

March 16, 1965

# DRESDEN UNIT 2 PRELIMINARY TECHNICAL INFORMATION

Commonwealth Edison Company's second nuclear generating unit, to be known as Dresden Unit 2, will be the largest privately owned single nuclear power unit in the world.

Scheduled for operation early in 1969, Dresden 2 will be built immediately adjacent to the power company's original nuclear unit at Commonwealth's Dresden Nuclear Power Station, 50 miles southwest of Chicago. The plant serves the greater Chicago area. The new nuclear unit will have the capacity to supply the power needs of a city the size of San Francisco (approximately 750,000 people).

Commonwealth Edison will apply initially to the U.S. Atomic Energy Commission for a construction permit for Dresden 2 to operate at 715,000 net electrical kilowatts (approximately 2250 MW Thermal). Authorization to operate at 755,000 net KW will be requested at a later date. The unit is expected eventually to reach a maximum capability of 793,000 net KW with turbine valves wide open.

General Electric will build the plant, supplying the boiling water reactor, turbine generator and other major components, including the first two fuel loads. GE will also furnish technical direction for plant startup.

At the top rating, the purchase price of Dresden 2 will be about \$76,000,000.

#### THE REACTOR

Dresden 2 will incorporate many advances in boiling water reactor technology.

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The boiling water reactor will be a single cycle, forced circulation unit with various technological developments aimed at increased simplicity. This will result in greater plant availability and reduced maintenance requirements.

The reactor pressure vessel will be 68 feet and three inches high on the inside, and measure 20 feet and 11 inches in diameter. It will weigh just over 800 tons. The vessel will have a design pressure of 1250 pounds per square inch (gauge) at 575 degrees Fahrenheit. The base metal will be chromium-mangenese-silicon alloy steel. The wall thickness will be 6-1/8 inches with an internal stainless steel cladding (chromium-nickel steel) 7/32 inches thick.

New stainless steel jet pumps with no moving parts will be installed within the reactor vessel. As a result, the reactor will require only two external recirculating loops compared with five in previous designs.

Uranium dioxide fuel of low enrichment, encased in zircaloy tubing, will be used in the first core. The zircaloy tubing has an outside diameter of 0.570 inches and a wall thickness of 0.036 inches. The fuel will be contained in 724 assemblies, 171 inches long and 5-1/2 inches square. Each assembly will contain 49 fuel rods arranged in a seven by seven pattern. Each rod will contain approximately 192 uranium dioxide pellets, 0.488 inches in diameter and approximately 3/4 inches long. Overall rod length, including end fittings, will be 159 inches.

The reactor will have 177 bottom-entry, independently operated control blades to regulate the rate of power production. The stainless steel blades will be in cruciform cross sections with a span of 9-7/8 inches and thickness of 5/16 inches. The blades will have an active boron carbide length of 144 inches.

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The bottom-entry feature permits refueling operations without having to disconnect the blades from the drive mechanisms. Control blade withdrawal rate is 3 inches per second. Only 3-1/2 seconds are required to effect insertion.

### POWER PRODUCTION

When power is being generated, water boiling inside the reactor will produce steam at 545 degrees Fahrenheit, at a pressure of 1000 pounds per square inch. Water will be separated from the steam by separators located in the top of the reactor vessel. The dry steam will flow to the turbine generator at a maximum rate of about 8.5 million pounds per hour. The separated water in the vessel together with feed water returning from the turbine plant will be pumped back to the bottom of the reactor vessel at a maximum recirculation rate of about 100 million pounds per hour.

# PLANT DESIGN

Dresden 2 will be immediately adjacent to Edison's original nuclear unit on the 953-acre Dresden site. Although this addition to the Dresden Station will produce more than three and a half times the amount of power, physically it will occupy only slightly more space than Dresden 1.

The reactor system will be housed in a building of conventional appearance, about 123 feet wide by 135 feet long and 158 feet high. It will be reinforced concrete construction up to the refueling floor, about 100 feet from ground level. Exterior concrete surfaces will be architecturally treated. Since the exterior concrete walls of the reactor building are not specifically required for shielding, their thickness will be set by structural requirements. It is probable that they will be twelve inches thick.

Above the refueling floor, the walls will be insulated metal siding on a structural steel frame.

Roof construction will be metal deck, insulation, and built up multi-layer roofing.

The reactor and recirculating piping will be contained in a steel enclosure, the "drywell", within the building. The drywell will be vented to a pool of water, also within the building. If pressure should build up in the drywell, it would be quickly suppressed in the pool. This type of primary reactor containment is known as pressure suppression and replaces the steel sphere used for Dresden 1.

The drywell will have the shape of a light-bulb -- a spherical bottom section surmounted by a cylindrical section. The spherical section will be about 64 feet in diameter and the cylindrical section, about 35 feet in diameter. The overall height of the drywell pressure vessel will be about llifeet. The dry well vessel will be made of carbon steel plate.

Ordinary reinforced concrete will be used to shield the drywell. The shielding thickness will depend upon the frequency of occupancy by personnel in areas adjacent to the drywell.

The suppression pool will be contained in a steel doughnutshaped pressure vessel called the suppression chamber. This vessel has a major diameter of about 94 feet and a minor diameter (or height) of about 31 feet which results in overall dimensions of about 125 feet in diameter. The suppression chamber, which surrounds the base of the drywell, will contain about 95,000 cubic feet of water.

The new turbine building will be an extension to the west of the existing turbine building. It will be about 300 feet long by 170 feet wide and 100 feet high. The new reactor building will adjoin the turbine building. The new control center will be adjacent to the control center on Dresden 1.

# TURBINE GENERATOR

Dresden 2 will use a non-reheat 1800 RPM, 6-flow, 4-casing General Electric turbine with 38-inch last stage buckets. The turbine generator will be approximately 200 feet long.

