BEFORE THE

UNITED STATES NUCLEAR REGULATORY COMMISSION

In the matter of

Docket Nos. 50-387
50-388

PENNSYLVANIA POWER &
LIGHT COMPANY

AMENDMENT NO. 12

APPLICATION OR CLASS 103

OPERATING LICENSES FOR THE SUSQUEHANNA

STEAM ELECTRIC STATION

UNITS NO. 1 AND NO. 2

Applicant, Pennsylvania Power & Light Company, hereby files Amendment No. 12 to its Operating License Application dated July 20, 1978.

This Amendment contains Revision No. 2 to the Susquehanna SES Environmental Report-Operating License Stage which provides updated information.

PENNSYLVANIA POWER & LIGHT COMPANY
BY:

N. W. Curtis
Vice President-Engineering & Construction

Sworn to and subscribed before me
this 16th of May 1979.

David M. Landis
Notary Public

My Commission Expires: March 15, 1980

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AMENDMENTS TO

SUSQUEHANNA SES LICENSE APPLICATION

AMENDMENT	CONTENT
1	Revision No. 1-FSAR
2	Revision No. 2-FSAR
3	Revision No. 3-FSAR
4	Revision No. 1-ER-OL
5	Revision No. 4-FSAR
6	Revision No. B-Security Plan
7	Revision No. 5-FSAR
8	Revision No. 6-FSAR
9	Revision No. 7-FSAR
10	Revision No. 8-FSAR (Proprietary)
11	Revision No. 9-FSAR
12	Revision No. 2-ER-OL

SUSQUEHANNA SES ER-OL
ER REVISIONS

The attached Revision 2; pages, tables and figures revise the Susquehanna Steam Electric Station Environmental Report.

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site) and at Danville (about 31 miles (49.9 km) downstream. The Corps of Engineers has compiled flood stage and discharge information for the Susquehanna River at Wilkes-Barre (Ref. 2.4-7). These data are based on records of flood stages dating from 1891. Data for the four most severe floods of record are presented in Table 2.4-5, Historic Floods in the Vicinity of the Susquehanna SES. Table 2.4-5 also includes the stages and discharges for floods at the site and at Danville. The flood frequency characteristics of the Susquehanna as measured at Danville are illustrated in Figure 2.4-6, Flood Discharge Frequency.

The passage of Tropical Storm Agnes through Pennsylvania on June 22 and 23, 1972 resulted in record flood levels in the Susquehanna River Basin. Flood crests exceeded the previous record flood level of 1936 at Wilkes-Barre by 7.5 feet (2.3 m). At Danville, a local maximum gage level resulting from a 1904 ice jam was exceeded by 1.6 feet (0.5 m). Peak discharge at Wilkes-Barre was an estimated 345,000 cfs (9,770 m^3/sec) or a unit discharge of 34.5 cubic feet per second per square mile (cfsm) (0.4 $m^3/sec/km^2$). Accumulated runoff for the drainage area above Wilkes-Barre for the period of 0000 hours, June 21, 1972 through 2200 hours, June 27, 1972 totaled 4.32 inches (11.0 cm) (Ref. 2.4-13).

2.4.2.5 Low Flows

Long term records from the USGS gaging stations at Danville and Wilkes-Barre provide the data base for the low flow frequency analyses presented in this Subsection. Long duration low flow frequency analysis has been performed by the Pennsylvania Department of Environmental Resources (DER). The resulting curves for low flow durations of two to 60 months and recurrence intervals up to 100 years for Danville and Wilkes-Barre are provided in Figures 2.4-7, Low Flow Duration at Danville and 2.4-8, Low Flow Duration at Wilkes-Barre, respectively.

Tables 2.4-6 and 2.4-7, Magnitude and Frequency of Annual Low Flow of the Susquehanna River at Danville and Wilkes-Barre, Pa. respectively, discuss the discharge for different recurrence intervals. Tables 2.4-8 and 2.4-9, Duration Table of Daily Flow of the Susquehanna River at Danville and Wilkes-Barre, Pa. respectively indicate the river discharge (Ref. 2.4-14).

The most extended drought period occurred in the 1960's. The lowest consecutive day flows for periods of 183 days and less have also occurred in this period. The mean monthly flows at Danville and Wilkes-Barre are provided in Table 2.4-10a, Mean Monthly Drought Year Flow Sequences. Mean Daily Flows During 1964 Drought, Table 2.4-10b for these two stations are provided for the four lowest flow months of this year.

