

GREEN ENERGY: AN ANALYTICAL DISCOURSE

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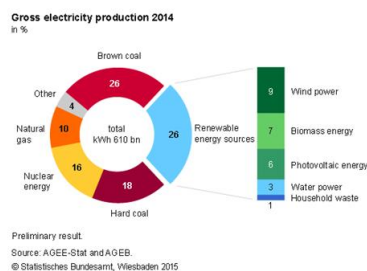
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Abstract

The climate change, the global warming, the population growth and the continuous demand on energy and electricity in specific made renewable energy one of the most appropriate and fitting to answer all these changes of our environment. However, the vested interested groups belonging to the fossil fuel cartel continue working tirelessly to discourage the use of renewable energy and renewable energy solutions in the world. Despite the recusant efforts of the Oil Cartel, renewable energy use has grown much faster than anyone anticipated. This paper: defines green and renewable energy; highlights its benefits; and illustrates that clean energy technologies are prepared for accelerated and widespread expansion in the global power sector. The paper critically examines the recusant efforts of the Oil Cartel undermining green renewable energy sector by bankrolling the production of unconventional oil and gas; and demonstrates that over-reliance on fossil fuels for power generation has significant health, environmental, and economic risks and is not a long-term solution to our energy needs. The paper concludes that a global transition to renewable energy is already underway. Renewable Energy offers an alternative to conventional sources and grants us greater control over future energy prices and supply. The energy choices we make during this pivotal moment will have huge consequences for our health, our climate, and our economy for decades to come.

Keywords: Renewable green energy, unconventional oil and gas, solar & wind energy

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1.0 BRIEF HISTORY

Since early recorded history, people have been harnessing the energy of the wind; Wind energy propelled boats along the Nile River as early as 5000 B.C. By 200 B.C., simple windmills in China were pumping water, while vertical-axis windmills with woven reed sails were grinding grain in Persia and the Middle East. Records of humans using petroleum can be traced back as far as 3000 B.C. with the Mesopotamians, residing in the modern day Iraq, using petroleum for ship caulking and building roads. Varied records of coal being used during the Bronze Age, as well as during Roman occupation also exist. Solar technology isn't new either. Its history spans

from 7th Century B.C. to today. World started out concentrating the sun's heat with glass and mirrors to light fires. Early in the 20th century, windmills were commonly used across the Great Plains to pump water and to generate electricity. New ways of using the energy of the wind eventually spread around the world. By the 11th century, people in the Middle East were using windmills extensively for food production; returning merchants and crusaders carried this idea back to Europe. The Dutch refined the windmill and adapted it for draining lakes and marshes in the Rhine River Delta. When settlers took this technology to the New World in the late 19th century, they began using windmills to pump water for farms and ranches, and later, to generate electricity for homes

and industry. Understanding the long history of our use of non-renewable fuel sources is essential to give reader a point of reference to discuss the emergence of green energy [1].

2.0 BACKGROUND

The current interest in renewable energy began at the United Nations 2002 World Summit on Sustainable Development in Johannesburg, South Africa. This conference highlighted the importance of access to basic, clean and renewable energy in supporting sustainable development and poverty eradication. However, it was the Renewables 2004 Conference in Bonn, Germany that laid the foundation for an expansion of renewable energy worldwide. This conference attracted 3,600 participants, including ministers and government representatives from 154 countries. Access to basic, clean energy is essential in supporting sustainable development and poverty eradication. Subsequent conferences, such as the 2005 Beijing International Renewable Energy Conference, continue to send clear messages that renewable energy can compete with conventional energy and must be the basis for future global development. Recognizing the benefits of renewable energy, countries around the world are introducing policies to encourage their development. The volatile world market prices for fossil fuels in the past years have significantly increased interest in the development of alternative indigenous sources of green energy all over the world; the term renewable energy has been interchangeably used for green energy. As part of their resources governance strategy, many countries are looking into the use of local biomass resources to replace traditionally imported fuels such as petrol and diesel with biofuels. The behaviour of crude oil prices in world markets affects input costs in all phases of modern industrial and agricultural production and distribution. Global biofuels output reached 120 billion litres in 2013 and now provides 3.5% of world transport fuel demand. Global biofuels output is estimated to grow at 3.5% per year on average from 110 billion litres in 2012 to 135 billion litres in 2018 and to provide 4% of global road transport fuel demand in 2018 [2].

