A National Energy Program

A White Paper on Achieving Energy Independence and National Transformation

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October 2013

Preface

The goal of a National Energy Program is to achieve independence from oil imported from the "arc of instability" running through North Africa and Southeast Asia plus elimination of the projected increase in U.S. demand - a reduction of five million barrels per day in consumption by 2025. The goal is to be achieved in addition to the projected increase in domestic production.

Stability at home and abroad is intertwined. Other nations have greater exposure to imported oil than America and the projected global shortfall for all consuming nations is 18 MBD by 2030 – an amount about equal to U.S. consumption. The implications for future conflicts are ominous, if energy supplies cannot keep up with demand and should states see the need to militarily secure dwindling supplies. With a darkening landscape at home and abroad and time our most precious resource as the world's oil supply moves from surplus to shortfall, the issue isn't a choice between green and black energy; it is "how much, how fast, how clean" can America produce both?

The approaches used to manage the Apollo program, finance and build the Interstate Highways and transform the nation during World War II are adapted to produce an overview of a strategy and plan to achieve energy independence. These efforts were of necessity national undertakings; because, they were instituted to deal with national security threats. A National Energy Program focuses on a similar threat and will be planned and implemented accordingly.

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Executive Summary: A National Energy Program – Why, When and How?

President Kennedy set a goal to send a man to the moon by the end of the 1960's. In similar fashion, a National Energy Program (NEP) will begin with setting a goal and timeline. In this white paper the goal is proposed as achieving independence from oil imported from the "arc of instability" running through North Africa and Southeast Asia (the region) and elimination of the projected increase in U.S. demand - a reduction of at least five million barrels per day (MBD) in consumption by 2025. This goal will be achieved in addition to the projected increase in domestic production and may be adjusted during the program to deal with world events.

As discussed in the 2010 Joint Operating Environment (JOE) Report from DOD, the region could become an "arc of chaos" involving the military forces of several nations. Turmoil in energy producing nations is on the rise, with increased potential for future combat operations. The implications for future conflicts are ominous, if energy supplies cannot keep up with demand and should states see the need to militarily secure dwindling supplies. A severe energy crunch is inevitable without a massive expansion of production and refining capacity.

Therefore, the goal isn't just concerned with reducing domestic oil use and increasing production; it is also concerned with America leading by example to induce other energy consuming nations to achieve their own energy goals. Stability at home and abroad is intertwined. Other energy consuming nations have greater exposure to imported oil than we do and JOE 2010 projects a global shortfall of 18 MBD by 2030 – an amount equal to current U.S. daily consumption. Going forward, every barrel of oil America produces, conserves and replaces with alternatives is a barrel of oil available on global markets that we won't need to defend.

In addition, as the supply/demand balance shifts, the power balance will shift to producers; limiting our ability to shape world events. Unfortunately, many producers have interests very different from our own. Examples: Today, Russia views America and NATO closing in as a threat and wants to push both away from its border. Tomorrow, Russia's ability to squeeze NATO and the E.U. by shifting its oil and gas exports to other customers via its expanding East-West pipeline network will grow as the shortfall grows enabling Russia to limit U.S./NATO cooperation to serve its interests. Today, in a period of supply/demand equilibrium with spare capacity available, America can place an embargo on Iran's oil sales. Tomorrow, oil consumers will be scrambling (and possibly fighting) for oil supplies, making such embargoes impossible.

America has fallen into a familiar pattern for hegemonic powers: over consumption, over extension and over optimism. In current market conditions with a domestic oil shale oil boom, some are saying that independence from imported oil will soon be achieved by our nation's oil and gas industry and market forces. However, the International Energy Agency (IEA) recently forecasted that U.S. oil production will peak at about 11.1 MBD in 2020 and then decline as demand grows primarily in non-OECD countries. October 2013 marked the 40th anniversary of the 1973 OPEC oil embargo. America's oil and gas industry and market forces haven't cured our addiction to imported oil in 40 years and shouldn't be relied on again to cure this addiction or reduce the global shortfall to the extent required to achieve our national security goals.

Prudence demands that we "hope for the best, but plan for the worst" to cover downside risk rather than continue to chase rosy scenarios being blindsided by unforeseen events. In credible scenarios, energy crises will be structural and involve disruptions, possibly associated with conflict, that are longer and more destabilizing than the OPEC oil embargo. Waiting for such crises to occur and trying to remedy them with a short term fix, surge or energy war; rather than implementing a long term program will be no more successful in the future than in the past.

Example: the U.S. must work with China and other nations in the Asia Pacific to secure adequate energy supplies and significantly reduce future demand; rather than stumbling into a war trying to cut China off from the energy resources of the South China Sea.

This program should be frontloaded to build up our green and black energy resources and exports as rapidly as possible to take advantage of favorable market conditions while they last to be well positioned to deal with a future global shortfall and shape world events accordingly. As the world's oil supply moves from surplus to shortfall America can't continue to be a big part of the problem, with a significant deficit between demand and supply, and be able to be part of the solution. We must stop wasting our nation's most precious asset – time.

NEP will achieve this objective in a decade. The "NEP decade" will be a transition period from dependence on imported oil to a sustainable future that will be "win-win" for stakeholders, America and the World. Expediting development/deployment of alternatives to fossil fuels that have a significant impact on achieving the goal "as a matter of national security" will increase their use to the greatest extent possible during this decade. This will contribute to reduced use of imported oil and an increase in our green energy exports that will produce a real change in the world's energy use profile going forward. Expanding fossil fuels production and refining capacity beyond currently projected levels will also contribute to achieving the goal. In so doing, NEP will create millions of new American jobs and new investments for our financial community. NEP will have an additional benefit - members of our armed services won't become casualties in wars that won't happen if America achieves energy independence from the region and leads and enables other consuming nations to achieve their own energy goals.

The military oriented, performance driven, time bound, program planning and management system used for Apollo will be adapted for NEP. When President Kennedy established the goal to send a man to the moon he turned to NASA which outlined a plan for Apollo. In a similar manner, a development project is proposed to outline a plan for NEP; working with DOD, civilian government, industry, financial institutions, research laboratories and academia.

Six top level sector objectives and implementation scenarios that achieve the goal and demonstrate the method are developed and presented in this white paper. The goal, objectives and scenarios are not set in stone and should be used as a baseline for discussion purposes to begin the project. The six objectives are:

- Energy Technologies Research, Development and Deployment: To develop and deploy energy technologies in rank order to achieve the goal.

- Building & Processes Sector: To replace imported oil, increase energy efficiency and reduce emissions in buildings and processes to meet end user needs and achieve the goal.

- Transportation Sector: To replace imported oil, increase energy efficiency and reduce emissions in motor vehicles and build the infrastructure and supply chain for the future conventional and alternatively fueled vehicles fleet built to achieve the goal.

- Power Sector: To build a safe, secure, optimized, energy efficient, smart, self healing 21st century power sector that controls emissions and replaces imported oil for the end customer.

- Fuels Sector: To build a national fuels sector that replaces imported oil and reduces emissions that can rapidly adjust to energy crises to avoid destabilizing disruptions at home and abroad.

- Defense Sector: To replace imported oil and increase energy efficiency in a U.S. military that has the operational energy security to go and win America's wars when called upon to do so without initial access to theater bases and energy supplies.

Energy independence will be achieved when the quantity of imported oil as part of total oil and other liquids used by each sector is replaced from other sources as required to achieve the goal. Sectors are tied together in cross sector supply chains: end uses (products, installation, aftermarket, customer service and support); customer/system interfaces (charging/fueling stations); energy production and supply (power and fuels) and supply chain management. Priority will be given to each sector based on comparative oil usage. Priority within sectors will be given to each project, based on its ability to contribute towards achieving the sector objective and the potential to develop and deploy related end to end supply chains within the timeline.

A key question with any program is, “how will we pay for it? Half the funds from tax expenditures, entitlements and subsidies cut from the budget will be invested in R&D, infrastructure and work force training. Part of this investment will be used for NEP. The other half will be used to reduce the budget deficit and pay down the national debt. Funds will be shifted on a case by case, “pay as you go” basis using NEP as a model. The way out of our current crisis cannot be more borrowing and spending, especially spending that does not build lasting assets that will help future generations pay off debts they will be saddled with. As President Eisenhower stated in his Farewell Address, “We want democracy to survive for all generations to come, not to become the insolvent phantom of tomorrow”.

The real cost of imported oil includes the cost of exploration, production, refining and distribution; plus hidden unfunded costs to defend imported oil. Unfunded defense costs that are part of the real cost of oil will also be paid on a pay as you go basis. This must be done to identify costs hidden by our leaders and passed on as debt to our children in order that the American people can focus on and evaluate the real threats posed by imported oil and make proper decisions on our nation’s future course. It has been projected that if unfunded annual costs were paid at the pump it would add 65-75 cents to the price of a gallon of gasoline. (This does not include costs in lives and treasure of our oil related wars). Spreading the cost to other oil based products would reduce the pump price. This will cost American taxpayers “net zero”; because such revenues will be used to reduce the defense budget and national debt going forward by an equal amount. The alternative, deep defense cuts are unsustainable; because it will limit our ability to defend imported oil and our other vital interests.

Apollo was a race against time. NEP promises to be a similar race set in turbulent times replete with unexpected and increasingly volatile conditions at home and abroad. Americans of nearly every political stripe are waiting and wondering whether their leaders are prepared to let the nation that saved the world in the twentieth century sink into history in the twenty first. We stand at a crossroads. We simply can’t risk going down the same path increasingly divorced from the real threats of today and the growing ones tomorrow. Will tomorrow belong to America? The genius of America is our ability to transform to meet changing conditions and new threats and become a better and stronger nation. Achieving energy independence is the right place to start.

With a darkening landscape at home and abroad and time our most precious resource as the world’s oil supply moves from surplus to shortfall, the issue isn’t a choice between green and black energy. The issue is “how much, how fast, how clean” can America produce both?

A National Energy Program

I. Introduction: Energy Independence - A Race Against Time

The proposed goal of a National Energy Program (NEP) is to achieve independence from oil imported from the "arc of instability" running through North Africa and Southeast Asia (the region) plus elimination of the projected increase in U.S. demand - a reduction of at least five million barrels per day (MBD) in daily consumption by 2025 (1). This goal will be achieved in addition to the projected increase in domestic production and may be adjusted during the program to deal with world events.

Stability at home and abroad is intertwined and other energy consuming nations have greater exposure to the region than America. By 2030, the world will require production of 118 MBD, but producers may only be producing 100 MBD [an 18 MBD global shortfall] unless there are major changes in current investment and drilling capacity… A severe energy crunch is inevitable without a massive expansion of production and refining capacity…

…The region could become an "arc of chaos" involving the military forces of several nations…Between now and the 2030's the military will almost certainly be involved in combat in the form of a major regular conflict or a series of wars against insurgencies…The implications for future conflicts are ominous, if energy supplies cannot keep up with demand and should states see the need to militarily secure dwindling supplies (2). Going forward, every barrel of oil America produces, conserves and replaces with alternatives is a barrel of oil available on global markets to reduce the shortfall that our military won't need to defend.

In addition, as the supply/demand balance shifts, the power balance will shift to producers; limiting our ability to shape world events. Many producers have interests very different from ours. Examples: Russia's ability to squeeze NATO/E.U. by shifting its oil and gas exports to other customers via its expanding East-West pipeline network will grow as the shortfall grows enabling Russia to limit European cooperation with the U.S. when it serves Russia's interests. Today, in a period of relative supply/demand equilibrium with spare capacity available, America can place an embargo on Iran's oil sales. Tomorrow, oil consumers will be scrambling (and possibly fighting) for oil supplies making such embargoes impossible.

Unfortunately, the DOD Defense Strategic Guidance (3) doesn't mention oil. This blind spot is remedied in the fuels and defense sector sections in which the geo-strategic situation in the region, energy security and national security are inextricably linked. This discussion is broken down by sub-region - Middle East, South Asia, Asia-Pacific, Central Asia and North Africa. The relationship of the region to Russia, China, Europe and the U.S. is also explored.

The top down, goal oriented, "democratic command" method used for program management of Apollo, building the Interstate Highway System and national transformation during World War II is adapted to produce an overview of a strategy and plan to achieve energy independence in this white paper. This approach uses an integrated, performance driven, time bound system to solve an energy problem that is generally viewed as being domestic and civilian; but, is in fact much more multidimensional - military, civilian, foreign and domestic. I worked for the Boeing Aerospace Group during the Apollo Program in a position that enabled me to learn how such efforts are planned and implemented.

These efforts were all national undertakings; because, they dealt with national security threats. In the past our nation has come together to implement such efforts primarily to deal with such threats. NEP focuses on a similar threat and will be implemented accordingly.

With our nation's military drawn from a small segment of the population the American people are able to live in denial and see our current danger in terms of swings in the price of gasoline rather than as a national security threat. However, an increasingly stretched volunteer military in which the few serve while the many make no sacrifice and plunder their children is unsustainable. The energy crises of the 1970's were caused by America's disputes with the Islamic World and were quickly over. In the increasingly unstable environment going forward, deteriorating supply/demand conditions and disruptions possibly accompanied by conflict will cause today's pump price to pale in comparison to tomorrow's prices and the chaos that follows.

Machiavelli wrote, "When the evils that arise have been foreseen, they can be redressed, but when, having not been foreseen, they are permitted to grow in a way that everyone can see them, there is no longer a remedy" (4). It is unlikely that a coherent national energy policy and program will be developed until everyone sees the danger. This whitepaper is derived from an unfinished work – Plan-B for the War and Home Front. The energy section was extracted and developed into a "Plan B for Energy" to run on a separate track from our current track – civil war and gridlock between green and black energy interests.

Democratic command is "the method". Energy is "a domain". Hopefully, using the method will enable our nation to solve our problems in the energy domain and lead to development of the cooperation, structures, experience and momentum that will be useful in other domains. At a minimum, the energy track will produce an action plan that will be available when everyone can see the danger. President Roosevelt's actions prior to Pearl Harbor are an example of this approach. The Roosevelt Administration planned and prepared for the coming war as best it could; which is all that could be done in a nation living in denial and isolationism.

America has fallen into a familiar pattern for hegemonic powers: over consumption, over extension and over optimism (5). Some say that North America will become the new Saudi Arabia of oil and gas (6). On the other hand, October 2013 marks the 40th anniversary of the 1973 OPEC oil embargo. America's oil and gas industry and market forces haven't cured our oil addiction in 40 years and can't be relied upon to cure our addiction or reduce the global shortfall as required in the next decade for America's national security.

Prudence demands that we "hope for the best, but plan for the worst" to cover downside risk and stop being blindsided by unforeseen events. In a period of shortfall going forward energy crises will be structural and involve disruptions that are longer and more destabilizing than the OPEC oil embargo. Waiting for such crises to occur and trying to remedy them with another short term fix or energy war; rather than implementing a long term program will be no more successful in the future than in the past. Example: the U.S. must work with China and other nations in the Asia Pacific area to secure adequate energy supplies and significantly reduce future demand; rather than stumbling into war trying to cut China off from the energy resources of the South China Sea.

Production during WWII and Apollo were races against time. NEP promises to be a similar race set in turbulent times replete with unexpected and increasingly volatile conditions at home and abroad. Most current policies and plans contain soft goals, few operational specifics, no firm evaluation measures and view energy without an integrated national and worldview. They mention soft timelines - or no timelines at all - as though America lives in a vacuum and the

world will stand still for a leisurely pace. We will get nowhere until we focus on the fact that our addiction to imported oil is a grave national security threat and use approaches that have been successful in dealing with such threats in the past.

With a darkening landscape at home and abroad and time our most critical resource the issue isn't a choice between green and black energy; it is "how much, how fast, how clean" can America produce both? America is running out of its most precious resource – time.

This white paper is divided in four parts:

- Planning Energy Independence: Outlines a project to develop a NEP plan and implementing organization using a program planning and management approach patterned on Apollo;
- Achieving Energy Independence: Proposes objectives and implementation scenarios that can achieve the goal using approaches patterned on the Space Program, the Interstate Highways and WWII;
- Financing Energy Independence: NEP will use variations of the self liquidating Federal-Aid Highway Act and other public/private financing mechanisms as required. Wherever possible, profit and loss will be shared by public and private investors based on their investment and risk using generally accepted accounting principles.
- Summary – Hard Choices.

II. Planning Energy Independence – NEP Development Project

America dealt with a similar threat during our nation's "Sputnik Moment". If the Russians could build a rocket that could deliver a satellite into orbit they could deliver a nuclear weapon to the U.S. President Eisenhower placed part of the blame for America's lagging space program on inter-service rivalries. Each service was pursuing a separate space program…Over the next year, large changes in public policy were enacted…the job of sorting out the military's space program was given to a newly created organization, ARPA…the immediate effect was to transfer all military space projects to ARPA…ARPA spent the first seven months during which it had decision making authority over the complete U.S. space program (before the formation of NASA) sorting through proposals and overlapping efforts to impose order to the Space Program (7).

When President Kennedy established the goal to send a man to the moon he was able to turn to NASA (created by President Eisenhower) which outlined specifications for Apollo (8) and then implemented the program. No similar democratic command organization exists today that has the ability to plan and achieve energy independence. Therefore, the NEP development project will be implemented to outline a plan and organization structure for President Obama; working with military/civilian government, industry, financial institutions, research laboratories and academia.

The project could be implemented by expanding the existing DOD/DOE memorandum "Concerning Cooperation in a Strategic Partnership to Enhance Energy Security". The MOU mentions that in the 2010 Quadrennial Defense Review DOD aims to speed innovative energy and conservation technologies from laboratories to military end users [using] military installations as a test bed…and create a market for…energy…technologies coming [from] DOE laboratories and other sources. [The MOU defines specific activities; but, doesn't provide authority for DOD and DOE to work on NEP. This authority must be added by the

Administration.] The MOU in no way restricts the parties from participating in any activity with other public or private agencies, organizations, think tanks, or individuals (9). Therefore, the project could be implemented by an outside entity or entities with DOD and DOE participation.

As in the past, a national energy policy and program must have a unifying national goal to break the gridlock and achieve passage in Congress. If the goal presented in this white paper isn't acceptable, another should be chosen that can achieve a broad consensus to begin the project. Democratic command won't work without stakeholders and the American people on board.

The project will consist of three phases:

- Program design
- Organization design
- Legislation

1. Program Design

In the words of Dwight Eisenhower "the basic principles of strategy are so simple that a child may understand them. But to determine their proper application to a given situation requires the hardest work…this planning meant the toilsome drudgery of grinding countless unrelated facts into homogenous substance…everything remotely concerned…was grist to our planning mill (10)

NASA used this planning approach to send a man to the moon. Today's leaders will need to learn and use this approach to plan and implement NEP. At the most basic level this will require learning the difference between a "project" and a "program".

President Obama mentioned "funding the Apollo projects of our time" in energy in his State of the Union message in 2010. He then mentioned electric cars and passenger rail in the same breath as Apollo as though all were projects. *Apollo wasn't a project; it was a program.* Programs achieve "ends" - goals and objectives - sending a man to the moon, building the national highways, achieving energy independence, etc. Ends and priorities must be defined and agreed upon first. Ends must be defined at the national level; because tradeoffs must be made between stakeholders to achieve consensus that can only be made when achieving a nationally accepted goal. "Means" - functions and projects – can then be defined and rank ordered (ex: electric cars, Keystone Pipeline, shale gas, cap and trade, etc.) by sorting through alternatives to define the proper mix to achieve defined ends. Perfection of means and confusion of ends seem to characterize our age (11). Concentration on competition between means before defining ends has produced gridlock. We will remain in gridlock if we keep doing things backwards.

