Appendix

Appendix
List of Acronyms and Glossary

List of Acronyms

ACRS —Advisory Committee on Reactor Safeguards
AE —architect-engineers
AEC –Atomic Energy Commission
AFUDC –allowance for funds used during construction
AIF –Atomic Industrial Forum
AGR —advanced gas reactor
ANS –American Nuclear Society
ASME –American Society of Mechanical Engineers
BWR —boiling water reactor
CAA –Clean Air Act
CEGB –Central Electricity Generating Board
COL —construction and operating license
CP —construction permit
CPCN –Certificate of **Public Convenience and** Necessity
CRBR –Clinch River Breeder Reactor
CRGR –Committee for Review of Generic Requirements
CRS –Congressional Research Service
CWA –Clean Water Act
CWIP —construction work in progress
DOE –Department of Energy
DRI –Data Resources, Inc.
EIS –Environmental Impact Statement
EPRI –Electric Power Research Institute
ERDA —Energy Research and Development Administration
ER –Environmental Report
FEMA –Federal Emergency Management Agency
FERC —Federal Energy Regulatory Commission
FSAR –Final Safety Analysis Report
GAP –Government Accountability Project
GCR –gas cooled reactor
GNP –gross national product
GPU –General Public Utilities
HTGR —high temperature gas-cooled reactor
HWR –heavy water reactor
IDCOR –Industry Degraded Core Rulemaking Program
IN PO —Institute of Nuclear Power Operations
JCAE –Joint Committee on Atomic Energy
KWU —Kraftwork Union
LMFBR –liquid metal fast breeder reactor
LWR –light water reactors
MITI –Ministry of International Trade and Industry (Japan)
NAS –National Academy of Sciences
NASA –National Aeronautics and Space Administration
NCRP –National Commission on Radiological Protection
NEIL –Nuclear Electric Insurance Ltd.
NEPA –National Environmental Policy Act
NERC –Northeast Electric Reliability Council
NML –Nuclear Mutual Ltd.
NPCC –Northeast Power Coordinating Council
NPDES —National Pollutant Discharge Elimination System permit
NPRDS –Nuclear Plant Reliability Data System
NPT –Non-Proliferation Treaty
NRC —Nuclear Regulatory Commission
NSAC —Nuclear Safety Analysis Center
NSSS —nuclear steam supply system
NTOL —near-term operating licenses
NUTAC –Nuclear Utility Task Action Committee
OECD –Organization for Economic Cooperation and Development
OL —operating license
OTA –Office of Technology Assessment
PCRV –prestressed concrete reactor vessel
PG&E –Pacific Gas & Electric Co
PHWR –pressurized heavy water reactor
Plus –process inherent ultimately safe reactor
PRA –probabilistic risk assessment
PSAR –Preliminary Safety Analysis Report
PUC —public utility commission
PURPA —Public Utility Regulatory Policies Act
PWR –pressurized water reactor
RNPA –regional nuclear power authority
RNPC –regional nuclear power company
SAI –Science Applications, Inc.
SEE-IN –Significant Events Evaluation and Information Network
SER –Safety Evaluation Report
SNUPPS–Standardized Nuclear Unit Power Plant System
SPDS –Safety Parameter Display Systems
SPP –Southwest Power Pool
SRP –Standard Review Plan
TM I –Three Mile Island
TVA –Tennessee Valley Authority
WPPSS –Washington Public Power Supply System

Glossary

absorption, neutron: Any reaction in which a free neutron is absorbed by a nucleus, including capture and fission.

Allowance for Funds Used During Construction (AFUDC): An account in the income statement of a utility in which interest is accumulated on the construction expenditures for construction work in progress that has not been entered into the utility's rate base and is therefore not yet earning a cash return on investment. The accumulated interest is then added to the actual construction expenditures when the plant enters the rate base.

base loaded: Keeping a power station continuously loaded at the maximum load because it is one of the lowest cost power producers on the system.

boiling water reactor: A reactor cooled by water that is allowed to boil as it passes through the core. This coolant is used directly to produce the steam which generates electricity.

capacity factor: Ratio of average plant electrical energy output to rated output.

chain reaction: The continuing process of nuclear fissioning in which the neutrons released from a fission trigger at least one other nuclear fission.

cladding: The term used to describe any material that encloses nuclear fuel. In a water-cooled power reactor this is the fuel rod tube.

