subsequent publication in 1962 of Rachel Carson's book *Silent Spring* that exposed the dangers of pesticides for both health and the environment. Today, it has been reinforced due to the global environmental crisis.

We do not agree with either of these positions. Against the first position, which regards technological progress as closely connected to the market, we say that the results and applications of research have a considerable impact on both human societies and daily life in the short, medium and long term. Consequently, the choices regarding the priorities and objectives of research, as well as the quantity and allocation of financial and human means, are eminently political. They cannot possibly be left to the laws of the market and to the needs of private companies.

Against the second position, we say that we do not have at our disposal the scientific knowledge or required technologies and techniques needed to confront the environmental crisis and, more specifically, to initiate the necessary and urgent energy transition. We are not living in an ideal world in which, over a short period, behaviours, economic production, and consumption could change radically; we are not in a world detached from the social and geopolitical relations of force, without domination, without greed ... We are aware that neither in 2015 nor in one, two, or three decades could this ideal world become reality, even though to move closer to it we need to pursue positive and consistent transformations. The optimal

theoretical use of available technologies and techniques is impossible. Moreover, even if their use became possible, the available technologies and techniques would not allow us to respond satisfactorily to the different challenges of the energy transition (see chapter two). For example, generalising the use of renewable energies would require us to answer the question of what is to be done when rare-earth elements are exhausted and what to do with the waste.

Assessment of the situation

Initiated on 1 January 2014, the 2020 Horizon programme⁷² brings together the European Union's different sources of financing for research and innovation. It is organised around three key priorities: 'excellent science', 'industrial leadership', and 'societal challenges'. The term industry is to be understood as all activities of companies, including internet services and education. There are seven societal challenges, including:

» *'Secure, clean and efficient energy' (excluding fossil and nuclear);*

*'climate action, environment, resource efficiency and raw materials'. A specific objective is also added: 'The era of seemingly plentiful and cheap resources is coming to an end: raw materials, water, air, biodiversity and terrestrial, aquatic and marine ecosystems are all under pressure. [...] There needs to be a decoupling of economic growth from resource use.' 'The objective of the Societal Challenge 'Climate action, environment, resource efficiency and raw materials' is to achieve a resource – and water – efficient and climate change resilient economy and society, the protection and sustainable management of natural resources and ecosystems, and a sustainable supply and use of raw materials, in order to meet the needs of a growing global population within the sustainable limits of the planet's natural resources and eco-systems.' 'Helping to build a green economy – a circular economy in sync with the natural environment – is part of the answer.'*⁷³

The overall framework is the European research space, launched in 2000, whose 'main objectives

⁷² <<https://ec.europa.eu/programmes/horizon2020/h2020-sections>>.

⁷³ Horizon 2020: Work Programme 2014–2015, p. 5, <https://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/main/h2020-wp1415-climate_en.pdf>.

dove-tail with the Lisbon strategy in order to prioritize scientific excellence, competitiveness and innovation promoted by improved cooperation and coordination of all involved players⁷⁴. So, from its very beginning the European research space supported the Lisbon strategy and its key driver of shaping Europe as ‘the most competitive and most dynamic area of the knowledge economy by 2010, able to combine durable economic growth with a quantitative and qualitative increase in employment and improved social cohesion.’ Today, that same space has become part of the Europe 2020 strategy, launched in 2010 and organised around seven initiatives including :

» *“Innovation Union” to improve framework conditions and access to finance for research and innovation so as to ensure that innovative ideas can be turned into products and services that create growth and jobs.’*

» *“An industrial policy for the globalisation era” to improve the business environment, notably for SMEs, and to support the development of a strong and sustainable industrial base able to compete globally.⁷⁵*

In essence, the Horizon 2020 European project for research and innovation relies mostly on calls for projects to be answered by research entities seeking European financing. These calls for projects require cooperation between research entities but only with a small number of partners. They are thus intended to reduce the fragmentation and overlapping of technological research characterised by a market approach. They in addition create a competitive environment that goes against the nature of research and that negatively affects necessary cooperation. In accordance with this logic, they require public-private partnerships that are focused on the short-term profit requirements of private entities. Finally, under pressure from the UE and the European governments, research on energy transition is focused on technology, while in fact the transition cannot be limited to technological aspects alone.

Finally, European research on energy transition suffers from the following disorders:

▶ Contradictory motivations – financial greed and focus on the short term, on the one end, and, on the other, a focus on societal objectives taking into account the medium and long term, with

the first consideration increasingly dominating the latter objectives.

▶ Economic and financial competition between nations and private enterprises. The result is a lack of coordination, a fragmentation, and dispersal of research (all the more so on an international scale), and therefore a waste of the financial and human resources dedicated to research. This situation generates industrial secrets during the research process and in the use of the results, and leads to patents that increase the cost of applying the results and limit their utilisation.

This situation is the direct result of the political choices of the EU and European governments that have given priority to international free trade and to the international free circulation of capital; the consequences have been domination by transnational companies and economic competition between nations. One of the key weapons used in this competition is innovation, more specifically a commercial kind of innovation, guided not by democracy but by the international market and by the greed of the companies and that of their owners (individuals or legal entities). Finally, the choices regarding research priorities, means allocation, and overall organisation are increasingly guided by the requirement to defend and strengthen the competitiveness of Europe’s regions, and are increasingly dominated by transnational companies.

In such a context, it is not surprising to see the difficulties, even the quasi-paralysis, that humanity feels when confronted by climate change, the turning upside down of the earth system and the urgency of an energy transition. These are real difficulties that must be resolved and not eluded by trying out geo-engineering solutions that aim to manipulate both climate and the environment on a global scale, with unpredictable outcomes due to the extreme complexity of the earth system. One such manipulation would be to send chemical compounds (such as sulphur) up into the atmosphere in order to reduce the absorption of solar energy by the weather system. IPCC has issued warnings about this technique called SRM: ‘SRM is untested and is not included in any of the mitigation scenarios. If it were deployed, SRM would entail numerous uncertainties, side effects, risks and shortcomings and has particular governance and ethical implications. SRM would not reduce ocean acidification. If it were terminated,

74 <http://www.horizon2020.gouv.fr/cid74154/objectifs-perspectives-eer.html>

75 Communication from the Commission, Europe 2020: A Strategy for Smart, Sustainable and Inclusive Growth, p. 5, <<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:2020:FIN:EN:PDF>>.

there is *high confidence* that surface temperatures would rise very rapidly impacting ecosystems susceptible to rapid rates of change.⁷⁶

Opposed to this techno-scientist flight forward, research has played and is still playing its vital role of whistle blower. The urgent need for a global and solidary mobilisation of humanity is based on research results (see chapter 3, part 2). But even there, we can see emerging difficulties. IPCC scenarios are built on foundations of sand, and their media and political instrumentalisation show that there are problems in terms of scientific communication and expertise.

Moreover, in conclusion, R&D contributing to the energy transition is under-financed both in Europe and in the world at large. According to the United Nations Environment Programme (UNEP), out of a total GDP in excess of \$70,000 billion, humanity allocated \$11.7 billion of R&D funds for renewable energy, including less polluting energy sources as well as sources responsible for environmental problems (deforestation, waste, use of rare resources) and social problems (agriculture to produce bio-fuels replacing local production for local use, displaced persons). In other words, when humanity spends \$10,000, less than \$2 is allocated to renewable energy sources (RES) research. Given the importance of the challenge, such a low level of spending is absurd. The share of Europe as a region in global expenditure on energy transition research amounts to \$4.3 billion, or 36% of the global total, an amount that is less unsatisfactory than the amount spent by the rest of the world. Nevertheless, taken together, these expenses are extremely inadequate. Within the \$4.3 billion, the relative weight of company R&D is very large as it amounts to \$2.9 billion, the remaining \$1.4 billion coming from the public sector. Moreover, companies are very influential in the allocation of the public sector share of expenses. Such an influence, wanted by the political entities (European government and EU institutions) is the main cause of the defects and abuses of public research. China, which ranks in first place regarding renewable energy economy shows a different public/private balance with \$1.7 billion allocated by the public sector and \$0.7 billion by private companies. However, the industrial power of China in developing renewable energy sources relies on multiple factors, even if R&D is an essential area.

R&D financing for renewable energy sources expressed in US dollars⁷⁷

	Public sector	Private companies	Total
Europe	1,4	2,9	4,3
China	1,7	0,7	2,4
USA	0,8	1,3	2,1
India	0,1	0,2	0,3
World Total	5,1	6,6	11,7

Principles and propositions

A democratic European energy transition requires putting research at the centre of a plan encompassing several decades (at the least to 2050) and coordinated across Europe with the voluntary collaboration of non-European partners.

The goal is to make the end-to-end energy chain less polluting and less hungry for scarce resources, including RES, energy consumption, transportation, and storage. The energy system as a whole must evolve in this direction as quickly as possible while improving energy access for all and aiming at all the objectives outlined in chapter 3, part 1 here. This also includes the development of research in energy sources and systems for the future, with the long term in mind for present implementation. Far-reaching and coordinated research programmes are necessary for these areas. These programmes must also target concrete short-term results for implementation as well as medium and long-term goals. Adequate means must be provided for three time horizons. And these programmes must fit in an overall single scheme that incorporates all dimensions of the energy system. Finally, they must take into account the unpredictable and also call for democratic validation of the choices. What is needed is integrative planning (defining the energy system as a whole and not a sum of parts) over time, including periodic evaluation and changeable modules as the transition moves forward; only this can turn our definition of the transition into practical realisation.

⁷⁶ IPCC, fifth Assessment Report – Summary for Policymakers, <http://ar5-syr.ipcc.ch/topic_summary.php#node165>.

⁷⁷ Source : UNEP Collaborating Centre for Climate and Sustainable Energy Finance, Global Trends in Renewable Energy Investment 2015. Frankfurt School, <<http://fs-unep-centre.org/publications/global-trends-renewable-energy-investment-2015>>

The transition towards RES requires research in order to reduce, even eliminate, the consumption of rare earth resources and its negative health and ecological consequences. For example, the alternators of wind turbines contain neodymium, a rare earth element that must be extracted and refined, resulting in adverse health and ecological consequences (numerous cancer cases near extraction sites as well as river pollution). The goal of research must be both to develop less polluting technologies for the extraction and refining of neodymium and also to find materials that can replace it.

Because of the importance of transition and its challenges, and especially because of the danger of a sudden acceleration of weather changes with unpredictable consequences for humans (weather disasters, destabilisation of entire regions, hundreds of millions of climate refugees, civil wars, and new forms of fascism), popular mobilisation must be global. Besides its technical and technological aspects, the transition must include a transformation of economic production, consumption patterns, societal organisation, ways of life, and thus a transformation of mentalities, values, and aspirations. The populations of the earth must own the transition. Each person must be convinced that the transition must happen, must support it, participate in it with solidarity and responsibility. In other words, the transition must be the result of a democratic process. In order to achieve this, Europe and its Member States must rethink their research policies, including research beyond technologies and techniques.

First of all, research results related to global warming must be communicated to society by focusing on what is essential, namely the nature and the importance of the risks of a possible acceleration of the process (without forgetting to point out or, worse, without hiding the limits of scientific knowledge); it must also focus on the mobilisation required to limit climate change and its consequences. To achieve this, we need a new way to communicate and interpret scientific results. In particular, it is necessary to stop the quantophobia on which the long-term scenarios presented by the IPCC rely. These fictitious scenarios focus citizens' attention on a cold technical discourse that fluctuates in time and is thus not appropriate to developing true mobilisation. As for the orientations and financing of climate research, they must be directed towards the development of knowledge and no longer be diverted towards the construction of scenarios intended to serve a certain type of political communication.

The transition also requires political-science, economic, and social research. The capacity to project ourselves into the near future (10-20 years) while preparing the more distant future (20-50 years) must be developed. It is a matter of research but is also an issue that cannot be solved by the present

political and economic system because state policies are dominated by international markets and transnational companies and financial groups (banks, pension funds, and the like). It is thus necessary to conduct research on alternative models to end the domination of the market, of transnational companies, and of banks over political decision-making; this is the key condition for effective democracy and the creation of the capacities needed to prepare the future and develop human solidarity. It is also necessary to think of transforming economic outputs, consumption, and of the organisation of our societies and ways of life. It is indispensable to develop research on societal foundations and models based on the heritage of radical Marxist and anarchist thinkers, on the works of anthropologists and historians, as well as on the more recent and ongoing experiences of democratisation and emancipation. Finally, the energy transition will be democratic only if society at large becomes more democratic. Research must be undertaken to analyse the current processes that weaken and endanger democracy in Europe. To reverse the trend, research must contribute to democratic renewal, for example contributing to the development or the improvement of citizen empowerment schemes based, among other things, on the analysis of different formats for discussion and deliberation and suggestions as to how they can become more dynamic or be renewed.

It is also a matter of understanding and providing concrete definitions of what constitutes a democratic energy transition for Europe. What does it include? What does it bring us? What are its consequences? From this perspective, research could result in broader knowledge and understanding of how its findings can be integrated in the various European models of energy transition. It must also present tools and useful data in order to compare different models and make choices. Research in psychology and social psychology can be directed towards the exploration of processes that engage individuals, as well as towards ownership and representation processes.