# SAFETY FEATURES

The plant will incorporate many inherent and engineered safeguard features:

- (1) The boiling water reactor regulates itself. If power tends to go up, more steam bubbles are formed and the power decreases.
- (2) The plant remains safe even if power supply to the reactor recirculating pumps is interrupted.
- (3) Small instruments, called "in-core monitors", are located throughout the reactor core to measure power and allow precise control of power distribution.

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(4) Positive, prompt closures capable of isolating the reactor system.

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- (5) The pressure suppression containment system includes multiple safety barriers -- the zircaloy cladding around the fuel, the reactor vessel, the drywell, the suppression vessel and the reactor building.
- (6) The control blades are actuated for rapidinsertion with great force by hydraulic energy.

### REFUELING IMPROVEMENTS

The time for removal and replacement of the reactor vessel head will be reduced approximately 75 per cent compared with Dresden Unit 1 by using a stud tensioner instead of stud heaters on the reactor vessel head bolts.

In-core instrumentation enters the top of the Dresden 1 reactor vessel, but a design improvement to be incorporated in Dresden 2 will permit the installation of this instrumentation through the bottom of the reactor vessel, thus eliminating handling damage and reducing refueling time.

Dresden 1 fuel is transferred in a 16-assembly basket through a tube between the refueling pool in the containment building to the storage basin in the fuel building. The Dresden 2 design will permit moving a single assembly directly from the reactor to an adjacent storage pool.

### OTHER PLANT FEATURES

Dresden 2 will include features to provide response to Commonwealth Edison's system load changes using a flow control system -- the reactor recirculating pump speed will be changed to adjust reactor power.

The plant will also incorporate a computer to perform data logging and performance calculations to achieve optimum fuel burn-up.

Dresden 2 will benefit from the experience of five years' operation of Dresden 1, as well as experience from eleven other General Electric boiling water reactor plants operating or under construction in the United States and overseas. In addition to Dresden 1, other General Electric reactors are now operating in California, Michigan, Japan, Italy and Germany. Four other plants are planned or under construction in New York, New Jersey, Germany and India.

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# DRESDEN UNIT 2 PRELIMINARY TECHNICAL INFORMATION

<u>Plant</u>		
	Net Electrical	715 MW
	Gross Electrical	752 MW
	Net Heat Rate	10,780 Btu/kw-hr
	Feed Water Temperature	330.4° F
React	oc <b>r</b>	· ·
	Thermal Rating	2250 MW
	Operating Pressure (Core)	1015 psia
	Total Core Flow	98 x 10 <sup>6</sup> lb/hr
	Steam Flow	8.62 x 10 <sup>6</sup> lb/hr
Core	• ·	
	Core Subcooling	20.40 F
	Fuel Clad and Thickness	Zircaloy - 0.036 in.
	Fuel Length	12 Ft.
	Fuel Array	7 x 7
	No. Bundles	724
	No. Control Rods/Pitch	177/12 in.
	Average Power Density	36.6 kw/liter
	Equivalent Core Diameter	182.2 in.
	Control Rod Poison Material	Boron Carbide
	Curtain Material	Boron - Stainless
	Core Average Voids	26.6%

Critical Heat Flux	1.5
Overpower - %	120
Central Fuel Temp <sup>O</sup> F	4550
Kw/ft.	18.3
Average Power Density, Kw/l	36.6
Specific Power, Kw/kg	15.6
Peak Heat Flux (rated) Btu/hr-ft <sup>2</sup>	348,000
Maximum Heat Flux	417,800
Voids in Channel - %	36.3
Vessel	
Inside Diameter	20 ft11 in.
Overall Length	68 ft 0 in.
Wall Thickness	6-3/8 in.
Recirculation Loops	
Number	2
Pipe Size	28 in.
Pump Capacity	45,000 gpm ea.
No. Jet Pumps	24

Containment Type

Single Containment Pressure Suppression Second Dresden Generating

Unit Plannec

Morris Herald-Feb-8 1965 New Plant to Cost About \$76 Million

Commonwealth Edison Co. plans to add a second nuclear generating unit at its Dresden station east of Morris.

J. Harris Ward, chairman, said Sunday Commonwealth Edison will apply for a permit from the Atomic

Energy Commission to construct a 714,000-kilowatt iunit.

He said a permit to operate at 755,000 kilowatts is likely to be requested at a later date and that it is possible that the capacity of the unit may eventually reach 793,000 kilowatts. At the top rating, the contract price of the new unit would be about \$76 million.

General Electric Co. will build the plant, supplying the reactor, turbine-generator and other major components, including the first two fuel cores. GE also will furnish technical direction for plant start-up and initial operation.

Ward said Commonwealth Edison's decision to build a nuclear unit resulted from careful consideration of alternate methods of producing power.

Economic Advantages

"Sound system planning and attractive costs favor the expansion of our Dresden nuclear operation at this time," Ward said. "Since we already have a 200.000-kilowatt nuclear unit at the station, another nuclear unit has both economic and technical advantages over a conventional unit.

"At Dresden we have the advantages of personnel experienced in nuclear generation and ideal access to our growing extra-high-voltage system.

"A year ago, although cost comparisons were close between nuclear and coal-fired units, we decided to build a new mine-mouth station near Taylorville, Ill. Factors affecting our decision then were the availability X.57.

of a site at the mouth of an efficient mine and our meed for extra-high-voltage interconnections with other systems.'

Ward said that power from the new Dresden unit will be generated and delivered to the Chicago area at a cost slightly lower than that of power from the company's newest conventional steam plants.

**Consider Alternate Methods** 

He emphasized, however, that the decision to build a nuclear unit now does not mean that Edison will confine its futuregenerating expansion to the atomic field.

