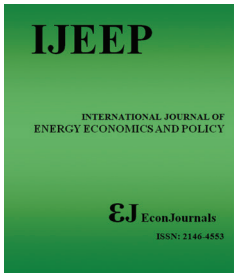

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Could the U.S. Energy Sector Become New Engine For Growth?

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ABSTRACT

The intent of this paper is to discuss the U.S. energy sector in the context of economic growth, employment conditions, manufacturing competitiveness, and trade deficits. The paper carefully examines how utilization of domestic energy resources can strengthen the United States economic position in both domestic and foreign markets. Consideration is given to expanding the use of domestic energy resources to improve competitiveness in the global goods market and reduce dependency on foreign oil. In particular, the sections of the paper discuss: The current U.S. macroeconomic situation with an emphasis on economic growth and labor market; domestic oil and gas production; energy security; institutional arrangements necessary to deliver reliable U.S. energy resources to domestic and foreign markets; and policy considerations deemed necessary to boost energy growth.

Keywords: Economic Growth, Energy Consumption, Energy Production, Development Policy
JEL Classifications: O, Q

1. INTRODUCTION

In the United States the development of advanced technologies and the discovery of new resources in oil and natural gas are beginning to shift supply dynamics, and have the potential to change the global energy trade balance. Shale gas in particular has already begun to alter the outlook for energy production as U.S. suppliers look to increase liquefied gas exports while decreasing imports. Unconventional sources of oil, such as, oil sand, and tight-oil (shale and tight sandstone formations) are also impacting the liquid markets as new technologies in hydraulic fracturing and horizontal drilling allow suppliers the opportunity to tap into new found resources and make previously untapped resources increasingly available and profitable. As increases in petroleum production supports U.S. self-sufficiency in liquids over the coming decades, the utilization of these resources also create an opportunity for domestic manufacturers to improve competitiveness in the goods markets, by stabilizing fluctuations in input costs due to dependency on foreign oil.

The turnaround in U.S. energy market is due to onshore production through the application of advanced technologies developed for the extraction of shale gas and oil. Continued deployment of these technologies can assist with incresing production and new job opportunities as the U.S. has become number one producer of oil and gas in the world in 2014 surpassing Russia and Saudi Arabia.

As the utilization of domestic energy resources helps stabilize production input costs, U.S. manufacturers become increasingly competitive in both domestic and foreign markets. This increase in competitiveness can lead to increases in production requiring new job creation in areas of manufacturing, distribution, transportation, sales, and finance. Investment opportunities increase as manufacturers look to expand production to meet demands for U.S goods at home and abroad. Consumer confidence improves as U.S. producers expand operations driven by demand for product, increased investment, and the creation of higher paying manufacturing jobs. Infrastructure needs necessary to increase production and distribution of oil, gas, and other resources such as pipelines, railroads, port facilities, roads, etc., should facilitate gross domestic product (GDP) growth and employment opportunities. A rise in demand for U.S. produced goods serves to grow the domestic economy resulting in a further increase in GDP.

The paper is structured as follows. The first section of the paper briefly examines economic growth and job creation fluctuations in the United States. The following Sections 3 and 4 discuss the U.S. production and global developments, and the country's electrical grid infrastructure in detail. The final main sections of the paper, 5 and 6, provide necessary environmental and policy considerations as important components of a national energy policy framework for the USA.

2. ECONOMIC GROWTH

Since the end of recession in June 2009, economic growth has been spotty averaging 1.6-2.5% annually with the low of −2.1% in the first quarter of 2014 and high of 4.6% in the fourth quarter of 2011, which is the weakest post-recession recovery in modern history and below the long term trend of 3-3.5% (www.bea.gov).

As the Fed continues to scale back their quantitative easing program, investor's behavior becomes increasing uncertain, as evident by the slow growth in the first quarter of 2014. According to the Commerce Department, GDP grew by a seasonally adjusted annual rate of 2.4% in 2014, followed by a drop of 0.2% in the first quarter of 2015 mostly due to a severe winter on the heels of −2.1% GDP growth recorded in the first quarter of 2014 - the worst decline during the past 5 years of recovery (www.richmondfed.org).

