Building a Low Carbon Society

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1. Introduction

There is a wide consensus that we are approaching the sunset of the oil era in the first half of the 21st century. From an environmental perspective, the dramatic rise in carbon dioxide emissions from the burning of fossil fuels is raising the earth's temperature and threatening an unprecedented change in the chemistry of the planet and global climate, with ominous consequences for the future of human civilization and the ecosystems of the earth.

From an economic perspective, while oil, coal, and natural gas will continue to provide a substantial portion of the world's and the European Union's energy well into the 21st century, there is a growing consensus that the full costs of our fossil fuel addiction is beginning to act as a drag on the world economy. And last but not least, the changes that the climate challenge will bear will also deeply affect our societies, questioning issues of sustainability, distribution of power, migration and intergenerational equity.

During this twilight era, the 27 EU member states are making every effort to ensure that the remaining stock of fossil fuels is used more efficiently and are experimenting with clean energy technologies to limit carbon dioxide emissions in the burning of conventional fuels. These efforts fall in line with the EU mandate that the member states increase energy efficiency 20 percent by 2020 and reduce their global warming

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emissions 20 percent (based on 1990 levels), again by 2020. But, greater efficiencies in the use of fossil fuels and mandated global warming gas reductions, by themselves, are not enough to adequately address the unprecedented crisis of global warming and global peak oil and gas production. Looking to the future, every government will need to explore new energy paths and establish new economic models with the goal of achieving as close to zero carbon emissions as possible. It must be clear that a reduction of greenhouse gas emissions by 80% in developed economies will never be achieved b business as usual plus a few windmills and solar panels. It is a complete reorganization of society which is needed.

In this context, the energy and climate change challenges have been seen, up to now, as a constraints to deal with rather than opportunities. Policies and actions to address them have been perceived as potential threats to our capacity to generate wealth and, moreover, to maintain our social models. Addressing climate change, especially during a period of global economic slowdown, has been seen as a "luxury" that collides with other compelling priorities such as the need to build sustainable social security systems, as well as support the welfare of low income groups, communities and nations. And this is especially true for Europe, which placed the need to preserve a social model based on solidarity, access and opportunity at the heart of its policies and values.

On the other hand, the vision of a post carbon society makes it possible to reframe the energy and climate change challenges as opportunities, not just to foster a wealthier society, but also a more equitable and sustainable one. In this sense, the European Union needs a powerful new social vision that will push the discussion and the agenda around climate change and peak oil from fear to hope and from economic constraints to economic possibilities. That narrative is just now emerging as

industries across Europe begin to lay the groundwork for a decarbonised society for the middle of this century.

In this paper we argue that the key, for both Europe and world, is to lay out a compelling "social vision" to accompany the new economic vision. The coming energy challenge provides the framework for the birth of a "New Social Europe" in the first half of the 21st Century. Just as the distributed Information Technology and internet communication revolutions dramatically changed the social context, as well the economic parameters of doing business, a distributed renewable energy revolution will have a similar impact on Europe and the world.

The aim of this contribution is to sketch the main lines of this social vision. To do so, we will briefly review the main elements that would allow for the creation of a post carbon society while focusing, in the second part of the paper, on how these would fit into the creation of a new social Europe.

2. The main elements of a Post-Carbon Society

2.2.1 Renewable Energy

The creation of a post carbon society is based on some main elements that we briefly review. First of all it has to be underlined the fundamental role of renewable energies. While Renewable forms of energy—solar, wind, hydro, geothermal, ocean waves, and biomass still account for a small percentage of the global energy mix, they are growing rapidly as governments mandate targets and benchmarks for their widespread introduction into the market and their falling costs make them increasingly competitive. Billions of Euros of public and private capital are being

spent into research, development and market penetration, as businesses and homeowners seek to reduce their carbon footprint and become more energy efficient and independent. Global investment in renewable energies topped $148 billion in 2007, a 60 percent increase from 2006[i]. Global investments in renewable energies are expected to leap to €250 billion by 2020 and €460 billion by 2030.[ii] Today, renewable energy manufacturing, operations, and maintenance provide approximately two million jobs worldwide.[iii] A recent study found that the number of jobs created per euro invested (and per kilowatt-hour produced) from clean renewable energy technologies is 3 to 5 times the number of jobs created from fossil fuel based generation.[iv]

