PROGRAMMATIC ENVIRONMENTAL ASSESSMENT

FRONT END FINANCING FOR COMBUSTION TURBINES PURCHASED BY GENERATION & TRANSMISSION BORROWERS AND INTERPRETATION OF 7 CFR §1794.15

ENGINEERING AND ENVIRONMENTAL STAFF
RURAL UTILITIES SERVICE

DECEMBER 2000

PROGRAMMATIC LEVEL ANALYSIS OF CERTAIN ENVIRONMENTAL EFFECTS OF COMBUSTION TURBINES, AND INTERPRETATION OF 7 CFR §1794.15

EXECUTIVE SUMMARY

1.0 Purpose

This programmatic analysis, in accordance with the National Environmental Policy Act (NEPA), is designed to reconcile Rural Utilities Service (RUS) procedural requirements for environmental analysis with the emerging needs of a deregulating electric utility industry. Increasing demand for electricity combined with a lack of new generation and retirement of obsolete plants has produced acute shortages and price spikes in some areas of the country.

To better manage power supply needs and to prudently hedge their exposure to power market risks, RUS generation and transmission (G&T) borrowers and others have turned to combustion turbine (CT) technology. Technological advances during the 1990s produced significant improvements to economic and operational efficiencies of CTs. Nearly 90 percent of new electricity generating capacity between 1997 and 2020 is projected to be combustion turbine technology fueled by natural gas or both oil and gas (See, EIA Annual Energy Outlook 2000).

In contrast to base load generating plants, construction and installation of CT plants typically have much shorter lead times (18-36 months) and generally cost much less. Rather than being custom constructed on site, CTs are assembled in a factory, delivered to the site substantially complete, and then are installed. CTs are not meant to be operated continuously, but rather, to meet peak load requirements. Thus, CT emissions are more infrequent and generally lower than base load facilities that are designed to run continuously.

Unlike custom built generating resources, CTs are "off-the-shelf" products that are essentially identical in the details of acquisition, installation and operation at any given power rating. These common characteristics lend themselves to a common, i.e., programmatic, assessment of many of the environmental effects associated with such power plants. These common characteristics and range of sizes also make it easier for power suppliers to match their needs more closely as CT modules can be added incrementally. The environmental effects of the installation of a CT on a particular site are, of course, site specific and often unique. The evaluation and resolution of those issues often determine the ultimate siting of the CT.

It is common for a power supplier to order a CT and make progress payments during its fabrication long before the site for the CT has been selected or even identified. This is partially explained by the fact that power suppliers often have alternative sites on which to install the CT in the event that an environmental review process for the preferred site leads to a different outcome. In the unlikely event that a power supplier is unable to find any suitable site for a CT that it has ordered, it may assign or otherwise liquidate its position rather than incur significant losses. By proceeding with the siting process in parallel with the fabrication of the unit, the power supplier is able to address the growing needs for an adequate and reliable supply of electricity on a more timely basis than if the power supplier proceeded sequentially.

In order to assure a reliable and affordable power supply for rural America, RUS plans to advance funds to make progress payments on an otherwise eligible CT project while the site selection process for that CT project is pending. Any funds being requested for site development work or installation of the CT would, if approved, be conditioned upon the borrower meeting all other environmental requirements, including completion of a RUS site specific environmental review. RUS will not advance any funds for the site development or installation of any CT unless and until RUS has completed its environmental analysis of the specific site and determined that such site is acceptable.

2.0 RUS Actions

Except for site specific issues, CTs present a set of common environmental issues. CTs use similar technology, have similar environmental impacts, have the same alternatives and otherwise raise the same environmental review questions. Except for site-specific issues, RUS has found performing individual environmental reviews for each CT is needlessly redundant and does not contribute to better environmental decisionmaking. Therefore, RUS plans to address environmental issues common to all CTs in this programmatic level analysis. RUS will perform site-specific environmental review and analyses on each proposed CT when presented with proposed siting alternatives. This tiered approach is practicable, reduces paperwork and delay and fosters better decision making (See 7 CFR §1794.16).

Along with programmatic level environmental analysis, this document offers guidance to RUS borrowers on the scope of actions permissible under 7 CFR §1794.15 that they may take pending completion by RUS of the second analytical tier, i.e., the site specific environmental analysis.

3.0 Conclusions

This analysis finds that considering the similar characteristics of most CTs and the limited reliable and affordable alternatives presently available for addressing rural America’s needs for peaking and intermediate supplies of electricity, RUS should tier its environmental analysis of CTs because it is practicable, reduces paperwork and delay, and produces better decision making. This programmatic analysis considers common characteristics and alternatives. RUS intends to consider on a case-by-case basis as they arise, whether the installation or operation of any particular CT on its proposed site will result in any significant environmental impacts. In making such individual determinations, RUS will consider the findings and requirements of other governmental entities having jurisdiction over the siting, development and operation of the CT and reserves the right to update this programmatic analysis to take additional information into account or develop particular elements of the analysis more fully as may be warranted in individual circumstances. Ordinarily, however, the analysis contained in this document will be incorporated either in its entirety or in part by reference in any further RUS analysis of particular CT projects.