As of June 2015, the U.S. civilian unemployment rate stood at 5.3%, which is the lowest rate since April 2008 (www.bls.gov). However, the labor force participation rate at 62.6% was the lowest in almost 38 years (www.stlouisfed.org). Duration of unemployment of 28.1 weeks in June 2015 although slowly declining since its peak of 40.4 in July 2011, is still significantly above the typical range of 10-20 weeks since the Department of Labor started compiling these statistics in 1948 (www.stlouisfed.org). The steady decline in the labor force participation rate since the 2008 financial crisis (down from 66.2% in January 2008), and the fact that the decline in the unemployment rate is skewed because many higher paying full time jobs have been replaced by lower paying part-time jobs, is a clear indication that the U.S. labor market continues to struggle. By continuing to develop the U.S. energy production market and expanding new production opportunities, new higher paying full-time jobs can be created, resulting in a strengthening of the U.S. labor market and momentum for economic growth.

The following two sections describe the U.S. energy production and developments and the country's electrical grid infrastructure, in detail.

3. U.S. ENERGY PRODUCTION AND DEVELOPMENTS

With the development of advanced technologies in the areas of hydraulic fracturing and horizontal drilling, along with the discovery of new energy resources the production of domestic oil and natural gas provides benefits including economic growth, job creation, supply stability and reduced dependency on foreign oil. According to the Annual Energy Outlook report released in April 2015 by the U.S. Energy Information Administration (EIA); net U.S. energy imports declined 17% from 2005 to 2013 due to increased domestic oil and natural gas production and reduced total energy consumption (EIA, 2015. p. 17). As a result of continued advancements in technology the U.S. is the world's leader in oil and natural gas production, producing 20% more oil than Saudi Arabia and surpassing Russia as the world largest oil producer in 2014 (Table 1). According to the data included there, since 2007, U.S. output of oil has increased by almost 65%, while entire African continent recorded a decline of 17% (Table 1). Table 2, on the other hand, identifies top 10 producers of the dry gas in the world.

In terms of potential production, consumption, and trade, no other major fuel source has seen as much change as natural gas as demand from industrial and electric power sectors continue to support natural gas as the fastest growing fossil fuel globally. As electricity consumption continues to become an increasing share of World's total energy demand the resources needed for power generation will impose increasing demands on oil and natural gas supplies. This increase in demand for oil and natural gas will continue to offer U.S. suppliers the opportunity to expand production and increase sales of U.S. resources in both domestic and foreign markets.

Despite the decline in crude oil prices the U.S. remained the world's top producer of petroleum and natural gas in 2014. The outlook for supplies of oil and natural gas remains positive as advances in tight oil and shale formations in the lower 48 states continue as new well productivity in all 7 of the most prominent U.S. regions (Bakken, Eagle Ford, Haynesville, Marcellus, Niobrara, Permian and Utica) increased between July 2014 and July 2015. These regions accounted for 95% of the growth in domestic oil and gas production between 2011 and 2013. Table 3 compares production data from December 2007 and June 2015 from the 7 prominent regions for oil and natural gas production in the United States (http://www.eia.gov/petroleum/drilling/pdf/summary.pdf).

The U.S. continues to increase production of petroleum and natural gas, between December 2007 and June 2015 domestic natural gas production increased 186% from 15,948,333 million cubic feet per day to 45,634,386 million cubic feet per day with domestic oil production increasing 342% during the same time period from 1,315,990 barrels per day to 5,811,795 barrels per day. The increases in domestic oil and natural gas production are due to advancements in fracking and horizontal drilling technology, which have allowed the U.S to surpass Russia as the world's largest natural gas producer and Saudi Arabia as the world's leader in oil production. The increase in domestic oil and natural gas production is largely due to the development of advanced drilling technologies that have increased drilling efficiency allowing for extraction of resources from tight oil formations and shale gas. According to the June 8, 2015 EIA drilling and productivity report, the new domestic oil production is expected to increase by a total of 87 barrels per day between June 2015 and July 2015 with the