A policy decision of the Susquehanna River Basin Commission regarding consumptive withdrawals during low flow periods provides that natural flows during droughts will not be diminished by future water users. On September 30 1976, this policy decision was implemented as an Amendment to 18 CFR Part 803 (Susquehanna River Basin Commission, Subpart D - Standards for Review, Section 803.61, Consumptive Uses of Water) (Ref. 2.4-15). Compensation shall be required for consumptive uses of water during periods of low flow. The provisions of this regulation apply to consumptive uses initiated since January 23, 1971.

2.4.2.6 Sedimentation

Annual sediment yields in the region surrounding the site are spacially uniform. Measurements at Towanda, Pa. about 105 miles (169 km) above the station, indicate on annual sediment yield of 150 tons/sq mi (52.5 metric tons/km^2) from a drainage area of 7797 sq mi (20,194 km^2). Annual yields at Danville, 11,220 sq mi (29,060 km^2) drainage area are estimated to be 140 tons/sq mi (49.0 metric tons/km^2) (Ref. 2.4-8). Daily sediment discharges at individual stations are highly variable. The daily sediment discharge at Danville ranges from a high of 556,000 tons/day (504,400 metric tons/day) to a low of 18 tons/day (16.3 metric tons/day).

Water quality sampling at the site included measurement of total suspended solids. A range of values from 1.6 mg/l to 912.6 mg/l with an average value of 57.0 mg/l was found. These results are further reported in Subsection 2.4.3.

Grain size analysis was performed on water samples taken in 1974 using an automatic image analyzer. The grain size determination was performed on treated and untreated river water samples. The results for the untreated samples are reported in Table 2.4-11, Sediment Grain Size Distribution.

2.4.2.7 Water Impoundments

The Susquehanna River supplies all the water required for normal station operation. A seven-acre (2.8 ha.) spray pond is located onsite to supply water to emergency heat dissipation systems. The warmed water from the reactors is cooled via the pond's spray system and then recirculated through the emergency cooling systems.

This spray pond has a relatively impervious liner. It is free-form in shape to conform to the natural topography of the area. Embankments and ditches are provided to direct surface water

3.3 STATION WATER USE

3.3.1 GENERAL

This section describes the Susquehanna SES water uses and their interrelationship with the environment. Detailed descriptions of the use of water for transport of waste heat, chemical wastes, domestic and radioactive wastes within the station are in Sections 3.4 through 3.7. The environmental effects to the river are described in detail in Sections 5.1 through 5.4. The facilities required to withdraw large quantities of water and return it to the river are described in Section 3.4. The environmental effects of the water withdrawal and return are described in Section 5.1.

3.3.2 WATER SOURCE AVAILABILITY AND QUALITY

The Susquehanna River supplies all the station water requirements. The river is heavily laden with iron rich, acid mine drainage and carries an average of 350 metric tons of iron past the station site daily. The presence of iron impairs biological life and has reduced the recreational use of this river. (Ref. 3.3-1).

Rainfall upon the surface of the spray pond is expected to compensate for most of the small evaporative loss from the pond during normal operation. Water from the cooling tower makeup lines can be diverted to the spray pond if additional river water make-up is required.

Figure 3.3-1, Water Use Diagram, presents the station water use maximum flows for the major uses. Table 3.3-1, Flows of Major Streams, shows the variation in flow with the separate system flows during station operation.

The average monthly calculated consumption of water during a typical year is shown on Figure 3.3-2, Monthly Average Water Demand and Availability. Also shown for comparative purposes are the monthly average river flows, seven-day 10-year and historical low flows. There will not be physical cause for a station outage due to insufficient water supply during a reoccurrence of the historical low flow condition.

3.3.2.1 Regulatory Constraint on Water Supply

The Susquehanna River Basin Commission may impose a restraint upon the consumptive use of the river water during periods of low river flow. (See Subsection 2.4.2.5). To meet this requirement the Applicant may supply replacement water to the river from an augmentation reservoir or purchase augmentation water from another source such specificed low flow conditions. The Applicant has pursued both alternatives since 1974, however, the additional water may not be available in either case in 1981 for Unit 1 operation.

3.3.3 STATION USES AND TREATED WATER QUALITY

The river water is used without treatment other than coarse screening to supply cooling water makeup. Table 3.3-2, Summary of Susquehanna River Water Analyses, shows the chemical composition of the river.