In determining which loan applicant activities may proceed in connection with CTs before RUS completes the second tier of its environmental review, RUS has determined that 7 CFR

§1794.15 permits an applicant to take all appropriate actions necessary to assure timely acquisition of CTs. Generally, during this period, applicants will take actions that do not have an adverse impact and do not preclude the search for alternatives, e.g., site acquisition, executing a purchase contract for a CT, making manufacturer's progress payments, and site planning and design. As contrasted with site development or project construction, which may have adverse environmental consequences, these purchase, planning and design activities clearly do not. Nor do the expenditures for these permissible activities preclude the search for alternatives. CTs are fungible, in limited supply, and have a broad worldwide market. In the unlikely event that an applicant can find no environmentally suitable site on which to locate a CT or otherwise changes its plans, commercially reasonable alternatives exist to effectively "unwind" the transaction in the case of a CT that has not yet been installed.

RUS believes that in the event that the proposed CT is not approved by the Administrator, the amount of unrecoverable losses which an applicant would consequently absorb would not jeopardize the Government's security interest in existing assets or otherwise compromise the objectivity of RUS review. In such an eventuality, RUS expects that even in a worse case scenario the applicant would incur only a modest cancellation charge as the manufacturer could reasonably be expected to sell the CT to another purchaser for a similar price. Given the current demand for CTs, at least for some time to come, it appears that a proactive applicant may be able to assign its purchase rights or otherwise transfer its rights in the CT to a third party and completely avoid losses. Accordingly, these pre-installation expenditures will not compromise RUS objectivity.

In a deregulated electricity market, failure to take prudent steps to acquire reasonably priced, reliable power supply resources in a timely manner exposes RUS borrowers, Rural Electrification Act (RE Act) beneficiaries, and RUS to unacceptably high levels of market risk and thereby frustrates the objectives of the RE Act. This tiered analysis and interpretation is fully consistent with NEPA and eliminates unnecessary procedural delays, costs and risks.

PROGRAMMATIC LEVEL ANALYSIS OF CERTAIN ENVIRONMENTAL EFFECTS OF COMBUSTION TURBINES, AND INTERPRETATION OF 7 CFR §1794.15.

TABLE OF CONTENTS

1.0 Purpose and Need

1.1 RUS Requirements for G&T Cooperatives

1.1.1 RUS Financial Assistance

The RUS Electric Program provides leadership and capital to upgrade, expand, and replace the rural American electric infrastructure. Under the authority of the RE Act of 1936, as amended, RUS makes direct loans and provides for loan guarantees to electric utilities to serve customers in rural areas. The Federal Government, through RUS, is the majority note holder for nearly 700 systems. Since the start of the program, RUS has approved approximately $57 billion in debt financing to support electric infrastructure in rural areas. About $28 billion in such debt remains outstanding and is owed to RUS.

1.1.2 General Environmental Requirements

Certain financing actions taken by RUS are classified as Federal actions subject to compliance with the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321-4346) (NEPA), the Council on Environmental Quality (CEQ) Regulations for implementing the Procedural Provisions of NEPA (40 CFR Parts 1500–1508), and RUS Environmental Policies and Procedures (7 CFR Part 1794). Approval of a financial assistance application from an electric program borrower is an action subject to environmental review by RUS (7 CFR §1794.3). The level of RUS environmental review a proposal receives is based on the classification system contained in 7 CFR Part 1794, Subpart C. Also, borrowers are, and will remain, subject to additional Federal, state and local permitting requirements. These requirements include without limitation, zoning, siting, noise, air quality, and water discharge permits.

Construction of most new RUS financed combustion turbine generation projects is classified under 7 CFR §1794.24(b) as normally requiring an environmental assessment (EA). Proposals in this category are subject to the requirements of 7 CFR Part 1794, Subpart F. Subpart F generally provides for public involvement, construction and operation monitoring and mitigation measures, evaluation of alternatives and consultation with appropriate Federal, state, and local agencies having jurisdiction.

Recognizing the importance of siting, the regulations distinguish between CTs placed on new sites (green fields) or on existing sites (brown fields). See 7 CFR §1794.24. Scoping hearings are normally held for proposals to install CTs of more than 50 MW at a new site, but existing sites do not require such hearings unless more than 100 MW is planned to be installed. Regardless of capacity, the regulations further distinguish between CT generating resources and other generating resources, by specifically excluding them from the list of types of generating resources that normally require an EIS. See 7 CFR §1794.25(a)(1). Pursuant to 7 CFR § 1794.7(a), RUS has issued RUS Bulletin 1794A-601 for additional guidance in preparing environmental reports for proposed actions that normally require RUS to make an environmental assessment of its actions.

