

ENERGY RESOURCES POLICY

I. Context..... 2

II. Global Climate Change and Energy Resource Depletion 4

III. Findings..... 6

IV. Transition to a Clean Energy Future..... 7

V. The Essential Role of Energy Conservation 9

VI. Protecting Environmental Values and Communities..... 10

VII. Energy Resources and the Transition to a Clean Energy Future..... 11

 A. Energy Efficiency 11

 1. Clean, Efficient Vehicles 11

 2. More Efficient Transportation Modes 11

 3. More Efficient Communities – in both new and existing development footprints..... 11

 4. Building and Appliance Efficiency Standards 12

 5. Clean Energy Funding 12

 6. Distributed Generation..... 12

 B. Resources Preferred by the Sierra Club 13

 1. Community Renewables, Distributed Generation 13

 2. Onshore and Offshore Wind 14

 3. Central Station Solar 14

 4. Combined Heat and Power 14

 5. Low-Temperature Geothermal..... 14

 C. Resources Generally Acceptable to the Sierra Club 14

 1. New Small Hydroelectric Plants 15

 2. Ocean Energy Resources 15

 3. High Temperature Geothermal 15

 D. Bioenergy, Gas and Oil..... 16

 1. Bioenergy 16

 2. Natural Gas and Liquefied Natural Gas (LNG)..... 18

 3. Oil 18

 E. Resources Opposed by the Sierra Club 19

 1. Coal-Fired Power Plants 19

 2. Coal-to-Liquids, Oil Shale, Bitumen and Tar Sands 20

 3. Coal-to-Gas (Synthetic Natural Gas or SNG) and Coal-Bed Methane..... 20

 4. Nuclear Power Plants 20

 5. New Large Hydroelectric Plants..... 21

 6. Incineration of Municipal Solid Waste 21

 7. Landfill Gas to Energy Facilities 21

 8. New Electric Generating Units Powered by Natural Gas 22

VIII. Direction to Sierra Club Entities on Implementation of this Policy 22

I. Context

Our society now faces a fundamental challenge greater than any in history. Dependence on fossil fuels is causing global warming, the depletion of energy resources, and severe damage to human health and the environment. The impacts of burning fossil fuels threaten the security of our nation, the survival of species, and impairs the Earth's capacity to sustain life.

Converging events, including rising energy prices, increasingly powerful hurricanes and melting glaciers have raised growing concerns, and our national fossil fuel addiction leaves us dependent on imports from unstable regions of the world.

Responding to these changes before they overwhelm us is often described as requiring sacrifice and hardship. Instead, the Sierra Club believes the most effective response will rely on determination, forward thinking, and hard but rewarding work to achieve a stable global climate and a sustainable energy system. The Sierra Club's strategy reduces all forms of pollution, not just greenhouse gases, and promotes species protection, environmental justice and security.

Guided by the conservation ethic, the Sierra Club has crafted this comprehensive Energy Resources Policy to promote a positive vision of a sustainable energy future. The Sierra Club's clean energy strategy will wean us from oil, coal and other fossil fuels, minimize energy waste, work in harmony with natural systems, and define the technologies and smart energy solutions that will meet our nation's energy needs.

As these changes unfold, other important benefits will follow. For example, bringing home and work closer together through better land-use planning will not only save energy, but also build a greater sense of community and allow us more time to enjoy it.

The path to a sustainable energy future starts by promoting energy conservation, tapping the enormous resource of energy efficiency, directly reducing dependence on non-renewable fuels and maximizing the benefits of renewable energy. At the same time, energy efficiency and renewable energy will be the engine of new economic growth, saving money and creating jobs. The result will be lasting improvements for our economy and our environment, more livable communities, more productive manufacturing, less wasteful use of materials, and less pressure on the natural systems of the Earth that sustain us.

Increased conservation, energy efficiency and use of renewable resources will not happen through new laws and policy alone. While those are necessary, there also must be a fundamental shift in awareness, attitudes and values that connects directly to experience, learning and thoughtful consideration of a better way to live on our planet.

The Sierra Club's ranking of energy resources set forth in this policy provides initial guidance, but this roadmap is only a first step. The journey cannot be perfectly mapped out before we begin moving forward. The Sierra Club's strategy incorporates the best "no regrets" strategies for the economy and the environment, whether fossil fuel depletion and global climate change advance rapidly or not as quickly as expected.

Although this document often refers to the United States, the challenge we face is a genuinely global one, and confronting it requires efforts on an international scale. The Sierra Club will promote energy conservation and efficiency and the development of appropriate energy production alternatives described in this policy in a manner that builds a humane global society, honors human rights and dignity, and restores and protects the natural environment. All persons require safe and affordable sources of energy at levels sufficient to provide for human needs and sustainable livelihoods. This policy supports that goal with effective action.

II. Global Climate Change and Energy Resource Depletion

Human activities are rapidly increasing the total stocks of greenhouse gases in the atmosphere and causing measurable increases in global average temperatures and ocean acidity. To stabilize the Earth's climate, these increases must be halted and reversed.

Stabilization of the global climate is an urgent matter requiring an immediate and effective response. International scientific consensus, confirmed by the most respected national scientific bodies in the U.S. and worldwide, indicates that continuing "business as usual" for even a few more years will greatly increase the risk of harmful and irreversible climate change, affecting the productivity of natural systems, the survival of species, and the safety and well-being of all human societies on Earth.

