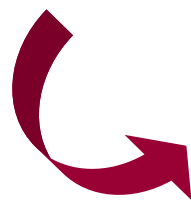


Fondazione Marisa Bellisario Woman , Economy & Power – New Energies

***“ New Answers to new questions
in a new Eco-Political Context ”***



Is Nuclear Energy an Answer ?

Current Status of Nuclear Energy Production in Italy

- ➔ **FOLLOWING THE REFERENDUM RESULTS ON NOVEMBER 1987, THE THREE NUCLEAR POWER PLANTS (TRINO E. FERMI, LATINA MAGNOX AND CAORSO BWR) IN OPERATION AT THAT TIME WERE SHUTDOWN AND ACCELERATED DECOMMISSIONING ACTIVATED IN 2001.**
- ➔ **THE CONSTRUCTION OF THE BWR IN MONTALTO DI CASTRO (90% COMPLETED) WAS STOPPED AND DEMOLITION IS IN PROGRESS.**



- Since 2001 Operational Waste Management and conditioning is in progress in all the sites.
- Decommissioning of BWR Turbine Island is in progress in Caorso.
- Conventional Island has been completely dismantled in Trino and Latina.



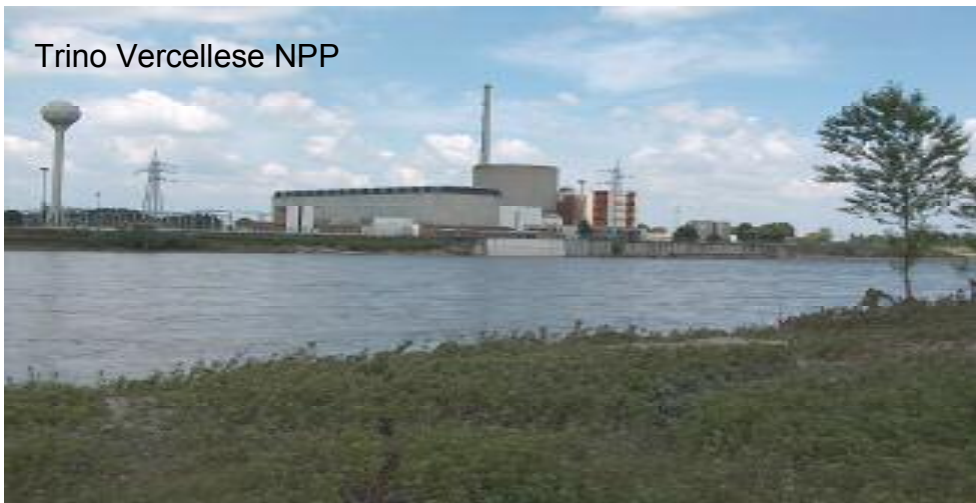
Current Status of Nuclear Energy Production in Italy



- All operating activities in Italy were stopped: almost all Italian Industries abandoned the nuclear sector.
- Ansaldo Nucleare went abroad to search for businesss and maintain competences
- The most important experience was the Design/Construction and Commissioning of Nuclear Units 1&2 in Cernavoda (Romania).
- Studies and Research activities on Generation III and IV for NPPs have never been stopped and ANSALDO NUCLEARE is currently involved in development of different Nuclear Technologies for NPP Erection in the International Market as well as in Italy in the frame of Gen III (LWR) as well as GEN IV (LFR) .

Current Status of Nuclear Energy Production in Italy

Trino Vercellese NPP



Montalto di Castro NPP



Latina NPP



Caorso NPP

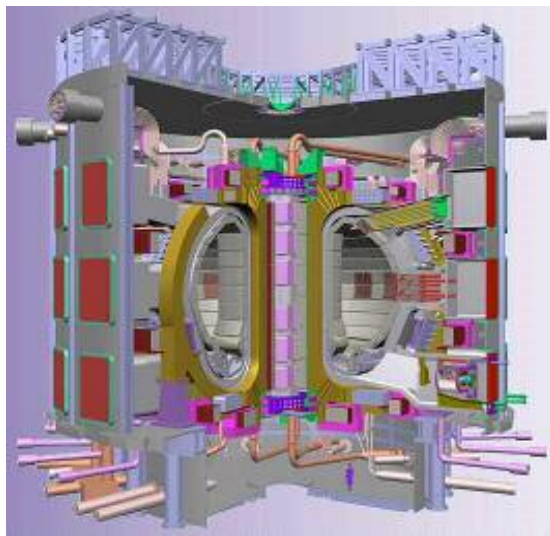


Current Status of Nuclear Energy Production in Italy

➔ **UNIVERSITIES, RESEARCH CENTERS AND INDUSTRIAL SYSTEM HAVE PARTICIPATED IN THE MEANTIME TO INTERNATIONAL RESEARCH PROGRAMS AS:**