Construction Work in Progress (CWIP): An account on the asset side of the utility's balance sheet that includes all construction expenditures for plant and equipment on plant that has not yet been placed in service.

construction leadtime: The time required to complete construction of an electric generating plant, usually defined from either date of reactor order or construction permit to commercial operation.

containment building: A thick concrete structure surrounding the pressure vessel and other reactor components. It is designed to prevent radioactive material from being released to the atmosphere in the unlikely event that it should escape from the pressure vessel.

control rods: Long thin rods that are positioned among fuel rods to regulate the nuclear chain reaction. Control rods are composed of material that absorbs neutrons readily. They interrupt or slow down a chain reaction by capturing neutrons that would otherwise trigger more fissions.

coolant: Fluid that is circulated through the core of a reactor to remove the heat generated by the fission process. In reactors that have more than one coolant system, the fluid which passes through the core of a reactor is known as the primary coolant. It absorbs heat in the core and then transfers it to a secondary coolant system.

core: The region of a reactor in which the nuclear chain reaction is initiated, maintained, and controlled. Coolant is constantly circulated through the core to remove heat produced by the fission process.

decay heat: The heat produced by radioactive decay of materials that are primarily the remnants of the chain reaction.

deplete: To reduce the fissile content of an isotopic mixture, particularly uranium.

elasticity: The ratio of change in demand for a product (in this case electricity) to change in a category of prices, or to change in income.

emergency core cooling system: Any engineered system for cooling the core in the event of failure of the basic cooling system, such as core sprays or injectors.

enrichment: The process of increasing the concentration of one isotope of a given element.

fabrication: The final step in preparing nuclear fuel for use in a reactor.

fast breeder reactor (FBR): A reactor cooled by liquid sodium rather than waste. In this type of reactor, the transformation of uranium-238 to plutonium occurs readily. Since plutonium fissions easily, it can be recycled and used as fuel for a breeder reactor. The conversion of uranium to plutonium is so efficient in an FBR that this reactor creates more fuel than it consumes.

feedwater: Water, usually from a condenser, supplied to replenish the water inventory of components such as boilers or steam generators.

fertile: Material composed of atoms which readily absorb neutrons to produce fissionable materials. One such element is uranium-238, which becomes plutonium-239 after it absorbs a neutron. Fertile material alone cannot sustain a a chain reaction.

fissile: Material composed of atoms which readily fission when struck by a neutron. Uranium-235 and plutonium-239 are examples of fissile materials.

fission: The process by which a neutron strikes a nucleus and splits it into fragments. During the process of nuclear fission, several neutrons are emitted at high speed, and heat and radiation are released.

fission products: The smaller atoms created when a nucleus fissions. The mass of the fission products is less than that of the original nucleus. The difference in mass is released as energy.

fossil plant: A powerplant fueled by coal, oil, or gas.

fuel: Basic chain-reacting material, including both fissile and fertile materials.

fuel cycle: The set of chemical and physical operations needed to prepare nuclear material for use in reactors and to dispose of or recycle the material after its removal from the reactor. Existing fuel cycles begin with uranium as the natural resource and create plutonium as a byproduct. Some future cycles may rely on thorium and produce the fissile isotope uranium-233.

fuel rod: An assembly consisting of a capped zircalloy or stainless steel tube filled with fuel pellets.

half life: The period required for an unstable radioactive element to decay to one-half of its initial mass.

heat rate: A measure of the amount of fuel used to produce electric and/or thermal energy.

total heat rate refers to the amount of fuel (in **Btu) required to produce 1 kilowatt-hour of electricity with no credit given for waste heat use.**

incremental heat rate is calculated as the additional (or saved) Btu to produce (or not produce) the next kilowatt-hour of electricity.

net *heat rate* (also measured in Btu/kWh) credits the thermal output and denotes the energy required to produce electricity, beyond what would be needed to produce a given quantity of thermal energy in a separate facility (e.g., a boiler).

interest coverage ratio: The ratio of a firm's earnings to its current interest obligations.

isotopes: Atoms having the same number of protons, but a different number of neutrons. Two isotopes of the same atom are very similar and difficult to separate by ordinary chemical means, Isotopes can have very different nuclear properties, however. For example, one isotope may fission readily, while another isotope of the same atom may not fission at all.

light water reactor: A general term that refers to all nuclear reactors which use ordinary water as a coolant. This includes pressurized water reactors and boiling water reactors, which are the predominant reactors in the United States.

load: The demand for electric or thermal energy at any particular time.

base load is the normal, relatively constant demand for energy on a given system.

peakload is the highest demand for energy from a supplying system, measured either daily, seasonally, or annually.

intermediate load falls between the base and peak.

load factor is the ratio of the average load over a designated time period to the peak load occurring during that period. Also used as a synonym for capacity factor.

load eye/e pattern is the variation in demand over a specified period of time.

loss-of-coolant accident (LOCA): A reactor accident in which coolant is lost from the primary system.

market potential: The number of instances in which a technology will be sufficiently attractive-all things considered—that the investment is likely to be made.

market-to-book ratio: The ratio of the market price of a firm's stock to its book value.

MWe: Megawatts of electrical energy.