In order to become fully engaged in these research directions and to be able to effectively face the challenges, the EU and the countries of Europe must

comprehensively revise their research policies. First of all, the decisions on priorities, research topics, and the amount and allocation of financial and human means must be grounded in democratic debates and decision-making; all researchers must be asked to contribute and their specificities must be recognised. Within such a framework, scientific activities must be undertaken by all involved in a responsible way, focusing on collective and individual scientific freedoms without interference from private companies or political actors. However, science must not be an ivory tower, especially since it is illusory to think of ‘scientific people’ as pure intellectual creatures; they are first and foremost human beings, likely to make mistakes and work within their human limitations. Therefore, the very dynamics of technological and scientific research must move in total transparency and visibility, in permanent dialogue with society, and with the due respect to ethical limits. Finally, democratic debates and choices must precede and the constantly accompany the determination of the development (or non-development) of the use of research results along with their actual realisation once the decision has been made.

To conclude, the actual implementation of this democratic research policy, which is necessary to

confront the social and ecological challenges of our time, can only move forward and be fully deployed within the context of a social, economic, and political transformation of Europe; the values of solidarity and of collective and individual responsibility must be liberated so that they replace the neoliberal so-called norms and become the engines of human implication for all, and certainly for all researchers

Science does not tell us what to do. At most, scientific results can serve as alerts that convince us to take action. Science can provide us with a space, A, of things we can do, a space, C, of things that cannot be done, and a more or less broad space, B, of things that could or could not be done. In no case does science tell us what to do; this is part of the human decision-making process (for example in the democratic domain). At best, science, technologies, and techniques allow us to determine a field of virtual possible scenarios, the outputs of which are then ‘released in society and nature’ and then modify ‘reality’ understood as psychology, societies, and environments. The field of the different possible scenarios is only able to modify ‘reality’ when the outputs are applied following a choice (or a non-choice).

Science, technologies and techniques	Define a field of possible scenarios
Societal actors: individuals, communities, organisations	Make choices (according to very variable criteria)
Reality of the physical world: human, social, and ecological	Undergoes modifications (always different from expectations or imagined reality)

Appendix – More concerning what scientists can bring to the energy transition issues

Here we emphasise some research contributions required by our energy transition project.

1. **Understanding what is a socio-ecological and democratic energy system transition**, what it entails, and what consequences it can have. These contributions can take the form of a wide range of knowledge and/or of their integration in a model of an energy system transition.

2. **Situational reviews of the existing energy systems**, their interrelations, and their various involvements in other social⁷⁸ and/or ecological systems. These contributions take the form of a wide range of knowledge and/or of their integration in a global review of the existing energy system and/or its integration in other systems; the different dimensions studied include:

- ▶ an analysis of the global energy system, including its different existing constitutive energy systems, their components, the contexts and interrelations between the different constitutive energy systems, the present and foreseeable circumstances, the actors, the spatial pattern, the mobilised resources, the budget and time line, the involved powers and their relations, etc.;
- ▶ an analysis of the interactions between the existing global energy system and other systems (both social and/or ecological);
- ▶ an analysis of the psycho-social contexts, circumstances, and trajectories: individual and collective representations and acceptances of the issue, values, desires, and needs, and the capacity and willingness to act;

This review is an instrument for developing contributions towards designing a global proposal for an energy system transition, evaluating their possible outcomes, and comparing them.

3. **Concerning means and processes** the research contributions address:

- ▶ **means**: solutions and mitigation and/or remediation processes and procedures; adaptation processes and procedures; delaying procedures for gaining time for developing relevant measures; resources mobilised, etc.;
- ▶ and **general processes**: monitoring, adjustment, and governance processes; regulation systems, actors and what they do when and where.

The contributions can then be variously integrated into global propositions designed to **launch, sustain, monitor, and adjust** one given energy system transition.

4. **Prediction systems** of the possible outcomes of any proposed- or ongoing- process dealing with chan-

ging the energy system. These prediction systems deal with the potential consequences of the energy system changes:

- ▶ for the energy system;
- ▶ but also for the associated socio-technical, psycho-social, and ecological issues.

5. **Analysis systems of the proposals in a contextual fashion**, which compare and weigh the different proposals in order to help choosing which proposal to adopt.

6. **Empowerment and facilitating procedures** that contribute to the transition

For all activities, data from the following disciplines should be considered, as much as possible, by everyone and at all times:

- ▶ **Semiology** to help in discussing the issue of the energy transition because data and discourse analysis reveals that:
 - many words used convey many different ideas according to the person, the time, the context: they are both polysemic and labile, with blurred and shifting boundaries;
 - there is often confusion between means and goals in ways of talking and during various exchanges, and values are unexpressed;
 - there is often confusion between knowledge and beliefs in writings and during various exchanges;
- ▶ **Psychology** to help understand how people may become engaged in this issue since:
 - understanding something in itself is not enough to perceive what it at stake and to really perceive all its dimensions and implications;
 - intellectual understanding is not enough in 'feeling' for something: 'gut feeling' is one of the more potent motivations for action (whether for better or for worse, of course);
 - 'feeling for' is not enough to become mobilised to act: to act you must also have the capacity and the possibility to do so; these can be supported and one can develop them.
- ▶ **Educational sciences** (in the broad sense):
 - to help design effective and beneficial 'nudges' to help people deal with this issue (either contributing to the conceiving of the energy transition or to the transition itself) in a mutual and self-empowerment effort;
 - which is also empowerment to facilitate living in and with the changes that each and everyone will experience.

⁷⁸ Social is here used in its wider meaning, that is, including the economic, financial, and political dimensions.

The Geopolitics of Energy

- ▶ *This chapter contains two sections, both dedicated to issues and aspects of the geopolitics of energy and their current evolution. In the first section, DIMITRI ZURSTRASSEN explores the geopolitical implications of the **relationships between supplier and user states**. He focuses on natural gas, a crucial source of energy for Europe, and discusses its impact in the overall context of the **evolution of the energy mix** and its consequences on alliances and policies. He argues that **2015 was a turning point** marked by the launch of the **European Energy Strategy** and the beginning of a new era. This effort on the part of the EU to diversify its sources away from OPEC and Russia saw the emergence of new associations and economic partnerships typified by the development of the Southern Corridor Project and Russia's own response, the South Stream.*
- ▶ *In the second section, JOSEF BAUM looks at the evolving **balance of forces between fossil energy and renewable sources** in Europe and on the impact and consequences of the 'Energy Union' concept. He argues for the need to develop **truly global solutions**, involving all states and popular movements and also for the necessity to define and popularise what he calls the 'missing link' of the energy transition, namely the acknowledgement on a global scale of **equal rights to an unpolluted atmosphere for all human beings**. His conclusion is that the enforcement of **class views instead of national paradigms** would broaden the support for new solutions and promote projects not only for mitigating climate change but also for new definitions of economic development and the protection of the environment.*

Energy Issues and the Balance of Power between the European Union and its Neighbours⁷⁹

DIMITRI ZURSTRASSEN

Introduction

The limits of the world's available energy is a new factor calling for public intervention. The nation-states are increasingly concerned with problems of raw-materials and energy supply and are deploying diplomacy to establish special relationships with energy suppliers. Nowadays, no one doubts that energy issues have an impact on geopolitics. Indeed, energy represents an object of power rivalry in territories for control of distribution networks, markets, or resources. It has therefore become a major strategic issue with many security implications for our countries, as is seen in the increased number of wars involving energy since the fall of the Berlin Wall, for example the two Iraq wars, the wars in Afghanistan or now the Ukrainian conflict.

The objective of this section is to show the influence of energy issues and the pressure they exert on the power balance between European countries and between the EU and its neighbours, and especially their influence on recent European policy. For reasons of space, our analysis will focus on natural gas and particularly on the struggle between the European Union and Russia over the supply of gas. Natural gas is an essential part of the European Union's energy mix. Used principally for the production of electricity, for heating, and as a raw material in industry and as fuel in transportation, it represents one fourth of the EU's energy consumption, a significant portion that can increase in the years to come because of decisions made in Member States on energy transition. Natural gas is therefore a strategic issue for the European Union.

The first part of our survey will present a panorama of the current geopolitical issues involving energy in Europe and provide data on energy dependence in Europe. We will then show how the European Union has recently reacted to those geopolitical developments and the problem of energy dependence in order to demonstrate how the energy issues have implications for the configuration of international alliances and policies.

The current geopolitical issues involving energy in Europe

The issue of energy independence in Europe has taken on importance in recent years. The instability of the situation of the exporting countries and their

capacity to play with the primary products prices have helped make this a key issue for importing countries. Generally, despite its importance, the problem of secure energy supply has been neglected by EU policy for many years and has only remained a concern for the Member States. However, with the recent appearance of various energy crises and oil shocks, which showed how vulnerable importers are, the members of the Community have privileged an intergovernmental approach in the framework of international organisations like the International Energy Agency (IEA) or have built contacts directly with the supplier countries to solve problems of energy supply. This approach is reflected in the European treaties which stipulate that European Union legislation cannot impede a Member State from choosing among different sources of energy and determining the general structure of its energy supply. This has led to diversification of energy mixes and sources of energy supply in the Member States of the European Union as the following table shows:

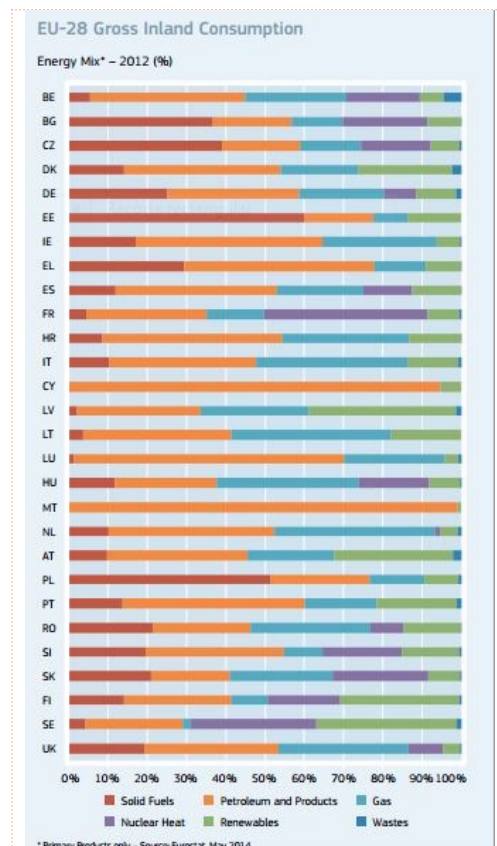


Figure 1: Energy mixes in the UE-28 countries in 2012 (in %)

⁷⁹ This contribution was written in the summer of 2015.

Despite the existence of hydrocarbon resources on European territory, the internal production of natural gas in the European Union represents only 30 per cent of its consumption,⁸⁰ obliging the EU to remain largely dependent on foreign resources and in the case of gas particularly on Russian reserves. These imports transit mainly through Ukrainian territory.

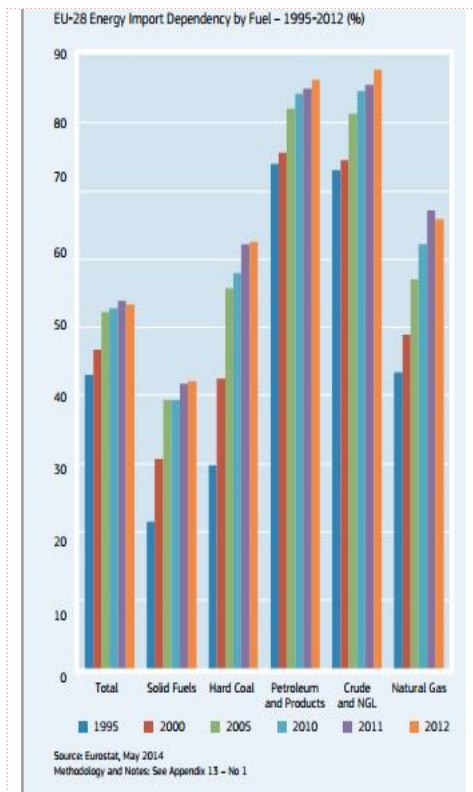


Figure 2: EU-28 Energy Import Dependency by Fuel - 1995-2012 (%)

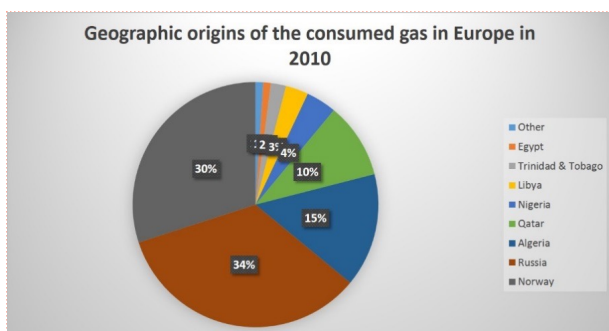


Figure 3: Geographic origins of consumed gas in Europe in 2010 (in %) - Source: Own figures based on data from the BP Statistical Review of Energy 2011

This situation was finally seen as too dangerous considering increasing tensions throughout the world,

such as the wars in Central Asia and in the Middle East, the contention between Azerbaijan and Armenia in the Nagorno-Karabakh territory, the military interventions in Iraq, the Israeli Palestinian conflict, the military coup in Egypt, or the effect of the re-election of Erdoğan in Turkey. In Europe, all attention was directed to the intensifying geopolitical crisis in the Caucasus, first with the crisis in Georgia in 2008 and then the conflict in Ukraine, since 70 per cent of Russian natural gas transits through the Ukraine. In these conflicts, domination and power strategies led to alliances and the use of energy as a weapon, as we have recently seen in Iraq, Libya, and now in Ukraine. This instability affects the European Union's energy independence since its suppliers have the power to cut off supply of their resources at any time, as the stance taken by Russia's nationalised company Gazprom since 2006, after several conflicts with the Ukrainian company Naftogaz, shows.

