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Thank you for the opportunity to testify today on the subject of coal liquefaction, or coal-to-liquids technology. My name is David Hawkins. I am director of the Climate Center at the Natural Resources Defense Council (NRDC). NRDC is a national, nonprofit organization of scientists, lawyers and environmental specialists dedicated to protecting public health and the environment. Founded in 1970, NRDC has more than 1.2 million members and online activists nationwide, served from offices in New York, Washington, Los Angeles and San Francisco.

Today's energy use patterns are responsible for two growing problems that require early action to keep them from spiraling out of control—oil dependence and global warming. Both are serious; both warrant much more proactive policy action than has occurred to date. But most important, both problems must be addressed together. Designing strategies that address only one of these problems and ignore the other is a recipe for huge and costly mistakes. Fortunately, we have in our tool box energy resource options that can dramatically reduce both oil dependence and global warming emissions.

Proposals to use coal to make liquid fuels for transportation need to be evaluated in the context of the compelling need to reduce global warming emissions steadily and significantly, starting now and proceeding constantly throughout this century. Because today's coal mining and use also continues to impose a heavy toll on America's land, water, and air, damaging human health and the environment, it is critical to examine the implications of a substantial coal-to-liquids program on these values as well.

Reducing oil dependence

NRDC fully agrees that reducing oil dependence should be a national priority and that new policies and programs are needed to avert the mounting problems associated with today's dependence and the much greater dependence that lies ahead if we do not act. A critical issue is the path we pursue in reducing oil dependence: a "green" path that helps us address the urgent problem of global warming and our need to reduce the impacts of energy use on the environment and human health; or a "brown" path that would increase global warming emissions as well as other health and environmental damage. In deciding what role coal might play as a source of transportation fuel NRDC believes we must first assess whether it is possible to use coal to make liquid fuels without exacerbating the problems of global warming, conventional air pollution and impacts of coal production and transportation.

If coal were to play a significant role in displacing oil, it is clear that the enterprise would be huge, so the health and environmental stakes are correspondingly huge. The coal company Peabody Energy is promoting a vision that would call for production of 2.6 million barrels per day of synthetic transportation fuel from coal by 2025, about 10% of forecasted oil demand in that year. According to Peabody, using coal to achieve that amount of crude oil displacement would require construction of 33 very large coal-to-liquids plants, each plant consuming 14.4 million tons of coal per year to produce 80,000 barrels per day of liquid fuel. Each of these plants would cost $6.4 billion to build. Total additional coal production required for this program would be 475 million tons of coal annually—requiring an expansion of coal mining of 43% above today's level.[1]

In this testimony I will not attempt a thorough analysis of the impacts of a program of this scale. Rather, I will highlight the issues that should be addressed in a detailed assessment.

Global Warming Pollution

To avoid catastrophic global warming the U.S. and other nations will need to deploy energy resources that result in much lower releases of CO_2 than today's use of oil, gas and coal. To keep global temperatures from rising to levels not seen since before the dawn of human civilization, the best expert opinion is that we need to get on a pathway now to allow us to cut global warming emissions by 60-80% from today's levels over the decades ahead[2]. The technologies we choose to meet our energy needs in the transportation sector and in other areas must have the potential to perform at these improved emission levels.

To assess the global warming implications of a large coal-to-liquids program we need to examine the total life-cycle or "well-to-wheel" emissions of these new fuels. Coal is a carbon-intensive fuel, containing double the amount of carbon per unit of energy compared to natural gas and about 50% more than petroleum. When coal is converted to

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[1] Peabody's "Eight-Point Plan" calls for a total of 1.3 billion tons of additional coal production by 2025, proposing that coal be used to produce synthetic pipeline gas, additional coal-fired electricity, hydrogen, and fuel for ethanol plants. The entire program would more than double U.S. coal mining and consumption.

