

NO-A190 147

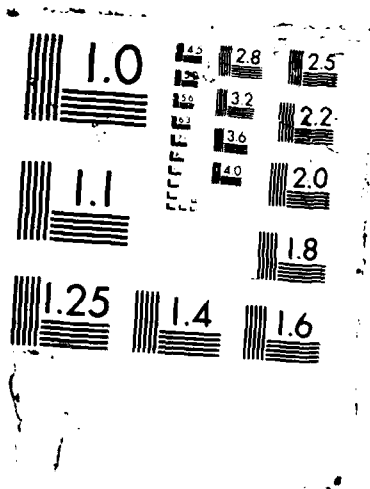
NUCLEAR POWER PLANTS(U) FOREIGN TECHNOLOGY DIV
WRIGHT-PATTERSON AFB OH 10 DEC 87 FTD-ID(RS)T-1374-87

1/1

UNCLASSIFIED

F/G 10/5.1 NL





2

FTD-ID(RS)T-1374-87

AD-A190 147

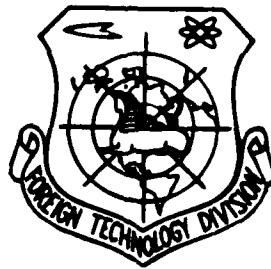
DTIC FILE COPY

FOREIGN TECHNOLOGY DIVISION



NUCLEAR POWER PLANTS

DTIC
ELECTE
JAN 27 1988
S H D



Approved for public release;
Distribution unlimited.

88 1 14 036



HUMAN TRANSLATION

FTD-ID(RS)T-1374-87

18 December 1987

MICROFICHE NR: FTD-87-C-001146

NUCLEAR POWER PLANTS

English pages: 10

Source: Zhong Guo He Xuehui, Sep 1986, pp.
Fr. Cover; 2; 4; 5; 6; 7; 8; 9; 12; 13

Country of origin: China
Translated by: Randy Dorsey
Requester: DET 22 AFSAC (AFIS)
Approved for public release; Distribution unlimited.



on For	
RA&I	<input checked="" type="checkbox"/>
B	<input type="checkbox"/>
nced	<input type="checkbox"/>
ation	
tion/	
bility Codes	
ail and/or	
Special	

THIS TRANSLATION IS A RENDITION OF THE ORIGINAL FOREIGN TEXT WITHOUT ANY ANALYTICAL OR EDITORIAL COMMENT STATEMENTS OR THEORIES ADVOCATED OR IMPLIED ARE THOSE OF THE SOURCE AND DO NOT NECESSARILY REFLECT THE POSITION OR OPINION OF THE FOREIGN TECHNOLOGY DIVISION

PREPARED BY:
TRANSLATION DIVISION
FOREIGN TECHNOLOGY DIVISION
WPAFB OHIO

A-1

TABLE OF CONTENTS

Graphics Disclaimer ii

Table of Contents 1

Nuclear Power Plants and Capacities for Various Countries and Regions
of the World (As of the end of 1985) 3

China Needs to Develop Nuclear Power 4

China has Already Established a Rather Comprehensive Nuclear Fuel
Cycle Complex 5

China has the Capability to Develop Nuclear Power 6

Qinshan Nuclear Power Plant Under Construction 8

Guangdon-Daya Bay Nuclear Power Plant to be Built Under Joint Venture 10

Handwritten notes:
1. 1985年
2. 1985年
3. 1985年

GRAPHICS DISCLAIMER

All figures, graphics, tables, equations, etc. merged into this translation were extracted from the best quality copy available.