By becoming the first superpower to establish a mandatory target of 20 percent renewable energy by 2020,[v] the EU has set in motion the process of vastly enlarging the renewable energy portion of its energy mix. Reflecting the new commitment to higher renewable energy targets, the European Investment Bank has ratcheted up its renewable energy investments and is slated to finance loans totaling more than €800 million per year.[vi] In Germany, alone, the renewable energy industry boasted an annual turnover of €21.6 billion and 214,000 workers in 2006, and the industry projects to grow to between 244,000 and 263,000 jobs by 2010, 307,000 to 354,000 jobs by 2020, and 333,000 to 415,000 jobs by 2030.[vii]

The 26 other EU member states are also creating new jobs as they bring renewable energy sources online to meet their objective of achieving a near zero carbon emission policy. Renewable energy in the EU generated €8.9 billion in earnings in 2005, and is expected to leap to 14.5 billion Euros by 2010.[viii] More than 700,000 jobs are expected to be created in the EU by 2010 in the field of electricity generation from renewable energy sources.[ix] By 2050, renewable energy is projected to provide nearly half the primary energy, and 70 percent of the electricity produced within the EU, and account for several million new jobs.[x]

Thanks to renewable energies, those economic sectors that played a major role in CO2 emissions could play a fundamental one in a post carbon society. For example, the construction industry is the largest industrial employer in the EU and, in 2003, represented 10 percent of the GDP, and 7 percent of the employment in the EU-15.xi Buildings are the major contributor to human induced global warming. Worldwide, buildings consume 30 to 40 percent of all the energy produced and are responsible for equal percentages of all CO2 emissions.xii Now, new technological breakthroughs make it possible, for the first time, to design and construct buildings that create all of their own energy from locally available renewable energy sources, allowing us to reconceptualize the future of buildings as "power plants". These buildings will collect and generate energy locally from the sun, wind, garbage, agricultural and forestry waste, ocean waves and tides, hydro and geothermal– enough energy to provide for their own power needs as well as surplus energy that can be shared.

2.2.3 Energy storage

To maximize renewable energy and to minimize cost it will be necessary to develop storage methods that facilitate the conversion of intermittent supplies of these energy sources into reliable assets. Batteries, differentiated water pumping, and other media, can provide limited storage capacity.

Hydrogen could also be used to store energy.

The important point to emphasize is that a renewable energy society becomes viable to the extent that part of that energy can be stored, because renewable energy is intermittent. When renewable energy is not available, electricity cannot be generated and economic activity grinds to a halt. But, if some of the electricity being generated, when renewable energy is abundant, can be used for instance to extract hydrogen

from water, which can then be stored for later use, society will have a continuous supply of power. Hydrogen can also be extracted from biomass and similarly stored.

The European Commission recognizes that increasing reliance on renewable forms of energy would be greatly facilitated by the development of hydrogen fuel cell storage capacity and, in 2003, established the Hydrogen Technology Platform, a massive research and development effort to move Europe to the forefront of the race to a hydrogen future.[xiii] Regions and national governments across Europe have already begun to establish hydrogen research and development programs and are in the early stages of introducing hydrogen technologies into the marketplace.

In 2006, the Federal Republic of Germany committed €500 million to hydrogen research and development and began readying plans to create a nationwide hydrogen roadmap, with the stated goal of leading Europe and the world into the hydrogen era by 2020.[xiv]

In October 2007, the European Commission announced an ambitious public/private partnership to speed the commercial introduction of a hydrogen economy in the 27 member states of the EU, with the primary focus on producing hydrogen from renewable sources of energy. In 2009, the European Institute of Technology will kick off its activities with two of its three priorities being renewable energy and climate change.

2.2.4 Smart grids

Smart grids should allow homeowners, small and medium size enterprises (SMEs), and large scale economic enterprises to produce renewable energy locally—through solar cells, wind, small hydro, animal and agricultural waste, garbage, etc.—and use it off-grid for their own electricity needs. Smart metering technology allows local producers to more effectively sell their energy back to the main power grid, as well as accept electricity from the grid, making the flow of electricity bi-directional.

The next phase in smart grid technology is embedding sensing devices and chips throughout the grid system, connecting every electrical appliance. Software allows the entire power grid to know how much energy is being used, at any time, anywhere on the grid. This interconnectivity can be used to redirect energy uses and flows during peaks and lulls, and even to adjust to the price changes of electricity from moment to moment.