[2] Meinshausen, M (2005) "On the Risk of Overshooting 2˚C", presented at: *Avoiding Dangerous Climate Change*, Met Office, Exeter, U.K.

liquid fuels, two streams of CO_2 are produced: one at the coal-to-liquids production plant and the second from the exhausts of the vehicles that burn the fuel. As I describe below, with the technology in hand today and on the horizon it is difficult to see how a large coal-to-liquids program can be compatible with the low-CO_2-emitting transportation system we need to design to prevent global warming.

Today, our system of refining crude oil to produce gasoline, diesel, jet fuel and other transportation fuels, results in a total "well to wheels" emission rate of about 27.5 pounds of CO_2 per gallon of fuel. Based on available information about coal-to-liquids plants being proposed, the total well to wheels CO_2 emissions from such plants would be about 49.5 pounds of CO_2 per gallon, nearly twice as high as using crude oil, if the CO_2 from the coal-to-liquids plant is released to the atmosphere.[3] Obviously, introducing a new fuel system with double the CO_2 emissions of today's crude oil system would conflict with the need to reduce global warming emissions. If the CO_2 from coal-to-liquids plants is captured, then well-to-wheels CO_2 emissions would be reduced but would still be higher than emissions from today's crude oil system.[4]

This comparison indicates that using coal to produce a significant amount of liquids for transportation fuel would not be compatible with the need to develop a low-CO_2 emitting transportation sector unless technologies are developed to significantly reduce emissions

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[3] Calculated well to wheel CO_2 emissions for coal-based "Fischer-Tropsch" are about 1.8 greater than producing and consuming gasoline or diesel fuel from crude oil. (Williams, R.H., E.D. Larson, and H. Jin, (2006) "Synthetic fuels in a world with high oil and carbon prices", prepared for: *8th International Conference on Greenhouse Gas Control Technologies*, Trondheim, Norway, 19-22 June 2006.) If the coal-to-liquids plant makes electricity as well, the relative emissions from the liquid fuels depends on the amount of electricity produced and what is assumed about the emissions of from an alternative source of electricity.

[4] Capturing 90 percent of the emissions from coal-to-liquid plants reduces the emissions from the plant to levels close to those from petroleum production and refining while emissions from the vehicle are equivalent to those from a gasoline vehicle. With such CO_2 capture, well to wheels emissions from coal-to-liquids fuels would be 8 percent higher than for petroleum.

from the overall process. But here one confronts the unavoidable fact that the liquid fuel from coal contains the same amount of carbon as is in gasoline or diesel made from crude. Thus, the potential for achieving significant CO_2 emission reductions compared to crude is inherently limited. This means that using a significant amount of coal to make liquid fuel for transportation needs would make the task of achieving any given level of global warming emission reduction much more difficult. Proceeding with coal-to-liquids plants now could leave those investments stranded or impose unnecessarily high abatement costs on the economy if the plants continue to operate.

Conventional Pollution

Conventional air emissions from coal-to-liquids plants include sulfur oxides, nitrogen oxides, particulate matter, mercury and other hazardous metals and organics. While it appears that technologies exist to achieve high levels of control for all or most of these pollutants, the operating experience of coal-to-liquids plants in South Africa demonstrates that coal-to-liquids plants are not inherently "clean." If such plants are to operate with minimum emissions of conventional pollutants, performance standards will need to be written—standards that do not exist today in the U.S. as far as we are aware. In addition, the various federal emission cap programs now in force would apply to few, if any, coal-to-liquids plants.[5]

[5] The sulfur and nitrogen caps in EPA's "Clean Air Interstate Rule" ("CAIR") may cover emissions from coal-to-liquids plants built in the eastern states covered by the rule but would not apply to plants built in the western states. Neither the national "acid rain" caps nor EPA's mercury rule would apply to coal-to-liquids plants.

Thus, we cannot say today that coal-to-liquids plants will be required to meet stringent emission performance standards adequate to prevent either significant localized impacts or regional emissions impacts.

