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Brief News on AD potential in the Nuclear Market

1. Data on the nuclear market
2. Main reactor designs and AD positioning
3. ITER potential
4. Basic nuclear Glossary

J.P HESSE – June 2010

Groupe ERAMET

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Data on the Nuclear Market

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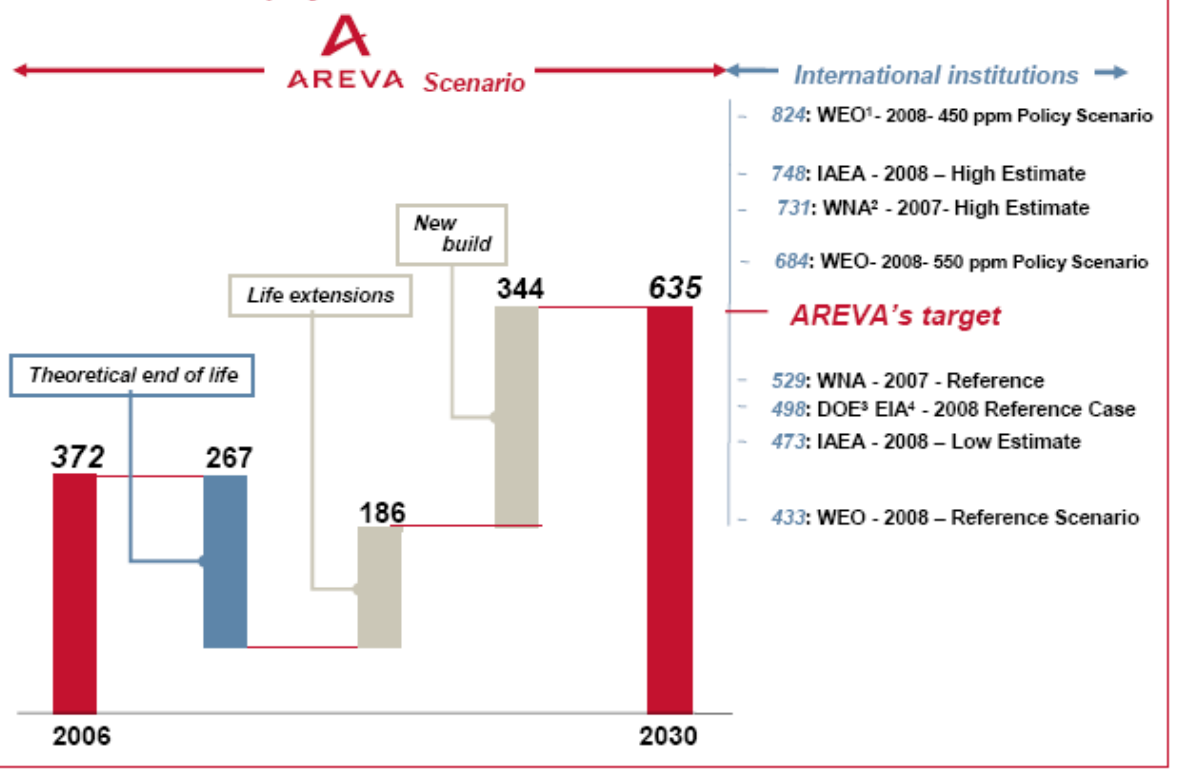
Long Term Perspective

AREVA

AREVA's 2030 scenario: construction or life extension of more than 500 GWe of nuclear power

