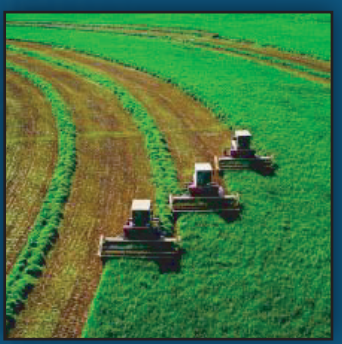
The American Energy Security Study

Building a Bridge to Energy Independence and a Sustainable Energy Future

Executive Summary



Southern States Energy Board

Acknowledgements

The American Energy Security Study has been guided by an expert Executive Panel comprised of representatives from the Southern States Energy Board, the U.S. Department of Energy-Naval Petroleum and Oil Shale Reserves, Peabody Energy, EnviRes LLC, the U.S. Department of Defense, the University of Kentucky, MitreTek Systems, Inc., Management Information Services, Inc., General*Bioenergy, Augusta Systems, and A.J. Mayer International. Primary consultants for the study were Management Information Services, Inc., A.J. Mayer International, General*BioEnergy, MitreTek Systems, Inc., the DOE-Naval Petroleum and Oil Shale Reserves oil shale consulting team under Anton Dammer, and Augusta Systems, Inc. Other participants in the study included Robert Addington, Kenneth Nemeth, Randy Randol, J. Edward Sheridan, Frederick Palmer, Ari Geertsema, Joe Regnery, Sherry Tucker, Khosrow Biglarbigi, James Bunger, James Cobb, and Gerald Weisenfluh.

These experts from industry, government, and academia have spent the last 12 months developing this plan, including a portfolio of legislative recommendations, which, if enacted by Congress and by state legislatures, will become America's first comprehensive energy plan to eliminate dependence on foreign oil.

To date, funding for the study has been provided by the Commonwealth of Kentucky, U.S. Army National Automotive Center, the Association of American Railroads, Rentech, Inc., EnviRes LLC, the Southern States Energy Board, Peabody Energy, and the National Mining Association. Consulting services and information from extensive ongoing studies of U.S. oil shale have been provided by the U.S. Department of Energy-Naval Petroleum and Oil Shale Reserves.

We would like to thank everyone who participated in this important body of work.

Website

A new website has been established to support ongoing activities of the American Energy Security Study. We invite you to visit the site for updated news and information on the emerging alternative liquid transportation fuels industry and on our outreach activities. Our website address is:

www.AmericanEnergySecurity.org

Building a Bridge to Energy Independence
and a Sustainable Energy Future

EXECUTIVE SUMMARY

The American Energy Security Study is a national initiative led by the Southern States Energy Board (SSEB). The study develops a comprehensive plan for the United States to establish energy security and independence through the production of alternative oil and liquid transportation fuels from its vast domestic resources, including coal, biomass, and oil shale. The plan also emphasizes the need for improved domestic enhanced oil recovery programs using carbon dioxide (CO_2) injection and storage, increased voluntary transportation fuel efficiency, and sensible energy conservation. Throughout this report the term oil means crude oil or both crude oil and refined transportation fuels.

This study is a leadership initiative designed to (1) establish an ambitious goal for the nation; (2) broadly frame a plan for success; (3) model the benefits of achievement and the great costs of inaction; and (4) formulate a package of specific federal, state, and local recommendations, including legislation to support the plan. It does not purport to offer detailed solutions to the many challenges that will be encountered if America demonstrates the will to pursue this bold course of action. We are confident, however, that the stated mission *can* be accomplished if national will is strong enough.

Another purpose of the study is to bring better awareness to the American people, industry, the financial community, the media, governors, and legislators and political leadership at the national, state, and local levels. America now faces a crisis of historic proportion: a liquid transportation fuels crisis. Oil, the lifeblood of our economy, is in increasingly short supply, and oil and derivative product prices have recently soared to record levels. Yet few realize the great possibilities that lie within our borders.

- America has the world's largest alternative liquid fuels resource base of coal, biomass, and oil shale to substitute for conventional oil imports.
- Exciting technologies are available to harness these resources in an environmentally respectful and economically rewarding manner.
- Capital is available in unprecedented quantities for good projects.

These enviable building blocks can be assembled to substantially reduce and ultimately eliminate our dependence on foreign oil. In support, federal and state legislatures are encouraged to champion and enact the legislative measures called for in this study without further delay.

Embarking on a national mission to achieve energy security and move toward liquid fuels independence will not only reduce risk and lower oil prices and oil price volatility, it also will facilitate an industrial boom, create millions of jobs, foster new technology, enhance economic growth, help to eliminate the trade and budget deficits, ensure affordable energy for citizens and strategic fuels for the military, and establish a reliable domestic energy base on which to rebuild U.S. industries to be globally competitive.

Following is an abbreviated presentation of key facts, figures, projections, plans, observations, and analyses contained in the American Energy Security Study. Recommendations for federal ,state and local incentives including legislation are also provided. Substantial support information is contained in the main body of the American Energy Security Study report, available on CD ROM and on our website: www.AmericanEnergySecurity.org.

THE CHALLENGE BEFORE US

America is at a crossroads. We can either choose to produce our own transportation fuels utilizing vast domestic resources to secure our own destiny, or we can continue to rely on expensive foreign oil from unstable sources. The choice is clear, and this report shows how this choice can and must be implemented. The essential elements for success are:

- A national commitment to immediately begin to implement all initiatives without delay;
- Federal incentives that build upon the legislation enacted in the last two years, including the Energy Policy Act of 2005. Many of the recommendations need to be enacted during the remaining days of the 109th Congress in order for startup in 2007;
- State and local incentives that complement the federal incentives; and
- Mobilization of the private capital required to build the needed facilities and infrastructure.

The Costs and Risks of U.S. Oil Import Dependence

The study finds that this nation faces four serious oil-related risks:

- Excessive dependence on the OPEC cartel and on other unstable foreign oil suppliers;
- Conventional petroleum supplies are not meeting dramatic increases in world demand;
- Rapidly increasing global competition for oil from China, India, and other nations; and
- Supply disruptions from natural disasters, political causes, and potential terrorism.

Tightening oil markets and record high prices have brought U.S oil vulnerability back into focus, and hurricane Katrina demonstrated how quickly oil supply disruptions can impact the country. More serious supply disruptions will likely occur in the future, caused again by natural forces like Katrina, or by terrorist acts, or purposeful rationing by the OPEC cartel and rogue nations such as Iran and Venezuela.

New oil discoveries are not keeping up with historic world increases in oil consumption, driven by the U.S., China and India. The U.S. faces a serious liquid transportation fuels crisis. To mitigate the unprecedented risks and to provide for future economic prosperity and national security, the U.S. must reduce its growing dependence on foreign oil suppliers by producing its own liquid fuels from domestic sources. While some refer to the oil risks and challenges the nation faces as an “energy crisis,” this is misleading. What we face is the ominous prospect of crippling oil and liquid fuel shortages and soaring, volatile prices.

America imports about 60% of the oil it consumes. In 2005 U.S. oil imports totaled approximately $250 billion, or $680 million per day. That figure is fast approaching $1.0 billion per day. The direct and indirect costs to the U.S. economy have been estimated to total about $300 billion per year. U.S. dependence on crude oil and refined product imports imposes an enormous economic penalty that is not fully reflected in the retail price of gasoline, diesel fuel, and jet fuel. It is the penalty of lost jobs, drained investment capital, and an increased national defense burden. The U.S. cannot pay this $300 billion (and rising) cost forever. When all of these elements are considered, they raise the "real" price of imported oil to well over $100 per barrel of crude. This translates into a pump price for gasoline of over $5.00 per gallon, or nearly $100 to fill an average gas tank.