Mining, Processing and Transporting Coal

The impacts of mining, processing, and transporting 1.1 billion tons of coal today on health, landscapes, and water are large. Peabody's coal-to-liquids vision advocates another 475 billion tons of coal production. To understand the implications of such an enormous expansion of coal production, it is important to have a detailed understanding of the impacts from today's level of coal production. The summary that follows makes it clear that we must find more effective ways to reduce these impacts before we follow a path that would result in even larger amounts of coal production and transportation.

Health and Safety

Coal mining is one of the U.S.'s most dangerous professions. The yearly fatality rate in the industry is 0.23 per thousand workers, making the industry about five times as hazardous as the average private workplace.[6] The industry had 27 fatalities in 2002, an all-time low,[7] and there were 55 deaths in 2004 and 57 deaths in 2005.[8] The first month of 2006 was particularly deadly, however, with 18 fatalities through February 1st. Sixteen of these deaths occurred in West Virginia mines, leading the Governor to call for an unprecedented suspension of production while safety checks were conducted. Coal

[6] Congressional Research Service, U.S. Coal: A Primer on the Major Issues, at 30 (Mar. 25, 2003).
[7] *Id.*
[8] Melissa Drosjack, FoxNews.com, Congress to Examine Mine Safety (Jan. 20, 2006), online at www.foxnews.com/story/0,2933,182276,00.html (visited Feb. 1, 2006).

miners also suffer from many non-fatal injuries and diseases, most notably black lung disease (also known as pneumoconiosis) caused by inhaling coal dust. Although the 1969 Coal Mine Health and Safety Act seeks to eliminate black lung disease, the United Mine Workers estimate that 1500 former miners die of black lung each year.[9]

Terrestrial Habitats

Coal mining - and particularly surface or strip mining - poses one of the most significant threats to terrestrial habitats in the United States. The Appalachian region[10], for example, which produces over 35% of our nation's coal[11], is one of the most biologically diverse forested regions in the country. But during surface mining activities, trees are clearcut and habitat is fragmented, destroying natural areas that were home to hundreds of unique species of plants and animals. Even where forests are left standing, fragmentation is of significant concern because a decrease in patch size is correlated with a decrease in biodiversity as the ratio of *interior* habitat to *edge* habitat decreases. This is of particular concern to certain bird species that require large tracts of interior forest habitat, such as the black-and-white warbler and black-throated blue warbler.

After mining is complete, these once-forested regions in the Southeast are typically reclaimed as grasslands, although grasslands are not a naturally occurring habitat type in this region. Grasslands that replace the original ecosystems in areas that were surface mined are generally categorized by less-developed soil structure[12] and lower species

[9] http://www.umwa.org/blacklung/blacklung.shtml
[10] Alabama, Georgia, Eastern Kentucky, Maryland, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia.
[11] Energy Information Administration. Annual Coal Report, 2004.
[12] Sencindiver, et al. "Soil Health of Mountaintop Removal Mines in Southern West Virginia". 2001.

diversity[13] compared to natural forests in the region. Reclaimed grasslands are generally characterized by a high degree of soil compaction that tends to limit the ability of native tree and plant species to take root. Reclamation practices limit the overall ecological health of sites, and it has been estimated that the natural return of forests to reclaimed sites may take hundreds of years.[14] According to the USEPA, the loss of vegetation and alteration of topography associated with surface mining can lead to increased soil erosion and may lead to an increased probability of flooding after rainstorms.[15]

The destruction of forested habitat not only degrades the quality of the natural environment, it also destroys the aesthetic values of the Appalachian region that make it such a popular tourist destination. An estimated one million acres of West Virginia mountains were subject to strip mining and mountaintop removal mining between 1939 and 2005.[16] Many of these mines have yet to be reclaimed so that where there were once forested mountains, there now stand bare mounds of sand and gravel.

The terrestrial impacts of coal mining in the Appalachian region are considerable, but for sheer size they cannot compare to the impacts in the western United States.[17] As of September 30, 2004, 470,000 acres were under federal coal leases or other authorizations to mine.[18] Unlike the East, much of the West– including much of the region's principal coal areas –is arid and predominantly unforested. In the West, as in the East, surface mining activities cause severe environmental damage as huge machines strip, rip apart and scrape aside vegetation, soils, wildlife habitat and drastically reshape existing land

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[13] Handel, Steven. Mountaintop Removal Mining/Valley Fill Environmental Impact Statement Technical Study, Project Report for Terrestrial Studies. October, 2002.