The larger context includes the arrival of new global economic powers that consume a great deal of energy in the world market. This leads to a rise in the global growth of energy demand, which could increase by ±27 % in 2030, with China and India and their 3 billion people consuming more than one third of the world resources.⁸¹

Finally, there is the issue of climate change, forcing countries to find alternatives to the consumption of fossil fuels, which contributes to tensions in the energy market.

The European Union's political answer

The growing external dependence on energy, the rise of energy prices, and the emergence of new conflicts in the beginning of the 21st century have highlighted the need for the European Union to develop a common European energy policy. As a consequence, since the dissolution of the Soviet Union in 1991, the European Union has resolved to implement an energy policy whose objective is to gradually move away from dependence on its suppliers, principally the Organization of the Petroleum Exporting Countries (OPEC) and Russia. The result in February 2015 was the launch of the European Energy Strategy, 'the most ambitious European energy project since the Coal and Steel Community', according to Jean-Claude Juncker, President of the European Commission.⁸²

80 Samuele Furfari, 'Le gaz naturel, nouvel élément structurant du Mare Nostrum', Confluences Méditerranée 91 (fall 2014), p. 71.

81 Noémie Rebière, 'De la Caspienne à la Turquie : les enjeux du corridor gazier sud-européen', Hérodote 155 (2014), p. 81.

82 <http://europa.eu/rapid/press-release_IP-15-4497_en.htm>.

This project, which has a budget of ±1,000 billion euros for the next five years and ±2000 billion euros until 2025,⁸³ aims to achieve a series of clear objectives. One of them is to diversify the external supply routes, the suppliers, and the corresponding infrastructures. To do so, the European Commission plans to reconfigure its alliances to partially reduce the EU's dependence on Russian gas. A proposed alternative is to expand the EU's influence in the Middle East and Central Asia, which together own more than 11% of the world's demonstrated gas reserves and export less than 5% of it: first by constituting regional associations, economic partnerships, or technical cooperations for the financing of infrastructures for the transport of energy goods and of people. Examples of these types of collaboration can be seen in the recent creation of the European Neighbourhood Policy, the Eastern Partnership, the Mediterranean Dialogue, or the Istanbul Cooperation Initiative; and then by the creation of new supply routes to gain independence from its principal suppliers.

A new pipeline project: The Southern Gas Corridor

One of these projects is the Southern Gas Corridor, a pipeline that would link Azerbaijan's natural gas reserves in the Caspian Sea to the Adriatic Sea via Georgia, Turkey, Greece and Albania. This new supply route, which is due to be opened in 2019-2020, could bring about 25 billion cubic metres of gas per year to the European market and be opened to other countries that want to be part of it in the long term, like Iran, Turkmenistan, or Iraq. In the Southern Gas Corridor project, we can see the presence of numerous gas pipelines. First, the South Caucasus Pipeline Expansion (SCPX) which would link the offshore fields of Shah Deniz in Azerbaijan to the Turkish-Georgian frontier. Then, the Trans-Anatolian Gas Pipeline (TANAP), which would connect the Georgian-Turkish frontier to the Greek-Turkish border. And, finally, there is the Trans-Adriatic Pipeline (TAP), which would join the Greek-Turkish border to the south of Italy via Albania.



Figure 4: Map of the Southern Corridor project

The key role of transit countries has to be emphasised in this project. Their participation in the Southern Corridor project is part of a long-term policy of the European Union to strengthen its cooperation with the countries of Central Asia.

The first of these, Turkey, is a key actor in allowing the international markets to benefit from the Caspian Sea resources. The country benefits from its position at the crossroads of Central Asia, the Middle East, and Europe, between the producing countries in the east and the consuming countries in the west. It also has taken advantage of its relative political stability and security in past years, which permitted the

country to transit energy safely to the European Union. However, the recent end of the truce between the government and the PKK could change this situation and undermine the stability in the region in the middle and long term. Moreover, Turkey is an important importer and consumer of energy. For the last ten years, the country has experienced a substantial growth of its energy demand, about 7-8 per cent per year, due to the paucity of resources in its own territory.⁸⁴ For these reasons, it remains a key actor in the diversification of the European Union's supply routes in connection with the Turkish strategy of strengthening links with the European Union for its future EU accession.

83 <http://ec.europa.eu/priorities/energy-union/docs/energyunion_en.pdf>.

84 Jana Jabbour and Noémie Rebière, 'La Turquie au cœur des enjeux géopolitiques et énergétiques régionaux' Confluences Méditerranée 91 (fall 2014), pp. 37ff.

Second, there is Azerbaijan, one of the most important shareholders of the Southern Gas Corridor thanks to the investments of its national company SOCAR in the Turkish, Greek, and Georgian markets. It owns 58 per cent of the TANAP shares; it is one of the principal shareholders of the Sha Deniz field located in the Caspian Sea; and since June 2013 it owns the national Greek company DESFA, which controls the distribution and production networks on Greek territory. This gives Azerbaijan major decision-making power for future supplies to the European Union. Furthermore, the Southern Corridor project allows Azerbaijan to pursue its strategy of liberation from domination by Russia of its transport and resource networks thanks to the help of western companies like BP in modernising its infrastructures.

Other countries do not participate in the Southern Gas Corridor but are interested in its development and could participate in the future: the Balkan countries for example, where energy supply is important in guaranteeing good living conditions for citizens due to the increase of energy consumption since the breakup of Yugoslavia. In this region, we can observe Russia's dominating presence as the principal gas supplier of the Balkan countries, which influences their gas policies. However, it should be noted that every Balkan region has a different relationship with Russia. Some countries seek to liberate themselves from Russian influence and play a role in international affairs, while others wish to respect their historic ties with Russia. The relationship of these countries with Russia will be a key factor for the European Union when it has to select the transit countries for the potential extension of the pipeline.

Another country which could participate in the Southern Gas Corridor project in the future is Turkmenistan. Indeed, as the sixth world gas producer with 9.4 per cent of the world's known gas reserves, the country could respond in the long term to the growing demand for gas from Europe and Turkey. Connection to Turkmenistan's reserves is on the list of the projects of common interest (PCIs) defined by the European Commission in 2013, and the country is regularly visited by European Commission officials to strengthen the EU's links to it. However, Turkmenistan's contracts with China commit significant quantities of its gas and limit the country's ability to

export additional gas to Europe without major investments in the development of new gas fields.

A counterproject to the Southern Corridor: The South Stream

In reaction to the development of the Southern Gas Corridor project, Russia decided to build a new pipeline, the South Stream. This had to pass through Turkish territorial waters in the Black Sea, enter Europe by way of Bulgaria, and transit through Serbia, Hungary, and Slovenia to the north of Italy to bring about 63 million m³ per year to Europe. Russia signed cooperative agreements with Romania, Bosnia and Herzegovina, Macedonia, Serbia, Montenegro and Croatia for future extensions of the South Stream. The construction of the pipeline was part of a Russian strategy to bypass Ukraine. The control of Ukraine is seen by Moscow as important for the establishment of the Eurasian Union, a project to strengthen Russian influence on the international scene. Bypassing Ukraine would have made it possible to reduce or end EU support for Ukraine.

In this project, we have to highlight the role of Gazprom, which decided from the year 2006 to pursue an acquisition strategy. In 2006, the company bought Jugorosgas, a public operator owning exclusive rights to develop a gas network in the south of Serbia at the junction between the Bulgarian and Serbian networks. In 2009, following the entrance of Serbia in the project on 25 January 2008, Gazprom took control of the Serbian public company NIS which has the monopoly for gas and oil exploitation in the country.

Nevertheless, the project was finally abandoned on 1 December 2014 because of 'European objections',⁸⁵ according to Russian authorities, and, according to Alexey Miller, Gazprom Management Committee Chairman, the fact that 'Bulgaria did not give a construction permit to build South Stream neither on-shore, nor in its territorial waters and economic zone'.⁸⁶ The abandonment of the project ended a period of legal conflict between the EU and Russia initiated in December 2013 when the European Commission announced that all contracts signed for the construction of South Stream violated European competition law, a legal weapon used to slow the construction of the pipeline.

85 <<http://www.euractiv.com/sections/global-europe/russia-says-south-stream-project-over-310491>>.

86 <<http://www.euractiv.com/sections/energy/russia-confirms-decision-abandon-south-stream-final-310712>>.

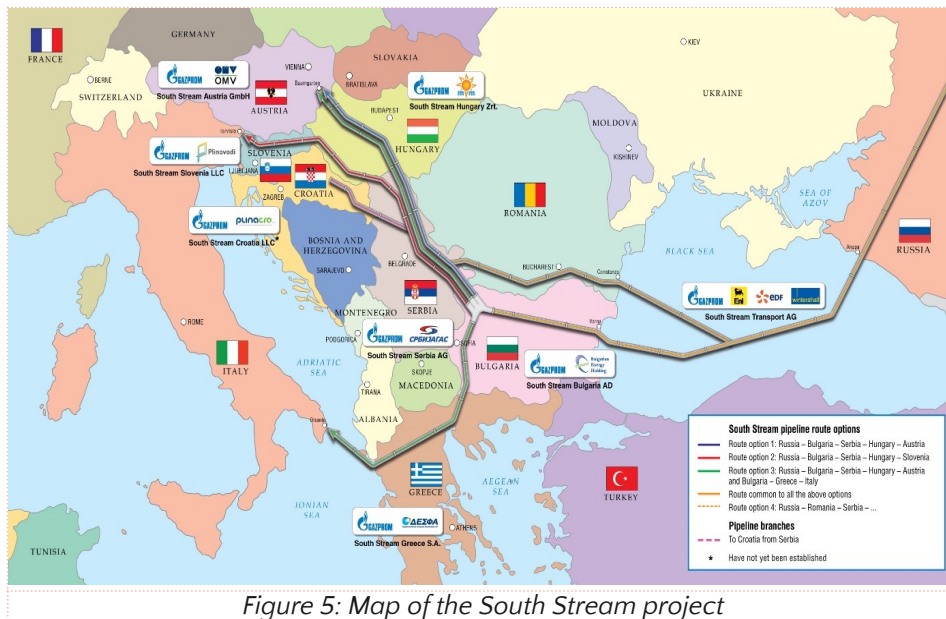


Figure 5: Map of the South Stream project

To substitute this aborted project, Russia decided to launch Turkish Stream in December 2014, an extension of the Blue Stream which links Russia and Turkey via the Black Sea and which would bring 63 billion m³ of gas from Russia to the Greek-Turkish border. This pipeline would allow Russian gas to bypass transit through EU Member States by installing a gas hub at the Greek-Turkish border that would not be subject to European laws.

The geopolitical consequences of the South Stream/Turkish Stream project: the reconfiguration of strategic alliances

The launching of those new pipeline projects has numerous consequences for the geopolitics in Europe.

To begin with, it strengthens the relationship between Russia and Turkey. Indeed, the Turkish Stream would permit supply to high-consumption regions like Istanbul and Eastern Thrace, which were not supplied by the Blue Stream. Moreover, Russia made a commitment to apply discounts on Russian gas for Turkey and to increase the capacity of the pipeline to meet the country's demand. This interferes with The European Union's plan for closer relations with Turkey, candidate for EU membership and already a NATO member.

Secondly, it leads to cracks in the solidarity between EU Member States. The first sign of this came with

the victory of SYRIZA in the Greek elections of 25 January 2015. Indeed, during his first official visit to Moscow at the beginning of the month of April, Alexis Tsipras declared that Greece wants to play a big role in the Turkish Stream pipeline project to boost investments and jobs in Greece,⁸⁷ as Greece's participation would allow the country to become one of the main distribution centres in the continent.

The figures confirm the project's benefits for Greece: it could gain hundreds of millions of euros from transit taxes a year, a reduction of gas prices for the country, which is one of the main importers of Russian gas (representing 60 per cent of its gas imports) and whose gas prices are among the highest in Europe.

This move was quickly followed by other Member States like Hungary or third countries like Macedonia and Serbia whose foreign ministers signed a declaration of intent regarding the Turkish Stream on 5 April 2015 in Budapest. These countries were also opposed to sharpening the economic sanctions against Russia, due especially to their fear of being deprived of additional gas resources.⁸⁸

These events affected the European Commission's recent Energy Union Package⁸⁹ presented a month earlier and led to a change in the EU's strategy vis-à-vis Russia. Russia could now use the Southern Corridor pipelines if the Turkish Stream is established, and on 2 April Ukraine had to accept the Russian

87 <<http://www.euractiv.com/section/global-europe/news/tsipras-turkish-stream-will-have-another-name-on-greek-territory/>>.

88 Jana Jabbour and Noémie Rebière, 'La Turquie au cœur des enjeux géopolitiques et énergétiques régionaux', p. 39.

89 <<https://ec.europa.eu/energy/en/publications/energy-union-package>>.

agreement proposal to extend the agreement for the supply of gas from Russia for three more months,⁹⁰ considering that more than half of Europe's gas supply transits through Ukrainian territory.

Conclusion

By presenting the general issues of the geopolitics of gas in Europe we wanted to demonstrate that energy is a geopolitical issue that has implications for international alliances and policies. As we have seen, the tensions in supplier countries, climate change, and the rise of energy consumption in emerging countries have impact on the relationships between the European Union and its neighbours around the challenges of supply zones and routes. In this struggle to achieve energy security in Europe, the reconfiguration of geopolitics plays a major role. Indeed, by trying to eliminate its dependency on Russian gas, the European Union is reconfiguring its alliances with the objective of participating in the race for world domination. However, as we have seen, many Member States do not share the strategic goal of isolating Russia. This situation represents a big threat for the European Union, which is struggling to reach its objectives: more solidarity between the Member States and more energy independence.