"We will continue to consider alternate methods of producing power," he said. "We are hopeful that the competitive balance now existing between nuclear and fossil-fucled power stations will bring about technological advances and cost reductions in both fields. Such progress will enable us to hold down the cost of producing electricity and ultimately will benefit our customers through lower rates."

When completed in 1969, the new Dresden unit will increase Commonwealth Edison's net generating capability to approximately 9.7 million kilowatts. The nuclear unit will raise the star tion's capability to almost pub million kilowatts, or about -10 per cent of the company total With the bulk of capacity sup-

plied by conventional steam units, Commonwealth Edison will continue to be one of the country's largest coal users; The company now has under construction four large coal fired generating units with and a aggregate capability of approximately, 2,300,000 kilowatts.

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**Completion Due in 1969** The new Dresden unit is Scheduled for service in April, 1969. It will have a single-cycle, boiling water reactor fueled with slightly enriched uranium. The new plant will incorporate a number of advanced technological improvements based on experience, obtained from the existing Dresden plant and other boiling water reactors. Among the innovations will be an improved and simplified reactor system and an advanced in-strumentation system to monitor all important phases of plant operating conditions.

Also built by General Electric, the present 200,000-kilowatt Dresden station was the nation's first privately - financed commercial atomic power plant. In operation since 1960, it has generated over four billion kilowatt-

hours of electricity, more than any other atomic power plant in the country. The nuclear unit has proven to be a very reliable machine, Ward said.

The plant is located on the Illinois waterway at the point where the Des Plaines and Kankakee Rivers join to form the Illinois River.

The new Dresden unit will be a major project in Commonwealth Edison Company's construction program, which calls for an expenditure of \$700 million in the five-year period, 1965 through 1969.



A 755,000 kilowatt nuclear generator, four times the capacity of the present atomic installation, will be installed by 1969 at the Dresden plant east of Morris.

The plant is operated by the Commonwealth, Edison Co., which initially operated it in conjunction with seven other electric combanies who sent engineers for experience in nuclear power.

Although Illinois Power, one of the seven cooperating companies,

proposed 755,000 some of the power generated by the new plant will go to its custome'rs.

- JOHN Messaglia, local Illinois Power manager, explained that electricity goes out on a grid system under which some of the been its higher cost as compared power generated by Commonwealth, is fed into Illinois Power lines and some of the electricity generated by Illinois Power feeds unit. into Commonwealth lines.

Messaglia noted that electricity from nuclear power is no different from that generated by conventional means.

The proposed generator at Dresden compares with 180,000 kilowatts for the present nuclear generator and 325,000 kilowatts for Illinois Power's Hennepin plant.

has no direct connection with the According to Commonwealth, installation, the new nuclear unit will provide Chicago area residents with more power at slightly lower rates than the company's newest conventional steam plants.

> ONE of the stumbling blocks to more widespread use of nuclear-generated electricity has to conventional plants - a balance Commonwealth apparently will tip with its new giant nuclear

# New Nuclear Unit to Be Built at Dresden

Commonwealth Edison Co.'s announcement today of plans to add another nuclear generating unit at its Dresden station 15 miles southwest of Joliet—which may become the world's biggest nuclear plant—was hailed by civic leaders today.

The cost of the new unit, to be built by General Electric Co., is estimated at \$76 million. Major construction is scheduled to start in about 10 months, pending an official permit from the

Atomic Energy Commission. The project is expected to be completed in 1969. It will provide employment for hundreds of construction workers employed by the contractor and subcontractors.

Mayor Maurice Berlinsky welcomed the planned expansion which he said will attract even more industry to the Joliet area and provide much needed job opportunities.

"It's another indication of the potential of the Joliet area future,...a faith which Commonwealth Edison has confirmed today."

Paul Scott, director of industrial development for the Joliet Region Chamber of Commerce added: "It indicates once again the dynamic potential for industrial development in the entire region, particularly southwest of Joliet, with the industrial complex growing in that area."

J. Harris Ward, chairman of Commonwealth Edison, said that the firm will apply for the permit from the AEC to construct a 714,000 kilowatt unit. He said a permit to operate at 755,000 kilowatts is likely to be requested later and it is possible that capacity of the new unit may eventually reach 793,000 kilowatts.

George Travers, district superintendent of the Joliet Public Service Division of Commonwealth Edison said that prior to major construction, site preparation contracts will be let.

Travers said it is believed that the new unit will be the biggest nuclear plant in the world.

Its initial generating capacity will be almost 3½ times that of the first Dresden nuclear unit completed at a cost approximating \$40 million. Prior to construction of that nuclear power plant some \$15 million was spent in research in a coordinated effort of several power companies.

The General Electric Co. in building the plant, will supply the reactor, turbine - generator and other major components, including the first two fuel coves. GE also will furnish technical direction for plant start-up and initial operation.

Ward said the decision to build the second nuclear unit here re-

ulted from careful consideraion of alternate methods for producing power. The Dresden station is in Grundy County at the confluence of the Desplaines and Kankakee riverst

"Sound system planning, and attractive costs favor expansion at this time," Ward said. "Since we have a 200,000 kilowatt nuclear unit at the station, another unit has both economical and technical advantages over a conventional unit.

"At Dresden we have advantages of personnel experienced in nuclear generation and ideal access to our growing extra high voltage system," Ward added. He said that power from the new Dresden unit will be delivered to the Chicago area at a cost slightly lower than that of power from the company's newest conventional steam plants. He emphasized, however, that the decision to build a nuclear unit now does not mean that Edlson will confine its future generating expansion to the atomic field.

"We will continue to consider alternate methods of producing power," he said, "We are hopeful that the competitive balance now existing between nuclear and fossil-fueled power stations will bring about technological advances and cost reduction in both fields. Such progress will enable us to hold down the cost, of producing electricity and ultimately will benefit our customers through lower rates," he added. 6

When completed in 1969, the new Dresden unit will increase Commonwealth Edison's net generating capability to approximately 9.7 million kilowatts. The nuclear unit will raise the station's capability to almost one million kilowatts, or about 10 percent of the company total.

