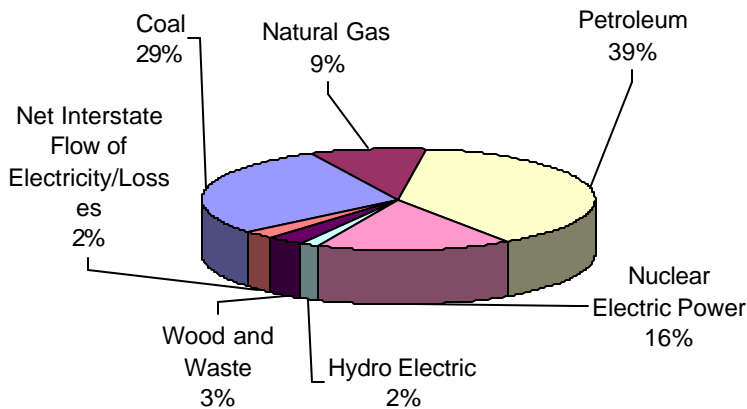


Chapter 2: Fossil Fuels

Major Sources of Energy in North Carolina

North Carolina relies on fossil fuels for most of its energy needs. As shown in Figure 2-1, petroleum supplies 40 percent, natural gas 25 percent; coal 22 percent, nuclear 8 percent, and renewables 4 percent. This chapter concerns fossil fuels. Renewables are discussed in Chapter 5 and 6.

**Figure 2-1:
North Carolina Energy Use in 1999 (2,447 TBtu total)**



Coal

Coal is a combustible, sedimentary, organic rock (composed primarily of carbon, hydrogen and oxygen) formed from vegetation, which has been consolidated between other rock strata to form coal seams, and altered by the combined effects of microbial action, pressure, and heat over a considerable time period. Unlike petroleum, only a small portion of North Carolina's coal supply is imported from other countries. However, the serious environmental impacts of burning coal have made clean coal technologies a key condition for continued reliance on this fuel.

National Trends for Coal

According to EIA's *Annual Energy Outlook 2002 (AEO2002)*, US coal consumption is projected to increase from 1,081 to 1,365 million tons between 2000 and 2020, an average increase of 1.2 percent per year. This projection is 68 million tons higher than the 2001 projection due to higher projected demand for electricity generation, which constitutes about 90 percent of the domestic demand for coal.

AEO2002 also projects that U.S. coal production will increase at an average annual rate of 1.3 percent, from 1,084 million tons in 2000 to 1,397 million tons in 2020, as domestic demand grows. Projected production in 2020 is 66 million tons higher than in AEO2001. Coal exports are projected to decline slightly through 2020, as European demand for imports declines as a result of environmental concerns and competition from other producers.

Coal in North Carolina

Electric utilities use most of the coal in the state: 93% of total coal consumption in 1999. The state now has 45 coal-fired power plants. Surrounding states, especially Kentucky, Georgia, and Tennessee, rely on coal for electric power as well. According to environmental experts, prevalent combustion of coal, particularly in older power plants not yet subject to enhanced air pollution control requirements, has damaged the ecosystems of natural areas, including most notably Mount Mitchell.

“Clean Smokestacks” Legislation for North Carolina

Due to the environmental consequences of coal-fired power plants, discussed in Chapter 2’s section on the environment, North Carolina’s leaders have been considering how best to reduce emissions from coal-burning plants and yet not negatively affect the state’s economy or the reliability of the state’s electricity supply. The current provisions of the Clean Smokestacks Bill (SB 1078), which may change through the legislative process, are:

Setting a statewide cap to reduce NO_x emissions year-round by 78% from 1998 levels. (Electric Membership Cooperative rules only apply during the ozone season.) The reduction would be phased in by 2009.

A statewide cap to reduce SO₂ emissions (the primary cause of haze and acid rain) by 73% from 1998 levels. This reduction would be phased in by 2013.

Directing Environmental Management Commission, the state’s rule-making body, to evaluate annually--beginning in 2004--the need for further reductions of these pollutants.