In 7 CFR §1794.15, RUS regulations state that until RUS completes its environmental review process, borrowers shall take no action concerning the proposed action that would have an adverse environmental impact or limit the choice of reasonable alternatives being considered in the environmental review process. RUS believes that a power supplier's placement of an order for the fabrication of a typical CT by an established supplier is distinguishable from construction and as such will not have any adverse environmental impacts. CT production of these suppliers is currently oversubscribed (See Buddy, Can You Spare a Turbine? Power Engineering, Vol. 4, Issue 5 B. Schimmoller, May 2000). Consequently, an RUS borrower's cancellation of an order would affect only the ownership of the production output. In addition, ordering a CT and making progress payments on it does not limit the choice of reasonable alternatives because the applicant can readily adjust its siting plans, cancel the purchase order, or even liquidate its position in the unlikely event that no environmentally satisfactory solution is found in time to install a proposed CT. As subsequently discussed, the current demand for CTs exceeds supply resulting in lengthy (years) periods of time elapsing between the execution of the purchase contract and the delivery date for the CT. This allows ample time for analysis and resolution of case specific environmental considerations in accordance with established RUS procedures.

1.2 Electric Energy Market

1.2.1 Deregulation

The electric utility industry, one of the largest sectors of regulated industries in the United States, is in the process of deregulation. Supply shortages and price spikes during the summers of 1998, 1999 and 2000 caused major turmoil within the industry. During the previous 10-20 years, very little new generation was constructed. Moreover, old plants were often retired without being replaced. In the meantime, sustained expansion of the U.S. economy and the onset of the digital age produced greater than expected demands for electricity.

This increased demand in combination with hot weather, severe storms and limited generating and transmission capacity produced serious power shortages that in turn caused power supply uncertainty across the United States and huge price increases, particularly in the Midwest and California. Spot prices that had previously ranged from $25 to $45 per MWh "spiked" to between $3,500 and $7,000 per MWh. Some utilities were forced to initiate power reduction measures that included voltage reduction while many customers experienced rotating power outages. The demonstrated volatility of the wholesale power market is encouraging many rural electric utilities to seek ownership and control of new generation facilities in order to manage the risk of insufficient capacity to meet their obligations to their customers.

1.2.2 Combustion Turbine Market

Due to the growing nationwide shortfall in peaking and, to a lesser extent, intermediate load generating capacity, electric utilities and independent power producers are placing orders for CTs at an accelerated rate. There is also competition for these units for industrial use and in foreign countries. Production capacity for these sophisticated machines is limited primarily to a mere handful of manufacturers (See Buddy, Can You Spare a Turbine? Power Engineering, Vol. 4, Issue 5 B. Schimmoller, May 2000). One major manufacturer reports that approximately 600 units of its standard model CT have either been installed or are on order. Another major manufacturer currently has a backlog of approximately 200 equivalent size CT units.

RUS recently contacted two major manufacturers of combustion turbines regarding availability of their standard units. One manufacturer indicated a 2 to 3 year lead-time for orders from contract to delivery. The other manufacturer had a 3 to 4 year lead-time for orders. Both manufacturers have established a payment schedule for their product. Based on the total cost of the order, a down payment of up to 10% is required. Progress (milestone) payments, 85% of the total cost, are required during the period from the release for fabrication to shipment. The balance (5%) is due upon acceptance.

2.0 Alternatives

2.1 Power Supply Alternatives

2.1.1 Purchased Power

Historically, power purchases from neighboring utilities or independent power producers have generally provided benefits over the construction of new facilities when supply exceeds demand. Purchases have allowed for flexibility in capacity amounts and timing of capacity increments to better match the needs of the existing generating system. Additionally, purchases have allowed for a wide range of potential pricing options.

The economics and risks to RUS borrowers associated with acquiring electric capacity through power purchase contracts or purchases on the spot market have dramatically changed over the past few years as electric generation in the United States has become increasingly deregulated. Prior to the summer of 1998, peaking power could be purchased from other utilities and power markets in the Mid-Continent Area Power Pool (MAPP) Region at $100 per MWh or less. The ready availability and commercially acceptable pricing were the result of regulatory constraints and significant excess generation capacity that kept prices below the incremental cost of building new peaking or intermediate load generation.

Since June 1998, the excess capacity situation has changed dramatically in many parts of the United States. For example, in Ohio and neighboring states, the electric generation business experienced: (1) the near depletion of the excess generation reserve margin that almost resulted in rolling blackouts due to supply shortages, and (2) wholesale electricity prices that increased to previously unseen levels.