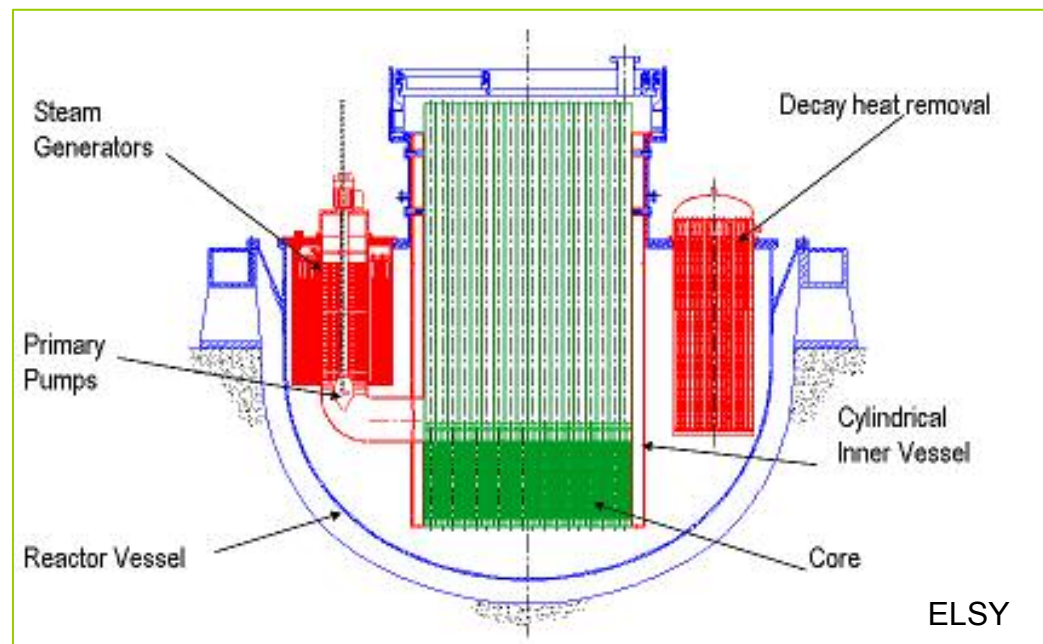
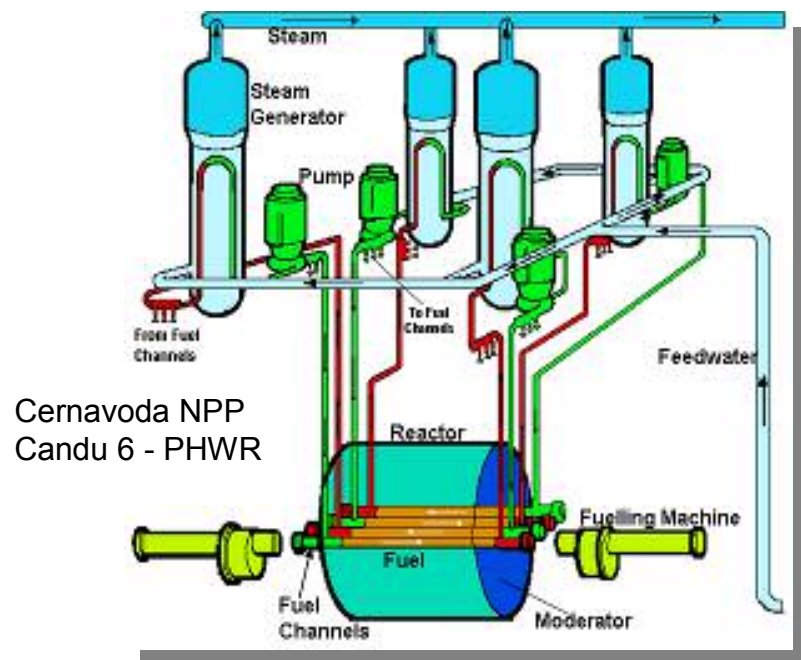
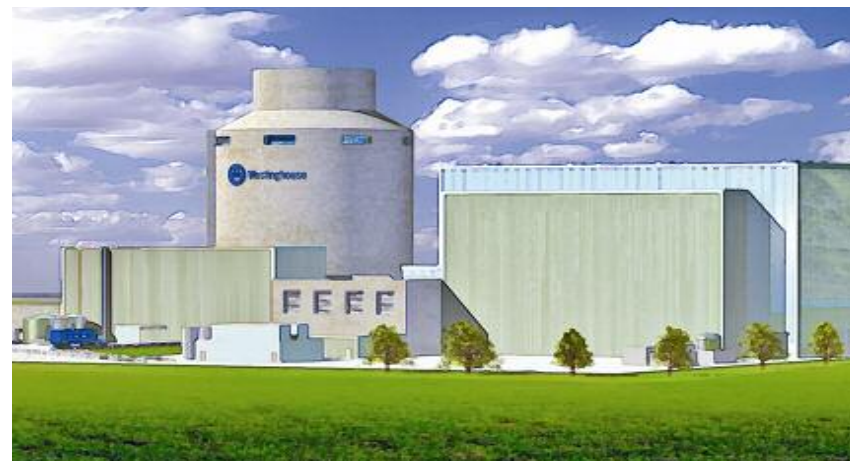
- Passive Technology in AP600 / AP1000 as well as Integrated Plant Design of the Reactor Building for AP1000
- Services Activities as Residual Life evaluation and PLEX for Embalse, Oskarsham and KRSKO NPPS
- Fusion Reactors as ITER and IGNITOR
- Generation IV developing the conceptual design for Accelerator Driven System and ELSY (LFR) Project