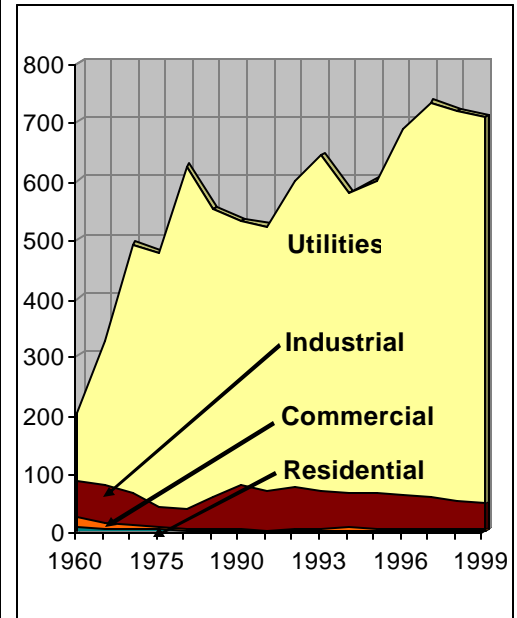
Direct the state to use its resources to compel other states to make similar reductions.

Direct the state to study issues related to setting standards for carbon dioxide emissions.

Direct the state to study issues related to setting standards for mercury emissions.

Utilities can recover the full cost of compliance for reductions pertaining solely to this bill; executives stated that they can and will meet the reductions called for in the bill. In April, the NC Senate

**Figure 2-2:
Historical Coal
Consumption in North
Carolina (TBtu)**



passed the Clean Smokestacks bill overwhelmingly. It is currently under consideration by the NC House.

Coal Supply to North Carolina

Most of the coal consumed in North Carolina comes from the Southeast – two-thirds from Kentucky, about one-third from West Virginia, a small percentages from Virginia, and even smaller quantities from Tennessee and Pennsylvania.

Policy Recommendations for Coal

The State Energy Office, working with the Public Utilities Commission and the state’s electric utilities, shall investigate coal’s ability to help meet future energy needs of the state. Due to environmental impacts and the increased cost of coal-fired power plants, most projections of future power plant construction in the state do forecast a minimal role for coal. This study shall consider whether clean coal technologies might prove cost effective and indeed permit coal combustion with minimal air emissions.

As part of the coal investigation, the study should examine the potential for co-firing renewable energy resources, such as biomass, municipal solid waste, or landfill gas, with coal. These renewable resources generated in North Carolina would reduce energy imports from other states and countries.

The state shall recognize the negative environmental impacts of coal-fired power plants in making policy decisions. For example, when considering whether to approve future power plant sites, the state shall require analysis of health impacts of the power plant on North Carolinians. The state, working through the Governor’s Air Summit and other regional efforts, shall put pressure on states west of North Carolina to reduce air pollution.

Table 2-1: Domestic Coal Imported into North Carolina

State of Origin	Thousand Short Tons	% of Total NC Imports
KY	17,179	62.0%
PA	1	*
TN	22	*
VA	735	2.7%
WV	9,780	35.3%
Total	27,717	
* less than 0.1%		

The State Energy Office, working with the Public Utilities Commission and the state’s electric utilities, shall investigate coal’s ability to help meet future energy needs of the state.

The state shall recognize the negative environmental impacts of coal-fired power plants in making policy decisions.

Natural Gas

Natural Gas in North Carolina

Natural gas contributes about 9% of total energy use in the state according to Figure 2-1, while it provides about 23% of national energy use. Thus, in North Carolina, natural gas has historically played a smaller role in meeting energy demands than in other states. However, new natural gas pipelines under construction will increase its consumption in several sectors.

Figure 2-3, shows that the industrial sector is the primary consumer of natural gas, using 49% of total natural gas use, while residential, 24% of total use, and commercial buildings, 17% of total use, are important consumers of the fuel as well. The electric utility and transportation sectors use very little natural gas, although the pipelines now under construction will supply future gas-fired generating plants now in the planning stages.

Natural Gas Pipelines for North Carolina

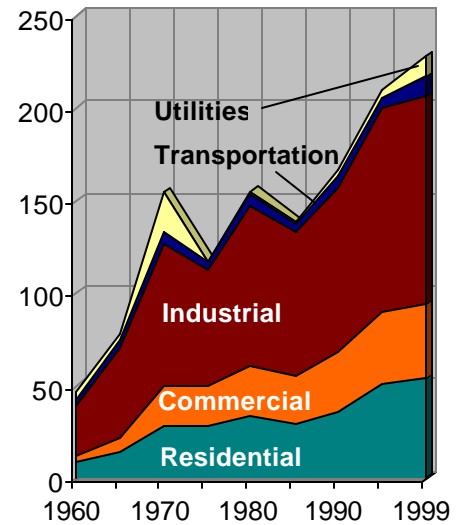
The Public Utilities Commission (PUC) of North Carolina recently approved a proposal by North Carolina Gas company Dominion Transmission for the Greenbrier Pipeline Project. The Greenbrier Project will deliver natural gas to growth markets in the Appalachian and Piedmont regions. The \$497 million project will deliver up to 600,000 dekatherms (or approximately 584 million cubic feet) of natural gas per day to serve this growing energy demand.