Table 1: Top 10 global producers of petroleum from 2007 through 2014

Country	2007	2008	2009	2010	2011	2012	2013	2014
USA	8469	8564	9130	9696	10,128	11,119	12,343	13,973
Saudi Arabia	10,749	11,429	10,315	10,908	11,467	11,841	11,702	11,624
Russia	9938	9,875	10,050	10,294	10,410	10,595	10,764	10,853
Africa (total)	10,490	10,579	10,430	10,678	9275	9926	9305	8716
China	3958	4039	4075	4373	4370	4459	4543	4572
Canada	3449	3348	3319	3442	3597	3856	4073	4383
United Arab Emirates	2947	3047	2795	2813	3214	3398	3441	3471
Iran	4039	4178	4178	4243	4214	3518	3192	3375
Iraq	2097	2385	2399	2403	2629	2987	3058	3371
Brazil	2284	2431	2562	2712	2685	2652	2694	2950

Oil data in thousand barrels per day

Table 2: Top global producers of dry natural gas from 2007 through 2013

Country	2007	2008	2009	2010	2011	2012	2013
USA	19,266	20,159	20,624	21,316	22,902	24,033	24,334
Russia	21,595	21,515	19,303	21,536	22,213	21,764	22,139
Africa (total)	6,749	7390	7111	7371	7124	7797	7328
Canada	6416	6046	5634	5390	5218	5070	5129
China	2446	2685	2975	3334	3629	3666	3986
Norway	3168	3503	3664	3756	3580	4052	3840
Saudi Arabia	2628	2841	2770	3096	3258	3508	3526
Netherlands	2687	2957	2786	3131	2851	2843	3052
Turkmenistan	2432	2490	1347	1600	2338	2437	2995
Algeria	2996	3055	2876	2988	2923	3053	2813

Dry natural gas data in billions of cubic feet

Table 3: U.S. Regional natural gas and oil gas production December 2007 versus June 2015

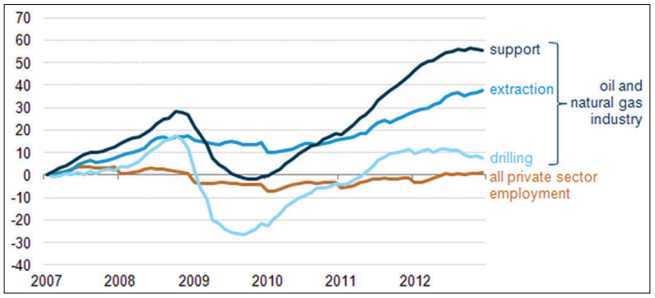
Region	NG December 2007	NG June 2015	%Δ	Region	Oil December 2007	Oil June 2015	%Δ
Marcellus	1,294,034	16,521,647	1177	Permian	862,874	2,056,378	138
Eagle ford	1,652,223	7,251,886	339	Eagle ford	53,352	1,643,687	2981
Haynesville	3,987,053	7,028,154	76	Bakken	195,436	1,499,390	667
Permian	4,722,015	6,436,121	36	Niobrara	123,087	430,802	250
Niobrara	3,981,292	4,611,101	16	Utica	9,491	65,337	588
Utica	164,421	2,519,057	1,432	Haynesville	60,584	59,259	−2
Bakken	147,295	1,266,420	760	Marcellus	11,166	56,942	410
Total	15,948,333	45,634,386	186	Total	1,315,990	5,811,795	342

Natural gas data in million cubic feet per day, oil data in barrels per day

Bakken and Eagle Ford regions expected to represent 51.7% of the total increase. The same report estimates new domestic gas production increasing by 454000 cubic feet per day between June 2015 and July 2015 with the Utica region representing 56.2% of the total increase (Table 2).

Employment in the oil and gas industry is outpacing total private sector employment. According to the Bureau of Labor Statistics, employment decreased by 3.7 million across all U.S. industries between 2007 and 2012. During the same period employment in the U.S. oil and natural gas industry increased by 31.6% or 135,084 jobs. The largest increase in terms of the number of jobs occurred in the state of Texas where 64,515 jobs were created between 2007 and 2012. Pennsylvania had the second largest increase in employment in terms of job count with 15,114 new jobs created between 2007 and 2012 which represents a 259.3% increase in employment in the state. The largest percentage change in employment in the oil and natural gas industry occurred in the state of North Dakota where employment increased by 354.3% between 2007 and 2012 (http://www.bls.gov/opub/ted/2014/ted_20140404.html) (Figure 1).

