Item 09-10

[The assembly approved Item 09-10 with amendment. See pp. 54, 55.]

The Power to Change: U.S. Energy Policy and Global Warming.

The Advisory Committee on Social Witness Policy (ACSWP) recommends that the 218th General Assembly (2008):

1. Approve the study and recommendations, entitled, "The Power to Change: U.S. Energy Policy and Global Warming," to revise existing energy policy, "The Power to Speak Truth to Power" (hereinafter, referred to as the "1981 Energy Policy"). [The 1981 Energy Policy was jointly adopted by the 121st General Assembly (1981) of the Presbyterian Church in the United States (*Minutes*, Presbyterian Church in the United States, 1981, Part I, pp. 122, 413–25), and the 193rd General Assembly (1981) of The United Presbyterian Church in the United States of America (*Minutes*, The United Presbyterian Church in the United States of America, 1981, Part I, pp. 42, 86, 293–306).]

2. Urge individuals and families in the Presbyterian Church (U.S.A.) to do the following:

a. Pray, asking for God's forgiveness and for the power and guidance to enjoy and care for creation in new ways.

b. Study energy sources, their advantages and disadvantages, and the impacts they have on human communities, all species, and the ecological systems that support life on Earth.

c. Practice energy conservation as a form of thanksgiving and sharing by adjusting thermostats, walking, biking, carpooling, using mass transit, turning off lights and appliances, recycling, minimizing the use of plastic water bottles and other wasteful packaging, etc.

d. Purchase energy-efficient appliances and fuel-efficient vehicles for use at home and at work.

e. Purchase sustainably grown food and other products from local producers in order to reduce the energy associated with producing, and shipping goods.

f. Reduce consumption of meat because the production of grain fed to most livestock is fossil fuel-intensive and their waste emits methane, which is a potent greenhouse gas.

g. Purchase Green-e certified energy and/or carbon offsets in the pursuit of a carbon-neutral lifestyle. Green-e certification ensures these payments result in additional installations of renewable energy generation capacity as well as verifiable and permanent environmental benefits.

h. Invest personal funds in the renewable energy industry and also in companies that demonstrate concern for the well-being of their workers, their communities, and the environment.

i. Advocate for change and leadership within the church and in all forms of government regarding energy policy and global climate change.

3. With regard to the councils[, governing bodies,] and agencies of the Presbyterian Church (U.S.A.), the 218th General Assembly (2008):

a. Urges synods and presbyteries to become models of energy-efficient institutions and proponents of renewable energy by

(1) stocking resource centers with information about energy issues;

(2) working with the New Church Development Committee to ensure that all new and remodeled churches meet high-efficiency standards;

(3) strengthening support for Stewardship of Creation Enablers, inviting them to provide workshops on energy and related concerns, and consulting with them to provide carbon-neutral meeting sites and transportation plans whenever possible;

(4) advocating before local, state, and federal governments for public policies that encourage energy efficiency and renewable energy generation; and

(5) adopting environmental education and energy conservation as high priorities at all Presbyterian camps and conference centers.

b. Urges the "Restoring Creation" program to establish a Presbyterian Green Energy Fund, which would help congregations and other organizations in our church reduce their carbon footprint through investments in energy efficiency, renewable energy production, and Green-e certified carbon offsets.

c. Urges the Office of the General Assembly to make future meetings as carbon neutral as possible (considering climate, travel requirements, amenities, and energy conservation efforts by hotels, conference centers, and academic institutions).

d. Urges the General Assembly Council, the Presbyterian Foundation, and the Board of Pensions to continue to improve the energy efficiency of the Louisville, Jeffersonville, Philadelphia, and other national agency offices.

e. Urges the Committee on Mission Responsibility Through Investment (MRTI) to expand efforts to engage businesses on energy efficiency and conservation in manufacturing, transport, and product design; to work with companies on appropriate technology applications, including co-generation, wind, solar, biomass, geothermal, and low-head hydroelectric; to support solutions to the problem of nuclear waste; and to advocate that utilities establish incentives to reduce electricity, oil, and gas usage while also eliminating barriers for small power producers to interconnect with the power grid.

f. Urges the Presbyterian Investment and Loan Program, Inc., to continue to encourage energy efficiency, renewable energy technologies, and new and mixed uses such as adding generating capacity or housing to underused city facilities.

g. Urges presidents of Presbyterian-related colleges and universities to consider becoming a signatory of the American College and University Presidents Climate Commitment, which obligates these schools to become carbon neutral in the future and to integrate sustainability into the curriculum.

h. Urges Presbyterian-related seminaries and conference centers to make environmental education on global climate change and energy a part of their curricula; to take measures to reduce energy consumption; and to encourage holistic thinking about the relationships between technology and nature.

i. Urges the Stated Clerk and other people representing the PC(USA) in ecumenical programs and initiatives to explore and develop whenever possible joint statements and studies on energy policy with other communions or councils of communions, and the General Assembly agencies to join in appropriate coalitions with non-church bodies to reinforce these measures of practical discipleship.

4. Concerning the church's social responsibility regarding U.S. energy policy, the 218th General Assembly (2008):

a. Endorses and approves the following principles and stances that will guide our church's advocacy work regarding policy discussions and legislative proposals to revise energy policy in the context of global climate change:

> **With our Lord, we will stand with "the least of these" (Matt. 25:40) and advocate for the poor and oppressed in present and future generations who are often the victims of environmental injustice and who are least able to mitigate the impact of global warming that will fall disproportionately upon them.**
>
> **As citizens of the United States, which has historically produced more greenhouse gases than any other country, and which is currently responsible for over a fifth of the world's annual emissions, we implore our nation to accept its moral responsibility to address global warming.**
>
> **In agreement with four prior General Assemblies (202nd, 210th, 211th, and 215th) that have called on the U.S. government to ratify the Convention on Climate Change and the Kyoto Protocol, we ask the U.S. government to do nothing less than repent of its efforts to block consensus and to work with the international community as it develops a binding agreement to replace the Kyoto Protocol when it expires in 2012.**
>
> **As advocates for justice, we reject the claim that all nations should shoulder an equal measure of the burden associated with mitigating climate change. Industrialized nations like the United States that have produced**

most of the emissions over the last three centuries deserve to shoulder the majority of the burden. Rapidly industrializing nations like China and India with very low per capita rates of energy consumption and greenhouse gas emissions should not be expected to bear an equal share of the burden. Our church challenges all nations to embrace their common but different responsibilities with regard to dealing with climate change.

The Presbyterian Church (U.S.A.) supports comprehensive, mandatory, and aggressive emission reductions that aim to limit the increase in Earth's temperature to 2 degrees Celsius or less from pre-industrial levels. Legislation should focus on the short-term goal of reducing U.S. greenhouse gas emissions 20 percent from 1990 levels by 2020, and 80 percent from 1990 levels by 2050.

In order to achieve these targets, we support legislative and policy proposals that:

(1) Internalize the social and environmental costs related to greenhouse gas emissions in the prices of fossil fuels. A preferred way to capture these costs would be through an initial auction and continued trade of a fixed number of emissions allowances in a "cap and trade" approach applied to all sectors of the economy. Affirming "the polluter pays" principle, emissions allowances should be sold because giving them away simply rewards the largest polluters. While the initial price may need to be low at the outset to avoid adverse economic repercussions, price caps defeat the purpose of harnessing the market to achieve this social and ecological good. A separate tax based on the carbon content of fossil fuels could compliment a cap and trade approach, but it should not replace it because a carbon tax lacks a guaranteed cap on total emissions. Revenues generated from either or both approaches should be utilized nationally to redress the regressive impact of higher energy prices on people who are poor, to increase funds for public transportation, to increase research and development as well as investment in renewable energy, and to encourage the purchase of energy efficient appliances and vehicles. Internationally, the United States needs to contribute funds to help poorer nations adapt to the social dislocation and ecological devastation caused by global climate change.

(2) Shift subsidies and financial incentives toward industries specializing in renewable energy and energy efficiency and away from the fossil fuel and nuclear power industries. One vital step would be to extend for ten years the federal tax credit for production of electricity from wind, solar, geothermal, closed-loop and open-loop biomass, landfill gas, and small irrigation power facilities. Similar incentives at the state and county level should be reauthorized and expanded. Subsidies can also influence personal consumption decisions. For example, "feebates" require purchasers of fuel-inefficient vehicles to pay a fee; these funds are then utilized to offer purchasers of fuel-efficient vehicles a rebate on the purchase price. Federal research and development grants are another important financial incentive. These funds need to be increased, and a much larger percentage must be dedicated to renewable energy, alternative fuels, and energy efficiency. Funding for these measures can be made revenue-neutral by reducing subsidies to the oil, gas, and nuclear power industries.

(3) Adopt significantly increased efficiency standards for all energy consuming appliances, buildings, and vehicles. Recently modest improvements have been made to federal laws regarding the energy efficiency of buildings and appliances as well as the nation's Corporate Automotive Fuel Economy Standards (CAFE). These increases are overdue and much needed, but states like California and New York should not be blocked from raising these standards if they wish to do so. Increased efficiency and fuel economy standards should be based on the best science available and in dialogue with the relevant industries, but ultimately legislated standards are more productive than voluntary goals negotiated with industries. In addition, public scrutiny must be brought to bear on regulatory agencies to ensure that they are insulated from undue industry influence.

(4) Mandate that an increasing percentage of the nation's energy supply be produced renewably and sustainably. More than half the nation's states have adopted renewable portfolio standards that impose differing mandates on energy providers. Not surprisingly, most of the investment in renewable energy production is taking place in these states. Adoption of a 20 percent national Renewable Energy Standard (RES) by 2020 would build on the success in the states. Environmental problems associated with ethanol production related to the federal Renewable Fuels Standard (RFS), however, indicate there can be dangers associated with ratcheting standards up too quickly. Any mandate must ensure that the energy is produced renewably and sustainably.

(5) Remove market barriers for producers of renewable energy. These barriers include expensive and overly complicated requirements for connecting to the electricity grid, insufficient transmission line capacity, and extremely low power purchase rates based on avoided costs from fossil fuel power plants that are not yet accountable for their impact on global warming. Both Germany and Japan have stimulated the renewable energy industry in their nations through requiring net billing and also mandating higher "feed-in" rates. Such measures would stimulate investment in residential solar and wind power in the United States and help

restore the nation as a leader in technological innovation. Other initiatives to expedite transmission capacity are also critical to the expansion of renewable energy in the nation.

(6) Encourage decentralized and distributed power generation. Decentralized, residential renewable energy systems, and distributed generation from community wind farms can relieve pressure on the power grid, create new jobs, and empower local communities. State and federal tax credits are one way to encourage investment in decentralized and distributed renewable energy production. Flexible financing schemes are also valuable. The state of Minnesota has pioneered a unique approach to community-based economic development (C-BED), which has resulted in the largest number of community-owned wind farms in the nation.

(7) Place a moratorium on all new coal-fired and nuclear power plants until related environmental concerns are addressed. Given the predominant role carbon dioxide plays in global warming and climate change, and given that coal-fired power plants are responsible for 40 percent of the nation's carbon dioxide emissions, it would be irresponsible to build new coal-fired power plants or coal-to-oil technologies until it can be demonstrated that the carbon can be captured economically and sequestered permanently. Similarly, given the extremely toxic danger that spent nuclear fuel poses to future generations for thousands of years, it is irresponsible to build new nuclear power plants until a permanent means of disposing of this waste is placed into service.