The summer of 2000 revealed serious supply shortages resulting in staggering electric bills for many California consumers (see, e.g. North American Electric Reliability Council Summer 2000 Reliability Assessment: "Generating capacity resources will be adequate to meet projected electricity demands in most areas in North America this summer. Areas of concern identified are New England, New York, and the Southwestern United States. An extended or widespread heat wave in the Southwest could lead to capacity shortages in California. Operating margins may be slim and thermal-loading problems may require curtailment of firm demand in Northern California, the San Francisco Bay area, and the San Diego area. Voltage and voltage stability concerns in the Fresno and Sacramento Valley areas may require the use of emergency operating procedures, including the curtailment of firm demand during extreme conditions. The Arizona-New Mexico-Southern Nevada and the California -Mexico Areas of the Western Systems Coordinating Council may not have adequate resources to accommodate a widespread severe heat wave or a significantly higher than normal forced outage rate for generation.").

Significant uncertainty exists whether sufficient additional generating capacity will be built in those areas of the country served by RUS borrowers. RUS has concluded that requiring its borrowers to rely primarily on purchased power to meet the electrical needs of their distribution cooperatives subjects their consumers to undue economic risk as well as the risk of non-delivery due to transmission constraints.

2.1.2 Non-generation Options

Non-generation alternatives are those alternatives that will allow the borrower to meet its obligation of supplying reliable electrical energy to its distribution members without generating or purchasing additional power.

<u>Conservation</u>: The goal of conservation is to decrease the overall energy usage and peak energy demand. Member systems of borrowers encourage their member-consumers to conserve energy whenever practicable. The probable effects of conservation efforts that can be readily anticipated are normally considered in the borrower's load forecast.

<u>Interruptible Loads</u>: Some borrowers have an agreement with their industrial customers whereby a portion of the load is interruptible. This type of load is valuable because the load can be curtailed during peak demand periods. Capacity is normally provided from reserves but some fixed costs are recovered from discounted demand charges to the customer. Where feasible, interruptible loads can reduce the demand on a system during peak conditions. One utility was able to reduce its peak demand by approximately 7% through an interruptible load agreement with a large industrial customer.

<u>Load Management</u>: Load management is similar to the interruptible loads described in the previous paragraph. Certain loads, typically electric water heater, air conditioners, water and heat pumps, space heaters, and standby generators may be equipped with controllable switches. During the time of system peaks, these loads are turned off for a certain period. The controlled devices are rotated, generally every 15 minutes, while another is allowed to operate, then the second group is controlled for 15 minutes, while the first is allowed to operate. The effect of load management is to shift peak load energy by lowering the overall system peak demand at peak hours, and increasing intermediate demand requirements at later hours. Where feasible, borrowers have instituted voluntary load management programs through their member systems. The potential for other borrowers' systems is being monitored to determine the optimum timing of this resource. Where found to be economically beneficial, load management can defer the need for some peaking capacity. One utility was able to reduce its 1998 summer

load by approximately 4.4% through controls on air conditioners and hot water heaters. Another utility installed radio control switches on the hot water heaters of more than 100,000 consumers, resulting in a winter peak reduction of approximately 100MW. However, this reduction, though helpful, was insufficient to meet the utility's intermediate and peaking load requirements.

Passive Demand-Side Management: Most borrowers have initiated programs to manage demand and energy growth in commercial and residential areas. This is accomplished by encouraging, through economic incentives, high efficiency lighting, heat pumps, and water heaters as well as home insulation improvements.

Rate Structure: Through a pooling concept, some borrowers apply the same rate to all member systems whether "on" or "off-system." Coincident demand billing will be adopted by at least one borrower this year. It will be implemented with a two-part demand rate, the average and excessive methodology, with the excess rate representing the cost of new combustion turbine capacity in the system. It will provide the proper price signal for peak shaving through load management or time of use rates.

Off-Peak Rate: At least one borrower recently developed an off-peak rate after studying the ability of the system to reliably and economically serve additional off-peak loads. The rate contains a penalty for additional on-peak loads.

Conclusions: Where found to be economically beneficial, a combination of the methods described previously for reducing peak loads have deferred, but not eliminated, the need for additional peaking capacity for many G&T's.

2.1.3 Generation

2.1.3.1 Combustion Turbines

CTs are internal combustion engines that operate with a rotary rather than reciprocating motion. CTs are used in a broad scope of applications including electric power generators and in various process industries. Electric utilities use CTs mostly as peaking units for meeting power demand peaks on a daily or seasonal basis. Individual units range in size from 15 MW to over 200 MW, with an average size of 45 MW. Owing to their modular nature, CTs can be installed in a single unit or a group of units either at the same time or over time. This ability to install increments of generation more closely matching immediate needs is one of their most attractive features.