Current Status of Nuclear Energy Production in Italy

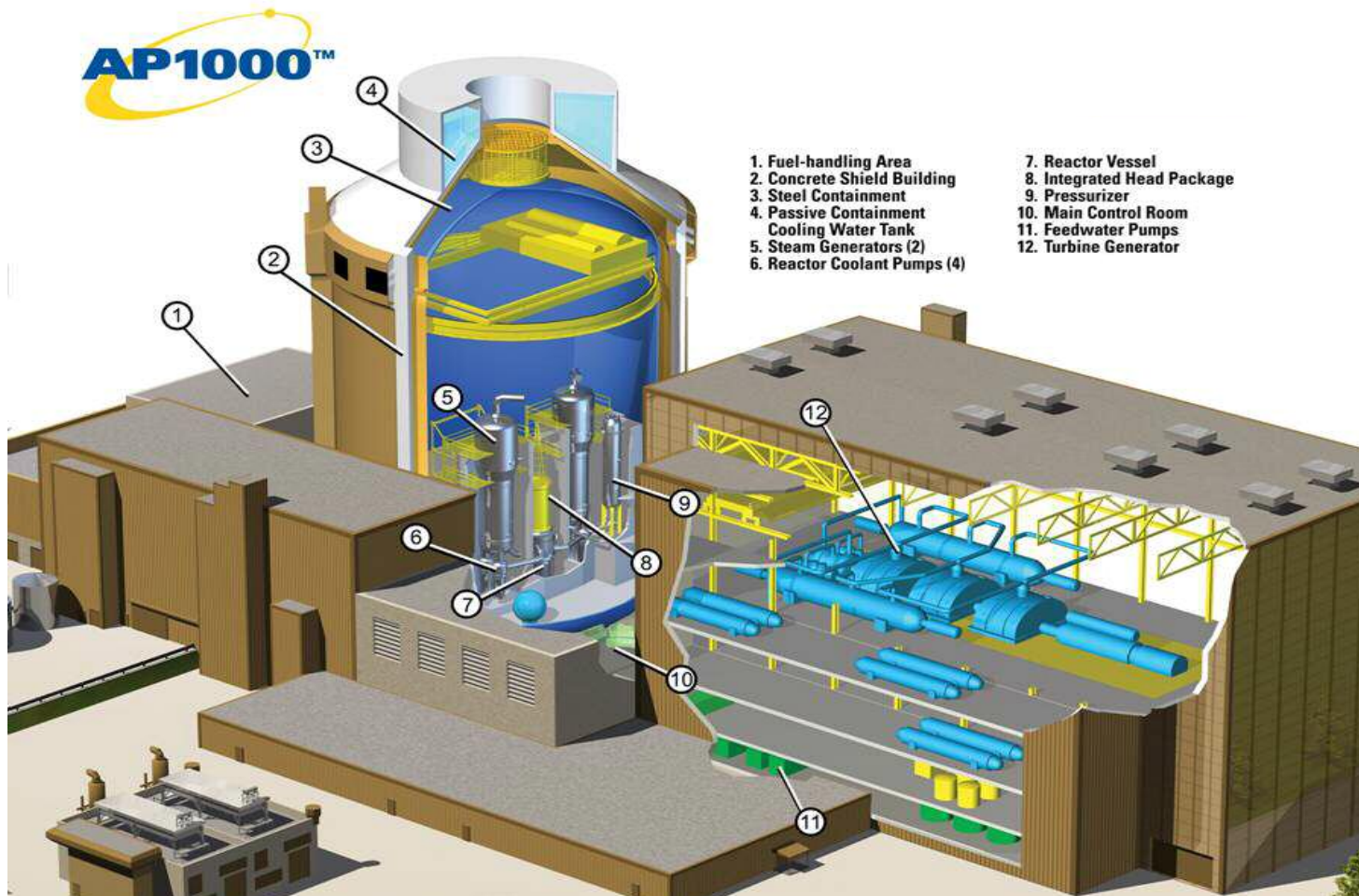


ITER Machine Assembly

AP1000
Reactor Passive

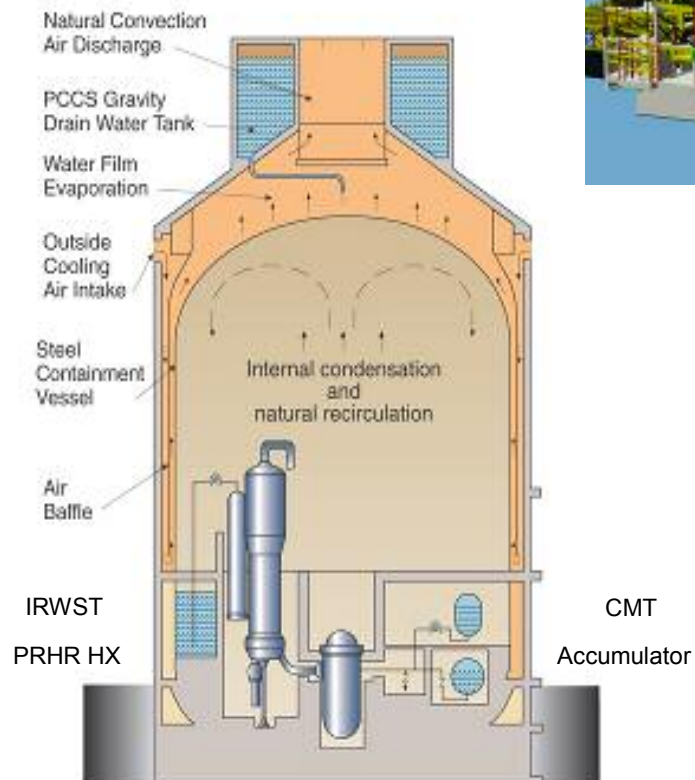


THE WESTINGHOUSE AP1000

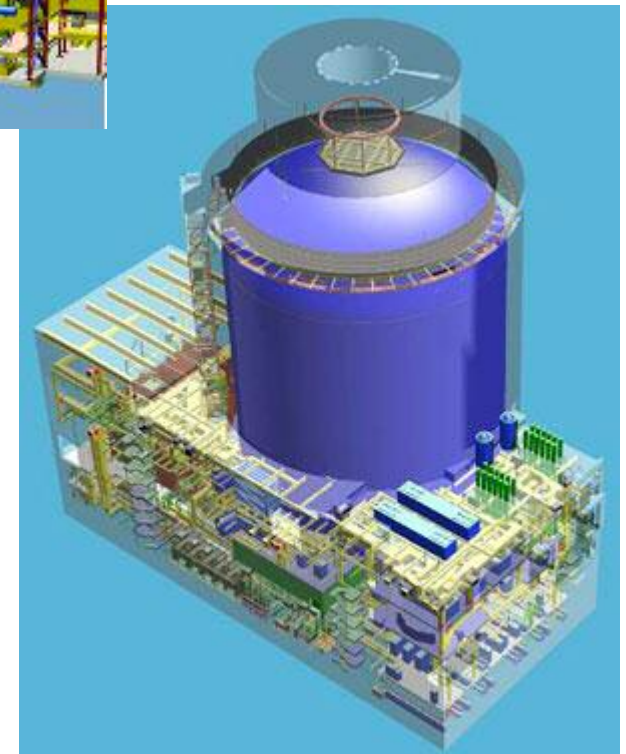