Preliminary plans for facilities include about 200 miles of 30-inch pipe from Dominion's existing Cornwell Station near Charleston, W.Va., to a point in Rockingham County, N.C.; about 44 miles of 24-inch pipe from Rockingham County to Person County, N.C.; and about 18 miles of 20-inch pipe from Person County to Granville County, N.C. The pipe will have a maximum allowable operating pressure of 1,250 pounds per square inch (psi) and a minimum operating pressure of 600 psi.

Gas supplies delivered from Dominion Transmission and Tennessee Gas Pipeline into Greenbrier near Charleston, W.Va., could come from the Appalachian, Canadian, Gulf Coast and Mid-Continent regions. A segment of the Greenbrier Pipeline is expected to be ready for service by the second quarter of 2005 to meet power generation market requirements, with the remainder scheduled for completion by the fourth quarter of 2005 to satisfy the market requirements of local natural gas utilities.

The Patriot Pipeline project was given preliminary approval for a natural gas pipeline that will cross Virginia's Blue Ridge Mountains. The project's sponsor, Duke Energy subsidiary East Tennessee Natural Gas Company, hopes to begin transporting fuel via the Patriot

**Figure 2-3:
Natural Gas Use (TBtu)**



Pipeline by May 2003 to eventually ship more than 500 million cubic feet of natural gas per day. Duke maintains the pipeline extension is needed to supply natural gas to the region to fuel new electric generating plants and provide improved reliability. The project will also create jobs in rural Virginia and North Carolina, the company said. The pipeline extension will bring natural gas service to portions of southwest Virginia for the first time and introduce a competitive supply of natural gas to North Carolina from Appalachian and Gulf Coast producers. The company plans to develop the Patriot project in three phases, initially having the capacity to transport 130 million cubic feet per day (MMcf/d), increasing to 310 MMcf/d in November 2003, and eventually transporting 510 MMcf/d in January 2004.

Currently, PSNC energy is the major natural gas pipeline servicing North Carolina. Recently, PSNC has been transporting more natural gas to power natural gas turbines for electricity generation. In the last three years, over ten new natural gas turbines have been added, generating almost 1,300 MW of power. These generating facilities all rely of PSNC to transport natural gas to their facilities.

There are 30 other natural gas turbine generation facilities under consideration in North Carolina, with 9,000MW of total capacity. While not all of these proposed facilities are likely to be constructed, natural gas use for electricity generation in North Carolina is certainly on the increase. According to the North Carolina Public Utilities Commission, the proposed generating plants would not have sufficient gas supply from the proposed pipelines, so additional capacity would be needed.

The Public Utilities Commission shall continue its work monitoring the growth of the natural gas industry in the state. The PUC shall work with natural gas and electric utilities, pipeline companies, and other organizations to project upcoming supply needs for natural gas in North Carolina and to design strategies to develop future supplies for the fuel. Since most new electrical generating capacity is slated to come from natural gas power plants, competition for the fuel may indeed become a major interstate issue.

Non-fuel Use of Natural Gas

Natural gas serves as an important feedstock for industry – meaning it is used for its value as a chemical – in addition to its role as a fuel used for combustion. One of its most important roles is in the production of fertilizers. When evaluating the future role of natural gas, its importance as a feedstock must be taken into account.

Other Policy Recommendations for Natural Gas

The Public Service Commission shall consider utility rate options that control price volatility to consumers, including such options as:

Rate structure options that allow natural gas customers to

The PUC shall work with natural gas and electric utilities, pipeline companies, and other organizations to project upcoming supply needs for natural gas in North Carolina and to design strategies to develop future supplies for the fuel.

The Public Service Commission shall consider utility rate options that control price volatility to consumers . . .

The state shall consider the overall tax structure for competing fuels and determine how to correct any problems of inequality.