Another desirable characteristic of CTs is that they are generally much cleaner than traditional generating sources. The primary fuel is natural gas; distillate (No. 2) fuel oil is normally used only as a backup fuel. Also, by design, CTs do not run continuously, but rather, are cycled on and off as power requirements vary. The life span of a CT is measured in the number of such on and off cycles. When cycled on, CTs produce fewer emissions than continuously running fossil fuel alternatives such as coal and oil. When cycled off, CTs produce little or no emissions.

A CT consists of three major components: compressor, combustor, and power turbine. Ambient air is drawn in and compressed up to 30-times ambient pressure and directed to the combustor section where fuel is introduced, ignited, and burned. Hot combustion gases are diluted with additional air from the compressor section and directed to the turbine section at temperatures up to 2,350ºF. Energy from the hot, expanding exhaust gases are then recovered in the form of shaft horsepower, of which more than 50% is needed to drive the internal compressor and the balance of recovered shaft energy is available to drive the external load unit.

The heat content of the gases exiting the turbine can either be discarded without heat recovery (simple-cycle); used with a heat exchanger to preheat combustion air entering the combustor (regenerative cycle); used with or without supplementary firing, in a heat recovery steam generator to raise process steam (cogeneration); or used with or without supplementary firing to raise steam for a steam turbine (combined-cycle).

Simple-cycle CTs are the least expensive generating plants to install. They are available in standard sizes that can closely match capacity requirements as single units. Multiple units of the same or similar size can be grouped to meet larger capacity requirements or added later as capacity requirements evolve. Because most of the components are assembled as modules, on-site installation time is minimal. Due to the relatively small size of the individual units and lack of extensive support facilities, simple-cycle units are relatively easy to site. The footprint of an actual three unit (434 MW total capacity) project is only 24 acres. The other components to be installed on the site include: step-up transformers, demineralized water tanks, raw water and fuel oil tanks, a water neutralization storage basin, and a transmission substation.

The primary criteria for siting a simple-cycle unit are proximity to a major gas pipeline, adequate transmission facilities and roads/railroad for access and delivery of materials. Water requirements normally can be supplied from either a groundwater source or from a municipal/rural water system. When sited near adequate transmission facilities, simple-cycle units can support the transmission system instead of requiring extensive transmission construction to move the generated power to load centers.

Because simple-cycle units are capable of rapid starts, from cold to full load in approximately 11 minutes, they have become the primary worldwide source for peaking capacity. By their engineering and economic characteristics, peaking units are designed to be cycled on and off with the ebbs and flows of electricity demand. Thus, they necessarily run less frequently than intermediate units and consequently produce fewer emissions.

2.1.3.2 Other Fossil and Nuclear Fuels

As of January 1, 1999, coal, nuclear, and petroleum, respectively, fueled 44 %, 14% and 9% of the electric utility generating capacity in the United States (Inventory of Electric Utility Power Plants in the United States 1999, DOE/EIA, November 1999). All three fuels utilize proven technologies. However, in addition to their high capital cost and extensive licensing and lengthy construction schedules, coal-fired and nuclear-fueled generating stations are still considered the "standard" for base-load capacity additions to utility systems. Neither of these fuels is as ideally suited for peaking and intermediate load operation, as is natural gas. Limited petroleum fueled capacity is still being installed in applications where it is the primary fuel in new diesel units and the backup fuel for combustion turbines.

2.1.3.3 Renewable Resources

Hydropower: utilizes the energy of falling water thorough turbines to produce clean renewable energy at no fuel cost and with no air emissions. The only hydroelectric generation units financed by RUS within the last 15 years have been associated with "run of river" facilities. These units have been installed at existing dams and use only the available river flows to generate electricity. Such facilities are generally not capable of meeting peaking needs because electricity production is dependent on the flow of the river. River flows can vary widely depending on the season and year. Most RUS borrowers have not pursued new hydroelectric facilities either due to the lack of suitable sites within their service territories or due to the lengthy licensing process and subsequent construction schedule.

Biomass: is generally defined as organic material that can provide heat by being burned directly or chemically converted to a burnable fuel. For municipal, animal, or wood wastes to be used economically in a utility generator, such materials would have to be available in sufficient quantities near plant sites to avoid large collection and transportation expenses. There are currently proposals to grow selected crops for ultimate use as fuel that would serve that purpose. However, large acreages of land would be required. Also, the current biomass generation technologies are better suited for base-load operation then for meeting utility peak demand requirements due to the time required for start-up and shut-down.

Wind: energy is a resource that has been and will continue to be utilized because it has a reasonable average energy cost and unlimited supply. Improvements have been made over the last several years to increase wind turbine reliability and decrease costs. However, the average cost of wind generation is not a meaningful measure of how it fits into the resource mix. Large acreages and suitable locations would be required to provide the amount of peakingcapacity required by RUS borrowers. Wind generation is also not as effective a resource as the gas-fired CT for meeting peak demand because of its intermittent nature. Availability varies depending on the day, season, year and location. Many RUS borrowers do not have suitable sites within their service territory.