=====
DOC: 1374-87 PRI: R RORG: 1DET22 RNAME: DESORMEAUX

RECD: 871218 DUE: 880109
LANG: CHI TO-LANG: TYPE: HT02 CLASSIF: U TNUM: T193

TITLE: ARTICLE
AUTHOR: ~~HE DIAN ZHAN~~ NONE

SOURCE: ZHANG GUO HE XUEHUI, SEP 1986

COSATI: 02 SUBJECT:

PPGS: FR COVER; 2; 4; 5; 6; 7; 8; 9; 12; 13

PGCNT: ~~0009~~ 0010

REMARKS: 71322

TRANSLATOR: Murray CONTRACTOR:

TO-CONTR: DUE-CONTR: FROM-CONTR: DATE CANCELLED:

CANCELLED PAGES: UNITS PER PATENT:

TRANSLATION COST: FMSIT: 871218

DIE
X SCIS 12/18

NUCLEAR POWER PLANTS

Nuclear Society of China September 1986

TABLE OF CONTENTS

An important source of energy for our time - nuclear energy 1

The world's energy sources, make-up and demand 2
(Pie charts for the years 1984 and 2000 showing percentages of world energy from various sources, coal, water-power, petroleum, nuclear energy, natural gas, other)
(Bar chart showing trend in world demand for energy for the years 1978, 2000, 2100)

The development of nuclear energy is a world trend 3
(Graph showing the trend in nuclear power capacity as a percent of total power generation for France, U.S., Japan and the entire world)
(Bar chart showing the percentages for various countries)

Nuclear power plant capacities by country and region (Table showing number of nuclear power plants in operation and under construction (& their capacities) 4

China needs to develop nuclear power 6

China has already established a rather comprehensive nuclear fuel cycle system 7

China has the capability to develop nuclear power 8

China establishes International Nuclear Safety Agency 10

Qinshan Nuclear Power Plant under construction 12

Guangdong-Daya Bay Nuclear Power Plant to be built under joint venture using foreign technology and Hong Kong capital 13

How nuclear energy is released	14
(Brief explanation of the splitting of Uranium atom)	
What is a nuclear power plant?	16
The steam generating system of a 900 megawatt pressurized water reactor power plant	18
(Overall diagram of a containment structure)	
Nuclear reactor	19
Nuclear fuel	20
Steam generator	21
Will a nuclear power station explode like a bomb?	22
Three barriers which prevent leakage of radioactive material . .	23
First barrier - fuel cladding	23
Second barrier - pressure vessel	24
Third barrier - safety vessel (this is containment structure)	24
Nuclear power plant safety systems	25
Three processes in nuclear power plants: gas, liquid, solid . . .	28
Nuclear power plants have very little effect on the environment	29
Nuclear power plants are a clean source of energy	30
Amount of fuel transported in comparison with coal-fired plants	32
Nuclear power is cheap compared to coal power	33
Radiation exposure from everyday sources	34
Calculating your radiation exposure	36
Radiation effects on living organisms	38
Is there a risk of cancer? (comparison with cigarette smoking)	39
U. S. Three Mile Island accident	40
Chernobyl accident	42
Nuclear power plants and the environment	45