MWt: Megawatts of thermal energy.

moderator: A component (usually water, heavy water, or graphite) of some nuclear reactors that slows neutrons, thereby increasing their chances of being absorbed by a fissile nucleus.

neutron: A basic atomic particle that has no electrical charge. Neutrons and protons, which are positively charged particles, form the central portion of the atom known as the nucleus. Negatively charged electrons orbit the nucleus at various distances. The chemical and nuclear properties of an atom are determined by the number of its neutrons, protons, and electrons.

neutron poison: The general name given to materials that absorb neutrons. These materials either interfere with the fissioning process or are used to control it.

nuclear island: The buildings and equipment that comprise the reactor and all its emergency and auxiliary systems.

nuclear steam supply system (NSSS): The basic reactor and support equipment, plus any associated equipment necessary to produce the steam that drives the turbines.

once-through fuel cycle: A nuclear system wherein nuclear materials are introduced into a reactor only once; they are not recycled.

plutonium: An element that is not found in nature, but can be produced from uranium in a nuclear reactor. Plutonium fissions easily, and can be used as a nuclear fuel.

power density: The power generated per unit volume of the core.

pressure vessel: A heavy steel enclosure around the core of a reactor. It is designed to withstand high pressures and temperatures to prevent radioactive material from escaping from the core.

pressurized water reactor: A reactor cooled by water that is kept at high pressure to prevent it from boiling. Primary coolant passes through the core of a

PWR, and then transfers its heat to a secondary coolant system. Steam is produced from the heated water in the secondary system.

primary coolant: The fluid used to cool the fuel elements. It may be liquid or gas.

qualifying facility: A **cogenerator or small power producer that meets the requirements specified** in the Public Utility Regulatory Policies Act of 1978–in the case of a cogenerator, one that produces electricity and useful thermal energy for industrial, commercial, heating, or cooling purposes; that meets the operating requirements specified by the Federal Energy Regulatory Commission with respect to such factors as size, fuel use, and fuel efficiency); and that is owned by a person not primarily engaged in the generation or sale of electric power (other than cogenerated power).

radioactive decay: The process by which a nucleus of one type transforms into another, accompanied by emission of radiation.

radioactive waste: Waste materials, solid, liquid, or gas, that are produced in any type of nuclear facility.

rate base: The net valuation of utility property i n service, consisting of the gross valuation minus accrued depreciation.

reactor: A facility that contains a controlled nuclear fission chain reaction, It may be used to generate electrical power, to conduct research, or exclusively to produce plutonium for nuclear explosives.

reactor containment boundary: The pressure envelope in which a reactor and its primary cooling system are located.

reactor vessel: The container of the nuclear core or critical assembly; may be a steel pressure vessel, a prestressed concrete reactor vessel (PCRV), or a low-pressure vessel (e.g., a calandria or sodium pot).

reprocessing: Chemical treatment of spent reactor fuel to separate the plutonium and uranium from the fission products and (under present plans) from each other.

safeguards: Sets of regulations, procedures, and equipment designed to prevent and detect the diversion of nuclear materials from authorized channels.

safety system: A mechanical, electrical, or instrumentation system or any combination of these, whose purpose is the safety of the reactor or of the public.

scram: The rapid shutdown, via introduction of neutron absorbers, of the chain reaction.

seismic load: The stresses imposed on a component by a seismic shock.

shutdown: The act of stopping plant operation for an y reason.

spent fuel storage pool: The pool of demineralized water in which spent fuel elements are stored pending their shipment from the facility.

spent nuclear fuel: Material that is removed from a reactor after it can no longer sustain a chain reaction. Spent fuel from a light water reactor is composed primarily of uranium and contains some radioactive materials, such as fission products. Spent fuel also contains some valuable nuclear materials, such as uranium-235 and plutonium.

steam generator: The main heat exchangers in a pressurized water or gas-cooled reactor powerplant that generates the steam that drives the turbine generator.

thermal efficiency: In a powerplant, the ratio of net electrical energy produced to total thermal energy released in the reactor or boiler.

thermal load: The stresses imposed on a component due to restriction of thermal growth caused by temperature changes.

thermal neutron: A neutron whose energy level has been lowered sufficiently so that upon collision with another atom it will cause the atom to split and release energy. Neutron energy levels can be lowered by recoil off moderating atoms.

thorium-232 (Th^{232}): A fetile, naturally occurring isotope from which the fissile isotope uranium-233 can be bred.

turbine generator: The assembled steam turbine coupled to an electric generator that produces the electric power in a powerplant.

uranium: A metallic element found in nature that is commonly used as a fuel in nuclear reactors. As found in nature, it contains two isotopes—uranium-235 and uranium-238.

uranium-233 (U^{233}): A fissile isotope bred by fertile thorium-232. It is similar in weapons quality to plutonium-239.

uranium-235 (U^{235}): The less abundant uranium isotope, accounting for less than one percent of natural uranium. Uranium-235 splits, or fissions, when struck by a neutron. When uranium is used as a fuel in a nuclear reactor, the concentration of urani - um-235 is often increased to enhance the fission process. For example, the fuel for light water reactors contains about 30/0 uranium-235.

uranium-238 (U^{238}): The more abundant uranium isotope, accounting for more than 99 percent of natural uranium. Uranium-238 tends to absorb neutrons rather than fission. When it absorbs a neutron, the uranium atom changes to form a new element-plutonium,

water hammer: The shock load imposed on a flowing pipeline by the rapid closure of a shutoff valve.