AP1000 REACTOR BUILDING OVERALL VIEW

Steel Containment Vessel



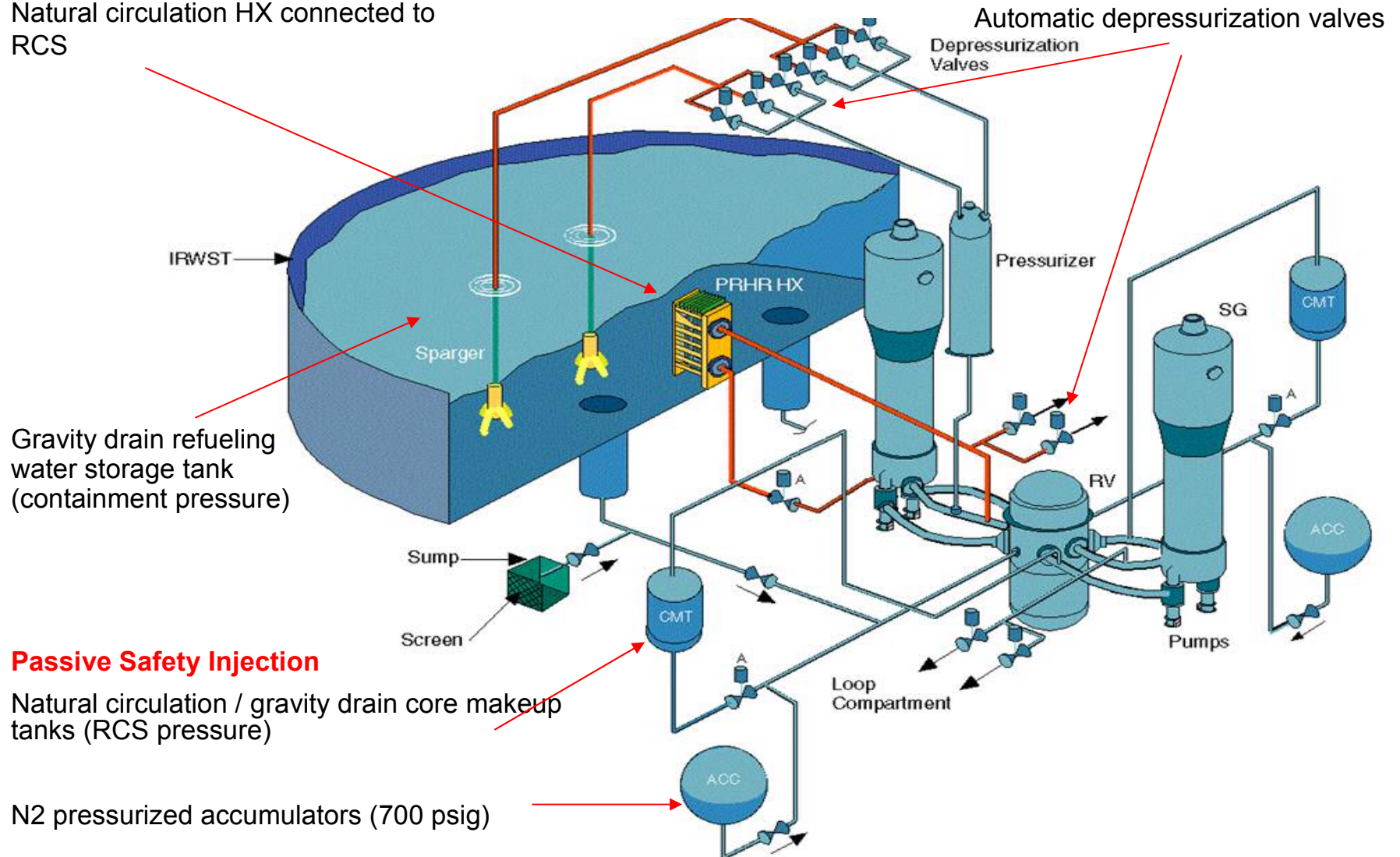
EPP European Passive Plant



PASSIVE CORE COOLING SYSTEM

Passive Decay Heat Removal

Natural circulation HX connected to RCS