The first step in program design is to produce a statement of the goal and timeline. NEP will then be designed from top level sector objectives down to specific means to achieve the goal using a "program breakdown structure" - the logical framework of Apollo. Energy independence will be achieved when the quantity of imported oil as part of total oil and other liquids used by each sector is replaced from other sources as required to achieve the goal. Sectors are tied together in cross sector supply chains: end uses (products, installation, aftermarket, customer service and support); customer/system interfaces (charging/fueling stations); energy production and supply (power and fuels) and supply chain management.

Priority will be given to each sector based on comparative oil usage. Priority within sectors will be given to each means based on its ability to contribute to achieving the sector objective and the potential to develop and deploy related supply chains within the available timeline. Figures 1-

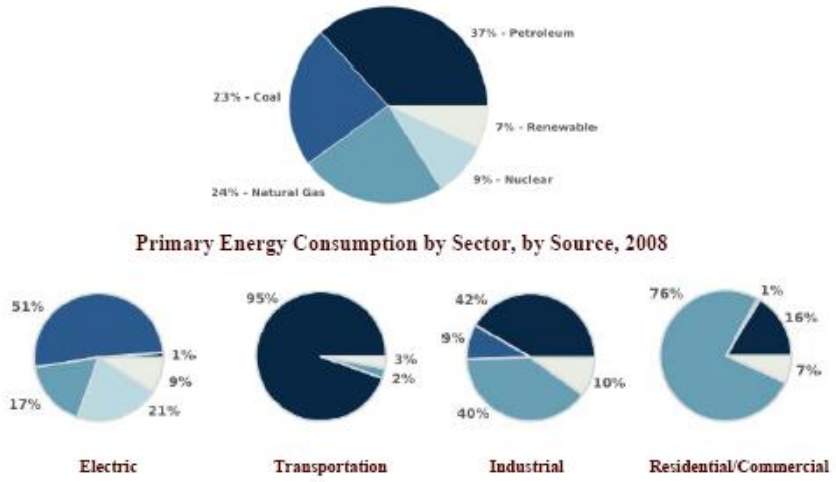
3 define current and projected energy consumption by source and sector. As illustrated, transportation would normally receive top priority; because, reduction in petroleum use in transportation will provide the largest reduction. However, energy supply/logistics to defend imported oil will receive priority; because, other sectors will be at risk and may not continue to be properly served if we can't properly defend imported oil until we are energy independent.

Constraints to implementation will then be defined by having participating stakeholders make tradeoffs to resolve differences while still meeting the goal. Ideally, design of each objective will be managed by the stakeholders that must be involved in implementation. In this regard, American industrial and financial community interests must be prominently represented to induce their participation; which is essential to the success of NEP. Six proposed top level sector objectives and implementation scenarios are presented in Part III. The goal, objectives and scenarios should be used as a baseline for discussion purposes to begin the project. The final program architecture will be incorporated into legislation.

A shared understanding of the meaning of words is absolutely necessary as people set out on a complex undertaking. Public and private stakeholders operations have different, often incompatible structures and implement many of the same means using different terms (the military and civilians in particular). Stakeholder efforts will be analyzed and sorted by grouping similar activities under related NEP sector objectives (ex: buildings with buildings) and means (ex: solar, geothermal, energy management, etc.) using agreed upon language and terms.

The architecture of NEP, a public/private sector enterprise, will differ from WWII, highway and space programs which were publicly funded. Stakeholders in NEP use different funding sources. Therefore, public and private sources and uses of funds will need to be defined and integrated. A common interface will be used to connect stakeholder and NEP efforts. As illustrated in Figure 4, this interface is finance; because, every project must be paid for. This interface will be defined using a "financial breakdown structure" that integrates available financing mechanisms, sector objectives and stakeholder operations. This financial system will facilitate tailoring and mass production of investments on a case by case basis using the corporation's resources to cover shortfalls from other available sources as required.

Figure 1: U.S. Primary Energy Consumption by Source



Source: Subsidyscope analysis of data from EIA, "Annual Energy Review 2008. " June 2009. Tables 1.3; 2.1b - 2.1f. http://subsidyscope.org/energy/summary/structure/

Figure 2: Delivered Energy Consumption by Sector, 1980-2035

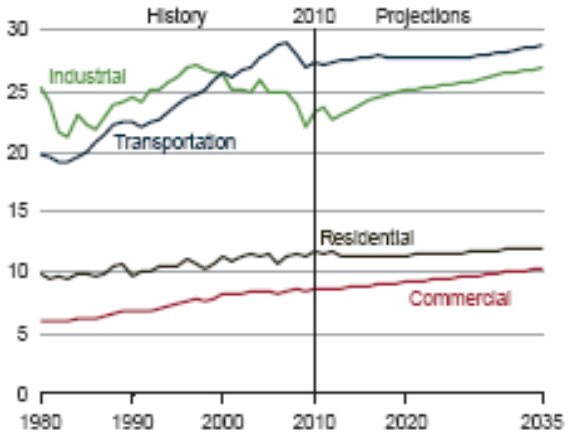
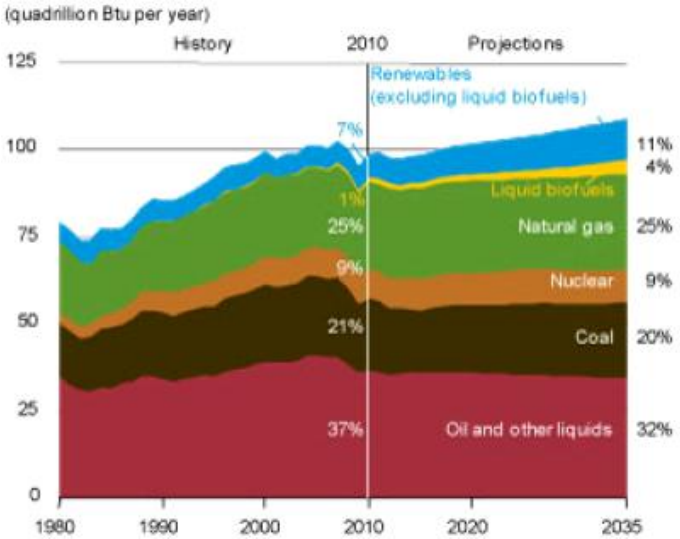


Figure 3; Energy Consumption by Fuel, 1980-2035



Source: AEO2011 Early Release Overview, Report Number: DOE/EIA-0383ER (2011]
http://www.eia.doe.gov/forecasts/aeo/early_fuel.cfm

Figure 4: Financial Breakdown Structure

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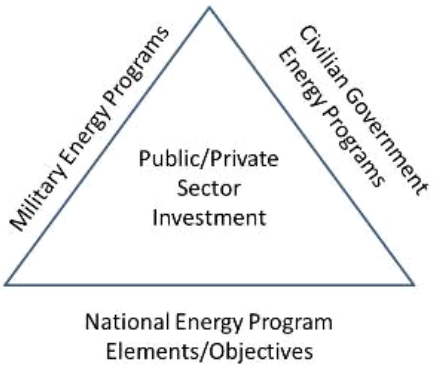


This system will provide one-stop services that enable parties to navigate the maze of government funding streams, regulations, contract types and public utility relationships to secure financing. The financial breakdown structure will be incorporated into proposed legislation.

Financial institutions serve markets based on market size and structure. NEP financial system must be designed to generate the large and structured flow of projects needed to secure adequate interest from financial institutions. For example: the announcement by Bank of America of the largest residential solar photovoltaic project in American history illustrates willingness of financial institutions to match financing with the opportunity size and demonstrates the benefits of job creation, market aggregation and economies of scale. SolarCity/Bank of America are moving forward with project SolarStrong, expected to build more than $1 Billion in solar projects…to create 300 MW of solar generation capacity providing power to up to 120,000 housing units…The project will allow privatized military housing developers to save money on energy costs that can be reallocated toward quality-of-life improvements and enhanced services for military families… SolarCity expects SolarStrong [will] create thousands of full-time and temporary jobs...help DOD secure more of its energy needs from renewable resources operated in parallel with the utility grid (12).

After the program begins, existing stakeholder experience currently available from multiple sources in fragmented form will be researched, grouped and archived for efficient retrieval. This will, for example, enable government staff working on the DOD/DOE MOU to rapidly find examples of similar projects from all sectors for use in specific projects. Grouping of NEP, public/private sector and utility financing and incentives will enable development of standardized applications project developers/energy consumers, government staff and financial institutions can use to integrate available financing, incentives and support services.

2. Organization design

Gus Grissom, Ed White and Roger Chaffee died in a fire in the command module while preparing for the first crewed Apollo flight. This tragedy triggered an exhaustive investigation of NASA's procedures after which the government asked Boeing to provide Apollo TIE (Technical Integration and Evaluation); because of its experience coordinating far-flung complex programs like Minuteman. Boeing then assigned 2,000 Boeing managers to the project. The TIE personnel ensured that everything worked in an integrated manner and daily monitored millions of pieces of hardware so that all the components of the spacecraft were in perfect working order. They also saw that contracts were met on schedule (13).

It is proposed that the public and private sectors will again assume roles they played during the later days of Apollo. This will be accomplished by focusing organizational design on a public/private partnership corporation managed and operated by qualified private sector professionals. The public sector will provide: support capabilities; enabling legislation; available civilian/military government financing to leverage private sector financing; necessary regulation/deregulation and timely oversight. This approach reflects the approach of the American Energy Innovation Council, a distinguished group of business leaders, which proposes that the program should be structured as a partnership between the federal government and the energy industry, and should operate outside the federal government…focused on technologies that can achieve significant scale, freed from political interference and earmarking (14). Focus on the corporate form should not preclude analysis of alternative structures. The final organizational model will be incorporated into the legislation.

3. Legislation

The capstone of the project will be drafting a proposed "National Energy Independence and Defense Act" to establish and operate NEP. A key output of the project will be securing the agreement between stakeholders required to induce them to work with their constituencies in Congress to pass the Act. You don't go to Congress before "you have your ducks in a row". Positions on energy are as fractured today as issues relating to space were in 1958. Congress was studying 29 different bills and resolutions dealing with space, spread between all three branches of the services, all with different plans. President Eisenhower harnessed the chaos by establishing a single space agency, a National Aeronautics and Space Administration (15). NEP will harness the existing chaos to establish an organization tailored to the task that will be able to manage achievement of energy independence.

III. Achieving Energy Independence – Program Objectives and Implementation

A military oriented, performance driven approach is adapted to solve a problem that is generally viewed as being domestic and civilian; but, is in fact more multidimensional - military, civilian, foreign and domestic. Using this approach, six top level sector objectives and implementation scenarios that achieve the goal and demonstrate the method have been developed and are presented below. The goal, objectives and scenarios presented in this white paper are not set in stone and should be used as a baseline for discussion purposes to begin the project:

- Energy Technologies Research, Development and Deployment: To develop and deploy energy technologies in rank order to achieve the goal.

- Building & Processes Sector: To replace imported oil, increase energy efficiency and reduce emissions in buildings and processes to meet end user needs and achieve the goal.

- Transportation Sector: To replace imported oil, increase energy efficiency and reduce emissions in motor vehicles and build the infrastructure and supply chain for the future conventional and alternatively fueled vehicles fleet built to achieve the goal.

- Power Sector: To build a safe, secure, optimized, energy efficient, smart, self healing 21st century power sector that controls emissions and replaces imported oil for the end customer.

- Fuels Sector: To build a national fuels sector that replaces imported oil and reduces emissions that can rapidly adjust to energy crises to avoid destabilizing disruptions at home and abroad.

- Defense Sector: To replace imported oil and increase energy efficiency in a U.S. military that has the operational energy security "to go and win America's wars when called upon to do so" without initial access to theater bases and energy supplies.

1. Energy Technologies Research, Development and Deployment

Today, energy technologies research, development and deployment (RD&D) is conducted in a fragmented manner by industry, government, the defense establishment, laboratories and academia working at times separately, together and often in competition. Few projects cost $100 million with many large and needed projects not being undertaken properly or at all. There is no

plan or timeline, minimal coordination, much duplication and waste, inefficient technology transfer and long time periods between research, development and deployment.

The problem here is that energy business R, D &D requires investments of capital at a scale beyond the risk threshold of most private sector investors. This high level of risk, when combined with existing market structures, limits the rate of energy equipment turnover. A slow turnover exacerbates the historic dearth of investments in new ideas, creating a vicious cycle of behavior [which may explain why]…the U.S. energy industry and the U.S. government together invest a mere 0.3% of total private sales in public and private R&D; which contrasts with 18.7% in the pharmaceutical industry and 11.5% in aerospace and space (16).

The current approach also doesn't consider the grave national security threat and short time line to eliminate it. Therefore, the approach used will draw on the experience of Apollo and WWII that dealt with time critical threats. R, D&D will be centrally managed to integrate the efforts of government, industry, laboratories and academia. Green and black energy technologies will be developed in rank order based on their potential to achieve the goal. Technologies that produce the greatest results will receive priority, financing and crash development. There will be winners and losers – a common occurrence in both the public and private sector. Therefore, a portfolio of technologies will be developed; because some won't pan out and/or a mix will be required. Multiple vendors will be funded to insure that the timeline is met. Older technologies will be replaced as required to keep pace and the plan will be modified accordingly.

A brief recounting of RD&D during Apollo and WWII provides an understanding of how the sector objective will be implemented. Apollo had an estimated cost of $181 billion (17) (All costs in this white paper are in 2011 dollars unless noted (18)). The largest project in the program was the Saturn V launch vehicle - one of the greatest R, D&D feats of the 20th. century – that cost approximately $41 billion. The largest WWII projects were the Manhattan Project and B29 that respectively cost $32 billion and $37 billion. There were many smaller and less costly projects. All efforts were implemented largely to plan and schedule.

The crash development that produced the Atomic Bomb (The Manhattan Project) in five years could produce and make ready for deployment a commercial vehicle battery that runs 300-400 miles on a single charge in a similar time frame. If America produced this battery and fast charging systems it would significantly reduce the use of the internal combustion engine going forward. In a similar manner, rapidly developing and deploying other alternatives to conventional fossil fuels during the "NEP decade" that impact on achieving the goal will increase their use to the greatest extent possible and drastically change the world's energy use profile going forward.

Implementation of energy resources R D&D will require a coordinated effort comparable to the great efforts of the past that goes well beyond the current fragmented approach. The current approach is business as usual, free market operation with some minor additional targeted support by government to jump start industry effort. This hasn't worked since the energy crises of the 1970's and won't work now.

The corporation will request proposals to achieve sector objectives as required. Hard selection criteria will be used to evaluate proposals (ex.: comparative cost/benefit; sharing of corporation/vendor costs and ownership; deployment potential within the timeline and out years; required support, service and fueling infrastructure and costs; risk and profit sharing by vendors and the corporation). R, D&D will be conducted as a continuous process to bring new products to market ASAP. Smaller businesses with technologies that meet program objectives will be incubated as possible. Significant leveraging of the corporation's investment with investment

from the private sector will be achieved. The potential for such leveraging was shown by the 2009 American Recovery and Reinvestment Act [that] appropriated $97 billion and mobilized roughly $100 billion more in private capital to invigorate energy related research and development (19). The corporation will receive an ownership interest for its investments with a good ROI for taxpayers. Revenues earned will be used to reduce the national debt.

2. Buildings & Processes Sector

The buildings and processes element is divided in three parts:

- Buildings;
- Commercial & Industrial Processes;
- Environmental Management and Useful By-products.

a. Buildings

Advances in building envelopes, equipment and appliances, and integrated systems may make it possible to achieve a 70% reduction in building's energy use by 2025. With on-site energy technologies, such as solar photovoltaics, it is possible that many buildings could become self-containing and even net energy producers. Smart building systems can integrate sensors, controls, and inputs from various building systems to inform an energy management system to optimize comfort and energy efficiency. Intelligent buildings can also communicate with the local utility to participate in peak shaving demand response activities to substantially reduce building owner's energy bills (20).

Existing utility based energy efficiency programs in buildings focus on electricity and natural gas, not imported oil and will only serve to achieve the goal peripherally when energy efficiency is produced in buildings that use oil as the heating source. To date, such programs have produced limited results; largely because energy savings achieved translated into lost revenues for utilities. This is indicated by the fact that statewide energy efficiency savings as a percentage of total kWh sales of utilities in each of the 14 market leading states in 2007 ranged from 0.1% to 1.8% (21). In addition, government and utility programs tend to focus on providing fixed subsidies - rebates and tax credits - to install individual measures (e.g., Energy Star™ appliances, 30% solar tax credit, etc.) rather than on whole building solutions. These programs generally write checks or provide loans/loan guarantees that come with eye glazing paperwork and lack standardized applications, financial arrangements and real back end delivery systems. They are also too fragmented to achieve national reach and economies of scale. And, there can be many dozens of independent, uncoordinated, uneconomic government and utility programs of varying quality in each state that sub-optimize the potential to leverage funds from the private sources.

NEP will establish a national network of compatible state subsidiaries operating through regional and local offices. They will use a one stop system and supply chain to market, finance and mass produce customized energy efficient buildings solutions with oil use reduced or eliminated. Existing federal, state, local government and utility incentives and public/private sector financing will be packaged to enable customers to receive all available incentives and financing at the point of purchase. The corporation and its subsidiaries will not compete with existing local contractors and vendors or engage in anti-competitive practices. Their function will be to organize and manage a mass production supply chain to generate large scale market growth and local employment. State subsidiaries will interact to share best practices and operating systems and build larger markets to produce greater economies of scale and lower prices for consumers. The buildings component of this objective is divided in two parts:

- Conversion grants to replace imported oil use in buildings.

Replacement of imported oil is a matter of national security that should be paid for as we pay for defense when market forces won't suffice. Therefore, a grant will be provided to convert oil HVAC systems; because, conversion won't occur at adequate scale to meet the goal through market forces by 2025. Conversion will be managed using an updated version of the emergency repair grant program system a firm I owned used to manage mass production of repairs on tens of thousands of homes after declared national disasters under contract to the federal government.

State subsidiaries will work with utilities to schedule conversions to provide alternatives to imported oil on the customer side of the meter. Initial properties for conversion will be located in areas where utilities have adequate gas supply and delivery infrastructure. Installations will be rolled out as utilities build up their gas delivery infrastructure. Property owners will be given a choice between geographically applicable green conversion alternatives where gas is unavailable. Existing conventional oil based systems will convert to domestically produced alternative drop in liquids as they become available. The program will:

- Act as the "customer's agent" to provide ease and convenience of installation (sign here and the job gets done for you free of charge);
- Arrange with suppliers for volume pricing, bulk purchasing of materiel, automated prepayment and logistics for contractor delivery or pickup;
- Recruit, screen and pre-qualify contractors to do installations and utility hookups;
- Coordinate with utilities to schedule properties for conversion;
- Prepare priced work orders for individual properties, packaged into blocks of multiple jobs based on contractor capabilities and transmit packages to contractors.
- Contractors pick-up pre-paid materiel, complete blocks, request inspection;
- Inspect blocks, certify completion to specification or produce punch lists;
- Owners sign-off on completed work. Disputes will be referred to arbitration
- Pay contractors through automated payment when blocks are certified complete.