There are at least several elements that comprise this burden:

- Military expenditures specifically tied to defending Persian Gulf oil
- The cost of lost employment and investment resulting from the diversion of financial resources
- The cost of the periodic "oil shocks" and disruptions the nation has experienced (and will likely continue to experience)
- The erosion of the U.S. industrial base

A growing number of oil industry experts predict that world crude oil production will “peak” by 2020, or sooner. As the “peak” approaches, world supplies will begin failing to meet world demand, and the shortfall will grow with time. This study forecasts that at oil peaking, oil prices would immediately increase by about 150 percent, and continue to rise as the gap between supply and demand widens. Many oil market specialists contend that if a peak occurs, oil prices could increase much more than 150 percent. Clearly, if oil peaks and the U.S. is unprepared, the economic impact will be catastrophic. Even without peaking, continuing tight markets represent risk.

The American Energy Security Study estimates that if oil peaks in 2010, and aggressive domestic alternative fuels production programs are not implemented, over the period 2010-2020 the U.S. economy will lose about:

- $4.6 trillion in GDP
- 40 million job years of employment
- $1.3 billion in federal, state, and local government tax revenues

We estimate that if oil peaks in 2020 and no crash programs are implemented, over the period 2020-2030 the U.S. economy will lose about:

- $13 trillion in GDP
- 100 million job years of employment
- $4 trillion in federal, state, and local government tax revenues

The American Energy Security Study shows that immediate implementation of “crash” programs to ramp up production of domestic alternative liquid transportation fuels is the only way to insure against peak oil. The potential economic costs and consequences of doing nothing in preparation far exceed the costs of implementing crash programs. Our economic analysis demonstrates that even if world oil production does not peak between now and 2030, implementing crash programs will have a very positive impact on the economy by increasing economic activity, reducing the trade deficit, and lowering prices for transportation fuels.

The economic, national security, and environmental advantages of establishing a thriving domestic alternative liquid fuels industry vastly outweigh the development costs. In contrast, doing little or nothing subjects America to energy supply disruptions and to potentially severe economic consequences and national security risks.

National Security Implications

The U.S. military uses between 300,000 and 400,000 barrels of fuel each day to defend our nation (primarily jet fuel and some diesel). The dramatic run up in the cost of fuel, and the elevated risk of supply disruptions and shortages, threatens military readiness.

Protecting oil shipping and transportation corridors and production facilities abroad requires a massive U.S. military presence in the Middle East, costing billions of taxpayer dollars and stretching military resources. As competition for oil intensifies, international confrontation and conflict will become more likely as nations attempt to secure needed oil supplies. Further, U.S. funds tendered to purchase imported oil are sometimes used to fund terrorist organizations.

Military leadership recognizes that national security is seriously threatened by dependence on imported oil. That is why the Department of Defense is so actively championing the rapid development of domestic sources of reliable, cost-competitive, high-performance, low emissions alternative fuels for military vehicles, aircraft, and ships.

A PLAN TO BREAK THE CHAINS OF DEPENDENCE

The American Energy Security (AES) Study shows that the United States can eliminate dependence on oil imports entirely by 2030. It establishes a bold plan to replace approximately five percent of imported oil each year for 20 years, beginning in 2010 (see Figure 1 below). Assuming aggressive implementation beginning in 2007, under the SSEB American Energy Security initiatives domestic liquid fuels production and transportation efficiency savings begin gradually after 2010 and ramp up to produce most of the nation's liquid fuels requirements by 2030 (see Figure 2).

U.S alternative resources of coal, biomass and oil shale are the largest in the world, rivaling conventional world oil resources. This tremendous resource base serves as the foundation of our plan. Numerous low and near-zero emissions alternative liquid fuel plants will need to be brought online each year to manufacture clean fuels from America's vast domestic resource endowment. Substantial improvements in transportation energy efficiency will also be necessary. Clearly, an enormous effort will be required from industry, the financial community, government, and the American people. **Though a very ambitious goal, the study shows how it can be achieved, why it must be achieved, and the tremendous economic, national security and environmental benefits that will result beginning almost immediately**.

To establish U.S. energy security and independence by 2030 all feasible supply and demand options must be aggressively pursued. There is no single answer:

- Transportation energy efficiency improvements are important but, by themselves, can contribute only a small portion of the required solution.
- Renewable biomass fuels are a critical part of the portfolio of required initiatives, but can produce less than one-fourth of the required liquid fuels.
- CTL, oil shale, and EOR will all contribute substantially, and all three technologies must be aggressively deployed.

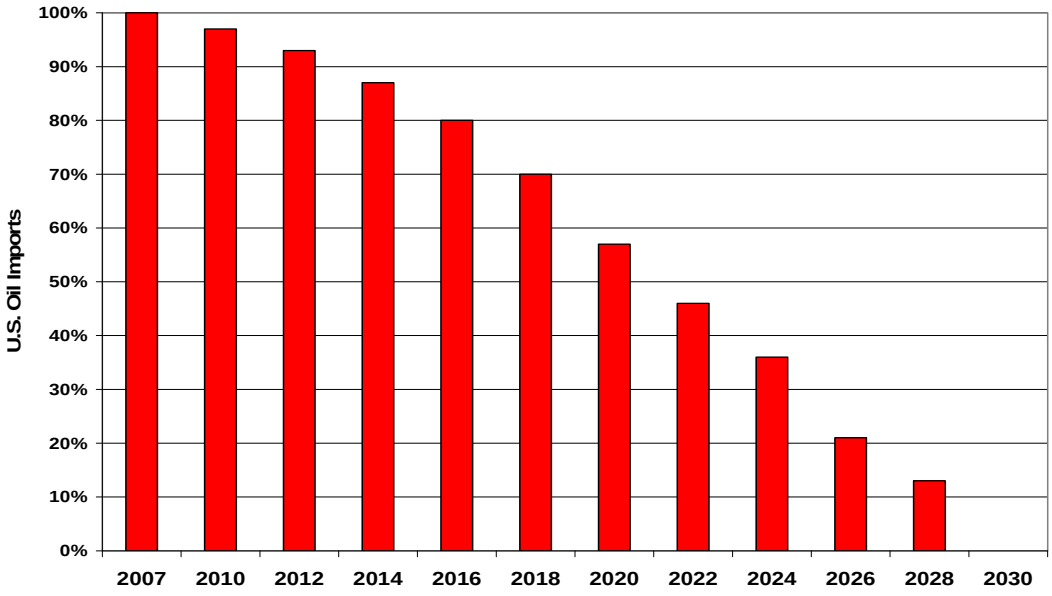
All of the options presented here are technologically feasible, rely on domestic U.S. resources, and are capable of attaining the goals established over the next two decades. The resource assessments, technology assessments, costs, and forecasts were developed by respected experts in their fields.

Figure 2 presents a visual portrayal of how America's most abundant liquids fuels resources can be responsibly harvested to supplement U.S. conventional oil output, reducing and ultimately eliminating the projected oil import gap. Utilizing clean production technologies, aggressive development programs in coal-to-liquids (CTL), various biomass-to-liquid fuels processes, oil shale extraction, and CO_2 enhanced oil recovery (EOR), will all play a critical role. Voluntary transportation efficiency and conservation (TE&C) programs that reduce consumption also will be necessary.

