

*A great energy era is ending | New energy attracts new investors*

Business, Politics & Culture

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**Jeremy Rifkin**

*We are in the twilight  
of a great energy era*



Can Europe lead the world into a “third industrial revolution” – one that will take us away from disruptive centralised power systems into a new age of energy-producing buildings, distributive power and smart grids? There is no other choice, says Jeremy Rifkin. ‘We have a window of about ten years.’

## The Rifkin vision

*‘We are in the twilight of a great energy era’*

| By Hughes Belin

Perhaps no other author or thinker has had more influence on the EU’s ambitious climate and energy policy than the famous American “visionary” Jeremy Rifkin. For the past several years, he has been advising the European Parliament and successive European presidencies, including that of Germany’s Angela Merkel, on the necessity of what he calls the “third industrial revolution”. His ideas have found their way into last year’s declaration of the European Parliament calling for a third industrial revolution and into the Energy Vision Paper presented in November last year at the European Council meeting, to accompany the European Commission’s Strategic Energy Technology (SET) Plan. Currently he is advising the new Spanish government. European Energy Review had a long and intensive conversation with the American who has become a champion of the ‘European dream’.

**What is the central energy question policymakers are faced with in your view?**

When Chancellor Merkel became Chancellor of Germany, she asked me to come to Berlin to debate the question ‘how do we grow the German economy in the 21st century?’ The first thing I asked the Chancellor was ‘how do you grow the German economy or the European economy, or for that matter the world economy, in the last stages of an energy era?’ This is the central question for not just the business and the political communities but for the human race. It is very clear now that we are in the twilight of a great energy regime of coal, oil, natural gas and uranium. And we have four critical problems: climate change; increasing debt all over the world, especially in the developing nations where the price of oil and gas continues to spike; increasing political instability in the oil producing countries of the Persian Gulf; and peak oil.



So what about the first problem, climate change? I don't think we have grasped the enormity of this. I'm talking about governments, heads of state whom I advise, CEO's and the public. When the fourth Intergovernmental Panel on Climate Change (IPCC) assessment report came out in January, what was so clear to all of us was that everyone had underestimated the speed of climate change at every step of the way because we had not been able to anticipate all of its subtle feedback loops. New data now shows that the permafrost is melting. The whole Arctic-Siberian continent is permafrost-covered. It's a burial tomb for all the carbon deposits of the pre-Ice Age. What we did not anticipate is that the carbon entombed in that permafrost is going into the water and coming up as methane, which is 22 times more potent than carbon. There are more carbon deposits in that burial ground from a previous period in history than all the rainforests in the world. It's a catastrophic release. It's happening now.

*What will be the consequences?*

A recent report from James Hansen, chief climatologist at NASA-Goddard Space Institute, and others said that if we don't go to 350 carbon parts per million we will see the demise of civilisation as we know it, perhaps within this century. He's saying if we hit just the targets that the EU wants to hit now, we could go to a 6°C increase in this century. That's just devastating. The

## *We can actually create buildings that produce more power than they use*

context is that 3°C takes us back to the temperature on earth three million years ago. Two to three degrees and we risk between a third to 70% of our species becoming extinct in maybe less than a century. We have only had five waves of biological extinction on this planet in 450 million years. And every time we had a wipe-out it took 10 million years to recover the biodiversity loss. The bottom line summary: I don't think we're grasping the enormity of this. If we did, we would have a global emergency and we would be operating in a very different mode than we are now, even among those who are the most enlightened.

*And that is only one of the four issues of high concern you raised. What about peak oil?*

As you know, peak oil is a petro-geology term that means that half the oil is used up. The optimists might say we are going to peak between 2025 and

2030 and the pessimists say between 2010 and 2020. Some have said we already peaked. I have no clue who is right but it makes no difference: there's only about a ten or fifteen-year gap between the pessimists and the optimists. That is the smallest window I can imagine to change the entire energy regime, the whole infrastructure built on it and all the goods and services attached. Once half of the oil is done, the prices are simply unaffordable: that's the end. Getting back to Chancellor Merkel, that's why the question is 'how do you grow an economy at the end of an energy era?' So with that as the context, we have a very sober scientific diagnosis. Nick Stern gave us a stern economic warning that we'd better heed this diagnosis in the business community.