- Energy Efficiency Purchase.

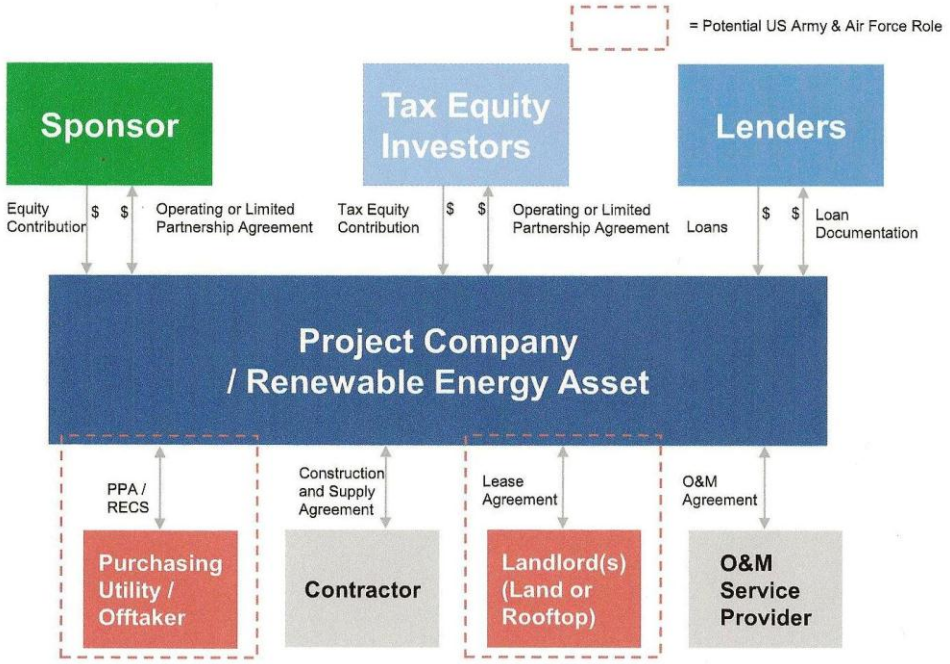
Giving money away is easy; selling a product customers will buy is hard. This requires delivery of a quality product at a good price and terms that is easy and convenient to buy. Longer term financing (Energy Savings Performance Contracts (ESPC's), Power Purchase Agreements (PPA's), Utility Energy Service Contracts, (UESC's), etc.) will be provided. Typical Non-recourse/Alternative Financing Structure is presented in Figure 5. Energy efficiency purchase should focus on installations with shorter term paybacks to generate volume. For example: the Empire State Building remanufactured its 6,514 windows onsite into "superwindows" which pass light but block heat. Requiring a third less air conditioning on hot days saved $17 million of the project's capital cost immediately, partly funding this and other improvements. In three years, energy savings above 40% will repay the owner's investment (22). Providing grants for fuel conversion will shorten paybacks for many installations.

A streamlined front end marketing, financing and sale system will be implemented to facilitate wider energy efficiency purchase. This system will be integrated with an expanded back end delivery system similar to the system discussed above. The front end system will:

- Provide cost effective whole building installations tailored to individual customer needs;
- Use integrative factory to installation design;
- Wherever possible, provide financing with no up-front cost on terms that enable monthly payments for energy and improvements to be less than existing energy bills;
- Seamlessly integrate all available incentives to make retrofit a better deal;

- Provide good customer service and support;
- Make all systems and financing available through utilities, government programs and energy services companies.

Figure 5: Typical Non-Recourse/Alternative Financing Structure



Source: "Sources and Structures of Alternative Finance for Renewable Energy Projects on Military Bases", Extract from presentation at U.S. Army & U.S. Air Force Energy Forum by Jonathan Yellin, Managing Director Morgan Stanley Global Markets, July 2011, www.usarmyusairforceenergyforum.com

The Buildings component will serve two markets;

- Mass market program – serves single family and small multifamily homeowners, multifamily housing owners of master metered buildings, and certain classes of small and mid-sized commercial customers that pay their own energy bills;

- Custom market program - serves all other residential, commercial, industrial and governmental customers;

There will be differences in the mass and custom market programs. For example: custom projects will be larger, more complex and will be implemented on a one off basis rather than in blocks. Owner or renter paid energy bills must be handled differently. Solutions to many of these issues will require change in existing energy purchase/payment systems. However, certain principles will apply to across the board such as: national market development; integration of public/private sector activities; whole building solutions; seamless integration of incentives; quality installation; mass purchasing; and economies of scale, etc.

b. Processes

This component is divided in three parts:

- Buildings and structures that enclose commercial and industrial processes: will receive grant and purchase financing as defined in the buildings component above;

- Processes that use oil in business operations: will receive a flexible grant, attractive financing, long term fuel purchase contracts, etc. on a case by case basis to lower the cost of applications and installations to convert processes from oil or make such processes more energy efficient. Priority for grants will go to industries that use greater amounts of energy and applications that produce the greatest cost/benefit. Industries such as metals, petroleum refining, chemicals, fertilizers, glass, pulp and paper, and cement are very energy intensive, while others, such as automobile manufacturing, appliances, electronics, textiles, and food and beverages, are much less so…

- Processes R, D&D:…About 80% of industrial energy is used in motors, steam, compressed air, pumps, fans, process heating and combustion (23). Therefore, R, D&D in processes will focus of development of more efficient subsystems in rank order. The corporation will also provide support to industry to develop advanced technologies that change basic manufacturing, cost effectively convert from oil use and make processes more energy efficient. Revenues from processes developed will be used to reduce the national debt.

c. Environmental Management and Useful By-products.

The economic value of America's wastes exceeds the GDP of many nations and contributes to environmental degradation of land, water and air. While such profligacy was tolerated in better economic times, our nation's wastes constitute an untapped economic resource that is needed today. Wastes from buildings, commercial/industrial processes, waste treatment plants, etc. will be reprocessed as possible on a cost effective basis to produce power, steam, etc. for use in buildings, processes and other useful purposes. Best practices will be adapted across military and civilian lines as provided for in the DOD/DOE MOU. For example: the U.S Army "Net Zero" program that covers waste, energy and water could be tailored for cross market use. This program can best be described as an integrated process of design, decision making and operations that takes a "system of systems" approach… it is composed of three core components coupled in an enabling hierarchy:

- Net Zero Energy installations produce as much energy on site as they use;
- Net Zero Water installations limit consumption of fresh water resources and returns water to the originating watershed;
- Net Zero Waste installations reduce the amount of waste generated, reuse and recover waste streams and convert them into resources with zero landfill (24).

3. Transportation Sector

The transportation sector is responsible for about 70% of all the petroleum used in the U.S., and petroleum now supplies 96% of the energy used in the transportation sector. EIA projects that between 2005 and 2030 transportation sector energy use will grow about 18%, while petroleum use will grow 13%...most of the energy use for transportation - about 59% - is used to power light duty cars and trucks (25). To achieve the greatest effect, this element will focus on motor vehicles, fueling infrastructure and supply chain. R, D &D will be implemented to build the alternatively fueled motor vehicles, fueling infrastructure and supply chains in rank order with the best potential to be built on a timeline to meet the sector objective. Existing approaches used in the aerospace industry have application to the transportation sector and should be transferred cross market. Transportation fuel is discussed in the fuels sector section.

a. Motor Vehicles

The scale and timing of investment to achieve the sector objective goes far beyond the investment the automotive industry will make using a business as usual approach. Therefore, today, there is no plan or timeline to achieve the sector objective, much duplication of effort, inefficient technology transfer, long time periods between R, D&D and no sense of urgency that takes notice of the national security threat. Sector transformation will require a large scale public/private partnership and rapid, targeted investment such as occurred during WWII.

President Roosevelt called Detroit the "Great Arsenal of Democracy". This arsenal integrated the effort of the defense industry and the automobile industry assembly line. Former automobile plants were retooled and new plants were built. These plants built everything from tanks to bombs to planes. Automakers and their suppliers produced approximately $400 billion worth of military equipment from 1942 to 1945 (26) using their own patents or licenses from other companies. This supply chain served 16 million members of our armed services and our allies around the world.

Today, automobile industry conversion will be less complex; because it will focus on motor vehicles. The industry showed great versatility during the war and should participate in NEP in all areas where it can be effective. The aerospace industry, now experiencing deep cuts, is a leader in environmental mitigation, lightweight/stronger materials, energy efficiency and alternative fuels and also has key program management and information system skills. The industry should participate in NEP in areas where it can be effective.

We could not have won WWII without international cooperation and America can't achieve energy independence without similar cooperation today. America must again lead by example to achieve the goal to induce and enable other nations to work in partnership with us. We also need to learn from other nations and emulate their successes. For example: China is now considering investments of up to $1.5 trillion over five years in seven strategic industries to accelerate the country's transition…to a leading purveyor of high-value technologies (27). NEP financing approach will produce a similar level of investment.

Even with extremely ambitious programs no one country will produce the majority of innovation that the world needs. The efforts of different countries will need to be connected to build on one another. U.S. utilities, for example, will need to utilize Chinese advances in clean-coal implementation; Indian solar manufacturers will need to benefit from basic research done in the U.S.; and Brazilian biofuel engineers will need to be able to tweak the inventions of Danish enzyme companies to make them work with local sugar cane (28).

American automakers and producers of specialty vehicles will again be asked to retool their plants to incorporate technological advances as fast as they emerge from R&D. Unlike WWII and Space and Highway programs, which were publicly funded, NEP is public/private funded. Therefore, the corporation will "co-invest" with companies to develop technologies to achieve the sector objective and all investors - public and private - will receive returns accordingly. Such co-investment is occurring today. For example: DOD is now using co-investment arrangements, such as for the HEMTT A3 Diesel Electric Hybrid vehicle (29) shown in Figure 6. This vehicle has versatility that makes it useful across military and civilian markets. Such technologies will be licensed to other companies to meet the sector objective with a good ROI to taxpayers on the corporation's investment if required. Revenues earned will be used to reduce the national debt.

Existing CAFÉ standards will provide a 40% increase in the U.S. fuel-economy standard to 35 mph by 2020…Raising fuel economy by 10 mph nationwide will…save 1.1 million barrels of oil

per day in 2020 - about half of U.S. imports from the Persian Gulf…and produce a reduction in greenhouse gases equivalent to taking 28 million of today's cars and trucks off the road…These savings will be largely negated in 2020 by increased driving (30). Strict new federal fuel-economy standards…set the equivalent of 54.5 mpg as the average the auto industry must achieve by 2025…the new rules derived from EPA regulation of pollution…set 163 grams of CO_2 emissions out of a car's exhaust that is directly linked to the amount of fuel it burns per mile as the target and that converts to 54.5 mpg (31).

Figure 6: HEMTT A3 Diesel Electric Heavy Expanded Mobility Tactical Truck
Off-road hauling capability and self-contained ability to generate 100 kW of clean exportable AC power

The sector objective and the goal are defined in terms of imported oil reduction. Therefore, average mpg for the fleet should be defined by the reduction in imported oil use to meet the sector objective or the EPA emissions reduction standard – whichever is greater. This can be achieved by a number of methods such as lightweighting, streamlining, improved logistics, and changes in motor vehicle engines that reduce or eliminate the use of gasoline.

A significant increase in fuel efficiency in motor vehicles will be accomplished through weight reduction. Two-thirds of fuel use is caused by weight, yet for the past quarter century, U.S. cars have gained weight twice as fast as their drivers. Now, lighter weight metals and synthetic materials are reversing automotive obesity. [Weight reduction of drivers would also improve fuel efficiency]…Rather than wringing pennies from old steel-stamping and engine technologies, automakers could exploit reinforcing advances in carbon fiber [and other lightweight materials] and its manufacturing (32).

12% of the petroleum used in the U.S. is used by commercial and freight trucks (32). In recent years, manufacturers have focused considerable attention on improving truck and tractor aerodynamics and have therefore achieved significant gains in fuel efficiency. For example: using a streamlined profile tractor with aerodynamic devices (roof fairing, cab extenders and side fairings) can reduce fuel consumption up to 600 gallons and eliminate five metric tons of green house gas emissions per year compared to a typical classic profile tractor [and advanced aerodynamics should be used for all vehicles going forward]…

…One of the best ways to improve fuel efficiency is through efficient transportation management. Improved freight logistics can optimize trucking operation efficiency, saving fuel and increasing profits for trucking companies. Logistics strategies include load matching, more efficient routing and scheduling of vehicles, improved vehicle receiving policies…reduction of long-duration idling…and packaging materials (34).

Changes in motor vehicle engine types will be implemented in two stages:

- Production of more energy efficient gasoline powered vehicles, efficient hybrid electric and flex fuel vehicles built to meet more stringent Café standards;

- Production of alternative fueled vehicles - natural gas vehicles (NGV's), fuel cell and all-electric vehicles, etc. as new technologies emerge from R&D.

Detroit has grown comfortable with the internal combustion engine business model. Without sharper market signals American automakers won't make the investments required on a schedule that will achieve the goal. Nations with sharper market signals lead in most areas. For example, Germany leads in "lightweighting". The corporation will make investments the industry wouldn't normally make using existing business models to induce integration of advances as fast as they emerge from R&D. The goal is achieving energy independence; not protecting domestic industry. Therefore, the corporation will work with all interested automakers – foreign and domestic.

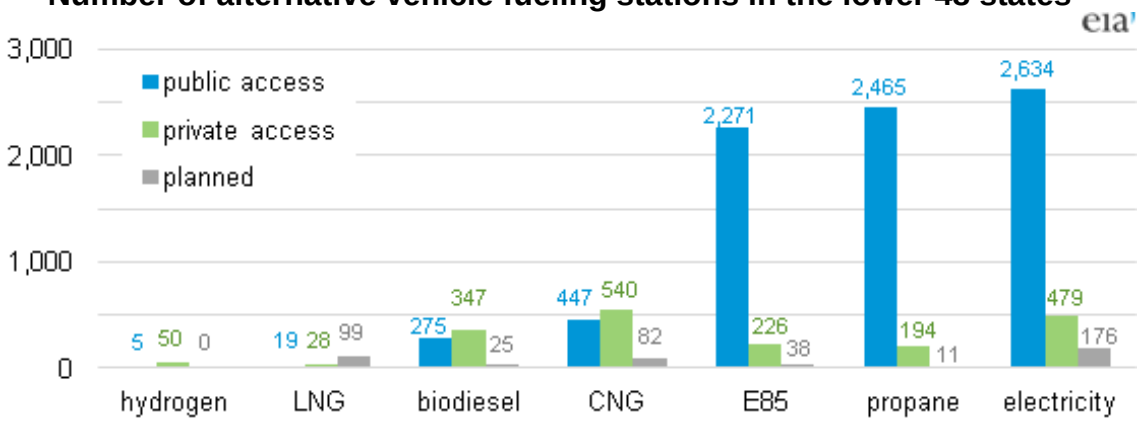
b. Fueling Stations and Infrastructure

Different types of alternative fueled vehicles have different properties that will determine their future uses. Future uses of alternative vehicles, by type, will change as limitations are addressed and supporting infrastructure and supply chains are built.

Alternative liquid fuels have been blended with gasoline and can be used as replacement drop in fuels, enabling use in existing gas stations. As will be discussed in the fuel sector element, most alternative liquid fuels have production and supply chain issues that must be addressed for extensive utilization. Electric vehicles use the national power grid and electrical outlets are potential charging stations. However, electric vehicles take more time to charge than liquid fueled vehicles do to fill up and have less driving range per charge. This limits today's electric vehicles to local uses sustained with longer charging times or overnight charging. NGV's can use…cascade and buffered fast fill stations that provide a fueling time similar to conventional liquid fueling (35) and there is a growing supply of domestic natural gas. Systems exist to convert vehicles from gasoline to natural gas (ex: Cummins Inc. recently released two new truck engines that run on natural gas) and conversion will be paid for by a grant to convert vehicles with adequate remaining useful life as required.

The existing national network of gasoline stations exists; because, it was built up over more than a century in tandem with the growth of motor vehicles using the internal combustion engine and government investment in roads. In aggregate, there are currently about 10,000 alternative fueling stations in the U.S, compared to approximately 160,000 gasoline stations in the country (36). Figure 7 indicates that the total number of existing and planned alternative fueling stations is inadequate to comprise the network required to support deployment of alternative fueled vehicles at necessary scale. Maps of the location of these stations by fuel type (37) indicate that station building is so fragmented that an adequate, coherent, national alternative fueling station network won't be built in the foreseeable future. Alternative fueled vehicles will not be produced at scale until the infrastructure and supply chains to support them are built. To deal with this "chicken and egg" situation, alternative vehicles types and their supply chains will need to be built in tandem. This will be accomplished by investment in fueling infrastructure by the corporation to eliminate unacceptable private sector risk. Revenues earned will be used to reduce the national debt.

Figure 7
Number of alternative vehicle fueling stations in the lower 48 states



Source: U.S. Energy Information Administration, based on U.S. Department of Energy (DOE), Alternative Fuels & Advance Vehicles Data Center, as of March 27, 2012. Note: LNG is liquefied natural gas, CNG is compressed natural gas, and E85 is a type of gasoline-ethanol blend.

The alternative fueling infrastructure, supply chain and related vehicles types will be built in three stages:

- Local Nodes – to serve vehicles types owned and operated by government, industry, institutions, etc. that are able to operate fueling stations at their own locations for vehicles operating in urban and other distance constrained areas. Vehicle types will include: postal delivery vehicles, airport shuttles, construction vehicles, sanitation trucks, police cars, fire engines, utility and telecommunications service trucks, farm vehicles, etc.;

- National Core Network – to include strategically located fueling stations across the nation. This network will be sparse and provision will be made to ensure that vehicles don't run out of fuel between stations. This will require development of onboard systems to map all fueling stations, provide drivers with refueling warnings and location of stations within the driving distance of remaining fuel on board. Vehicles types will include: long distance trucks, recreation vehicles, inter-city buses, etc.;

- Complete National Network - build-out of a national network to provide fueling stations to serve all vehicle types.

Vehicles are of two types - fleet and consumer owned. Concentration should initially be placed on fleet vehicles. The concentration of buying power associated with fleet operators and fleet management companies represents a significant opportunity to assist early market development (38). Example: the price of natural gas is currently so low that no trucking company would use diesel if their trucks could run on LNG; but a fleet of LNG powered trucks will never come to be if the infrastructure does not exist to fuel them (39). Fleet trucking, oil and gas downstream operations, automotive industry and financial interests should work together for mutual benefit to plan to rapidly convert millions of trucks to natural gas and build a long range trucking NGV national core network. This will require the trucking industry to commit to conversion of an adequate number of trucks to induce other stakeholders to finance, build and maintain the supply chain needed to support them. This effort could be economically viable. However, the corporation should invest to cover any shortfall between private sector investment and total investment required. At a minimum, the corporation would provide the venue to "cut the deal" and work with stakeholders to cut red tape and secure necessary approvals.