With the bulk of capacity supplied by conventional steam units, Commonwealth Edison will continue to be one of the country's largest coal users, he said. Such units are operated at Brandon Road Station Nine and Romeoville Station Eight. The company now has under construction four large coal-fired generating units with an aggregate capability of approximately 2,300,000 kilowatts.

The new Dresden unit will be a major project in the company's construction program, which calls for an expenditure of \$700 million in the next five years.

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TEB 16 1965 THE COMMONWEALTH EDISON company has announced A that it will install a second nuclear generating unit in Dresden, Ill., where the Des Plaines and Kankakee riversjoin to become the Illinois. The present station in Dresden was the first privately financed commercial atomic power plant in the United States when it was opened in 1960. Its -capacity is 200,000 kilowatts, and since its opening it has generated more than 4 billion kilowatt-hours of electricity.

Power Plant

Chicago's American

The Edison company will ask the Atomic Energy commis-Ision for permission to build a 714,000 kilowatt unit, and may increase production to 793,000 kilowatts later. J. Harris Ward, Edison's chairman, said the nuclear-powered station will be able to produce electric power, for the Chicago district at slightly lower cost than the conventional coal-burning steam plants can do, and will lead to a decrease in rates to users.

This is a peaceful use for atomic power which has limitless possibilities for human advancement. We are happy that the first big-scale experiment of the kind was made in Chicago and that it has been so successful.

The Dresden plant is 50 miles southwest of Chicago. The building of the new generation unit will begin at once, and the unit will go into operation in April, 1969. It will cost about 76 million dollars.

We have developed explosives more completely than any other nation. They have kept us at peace in a warlike world, but they are things to be thought of with dread. We will be glad when many other communities follow the Chicago exam-Tple of putting atoms to work creating jobs and making life more pleasant for everybody;

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# **Boost** for Area JOLIET HERALD-NEWS Dresden Nuclear Power Station To Be Expanded

Announcement that the Commonwealth Edison Co. and Publie Service Co. will build a large addition to the Dresden Nuclear Power station, 15 miles southwest of Joliet, foreshadows tremendous new industrial development for this area.

As currently envisioned the station will cost \$76 million, nearly twice the amount expended on the existing Dresden nuclear unit. The Atomic Energy. Commission will be asked for a permit to construct a station with a rated capacity of 714,000 kilowátts. In actual operation, it is expected that the plant will produce 755,000 kilowatts, or perhaps more. It will make Dresden the largest generating station of its kind in the world. View grady Ma . 1

Decision to build the new Dresden addition reflects the advanced thinking among public utili-ties that has fueled the tremendous industrial expansion of the Joliet-Chicago area in the past two decades. The forward look has not been exclusive with the electric industry, but it has been adopted by the Northern Illinois Gas Co., with its extraordinary development of underground storage areas, and by the Illinois Bell Telephone Co., with its constant program of expanding and improving local and long-line service

So far as electric power is concerned, carefully kept cost studles have shown that current produced by nuclear energy is nearly as economical as that generated by standard coal-fired plants. The new Dresden unit, scheduled for completion in 1969. is expected to put power into the lines at a cost slightly lower than that for conventional steam generation. The thinking of the company, as expressed by J. Harris Ward, president of Commonwealth Edison, is that alternate methods of producing power will be constantly evaluated. and that the firm will continue to rely on its steam turbines for a major portion of its output. When completed in 1969, the Dresden station will bring Edison's total capacity to 9.7 million kilowats.

Officers and directors of Edison are convinced, apparently, that industrial growth will continue in the Chicago area served by the company, and that expansion of the use of electricity for home, apartment, and office building heating is very much in the cards. Increased capacity will mean that the company can supply electric power at lower cost for all sorts of needs, Coupled with construction of the new steam plant on the Des Plaines river, and the recent expansion of the Romeoville generating station, these units make the Joliet area an important hub of electric power production inl the southwest suburban section. Actually, Edison's lines are hooked into a vast power dist tribution network that extends eastward as far as West Vir ginia.

We can all be proud that these developments are being undertaken by private capital, without any recourse to a demand for federal aid.

#### CHICAGO SUN-TIMES, Mon., Feb. 8, 1965

# Nuclear Powered Station

announced Sunday it will build (the original) nuclear unit at another multimillion dollar nu- the station, another nuclear unit clear-powered generating sta- has both economic and technition with a much higher capacity than its Dresden unit.

J. Harris Ward, board chairman of the company, said the new facility will be constructed at the Dresden station near Morris, Ill., and may eventually produce four times as much power as the original unit.

The 200,000-kilowatt Dresden station, opened in October, 1960, was the nation's first nuclear plant financed by private funds.

Seeks Permit

apply for an Atomic Energy Commission permit for construction of a 714,000-kilowatt unit. A permit to operate at 755,000 kilowatts probably will be requested at a later date and the capacity "may eventually reach 793,000 kilowatts," he said.

- At the top rating, the proposed unit would cost about \$76,000,000. It is scheduled for completion in 1969.

General Electric Co. will build the plant and supply the reactor, turbine-generator and other major components, including the first two "slightly enriched uranium" fuel cores, Ward continued. GE also will furnish technical direction for starting up the plant and its early operation.

The Decision

Ward said his company's decision to build another nuclear unit came after considerin; other methods of power production,

He emphasized, however, that the decision does not mean Commonwealth Edison will confine its future expansion to nuclear facilities.

"Sound system planning and attractive costs favor the expansion of our Dresden nuclear operation at this time," Ward

Commonwealth Edison Co. said. "Since we already have ... cal advantages over a conventional unit."

**Future Studies** 

Ward said his company will "continue to consider alternate methods of producing power.