(8) Limit exploration and exploitation of new fossil fuel supplies to parts of the nation where this can be done without adverse damage to people and the environment. As the climate in the Arctic warms, it is doubtful that the economic benefits of drilling in the Arctic National Wildlife Refuge can outweigh the environmental damage that this will do to one of the nation's most beautiful and wild places. Another example of such a limit would be the ecological devastation associated with mountaintop mining in Appalachia.

(9) Support a systemic shift to rail-based public transportation and urban planning that emphasizes mass transit. These measures would discourage urban sprawl and the depletion of water and energy resources, especially in the Southwest. Farmland in and around cities should be preserved to maintain and increase the capacity for local food production. Support for public transportation will also require substantial funding to repair the nation's highways, bridges, and dams. Efforts should be focused on increasing the quality of the nation's transportation and energy infrastructure, not on increasing the size of it.

(10) Revise U.S. national security policies. Decrease attempts to control oil resources owned by other nations and the profligate use of energy supplies to enforce inevitably temporary as well as massively tragic military interventions. Increase the authority of science-based international standards for addressing the issue of global climate change. Strive to decouple nuclear power from nuclear weapons production so as not to encourage a new round of nuclear proliferation.

b. Expresses gratitude to climate scientists in government, industry, academia and the United Nations, and to environmental public-interest groups and far-sighted political leaders, for their steadfast commitment to the common good and future welfare of all species.

c. Directs the Stated Clerk, the Presbyterian Washington Office, the Presbyterian United Nations Office, the Environmental Justice Office, and other General Assembly representatives to advocate for this approach to national energy policy before Congress, the Executive branch, state legislatures, and regulatory agencies, including those specifically involved in the areas of climate change and international cooperation, with the goal of restoring the United States of America to a leadership position in taking responsibility for reducing the scale and speed of global climate change.

Rationale

These recommendations and the supporting study document are in response to the following referral approved by the 214th General Assembly (2002*): Overture 02-57. On Revising the Denominational Policy on the Issue of Energy* (*Minutes*, 2002, Part I, pp. 72 and 596).

Study Document[1]

Introduction

To imagine the fullness of God is to talk about energy. From beginning to end, the Bible is replete with images of energy and divine activity. In the first verses of Genesis "a wind from God swept over the face of the waters" inaugurating God's creation of the world (Gen. 1:2).[2] In the last chapter of Revelation "the river of the water of life" flows from the throne of

God to water the trees of life which grow along its banks, and whose twelve kinds of fruit are for the healing of the nations (Revelations 22).

Energy is central to God's work as Creator, Redeemer, and Sanctifier. In the first creation account God works for six days to create the world, which God proclaims "very good" (Gen. 1:31). The second creation account emphasizes that the first human being (Adam) is created from energy-intensive and life-sustaining humus (adamah) (Genesis 2). God's redeeming and liberating work is also described in dramatic and energetic ways. After parting the Red Sea, God leads the freed Hebrew slaves in a pillar of cloud by day, and a pillar of fire by night (Ex. 13:21). The prophet Amos compares God's quest for justice to the powerful force of a waterfall and the might of a raging river that clears everything from its path (Amos 5:24). Finally, God's gift of the Holy Spirit on the day of Pentecost is preceded by "a sound like the rush of a violent wind" after which "tongues, as of fire" rested on each of the disciples (Acts 2:1–3).

God provides energy in abundance for all whom God has made (Ps. 145:15). Both the birds of the air and the fish of the sea first receive the same blessing God bestows on human beings—to be fruitful and multiply (Gen. 1:22). As the people of God wander in the wilderness after the Exodus, God sends "enough" manna each day to sustain the community (Exodus16). The jubilee legislation in Exodus and Leviticus stressed the needs of the poor and wild animals to eat from fields left fallow every seven years because all creatures are entitled to the energy they need to live. In the Gospel of John, Jesus proclaims that he has come so that all "may have life, and have it abundantly" (John 10:10). Jesus demonstrates this in the feeding of the five thousand, where all are fed and there are twelve baskets of food left over (Mark 6:39–44). Paul summarizes: "God is able to provide you with every blessing in abundance, so that by always having enough of everything, you may share abundantly in every good work" (2 Cor. 9:8).

There can be no greater measure of God's abundant provision than the energy provided by Earth's sun. Each hour of every day the sun delivers more energy to Earth than human beings consume in an entire year. Renewable energy sources can provide almost six times more power than human communities currently consume from all energy sources.[3] Unlike virtually all other species, however, human beings in the modern era have not learned how to live in harmony with current solar energy. Instead, human communities have grown and some have prospered over the past three centuries by tapping into banked solar energy that has been buried for millions of years beneath Earth's surface.

Today, heavy reliance on these fossil fuels (coal, oil, and natural gas) has produced grave threats to justice, peace, and the integrity of creation. The American Lung Association estimates more than 150 million people in the United States live in areas where poor air quality due to the combustion of fossil fuels puts their health at risk.[4] Those who bear the brunt of this pollution are asthmatics, the elderly, the very young, and those who live nearest polluting industrial facilities or busy highways, generally the poor and often racial minorities. Economically, the rising cost of petroleum fuels has impacted all Americans. The average price of gasoline has more than doubled since 2002, rising to over $3 a gallon.[5] Persons in low-income households often must choose between paying their energy bills or buying food and medicine. This is unjust.

Politically, various studies estimate that the U.S. spends between $55 billion and nearly $100 billion each year on the military to secure oil supplies around the world.[6] These estimates do not include more than $100 billion spent each year since 2003 for the war in Iraq, which has the world's third largest proven reserves of oil.[7] Recently the National Petroleum Council warned that international energy development and trade are more likely to be influenced by geopolitical considerations and less by market factors.[8] President Bush acknowledged this reality in his 2006 State of the Union address when he remarked: "America is addicted to oil, which is often imported from unstable parts of the world."[9] Our dependence on fossil fuels is a threat to peace.

There are also serious environmental problems associated with our heavy reliance on fossil fuels. Oil spills around the world despoil waters and harm wildlife. Mountaintop coal mining in Appalachia erodes hillsides, ruins scenic lands, and degrades surface streams and groundwater supplies. Nitrous oxide emissions and particulate matter from fossil fuel combustion play havoc with respiratory systems. Volatile organic compounds in petroleum fuels produce cancers and other diseases. Sulfur dioxide emissions from the burning of coal produce acid rain that destroys forests and significantly reduces agricultural production around the world.

While these are all serious problems, they pale in comparison to the perils posed by global warming and climate change. The related challenges posed by global climate change are unprecedented in human history. If the world takes a business-as-usual approach and continues a fossil fuel-intensive energy path during the 21st century, the Intergovernmental Panel on Climate Change (IPCC) projects current concentrations of greenhouse gases could more than quadruple by the year 2100. Under this scenario, the IPCC projects the global-average surface temperature will increase 4.0º Celsius (7.2º Fahrenheit) by the end of the 21st century. Put into perspective, the global-average surface temperature only increased 0.6ºC (1.1ºF) during the 20th century. [10]

This rapid rate of global warming will raise sea levels, endangering millions living in low-lying areas, despoil freshwater resources, widen the range of infectious diseases like malaria, reduce agricultural production, and increase the risk of extinc-

tion for 25–30 percent of all surveyed species.[11] A subsequent report released by the U.S. Climate Change Science Program claims "[w]e are very likely to experience a faster rate of climate change in the next 100 years than has been seen over the past 10,000 years."[12]

These findings have prompted scientists all over the world to plead for reductions in greenhouse gas emissions. James Hansen, the leading climate scientist in the U.S., argues that following a business-as-usual approach for ten more years "guarantees that we will have dramatic climate changes that produce what I would call a different planet."[13] Nathan Rive of the Center for International Climate and Environmental Research in Oslo writes: "If we are to have a 50 percent chance of meeting a 2º Celsius [3.6º F.] target we would have to cut global emissions by 80 percent by 2050."[14]

Together with people all around the world, Christians at the outset of the 21st century must respond to this climate crisis by developing a new way of living in harmony with Earth's energy resources and in solidarity with all of God's creatures. This moral obligation involves our commitment to the poor and marginalized among the present generation, but it especially includes our responsibilities to future generations. Actions taken or not taken today will impact the welfare of the planet for centuries to come.

Those of us living in the United States have a unique moral responsibility to change our energy consumption practices in the face of global climate change. According to the World Resources Institute, our nation is responsible for nearly 30 percent of the carbon dioxide emissions produced by the combustion of fossil fuels from 1850–2002, and we still lead the world accounting for approximately 23 percent of all greenhouse gas emissions today.[15] The U.S. is also the sixth largest per capita polluter. Only Qatar, the United Arab Emirates, Kuwait, Australia, and Bahrain emit more greenhouse gases per person.[16] Each person in the United States produces 24.5 tons of greenhouse gas emissions per year, compared to only 3.9 tons per person in China.[17] There is no question that as a nation, and as individuals, the United States must accept its moral responsibility to deal with the negative consequences associated with fossil fuel consumption and global warming.

Presbyterians in the United States first addressed issues related to energy policy in a comprehensive policy statement adopted in 1981: *The Power to Speak Truth to Power.*[18] This important social policy document elaborated an ethic of ecological justice that attempted to unite in one broad scope of moral concern the ethical obligations Christians have both to present and future generations, as well as to all human and natural communities. Four norms rooted in Scripture and Christian theology were central to this ethic: Justice, sustainability, sufficiency, and participation. Twelve guidelines rooted in these norms were also identified to aid in ethical assessment of energy options: Equity, efficiency, adequacy, renewability, appropriateness, risk, peace, cost, employment, flexibility, timely decision-making, and aesthetics.

The ethic of ecological justice and its related norms were developed further a decade later in 1990 when the PC(USA) approved a major teaching on environmental policy, *Restoring Creation for Ecology and Justice*.[19] This study recast the norm of justice in terms of solidarity and honed the application of the other norms to environmental issues.

As new scientific studies further confirmed the phenomenon of global warming, and as the prospects grew for a second war in oil-rich Iraq, delegates at the 214th General Assembly (2002) approved a proposal to revise the 1981 policy.[20] The recommendations and accompanying study document, *The Power to Change: U.S. Energy Policy and Global Warming,* were developed in response to that plea. They utilize the ecojustice norms and energy guidelines to engage in a revised ethical assessment of U.S. energy policy within the context of challenges posed by global warming and climate change.

There are three important truths revealed in the accompanying study document. First, the potential supply of renewable and alternative energy sources far exceeds the current and projected demand from all energy sources. God has truly furnished creation with energy in abundance. Nevertheless, the second truth is that our nation still relies heavily on fossil fuels and nuclear power to provide 93 percent of the energy we currently consume. We are not living sustainably in relationship with God's creation. This leads to the third, sad truth: Our reliance on these traditional energy sources poses grave dangers to justice, peace, and the integrity of creation. In fact, we find ourselves at a pivotal moment in history with regard to global climate change. Scientists warn that global greenhouse gas emissions need to be reduced 80 percent below 1990 levels by the year 2050 in order to avert catastrophic consequences associated with global warming.

After this brief introduction, the second part of this study explores in greater detail various problems associated with the heavy use of fossil fuels and the extraordinary challenges posed by global climate change. The third part identifies theological and ethical resources to grapple with these problems, and the fourth part uses these resources to conduct an ethical assessment of U.S. energy options.[21]

The challenges we face are daunting, and to many they appear insurmountable. Certainly our Presbyterian tradition supports a hard-eyed realism with regard to the nexus of issues related to energy policy and global climate change. We do not inventory here the political failures and missed opportunities of the past twenty-five years that have led to greater dependency on fossil fuel and the undermining of science-based regulation in favor of short-term market incentives and market manipulation by companies like Enron. It can be argued that massive subsidies to the coal, oil, gas, and nuclear power industries have

corresponded with a deliberate disinvestment in public transportation and infrastructure, while also retarding the acquisition of technological expertise in the U.S. alternative energy sector. Empowered, however, by a just, good, and gracious God, we must resist the temptation of despair. Among the wealthy and powerful such despondency can be self-serving because it leads to moral paralysis. This "cheap despair" changes nothing and preserves the status quo from which the wealthy and powerful currently benefit. Empowered by God's costly grace, we must work tirelessly with others as individuals, as a church, and as global citizens to live in harmony with the energy resources God has so abundantly provided.