Other station uses require higher quality water. This water is treated by clarification and filtration to remove suspended solids and iron. The filtered water is used without further treatment to supply pump seals and for housekeeping operations in the nonradioactive areas of the station and for fire protection.

The filtered water is further treated to provide a potable water supply for drinking and washing. Also the filtered river water is given further treatment for removal of suspended and dissolved solids before being added to the reactor steam cycle.

Water reclamation practices, as described in Section 3.6, limit the demand for water and reduce the volume of liquid wastes generated in the treatment stages that supply water for all the station uses.

As shown on Figure 3.3-1, heat dissipation from the steam power cycle is the major consumptive use of water during normal operation. This heat and the heat from minor friction and electrical losses require the evaporation of a maximum of 28,700 gpm of water in the cooling towers. Other station needs require the withdrawal of an additional 10,400 gpm from the river, which is treated as described in Section 3.6, and returned to the river.

The station is also equipped with an emergency heat dissipation system. The system is supplied with water from the spray pond on site. The pond is initially filled with river water.

operating equipment for trash handling screens, motor control centers, screen wash strainers and a debris handling facility.

The substructure contains two water entrance chambers that house the travelling screens and two pump chambers. The intake openings are formed by the floor and sides of the entrance chambers. See Figure 3.4-4 for plan of substructure. The top of the intake openings is formed by a inverted weir that extends one foot below the minimum river water level, elevation 484.0 ft, to intercept floating oil and debris. The front of the intake is at the river bank with flared wing walls extending down the natural slope of the bank to provide for an even and gradual water approach velocity.

The intake flow velocity is perpendicular to, and considerably smaller than, the river velocity, which tends to move submerged aquatic life and floating debris past the intake. Figure 3.4-4 shows the average horizontal velocity of the water flowing from the river to the intake pumps.

Four nominal 33.33% capacity intake pumps that have a capacity of 13,500 gpm (30 cfs) each are installed in the intake structure. As shown on Figure 3.3-2 and Table 3.3-1, 100% station load operation of both units can be supported with 39,100 gpm (87 cfs) intake flow under the least favorable (one %) meteorological conditions.

The two water entrance chambers are each equipped with two automatically operated trash removal screens in series. A bar screen is provided behind each of the inverted weir intake openings to prevent large debris from impeding operation of the automatic traveling screen located downstream. The bar screen trash rakes and traveling screens are operated automatically by differential pressure sensors or by a timer for periodic cleaning. Water spray systems wash debris from the screens into a pit for disposal whenever the trash rake or traveling screens operate. The bar screens consist of vertical 1 1/4 in. bars with a 1 in. opening between bars. The traveling screens have 3/8 in. mesh wire openings.

Stop log slots are provided in front and behind the screens so that the provided stop logs may be lowered and the chamber dewatered for repair of the screens. Another set of stop logs may be used to close the slot in the center wall for the purpose of dewatering one of the pump chambers. The insertion of these barriers requires the effort of heavy portable equipment and a several-man maintenance crew. The scheduling of such an effort will normally be during a period of reduced station load when less water is required and design intake velocities are not exceeded.

The velocity of water through both intake structure passages when three pumps are operating (the flow is 39,100 gpm) is as follows:

Through the entrance openings (i.e under inverted weir) is independent of river level: 0.37 fps.

Through the clean bar screen openings at minimum river level 484 ft above msl: 0.58 fps.

Through the clean traveling screen openings at the minimum river level 484 ft. above msl: 0.64 fps.

There is a potential for increased velocities, since there is the capability to block off one of the passages.

Under the worst case anticipated, with three pumps operating at a flow of 39,100 gpm and with only one passage open, the inlet velocity would be 0.75 fps. As noted elsewhere there is no need for four pump operation since three pumps will exceed the maximum station demand for water. The insertion of stop logs is regulated by strict administrative procedures.

The amount of trash collected by the debris handling screen is estimated to be 150 ft^3 per month, a quantity which would fill one dumpster. The trash collected in the dumpster is disposed of as discussed in Section 3.7. The type of trash collected is primarily sticks and leaves during periods of high debris. This estimated amount of trash is based on the Applicant's Martin's Creek station, which is on the Delaware River and uses the same intake structure screening arrangements.

The intake structure is oriented with respect to the river flow direction so that silt and debris as well as fish and other biota are carried by the river flow past the entrance (see Figure 3.4-3).