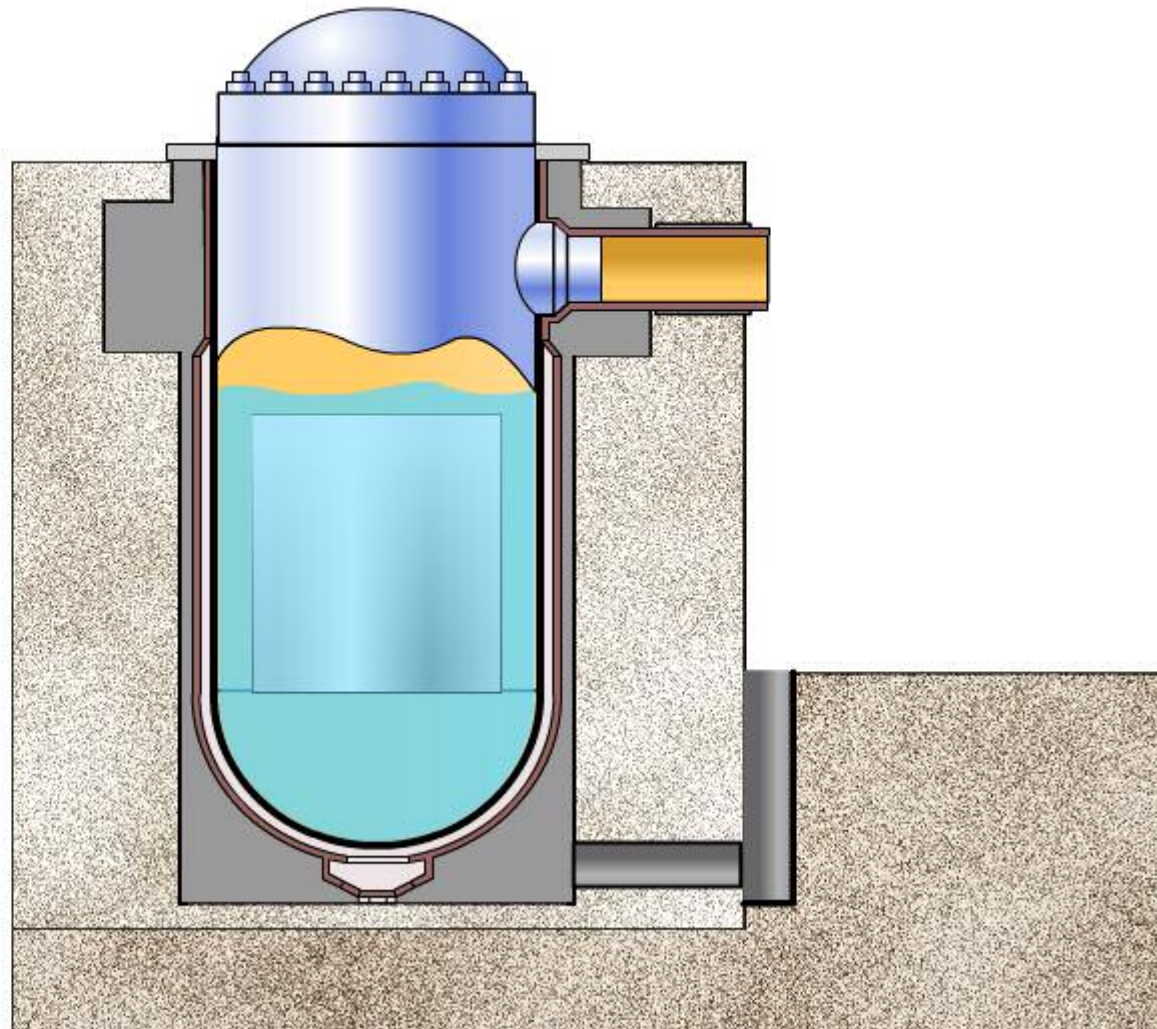


Passive Safety Injection

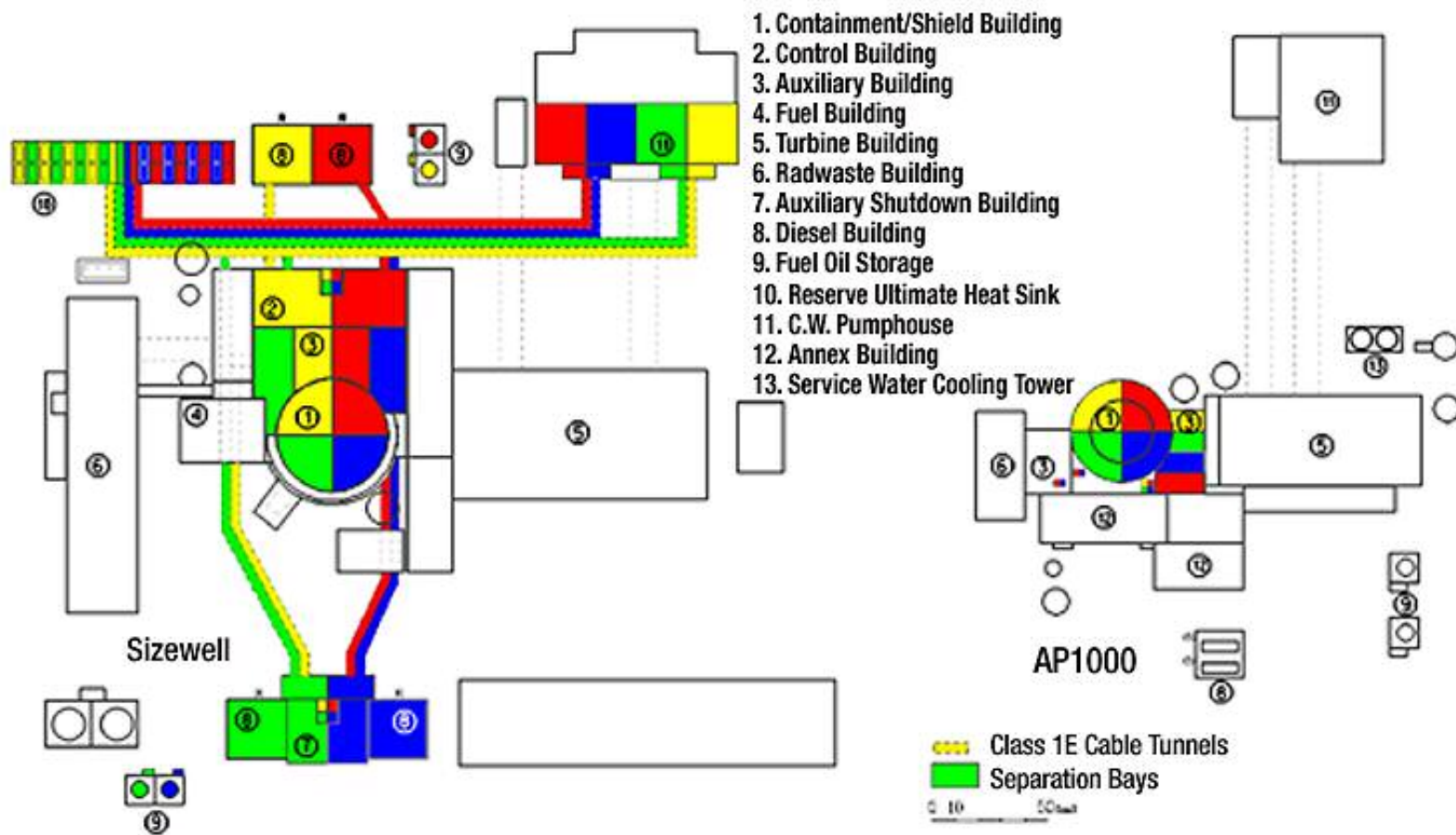
Natural circulation / gravity drain core makeup tanks (RCS pressure)

N2 pressurized accumulators (700 psig)