"We are hopeful," he added, "that the competitive balance now existing between nuclear and fossil-fueled power stations will bring about . . . cost reductons in both fields. Such progress will enable us to hold down the cost of producing Ward said the company will belectricity and ultimately will benefit our customers through lower rates."

> Ward said that power from the new Dresden unit will be generated and delivered to the Chicago area at a cost slightly lower than that of power from the company's newest conventional steam plants.

# uclear Unit ned by Edison

Commonwealth Edison com- | watts. It will raise the station's pany disclosed yesterday it plans to add a big nuclear gen- | kilowatts. erating unit at its Dresden station near Morris, Ill. The unit will cost about 76 million dollars, and is scheduled to go into operation in April, 1969.

J. Harris Ward, the utility's chairman, said the new Dresden unit will generate and deliver power to the Chicago area at slightly lower cost than do the company's newest conventional steam plants.

Ward said Edison will apply for a permit from the atomic energy commission to construct a 714,000 kilowatt unit.

Sees Later Increase

He said that a permit to operate at 755,000 kilowatts likely will be requested later and that the capacity may eventually reach 793,000 kilowatts.

"Sound system planning and attractive costs favor the expansion of our Dresden nuclear operation at this time," said Ward,-"Since we already have a 200,000 kilówatt nuclear unit at the station,' another nuclear unit has both economic and technical advantages over a conventional unit."

Completion of the new nuclear unit will increase the utility's net generating capability to approximately 9,700,000 kilo-

capability to almost one million

Plan Major Construction The Dresden station is 50 miles southwest of Chicago. It is on the Illinois waterway at a point where the Des Plaines and Kankakee rivers join to form the Illinois river.

The new Dresden unit will be a major project in the utility's construction program, which calls for spending 700 million dollars in five years.

Ward said that the decision to build another nuclear unit does not mean Edison will confine its future generating expansion to the atomic field.

Hopes for Cost Savings

"We will continue to consider the alternate methods of producing power," Ward explained.

"We are hopeful that the competitive balance now existing between nuclear and fossil fueled power stations will bring about technological advances and cost reductions in both fields.

"Such progress will enable" us to hold down the cost of producing electricity and ultimately will benefit our customers thru lower rates."

The present 200,000 kilowatt Dresden station was the country's first privately financed commercial at o mic. power plant.

Unit Used Since 1960

It has been operated, since 1960 and has generated more than 4 billion kilowatt-hours of electricity. This is more than any other atomic power plant in the country has produced.

The new Dresden unit will have a boiling water reactor fueled with slightly enriched uranium. The plant will include numerous technological improvements based on experience gained from the existing Dresden unit, Ward said.

General Electric company built the present Dresden facility and will build the new unit. It will also supply the reactor, turbine-generator, and other major components, including the first two fuel cores, 26

THE WALL STREET JOURNAL, Monday, February 8, 1965

Chicago Utility Plans \$76 Million Atom Power Plant

Commonwealth Edison Unit With714,000-Kilowatt-Plus Output to Be Built by GE

Cost Seen Lower Than Coal

By & WALL STREET JOURNAL Staff Reporter -

CHICAGO-Commonwealth Edison Co. said it plans to build an atomic power plant costing about \$76 million, one of the largest commercial nuclear power plants in the country.

The big generating unit, which will supply electric power to Chicago, will be built at the company's Dresden station near Morris, Ill., 50 miles southwest of Chicago. The Dresden station is the site of Commonwealth Edison's first nuclear plant, a 200,000-kilowatt unit in operation since 1960.

General Electric Co. will build the new atomic plant, which will have a capacity of at least 714,000 kilowatts. Commonwealth Edison will apply for a permit from the Atomic Ener-gy Commission to construct a plant of that a "possibility" of some debt financing, he will apply for a permit from the Atomic Enercapacity, J. Harris Ward, chairman, said. Aj added. permit to operate at 755,000 kilowatts is likely, to be requested later, he said, and the unit may eventually reach a capacity of 793,000 kilowatts,

GE will build the plant and supply the reactor, the turbine-generator and other major: components, including the first two fuel cores, the utility said. GE also will furnish technical direction for plant startup and initial operation. Other atomic plant builders that bid on the Commonwealth Edison project were Westinghouse Electric Corp., Combustion Engineering, Inc., and Babcock & Wilcox Co.

Cost Advantages Seen

Commonwealth Edison chose the nuclear plant over one using coal or other fuel partly because of cost advantages, Mr. Ward said.

"Sound system planning and attractive costs favor the expansion of our Dresden nuclear operation at this time," he said. "Since we already have a 200,000-kilowatt nuclear unit at the station, another nuclear unit has both economic and technical advantages over a conventional unit." He noted that at Dresden the company has the advantage of personnel experienced in nuclear generation.

Power from the new atomic plant will be generated and delivered to the Chicago area at a cost "slightly lower" than that of power from the company's newest conventional steam plants, Mr. Ward said. A company spokesman estimated the cost of power from the atomic plant would be 5% to 10% less than from new coal-fueled units. "Over the long haul, this will help us keep our rates down," the spokesman commented.

Mr. Ward stressed that the company's decision doesn't mean Commonwealth Edison will confine its future generating expansion to the atomic field. "We will continue to consider alternate methods of producing power," he said. "We are hopeful that the competitive balance now existing between nuclear and fossil-fueled power stations will bring about technological advances and cost reductions in both fields,"

Startup Set for 1969

The new atomic unit is scheduled to begin operation in April 1969. It will have a singlecycle boiling-water reactor fueled with 'slightly enriched uranium," the utility said.

The new atomic unit will be one major project in the company's \$700 million construction program for the years 1965 through 1969, which was announced last December. The company previously hadn't commented on financing the outlays, but a spokesman said yesterday that outside financing wouldn't be



Commonwealth Edison The Company announced plans over the weekend for adding another nuclear unit at its Dresden station 50 miles southeast of Chicago near Morris, Ill.