Mass conversion of fleet trucks to gas would stimulate conversion of other vehicles, production of new gas vehicles and roll-out of a national network. Natural gas is bridging fuel for transportation. Electric vehicles would have to be "new". New vehicles would be more costly than conversions and the supply chain would take more time to build; thus many fewer all electric vehicles could be built and sold than converted by 2025. And, a large scale, all-electric vehicles/network could only follow when cost competitive batteries/fast charging and support systems emerge from R&D. Alternative liquid fuels may also be used as they become available.

Going forward, the national vehicle fleet will comprise many types of vehicles. Drivers must be charged a Vehicle Mileage Tax (VMT) or other charge that reflects road usage and repair needs and apportions the real cost to rebuild and maintain our nation's roads by vehicle type, weight and how much and where vehicles drive in order for our nation's roads to be properly maintained. Systems exist to track mileage and location of usage that would provide an accurate method to account for road usage (ex: companies that monitor fleet vehicles now track cell phones and GPS devices in cars and trucks use mobile navigation programs). The cost to build the national fueling network for alternative vehicles could also be paid as an add-on in the VMT by vehicle type. This would eliminate the need to pay for this network in the purchase price of the vehicles; lowering up front cost and increasing market acceptance accordingly.

Fueling stations can be standalone or integrated into company operations. For example: a leading third party logistics company, GENCO ATC, is partnering with customer Kimberly-Clark Corporation, Plug Power Inc., and the Aiken-Edgefield Development Partnership to launch the nation's first multi-use fueling station to supply hydrogen directly for industrial, commercial, and government use. The station supplies hydrogen directly to Kimberly-Clark's 450,000 square foot distribution facility managed by GENCO ATC to be used with fuel cells powering Toyota forklifts…The supply chain industry estimates that annual greenhouse emissions created by an average 20 truck lead acid battery powered forklift fleet can be reduced by hundreds of tons a year simply by converting to fuel cell powered equipment (40).

4. Power Sector

The power sector objective incorporates: creation of the 21st Century national transmission grid; optimized distribution grid and power production; energy safety and security systems adequate to deal with the current and future terrorist threat environment; customer/system interfaces and services; and, replacement of imported oil on the customer side of the meter. Fuels for power production are discussed in the fuels sector element. Replacing oil use on the customer side of the meter was discussed in the buildings and processes sector element.

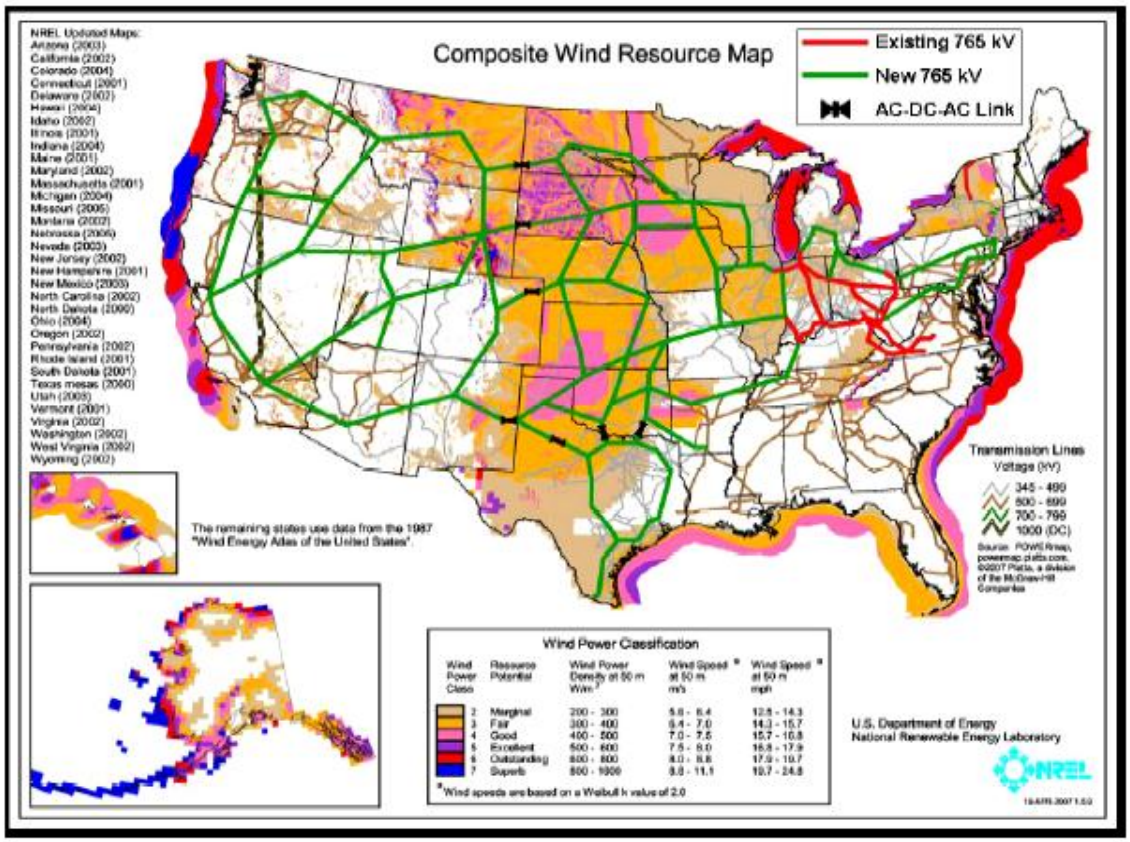
a. National Transmission Grid

Rather than constituting a national network, the transmission grid is in effect a patchwork that is not subject to the jurisdiction of any common regulator - indeed, some areas are wholly unregulated at the federal and state level. This balkanized structure makes it difficult to both site and finance transmission lines (41). The real impediment to a national transmission grid is that state and regional regulators have jurisdiction over whether transmission is built, where it is built, and who pays for it. They are chiefly concerned with building transmission lines that benefit their state and typically neglect the national benefits of interstate projects (42). This stunts grid expansion to exploit opportunities presented by wind and solar energy, production of which is mostly in sparsely populated areas distant from significant electrical loads (43).

State and regional regulators also overlook limitations placed upon the current infrastructure to supply future demand. These limitations result from a decades-long lapse in regional transmission construction due to increased investment in gas-fired generation units close to load centers…until a federal entity has authority to site new transmission lines, conflicts between states and regions will continue to stifle progress toward a modern transmission grid capable of meeting 21st century energy demands…

…In 2008 American Electric Power working with DOE…designed a conceptual interstate transmission system illustrated in Map 1…This network of proposed transmission lines bears a striking resemblance to the layout of the proposed highways of the 1956 Eisenhower Interstate Highway Plan…Whereas the highway plan focused on removing barriers to commerce by facilitating transit of goods and people, an interstate transmission network would remove barriers to commerce by facilitating the transit of energy (43). It is important to do more than look at how energy is generated and consumed. Utilizing advanced transmission technologies can increase the efficiency and reliability of the energy supply chain. By viewing the system as a whole – including diverse generation, efficient delivery of energy and expanding smart grid initiatives – the maximum value of these efforts can be realized…We should be planning for an electric transmission system which meets the needs of the entire country rather than local fixes that compose the patchwork of today's transmission system… For example: A U.S. 765-kV transmission overlay illustrated in Map 1 would reduce peak load losses by more than 10GW and CO_2 emissions by some 15 million metric tons annually (45).

Map 1: Vision of the Next Interstate at 765 kV



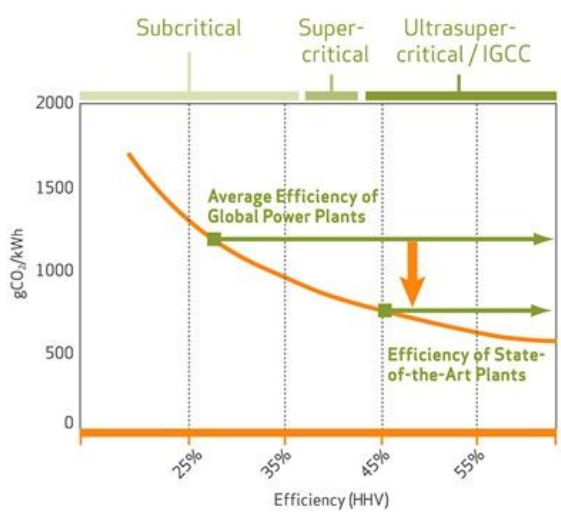
Source: "Interstate Electric Transmission: Enabler for Clean Energy", Michael Heyeck PE, American Electric Power, April 2008, p. 9. http://www.aep.com/about/transmission/docs/EnablerforCleanEnergy.pdf

The justification for the interstate transmission system parallels the justification for the interstate highways. America's love affair with the automobile inspired President Eisenhower to launch what would become his principle domestic legacy. His justification to Congress was that he wanted more multilane highways to evacuate American cities in case of nuclear war (46). The same justification - national security – will be used to build the 21st century power grid; because this grid must be configured to be safe and secure from cyber attack. The approach used to build the grid will parallel the approach used to build the highways - central planning, self-liquidating national trust fund financing, eminent domain and local match (i.e., utility distribution grid level programs for energy efficiency, safety/security and customer fuel switching from oil). Priority in financing transmission grid improvements should be given to utilities based on the efficacy of their local match in achieving the power sector objective. Today, DOE and FERC are encouraging activities that are yielding better regional and interregional planning. This is a step in the right direction.

b. Power Production, Distribution and Environmental Management

Transformation of the power grid's antiquated plant and equipment is also required. This problem can't be solved through more of the same standard upgrades and inefficient power plants - the conventional utility approach. For example: in the U.S. the most efficient coal-fired plants achieve around 40% efficiency…while the U.S. is still debating whether to build a more efficient kind of plant that uses extremely hot steam, China has begun building such plants at a rate of one a month…construction has stalled in the U.S. on a new generation of low-pollution power plants that turn coal into a gas before burning it…20% to 30% of the power generated by a plant is currently used in Carbon Capture Systems (CCS) (47) making the process uneconomic and stunting deployment. [Converting waste heat to produce electricity will reduce this parasitic load and lower CCS costs]. As illustrated in Figure 8, a 1% improvement in efficiency of a conventional pulverized coal combustion plant results in a 2-3% reduction in CO_2 emissions. Highly efficient modern coal plants emit almost 40% less CO_2 than the average coal plant currently installed…deploying the most efficient plant possible is critical to CCS in the future (48).

Figure 8:
Improving the Efficiency of Coal-fired Power Plants Reduces CO2 Emissions



Source: IEA "Focus on Clean Coal" (2006)
Note: 1% increase in efficiency = 2-3% decrease in emissions

Gas is the only fossil fuel set to increase its share of energy demand…The biggest advances in use of gas have been in power generation. A technological breakthrough, the combined-cycle gas turbine, a spin-off from the aviation industry, has transformed the economics of the industry. Not only has it made it cheaper to generate electricity from gas, but the process releases up to 50% less carbon dioxide than coal. As governments strive to cut greenhouse-gas emissions, replacing coal with gas will bring swift results. Already the share of gas in the overall energy mix, which remained at 16% from the late 1960s to the 1990s, has risen to 21%...Gas power stations are… relatively cheap to build, beating nuclear power hands down in terms of capital costs, and in most cases they are also less expensive than renewables…And if gas is cheap enough and techniques such as CCS can be developed that make commercial sense, gas could thrive for much longer even in a world that had radically cut carbon emissions…

…Between 2006 and 2012 gas went from providing 20% of America's electricity to near 25%, mainly at the expense of coal. Cheap gas and environmental legislation under the Clean Air Act aimed at emissions of sulphur dioxide, nitreous oxide and mercury (but not carbon dioxide) from dirty coal plants, accelerated a trend that is set to continue. For decades coal had provided well over half America's electricity. In 2011 coal-generated power was down to 42%, its lowest level since 1949, when records began. The EIA says the switch will speed up, with coal falling to just 36% of the total. Gas has wrought some remarkable changes. Over the past five years America has recorded a decline in greenhouse gas emissions of 450 million tons - biggest in the world (49).

The distribution grid's operating and telecommunication systems are antiquated. New planning and operating systems (new tools) that can produce a significantly more energy efficient power delivery system have been developed. They haven't been implemented and have fallen by the wayside; because they would have required real change in utility operations, culture and labyrinthine regulation. Their use will eliminate massive waste of money on unnecessary standard upgrades, line losses and customer losses from systems disruptions. Avoidance of these costs will help to pay to build the 21st Century Power Sector America needs.

The new tools will facilitate near real-time management and efficient interoperability of distribution systems with regional and national transmission. They will cost effectively resolve disputes between utilities and conservation/environmental movements and facilitate proper integration of standard upgrades, energy efficiency, renewables, production and emissions control in the distribution grid on an accurate, quantitative, cost/benefit basis. This is accomplished by:

- Grid optimization using multiple variables at the same time - power, voltage and emissions, etc. – to facilitate quantitative cost/benefit tradeoffs between conservation, production and emissions control;

- Enabling utilities to find 10% more power, not seen using existing archaic tools, without the need for hardware upgrades. This will enable utilities to meet existing energy efficiency performance standards at minimal cost. Energy efficiency is the cheapest and most cost effective way to produce new capacity and has the added benefit of zero emissions;

- Viewing the grid in its entirety, rather than in small sections using existing tools. This will prove that the avoided cost model (i.e., every MW in the grid has the same value regardless of placement) used by utilities to make investment decisions is wrong and that each asset has a definable locational marginal benefit (LMB). Use of LMB will enable placement of energy efficiency and renewables versus standard upgrades in the grid and buildings on a cost/benefit basis and significantly lower the cost to implement Renewable Performance Standards (RPS);

- Facilitating "generation to smart plug, light, and appliance" grid operation through integrated, intelligent, communications, command and control platforms that enable automated and wireless management of customer energy management systems and other building functions (i.e., cable, VOIP, safety, security, etc.).
  c. Smart Grid, Grid Reliability, Safety and Security and end customer services

New technologies that allow each building or complex to be self sufficient for energy and load balance to meet available local generation/energy supply needs including the ability to auto source from numerous power sources simultaneously (i.e., solar, wind, diesel gen-sets, fixed/mobile distributed generation/cogeneration (DG), renewable energy and the local distribution grid) have also been developed. These technologies will provide sophisticated reporting and management of building security, environment (including air-borne bio and chemical hazards) lighting, communications, traffic patterns, and a host of other key services.

Defense Secretary Leon Panetta warned that the U.S. was facing the possibility of a "cyber-Pearl Harbor" and was increasingly vulnerable to foreign computer hackers who could dismantle the nation's power grid, transportation system, financial networks and government…He said he was reacting to increasing aggressiveness and technological advances by our nation's adversaries, which officials identified as China, Russia, Iran and militant groups (50). In particular, according to U.S. intelligence officials, both Chinese and Russian organizations have been attempting to map critical U.S. infrastructure, such as the electrical grid and pipelines (51). National security officials believe that cyberspies have penetrated the U.S. electrical grid and planted software programs that could be used to disrupt the system (52). Hopefully, a successful cyber attack on the New York City power grid won't happen before everyone sees the danger. New technologies and DG can provide workarounds of grid problems and secure islanding of strategic and critical loads after outages from cyber attack or naturally occurring events. However, DG on the customer side of the meter reduces utility revenues and appropriate regulation is required to enable utilities to participate in DG for strategic and critical loads on a profitable basis.

Attack on the grid is a key issue for homeland security today as it was in Iraq. Sabotage attacks cut the power flowing through more than 100 transmission lines that form the backbone of Iraq's electrical grid at the beginning of the American led invasion, and nearly 1,200 of the huge towers supporting the lines were toppled. Maintaining Iraq's power grid [then and is now is] fairly hopeless and DG – might have been a better option (53). I worked on a team that proposed a base load DG and microgrid (local power) system in Iraq in 2005 that wasn't implemented. This system would have deployed 2,000 MW of distributed power in 18 months operated from regional control rooms via an interactive C3 system using redundant wired and wireless encrypted communications. I also worked on the systems architecture of a power plant to smart appliance system using the new tools that integrated central and local power systems. At a minimum, such systems should be implemented in the U.S. in areas that are prime targets for cyber attack to securely island and keep strategic and critical loads in operation while the new tools provide rapid workarounds of outages. (Such systems in Iraq would have provided a pilot test of systems needed in the U.S.) Such systems could also avoid long wide area outages such as the northeast blackout of 2003 by rapid localization and automated reporting of outages.

The nation's electrical system is where telecommunications was 25 years ago (54). Utilities provide "dumb power" via one way synchronous connection through the grid central plants to "dumb customer loads" in much the same way mainframes provided data to dumb terminals in the 1980's. Utilities are beginning to implement the "Smart Grid" that provides two way asynchronous digital communications between utilities and smart meters (the new

customer/system interface); which enable customers to manage load purchases and customer owned local DG as individual units and in microgrids.

Our utilities are museum pieces that operate as monopolies, as the phone company once did…They have no incentive to replace aging infrastructure (55) and face many obstacles to modernization. Utilities will implement incremental changes, such as Smart Grid deployed on the customer side of the meter. Such changes are easier to implement than change on the utility side of the meter within the existing regulatory structure. Utilities haven't implemented real change that will transform the grid and eliminate vast waste. Supportive financing and regulation at the national level is required to cut through the labyrinth of state and regional regulation. Without such change the 21st Century Power Sector will not be built any time soon.

5. Fuels Sector

The fuels sector consists of exploration, extraction, refining, production, distribution and marketing. Components will vary by fuel type and all components must be considered as parts of integrated supply chains when comparing and ranking the viability of conventional and alternative fuels for development. Decisions regarding end uses and fuels are intertwined. For example: greater use of NGV's is dependent on logistics of natural gas supply, fueling infrastructure, vehicles and aftermarket, etc. The fuels sector element is divided into three parts:

- Alternative fuels
- Fossil Fuels
- Energy Crises of the Future.

a. Alternative Fuels

The potential to develop alternatives to conventional liquid fossil fuels - such as coal-to-liquids (CTL) and biofuels - must be viewed in perspective with the greater potential for development of conventional fossil fuels on a timeline to achieve the goal. However, NEP will be able to develop alternatives to conventional fossil fuels on a faster track than otherwise possible. This will be accomplished through R, D &D of alternative fuels and their supply chains with the best potential to be built on a timeline to meet the sector objective.

The Global oil market is the world's largest supply chain, and the scale of oil consumption is unprecedented: three billion gallons a day. The current system, which took over a century to develop, includes exploration, extraction, refining, production, distribution and marketing and at each point is under pressure to expand to meet anticipated growth in global demand over the decades ahead….