90 <<http://www.euractiv.com/section/europe-s-east/news/ukraine-and-russia-sign-3-month-gas-agreement/>>.

New Geopolitical Developments, Socio-Ecological Transformation in Europe and the Missing Link for the Climate Solution

JOSEF BAUM

Beyond the geopolitical aspects of EU energy policy in relation to the EU's neighbourhood (see the first part of this chapter) new geopolitical factors in a broader context should also be considered for energy policy. In the framework of a socio-ecological transformation in Europe adequate for an effective climate change policy the following factors, among others, are relevant:

- ▶ The emerging of **BRICS** as the take-off of the global south with huge resource and energy implications;
- ▶ the '**new silk road**' shaping future Eurasia as a foreseeable historically unique global investment programme triggering development but also influencing the whole resource and energy context;
- ▶ well-known dramatic changes in the Arab world, which – aside from the large migration flows – increase the **volatility** and uncertainty of energy markets;
- ▶ and sanctions policy towards Russia and tensions around Ukraine, which also increase volatility and uncertainty and limits the possibilities of cooperation of Europe.

As further pertinent aspects of energy (markets) we see:

- ▶ the tremendous fall in the **costs of solar energy** (PV);
- ▶ looming '**peak oil**' and the peak of most resources;
- ▶ the current evolution of **lower oil prices** and the specific strategies that lay behind this.

However, there is great uncertainty attached to forecasts for fossil energy costs. At any rate, the prob-

able strategy behind the reduction of oil prices by the Saudis is to weaken the its 'unconventional' fossil competitors – with the welcome side effect of dealing a blow to Russia – is rational not for the very short term but for a period of some years. Still, unpredictable developments in many oil countries, from Iraq, Libya, Nigeria, and Venezuela to Iran, Saudi-Arabia, and others (including unintended implications of such policies) are possible. The volatility of this sector has increased. And in the longer run the tendency of oil and gas prices to increase is foreseeable generally because of peak oil and especially because of the continuing high level of energy consumption in the global north and the emerging development in the global south.

In contrast to the increasing cost of production and instability of fossil energy, with fundamental consequences for politics and global relations, the situation of renewables is quite different: the costs are predictably continuing to drop significantly.

Of course, the drop in prices of fossil energy currently has negative effects for a transformation towards an energy system based on renewables but, due to the recent breakthrough in costs, now in a competitive range, of renewables, **one should not overestimate the negative effects of lower-priced fossil energy**. And the lower energy prices do also generally limit investments in fossil fuels with very negative environmental effects (deep sea drilling, arctic, tar sands, fracking...). Moreover, the sun only partly competes with oil; oil is mainly used to run cars; but PV is mainly used to generate electricity.

With wind energy, we see a rapid development. But the most important development is that **photovoltaics is achieving grid parity!** (Grid parity indicates the point at which the cost of photovoltaic electricity is equal to or cheaper than the price of grid power; grid

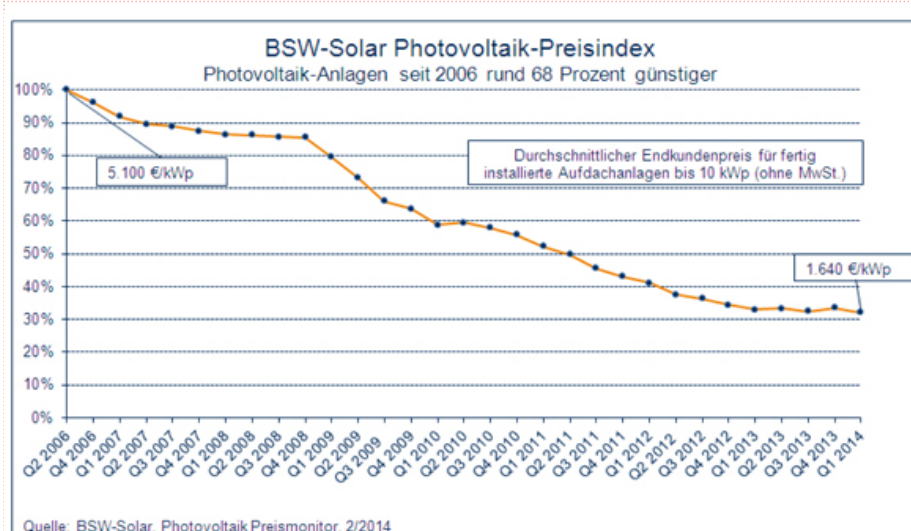


Figure 1: PV module price 2006–2014: a 70 % reduction in cost
Source: BWS-Solar Photovoltaik Preismonitor 2/2014

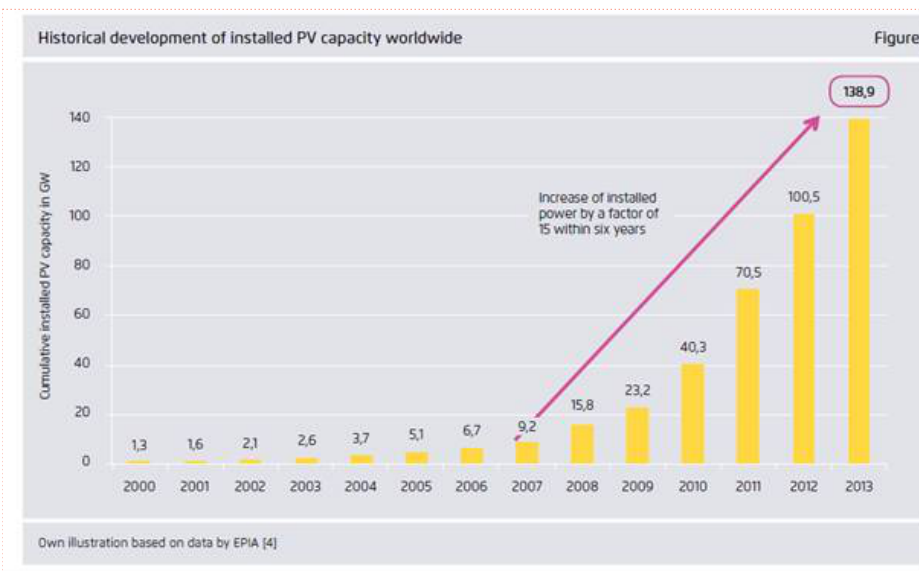


Figure 2 – Source: Fraunhofer Institute for Solar Energy Systems (ISE),
Current and Future Cost of Photovoltaics, p. 19

» 'Solar photovoltaics is already today a low-cost renewable energy technology.

Cost of power from large scale photovoltaic installations in Germany fell from over 40 ct/kWh in 2005 to 9 ct/kWh in 2014. Even lower prices have been reported in sunnier regions of the world, since a major share of cost components is traded on global markets.

Solar power will soon be the cheapest form of electricity in many regions of the world. Even in conservative scenarios and assuming no major technological breakthroughs, an end to cost reduction is not in sight. Depending on annual sunshine, power cost of 4–6 ct/kWh are expected by 2025, reaching 2–4 ct/kWh by 2050 (conservative estimate).⁹²

⁹¹ Translation of Figure 1: German Solar Industry Association (BSW) photovoltaic price index – Photovoltaic investments since 2006 are ca. 68 cheaper – €5,100/KWp (peak kilowatt) – average retail price for fully installed roof-mounted systems up to 10 KWp (without value added tax) – €1,640/KWp

⁹² Fraunhofer Institute for Solar Energy Systems, *Current and Future Cost of Photovoltaics: Long-Term Scenarios for Market Development, System Prices and LCOE of Utility-Scale PV Systems* (February 2015), <<http://www.agora-energiewende.de/en/topics/-agothem-/Produkt/produkt/88/Current+and+Future+Cost+of+Photovoltaics/>>, p. 1.

For decades we had high hopes of a reduction in the costs of renewable energy, but now we are truly seeing a breakthrough in costs: Photovoltaics (PV) now is now about 25 % of what it cost ten years ago (not minus 25 %, but minus 75 %!) – and this **without fundamental new technologies but merely by realising economics of scale and scope and through the learning effect**. The significant drop of prices from 2008 to 2010 was mainly a reaction to the comprehensive Chinese anti-crisis programme.

The evolution of PV costs triggered a genuine take-off in PV implementation – see Figure 2 above.

The productive forces have, at all events, laid the foundation of new relations of productions.

But this is not the whole story; it is a breakthrough in production, but there are still open issues such as grid integration, and storage. **Investments in the grid have long been too small due to neoliberal privatisation, disrespect of the commons, and profit orientation.**

At present there are also signs of cost revolutions in the storage of (solar) energy. It will in any case still be hard to transform whole energy systems. What is clear is that there has to be a major comprehensive improvement and optimisation from a life-cycle

point of view in the production of renewable energy in relation to all necessary resources. Thus:

» *‘financial and regulatory environments will be key to reducing costs or have a better energy efficiency in the future. Cost of hardware sourced from global markets will decrease irrespective of local conditions. However, inadequate regulatory regimes may increase cost of power by up to 50 percent through higher cost of finance. This may even overcompensate the effect of better local solar resources. Most scenarios fundamentally underestimate the role of solar power in future energy systems. Based on outdated cost estimates, most scenarios modelling future domestic, regional or global power systems foresee only a small contribution of solar power. The results of our analysis indicate that a fundamental review of cost-optimal power system pathways is necessary.’⁹³*

We stand now in the **first stages of the end of fossil fuel**: Solar (PV) makes up less than 1 per cent of electricity today but will be the biggest single source by 2050, according to the International Energy Agency, which is not usually a champion of renewables:

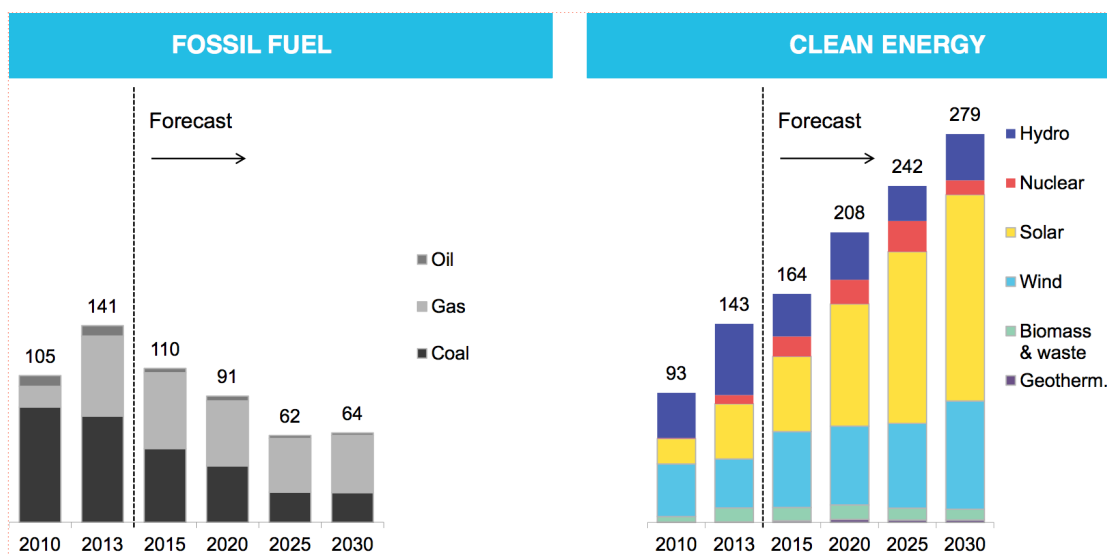


Figure 3: Power generation capacity additions – Source: Bloomberg New Energy Finance, 2015

Whether or not this prognosis can ultimately be undermined by vested (fossil-fuel) interests, global investment in clean energy is now increasing rapidly. Its main drivers are solar/PV and also wind. Hydro potential is limited when we consider biodiversity and a total socio-ecological view. Nuclear energy in

new plants in Europe is hardly economically competitive – all the more so when the costs of storing nuclear waste are included.

