

Chapter 2

The Next Economics

Woodrow W. Clark II

Abstract This chapter explains what The Next Economics is about with some specific examples and cases that are expanded upon in other chapters by other authors. The focus is primarily upon the green industrial revolution (GIR) which is the topic of another book that Clark and Cooke discuss in their book, *Global Energy Innovation* (Praeger Press 2011) and will be a book itself due out in 2013. Certainly, there is also a blue industrial revolution (BIR) as one of the chapters in this book illustrates. The point of the GIR (and BIR) requires new way of thinking about a economic paradigm. Clark (2013) discusses some of that in an article that is part of a special issue for the *Contemporary Economic Policy* journal.

Below in this chapter, the basic areas and countries where The Next Economics has been done successfully are referenced with some examples. The case that stands out the most is China which appears to be addressing economic reform moving from the extremes of Communism and Capitalism to a new paradigm while focused on social issues ranging from the environment, climate change, pollution and carbon emissions to health and medical care, aging population, and the continued growth of communities in order to make them sustainable in terms of strong environmental and emissions standards. This chapter sets the stage for other chapters related to a new economic paradigm called “social capitalism.”

Keywords Green Industrial Revolution • Sustainability • Social capitalism

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W.W. Clark II, Ph.D. (✉)

Qualitative Economist, Academic Specialist, Cross-Disciplinary Scholars in Science and Technology, UCLA and Managing Director, Clark Strategic Partners, California, USA
e-mail: www.clarkstrategicpartners.net

Introduction

A Green Industrial Revolution (GIR) or Blue-Green Industrial Revolution of renewable energy, smart green sustainable communities, water and waste along with advanced technologies has started in China and taken the USA by surprise. The EU, South Korea, and Japan had started a GIR over two decades ago (Clark and Cooke 2011). The GIR is the significant paradigm change from the fossil fuels and nuclear power plants of the Second Industrial Revolution (2IR), which has dominated global economics since the late 1890s, to renewable energy in the late 1990s and growing at an extraordinarily rapid rate in the twenty-first century. While the USA had invented and even began to commercialize many of the technologies developed into mass markets by the EU and Japan, it failed in the last two decades to move ahead of corporate interests, while at the same time recognizing the growing importance of climate change for the future (Chomsky 2012).

Consider China which has twelve 5-year plans and is ready to start its thirteenth in 2014. Each plan provides clear and formulated policies, with budgets, to address national, international, environmental issues and their solutions. China has “leapfrogged” into the GIR in order to avoid the mistakes of the western developed nations in a variety of infrastructure areas (Clark and Isherwood 2008 and 2010). Also the USA must look comprehensively into the corporate and political reactions to the 2011 Japanese tsunami and ensuing nuclear power plant explosions in Fukushima, as well as the 2010 BP oil spill in the Gulf of Mexico off Louisiana. The USA and other countries cannot ignore the environmental consequences and economic costs of the 2IR that have handicapped it moving into the GIR. The end result is not good for the American people, let alone the rest of the world.

The deregulation of industries starting in the Reagan and Thatcher eras was a mistake and a completely naïve view of reality from the neoclassical economics of Adam Smith. There has never been a society or area in the world in which the principles of capitalism have been proven to work in reality. Instead just the opposite has been the reality. Chomsky (2012) looks at the history of economics in far more concrete manner. Even the economist in two special issues labels modern economics as “state capitalism” (January 23 2012) and another, soon after that, as the Third Industrial Revolution (April 2012), a theme from Jeremy Rifkin (2004) and his book with that title in 2012. Clark has published several articles and given numerous talks about the Third Industrial Revolution or 3IR (2008, 2009, 2010, and 2011) but prefers to think of it as the Green Industrial Revolution or GIR (Clark and Cooke 2011). Basically, the GIR concerns renewable energy, smart green communities, and advanced technologies that produce, store, and transmit energy for infrastructures while saving the environment.

The point is that the development of the USA into a powerful world leader had a lot to do with its military strength, but also its economic development for over a century in the Second Industrial Revolution (2IR) in which fossil fuels, combustion engines, and related technologies including atom bomb and nuclear power dominated (Chomsky 2012). The growth of the USA started over a century ago with businesses and their owners who control today the economy. There was little or no

competition. But even more significant is that the basis for this wealth is in fossil fuels and continues to be there. Hence, the environment is continuing to be damaged in order to produce more and oil and natural gas causing climate change. But this 2IR retards and places the USA back decades when compared to emerging economics and even some other western developed nations.

As historians have documented the development of the 2IR in the USA, this too was primary based on “state capitalism” since oil companies got land grants, funding, and even trains, transmission and pipelines for transporting their fossil fuels. That governmental support continues today. Consider the issue of the USA getting shale oil from Alberta, Canada and the massive pipelines installed throughout the USA to get the oil processed and distributed. Furthermore, these same companies get tax breaks and credits such that their economic responsibility to the USA is minimal. The argument that America will be “energy independent” with these fossil fuels is false. The USA needs to stop getting its energy from fossil fuels anywhere in the world, including domestically or from its neighbors.

Hence, the argument is that China will buy oil from Canada. Basically, Canada (and the USA) should not even extract oil from the ground, which permanently destroys thousands of acres of land, making them impossible to repair or restore. There are far more and better resources from renewable energy like sun, wind, geothermal, run of the river, and ocean or wave power to provide energy for central power and on-site demands.

Introduction and Background

A Green Industrial Revolution (GIR) emerged at the end of the twentieth century due, in large part, to the end of the Cold War that dominated the globe since the end of World War II. The Second Industrial Revolution (2IR) had dominated the twentieth century because it was primarily based on fossil fuels and technologies that used primarily mechanical and combustion technologies. On the other hand, the GIR is one of the renewable energy powers and fuel systems and smart “green” sustainable communities that use more wireless, virtual communications and advanced storage devices like fuel cells (Clark and Cooke 2011). The GIR is a major philosophical paradigm change in both thinking and implementation of environmentally sound technologies that requires a new and different approach to economics (Clark 2011).