Renewable energy and energy efficient technologies are poised to be a large part of the world's energy future, and investors are demonstrating an increased interest in financing renewable energy initiatives both through conventional and innovative financing mechanisms. Public and private sector investment in renewable energy is growing rapidly. Increased awareness of renewable energy opportunities and government policies supportive of renewable energy development are helping to speed this transition to a sustainable energy future. Examples of supportive policies and innovative financing solutions from countries around the world provide examples and

opportunities to pursue. New policy initiatives and plans by utilities to boost renewable energy capacity in countries such as United States, Germany, Japan and Spain are also helping to spur the rate of investment in renewable energy. Renewable Green Energy is the solution to the problems of climate change, air pollution, water pollution, and energy insecurity and requires a large-scale conversion to clean, perpetual, and reliable energy at low cost together with an increase in energy efficiency. Czisch (2006) [3] suggested that a totally renewable electricity supply system, with intercontinental transmission lines linking dispersed wind sites with hydropower backup, could supply Europe, North Africa, and East Asia at total costs per kWh comparable with the costs of the current system.

3.0 GREEN ENERGY DEFINED

Green Energy is an energy that can be extracted, generated, and/or consumed without any significant negative impact to the environment. The planet has a natural capability to recover which means pollution that does not go beyond that capability can still be termed green. Green power is a subset of renewable energy and represents those renewable energy resources and technologies that provide the highest environmental benefit. The U.S. Environmental Protection Agency defines green power as electricity produced from solar, wind, geothermal, biogas, biomass, biofuels and low-impact small hydroelectric sources [4]. Renewable energy is generally defined as energy that comes from resources which are continually replenished on a human timescale such as sunlight, wind, rain, tides, waves and geothermal heat. In contrast, fossil fuels are a finite resource that take millions of years to develop and will continue to diminish with use [5].

4.0 TYPES OF GREEN AND RENEWABLE ENERGY

Research into renewable, non-polluting energy sources is advancing at such a fast pace, it's hard to keep track of the many types of green energy that are now in development. Here are six of the most common types of green energy.

4.1 Solar Energy

Can be generated in two forms, namely electricity and heat. Solar cells or "photovoltaics" are used to convert solar radiation into electricity. Photovoltaic systems release no greenhouse gases into the atmosphere and they don't even need direct sunlight to produce energy; they just need daylight and this means they can operate even during cloudy and less bright days. Passive Solar energy is also used to heat buildings and water, provide natural lighting

and cook food. Solar technologies have become inexpensive enough to power everything from small hand-held gadgets to entire neighbourhoods [4].

4.2 Wind Energy

Air flow on the earth's surface can be used to push turbines, with stronger winds producing more energy. High-altitude sites and areas just offshore tend to provide the best conditions for capturing the strongest winds. According to a 2009 study, a network of land-based, 2.5-megawatt wind turbines in rural areas operating at just 20% of their rated capacity could supply 40 times the current worldwide consumption of energy [4, 6].

4.3 Hydropower

Also called hydroelectric power; hydropower is generated by the Earth's water cycle, including evaporation, rainfall, tides and the force of water running through a dam. Hydropower depends on high precipitation levels to produce significant amounts of energy [4].

4.4 Geothermal Energy

Just under the earth's crust are massive amounts of thermal energy, which originates from both the original formation of the planet and the radioactive decay of minerals. Geothermal energy in the form of hot springs has been used by humans for millennia for bathing, and now it's being used to generate electricity. In North America alone there's enough energy stored underground to produce, ten times, as much electricity as coal currently does [4].

