

LOGISTICA SOSTENIBILE: NECESSITÀ OD OPPORTUNITÀ?  
*Imprese e Pubbliche Amministrazioni a confronto*

Torino - Centro Incontri Regione Piemonte - 28 novembre 2005

Prof. Jeremy Rifkin

The great economic revolutions, the really big ones, they occur when two things happen, first a basic change in the way we organize the energy in the planet, and secondly a basic change in the way we communicate with each other to organize the energy regimes. The coming together of new energy regimes and new communication regimes to organize them, those are the pivotal points in history. They change the human equation, they are very infrequent and when they happen, the world is never the same again.

Example: ancient Iraq, Sumerians. The Sumerians were the first to create sophisticated hydraulic agriculture. Stored rain became the primary energy for civilization. But when the Sumerians went to hydraulics and agriculture, it was complicated. It required a new kind of communication between people to organize this agricultural system, it was called cuneiform writing. The coming together of writing and agriculture and a new communication form for a new energy regime, stored rain, had a ten thousand years accelerator impact, the Agricultural Revolution.

Skipping to the early modern era, Gutenberg reinvented the printed press. Chinese already had it, but Gutenberg was a better engineer. The printed press was an economic orphan for two centuries, it had no economic mission, it had a social mission, when they began to mass produce Bibles in vernacular language, it created a great schism in Christianity, it gave birth to the Reformation, the Counter Reformation, social upheavals, religious strives across Europe. But the economic mission of the print press didn't become clear until James Watt created the steam engine at the dawn of the Industrial Revolution. We went to coal and steam power, we increased the pace, the speed, the flow, the connectivity and the density of human exchanges. Logistics is all about spatial, temporal reorientations. Let me back up for a minute: in my new book "The European Dream" and in my last book "The Hydrogen Economy" I mention a fact, the great shifts in human consciousness are temporal and spatial, we are tool-makers, we create tools to extend our body, to compress time and space, so we can exchange quicker between people: that's logistics.

So for example a bow and arrow, extends my throwing arm, a locomotive extends my legs, a computer extends my brain. Through history we have created new technologies to extend our physicality so that we compress time, shorten distances and increase the exchange between people: it's called logistics.

When we went to steam power and coal, we were squeezing the speed, the pace, the flow, the density of exchange between people. Complicated. It required a new way of communicating to organize it. In the 20<sup>th</sup> century the telegraph and telephone, and electricity became the command and control mechanism to organize the second industrial revolution. The internal combustion engine, the highway culture. When we shifted from steam, power coal and rail logistics, to the internal combustion engine and the highway culture we had to have electricity as the command and control mechanism to organize the interchange and the exchange between people. Why am I mentioning this? We cannot even begin our revolution in logistics, until we understand the following: there has been a great revolution in communication in 1990s, personal computer, the world wide web, the Internet, satellite and wireless communication, we have ousted the central nervous system of the human beings, I can connect my central nervous system to a billion people on the Internet at the speed of light. We have done it in less than 15 years. Imagine the enormity of this, two hundred years ago your great-great-great-grand-parents, the average amount of people they would be in contact with in their lifetime was 200 people, may be 500 maximum. And the amount of information in one weekly edition of "La Stampa" is more information than your great-great-great-grand-parents had in their lifetime, because most of the information was on the stained glass windows of a local dome. So in the last 10, 15 years we've greatly sped up our ability to exchange information and transportation between people. We have connected the central nervous system of a billion people. Of course the downside is stress, stress-related diseases. The hallmark of this generation is stress-related diseases, stroke, cancer, and diabetes all the way to the nanosecond culture. The fast exchange, the over-stimulation, so we created a great communication revolution in the 1990s first the computer, the world wide web, the Internet, wireless satellites, wi-fi, what has this got to do with logistics? Everything. We could have not organized the rail culture, rails without the telegraph, because the telegraph allows logistics to be organized. So you could take a railway no matter where it was and communicate, the telegraph was essential to the rail. This communication revolution, that we are now in, has a deeper mission. It is going to be in logistics in the next two or three years, this decentralized communication revolution in the 1990s gives the command and control mechanism, the organizing mechanism for a new energy regime. For making a shift from fossil fuels to renewable energy, stored hydrogen, a hydrogen economy. Hydrogen is the basic element of the universe, and when you burn hydrogen you get two by-products, pure water that you can drink right out of the exhaust, and heat. With the hydrogen economy we finally have an exit strategy from carbon-based fuels. Coal, oil, natural gas, they all emit CO<sub>2</sub>, and with the hydrogen economy we have an exit strategy, finally for carbon-based fuels on this planet. What is the relationship between this communication revolution in the 1990s and hydrogen