*What can we do then?*

What we need now is an economic game plan that might be sufficient to address the enormity of climate change and peak oil. The great economic revolutions in history occur when two things happen. First, a basic change in the way people draw on the energy of the planet. And then second, a basic change in the way people communicate to organise new energy regimes. The convergence of energy revolutions and communication revolutions creates the really pivotal points in history. Everywhere we created hydraulic civilisations in history, independently, people created writing: the Middle East, China, India, Mexico and now the knot systems that they put together in Peru. In the early modern era, the print communication revolution converged with coal, steam and rail to create the first industrial revolution between 1820 and 1880. In the early twentieth century, the telegraph and telephone converged with oil and the internal combustion engine to give us a second industrial revolution. So now I believe we are definitely on the cusp of a third industrial revolution. I'm not sure we can get through the door in time but I don't think there's a plan B.

*On what would the third industrial revolution be based?*

We've had a very powerful communication revolution in the last fifteen years and it's what we call "distributed" communication. Anybody can communicate with anybody in the world in any ratio – one-to-one, one-to-many, many-to-many. What we will begin to see now is that this distributed communication revolution will begin to converge with a new energy regime.

*Do you mean "distributed" as in distributed energies? Because the term "distributed" is very loosely used now.*

Yes, you have to contrast them to elite energies. The



elite energies are not found in the backyard; unless you are lucky you don't have coal, oil, gas and uranium in your backyard. They're only found in certain regions of the world and they require a huge political, military and capital investment. And they are always organised from the top down: they are centralised. Now, distributed energies are in your backyard: the sun, the wind, garbage, agricultural and forestry waste, ocean waves and tides on the coast – and most of our urban populations are on the coast – geothermal, hydro, biomass; these are all distributed.

How do you collect these energies? They are distributed all over the world.

Right now, the big solar parks on the continent and wind parks in the Atlantic employ the centralised approach used for energies in the second industrial revolution. I do not oppose that in the short run. Those are sometimes easier to get online and they buy you some time. But you could not run the entire economy on centralised renewable energies. The key is renewable energies are distributed and found everywhere and this is where the second pillar of the third industrial revolution comes in: the buildings and the infrastructure. We have to imagine that every building is a power plant. Solar roofs, wind turbines, garbage on site that can be converted into energy, agriculture and forestry waste, ocean waves and the tides on the coast, geothermal and hydro. Acciona in Spain and Bouygues in France are putting up

buildings that load local renewable energy on site and produce positive power. The construction industry is the centrepiece of the European economy: it is 10 to 20% of the GDP of Europe and it provides 10% of the employment.

And how do we store this energy?

That's pillar three. That's where hydrogen comes in as a universal storage carrier. We would use other storage methods for niche purposes but hydrogen will be the

### *You could not run the entire economy on centralised renewable energies*

universal carrier. It can carry and store renewable energy, much like media that is stored in digital binary form and then converted back into the other forms of media. There are losses but that is thermodynamics. Losses are enormous with centralised energies. With some forms of renewable energy, you can even get the hydrogen directly: with biomass you don't have to go through electrolysis.