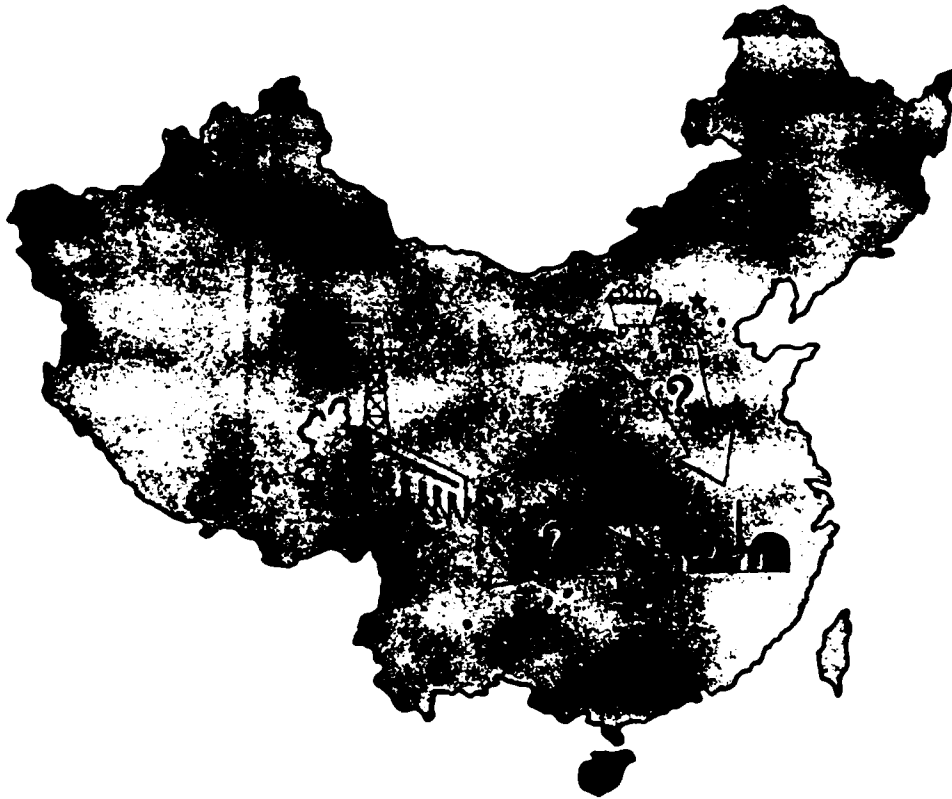
NUCLEAR POWER PLANTS AND CAPACITIES FOR VARIOUS COUNTRIES AND REGIONS OF THE WORLD (As of the end of 1985)

國名 Country	In operation		Under construction		Total	
	No. of reactors	Megawatts	No. of reactors	Megawatts	No. of reactors	Megawatts
Argentina	2	935	1	692	3	1627
Belgium	8	5485	—	—	8	5485
Brazil	1	626	2	2490	3	3116
Bulgaria	4	1760	2	2000	6	3760
Canada	16	10092	6	5114	22	15206
China	6 *	4884 *	1	300	7	5184
Czechoslovakia	5	2200	5	2200	10	4400
Finland	4	2310	—	—	4	2310
France	46	37785	18	22445	64	60230
West Germany	5	2270	2	880	7	3150
East Germany	17	16341	6	6569	23	22910
Hungary	3	1320	1	440	4	1760
India	6	1244	4	880	10	2124
Italy	3	1285	2	1964	5	3249
Japan	33	23783	8	7331	41	31114
South Korea	4	2685	5	4581	9	7266
Netherlands	2	500	—	—	2	500
Pakistan	1	125	—	—	1	125
South Africa	2	1844	—	—	2	1844
Spain	8	5682	4	3729	12	9411
Sweden	12	9325	—	—	12	9325
Switzerland	5	2882	—	—	5	2882
U. K.	38	11748	4	2640	42	14388
U. S.	98	81686	24	27124	122	108810
U. S. S. R.	45	29295	11	10650	56	39945
Yugoslavia	1	615	—	—	1	615
Total	375	258707	106	102029	481	360736

* China's Taiwan province

CHINA NEEDS TO DEVELOP NUCLEAR POWER

China's energy resources are unequally divided. Most of the coal reserves are in the north and most of the water power resources are in the western part of the country. It is imperative that nuclear power be developed in the energy-poor regions of the east, the south and the northeast where industry and population is rather concentrated.



Should the north's coal be transported to the south?

The amount to transport is immense. This is economically unfeasible.