In the future, intelligent utility networks will also be increasingly connected to moment to moment weather changes—recording wind changes, solar flux, ambient temperature, etc.- giving the power network the ability to adjust electricity flow continuously, to both external weather conditions as well as consumer demand. In this context, even the hydrogen- powered fuel cell automobile or the electric vehicle fitted with batteries is a "power station on wheels" with a generating capacity of twenty or more kilowatts. Since the average car is parked most of the time, it can be plugged in, during non-use hours, to the home, office, or the main interactive electricity network, providing premium electricity back to the grid.

The new EU energy plan is preparing the way for the smart grids, with the demand that the power grid be unbundled, or at least made increasingly independent of the power companies that also produce the power, so that new players—especially small and medium size enterprises and homeowners—have the opportunity to produce and sell power back to the grid with the same ease and transparency as they now enjoy in producing and sharing information on the internet. The European Commission has also established a European Smart Grid Technology Platform and prepared a long-term vision and strategy document in 2006 for reconfiguring the European power grid to make it intelligent, distributed, and interactive. [xv]

3. A New Social Europe in the 21st Century

3.2 The energy and climate change challenge as opportunities for a new social Europe

Today, the energy crisis and climate change are challenging the European social vision. Obviously, the disastrous environmental consequences of climate change will challenge the very nature of every social system. The steep rise in oil prices is already boosting inflation which has long been regarded as the most unequal "tax" as it redistributes wealth from low income to high income groups. The long term rise in the price of oil on world markets and the increasing real time effects of climate change on commercial sectors ranging from agriculture to tourism are already having a dramatic impact on the standard of living of millions of European citizens. Food prices are dramatically increasing as well as the price of consumer products and services and home heating and petrol cost, threatening the economic well being of European families. It is virtually certain that these circumstances will worsen in the years ahead, endangering the European vision of a wealthier and more equitable society. For this reason, reducing our dependence on fossil fuels and containing, as much as possible, energy driven inflation, is a first step to preserve equity in the distribution of wealth.

Of course, independence from fossil fuels has positive impacts that go far beyond the issue of reducing inflationary pressures. Making the transition to distributed power and a post carbon society represents a unique and unprecedented opportunity to transform society into a wealthier, more equitable and sustainable one- a society that can fully realize and integrate the vision of the Lisbon strategy with that of a new social Europe.

Energy is one of the major sources of wealth in every society, and both the availability and configuration of the energy system have been critical in shaping the availability and distribution of wealth. In our energy regime dominated by fossil fuels, the location of sources as much as the processes and technologies through

which energy is collected, stored and distributed, has an obvious influence on who will benefit the most from its utilization.

Now that the fossil fuels energy paradigm is approaching its sunset, the question is how will the new sunrise energies impact or reshape the European social model. A model which is rooted in a tradition that conjugated wealth creation with the need to ensure a fair and equitable redistribution. In the next sections we review the European social tradition and explore how a post carbon society might allow not just for the creation of wealth, but also for new forms of distribution between citizens and countries. Finally we will explore how these opportunities might translate in the rethinking of some major EU policies, namely the Lisbon strategy.

3.1 The European social tradition

At the core of social Europe is the effort to promote both individual freedom and social responsibility. These key principles have been translated into market initiatives and social models with the aim of ensuring economic growth, as well as broad access, social cohesion and solidarity.

To achieve these dual ends, Europe has developed an economic model in which the pursuit of wealth has always been accompanied by a continuous public policy debate over appropriate redistribution policies. Social policies have varied across European member states and have changed focus over time. Some countries developed a welfare tradition based on more top-down models in which the state plays an active and direct role in redistributing wealth; others have adopted more bottom-up models in which the state creates the framework conditions for social actors to play the major role.

During the last few decades, there has been a tendency to move from top-down to bottom-up models. Globalization imposes the creation of open and competitive systems which are hardly compatible with interventionist and protectionist policies.

A major example of the increasing focus on bottom up approaches is the Lisbon Agenda which views knowledge as the primary tool to ensure equal access and opportunities in a globalized economy. Education, life long learning and innovation are the means by which more and better jobs can be created, allowing European citizens to aspire to steady advances in the labor market. Knowledge is, for the first time, seen as a primary tool to ensure social security and economic opportunity for everyone.