…Many opportunities exist for alternative fuels to alleviate some pressures on the system [However]…massive amounts of capital will be required to introduce new technologies and feedstock into the supply chain at significant scale. New alternatives and supplemental fuels require infrastructure not limited to production facilities and a distribution network…Alternatives [to fossil] fuels also have a different risk profile than that of traditional petroleum business and the risk profile differs for biofuel and [other alternatives from fossil fuels]. Biofuel supply will vary depending on weather, crop availability and political forces may limit its growth depending on reaction to cross sector economic impacts (including geopolitical issues related to cross border economics). The risk profile for [alternatives from fossil fuels] is similar to oil; but, the high cost of production could limit its viability at a time of lower oil or higher natural gas prices and its often elevated environmental impact may make it vulnerable to shifting political winds…

…Even without consideration of new alternative fuels, the capacity of all freight transportation options is currently becoming constrained. Additional freight for biofuels will only strain the system. Significant strategic issues related to the dispersive nature of alternative fuels feedstock, processing facilities and demand centers remain to be addressed as the scale of alternative fuel production and use grows. With synthetics there is a strong case for manufacturing very near the resource base; because, while some of the new fuels, such as synthetic oil shale crude from Alberta, are easy to plug into the system, others like biofuels may require entirely new production and distribution chains. For example: coal traditionally moves by rail to point of usage. If the production of coal doubles for CTL processing there will be an increased demand on an already strained railroad network to transport the resource from mine mouth to the processing facility. If CTL plants are built at mine mouths, there will be a need for more pipelines (56).

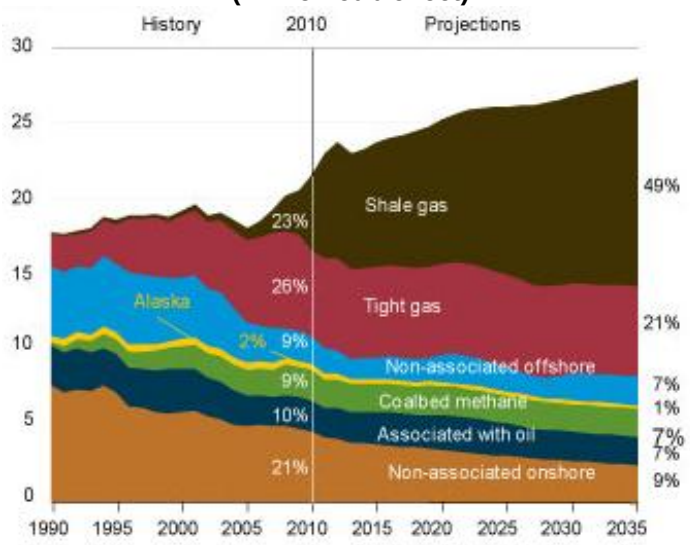
b. Fossil Fuels

Refusing to develop secure sources of domestic fossil fuel production has lead to an unnecessary over-reliance on imported oil… Though the U.S. will still require a significant amount of imported oil in the transportation and industrial sectors, a much greater portion of that oil will be produced within the U.S., preserving national wealth and reducing the amount of America's oil consumption that is directly vulnerable to a catastrophic oil supply disruption (57). This will be facilitated through NEP.

We must utilize our significant reserves of liquid fuels derived from coal, oil sands, and oil shale throughout North America…The U.S. Department of Interior estimates that the Outer Continental shelf contains 86 billion barrels of oil and 420 trillion cubic feet of natural gas…the U.S. has recoverable resources of coal equivalent in energy value to nearly 6 trillion barrels of oil; oil shale accounting to more than 2 trillion barrels of oil equivalent; and heavy oil and oil sands equal to another 154 billion barrels of oil equivalent, some portion of which can be converted to liquid fuels such as gasoline and diesel. Another potential source of significant amounts of domestic natural gas is methane hydrates, an icelike substance containing natural gas, found beneath the ocean floor and in the Artic permafrost. The U.S. Geological Survey estimates there are some 317 quadrillion cubic feet of methane gas stored in hydrates in the U.S. This represents 1,600 times the amount of conventional natural gas reserves estimated in the U.S. (58).

Projected U.S. natural gas production by type is presented in Figure 9. Shale gas - an "unconventional" source of methane, like coal-bed gas (in coal seams) and tight gas (trapped in rock formations) - has rapidly transformed America's energy outlook. At the same time discoveries of vast reserves of conventional gas from traditional wells have pushed up known reserves around the world… the IEA reckons that the share of gas in the global energy mix will rise from 21% today to 25% in 2035…over that period total global consumption will grow spectacularly. If the obstacles can be overcome, more gas and lower prices will mean a rise of 50% in global demand for gas between 2010 and 2035… Shale, along with new finds of conventional gas, will allow more countries to produce their own gas and make available gas for export from more places, many of which are less difficult to deal with than some oil-producing countries. Developed of shale gas is vital to our national security; because, without shale gas, Russia and Iran will dominate the global gas market (59). Conversion rapidly and at scale from imported oil to domestic natural gas in buildings, processes and transportation will help to achieve the goal and benefit the environment.

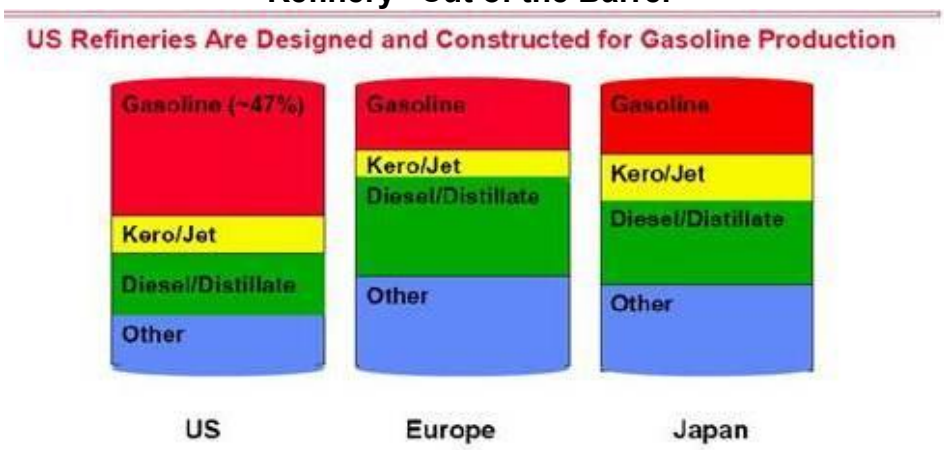
Figure 9: U.S. natural gas production, 1990-2035
(Trillion cubic feet)



Source: DOE AEO2012 Early Release Review
http://www.eia.gov/forecasts/aeo/er/pdf/0383er(2012).pdf

Wastes from the energy supply chain will be turned into profitable by-products to lower the cost of meeting climate mitigation targets. For example: CO_2 is both a green house gas to be reduced and a valuable by-product for which demand exceeds supply. Captured CO_2 can be sold to assist in energy production; but, infrastructure must be built to move CO_2 from power plants and other locations where it is emitted to where it can be used. There will be enough CO_2 available to recover 210 billion additional barrels of oil from existing worn out domestic oil fields for 29 years of U.S. consumption. As a bonus, the same rock formations that trapped the oil can be used to store the CO_2. About one-third of the world's natural gas reserves are mixed with high levels of CO_2. For example: In Exxon's natural gas fields near La Berge about 65% of the gaseous mixture from the wells is CO_2. Natural gas is only 22%. Exxon currently captures four million metric tons of CO_2 at La Berge (60).

Figure 10
Refinery "Cut of the Barrel"



Source: Jim Williams 2007 American Petroleum Institute Diesel Fuel, Use, Manufacturing and Supply,
http://www1.eere.energy.gov/vehiclesandfuels/pdfs/deer_2007/session7/deer07_williams.pdf

Refining capacity is a key constraint on supply … there is a significant mismatch between the product requirements of the world's consumers and refineries' capabilities… [that require reciprocal] imports and exports of finished products. As shown in figure 10, Europe is emerging as a middle distillate [diesel] market and the U.S. remains firmly in the gasoline mode [as diesel demand has grown in Europe, gasoline became surplus and was exported - much to the U.S]… In the U.S. there is considerable capacity to convert middle distillate to gasoline. Converting light products to middle distillate is much harder and there are few processes available…other products include ethane, LPG and naphtha which are extensively used in petrochemical production. Total demand may exceed the refinery capacity…as condensate and LPG may not be processed in a refinery and are counted as other demand (61). The world is not well equipped to deal with light sweet crude becoming much more expensive in coming years. When we are eventually forced to use heavy sour crude that requires more sophisticated and expensive refineries most countries will be caught off guard.

Figure 11: Gasoline Refinery Supply/Demand Balance Comparison (mbd) (2009-2015)

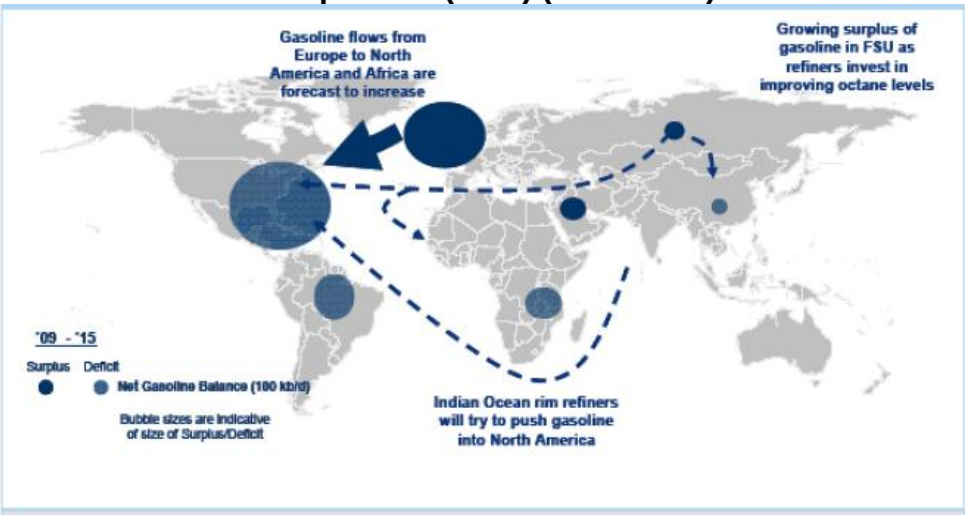
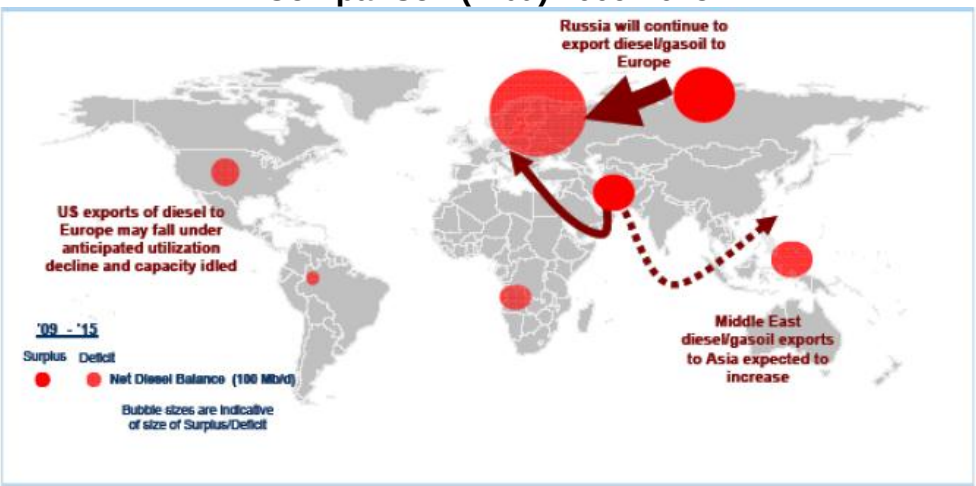


Figure 12: Diesel Refinery Supply/Demand Balance Comparison (mbd) 2009-2015



"Outsourcing U.S. Refining? The case for a strong domestic refining industry", American Petroleum Institute, June 2011, http://www.api.org/~/media/Files/Oil-and-Natural-Gas/Refining/API_Case_for_US_Refining_WoodMackenzieReport.pdf

On a global scale, as regional refining centers seek to optimally meet their respective demand for products there are supply/demand imbalances which drive inter-regional global trade. For example, as indicated in figure 11, under normal circumstances excess gasoline from European refineries will continue to satisfy U.S. demand. Similarly, as indicated in figure 12, refiners will compete to satisfy the shortfall in local European diesel supply.

Achieving independence from imported crude oil from the region by 2025 is achievable; but, America will still need to import certain refined products or build new refineries to meet America's needs. Inadequate U.S. refining capability and inability of our military to "reach back" to North America for all its petroleum needs for logistical reasons makes it currently impossible to set a goal, as some propose, to become independent from oil from outside North America.

c. Energy Crises of the Future.

Growing instability, unforeseen events, a severe energy crunch – individually or in combination – could lead to long term energy crises and possibly chaos. Turmoil in energy producing nations is on the rise, with increased potential for future combat operations…The implications for future conflicts are ominous, if energy supplies cannot keep up with demand and should states see the need to militarily secure dwindling supplies. A severe energy crunch is inevitable without a massive expansion of production and refining capacity (62)**.** With each passing year, the global oil trends now at work – rising consumption, reduced spare production capacity, politicized investment strategies, and high levels of instability in key exporting countries – all increase the likelihood of an oil crisis (63). And, bi-lateral energy deals will make world energy markets less flexible and able to deal with emerging conditions.

To visualize the potential for such a scenario consider how the Persian Gulf War could have played out differently. Saudi Arabia's oil fields are in the east along the Persian Gulf and could have easily been taken by Iraqi forces. From the logistician's perspective, if Saddam had seized control of the major Saudi ports and airfields any subsequent effort to retake the Arabian peninsula would have been immeasurably more difficult and costly (64). Even with complete Saudi cooperation, excellent ports, bases and fill-up at local gas stations it still took allied forces six months to move, supply and position forces to be prepared to attack. Vulnerability to attack as we put our forces and logistics in place during Desert Shield was considered every day. What will we do if the Iraqis decide to attack today? This scenario was updated continually, from hour to hour, as pertinent information became available…To this day it remains a mystery why Saddam Hussein didn't continue to advance through Kuwait and on through Saudi Arabia (65).

Without access allied forces would have had to fight their way into Saudi Arabia over a long period with increased casualties. Saddam Hussein could have held the oil fields and American gas stations hostage for years to negotiate favorable terms. If the Iraqis, in withdrawal, had destroyed the oil fields of Kuwait and Saudi Arabia a key portion of the world's oil supply would have been out of commission for years. Above all, Americans must not allow themselves to be deluded into believing their future opponents will prove as incompetent as Saddam Hussein.

Iraq was created as lines drawn on a map by the British colonialists to maintain lines of communication to India, extract oil wealth and maintain control through compliant Sunni despots. America's real interest in Iraq has always been oil. Our presence began with an oil find that resulted from the 1928 "Redline Agreement" by a number of foreign oil companies to carve up the oil wealth within a line drawn on a map to include the entire ex-Ottoman territory in the Middle East including the Arabian Peninsula (plus Turkey) but excluding Kuwait. The power struggle that ensued after the British puppet King Faisel II was assassinated resulted in

government takeover by the Baath Party led by Saddam Hussein. A coalition led by the U.S. overthrew Saddam Hussein and there was an opportunity to establish a democratic state.

Over and over in Iraq, and in the Mideast, bewildered Arabs repeated this mantra in the 2000's: "We thought you Americans could do anything. How did you make such a mess in Baghdad?" (66) Iraq was lost when Nuri al-Maliki formed a Shiite dominated government with Muqtada al-Sadr shutting out the Iraqiya coalition and the Sunnis. Today, Iraq is breaking down along predictable lines and is descending into chaos. Syria is already there. And, both are suffering the fate of other nations created by colonial powers to serve their interests that made no sense as nations and could only be held together at gunpoint. Iran won, China got a cut of Iraqi oil and America was squeezed out. (As we should have learned in Vietnam, absent a sound strategy to win, troop surges just waste precious time and lives chasing rosy scenarios).

As America's footprint shrinks in the Middle East, authoritarian and pro-U.S. regimes evaporate and Sunni and Shiite ratchet up a conflict to determine the successor to Muhammad that dates back to his son in law Caliph Ali who was assassinated in the 7th Century. (The Middle East, then and now a zero sum game.) Iran's alleged aim to develop nuclear weapons, interference with Shiite populations in the Gulf States and in Iraqi, Syrian and Lebanese politics and growing conflicts feeds fears in Sunni states, particularly Saudi Arabia, that Iranian ascendancy might tip the balance of power towards Shiite domination of the Middle East. The origin of current events is blowback from C.I.A overthrow of Iran's democratically elected government to protect Britain's oil monopoly from nationalization and America's installation of the Shah to serve its interests (67). With nationalization intact, a consortium of foreign oil companies marketed Iran's oil, with Britain surrendering a large share to American oil companies for services rendered.

After 25 plus years of wealth extraction, the oppressive Shah was overthrown and replaced by an Islamic Republic. Iraq then invaded Iran with support from America and Gulf States and the ensuing war produced one million casualties. Today, after 30 plus years of U.S. sanctions and frozen relations, the Iranian regime sees America as an unrelenting threat and acts accordingly. With the removal of the Shah, our policeman in the Persian Gulf, and under cover of the Iran-Iraq War the Soviets saw an opportunity to move through Afghanistan, a vital crossroads in Central Asia, to the Gulf. This led to 9/11 and our War in Afghanistan.

Saudi Arabia is aware that China and Asia are the markets that drive demand and may be less compliant to our needs in the future. More than half of Saudi oil now flows to Asia, compared with the 14% that flows to the U.S. In February 2012, China imported 1.39 mbd from Saudi Arabia. That was 39% higher than in February 2011…In what Riyadh calls "the largest expansion by any oil company in the world", Sinopec's deal with Saudi Aramco will allow a major oil refinery to become operational in the Red Sea port of Yanbu by 2014 (68). China and Saudi Arabia are also building a refinery in Kunming in Yunnan Province in China. This refinery will be served by pipelines running through a transportation corridor through Burma that originates at a Chinese base at Sittwe on the Bay of Bengal. China's investment in oil infrastructure and refining capacity is unparalleled. It executes a consistent strategy of developing world-class refining facilities in partnership with OPEC suppliers. Such relationships mean economic leverage that could soon subordinate U.S. relations with the same countries. China is also buying up energy resources eliminating their availability to world markets. It is quite likely that China will act in its own interests, not world interests, during future energy crises making matters worse.

U.S. dependence on the long-haul Middle East has fallen sharply …since oil is a global market, the relevant measure for that vulnerability is not U.S. dependence, but world dependence on Middle East oil - and that has not shrunk… [However, U.S. refinery closures will result in a

greater reliance on foreign refineries, such as those being built in the Middle East and India.] Demand among the developed countries in the OECD has already peaked, but non-OECD developing countries want more oil to fuel their burgeoning auto industries caused by a growth in wealth (69). Global energy consumption will grow 53% from 2008 to 2035 with the majority of the consumption, 83% occurring in non-OECD countries (70). China alone will account for more than 30% of the projected demand growth and will soon supplant the U.S. as the largest consumer of the world's energy resources (71).

Prudence demands preparation for a possible challenge in the Pacific; but it's important to distinguish between threats that are the most dangerous and threats that are most likely. Especially during challenging fiscal times the U.S. should not tailor its military capabilities for the Pacific at the expense of the rest of the world – particularly the Middle East - where economic, demographic and political trends make conflict more likely …As recent events have demonstrated, predictions of Middle Eastern democracy are premature at best. But, political change is frequently accompanied by violence. With numerous countries in political transition, the likelihood of future regional conflict is high (72).