AREVA nuclear projection is in line with international institutions forecasts



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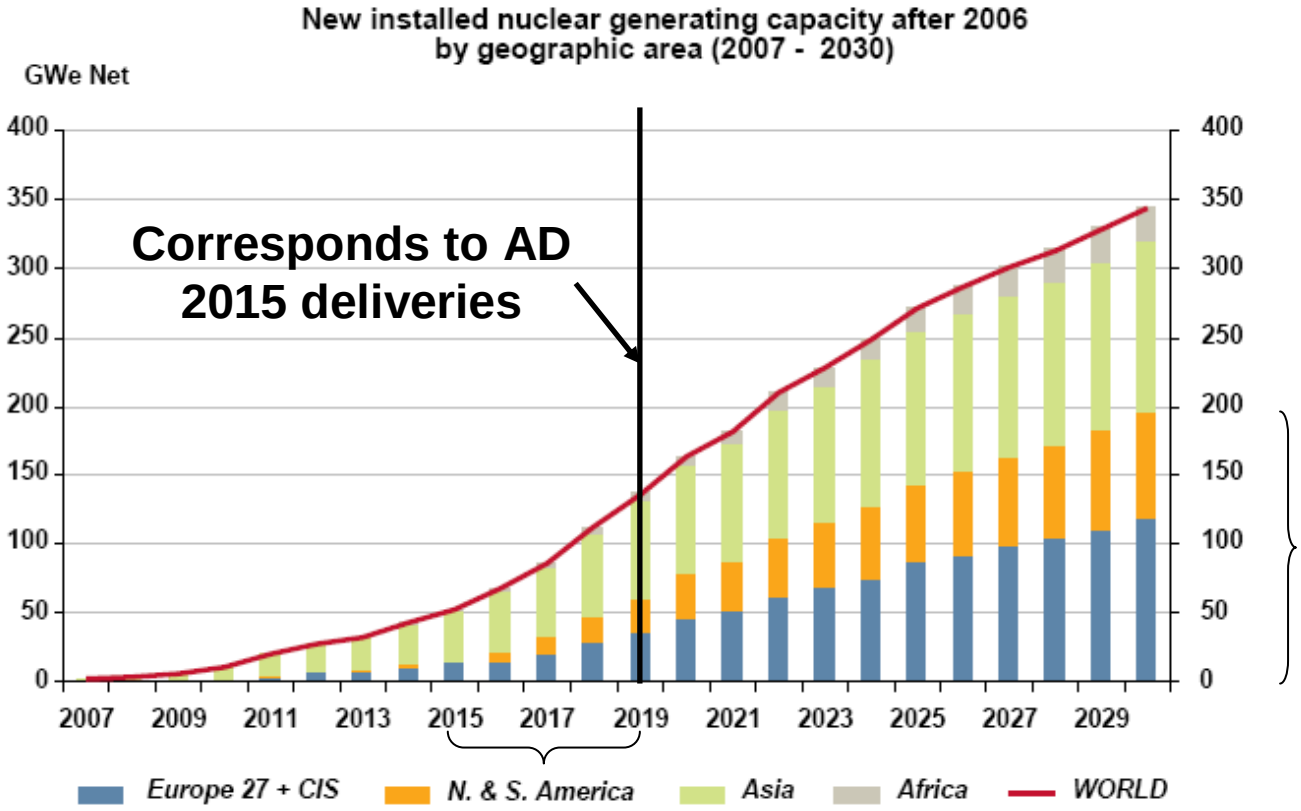
New build breakdown by area