Our society's actions will determine the level of eventual success. Starting quickly and decisively is the most important element in our climate stabilization strategy, because greenhouse gases emitted now will persist in the atmosphere and have effects for centuries to come.

Carbon dioxide (CO₂) is the most important greenhouse gas because it acts as the Earth's principal "climate control knob." Our civilization started emerging thousands of years ago when CO₂ concentrations rose to a stable level associated with a moderate global climate. But emissions from more than two centuries of fossil fuel use and deforestation have increased the level well beyond the safe climate limit.

Atmospheric CO₂ levels are now 390 parts per million (ppm) and rising fast, compared to 280 ppm in 1750. Under "business as usual," CO₂ concentrations could reach 700 to 1,000 ppm by the year 2100, creating runaway climate chaos.

As a result, the most important climate goal is to limit and reduce the total stock of CO₂ in the atmosphere as quickly as possible. In addition to dramatically reducing CO₂ emissions, other greenhouse gases and black carbon must also be reduced, and "green carbon" must be built up by capturing more airborne CO₂ through natural forest protection, reforestation and other efforts.

Even the current levels in the atmosphere are enough to create serious problems. Further greenhouse emissions will increase global average temperatures and dramatically expand climate impacts.

Confirming this, new research from around the world shows that climate change is coming at us faster and harder than seemed possible even a decade ago. Many leading climate scientists now believe that CO₂ should be reduced below 350 ppm within the next century in order to avoid severe climate disruption and irreversible tipping points.

As the nation with the largest historical emissions of greenhouse gases, the U.S. has a moral obligation to respond vigorously. The Sierra Club places primary emphasis on making substantial cuts in CO₂ emissions as soon as possible by moving beyond coal and oil, shifting to a clean and sustainable energy economy, reducing other greenhouse gases, and protecting forests and other lands to build “green carbon” and provide resilient habitats. There is no time to lose.

Fossil fuels contribute a large part of greenhouse gas emissions, but at the same time supplies of cheap and easily available oil, gas and coal are diminishing, leading the energy industry to explore and produce these resources from increasingly remote areas. This results in higher costs, more unconventional techniques and greater environmental damage.

Production of oil and gas in the U.S. using conventional drilling techniques has been in decline since the early 1970s, and the industry has turned increasingly to offshore production in the Gulf of Mexico, foreign sources of oil, and unconventional natural gas techniques such as coalbed methane. At the same time, new discoveries of oil and gas worldwide have been falling, and peak production globally may soon occur. The dependence of our society on these cheaply priced fossil resources, along with their impact on the global climate, accelerates the need to phase them out and turn to clean energy alternatives.

Together with the wide availability of renewable energy resources that can replace fossil fuels, the availability of very large energy savings through conservation practices and efficiency measures offers a substantial opportunity to decrease greenhouse emissions, improve the economy and protect the environment.

We can achieve a stable climate and sustainable energy system through continuous improvement in energy use, technology choice, and public policy, economic decision-making that fully incorporates environmental values and protects communities, and individual conservation commitments that every person can make.

III. Findings

The Sierra Club finds that:

A. Fossil fuel use is increasing carbon dioxide (CO₂) and other greenhouse gas emissions to levels that are changing our climate substantially, threatening human health and harming natural systems.

B. The current use of fossil fuels causes serious damage to public health. Nitrogen and sulfur compounds, soot, smog precursors, radionuclides, and toxic substances such as mercury from the combustion of coal affect the health of all people and contribute to tens of thousands of premature deaths in the U.S. each year. All too frequently this damage is concentrated locally, putting the health and livability of entire communities at risk.

C. Significant environmental damage is starting to occur from greenhouse gas emissions already in the atmosphere, and further emissions will accelerate the harm. Without immediate action to reduce these emissions, degradation of the world's climate and natural systems, including the risk of widespread habitat destruction and species extinction, will dramatically increase within our lifetimes.

D. If we are to minimize the risk of dangerous climate change, global average temperature increases must be stabilized at 1.5 degrees Celsius (2.7 degrees Fahrenheit), relative to pre-industrial levels. Many leading climate scientists now believe that CO₂ should be reduced below 350 ppm within the next century in order to avoid severe climate disruption and irreversible tipping points. The Sierra Club supports this emissions reduction target as an ultimate goal.

E. With less than 5% of the world's population, the United States produces 20% of the world's greenhouse gas emissions. Our nation has an obligation to lead the world in cutting fossil fuel use. Emissions of CO₂ per year in the United States must be reduced to at least 90% below the present (2011) by 2050. Other greenhouse gas emissions must likewise be reduced, and "green carbon" strategies to protect and enhance forests and other land-based carbon sequestration must be accelerated.

IV. Transition to a Clean Energy Future

The Sierra Club envisions that within this century the world energy system will use almost no fossil fuels, and will instead rely on the efficient use of abundant renewable energy from the sun, the wind, water, biomass, and the Earth's own heat. To achieve this, the nations of the world must immediately and decisively shift to building a clean energy future.

By 2050 the US must eliminate virtually all use of fossil fuels. Our fossil fuel emissions must be reduced as rapidly as possible. Different economic sectors can advance at different paces, with society having the most options to replace coal as an electricity source, and less flexibility for industrial processes that emit carbon directly, such as steel and cement.