4.5 Biomass

Recently-living natural materials like wood waste, sawdust and combustible agricultural wastes can be converted into energy with far fewer greenhouse gas emissions than petroleum-based fuel sources. That's because these materials, known as biomass, contain stored energy from the sun [4].

4.6 Biofuels

Rather than burning biomass to produce energy, sometimes these renewable organic materials are transformed into fuel. Notable examples include ethanol and biodiesel. Biofuels provided 3.5% of the world's fuels for road transport in 2013, and have the potential to meet more than 25% of world demand for transportation fuels by 2050 [6].

5.0 THE AGE OF UNCONVENTIONAL OIL AND GAS

The explosive growth of automotive and aviation travel, the suburbanization of significant parts of the planet, the mechanization of agriculture and warfare, the global supremacy of the United States, and the onset of climate change: these were the hallmarks of the exploitation of conventional petroleum. At present, most of the world's oil is still obtained from a few hundred giant onshore fields in Iran, Iraq, Kuwait, Russia, Saudi Arabia, the United Arab Emirates, the United States, and Venezuela, among other countries; some additional oil is acquired from offshore fields in the North Sea, the Gulf of Guinea, and the Gulf of Mexico. This oil comes out of the ground in liquid form and requires relatively little processing before being refined into commercial fuels. But such conventional oil is disappearing. According to the IEA, the major fields that currently provide the lion's share of global petroleum will lose two-thirds of their production over the next 25 years, with their net output plunging from 94 million barrels per day in January 2015 to a mere 26 million barrels in 2035. The IEA assures us that new oil will be found to replace those lost supplies, but most of this will be of an unconventional nature. In the coming decades, unconventional oils will account for a growing share of the global petroleum inventory, eventually becoming our main source of supply. By far the most worrisome consequence of the distinctive nature of unconventional fuels is their extreme impact on the environment. Because they are often characterized by higher ratios of carbon to hydrogen, and generally require more energy to extract and be converted into usable materials, they produce more carbon dioxide emissions per unit of energy released. In addition, the process that produces shale gas, hailed as a "clean" fossil fuel, is believed by many scientists to cause widespread releases of methane, a particularly potent greenhouse gas. All of this means that, as the consumption of fossil fuels grows, increasing, not decreasing, amounts of CO₂ and methane will be released into the atmosphere and, instead of slowing, global warming will speed up [16].

And here's another problem associated with the third carbon age: the production of unconventional oil and gas turns out to require vast amounts of water; for fracking operations, to extract tar sands and extra-heavy oil, and to facilitate the transport and refining of such fuels. This is producing a growing threat of water contamination, especially in areas of intense fracking and tar sands production, along with competition over access to water supplies among drillers, farmers, municipal water authorities, and others. As climate change intensifies, drought will become the norm in many areas and so this competition will only grow fiercer. Along with these and other environmental impacts, the transition from conventional to unconventional fuels will have economic and geopolitical consequences hard to fully assess at this moment. As a start, the exploitation of unconventional oil and gas reserves from previously inaccessible regions involves the

introduction of novel production technologies, including deep-sea and Arctic drilling, hydro-fracking, and tar-sands upgrading. One result has been a shakeup in the global energy industry, with the emergence of innovative companies possessing the skills and determination to exploit the new unconventional resources; much as occurred during the early years of the petroleum era when new firms arose to exploit the world's oil reserves.