New construction should affect all regions of the world



From 2021, mainly renewal of existing facilities

Source: AREVA's estimates

FYP period = 60% are Asia new build

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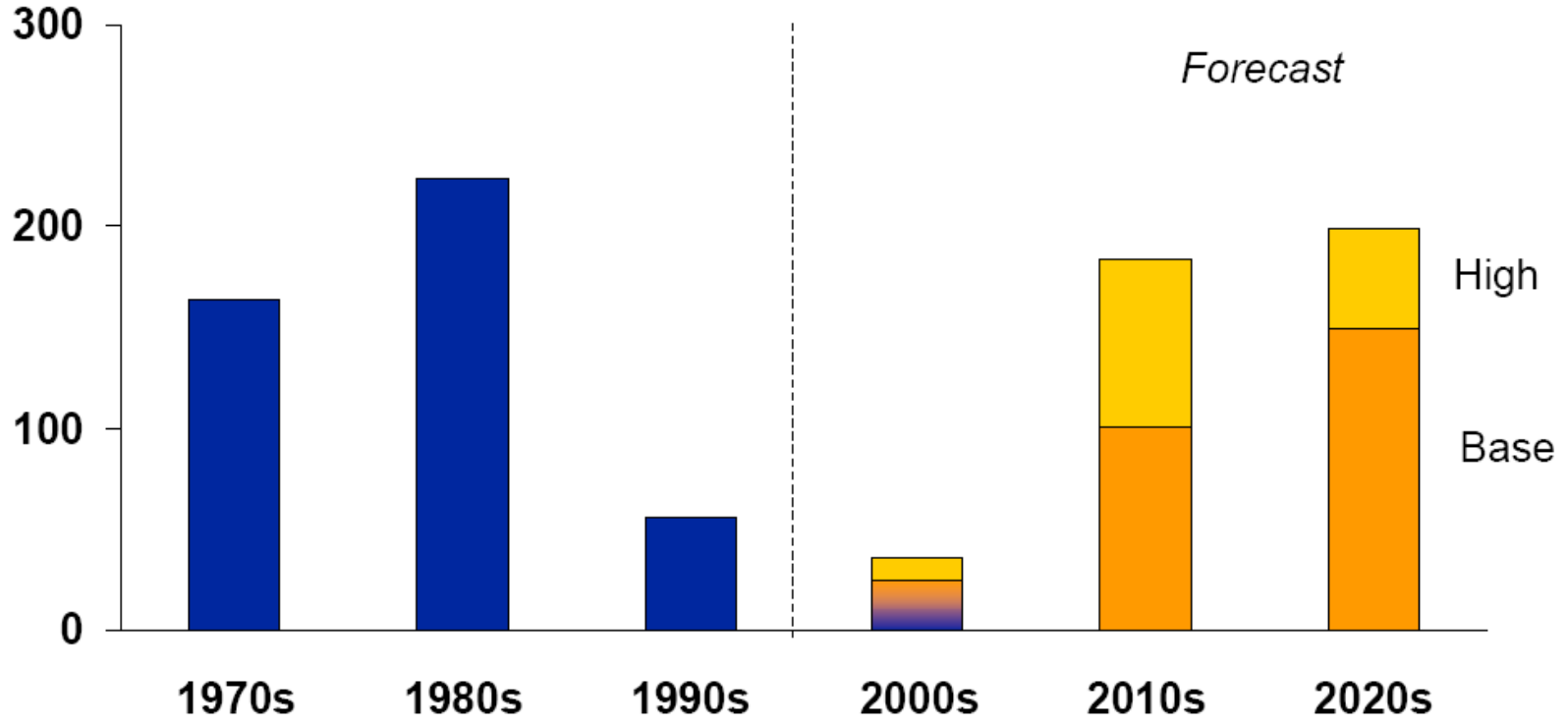
An accelerated rate of new build

World nuclear plant new build by decade

Cumulative number of plants, estimate

Estimation « RR Civil nuclear » nouveaux réacteurs à construire 2010/2030.
Hypothèse basse = 260. Hypothèse haute = 380