Solar: technology includes thermal and photovoltaic (PV) cells. Solar thermal involves collection and conversion of sunlight to heat. The heat can be utilized to reduce the consumption of electricity and other forms of energy or to generate electricity. PV cells are solid-state semiconductor devices that convert sunlight to direct current electricity that can then be converted to alternating current for utility use. PV technology ranges from large-scale concentrator systems to customer located PV cells, which can be developed in small increments (1 kW). A large PV system requires a significant tract of land and is not cost competitive with other generation technologies. Currently the most cost effective use of solar energy is for dispersed generation in remote areas, customer use for water heating, and remote equipment operation such as irrigation/stock tank pumps and lighted signs and signals. Availability of the resource varies greatly by region and also will vary depending on the day, season and year.

2.1.3.4 Energy Storage

Energy storage can be used to dampen out fluctuations in the demand for electrical energy. It also allows for electricity to be generated by base load units at low cost at times of low demand and then retrieved from storage during periods of high demand. Energy storage options include batteries, compressed air and pumped storage hydro.

Batteries are well known for their ability to store electrical energy. They represent a resource option for electric utilities, a 40 MW unit is being contemplated by an Alaska borrower. However, the most common type of battery (lead-acid) used for storage in larger-scale operations have a limited life (1500-2000 charge-discharge cycles) and are expensive to operate. As a result of the high cost and limited experience in utility sized operation, batteries for energy storage are not a feasible option for most RUS borrowers.

Compressed air is a technology whereby electricity is used during off-peak periods to compress air in underground caverns or porous rock reservoirs. During peak demand periods the stored air can be released to provide compressed air for the combustion portion of a combustion turbine. The only utility sized project in the United States is a prototype plant owned by a RUS borrower. Because the prototype plants have not performed to expectations, this technology is not yet considered a feasible option for RUS borrowers. The availability of suitable underground rock formations is a limiting factor is siting these facilities.

Pumped storage hydro refers to an energy storage technology wherein water is pumped to a high reservoir during off-peak hours and released to generate electricity during peak hours. The technology is mature and a number of projects are operating in the United States. The combination of lack of suitable sites and the large acreage required for the storage reservoir eliminates this option for most RUS borrowers. The environmental impacts associated with such projects are on a greater order of magnitude than those associated with CT projects. Furthermore, few RUS borrowers have excess baseload capacity available during off-peak hours to refill a pumped storage hydro reservoir.

3.0 Affected Environment and Associated Impacts

3.1 General

RUS has previously financed borrower CT projects in seven states and is expected to finance several more projects in the next year. This discussion will focus on those elements that RUS will consider and incorporate into every site-specific environmental review it conducts for a CT project. Many of these same elements (e.g., air quality) will be subject to a separate permitting or approval process by Federal, state and local agencies or jurisdictions. Project construction is contingent on the receipt of these permits and approvals.

3.1.1 Land Use

Except where CT units will be installed at an existing generation facility, the majority of borrower projects are being constructed in rural areas. The current land use is predominantly agricultural. Simple-cycle projects of up to 500 MW usually directly impact less than 30 acres even though the amount of land purchased is often 3 to 4 times that amount. Gas pipeline and transmission line rights-of-way can also be returned to their former agricultural use. It should be noted that in many cases, CT projects are sited so that no new gas pipeline and transmission line construction is required.

Plant facilities are normally arranged in a compact design. This serves to minimize the amount of land area that is removed from its previous use, which in rural areas is normally crop production or pasture. Siting these plants in close proximity to natural gas pipelines and electric transmission lines also minimizes the amount of land needed for new utility rights-of-way.

3.1.2 Important Farmland

The Farmland Protection Policy Act (FPPA) and USDA Departmental Regulation No. 9500-3, Land Use Policy, provide protection for important farmland, prime forestland, and prime rangeland. USDA regulation 7 CFR Part 658 implements the FPPA. RUS recommends that prime farmland soils be avoided whenever possible. In those situations where impacts are unavoidable, it is generally because a very high percentage of the land within the affected county consists of prime farmland soils. When the amount of prime farmland removed from production by generation facilities is compared to the total acreage of prime farmland in a county the amount is minimal, usually less than 0.05%. The amount of prime farmland affected by transmission line structures is limited to the area occupied by the base of each structure. Prime farmland is normally unaffected by buried pipelines.