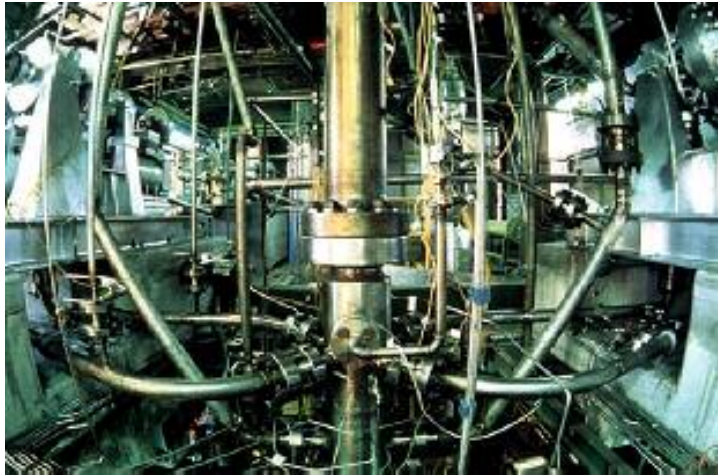
IN-VESSEL RETENTION AT WORK



Comparison between PLOT PLAN AP1000 and Standard PWR



AP600 and SBWR Design Certification Test Programs



Full Height, Full Pressure
Integral Systems Test (SPES)