Assuming initiation in 2007, the programs begin to displace a small portion of U.S. oil imports after 2010. As the programs ramp up over the two decades, they begin to replace a larger portion of U.S. oil imports every year:

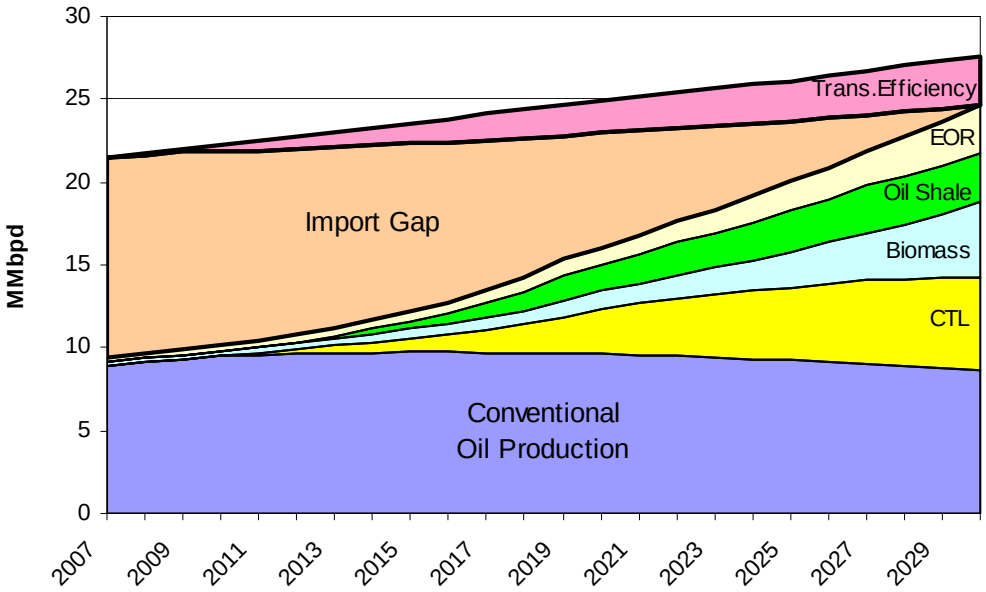
- By 2015, the AES initiatives replace about 16 percent of U.S. oil imports.
- By 2020, they replace about 43 percent of U.S. oil imports.
- By 2025, they replace nearly three-quarters of U.S. oil imports.
- By 2030, they replace all of U.S. oil imports.

Figure 1: Reduction in U.S. Oil Imports Resulting From the AES Initiatives



Source: Southern States Energy Board and Management Information Services, Inc., 2006.

Figure 2: The Path to U.S. Energy Security and Independence



Source: Southern States Energy Board and Management Information Services, Inc., 2006

It is important to note that time is of the essence. Implementation of the American Energy Security initiatives must begin no later than 2007, and delay is not an option. This study finds that, even with aggressive implementation of all of the initiatives starting next year, it will take at least a decade to begin significantly reducing U.S. oil imports, and well over two decades to achieve national energy security and independence. Any delay will leave the U.S. highly vulnerable to shortages, supply disruptions, high and volatile prices, and the catastrophic possiblity that world oil production may soon peak.

National Will and Partnership

Strong leadership will be required to achieve the goals stated in the American Energy Security Study. Political, business, and community leaders will be called on to inspire the time proven energy, ingenuity, and resolve of Americans in crisis—elevating *national will*. Our study assumes that leadership at all levels will create a new national mission, bringing Americans together behind the cause of oil security and independence, much as was done during World War II to achieve a crucial goal of similarly enormous proportions. Our hope is that many will rise up to this leadership challenge. The stakes could not be greater.

American partnerships will need to be strengthened between industry, government, and our communities. Industry sectors inclined to compete against each other will need to find common ground to work together in a cooperative spirit. The American people and local communities must be inspired to offer their patriotic support for new industries and businesses that manufacture the domestic alternative liquid fuels on which America's future depends. Though the challenges ahead are great, there will be bountiful benefits and opportunities created for all if we join together as a country to overcome foreign oil dependency.

Responsible Bridge to a Sustainable Energy Future

Technology offers great energy promise. One day it is likely that all of our energy needs will be met by renewable and sustainable resources. Fossil fuels, after all, are finite resources, and alternatives must ultimately be established. But this will take decades.

For now, fossil fuels are the lifeblood of our economy, our civilian transportation system, and our military. Developing reliable, clean domestic sources of fuels will ensure economic prosperity and an improving standard of living during the transition to a sustainable energy future.

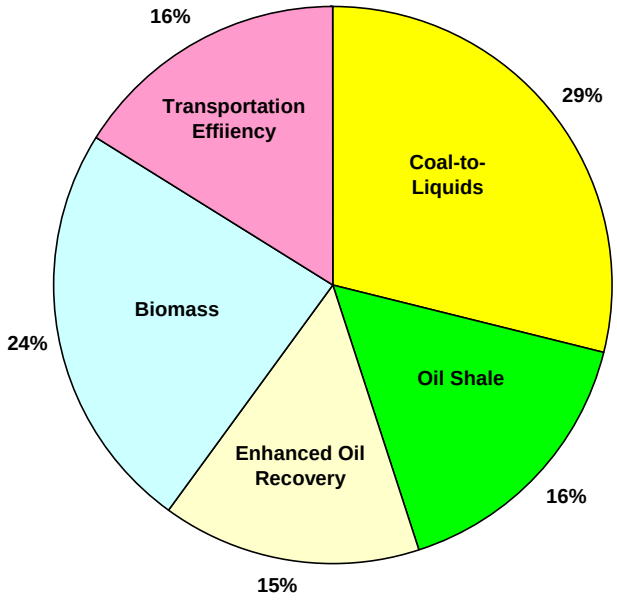
GENERAL FACTS AND FINDINGS

The United States can and should become energy secure and independent by 2030.

- The U.S. is endowed with the largest alternative oil resources in the world. This includes five hundred billion tons of coal (oil equivalent of approximately 750,000 billion barrels), the potential to sustain 1.3 billion tons of biomass collection/harvesting for liquid fuel production by 2030 (oil equivalent of approximately 4.5 million barrels per day to perpetuity), more than a trillion barrels of oil shale liquid fuels, and 80+ billion barrels of oil stranded in conventional reservoirs that are technically recoverable using CO_2 injection and sequestration to enhance oil recovery. These resources rival estimated worldwide conventional oil resources of 1-2 trillion barrels.
- The following graphic (Figure 3) shows the contribution projected for each alternative resource in 2030, as a percentage of total oil imports displaced. Transportation efficiency & conservation also contribute by reducing projected oil consumption. Note

that coal-to-liquids is anticipated to carry the greatest load, and that renewable biomass and transportation efficiencies together account for 40% of the total.

Figure 3: Estimated Contributions of Each Resource to Eliminate U.S. Oil Imports in 2030



Source: Southern States Energy Board and Management Information Services, Inc., 2006.

- Proven technologies are commercially available today to produce mass quantities of ultra-clean alternative liquid fuels from coal and biomass competitively at a profit in today's marketplace. Highly promising oil shale and biomass-to-fuel technologies are rapidly emerging.
- Commercial coal-to-liquid fuels (CTL) technologies have existed for decades. Sasol, a South African company, currently provides almost 30 percent of that country's liquid fuel needs through coal gasification and follow-up Fischer-Tropsch conversion of the syngas into premium, ultra-clean liquid fuels. It does so, profitably, in the open market. Sasol was created with support from government to decrease dependence on foreign oil. The company quickly outgrew its need for government assistance and is highly profitable today. The U.S. can and should follow the Sasol model, which clearly demonstrates that it is not only possible but also highly profitable to rapidly ramp-up production of ultra-clean liquid fuels from domestic coal.
- Biomass derived liquids, specifically starch/grain base ethanol and biodiesel fuels, are already flowing into the U.S. marketplace in commercial volumes. With a mandate from Congress, corn/grain-based ethanol and biodiesel production are projected to continue to grow rapidly over the next few years. This study has identified three emerging biomass technologies expected to contribute on a much larger scale: cellulosic ethanol; biomass gasification with Fischer-Tropsch fuel synthesis, and pyrolysis.