economy? A fuel cell powered by hydrogen develops a renewable energy; a fuel cell powered by hydrogen gives an address to a personal computer. Understand this and you understand the future of the logistics revolution. With a computer you and I, we generate more information, we are the producers, we produce all the information that I share with all of you, it is a horizontal communication revolution. Try to imagine a fuel cell and then hundreds of millions of fuel cells twenty five years from now. I remember when they asked Mr. Watson the CEO of IBM, how many computers will the world need, he predicted four, he was a little off, we produced hundreds of millions of computers in less than 25 years and now they are cheap enough for the Third World. Try to imagine in 25 years from now, hundreds of millions of fuel cells, portable fuel cells, that I can take with me on my wallet, stationary fuel cells in every home, in every office, in every commercial store, in every factory, every automobile, every truck, every railroad, every vehicle in the world has a day job and a night job. It's a vehicle for transport when you need it, it is a power station on wheels when we want to plug it in. Now, try to imagine hundreds of millions of fuel cells powered by hydrogen from renewable energy, I generate power with my fuel cell, in my home, my industrial park, my producer cooperative. I don't need a surplus, I send it back to the grid and share in larger loads with others, but when we do, we have to shift the grid, the power across Italy, Europe and the world is centralized it is like the communication grid was 30 years ago. Here is when the communication revolution comes together with the energy revolution. We are going to have the same hardware, the same software, the exact same architecture that we created in Silicon Valley for the communication revolution, and we are going to redesign and reconfigure the whole power grid in the whole world in the next 25 to 30 years using the same software, the same hardware, the same markets, the same architecture that we created for the Silicon Valley for the computer revolution.

So, when I generate power with my hydrogen fuel cell I can take the surplus that I don't need and if the price of the electricity on the grid is higher than the price that it costs me for the hydrogen, I can send my surplus energy in real time, back to a smart grid, just like a world wide web can share. This is power to people, this is going to have a significant impact on civilization as we went from centralized communication to millions of people being their own producers of information. This is the third Industrial Revolution, the coming together of decentralized communication, a distributed generation of hydrogen; it should have a multiplier effect.

As the coming together of print, as communication modality for steam, coal and rail producing the infrastructure of the 19<sup>th</sup> century, we had a century multiplier effect and we called it the first Industrial Revolution.

The coming together of communication and distributed generation of hydrogen, should be as impact full as the coming together of the telegraph and telephone as the command and control for the automobile and the highway culture and the internal combustion engine.

In the two first industrial revolutions we went from steam, coal and rail and the print communication and vehicle, we went from fuel economy to market capital, we shifted from little city states to national markets, we went from monarchy to democracy, now imagine a horizontal brain revolution distributing communication with power to the people. It is going to change the institutional relationships. The command and control mechanisms are still hierarchical, top down, because the energy regimes of coal and oil were centralized and top down. When we move to generate power regionally, and distribute it locally, across regions, it flattens the old power relationships, it changes the human equation. Third Industrial Revolution: exit strategy. A whole world run by oil, top logistics run by oil, we grow our food fertilized in pesticides from oil, our plastics and building materials are derived from oil, our synthetic clothes are petrochemical based, our pharmaceutical products are primarily petrochemical based, our power, our transport, our light are derived from oil.

We know got three problems: logistically, they are all historical in dimensions: global warming, the Third World gap and the increasing geopolitical problems in the Middle East.

Global warming, is the dark side of the industrial revolution. Some of you may have read a book that I wrote 25 years ago called "Entropy".

How many engineers are here? Logistics, and how many engineers? Well engineers know when economists don't know. I always said that our engineers teach our economists about economics. Economy is all about energy issues, but most of our economists don't know anything about these issues.

We have been spewing carbon dioxide now for two hundred years, coal, oil, natural gas, we have been digging up the burial ground of the Jurassic Age and used its stored energy, we powered the logistics of modern industrial life, we compressed the space, we decreased the prosperity of 20% of the human race at least, and now we pay the bill.

Global warming, increased CO<sub>2</sub> in the atmosphere. This week my friends, two days ago, the Journal of Science, the premiere scientific journal in the world, published a study. This study is the single most devastating piece of news in my lifetime, and I am 60 years old. It appeared inside the New York Times a couple of days ago. What I am about to tell you is the single most devastating statistics. How many heard about this statistics? No one. They went back into the geological records digging down into the Antarctic snow basin, way down under, to look at the geology of the last 30 years. And do you know what they found, the scientists? That the concentration of global warming gases in the

atmosphere today, this morning, copper oxide, methane, nitrous oxide, and more, may be because of human use, industrial use, the concentration of global warming gases on our planet, in the atmosphere, this morning is greater a concentration than in any time in the last 650,000 years.

This is the single most devastating statistic that I have read in my lifetime.

Our scientists tell us that the on one hand there is an increase of 2 to 3 degrees Fahrenheit in temperature in the next century, global warming, on the other side we may see 6 degrees, 7 degrees, 8, 9, 10 degrees or more.