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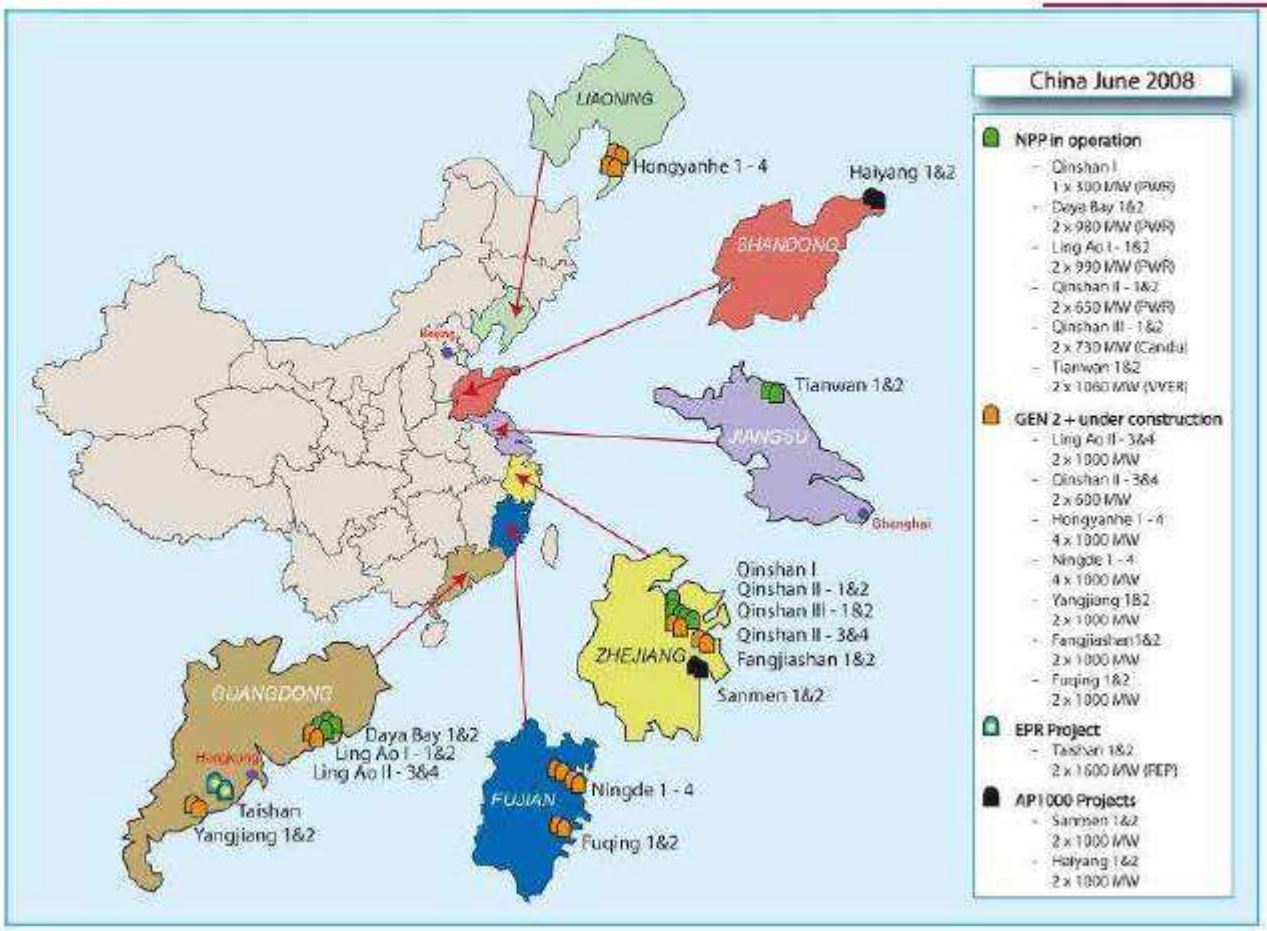
China : already very active

China: nuclear civilian sites
11 reactors in operation – 18 under construction



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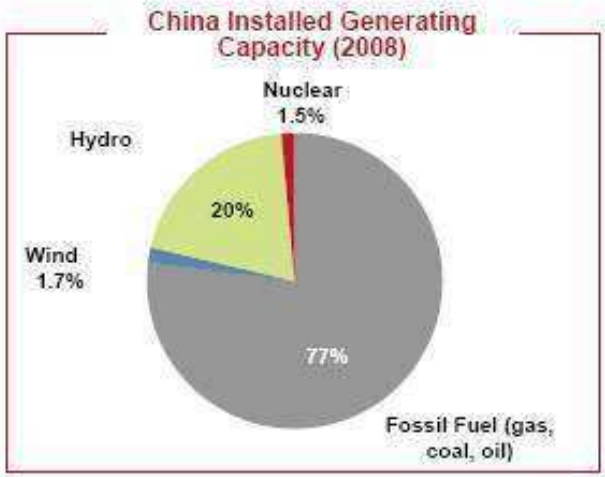
China : 100 new built until 2030