The USA lived in denial about the world “being round” during the 1970s and then again since the early 1990s, which became apparent for both Democrat and Republican Presidential Administrations in their lack of proactive policies globally through the Kyoto Accords and most recently the UN Intergovernmental Panel on Climate Change (UNIPPC) Conference in Kopenhagen (December 2009) and Cancun (2010). On the other hand, in the early 1990s, economic changes in Europe and Asia were made due to the end of the Cold War to meet the new global economy. The Asian and EU conversions from military and defense programs to peacetime business activities were much smoother than that of the USA. Environmental

economist Jeremy Rifkin recognized this change and developed the concept of the “Third Industrial Revolution” in his book, *The European Dream* (2004). According to Rifkin the 3IR took place a decade earlier in some EU countries. He did not recognize that Japan and South Korea had been in a GIR even decades before that (Clark and Li 2004).

At the same time, Clark and Rifkin et al. (2006) published a paper on the “Green Hydrogen Economy” that made the distinction between “clean” and “green” technologies when related to hydrogen and other energy sources. The former was often used to describe fossil fuels in an environmentally friendly manner, such as “natural gas” and “clean coal.” Green, on the other hand, means specifically renewable sources such as the sun, wind, water, wave, and ocean power. In short, the paper drew a dividing line between what technologies were part of the 2IR (i.e., clean technologies such as clean coal and natural gas) and the GIR (solar, wind, ocean, and wave power as well as geothermal). The GIR focused on climate change and replacing the technologies and fuels that caused it; or at least mitigate and stop the negative pollution and emission problems that impacted the earth.

Clark and Fast (2008) in founding the science of “qualitative economics” made the point about economics that definitions are needed to define ideas, numbers, words, symbols, and even sentences. Therefore, due to the misuse of “clean” to mean really fossil fuels and technologies clean technologies were not good for the environment. Tickell’s documentary film, *Fuel* (Tickell 2009), made these points too, as it told the history about how “clean” was used to describe fossil fuels like natural gas in order to placate and actually deceive the public, politicians, and decision makers. For example, Henry Ford was a farmer and used biofuels in his cars until the early 1920s, when the oil and gas industries forced him to change to fossil fuels.

Hawkins et al. (1999) refer to the environmental changes as the beginning of “the Next Industrial Revolution.” This observation only touched the surface of what the world is facing in the context of climate change. And the irony is that China has already “leapfrogged” and moved ahead of the USA into the GIR (Clark and Isherwood 2008 and 2010). While China leads the USA now in energy demand and CO₂ emissions, it also is one of the leading nations with new environmental programs, money to pay for them and their installation of advanced infrastructures from water to high-speed rail systems.

These economic changes came first from Japan, South Korea, and the northern EU nations. Rebuilding after WWII from the total destruction of both Asia and Europe meant an opportunity to develop and recreate businesses, industries, and the commercialization of new technologies. The historical key in Japan and then later in the EU was get off dependency on fossil fuels for industrial development, production, and transportation. For Japan, as an island nation, this was a critical transformation for them when in the mid-nineteenth century with the American “Black Ships” demanding that Japan open itself to international, especially American, trade. However, as recent events testify, Japan made the mistake of bending to the political and corporate pressures of the USA to install nuclear power plants despite the atomic bombings of two of its major cities in WWII. The final results of tragedies from the 9.0 earthquake in 2011 are not final yet in terms of the nuclear power

plants in Fukushima and its global impact on the environment, let alone in Japan and the immediate region of northern Asia.

Soon after the end of the Cold War in the early 1990s, the GIR became dominant in Japan, Nordic countries and spread rapidly to South Korea as well as Taiwan and somewhat to India. China came later when it leapfrogged into the twenty-first century through the GIR. Germany, Japan, and S. Korea took the lead in producing vehicles that required less amounts of fossil fuels and were more environmentally “friendly,” often called “clean tech.” by mistake but due to pressures from the oil and gas industries. Hence, their industrial development of cars, high-tech appliances, and consumer goods dominated global markets.

America ignored the fledging technological and economic efforts in the EU, South Korea, and Japan as the nation tilted into a long period of self-absorption, bubble-driven economic vitality driven by the false economic premises of the western real estate and financial markets. The nation had a history of cheap fossil fuels primarily from inside the USA and given high tax breaks and incentives (op. cit. Tickell 2009). The 2IR also had survived WWII successfully. Furthermore, the end of Cold War meant to Americans that their 2IR was to dominate and in control of global economic markets. The Soviet Union had failed to challenge them. Then came 9/11 and its aftermath along with the longest continuous war in American history as well as the battle with fundamental Islamic terrorists. With its own unique and fractured political debate and power struggles, America labored to make sense of a post-Cold War era where special interests replaced reason and any movement toward a sound domestic economic policy.

Instead, the American ideological belief in a “market economy,” entrenched in the late 1960s to mid-1970s, replaced the historical reality of how government and industry must collaborate and work together. The evidence of the problems and hardships from “market forces” came initially from a convergence of events in the early part of the twenty-first century, including a global energy crisis, the dot.com collapse, and terrorist attacks. Spending and leveraging money into the market caused the global economic collapse almost a decade later in October 2008.

The Economist even characterized the basic economic problem the best when in mid-2009, a special issue was published under the title “Modern Economic Theory,” superimposed on the Bible melting (Economist 18–24 July 2009). Basically the case was made that economics is “not a science” in large part because its theories and resultant data “did not predict” the global economic recession that started in the fall of 2008 and continues today. From that special issue of the Economist in the summer of 2009, an international debate about conventional modern economics started and continues today.