If it is the low side 2 to 3 degrees Fahrenheit, it is going to be devastating but we can probably control it, if it is anything more than 6 degrees I have no solution to offer you. That's why the statistic was so alarming. The other complication, only 9 degrees Fahrenheit of changing temperature puts us as we were fifty thousand years ago, when half of the planet was under ice. Our scientists have told us to look for the challenges of signs of global warming, the ice cap will begin to disappear quickly on the great ranges of the Alps, of the Kilimangiaro and the Andes, it is happening faster than we project. They said, look to the Arctic you will see the ice melting quickly from the Arctic and we should see a lake by 2050 for the first time in history.

And they said look to the Gulf of Mexico and the Southern Atlantic where the Gulf Stream is, you will see an increase in the intensity of the hurricanes in the Gulf Region and in the Caribbean.

Two weeks after Katrina hit the Gulf coast, the journal had just published a study.

Hurricanes intensity has doubled in 30 years, just like the predictions. New Orleans and the Gulf, Katrina and Wilma, this was global warming in real time, we are in real time now of global warming. That's the bill of the Industrial Age. Perpetuating a logistic revolution that has allowed us to change between people quicker by using fossil fuels. And the National Academy of Sciences published a study a couple of years ago. And said we expect global warming year after year, but the geological records showed something very different. How many of you saw "The Day After"? And you thought it was science fiction. But actually it's more serious than that. When you look at the geological records according to the National Academy of Science, the most prestigious scientific body in the United States, they found that one third of all the most impressive changes in the climate occurred in less than ten years.

What the scientists are worried about is that the green way of ice sheet is melting so quick that is coming down to the Gulf Stream and can eat up water, that water would be cool quicker, and if it's cool quicker there would be a tipping point.

If you can imagine the human economy in terms of sheer impact we have to say that the global warming is the greatest single accomplishment in the hands of the human beings. The negative part,

but we are now affecting the entire chemistry of the planet. Third World gap: the oil, we sell oil at 60\$ a barrel here in Italy, what do you think going down in Africa and Asia? 90 countries are worse off today than 10 years ago. Back in the 50s and 60s our economies recently liberalized from old colonial rules, modernized their economy with oil: it made sense. Oil is a commodity, you are all logistic people: do you remember what oil was selling for in 1973? 3 dollars a barrel. It was a commodity. None of us anticipated OPEC, within 12 weeks after OPEC imposed the oil embargo, the world oil went from 3 to 12\$ a barrel, since then the price has never come down. For 30 years Third World countries have been desperately borrowing money from the World Bank, the IMF and other lending institutions to try to pay for the increased price of oil in the markets, they can never catch to the price. Today 83 cents out of every dollar is used to pay off the debt. Never before in history we had a divide between the "haves" and the "have not" as we have today. And you could trace it to oil.

In Ancient History there wasn't a great divide, because we were hunters and gatherers, we had no stored rain we had no way to create surplus, we were mobile, so there wasn't a big divide between those who had and those who did not.

We didn't create the idea of surplus until we created power, with power you can store rain, then you can have the haves and the have not, those who control the power.

If you go back from Ancient Antiquity to the Early Modern Era, to the early 20<sup>th</sup> century you'll never see a divide as we see today. Today the 350 wealthiest people in the world, you can put them in this room, their combined wealth is equal to the income of 40 % of the human race. The 3 richest people in the world, Mr. Gates, Mr. Warren Baffin and the Wal-Mart family, three families, their combined wealth equals the annual income of 940 million people. Oil is what boosts the economy, what we need to understand is that if that comes like that, if we don't see the point of boil, this is increasing the divide between the haves and the have not, the connected and the unconnected.

Third world debt, the oil crisis, global warming, the oil crisis, Middle East, oil.

I was one of those who gave President Bush the benefit of the doubt; my wife said I was naïf.

I believe, that he believed that there were weapons of mass destruction in Iraq. Because, Mr. Cheney, Condoleeza Rice etc., had an agenda and he did just what they told him.

The former secretary of treasury Mr. O'Neil, at the 2<sup>nd</sup> week in the office of the Bush administration at the National Security Council in the Oval Office, they rolled out the oil map in Iraq to divide up the oil.

This is a dangerous geopolitical game, like in Asia with Viet Nam. We can't stay in, we can't get out. And now we reiterate a whole new generation of terrorists. It's going to take a whole generation to deal with. Middle East, terrorism, oil.

Global warming, as logistic people you have got another problem. That's why you are here today. Oil is selling at 60\$ a barrel, when I wrote the "Hydrogen Economy" in 2002, oil was at 25\$ a barrel. I had predicted at 50\$ a barrel this time. All said: "Mr. Rifkin, you are such an alarmist, 50 dollars a barrel, no way", including the oil institutions, but we are now at 60\$ a barrel. And the IMF says, logistic people, that you will stand or fall, based on price of oil here.