[14] *Id.*

[15] EPA. Mountaintop Mining/Valley Fills in Appalachia: Draft Programmatic Environmental Impact Statement. 2003

[16] Julian Martin, West Virginia Highlands Conservancy, Personal Communication, February 2, 2006.

[17] Alaska, Arizona, Colorado, Montana, New Mexico, North Dakota, Utah, Washington, and Wyoming.

[18] Bureau of Land Management, Public Land Statistics 2004, Table 3-18

forms and the affected area's ecology to reach the subsurface coal. Strip mining results in industrialization of once quiet open space along with displacement of wildlife, increased soil erosion, loss of recreational opportunities, degradation of wilderness values, and destruction of scenic beauty.[19] Reclamation can be problematic both because of climate and soil quality. As in the East, reclamation of surface mined areas does not necessarily restore pre-mining wildlife habitat and may require scarce water resources be used for irrigation.[20] Forty-six western national parks are located within ten miles of an identified coal basin, and these parks could be significantly affected by future surface mining in the region.[21]

Water Pollution

Coal production causes negative physical and chemical changes to nearby waters. In all surface mining, the overburden (earth layers above the coal seams) is removed and deposited on the surface as waste rock. The most significant physical effect on water occurs from valley fills, the waste rock associated with mountaintop removal (MTR) mining. Since MTR mining started in the United States in the early 70's, studies estimate that over 700 miles of streams have been buried from valley fills, and 1200 additional miles have been directly impacted from valley fills through sedimentation or chemistry alteration.[22] Together, the waterways harmed by valley fills are about 80 percent as long as the Mississippi River. Valley fills bury the headwaters of streams, which in the

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[19] See, e.g., U.S. Department of the Interior, Bureau of Land Management, 1985 Federal Coal Management Program/Final Environmental Impact Statement, pp. 210-211, 230-231, 241-242, 282 (water quality and quantity),, 241, 251, 257

[20] Bureau of Land Management. 3809 Surface Management Regulations, Draft Environmental Impact Statement. 1999

[21] National Park Service, DOI. "Coal Development Overview". 2003.

[22] EPA. Mountaintop Mining/Valley Fills in Appalachia: Draft Programmatic Environmental Impact Statement.

southeastern U.S. support diverse and unique habitats, and regulate nutrients, water quality, and flow quantity. The elimination of headwaters therefore has long-reaching impacts many miles downstream.[23]

Coal mining can also lead to increased sedimentation, which affects both water chemistry and stream flow, and negatively impacts aquatic habitat. Valley fills in the eastern U.S., as well as waste rock from strip mines in the west add sediment to streams, as does the construction and use of roads in the mining complex. A final physical impact of mining on water is to the hydrology of aquifers. MTR and valley fills remove upper drainage basins, and often connect two previously separate aquifers, altering the surrounding groundwater recharge scheme.[24]

Acid mine drainage (AMD) is the most significant form of chemical pollution produced from coal mining operations. In both underground and surface mining, sulfur-bearing minerals common in coal mining areas are brought up to the surface in waste rock. When these minerals come in contact with precipitation and groundwater, an acidic leachate is formed. This leachate picks up heavy metals and carries these toxins into streams or groundwater. Waters affected by AMD often exhibit increased levels of sulfate, total dissolved solids, calcium, selenium, magnesium, manganese, conductivity, acidity, sodium, nitrate, and nitrite. This drastically changes stream and groundwater chemistry.[25] The degraded water becomes less habitable, non potable, and unfit for recreational purposes. The acidity and metals can also corrode structures such as culverts

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[23] *Id.*
[24] Keating, Martha. "Cradle to Grave: The Environmental Impacts from Coal." Clean Air Task Force, Boston. June, 2001.
[25] EPA Office of Solid Waste: Acid Mine Drainage Prediction Technical Document. December, 1994.