J. Harris Ward, chairman of Commonwealth Edison, said the company would apply for a permit from the Atomic Energy Commission to construct a 714, 000-kilowatt unit. He said a permit might be requested later to increase the unit to 755,000 kilowatts or possiblye to 793,000 kilowatts. At the top rating, he estimated the cost at about \$76 million. 'The General Electric Company will build the unit,

Mr. Ward said that since Commonwealth Edison already has a 200,000-kilowatt nuclear unit at the station, another nuclear unit has both economic and technical advantages over a conventional unit, 1.18

#### Feb 15 1965 ELECTRICAL WORLD

Commonwealth Edison to seek AEC construction permit for 714-Mw BWR, singlecycle nuclear unit at its Dresden Station near Morris, Ill. Under a \$76-million turnkey contract. General Electric will build the new unit for April 1969 commercial service, warranted for 755-Mw net and sized for possible uprating to 793 Mw. Reactor will use slightly enriched uranium at expected burn-up rate of 16,500 Mw days/Tonne U for first core and 22,000 for second. First two cores will be supplied by GE under a subsequent contract. Unit will feature improved reactor vessel with stainless-steel jet pumps inside to provide adequate coolant circulation and increased dependability with minimum of external recirculating loops. Steam-water separators will be compact and efficient, incorporating latest designs. Improved containment-pressure suppression eliminates need for familiar domed enclosure. Commonwealth Edison Chairman J. Harris Ward says delivered cost of energy will be 5-10% less than from their newest conventional units (Joliet No. 7 and 8 are expected to have bus-bar energy cost of less than 5 mills per kwhr). Ward expressed hope "that competitive balance between nuclear and fossil-fuel stations will bring technological advances and cost reductions in both fields . . ."



# FEB 8\_1965

Commonwealth Edison Co. will be able to supply power to the Chicago area from a nuclear plant "at a cost slightly lower than that of power from the company's newest conventional steam plant," the utility revealed Monday in announcing a major addition to the Dresden nuclear generating station.

The new nuclear plant, to be constructed near Morris, Ill., will cost as much as \$76,-000,000 and have a capacity nearly four times that of the present nuclear unit now in operation.

J. Harris Ward, chairman, said the company will apply for a permit from the Atomic Energy Commission to construct a 714,000 kilowatt unit. Operation of the plant at 755,-000 kilowatts is being considered, and it might go as high as 793,000 kilowatts/

GENERAL ELECTRIC CO. will build the plant, supplying the reactor, turbine-generator and other major components, including the first two fuel cores, Ward said. Ward said the company has been studying alternate methods of producing power. "Since we already have a 200,000-kilowatt nuclear unit at the station, another nuclear unit has both economic and technical advantages over a conventional unit," he said.

"At Dresden we have the advantages of personnel experienced in nuclear generation and ideal access to our growing extra-highvoltage system.

"A year ago, although cost comparisons were close between nuclear and coal-fired units, we decided to build a new mine-mouth station near Taylorville, Ill. Factors affecting our decision then were the availability of a site at the mouth of an efficient mine and our need for extra-high-voltage interconnections with other systems."

WARD ADDED THAT THE decision to build a nuclear unit now does not mean that Edison will confine its future generating expansion to the atomic field.

"We are hopeful that the competitive balance now existing between nuclear and fossilfueled power stations will bring about technological advances and cost reductions in both fields.

"Such progress will enable us to hold down the cost of producing electricity and ultimately will benefit our customers through lower rates," Ward said,

The new unit, when completed in 1969, will increase Commonwealth Edison's net generating capability for the system to approximately 9,700,000 kilowatts. The station's capability will approximate 1,000,000 kilowatts.

The new Dresden unit will have a singlecycle, boiling water reactor fueled with slightly enriched uranium.

# Edison Plans 2d Dresden Nuclear Unit

Commonwealth Edison company announced plans for a second multimillion dollar nuclear generating unit at its Dresden station near Morris, Ill., 50 miles southwest of Chicago. FEB 8 1965

The 76-million-dollar unit is scheduled to go into operation in April, 1969, according to J. Harris Ward, the utility company's chairman.

He said power from the new unit will be generated and delivered to customers in the Chicago area at a cost slightly lower than it is from the company's new est conventional steam plants.

#### Firm Seeks Permit

Ward said his firm will ask for a permit from the Atomic Energy commission to build the 714,000-kilowatt unit, which eventually may be raised to a capacity of 793,000 kilowatts.

"Since we already have a 200,000-kilowatt nuclear unit at the station, another nuclear unit has both economic and technical advantages over a conventional unit," Ward said. The present Dresden station was the country's first private

was the country's first privately financed commercial atomic, power plant.

G. E. to Build Unit

Completion of the new atomic unit will increase the firm's net generating capability to approximately 9.7 million kilowatts, Ward said.

General Electric company, which built the present Dresden facility, will also construct the new unit and supply the reactor, turbine generator, and first two "slightly enriched uranium" fuel cores.

Ward said the new unit will be a major part in the company's 700 million dollar, 5-year construction program,

The Dresden station is on the Illinois waterway where the Des Plaines and Kankakee rivers join to form the Illinois river,

# N. Y. HERALD TRIBUNE Chicago Ed Sets Another Nuclear Unit FEB 8 1965

Commonwealth Edison Co. said yesterday it will build another nuclear generating unit at its Dresden Station, near Morris, Ill. The company indicated it will apply for an Atomic Energy Commission permit to construct a 714,000 kilowatt unit.

Looking ahead, J. Harris Ward, Chicago chairman, said a permit to operate the station at 755,000 kilowatts is likely to be requested at a later date. He stated that the new unit will be capable of delivering power to the Chicago area at a slightly lower cost than power generated from the company's new conventional steam plants.