The IMF says the price of oil is going up every single year for the next 25 years. Golden Sachs says expect, 80, 90, 100\$ a barrel. We are not just in real time global warming; we are in real time energy peak.

The last energy crisis was supply-driven, this energy crisis is demand driven. The bottom line: we are using 3 barrels of oil in this planet, for every barrel we discover. That's the bottom line.

Peak is a geological term, peak is when half the oil in the planet is used up. That's the time of the Hubert bell curve, when half the oil is used up that's the end of the era.

America's peak on this curve was in 1972. There is a big discussion as to when we reach global peak in oil production, the optimists at the International Energy Agency say that if we grow at a 2% rate of growth in demand of oil, which is very conservative, 2% growth rate increase in demand of oil in the world a year, we peak according to the optimists in 2037, that's 32 years from now. That's very quick. In the last several years a dozen of the best geologists in the world, world class, made a simulation model, they have been looking at the numbers. Hold on, they said, we think we may have got the numbers wrong. A new computer study is showing that we may peak in oil production as early as 2010. 4 to 5 years from now.

The pessimists say 2020. I don't know who is right; it does not make a great difference who is right. Twenty years, what's the difference whether we peak on oil in 2020 or 2030 or 2040 as the optimists say? It is just 20 years. In geological terms it is nothing. In historical terms that's almost no window. And what the pessimists and optimists agree on is, regardless a peak, when we do peak 2/3 of the oil in the world.

The energy companies understand this, they diversify their portfolios to natural gas first, but it is still a problem with CO<sub>2</sub>, studies show that natural gas shadows oil in terms of CO<sub>2</sub> and the price as well.

My friends, in real time we can now see the end of the oil era, just like in real time we see the global warming era.

I am sure that in logistics industry every time you are talking about the price of oil.

You are talking about fuels. So what can we do?

So in real time oil peak, 2010 peak according to the studies.

And now new studies, on Saudi Arabia, the former Chief Energy Consultant said, I am not sure the Saudi have all the reserves they said they have. So what do we do? The energy companies are aware of this. Gas is not enough. And many say there are plenty of fossil fuels. We are not running out of fossil fuels, there is charcoal in Canada, they are producing oil now from charcoal at 12 dollars a barrel. And there is Mexico, Venezuela etc.

There is plenty of heavy oil in Venezuela and there is coal around the world. The problem is that they are dirty and they emit CO<sub>2</sub>. More global warming. So if we make a shift to the dirtier fuels we have to re-look at the computer studies that we did and include more global warming. What does it take to get this? When politicians that I don't care like in Italy or in USA, when politicians say we have to think about coal, what are they talking about?

More concentration of gases and global warming than in 650.000 years, this is what they are talking about, is this coal? Or that means we deserve our extinction.

These are the last several decades of the age of oil and again we carry coal from Newcastle, winding down those oil fields in the Persian Gulf, we have a window to a new energy regime: hydrogen.

We get off the carbon cycle not including energy, that's the good news, let me give the bad news: hydrogen is not a primary energy carrier, you engineers know it's a secondary carrier, that is hydrogen is not free-flowing on this planet, we have to extract hydrogen from something else. That's when the thermodynamics comes in. You could extract hydrogen from coal, or natural gas, or oil, you could steam hydrogen right out of a car. In fact most of the hydrogen we use today comes from natural gas, but then you have CO<sub>2</sub>! We could extract hydrogen from coal and the coal industry says trust us, we are the industry of the future: clean coal: oxymoron. And what the coal industry says, we'll steam hydrogen out of coal, and give us enough time, enough money, give us enough research and we will find a way to bury the CO<sub>2</sub> underground. Now, for those of you who smile, your smile is appropriate. First of all there is no economic feasible way to do this. It would cost a 100% of the cost today to bury CO<sub>2</sub>, and you would pay 100% more for coal? 100% more to get the electricity, but let's assume that we do that. How would you bury that CO<sub>2</sub> in underground caverns all over the world, for eternity? This is a déjà vu, of what we did for safety in early 1950s. They said, go to nuclear power plant, we'll build them and give us enough time, give us enough money and we'll find a way to transport the wastes produced logistically so it's safe and we'll find a way to bury it, so that the half life of 10.000 years radiation, it'll stay safe.

Here we are 60 years later and the nuclear industry still doesn't know how to safely transport the nuclear fuel so we have nuclear fuel gathering all around the nuclear power plants in the world. In America we spent 2 billion dollars to create an underground nuclear burial, but is not even open yet,



it's leaking. And it's supposed to be safe for 10.000 years. Remember 10.000 years is supposed to get a civilization. So, we could go to coal, to get hydrogen out of coal but we would get more CO<sub>2</sub>. And we now have the greatest concentration of global warming gases in 650.000 years. Do you want to buy 10 years at the expense of a million? Do it.