While the new bottom up models emphasize the key role of education, life long learning and innovation in advancing individual opportunity, there is also an acknowledgement that government can and should play a principal role in establishing programs and policies to nurture the process along. The Lisbon Agenda's prime mission is to do exactly that.

The vision of a new Social Europe emphasizes not only individual opportunities but also the quality of life of society. Indeed, the two objectives are inseparable- each requires the other.

The conventional 20th century economic indicators that emphasize gross domestic product and per capita income are now being accompanied by equally important quality of life indicators that measure a good economy in terms of a commitment to social and human rights, an educated citizenry, a healthy population, safe communities, a proper balance of work and leisure, and a clean and sustainable environment. A quality of life economy promotes both the market and social models simultaneously by emphasizing personal economic opportunity along with a sense of social commitment to create a sustainable society for every citizen.

3.3 The distribution of power among social actors: the "empowered" generation

Unlike fossil fuels which are only found in a few places, renewable energies, including solar, wind, hydro, geothermal, biomass and ocean waves, are everywhere. With the proper technologies, each building can collect, produce and store renewable energies locally to provide for their own power needs as well as provide surplus energy that can be shared. And, again, thanks to technological developments, we can create intelligent power grids to distribute energy from the places where there is a surplus to those where there is a demand.

In the future, millions of people, businesses, and other institutions will have the opportunity to play an active role in renewable energy production and benefit from its value. Distributed energy means distributed wealth. The post carbon society can pave the way to a New Social Europe where power, itself, is broadly distributed, encouraging unprecedented new levels of collaboration among its 500 million citizens.

In the new era, businesses, municipalities and homeowners increasingly become the producers as well as the consumers of their own energy—so-called "distributed generation." Just as the distributed communication revolution of the last decade spawned network ways of thinking, open source sharing, and the democratization of communications, a post carbon society follows suit with the democratization of energy.

We can begin to envision a Europe where millions of people are "empowered", both literally and figuratively, with far reaching implications for European social and political life. The democratization of energy becomes a rallying point of a New Social Europe and access to power becomes an inalienable social right.

The 20th century saw the extension of the political franchise and the broadening of educational and economic opportunities to millions of Europeans. In the 21st century, individual access to energy also becomes a social and human right. Every European should have the right and the opportunity to create their own energy locally and share it with others across the European intergrid. For a younger

generation that is growing up in a less hierarchical and more networked world, the ability to share and produce their own energy in an open-access intergrid, like they produce and share their own information on the internet, will seem natural and commonplace.

3.4 The distribution of power among countries: reshaping globalization

A post carbon society will not only be an opportunity to advance equity in the distribution of wealth and to widen power among social actors; it will also allow for a broader involvement of countries that have traditionally been energy importers. Within Europe, a continent-wide, fully integrated, intelligent intergrid could allow each EU member country to both produce its own energy and share any surpluses with the rest of Europe in a "Network" approach to assuring EU energy security. When any given region of the EU enjoys a temporary surge or surplus in its renewable energy, that energy can be shared with regions that are facing a temporary lull or deficit.

The new energy paradigm also holds great implications for the distribution of power outside Europe. The half century transition from the second to the Third Industrial Revolution is going to dramatically change the globalization process. The most significant impact is likely to be on developing nations. Incredibly, over half of the human population has never made a telephone call and a third of the human race has no access to electricity. Lack of access to electricity is a key factor in perpetuating poverty around the world.

Conversely, access to energy means more economic opportunity. If millions of individuals and communities around the world were to become producers of their own energy, the result would be a profound shift in the configuration of power. Local peoples would be less subject to the will of far-off centers of power.

Communities would be able to produce goods and services locally and sell them globally.

This is the essence of the politics of sustainable development and re-globalization from the bottom up. The European Union, working with European industries and civil-society organizations, can help facilitate the next phase of sustainable globalization by re-orienting development aid, leveraging macro and micro-financing and credit, and providing favored-nation trade status in order to help developing nations establish a Third Industrial Revolution.