The Club will also advocate for the following 2030 clean energy outcomes:

1. 100% carbon free in the power sector
2. 50% reduction in oil use in the transportation sector below 2005 levels.

The way forward will involve a transition period during which new and improved technologies are developed, old systems are replaced, and society moves toward a more sustainable structure. While there will be breakthroughs in technologies, policies and public attitudes, change must also come through incremental progress, because it takes time to replace existing infrastructure and practices.

Only a broad portfolio of options can achieve these ambitious objectives. The Sierra Club supports moving quickly to make a major reduction in CO₂ emission and build the momentum for much broader improvements. It may prove difficult to cut CO₂ much faster than a few percent per year, because doing so depends on many factors: the rate at which buildings and equipment can be upgraded or replaced, efficiency measures and renewable technologies can be developed and brought to market, and a shift from waste and overuse to conservation can occur. To accomplish this energy transition, the United States and the international community must take the following actions:

- Seek to change individual behaviors and attitudes about energy consumption.
- Adopt public and private policies that support significant reduction in energy usage.
- Invest in research and development of new technology.
- Emphasize efficiency as the most accessible and cost-effective way to reduce energy usage.
- Choose existing energy options that will reduce, and eventually eliminate, the use of fossil fuels and other sources of greenhouse gases, while recognizing that all energy use has adverse environmental consequences.
- Ensure the equitable availability and affordability of critical resources for all people, now and in the future.
- Remove subsidies, incentives and tax benefits for resources that create pollution and greenhouse gas emissions.
- Promote change in energy use and production in deference to the need for healthy ecosystems, protecting human health, and providing for environmental justice.

During this transition the Sierra Club will focus on three goals:

(1) **SUPPORT THE CLEAN.** Accelerate the development and market growth of sustainable, low carbon energy resources, including improving the efficiency and performance of buildings, vehicles, and industrial processes, and implementing distributed generation, community-scale, and utility-scale renewable sources.

(2) **ELIMINATE THE DIRTY.** Phase out environmentally damaging energy fossil fuel and nuclear technologies. Priority will be given to first eliminating the dirtiest, most damaging technologies such as coal and tar sands.

(3) **REGULATE ALL.** Ensure proper siting and effective regulation of all energy facilities.

During the transition, however, the pathway to carbon-free energy production by 2050 must be carefully prepared and encouraged. Unnecessary new barriers should not be created to the rapid deployment of energy efficiency and renewable energy.

Success also requires progress on a long list of concerns outside the scope of this Energy Resources Policy. These issues are addressed in existing and forthcoming Sierra Club policies. They include moving toward sustainable land use and agricultural practices, considering energy and carbon taxes and incentives, reducing ecosystem impacts from energy and fertilizer pollution, addressing a host of equity and environmental justice issues, and much more. In particular, because population relates to energy use and carrying capacity, every effort must be made to foster the social and economic changes that reduce population growth throughout the world and achieve a sustainable level.

Innovation in technology and methods of energy use is a key to achieving a sustainable energy future. Human ingenuity, imagination and strategic investment in research and development of new technologies will usher in a new energy era. However, experience shows that support for innovation must be tempered with thorough review of new practices and technologies to fully understand their life-cycle impacts and be able to respond to unanticipated consequences.

V. The Essential Role of Energy Conservation

Energy conservation is a top priority for the Sierra Club. Energy conservation – practices that reduce and eliminate unnecessary use of energy and materials – guides the Sierra Club in all our actions and energy source-related decisions. The Sierra Club is committed to an array of conservation and efficiency strategies that will reduce energy consumption.

Along with the savings generated by widely available renewable replacements for fossil fuels, the expected large energy savings from practices such as increasingly stringent vehicle fuel-efficiency standards offer the quickest and least expensive opportunity to decrease greenhouse gas emission, improve the economy and protect the environment. These savings will be achieved through a combination of individual action, public policy and business technology choices.

Americans collectively use more energy than any other nation, so we have the greatest opportunity and responsibility to conserve. Telecommuting, recycling, living closer to work, shopping, and recreation, and making more efficient use of vehicles, buildings and equipment are all examples of possible conservation actions by individuals. Improved community design, land use and transportation modes are examples of policy areas where conservation can be achieved.

The Sierra Club itself can provide a model for the energy use of our society as a whole. Sierra Club members are called upon to take action in their homes, workplaces and communities, and to minimize the energy impacts of their travel and transportation choices.

Individual commitments and actions must be accompanied by public and private sector policies that help reduce over-consumption of energy and materials and hasten the transition to a clean energy future.

Several of the preferred energy sources listed in Section VII can be located in communities, often on buildings or associated with industrial processes. As such they can share many attributes (minimal impacts, elimination of need for transmission, etc.) with building or process efficiency measures and may often be done as part of a combined project. Distributed generation is an obvious example, and active and passive solar design can be used to provide heating and cooling in residential and commercial buildings and can play a key role in industrial processes.

VI. Protecting Environmental Values and Communities

As the United States builds a clean energy economy and makes a rapid transition away from fossil fuels and nuclear power, the Sierra Club will both promote the transition and work to protect the natural environment and communities from avoidable negative impacts associated with even clean energy sources. As an equal priority to the deployment of clean energy, we must protect and restore wild places and build resilient habitats that can help species and ecosystems survive climate change.

Areas unsuitable for development by either commercial renewable energy projects or other energy projects should be identified, defended and protected.