We could use nuclear power and the industry says trust us; let's build a new generation of nuclear power plants across Europe and across the world. And it's not doable, first of all because in order to mine the material that's a very polluting process. Secondly, we don't know how to deal with nuclear wastes. In my country the governors will not allow the nuclear wastes to be logistically transported across their states, it's not a political issue, they say no.

We don't know how to bury it. Third, I work with power industry, all over the world, it's one of the biggest powers, and none expect to build a power plant unless it is subsidized. Not even one. Within nuclear power deregulation the nuclear power industries are subsidized.

In the 2000 crash in the stock markets the big hit were telecom and the utility companies lost 1/3 of their equity. So the power companies have lost their liquidity in the last years. The idea of financing a new generation of power plants in the capital market? Forget it, unless the taxpayers subsidize it. It won't happen.

The first attack of terrorists to the Twin Towers was symbolic, to the Pentagon, when terrorists want to be serious, they turn to the power structures, I don't want to tell you logistics people, they are going to go after the heart of the logistics of power.

Those nuclear power plants are a soft target waiting to happen. Any terrorist in the world and there are thousands, can just put a missile in a SUV, go to a mile next to a power plant and turn this into a nuclear bomb.

Is this academic only? Ten days ago in Australia, the Australian government held up a terrorist and what they saw is that they were planning to destroy the main nuclear plant of the biggest urban population in Australia.

And so now we want to talk about building nuclear power plants all over Europe, in America or in Asia and they are soft targets for terrorism, that's nuts!

Just as strange is building a new generation of new coal plants when we have global warming to the extremes. So what's the alternative? Renewable energy, the sun, the wind, geothermal, hydro. Generate electricity with renewable energy and what we do with the surplus we don't need? Take the surplus electricity that you generate and electrolyse it with water. The anode, the cathode electrolyse water, how many of you remember this? What is hydrogen? Stored energy.

And with biomass you don't have to go through that process you can take energy crops, sugar beans they would be the best with corn thermodynamically, you can take agricultural wastes and organic garbage and grab hydrogen directly. Now many people say to me: " Wait a minute, we want renewable energy for our children, but why do we need hydrogen?". Even if we are adolescents we are likely to understand the one to one relationship between renewable energy and hydrogen. You cannot have a renewable energy society for our children without hydrogen.

Hydrogen is a way to store renewable energy. The sun isn't always shining, the wind isn't always blowing, the water isn't always flowing in the river, when there is draught. So that means intermittent energy; that means in good times, when the sun is shining and the wind is blowing, the water is flowing, you generate electricity and take some of the surplus, grab it, electrolyse it with water, grab hydrogen directly and you have spare energy for bad times. And you cannot run transport without energy; you cannot run a truck or a train on a windmill. It has to be stored energy. This is not just theoretic. Do you want to hear about a logistics nightmare? Brazil. Brazil is the only one of the 12 major industrial countries in the world where 92% of the electricity is renewable, hydroelectric, water from the dams. In the year 2001 water stopped flowing out of the dam: draught and I suspect a global warming issue. So the electricity kept going on and off all over the country, no electricity. Had they had hydrogen in place during the good times, with water generating electricity they could take some of the electricity; electrolyse it with the remaining water to have hydrogen. And they would have had stored energy. Renewable energy has to be stored. It's expensive? Engineers we got a big thermodynamic bill yet, to generate electricity twice, correct? Remember, you always lose energy, when someone says you are losing more energy than you gain, I always laugh, and the engineers should laugh, because you always lose more energy than you put out. Question in Brazil and the alternatives. Two bell curves, the bell curve for oil and gas is going up, direct costs are going up, we are heading for a peak in oil and gas, with 60\$ a barrel; we'll never be back to 30\$ again. The indirect costs are now going up, global warming; we haven't even begun to calculate the costs. I was in Germany a couple of weeks ago; do you know how much the Germans have put up for New Orleans? We study to try to calculate the cost of global warming, that is hurricanes and draught and floods and see what arise the cost of damages: it's easy, it's the cost in the range of health impact, you can't even calculate. Eventually, you will have trillions of dollars. That's when you reach the watershed for entropy regime. When the cost of dealing with the maintenance and repair exceeds the value of the net energy, that's when civilizations collapse. When you end up spending more for cleaning it up, like in New Orleans.

So the direct costs of oil and gas are going up, the indirect costs are going up, generating new costs, the US now spend more in securing their oil in the Middle East than the net value of energy they are getting. It was before the war, that was hundreds of millions of dollars.

Meanwhile, the indirect and direct costs of renewable technologies and fuel cell technologies and hydrogen technologies are going down.