That deal highlights an especially worrisome feature of this new era: the deployment of massive funds by giant energy firms and their financial backers (Bankers) to acquire stakes in the production of unconventional forms of oil and gas in amounts far exceeding comparable investments in either conventional hydrocarbons or renewable energy. It's clear that, for these companies, unconventional energy is the next big thing and, as among the most profitable firms in history, they are prepared to spend astronomical sums to ensure that they continue to be so. If this means investment in renewable energy is short-changed, so be it. Without a concerted policymaking effort to favour the development of renewables, future investments in the energy field will likely continue to flow disproportionately toward unconventional oil. In other words, there will be an increasingly entrenched institutional bias among energy firms, banks, lending agencies, and governments toward next-generation fossil-fuel production, only increasing the difficulty of establishing national and international curbs on carbon emissions. This is evident, for example, in US administration's undiminished support for deep-offshore drilling and shale gas development, despite its purported commitment to reduce carbon emissions. It is likewise evident in the growing international interest in the development of shale and heavy-oil reserves, even as fresh investment in green energy is being cut back. As in the environmental and economic fields, the transition from conventional to unconventional oil and gas will have a substantial, if still largely undefined, impact on political and military affairs [16]. In addition, the 'vested interest groups' belonging to the fossil fuel cartel will continue working tirelessly to discourage the use of renewable energy and renewable energy solutions in the world. The complexities of these networks are such that, they have representations in various levels of business, finance, political, governmental and administrative structures etc., who will work in a manner that the renewable energy is not supported or promoted adequately. Even the governance of international bodies such as International Monetary Fund, the World Bank, and the World Trade Organization seems to be compromised, turning them, almost, into 'Extractive Institutions' serving vested interests at times.

6.0 CRITICAL OVERVIEW

It is one of the most profitable businesses now a day to have Renewable Energy Industries. The climate change, the global warming, the population growth and the continuous demand on energy and electricity in specific made Renewable Energy one of the most appropriate and fitting to answer all these changes of our environment.

The two major areas of growth in renewable energy are; Photovoltaic (PV), and Wind Energy (WE). If we look at the progress at the end of 2013, the Photo Voltaic (PV) global cumulative installation reached 138.9 GW. This is equivalent to 105 full-size 1,300 MW nuclear reactors. The module price dropped to an average of 0.57 US\$/WP which is in parity with electricity generated with gas or oil. Also the PV efficiency of both mono and poly crystalline silicon cells has reached more than 20%. China has more than 500 production companies and had 65% of the market [7]. Renewables represent a better 'Model' as all 'Renewables': are safe, domestically sourced, and virtually unlimited; they offer energy independence from foreign cartels; they keep nations sovereign; reduce air pollution and greenhouse gases, bringing hope to future generations; reduce water use; and are based on market economy pricing, free from oligopolistic pricing schemes that manipulate historically traditional energy prices [8].

In the wind energy sector, the cumulative installation was 318.1 GW in 2013 and it is set to grow by 30% each year [9]. Europe has the largest share of the market. The electricity generation by WE on shore was 50\$/MWh, while electricity generated by gas was 60\$/MWh. WE turbine sizes increased considerably so that 8 MW machines are available in the market. Offshore WE cost is approximately 20% more while it has better wind prospect and can be out of sight. The growth of the renewables is happening much quicker than expected as they fit within cities as well as in regions which is where most power has been produced. Finally the growth of the renewables enables the first sense that a fully carbon-free city can be envisioned; not just with power but also transport. The rapid change in cities towards renewably-powered electric transport and biofuels suggests that the replacement of fossil fuels can now be planned for with confidence [10]. Wind Power: Offers clean, inexpensive, domestic, renewable energy; Highly efficient - One commercial wind turbine can equal 16,000 solar panels; Can be used for utility-scale generation or in small, democratic, commercial or residential units; and typically doesn't take up valuable space -the wind farms can be sited offshore or on farms where farmers can farm underneath the wind turbines [8].