This development is even more phenomenal when we acknowledge that **fossil-fuel subsidies outpace(d) renewable-energy subsidies by a factor of**

93 Fraunhofer Institute, Current and Future Cost of Photovoltaics, p.1.

6:1: G-20 nations spent \$160 billion supporting the production – led by Saudi Arabia and Iran – and consumption of fossil fuels 2010. The OECD estimated its member countries gave oil, coal, and natural gas producers between \$45 billion and \$75 billion a year in support for production from 2005 through 2010. State spending to cut retail prices of gasoline, coal, and natural gas rose 36 percent to \$409 billion as

global energy costs increased. Aid for biofuels, wind power, and solar energy rose 10 percent to \$66 billion. While governments argue that fossil fuel subsidies are designed to help the poorest members of society, they generally fail to meet that goal, according to the International Energy Agency. Just 8 percent of aid reached the poorest 20 percent of each country's population.⁹⁴

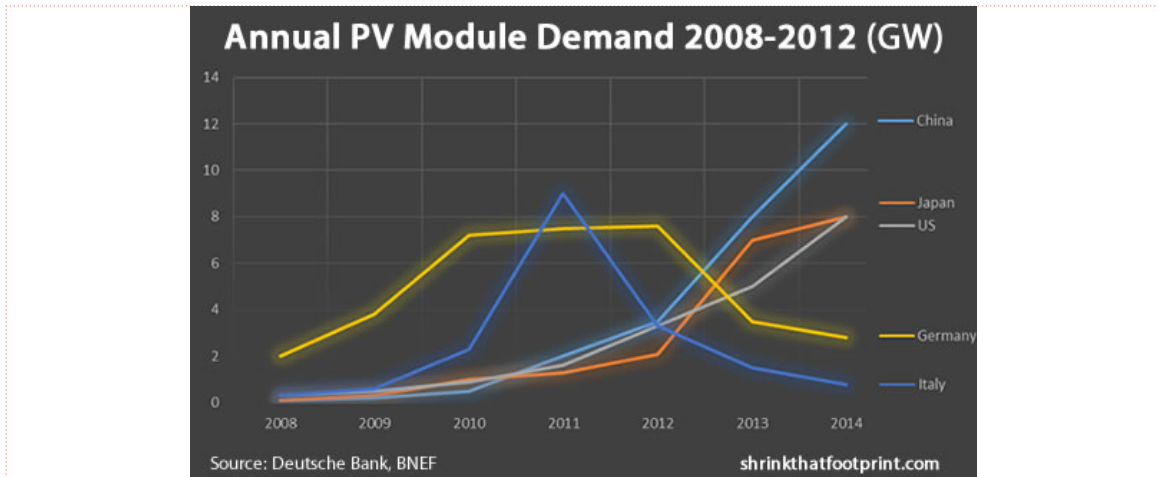


Figure 4: Due to austerity and decreasing socio-ecological commitment within the EU, Europe no longer leads in the implementation of renewables – Source: Deutsche Bank, BNEF

Europe's global share in renewable energy is dramatically shrinking

Western Europe's share in global renewable energy has been falling drastically in the last five years. The global distribution of additional capacity in 'clean

energy' (however it is defined) has dramatically changed: While in 2011 Western Europe represented two-thirds of the world's 'clean energy' in terms of additional capacity, its share is now only about 15%. At the same time, the USA, Japan, and China are advancing. And the forecast calls for an increase in

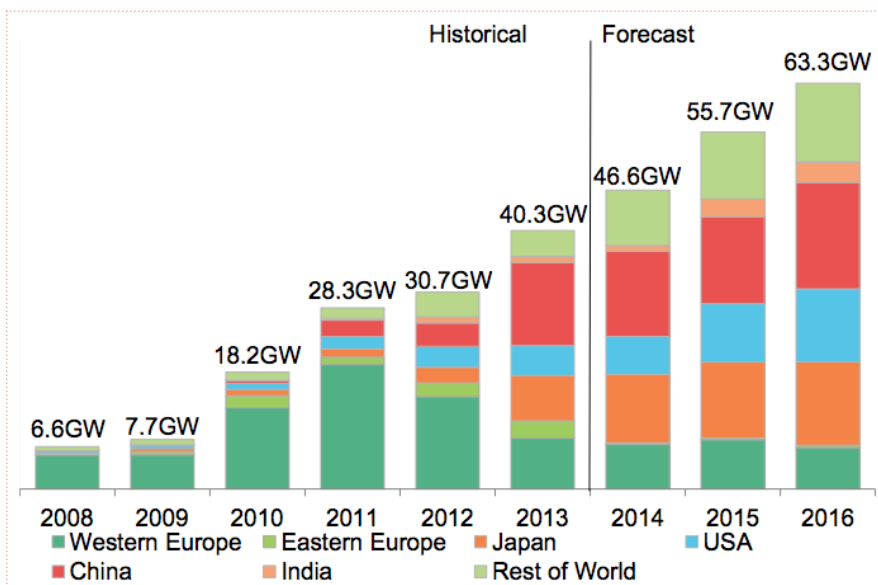


Figure 5 – Source: Bloomberg New Energy Finance

94 <www.bloomberg.com/news/articles/2011-11-09/fossil-fuels-got-more-aid-than-clean-energy-ia>.

This is, moreover, not the whole story. The transformation of fossil mobility will still be a complicated issue because of the strong interests of the capital invested in fossil mobility. This requires no less than the conversion and reconstruction of the largest industries and those oligopolies with the greatest global weight.

Energy is a central factor for political economy and political ecology. Energy is connected to climate change via the CO₂ emissions of fossil energy. Ever since the industrial revolution energy has been decisive for the productivity of labour. **Energy** issues can thus be seen as **pivotal**: for example, food prices are highly correlated to energy prices, because a great deal of fossil fuel is embodied in food.

'Energy union' proposals for the EU's energy policy are oriented to '**markets**', which are not markets as Adam understood them, but are in reality **distorted and dominated by oligopolies** and their power policy, which only rolls forward the fossil lock-in. Alternatives focus on renewable energy, energy efficiency, cutting all fossil (and nuclear) subsidies, energy democracy and democratic control, and improved cooperation with neighbouring regions aimed at changing the energy basis.

Nicholas **Stern** offers a very realistic analysis of the consequences of BAU (business as usual) in climate change scenarios and a good argument for massive and quick action. He also openly asserts that climate change is the 'biggest market failure' in history. But, on the other hand, he has created a **new strong narrative of capitalism**: it is only capitalism – he refers to Schumpeterian theories – that has the creative and innovative potential to confront the unprecedented challenges. To which we could respond that capitalism, despite its evidently great flexibility, has quite simply caused the mess. Why should the perpetrator and antidote be the same? What about the **rebound effect** (more energy efficiency but also more demand for energy) implicit in capital accumulation? What about the lock-in in fossil technologies because strong oligopolies can prevent devaluation of capital invested in these technologies? What about the domination of **short-term** rents and profits (reinforced by the financial sector)? And what about the **blindness to the big picture**? There is no, or very little, integration of social and environmental costs in prices.

The lobbies of big European industrial corporations are disseminating the fable that '**unconventional fossil resources**, hardly regulated in the EU, are benefitting **US capital** and that the EU should con-

sequently further relax climate and energy regulation to restore competitiveness. The truth is quite different: the 'unconventional' fossil resources will, at least in the medium term, impede the US from escaping **fossil lock-in**; it will impede higher energy efficiency and innovation generally; and therefore it will also generally not promote the USA within the 'competitiveness' discourse. Higher energy prices in the EU should/will be incentives for EU-industry to invest in energy efficiency, so as to innovate, adopt new technology and reduce energy bills not by reducing energy prices but by reducing the quantities of energy used through greater energy efficiency.

As to **Russia**, it is suffering from a '**curse of resources**': Russia's economy is currently not only based on the enormous richness of its resources, but because of this and the domination by its oligarchs in this field, Russia is also stuck in fossil resources and technologies with low incentives for fundamental innovation generally and specifically for renewable energy. Perhaps the embargo also represents a real opportunity for diversification of Russia's economic foundations. Despite current tensions between Russia and the EU, there still a great deal of mutual dependence, and so for a long period, in the field of fossil energy. As a consequence, relations between Russia and China have become more cooperative than ever before in the last fifty years, and due to the complementarity of their economic structures this cooperation has great potential. Be that as it may, the policy of confrontation should be replaced by energy cooperation, in which there should be gradual transformation to renewables.

The Chinese initiative for a '**New Silk Road**' or '**New Economic Belt**' emerging from the logic of capital accumulation in China will probably become **the biggest (global) investment programme in history** and will reshape Eurasia. The buzzword is 'connectivity', and new infrastructure is at the centre: railways, highways, ports, air traffic, power grid, pipelines, and so forth. The decisions taken on the AIIB (Asian Infrastructure Investment Bank), created by the Chinese, without the USA but with European countries, represent processes occurring in a new context. The concrete realisation of transport and energy systems will have important implications for resources and climate policy.

The **Paris Conference** in December 2015 cannot be overestimated in its significance for humanity. However, obviously, the **dominant forces do not want a binding treaty** like KYOTO. Especially, corporate capture and the lack of climate-justice principles prohibit binding regulations and enforcement. The

agreement will thus unfortunately represent the (insufficient) sum of voluntary goals without which would be required for an efficient mitigation policy. This is a setback compared to Rio 1992 and Rio 2012, where the principle of 'common but differentiated responsibility' (CBDR) was acknowledged.

There have been signs that such regression could be averted through pressure exerted by popular movements. Encouraging signs are the manifestation of 500,000 people in New York in September 2014, the biggest climate demonstration up to now; the recent papal encyclical on climate change; and many encouraging concrete regional instances of low carbon use or even zero CO₂ developments.

It is well-known that women cause less emissions than men, for example in transportation. Generally, **per capita emissions are socially differentiated**.⁹⁵ We see a clear empirical correlation between emissions and stratification **along income, strata, class, and gender lines**: there are differentiated emissions per capita differently affected impacts of climate change. There follow some examples of differentiated emissions per capita within countries:

Systematic statistics for households in Austria reveal wide differences in the use of cars by different income groups : 40 km are travelled per household on a working day in the second income quartile, which is twice the corresponding kilometres (20) of the first income quartile; the third quartile travels some 53 km; and in the upper quartile we see 80 km, which is four times the kilometres of the first quartile.⁹⁶ If we assume proportionate emissions for the daily car trip, understanding that traffic emissions are the most dynamic of climate relevant gases, we see contributions to emissions that are very different according to income.

Social class differentiation in transportation consumption has also been studied in historical context. For the year 1912 the transportation budget for Swiss regions was analysed according to different incomes. The share of the transportation budget was approximately similar between all income classes: in every income class about 2% (1.8% in the smallest

income classes) of income was spent on transportation. As a result of the great disparity in income – the minimum of the lowest income class being 1,000 Swiss francs a year, with the highest class earning 10,000 to 20,000 a year – the corresponding relative share of what was spent on transportation in the different income classes involved widely differing absolute quantities (18 Swiss francs in the lowest income class, 400 in the highest income class).⁹⁷

And we can see a correspondingly absolutely asymmetric contribution to climate change on the global level:

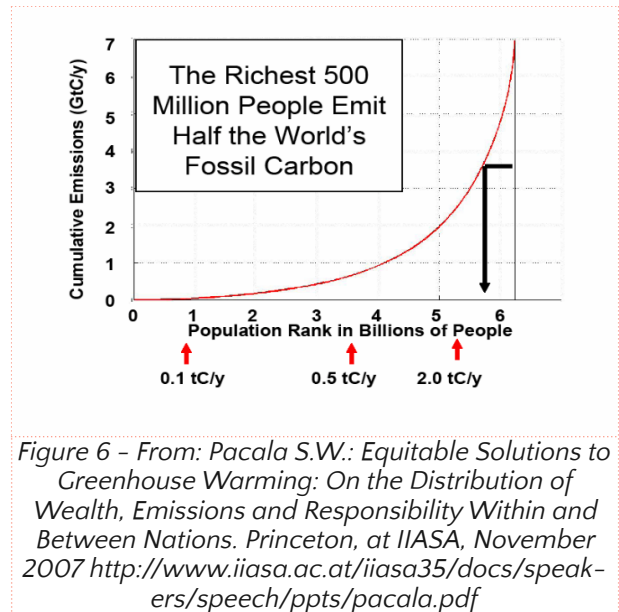


Figure 6 – From: Pacala S.W.: *Equitable Solutions to Greenhouse Warming: On the Distribution of Wealth, Emissions and Responsibility Within and Between Nations*. Princeton, at IIASA, November 2007 <http://www.iiasa.ac.at/iiasa35/docs/speakers/speech/ppts/pacala.pdf>

The extent of worldwide inequality once again varies dramatically when nations of different income levels are compared: an average **US citizens emits 540 times more CO₂ than citizens in Ethiopia, Burundi, Afghanistan, and similar countries**. **If US millionaires are compared to the mass of poor people in these countries the relation becomes 1: 10,000 or 100,000**.⁹⁸

If the factor of historical causation is included in the calculations for sharing the burden of global mitigation we would have to go much further still.

95 Josef Baum, *Pareto-optimal Sinking in the Climate Change or Redistribution – The 'Brazil Proposal' and Equity Concepts for Sharing the Burden of Mitigation Activities on Climate*. European Conference of Ecological Economists, 2007. <<http://www.josefbaum.at/en/presentations-and-lectures.php>>.

96 Klaus Steininger, Werner Gobiet et al., *Technologien und Wirkungen von Pkw-Road Pricing im Vergleich*, Wegener Zentrum für Klima und Globalen Wandel Karl-Franzens-Universität Graz, Wissenschaftlicher Bericht 1/2005, p. 20f.

97 Thomas Frey and Hans-Ulrich Schiedt, 'Wie viel Arbeitszeit kostet die Freizeitmobilität? – Monetäre Reisekosten in der Schweiz 1850–1910', Hans-Jörg Gilomen, Beatrice Schumacher, and Laurent Tissot (eds), *Freizeit und Vergnügen vom 14. bis zum 20. Jahrhundert – Temps libre et loisirs du 14e au 20e siècles*, Zürich: Chronos, 2005, p. 159.

98 J. Timmons Roberts and Bradley C. Parks, *A Climate of Injustice: Global Inequality, North-South Politics, and Climate Policy*, Cambridge, MA: MIT Press, 2007, pp. 146–8 and 284.