China: nuclear power's share is expected to quadruple by 2020

- Total installed capacity in 2008: 792 GW, mostly thermal



- Nuclear power's share is still limited in China: 9 GW, corresponding to 1.5% of 2008 total installed generating capacity in China
- Objective: 5% by 2020, i.e. 70 GW

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India : 50 new built until 2030

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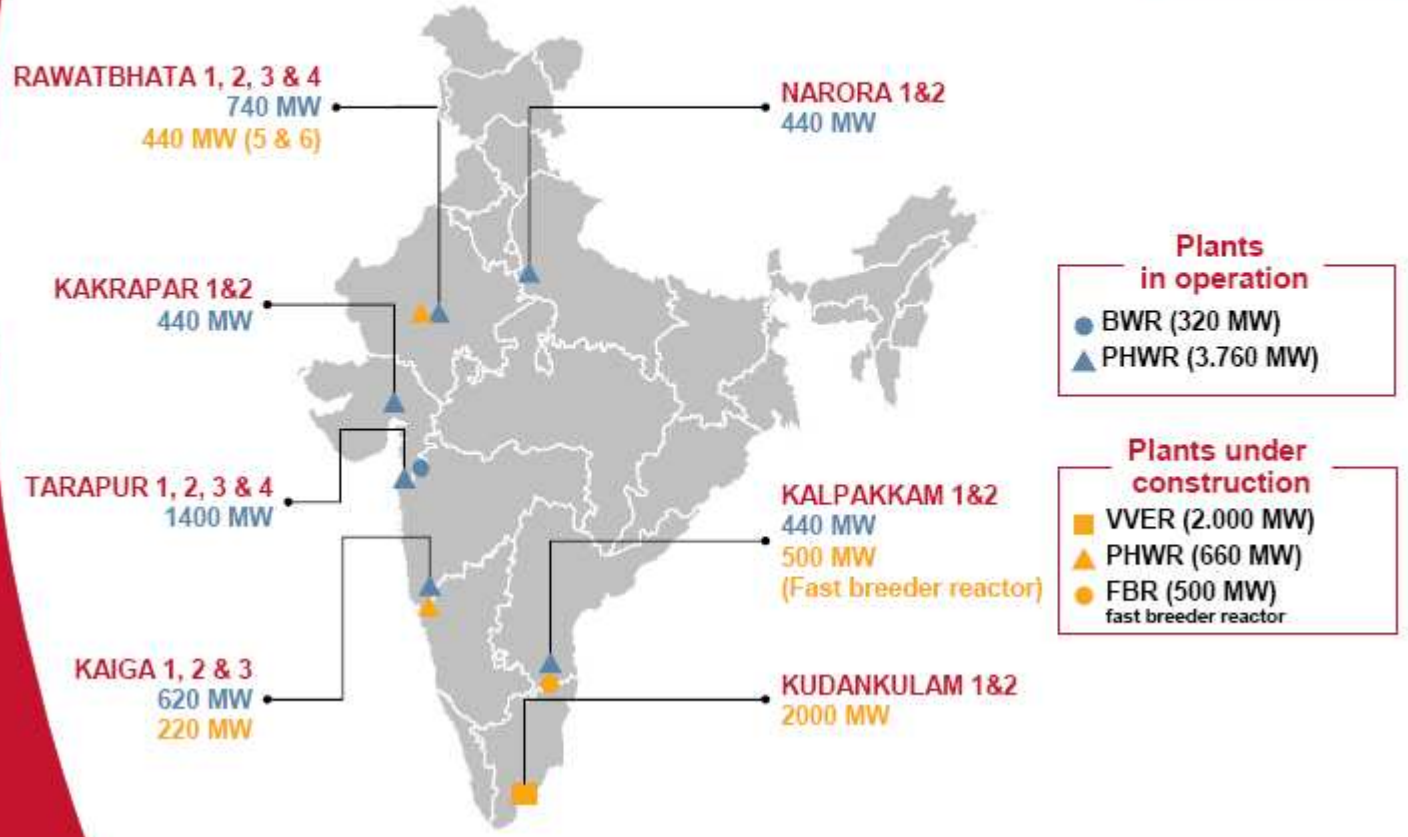
India: 17 reactors in operation and 6 under construction