Is renewable energy sustainable? The answer to this question is not possible without a clear definition of 'sustainability'; a much used, and often abused, word. The True sustainability balances the competing needs of the society, the environment and the economy; objectively and rationally, over the life-cycle of the proposition. Electricity brings huge

benefits to society including; increases in life expectancy, access to information and education, and development of industries providing needed goods and services. But there are hidden costs (and some benefits) to power generation, across the life-cycle, which are not reflected in market prices. If we are not including external costs and benefits in energy decisions, true environmental, social and economic pinnacle will elude us. True sustainability requires that all costs, regardless of who (or what) must bear them, are balanced against the benefits produced; not just the proponents in the form of profits, but to society and the environment as a whole. Put more quantitatively, to be sustainable, the full environmental, social and economic benefits of a proposition must exceed its environmental, social and economic costs, over its life-cycle. Renewables are not all created equal, and they are not always sustainable. By considering renewables objectively and rationally, we can move away from the hype that too often clouds and over-simplifies the energy-climate discussion, and focus on what really delivers value, when, where, how and for whom. A key part of the change in the 21st Century is through the adoption of smarter and appropriate technologies, better integration and smarter management of energy use through Human Scale Development [11, 12].

'Green economy', whose green energy is a segment, is another new euphemistic term that has been widely used in the corporate world of tourism. But so far, there is no agreed definition or an international consensus on what green economy means, and it remains unclear how people and nations, particularly in the developing world, can benefit from it. The idea, which was first introduced by UNEP in late 2008, is to develop a system of green economic activities "that result in improved human wellbeing over the long term, while not exposing future generations to significant environmental risks and ecological scarcities" [13]. Surely, few would object to a green economy – an economy that is environmentally-friendly, sensitive to the need to conserve natural resources, minimize pollution and emissions during the production process and promotes environmentally-friendly lifestyles and consumption patterns. But serious concerns have been raised by developing countries' delegates, civil society and Indigenous Peoples' organizations that the green economy concept is prone to abuse and could give rise to harmful developments that particularly affect poor countries and people.

Participants of a side event held during a United Nations Conference on Sustainable Development (UNCSD) meeting in 2011 in New York asked 'whose green economy' is this and why did the topic of green economy suddenly emerge in all kinds of dialogue mechanisms after 2008. The fact that United Nations Environment Program's (UNEP) Green Economy Initiative (GEI) has been spearheaded by Pavan Sukhdev, an investment banker on sabbatical from Deutsche Bank and chairman of the World

Economic Forum's Global Agenda Council on Biodiversity, added to the suspicion that the green economy idea was brought up to push big business interests and to dominate the global agenda in the run-up to Rio+20. As Thomas comments, "the most vocal cheerleaders are the Davos crowd of Fortune 500 companies and G8 diplomats. Most alarmingly, some of these voices are positioning the 'green economy' as an upgrade or replacement to the 'outmoded' concept of 'sustainable development' that was agreed on 20 years ago. They seem content to throw out Rio's 'baby' of sustainable development for new green bathwater just as the baby reaches the age of maturity" [14]. Discussions on the green economy concept and related policies have gained much in importance as one of the two key themes at the UN Rio+20 conference in 2012: is 'Green economy in the context of sustainable development and poverty reduction'. However, this should not turn green economy into greed economy as the REDD (Reduction of Emissions from Deforestation and Forest Degradation) program is turning into a tool to "buy and sell polluting permits in the carbon markets". Development aid is not the solution to the problem of underdevelopment; dismantling the extractive institutions which dominate poor countries would be a far better start. Of course some aid, often far too much of it, gets stolen. But this is the nature of the beast. Almost by definition any poor country is dominated by 'Extractive Institutions' [15], so it is inevitable that extractive elites should siphon off some of it. Yet this is not an argument for abandoning poor people to their fate or instead giving aid only to "deserving" countries with functional governments; it is a plea to re-think aid and try to find ways in which it can be used to build institutions and move away from 'Extractive Institutions'.