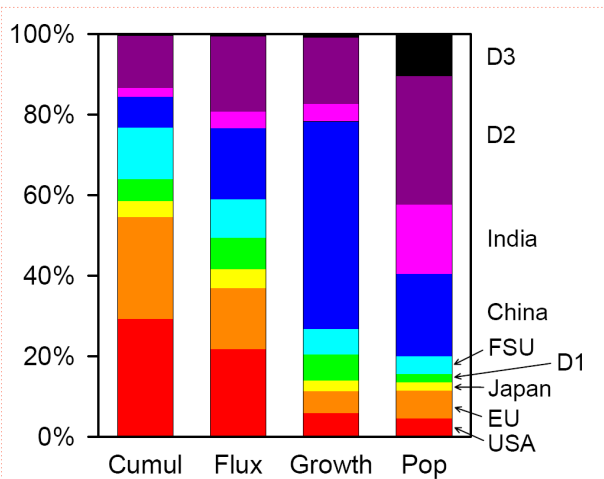


Figure 7 - Global distribution of emissions (GHG) from different vantage points. Cumul = Cumulative historical causation - Flux = Current flux - Growth = Probable growth potential - Pop = in relation to population - D = developing countries - D3 = least developed
Source: Raupach et al.: Global and regional drivers of accelerating CO2 emissions. PNAS 2007

In terms of cumulative historical causation the USA has a share of about 30 % and China less than 10 %. On the other hand, the growth view reflecting the probable future growth potential has the USA at less than 10 % but China at almost 50 %. The current flux calculation is somewhere between these two: Europe performs similarly to USA but to a less extreme extent. Considering population, India and other developing countries (D2) have only high shares. For the least developed countries (D3), the only relevant calculation concerns the relative size of their populations.

These four different factors underlie completely different bases for solutions to 'burden sharing' in climate policy distribution.



The missing link, the solution for climate policy is basically extremely simple, it is the actual acceptance of the notion of **equal rights** for all human beings. The accomplishment of equal rights vis-à-vis

In addition, we must also take into account the emissions caused by products that are produced in one place, such as China, and then transported and used in another, for example in Europe and the United States. If the emissions caused by such activities were attributed to the countries of consumption, instead of being included in the statistics of the manufacturing country, the results would be completely different as the percentage of CO2 emissions would be lowered for China and increased for the countries of use. Such details provide us hints suggesting that that in developing a worldwide CO2 reduction programme, we will be confronted with complex intertwined equity issues.

Let us now look at some other specific elements likely to be included in the elaboration of CO2 reduction programmes.

The core rationale of climate policy is that stabilisation, due to the irreversibility and the uncontrollable implications of a temperature rise of more than +2°C, is defined by a fixed volume of remaining GHG emissions. The question then is how to allocate this volume of remaining GHG emissions? How is it to be distributed among countries and persons? We have an international agreement based on the +2°C target included in the Copenhagen Accord 2009 and we have another international agreement on the basic distribution principle of **CBDR ('common but differentiated responsibility')** included in the 1992 Rio Declaration, and subsequently modified in the 2012 Rio +20 as the 'common but differentiated responsibility and respective capabilities' (CBDRRC). What, we could ask, is the missing link (X) of climate policy that would provide true stabilisation? What would the concrete implementation of CBDR be defined as?

What is the solution of the equation as below?



the atmosphere, meaning how much can it be polluted via emissions, based on equal rights, would be the solution; But this seemingly simple statement becomes complex simple statement in a very un-

In today's situation, there are now 'deadlines' that must be met for solving the climate issue; these deadlines have created existential questions for humanity. Irreversible tipping points have changed the rules of the game,⁹⁹ And even if a radical turn in daily practices seems unrealistic, it remains true that more 'business as usual' must be seen as genuinely unrealistic; indeed it is a 'utopian fantasy'.¹⁰⁰



The challenge can thus be defined as follows; At the minimum, CO₂ emissions would have to be reduced to at least 80 % below the present level to reach the 2°C target. But achieving this broadly accepted 80% reduction by 2050¹⁰¹ – through fair global solutions with the acknowledgement of equal rights for all human beings – means that the global north would have to achieve **at least a 90 % reduction** of CO₂ emissions by 2050.

On top of this essential target and deadline, here is also a problem within the current logic of negotiations over possible transfers to compensate historical accumulation of emissions. Within the existing framework of states these possible transfers from the global north do not on average rest on the shoulders of the wealthiest strata of the population but on those of the 'middle classes' and poorer parts of the population; this is achieved through taxation. Moreover, on average, the proposed flows are designed in favour of the wealthiest strata of the populations in the global south. Thus, class-based paradigms instead of the current national paradigms would not only result in more justice but also would expand popular support for the proposed solutions.

Perhaps the issue of social and global justice will not

be sufficient to win the hearts of billions of people. However, the 'side effects' of an efficient climate change policy on health, regional development, job creation, and liveable cities are overwhelming.

We are currently confronted with high and increasing levels of GHG emissions and with a weak awareness, at least in the global north of the distributional aspects of the problem, as well as of its historical dimensions and associated development issues for the South. People are often confused by complex challenges with many losers and few winners and often refuse to face the inconvenient truth. It is no longer possible to postpone the 'deadlines'. We in fact only have a window of opportunity of about 5 to 10 years to keep any drastic change within the realm of 'known territory', that is to say within our ability to control it. Thus, to paraphrase Michel Jarraud, Secretary-General of the World Meteorological Organization,¹⁰² Time is NOT on our side.

The solution to the climate issue can only be global; it requires the involvement of almost all countries. There will be only be comprehensive and large-scale solutions or there will be no relevant solutions at all.

Today, the 'poor' are relatively speaking the most affected, but climate change will eventually strike the 'rich' as well. The fact is that the poorer countries will only join the effort if there is a basis of fairness and equality in the proposed solutions. This means that the historic responsibility for the accumulation of greenhouse gases by industrialised and advanced countries must be dealt with. Such a responsibility will bring the capitalist global North's polluting past back home in a rather unexpected way. The global South is in a legitimate position when it asks the North to take early forms of pollution into account and requests support for its own development. If these facts are recognized and accepted as true, climate change could stimulate 'simultaneous' solutions for most problems of development and environmental protection. In fact, designing a fair solution to finance the costs of climate change mitigation and adaptation can create a foundation for the development of the global south through redistribution, and thus global convergence and cohesion. But, as mentioned above, efforts must urgently be stepped up and accelerated before time runs out on us..

99 Naomi Klein, *This Changes Everything: Capitalism vs. the Climate*, New York: Simon & Schuster, 2014.

100 John Bellamy Foster, *The Ecological Revolution - Making Peace with the Planet*, New York: Monthly Review Press, 2009, p. 259.

101 <http://ec.europa.eu/clima/policies/roadmap/faq_en.htm>.

102 WMO: *Still Time to Act on Climate Change - Need for Action on Greenhouse Gases Backed by Scientific Evidence*, 19 September 2014, <https://www.wmo.int/pages/mediacentre/press_releases/pr_1004_en.html>.

Greece: From Guinea Pig for Austerity to Lab for Possibilities?

▶ Greece's natural setting is **particularly favourable** for the development of renewable energy sources, especially solar-, wind-, and marine- (ocean turbines) based. However, **93%** of total energy consumption comes **from fossil sources**, versus the European average of 75%.

Syriza, in power since January 25th 2015, has an ambitious and realistic project for the fast development of renewable energy sources. Its plan is to close down the use of lignite in electricity production before 2050; in 2015 70% of the electricity used in the country came from lignite extracted from mines located in Greece. Syriza also intends to switch from a centralized system, whereby the Public Power Corporation (PPC) controls 93% of electricity production, to a model of citizen and local ownership.

▶ But the EU continues to force Athens to adopt competition-based policies, a situation that is further exacerbated by the conditions imposed by the Troika that also include the privatisation of PPC. Whereas Greece had the opportunity to become a 'laboratory' for the energy transition, a position that would have been beneficial for the whole of Europe and beyond, it has now been reduced to an experimental ground for neoliberalism under the domination of the most powerful EU states, and is being colonized by trans-national companies.

Thermal solar energy offers some very interesting possibilities. The sub-chapter **With the sun out of the crisis** illustrates the democratic, ecological, social and cultural potential of this renewable source of energy and shows how it could be used by the whole of Greek and European society as part of a left transition.

Syriza's Project for an Alternative Energy Transition

JEAN-CLAUDE SIMON

The Greek energy situation and approaches to the transition

Today, Greece can be described as a country that is highly dependent on fossil fuels and has a relatively weak (and privately owned) renewable energy industry. A few numbers speak for themselves. While 46% of the energy consumed in the EU is imported, that same number is 64% in the case of Greece; this is comprised essentially of gas and oil imports. According to the 2015 Report 'Energy Democracy in Greece' published by Trade Unions for Energy Democracy (TUED), about 93% of energy consumption comes from fossil fuels (EU average 75%) and in terms of electricity production, 27% of power generated comes from imported oil and gas.¹⁰³



Figure 1: Lignite extraction in Greece

In addition, Greece has a thriving extractive industry in the form of lignite (brown coal) from open mines as shown by figure 1 on the left. Domestic lignite produces 70% of consumed electricity. It should be noted that lignite is a particularly dirty form of coal, so that a typical power station using it emits 37% more carbon dioxide per unit of power than a similar station using black coal. We must also note at this stage the critical role played by the Public Power Corporation (PPC). The PPC owns 93% of the country's installed power capacity; it runs 98 power plants (using lignite, oil, hydro, and natural gas) and a number of solar energy parks. The PPC also owns the country largest two lignite mines that supply 56% of needed power.

What does all this mean in terms of future choices? In October 2013, the Rosa Luxemburg Foundation organised a conference in Athens titled 'Power Im-

balances'. Four possible alternative scenarios were discussed:

- ▶ **Extractivism:** Made popular by political alternatives being considered in Latin America, extractivism in Greece would mean additional reliance on lignite and the exploitation of potential 'unconventional oil' deposits underground and under the Aegean Sea. This would be more than an economic choice as it would entail the construction of a particular state-civil society complex.
- ▶ **'All of the above':** Also made popular in the United States, as it is the official name of Barack Obama's energy and climate analysis, it comes down to not having to make any real choices but to carry on with all possible energy sources. Such an approach, however, is skewed: in economic terms, fossil fuel extraction today is one of the most lucrative businesses on the planet. Thus, investing in extractivism is certain to crowd out other slower or less profitable investments, such as those needed to develop a community-controlled renewable sector.
- ▶ **Large-scale renewables (LSRs):** such a strategy could provide Greece with enough power for its own needs and to become a major exporter of clean energy based on sun and wind. The problem with LSRs is that they often require building new grid lines and launching large-scale (and expansive) construction projects. In addition resistance is cropping up in Europe against 'unnecessary imposed megaprojects' in several countries.
- ▶ **Small-scale, democratically controlled renewables:** more than an energy strategy, this is actually a socio-ecological transformation based to a large extent on relatively small-scale community-developed and -controlled projects as described in "Citizens Initiatives".

Also in October 2013, Alexis Charitsis, member of the Secretariat of Syriza and responsible for the party's energy policy at the time, and Giorgos Velegrakis, a Ph.D. researcher from Harokopio University Athens, published a study entitled 'Transition beyond oil in

¹⁰³ Trade Unions for Energy Democracy, *Energy Democracy in Greece*, Rosa Luxemburg Stiftung – New York Office and Cornell University ILR School, 2015, p. 3, <<http://www.rosalux-nyc.org/energy-democracy-in-greece/>>..

Greece'. This was also the period when Syriza began launching public discussion on the issue of the energy transition. In their conclusion, the authors noted:

- » *'An alternative development model, as the one currently presented in the public discussion by Syriza, which will be built around the "economy of basic needs" and which will promote the idea of socio-ecological transformation of the production process, cannot take as given and reproduce the current dependence on oil.'*
A key tool should be the democratic planning of energy policies, which while taking into account the international initiatives to halt climate change, will prioritise the keystones of energy policy according to the public interest.'
- » *The requirements of the IPCC on reducing greenhouse gas emissions means we need to develop a road-map for the transition to an energy system without fossil fuels by 2050. We thus need a comprehensive plan to mitigate the environmental impact of the existing lignite plants. The production rehabilitation and environmental restoration of the impacted regions will be included in the plan.*
- » *As 'capital came to dominance together with its own energy technologies and the environmental and social devastation brought with them, shifting beyond capitalism, from an alternative/radical perspective, could not be achieved without the introduction of energy technologies that are designed and used to support protection of the environment and enhance social welfare based on equality. Crucial therefore for the ecological transformation of the production process and for a deep change in social relations is the replacement of the energy technologies of capital with energy technologies that will use renewable sources.'*

The meaning of Syriza's programme and energy democracy

At the time of the first party congress in July 2013, Syriza stated its aim to work toward 'the development of a new paradigm of social, environmental and economic development' that was included in the final resolution. It also committed to a 'planned transition to renewable energy' that also included a new status for the PPC, which controls 75% of Greek energy. While it is presently difficult to predict what will happen with this commitment, several studies have shown that Syriza's programmatic commitments in this area have some important con-

sequences. The above-mentioned TUED report outlined a number of short- and long-term goals regarding energy democracy proposals for Greece. They are as follows:

- ▶ **Re-establish control over energy (energy self-determination):** this will include stopping the privatisation of the PPC and the neoliberal approach to renewable energy.
- ▶ **Develop and implement a national energy transition plan** that calls on the Greek people to take charge in order to ensure flexibility, diversity, resilience, and equity.
- ▶ **Promote energy independence** since Greece has the potential to produce enough renewable power to meet its needs from within its own borders, and to do so in a way that will generate jobs and savings.
- ▶ **Decentralise energy production** so that Greece's next energy system becomes a pillar of popular power. This means that the public sector must drive the development of renewable energy. In turn, renewable energy technologies will open the door to community-based municipal control over electrical power generation and will signal the end of an over-reliance on centralised generation.

There is an obvious fit between these goals and the key points of the study by Charitsis and Velegrakis. Given the importance of lignite and the availability of solar energy, Greece can establish a considerable level of control over supplies rather quickly. This shows the importance of the transition plan.

But considerable political will needs to be exercised in order to move in this direction since over the past years a number of laws have been passed to comply with both EU policies of energy privatisation and with the 2009 commitments of the 20-20-20 programme. In addition, the sense of being colonised by multinationals has been, as analysed by the TUED report, reinforced by the Troika's conditions and the proposed privatisation of the PPC and other public assets in order to meet repayment obligations.