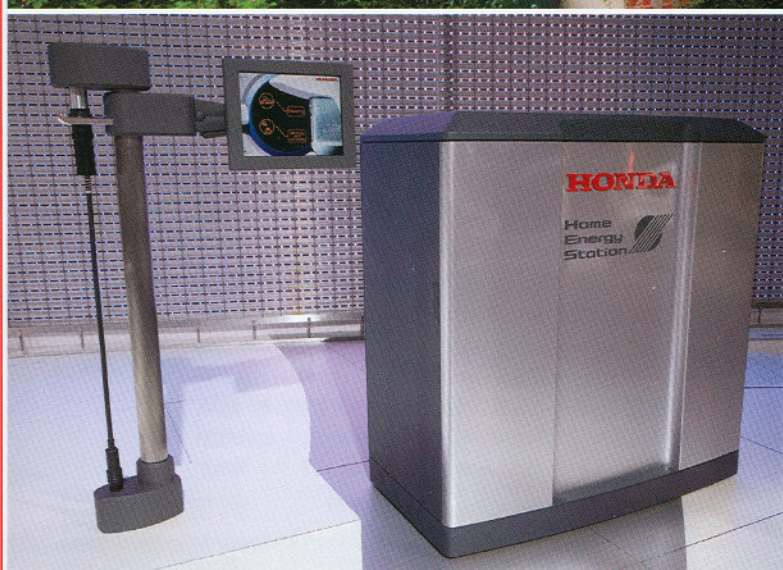
So what is the fourth pillar?

It connects the communications revolution to the energy revolution. How do we distribute this energy in and around the entire European Union? We take

*Meat production is the second major cause of climate change. Photo: David Stoecklein/Corbis*







Decentralised renewable energy production has the future.  
Hydrogen can be used as a storage carrier.

the same technology that we used to create the internet and we make the power grid of the EU smart, distributed and intelligent, just like the internet. I call it the "intergrid". Some call it "smart grid", some call it the "intelligent utility network". So when millions and millions of buildings are producing their own locally generated power, stored in the form of hydrogen, the way we store digits in the form of media, the smart grid allows us to share liquidity of energy across the entire European economy and associated regions. It's power to the people. It is the third industrial revolution.

It is science fiction!

No, this is critical and answers the question that every head of state and CEO is always asking me: 'How can you run an entire world on wind mills? And solar roofs, and garbage, and agricultural and forestry waste, and ocean tides and waves, and geothermal, and hydro?' We could not have answered that question seven years

ago. Now we can because in the last seven years we have had a new IT revolution called "grid technology". We can now connect tens of thousands of little tiny desktop computers. And when we connect them, the distributed computing power connecting those tens of thousands of little desktop computers exceeds by a magnitude any kind of computing power you can get from the most expensive centralised super computers placed anywhere in the world. That's the value of distributed power. We can now do that with the power grid.

So if it is not science fiction, how will we ever get there?

I think it's the next step of European integration. Europe started with energy: coal, steel and atomic energy. When asked to come to the fifty-year anniversary of European integration, I asked, what's the next fifty years for Europe? It's energy security again. But this time, Europe leads the world into a third industrial revolution. Europe has a golden goose: you have 500 million consumers in the biggest internal market in the world. You have an additional 500 million people in your associated regions into the Mediterranean, the Middle East and North Africa. And you have the most powerful currency in the world.

That's why you've come to Europe to spread your word?

Yes. I've spent a lot of time here but in 2002 I made the decision, after talking to Romano Prodi, to spend



50% of my time here because I believe the EU is the laboratory – with all of its faults and I'm not naïve about Europe – but the EU has the dream that I think is both compatible with globalisation and compatible with getting us into a third industrial revolution. And that dream is quality of life, sustainable development and human rights, balancing work and play, as well as the market and social models, and building peace. What you don't have is that you are not integrated logistically. If you can have a seamless transport grid, power grid and communications grid with an energy regime that is local but interdependent across the EU, you'll not only be off the old regime, but you'll have a sustainable-development model that can be exported to the rest of the world.

**What about the conversion to this new energy regime and logistics? It cannot be from one day to another.**

You have to be on two tracks at once, this is not "either/or". The EU last year made a commitment to the 20-20-20 rule. The first two 20s (20% increase in energy efficiency and 20% lower carbon emissions) are to clean up the traditional energies by making fossil fuels and uranium more efficient, and reduce the carbon footprint- that's track one. The third 20, which is, track two, is 20% renewable energies by 2020, which means 35% of electricity from renewables by 2020. That's pillar one of the third industrial revolution. The IPCC says the world has seven to ten years to create one roadmap, one model for the entire world, for the rest of the century. Everyone has to be on the same map and we can't afford any mistakes. We're already making big mistakes.