Judging the protection appropriate for a particular site or area involves a complicated analysis involving numerous factors. In particular the degree to which the site has already been disturbed by agricultural practices and other forms of human development may be taken into account. The Club may require mitigation of the expected, negative impacts of the renewable energy installation a condition of support.

The Sierra Club opposes energy development on public and private lands and in waters that are currently protected by legislative or administrative designations or that the Sierra Club has proposed for special designation based on specific environmental or wilderness criteria. Exceptions are allowed only where the proposed development can be shown to have insignificant effect on the resources for which the special designation was, or would be, established. This overarching consideration applies to all energy resources covered in this policy.

VII. Energy Resources and the Transition to a Clean Energy Future

The Sierra Club analyzed available and potential energy options and ranked them according to the pollution they cause, their global warming emissions, their effect on the land, the energy used to produce them and the waste they create. The Sierra Club also assessed the ability of these options to reduce the use of fossil fuels, speed the transition toward an affordable energy economy and minimize damage to human health and natural systems. Many technologies and programs are ready to make a major contribution now, but others need time for significant research and development.

A. Energy Efficiency

Energy efficiency – using improved technology and operations to deliver the same energy services with less fuel – is the foundation on which all of our other recommendations are based. The efficiency programs outlined below can be implemented now and make a substantial, immediate contribution to reducing energy use and greenhouse gas emissions. Moreover, they can save money and provide high-quality jobs. Programs already exist in some states, but they must be expanded without delay. The Sierra Club identifies these key approaches for immediate action:

1. Clean, Efficient Vehicles

Decrease CO₂ emissions from passenger vehicles through a combination of electrification, more efficient engines and vehicle design, and if they can genuinely be produced sustainably, biofuels. Increase vehicle efficiency by raising standards for cars and light trucks to at least 60 mpg by 2025 and 143 grams/mile CO₂. Promote rapid expansion of electrification in passenger vehicles and truck fleets. Standards for the full range of trucks must continue to improve after the initial 2014-2018 standards. These standards must encourage hybrid and other advanced technologies.

2. More Efficient Transportation Modes

Adopt a concerted national program to enhance the rail system to shift freight and intercity passenger transportation away from highway use and aircraft. Railroads move freight much more efficiently than trucks and aircraft and moving freight from trucks to rail will reduce damage to existing roads. Transportation produces one-third of all CO₂ emissions in the United States. Effective and affordable transportation is essential to a modern society, so substantial changes will be needed to reduce energy use and dramatically decrease CO₂ and other greenhouse gas emissions. These changes must occur in four basic areas: vehicles, fuels, alternative modes and changes in travel patterns. The heavy transportation industry is very sensitive to energy prices and has already invested substantially in energy efficient trucks, trains, airplanes and watercraft.

3. More Efficient Communities – in both new and existing development footprints

The following policies should govern both new development and be applied wherever feasible to our existing developed areas:

Reduce the need to drive passenger vehicles by shortening the distance between workplace, home, shopping and school, using “smart growth” planning and improved transportation options. Provide safe and appealing options for walking, bicycling and mass transit, including light rail passenger trains, which will reduce vehicle trips, emissions, fuel consumption, and the demand for new roads and pavement. Well-designed mixed-use communities create long-term reductions in energy usage. Appropriately designed public transportation systems are an essential component of a sustainable energy society.

Appropriate pricing for parking and highway access and better planning for distribution of goods can also achieve energy savings. Congestion pricing should be applied, when feasible. Parking costs should be efficiently and conveniently unbundled to give consumers and employees more control over how they choose to spend their money. Expansion of alternatives is directly tied to land use and transportation planning, as shown in the success of new developments such as the light rail systems in many U.S. cities. For more details refer to the entire transportation policy at <http://www.sierraclub.org/policy/conservation/trans.aspx>

4. Building and Appliance Efficiency Standards

Adopt a three-step market transformation strategy: (a) significantly tighten building energy codes and appliance efficiency standards; (b) promote programs to encourage above-code energy efficiency and sustainable building construction such as the LEED program (Leadership in Energy and Environmental Design); and (c) develop mechanisms that spread the use of best practices going beyond current building energy codes.

5. Clean Energy Funding

Funding for energy efficiency incentives and assistance with financing are vitally important for wide deployment of energy efficiency. The Sierra Club supports providing revenues to well-managed energy efficiency programs, and to on-bill or other methods of financing for building owners, using utility revenues, government funding, tax credits, and other effective measures.

6. Distributed Generation

While distributed generation is discussed in Section B below, it is included here because it also can make a significant contribution to system efficiency. Distributed generation can reduce the distance needed for transmission and distribution of power to decrease transmission losses and improve grid stability and reliability. Many opportunities exist in our communities for the local, small-scale application of renewable technologies (such as rooftop solar) or the efficient use of waste heat from fuel use (combined heat and power).

B. Resources Preferred by the Sierra Club

The Sierra Club prefers the following energy supply options. Combined with conservation and efficiency measures, these resources have the greatest potential to decrease greenhouse gas emissions, contribute to a stronger economy, and reduce environmental damage and harm to human health. Our society should seek maximum reliance on these technologies. It is especially important to provide support for renewable energy resources through the use of renewable portfolio standards, advanced renewable tariffs, public benefit funding, tax-based incentives, feed-in tariffs and other policy tools at the local, state and national level to promote these renewable energy resources.