Morse law in setting in, we first discovered Morse law in the software telecom revolution. We began to realize that at a critical point the technologies are moving so quickly. That you begin to double your knowledge base at half your costs every 18 months, in the software revolution, there is so much technology moving in R&D. Morse law in the biotechnology revolution, now we are setting in with renewable energies wind, solar, geothermal and hydro, biomass, fuel cell technologies.

Fourthly, while it's expensive to generate electricity twice, with biomass it won't happen, a fuel cell is two and half times more efficient than an internal combustion engine so you can save it at the end of the line. Logistics people you get that? A fuel cell powers DHL trucks or Federal Express trucks or whatever, the fuel cell is two and a half times more efficient than the internal combustion engine.

Because you generate at the end of the line, the end user can co-generate, the heat, gas and you are saving more. You have to look at the entire equation. So, the direct and indirect costs of oil and gas are going up, the direct and indirect costs of renewable technologies, fuel cell and hydrogen is going down, as the two bell curves are approaching we begin to see a window to a new energy era.

But there is no "fait accompli". In order to take advantage of this very small window, which is 20 to 25 years max, may be, we have to mobilize the entire capital base. The public and private resources of the entire planet, to lay down the infrastructures for a new logistics revolution. We've got to begin now. We have to put everything into it. The window is very small and the window is closing quicker than we expect. Yes there are problems, there is a nightmare of problems with the fuel cell technologies, the cost of the materials, we still haven't got. The safety questions are still here: how do we lay down the infrastructure for fuelling safety, who's going to pay for it? How do we deal with the changes in the regulatory regime, how do we shift over the whole power grid. It is one big, enormous, disruptive technology revolution. Fraud, the problems, so what? We could have said the same thing about steam, coal, and rail. And we overcame those problems and laid down an infrastructure in less than 50 years and across the industrial world. We had the same problems when we introduced oil and the internal combustion engine and the telegraph and the telephone. Enormous disruptive revolution moving from steam power to electricity and oil, but we laid down the infrastructure in 25 to 30 years, all over the world. It can be done; the question is the political will and the public awareness to focus from the problem to the solution.

Let me give you timetables, the first portable fuel cell is coming out in January 2007. Hitachi is going to make it. Many other companies may be coming out first with a fuel cell portable making hydrogen out of oil in January 2007. All you have to do is going out and grab it January 2007. And you'll be able to use this hydrogen fuel cell? To power your cell phone and your lap top for 20 days. No plug. Do you know how much money Hitachi is going to make? In Tokyo.

Do you remember when the power went off in America, two years ago, and there was a power black out four years ago in Italy? Do you remember a cover of the "L'Espresso", I like "L'Espresso", and I hope you read "L'Espresso". There was a cover showing the Manhattan skyline, all black, do you remember this? But if you remember there was a building lit, in the darkness. Grand new building, fuel cells: they were lit when the light went off from the Manhattan skyline. Dow Chemicals is a company that buys fuel cells why? Many of the companies that I work with, don't trust that the power companies provide them energy within peak loads. Because of the drop in liquidity, power companies will not have the liquidity to meet peak demand, during peak periods during the year. So many companies say: we can't have a black out. If we lose our production line in England we have an impact in California and we lose millions in terms of programming, and they are just beginning to ask the manufacturers to back up power grids.

Automobiles, trucks, buses, airplanes, the auto industry has spent over several billion dollars to bring fuel cells in trucks, automobiles. Now the environmental community said the automobile companies trucks and buses are tricking us with hydrogen. They are talking about some fantasy not polluting future with hydrogen why? They do not want to give the café standards. The conservation of energy. They are ambitious talking about a future that could be centuries away in order to divert our attention for fuel cells today. Conservation, is a trick?

We change our entire equation.

A couple of years ago the state of California revolted the legislation, and the industry was lobbying against, the legislation of California said, by its Governor, if you want to sell a car in California in the year 2009 you need to have zero emission: that's hydrogen.

Companies sued the state of California, President Bush joined. You cannot lose California the fourth largest economy in the world, it's the biggest single automobile market in the whole planet, you cannot lose California. This week the New York state followed California, zero emissions, and now twelve other states, who buy gas, the Congress, the White House and so on: zero emissions, that's hydrogen. So, the whole industry is racing toward hydrogen Toyota, BMW Fiat, GM, Ford, they are all racing, no one wants to be second in the market, and nobody wants to be the first to test the market. You understand what I am saying logistics? Toyota will be first out, actually Fiat and BMW will be first

out by 2009, they are going to have an internal combustion engine operating with hydrogen, Toyota will be the first out on four wheels in 2010, and GM said they will be out with a truck. Even GM has dedicated in this dead time 250 million dollar a year and full time , to hydrogen, does that sound serious to you? A General Motors car interestingly enough is a conceptual revolution although I think it may be beaten up by Toyota.

GM has an amazing car it is truly amazing. I have to tell you this car looks like a movie spy car, gorgeous, all Plexiglas, beautiful, streamline.