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Main reactor Designs and AD positioning

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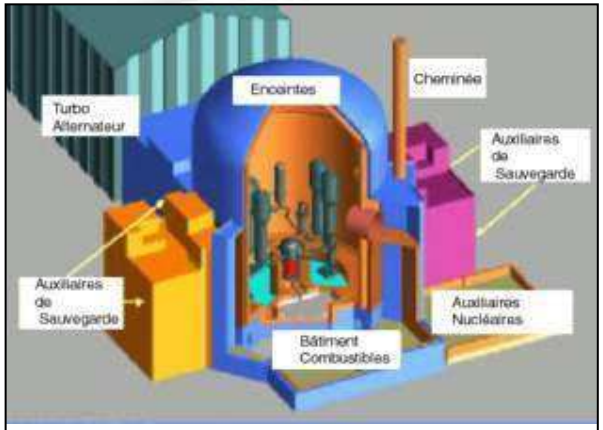
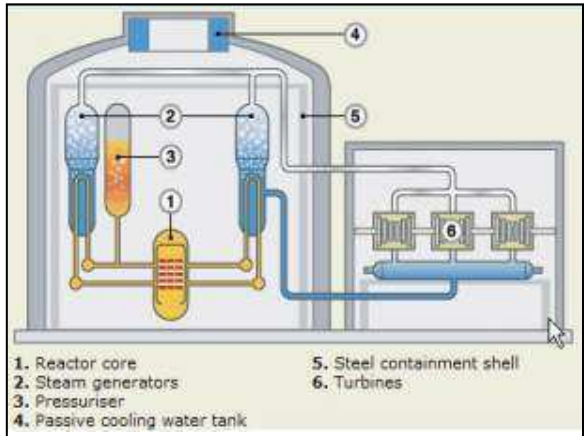
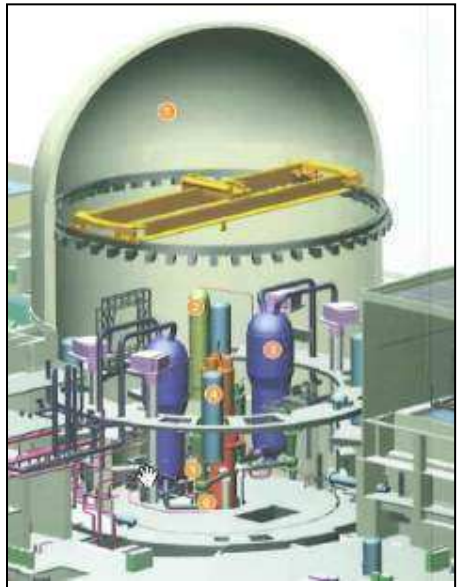
Main reactor Designs (I)