Launching a transition plan requires the abolition of these laws and their replacement by new ones that will enable Greece to democratise its energy system and initiate the transition.

To be credible in terms of a switch to a Renewable Energetic System, the plan will have to include what TUED calls capping levels of lignite for power generation and establishing a timeframe to phase out lignite use between now and 2040/2050. This would fit with the key aspects of the transition deployment described above. Needless to say, the phasing out will depend on how fast renewable energy (solar and wind) can be scaled up. In addition, as described in “Citizens Initiatives”, energy democracy requires a plan so that workers and communities that presently draw their livelihood from lignite mining are able to determine their future and participate directly in the future designs for decentralised energy production.

Conclusion

As of today, nothing is certain: Will there be austerity without end for Greece, and therefore no energy transition, or will the diktats of the Troika eventually be rejected? One thing is sure and that is the need to end reliance on fossil fuel in order to avoid an ecological disaster. Our conclusions developed in previous chapters have shown that the switch to renewable energy sources is urgently needed – but this is not happening. However, the fact that it requires a general and solidarity-based mobilisation to get moving shows us the way: let us multiply citizen initiatives and thus give substance to the notion of mobilisation. Let us take matters into our own hands.

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With the Sun out of the Crisis

Cooperative project for greater implementation and development of solar-thermal facilities in Greece

JOSEF BAUM

The following comprehensive project is intended to **promote the implementation, production, and development of solar-thermal facilities in Greece** on the level of **households, industry, SMEs, and farming** by

- ▶ connecting people and, generally, competence between Greece and other countries (knowledge transfer in both directions); and
- ▶ **consulting** institutions, communities, households, NGOs, and companies
- ▶ evaluating, initiating, and supporting investment, production, and R&D.

The prospective main objective of the project is – after rough evaluation of concrete needs and potentials – **to establish a framework for cooperation**, to be subsequently specified in detail. In particular, appropriate persons should be motivated and integrated, and concrete funds for comprehensive project should be identified and tapped.

Solar-thermal energy – often called solar heating – is

a cousin of photovoltaics. Solar thermal collectors usually collect heat by absorbing sunlight (or – in cloudy weather – also dim sunlight with the newest technology) and basically heat water (primarily to provide hot water, but also to heat – and cool (!) – spaces, and also for use in industrial processes (as well as simply too furnish electricity).

Solar-thermal energy seems to be a hidden champion. PV solar panels are approximately 15% efficient (that is, they exploit 15 % of the energy received), but the conversion of solar energy into heat (i.e., heated water) can reach more than 50% efficiency. PV generally is technologically more challenging and thus more ‘sexy’, and can be integrated into big grids. Up to now, solar heat has usually been simpler in technological terms; its integration into bigger grids is more difficult. But the connection to central heating (via buffer storage) and other systems is more complex, requiring more system thinking and (social) interfaces. Although solar heating is significantly cheaper (than PV) and has high potentials it is often not even specifically mentioned in many pro-

The comparative status of the implementation of solar thermal energy globally, in Europe, and in Greece

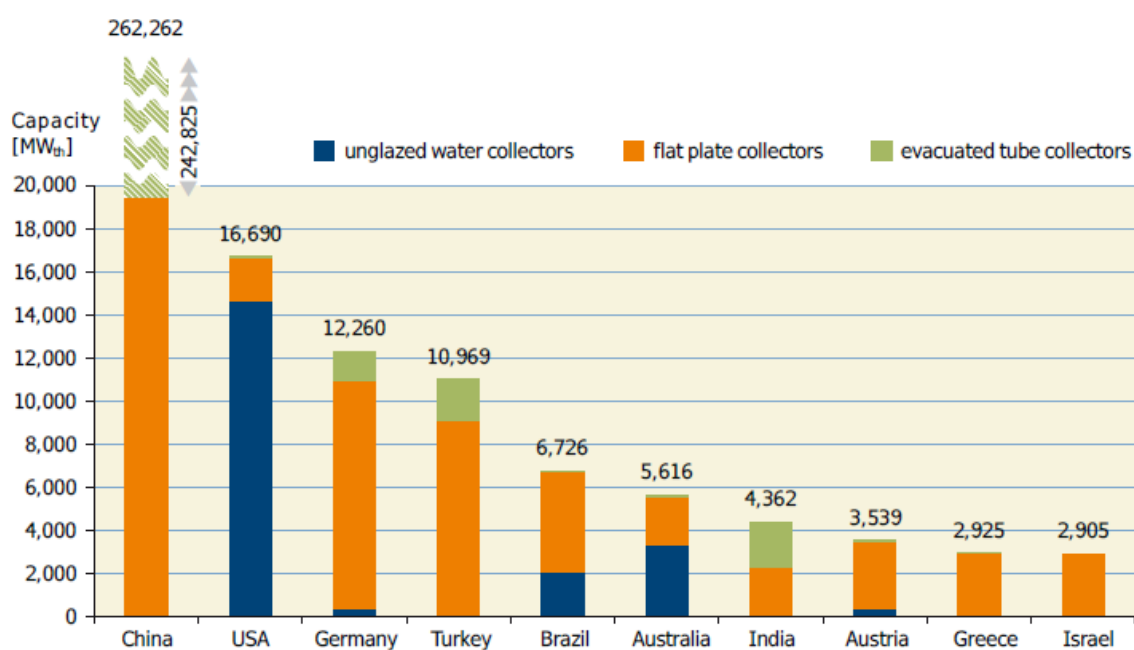


Figure 1: Installed solar thermal capacity 2013 – cumulative glazed and unglazed water collectors in operation for the 10 leading markets – in absolute figures – MW_{th}
 Source: AEE INTEC (June 2015): Solar Heat Worldwide Markets and Contribution to the Energy Supply 2013, Edition 2015, p. 14.

Per capita solar thermal capacity in operation in Europe 2013

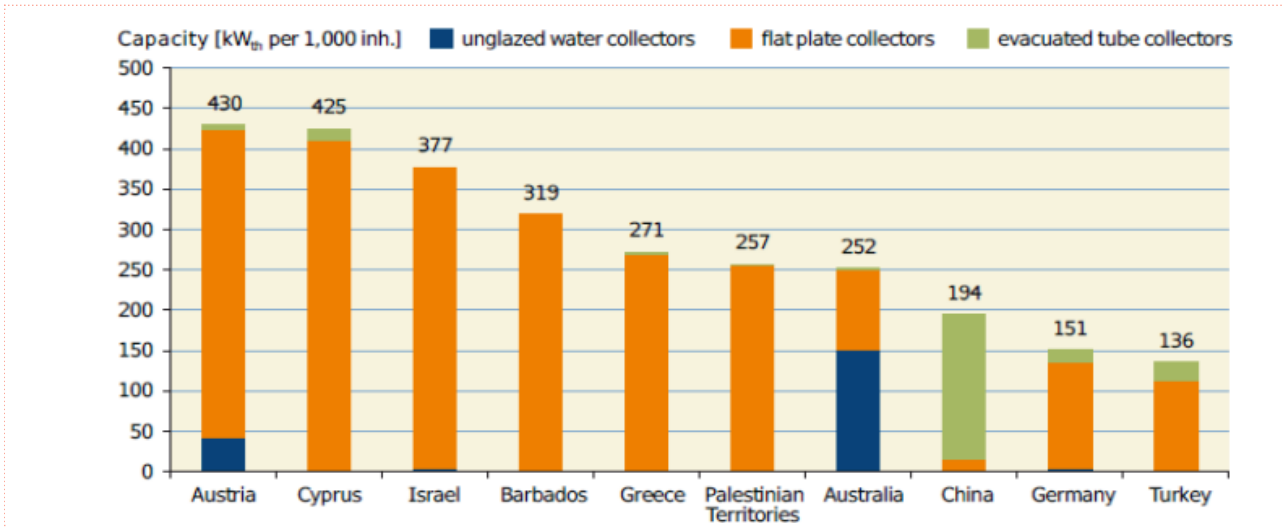


Figure 2: Cumulative water collector installations - relative figures in kW_{th} per 1,000 inhabitants
 Source: AEE INTEC (June 2015): *Solar Heat Worldwide Markets and Contribution to the Energy Supply 2013, Edition 2015, p. 14.*

Greece and Austria have – together with Cyprus – the highest use of solar thermal facilities per capita in

the EU. (In Austria, these facilities resulted from the efforts of self-construction groups after anti-nuclear

Newly installed solar thermal capacity per 1,000 inhabitants in 2013

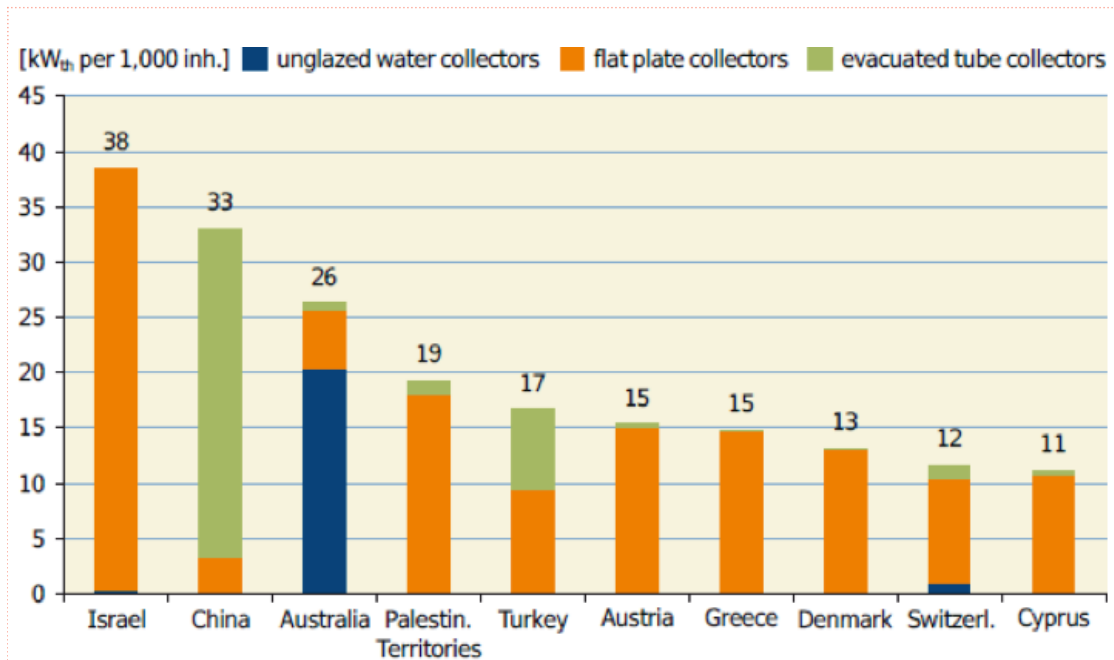


Figure 3: relative figures in kW_{th} per 1,000 inhabitants
 Source: AEE INTEC (June 2015): *Solar Heat Worldwide Markets and Contribution to the Energy Supply 2013, Edition 2015, p. 23.*

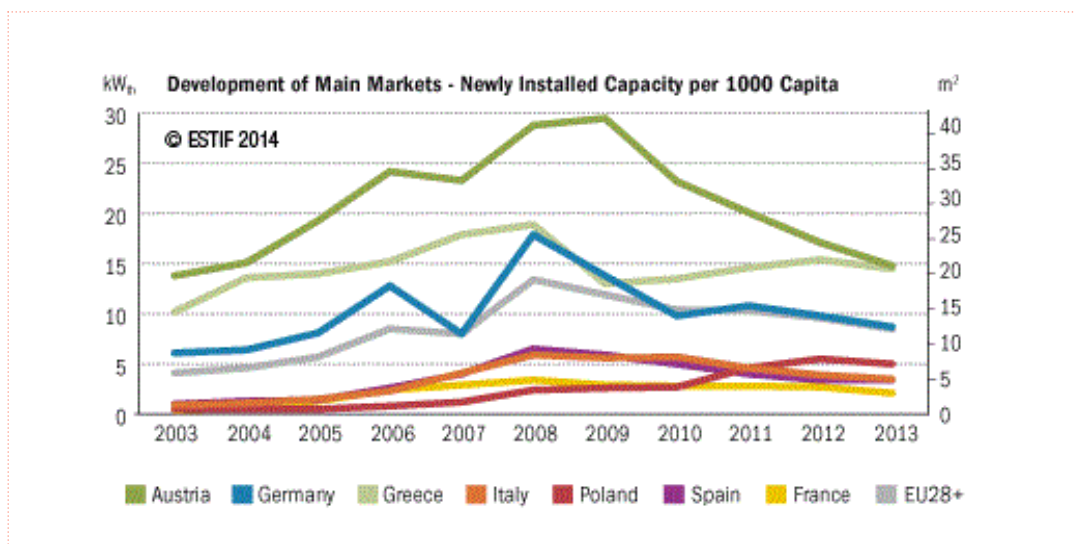


Figure 4: Development of annual newly installed solar thermal capacity per capita in Europe

Status of solar thermal energy in Greece¹⁰⁴

- ▶ The share of solar thermal energy in total renewable energy in Greece was 6% in 2006.
- ▶ Renewable energy accounted for 5.3 % of gross domestic energy consumption in 2006 and 18 % (=1.8 Mtoe) of primary energy production in Greece.
- ▶ Thus the **share of solar thermal energy** in gross domestic energy consumption was about 0.32 %, and in primary energy production about 1%.