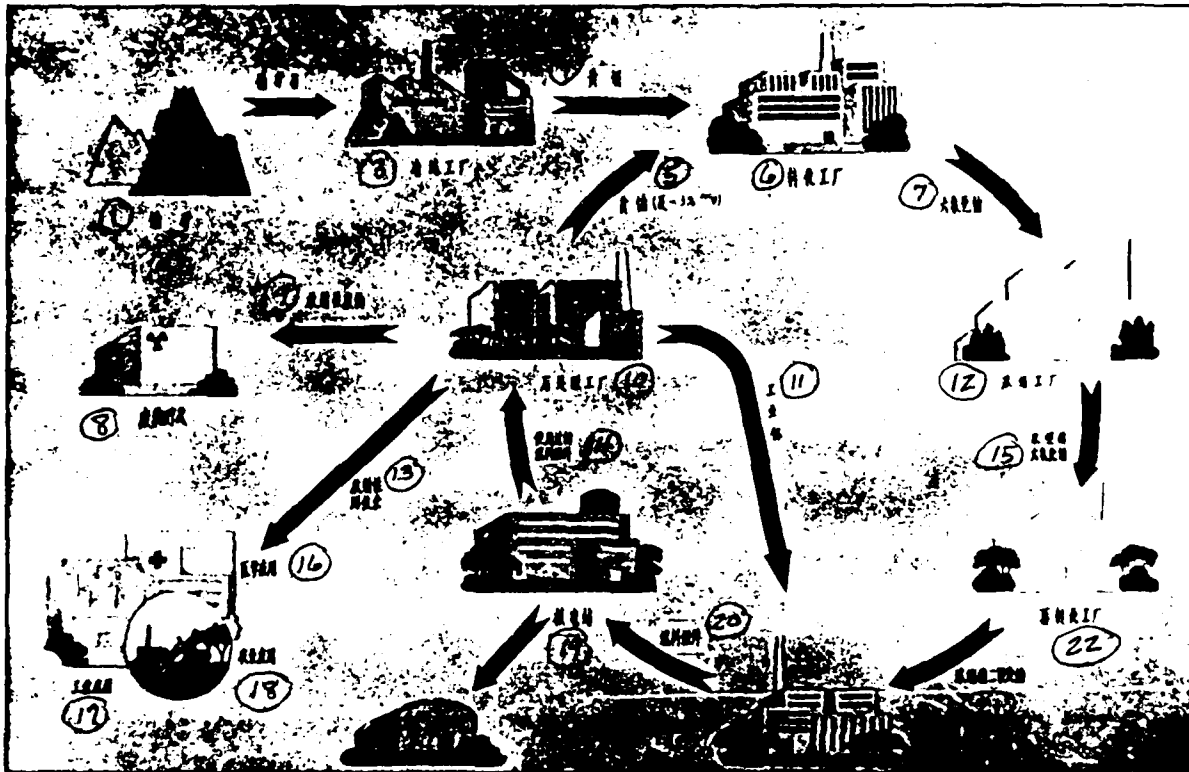
Should the electric from the west be supplied to the east?

This is technologically complicated and very expensive.

Oil is scarce. It's a shame to burn it all up.