Focus on the Middle East is also necessary because its energy resources are as vulnerable as they are critical. The Strait of Hormuz is the world's most important oil chokepoint due to its daily oil flow of almost 17 mbd in 2011… The Strait is only part of the chokepoint at the entry to the Persian Gulf. Tanker channels extend nearly 100 miles to the West part of the Iranian and Iranian held islands…As is the case in the rest of the Gulf which is never deeper than the length of a nuclear submarine – current and depth affect mine operations and "noise" can conceal submarines and submersibles… The military geography of the Gulf extends beyond the coastline and includes civil as well as military and petroleum facilities… [For example:] Saudi Arabia's Ras Tanura is the world's largest offshore oil loading facility [and]…provides a larger area target and a facility where a precision attack, sabotage [or Iranian ground to ground missiles] could do major damage…conflict can occur anywhere in the Gulf and even low-level threats and "wars of attrition" can affect petroleum cost and tanker movements…any serious interruption in the Gulf supply will affect roughly 30% of World liquids production through 2035…Asian states are exceptionally dependent on Gulf exports. Any contingency would so threaten the global economy that it would almost certainly lead to a massive military response to secure Gulf exports (73).

Prudence demands that adjustments be made in the fuels sector as soon as possible to avoid destabilizing long term disruptions at home and abroad that could accompany a conflict or terrorist attack on key facilities in the Persian Gulf. This will leave our military free to deal with such scenarios; because civilian leaders wouldn't have to choose between supplying gas stations at home and providing fuel to military vehicles and aircraft engaged abroad.

As supply/demand conditions tighten with rising consumption, Saudi Arabia's ability to act as a "swing producer" to increase output for energy markets during crises to stabilize energy markets will decline. The main risk to Saudi exports may, in fact, come from rising domestic demand unless the Saudis establish fair market prices for their own use of oil and gas (74). However, removal of current subsidies is unlikely and is part of a growing trend. King Abdullah recently pledged $131 billion for public sector jobs and large wage hikes for government employees - 30% of GDP - to keep dissent at bay (75) and continue to keep his people living in the past. The Wahhabi - Saud alliance that united the country in 1924 dates back hundreds of years. (This alliance had previously captured Mecca and Medina in the early 19th century before being driven out). Today, Wahhabi fundamentalism is a trace element in Islam and wouldn't be noticed without financing from Saudi and other Gulf States sources. The U.S. is often dependent on the same nations that pose the greatest threats to U.S. interests.

Our stability and world stability very much depends on stability in Saudi Arabia until America and other energy consuming nations become independent of oil from the Middle East. This stability is not assured. To the extent NEP rapidly reduces America's demand for imported oil it will provide new capacity that can replace Saudi spare capacity and buy time to make other adjustments in the fuel sector. For example: in the U.S…no new refineries have been built in more than 30 years…A shortage of refining capacity, particularly acute in the U.S. but also prevalent in many nations throughout the world, is a key cause of the global supply crunch…to ensure the efficient operation of the global oil market, it is vital to have the right amount and mix of refining capacity so that supply can adequately meet the wide range of consumer demand (76).

6. Defense Sector

The energy required to conduct military operations, or "operational energy" is essential to DOD's core mission to protect the security of the nation. In current operations, for example, deployed forces and fixed installations that directly support military operations require a steady supply of energy for mission success. In an increasingly complex and dynamic security environment, future U.S. forces will also require a reliable supply of operational energy in order to be able to rapidly respond to a range of contingencies around the world (77).

The tyranny of distance will always influence the conduct of America's wars, and the Joint Forces will confront problems associated with moving forces over great distances and then supplying them with fuel, munitions, repair parts, and sustenance…failure to keep joint forces supplied…could lead to disaster, not just un-stocked shelves (78). The military should not have to reach back to North America for oil to conduct operations around the world. We must be able to source finished products from other nations when necessary. However, if necessary, our military must be independent of oil from the region to be able to conduct operations in conflicts in which our adversaries can initially deny our forces access to theater bases and energy supplies.

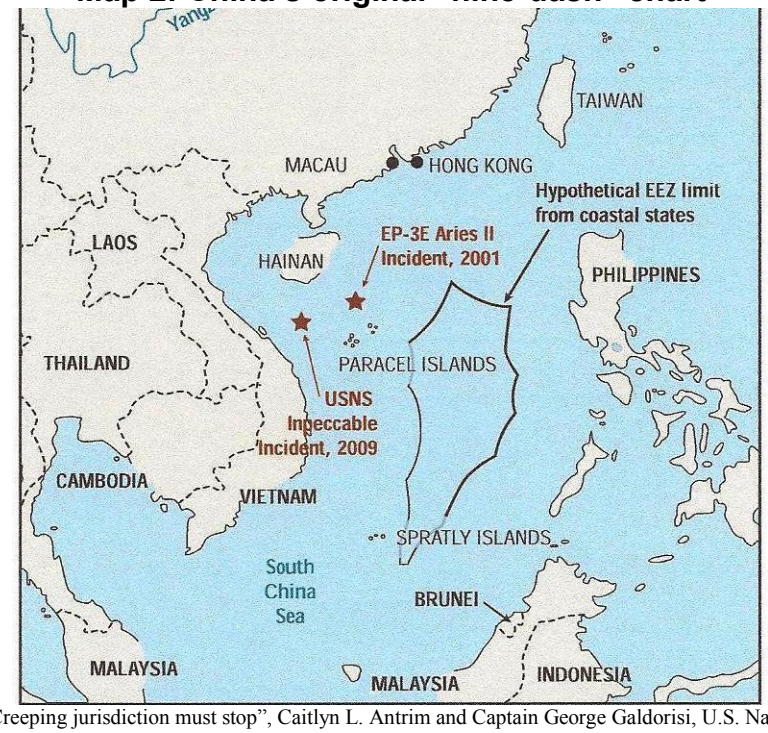
The battle for access may prove not only the most important, but the most difficult…[This is becoming clear as] countries with high performance weapons develop capabilities to deny our forces access to theater based energy supplies… combinations of regional powers with sophisticated capabilities could band together to form a powerful anti-American alliance…to deny U.S. forces access into their countries [and] prevent American access to the global commons at significant ranges from their borders …

…The buildup of Navies has implications for how the U.S. develops its strategy as well as deployment of its naval forces… there is a sense that in certain areas such as submarine warfare, space, and cyber warfare, China can compete on a nearly equal footing with America (79). In response, India is developing a blue-water navy and shifting much of its navy to the Bay of Bengal (80). This will make India the dominant player in South Asia and the Middle East (81). The U.S. Navy is the foundation of our national presence in the world …Naval readiness is highly fragile. In order to meet current operational requirements, the shrunken fleet stays deployed longer and gets repaired less. There is now a serious shortage of Navy combat aircraft, and for the first time since WWII there are essentially no combat attrition reserves. But, the biggest effect of budget cuts will be on naval shipbuilding…It is far from certain that the administration's budgets will sustain building eight ships per year, and even if they do, the U.S. is headed for a Navy of 240-250 ships at best (82). Empire shrinks as insolvency grows.

While the U.S. will continue to contribute to security globally, we will of necessity rebalance to the Asia-Pacific region (83). Unfortunately, as we transition from past conflicts in part or whole growing from energy resources to potential new conflicts over energy resources in the Asia-

Pacific, the new Defense Strategic Guidance doesn't mention oil. This blind spot in military strategy reflects a similar blind spot on the part of civilian leadership. Our civilian leaders waste precious time squabbling over green versus black energy making vague references to energy security; but, appear not to grasp the centrality of energy security to our national security. The relationship between America's national security and dependence on imported oil has been clear since President Roosevelt hosted Saudi King ibn Saud aboard the U.S.S. Quincy in 1945. Our vulnerability to oil imports from the Middle East is well known and was discussed above. Of equal importance, energy dependence extends to the entire region and involves many energy consuming nations. Other parts of the region - South Asia, Asia-Pacific, Central Asia and North Africa – in which energy is a driving force are discussed below. The interrelationship of the region with Russia, China, Europe and the U.S. is also discussed.

Map 2: China's original "nine-dash" chart



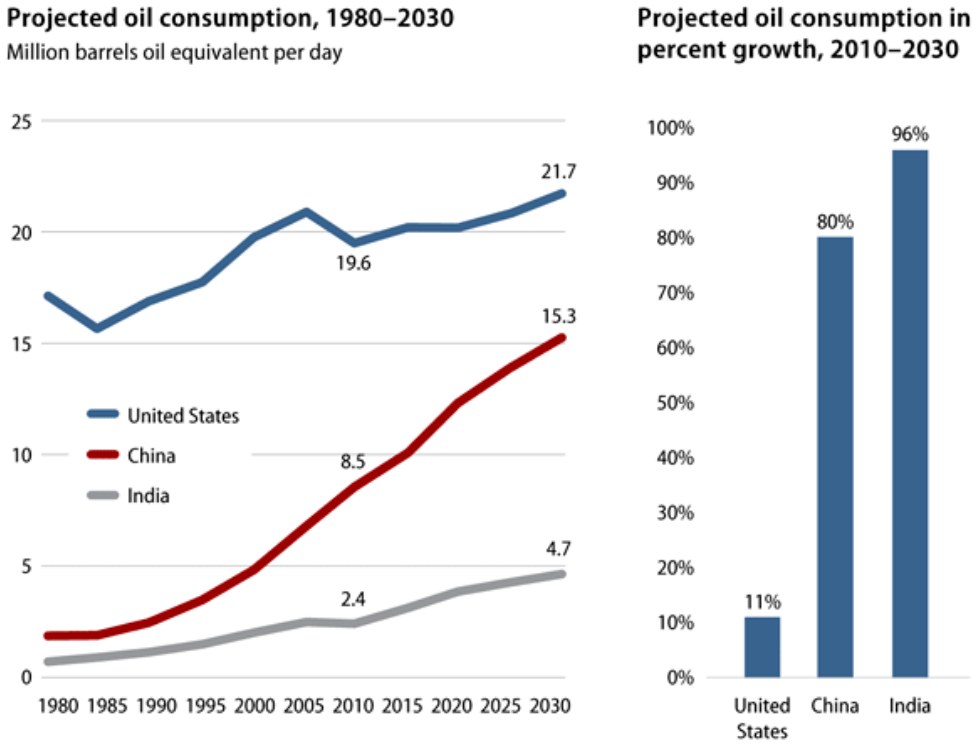
Source: "Creeping jurisdiction must stop", Caitlyn L. Antrim and Captain George Galdorisi, U.S. Navy (retired), Ocean Law.org, April 2011, p. 67. http://www.oceanlaw.org/downloads/Antrim-Galdorisi%20Proceedings%20April%2011.pdf

Energy is a driving force in the South Asia/Asia-Pacific. With its strategic position and potential value of its energy resources, the South China Sea has become an area of tension and conflict both for coastal states and the U.S. Energy is a key issue, because the sea floor is believed to be the repository of large amounts of oil and gas, making jurisdiction an interest of all the coastal states and a security interest of China's energy and resource hungry industrial sector. In addition, 50% of the world's crude oil and 66% of its natural gas transit through the sea…China has argued that the United Nations Convention on the Law of the Sea (UNCLOS) prohibits foreign military operations within its Exclusive Economic Zones (EEZ), a contention found nowhere in the text …Map 2 is adapted from China's original "nine-dash" chart and illustrates China's perceived territorial claims including the EEZ it has claimed around the "rocks" of the Spratley and Paracel islands, where the Chinese harassed U.S. surveillance vessels…(84). China has taken other actions. For example: China has warned India against

collaborating with Vietnam over oil and gas exploration in the South China Sea where Indian companies are heavily invested and want to expand. The Central Military Commission, China's most powerful military body, has approved the deployment of a garrison of soldiers from the People's Liberation Army to guard disputed islands claimed by China and Vietnam in the South China Sea (85). The U.S. should join UNCLOS to be credible in mediating disputes.

Washington's recent foreign policy initiatives to bring India into its geopolitical orbit seem to be partly responsible for an alternation in regional blocks with Iran, China and Russia in one block and the U.S., India and the GCC in another block. The 11th annual meeting of the Russia-India-China (RIC) Foreign Ministers was held in Moscow in 2012. Continuity in the annual parleys has gathered the mass and momentum to make this forum appear to have the potential for global and systemic implications for the 21st century world order (86). Iran and Russia are essentially petro-states while China is a large net oil consumer as is the U.S. As indicated in figure 13, China's oil consumption is projected to grow by 80% by 2030 (87).

Figure 13



Source: Energy Information Administration, Office of Energy Markets and End Use, "World Petroleum Consumption, Annual Estimates, 1980-2008," October 6, 2009, available at: http://www.eia.gov/emeu/international/RecentPetroleumConsumptionBarrelsperDay.xls (accessed February 26, 2010); EIA, International Energy Outlook 2009, Table A5, "World Liquids Consumption by Region, Reference Case, 1990-1930," May 2009, available at: http://www.eia.doe.gov/oiaf/ieo/excel/ieoreftab_5.xls (accessed February 26, 2010).

The way to ensure the peaceful rise of China [and movement away from Russia and Iran and closer to the U.S.] is to ensure its access to adequate energy sources to fuel continued economic development (88). To the extent China sees America's "pivot to Asia" as a threat it will move closer to Russia and Iran. It is worth noting that coinciding with Xi Jinping's first visit to Russia, Beijing and Moscow signed the largest weapons procurement contract in the past decade (89) and China and Russia pledged to expand energy cooperation in projects of oil and gas supply, nuclear energy and renewable energy (90).

In any event, the "coalition of the willing" for conflict with China or Iran in South Asia/Asia Pacific will be small. The attitude in Southeast Asia was expressed by a senior Indonesian official: don't leave us, but don't make us choose (89) between America and China. China-ASEAN trade reached a record high in 2011 totaling $292 billion, up 37.5% from the year before (92). And, India - China trade is expected to touch $100 billion by 2015 (93).

In Southwest Asia, Pakistan and India are disinclined to follow the U.S. lead in Iran…India has gained strategically pivotal access to Central Asia by constructing a road from Iran's Chabahar port on the Arabian Sea to western Afghanistan. This road, along which India is constructing a railway…is primarily aimed at accessing Afghan and Central Asian natural resources (94). India will not halt imports of Iranian crude oil (95). [Will the U.S. impose sanctions on India?] The Reserve Bank of India (RBI) had to work out special payment channels for the Iranian oil imports as restrictions were imposed on dollar trade with Tehran …Talks of [Indian participation in] the Iran-Pakistan-India (IPI) gas pipeline…has almost fallen through. India is negotiating [to participate in the American supported] TAPI pipeline (96) connecting Turkmenistan to India – a pipedream without security in Afghanistan. Pakistan let it be known that…Islamabad is intent on proceeding with IPI [because] if Pakistan doesn't complete the Pakistan section by the end of 2014 it will have to pay financial penalties to Tehran (97). Iran reportedly gave Pakistan a $500 million loan for the project, expected to cost Islamabad $1.5 billion….construction has begun, on Pakistan's part of the pipeline. Iran has completed most of its link to Pakistan (98). TAPI and IPI pipelines are shown in Map 3.

Map 3: TAPI and IPI Pipelines

Source: "Iran-Pakistan Pipeline Shows America's Declining Influence", Joshua Foust, March 2013
http://www.transitionistas.com/2013/03/08/iran-pakistan-pipeline-shows-americas-declining-influence/

Pakistan faces daunting problems, including a bloody fight with armed groups, sluggish economic growth, high inflation, a crumbling currency, the threat of a balance of payments crisis, and crippling electricity shortages. This threatens our tenuous supply corridor into Afghanistan, destabilizes the India/Pakistan relationship and has ripple effects in surrounding nations and throughout South and Central Asia. [If America imposed sanctions on Pakistan for participation in IPI, Pakistan could close our supply corridor at a time our troops are leaving Afghanistan]...

… There are an estimated 10,000 Chinese and more than 120 Chinese companies in Pakistan, many working on infrastructure and energy projects… trade between China and Pakistan hit a 12-month figure of $12 billion…up 18% on the previous year (99). China has backed Pakistan, its largest export market for arms, as a strategic counterweight to India. Beijing has been given sovereign rights to a port it built at Gwadar near the Strait of Hormuz as part of plans to develop a transport corridor from China's northwest through Pakistan to the Arabian Sea. [IPI could be extended to China through this corridor and become the IPC.] Gwadar is part of a "String of Pearls" strategy, [illustrated in Map 4] in which China strengthens diplomatic ties and builds naval bases along the sea lanes from the Middle East to the Asia-Pacific. This strategy is designed to protect China's energy security, negate U.S. influence in the region and project power overseas (100). In many cases, China's growing economic foothold has translated into a military foothold, given the large-scale participation of Chinese army personnel in overseeing energy and infrastructure projects and the "strategic partnerships" that Beijing has formed with key states (101). Add these partnerships to China's relationships with Russia and Iran and conflict with China and/or Iran could spread from the Middle East to the Asia Pacific and beyond.

Map 4: China: "String of Pearls" Strategy

Source: Juli MacDonald and Bethany Danyluk, Energy Futures in Asia, Booz Allen Hamilton Report sponsored by the Director of Net Assessment, November 2004, P. 17.

Energy is a driving force in North Africa; which presents a unique set of challenges, including economic, social, and demographic factors, exacerbated by conflict, corrupt and criminalized states, interference and exploitation by external powers, health crises, deteriorating environmental conditions and growing presence of terrorist networks dedicated to government overthrow and eliminating the influence of external powers. North Africa is a major niche supplier of oil and gas to Europe. Libya and Algeria have enough proven oil reserves to give them the potential to grow their production significantly and Algeria has a major reserve of gas. North African oil and gas reserves are at risk (102). Damage to energy facilities in North Africa by insurgents or terrorists would lead to supply disruption, primarily in Europe.

There are many such groups in North Africa. For example: the stated goal of al Qaeda in the Islamic Maghreb (AQIM) is to overthrow the Algerian state and at a broader level, to follow al Qaeda strategy of attacking the West, particularly Europe…the central aspect that binds AQIM to other terrorist and criminal networks, which is the bulk of nonstate armed actors, is the informal series of overlapping pipelines [supply chains] that these operations use to move products, money, weapons, personnel and goods…[and] relationships between nonstate and state actors provide numerous benefits to both (103). The line between insurgency and organized crime will continue to blur…growing convergence will make them more dangerous and effective [ex: AQIM and West African criminal syndicates]…These networks are intermingling to construct their own "shadow globalization" building micro markets, and trade and financial networks that will enable them to coordinate nefarious activities on a global scale…the current size of these shadow markets is already $2-3 trillion and is growing faster than legal and commercial trade; it has he potential to equal a third of global GDP by 2020…As they grow, these markets will allow adversaries to generate attacks at a higher level of rapidity and sophistication beyond law enforcement's capability to interdict …Where an increase in terrorist activity intersects with energy supplies [ex: attack on an Algerian gas plant] or weapons of mass destruction, Joint Force commanders will confront the need for immediate action that may require employment of significant conventional capabilities (104).

