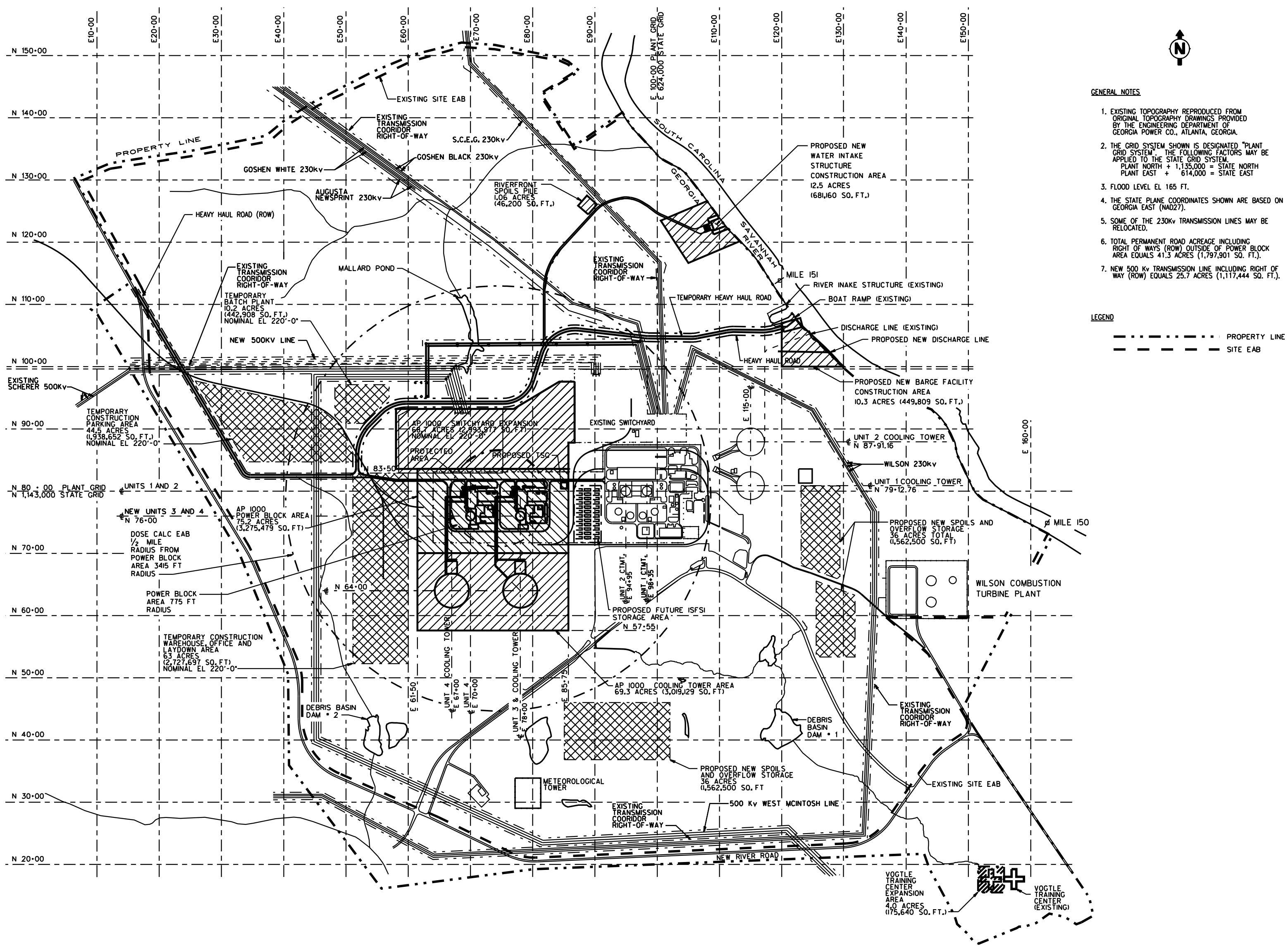

Figure 3.1-3 ESP Site Utilization Plan

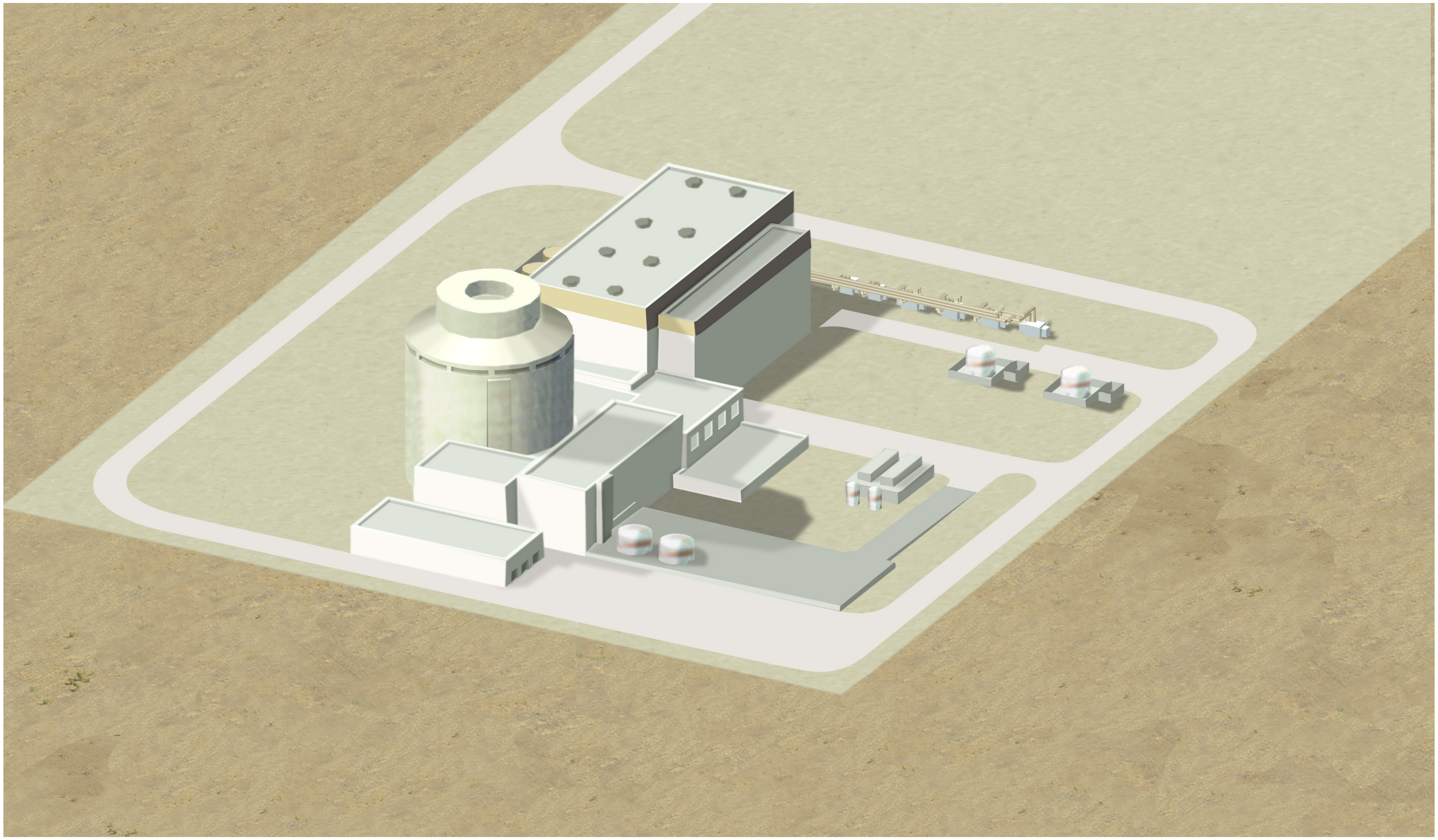

Figure 3.1-4 Artist's Rendering of AP1000 Standard Unit

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3.2 Reactor Power Conversion System

The AP1000 design is based on Westinghouse pressurized water reactor (PWR) technology. Major components include a single reactor pressure vessel, two steam generators (SGs), and four reactor coolant pumps for converting reactor thermal energy into steam. A single high pressure turbine and three low pressure turbines drive a single electric generator. The AP1000 was certified by the NRC under 10 CFR 52, Appendix D. Figure 3.2-1 provides a simplified depiction of the reactor power conversion system.

The AP1000 reactor is connected to two SGs via two primary hot leg pipes and four primary cold leg pipes. A reactor coolant pump is located in each primary cold leg pipe to circulate pressurized reactor coolant through the reactor core. The reactor coolant flows through the reactor core, making contact with the fuel rods that contain the enriched uranium dioxide fuel. As the reactor coolant passes through the reactor core, heat from the nuclear fission process is removed from the reactor. This heat is transported to the SGs by the circulating reactor coolant and passes through the tubes of the SGs to heat the feedwater from the secondary system. The reactor coolant is pumped back to the reactor by the reactor coolant pumps, where it is reheated to start the heat transfer cycle over again. Inside the SGs, the reactor heat from the primary system is transferred through the walls of the tubes to convert the incoming feedwater from the secondary system into steam. The steam is transported from the SGs by main steam piping to drive the high pressure and low pressure turbines connected to an electric generator to produce electricity. After passing through the three low pressure