Isolation
Condenser

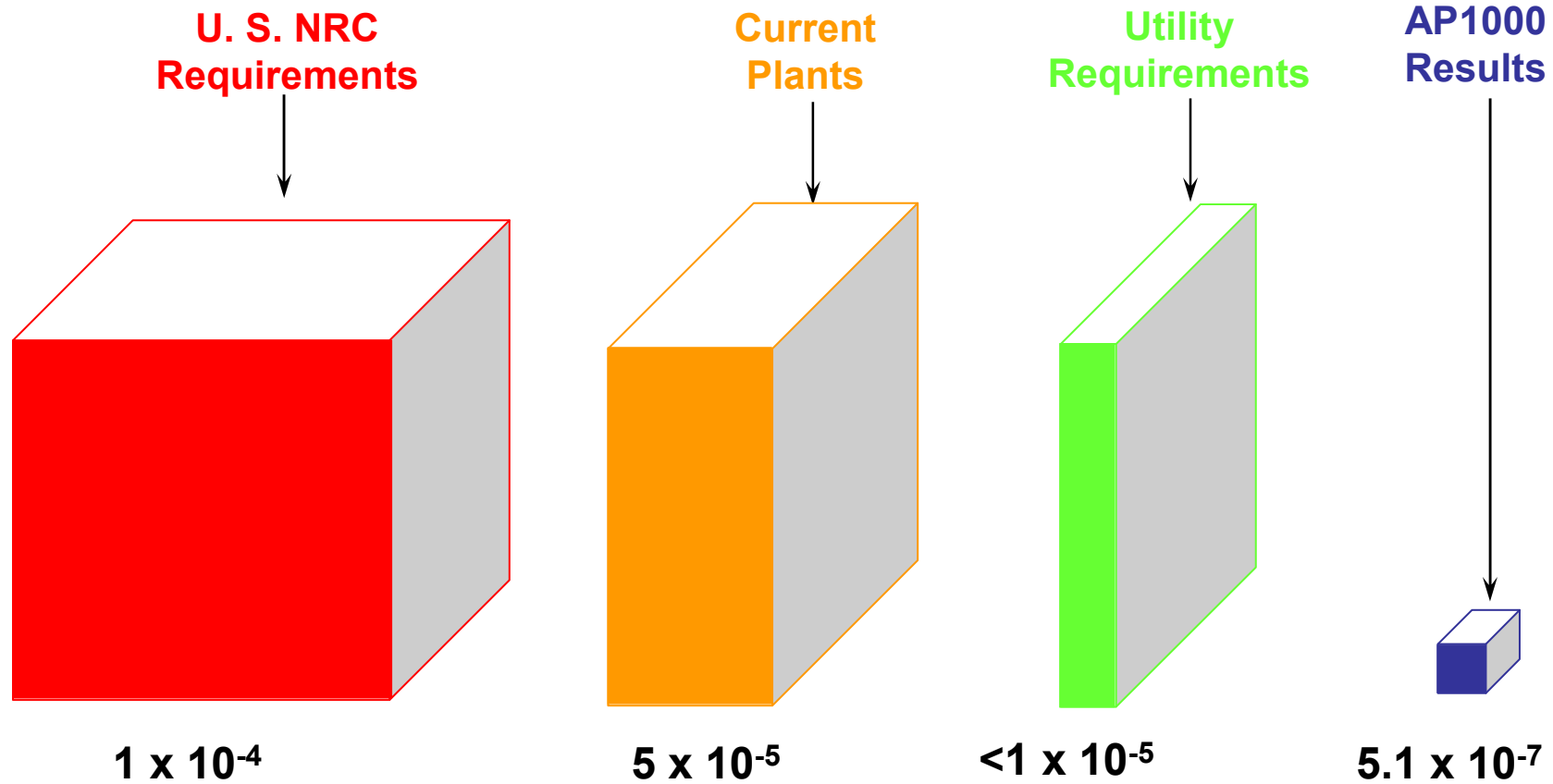


Casaccia, Italy
Full-scale (ADS)



(PCCS)
Containment
Vessel Water
Distribution/
Heat Transfer
Tests

CORE DAMAGE PROBABILITY FOR REACTOR YEAR



GOALS FOR GENERATION IV Nuclear Energy Systems

Sustainability

1. Generate energy sustainably, and promote long-term availability of nuclear fuel
2. Minimize nuclear waste and reduce the long term stewardship burden

Safety & Reliability

3. Excel in safety and reliability
4. Have a very low likelihood and degree of reactor core damage
5. Eliminate the need for offsite emergency response

Economics

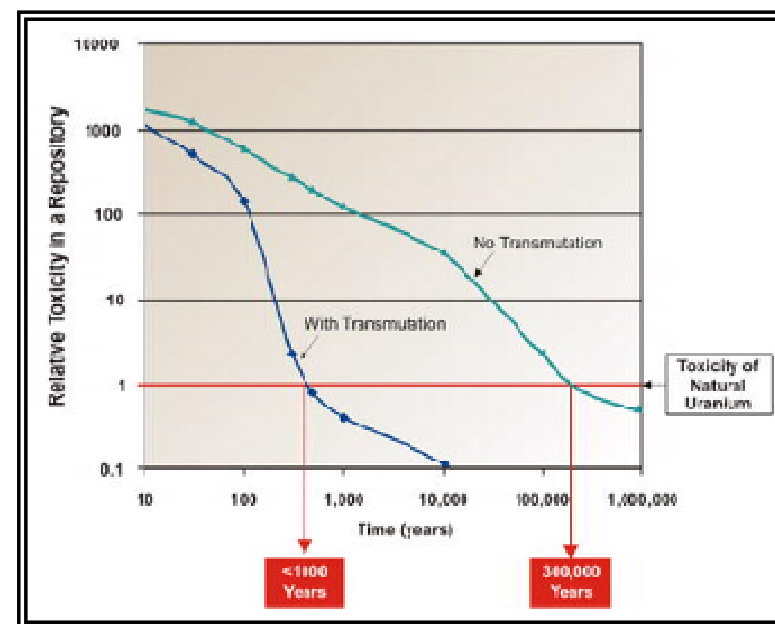
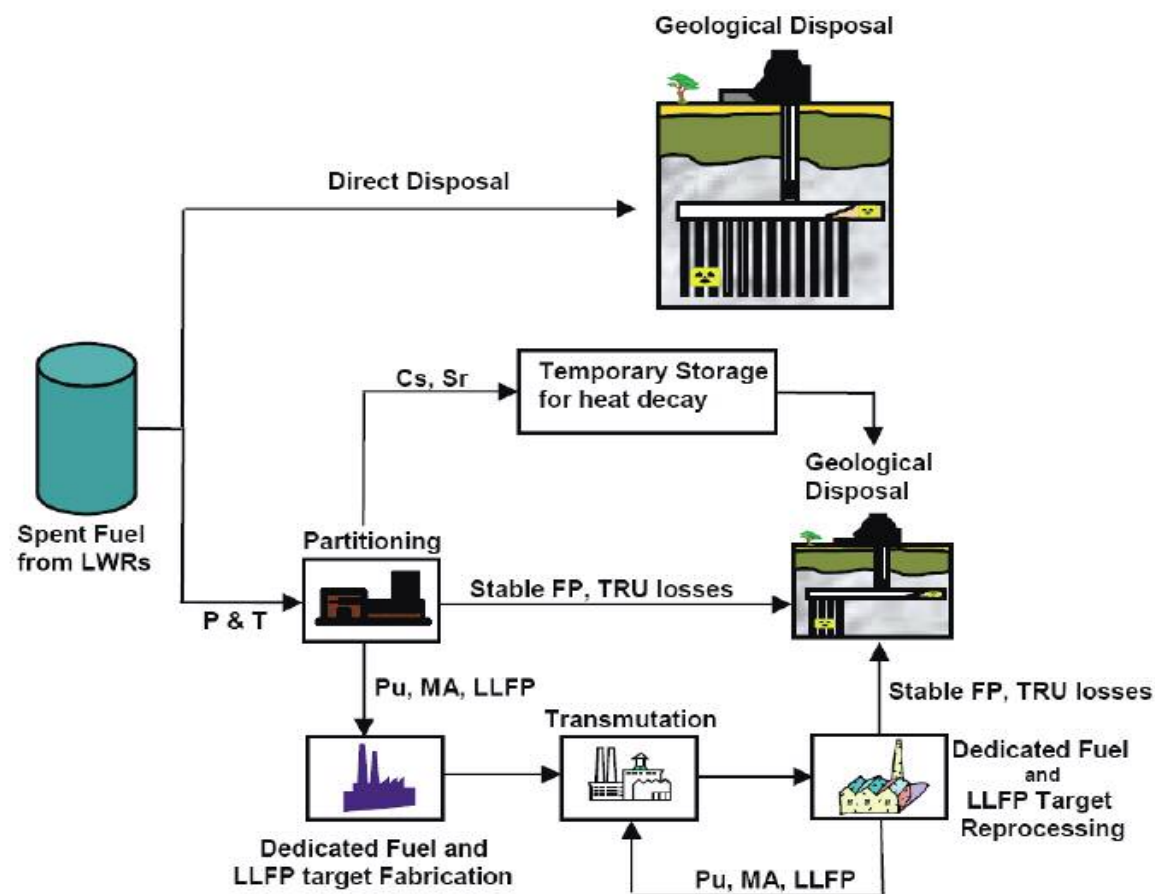
6. Have a life cycle cost advantage over other energy sources
7. Have a level of financial risk comparable to other energy projects