The Green Industrial Revolution impacts America in a completely different perspective and rational at the local level than at the regional, state, or national levels. Infrastructures of energy, water, waste, transportation, and IT among others and how they are integrated are the core to the GIR (op.cit. Clark and Cooke 2011). These infrastructure systems need to be compatible yet integrated with one another. For example, renewable energy power generation must be used in homes, businesses, hospitals, and nonprofit organizations (government, education, and others) that are

metered and monitored as “smart on-site grids” and also used for the energy in vehicles, mass train, and buses among other transportation infrastructures (Knakmuhs 2011). Such “agile energy” or “flexible systems” (Clark and Bradshaw 2004) allow people to generate their own power while also being connected to a central power grid. However, both the local power and central power in the GIR need to be generated from renewable energy sources, with stand by and back up storage capacity.

There are five key basic elements for the Green Industrial Revolution: (1) energy efficiency and conservation; (2) renewable power generation systems; (3) smart grid connected sustainable communities; (4) advanced technologies like fuel cells, flywheels, and high-speed rail; and (5) education, training, and certification of professionals and programs. First, communities and individuals all need to conserve and be efficient in the use of energy as well as other natural resources like land, water, oceans, and the atmosphere. Second, renewable energy generated from wind, sun, ocean waves, geothermal, water, and biowaste must be the top priority for power on-site and also central plants.

The third element is the need for smart green grids on the local and regional levels in which both the monitoring and control of energy that can be done in real time. Meters need to establish base load use so that conservation can be done (systems put on hold or turned off if not used) and then renewable energy power is generated when demand is needed. The fourth element needs to be advanced storage technologies such as fuel cells, flywheels, regenerative brakes, and ultra-capacitors. These devices can store energy from renewable sources, like wind and solar that produce electricity intermittently, unlike the constant supply of carbon-based fuel sources. Finally, the fifth element is education and training for a workforce, entrepreneurial, and business sector that is growing and provides employment opportunities in the GIR.

In general, the GIR must provide support and systems for smart and “green” communities so that homes, businesses, government, and large offices and shopping areas can all monitor their use of the natural resources like energy and water. For example, communities need devices that capture unused water and that can transform waste into energy so that they can send any excess power that is generated to other homes or neighbors. Best cases from around the world of sustainable communities that follow these elements of the GIR exist today (Clark 2009, 2010).

Essentially the GIR was started by governments who were concerned about the current and near-future societal impact of businesses and industries in their countries. The EU and Asian nations in particular have had long cultural and historical concerns over environmental issues. The Nordic nations and Singapore, for example, have started Eco-Cities as well as reuse of waste for more than three decades. Sweden, Denmark, and Norway either have all eliminated dependency on fossil fuels now for power generation or will be in the near future. All but Finland are shutting down nuclear power plants for their supply of energy as well. The same since the 1980s has been true in most other EU nations, except France which is over 75% dependent on nuclear power.

However, the key factor in the EU and Asia have been their respective government leadership in terms of public policy and economics. Consumer costs for oil and gas consumption are at least four times that of the USA due to the higher taxes

(or elimination of tax benefits) to oil and gas companies in these other nations. The EU has implemented such a policy for two decades, which has also motivated people to ride more in trains and take mass transit or ride their bikes rather use their individual cars. The USA on the other continues to subsidize fossil fuels and nuclear power though tax incentives and government grants. Not so in the EU and Asia. The impact of fossil fuels on climate change was the basis for changing these policies and financial structures over two decades ago. Today in the USA, unlike northern EU, the impact on the environment has become severe, and thus, it is even more significant for future generations around the world.

The historical difference has been the American contemporary economic ideology of market forces to simply have a balance of supply and demand so that these market force of businesses can thrive and prevail. This neoclassical economic model has failed for many reasons, especially due to one of the two key issues presented in the economist special issue (July 2009) that points out that economics is not a science. This is important for a number of reasons, but the basic one, which pertains to the GIR, is that contemporary economics does not apply to major industrial changes, such as the GIR, let alone the beginning of the 2IR Clark (2013). For most economists to be confronted with a challenge to their field not being a science is disturbing. The “dismal science” may be boring with its statistics, but is not a science at all, since it fails to question the entire contemporary field of economics and its future.

The debate is over how does a community or nation change? Economics is one of the key factors. The issue is, are “market forces” the key economic change factor? The 2IR discovered that market forces or businesses by themselves could not get fossil fuels and other sources of energy into the economy at reasonable economic costs. It took time, government support, and policies that provided the market with capital and incentives. Additionally, a GIR economic paradigm includes economic externalities such as the environmental and health costs.

In short, the “market force” neoclassical paradigm represented American economic policies (and also the UK) for over the last four decades when Prime Minister Thatcher and then President Reagan were the embodiment and champions of this economic paradigm derived from Adam Smith (Clark and Fast 2008). Market force economics had some influence on the EU and Asia but then demonstrated its failure in October 2008 with the global economic collapse that started in the USA on Wall Street. That failure meant some of the government programs in the EU and Asia, which had succeeded, now needed to be given more economic attention because they basically differed greatly from the USA and UK economic models.

These other nations have been in the GIR themselves for several decades, which succeeded and continued to do so with a different economic model. Northern EU, Japan, South Korea, and China are clear documented examples of a different economic model. For example, a key economic government program representing the GIR in the EU is the Feed-in-Tariff (FiT), which started in Germany during the early 1990s and was successfully taking route in Italy, Spain, and Canada as well as nations in the EU and Asia. While there are economic problems in Spain and Italy, Germany has decided to cut it back, the USA has not started a FiT in any significant, long-term planned policy programs on a national, let alone a state level. Some American communities and states have started very restrictive and modest FiT programs.