Only God can give us the power to change. Our Reformed tradition reminds us that it is God who created the earth and saw that it was good, God who sustains the earth and seeks to hold its processes together, God who judges sin and greed, and God who reveals in Jesus Christ that love and justice are the essence of God's power. God is the inexhaustible source of energy for personal, social, and ecological transformation. Although we are complicit in the evils we face, we can repent of our own sinful misuse and abuse of the Earth as we confess our sins. As recipients of God's endless mercy, this redemptive energy frees and empowers us to be good stewards of God's creation.

Energy choices, more than ever, are moral choices. As our planet grows warmer, our Christian witness must become bolder. As individuals, families, congregations, and church administrative bodies, we must become the change we want to see in our nation. We must put our own houses in order even as we call on our nation to accept its moral responsibility with regard to energy policy and climate change. Together we must radically reduce our carbon footprint.[22]

Two years ago, the 217th General Assembly (2006) voted to "strongly urge all Presbyterians immediately to make a bold witness by aspiring to live carbon neutral lives."[23] Carbon neutrality requires us to reduce energy consumption that releases carbon dioxide into the atmosphere and to purchase carbon offsets to compensate for those carbon emissions that cannot yet be eliminated. For example, offset funds can be used to plant trees that absorb carbon dioxide; to invest in alternative energy sources; to facilitate energy-efficient design, building and operation of buildings; or to purchase energy-efficient appliances for those individuals or churches that cannot otherwise afford them.[24] The recommendations above emphasize the importance of carbon neutrality for all expressions of our church.

Faced with the nexus of issues related to energy policy and climate change, and guided by the ecojustice norms and energy guidelines, Christian stewardship is expressed in three major areas of responsibility. Our witness begins at the personal level, it must be reflected in the practices and priorities of all organizations in our church, and it culminates in our advocacy for changes in public policy at all levels of government. The above recommendations address each of these dimensions of social responsibility.

I. Problems Related to Fossil Fuel Energy Sources

Energy is a key factor in advancing well-being and realizing human potential. Advances in the creative and efficient use of modern, fossil fuel energy sources have been at the heart of progress in affluent industrial nations, enabling advances in living standards to levels never experienced before in history. Energy is vital for growing and providing food for the world, for facilitating advances in health technologies, for powering transportation and industry, and for powering the growth of the information and communication revolution. As technologies have advanced, energy costs as a share of economic output have tended to decline. This has created the foundation for sizable growth in living standards, reducing the burden of human toil and turning what were once conveniences into virtual necessities for those in the industrial and industrializing worlds.

Nevertheless, roughly one-third of the world's population (more than two billion people) still lacks access to adequate supplies of energy, particularly electricity. This lack of access impairs human health and welfare, wastes environmental resources, and limits development in countless ways. For cooking, reliance on inefficient wood stoves leads to emission of large amounts of carbon monoxide and particulate matter, creating high levels of indoor air pollution that induce respiratory illness and shorten lives. Deforestation brings its own tragedies. Without electricity, there is no refrigeration to cool vaccines, no power for lights and computers needed to expand education, and limited connection to the wider world.

While one-third of the world's population experiences serious problems associated with too little access to modern supplies of energy, all nations are grappling with various problems associated with too much use of fossil fuel energy sources by the rest of the world.

Social Problems. Even in the United States, where environmental regulations have slowed the rate of emissions related to the increasing use of fossil fuels, the American Lung Association estimates more than 150 million people live in areas where the air quality puts their health at risk.[25] Health impacts are spread across the United States, but have a particularly harsh effect on vulnerable populations such as asthmatics, the elderly, the very young, and those who live nearest polluting industrial facilities or busy highways, generally the poor and often racial minorities. Each year diesel exhaust alone is responsible for more than 125,000 cancer cases in the United States, and nearly 100,000 Americans die each year from causes attributable to smog.[26] Around the world, the global toll from air pollution is much worse, likely exceeding a million deaths

annually. This is particularly the case if indoor air pollution is included, which has a very significant impact on women and children who spend more time indoors.

Health issues associated with coal mining and the burning of coal to generate electricity are especially sobering. Next to petroleum, coal is the second largest source of energy in the world.[27] Each year more than six thousand coal miners are killed in China's coal mines.[28] Since 1900, more than 100,000 people have been killed in coal-mine accidents in the United States, and black lung disease is estimated to have killed twice as many miners over the same period of time.[29] Accounting for nearly half of all electricity generation, coal-fired power plants in the U.S. produce two-thirds of all sulfur dioxide (the leading cause of acid rain), 22 percent of all nitrogen oxide (a major contributor to smog), approximately 40 percent of carbon dioxide (the principal greenhouse gas), and a third of all mercury emissions (a potent neurotoxin that accumulates in body tissues).[30] The Centers for Disease Control and Prevention reports that one in twelve women in the U.S. has an unsafe level of mercury in their blood, and that as many as 630,000 babies could be at risk for health problems. The Environmental Protection Agency has issued advisories in forty-four of the fifty states regarding high mercury levels in various kinds of fish. [31]

*Economic Problems***.** For various reasons, energy prices have risen sharply in the United States over the past decade. Persons in low-income households (especially elderly residents, the disabled, and children) are most vulnerable to rising costs and often must choose between paying their energy bills or buying food and medicine. Congress created the Low Income Home Energy Assistance Program (LIHEAP) in 1981 precisely to address this need. Families receiving LIHEAP assistance must have income below 150 percent of the federal poverty level. Two-thirds of LIHEAP families earn less than $8,000 per year. Sadly, funding levels for the program have not kept pace with the growing number of households eligible for assistance. In recent years Congress has only authorized sufficient funding to provide LIHEAP assistance for 16 percent of the eligible population.[32]

The rising cost of petroleum fuels has impacted all Americans. The average price of gasoline has more than doubled since 2002, rising to over $3 a gallon.[33] Since U.S. oil production peaked in the 1970s, imports have been rising steadily to meet demand. Today, the United States imports more than 60 percent of the oil it consumes. Imports of energy-related petroleum products in 2006 cost more than $290 billion and represented more than 30 percent of the nation's international trade deficit.[34] Spurred by rapidly increasing demand in China, record prices for oil are pushing the U.S. cost of imported oil even higher.

There are other significant costs related to U.S. oil supplies. Various studies estimate that the United States spends between $55 billion and nearly $100 billion each year on the military to secure its oil supplies around the world.[35] These estimates do not include more than $100 billion spent each year since 2003 for the war in Iraq, which has the world's third largest proven reserves of oil.[36] With the number of civilian and military deaths in Iraq approaching 100,000 people, those who mourn the loss of their loved ones remind us that the human toll far exceeds the economic costs of this war.[37] Nevertheless, when these costs are added to the cost of federal and state subsidies to the oil industry, and combined with estimates of health-care costs related to fossil fuel pollution, some analysts argue that the true cost of a gallon of gasoline at the pump ranges from $8 to $11 per gallon.[38]

Political Problems. Recently the National Petroleum Council warned that international energy development and trade are more likely to be influenced by geopolitical considerations and less by market factors.[39] President Bush acknowledged this reality in his 2006 State of the Union address when he remarked: "America is addicted to oil, which is often imported from unstable parts of the world."[40] In recent years, more than half of U.S. oil imports have come from four leading suppliers: Canada (19 percent), Saudi Arabia (12 percent), Mexico (11 percent), and Venezuela (10 percent). Nigeria, Algeria, Angola, Iraq, Russia, and Ecuador round out the other top ten suppliers.[41] While the U.S. enjoys primarily positive foreign relations with its neighbors, Canada and Mexico, it has strained relationships with Saudi Arabia, Venezuela, and Russia. In addition, the relationship between blood and oil is all too clear in Iraq's civil war, and it is becoming more apparent as the level of violence and civil unrest grows in nations like Nigeria and Angola where oil wealth is not being spread broadly to all residents of these oil-exporting nations.

Once oil has been extracted from beneath the ground, transporting the oil can lead to another set of political problems. More than half the world's oil passes through a few potential "choke points," including the Suez Canal, the Bosporus, and the Straits of Hormuz and Malacca.[42] A significant disruption of oil shipments through any of these points could wreak havoc on the world's economy. Nine out of the last ten recessions in the United States were preceded by oil price shocks related to supply disruptions.[43] Many analysts fear that Iran may lay siege to tankers in the Strait of Hormuz if the United States or Israel attack the facilities it has built to enrich uranium.

With demand for natural gas rising around the world, Russia's control of natural gas supplies raises concerns for many nations in Europe and Central Asia. Recently Russia signed a deal to build a pipeline from Turkmenistan through Kazakhstan, which will feed Russia's network of pipelines to Europe. The deal seeks to thwart efforts by the U.S. and other European nations to build oil and gas pipelines that would avoid Russia by connecting to Europe through Azerbaijan and Turkey.

Having recently reduced the flow of natural gas to Georgia and other countries, many European nations fear Russia will use its virtual monopoly over natural gas resources for political purposes.[44]

This brief overview reveals a host of social, economic, and political problems associated with our heavy reliance on fossil fuels. There are also serious environmental problems. Oil spills around the world despoil waters and harm wildlife. Mountaintop coal mining in Appalachia erodes hillsides, ruins scenic lands, and degrades surface streams and groundwater supplies. Nitrous oxide emissions and particulate matter from fossil fuel combustion play havoc with respiratory systems. Volatile organic compounds in petroleum fuels produce cancers and other diseases. Sulfur dioxide emissions from the burning of coal produce acid rain that destroys forests and significantly reduces agricultural production around the world.

II. Global Warming and Climate Change

While these are all serious problems, they pale in comparison to the unprecedented perils posed by global warming and climate change. After nearly two decades of intensive study, scientists around the world have reached a much greater consensus about these phenomena, their causes, and likely impacts. The United Nations established the Intergovernmental Panel on Climate Change (IPCC) in 1988 to review and assess the most recent scientific, technical and socioeconomic information relevant to climate change. The IPCC has issued reports every five years and issued its Fourth Assessment Report in four installments during 2007. More than 1,200 authors contributed to the report and their work was reviewed by more than 2,500 scientific experts.[45] Since each report for policy makers is approved line-by-line in plenary sessions, the IPCC's findings are arguably the least controversial and most accepted assessments of climate change in the scientific community.

The IPCC Fourth Assessment Report in 2007 finally persuaded many that global warming is real, that it is caused by human activity, and that it will very likely produce climate change in the 21st century that will be unprecedented in human history. The following are some of the key findings reprinted directly from the IPCC reports.

Human and Natural Drivers of Climate Change[46]

- Global atmospheric concentrations of carbon dioxide, methane and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values determined from ice cores spanning many thousands of years.

- Carbon dioxide is the most important anthropogenic greenhouse gas. The global atmospheric concentration of carbon dioxide has increased from a pre-industrial value of about 280 ppm to 379 ppm in 2005. The atmospheric concentration of carbon dioxide in 2005 exceeds by far the natural range over the last 650,000 years (180 to 300 ppm) as determined from ice cores.

- The primary source of the increased atmospheric concentration of carbon dioxide since the pre-industrial period results from fossil fuel use, with land use change providing another significant but smaller contribution.