He emphasized; however, that the decision to build a nuclear unit at this time does not mean that Edison will confine its future generating expansion to the atomic field. He said the company has designated General Electric Co. to build the new atomic plant and supply the major components, including the first two fuel cores.



CHICAGO (A) - Commonwealth Edison Co. has announced plans for a second nuclear generating unit at its Dresden Station near Morris, 50 miles southwest of Chicago.

J. Harris Ward, Commonwealth Edison chairman, said Sunday his firm will request authority from the Atomic Energy Commission to build a 714,000kilowatt unit which eventually may generate 793,000 kilowatts of power.

Ward said the unit will cost about \$76 million. He said General Electric Co. will build the plant and will furnish technical direction for its initial operation. Real Providence

Ward said the new unit will increase the firm's net generating capability to approximately 9.7 million kilowatts when it is completed in 1969.

The present unit has a capacity of 200,000 kilowatts. It is located on the Illinois Waterway where the Des Plaines and Kankakee rivers join to form the Illinois River.

He said power from the new plant will be generated and delivered to customers in the Chlcago area at a cost slightly lower than that of power from the company's newest conventional steam plants,

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# Commonwealth Edison Co. Plans To Add Nuclear Unit

station near Morris.

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At the top rating, the con-tract price of the new unit would be about \$76 million. Completion date is 1969.

General Electric Co. will build the plant, supplying the reactor, turbine - generator and other major components, including the first two fuel cores. GE also will furnish technical direction for plant startup and initial operation.

Ward said Commonwealth Edison's decision to build a nuclean unit resulted from consideration of alternate methods of producing power.

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# Another Nuclear **Generating** Plant Is Being Planned

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General Electric Company will build the plant, supplying the reactor, turbine-generator and other major components, including the first two fuel cores. GE also will furnish technical direction for plant start-up and initial operation,

Ward said Commonwealth Edison's decision to build a nuclear unit resulted from careful consideration of alternate methods of producing power. 5 "Sound system planning and attractive costs favor the ex-pansion of our Dresden nuclear operation at this time," Ward said, "Since we already have a 200,000-kilowatt nuclear unit at the station, another nuclear unit has both economic and nuclear technical advantages Gover a

# GALESBURG REGIS. **Power Firm** To Build 2nd 2-8-65 Nuclear Unit

CHICAGO (AP) - Commonwealth ... Edison ... Co. has announced plans for a second nuclear generating unit at its Dresden Station near Morris, 50 miles southwest of Chicago.

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Ward said the unit will cost about \$76 million. He said General Electric Co. will build the plant and will furnish technical direction for its initial operation.

Ward said the new unit will increase the firm's net generating capability to approximately 9.7 million kilowatts when it is completed in 1969. The present unit has a capacity of 200,000 kilowatts. It is lo<sup>2</sup> cated on the Illinois Waterway where the Des Plaines and Kankakee rivers join to form the Illinois River.

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# CHICAGO, SUN, TIMES EDISON DECISIO Atoms Move Up In The Power Field

#### / By Edwin Darby Sun-Times Financial Editor

J. Harris Ward, the lean and handsome board chairman of Commonwealth Edlson Co., was choosing his words carefully. He had no wish to get into a public fight with the coal industry, and he didn't want it to appear that atomic power would take over the electrical utility business on the instant, like the genie leaping from Aladdin's lamp.

But he made it plain that the atomic-fueled electric power plant has finally come of age, that the atomic-fueled plant is fully competitive with the traditional coal-fueled plant, that it is

#### First of Two Articles

an even-up choice today and tomorrow between coal and atoms, with the decision dependent on special factors.

Until now the plants built to generate electricity from atomic fuel have carried an unseen label reading "experimental."

Last week Ward announced that Commonwealth Edison would build a \$76,000,000 nuclear generating unit alongside its existing nuclear unit at Dresden, 50 miles southwest of Chicago. In applying to the Atomic Bnergy Commission for a permit, the company will list the unit at 714,000 kilowatts, and say the unit might actually operate at 755,000 kilowatts, or even 793,000. At the moment there's no private nuclear electric plant of anywhere near that size. In fact, the new unit alone will have a capacity equal to more than two-thirds of the atomic-fueled capacity built in this country since the first experiment in 1956.

### The Decision Explained

HERE'S CHAIRMAN WARD explaining this landmark decision;

"The progress of atomic power has been steady, but some people have been unwilling to recognize it.

Another Atomic Step Streator Times Press 2-18-65 Announcment by the Commonwealth Edison Company

that it is adding a big new nuclear generating unit at the

Presden station near Morris has special significance, not

only in this area but throughout the country. It is impres-

sive evidence that there will be additional power available

throughout the territory served, and that nuclear power is

practical, and apparently can be produced at a cost com-

tricity, the experience of this company is being watched

with intense interest, for areas of the world without water

power or fuels with which to generate electricity envision

the atomic plant as an answer. It is a step forward in the

advancement of the atomic age, destined to give man

added tools to lift him far above the levels of the present

A pioneer in harnessing the atom to generate elec-

parable to other power sources.

civilization.

"Commonwealth Edison's first obligation is to its customers and then to its stockholders. At any given moment, Edison attempts to make the best deal it can in connection with building a plant. Certain conditions-the site, the fuel prospects, the capital costs—may make a deal desirable. "We now have on order more than 2,000,000 kilowatts of

new coal-burning capacity which we decided to purchase aftergiving very careful attention to nuclear power possibilities. (The larger part of this new capacity is a \$100,000,000 coalfired generating plant being built near Kincald, 15 miles southeast of Springfield, near one of the largest underground coal mines in the world. The decision to build the Kincaid. plant was announced on Jan. 3, 1964.)