European Union Policies

Germany jumped out in the lead of the GIR in the EU with its FiT legislation in 1990. Basically, the FiT is an incentive economic and financial structure to encourage the adoption of renewable energy through government legislation. The FiT policy obligates regional or national electricity utilities to buy renewable electricity at above-market rates. Successful models like that exist such as the EU tax on fuels and the California cigarette tax, both of which. The smoking tax cut smoking dramatically in California and the gas tax forced people to use mass transit and trains rather than drive their cars as much in the EU. But also provide incentives and metering mechanisms to sell excess power generated back to the power grid. Other EU nations, especially Spain, followed, and the policy is slowly being developed in Canada and some US states and cities. Chart 2.1 shows the economic impact of the FiTs. Over 250,000 “green” jobs created in Germany alone. The graphs in Chart 2.1 also show the growth in Germany of the solar and wind industries and how this expansion is becoming global.

Germany was the world’s leading producer of solar systems until China took over in 2012 because it has more solar systems installed than any other nation based on the creation of world leading solar manufacturing companies, solar units sold and installed are measured by sales, amount of kilowatts per site and records keep

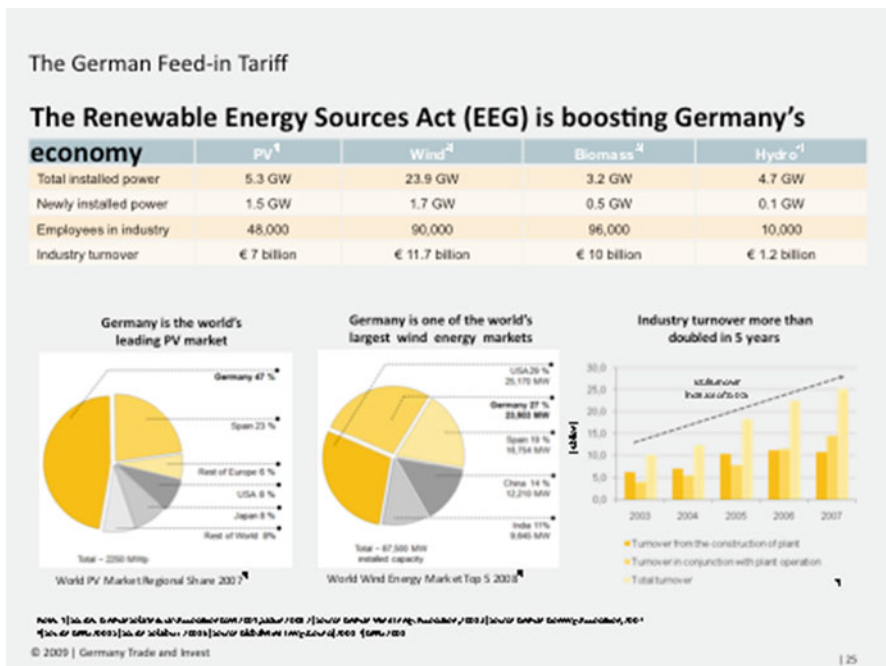


Chart 2.1 The Germany feed-in-tariff policy and results (1990–2010)

by the local and national governments (Gipe 2011). The extensive use of solar by Germany is despite the fact that the nation has many cloudy and rainy days along with significant snow in the winter is common to northern Europe. Japan implemented in 2010 a similar aggressive FiT system in order to stimulate its renewable energy sector and regain renewable energy technological (solar and system companies and installations) leadership that held in the early part of the *twenty-first century*. Technical and economic measurements were kept by the solar companies as well as local and national governments. Then MITI, the Japanese national research organization measures the use of renewable energy systems on a quarterly basis. However, the aftermath of the Japanese earthquake and destruction of the nuclear power plants in 2011 could actually expedite renewable energy growth and installation through a number of government programs and incentives that are being proposed.

Other European countries have similar GIR programs as well. Denmark, for example, will be generating 100% of its energy from renewable power sources by 2050. While trying to meet that goal, the country has created new industries, educational programs, and therefore careers. One good example of where the FiT policy has accomplished dramatic results is the city of Frederikshavn in the Northern Jutland region of Denmark. The city has 45% renewable energy power now, and by 2015, it will have 100% power from renewable energy sources (Lund 2009). In terms of corporate development in the renewable energy sector, for example, one Danish company Vestas is now the world's leading wind power turbine manufacturer with partner companies all over the world. Vestas was able to achieve that recognition for a number of reasons including FiT and its partnership and joint ventures in China since the early 1990s. Vestas continues to introduce improved third-generation turbines that are lighter, stronger, and more efficient and reliable. They also continue to design new systems, like those that can be installed offshore away from impacted urban areas.

Germany, Spain, Finland, France, UK, Luxembourg, Norway, Denmark, and Sweden are on track to achieve their renewable energy generation goals. Italy is fast approaching the same goals when in 2010, it took the distinction as having the most MW of solar installed from Germany. However, Denmark is one of the most aggressive countries due to its seeking 100% renewable energy power generation by 2050. Already Denmark has a goal of 50% renewable energy generation by 2015 (Clark 2009, 2010). Other EU countries are lagging behind, especially in Central and Eastern Europe. The EU has required all its member nations to implement programs like those in Western EU in order to be energy independent from getting oil and gas, especially now since most of these supplies come from North Africa, the Middle East, and Russia.