turbines, the steam is condensed back to water by cooled circulating water inside titanium tubes located in the three main condensers. The condensate is then preheated and pumped back to the SGs as feedwater to repeat the steam cycle. The circulating water is cooled by a natural-draft cooling tower. Each unit's cooling tower will reject the main condenser/turbine plant heat exchanger duty of approximately 7.54 x 10^9 BTU/hr (2,208 MWt) of waste heat to the atmosphere. The unit thermal efficiency of the complete cycle is approximately 35 percent.

The Rated Thermal Power (RTP) of the AP1000 reactor is 3,400 MWt, with a nuclear steam supply system rating of 3,415 MWt (core plus reactor coolant pump heat). The gross and minimum net electrical outputs of the AP1000 design are approximately 1,200 MWe (with an 87°F circulating water cold water temperature) and 1,117 MWe respectively, with maximum station and auxiliary service loads of 83 MWe.

The AP1000 reactor uses uranium dioxide enriched with U-235 for fissile material. The reactor fuel consists of individual cylindrical uranium pellets enclosed in a sealed ZIRLO[1] tube to constitute a fuel rod. The AP1000 fuel assembly consists of 264 fuel rods grouped in a 17 x 17 array approximately 14 ft long. The AP1000 reactor contains 157 fuel assemblies consisting of 41,488 total fuel rods. Total uranium dioxide fuel weight is 211,588 lb. Enrichment of the uranium will be approximately 2.35 to 4.45 weight percent U-235 for the initial reactor core load

1. ZIRLO is a trademark of Westinghouse Electric Company.

and 4.51 weight percent U-235 for core reloads. The expected burn-up of discharged fuel is approximately 48,700 megawatt-days per metric ton of uranium (MWD/MTU), with an expected cycle burn-up of 21,000 MWD/MTU. The maximum fuel rod average burn-up value for the AP1000 reactor is 60,000 MWD/MTU. The total fuel capacity for the AP1000 reactor is approximately 84.5 MTU. **(Westinghouse 2003, 2005)**