and bridges.[26] In the eastern U.S., estimates of the damage from AMD range from four to eleven thousand miles of streams.[27] In the West, estimates are between five and ten thousand miles of streams polluted. The effects of AMD can be diminished through addition of alkaline substances to counteract the acid, but recent studies have found that the addition of alkaline material can increase the mobilization of both selenium and arsenic.[28] AMD is costly to mitigate, requiring over $40 million annually in Kentucky, Tennessee, Virginia, and West Virginia alone.[29]

Air Pollution

There are two main sources of air pollution during the coal production process. The first is methane emissions from the mines. Methane is a powerful heat-trapping gas and is the second most important contributor to global warming after carbon dioxide. Methane emissions from coal mines make up between 10 and 15% of anthropogenic methane emissions in the U.S. According to the most recent official inventory of U.S. global warming emissions, coal mining results in the release of 3 million tons of methane per year, which is equivalent to 68 million tons of carbon dioxide.[30]

The second significant form of air pollution from coal mining is particulate matter (PM) emissions. While methane emissions are largely due to eastern underground mines, PM emissions are particularly serious at western surface mines. The arid, open and frequently windy region allows for the creation and transport of significant amounts of

[26] EPA. Mountaintop Mining/Valley Fills in Appalachia: Draft Programmatic Environmental Impact Statement. 2003

[27] EPA. Mid-Atlantic Integrated Assessment: Coal Mining. http://www.epa.gov/maia/html/coal-mining.html

[28] EPA. Mountaintop Mining/Valley Fills in Appalachia: Final Programmatic Environmental Impact Statement. 2005

[29] *Id.*

[30] DOE/EIA, 2005. Emissions of Greenhouse Gases in the United States 2004. (December).

particulate matter in connection with mining operations. Fugitive dust emissions occur during nearly every phase of coal strip mining in the west. The most significant sources of these emissions are removal of the overburden through blasting and use of draglines, truck haulage of the overburden and mined coal, road grading, and wind erosion of reclaimed areas. PM emissions from diesel trucks and equipment used in mining are also significant. PM can cause serious respiratory damage as well as premature death.[31] In 2002, one of Wyoming's coal producing counties, Campbell County, exceeded its ambient air quality threshold several times, almost earning non-attainment status.[32] Coal dust problems in the West are likely to get worse if the administration finalizes its January 2006 proposal to exempt mining (and other activities) from controls aimed at meeting the coarse PM standard.[33]

Coal Mine Wastes

Coal mining leaves a legacy of wastes long after mining operations cease. One significant waste is the sludge that is produced from washing coal. There are currently over 700 sludge impoundments located throughout mining regions, and this number continues to grow. These impoundment ponds pose a potential threat to the environment and human life. If an impoundment fails, the result can be disastrous. In 1972 an impoundment break in West Virginia released a flood of coal sludge that killed 125 people. In the year 2000 an impoundment break in Kentucky involving more than 300 million gallons of slurry (30 times the size of the Exxon Valdez spill) killed all aquatic life in a 20 mile

[31] EPA. Particle Pollution and Your Health. 2003

[32] Casper [WY] Star Tribune, January 24, 2005.

[33] National Ambient Air Quality Standards for Particulate Matter, Proposed Rule, 71 Fed. Reg. 2620 (January 17, 2006); Revisions to Ambient Air Monitoring Regulations, Proposed Rule, 71 Fed. Reg. 2710 (January 17, 2006).

diameter, destroyed homes, and contaminated much of the drinking water in the eastern part of the state.[34]

Another waste from coal mining is the solid waste rock left behind from tunneling or blasting. This can result in a number of environmental impacts previously discussed, including acid mine drainage (AMD). A common problem with coal mine legacies is the fact that if a mine is abandoned or a mining company goes out of business, the former owner is under no legal obligation to cleanup and monitor the environmental wastes, leaving the responsibility in the hands of the state.[35]

Effects on Communities

Coal mining can also have serious impacts on nearby communities. In addition to noise and dust, residents have reported that dynamite blasts can crack the foundations of homes[36], and many cases of subsidence due to the collapse of underground mines have been documented. Subsidence can cause serious damage to houses, roads, bridges, and any other structure in the area. Blasting can also cause damage to wells, and changes in the topography and structure of aquifers can cause these wells to run dry.