"lock in" prices and provide an option for longer term purchase agreements

Protection of low income consumers from sudden price jumps

The state shall consider the overall tax structure for competing fuels and determine how to correct any problems of inequality.

In addition, the state will evaluate intrastate natural gas transportation rates to determine whether they are fair and equitable.

The state shall also consider mechanisms to encourage purchase of fuels derived from domestic sources, rather than international. In order to meet national security objectives of the State Energy Plan.

Petroleum

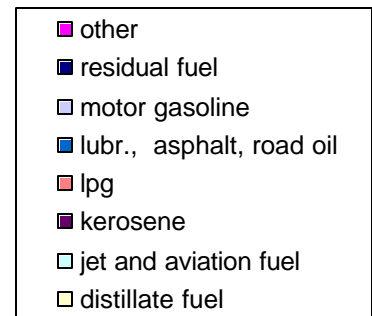
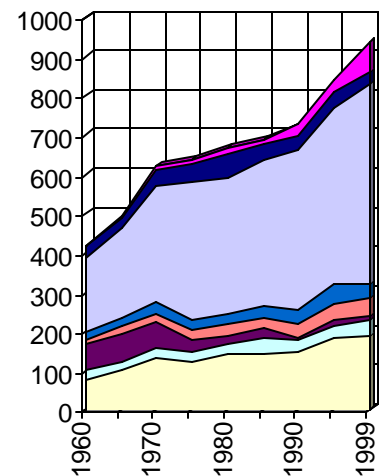
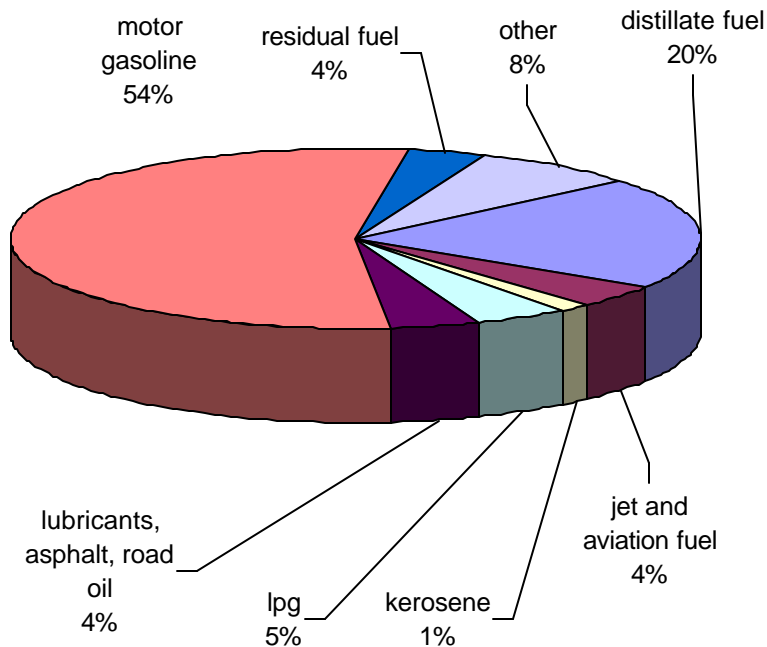
Past and Current Use of Petroleum in North Carolina

Figure 2-1 shown earlier shows that petroleum supplies 39% of energy needs for the state. Figures 3-4 and 3-5 show historical energy use of petroleum by fuel type. Note that motor gasoline and distillate fuel (such as diesel) are the predominate uses with 74% of the total in 1999.

The state shall also consider mechanisms to encourage purchase of fuels derived from domestic sources, rather than international in order to meet national security objectives of the State Energy Plan.