- The understanding of anthropogenic warming and cooling influences on climate has improved since the Third Assessment Report (TAR), leading to *very high confidence* [greater than 90 percent probability] that the globally averaged net effect of human activities since 1750 has been one of warming.

Direct Observations of Recent Climate Change[47]

- Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level.

- Eleven of the last twelve years (1995–2006) rank among the 12 warmest years in the instrumental record of global surface temperature.

- At continental, regional, and ocean basin scales, numerous long-term changes in climate have been observed. These include changes in Arctic temperatures and ice, widespread changes in precipitation amounts, ocean salinity, wind patterns and aspects of extreme weather including droughts, heavy precipitation, heat waves and the intensity of tropical cyclones.

- Average Arctic temperatures increased at almost twice the global average rate in the past 100 years.

Projections of Future Changes in Climate[48]

- Continued greenhouse gas emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would *very likely* be larger than those observed during the 20th century.

- Best estimates and likely ranges for globally average surface air warming for six emissions scenarios are given in this assessment. For example, the best estimate for the low scenario is 1.8°C [3.2ºF], and the best estimate for the high scenario is 4.0°C [7.2ºF].

- Both past and future anthropogenic carbon dioxide emissions will continue to contribute to warming and sea level rise for more than a millennium, due to the timescales required for removal of this gas from the atmosphere.

Current Knowledge of Future Impacts [49]

- Drought-affected areas will likely increase in extent. Heavy precipitation events, which are very likely to increase in frequency, will augment flood risk.

- In the course of the century, water supplies stored in glaciers and snow cover are projected to decline, reducing water availability in regions supplied by meltwater from major mountain ranges, where more than one-sixth of the world population currently lives.

- The resilience of many ecosystems is likely to be exceeded this century by an unprecedented combination of climate change, associated disturbances (e.g., flooding, drought, wildfire, insects, ocean acidification), and other global change drivers (e.g., land use change, pollution, over-exploitation of resources).

- Approximately 20–30% of plant and animal species assessed so far are likely to be at increased risk of extinction if increases in global average temperature exceed 1.5–2.5°C.

- Globally, the potential for food production is projected to increase with increases in local average temperature over a range of 1–3°C, but above this it is projected to decrease.

- Many millions more people are projected to be flooded every year due to sea-level rise by the 2080s. The numbers affected will be largest in the mega-deltas of Asia and Africa while small islands are especially vulnerable.

- Poor communities can be especially vulnerable, in particular those concentrated in high-risk areas. They tend to have more limited adaptive capacities, and are more dependent on climate-sensitive resources such as local water and food supplies.

Clearly global warming and related climate change brought on by the combustion of fossil fuels pose grave threats to justice, peace, and the integrity of creation. The information provided by the IPCC raises at least two fundamental ethical issues. The first is an intergenerational question: What are our obligations to future generations with regard to reducing or mitigating the challenges posed by climate change? The second is an intragenerational question: How do we equitably distribute responsibility among present generations for meeting our obligations to future generations?

III. Theological and Ethical Resources

These are not new questions; Presbyterians identified and addressed them more than twenty-five years ago when they adopted *The Power to Speak Truth to Power* in 1981. This important social policy document elaborated an ethic of ecological justice that attempted to unite in one broad scope of moral concern the ethical obligations Christians have both to present and future generations, as well as to all human and natural communities. Four norms rooted in Scripture and Christian theology were central to this ethic: justice, sustainability, sufficiency, and participation. Twelve guidelines rooted in these norms were also identified to aid in ethical assessment of energy options: Equity, efficiency, adequacy, renewability, appropriateness, risk, peace, cost, employment, flexibility, timely decision-making, and aesthetics.

The ethic of ecological justice and its related norms were developed further a decade later in 1990 when the PC(USA) approved a major teaching on environmental policy entitled *Restoring Creation for Ecology and Justice*.[50] This study recast the norm of justice in terms of solidarity and honed the application of the other norms to environmental issues.

Today we need to apply these norms and guidelines to engage in a revised ethical assessment of U.S. energy policy within the context of challenges posed by global warming and climate change. What follows is a brief summary of the four norms drawn from *Restoring Creation for Ecology and Justice* as well as a revised description of the twelve guidelines identified in *The Power to Speak Truth to Power.*

Eco-Justice Norms

Sustainability "means … the capacity of natural systems to go on functioning properly, so the living creatures that belong to these systems may thrive. As a norm for human behavior, sustainability expresses the meaning of God's call to earth-keeping: Relate to the world so that its stability, integrity and beauty may be maintained …. Sustainability is the capacity of the natural order and the socioeconomic order to thrive together."[51]

Participation "means being included in the social process of obtaining and enjoying the good things of God's creation. Because the Creator's intention is that nature's gifts of sustenance be available to all members of the human family, all have a right and a responsibility to participate. … If any are excluded, something is unacceptably wrong."[52]

Sufficiency "… insists that all participants be able to obtain a sufficient sustenance … enough for a reasonably secure and fulfilling life.[53]

Solidarity "means … vibrant community based on commitment and fidelity. … [I]it embraces ecological, ethical themes of each individual's worth and dignity together with the fundamental interdependence and unity with the Creator's creatures. … [H]uman beings are all members of one human family … while belonging also to nature as integral components of one creation."[54]

These four norms sketch the broad outline of an ethic of ecojustice. The following twelve guidelines help to apply these norms to specific issues related to energy policy and global climate change.

Energy Policy Guidelines[55]

Equity concerns the impact of policy decisions on various sectors of society with special concern for the poor and vulnerable. Burdens and benefits should be assessed and distributed so that no group gains or loses disproportionately.

Efficiency is the capability of an energy policy or alternative to provide power with the input of fewer resources. It also means frugality in consumption and a decrease in pollution. New technologies are essential to satisfying this guideline.

Adequacy addresses the complex problem of supply. Policies and energy alternatives should be sufficient to meet basic energy needs. The meeting of basic needs takes priority until they are satisfied, then gives way to other guidelines, especially frugality and conservation.

Renewability refers to the capacity of an energy option to replenish its source. Reliance on renewable sources should take priority.

Appropriateness refers to the tailoring of energy systems to (a) the satisfaction of basic needs, (b) human capacities, (c) end uses, (d) local demand, and (e) employment levels. Energy decisions should lead to a variety of scales and level of technical complexity.

Risk concerns the measurable potential of an energy policy or alternative to harm human health, social institutions, and ecological systems. Low risk options are preferable.

Peace points to the potential of an energy policy to decrease the prospects of armed conflict. While international cooperation is essential to a sustainable energy future, energy dependence should be avoided to prevent disruption of supplies.

Cost refers to monetary costs as well as other social and environmental costs. All costs should be included in the prices consumers pay for energy.

Employment concerns the impact of a policy or alternative on employment levels, skills, and the meaningfulness of work. Policies and systems should stimulate the creation of jobs and new skills.

Flexibility points to the capacity of policies and options to be changed or reversed. High flexibility is preferable, and systems subject to sudden disruption should be avoided.

Participation and timely decision-making refer to the processes used to set energy policies and choose alternatives. Processes should allow for those affected to have a voice without leading to endless procrastination.

Aesthetics points to beauty as one aspect of a flourishing life. Policies and alternatives that scar the landscape should be avoided.

IV. Assessing Major Energy Options

The four ecojustice norms and twelve energy guidelines provide a means by which to conduct an ethical assessment of the traditional and alternative energy options available to policy-makers.

Traditional, Non-Renewable Energy Sources

The U.S. Energy Information Administration (EIA) reports that more than 93 percent of the nation's energy is currently provided by coal, oil, natural gas, and nuclear power.[56] Under the EIA's long-term reference case scenario, which assumes present trends will continue, these four sources will grow in volume and continue to supply a similar percentage of energy along with increased greenhouse gas emissions in 2030.[57]

Coal remains the chief source of energy to generate electrical power in the United States. Almost 50 percent of the electricity we use comes from coal-fired power plants.[58] Coal is also the most abundant fossil fuel in the world, and the United States has more reserves than any other nation. At current rates of consumption, the nation's coal supply would last more than 250 years.[59] Given this large domestic resource, utilities around the United States have proposed building 151 new coal-fired power plants in order to meet rising demand. The Department of Energy's Energy Information Administration projects that the nation will need 290 new plants to meet projected demand by 2030.[60]

Viewed through the lens of the ecojustice norms and energy guidelines, coal provides the U.S. with a large domestic energy resource that reduces dependency on foreign supplies, provides jobs in the mining, rail, and utility industries, and generates electricity at low economic costs. As the nation's dependency on foreign oil grows, many are also eager to tap the flexibility of this resource by converting coal into a liquid transportation fuel or into synthetic natural gas. These advantages are overwhelmed, however, by the fact that coal is a carbon-intensive fossil fuel whose combustion is producing enormous greenhouse gas emissions. Coal-fired power plants alone produce 40 percent of U.S. carbon dioxide emissions.[61] While these emissions will have a significant and inequitable impact on future generations through global climate change, they also have a deleterious impact on present generations through mercury pollution, acid rain, and the aesthetic destruction of mountaintops and valleys. Continued dependence on coal-fired electricity generation violates the norms of sustainability and solidarity.

Cognizant of these flaws, the coal and utility industries are promoting a new generation of "clean coal" technologies. In fact, 77 of 151 proposed new power plants intend to utilize one of four different technologies that either improve combustion or gasify coal, thus modestly increasing the efficiency of coal-fired power plants from 38–40 percent to over 50 percent.[62]

The most important technology on the horizon, however, is carbon capture and sequestration (CCS). At some locations around the world, carbon dioxide is already being captured and pumped underground to force more oil out of the ground. The gas is not being sequestered, however. Eventually the gas is free to find its way back to the surface and up into the atmosphere. Given its contribution to global warming and climate change, the only way to responsibly expand coal-based generation in the future will be if the related carbon emissions can be permanently sequestered below ground. Research is under way to accomplish that goal, but even proponents of this technology acknowledge that it is at best fifteen years away from widespread commercial application.[63] Close scrutiny must be brought to bear on this research because concentrations of carbon dioxide pose real dangers to human and ecological health, both for present and future generations. Deep ocean storage risks acidifying water and damaging aquatic ecosystems. Storage underground as a gas poses risks to human populations because carbon dioxide is heavier than air and can cause suffocation at concentrations of 7–8 percent by volume. While it is not known whether it will be possible to sequester carbon dioxide permanently, studies project that CCS will lead to at least a doubling of the cost of coal-fired electricity.

Given the fact that carbon dioxide is the principal greenhouse gas, and that the combustion of coal produces enormous emissions, the ecojustice norms of sustainability and solidarity justify a moratorium on all new coal-fired power plants until it can be demonstrated that carbon capture and sequestration can be done in a verifiable and permanent way. In the mean time, the nation should use the next two decades to reduce demand for electricity by investing in energy efficiency and practicing energy conservation.

Oil products like gasoline and diesel fuel the nation's transportation sector and also serve as a primary feedstock in the plastics and chemical industries. Unlike coal, however, the world's proven reserves of oil may not be able to fuel growing consumption demands much longer. United States oil production peaked in the 1970s and many predict that global oil pro-

duction will peak within the next two or three decades, if it has not done so already. Once conventional oil production peaks, it is expected to decline by as much as 3 percent per year.[64] Thus, fifteen years after the peak there could be 45 percent less oil available on the market. This relatively rapid change has the potential to spur inflation, plunge economies into recession, and ignite conflict around the world. While it is possible to extract oil from oil shale and tar sands, and even to convert coal to synthetic petroleum, all of these options are expensive both economically and environmentally. Clearly the world needs to find alternative fuels to power the transportation sector.