3.1.3 Flood Plains and Wetlands

Executive Order (E.O.) 11988, "Flood plain Management," requires Federal agencies to avoid actions, to the extent practicable that will result in the location of facilities in flood plains and/or affect flood plain values. The purpose of E.O. 11990, "Protection of Wetlands," is to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. To meet these objectives, the E.O. requires Federal agencies, in planning their actions, to consider alternatives to wetland sites and limit the potential damage if any activity affecting a wetland cannot be avoided. Where wetlands cannot be avoided, measures to minimize adverse impacts to wetlands must be examined. Section 404 of the Clean Water Act establishes a Federal-permitting program that regulates activities in wetlands. Section 404 requires that anyone proposing to deposit dredged or fill material into "waters of the United States" including wetlands, must obtain a permit the Corps of Engineers, the agency responsible for administering the Section 404 permitting process for such activities.

Flood plains and wetlands are normally avoided in siting the major facilities associated with generation projects. Crossing flood plains and wetlands with overhead transmission lines or burying gas pipelines in flood plains and wetlands is often unavoidable. If large volumes of water are required for plant operation, water intake and discharge structures often must be located in a floodplain. Most impacts to flood plains and wetlands can be mitigated. Increasing the distance between individual structures avoids direct impacts to small wetlands and reduces the number of structures located in a flood plain. Water intake and discharge structures are normally located at or below the normal water level of the affected water source.

3.1.4 Threatened and Endangered Species

The Endangered Species Act (ESA) of 1973 establishes a national program for the conservation and protection of threatened and endangered species of plants and animals and the preservation of habitats upon which they depend. Under Section 7 of the ESA, Federal agencies may be required to consult with the USFWS or the National Marine Fisheries Service (NMFS), as appropriate, to ensure that the actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any federally listed threatened or endangered species or result in the destruction or adverse modification of a critical habitat. According to the ESA, mitigation measures or reasonable and prudent alternatives must be implemented which essentially reduce an impact to minimal levels when a proposed project cannot avoid critical habitat areas. Such measures and alternatives must be negotiated among RUS, the applicant, and the USFWS or NMFS.

Borrowers can obtain information about federally listed species and their critical habitat from the USFWS. Information on state listed species can be obtained from the equivalent state organization. Plant sites are selected that will avoid impacting Federal or state listed species or critical habitat. Potential impacts resulting from the construction of gas pipelines, transmission lines and intake and discharge structures and associated water lines are mitigated if avoidance is not possible. Such mitigation could include route modifications, restricting construction during nesting or migration seasons and structure modification.

3.1.5 Cultural Resources

The National Historic Preservation Act of 1966, as amended (16 U.S.C. § 470 *et seq.*) and the Advisory Council on Historic Preservation's implementing regulations (36 CFR Part 800) require Federal agencies to take into account the effect their actions may have on historic properties prior to carrying out such actions. Where the potential for the presence of such resources is high, the appropriate level survey is conducted. Rarely are significant resources identified by surveys. Cemeteries, historic structures and listed archeological sites are usually avoided in the siting of CT projects.

3.1.6 Air Quality

Most borrower CT projects are sited in rural areas and are not close to other industrial facilities, large or small. For that reason these areas are normally in attainment for all criteria pollutants (Prevention of Significant Deterioration Class II). The primary background air pollutants are particulates generated by farming activities, traffic on unpaved roads, wind erosion, and burning of trash and vegetation. Particulate matter generated by these sources is temporary and intermittent.

Construction and operation of CT projects do not have a significant impact on air quality. Local air quality could be slightly degraded during plant construction by dust and exhaust from motorized equipment. Natural gas is a clean burning fuel with no odor or visible exhaust. Burning distillate oil results in slightly higher emissions. However, oil is a backup fuel and will normally be used less than 10% of the time. The primary pollutants of concern are sulfur dioxide (SO_2), nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOC) and particulate matter (PM_{10}). Both fuels may contain trace amounts of hazardous air pollutants (HAP) that will be volatilized during the combustion process. The actual concentration of HAP in the exhaust gases from CTs is too small to measure with current monitoring techniques. Emission controls are available that will keep local ambient air quality parameters below significance levels. To ensure compliance with applicable standards, borrowers are required to install, operate, and certify NO_x continuous emission monitoring systems.

3.1.7 Water Requirements

The simple-cycle CT plant has a limited water requirement that can normally be obtained from ground water sources or in some cases, from a municipal /rural water system. That requirement includes equipment cooling, turbine cleaning, NO_x emission control (oil firing) and potable water. Wastewater from various sources is collected and normally treated on-site. Depending on local permitting requirements, sanitary wastes would be routed through a septic system. Other wastes would be stored for periodic removal and disposal at a licensed treatment facility.