Figure 1: Percent change in employment, oil and natural gas industry and all private sector employment



4. U.S. ELECTRICAL GRID INFRASTRUCTURE

Under Title IV of the American Recovery and Reinvestment Act of 2009, 4.5 billion dollars have been allocated for "electricity delivery and energy reliability," these funds are intended for use in areas regarding modernization of the electric grid for improved electricity delivery and reliability, and to address the increasing

demand for electricity generation (ARRA H.R. 1-24). Faced with increasing demands the current electrical grid infrastructure lacks the capacity to reliably deliver power without disruptions to the energy supply. These disruptions present significant challenges to producers of goods and services as producers risk losing output due to the loss of power and therefore must increase capital and operating expenses used to develop, operate, and maintain emergency power systems designed to offset such losses. In addition, there are some possible dangers the U.S. electrical grid is exposed to. They may result from a terror attack targeting a key substation, a massive solar storm, or an electro-magnetic-pulse (EMP) attack created by a nuclear explosion several hundred miles above the ground. According to recent studies, an EMP attack could disable the U.S. electrical grid for weeks or even years. This means lack of transportation, refrigeration, sanitation, temperature control, and also water supply that could potentially wipe out 90% of the U.S. population within a year according to the EMP Commission Report of 2004 (www.empcommission.org).

As the risks of disruption in electrical energy supply continue to increase, due to malfunction of deteriorating infrastructures, solar storm, or an EMP attack, the cost of production operations continues to rise making U.S. manufacturers less competitive in both domestic and foreign markets. In accordance with the American Recovery and Reinvestment Act of 2009, infrastructure improvements can be accomplished by investing in converting electrical generating plants to natural gas, as natural gas continues to become a preferred fuel resource for electricity generation (Table 4). Developing long term plans for improving the infrastructure of electrical power distribution systems and utilizing domestic natural gas resources can also serve to strengthen U.S. industrial competitiveness by increasing reliability and supply stability. These improvements will require inputs of labor and capital which will help create new jobs and investment opportunities.

Electrical power plants continue to generate power by consuming large quantities of coal through the use of systems that require increasing amounts of maintenance labor and fuel consumption as these systems are becoming antiquated, inefficient, and increasingly unreliable. Investing in the expansion of natural gas infrastructure intended to deliver resources to electrical generation plants and converting coal consuming power plants to natural gas will improve the reliability and efficiency of distribution systems.

Consideration must be given to the fact that electrical power generation infrastructure in the U.S. is declining and improvements must be made to ensure reliable distribution of electricity. The cost of securing the grid against a solar storm or a terrorist attack although high is not prohibitively expensive and runs into several hundred million dollars. However, the costs of ignoring this problem will continue to escalate as manufactures struggle to find dependable sources of energy. Production costs will increase at a faster rate as electrical infrastructure systems continue to deteriorate because capital investment must be utilized to provide emergency power systems to offset risks associated with the loss of electrical power as opposed to being used to develop more efficient production operations.

Table 4: Primary energy consumption by fuel source in EIA reference case 1980-2040

Source	1980-1990 (%)	1990-2013 (%)	2013-2040 (%)
Petroleum and other liquids	40	38	33
Natural gas	23	27	28
Coal	23	18	18
Renewables	7	8	10
Nuclear	7	8	8
Liquid biofuels	<1	1	1

EIA: Energy Information Administration

The last two main sections of the paper provide necessary environmental and other policy considerations as important components of a national energy policy framework for the USA.

5. RENEWABLE ENEGY AND ENVIRONMENTAL CONSIDERATIONS

Total energy consumption in the U.S. in 2013 amounted to 97.1 quadrillion of British thermal units (or Btu) with the biggest share (36%) going to petroleum and other liquids used mainly in transportation with natural gas (27%) coming second (Table 4). Coal is 18% mostly used for electricity generation. By year 2040 it is estimated that total energy consumption will increase to 105.7 quadrillion Btu with the share petroleum decreasing slightly to 33% and natural gas increasing slightly to 29% while coal remaining the same at 18% (EIA, 2015. p. 15). Future CO_2 emissions attributed to consumption of fossil fuels are expected to follow trends in energy consumption as the share of cleaner natural gas and renewable sources are predicted to increase from 35% to 39%, while combustion of coal and petroleum based fuels is expected to decline from 54% to 51%. As a result, the U.S. EIA projections for 2040 at 5.5 billion metric tons of CO_2 emissions are lower than the peak of 6.0 billion tons in year 2005. Improved efficiency of energy users and a gradual shift from more carbon-intensive fuels helped stabilize U.S. carbon-dioxide emissions for the next 25 years below the record 2005 level of 6 billion metric tons (EIA, 2015).