A continued reliance on oil violates almost all of the ecojustice norms and energy guidelines. Oil is the largest source of U.S. greenhouse gases, producing 44 percent of the nation's total emissions.[65] Approximately 67 percent of these emissions are attributable to the vehicle transportation sector of the U.S. economy.[66]

While we enjoy the convenience of our cars and drive ever more miles every year, we pass the ecological consequences of our driving on to future generations who have no control over our actions. This clearly violates the norms of sustainability and solidarity. Given the imminent scarcity of oil worldwide, a more efficient use of this vital resource is clearly warranted.

As we have seen, there is a significant link between oil and geopolitics that poses a direct threat to peace, democracy, and equity. United States dependence on oil from the Middle East in particular is ironic, self-defeating, and counterproductive. It is ironic because the U.S. military is the nation's largest consumer of oil. In 2006, the defense establishment spent $13.6 billion to consume 340,000 barrels of oil per day, representing 1.5 percent of total U.S. energy consumption.[67] The average U.S. soldier in Iraq and Afghanistan daily consumes sixteen gallons of oil either directly or indirectly through the use of Humvees, tanks, trucks, helicopters, and air strikes.[68] It is a bitter irony that some wars in the future may be fought in part to secure the oil to fight them.

United States dependence on Persian Gulf oil is self-defeating because some of the money the U.S. expends to import oil from this region has wound up in the pockets of those committed to sponsoring terrorism around the world. Fifteen of the nineteen terrorists who hijacked planes and crashed them into the World Trade Center and the Pentagon were citizens of Saudi Arabia. Osama bin Laden is a Saudi and oil money has helped finance Al-Qaeda. In 2005, the U.S. spent nearly $40 billion to import oil from the Persian Gulf while at the same time it financed a war on terror.[69] To some extent, every gallon of gas we purchase helps fund terrorists.[70]

United States dependence on foreign oil is counterproductive because it often requires the U.S. to do business with nations that do not support democracy. In a recent book, U.S. Congressman Jay Inslee cites Tom Friedman's First Law of Petropolitics: "The price of oil and the pace of freedom always move in opposite directions."[71] Inslee claims "[i]t is not a coincidence that of the ten nations with the largest proven oil reserves … only one (Canada) is a true democracy."[72] Among the top ten suppliers of oil to the United States are nations like Nigeria and Angola, which are experiencing civil unrest because their oil wealth has not been spread very broadly. In addition, the leaders of two other major U.S. suppliers, Vladimir Putin in Russia and Hugo Chavez in Venezuela, are taking steps to shore up their personal power in ways many believe will undermine democracy in these nations.

Viewed through the lens of the ecojustice norms and the energy policy guidelines, there is little question that reducing U.S. dependence on oil in general, and Persian Gulf oil in particular, need to become national priorities.

Natural gas is the most desirable fossil fuel because it is about half as carbon intensive per unit of energy as coal or oil, and it is a highly flexible resource that can be utilized in a variety of end uses and sized to scale. Prices for natural gas have risen sharply in recent years, in part due to market manipulation by companies like Enron, but mostly because of the increase in natural gas-fired electricity generation. Utilities have invested in gas-fired power plants for various reasons. They are ideal for responding to peak-load demands throughout the year because they can be brought on-line quickly. In addition, they are more economical to build than coal-fired or nuclear power plants and it is also easier for utilities to secure the necessary environmental permits. This increased demand for natural gas due to electrical generation has driven up the cost of heating homes and businesses as well as the cost of production in agriculture and other industries where natural gas serves as an important energy source or chemical feedstock.

Application of the energy guidelines produces a mixed assessment of natural gas. On the one hand, it is far less polluting than the other fossil fuels, it is a very flexible resource, and it plays an important role in the economy. On the other hand, domestic production lags behind consumption, the majority of global supplies are unevenly concentrated in the Middle East and Russia, and thus the potential for conflict will increase over access to this valuable energy resource. The United States now imports a growing percentage of natural gas from Canada, Mexico, and the Caribbean—increasingly in the form of liquefied natural gas, which is dangerous to transport and vulnerable to terrorists. As with oil, experts predict global production will peak in the first half of this century and be followed by even higher prices.

The ecojustice norms of sustainability and sufficiency require us to use this valuable resource wisely as a bridge to a future in which fossil fuels play a diminishing role. Key to this effort will be to replace the role natural gas plays in electricity

generation with investments in renewable energy generation. While it is possible to gasify coal and to process methane hydrates sequestered on the ocean floor into natural gas, it would be more prudent to capture and utilize methane that is already being emitted into the atmosphere via livestock and landfills because methane is twenty-one times more potent a greenhouse gas than is carbon dioxide.[73]

Nuclear power is undoubtedly the most controversial of the traditional energy sources in the United States. Currently 104 commercial reactors produce 19 percent of the nation's electricity and serve approximately fifty million people.[74] Together with coal-fired power plants, these facilities are the backbone of the nation's base-load electricity supply. While no new reactors have come on-line since 1996, more than two dozen are now on the drawing boards due to a variety of tax, insurance, and production subsidies made available to the industry via the federal Energy Policy Act of 2005.[75]

Faced with the prospect of rapid climate change, the primary strength of nuclear power is that it produces virtually no greenhouse gas emissions once reactors are operational and construction is completed. While construction costs are very high, operational costs have been relatively low. In addition, while the region around Chernobyl in Russia had to be abandoned and cordoned off due to high radiation levels, the nuclear power industry in the United States has never suffered such a major catastrophe. The Nuclear Regulatory Commission proudly emphasizes that there has been no loss of life associated with the operation of the nation's commercial nuclear reactors in the history of the industry.

The primary weakness of nuclear power is that the United States has not figured out how to dispose of the highly radioactive toxic waste that is produced by the reactors. Spent fuel rod assemblies are piling up in cooling ponds and in aboveground storage casks at two-thirds of the reactors around the nation because the federal government has failed to open an underground geological repository to receive this waste. While Congress mandated that Yucca Mountain in Nevada become the site for this facility, its original opening in 1998 has been postponed several times and now is slated to open no sooner than 2017. If and when it does open, the facility will be too small to accommodate the amount of spent nuclear fuel produced to date.

The energy guidelines illuminate additional concerns related to nuclear power. Recent discoveries of steel embrittlement and leaks of tritium into groundwater supplies from aging reactor facilities raise concerns about the safety risks associated with operating these facilities beyond the length of their original operating licenses. While reactor facilities are heavily guarded, many fear what would happen if terrorists managed to damage a reactor or casks entombing spent fuel rods outside the reactor building. Others ask whether nuclear power is an appropriate way to produce the steam used to propel the generators that produce electricity. The complexity and danger of this energy source are so great that it is regulated by an independent body within the federal government, the Nuclear Regulatory Commission.

Advocates within the industry point to new reactor designs that should make nuclear reactors much safer to operate in the future.[76] Some also encourage the United States to reprocess its spent nuclear fuel in order to reduce the waste burden and to recycle the energy that remains in spent fuel rod assemblies. President Jimmy Carter abandoned reprocessing in the 1970s over concerns about nuclear proliferation and because he believed it was too expensive. The federal Energy Policy Act of 2005 reversed this policy by authorizing $580 million for research and development of nuclear reprocessing and transmutation processes.[77] Recently the Department of Energy announced that it would remove nine metric tons of plutonium from hundreds of the nation's nuclear warheads and refabricate the plutonium into a mixed uranium and plutonium oxide (MOX) fuel that can be burned in commercial nuclear reactors.[78]

France reprocesses more than one thousand metric tons of spent fuel every year from its fifty-nine reactors, but it never built breeder reactors that were supposed to burn up the plutonium and other high level nuclear waste left over after reprocessing. With breeder reactors out of the picture, France is burning a MOX fuel that consists of 8 percent plutonium and 92 percent depleted uranium in the nation's reactors. One of the problems, however, is that MOX fuel has almost five times as much plutonium as enriched uranium fuel, which increases the risk of unexpected chain reactions during operation and reprocessing. In addition, spent MOX fuel is three times as hot as spent uranium fuel and thus needs to be placed in cooling ponds for 150 years before it can be placed in an underground waste repository like Yucca Mountain. These used fuel assemblies are starting to pile up at France's reprocessing facility in La Hague and have as yet no permanent home in an underground geological repository.[79]

Given the extremely toxic nature of high-level nuclear waste, the ecojustice norm of solidarity and the energy guideline of equity require that the long-term waste issue be resolved. It is not fair to burden future generations with highly toxic waste. At the same time, the norm of sustainability and the adequacy guideline remind us that nuclear power provides a significant amount of our electricity supply today and does not produce greenhouse gas emissions that imperil generations in the future. Like natural gas, it may be best to view nuclear power as a resource that can bridge the gap to a more sustainable energy future. Unless and until the waste issue can be resolved, however, it would be best to bring intense scrutiny to bear on proposals to re-license existing reactors and to put a moratorium on the construction of new reactors. If the waste and related safety issues cannot be resolved with a very high degree of confidence and integrity, nuclear power should be phased out.

Alternative and Renewable Energy Sources

The U.S. Energy Information Administration (EIA) reports that only 7 percent of the nation's energy supply is currently provided by renewable energy sources. Of this total, biomass (48 percent) and hydroelectric power (42 percent) lead the way, followed by geothermal (5 percent), wind (4 percent), and solar (1 percent).[80] Under the EIA's long-term reference case scenario, which assumes present trends will continue, renewable energy sources will grow in volume but still represent only 8 percent of the nation's energy supply in 2030.[81] If changes are made in national energy policy, however, the EIA projects that 25 percent of the nation's electricity supply and transportation fuels could be produced renewably by 2025.[82] Globally, the European Renewable Energy Council and Greenpeace International claim "renewable energy, combined with the smart use of energy, can deliver half of the world's energy needs by 2050."[83]

Not surprisingly, energy efficiency and renewable energy sources fare better than fossil fuels and nuclear energy when assessed in light of the ecojustice norms and energy policy guidelines. For example, sustainability is emphasized when we take advantage of the renewable energy resources offered by the sun and the geothermal energy from the earth. The norm of sufficiency is well addressed through efforts to promote energy conservation and efficiency. Solidarity and equity are enhanced as the burden of greenhouse gas emissions are reduced for future generations. Investments in renewable energy and energy efficiency should also improve the prospects for peace by increasing domestic energy supplies and by diminishing reliance on nuclear energy and the risks it poses. Finally, the norm of participation is expressed through individual acts of energy conservation and the prospect renewable energy technologies offer for decentralized power generation. Proponents claim millions will benefit from the boom of new jobs in the renewable energy sector.

There are certainly areas of concern, however. Since renewable energy sources currently provide so little supply both nationally and globally, will they have the capacity to meet demand with an adequate and sufficient supply in the future? Access to affordable energy sources is vital to human well-being. There are also concerns about the environmental consequences of some approaches to renewable energy production. For example, corn-based ethanol currently requires large amounts of fossil fuel inputs, is water intensive, and increases the risk of soil erosion. Debates also whirl around whether the cost of new renewable energy technologies will have a regressive impact on the poor and possibly plunge national economies into recession. Finally, aesthetic concerns are rising as more and larger wind turbines occupy greater swaths of land.

With this general assessment in mind, we turn now to explore the potential of specific alternative and renewable energy sources in greater detail.

Energy Conservation and Efficiency offer the U.S. the most substantial and immediate ways to maximize supplies and decrease annual greenhouse gas emissions. Energy conservation taps the moral virtue of frugality and seeks to make wise use of God's precious energy resources through behavioral changes in lifestyle practices. Energy efficiency utilizes available technology to use less energy to produce goods and services. Taken together, energy conservation and energy efficiency are vital hallmarks of good stewardship and a sustainable energy future.