Various EU nations have widely different starting positions in terms of resource availability and energy policy stipulations. France, for example, is a stronger supporter of nuclear energy. Finland, recently, has installed a nuclear power plant due to its desire to be less dependent on natural gas from Russia. However, Sweden is shutting down its nuclear power plants. The UK and the Netherlands have offshore gas deposits, although with reduced output predictions. In Germany, lignite offers a competitive foundation for base-load power generation, although hard coal from

The German PV Market

The PV market in Germany boomed in 2004 following amendment of EEG

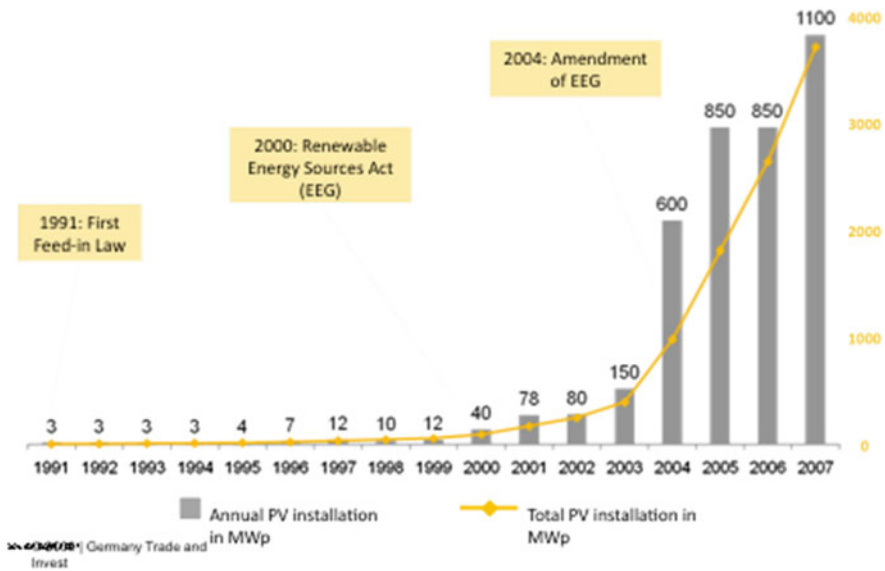


Chart 2.2 The Germany feed-in-tariff policy economic results (1990–2007)

German deposits is not internationally competitive. In Austria, hydropower is the dominating energy source for generating power, though expansion is limited.

Other EU directives toward energy efficiency improvement and greenhouse gas emission reductions also impact electricity generation demand. Many EU members have taken additional measures to limit GHG emissions at the national level. Since the EU-15 is likely to miss its pledged reduction target without the inclusion of additional tools, the European Parliament and the Council enacted a system for trading GHG emission allowances in the community under the terms of Directive 2003/87/EC dated 13 October 2003. CO₂ emissions trading started in January 2005 but have not produced the desired results due to the limitations of “cap and trade” economic measures and the use of auctions over credits given for climate reduction.

After being established for three years, by 2007, the results are not good, however, as the economics and “markets” are not performing as predicted. Basically the carbon exchanges have performed poorly and not as promised to either buyer or seller of carbon credits (or other exchange mechanisms). The initial issues are emission caps not tight enough with a lack of significant EU or local government oversight (EU 2009). By 2010, many of the exchanges have closed or combined with others. The problem is often cited as the lack of supporting governmental (EU or by nation) policies, but the real issue is that economics does not work as well as the control over carbon emissions. The trading and auction mechanisms furthermore do

not provide direct and measurable solutions to the problem of emissions and its impact on climate change. A far more direct finance and economic mechanism as proposed by several EU nations and China would be to have a “carbon tax.”

An important lesson from the FiT policies in Germany came from the two decades of the policies from 1990 through to 2007. As Chart 2.2 shows, Germany learned that a moderate or small FiT was not sufficient to push renewable energy systems like solar into the main stream of its economy. In short, a far more aggressive use of the FiT type of financing and/or direct carbon taxes need to be made.

On its own, the solar industry would not move fast enough into the GIR. In many ways, this is the lesson for other nations. In fact, the reality of the 2IR historically has been to have strong and continuous government incentives from the late nineteenth century to the present day. The definition and model of economics as a market remains critical in understanding how the USA can move into the GIR. Consider now how Japan and South Korea did just that: moved into the GIR with strong government leadership and financial support.

Japan and South Korea Are Leaders in the Green Industrial Revolution

While it took an extraordinary political transition to prompt Europe to open the door to the Green Industrial Revolution (GIR), Japan and South Korea in particular have taken a completely different path. And now China is moving aggressively ahead in to the GIR. Most of the information and data below will be focused on China (Clark 2009). For example, China led the USA and the other G-20 nations in 2009 for annual “clean energy investments and finance, according to a new study by The Pew Charitable Trusts” (Lillian 2010: 4):

Living in a country with limited natural resources and high population density, the people of Japan had to work on sustainability throughout their history as a matter of necessity. With arable land scarce – some 70-80% of the land is mountainous or forested and thus unsuitable for agricultural or residential use – people clustered in the habitable areas, and farmers had to make each acre as productive as possible. The concept of “no waste” was developed early on; as a particularly telling, literal example, the lack of large livestock meant each bit of human waste in a village had to be recycled for use as fertilizer.

Along with creating this general need for conservation, living in close proximity to others inspired a culture in which individuals take special care in the effect their actions have on both the surrounding people and environment. As such, a desire for harmony with others went hand in hand with a traditional desire for harmony with nature. Nature came to be thought of as sacred and to come into contact with nature was to experience the divine. Centuries-old customs of cherry blossom or moon viewing attest to the special place nature has traditionally held in the Japanese heart.

In April 2011, China became the world leader of financial investment in “clean tech” with \$54 billion invested which was over \$10 billion from second place Germany and almost double third place, USA (San Jose 2011:8). Wind was the favorite sector of renewable energy with \$79 billion invested globally. This article

noted in particular a comment by a senior partner in a venture capital firm, “a lot of the clean technologies are dependent on policy and government support to scale up. In some other parts of the world (not USA), you have more consistency in the way these types of funds are appropriated” (op cit.:8).

The Japanese have had a long cultural and business history in commercializing environmental technologies. The 2011 earthquake made Japan focus back on that historical tradition. The future has yet to become clear and will not be defined for some months and years ahead. However, in Japan, the environment took a backseat to industrial development during the drive toward modernization and economic development that began in the latter half of the nineteenth century. After nearly 300 years of self-imposed isolation from the world, Japan was determined to catch up to the industrialized West; in a fraction of that time, Europe and the USA made their transitions, eventually emerging Japan as a great power in the beginning of the twentieth century.