3.1.8 Noise

Most borrower CT projects are sited in rural areas. Typical noise sources include traffic, agricultural equipment and wind. Acceptable noise levels for residential areas, as per U.S. Department of Housing and Urban Development guidelines are 65 decibels (day) and 55 decibels (night). The primary source of noise from CT projects would be the CT unit. A secondary source of noise would be the cooling towers associated with combined-cycle plants. Depending on the size of the site and the number and size of the units, acceptable noise levels could be exceeded at the project boundary. Since most rural areas tend to be sparsely settled, the number of sensitive receptors (nearby residences) exposed to noise caused by facility operation is normally minimal.

Acoustic shielding is the primary method of minimizing noise from the operation of CT components. A typical two-unit (200 MW) plant would be able to meet the daylight sound level at a distance of 400 feet from the plant buildings and the nighttime sound level at a distance of 900 feet from the plant buildings. This assumes that the intervening topography is flat and there are no other sound absorbing objects such as trees. Locating plant facilities within a larger site often creates a sufficient buffer between the noise source and the nearest receptor. Also, peaking units normally do not operate after 10:00 PM.

3.1.9 Aesthetics

A CT plant, which is an industrial facility, may create a visual contrast when placed in the typical rural setting. This contrast can be somewhat offset if the new facility is sited on or adjacent to an existing generation or substation site. Turbine exhaust stacks, which range in height from 60 to 90 feet, would be difficult to screen. Mist and water vapor from the exhaust stacks and evaporative cooling towers would be visible during operations in humid and cold weather. External plant lighting can create a visual contrast at night. Transmission lines also create a visual contrast in the typical rural setting but typically they are already present.

The visual contrast created by siting a CT project in a rural area can be partially offset through the erection of earthen berms or vegetative plantings such as rows of trees around the perimeter of the facility.

3.1.10 Socioeconomic

The socioeconomic impact from the construction and operation of a CT project in a rural area will vary with the size of the project and the particular demographics of the surrounding area. The construction period for the average CT project is approximately 12 months. The maximum number of construction workers on-site at any on time averages about 50. The permanent operating staff normally is less than 5 at small installations and averages between 15 and 20 at large installations. Such small numbers would only have a minor impact on the local economy through the purchase of goods and services. The major positive impact of these projects would be their contribution to the property tax base for the local school districts and townships.

The selection of a site for industrial development is normally driven by such factors as available workforce, existing infrastructure and favorable tax climate and is unlikely to be affected by the presence of a CT. The decision to choose a combined-cycle facility instead of a simple-cycle facility might be influenced by the presence of companies that require processed steam.

3.1.11 Environmental Justice

E.O. 12989 (Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations), dated February 11, 1994, and USDA Departmental Regulation 5600-2 (Environmental Justice), dated December 15, 1997, require, in part, including an analysis of environmental justice issues in NEPA documents. CT projects are not expected to cause adverse environmental or human health impacts in general, or to low-income and minority populations in particular. RUS expects that most of the CT projects it will be asked to finance will be buffered from any surrounding population. RUS will consider and evaluate environmental impacts on minority and low-income populations as part of the site-specific analysis.

4.0 Summary

Growing demand for electricity in the United States has absorbed surplus capacity in many regions in the country and is causing an increase in demand for new generating capacity to avoid system failures and price spikes. Due to improvements in technology and deregulation of much of the gas and electric markets, utility and non-utility generators alike are installing gas-fired CTs as a cost-effective incremental way to meet their growing needs for peaking capacity. As a result of these changing industry norms, the process for adding new generating capacity today has become less design and build and more order and install. Power suppliers typically order CTs by choosing among the standard models offered by the four principal manufactures, wait several months or even years for the order to be delivered, and then install these units on sites for which they have received all necessary regulatory approvals and permits.

RUS will participate in the siting review process for any CT which it has conditionally approved for funding or is considering funding. During the long lead time that elapses between the execution of the purchase order and the scheduled delivery date, an applicant may make progress payments and RUS, at its discretion, may advance loans to enable a borrower to make such progress payments, for the manufacture of a CT, but not for installation or site preparation. Because of their design and operating characteristics, it is unlikely that an RUS borrower could not find an environmentally suitable site for these modest facilities. But even in such an unlikely eventuality, as a practical matter the interest in the CT could be disposed of in a commercially reasonable matter without exposing the borrower or RUS to significant losses or risks. Accordingly, such minimal exposure will not preclude RUS from considering alternatives.

In completing its environmental review of specific projects to be installed on specific sites, RUS will incorporate the general analysis contained in this programmatic document, which is the first tier of the EA required under RUS environmental policies and procedures. RUS reserves the right to refine and supplement any portion of this document to take additional information into account and to consider any unique aspects of specific projects to be installed on specific sites. RUS environmental reviews will be conducted in conformance with the requirements of 7 CFR Part 1794.

Approved by: ________________________________ December 1, 2000

Blaine D. Stockton, Jr. — Date
Assistant Administrator-Electric
Rural Utilities Service