The disruptions in oil supply and resulting price shocks during the 1970s triggered a national commitment to energy conservation and efficiency in the United States. During this period some of the nation's smokestack industries also moved offshore. As a result, per capita energy use has stayed about the same over the past thirty years while per capita economic output has increased 74 percent.[84] Compared to 1973, the U.S. saves more energy today than it produces from any single energy source, including oil.[85]

The potential to save even more energy in the future is significant. United States energy use per dollar of gross national product is almost double that of other industrialized countries.[86] Energy use per capita in the U.S. is twice that of citizens of countries in the European Union. The U.S. Department of Energy conservatively estimates that increased efforts at energy efficiency could cut national energy use by 10 percent in 2010 and approximately 20 percent in 2020. The American Council for an Energy-Efficient Economy more optimistically estimates that adoption of new policies and laws could lower national energy demand by 18 percent in 2010 and by 33 percent in 2020.[87] When these investments in energy efficiency are coupled with increased renewable energy generation, other studies indicate that the U.S. could cut in half the carbon dioxide emissions related to electricity generation by 2020.[88]

Cost-effective technologies exist today to reduce substantially energy consumption in all of the nation's energy sectors (industrial, commercial, residential, and transportation). Past experience reveals, however, that legislative action is key to achieving these gains. The disruptions in oil supply and resulting price shocks during the 1970s triggered a national commitment to energy conservation and efficiency in the United States. Acting in a bi-partisan manner, Congress drafted the nation's first Corporate Automotive Fuel Economy (CAFE) standards that President Richard Nixon signed into law in 1975. These standards required automakers to double the average fuel economy of cars from 13.6 miles per gallon (mpg) in model year 1974 to 27.5 mpg in model year 1985. Similar fuel economy standards were adopted for light trucks. As a result, U.S. oil imports dropped from 46.5 percent in 1977 to 27 percent in 1985.[89]

Unfortunately this trend did not continue. The 27.5-mpg standard for cars remained the same after 1985, and the standard for light trucks only increased from 20 mpg in 1989 to 21.6 mpg in 2006.[90] As a result, U.S. fuel economy standards have lagged well behind virtually all other industrial countries. In Japan, new vehicles must achieve approximately 46 mpg, in the European Union the figure is 37 mpg, and even China's standard of 29 mpg exceeds the current U.S. average.[91]

Recently, however, President George W. Bush signed into law the Energy Independence and Security Act, which included the first major increase in the nation's CAFE standards in more than twenty years.[92] In contrast to the initial CAFE legislation that resulted in a 100 percent increase in fuel economy**,** the new legislation mandates only a 40 percent increase over thirteen years. Automakers will have to increase the combined average fuel economy of cars and light trucks from 24.5 mpg today to 35 mpg in 2020. Under this law, U.S. oil imports should be reduced by 1.2 million barrels per day and level off at approximately 10 million barrels per day in 2030, instead of continuing to grow beyond 12 million barrels per day.[93]

While legislative action can increase the number and variety of energy efficient products in the marketplace, consumers do not have to wait to invest in energy efficiency or to practice energy conservation. Trading in a sedan that gets 24 miles per gallon in combined city and highway driving for a hybrid sedan that gets 36 miles per gallon improves energy efficiency by 50 percent and cuts related greenhouse gas emissions in half. These gains can be further increased if citizens conserved fuel by choosing to drive fewer miles every year. Similar gains can be made by reducing energy consumption in the buildings in which we live and work. The American Institute of Architects reports that the energy consumed to heat and power buildings across the United States produces 48 percent of the nation's greenhouse gas emissions.[94] Adjusting thermostats, sealing leaks, installing insulation, and investing in more efficient lights, appliances, furnaces, and air conditioners could substantially reduce energy consumption in our homes and business settings.

There is no question that energy conservation and efficiency represent the least expensive and largest "source" of energy in the United States. They also offer the fastest way to reduce the nation's carbon footprint and greenhouse gas emissions. While reduced consumption could reduce economic activity, this should be offset by the acquisition of more efficient goods. Energy conservation, in particular, is one area where we don't have to wait for the government to exercise greater responsibility. Each and every one of us can exercise greater personal responsibility by being better stewards of energy by practicing energy conservation and investing in energy efficiency. The ecojustice norms and energy guidelines compel us to make energy conservation and energy efficiency personal and national priorities.

Solar energy also offers enormous potential. Every day the sunlight that reaches Earth provides 2,850 times more energy than human communities currently consume.[95] This energy can be utilized in a variety of ways with different technologies. Residential solar thermal collectors capture and store the sun's energy in water. According to a study by the Department of Energy, these systems could provide half of the space heating and 65–75 percent of the hot water needs for U.S. homes.[96]

Concentrated solar thermal collectors are often located in desert regions and produce high-temperature heat for industrial processes or steam that can be used to generate electricity. A recent report indicates that seven states in the southwestern region of the U.S. could use concentrated solar power to produce ten times more electricity than is produced from all sources in the nation today. While it currently costs 9–12 cents per kilowatt hour to produce electricity in this manner, costs are expected to decline to 4–7 cents per kilowatt hour by 2020.[97]

Solar chillers use thermal energy to cool and dehumidify air like conventional air conditioners. This new technology has been successfully demonstrated and will likely make major inroads in the near future.[98]

Photovoltaic (PV) cells are the most visible solar energy technology, and their installation is growing rapidly around the world. These cells convert sunlight into electricity and can be utilized in a variety of scaleable applications. They are often the least expensive way to bring electricity to remote locations, but most PV installations today are connected to the electricity grid. Global production of PV cells has grown sixfold since the year 2000, rising largely in response to public policies in Japan and Germany, which seek to encourage their use. According to a study by the International Energy Agency, PV could meet 55 percent of U.S. electricity demand.[99] One of the drawbacks to PV production is that the cells are constructed with toxic chemicals and heavy metals. These materials are used widely in the semiconductor industry, however, where new techniques are emerging to reduce the environmental and safety risks.

Wind energy is being converted into electrical energy by wind turbines at a record pace in the United States and around the world. In recent years only natural gas-fired power plants have added more capacity to the U.S. power grid than have wind farms.[100] The U.S. has led the world in wind energy installations since 2005.[101] Even with turbine and component prices rising with global demand, installations with an excellent wind resource can often generate electricity at a lower cost (3–5 cents per kilowatt hour) than natural gas-fired power plants.[102]

The U.S. wind resource is distributed around the nation, but the most abundant winds are in the Great Plains region. Theoretically North Dakota, Kansas, and Texas together could furnish the U.S. with all of the electricity it consumes.[103] The

Department of Energy estimates that the U.S. off-shore wind resource could support as much generating capacity as currently exists in all of the nation's coal-fired, natural gas, and nuclear power plants.[104]

One of the main drawbacks to wind power, as with solar, is its intermittent nature. The wind industry is vigorously exploring storage options so that wind energy can be dispatched on an hourly basis rather than just when the wind blows. Another important drawback concerns the lack of transmission capacity. While there is plenty of wind resource in the nation, too often the wind farms that harvest this energy are long distances from major metropolitan centers and thus require the construction of new transmission lines. Public resistance to the construction of new transmission lines is hampering the construction of a smarter grid that can handle the flows of energy from new wind farms.

Some oppose new transmission lines because they fear the electromagnetic fields in these lines may have an adverse effect on human health, but there is no dispute that the combustion of fossil fuels is definitely having an adverse effect on human health today and that this will only get worse in the future.[105] Others oppose the construction of large wind farms for aesthetic reasons, but the impact of wind turbines on the landscape pales in comparison to the ravages of mountaintop coal mining or the dangers posed by global warming. Finally, while there has been increased avian mortality associated with early turbine designs and the unwise siting of a few wind farms in migratory bird flyways, studies indicate that the vast majority of avian mortality is caused by housecats, vehicles, cell phone towers, and birds flying into windows.[106]

Biomass energy accounts for nearly half of the renewable energy currently produced in the United States. Biomass energy takes two primary forms. Biopower is produced when agricultural and forestry residues are used to generate heat and power. Biofuels are produced when the energy in crops and other plants are fermented into transportation fuels. When the feedstocks for biopower and biofuels are grown and harvested sustainably, biomass energy is truly renewable and carbon neutral. This is because the carbon dioxide that is released had previously been absorbed from the atmosphere by the plants.

The forest products industry is the largest producer of biopower. It burns forest residues to produce heat and electricity. At other sites around the nation, crop residues and switchgrass are burned with coal to produce electricity, thus reducing the net emission of carbon dioxide. Studies indicate that up to 15 percent of all coal could be replaced with biomass if upgrades are made to coal-fired power plants. Still another use of biomass is to capture methane from the decomposition of organic matter found in landfills, sewage treatment plants, and livestock facilities. Using this methane to produce heat or power is much wiser and more lucrative than letting this potent greenhouse gas enter the atmosphere.

Corn-based ethanol is currently the largest source of biofuel in the nation. The industry has grown rapidly in response to government incentives and market forces. It has been a boon to many farmers because corn prices have risen almost 50 percent in recent years.[107] It has also benefited rural communities because just one ethanol facility that produces forty million gallons per year can inject $140 million into the local economy.[108] Today, approximately 20 percent of the U.S. corn harvest is utilized for ethanol production, and that percentage is rising.[109] The Government Accountability Office projects that 30 percent of the nation's corn crop may be devoted to ethanol production by 2012.[110]

There are many problems with corn-based ethanol production, however. Almost all corn in the nation is planted, fertilized, cultivated, and harvested with machinery powered by fossil fuels. The fermentation and transportation of corn-based ethanol is also fossil-fuel intensive. As a result, burning corn-based ethanol in gasoline tanks only lowers greenhouse gas emissions by 13 percent.[111] There are also other environmental problems. The production of ethanol is water-intensive and thus puts significant stress on local groundwater resources; it can also produce significant air and water pollution. Finally, there is good reason to fear that soil erosion will increase as rising prices encourage farmers to plant corn in some of the thirty-five million acres currently set aside for soil and wildlife conservation.[112]

Economically, the increased use of corn for transportation fuel is driving up the cost of grain for livestock producers as well as the cost of food in grocery stores. Globally, grain prices have reached their highest levels in a decade. As a result, the United States is purchasing about half the grain it bought to distribute as food aid in 2000.[113] The United Nations Food and Agriculture Organization warns that rising food prices and reduced food supplies are increasing the likelihood for social unrest in developing countries.[114] In 2006 the rapidly increasing price of tortilla flour led to riots in some parts of Mexico.[115] Recently, the United Nations special rapporteur on the Right to Food called for a five-year moratorium on the production of first-generation liquid biofuels made from food crops such as corn, wheat, palm oil, and rapeseed.[116]

Obviously there are serious problems associated with the way biofuels are currently being produced in the United States. Even if the entire corn crop were devoted to ethanol production, it would only produce 12 percent of the gasoline we consume. Devotion of the entire soy bean crop to biodiesel production would only replace 6 percent of the nation's diesel consumption.[117] Key to biofuel production in the future will be new feedstocks and conversion technologies. While important technological challenges still need to be overcome, the potential of cellulosic ethanol is large because it produces ethanol from portions of plants not used for food and also from fast-growing trees and perennials like switch grass. Studies indicate that one third of the nation's current petroleum demand could be satisfied if cellulosic ethanol becomes commercially viable.[118]

There is clearly a great need for alternative fuels but the norm of precaution needs to be exercised, especially when genetic engineering is employed to develop new crops for biofuel production. Just as government incentives to spur corn-based ethanol production have had unforeseen and deleterious consequences, so too could genetic engineering of biofuels feedstocks if this research is not conducted carefully and regulated closely.