Most of these preferred resources are renewable electricity generation sources which can have significant environmental impacts. Within the context of general support for prompt development of all these types of preferred energy sources, the Sierra Club will endeavor to reduce their environmental impacts through improved siting and other forms of mitigation. For some individual cases the Sierra Club may determine that adverse impacts are of such a degree that it will oppose the particular project unless the impacts are reduced. (See Section VI above.)

Decisions to oppose a specific facility in a preferred resource category must be justified with a detailed description of the significant environmental harm. When the Sierra Club opposes a particular project in the preferred category, it should always make clear that opposition is based on the location or other project-specific characteristics, and that the Sierra Club generally supports reliance on these energy resources.

Difficult and complex judgments may be necessary to determine whether or not a particular renewable energy project is sited too poorly or otherwise has unacceptable impacts. However, the Sierra Club is certain that failure to develop a broad, geographically diverse suite of these preferred renewable resources will cause irreversible harm to the natural values we care about.

Before the Club takes a position on a project, whether to support or to oppose, it will consult with its campaigns and the appropriate chapters or other local entities. As appropriate, it may be helpful to outline specific procedures for this consultation from time to time.

1. Community Renewables, Distributed Generation

Many opportunities exist in and adjacent to our communities for the local, smaller-scale application of renewable technologies (such as rooftop solar). Distributed clean energy involves the entire community in energy solutions, and reduces transmission impacts and disruptive transmission bottlenecks. The Sierra Club supports properly sited and designed local and district energy projects, and calls for measures to ensure that local, smaller-scale projects have access to the transmission and distribution system. Because distributed generation generally takes place in an urban or otherwise developed environment, serious siting problems or unacceptable environmental impacts are uncommon.

Small-scale photovoltaic (PV) electric power and solar thermal heating systems are already used widely. On-site solar can provide substantial residential and commercial energy even in high latitudes and cloudy climates, and reduces transmission and land use requirements. Active and

passive solar design and siting can be used to provide heating and cooling in residential and commercial buildings and can play a key role in industrial processes.

2. Onshore and Offshore Wind

Wind power is widely available and the industry has matured rapidly in the last decade. While output from individual wind turbines varies based on daily and seasonal weather, at the regional scale wind power is a clean, consistent, reliable and safe energy resource. The Sierra Club strongly supports direct use of wind energy.

Wind energy systems may have noticeable visual impacts and can disturb sensitive or endangered plants and wildlife. Existing wind energy systems with significant impacts on avian and bat populations should be modified to mitigate those impacts; if modifications prove to be ineffective, turbines should be curtailed or dismantled. Locations with lesser impacts should be sought for new projects. Offshore sites may have access to a superior wind resource, but may disturb coastal and marine environments. In general, the environmental impacts of wind energy systems should be reduced through careful technology choice, siting, reliable pre-construction monitoring, and operations. The Sierra Club supports further research, both general and site-specific, and development of new technologies, to minimize and mitigate impacts of wind energy systems. (The Sierra Club's Wind Siting Advisory contains further guidance.)

3. Central Station Solar

There are several types of utility-scale solar electric generation including photovoltaic, high-temperature concentrating solar trough and tower systems, and low-temperature solar thermal. Solar energy is well matched to daily and seasonal energy demand. As costs continue to drop, solar generation will become a prominent national energy resource.

4. Combined Heat and Power

Efficient CHP systems produce both electricity and steam or other useful heating or cooling services, providing the most value and least pollution from a fuel source. Use of the waste heat from industrial processes decreases on-site energy requirements for grid power and may provide off-site supply. In conjunction with smart development of city and town centers, district energy systems can provide both electricity and usable heat. Note: Sierra Club support for CHP does not change our opposition to coal-fired power plants.

5. Low-Temperature Geothermal

Low-temperature geothermal energy uses the Earth's own heat for building and district heating and cooling, and can be provide an effective residential and neighborhood energy supply.

C. Resources Generally Acceptable to the Sierra Club

Resources in this category should play a role in a clean energy future, but they have larger potential environmental costs than resources in the preferred category. Sierra Club entities may support or remain neutral on projects employing these technologies. Sierra Club entities always may oppose an inappropriate site or project. Since the resources in this category are less desirable technologies, criteria may be more restrictive than for preferred resources. However, when the Sierra Club opposes a particular project, it should always be made clear that opposition

is based on the location or other project specific inadequacies, and that the Sierra Club generally supports further reliance on these energy resources.

1. New Small Hydroelectric Plants

Small-scale hydroelectric projects can produce power from water stored behind a dam for regulated flow, use the natural streamflow without an impoundment (“run of river”), or divert the flow through a pipe or canal. Microhydro is generally considered to be up to 100 kilowatts of capacity, and small hydro is up to 10 megawatts.

While significant numbers of sites could be developed for small-scale hydro, each site must be considered for its local and cumulative effects on water quantity and quality, minimum streamflow, habitat, and fish passage. All installations must provide full mitigation for any detrimental effects. Some stream segments should not be developed at all in order to preserve the benefits of free-flowing rivers. The Sierra Club opposes installations in stream segments proposed for listing as federal or state Wild and Scenic Rivers or in roadless areas.