3.5 The Lisbon agenda as the social strategy for a post carbon society

Finally, the new energy paradigm represents a dramatic change in the European policies aimed at creating more and better jobs. The transition to a post carbon society will require a wholesale reconfiguration of the entire European infrastructure, creating millions of jobs, and countless new goods and services, with an economic multiplier effect that will stretch to the second half of the 21st century. We will need to invest in renewable energy technology on a massive scale; redesign the continent's millions of buildings, transforming them into positive power plants, embed hydrogen and other storage technology throughout the European infrastructure, transform the automobile from the internal combustion engine to the fuel cell car, and lay down an intelligent utility network across the continent.

With the Post carbon society looming on the horizon, the Lisbon Agenda acquires a new and greater significance. Knowledge will be key in fostering the Post carbon society and ensuring a smooth social transition.

The wholesale remaking of the European infrastructure and the retooling of industries is going to require a massive retraining of European workers on a scale matching the vocational and professional training at the onset of the first and second industrial revolutions. The new high-tech European workforce of the Post carbon

society will need to be skilled in renewable energy technologies, green construction, IT and embedded computing, nano technology, sustainable chemistry, fuel cell development, digital power grid management, hybrid electric and hydrogen powered transport, and hundreds of other technical fields.

Entrepreneurs and managers will need to be educated to take advantage of cutting edge businesses models, including open-source and networked commerce, distributed and collaborative research and development strategies, and sustainable low carbon logistics and supply chain management. The skill levels and managerial styles of the Post carbon society workforce will be qualitatively different from that of the workforce of the second industrial revolution.

Just as the first and second industrial revolutions were accompanied by vast changes in the educational system, The Post carbon society will require equally innovative educational reforms if we are to prepare future generations to work and live in a post-carbon world. The new curriculum will focus increasingly on advanced information, bio and nano technologies, the earth sciences, ecology, systems theory, collaborative and distributive education, open-source learning models, and social capital. We will need to educate our children to think as global citizens and prepare them for the historic transition from 20th century conventional geopolitics to 21st century global biosphere politics. Education will increasingly focus on both global responsibility to preserve the health of the planet's biosphere and local responsibility to steward regional ecosystems. Living sustainably will become the anchor of 21st century learning environments.

More research will also be needed to develop the technologies that are necessary to advance renewable energies, reconfigure existing buildings and construct new ones that serve as positive power plants, establish hydrogen storage technologies, create intelligent utility networks, and pursue a new generation of electric and hydrogen fuel-cell vehicles, as well as support all of the other ancillary industries and services that accompany the Post carbon society.

Given the limited availability of public resources, private resources must be mobilized to invest more in research and education. To do so, a new pact should be made between the business and research communities that can overcome the traditional barriers in Europe that have long separated these two sectors. And this pact is needed not only to attract more resources, but also to orient research and education towards grand challenges. This will require a profound rethinking of the research endeavor, blurring the boundaries between disciplines to become interdisciplinary, between basic and applied research to become innovation driven, and between organizations to pool together fragmented resources to achieve the needed critical mass.

To advance these goals, the Commission is bringing forward a series of initiatives to make the Lisbon Strategy a concrete pillar of the new post carbon society. The European Institute of Innovation and Technology will be a laboratory to pursue new educational programmes, provide needed skills, as well as create strategic partnerships between the business community and the research and education communities to advance the new energy paradigm. The Institute aims at inspiring and driving the changes and reforms needed by European knowledge intensive organizations to fully contribute and benefit from the Post carbon society.

4. Conclusions

The Post carbon society makes possible a New Social Europe in the 21st century. The European dream, which lies at the very heart of the New Social Europe, emphasizes social and human rights, balancing the social and market models, and building bridges of cooperation and peace. Underlying this expansive new dream of a 21st century social Europe is the commitment that millions of Europeans share to create a just and sustainable society for their children and future generations.

The recognition that consumption of oil and gas fuels is not sustainable in the medium term and the impact of climate change on communities and ecosystems may endanger our vision for a social Europe. Without a well-thought-out plan to usher in a Post carbon society, the hope of a New Social Europe will begin to fade, putting the European experiment in jeopardy. The Post carbon society, therefore, is the base upon which a New Social Europe can be built. Together, the Post carbon society and a New Social Europe offer a compelling narrative for the next 50 years of European integration.

By articulating a clear social vision to advance the Post carbon society, the European Commission will help take the European project to the next stage of its development, and, in the process, bequeath a powerful legacy for future generations in Europe. The new politics provides the EU with an opportunity to become a beacon of hope for the rest of the world in the 21st Century.

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