Economic development continued unabated until World War II, when its capacity was destroyed by American bombings. Economic growth restarted again in the postwar period at a rapid pace but with a distinctive orientation and concern for the limited nature resources of the island nation. By the 1970s, on the strength of its industry and manufacturing capabilities, Japan had attained its present status as an economic powerhouse. Companies like TOTO (concerned with bathroom water and waste conservation and technologies) along with the Japanese auto makers concerned with atmospheric pollution, emerged as global leaders. A large part of that success was the need for the government to invest in research and development organizations (e.g., METI) to support companies and business growth, what would now be called the GIR. For example, high-speed rail was started in Japan in the mid-1980s, and expanded. Such transportation systems were economically efficient along with being environmentally sound at reasonable rates.

While this incredibly successful period of development left many parts of the country wealthy, it also resulted in serious environmental problems. In addition, an oil crisis had hit Japan particularly hard because of its lack of natural resources, making it difficult for the industrial and manufacturing sectors to keep working at full capacity. To respond to the effects of pollution, municipalities began working in earnest on ways to reduce emissions and clean up the environment, while Japanese industry responded to the oil crisis by pushing for an increase in energy efficiency.

At the same time, Japan’s economy was evolving more toward information processing and high technology, which held the promise of further increases in energy efficiency. Japan had created new innovative management “team” systems that were copied in the USA and the EU. Many manufacturing firms saw value in establishing plants in other developed countries in part to create a market for their products, employ local workers, and establish firm and solid roots. For example, Toyota and Honda established their Western Hemisphere Headquarters in Torrance, California. Other high-tech companies established large operations throughout the USA. In this way, Japanese government, industry, and academia have worked collaboratively with local and regional communities to reincorporate traditional Japanese values about conservation and respect for the environment in order to create sustainable lifestyles compatible with modern living.

Community-level government efforts in Japan, supported by national government initiatives, have led to unique advancements in energy efficiency and sustainable lifestyles, including novel ways of preventing and eliminating pollution. Japan is responsible for some 4% of global CO₂ emissions from fuel combustion, and through this is the lowest percentage among the major industrialized nations. Carbon is still what Japan intends to reduce, with a long-term goal of reducing emissions by 60–80% by 2050. With the majority of energy coming from coal, Japan also is attempting a major shift toward renewable energy.

As of November 2008, residential-use solar power generation systems have been put in place in about 380,000 homes in Japan. A close examination of the data on shipments domestically in Japan shows that 80–90% are intended for residential use. Thus shipments are likely to increase, as the government aims to have solar panel equipment installed in more than 70% of newly built houses by 2020 to meet its long-term goals for reductions in emissions. Current goals for solar power generation in Japan are to increase its use tenfold by 2020 and fortyfold by 2030. Furthermore large proposed subsidies for the installation of solar – 9 billion yen or \$99.6 million total in the first quarter 2009 – along with tax breaks for consumers, will continue the acceleration of solar adoption by Japanese households.

In recent years, Europe, China, Southeast Asia, and Taiwan saw tremendous growth in energy generation almost entirely from solar power installations. However, these have mostly involved large-scale solar concentrated power facilities that do not fit for individual households. In Japan, however, as solar power generation systems for residential use become increasingly commonplace, they have become smaller thin film for creating sustainable communities through use on roofs of local homes and businesses.

The same is true with the LED light bulbs. Today, LED bulbs may cost a few pennies more, but they last far longer than a regular light bulb and can be recycled without issues of mercury and other waste contamination. The result is better lighting for homes and offices with significantly less costs in terms of the systems, demand and the environment. Some LED bulbs are guaranteed to last from 6 to 8 years (Nularis 2011). While energy demands in homes and offices continue to rise due to the internet, computers, and video systems, the installation of energy efficient and now cost-saving systems is very much in demand. Some states are even requiring by law to change from the less efficient light bulbs to the newer LED ones.

Distributed Renewable Energy Generation for Sustainable Communities

Adding more complications to the EU, Japan, and S. Korea's policy decisions are the reality of an aging grid and under capacity. The EU must crank up investment in this new generation. Estimates are coming that indicate to meet demand in the next 25 years, they will need to generate half as much electricity as they are now generating. According to the International Energy Outlook 2010, conducted by the U.S. Energy Information Administration (USEIA 2011), the world's total consumption

of energy will increase by 49% from 2007 to 2035. This could result in a profound change in the EU's power generation portfolio, with options under consideration for new plants including nuclear energy, coal, natural gas and renewables.

Originally, when nations electrified their cities and built large-scale electrical grids, the systems were designed to transmit from a few large-scale power plants. However, these systems are inefficient for smaller scale distributed power from renewable sources (Clark 2006). Although some systems will allow for individual households to either buy power or sell power back to the grid, the redistribution of power from numerous small-scale sources are not yet managed well economically (Sullivan and Schellenberg 2011). As Isherwood et al. (1998 and then in 2000) document in the studies of remote villages, renewable energy for central power can meet and even exceed the entire demand for a village, hence making it energy independent and not needing to import any fossil or other kind of fuels. This model and program has worked in remote villages, but can also be applied to island nations and even larger urban communities or their smaller districts.

The grid of the future has to be “smart” and flexible and based on the principles of sustainable development (Clark 2009). As the Brundtland Report said in 1987 “as a minimum, sustainable development must not endanger the natural systems that support life on Earth: the atmosphere, the waters, the soils and the living beings” (Brundtland 1987: Introduction). With that definition in mind, a number of communities sought to become sustainable over the last three decades.

