Appendix to UN Statement

UN General Assembly Interactive Thematic Dialogue

Energy Efficiency, Conservation and New and Renewable sources of Energy

Energy systems should safeguard the environment

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This Appendix provides further information on the energy efficiency and renewable energy strategies that should be incorporated as the foundation for sustainable development and as the groundwork for a reliable energy portfolio consistent with growing global demand.

Energy Efficiency

Aggressive deployment of energy efficiency measures can be expected to reduce the world's projected energy needs in 2050 by one third, with associated reductions in GHG emissions. Energy efficiency can be achieved on a broad scale through comprehensive efficiency standards for appliances, and efficiency requirements incorporated into building codes and transportation. With respect to capital requirements, most energy efficiency measures pay for themselves over time through the savings generated by reduced energy consumption. For utilities investing in energy efficiency, for example, the costs can be recovered by holding customer bills constant and using the cost savings from reduced consumption to pay for the energy efficiency measures.

Appliance Standards: Adoption of appliance standards can produce significant reductions in energy use while saving consumers and businesses billions of dollars. The International Energy Agency estimates, for example, that switching to the best, most energy efficient appliance technologies would save at least 40% of residential electricity consumption in most appliance categories. With respect to the U.S. experience, appliance standards had reduced U.S. electricity use in 2000 by approximately 88 billion kWh and reduced U.S. total energy use by approximately 1,200 trillion Btus, representing savings of 2.5% and 1.3% of U.S. electricity and energy use in 2000, respectively. With respect to peak generating needs, appliance standards produced a reduction of approximately 21,000 MW — equivalent to displacing seventy 300 MW power plants. Over the preceding 10-year period, standards produced reductions to consumer energy bills by approximately $50 billion. As old appliances and equipment wear out and are replaced, savings from existing standards will steadily grow. By 2010, savings will total more than 250

billion kWh (6.5% of projected electricity use) and reduce peak demand by approximately 66,000 MW (a 7.6% reduction).

Building Codes: Approximately 43 percent of the CO_2 emissions from fossil fuel combustion in the U.S. are the result of energy services such as lighting, appliances, and heating and cooling systems in commercial, industrial, and residential buildings. There is a vast potential for emission reductions simply by increasing energy efficiency in buildings. A recent study by McKinsey & Company finds that fully developed efficiency technologies could provide between 710 and 870 megatons of emissions annual abatement potential (in CO2-equivalents) by 2030 *at negative costs*—saving money while reducing emissions. Examples of these technologies include lighting retrofits; improved heating, ventilation, and air conditioning systems; building envelopes; higher performance appliances and electronic equipment; and use of advanced information and communication technologies to monitor and optimize energy use in buildings.

Lighting: Semiconductor-based light-emitting diodes (LEDs) use much less power than traditional bulbs, do not contain mercury like fluorescents, and they last for years, sometimes even decades. The Department of Energy has estimated that LEDs could reduce national energy consumption for lighting by 29% by 2025. That would save U.S. households $125 billion on their electric bills.

Industrial Processes: Industrial process efficiency is affected by a number of factors: technology design, age and sophistication of equipment, materials of construction, mechanical and chemical constraints, inadequate or overly complex designs, and external factors such as operating environment and maintenance and repair practices. Processes typically use a lot more energy than the practical minimum energy that is required. Technologies under development focus on removing or reducing process inefficiencies, lowering energy consumption for heat and power, and reducing the associated greenhouse gas emissions. In the U.S., for example, the industrial sector consumes approximately one-third of energy use and accounts for 28 percent of domestic GHG emissions. Much of this energy is used in processes that are common across numerous industries. By developing and promoting technologies that can be applied in many industrial settings across the most energy-consuming manufacturing processes, significant energy efficiency savings can be captured and thereby achieve corresponding GHG emissions reductions.

Combined Heat and Power (CHP): CHP, also known as cogeneration, is the concurrent production of electricity or mechanical power and useful thermal energy (heating and/or cooling) from a single source of energy. CHP is first and foremost an energy efficiency resource, as it allows users to produce needed electricity, heat, and mechanical energy while using as little fuel as possible. As an efficiency technology, CHP can lower overall energy demand, reduce reliance on traditional energy supplies, make businesses more competitive, cut GHG emissions, and reduce the need for infrastructure improvements. Because of its inherent efficiency, performance, and reliability, CHP is an effective near-term solution that can address a nation's current and future energy needs. CHP is a type of distributed generation, which, unlike central station generation, is located at or near the point of consumption.

District Energy Systems: District energy systems can integrate multiple energy users within the same energy infrastructure as efficiently as possible by relying on CHP technology or renewable fuel sources, such as geothermal or biomass. District energy systems in the United States, for example, have served up to 400 customer buildings; the technology is highly beneficial to densely clustered establishments like universities or industrial compounds. These systems also can achieve massive economies of scale, as they can employ an optimal, diverse fuel selection at any given time that otherwise would be economically unfeasible or technically impossible, thereby providing benefits directly to customers in the form of enhanced energy efficiency, avoided capital costs, consistently reliable energy service, and decreased power demand. In Denmark, 60 % of all households are heated with district heating, and half of all electricity is produced by CHP.

Renewable Energy Sources

The displacement of expensive fossil-fired sources with renewable energy sources provides cost savings, promotes more diversity in the fuel supply, achieves dramatic reductions in GHG emissions, and can eliminate crippling dependence on foreign sources of petroleum. An additional feature of renewable energy is the ability to deploy these technologies on a smaller, more localized scale (referred to as

“distributed generation”), which offers the opportunity for capacity building within local communities. Large, central generating stations, on the other hand, r

Hydro: Hydroelectric power or hydropower is generated by kinetic power of flowing water as it moves. Generally, there are three types of hydropower facilities: impoundment, diversion, and pump storage. Micro hydro plants can produce as little as 100 kilowatts, while large hydro facilities can exceed 1000 MW. China is currently the leading hydropower producer in the world, with 172 million kW of installed capacity, with plans to increase this figure to 300 million kW by 2020. A distinct advantage of hydropower is its load-following ability, *i.e.*, the water is run through the turbines to generate electricity as needed. Hydro projects can have adverse environmental impacts, such as fluctuation in water quality and flow, and affect biodiversity as a result of loss of land and natural habitat. Fish populations can also be adversely affected if they cannot migrate past impoundment dams to spawning grounds or cannot access the ocean. A large dam can also cover land and river habitat with water displacing human populations.

Emerging Water Power Technologies: Marine and hydrokinetic devices offer the potential to capture energy from waves, tides, ocean currents, and the natural flow of water in rivers, as well as marine thermal gradients, without building new dams or diversions. Ocean currents, for example, contain a remarkable amount of kinetic energy and have potential worldwide capability.

Geothermal: Electricity and other forms of power can be created from hot gases escaping near the Earth's surface. Additionally, this hot water can be piped directly into buildings and factories for heat. Worldwide, geothermal power is being generated in more than 20 countries including Canada, Iceland,