3.4.3 CIRCULATING WATER SYSTEM

Each circulating water system consists of a main condenser, circulating water pumps, piping and valves, a natural draft cooling tower and a basin below the tower that acts as a reservoir for the cooled circulating water.

contractor. The contractor is required by contract to dispose of the materials in a manner acceptable to the federal, state and local agencies.

3.7.2.2.3 Cooling Tower Basin Sediment

Sediment from the cooling tower basins is disposed of on-site in one of the existing erosion control ponds which were not needed after construction. The estimate for the rate of accumulated sediment in the tower basins is 2,700,000 lbs./year/tower. At this rate, the tower basins are not expected to need cleaning for several years after station startup. (Ref. 3.7-1).

3.7.2.2.4 Water Treatment Solid Wastes

As described in Section 3.3, the liquid water treatment wastes are filtered and the water recovered as cooling tower makeup. Approximately ten cubic feet per day of a semi-solid filter cake is generated. This cake is encapsulated in a disposable paper container and consists of: diatomaceous earth, river silt, gypsum and a small amount of aluminum hydroxide.

The disposal of this material is contracted to a disposal contractor who is required by contract to dispose of the material in full compliance with applicable state and federal regulations, (Ref. 3.7-1).

3.7.2.3 Gaseous Wastes

3.7.2.3.1 Diesel Generator Effluent

Gaseous effluents are produced by the four emergency diesel generators (6500 hp each) serving Units 1 and 2. Each is fueled with No. 2 fuel oil and operated for a minimum of one-hour per month. The gaseous effluent primarily consists of hydrocarbons, carbon dioxide, carbon monoxide and oxides of nitrogen. A small amount of sulfur dioxide is produced but is negligible since a low sulfur oil is used. The following are the quantities of pollutant emissions from each of the emergency diesel generators:

Engine	4-cycle, 600 RPM, 6500 Nominal Horsepower
Brake Mean Effective Horsepower	5700
Brake Mean Effective Pressure (psi)	200
Nitrogen Oxides-NO_x (ppm)	2167
Total Hydrocarbons - HC (ppm)	33
Carbon Monoxide - CO (ppm)	730
Air Intake (cfm)	17,500
Exhaust Temperature (°F)	900-1000

3.7.2.3.2 Emergency Diesel Fire Pump Effluent

Gaseous effluents are produced by a diesel used during emergency situations to supply water to the fire protection system. This engine is fueled with No. 2 fuel oil and is operated by automatic controls for a minimum of 30 minutes per week. The primary constituents of the effluent are listed below with the exception of sulfur dioxide which is considered negligible since a low sulfur oil is used.

Four-Cycle Engine (Nominal Horsepower)	285@1750 RPM
Brake Mean Effective Horsepower	250
Brake Mean Effective Pressure (psi)	150
Nitrogen Oxides - NO_x (ppm)	1,970
Total Hydrocarbons - HC (ppm)	40
Carbon Monoxide - CO (ppm)	640
Air Intake (cfm)	3,300
Exhaust Temperature (°F)	1,100

3.7.3 REFERENCES

3.7-1. Water Quality Management Permit Application for the Susquehanna Steam Electric Station, Department of Environmental Resources, October 22, 1976.

CHAPTER 8

ECONOMIC AND SOCIAL EFFECTS OF STATION CONSTRUCTION AND OPERATION

Construction and operation of the Susquehanna SES affects both the social and economic conditions of residents of Luzerne and Columbia counties, Pennsylvania and to a lesser degree the entire nation. This chapter assesses both the beneficial and adverse effects of operation of the Susquehanna SES and, where possible, places a monetary value upon them. All monetary values are expressed in 1981 present worth dollar values unless otherwise noted. Monetary values relevant to the Applicant were developed using an 11.15% discount rate that reflects its average incremental cost of capital. Monetary values relevant to the Cooperative were developed using a 9% discount rate that reflects its average incremental cost of capital. The effects for which monetary values cannot be concisely stated are qualitatively described in a manner consistent with the underlying concepts of cost-benefit analysis.

8.1 BENEFITS

8.1.1 PRIMARY BENEFITS

The primary benefits resulting from operation of the Susquehanna SES are those inherent in the value of the generated electricity which will be delivered to the Applicant's and the Cooperative's customers. (Ref. 8.1-1). The true value of the energy to customers in terms of need, safety, convenience, etc. is difficult if not impossible to estimate, therefore, energy benefits are not monetized but are presented only in terms of killowatt-hours (KWH). Table 8.1-1, Benefits from the Proposed Facility, provides a summary of these and other expected benefits.