*I'm not sure we can get through the door in time but I don't think there's a plan B*

**Such as?**

First was corn, the biofuel mistake. This is a monumental mistake in the US and the EU would be better off not going down that path. Scientists like David Pimentell have done studies for years showing the amount of energy required to produce the corn results in almost no net-benefit gain on the energy when the ethanol is finally processed. But what's worse, it forces basic changes in the land-use pattern for arable land. The price of food goes up because the arable land is being used for corn for biofuels. As more arable land is used for biofuels, we then are using more marginal lands in order to produce food grains or for cattle pasture, and then we are deforesting. And that means more CO<sub>2</sub> is being released. Corn is a loser but now we're locked in and American politicians are reluctant to say anything about the corn-based ethanol because of the votes.

**Other mistakes?**

You know, there are three great causes of climate change. One year ago, the German government asked me to do the opening address to the environmental ministers' meeting during their presidency. We had 27 ministers there. I said, 'Do you know what the three major causes of climate change are?' What do you think they are?



Current renewable energy projects still employ a centralised approach. Photo: Econcert



### Energy, cattle...

You got it. Buildings are number one, meat production is two, and worldwide transport is three. Livestock accounts for 9 percent of human induced CO<sub>2</sub>, 65 percent of nitrous oxide, and 37 percent of methane. There has not been one government leader, not one party leader, not one CEO who has made one speech about the second cause of climate change in the world. Not one. Rajendra Pachauri, IPCCs chairman is the only actual public official in the scientific community



*The melting of the tundra may release vast quantities of methane*

who has said that publicly, as far as I know. How come we're doing nothing on number two? Now here's why I raise this: dealing with meat production would also deal with the biofuel issue. One third of the grain in the world is feed grain. Two thirds is food grain. All the arable land is pretty well taken up in the world. We can't eliminate food grain because a billion people are already hungry because of the price going up. What could you eliminate? Feed grain for animals. We're omnivores, meaning we're designed in evolutionary terms to consume large amounts of fruits and vegetables and very small amounts of meat. So what we need to do is discourage meat production. If we're willing to tax petrol and fuel and energy, why aren't we willing to tax feed grain and meat?

**Do you realize that you are spreading your message right in the middle of a 'nuclear renaissance'?**

Nuclear is not going to happen. I work with some of the biggest power and utility companies in the world. Here's what doesn't square: there are 439 nuclear power plants in the world, producing 5% of the energy we use on this planet. That's all. They're all grandfathering out, they're pretty old. Does anyone believe that we're even going to replace the 439 existing nuclear plants in the next 25 years? To affect climate change, nuclear power would need to be responsible for 20-25% of the energy mix. For this you'd have to build 2,000 nuclear power plants. You'd have to put three nuclear power

plants under construction every 30 days for the next 60 years. That's the math. And we still don't know how to get rid of the waste. In the USA, we just spent 18 years and \$8-9 billion building the Yucca Mountain vault and it's leaking before we put in any nuclear waste. We could face uranium deficits between 2025 and 2035, according to the International Atomic Energy Commission. We could recycle uranium to plutonium but then do we want plutonium all over the world in an age of terrorism.

Then the big one; this gets to France. This is what every utility company knows: we don't have the water for nuclear power. Some 40% of all the fresh water consumed in all of France goes to cooling the nuclear reactors. Now, when the water comes back heated, it dehydrates the lakes and streams that are already affected by drought. Because of climate change, we don't have enough water to provide for nuclear power and provide for irrigation and water for people. Maybe they'll build fifty nuclear power plants. I can't imagine them building a hundred. They're certainly not going to replace the existing 439 nuclear power plants. And that still keeps us at 5% or less of the global energy contribution.