"Roughly half of this total will be built at the mine mouth (Kincaid), and the other half will be built at our Joliet station, where we will have excellent unit train service for coal.

"In other words, the circumstances at the time those contracts were placed favored coal-burning plants.

"The day we made our decision to build Dresden II, the new nuclear-powered station, the circumstances favored nuclear power.

"We have had the experience from Dresden I. Dresden I, in operation since 1960, was built for Edison by General Electric. It has generated more than 4 billion kilowatt-hours of electricity, more than any other atomic power plant.) We had a good site for the new plant at Dresden and we received an attractive offer from General Electric.

We felt the time had come to take advantage of the very rapid technological progress apparent in the nuclear-power field, Incidentally, we achieve in this purchase (Dresden II) a greater diversity of power source. We have new protection against coal transportation failures.

# Coal Sent By Wire

"NUCLEAR POWER, of course, is immune to most transportation problems. Coal- is brought from the mines to our Joliet station by train and by barge. Kincaid - at the mine mouth, in effect-sends coal to Chicago by high tension wire, Our, customers are protected. It is also interesting that Kincaid, Dresden and Jollet all minimize Chicago's air-pollution problem; our plants are not concentrated in the city,

"Actually, a reactor is a much neater and nicer operation than a coal-fired generating station. You could put one in the middle of a garden, while with the traditional steam plant you may have a hundred coal cars arriving each day." In sum, what Ward is saying is that in the year and eight days between the announcement of the coal-fired Kincaid plant and the atomic-powered Dresslen II, atomic power has moved into the favored position for the future-barring extenuating circumstances. 1.5.4

THURSDAY: New Benefits from Atoms.

### LAW BULLETIN 2-8 Nuclear generator

A 755,000 kilowatt nuclear generator will be installed at the Commonwealth Edison, Dresden station near Morris by 1969.

Edison announced Sunday the nuclear unit would provide Chicago area residents with more power at slightly lower rates than the company's newest conventional steam plants.

J. Harris Ward, company chairman, said a permit from the Atomic Energy Commission is needed before construction can begin.

lization. If he can advance socially, and in the realm of politics and economics, there is a tremendous future that awaits him. Expansion of the nuclear plant at Dresden station has

great implications that only the dreamer can envisage. الأناع والمستعل وتبرأ والمترا

# FEB 18 1965



#### By Edwin Darby Sun-Times Financial Editor

A significant key to the battle between coal and the atom for the gigantic electrical utility market was provided in Commonwealth Edison's announcement last week that it would build a second big nuclear generating unit at Dresden. The anouncement said the unit would be able to turn out 739,000 kilowatts

of electricity. And it would cost about \$76,000,000 to build. Simple arithmetic unveils the key. Dividing the kilowatt

capacity into the construction cost indicates a dramatic reduction in the figure utilities are most interested in when they set out to build new generating plants: How much will it cost to obtain each kilowatt of new capacity? The answer for Dresden II: About \$96 per kilowatt.

By comparison, it cost Commonwealth Edison approximately \$183 per kilowatt for Dresden I, its trail-blazing 200,000 kilowatt nuclear unit, completed in 1959.

This remarkable reduction makes the nuclear reactor generating station highly competitive on cost with the conventional

#### Second of Two Articles

coal-fired generating plant. But it doesn't mean the atom is going to replace coal as the fuel for power generation.

What it does mean is that the atom is now in there as a fully established commercial competitor, and that the developing competitive race could still further lower the final cost of electricity to the consumer.

Big numbers are involved. The electric utilities buy more than 210,000,000 tons of coal annually. That's something close to half the coal produced. The railroads collect upward of \$1 i billion a year for hauling coal to all customers.

# The Outlook For Coal

IT IS POSSIBLE to see real trouble for the coal industry and the railroads in the new competitive status of the atom. But actually a good chunk of the coal industry is in better shape than ever, and the utilities will be buying ever increasing amounts of coal for some time to come.

Since 1956, nuclear reactors accounting for about 1,100,000 kilowatts of electricity have gone critical. It is easy to see the big build-up in the figures on nuclear construction now under way and planned. Not counting the 793,000 kilowatt Dresden II, stations that will produce 1,300,000 kilowatts are actually under construction. Announced intentions, with completion dates running to 1969, would add more than 3,900,000 kilowatts. Almost certainly, the Commonwealth Edison decision — and figures—will stir up more activity.

But Commonwealth Edison itself is now building coal-fired lacilities with a capacity of more than 2,000,000 kilowatts. And other utilities are ordering conventional capacity in big amounts as the country's demand for electric power surges forward.

- But the point for the future is that nuclear power is now in the same ball park with coal, not only on plant construction costs but on annual fuel costs. That the atom is competitive on annual fuel costs is particularly significant in view of the tremendous and effective effort by both the coal companies and the railroad to reduce the price of delivered coal.

Real and steady progress in nuclear reactor technology is the answer to the atom's new commercial status. "The delivered price of coal has been declining," J. Harris Ward, board chairman of Commonwealth Edison, says. "But capital costs for nuclear stations have gone down faster."

# **Surprises Are Possible**

TECHNOLOGICAL PROGRESS is apt to continue---with the possibility of dramatic surprises.

Chairman Ward has this to report:

"The unknowns in the development of a new technology can not be overemphasized.

"We have found in the ashes of Dresden I various elements we had not expected to find and which are currently of considerable value. If we can separate them, we can meet a current demand at a material benefit to our over-all operation,

"In addition, there are two kinds of Plutonium and both are produced to some degree at Dresden. The best uses for them have not been determined. These very hot, fissionable materials may be used in the fast breeder reactors.

"All of these byproducts would possibly be used in the field of power generation. (In other words, as fuels.) But the unknowns could include uses outside power generation. Most of the people at General Electric, those who built our reactor, didn't suspect that we would find what we have already found."