The Sierra Club generally does not support small-scale hydro development requiring new dams and impoundments. Retrofit of existing dams that are unlikely to be removed may be appropriate provided river impacts are minimized and both upstream and downstream fish passage addressed. Run-of-river and channel diversion projects must minimize river impacts and provide fish screening, and minimum streamflows must be maintained in the natural channel.

There is a modest but meaningful amount of potential to generate electricity by adding hydropower to existing dams. Where this is feasible and the existing dams are not problematic or likely to be removed soon, the Sierra Club supports these developments.

2. Ocean Energy Resources

Ocean energy includes tidal power, wave power, ocean current power, and thermal energy projects. The ocean energy resource is very large, widely available and renewable, but the available technologies for capturing the energy are still in development and their environmental impacts are not well characterized, but could potentially affect marine and coastal resources. Careful development with tight controls over siting and operation will be necessary for commercial-scale facilities.

3. High Temperature Geothermal

Geothermal energy is a resource with almost no greenhouse gas emissions. For conventional hydrothermal (steam or hot water) resources, modern re-injection designs nearly eliminate toxic emissions, particularly hydrogen sulfide, and sustain the resource for far longer. Since geothermal resources are often associated with significant surface features such as geysers, volcanoes and hot springs, and tend to be in sensitive areas, siting criteria are crucially important. The potential for geothermal energy from hot dry rock resources is much larger than hydrothermal resources, but the technology to extract energy from these resources has not developed beyond the pilot stage.

D. Bioenergy, Gas and Oil

Many of these fuels pose major environmental problems, and are neither categorically supported nor categorically opposed. Detailed guidance follows.

1. Bioenergy

Biomass energy (or “bioenergy”) is the use of organic materials to be burned for heat and/or electric power, or converted to liquid fuels (often called “biofuels”).

Bioenergy must be considered in its broad environmental context, not merely as a one-for-one fossil fuel substitute. Many claims for the “sustainable” and “carbon neutral” nature of bioenergy are untrue.

Biofuels from sustainable feedstocks using appropriate production technologies and facilities can be an important ingredient in a clean energy future. Inappropriately located, poorly regulated or excessively large biofuel facilities can easily create environmental problems greater than those they solve. Air pollution, water pollution, land degradation, health impacts and the increased direct and indirect emissions of greenhouse gases are all serious risks. Despite these serious downsides, biofuels from sustainable feedstocks using appropriate production technologies and facilities may be an important ingredient in a clean energy future.

General Bioenergy Pathways

The environmental balance sheet for each specific bioenergy pathway (source, process, use) must take a full life cycle view and then be compared to the alternatives.

The Club will oppose bioenergy proposals which reduce total carbon storage on large landscapes with the promise that these will later be replaced. Bioenergy is only acceptable if it produces net carbon gains in the short term as well as the long term. A bioenergy proposal whose purpose is to encourage carbon storage in a more stable state could be supportable, such as removing accumulations of highly flammable small-diameter wood from a forest, thus protecting and encouraging the growth of large fire-resistant trees which provide more sustainable long term carbon storage.

The Club opposes further deployment of corn-based ethanol based on its extremely dubious net carbon benefits and its unresolved direct and indirect environmental impacts. The Club also opposes proposals to use agricultural waste and residue products (e.g., corn stover) without rigorous evidence that the material being used is surplus to the needs of soil health and fertility.

The Club opposes all bioenergy generation projects that:

- (a) Threaten the wild forest characteristics of old growth, native or roadless areas on national, state or private land forests.

(b) Rely upon ecologically destructive clearcutting, in situ chipping where excessive amounts of biomass are being removed from the land, or involve conversion of native forests to non-native species.

(c) Jeopardize fully functioning forest ecosystems on public or private lands, or interfere with ongoing restoration of ecosystems with native plants and animals, or with the protection of biological corridors.

(d) Are scaled beyond the reliably available, environmentally sustainable feedstocks.

(e) The Sierra Club opposes all commercial logging on federal public lands, regardless of the stated purpose of the logging. Personal firewood permits for individuals are not considered commercial logging.

Ensuring Sustainable Feedstocks

Feedstocks based on native, perennial polycultures are likely to be more environmentally sustainable than those based on introduced annual monocultures.

Excessive scale for a particular biofuel is likely to encourage reliance on unsustainable feedstocks. Biodiesel fabricated from waste cooking oil is a generally beneficial biofuel use, but has very limited scalability. Palm oil for energy fuel has become a major environmental and human rights threat, particularly in tropical regions where palm oil plantations have replaced native forest.

Landscapes producing critical ecosystem services – habitat, watershed, carbon storage – should not be converted for bioenergy at the cost of these services.

Evaluation must include indirect land use impacts: will the development of a particular feedstock cause land conversion in other locations to replace displaced food, fodder or fiber production?

Project-Specific Evaluation

Individual projects must be individually assessed for their environmental impacts.

Even for the same source material, bioenergy collection and production methods have very different effects. For example, burning woody biomass in high-efficiency boilers to create electricity is a completely different process than converting it into cellulosic ethanol. The direct and indirect air, water and greenhouse emissions must be assessed, including the fossil fuel inputs for biomass transportation and processing.

If biomass is used to co-fire coal power plants or other utility-scale projects, the effect on toxics, greenhouse gases, life extension of coal use and other factors must be rigorously assessed.

For end-of-cycle and waste materials such as construction and demolition debris, alternatives to bioenergy feedstock including reuse and recycling must be assessed.