Who's this best design, Fiat of course. This car has more than an internal combustion car, it accelerates at the same speed of an internal combustion vehicle, reaches 250 miles, the exhaust is pure water that you can drink, no carbon dioxide. The car is marvellous you buy a power plant on wheels, that's the concept. GM said you buy a dual-purpose machine; it's a vehicle for transport and a power plant on wheels. You buy the four wheels; when you need and a chassis, and then you snap whatever car you want, you snap on a convertible, snap on an SUV, snap on a sedan.

No steering wheels, no race, no engine. It's run by a joystick, a software. The dot.com car, the dot.com kids. How many of you have children under 18, how many? Every one of your kids can run this car in ten days. It's like video games. They are testing hydrogen on buses and trucks all over the world. But this vehicle has a day job and a night job. We only drive our vehicles especially our automobiles may be 80% or less a day and then we park. Even trucks don't run all day. So, when you're driving your automobile you are using the hydrogen, but what about when you're parked? When you're parked you can plug you truck, plug your bus, plug your car, plug your train back in the power grid. And when the cost of the electricity in a given time of the day in the grid is higher than the cost of fuelling the hydrogen, you sell your electricity back, so you have two jobs. A logistic company becomes not only a user of energy but becomes a net producer and sells it back, you know how many trucks there are in logistics worldwide.

We have to think of the new power grid in Italy and Europe and the world in the next five years, with the same architecture, the same software they have in Silicon Valley it's identical. So the power grid in Italy is smart, distributed just like the worldwide web. So you have two jobs in logistics industry, you both provide transport and you are a producer of power. A couple of months back, I said do you understand the capability of a logistic company? Thousand and thousands of trucks or rail, the actual opportunity to become a producer of electricity a producer of energy? So logistics in the future is going to be dual, you are not just transporting and using other energy you are transporting, producing and shipping in ten years from now, like a producer of energy. If you are there, not I do not see how you can survive in the logistics industry in fifteen years from now. Because you'll have to buy energy

from someone else, why would you want to do that? So let me point out this issue: who's going to control this energy regime? Well it's going to be a little like the Internet, the worldwide web, that control the information. The early pioneers of the communication revolution, said all information is free, we are just talking among computers, we will share information, but then Microsoft came along and said good idea we want share information but to share information use the Window.

The struggle goes on, when Bill Gates goes to bed at night he has two nightmares, he has cold sweat because of Goggle, he has cold sweat because of Linux. One Scandinavian has beaten Gates, Linux is free is a source of information how can he beat first Goggle or Linux?

What about the information, all the companies say we will have encryption technologies, copyright, legislation, but there is only one problem with all of this. Go home and check out what your 13 year-old kid is doing after school, it is a little dangerous, but knock at the door of your 13-year-old boy or girl and ask him what's on the computer screen. There are millions and millions of kids that, all over the world every day, have nothing better to do than figure out how to get all this stuff for free. They can get free the CD, the information. Protecting the information against millions and millions of kids. Who do you think is going to win? It's the numbers that win; you can't beat millions and millions of kids all over the world. So the information and communication revolution has happened, old chaps. It is not bottom up, it's a compromise. When we get together there is a deeper issue because whoever controls energy , controls power.

So when I say the energy companies and the utility companies they are going to control this in time forget, you are going to do it in partnerships, there is room for the energy companies like Shell, BP to use their big pockets to help and develop technologies to move in a hydrogen infrastructure, there is room for the automobile industry to develop technologies for bus, trucks, aerospace there is room for the utility companies that run the sophisticated decentralized peer to peer web type grids. But there is room for the end users. If you are a producer cooperative, if you are a logistics company, if you are a contractor building a residential community, if you are an industrial partner, if you are a municipality, you begin to mobilize the end users to go with the partnership to purchase the fuel cells, to run the local infrastructures and then to create partnerships with local energy companies that run the grid. And the logistics companies, would you ever take thousands and thousands of trucks from a centralized source when you can actually have trucks with the fuel cells, join your partnership with the power company that buys back your energy?

So it won't be bottom up or top down, it is a compromise, it's going to be a win-win, the auto, the chemical industry, transport, producer cooperatives, industrial parks, municipality will have to develop partnerships. I tell you one thing interesting, seven companies have contacted my office, seven