When it comes to energy and economics in the climate-change era, nothing is what it seems. Most of us believe (or want to believe) that the second carbon era, the Age of Oil, will soon be superseded by the Age of Renewables, just as oil had long since superseded the Age of Coal. Many other experts share this view, assuring us that increased reliance on "clean" natural gas combined with expanded investments in wind and solar power will permit a smooth transition to a green energy future in which humanity will no longer be pouring carbon dioxide and other greenhouse gases into the atmosphere. All this sounds promising indeed. However, the irony is that it is not, in fact, the path we are presently headed down. The energy industry is not investing in any significant way in renewables. Instead, it is pouring its historic profits into new fossil-fuel projects, mainly involving the exploitation of what are called "unconventional" oil and gas reserves. The result is indisputable: humanity is not entering a period that will be dominated by renewables. Instead, it is pioneering the third great carbon era, the Age of Unconventional Oil and Gas. That we are embarking on a new carbon era is increasingly evident and

should unnerve us all. Hydro-fracking: the use of high-pressure water columns to shatter underground shale formations and liberate the oil and natural gas; supplies trapped within them are being undertaken in ever more regions of the United States and in a growing number of foreign countries. In the meantime, the exploitation of carbon-dirty heavy oil and tar sands formations is accelerating in Canada, Venezuela, and elsewhere. It's true that ever more wind farms and solar arrays are being built; however, investment in unconventional fossil-fuel extraction and distribution is now expected to outpace spending on renewables by a ratio of at least three-to-one in the decades ahead [16].

According to the International Energy Agency [17], an inter-governmental research organization based in Paris, cumulative worldwide investment in new fossil-fuel extraction and processing will total an estimated \$22.87 trillion between 2012 and 2035, while investment in renewables, hydropower, and nuclear energy will amount to only \$7.32 trillion. In these years, investment in oil alone, at an estimated \$10.32 trillion, is expected to exceed spending on wind, solar, geothermal, biofuels, hydro, nuclear, and every other form of renewable energy combined. In addition, as the IEA explains, an ever-increasing share of that staggering investment in fossil fuels will be devoted to unconventional forms of oil and gas: Canadian tar sands, Venezuelan extra-heavy crude, shale oil and gas, Arctic and deep-offshore energy deposits, and other hydrocarbons derived from previously inaccessible reserves of energy. The explanation for this is simple enough. The world's supply of conventional oil and gas, fuels derived from easily accessible reservoirs and requiring a minimum of processing, is rapidly disappearing. With global demand for fossil fuels expected to rise by 26% between now and 2035, more and more of the world's energy supply will have to be provided by unconventional fuels [16].

7.0 A BRIGHT FUTURE FOR GREEN AND RENEWABLE ENERGY

Despite the recusant efforts of the Oil Cartel, Renewable energy use has grown much faster than anyone anticipated. Wind turbines generated nearly 40 percent of Danish electricity in 2014, and Denmark has many biogas digesters and waste-to-energy plants as well - together, wind and biomass provided 55% of Denmark's electricity. Spain's 47 million inhabitants meet one-third of their electrical needs from renewables. The incentive to use 100% renewable energy is created by global warming and ecological as well as economic concerns, post peak oil. The first country to propose 100% renewable energy was Iceland, in 1998. Proposals have been made for Japan in 2003 and for Australia in 2011. Norway and some other countries already obtain all of their electricity from renewable sources. Iceland

proposed using hydrogen for transportation and its fishing fleet. Australia proposed biofuel for those elements of transportation not easily converted to electricity. The road map for the United States, commitment by Denmark, and Vision 2050 for Europe set a 2050 timeline for converting to 100% renewable energy later reduced to 2040 in 2011. Zero Carbon Britain 2030 proposes eliminating carbon emissions in Britain by 2030 by transitioning to renewable energy [18].