2. Natural Gas and Liquefied Natural Gas (LNG)

The Sierra Club's goal is to develop and use as little natural gas as possible and to wean ourselves from most fossil fuels, including natural gas, as swiftly as possible and by no later than 2050. Our strong preference is to replace existing nuclear and coal plants with clean renewable energy whenever possible, not natural gas.

While natural gas may burn cleaner than other fossil fuels, it is still a fossil fuel and it is far from clean. Natural gas exploration, production, and transportation causes significant damage to communities and ecosystems, including air and water pollution, surface disturbance, and waste disposal impacts. The production, transport and burning of natural gas remains a significant source of CO₂ and methane. (See separate hydrofracking policy and environmental siting criteria.)

The Sierra Club supports the expeditious development and enforcement of strong and robust federal and state safeguards that cover each step in the natural gas lifecycle, including the extraction, transport, and combustion stages. Pollution and other environmental damage must be eliminated or reduced to levels sufficiently low to assure protection of local communities and ecosystems. Natural gas developers should not be allowed to proceed with development until safeguards are put in place, which credibly assure protection of communities and ecosystems. The natural gas industry should not be exempted from any federal, state or local environmental, disclosure or safety laws and regulations. States should be required to monitor gas development to limit environmental damage and be adequately funded to enforce all safeguards. Unsuitable areas should be placed off limits to development.

LNG has a higher carbon footprint than natural gas due to the energy required to compress, transport and decompress the fuel, and is often produced under very poor environmental regulation. LNG should be used only where domestic gas or renewable energy cannot be made available to meet demand and phased out as swiftly as possible.

The Sierra Club opposes poorly-sited LNG terminals and connecting pipelines with serious environmental impacts or major public safety threats. The Sierra Club also opposes imported LNG from any existing gas fields with unacceptable environmental practices or human rights abuses, or from frontier gas fields. To the extent possible, LNG facilities should obtain gas that otherwise would be flared at existing oilfields. In general, onshore siting is less preferable than offshore siting for both safety and environmental protection reasons, and closed loop processing is preferred over open loop because it substantially reduces the volume of intake water and minimizes the temperature change in the effluent. The Sierra Club supports concurrent state and regional planning to determine the need for new LNG facilities, and shared federal, state and local siting authority for both offshore and onshore facilities. The Sierra Club opposes the export of LNG.

3. Oil

The Sierra Club seeks to phase out our dependence on oil as swiftly as possible, with most forecast oil demand replaced by 2030 with a combination of higher vehicle efficiency, mass transit, electrification, sustainable biofuels, pricing, telecommuting, biking, walking and other conservation measures. The Club will oppose the most damaging types of oil production – tar sands and oil shales, drilling in protected areas and other pristine lands, and opening new areas to offshore drilling, particularly in deep water or frontier fields.

The Sierra Club supports the expeditious development and enforcement of strong and robust federal and state safeguards that cover each step in the oil lifecycle, including the extraction, transport, and combustion stages. Pollution and other environmental damage must be eliminated or reduced to levels sufficiently low to assure protection of local communities and ecosystems. Oil developers should not be allowed to proceed with development until safeguards are put in place which credibly assure protection of communities and ecosystems. The oil industry should not be exempted from any federal, state or local environmental, disclosure or safety laws and regulations. States should be required to monitor oil development to limit environmental damage and be adequately funded to enforce all safeguards. Unsuitable areas should be placed off limits to development.

The Sierra Club opposes any development of new “frontier” oil fields, especially in pristine areas such as the Arctic National Wildlife Refuge. Oil from foreign sources, especially from politically unstable areas, jeopardizes security and distorts both foreign and domestic policies.

The Sierra Club strongly supports the longstanding moratorium on exploration and production on the Outer Continental Shelf of the east and west coast of the U.S., the coast of Alaska, and the Florida Gulf Coast. We also join the Sierra Club of Canada in support of moratoria off the Canadian coasts.

E. Resources Opposed by the Sierra Club

The Sierra Club generally opposes additional development of these resources, and supports phasing out existing uses quickly during the clean energy transition. Sierra Club entities may support public policy proposals that include these resources only if they find that the overall balance of the proposal strongly favors efficiency, renewable energy and greenhouse gas reductions, and that the environmental impacts are insubstantial. The Club will support research designed to minimize the environmental impacts of these technologies if funding is not disproportionate to more promising technologies.

1. Coal-Fired Power Plants

The Sierra Club is campaigning to end coal use no later than 2030. Coal provides less than 45% of the electric power in the U.S.; coal-fired power plants alone are responsible for about 10% of global greenhouse gas emissions. The U.S. has the largest coal reserves in the world and an ethical obligation to ensure that it does not increase greenhouse emissions and other harmful impacts of its reliance on coal.

There is no such thing as “clean coal.” The coal fuel cycle, from mining to coal sludge impoundments and disposal of tailings and fly ash, causes extensive pollution of air, water, land, the food chain, and local communities. Damage is caused by all forms of mining, whether underground, longwall or the various forms of “mountaintop removal.” While toxic and particulate emissions are significantly lower in new coal fired power plants, and regulation and legal action have forced the retrofit of some older facilities, the industry has consistently undermined efforts to reduce the worst polluting practices and avoided responsibility for cleanups.

Mountaintop removal coal mining must be stopped immediately, and other existing harmful mining practices such as long wall mining must be significantly improved or banned as coal burning is phased out.