China's String of Pearls strategy extends to Africa. President Hu Jintao recently said that China would lend $20 billion to African governments for infrastructure and agriculture in the next three years… and signaled that China was pressing ahead with aid programs in African nations with abundant energy and mineral resources but with more focus on grass-roots projects. China's aid to Africa has expanded in the past decade as the continent has become a major source of oil. China's projects - roads, pipelines, and ports - have focused on benefiting its extractive industries, not African people (105).

Developing countries…are growing resentful of China's domination over their economies, as some are looking to diversify their relationships – an opportunity the U.S. should exploit. In many cases of natural resource investments, state-owned Chinese companies' motive was not to make money; it was for the Chinese government to capture valuable resources to fuel the country's economic rise… Sometimes the attractive economic terms offered by Chinese businesses in Africa and elsewhere turn out to be illusory. As a result, operations will end up extracting less oil than the Western one would have and sometimes will permanently damage the reservoir... Chinese companies take longer to extract resources than their counterparts…saving the resource for later, when Chinese demand for it has increased… The 20% royalty rate applies to a smaller pie - and may come at a higher cost…China also has earned a reputation for not hiring locals, ignoring environmental considerations, and employing subpar technologies (106).

Energy is a driving force in Central Asia. Russia, China and Iran are acquiring the energy resources of Central Asia and the Caspian area. Turkmenistan is a pivot in Eurasia's great energy game. The Dauletabad-Sarakhs-Khangiran (DSK) pipeline connects Iran with Turkmenistan's vast gas field…The massive Turkmenistan-China pipeline will carry natural gas from eastern Turkmenistan through Uzbekistan and Kazakhstan to China's far west… Moscow and Ashgabat agreed to build jointly an east-west pipeline connecting all Turkmen gas fields to a single network [This network connects nations with the world's largest, second and fourth largest gas reserves, enabling the potential creation of a natural gas cartel. This network also enables] pipelines leading toward Russia, Iran and China to draw from any of the fields (107). Russia has just agreed to supply China with natural gas, a deal which could see China surpass Germany as the largest importer of Russian gas… annual deliveries could reach 60 bcm a year (108). Russia has also

completed its largest infrastructure project since the Soviet Union by expanding its eastern oil pipeline…from East Siberia to the Pacific Ocean (ESPO)…Transneft has said Japan bought a third of ESPO exports this year followed by China with 24% and the U.S. with 22% (109). Beijing is considering infrastructure projects that would eventually link China and Iran via pipelines, railways, and roads, allowing the People's Republic to import Iranian energy sources overland in case current maritime routes in the unstable Persian Gulf region are threatened (110).

The 1689 Treaty of Nerchinsk between Russia and the Manchu-Chinese Ch'ing Dynasty, effectively partitioned Central Asia between the two powers [closing the Silk Road that had at times existed as a vast free trade and travel zone]…In the 19th Century the Russians conquered the Caucuses and the last remaining Central Asian khanates …in all of Central Eurasia only the Kingdom of Afghanistan survived as a fully independent state - a buffer between the Russians, Manchu-Chinese, and British India …[With the Soviet Union's demise] the newly independent states of Western Central Asia…mostly fell prey to rapacious politicians [Stans despots] who kept them poor, weak…prey to fundamentalism and home of terrorists…Central Eurasia will only recover if and when a relatively coherent unifying political system develops there…like the benevolent influence once exercised by the nomadic empires…

… Prospects for recovery look slim (11). The Russians will fight to the last American in Afghanistan; but otherwise want America and NATO out of Central Asia. The manner in which Russian "peace-keeping" forces were mobilized in the Georgia war made a deep impact; heightening the sense of vulnerability (112). Stans despots see American forces as a counterweight to Russia trying to maintain hegemony; while America ignores the oppression of Central Asia and the North Caucasus to maintain access to Afghanistan through the Northern Distribution Network (NDN) – the bi-directional system of air, land and sea supply routes that support the war in Afghanistan from the north. In any event, festering border and other disputes in the Stans have often turned violent, with frequent cross-border shoot-outs resulting in military and civilian deaths; making a return of the Silk Road problematic.

In the West, one makes money in the market, and uses it to buy or influence power. In the East, one seizes power, and uses it to make money (113). Foreign energy companies pay large bribes that American companies can't pay (ex: President Berdymukhamedov of Turkmenistan received a €60m yacht from the Russian gas and resources company Itera). Stans depots also appreciate the large sums of money that has poured in to secure…basing, access and transit rights [that] usually have lined the pockets of…the region's elite. As Western militaries prepare to pull out heavy equipment, they expect Central Asian agencies and border officials to extort even greater payments as reverse transit takes place (114). As America's footprint shrinks in Central Asia, our smaller forces that may remain to train Afghan forces after 2014 will provide little counterweight to Russia, won't spend money on the NDN or pay bribes. Our access to Central Asia and its energy resources will diminish accordingly.

Afghanistan ranks last on Transparency International's Corruption Perception Index (115). Going forward, our smaller forces, reduced spending and bribery will diminish our influence in Afghanistan accordingly. The C.I.A. is plying the presidential palace with cash…with little evidence that the payments bought influence the C.I.A. sought. Instead, some American officials said, the cash has fueled corruption and empowered warlords, undermining Washington's exit strategy from Afghanistan (116). Defections from the Afghan Army will grow as U.S. forces withdraw and the equipment, supplies and air support they provide diminishes. Infiltration and attacks by the Taliban will grow accordingly, filling the void left by our drawdown. (Absent a sound strategy to win, troop surges just waste precious time and lives chasing rosy scenarios). This void will also be filled by neighboring nations. Example: Iran is funding aid projects

working with Afghans…and is expanding intelligence networks across Afghanistan - [assets] Iran could wield against American interests should the U.S. military strike Iran's nuclear program (117). Afghanistan won't be a typical training and transition mission. If our forces remain in smaller numbers, they must have adequate force protection and logistics for a safe and rapid withdrawal in place in light of the British experience in the first Anglo-Afghan War.

Energy is a driving force in Europe. In the 1990's America had the choice to support NATO expansion to corner Russia or to bring a democratic Russia into the mainstream of nations. We chose the former and today, Russia views America and NATO closing in as a threat and wants to push both away from its border. The Russians also see deployment of an ABM system in Eastern Europe ostensibly proposed to protect them from nuclear attack by Iran as a reprise of "missiles in Turkey" pointed at them. In some European countries, energy imports [oil, gas and coal] from Russia topped 80-90% and the E.U. imports 27% of its crude oil and 31% of its natural gas from Russia (118). US LNG will likely go to markets with Atlantic access such as Britain and Belgium, while the closer a country is to Russia, the more dependent it is on Russia for natural gas.

In addition, Russia has built its pipelines in a manner that creates a powerful leverage for oil and gas flow switches from East to West and visa versa, sending a warning signal that Russia can cut oil and gas supplies to the E.U. (119). As illustrated in Map 5, Russia is building the South Stream and Nord Stream pipelines to provide an alternative to pipelines through Eastern Europe. (Prior to opening Nord Stream 80% of Russian gas exports to the E.U. flowed though Ukrainian pipelines). Disputes with Ukraine in the winters of 2006 and 2009 showed that Russia will wield gas as a weapon to keep Eastern Europe in check….Only a handful of countries in Eastern Europe were affected, but the sense of insecurity spread across the continent (120). The U.S. and E.U advanced the Nabucco pipeline as an alternative to South Stream. However, Turkmenistan [and Azerbaijan are] able to commit their gas exports to China, Russia and Iran [and] have no need to connect to Nabucco (121). Without gas supply Nabucco is a pipedream.

Map 5: Nord Stream, South Stream and Nabucco Pipelines

Source: South Stream making progress, DeepResource, July 2012, http://deepresource.wordpress.com/2012/07/01/south-stream-making-progress/

The U.S. has enduring interests in supporting peace and prosperity in Europe as well as bolstering the strength of NATO (122). During the Suez Crisis in 1956, President Eisenhower threatened Britain and France with an oil embargo forcing their withdrawal. Going forward, Russia's ability to squeeze NATO/E.U. by shifting its crude oil and natural gas exports to other countries via East-West pipelines will grow as the shortfall grows enabling Russia to limit European cooperation with the U.S. when it serves Russia's interests. Reduced Russian crude oil exports to the E.U will reduce production by European refineries; thus reducing export of gasoline to America. Oil exports and the Marshall Plan facilitated reconstruction after WWII enabling Europe to become our partner in NATO to contain the Soviet Union. America must provide greater green and black energy exports to Europe and work in partnership with Europe to reduce reliance on energy from Russia and the region as a matter of European and U.S. security.

Overall, as the supply/demand balance shifts, the power balance will shift to producers; limiting America's ability to shape events. Today, in a period of relative supply/demand equilibrium with spare capacity available, America can place an embargo on Iran's oil sales. Tomorrow, oil consumers will be scrambling (and possibly fighting) for oil supplies; making embargoes impossible for America. Conversely, if America achieves the goal its production and export of green and black energy will grow accordingly. This will have the impact on the global shortfall needed to enable America to control world events long term. Whatever the case, in an environment dominated by producers, where will our military get the oil for its gas guzzlers? What will it cost? How will our military secure access/logistics to the battlefield?

As America moves offshore, access is not guaranteed once American forces complete their withdrawal from current conflicts and consolidate in smaller numbers on the periphery… Precision air strikes remain an option… [but] unduly reducing American ground forces risks creating a vacuum (123). The cumulative impact of retrenchment in defense accounts will be reduced capacity in terms of force structure. While the armed forces are likely to grow smaller, it is less likely their operational tempo will decrease…the capability advantage that U.S. forces have over many potential adversaries may narrow in the future (124). The implications for future conflicts are ominous, if energy supplies can't keep up with demand and should states see the need to militarily secure dwindling supplies.

Prudence demands that America achieve independence from oil from the region rather than engage in new conflicts to defend it. With a darkening landscape at home and abroad and time our most critical resource the issue isn't a choice between green and black energy; it is "how much, how fast, how clean" can America produce both? Therefore, NEP will facilitate integration of civilian/military government and industry efforts to promote rapid development and deployment of energy products and services across all markets at home and abroad. As possible, revenues earned through DOD efforts will be used to pay defense costs.

According to the Defense Science Board Task Force on DOD Energy Strategy, DOD is the largest single consumer of energy in the U.S. (125). In 2011, the department consumed 116.8 million barrels of fuel at a cost of $17.2 Billion ($3.51/gallon) (126). DOD should use its market leverage to shorten the road from research to deployment by partnering with industry and serving as a "base customer" to grow businesses at scale. Components of existing DOD energy delivery systems are fragmented across the armed services, headquarters and bases. Pulling DOD components together on an intra or inter service basis will be difficult in such a vast organization. A Defense Operational Energy Board (127) has been established to address this problem. As a program management oriented organization, the corporation will be able to work seamlessly with this Board, DOD components and public/private sector to integrate military and civilian efforts. Cross market operations will vary by sector as follows:

The Buildings & Processes sector is an example of the potential for complete compatibility. DOD's built infrastructure contains 2.2 billion square feet of space in 307,295 buildings (128) that mirror civilian space. Since 1985, DOD has decreased energy consumption per building square foot by 30%. Over the past decade, its Energy Conservation Investment Program (ECIP) financed more than $440 million worth of energy efficiency improvements through innovative third-party financing mechanisms… To continue these efforts and deploy successful initiatives across installations, DOD has initiated the Installation Energy Test Bed Program that has more than 45 demonstration projects underway and hopes to reduce demand by 50% in existing buildings and 70% in new construction (129). DOD programs, public/private sector and NEP operations should be integrated to form cross market end to end buildings & processes sector delivery systems.

The Power Sector is an example of the potential for complete compatibility with DOD in its domestic uses of power. Theater applications will also have application. The military is implementing applications to reduce energy costs, lower emissions, and become more independent of the power grid. For example: the Soaring Heights community at Davis-Monthan Air Base, Arizona… will rely on solar power for 75% of its residential needs… the Air Force leads all federal entities in clean power purchasing with 37 bases meeting some portion of their electrical requirements with renewable sources (130). Dr. Robyn, Deputy Under Secretary of Defense for Installations and Environment announced that she had been given the authority to approve long term contracts (up to 30 years) for PPA's for all electrical energy sources (131) enabling investors to implement utility scale projects. Microgrids can shrink the amount of fossil fuels consumed to create electricity by networking generators as a system to maximize efficiency. Microgrids also enable military bases – both stationary and forward operating bases – to sustain operations, no matter what is happening in theater. Over 40 DOD military bases either have currently operating microgrids, planned microgrids, or have conducted studies or demonstrations.

The Transportation Sector is an example with moderate compatibility. A Prius sputtering out on a highway back home is inconvenient; an armored vehicle stalling out in the Mesopotamian desert or Hindu Kush can be deadly …Through the Tank Automotive Research and Development Center (TARDEC) in Warren, Michigan, the Army is experimenting with new energy-efficient technologies that could be embedded into different vehicles. These include lightweight transmission and composite moldings as well as research into hybrid vehicles…DARPA is exploring different processes for making titanium [40% lighter than steel and has better strength and flexibility] affordable (132). Lightweighting using titanium could significantly reduce fuel usage. If titanium becomes cost competitive with steel it will have cross market application. Because defense and commercial industrial bases are closely aligned, technological advances will have cross market application …Moreover, efficiency gains in electric vehicle deployment in civilian markets can also relieve DOD's burdens associated with securing oil transport routes and the impacts of climate change (133). Breakthroughs in battery and fast charging technology could marginalize the internal combustion engine in new military vehicles over time, reducing the size of supply trains to haul liquid fuels and be readily transferable to our nation's roads.

The Fuels Sector is an area of almost complete compatibility. The military should develop its own dedicated fuel supply to be able to operate free of the marketplace in conflicts that accompany a shortfall and related supply disruptions that cause shortages in the homeland for an extended period of time. In so doing, the military will become a base customer and build new businesses for developing and producing alternative fuels for its own use and civilian markets. The fuels now being pursued by the military and commercial transportation industries are drop-in substitutes for petroleum fuels (134). For example, blends of up to 50% petroleum-based jet fuel and 50% sustainable bio-fuels have been tested and will be used in commercial and military aircraft. CTL is also a potential area for development. However, the Energy Independence and

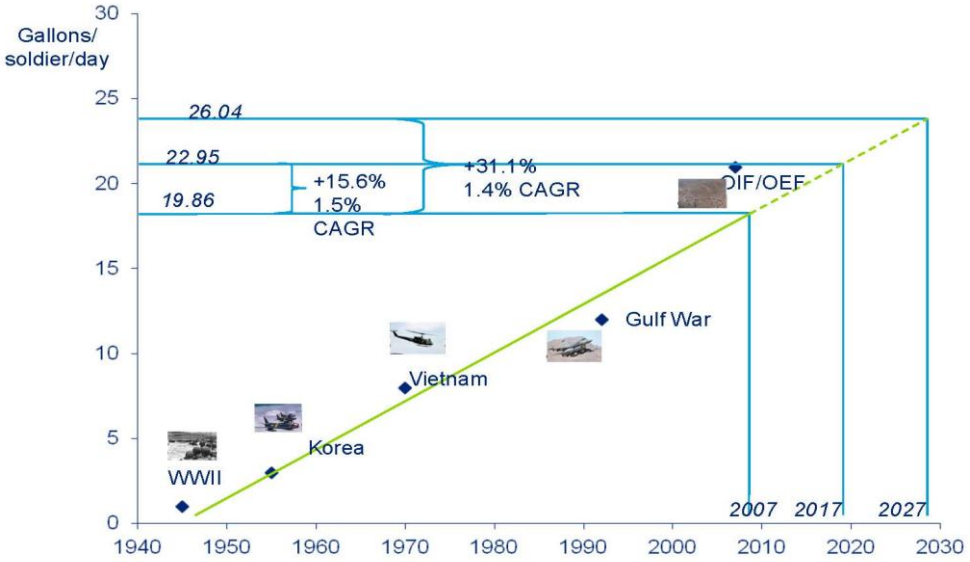
Security Act of 2007 [limits] federal agencies from purchasing synfuels whose life cycle green house gas emissions exceed those from conventional crude oil, thus limiting the use of CTL fuels (135). Exemption should be made for military use; which has first priority in NEP. Concurrently, R, D&D to enable CTL to meet environmental standards should be rapidly undertaken to facilitate wider use of our nation's abundant coal resources in civilian markets to replace imported oil.

Many efforts will be unique to the military. For example: only the U.S. Navy operates aircraft carriers. Navy Secretary Mabus' idea is to turn one of the [carrier strike groups] into an environmentally friendly armada by 2016 to demonstrate that the military's biggest gas guzzlers don't have to stay that way (136). Climate change is included as one of the ten trends most likely to impact the Joint Force (137). Retreating ice creating access to previously unavailable natural resources and is one example of potential security challenges that did not exist in the past (138).

Over 70% of the tonnage required to position today's U.S. Army into battle is fuel…and the number of convoys required to transport an ever increasing requirement for fossil fuels is itself a root cause of casualties, both killed in action and wounded (139). Green versus black fuel isn't the issue; it is reducing the tonnage of "all liquid fuels" on the battlefield. Unfortunately, the trend is going in the opposite direction. Figure 14 illustrates the progression of fuel use from the early 1940's through the Middle East wars, and the increasing numbers of gallons required per U.S. soldier per day from WWII, to the Korean conflict, to Vietnam, the Gulf War, to Operation Enduring Freedom (OEF) in Afghanistan, and Operation Iraqi Freedom (OIF). It is estimated that as of 2007, average consumption per U.S. soldier per day was 22 gallons…it is predicted that there will be a 15.6% increase in gallons consumed per soldier per day by 2017, for a 1.5% compounded annual growth rate (CAGR) (140). This growth rate will be unsustainable from a cost standpoint as the shortfall grows and on the battlefield from an access/logistics standpoint.

Figure 14: Energy Use in Warfare: A Rising Trend

Historic Fuel Consumption



Source: Energy Security – America's Best Defense: A study of increasing fossil fuels in wartime, and its contribution to ever higher casualty rates, Deloitte LLP, p. 3.
http://www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents/AD/us_ad_EnergySecurity052010.pdf

However, the potential for logistics disruptions is not simulated and remains a blind spot in war games and planning future forces. One possible reason is that the military has been successful throwing mass and money at logistics problems over the past 12 years and sees no need to change its approach in the future. This is indicated by the fact that current requirements development and acquisition processes do not adequately analyze the ability of adversaries to interdict energy logistics, the effects of attrition on force effectiveness, or the effects of containment demand on force capability and effectiveness (141).

Going forward, the military will have less mass and money to throw at problems and potential adversaries will be more able to deny access and interdict supply lines. The region is becoming increasingly unstable. Conflicts may not be confined to one nation. A conflict that starts in one nation could spread and involve state and non-state actors and WMD. It may also be fought in cyber space – on the battlefield and in our homeland - and could involve disruption of energy supplies to the military, homeland and our allies. As the shortfall grows energy costs will rise accordingly making current levels of energy use by our military unaffordable. DOD should develop a series of planning scenarios to game out fuel needs against different potential combat concepts, absolute shortages of energy, major price spikes (142) and generally higher energy costs.