Hydropower is the second largest source of renewable energy in the U.S., producing 7 percent of the nation's electricity supply. The vast majority of this power comes from several large dams along major rivers in the western and eastern regions of the country. One advantage these facilities have over other power plants is that the amount of electricity can be increased or decreased relatively easily by adjusting the amount of water released to the turbines. This flexibility is important when accommodating the intermittent production of other renewable energy sources like solar and wind.[119] A major disadvantage of large hydropower projects, however, has been their toll on fish habitats, especially in the Pacific Northwest.

Remarkably, only 3 percent of the 80,000 dams in the U.S. are used to generate electricity. The Department of Energy reports that hydropower capacity could be doubled in the U.S. by installing generators at some of the dams that do not have them, and by installing more generators at dams that already are producing electricity. A significant share of this electricity could be generated at smaller hydroelectric dams that were taken out of production decades ago when their productive capacity was eclipsed by large coal-fired and nuclear power plants.[120]

Geothermal energy taps into heat from the center of the Earth, which is nearly as hot as the surface of the sun. Geothermal power plants tap some of this heat to create steam that powers turbines. The U.S. leads the world in geothermal electric power capacity installed at plants in four western states, but the Geothermal Energy Association estimates that this capacity could grow tenfold by the year 2025.[121] Other reports estimate that up to 20 percent of the nation's electricity could be produced by geothermal power plants by 2030.[122] Some of the drawbacks to the industry have been the high costs and risks associated with drilling, but new techniques are beginning to reduce these factors. In addition, while small amounts of carbon dioxide and hydrogen sulfide are often released, these emissions pale in comparison to those emitted by coal-fired power plants.

While the best geothermal power sources are located in the West, all areas of the U.S. are suitable for geothermal heat pumps. These pumps utilize the constant temperature of earth or groundwater near the surface of the ground as a heat source in winter and a heat sink in summer to regulate indoor temperatures. Heat pump sales are growing at about 15 percent a year and could expand further if this technology were routinely incorporated in the construction of new homes and buildings.[123]

Marine energy makes use of the waves, tides, and currents of the oceans that cover 70 percent of the planet. Since seawater is eight hundred times as dense as air, even small movements of seawater contain significant amounts of energy. Globally, wave energy is estimated to be equivalent to present world energy demand. Nationally, the Electric Power Research Institute estimates that near-shore wave resources in the U.S could generate eight times more electricity than all of the nation's hydroelectric dams. Unfortunately, few wave energy devices have been tested.

Historically the most common form of marine energy has been tidal power, which involves using dams to trap water in a bay or estuary and then releasing it through turbines at low tide. Tide mills were common in Western Europe during the Middle Ages but fell out of favor during the coal-fired Industrial Revolution. Today efforts are underway to recapture the energy contained in tides, waves, and currents. Tidal projects in New York City's East River and in the Puget Sound near Tacoma have the potential to power thousands of homes in these cities but they are still at the experimental stage. Marine energy is currently not cost-competitive with any of the nation's renewable or non-renewable energy sources.[124]

Hydrogen may be the ultimate alternative and renewable energy source because it is the most abundant chemical element in nature. One of the challenges, however, is that hydrogen does not exist in large quantities in its pure form; it has to be separated from water, ammonia, or even fossil fuels before it can be used as a fuel source. This is an energy-intensive process. The use of fossil energy to do this work results in greenhouse gas emissions. The only way to make hydrogen a truly clean energy source is to use renewable energy to reform the hydrogen, and this is expensive. Nevertheless, once reformed, the hydrogen can be used in a fuel cell to produce electricity with water as the only emission, or it can be burned in an internal combustion engine. Other challenges remain, however. The platinum used in current fuel cell designs is in limited supply and expensive. Another challenge revolves around the safety of hydrogen storage. As the smallest chemical element, hydrogen easily escapes from most containers and is highly flammable. These production, storage, safety, and cost issues will all have to be resolved before hydrogen can become the fuel of the future.

Conclusion

This ethical assessment of the major energy options facing U.S. policy makers reveals three important truths. First, the potential supply of renewable and alternative energy sources far exceeds current and projected demand. God has truly furnished creation with energy in abundance. The second truth, however, is that the United States still relies heavily on fossil

fuels and nuclear power to provide 93 percent of the energy we currently consume. We are not living sustainably in relationship with God's creation. This leads to the third, sad truth: Our reliance on these traditional energy sources poses grave dangers to justice, peace, and the integrity of creation. In fact, we find ourselves at a pivotal moment in history with regard to global climate change. Scientists warn us that global greenhouse gas emissions need to be reduced 80 percent below 1990 levels by the year 2050 in order to avert catastrophic consequences associated with global warming.

The challenge we face is daunting. The temptation to despair is real. Only God can give us the power to change. Our Reformed tradition reminds us that it is God who created the earth and saw that it was good, God who sustains the earth and seeks to hold its processes together, God who judges sin and greed, and God who reveals in Jesus Christ that love and justice are the essence of God's power. God is the inexhaustible source of energy for personal, social, and ecological transformation. Although we are complicit in the evils we face, we can repent of our own sinful misuse and abuse of the Earth as we confess our sins. As recipients of God's endless mercy, this redemptive energy frees and empowers us to be good stewards of God's creation.

Energy choices, more than ever, are moral choices. As our planet grows warmer, our Christian witness must become bolder. As individuals, families, congregations, and church administrative bodies, we must become the change we want to see in our nation. We must put our own houses in order even as we call on our nation to accept its moral responsibility with regard to energy policy and climate change. Together we must radically reduce our carbon footprint.

Two years ago, the 217th General Assembly (2006) of the Presbyterian Church (U.S.A.) voted to "strongly urge all Presbyterians immediately to make a bold witness by aspiring to live carbon neutral lives."[125] Carbon neutrality requires us to reduce energy consumption that releases carbon dioxide into the atmosphere and to purchase carbon offsets to compensate for those carbon emissions that cannot yet be eliminated.[126] The appendix and recommendations that accompany this study emphasize the importance of carbon neutrality for all expressions of the Presbyterian Church (U.S.A.).

Faced with the nexus of issues related to energy policy and climate change, and guided by the ecojustice norms and energy guidelines, Christian stewardship is expressed in three major areas of responsibility. Our witness begins at the personal level, must be reflected in the practices and priorities of all organizations in our church, and culminates in our advocacy for changes in public policy at all levels of government. The accompanying document makes specific recommendations for the 218th General Assembly (2008) regarding each of these areas of responsibility.

Appendix I

Carbon Neutrality and the PC(USA)

Presbyterians can set an important example of stewardship by not only minimizing our energy consumption, but also by pursuing a carbon neutral lifestyle. This can take many forms. For example, funding the installation of energy efficient products and photovoltaic cells in lower income countries or communities helps to reduce emissions of greenhouse gases while also improving the well-being of those in these regions; similarly, replanting trees in deforested areas removes carbon from the atmosphere and restores farmland and nature. When Nobel Prize-winner Wangari Maathai of Kenya, founder of the Greenbelt Movement, preached in 2004 to her long-time friends in the White Plains Presbyterian Church in suburban New York, she invited all Presbyterians to join in that practical and very participatory work of planting belts of green trees around encroaching deserts. Thus the voluntary adoption of a carbon-neutral lifestyle can be justified on fairly self-interested grounds, but contributions can also be understood to be participation in a movement of social restoration, even a form of communal redemption that goes against the materialistic grain.

There are many ways to calculate the carbon footprint of an individual or business, but one of the best calculators is available at the website of the U.S. Environmental Protection Agency: http://www.epa.gov/climatechange/emissions/_ind_calculator.html. Prudential choices in household energy management and personal transport can greatly reduce greenhouse emissions as well as other pollutants while also saving money. Perhaps the most vivid example is in the case of household lighting. The cost of compact fluorescents has dropped drastically due to technological advances and economies of scale. The replacement of twenty 100-watt incandescent bulbs with new compact fluorescent bulbs would reduce a typical family's carbon dioxide emissions by approximately 2.5 tons each year and save them around $100. It is possible for a family to reduce another 1.2 tons of carbon dioxide emissions each year by increasing insulation, tuning up of a furnace, and installing energy efficient showerheads. Additional energy savings are realizable by purchasing Energy Star appliances and fuel-efficient or hybrid vehicles. Energy conservation can be practiced by using mass transit or ride-sharing more often, and also by walking or biking to places you would ordinarily drive.

As with One Great Hour of Sharing offerings in Lent, frugality with regard to our energy consumption can yield savings sufficient to buy carbon offsets for the emissions we still produce. Although the U.S. has not taken responsibility for its greenhouse gas emissions, a tool does exist in tax law for climate protection. United States tax-exempt charitable groups qualifying under section 501(c)(3) of the Internal Revenue Code can arrange carbon offset purchases from groups such as Climate Care or Native Energy, and gifts to them designated for such purposes should ordinarily be tax deductible for those itemizing deductions in federal tax returns and for many state and local income taxes as well. A Presbyterian Energy Fund would operate within these already tested guidelines, as our church and others already run designated-use funds of many kinds at relatively low administrative cost. A Presbyterian Energy Fund could help congregations and other organizations in our church reduce their carbon footprint through investments in energy efficiency and through the purchase of carbon offsets from reputable sources.

Additional resources related to living a carbon neutral lifestyle are available on the Restoring Creation program website, http://www.pcusa.org/environment/restore.htm, and the website of the Advisory Committee on Social Witness Policy: http://www.pcusa.org/acswp/wwd/energy.htm. For a list of carbon offset providers by state, consult the website for the U.S. Environmental Protection Agency's "Green Power Program," http://www.epa.gov/grnpower/. Congregations, presbyteries, and synods interested in purchasing "green power" from renewable energy facilities developed on American Indian/Native American reservations should consult the Native Energy website, http://www.nativeenergy.com/.

Endnotes

1. This study document was commissioned by the Advisory Committee on Social Witness Policy and produced by the Reverend Dr. James B. Martin-Schramm, Professor of Religion at Luther College in Decorah, Iowa.

2. All biblical citations are from the New Revised Standard Version.

3. European Renewable Energy Council and Greenpeace International, *Energy Revolution: A Sustainable World Energy Outlook,* January 2007, p. 60, accessed online July 10, 2007 at http://www.greenpeace.org/raw/content/new-zealand/press/reports/global-energy-report.pdf.

4. Terry Tamminen, *Lives Per Gallon: The True Cost of Our Oil Addiction*, (Washington, DC: Island Press, 2006), p. 13.

5. Energy Information Agency, *Short-Term Energy Outlook—July 2007,* accessed online July 23, 2007, at http://www.eia.doe.gov/emeu/steo/pub/a4tab.html.

6. Evan Harrje, *The Real Price of Gasoline,* (Washington, DC: International Center for Technology Assessment, 2000), cited in Tamminen, *Lives Per Gallon,* p. 59.

7. Energy Information Administration, *World Proved Reserves of Oil and Natural Gas, Most Recent Estimates,* January 9, 2007, accessed online July 23, 2007, at http://www.eia.doe.gov/emeu/ international/reserves.html.

8. National Petroleum Council, *Facing the Hard Truths About Energy*, July 2007 pre-publication draft, Executive Summary, p. 25, accessed online July 20, 2007, at http://www.npc.org/.

9. George W. Bush, "State of the Union Address by the President," January 31, 2006, accessed online July 23, 2007, at http://www.whitehouse.gov/stateoftheunion/2006/.