Greece has a solar industry, and solar systems are widely used in all types of buildings. Basically there is a move away from small and medium users and from traditionally used stand-alone thermosiphon systems (which do not require mechanical pumps) towards forced circulation ones, requiring integrated design and implementation of whole-system solutions.

Greece set high targets for solar thermal systems until 2016:¹⁰⁵ The Greek target (before the financial crisis) was an 18 % share of renewables in gross domestic energy consumption. In the household sector by providing incentives for the installation of central solar thermal systems and through financial incentives for further small scale solar thermal systems in housing the yearly capacity should be tripled between 2010 to 2016 from 180 to 540 GWh. Similar targets were set for the tertiary, industrial and public sectors.

But crisis and austerity policy resulted in budget cuts and lowered incentives and thus low implementation of targets.¹⁰⁶ At the beginning of the crisis there was a decline in solar thermal investments in Greece and almost everywhere in Europe; on the other hand, in Greece there is a significantly increasing need to replace investments because Greece started decades ago investing in solar thermal energy. Although at this moment there is an appreciable need and also some move to replace old and less efficient investments in solar thermal facilities, it is a fact that both Greece and Greece's solar thermal industry have seen better times. However, Greece's solar thermal industry still is alive and is one of the industries in Greece with high potential.

Some technology transfer or R&D seems to be necessary especially for large scale systems. Substantial R&D in renewable energy since the crisis and austerity policy in Greece has been tending towards zero.

Starting point: there is still a huge potential in Greece for solar thermal energy

- ▶ Due to its specific climatic conditions, Greece already makes, in comparison to other countries, impressive use of solar thermal facilities, but, as in most other countries and particularly in Greece, there is still huge unrealised potential
- ▶ Given the current unemployment and crisis of income in Greece support for specific projects take on an additional importance.

104 Ministry of Development, Hellenic Republic (February 2009), *Energy Outlook of Greece*, p. 17.

105 *Energy Outlook of Greece*, pp. 40, 52.

106 Source: Centre for Renewable Energy Sources and Saving (CRES)

(the Greek national entity for the promotion of renewable energy sources, rational use of energy and energy conservation)

- ▶ Strategies for endogenous development must stress the use of endogenous resources. Basically, the available resources should be used to a greater extent for concrete in Greece, the sun has a specific character as a resource.
- ▶ Last but not least, there was a significant general positive response to the outline of this project by Alexis Charitsis, (former) coordinator of the Energy Department of SYRIZA.

The general economic, social, political, and socio-ecological advantages of a project aiming at increased implementation of solar thermal facilities in Greece

THE GENERAL ECONOMIC ADVANTAGES OF SOLAR HEAT:

- ▶ It improves the **national energy balance** (less imports of fossil energy) and so the **balance of trade**;
- ▶ it will support **SMEs and the regional economy** through the installation of solar thermal facilities by local technology firms; it will improve overall energy efficiency, because solar heat outperforms other primary energy in energy efficiency.

THE SOCIAL ADVANTAGES OF SOLAR HEAT:

- ▶ It will, in any case, **reduce the energy expenditures of many households** in the midterm – especially in rural areas – because the return time of investments in this area is usually only a few years (which is much faster than with PV),
- ▶ and so it can – embedded in a financial framework e. g. of contracting – mitigate energy poverty for people with low income and high energy costs – by decreasing the energy bill and distributing the investment cost over a long period of use;
- ▶ also existing ‘**old energy systems**’ often used by poorer people – can be optimised, improved, or upgraded through consultation and small investments – supported by a framework of financial instruments.

POLITICAL AND SOCIO-ECOLOGICAL ADVANTAGES OF SOLAR HEAT:

- ▶ It will contribute to **decentralising** the energy system and encourages personal and local initiative and responsibility;
- ▶ it will recreate more **trust in renewable energy** generally (after many failed large PV projects);
- ▶ it will thus **empower people** on the ground to

sustain their livelihoods and to create **energy democracy**, and to go on to further projects for implementing renewable energy;

- ▶ it will improve the **carbon footprint** through less greenhouse gas emissions.

THE ADVANTAGES FOR AN ENDOGENOUS ECONOMIC DEVELOPMENT:

- ▶ Support for households and small scale plants are important issues because of the particular social dimension of this form of energy. Existing solar thermal plants in Greece are rather low tech. Upgraded replacement will improve efficiency, save money, and can provide further stimulus for the local economy.
- ▶ Local craft, installation, maintenance, and repair industries, and business service can increase local value added, jobs and taxes.
- ▶ Solar heat can also be used for **power production, cooling and supporting heating systems for buildings also in larger scale units**. New technologies can use light at times when the sun is not shining.

Perspectives: Production and R&D – Greece as the centre of solar thermal knowhow in the Mediterranean region

- ▶ The potential for a significant increase in the industrial production of solar thermal plants or components, together with special services, is considerable; different options (supporting and upgrading existing Greek industry, joint ventures, foreign direct investment (FDI), and other forms) are possible and need to be discussed.
- ▶ **R&D** in Greece virtually collapsed in broad areas and has to be revived; thermal solar technology should be developed further and optimized along the specific Greek conditions.
- ▶ **Greek technicians** could thereby be **employed**;
- ▶ Through R&D and production, Greece could emerge as a **centre of solar-thermal competence** in the Mediterranean region

Giving the financial sector a positive function

It is crucial to **finance the increased implementation** of solar thermal systems; although these systems are not overly expensive, the vast majority of households cannot now afford to invest in them.

Here the financial sector could shift from speculation and be creative in the classical positive sense: by

fulfilling its specific function to collect money from those who have it and lend it to those who need it (for investments) and will get it back (e.g. through continuous saving of energy). This would be the good old 'transformation-of-payments' function of banks. Specifically, banks can do "contracting" to manage investments, saving fossil energy at households by pre-financing. So, for example, when people shift from fossil energy to renewables they continue for some time to pay their former energy bill, and at the same time realise low carbon or zero carbon energy systems. Basically, the energy bill would then be significantly less, but the investment would also have to be paid back - and the ability to repay this is based on the saving from (fossil) energy. In this way the impact of investments especially on poor people is removed.

Designing a European and international project

Various appropriate institutions, hopefully including state ministries, should be integrated and required to contribute to a European project.

The project **originated in Austria** as a country with a number of dedicated activists (both in renewable energy and in solidarity movements) and experts, whom Austria's strong industrial performance in this field has produced. Many **interested people and institutions of other European countries ought to be involved**, and it should be an attempt to tap supranational institutions. **Greek institutions, movements, and companies** of course must play a central role.

Some continuity with former projects like 'Development of pilot solar thermal energy service companies with high replication potential' should be possible.¹⁰⁷

Connections through the University of Vienna to Huang Ming, who was awarded the Right Livelihood Award 2011 and played a major role in drafting the Law on Renewable Energy in China, and is the owner of HIMIN, the worldwide biggest solar thermal company, could be activated to initiate economic activities realising synergies.

Conclusive questions

- ▶ **Large-scale projects** should not be the focus, but they should also not be ruled out.
- ▶ **Municipalities, NGOs and grassroots organisations** should be involved.

Because similar conditions exist in similar countries the project has **transferability**. Especially in Spain and other southern countries there are comparable socio-economic and political conditions.

A general problem is the integration of renewable energy into the system of capital accumulation. Compromises for the time being probably will be necessary within the existing political and economic framework. In particular, a sensitive issue is the (concrete) inclusion of (big) **companies as cooperative partners** (with their self-interests). It is essential here to regulate this area firmly through **public procedures that respect transparency**.

Solar thermal technology has a special **potential in promoting decentralisation, empowerment, small-scale development, in overcoming energy poverty**, and, last but not least, in generating new relationship to natural resources. And this could represent a small but significant contribution to a new type of accumulation and socio-ecological transformation.

107 <<https://ec.europa.eu/energy/intelligent/projects/en/projects/st-escos>>.

Conclusion

Humanity has the means to act quickly, effectively, and with solidarity

MARC DELEPOUVE

The question of energy is located at the intersection of multiple issues: environmental, economic, social, geopolitical, democratic, etc. Confronting climate change, humanity has to put an end to the use of fossil fuels – this much is urgent. Paradoxically, while humanity is possessed of an economic, financial, and political system that forces it to focus on the short term, never before has it been so urgently necessary to take account of the future. In the end, it is the survival of human societies that is at stake.

Humanity is at a turning point in its history. It needs to think, to mobilise, and to collectively transform itself in order fully to integrate in its present activity the conditions of its survival and the preparation of its future well-being.

The first human consequences of climate change are already here. The most affected populations are generally among the poorest. Already, each year, millions of people are forced to give up their way of life. According to a report from the International Organization for Migration (IOM), 'the most frequent forecast' for the year 2050 of the number of people displaced due to climate change has grown to 200 million.

Climate change is inseparable from the totality of consecutive environmental disruptions of human activity. The first signs of a surge in these disruptions are visible today. The conditions of humanity's life could collapse. Nevertheless, humanity possesses the means to act effectively and rapidly to face this peril, while at the same time responding to human and social issues, reducing the sources of tension and conflict in the world. The implementation of these means requires a general and solidary mobilisation of all humanity. From the individual level to the international scale, decisions have to be made and changes have to be brought about. The modes of life, production, and consumption have to be rebuilt. This involves all sectors, in particular the energy sector.

However, due to many obstacles, humanity is not taking this road.

First among the obstacles is free international commercial exchange and the freedom of movement for capital that subjects all territories and nation-states to a mortifying economic confrontation. The cold and blind 'invisible hand' of the market attacks social

well-being and democratic regimes, diverts people's activities from human goals, and forces them to destroy the environment. A supranational financial and economic oligarchy derives profit and power from this. Moreover, the commodification of public services, media, and culture, or, even more, the power of the advertising sector, supplies this oligarchy with the tools for the ideological domination that protects it, at least up to now, from any challenge to the system of free-market exchange and the free movement of capital on which their privileges rest.

Then, international inequities and the military and economic domination of western countries (which, to be sure, meet resistance and have their own limits) frustrate all hope of building trust between nations. But this trust is indispensable for a general mobilisation of humanity. Can we hope tomorrow for a rapid halt to the use of carbon – which costs less money than other energy sources – in countries with medium or low income, while at the same time high-income countries have abundant access to renewable energy at a higher monetary cost? Originating at the beginning of the modern epoch (the late 15th and early 16th centuries), this situation of inequities and domination has grown through several centuries. During the 20th century, the rise of the powers of Japan and Russia, then especially China, have initiated a still largely incomplete rebalancing.

In addition, there is now a sort of confinement within the nation-states, a withdrawal to a sub-level. Nation-states are today organising international military, economic, and financial domination. They represent an instrument of international destabilisation. Moreover, the confining of populations within national and sub-national frameworks leads to their division, which most benefits the economic and financial oligarchy. As long as this confinement lasts, the capitalist oligarchy will reign. The extreme-right parties cultivate this confinement in a very clear way. In the face of our century's transnational problems, human beings need to rise to the level of humanity. Developing a sense of belonging and of responsibility in relation to humanity today is much more than an ideal; it is a historic necessity for the maintenance of a viable environment but also to counter dangers such as those of post-humanism and geoengineering. At the same time, between the national and the global levels, a plurinational level of significantly suf-

ficient dimensions (European, for example) is indispensable to pull nations away from the power of the international markets and the oligarchical power of transnational corporations.

Finally, a major contemporary crisis concerns the production of knowledge and technology. Humanity's research potential is immense today, but it is very largely under-utilised and perverted due to causes that are mutually reinforcing:

- ▶ An increasingly strong focus of research, in the context of global economic competition, on the satisfying of the competitive needs of territories (the European Union, countries, regions, etc.). To this is added the increasing control exercised by big corporations.
- ▶ A devastating neoliberal ideological stranglehold of whole sectors of research. Economic science is a blatant example.
- ▶ A yawning gap between research and society (except for its corporate capitalist component).
- ▶ The myth of the omnipotence of the sciences as expressed in the language of mathematics to the detriment of an approach that takes account of complexity and the non-quantifiable.
- ▶ Finally, the capacity of research to contribute to human ends and the resolution of problems faced by humanity is very largely under-utilised. Worse, certain research activities contribute to the degradation of the environment and the weakening of democracy. However, research, if correctly oriented and organised, is an essential centrepiece of the response to the crucial challenges facing humanity.

The way forward

To deconstruct the power of the oligarchy and of the markets, to (re)construct democracy and, for this purpose, to refound the exchanges between Europe and the rest of the world, and more generally international relations, according to principles of cooperation and mutualisation; to reorient the activity of human societies and rebuild research and knowledge, giving full space to human ends and to the complexity of the real world – these are the conditions for quick, effective, and solidary action on the part of humanity in the face of climate change and all the environmental disruptions; these are the conditions for the birth of humanity as a group able to gather together and decide solidaristically about its future.

From alterglobalism to anti-fracking networks, very diverse and increasingly numerous international movements are working today in this direction. However, the question remains of how to translate it into politics. In 2015, the electoral victories in Greece, with SYRIZA forming the government, and Spain, with Podemos capturing mayoralties in large cities and destroying the reigning bipartisanship at the national level, then in Britain, with Jeremy Corbyn becoming Leader of the Labour Party – are these the first signs of a groundswell? The great majority of political movements that presently govern the nation-states have espoused archaic positions that are diametrically opposed to what is needed now and in the future. A powerful European and international political movement has to be a vehicle for a general and solidary mobilisation of humanity as a whole – a movement whose flexibility guarantees democratic life and appropriation at the local and nation-state levels and whose relevance has to rest on the will and capacity to go beyond nation-states.