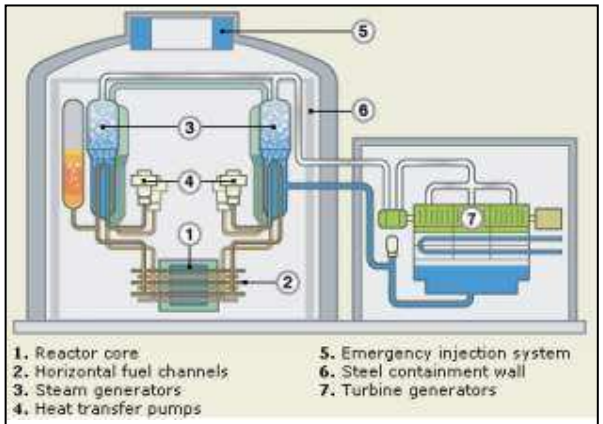
EPR / AREVA



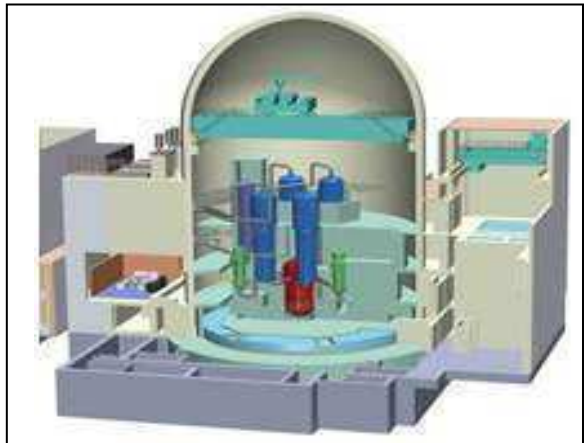
AP 1000 / WESTINGHOUSE



APR 1400 / KOREA

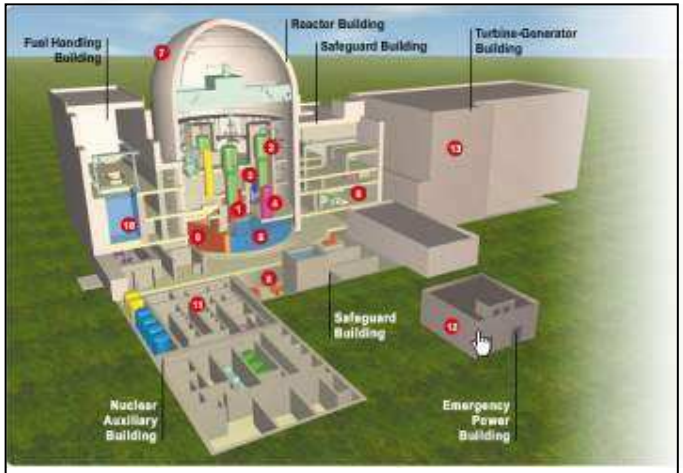


ACR 1000 / CANDU

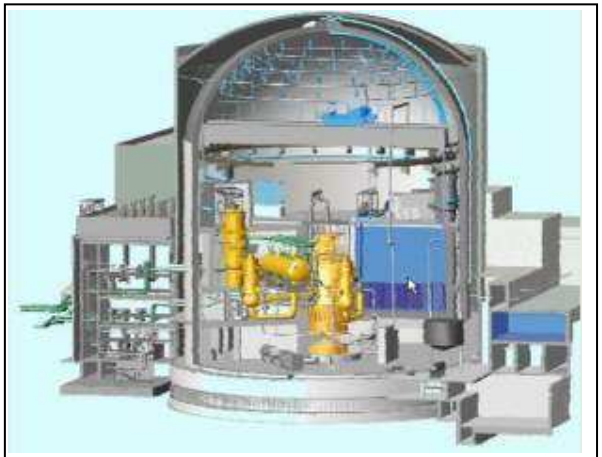


APRW / MHI

Main reactor Designs



ATMEA / AREVA + MHI



VVER / ROSATOM

CPR 1000 / CHINA

AD positioning vs non-Areva* main Reactors characteristics

Technology	Main Characteristics	AD positioning
Westinghouse AP 1000	Complex-shaped AVBs Partition Plates 76mm	Sales Sales
Rosatom - VVER	Horizontal Steam Generator, in AISI 321	No possibility
Doosan – APR 1400	Thick partition plates	Potential sales
INDE- CANDU ACR 1000	Headers in alloyed steel ESR → requires larger ingots	Study underway

* Areva-type reactors represent ≈ 20% of the installed base

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ITER Potential

ITER : AD Potential and Actions

- **Vacuum vessel :** while 7 sections are made in Europe, 2 will be made in Korea (Hyundai). Potential : volume of bars for housings and keys.