**Figure 2-4:
Past Use of Petroleum in North Carolina**

**Figure 2-5:
1999 Petroleum by Fuel Type in North Carolina
(937 TBtu total)**



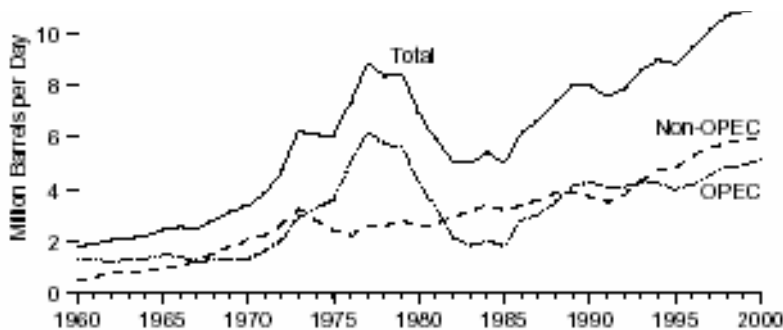
Future National Trends

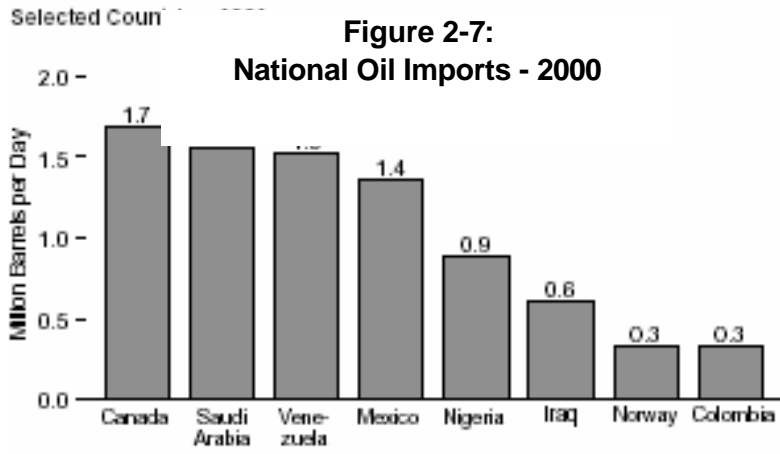
According to *AEO2002*, petroleum demand is projected to grow at an average annual rate of 1.5 percent through 2020, led by growth in the transportation sector, which is expected to account for more than 70 percent of petroleum demand in 2020. Projected demand in 2020 is higher than in *AEO2001* by 830 thousand barrels per day due to higher transportation demand.

Increasing demand for petroleum is projected to raise the share of demand met by net imports from 53 percent in 2000 to 62 percent in 2020 (lower than the 64-percent share in *AEO2001*, due to higher domestic production). *AEO2002* also projects that U.S. crude oil production will decline at an average annual rate of 0.2 percent from 2000 to 2020, to 5.6 million barrels per day. Production is projected to increase in the latter half of the forecast and is 0.6 million barrels per day higher in 2020 than in *AEO2001*, due to production from more fields in the National Petroleum Reserve- Alaska, which is expected to begin in 2010. As a result of projected increases in natural gas plant liquids production, total petroleum production is expected to increase through 2020.

Nationally, Figure 2-6 shows that imports from OPEC countries are now expanding, as are imports from non-OPEC countries. Figure 2-7 shows that our nation's primary oil trading partners are Canada, Saudi Arabia, Venezuela, and Mexico.

**Figure 2-6:
Breakdown of National Oil Imports**





North Carolina Policy Recommendations Concerning Petroleum

The state shall change sulfur reduction requirements for gasoline to match EPA standards. The gasoline refining industry incurs substantial costs developing specific regional or local fuels. Current environmental rules in North Carolina require that the industry reduce the sulfur content of gasoline on an accelerated schedule compared to EPA's national requirements.

The state shall investigate developing strategic fuel storage supplies in the state. In public response thus far in developing the State Energy Plan, industry representatives have not actively promoted the need for more in-state storage. However, with concerns of both national security and recent rapid price fluctuations that caused considerable economic hardship, increasing storage capacity available during an emergency certainly bears evaluation.

The state shall determine whether viable economic pricing mechanisms, such as gasoline taxes, exist to encourage purchase of more efficient vehicles or more widespread use of mass transit. Over the year, gasoline taxes have proven to be a very unpopular policy options. Implementation of a statewide tax, particularly one high enough to change consumer behavior, would have widespread impacts. The State Energy Office should continue to evaluate what types of fuel pricing policies could be applied fairly.

Propane

Propane is a by-product of two other processes, natural gas processing and petroleum refining. Propane naturally occurs as a gas at atmospheric pressure but can be liquefied if subjected to moderately increased pressure. It is stored and transported in its compressed liquid form, but by opening a valve to release propane from a pressurized storage container, it vaporizes into a gas.