- Several large scale oil shale recovery technologies are nearing the commercial stage: surface retorting of mined oil shale feedstocks, and in-situ processing and recovery of oil shale kerogen which is converted to oil. A good analog for U.S. oil shale is the success Alberta, Canada, has had developing its tar sands with new technology. Canada is now second only to Saudi Arabia in proven oil reserves and ninth in the world in annual oil production. This is a direct result of successful development of its tar sands. The driving force has been the Alberta government's decision to help promote and develop this vast alternative liquid fuel resource, and not giving up as methods and technologies were evolved to allow highly profitable oil recovery. Projections in this study indicate that the emerging oil shale technologies can be profitable in the very near-term.
- As part of this study, capital and operating cost estimates were assembled and/or prepared for coal-to-liquids plants, the principal emerging biomass technologies, oil shale operations, and CO_2 Enhanced Oil Recovery. Extensive work was done to prepare up-to-date cost estimates for 16 different CTL plant configurations. The viability-threshold price for CTL plants ranges from $35 to about $55 per crude equivalent barrel of oil, depending on the plant size, coal rank, and configuration. This translates to finished diesel fuel sales prices of $45.50 to $71.50 per barrel. Oil shale, biomass and CO_2 EOR costs are all comparable.
- Large combination carbon-to-liquids plants are envisioned that can process a varied blend of coal, biomass and oil shale derived feedstocks into high quality fuels. These combination plants first will gasify the carbon-bearing feedstocks and then combine the product syngases into liquid fuels using well established Fisher-Tropsch technology.
- Building near-zero emissions production facilities that will take the place of otherwise necessary new conventional refinery capacity, a substantial reduction in emissions will be realized. Gasification/Fischer-Tropsch plants, for example, can and will economically capture CO_2 and make it available for productive uses such as enhanced oil recovery and storage. Because many of the new technologies will allow economic CO_2 capture, we see new these fuel production facilities changing the way CO_2 is viewed. With large CO_2 streams soon to be available at reasonable cost, many new applications will be developed to utilize and sequester this "strategic gas." Incentives to capture, utilize and store CO_2 are part of the AES plan, as set forth in "Policy Recommendations" below.
- Commercial success over the past 20 years with Enhanced Oil Recovery using CO_2 flooding suggests that American oil and gas production can be dramatically increased by this method. Miscible and immiscible CO_2 flooding can revitalize certain mature oil fields. In addition, CO_2 injection into coal seams and traditional natural gas formations is an emerging technology that will increase natural gas production. At present, limited availability of CO_2 supplies severely constrains this production enhancing technique. However, coal, oil shale, and biomass-to-liquids plants will produce and capture large quantities of CO_2, which can be sold to oil and gas producers for such enhanced recovery uses. Thus, the CO_2 generated by these plants can be put to a positive use, while at the same time permanently and safely storing it in reservoirs deep beneath the earth's surface.
- By producing environmentally superior transportation fuels from near-zero emissions plants, the United States can set an example for the world. Coal, biomass and oil shale derived liquid fuels produced from gasification and follow-up Fischer-Tropsch (FT) processing, for example, will produce ultra-clean, bio-degradable, essentially zero sulfur, low particulate and NO_x emissions diesel and jet fuels, having performance characteristics superior to their conventional distillate counterparts. Zero sulfur gasoline also can be produced. Increased performance from FT fuels translates to lower CO_2 emissions per mile traveled.

- In this study we assumed that, coincident with the crash substitute fuels programs, transportation fuel efficiency also will increase substantially by 2030. The gains likely from transportation efficiency and conservation reduce the forecast for overall U.S. petroleum requirements. Vehicles and light-duty trucks offer the greatest promise for significant consumption savings. Following Europe's lead, a shift to diesel and Fischer-Tropsch zero sulfur diesel is anticipated. Diesel vehicles are typically 20 to 40% more fuel efficient than gasoline counterparts, reducing not only fuel consumption but also emissions. Diesel hybrids can approximately double the efficiency.
- Increases in coal and oil shale mining will be accomplished responsibly. Contrary to common belief, existing mining laws are very tough, strictly prohibiting pollution. In addition, remining of previously abandoned mined areas and mine reforestation programs are having very positive environmental results. The study encourages mining regulatory authorities and mining companies to advance remining and reforestation programs. Experimental reforestation projects have demonstrated that tree growth rates can be dramatically increased from normal rates experienced in nature by preparing mined ground properly before planting. Young, fast growing trees capture greater volumes of CO_2. The new soil preparation techniques provide greater moisture collection for the trees, and reduce water runoff from mine sites. Expanding programs that incorporate accelerated-tree growth into mine reclamation plans show great promise for reestablishing forests, increasing property values of mined land, providing a dynamic new source of arbor fuel crops and wood products resources, and capturing CO_2. Reforestation is a natural form of CO_2 capture and storage.
- The jump-starting of a new domestic alternative liquid fuels manufacturing industry will require tremendous investment of private capital. The risks associated with such investment are perceived to be substantial, given the historic volatility of oil prices. The most significant contribution that federal and state governments can make is develop programs that lower the risk profile of alternative fuel projects. By mitigating risk, project sponsors, backed by large pools of private capital, will rush to build alternative liquid fuels plants in all 50 U.S. states, strengthening economies, creating millions of jobs, stabilizing fuel prices, and lessening our dependence on foreign oil. Tax and fiscal incentives also are recommended to help catalyze development. The AES study has developed a portfolio of policy recommendations, outlined at the end of this executive summary, that can ensure a stable, long term, liquid fuels industry.
- America has the natural resources, the financial resources, and the technologies to achieve U.S. energy security, freedom, and independence. All that is required is *national will*.

Alternative Energy Farms

Tremendous opportunities now exist to develop multi-source energy complexes that co-produce liquid fuels, natural gas substitutes, hydrogen, electric power, process heat, agricultural fertilizer and petrochemical feedstocks. Some are calling these facilities of the future "Alternative Energy Farms" or "AEFs." They will include various integrated combinations of alternative energy production units, such as:

- Coal-to-liquids/gas/electricity/fertilizers/hydrogen/chemicals/steam (including co-feed with biomass)
- Biomass-to-liquids/gas/electricity/ fertilizers/hydrogen/chemicals/steam
- Oil shale-to-liquids/ gas/electricity/chemicals/steam

Wind, solar, and hydro modules also are possible, depending on site locations. Siting some AEFs beside oil refineries makes sense because AEF's can supply refineries with competitively priced ultra-clean diesel and jet fuel, gasoline, and naphtha for blending and marketing, as well as

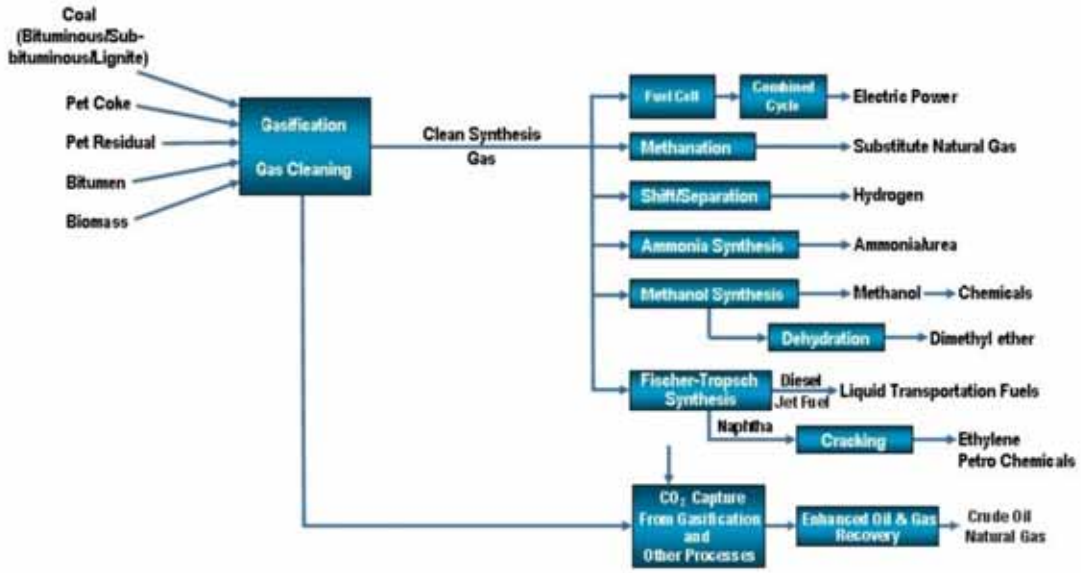
electricity, process heat/steam, and hydrogen from near-zero emissions production facilities. The hydrogen economy will need economic production facilities distributed across the country—AEFs and stand-alone coal-to-liquids and biomass-to-liquids plants can serve this purpose.