➔ **Action : intensify contacts with prescribers / decision makers**

- **Ports :** we have an inquiry from Russia for upper ports. Hyundai (Korea) is in charge of equatorial and lower ports.

➔ **Action : intensify contacts with prospects**

- **Magnet System :** potential still to be identified

- **Blanket First Wall Panel or Primary Wall**
- Only The central manifold in 316L is of interest to AD

➔ **Action : identify and contact prescribers / decision makers**

- **Blanket Shield** : made of shield blocks (1.5 m x 1 m x 0.8 m). Split 50/50 China/Korea.

➔ **Action : identify and contact prescribers**

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Basic Nuclear Glossary

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Nuclear Glossary 1/3

Reactor types

ABWR	ADVANCED BOILING LIGHT WATER COOLED AND MODERATED REACTOR
AGR	ADVANCED GAS COOLED GRAPHITE MODERATED REACTOR
APWR	ADVANCED PRESSURISED WATER REACTOR
ATR	ADVANCED THERMAL REACTOR
BWR	BOILING WATER REACTOR
GBWR	GRAPHITE BOILING WATER REACTOR
GCHWR	GAS COOLED HEAVY WATER REACTOR
GCR	GAS COOLED (GRAPHITE-MODERATED) REACTOR
GFR	GAS FAST REACTOR
GLWR	GRAPHITE LIGHT WATER REACTOR
HRB	HOCHTEMPERATUR-REAKTORBAU GMBH
HRE	HOMOGENEOUS REACTOR EXPERIMENTAL
HTGR (or HTGCR)	HIGH TEMPERATURE GAS COOLED GRAPHITE MODERATED REACTOR
HTR	HIGH TEMPERATURE REACTOR
HWBLWR	HEAVY WATER BOILING LIGHT WATER REACTOR
HWGCR	HEAVY WATER MODERATED GAS COOLED REACTOR

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Nuclear Glossary 2/3

Reactor types

HWLWR	HEAVY WATER MODERATED BOILING LIGHT WATER COOLED REACTOR
LFR	LEAD FAST REACTOR
LWBR	LIGHT WATER BREEDER REACTOR
LWCHWR	LIGHT WATER COOLANT HEAVY WATER REACTOR
LWGR	LIGHT WATER COOLED GRAPHITE MODERATED REACTOR
LWR	LIGHT WATER REACTOR
MSR	MELT SALT REACTOR
PHWR	PRESSURISED HEAVY WATER MODERATED AND COOLED REACTOR
PWR	PRESSURISED LIGHT WATER MODERATED AND COOLED REACTOR
RBMK	REAKTOR BOLCHOI MOCHTCHNOSTI KANALNI (RUSIE)
SCWR	SUPER CRITICAL WATER REACTOR
SFR	SODIUM FAST REACTOR
SGHWR	STEAM GENERATING HEAVY WATER MODERATED AND COOLED REACTOR
SGR	SODIUM GRAPHITE REACTOR
VHTR	VERY HIGH TEMPERATURE REACTOR
VVER or	VODIANO VODIANOI ENERGUIETITCHESKI REAKTOR (RUSSIAN)
WWER	WATER COOLED WATER MODERATED POWER REACTOR (= VVER)

Nuclear Glossary 3/3

Main brandnames for Pressurized Water Reactors :

CHINA		
CPR 1000	CHINA PRESSURE REACTOR	1000 Mw

USA		
AP1000	WESTINGHOUSE	1100 Mw

FRANCE		
EPR	EUROPEAN PRESSURE REACTOR	1600 Mw
ATMEA	AREVA / MHI	1100 Mw

KOREA		
OPR 1000	OPTIMISED POWER REACTOR	1000 Mw
APR 1400	ADVANCED POWER REACTOR	1350 Mw

INDIA		
CANDU 6	AECL HEAVY WATER MODERATOR	700 : 900 MW
ACR 1000	AECL	1200MW

RUSSIA		
VVER 1000	Water – water reactor	1000 Mw
VVER 1200	Water – water reactor	1200 MW