"Less Fuel, More Fight": Reduce the demand for energy in military operation (143). Green versus black fuel isn't the issue; it is reducing the tonnage of all liquid fuels on the battlefield. Reductions on the battlefield should be rapidly translated into reductions at home. "More Fuel, Less Fight": The more fuel available in world energy markets the less need to fight for it. The implications for future conflicts are ominous, if energy supplies cannot keep up with demand and should states see the need to militarily secure dwindling supplies. Members of our armed services won't become casualties in wars that won't happen if America achieves energy independence from the region and induces and enables other nations to achieve their energy goals.

America needs a long term program to eliminate its oil addiction and the loss of lives and treasure that flow from it. We will get nowhere as long as the American people continue to live in denial and see our current danger in terms of swings in the price of gasoline at the pump; rather than as the grave national security threat that it is.

IV. Financing Energy Independence – Using Standard Accounting Practices

a. Financial Principles

NEP financial system will use generally accepted accounting practices; rather than the corrupt government practices that are leading our nation to insolvency using a system based on the following principles:

- NEP will use variations of the self liquidating Federal-Aid Highway Act applicable in today's environment and other public/private financing mechanisms as required. Wherever possible, profit and loss will be shared by public and private investors based on their investment and risk using generally accepted accounting principles. Public return may be calculated in a number of ways including: return of investment possibly with a profit; jobs and tax revenues created; reduction of environmental degradation; reduction of costs to defend imported oil, etc.;

- Americans will pay the real cost of what they get, stop using their children's credit cards and lives to pay part of the cost and pay down the national debt.

We - you and I, and our government - must avoid the impulse to live only for today, plundering, for our own ease and convenience, the precious resources of tomorrow. We cannot mortgage the material assets of our grandchildren without risking the loss also of their political and spiritual heritage. We want democracy to survive for all generations to come, not to become the insolvent phantom of tomorrow (144);

- Replacement of imported oil is vital to our national security and will be paid for as we pay for defense where market forces won't suffice to achieve the goal;

- NEP will begin America's movement from a consumption based economy to an economy that strikes a proper balance between austerity and growth. Half of the funds from tax expenditures, entitlements and subsidies cut from the budget will be invested in R&D, infrastructure, work force training initiatives connected to real jobs. Part of this funds transfer will be used for NEP. The other half will pay down the national debt. The way out of this crisis cannot be more borrowing and spending, especially spending that does not build lasting assets that will help future generations pay off debts they will be saddled with (145);

- America can't remain competitive and be a first rate power by consuming its crumbling infrastructure to pay for our current ease and convenience. America's infrastructure has received a GPA of "D" on the American Society of Civil Engineers infrastructure report card (146). This infrastructure is inadequate to serve current population, much less a population projected to grow to 392 million by 2050 (147);

- Development of domestic green and black energy will turn a massive capital outflow into massive domestic investment. The U.S. is spending approximately $1 billion a day overseas on oil instead of investing this money at home (148). Each day, the U.S… loses $4 billion indirectly to the macroeconomic costs of oil dependence, microeconomic costs of oil volatility, and cost of keeping military forces ready for intervention in the Persian Gulf (149);

- Americans will pay the real cost of imported oil at the pump, rather than adding currently unfunded energy costs to the national debt**.** Nations with higher pump prices more in line with the real market price are developing green technologies and exporting them to America adding to our trade deficit. For example: Analysis of [the stimulus package indicates that] of $2 billion in grants to wind power companies $1.7 billion - 85% - was awarded to foreign firms (150). This market will be served. The difference will be the nations that capture this market and its millions of jobs.

President Eisenhower achieved passage of the "The Federal-Aid Highway Act of 1956" (popularly known as the National Interstate and Defense Highways Act). NEP will adapt the central planning, management, eminent domain and self liquidating trust fund financing that built America's highways to achieve energy independence. NEP will also use targeted government investment to leverage private investment with a good ROI for taxpayers.

The Highway Act adapted the WWII military command system for domestic use by giving the Bureau of Public Roads authority to overcome state and regional interests to plan and place the new, interstate highways…in a manner that best served the nation using eminent domain (151). Today, planning, siting, regulation, etc. of many elements of interstate infrastructure are still controlled by state and local governments. This system in many cases relies on fragmented government funded projects, labyrinthine regulation and lacks eminent domain authority. President Obama proposed an Infrastructure Bank to receive federal money, $60 billion over 10

years [recently reduced to $10 billion, NYT], to provide financing to transportation infrastructure projects across the nation (152). This sum pales in comparison to the $2.2 trillion needed in five years just to bring our nation's infrastructure up to good condition (153).

Wherever practicable, national, self liquidating programs that are able to properly focus the large sums of money required will be used; rather than fragmented government funded projects that approach large problems piecemeal, don't these solve them and add to the budget deficit. For example: the cost of construction [of the Highway System] has been estimated at $475 billion in 2011 dollars (154). With budget cuts on the horizon the current system based on government bureaucracy, influence and earmarking is drying up. In future, state and local governments will have the choice of supporting national approaches analogous to the approach that built our nation's highways or seeing the infrastructure cities, states and America needs not be built.

b. Financial Accounts

NEP financing system will contain two accounts:

- An account to fund energy production, energy efficiency and alternative energy technologies RD&D that will have the following sub-accounts:

- Production of conventional domestic fossil fuels (i.e.; coal, natural gas and oil) – Investment to plan will be provided by the corporation and energy producers with the corporation taking an investment position and getting paid back via surcharges on products produced and deployed. Regulatory and other impediments will be reduced shorten implementation time and in other ways lower project costs. Investment should be focused in areas in which energy producers would not make the needed investments to achieve the goal using existing business models. For example: oil refining has historically been a low margin environment.

  Investments made by the corporation in foreign fossil fuels production should be integrated with U.S. foreign aid and infrastructure projects to meet national goals and objectives. Regulations will be reduced or rewritten to enable American energy producers to be more competitive with foreign producers. The U.S. has long lacked even the semblance of a strategy for competing with China in emerging markets…Not only does the government offer minimal help; at times, its own excessive regulations and reporting requirements actually discourage U.S. firms from entering new markets…. China subsidizes its state owned companies in their bids for natural resources…and bundles major infrastructure investments with natural resource bids. Brazil, India, and Russia also regularly throw their political weight behind their state-owned companies …Emerging markets offer high returns and access to crucial natural resources the U.S. cannot afford to pass up, as well as promising opportunities to deepen relations with strategically important countries (155).

- Production technologies to develop alternatives from domestic fossil fuels (i.e., coal gasification, CTL, gas liquification, fracture gas, etc.) – Investment will be provided by the corporation and industry partners with the corporation taking an investment position and getting paid back via surcharges/licenses on products deployed. The corporation will provide venture capital for R&D by early stage companies without industry partners.

  Development of certain alternative fuels may adversely affect the environment. People can live without alternative fuels; but not without clean water. Drinking and waste water get the poorest grades (156). America is now in the midst of the nation's most widespread drought in 60 years, stretching across 29 states and threatening farmers, their crops and livestock. But

there are other risks as water becomes more scarce. Power plants may be forced to shut down, and oil and gas production may be threatened. About half of the nation's water withdrawals are for cooling power plants. The oil and gas industries use tens of millions of gallons a day, injecting water into aging oil fields to improve production, and to free natural gas in shale formations through hydraulic fracturing (157).

Studies by government and utilities agree that cities and towns will need to spend $250-$500 billion more over the next 20 years to maintain drinking water and waste systems…in a country accustomed to paying about $2.50 per 1,000 gallons – the lowest tap price in the world…A major problem is that utilities haven't been charging customers the true cost to provide water but instead subsidize the services with other revenues (158). Water wars in our western states; which are looking as far afield as the Great Lakes indicate that the days of cheap water are just about over. Overall, adequate water supply is a prerequisite for a secure future at the national, regional and global levels.

- Production technologies to develop alternatives to fossil fuels (i.e., solar/geothermal/wind power, bio-fuels, etc.) – Investment will be provided by the corporation and industry partners with the corporation taking an investment position and getting paid back via surcharges on related power production, products/licenses. The corporation will provide venture capital for R&D by early stage companies without industry partners.

- Buildings technologies to develop alternatives to fossil fuels (i.e.; energy efficiency, solar, bio-fuels, etc.) - Investment will be provided by the corporation and industry partners with the corporation taking an investment position and getting paid back via surcharges/licenses on products deployed. The corporation will provide venture capital for R&D by early stage companies without industry partners;

- Power grid technologies (i.e., energy efficiency, renewables, DG, new tools, etc) to replace standard upgrades in the power grid (i.e., central power plants and wires) – An RPS should be legislated at the national level to be adapted on a state by state basis as required. Energy efficiency, renewables, etc. will be financed and installed on a quantitative, cost effective $/kW basis with standard upgrades based on LMB with utilities able to make their accepted profit margin on such activities. Utility infrastructure development will be implemented as a standard utility investment where conversion from oil to gas in buildings produces adequate revenue for utilities. Investment beyond this level will be provided by the corporation. Costs on the customer side of the meter to convert from oil will be paid for by a grant.

- Vehicles technologies (i.e., new materials, electric and natural gas vehicles, etc.) – Investment will be provided by the corporation and industry partners with the corporation taking an equity position and getting paid back via surcharges/licenses on products deployed. Venture capital for R&D of technologies by early stage companies without industry partners will be provided. A grant will be provided to convert vehicles with adequate remaining useful life from gasoline to other energy sources if required.

- An account to build, operate and maintain the national energy infrastructure that will have two sub-accounts:

- An account to build the national alternative vehicles fueling stations network - will be financed via an up front charge in the purchase price of alternatively fueled vehicles or as part of a vehicle miles traveled tax (VMT).

The financing system used to build our nation's roads based on the gasoline tax and highway tolls is becoming obsolete as revenues decrease as more fuel efficient vehicles pay less at the pump, electric cars pay nothing and the Highway Trust Fund becomes insolvent. Going forward, drivers should be charged a VMT or other charge that reflects road usage and repair needs and apportions the real cost to rebuild and maintain our nation's roads by vehicle type, weight and how much and where vehicles drive. Systems exist to track mileage and location of usage that would provide an accurate method to account for road usage (ex: companies that monitor fleet vehicles now track cell phones and GPS devices in cars and trucks use mobile navigation programs). The cost to build the alternative fueling stations network could also be paid in the VMT on vehicles that use the network. This would eliminate the need to pay for the network in the purchase price of alternative vehicles; lowering up front cost and increasing market acceptance accordingly.

- An account to build the "21st Century" national transmission grid - the real cost to build this grid includes the cost to deliver power, maintain the existing grid and build the national transmission grid America will need in the future. The existing power grid receives a grade of D+ (159); because, Americans pay the cost to deliver power and only part of the cost to maintain, replace and expand the existing patchwork grid. Transmission investments will be financed through a surcharge on transmission charges on customer electricity bills. A local match will be provided through utility distribution level investments to meet the goal.

Imported oil is another example of Americans not paying the real cost. The real cost of imported oil includes the cost of exploration, production, refining and distribution; plus hidden unfunded subsidy costs to develop and defend imported oil. Subsidies for fossil fuels development totaled approximately $72 billion from 2002 to 2008 (160). The ongoing cost to protect chronically vulnerable infrastructure in hostile areas and patrolling oil transit routes are between $67.5-$83 billion annually; plus $8 billion in military operations (161). Today, the U.S. military's nine combatant commands must protect oil assets and transportation routes…The U.S. Army would love Mission Unnecessary in the Persian Gulf; the U.S. Navy would not need to worry as much about conflicts from the Arctic to the South China Sea (162).

Currently unfunded annual costs of $85-$100 billion to produce imported oil and defend it will be paid on a "pay as you go" basis as part of the cost of goods sold. This will cost American taxpayers "net zero" because revenues will be used to reduce the defense budget and national debt going forward by an equal amount. In 2011, the U.S. consumed about 134 billion gallons of gasoline… (163). If all unfunded costs were paid at the pump this would add 65-75 cents to the price of a gallon of gasoline. Spreading the cost to other oil based products would reduce the pump price. The alternative, deep defense cuts are unsustainable; because it will limit our ability to defend our oil supply and other vital interests.

This approach is patterned on the East India Company charter for Britain's Asia trade …the English Crown did not care to commit its resources to so uncertain an undertaking …[and gave the Company] the right to arm its vessels to fend off interlopers …the Company's naval prowess encouraged the Mughals to grant trading rights, having no Navy of their own…by 1678 Company exports from India to Europe met the pay bill of 17,000 cavalrymen…[and reached] 2 million pounds in 1740 (164) enabling the Company to pay its defense costs as a cost of good sold. Britain's symbiotic relationship with the Mughals resembles America's relationship with the Saudis today. And, the Persian Gulf War of 1990-1991 resembles the Company's conflicts; because, America's costs were paid for out of Saudi Arabia's oil revenues as a cost of goods sold.

V. Summary – Hard Choices.

America's conflicts since WWII have mostly been fought in the region and we have taken great losses in lives and treasure when our strategy was based on muddled objectives, unsupported assumptions, rosy scenarios, failure to learn from history and deception of the American people. These factors must be taken into consideration as America rebalances its military forces to the Asia-Pacific, so that we can avoid repeating the mistakes of the past. As we learned in the Korean War, basing strategy on the unsupported assumption that China wouldn't fight when threatened led to disastrous consequences. Today, America must. work with China and other nations in South Asia/Asia Pacific to secure adequate energy supplies and significantly reduce future demand rather than threatening China and stumbling into a war trying to cut China off from the energy resources of the South China Sea.

The U.S. must take care not to repeat in its China policy the pattern of conflicts entered into with vast public support and broad goals but ended when the American political process insisted on a strategy of extrication that amounted to abandonment, if not complete reversal of the country's proclaimed objectives…We would then be obliged to face anew the very task that confronts us today - the construction of an international order in which America and China are significant components …The rise of China is less a result of its increased military strength than our own declining competitive position, driven by factors such as obsolescent infrastructure, inadequate attention to R&D, and a seemingly dysfunctional government (165).

Today, Americans plunder their children, infrastructure and homes by cutting infrastructure spending to 2.5% of GDP (166), disinvesting in education and using their homes as ATM's. The government's financial surge primarily benefits the top 1%, Big Banks and Corporations; while the underlying problem - the division of our society between rich and poor - grows as median income remains stagnant and low income workers lose ground (167). By contrast, by 1960 the interstate highways were being built, the power grid was growing and U.S. federal public spending on infrastructure was 5% of gross GDP. By the time the original "GI Bill" ended in 1956, 7.8 million of 16 million WWII veterans had participated in higher education or training programs (168); producing a significant upgrade of the skills of the American work force.

Investment in R&D and infrastructure to expedite the growth and flow of commerce and in education and training to upgrade worker's skills translated into higher incomes and buying power that underpinned creation of the great American Middle Class and the national transformation of the 1940's -1950's. During this "greatest generation" these investments contributed to U.S. GDP growth of 261% from $1.07 trillion at the beginning of 1940 to $2.80 trillion at the end of 1960 (169). America faces a hard choice. We can apply these lessons from our greatest generation or, judging from the slow growth in this century, America will continue to stagnate and the "new normal" will become permanent. This stagnation is indicated by the fact that from the beginning of 2000 to the end of 2012, U.S. GDP grew 20% – about the same growth rate as during the Great Depression that began in 1930 and ended in 1940 (170) when the unemployment rate was cut by one-third by government spending to prepare for war.

Investment in NEP is a good example of this approach. The "NEP decade" will be a transition period from dependence on imported oil to a sustainable future that will be "win-win" for stakeholders, America and the World. Expediting development and deployment of alternatives to fossil fuels that have a significant impact on achieving the goal as a matter of national security will increase their use to a greater extent than otherwise possible during this decade. This will contribute to reduced use of imported oil and an increase in our green energy exports that will produce a real change in the world's energy use profile going forward. Expanding fossil fuels

production and refining capacity beyond currently projected levels will also contribute to achieving the goal. In so doing, NEP will create millions of new American jobs. It will also create new investment opportunities for our financial community building lasting assets. NEP will have an additional benefit - members of our armed services won't become casualties in wars that won't happen if America achieves energy independence from the region and leads and enables other consuming nations to achieve their own energy goals.

America has fallen into a familiar pattern for hegemonic powers: over consumption, over extension and over optimism. In current market conditions with a domestic oil shale oil boom, some are saying that independence from imported oil will soon be achieved by our nation's oil and gas industry and market forces. However, the International Energy Agency (IEA) recently forecasted that U.S. oil production will peak at about 11.1 MBD in 2020 and then decline (171) as demand grows significantly in non-OECD countries. October 2013 marked the 40th anniversary of the 1973 OPEC oil embargo. America's oil and gas industry and market forces haven't cured our addiction to imported oil in 40 years and shouldn't be relied on again to cure this addiction or reduce the global shortfall to the extent required to achieve our national security goals.

Prudence demands that we "hope for the best, but plan for the worst" to cover downside risk rather than continue to chase rosy scenarios being blindsided by unforeseen events. In credible scenarios, energy crises will be structural and involve disruptions, possibly associated with conflict, that are longer and more destabilizing than the OPEC oil embargo. Waiting for crises to occur and trying to remedy them with a short term fix, surge or energy war; rather than implementing a long term program will be no more successful in the future than in the past.

This program should be frontloaded to build up our green and black energy resources and exports as rapidly as possible to take advantage of favorable market conditions while they last to be well positioned to deal with a future global shortfall and shape world events accordingly. As the world's oil supply moves from surplus to shortfall America can't continue to be a big part of the problem, with a significant deficit between demand and supply, and be able to be part of the solution. We must stop wasting our nation's most precious asset – time.

Americans of nearly every political stripe are waiting and wondering whether their leaders are prepared to let the nation that saved the world in the 20th century sink into history in the twenty first (172). We stand at a crossroads. We simply can't risk going down the same path increasingly divorced from the very real threats of today and the growing ones tomorrow (173). Will tomorrow belong to America? The genius of America has been our ability to transform to meet changing conditions and new threats and become a better and stronger nation. Achieving energy independence is the right place to start.

With a darkening landscape at home and abroad and time our most precious resource as the world's oil supply moves from surplus to shortfall, the issue isn't a choice between green and black energy. The issue is "how much, how fast, how clean" can America produce both?

Footnotes

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About the Author

Lawrence Klaus began his career as an architect in the offices of Emery Roth & Sons working on projects including the working drawings for the World Trade Center. As a research engineer in the Boeing Aerospace Group (ASG) he designed and implemented automated business systems concerned with the design, manufacture, test, delivery, and installation of major military missile, space, and associated programs. He also participated in internal business planning to define ASG program management and information systems capabilities that had civilian applications. At Peat Marwick Mitchell (now KPMG) he designed PPB and management and reporting systems for federal government agencies. This included projects such as development of a program planning system for regional plans for the Public Health Service. He founded and was president of Development Management Consultants Inc. and planned and managed company operations on dozens of projects working with utilities, lenders, contractors, non-profit organizations and government. This work included projects such managing local and federal disaster rapid emergency mass home repair. As a manager in the network systems group of Unisys Corporation he worked with company engineers to design networked PC to mainframe systems that integrated company and vendor software and hardware. This included projects such as the user friendly IDEAS online education system for the Air National Guard. He was a consultant at Synergic Resources Corporation (now Navigant Consulting) working on energy efficiency projects for utilities such as MidAmerican Energy. As an independent consultant has worked on projects related to energy policy, networks and distributed generation.

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