Energy Farms will more fully and efficiently utilize local natural and waste resources, process heat, infrastructure, product blends, manpower, technology, land, and capital. Resulting synergies can significantly improve resource utilization and efficiencies, thereby lowering production costs. Environmental benefits will abound.

One of the many possible benefits of an AEF is that excess heat recovered from coal-to-liquids and other operations can greatly reduce the cost of co-producing ethanol, biodiesel, and other heat intensive processes. By capturing CO_2 from an entire AEF complex, and making it available for productive use (such as the enhancement of oil and gas production) and ultimate storage, an AEF can approach zero emissions.

The following diagram (Figure 4) highlights the broad array of products that are possible by gasifying various carbon resources, including biomass and coal. Gasification plants are anticipated to serve as the foundation of many Alternative Energy Farms. The age of near-zero emissions carbon gasification is believed to have arrived.

Figure 4
The Many Products Possible from Gasification



ECONOMIC IMPACT

Achieving U.S. energy security and independence will require a paradigm shift resulting in massive, continuing, decades-long effort by the private and public sectors. Thus, appropriate fiscal, regulatory, and institutional support mechanisms must be put in place and remain in effect for about two decades to achieve stated goals. The rewards will be great.

This study demonstrates that embarking on a national mission to achieve liquid transportation fuels independence will substantially reduce economic and national security risks and lower oil prices and oil price volatility. It will also facilitate a U.S. industrial rebirth.

The American Energy Security plan will facilitate an industrial boom. It will create millions of jobs, foster new technology, enhance economic growth, help eliminate the trade and budget deficits, and establish a reliable domestic energy base upon which to rebuild U.S. industries to be globally competitive.

By 2020, here are some of the annual benefits generate by the AES initiatives (2005 dollars):

- Domestic alternative liquid fuel production plus transportation efficiency savings of 8.4 million barrels per day
- New investments of $100 billion
- Nearly 200 billion dollars in increased industry sales
- Nearly 900,000 new jobs
- $8 billion in profits
- Nearly $60 billion in increased federal, state, and local government tax revenues.
- A reduction of a quarter trillion dollars in the U.S. trade deficit

By 2030, these annual benefits are projected to increase to (2005 dollars):

- Domestic alternative liquid fuel production plus transportation efficiency savings of 19 million barrels per day
- New investments of nearly $200 billion
- One-third of a trillion dollars in increased industry sales
- More than 1.4 million new jobs
- $14 billion in profits
- Nearly $100 billion in increased federal, state, and local government tax revenues.
- A reduction of over $600 billion in the U.S. trade deficit

Table 1: Summary of the Economic Impacts of the AES Initiatives
(dollars in billions of 2005 dollars)

	2020	**2030**
Capital Expenditures	$51	$53
Operating and Maintenance Expenditures	$49	$132
Total Industry Sales Generated	$182	$332
Jobs Created	894,000	1,403,000
Industry Profits	$8	$14
Federal, State, and Local Government Tax Revenues Generated	$56	$94
Reduction in U.S. Trade Deficit	$250	$625

Source: Southern States Energy Board and Management Information Services, Inc., 2006.

The American Energy Security plan will revitalize major U.S. industries. Major industry beneficiaries will include technology providers; construction; petroleum and coal products; machinery; mining; professional, scientific, and technical services; primary metals; chemicals; oil and gas; motor vehicles; fabricated metal products; forestry; farming; and related industries.

American Energy Security initiatives will create an especially robust labor market and greatly enhanced employment opportunities in many industries and in professional and skilled occupations such as chemical, mechanical, electronics, petroleum, and industrial engineering; electricians; sheet metal workers; geoscientists; computer software specialists; skilled refinery personnel; tool and die makers; computer controlled machine tool operators; industrial machinery mechanics; electricians; oil and gas field professionals and technicians; machinists; engineering managers, electronics technicians; carpenters; welders; plumbers; and others.

In 2025 the SSEB American Energy Security initiatives will produce or save nearly six times the amount of oil that the U.S. would be importing from the Middle East in that year. In fact, one of the options alone, coal-to-liquids, would be providing twice the amount of liquid fuels required to make the U.S. independent of oil imports from the Middle East in 2025. And each of the other initiatives would individually be producing or saving about enough liquid fuels to make the U.S. independent of oil imports from the Middle East.

With the American Energy Security initiatives, *by 2030 U.S. domestic resources will be providing nearly 60 percent of total U.S. liquid fuels requirements,* Coal-to-liquids will be providing about one-fifth of U.S. liquid fuels requirements, and biomass more than one-sixth. In essence, the structure of U.S. liquid fuels supply will be radically changed, with substitute fuels production from domestic sources replacing oil imports.

Economic and Jobs Benefits of the American Energy Security Program

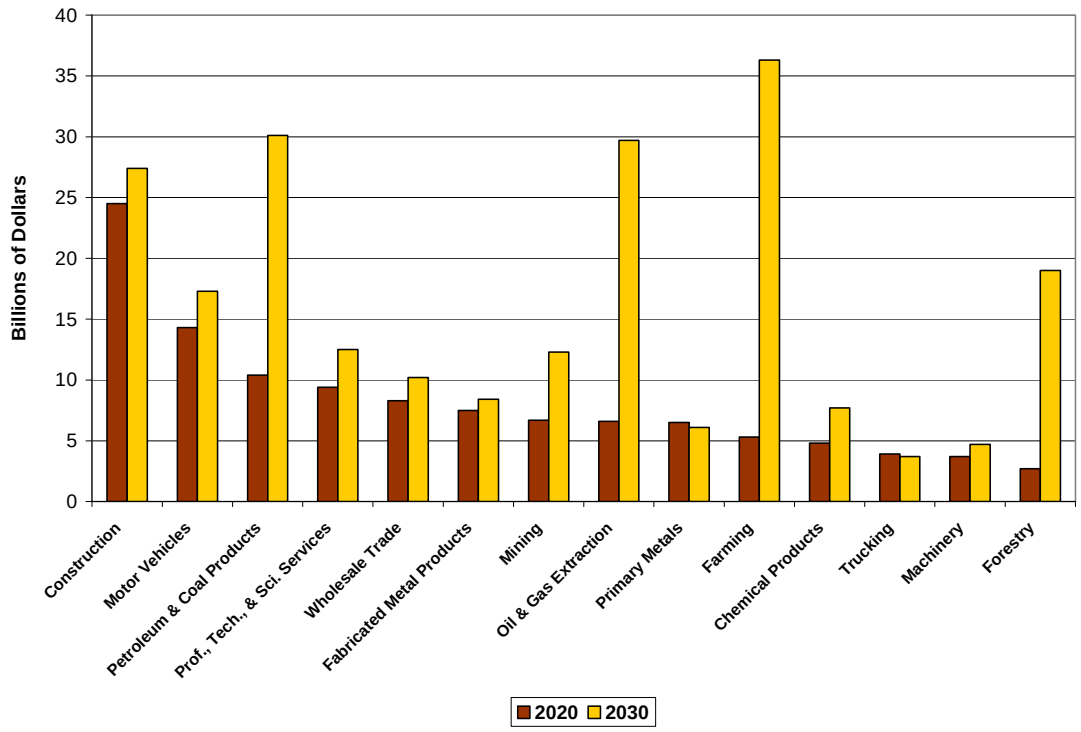
Not surprisingly, industry sales are dramatically increased by the AES initiatives. In 2020 construction realizes the greatest increases, and by 2030 farming is realizing the greatest sales gains (see Figure 5). The AES initiatives are also a powerful engine for job creation.