Renewable fuels (aka alternative fuels) are expected to gain share in total energy mix. Although the term “renewable” is a misnomer because energy can’t be recycled, it usually describes hydroelectric, wind, and solar forms of energy that are supposed to be abundant and “free.” Hydropower provided about 50% of all renewable energy in 2013 and is expected to fall to about 33% in 2040 mostly due to the fact that many places suitable for dam construction have already been utilized. Wind, which is the second source of electricity generation after hydropower, is expected to provide around 30 to 33% of alternative energy electricity generation. The main problem associated with wind energy its unpredictability. In addition, the biggest wind turbines take lots of land and can muster 5-6 megawatts of electric power which is <1% of a traditional power plant. Solar energy, on the other hand, requires lots of space and a typical one square yard solar cell can power only a couple of light bulbs. Photocells are more efficient but yet quite expensive. As a result, solar energy is expected to account

no more than 2% of total electricity output in 2040. Solar energy, however, has one large benefit: It provides most electricity during hot sunny days when the grid system is taxed to the maximum due peak demand for air conditioning (Table 5).

Even though alternative energy produces relatively little of CO_2 emissions, its cost and impact on the environment are still high (demand for space needed for windmills and solar cells is still very high). Many of power generation from alternative sources of energy can function today because of subsidies and tax incentives.

Natural gas is the most environmentally friendly of fossil fuels. It only emits 40% of greenhouse emissions of coal while it costs about 33% less than coal to produce 1 kwh. Since 2011 the U.S. has become the largest producer of natural gas and its output has increased by over 20% between 2008 and 2013. Such an increase has become possible due to new technologies such as hydraulic fracturing (fracking) and horizontal drilling that have been utilized on a large scale in the last several years. The technology of hydraulic fracturing has been a controversial subject due to concerns raised by some environmental groups.

The technology of fracking has been around for nearly 70 years. It has been first applied in 1947 and involves a 99% mixture of water and sand pumped at high pressure to crack and open fissures in hard rock formations located at depths of one mile or more underground. The remaining 1% of the solution is made up of chemical additives used to condition and prevent the corrosion of well casings and kill bacteria[1]. Cracking solid rock formations allow trapped oil and gas to flow to the surface and be recovered by a drilling operator. To address the groundwater concerns calibrated steel casings are inserted up to depths 5,000-10,000 feet below surface and then cemented to protect near-surface groundwater from the well. Smaller diameter casings ranging from 24" tubes to 13" tubes are cemented up to 1,000 feet below the ground to protect the deep groundwater aquifer as well from oil and methane. So far over one million have used fracking safely and multiple studies conducted by the Environmental Protection Agency (EPA) and the U.S. Department of Energy have found no incident of water contamination as well as pollution resulting from 10% of wastewater flowing back to the surface[2]. Most states allow that wastewater to be injected back to the well while some require its treatment and disposal at wastewater facilities[3]. Recently, in June 2015, the EPA released a long awaited report in which it was stated that despite some isolated incidents of pollution resulting from poorly constructed wells and inappropriate wastewater disposal, hydraulic fracturing "poses no threat to drinking water." According to EPA, none of those incidents affected the quality of groundwater (http://www2.epa.gov/hfstudy/hydraulic-fracturing-study-draft-assessment-2015).

Table 5: Electricity generation by fuel source in EIA reference case 2000-2040

Source	2000 (%)	2013 (%)	2040 (%)
Coal	52	39	34
Natural gas	16	27	31
Renewables	9	13	18
Nuclear	20	19	16
Petroleum and other liquids	3	1	1

EIA: Energy Information Administration

6. POLICY RECOMMENDATIONS

6.1. Conducive Macroeconomic Policies

In order for national energy policy to be successful appropriate fiscal, monetary, and exchange rate policies are necessary to enhance the performance of the US economy and to facilitate industrial growth and development efforts. A prudent fiscal management and tax incentives should seek to achieve private productive investments in the sector. Indeed, fiscal policy along "functional finance" lines to secure higher levels of economic activity is very important and relevant here, at least in the short and medium-term[4]. The objectives of monetary policy, on the other hand, must promote longer time horizons, encourage stability of exchange rates to assure competitiveness and maintain an interest rate policy that allows firms investing in the energy sector to acquire necessary capital. Policies may also be directed toward removing imbalances between private savings and investments (in order to raise the level of domestic savings and finance higher levels of productive investments) and easing balance-of-payments constraints (Karagiannis and Madjd-Sadjadi, 2012).