Climate change (particularly loss of the Arctic sea ice cap), air pollution, and energy insecurity are the current and growing problems, but it takes several decades for new technologies to become fully adopted. It is, therefore, apropos to consider only options that have been demonstrated in at least pilot projects and that can be scaled up as part of a global energy system without further major technology development and to avoid options that require substantial further technological development and will not be ready to begin the scale-up process for several decades. Technologies based on the state of development of the technology only rather than whether industrial capacity is currently ramped up to produce the technologies on a massive scale or whether society is motivated to change to the technologies. In order to ensure that our energy system remains clean even with large increases in population and economic activity in the long run, only those technologies be considered that have essentially zero emissions of greenhouse gases and air pollutants per unit of output over the whole 'lifecycle' of the system. Consider only those technologies that have low impacts on wildlife, water pollution, and land, do not have significant waste-disposal or terrorism risks associated with them, and are based on primary resources that are indefinitely renewable or recyclable [19].

Clean energy technologies are prepared for accelerated and widespread expansion in the global power sector. World over; solar, wind and other renewable energy sources will represent a significant share of the new generating capacity deployed in the coming years. These technologies will also be in demand as the world addresses local and global environmental challenges and because clean energy will be sought after in order to achieve greater energy security. For all these reasons, the future of clean energy is bright. Scandinavian countries and Germany are, perhaps, in a more competitive position in this fast-growing sector. On a variety of key measures, from innovation and manufacturing to deployment and exports, these countries are leading in the global economic and technological spurt.

8.0 THE GERMAN ENERGY TRANSITION: AN UNDERTAKING FOR THE WORLD TO EMULATE

Germany has the fourth largest economy in the world with 2014 GDP reported at 3.853 trillion US dollars; it is the largest economy in the whole of Europe. Germany has an ambitious goal of demonstrating that a thriving industrial economy can switch from nuclear and fossil energy to renewables and efficiency. The German *can-do* attitude is based on the experience over the last two decades, when renewables matured much more quickly, became more reliable and much cheaper than expected. Germany's renewable energy sector is among the most innovative and successful worldwide. Net-generation from renewable energy sources in the German electricity sector has increased from 6.3% in 2000 to about 31% in 2014 (Figure: 1); for the first time ever, wind, biogas, and solar combined accounted for a larger portion of net electricity production than brown coal (Lignite). While peak-generation from combined wind and solar reached a new all-time high of 74% in April 2014, wind power saw its best day ever on December 12, 2014, generating 562 GWh; Germany has, rightfully, been called "the world's first major renewable energy economy" [20].

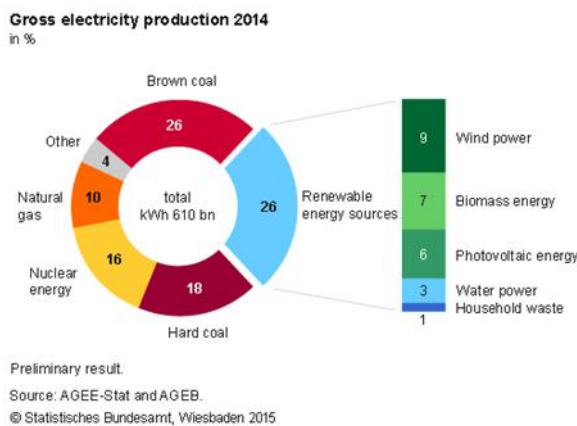


Figure 1 German power sector in 2014 by source (Bundesamt, 2015)

Germans want clean energy, and a lot of them want to produce it themselves. The Renewable Energy Act guarantees priority grid access to all electricity generated from renewables and is designed to produce reasonable profits. By 2014, more than half of investments in renewables had been made by small investors. Large corporations, on the other hand, have invested relatively little so far. The switch to renewables has greatly strengthened small and midsize businesses, and it has empowered local communities and their citizens to generate their own renewable energy. Across Germany, a rural energy revolution is underway. Communities are benefiting from new jobs and increasing tax revenues, which has become even more important after the debt crisis in the euro zone. Already, roughly 380,000 Germans work in the

renewables sector; far more than in the conventional energy sector

German climate and energy policies are designed to maintain a strong manufacturing base at home. On the one hand, industry is encouraged to improve its energy efficiency and on the other, industry benefits from exemptions to regulations (some of them probably too generous) to ease the burden on industry. Contrary to one common misconception, renewables have turned Germany into an attractive location for energy intensive industries. In 2012, wind and solar energy drove down prices on the wholesale power market by more than 10%. Germany's energy policy is a mix of market-based instruments and regulation. Under the Renewable Energy Act, renewable electricity has been guaranteed grid access to provide investment certainty and allow family businesses and small firms to compete with large corporations.