To highlight job growth we disaggregated the employment generated by the AES initiatives into occupations and skills for selected occupations in 2020 and 2030 (see Figure 6). The jobs generated are concentrated in fields related to the construction, energy, and industrial sectors. **Clearly, the plan will revitalize large sections of U.S. industry and create disproportionately large numbers of jobs for professional, technical, and skilled occupations** such as civil engineers, electricians, geoscientists, machinists, mechanical engineers, petroleum system and refinery operators, welders, and software engineers.

These requirements will create an especially robust labor market and greatly enhanced employment opportunities in many industries and in professional and skilled occupations such as chemical, mechanical, electronics, petroleum, and industrial engineers; electricians; sheet metal workers; geoscientists; computer software engineers; skilled refinery personnel; tool and die makers; computer controlled machine tool operators; industrial machinery mechanics; electricians; oil and gas field technicians, machinists, engineering managers, electronics technicians, carpenters; welders; and others. However, it also is important to note that millions of jobs will be created at all skill levels for occupations such as laborers, farm workers, truck drivers, security guards, managers and administrators, secretaries, clerks, service workers, and so forth. Workers at all levels will greatly benefit.

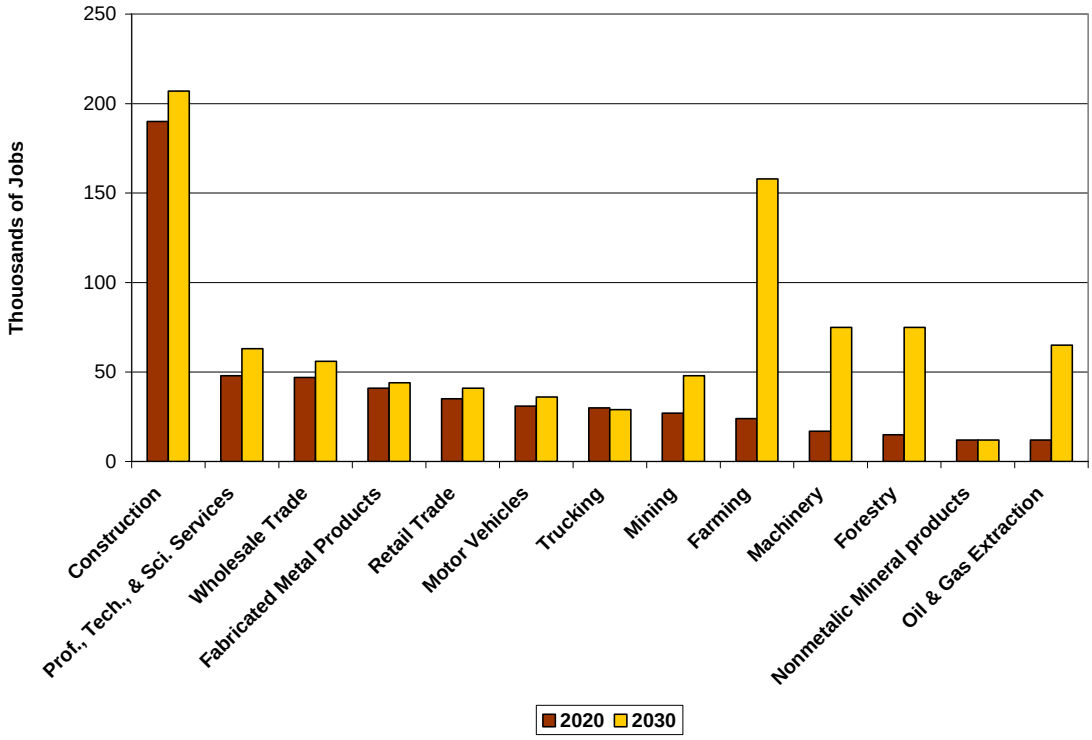
Clearly, the economic advantages of establishing a thriving domestic alternative liquid transportation fuels industry vastly outweigh the development costs. In contrast, doing little or nothing subjects the U.S. to energy supply disruptions and to potentially severe economic consequences. The national security and environmental benefits make the AES plan even more compelling.

Figure 5: Sales Created in Select Industries in 2020 and 2030



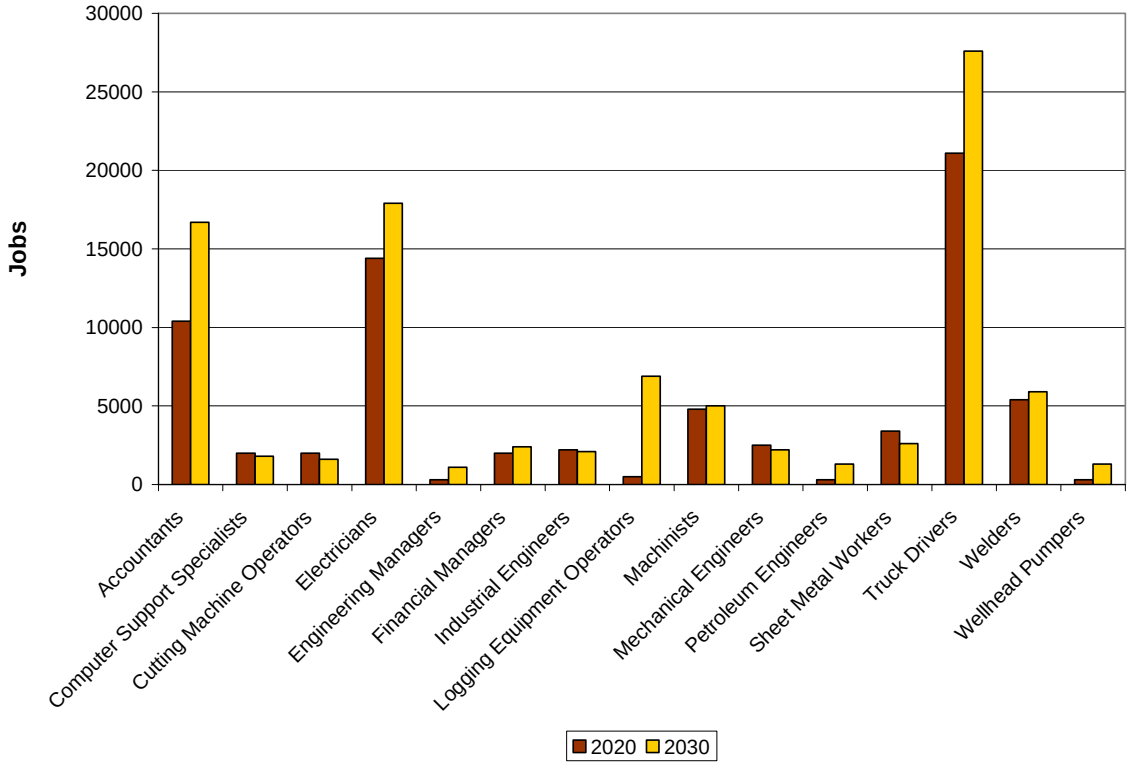
Source: Southern States Energy Board and Management Information Services, Inc., 2006.

Figure 6: Jobs Created in Select Industries in 2020 and 2030



Source: Southern States Energy Board and Management Information Services, Inc., 2006.

Figure 7: Jobs Created for Select Occupations by the Initiatives in 2020 and 2030



POLICY RECOMMENDATIONS

Some argue that the free markets will provide solutions to our liquid fuels crisis. Unfortunately, the oil markets are anything but free. They are controlled by a cartel of oil producing nations (many unfriendly to the U.S.) and by the multinational oil companies. Both groups are making record profits under current market conditions. Both have tremendous market and political influence, and are expected to use this influence to prevent competitive alternative oil and liquid fuels production from developing significant market share.