Integrated “agile” (flexible) strategies applied to infrastructures are needed for creating and implementing “on-site” power systems in all urban areas that often contain systems in common with small rural systems (Clark and Bradshaw 2004). The difference in scale and size of central power plants (the utility size for thousands of customers) with on-site or distributed power can be seen in the economic costs to produce and sell energy. Historically, the larger systems could produce power and sell it far less than the local power generated locally for buildings. Those economic factors have changed in the last decade (Xing and Clark 2009). Now on-site power particularly from renewable energy power (e.g., solar, wind, geothermal, and biomass) has become far more competitive and is often better for the environment. Large-scale wind farms and solar concentrated systems are costly and lose their efficiency due to transmission of power over long distances (Martinot and Droege 2011).

Developing World Leaders in Energy Development and Sustainable Technologies

Some of the major benefits of the Green Industrial Revolution are job creation, education, and new business ventures (Clark and Cooke 2011). Considerable evidence of these benefits (Next 10 2011) can be seen in the EU, especially Germany and Spain (Rifkin 2004). Many studies in the USA have documented how the shift to renewable energy requires basic labor skills and also a more educated workforce, but one that is also locally based and where businesses stay for the long term. This is a

typical business model for almost any kind of business and is what has motivated EU universities to create “science parks” which take the intellectual capital from a local university and build new businesses nearby the campus (Clark 2003a, b).

Asia’s shift to renewable energy will require extensive retraining. Consider the case of wind power generation in China. In the early 1990s, Vestas saw Asia and China as the new emerging big market. Vestas agreed to China’s “social capitalist” business model (Clark and Li 2004; Clark and Jensen 2002), where the central government sets a national plan, provides financing, and gives companies direction for business projects over 5-year time frames, which are then repeated and updated. National plans like business plans are critical to any company, group or family, especially when set and followed by national and regional governments.

A major part of the Chinese economic model required that foreign businesses be co-located in China with at least a 51% Chinese ownership. This meant that in the late twentieth and early twenty-first centuries, the Chinese government owned companies or were the majority owners of the new spin-off government owned ventures, which established international companies or businesses started in China. Additionally, China required that the “profits” or money made by the new ventures be kept in China for reinvestments.

Additionally, the results, such as with the renewable energy companies like wind and solar industries, were that all the ancillary supporting businesses also needed to support the companies from mechanics, software, plumbing and electricity to installation, repair and maintenance, and other areas. Supporting industries were also needed such as law, economics, accounting, and planning, especially since the Chinese government began to create sustainable communities that required all these skill sets (Clark 2009, 2010). Hence, these businesses grew and became located in China.

However, the Chinese social capitalism model is not rigid with the government owning controlling percentage of a company. Many businesses were started by the Chinese government with its holding from 25–33% of shares, while the other firms were owned by the former government employees, until the companies went public (Li and Clark 2009). Yet in almost all cases, the companies are competitive globally and are performing remarkably well as demonstrated again in the renewable energy sector, where in early 2011, SunTech, a Chinese based publically traded company, became the world’s largest manufacturer and seller of solar panels (Chan 2011). According to a press release by the company in February 2011, it has delivered more than 13 million PV panels to customers in more than 80 countries.

Today, China is the world leader in wind energy production and manufacturing with over 3,000 MW installed in China alone (Vestas 2011). The Chinese are now following a similar business model in the solar industry (Martinot et al. 2007–2010). As such, China and Inner Mongolia (IMAR) has contracted Vestas to install 50 MW for IMAR (op. cit. Vestas 2011), according to a report from the Asian Development Bank (Clark and Isherwood 2008 and 2010) which argues for targeted needs to:

- Create international collaborations between universities and industry.
- Conduct research and development of renewable energy technologies.

- Build and operate science parks to commercialize new technologies into businesses.
- Provide and promote international exchanges and partnerships in public education, government, and private sector businesses.

The end results for the EU are smart homes and communities. The Green Industrial Revolution starts in the home so that energy efficiency and conservation are a significant part of everyone's daily life. The home is the place to start. But it is also the place to start with the other elements of the GIR: renewable energy generation, storage devices, smart green grids for communities, and new fuel sources for homes and transportations.

Costs, Finances, and ROI

Government policy(s) and finance are critical for economic growth especially concerning the environment and climate change. The basis of the GIR in the EU, South Korea, and Japan can be seen in their articulation of a vision and financial programs. Most of these countries also had established government energy plans. China in fact has had national plans since the PRC was established in 1949. Having a plan is in fact the basic program and purpose of most business educational programs. Governments need to have plans, as most businesses do. Business plans are for themselves and their clients. Yet the USA continues without any national energy or environment plans. Most American states do not have them either, while an increasing number of cities and communities are developing them in order to plans for becoming sustainable.

This lack of planning has both long-term and short-term impacts. The finance of new energy technologies and systems (like any new technology) is often dependent on government leadership through programs in public policy and finance (Clark and Lund 2001). Fossil fuel energy systems in the 2IR have been funded and supported by the governments of western nations through tax reductions and rebates that continue today. For the GIR, it is only logical and equitable that such economic and financial support continues. That means the American national government should provide competitive long-term tax incentives, grants, and purchase orders for renewable energy sources rather than just fossil fuels.

Meanwhile, the EU, South Korea, and Japan took the leadership in planning, finance, and creation of renewable energy companies, while other nations including the USA did not (Li and Clark 2009). For example, because of the national policy on energy demand and use, Japan has one of the lowest energy consumption measurements in the developed world. This has been made possible by its continued investment in long-term energy conservation while developing renewable sources of energy and companies that make these products. Japan's per capita energy consumption is 172.2 million Btu versus 341.8 million Btu in U.S.A.

One critical of a long-term economic plan is the need for life-cycle analysis (LCA) versus cost-benefit analysis (CBA). While these two very different accounting

processes are not discussed much in this chapter, elsewhere Clark and Sowell (2002) cover the topic in-depth as the systems apply to government spending. Each approach is critical in how businesses learn what their cash flow is and their return on investment (ROI). The CBA model only provides for 2–3-year ROI since that is what most companies (public or government) require for quarterly and annual reports. However, for new technologies (like renewable energy, but also even wireless and WIFI technologies), more than a few years are needed on the ROI. The same was true in the 2IR when oil and gas were first discovered and sold. Now in the GIR, economic and financial ROIs are needed.