**What about carbon capture and storage?**

I have a global team consisting of some of the best scientists in the world and I've asked them if it is commercially feasible to capture the carbon. They said not at the present time. There is no commercially viable way to capture the carbon and that is why President Bush invested over a billion dollars into carbon capture and storage. They abandoned the entire project two months ago. The Department of Energy said it's not commercially feasible. It may be possible at some point to do this but then the question is where would you store all that CO<sub>2</sub>? The Earth's plates are shifting all the time so if you place massive volumes of CO<sub>2</sub> in one period of history underground or under the oceans, there's no way to assure that it's vaulted in for another period of history. What we're getting here is pipe dreams at the end of an energy era. What we're getting here is denial. What we're getting here is desperately trying to hold on to the old centralised energies and trying to create a political and public stance around them in order to convince everyone that everything's okay and we don't have to make big shifts in our way of life. It keeps us from what we need to do. I do think we need to make traditional energies more efficient and reduce their carbon footprint. But if we move heavily into coal-fired power plants with some idea that down the line we may find a way to make it commercially feasible to bury the CO<sub>2</sub>, that's not the right way to go into the next period of history. That's



## *If we grasped the enormity of the problem, we would have a global emergency now*

a mistake like corn-based biofuel. You can't make too many of these mistakes. The window gets narrower each year. We've got ten years.

**What did you achieve so far with EU decision-makers?**

Last year the parliament passed a historic written declaration calling for the third industrial revolution. Leaders of seven political groups signed it. Then in June, Spanish Prime Minister Zapatero, whom I advise, told me to go to see Portuguese Prime Minister Socrates, the forthcoming EU Council President. Socrates said, 'during my presidency, bring in your global team, let's work with our folks and see if you can help us with a vision paper that would go with the Strategic Energy Technology (SET) plan and the energy and climate plan for the Council.' My team came in, as well as other contributors. We put together a 35 page white paper calling for a vision of a distributed-power revolution.

**Another vision paper...**

Then, in December 2007, we brought a group of business leaders and a few of the chairpeople of the EU technology platforms together, in President Barroso's office, to say 'look, we now need the technology platforms'. There are 26 of them and they

are supposed to be the economic and R&D engines for the future of the European economy. We found 12 that were essential to lay down the infrastructure for a third industrial revolution and then asked their chairpersons: 'would you come together?' And we began a network, a third industrial revolution inter-technology-platform group that could begin to interface. It must be interdisciplinary so we can actually have a roadmap here for the energy and climate change packages. I spent some time with many EU commissioners, telling them we are going to need to create an economic narrative that frames all the components of the Commission's legislative initiatives and the Council's mandates. So far there is no roadmap but once you lay out that narrative, as I have with CEO's, they then can start understanding their strategic partnerships and how to proceed. I am also advising the Slovenian presidency. We'll see what happens in the June European Council meeting.

We know we have to go to renewables. We can do it now. We can actually create buildings that produce more power than they use. Then we have to store the power in the form of hydrogen for use as a transport fuel or for conversion back to electricity for distribution via the smart grids. Then we can create more distributive power than centralised power - this is not rocket science. ■

### Who is Jeremy Rifkin?

Jeremy Rifkin, born in 1945 in Denver, Colorado, has written 17 books over the last thirty years, including *The Hydrogen Economy* (2002) and *The European Dream: How Europe's Vision of the Future is Quietly Eclipsing the American Dream* (2004). He is president of the Foundation on Economic Trends (FOET), whose Sustainable Development Team has advised governments the world over. Most recently, Rifkin was an advisor to the Slovenian, Portuguese and German governments when they held the EU presidency. He has also been instrumental recently in assembling a formal network of 12 European technology platforms into one "super-platform" which aims to 'integrate their various scientific and technological initiatives into an overarching narrative that can help usher in a third industrial revolution'. More information on [www.foet.org](http://www.foet.org).



Photo: Thierry Monasse