6.2. Mixture of Domestic and Competitive Developmentalism

Developmentalism in the U.S. context could be best understood as consisting of a range of technically proficient strategies and policies that place energy sectors at the center of economic development. The key is to ensure industrial and resource development serves the national interest and this requires a two-pronged approach of "inward focus" (to take care of the human, material, and financial requisites deemed necessary to boost local production lines) and "outward orientation" (to expand productive capacity and export growth).

Central choices for implementation should be energy sectors that are closely aligned with development of modern technology and require significant R and D expenditures: Solar, renewable and alternative energy. These dynamic engines are expected to be supply-chain partners for the country's other sectors. These activities will also increase benefits to primary production and services because they will enhance complementarities and forward and backward linkages, and would allow for product differentiation on the international stage (Karagiannis and Madjd-Sadjadi, 2012).

6.3. The Need for Industrial Growth

Growth is governed by the growth of aggregate demand and supply, and demand for development of necessary infrastructure such as pipelines, refineries, liquefied natural gas (LNG) terminals

1 According to "facts on fracking" Policy Report prepared by John Locke Foundation, August 2014. This report includes an extensive list of chemicals used in fracking and their household applications.

2 Ibid.

3 For example, the State of North Carolina does not permit the reuse of wastewater for fracking purposes.

4 Lerner, 1943.

leads to output growth and important efficiency benefits which induce further growth of demand. The expansion of industry represents a net addition to the effective use of resources and contributes to a higher degree of capacity utilization. Indeed, the growth of aggregate demand provides the opportunities for the growth of supply both industry-wide and nationally. Energy policy has a role as an important component of such a supply-side growth strategy (Karagiannis, 2002).

The US government's role at the national level should be limited to strategic oversight of endogenous development efforts "which are essential in the case of a limited array of key industries or sectors (e.g. LNG, solar, wind, and alternative energy) - many activities being left to market processes without strategic guidance" (Cowling, 1990. p. 18). The US government should adopt a strategic view of future energy sector as a major engine of economic growth. The newly-developed energy sectors can utilize modern knowledge and transform this knowledge into new technologies and products. As profitability depends upon continuous technological advancement, technical change can be expected to influence the volume of investment expenditure and opens up new and more profitable opportunities for expansion.

Still, there are dangers associated with this energy developmental approach. It is difficult to identify certain areas of industrial activity on which human, material, and financial resources should be concentrated and thus neglect others. It is also potentially dangerous to continually protect certain areas of industrial activity from the market discipline and international competition (Cowling, 1990. p. 20). There are three reasons that support this approach. The first is the obvious one: If policy makers try to subsidize as many firms as possible, they will quickly run into fiscal constraints. The second is less intuitively obvious but actually far more important: Only unequal subsidization can alter or extend a competitive advantage (Karagiannis and Madjd-Sadjadi, 2007). The third has to do with the harsh reality: The US government must address systemic deficiencies manifested in key macroeconomic imbalances (i.e., massive national debt, the imbalance between savings and domestic investments, and the trade deficit) by implementing a strategically focused production-oriented approach.

Creating a proper environment for the U.S. energy sector require detailed information on the quantity (how much) and quality (what type) of human and material resources needed by these sectors so new investments are profitable. It is this thoroughness and proficiency that can make national development goals and strategic investments successful (Karagiannis, 2002).

6.4. Emphasis on Quality

For the U.S.A. to succeed, it must do so as a quality value-based producer, as opposed to simply a low-cost one. The United States simply cannot compete in the low-wage areas and so must be vigilant to improve quality and provide good value for the consumer, including energy products. This must be a recurrent theme throughout the supply chain and requires modern management techniques such as total quality management. This also requires constant retraining of workers, an emphasis on purchasing high-quality machinery, and having an adequate supply of labor to configure and maintain these machines. It requires an understanding of proper inventory control procedures and minimization of transportation costs, as well as rigorous quality control, occupational and environmental safety standards, and testing.