premiere companies, they say we want to create the infrastructure in the region, they are not waiting for Rome, they are not waiting for Brussels, this is just Italy, I can tell you this for other countries too. A premiere company in this region said: "Look the high energy price is going to kill us, we got to be competitive in Italy and competitive globally, we have to have cheap energy, so we keep business here. And we got consumers that cannot afford the petrol costs, how can we develop an infrastructure in our region, so that we become efficient off the grid. How can we then work with local banks in each region to create a regional infrastructure, bringing in logistics company, bringing in local companies, municipalities, producer cooperatives and creating regional programmes so that we can be on the grid and off the grid and sell back to the grid". Then we need to start connecting the regions. There is already in Europe a hydrogen highway, you know this. You know the Roman highway from Amsterdam to Rome, there is a hydrogen highway commission, they gather representatives of regions across the highway to begin set up infrastructures for the fuelling. And from Munich to Rome it can only be renewable, because there is a lot of hydro, up in the Alps, geothermal and there is biomass. So from Munich to Rome we are looking at renewable energy. There is no reason why any region should be behind the gate. Don't wait for Brussels, don't wait for Rome. Let me finish off with some politics. First let me say that the real beneficiaries of this third industrial revolution, the hydrogen revolution, call it clean hydrogen, renewable hydrogen, from coal, oil and gas, nuclear, green hydrogen renewable energy. The real beneficiary is the third world. They don't have power that's why people are powerless. We talk about global connectivity, to talk about globalisation, we talk about connecting the central nervous system in the planet, we talk about logistics revolution, over 60% of the human race has never made a single telephone call. A third of the human race this morning has no electricity, so when we talk about globalisation understand that it's not the possess and the dispossess, the 21<sup>st</sup> century is also the connected and the unconnected, the powerless because they have no power. That means a tremendous opportunity to get this way; the prices go down due to this communication revolution, economies of scale. So we can import to the third world. Every third world country should have solar collectors across every home, factory and office, there should be wind and hydro and fuel cell structures off grid and on grid in the third world countries in 30 years.

Globalisation has failed, why? It was too elite. It only involved 20% of the human race. Those that have electricity. You can't have a globalisation revolution if 80% of the human race is marginal or left out. Because they don't have a stake in the future. We re-globalisation now from the bottom up. How you do it? Electricity. The United Nations did a study in South Africa and they found out that every 100 families that get the electricity 20 new businesses, if we want re-globalisation from the bottom up we have to give electricity to everybody. Then the third world, you produce global, you sell global. We

keep a trade so at every level people are engaged in commerce so that 20% of the human race is then 100%. Good news for the logistics? You bet it. Because you are rising from 20% to 100%. Last thought. In 2002 I presented Romano Prodi, he was then President of the European Commission, I presented Mr. Prodi with a strategic plan, in order for the European Union to have an exit strategy from oil and move to renewable energy and the hydrogen economy, in 25 to 50 years.

He and I met, we discussed it, he gave a green light. We announced a platform for renewable energy in Brussels only 2 billion euros, but a beginning. I believe that Europe is again an atypical point, which is equivalent to the logistics revolution. You have an economic model, an alternative one to America, don't follow the American model. It is a "winner take all", we have a greater divide between rich and poor in history, we got 1 out of 5 people in poverty, we got 2% of adult men in jail, we got consumer that spend more than they make. But you have an alternative model. The alternative model here in Europe, the golden goose, is the integration logistically of the infrastructure. You have the biggest commercial market in the world in potential, you have 450 million consumers in potential, you need an integrated power grid and transportation grid across the EU 25 countries, in 20 years, integrated transportation across Europe. You need an integrated power grid and communication grid to run your transportation grid. You need a single set of policies on capital and labour that's just inoperable in 20 years, and if you can integrate the infrastructure of the EU. Transportation, power and communication so that you can engage and concentrate logistically in 25 states with the same ease as in the 50 states of the US, you have a single market. This is the way to restore the European economy, to maintain the European dream. And to make it sustainable you have the third industrial revolution, renewable energy, stored hydrogen. Transport should be the first lance to make the investment. Because the integration of the transportation grid will make of Europe the number one country in the world. It may happen, it may not happen.

When we developed for Europe the new plan for hydrogen and integrated infrastructure, renewable energy, when Mr. Bush heard that, he said, no America will be the first in hydrogen but this hydrogen is black hydrogen, therefore coal. So hydrogen will be part of the old energy regime, black hydrogen. That puts America 25 years behind. Now here in Italy, I have to tell you, I worked with the business leaders and what did they say, what about coal what about nuclear, that's the wrong way, there are two things: one, how can you save energy in Italy? Except going to coal...The Energy Commission Paper for European Union says if you put together conservation within 5 years you can save 20% of the energy that you use in some countries you can save up to one third of your energy bill.



By adopting a conservation programme managed logistically each region saves 20 to 30% of the energy costs. A region-to-region approach to build renewable energy infrastructure in connected regions.

So you can have gradual energy conservation against high price of oil then use that time for renewable energy and the hydrogen economy in each region.

Restore your economy, lead the European economy and use standards for sustainable development in the world. If the logistics industry can get ahead of this game you can begin to help Europe with an economic infrastructure in which the European dream is a standard for the rest of the world.

The logistics industry should lead.

Thank you and good morning.