Government policies are clearly necessary to ensure against market manipulation and other predatory business practices by OPEC and the multinationals. These practices create a risky business environment, and will prevent alternative oil and liquid transportation fuel production from developing to any significant degree.

SSEB recommends that the following private capital formation policies be implemented to encourage the private sector to step forward on a massive scale. The specific fiscal, tax, legislative, and regulatory recommendations presented below are designed to encourage private sector commitments to build alternative liquid fuel plants that will provide for America's security and economic and energy future. It is a logical response to the liquid fuels "crisis" that Department of Energy Secretary Bodman recognizes we now face.

Federal Fiscal, Tax, Legislative, and Regulatory Recommendations

Two bills have been introduced that incorporate many of the AES Study recommendations. Copies of these bills are available on the American Energy Security website under the "Legislative Initiatives" heading at www.AmericanEnergySecurity.org.

S. 3325- The Coal-to-Liquid Fuel Promotion Act of 2006 introduced by Sen Jim Bunning (R-KY), Sen Barack Obama(D-IL), Sen Richard Lugar(R-IN), Sen Conrad Burns(R-MT), and Sen Mark Pryor(D-AR) on May 26, 2006. Co-sponsors include Sen Lisa Murkowski (R-AK), Sen Kit Bond (R-MO), Sen Mel Martinez (R-FL), and Sen Craig Thomas (R-WY).

H.R. 5653- The Investment in American Energy Independence Act of 2006 introduced by Rep. Ron Lewis (R-KY) on June 20, 2006. Co-sponsors include Rep. Harold Rogers (R-KY) and Rep. Chip Pickering (R-MS).

References to the relevant section in these bills are provided.

1. Extend the $0.50 Per Gallon Alternative Liquid Fuels Excise Tax Credit

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users, SAFETEA-LU 2005 extension, provides a $0.50 per gallon excise tax credit for certain alternative liquid fuels, including coal-to-liquids products. This incentive is set to expire in 2009, before any major new alternative liquid fuel plants can come online, and its extension through 2020 is required. See S. 3325, Section 8; H.R. 5653, Section 4.

2. Provide Accelerated Cost Recovery to Alternative Fuel Plant Owners

Authorization for 100 percent expensing in the year of outlay for any alternative liquid fuel plant begun by 2020 will provide a substantial tax incentive to build alternative fuels manufacturing capacity. Providing for a 20% investment tax credit for the amount that is not expensed will improve the financial viability of projects. See S. 3325, Sections 6 & 7; H.R. 5653, Sections 2 & 3.

3. Incentivize the Refining of Alternative Liquid Fuels

We recommend extension of the now temporary expensing allowance for equipment used in refining to 100 percent of any required additions to existing refineries needed to handle domestic alternative liquid fuels products. This will redirect refinery owners to domestic feedstocks and away from imported feedstock sources. See H.R. 5653, Section 7.

4. Provide Explicit DOE Authority and Appropriations for Loan Guarantees

EPAct 2005 establishes a loan guarantee program within DOE. However, DOE feels that the Federal Credit Reform Act of 1990 prevents it from issuing loan guarantees until it has an authorization in an appropriations bill. We recommend that Congress provide authorization in the form of a federal loan facility to support the first 100,000 bpd of new production capacity for alternative liquid fuel facilities. We also recommend that appropriations be provided for technologies demonstration, as provided in the EPAct 2005. See S. 3325, Section 3.

5. Fund the DoD Alternative Fuels Testing and Development Program

An assured supply of turbine (jet) fuels is critically important to national defense and the commercial aviation industry. The Department of Defense (DoD) currently has an Assured Fuels Initiative underway to evaluate, demonstrate, and qualify turbine (jet) fuels made from alternative energy resources for use in military aircraft, ships and diesel-powered ground vehicles. The

program is coordinated with the industry organizations responsible for turbine fuel standards, and will simultaneously qualify these fuels for use in commercial aircraft. The new fuels are expected to improve aircraft engine life and reduce soot output, thus offering important economic and environmental advantages. They will also be freely interchangeable with existing turbine fuels in keeping with the DoD Single Battlefield Fuel policy, and avoiding any complex changeover period between fuel types. The ultimate goal is to develop a Joint Battlefield Use Fuel of the Future (J-BUFF).

By qualifying turbine fuels from alternative resources in military equipment, the Assured Fuels Initiative will prepare the DoD to use an assured domestic fuel supply, and accelerate by several years the acceptance of these fuels by commercial aviation. We encourage Congress to fully fund DoD's fuel testing program through FY 2013. See S. 3325, Section 10.

6. Authorize and Fund Military Purchases of Alternative Fuels Under Long-term Contract

Oil consumption by U.S. military forces totals approximately 300,000 bpd. Through the development of BUFF specifications, a substantial portion of this can be met with domestically produced alternative liquid fuels. DoD desires to enter into long term contracts for the purchase of alternative fuels made from domestic U.S. resources as part of DoD's Total Energy Development (TED) Program. We encourage Congressional support for the TED program, including extending its long-term contracting capabilities from five years to as long as 25 years. See S. 3325, Section 11.

7. Eliminate The $10 Million Cap for Tax Exempt Industrial Development Bonds

To encourage investment, certain pollution control and solid waste disposal facilities are currently not included in the $10 million limit on tax exempt Industrial Development Bonds (IDBs). We recommend that alternative liquid fuels production facilities be added to this list of activities having no tax exempt IDB size limits.

8. Provide Regulatory Streamlining for the Production of Alternative Liquid Fuels

In order to facilitate the rapid scale-up of alternative liquid fuels production capabilities in the U.S., regulatory changes are necessary. Standardizing, simplifying, and expediting the permitting process for manufacturing/processing facilities, mines, agricultural operations, and necessary infrastructure is crucial, and our recommendations to address this problem include:

- Standardize, simplify, and expedite permitting and siting with joint federal, state and local processes, policies, and initiatives.
- Make appropriate federal sites available for alternative liquid fuels manufacture, including Base Realignment and Closure (BRAC) military sites.
- Exempt initial alternative liquid fuels processing facilities from New Source Review (NSR) and National Ambient Air Quality Standards (NAAQS) offset requirements.
- Prioritize, expand, and promote the reforestation work being done to accelerate the rate of tree growth by creating optimal soil conditions at reclaimed mine sites.

See S. 3325, Section 5

9. Establish a Self-sustaining Insurance Corporation to Provide Market Risk Insurance

We encourage Congress to establish the Strategic Energy Security Corporation (SESC) as a self-funding, self-sustaining government corporation that will administer a new alternative liquid fuels market insurance program to protect against predatory pricing by OPEC and others. SESC will provide the following functions:

- Collect insurance premiums from companies that "opt in" to the SESC insurance program
- Invest net premiums in an insurance fund for future payout to program members if and when necessary
- Facilitate market insurance payments to members if oil prices fall below a defined "Low Trigger Price"
- Administer the collection of "standby" insurance fees, to be levied on imported oil if oil prices fall below the "Low Target Price" and the accumulated investment pool of insurance premiums is exhausted

10. Expand the Strategic Petroleum Reserve (SPR) Program to Include Alternative Liquid Fuels Products

Congress should examine the feasibility of purchasing and storing "finished" alternative fuel products such as diesel fuel, jet fuel, heating oil, and ethanol at locations strategically dispersed throughout the U.S., as an extension of the SPR program.[1] Fischer-Tropsch (FT) wax produced from coal, biomass, and oil shale may be an ideal product for this purpose, and this wax is an alternative to producing diesel and jet fuels. The wax has a very long shelf life, and can be upgraded to superior quality fuels much more quickly and inexpensively than crude oil. Alternative fuels could be purchased by the SPR under long-term contract, and Congress should authorize the sale of portions of the crude oil currently in storage to fund these purchases. See S. 3325, Section 10.