Susquehanna SES is a nominal 2100 MWe (net) two unit station. Unit #1 is scheduled for commercial operation in early 1981 and Unit #2 in mid 1982. The net average annual energy generation of the station, calculated at a 70% capacity factor, is 12,877 million KWH. The goal of the Applicant is to achieve an 80% station capacity factor.

The energy delivered by the station is divided into four categories: residential, commercial, industrial and other. System losses reduce the net annual energy delivered to customers to 10,603 million KWH for the Applicant and 1216.6 million KWH for the Cooperative. The 1981 demand for electrical energy is distributed to the Applicant's customers and to the Cooperative members customers as shown on the following summary:

Category	Million KWH Applicant	Million KWH Cooperative Members
Industrial	3965.5	60.8
Commercial	2640.2	97.3
Residential	3477.8	1034.1
Other	519.5	24.4
Total	10603.0	1216.6

No sale of steam or other products or services from the station is currently anticipated.

The importance of Susquehanna SES in providing an adequate and reliable power supply for the Applicant, for the Cooperative and for the Pennsylvania-New Jersey-Maryland (PJM) Interconnection is discussed in Section 1.1. That discussion describes load-capacity-reserve conditions at the time the station was committed and also describes load-capacity-reserve conditions based on current projections. While this information indicates that the Applicant's currently projected capacity needs for the 1980's are reduced substantially from forecasts made at the time of commitment, it also indicates that benefits from the Susquehanna SES capacity continue to be substantial. For example, as noted in Section 1.1, System Demand and Reliability, the Applicant's operating costs if Susquehanna Unit #1 were delayed one year will increase by an amount estimated to be in the range of $35 million to $105 million. In 1983, operating costs without both Susquehanna Units are projected to increase in the range of $70 million to $285 million. Also as detailed in Section 1.1 and Appendix A, delays from current in-service schedules for the station are likely to add substantially to the Applicant's overall cost of service for the life of the station. For example, if both units were delayed one year, and if load growth were as low as the Very Low load projection, the Applicant's cost of service was estimated to increase by about $850 million ($130 million-1980 present worth) over the assumed station life.

Also, as previously discussed, operation of Susquehanna SES as planned provides a supplemental margin of service reliability for the Applicant's customers (and PJM), and similarly benefits the Cooperative by providing a more reliable, economic and controllable source of power than would otherwise be possible. Furthermore, operation of Susquehanna SES will provide

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APPENDICES

RECAP OF CASES IN THIS SUSQUEHANNA EVALUATION

Case	Page Reference	On Schedule (Unit No. 1-11/80 Unit No. 2-5/82) Versus	Annual Load Growth Rate PP&L	Annual Load Growth Rate PJM		Cumulative Difference Actual ($ Millions)	Cumulative Difference Present Worth @ 10.5% ($ Millions)
Base Case	1 to 14	1 Yr. Delay Each Unit	4.6%	4.7%	Carrying charges on plant investment	$ 690	$ (47)
					Net energy costs	274	213
					O&M costs	(61)	(7)
						903	159
1983/87 - 4.6%	15	No. 1 - 1983 No. 2 - 1987	4.6	4.7	Carrying charges on plant investment	2,466	(62)
					Net energy costs	1,083	701
					O&M costs	(230)	(150)
						3,319	489
1980/87 - 4.6%	15	No. 1 - On Schedule No. 2 - 1987	4.6	4.7	Carrying charges on plant investment	1,699	94
					Net energy costs	743	440
					O&M costs	(143)	(84)
						2,299	450
1983/87 - 2.5%	16	No. 1 - 1983 No. 2 - 1987	2.5	2.5	Carrying charges on plant investment	2,466	(62)
					Net energy costs	727	479
					O&M costs.	(230)	(150)
						2,963	267
One Yr. Delay - 2.5%	16	1 Yr. Delay Each Unit	2.5	2.5	Carrying charges on plant investment	690	(47)
					Net energy costs	238	184
					O&M costs	(61)	(7)
						867	130
Oil Escalated at 5% vs 7%	17	1 Yr. Delay Each Unit	4.6	4.7	Carrying charges on plant investment	690	(47)
					Net energy costs	217	166
					O&M costs	(61)	(7)
						846	112