A lot of countries are struggling to fulfil their climate commitments. Germany is on track to meet its climate targets. Even after eight nuclear power plants were taken offline in the spring of 2011, Germany reduced its greenhouse gas emissions by 2% from the previous year. Though eased by a warm winter, this outcome is remarkable given the GDP growth and continued net electricity exports to neighbours. Germany's energy transition is not only about switching from nuclear and coal to renewables in the electricity sector; electricity only makes up roughly 20 percent of German energy demand, with roughly 40 percent devoted to heat and 40 percent to transportation. Most public attention has focused on the power sector, with the nuclear phase-out and the switch to wind power and solar power making headlines; on 29 May 2011, Merkel's government announced that it would close all of its nuclear power plants by 2022. But in fact, Germany is a leader in "passive houses," which make heating systems in homes largely redundant. The public strongly supports extending renewables, even in light of rising retail power rates. Germans expect their political leaders to take on the challenge of the energy transition. There are disagreements across the political spectrum about which strategies are the best, but in general all German political parties today support the energy transition because the German public overwhelmingly does.

Germany has benefited economically from its international leadership role in going renewable; similar to Denmark and other pioneers moving to renewables. Germany has created the world's largest domestic solar PV market; German commitment and Chinese mass scale production has helped to drive down the cost of renewables worldwide. In Germany, installed system prices for solar PV plummeted by 66% from 2006 to mid-2012. It will be much cheaper for other countries to invest in renewables now that the costs are lower. On top of that, many countries have much better solar resources than Germany; some of them with the capability of producing up to twice as much power

from the same solar panel, because of more sunshine. Given the environmental and health hazards of power generation by fossil fuels, it is imperative that Nations should opt for 'Renewable Energy' for power generation; electricity from sustainable sources like wind, solar, and geothermal power with little or no pollution or global warming emissions. We want to engender a world free of oil accidents, coal pollution and nuclear waste; a world where energy is Clean, Safe and available for all.

9.0 CONCLUSION

A global transition to renewable energy is already underway. Renewable energy offers an alternative to conventional sources and grants us greater control over future energy prices and supply. Individuals, businesses, and communities can meet their energy needs through local, distributed energy production that provides additional economic benefits including jobs and community development. The technology that will make renewable energy a viable and cost-competitive solution requires innovation to improve cost efficiencies. System costs are directly related to performance and available technologies. To achieve any significant impact in energy production over the next 25 years, innovation and development in technology is crucial, as are optimization strategies for renewable energy [21].

Climate change, pollution, and energy insecurity are among the greatest problems of our time. Addressing them requires major changes in our energy infrastructure. A solution to the problems of climate change, air pollution, water pollution, and energy insecurity requires a large-scale conversion to clean, perpetual, and reliable energy at low cost together with an increase in energy efficiency [19]. As the alternative energy industry grows and refines the available technology, the cost per kilowatt-hour for renewable energy will decrease, and alternative power generators will become capable of supplying more power from less wind or sun, making them more reliable as a year-round power source. Over time, as fossil fuel resources become scarcer and environmental regulations become stricter, the cost of utility supplied electricity and fuel oil will increase. It's only a matter of time before alternative power sources present themselves as the only sensible source of electrical power for residential, remote and utility-level power generation [22]. Over-reliance on fossil fuels for power generation has significant health, environmental, and economic risks and is not a long-term solution to our energy needs. The energy choices we make during this pivotal moment will have huge consequences for our health, our climate, and our economy for decades to come.

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