CHINA HAS ALREADY ESTABLISHED A RATHER COMPREHENSIVE NUCLEAR FUEL CYCLE COMPLEX

Nuclear fuel cycle

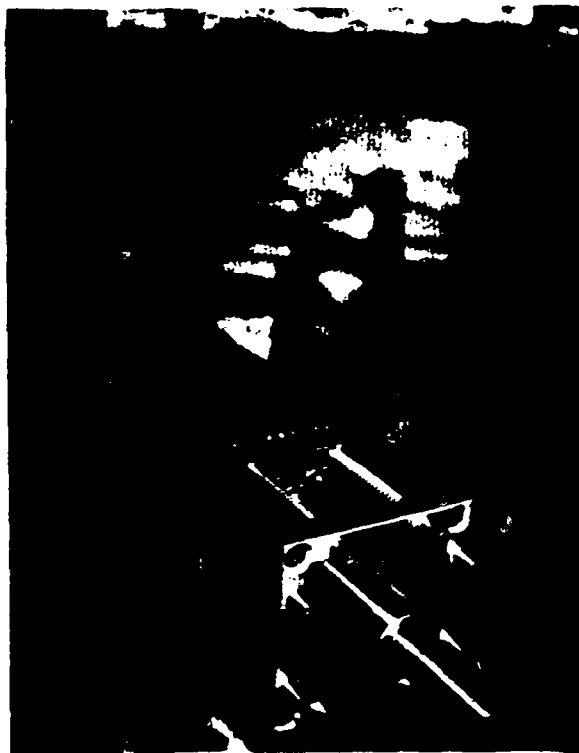


KEY: (1) Uranium mine; (2) Uranium ore; (3) Smelting plant; (4) illegible; (5) (illegible) uranium (up to 3% ^{235}U); (6) Conversion plant; (7) Uranium hexafluoride; (8) Waste storage; (9) Radioactive waste; (10) Aftertreatment plant; (11) Industrial plutonium; (12) Enrichment plant; (13) Radioactive isotopes; (14) Used up (spent) fuel assemblies; (15) Enriched uranium hexafluoride; (16) Medical applications; (17) Industrial applications; (18) Agricultural applications; (19) Nuclear power plant; (20) Fuel assemblies; (21) Enriched uranium dioxide; (22) Reconversion plant.

China has already established a rather comprehensive nuclear fuel cycle complex, from geological exploration and mining to elemental processing and aftertreatment, etc. It has been verified that there are adequate uranium ore reserves to supply nuclear power plants with sufficient nuclear fuel.

CHINA HAS THE CAPABILITY TO DEVELOP NUCLEAR POWER

China's nuclear industry already has a 30-year history of development, has become a fairly comprehensive nuclear industry complex, has already built many different types of nuclear reactors, and has accumulated 140 reactor years of safe management and operational experience. This industry has a contingent of qualified scientists and technicians who possess the ability to research, design and build nuclear power plant equipment. At the present time they are building the 300-megawatt Qinshan Nuclear Power Plant which they designed themselves.

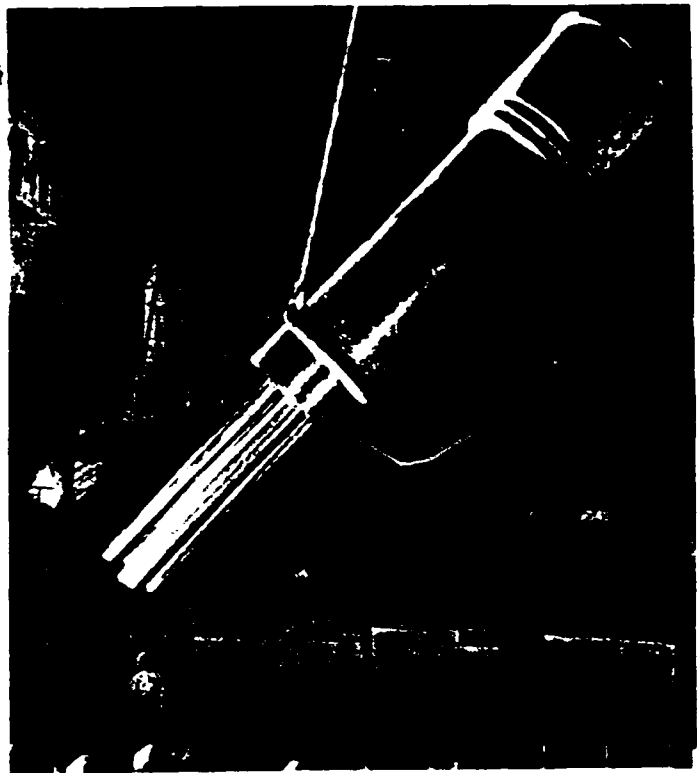


Qinshan Nuclear Power Plant
fuel element assembly



High-flux process
experimental reactor

China operated her first experimental heavy-water reactor for more than 20 years, then in 1982, the reactor core was replaced and the reactor was successfully rebuilt. The reactor is still in safe operation and produces radioactive isotopes.