Propane has a variety of uses: heating homes, heating water, cooking, drying clothes, fueling gas fireplaces, and as an alternative fuel for vehicles. Propane is also used to make petrochemicals, which are the building blocks for plastics, alcohols, fibers, and cosmetics, to name just a few.

Propane in North Carolina

Figure 2-8 shows that the residential and industrial sectors dominate propane demand with 89% of total use. Residential consumption is the highest and supports a host of private propane retailers around the state. Two trends will have an impact on the propane industry:

1. Electric utilities have expanded the scope of their services and many now offer propane as a fuel option.
2. As natural gas supplies grow in rural areas with the construction of more natural gas pipelines, pricing pressures may have a negative impact on smaller retailers.

U.S. Propane Supply

In addition to natural gas processing and petroleum refining, demand for propane is met by imports of propane and by using stored inventories. Although imports provide the smallest component of U.S. propane supply (about 10 percent), they are vital when consumption exceeds available domestic supplies of propane. Propane is imported by land, via pipeline and rail car from Canada, and by sea, in tankers from such countries as Algeria, Saudi Arabia, Venezuela, Norway, and the United Kingdom.

Policy Ideas

The State Energy Office should work with the propane industry to determine how the industry will fare with increased competition from new companies, several of which are subsidiaries of electric utilities, and with increased natural gas supply in the state. The key question is how best to use this fuel, which has provided a stable source of energy to rural customers for much of the past century.

The State Energy Office shall work with the state Department of Transportation and other agencies related to emergency management to ensure that high priority is given to fuel delivery

Figure 2-8: Historical Propane Use (Tbtu)

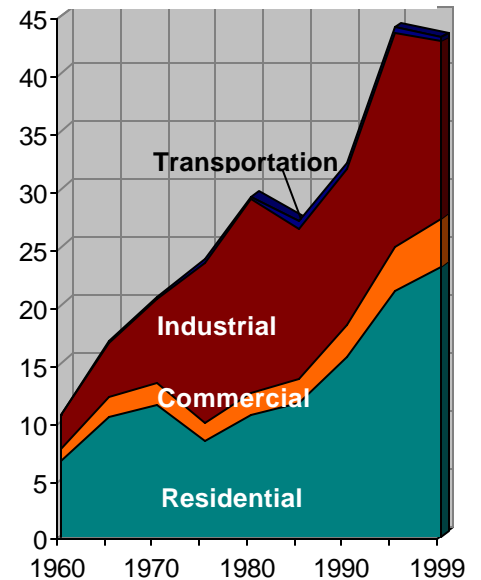
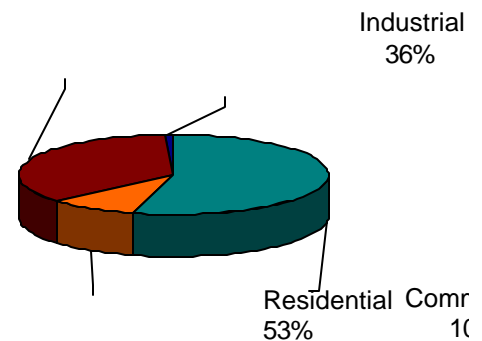


Figure 2-9: Breakdown of Propane Use in 1999 (43 Tbtu total)



The State Energy Office should work with the propane industry to determine how the industry will fare with increased competition from new companies, several of which are subsidiaries of electric utilities, and with increased natural gas supply in the state.

during severe weather or other emergencies. Members of the propane industry report that roadways needed to unload and deliver propane were not cleared promptly during the winter of 2000 to 2001, resulting in industrial and residential customers who were out of fuel with no replacement on the way. Increased communication and cooperation among propane industry and state agencies is needed to prevent propane customers from running out of fuel during extreme winter weather.

Energy Production Overall

The Energy Policy Council shall continue to consider a wide array of energy resources to meet the energy demands of the state. Offshore oil and natural gas production have been proposed over the years. As part of an overall energy emergency response plan, the state should consider how quickly the industry could develop in-state resources in an environmentally benign manner. In addition to considering how to extract the fuel, the plans should also evaluate the infrastructure needed to deliver the fuel sources to markets throughout the state.

The State Energy Office shall work with the state Department of Transportation and other agencies related to emergency management to ensure that high priority is given to fuel delivery during severe weather or other emergencies.

The Energy Policy Working Group shall continue to consider a wide array of energy resources to meet the energy demands of the state.