LCA covers longer time periods, such as 3–6 years, and within renewable energy systems, some as long as 10–20 years, depending on the product and/or service. Furthermore, LCA includes externalities such as environment, health, and climate change factors, all of which have financial and economic information associated with them. The point is that cost-benefit analyses are limited. The basic concept is that the LCA consists of one long-term finance model in the USA today for solar systems; it is called a Power Purchase Agreement (PPA) that contracts with the solar installer or manufacturer for 20–30 years. PPA is a financial arrangement between the user “host customer” of solar energy and a third party developer, owner, and operator of the photovoltaic system (Clark 2010).

The customer purchases the solar energy generated by the contractor’s system at or below the retail electric rate from the owner, who in turn along with the investor receives federal and state tax benefits for which the system is eligible on an annual basis. These LCA financial agreements can range from 6 months to 25 years and hence allow for a longer ROI. However, there are other ways to finance new technologies especially if they are installed on homes, office and apartment buildings. Today financial institutions and investors can see a ROI that is attractive when the solar system on a home, for example, is financed as a lease, part of tax on the home, or included in the mortgage itself like plumbing, lighting and air-conditioning are today.

What is interesting are some newer economic ideas on how to finance technologies that reduce “global climate change.” One way to describe the GIR financial mechanisms is by looking at the analytical economic models that financed the 2IR. For example, the 2IR was based upon the theory of abundance. The misunderstand assumption was that the earth had abundant water and ability to treat waste, hence buildings, businesses, homes and shopping complexes all had plumbing for fresh water and drainage for waste. The same scenario occurred in electrical systems that took power from a central grid for use in the local community buildings. Locally and globally, people have found that systems work, but now especially with climate change there is the need to conserve resources and be more efficient.

When these economic considerations are factored into even the CBA rather than a LCA financial methodology, the numbers do not work (Sullivan and Schellenberg 2011). The financial consideration for energy transmission and then monitored by smart systems are needed, but costly. Long distances make them even more costly because the then impact of the climate (storms, tornadoes, floods, etc.) with required operation and maintenance is added today with security factors. The actual “smart” grid at the local level is where these and other uncontrolled costs can be eliminated and monitored.

The financing of water, waste, electrical, and other systems for buildings was over time incorporated into the basic mortgage for that building. In short, the 2IR infrastructure systems were no longer outside (e.g., the outhouse or water faucet) but inside the building. What this 2IR financial model does is set the stage for the GIR financial model. Much of the 2IR financing for fossil fuels and their technologies came about as leases or building mortgages. A variation of the 2IR model which is a bridge to the GIR is the PACE (Property Assessed Clean Energy) program started in 2008 in Berkeley, California, whereby home owners can install solar systems on their buildings, for example, and then pay for them from a long-term supplemental city tax that is on their property taxes. The financing is secured with a lien on the property taxes, which acquires a priority lien over existing mortgages. Thus program was put on hold in July 2010 when the Federal Housing Finance Agency (FHFA) expressed concerns about the regulatory challenge and risk posed by the priority lien established by PACE loans. Nevertheless, the US Department of Energy continues to support PACE.

The dramatic change to the GIR, however, moves past that financial barrier of a property tax. Mortgages are part of the long-term cost for owning a property. Therefore, in the GIR, the conservation and efficiency for the 2IR technologies in buildings can be enhanced with the renewable energy power, smart green grids, storage devices, and other technologies through mortgages that can be financed from one owner to another over decades (20–30 years or more). This sustainable finance mortgage model is long term or a LCA framework and provides for technologies and installation costs to the consumer that makes the GIR attainable with a short time. Changes, updated and new technologies, can easily be substituted and replaced the earlier ones. What needs to happen is that the banking and lending industries try this GIR finance model on selected areas. After some case studies, the financial model can be replicated or changed as needed.

Conclusions and Future Research Recommendations

The basic point of this chapter is to highlight the need for economics to be more scientific in its hypothesis and data collection. Furthermore, the economics of the 2IR and the GIR are very similar, if not parallel. That is, for example, the role of government since it must often take the first steps in directing, creating, and financing technologies. As the 2IR needed government to help drill for oil and gas as well as mine for coal, the government needed to build rail and road transportation systems to transport the fuels from one place to another.

The GIR is very much in the same economic situation. The evidence can be seen in Asia and the EU. And especially now in China, the central government plans for environment and related technologies help a nation move into the GIR. Moreover there is a strong need for financial support that is not tax breaks or incentives, but investments, grants and purchasing for GIR technologies, such as renewable energy. This can be seen in the USA today with the debate over smart grids. What are they?

And who pays for them? When the smart grid is defined as a utility, then the government must pay for them since they are part of the transmission of energy, for example, over long distances that must be secure and dependable.

But as the GIR moves much more into local on-site power, the costs of the smart grid are at homes, office buildings, schools and colleges, shopping malls, and entertainment centers. Local governments are also involved as they are often one of the largest consumers of energy in any region and hence emitters of carbon and pollution. Within any building, a smart grid must know when to regulate and control meters and measurement of power usage and conservation. The consumer needs the new advanced technologies, but the government must support these additional costs and their use of energy as they impact the local community and larger regions residential and business needs.

Economics has changed in the GIR. And yet, economics has a basis of success in the 2IR. Historically, 2IR economics was successful because the government was needed to support its technologies along with goods and services. The evolution into the neoclassical form of economics was far more a political strategy backed by companies who wanted control of infrastructure sectors. But the reality was that “greed” took over and has now forced a rethinking of economics as nations now move into the GIR.

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