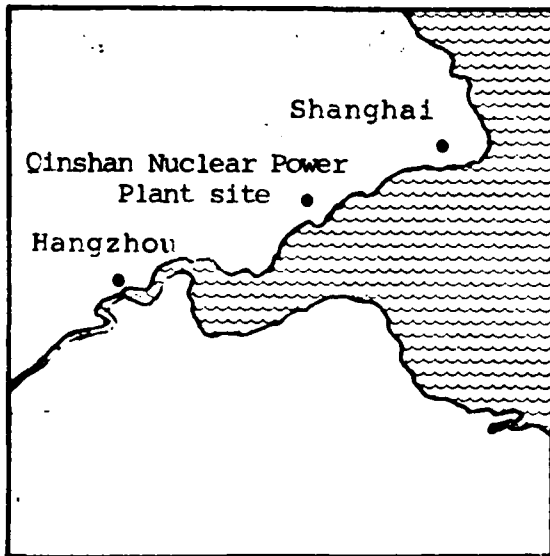


A high-flux process experimental reactor which was Chinese designed and built, went into operation in 1980.



QINSHAN NUCLEAR POWER PLANT UNDER CONSTRUCTION

The Qinshan Nuclear Power Plant is a 300-megawatt pressurized water reactor nuclear power plant (the first Chinese-researched, designed, and built nuclear power plant). It is expected to go into operation producing electrical power in 1989.



The Qinshan Nuclear Power Plant is located on Hangzhou Bay in Haijian county in Zhejiang Sheng, about 120 kilometers from Shanghai and about 80 kilometers from Hangzhou. The site's geological structure is stable, earthquake intensity is low, and the main plant building will sit directly on bedrock. Three sides are encircled by mountains and the other side overlooks the ocean.

Principal Parameters

No. of reactors	1
Thermal capacity	966 MW
Electrical Power	300 MW
Coolant inlet/outlet temperature	288.8/315.2 ^o C
Coolant pressure	155 kg/cm ²
Coolant flow	24,000 m ³ /h

The Qinshan Nuclear Power Plant construction site. The structure in the photograph is the reactor containment structure.



GUANGDONG-DAYA BAY NUCLEAR POWER PLANT TO BE BUILT UNDER
JOINT VENTURE

The Guangdong-Daya Bay Nuclear Power Plant will be a 2 X 900 megawatt pressurized water reactor nuclear power plant. China is building this power plant using foreign technology and Hong Kong capital.

The Guangdong- Daya Bay Nuclear Power Plant site is located on Daya Bay east of the mouth of the Zhujiang River about 45 kilometers from Shenzhen and about 50 kilometers from Hong Kong. The plant site overlooks the sea to the south and is encircled by mountains on the north. It is located on the northwest side of Daya Bay and situated in an area where the stability of the earth's crust is fairly good.

Principal Parameters

No. of reactors	2
Thermal capacity	2905 MW
Electrical Power	900 NW
Coolant inlet/outlet temperature	293/328.3 ^o C
Coolant pressure	158 kg/cm ²
Coolant flow	68,230 m ³ /h

A design model of the Guangdong-Daya Bay Nuclear Power Plant



DISTRIBUTION LIST
DISTRIBUTION DIRECT TO RECIPIENT

<u>ORGANIZATION</u>	<u>MICROFICHE</u>
A205 DMAHTC	1
A210 DMAAC	1
B344 DIA/RTS-2C	9
C043 USAMIA	1
C500 TRADOC	1
C509 BALLISTIC RES LAB	1
C510 R&T LABS/AVRADCOM	1
C513 AVRADCOM	1
C535 AVRADCOM/TSARCOM	1
C539 TRASANA	1
C591 FSTC	4
C619 MIA REDSTONE	1
D008 NISC	1
E053 HQ USAF/INET	1
E404 AEDC/DOF	1
E408 AFWL	1
E410 AD/IND	1
E429 SD/IND	1
P005 DOE/ISA/DDI	1
P050 CIA/OCR/ADD/SD	2
AFIT/LDE	1
FTD	1
CCN	1
MIA/PHS	1
LLYL/Code L-389	1
NASA/HST-44	1
NSA/T513/TDL	2
ASD/FTD/1QIA	1

END
DATE
FILMED

4-88

DTIC