Transportation of Coal

Transporting coal from where it is mined to where it will be burned also produces significant quantities of air pollution and other environmental harms. Diesel-burning trucks, trains, and barges that transport coal release NOx, SOx, PM, VOCs (Volatile Organic Chemicals), CO, and CO2 into the earth’s atmosphere. Trucks and trains (barge

[34] Frazier, Ian. “Coal Country.” On Earth. NRDC. Spring, 2003.
[35] Reece, Erik. “Death of a Mountain.” Harper’s Magazine. April, 2005.
[36] *Id.*

pollution data are unavailable) transporting coal release over 600,000 tons of NOx, and over 50,000 tons of PM10 into the air annually.[37,38] In addition to health risks, black carbon from diesel combustion is another contributor to global warming.[39] Land disturbance from trucks entering and leaving the mine complex and coal dust along the transport route also release particles into the air.[40] For example, in Sylvester, West Virginia, a Massey Energy coal processing plant and the trucks associated with it spread so much dust around the town that "Sylvester's residents had to clean their windows and porches and cars every day, and keep the windows shut."[41] Even after a lawsuit and a court victory, residents – who now call themselves "Dustbusters" – still "wipe down their windows and porches and cars."[42]

Almost 60 percent of coal in the U.S. is transported at least in part by train and coal transportation accounts for 44% of rail freight ton-miles.[43] Some coal trains reach more than two miles in length, causing railroad-crossing collisions and pedestrian accidents (there are approximately 3000 such collisions and 900 pedestrian accidents every year), and interruption in traffic flow (including emergency responders such as police, ambulance services, and fire departments). Local communities also have concerns about coal trucks, both because of their size and the dust they can leave behind. According to one report, in a Kentucky town, coal trucks weighing 120 tons with their loads were used,

[37] DOT Federal Highway Administration. Assessing the Effects of Freight Movement on Air Quality, Final Report. April, 2005
[38] Energy Information Administration: Coal Transportation Statistics.
[39] Hill, Bruce. "An Analysis of Diesel Air Pollution and Public Health in America." Clean Air Task Force, Boston. February, 2005.
[40] EPA. Mountaintop Mining/Valley Fills in Appalachia: Draft Programmatic Environmental Impact Statement. 2003
[41] Michael Schnayerson, "The Rape of Appalachia," *Vanity Fair*, 157 (May 2006).
[42] *Id.*
[43] http://nationalatlas.gov/articles/transportation/a_freightrr.html

and "the Department of Transportation signs stating a thirty-ton carrying capacity of each bridge had disappeared."[44] Although the coal company there has now adopted a different route for its trucks, community representatives in Appalachia believe that coal trucks should be limited to 40 tons.[45]

Coal is also sometimes transported in a coal slurry pipeline, such as the one used at the Black Mesa Mine in Arizona. In this process the coal is ground up and mixed with water in a roughly 50:50 ratio. The resulting slurry is transported to a power station through a pipeline. This requires large amounts of fresh groundwater. To transport coal from the Black Mesa Mine in Arizona to the Mohave Generating Station in Nevada, Peabody Coal pumped over one billion gallons of water from an aquifer near the mine each year. This water came from the same aquifer used for drinking water and irrigation by members of the Navajo and Hopi Nations in the area. Water used for coal transport has led to a major depletion of the aquifer, with more than a 100 foot drop in water level in some wells. In the West, coal transport through a slurry pipeline places additional stress on an already stressed water supply. Maintenance of the pipe requires washing, which uses still more fresh water. Not only does slurry-pipeline transport result in a loss of freshwater, it can also lead to water pollution when the pipe fails and coal slurry is discharged into ground or surface water.[46] The Peabody pipe failed 12 times between 1994 and 1999. The Black Mesa mine closed as of January 2006. Its sole customer, the Mohave Generating Station, was shut down because its emissions exceeded current air pollution standards.