The government and society must realize actions of individual businesses will reflect on all companies in the country. American firms must realize that, in order to be globally competitive, they must be competitive on both quality and price, providing the most "bang for the buck." Products that do not live up to these standards not only will backfire against the firms that produce them but against other American companies too, causing a further deterioration in the terms of trade and the balance of payments.

6.5. Necessary Politico-institutional Reforms and Regulatory Environment

In the United States, policies are developed in short segments by one elected government and often circumvented or conflicted by the next administration as experienced by the Energy Policy Act of 2005. This is a fundamental feature of any political system that has term limitations on its executive branch and, therefore, a major constraint on the pursuit of developmental strategies and policies. For this important reason, and perhaps for others, development of any national energy policy in the USA would require wide consultation, broad political consensus, a strong sense of realism, and commitment to "national purpose" goals in order to ensure such policies cannot easily be reversed. Such policy formulation needs to be crafted in a consultative manner with scientists, experts, and forward-looking businessmen (Karagiannis and Madjd-Sadjadi, 2012).

Energy policies, including developmental and environmental issues, should be supported by the proper regulatory framework. Still, without fundamental reform of relevant government institutions, the results will likely be stillborn. Government intervention requires a technocratic but managerially competent public sector that can thoroughly formulate and properly execute policy to bring about desired results. It has to be reminded that by promoting the interests of the few over the needs of the many the American society has suffered from an overemphasis on the needs of special interests (Karagiannis and Madjd-Sadjadi, 2012).

In order to achieve success, the following preconditions must be met: (1) The government must credibly commit to pursuing a production-oriented strategy without unnecessary and stifling regulations, (2) the government bureaucracy overseeing and regulating the energy sector both at federal and local levels must be streamlined and insulated from political and industrial pressure, (3) a long-term development view must replace the current focus on the short-run in both government and the financial sector; and (4) the government sector must have its incentive structure changed so as to dissuade rent-seeking, lobbying, and other corrupt behavior (Aherns, 1997. p. 116).

Without these preconditions, energy development strategy, and alternative energy development in particular, will founder on

short-term expediency, the deficiencies and conservatism of the civil service, the existing configuration of socio-economic power and certain interests, or the mindset of politicians and people (Karagiannis and Madjd-Sadjadi, 2012).

7. CONCLUSION

From the beginning of 2007 through 2012, the U.S. private sector added about 1 million or about 1% of all jobs. Over the same period, the oil and natural gas industry added over 160,000 jobs, or 40% increase. As a result, the U.S. should continue to develop infrastructure for the supply of energy resources to both foreign and domestic markets. Reliable domestic supply of oil and natural gas resources can serve to improve U.S. competitiveness in both domestic and foreign markets by stabilizing input costs of production. Developing reasonable balance between foreign and domestic supplies benefit both producers of oil and natural gas and U.S. manufactures of goods and services by stabilizing oil and natural gas supply and prices. This can result in improved economic growth, increased competitiveness in global markets, reduce dependency on foreign oil, and provide much needed relief to the current account balance.

Energy consumption continues to grow, especially in the developing world, as technological improvements in energy efficiency create a shift from traditional energy sources and structural transformation in the economy increases the demand for alternative forms of energy production and distribution. The energy mix will be dominated by fossil fuels, but their share is expected to plateau and potentially decline in years to come. Over the next two to three decades, coal and oil may reach near peak consumption in the West, and global coal consumption is likely to level off and decrease if environmental policies unfold as expected.

If the United States wishes to place special emphasis on the development of alternative energy sectors while taking full advantage of current opportunities, a strategic approach encompassing technically proficient developmental action must be seen as necessary in the face of the unprecedented changes in the global environment. To be successful will require realism, determination, wide consultation, broad consensus, and market-augmenting policy of high quality. There is no need for vast bureaucratic machinery and procedure because the approach is clearly entrepreneurial. Such an approach will utilize and maximize productive resources available for endogenous growth; promote cross-sectoral links, and create economies of scale across a whole range of industries; place emphasis on industrial accelerators; and, finally, identify inefficiencies and gaps to adequately develop and use new products and processes. Such an alternative framework will have to be underpinned by a strong commitment to national development, and focused collaboration among government, business, and civil society.

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