New attempts at carbon capture and storage may at some point in the future showcase that it is possible to capture the carbon dioxide, compress it, and pump it underground into permanent repositories. No approach currently exists to do so on a commercial basis. Due to the possibility that coal (as well as other fuels that generate CO₂) may continue to be used for more than the next decade, and the importance of reducing its CO₂ emissions, any research efforts on effective CCS technologies should focus on demonstrating whether it is feasible at an affordable cost, recognizing that energy efficiency and renewable power is cheaper and cleaner

2. Coal-to-Liquids, Oil Shale, Bitumen and Tar Sands

Increasing gasoline prices have revived interest in unconventional techniques to convert coal, oil shale and bitumen into liquid fuel. Such conversion operations require substantial fossil fuel inputs (usually natural gas), spoil land permanently, consume large quantities of water, and unavoidably create substantial pollution in addition to the pollutants and greenhouse gases from the use of the fuel. The Sierra Club strongly opposes all of these dirty fuels.

3. Coal-to-Gas (Synthetic Natural Gas or SNG) and Coal-Bed Methane

While gas produced from coal is cleaner than coal when combusted for power or heat, the lifecycle process to produce gas from coal has huge negative impacts on land and water resources and communities. Also the amount of carbon dioxide and other pollutants (SO_x and NO_x) produced during the lifecycle of various coal-to-gas technologies make these fuels unacceptable. The Club also opposes all coal-bed methane (CBM) production, a very destructive gathering method that forces gas and groundwater out of seams of associated coal.

4. Nuclear Power Plants

Nuclear power produces less CO₂ than fossil alternatives but more than energy efficiency and most forms of renewable energy on a life cycle basis. But nuclear power is not safe, affordable, or clean with currently available technology and practice. Mining uranium risks workers' health and creates toxic residues. All current plant designs are complex, prone to accidents and have severe security vulnerabilities. Nuclear waste transportation, storage and disposal problems remain unsolved. The industry is heavily subsidized by public subsidies, incentives and liability

shielding everywhere it operates, dependencies that dramatically increased in recent federal legislation. The nuclear fuel cycle increases weapons proliferation and risk among nations and non-state entities.

The Sierra Club will continue to oppose nuclear power unless these deficiencies are eliminated. While it is possible that a different approach to nuclear power might substantially address these issues, the likelihood is remote given the decades of research and investment already made. Clean energy resources are sufficient to address climate change and are cheaper than nuclear power. In addition, the huge investment to bring additional nuclear facilities online would siphon capital from much more cost-effective uses of financial resources, especially investments in efficiency.

Existing nuclear plants should be frequently inspected and thoroughly monitored. They should be retired upon the expiration of their licensed operating period, and should be shut down immediately if significant safety, security or environmental threats are found. It is imperative for spent fuel from operating nuclear plants to be moved into safer temporary storage and for an effective long-term storage strategy to be developed as quickly as possible.

5. New Large Hydroelectric Plants

While few if any large hydro sites still remain for development in the U.S., Canadian sites that could serve the U.S. market are being actively explored. Of additional concern are efforts in developing countries, often with the support of international finance institutions, to build large dams in the few remaining natural sites. The well-known drawbacks of large hydro include inundation of large natural areas, substantial damage to fish and wildlife, interference with fish migration and reproduction, and displacement of human and natural communities. Some reservoirs fill up prematurely and are rendered useless for power generation due to siltation. There is also evidence that large dam impoundments, especially in the tropics, emit significant amounts of methane and CO₂. The Sierra Club strongly opposes the construction of new large hydroelectric dams.

6. Incineration of Municipal Solid Waste

The Sierra Club strongly opposes combustion of municipal solid waste. It has proven impossible for industry to develop a combustion process, even with a large biomass proportion, that does not produce unacceptable toxic and hazardous air emissions. Combustion of biomass or wood waste even with a dedicated acceptable fuel supply is problematic because economic pressures on plant operators may cause them to accept solid waste when the intended fuel is in short supply. For more details and background see:

(<http://www.sierraclub.org/policy/conservation/municipalsolidwaste.pdf>.)

7. Landfill Gas to Energy Facilities

The Sierra Club opposes establishment of new Landfill Gas to Energy (LFGTE) facilities, and conversion of existing facilities to LFGTE technology, except at facilities that have completed the process of separating all organic materials from the waste stream going to the landfill,

permanently covered the cells being used to generate methane, and adopted best management practices to minimize methane generation inside the covered cells. The Sierra Club finds that LFGTE facilities operated under current practices very likely are net contributors to greenhouse gas emissions.

8. New Electric Generating Units Powered by Natural Gas

The Sierra Club opposes new electric generating units powered by natural gas, including peaking and combined cycle units. Consistent with the Board's goal of eliminating all fossil fuels from the electric sector no later than 2030, it is critical that the US avoid further high-capital investments in new natural gas plants and related infrastructure.

VIII. Direction to Sierra Club Entities on Implementation of this Policy

All actions and statements by Sierra Club entities with regard to energy policy and facilities shall be in furtherance of and consistent with this policy. This policy takes precedence over any earlier energy policies, guidelines, advisories or positions.

Adopted by the Sierra Club Board of Directors, September 16, 2006; amended February 21, 2009; May 16, 2009; July 25, 2011; November 21, 2014; October 22, 2015; April 21, 2016.