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[44] Erik Reece, Lost Mountain: A Year in the Vanishing Wilderness 112 (2006).

[45] Personal communication from Hillary Hosta and Julia Bonds, Coal River Mountain Watch (Apr. 7, 2006).

[46] NRDC. Drawdown: Groundwater Mining on Black Mesa.

A Responsible Action Plan

The impacts that a large coal-to-liquids program could have on global warming pollution, conventional air pollution and damage from expanded coal production are substantial. Before deciding whether to invest scores, perhaps hundreds of billions of dollars in a new industry like coal-to-liquids, we need a much more serious assessment of whether this is an industry that should proceed at all.

Fortunately, the U.S. can have a robust and effective program to reduce oil dependence without rushing into an embrace of coal-to-liquids technologies. A combination of efficiency, renewable fuels and potentially, plug-in hybrid vehicles can reduce our oil consumption more quickly, more cleanly and in larger amounts than coal-to-liquids even on the massive scale advocated by Peabody Energy.

A combination of more efficient cars, trucks and planes, biofuels, and "smart growth" transportation options outlined in report "Securing America," produced by NRDC and the Institute for the Analysis of Global Security, can cut oil dependence by more than 3 million barrels a day in 10 years, and achieve cuts of more than 11 million barrels a day by 2025, far outstripping the 2.6 million barrel a day program being promoted by Peabody.

The Securing America program is made up of these sensible steps that will cut oil dependence, cut global warming emissions, and reduce other harmful impacts of today's energy production and consumption patterns:

Accelerate oil savings in passenger vehicles by:

- establishing tax credits for manufacturers to retool existing factories so they can build fuel-efficient vehicles and engineer advanced technologies, and
- establishing tax credits for consumers to purchase the next generation of fuel-efficient vehicles; and raising federal fuel economy standards for cars and light trucks in regular steps.

Accelerate oil savings in motor vehicles through the following:

- requiring replacement tires and motor oil to be at least as fuel efficient as original equipment tires and motor oil;
- requiring efficiency improvements in heavy-duty trucks; and
- supporting smart growth and better transportation choices.

Accelerate oil savings in industrial, aviation, and residential building sectors through the following:

- expanding industrial efficiency programs to focus on oil use reduction and adopting standards for petroleum heating;
- replacing chemical feedstocks with bioproducts through research and development and government procurement of bioproducts;
- upgrading air traffic management systems so aircraft follow the most-efficient routes; and
- promoting residential energy savings with a focus on oil-heat.

Encourage growth of the biofuels industry through the following:

- requiring all new cars and trucks to be capable of operating on biofuels or other non-petroleum fuels by 2015; and
- allocating $2 billion in federal funding over the next 10 years to help the cellulosic biofuels industry expand production capacity to 1 billion gallons per year and become self-sufficient by 2015.

Technologically Achievable Oil Savings (million barrels per day)		
Oil Savings Measures	**2015**	**2025**
Raise fuel efficiency in new passenger vehicles through tax credits and standards	1.6	4.9
Accelerate oil savings in motor vehicles through		
fuel efficient replacement tires and motor oil	0.5	0.6
efficiency improvements in heavy-duty trucks	0.5	1.1
Accelerate oil savings in industrial, aviation, and residential sectors	0.3	0.7
Encourage growth of biofuels industry through demonstration and standards	0.3	3.9
Total Oil Saved	**3.2**	**11.2**

To cut our dependence on oil we should follow a simple rule: start with the measures that will produce the quickest, cleanest and least expensive reductions in oil use; measures that will put us on track to achieve the reductions in global warming emissions we need to protect the climate. If we are thoughtful about the actions we take, our country can pursue an energy path that enhances our security, our economy, and our environment.