10. Intergovernmental Panel on Climate Change (IPCC), Fourth Assessment Report: The Physical Science Basis (Geneva: IPCC Secretariat, February 2007), pp. 11–14, accessed online July 7, 2007, at http://www.ipcc.ch/SPM2feb07.pdf. This mean projection is for the fossil fuel-intensive A1F1 scenario, the worst of the six developed by the IPCC. Under this scenario greenhouse gas concentrations are projected to increase from approximately 430 ppm of carbon dioxide equivalent (C02e) in 2005 to 1,550 ppm C02e by 2100. Even under the IPCC's best case scenario (B1) greenhouse gas concentrations increase to 600 ppm C02e by 2100, which they estimate will lead to a warming of 3.2ºF by the end of this century—almost three times the rate of warming over the past 100 years.

11. Intergovernmental Panel on Climate Change, Fourth Assessment Report: Climate Change Impacts, Adaptation, and Vulnerability (Geneva: IPCC Secretariat, April 2007), p. 8, accessed online July 7, 2007, at http://www.ipcc.ch/SPM6avr07.pdf.

12. U.S. Climate Change Science Program, *The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity* (September 2007 public review draft), p. 7, accessed online September 12, 2007, at http://www.climatescience.gov/Library/sap/sap4-3/public-review-draft/sap4-3prd-all.pdf.

13. James Hansen, "Why We Can't Wait," The Nation, April 19, 2007, accessed online September 12, 2007, at http://www.thenation.com/doc/20070507/hansen. One month later Hansen said the following in the abstract of an article he jointly authored: "Recent greenhouse gas (GHG) emissions place the Earth perilously close to dramatic climate change that could run out of our control, with great dangers for humans and other creatures." See James Hansen, et al., "Climate Change and Trace Gases, Philosophical Transactions of the Royal Society, (2007) Vol. 365, p. 1,925.

14. Alister Doyle, "World Needs to Axe Greenhouse Gases by 80 Percent: Report," *Reuters News Service,* April 19, 2007, accessed online September 14, 2007, at http://www.commondreams.org/archive/ 2007/04/19/638/.

15. Kevin A. Baumert, Timothy Herzog, and Jonathan Pershing, *Navigating the Numbers: Greenhouse Gas Data and International Climate Policy,* (New York: WorldWatch Institute, 2005), pp. 31–33, accessed online September 29, 2007, at http://www.wri.org/climate/pubs_description.cfm?pid=4093# pdf_files.

16. Ibid.

17. Ibid, pp. 21–24. Per capita emissions of carbon dioxide equivalent in 2000. The world average was 5.6 tons; the average for developed nations was 14.1 tons; the average for developing nations was 3.3 tons.

18. This statement was jointly adopted by the Presbyterian Church in the United States and the United Presbyterian Church in the United States of America. See, *Minutes*, PCUS, 1981, Part I, pp. 122, 413–25; and *Minutes*, UPCUSA, 1981, Part I, pp. 42, 86, 293–306.

19. The Office of the General Assembly, *Restoring Creation for Ecology and Justice: A Report Adopted by the 202nd General Assembly (1990),* (Louisville, Ky.: The Presbyterian Church (U.S.A.), 1990). See http://www.pcusa.org/environment/restore.htm.

20. *Overture 02-57. On Revising the Denominational Policy on the Issue of Energy* (*Minutes*, 2002, Part I, pp. 72 and 596).

21. The Advisory Committee on Social Witness Policy has developed an accompanying set of recommendations regarding U.S. energy policy in the context of global warming and climate change for review and action at the 218th General Assembly (2008).

22. A resource paper produced by an ACSWP study group describes a number of these approaches in greater detail. The paper points to the need to shift all elements of the economy toward a model that minimizes "through-put" of all kinds rather than simply maximizing "output." See http://www.pcusa.org/acswp/wwd/energy.htm**.**

23. *Minutes*, 2006, Part I, pp. 895–96.

24. See Appendix I in the accompanying study document for more information about the concept of carbon neutrality and carbon offsets.

25. Terry Tamminen, Lives Per Gallon: The True Cost of Our Oil Addiction, (Washington, DC: Island Press, 2006), p. 13. But the mother of all subsidies to the oil industry, and the automakers who depend on it, occurs in the realm of defending the supply of petroleum itself. According to a summary of studies complied in 2001 by the New York Times, the United States had already been spending $25 billion a year on the military defense of oil-exporting countries in the Middle East.[i] The Bush administration will spend $98 million more to protect just one pipeline that delivers oil, bound for the United States, to a transportation terminal on the Columbian border with Venezuela, the Canon Limon oil pipeline, which is owned by Los Angeles-based Occidental Petroleum.[ii] Multiple estimates agree that the annual cost to U.S. taxpayers to defend our oil supply around the globe is between $55 billion and nearly $100 billion.[iii] This estimate does not include more than $100 billion spent each year in Iraq for the war in that country, at least some of which is attributable to securing oil.

    The sources used by Tamminen himself are as follows:

    [i] Rob Nixon, "A Dangerous Appetite for Oil," *New York Times,* October 29, 2001.

    [ii] Ruth Morris, "U.S. Aims to Stem Pipeline's Flow of Trouble," *Los Angeles Times,* February 6, 2002.

    [iii] *The Hidden Cost of Oil* (Washington, DC: National Defense Council Foundation, October 2003); and Evan Harrje, *The Real Price of Gasoline* (Washington, DC: International Center for Technology Assessment, 2000); and Mark Mazzetti and Joel Havemann, "Bush's Bill for War is Rising," *Los Angeles Times,* February 3. 2006

26. Ibid, p. 22.

27. Energy Information Administration, *International Energy Outlook 2007,* accessed online July 20, 2007, at http://www.eia.doe.gov/oiaf/ieo/world.html.

28. Jeff Goodell, *Big Coal: The Dirty Secret Behind America's Energy Future* (New York: Houghton Mifflin Company, 2006), p. xii.

29. Ibid, p. xx.

30. Ibid, p. 122.

31. Centers for Disease Control, *Second National Report on Human Exposure to Environmental Chemicals,* 2003. Cited in Jeff Goodell, *Big Coal,* p. 135.

32. SupportLIHEAP.org, accessed online July 20, 2007, at http://www.supportliheap.org/.

33. Energy Information Administration, *Short-Term Energy Outlook—July 2007,* accessed online July 23, 2007, at http://www.eia.doe.gov/emeu/steo/pub/a4tab.html.

34. U.S. Census Bureau, *U.S. International Trade in Goods and Services—2006,* Exhibit 17, "Imports of Energy-Related Petroleum Products, Including Crude Oil, accessed online July 23, 2007, at http://www.census.gov/foreign-trade/Press-Release/current_press_release/exh17.pdf.

35. Evan Harrje, *The Real Price of Gasoline,* (Washington, DC: International Center for Technology Assessment, 2000), cited in Tamminen, *Lives Per Gallon,* p. 59.

36. Energy Information Administration, *World Proved Reserves of Oil and Natural Gas, Most Recent Estimates,* January 9, 2007, accessed online July 23, 2007, at http://www.eia.doe.gov/emeu/ international/reserves.html.

37. Estimate of civilian deaths since the start of the war (73,264–79,869) provided by IraqBodyCount.org, accessed online September 20, 2007, at http://www.iraqbodycount.org/; estimate of coalition military fatalities (4,089) provided by iCasualties.org, accessed online September 20, 2007, at http://icasualties.org/oif/; estimate of Iraqi police and security force deaths (7,451) provided by iCasualties.org, accessed online September 20, 2007, at http://icasualties.org/oif.

38. Statement of Milton R. Copulus, president, National Defense Council Foundation, testifying at a hearing, "The Hidden Cost of Oil," before the Committee on Foreign Relations of the U.S. Senate, March 30, 2006, p. 5.

39. National Petroleum Council, *Facing the Hard Truths About Energy,* July 2007 pre-publication draft, Executive Summary, p. 25, accessed online July 20, 2007, at http://www.npc.org/.

40. George W. Bush, "State of the Union Address by the President," January 31, 2006, accessed online July 23, 2007, at http://www.whitehouse.gov/stateoftheunion/2006/.

41. Energy Information Administration, *U.S. Imports by Country of Origin,* accessed online February 25, 2007, at http://tonto.eia.doe.gov/dnav/pet/pet_move_impcus_a2_nus_ep00_im0_mbbl_m.htm.

42. National Petroleum Council, *Facing the Hard Truths about Energy,* p. 8.

43. Statement of Hillard Huntington, Executive Director, Energy Modeling Forum, Stanford University, testifying at a hearing, "The Hidden Cost of Oil," before the Committee on Foreign Relations of the U.S. Senate, March 30, 2006, p. 13. Recent price increases have not yet triggered a recession because energy efficiency has made energy costs a smaller percentage of the nation's gross domestic product.

44. Alexander Vershinin, "Russia to Control Gas Out of Central Asia," *The Washington Post,* May 13, 2007, p. A16, accessed online July 23, 2007, at http://www.washingtonpost.com/wp-dyn/content/article/2007/05/12/AR2007051201394.html.

45. Intergovernmental Panel of Climate Change, Fact Sheet for "Climate Change 2007," accessed online July 24, 2007, at http://www.ipcc.ch/press/factsheet.htm.

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47. Ibid, pp. 4–6.

48. Ibid, pp. 10–13.

49. Intergovernmental Panel on Climate Change, *Fourth Assessment Report: Climate Change Impacts, Adaptation, and Vulnerability* (April 2007), pp. 7–9.

50. The Office of the General Assembly, *Restoring Creation for Ecology and Justice: A Report Adopted by the 202nd General Assembly (1990),* (Louisville, Ky.: The Presbyterian Church (U.S.A.), 1990). See http://www.pcusa.org/environment/restore.htm.

51. *Minutes*, 1990, Part I, p. 654, paragraphs 40.657–.659.

52. Ibid, Part I, p. 655, paragraph 40.671.

53. Ibid., Part I, p. 655, paragraph 40.675

54. Ibid, Part I, p. 656, paragraph 40.680.

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Item 09-11

[The assembly approved Item 09-11 with amendment. See pp. 54, 55.]

A Resolution to Study Immigration Detention in the United States

The Advocacy Committee for Women's Concerns (ACWC) recommends that the 218th General Assembly (2008) do the following:

1. Direct the Advisory Committee on Social Witness Policy (ACSWP) [, in consultation with the appropriate General Assembly Council (GAC) and Office of the General Assembly (OGA) ministries areas,] to

a. [~~study and monitor detention in relation to immigration in the United States, giving attention to the experiences of women and children detained and affected~~] [analyze the social witness policy of the PC(USA) regarding detention in relation to immigration in the United States, giving attention to the experiences of women and children detained and affected]; [and]

[~~b. explore the social witness policy of the PC(USA) regarding detention; and~~]

[~~c.~~] [b.] report its findings and recommendations to the 219th General Assembly (2010).

2. Urge the Office of General Assembly and General Assembly Council to

a. support the program work of the Office of Immigration Issues, and provide adequate financial support for the development of resources regarding detention and immigration; and

b. support regional study seminars across the church focusing on detention and immigration and promote these events with connectional structures as appropriate.

3. Direct the Washington Office and the Office of Immigration Issues to

a. partner with ecumenical and interfaith entities to build/join in coalitions against detention; and

b. advocate for alternatives to detention.

Rationale

After spending two years studying immigration and its affect on women and children, ACWC recommends action. Detention happens throughout the country and in many communities. The stories are troubling. One was reported in the *Cleveland Plain Dealer*, November 9, 2007. Officials took a twenty-seven-year old woman in Conneaut, Ohio, into custody after