11. Provide Incentives for Existing Ethanol Plants to Convert to Coal

Until recently, the ethanol plant fuel source of choice for process heat and electricity was natural gas. However, with the recent increases in natural gas prices, new ethanol plants are opting for coal firing, and limited domestic natural gas supplies have necessitated increasing imports of this fuel as LNG to produce ethanol. We recommend providing for 100 percent expensing in the year of outlay for the cost of converting ethanol plants currently using natural gas to domestic coal, if the new plant is placed in service by 2010. See H.R. 5653, Section 8.

12. Provide Incentives for Enhanced Oil Recovery and Enhanced Coalbed Methane Recovery Using CO_2 Captured From Alternative Fuel Plants

The capture and use of the CO_2 from alternative liquid fuel plants can greatly expand domestic oil production from existing oil fields and enhance methane recovery from coalbed methane operations. To lower the barriers to expanded use of CO_2 injection we recommend:

- Exclusion of the oil produced from the Alternative Minimum Tax
- Increasing the investment tax credit to 50 percent

[1]There are only four centrally located SPR storage sites in the U.S. -- two in Texas and two in Louisiana. All four sites are centrally situated on the hurricane-prone Gulf Coast, making them vulnerable to natural disaster and also to terrorist attack.

- Provision of federal royalty and severance relief until the investment in CO_2 injection is recovered
- Provision of access to federal lands for construction of CO_2 pipelines

See H.R. 5653, Section 5.

State Fiscal, Tax, Legislative, and Regulatory Recommendations

SSEB recommends that the following policies be implemented at the state and local level to encourage the private sector to step forward on a massive scale. The specific fiscal, tax, legislative, and regulatory recommendations presented below are designed to jump-start early facilities and complement the federal incentives designed in order to encourage private sector commitments. Each state must assume responsibility for its contribution to the national objective of Energy Security and Independence. A number of states committed to alternative liquid fuel facilities have already taken steps to provide some incentives, but a more consistent approach is needed to avoid unnecessary competition between the states. Any gaps in state incentives requiring legislation should be enacted at the next convening of the state legislature.

1. **Authorize and Fund Multi-year State and Local Government Purchases of Plant Output, Especially Alternative Transportation Fuels, Under Long-term Contract**

   We recommend providing for transportation fuel, electricity and steam purchasing under multi-year contracts of at least 10 years, arranging for state and local contractors to purchase transportation fuel and other products, and securing transportation fuels under multi-year contracts for first responders for use in case of emergency.

2. **Provide State Loans or Grants on Matching Basis with Private Industry to Assist with Preliminary Engineering and Site Qualification.**

3. **Provide for Tax Incentives**

   A number of states have tax incentives on the books. Provision should be made for explicit investment tax credits, corporate tax abatement, and local property tax abatement.

4. **Provide for Fiscal Incentives**

   We recommend that states provide loans at favorable rates, and qualification for industrial development bonds.

5. **Incentivize the use of CO_2 for carbon capture and storage**

   A few states have developed a variety of incentives for what is known as “tertiary recovery”. We recommend that all states provide for state royalty and severance tax relief until the investment in CO_2 injection is recovered
   a. Also, providing access to state lands for construction and expansion of CO_2 pipelines will stimulate the growth of the needed infrastructure.

6. **Provide Regulatory Streamlining and Central State Agency Coordination of the Permitting Process for the Production of Alternative Liquid Fuels**

   Some states have developed an enlightened approach to siting new facilities. We recommend;

a. pre-qualification of sites;
b. identification of options to meet air and water requirements;
c. standardization and expedited permitting and siting under established timelines with joint federal, state and local processes, policies, and initiatives, making appropriate state and local government sites, including suitable brownfield sites, available for alternative transportation fuels manufacture; and
d. encouraging local authorities to modify approaches to zoning and other land use and business regulations to accommodate alternative transportation fuels production facilities.

7. Involve State Research and Development Enterprises

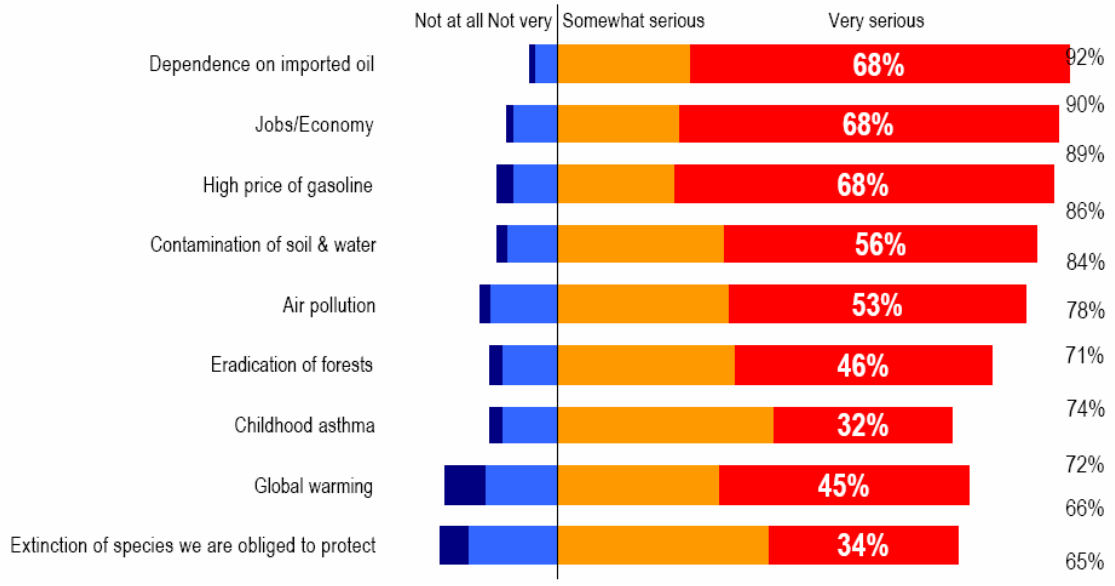
Many states have important capability to provide R&D support to supplement the Federal activity. We recommend that states engage in a collaborative arrangement to make best use of the available R&D funding aligned with the needs of the commercial development interests.

A TOP CONCERN OF AMERICANS

The following summarizes the key findings of a national survey conducted by the Yale Center for Environmental Law and Policy in May 2005. Note that the price of oil and gasoline have both risen since the date of the survey.

Top Concerns: Dependence on Imported Oil

Americans are nearly unanimous in the belief that dependence on imported oil is a very serious problem. Fully 92% say it is a serious problem and 68% say it is a 'very' serious problem.



Yale Environment Survey, May 15-22 2005, 1002 interviews

- Americans are more concerned about our dependence on imported oil than about global warming, air pollution or contamination of soil and water. Democrats (70%), Republicans (68%) and Independents (66%) all agree, this is a very serious problem.

TAKE ACTION

You can help to advance the cause of American liquid transportation fuels independence. First and foremost, please support the legislation we are recommending. This is vital.

We are currently seeking additional contributions to help us carry on with the next phase of the American Energy Security program: educating policy makers, stakeholders, the media and the American people about the possibilities. Our goal is to raise at least $500,000 pursuant to this mission.

Those interested in helping to fund our ongoing outreach program should call Ken Nemeth, executive director of the Southern States Energy Board, at 770-242-7712 or Jim Mayer, president of A. J. Mayer International, at 717-359-0014.

We also invite you to visit our website to learn more about our program and how you can help. When you visit, please subscribe to our email list so that we can keep you current regarding our activities. And please be sure to invite your friends, colleagues and associates to visit the site. Thank you.

www.AmericanEnergySecurity.org