Proliferation Resistance & Physical Protection

8. Be a very unattractive route for diversion or theft of weapons-usable materials, and provide increased physical protection against acts of terrorism

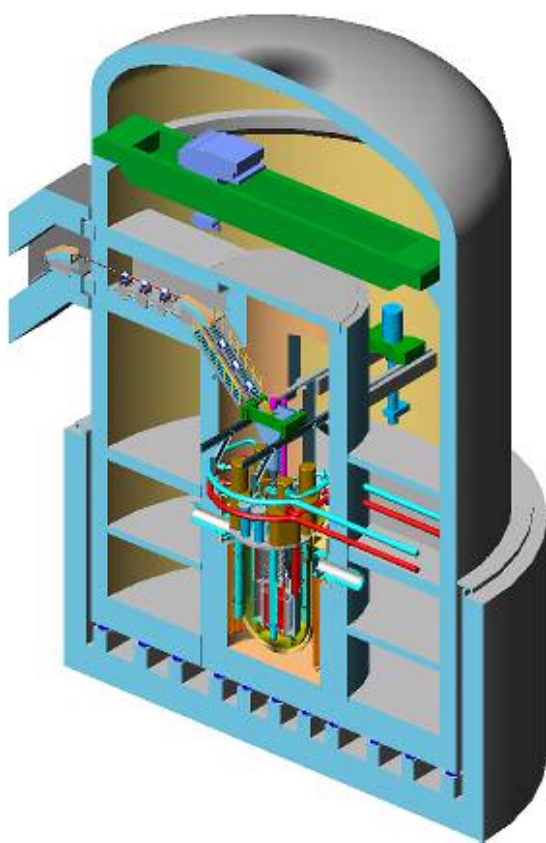
POSSIBLE SCHEMES FOR WASTE MANAGEMENT

(Acknowledgement: EUROTRANS)

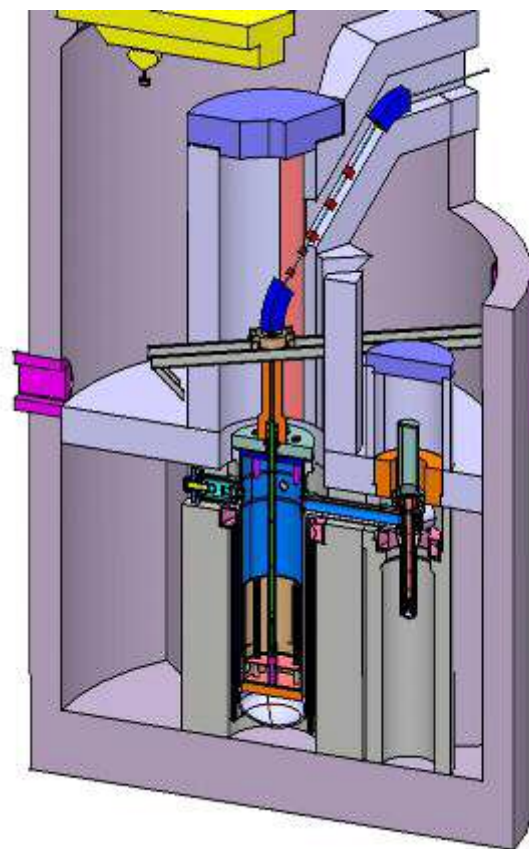


LLFP: Long lived fission products (Tc-99, I-129, Se-79, ...); MA: Minor Actinides (Am, Np, Cm)

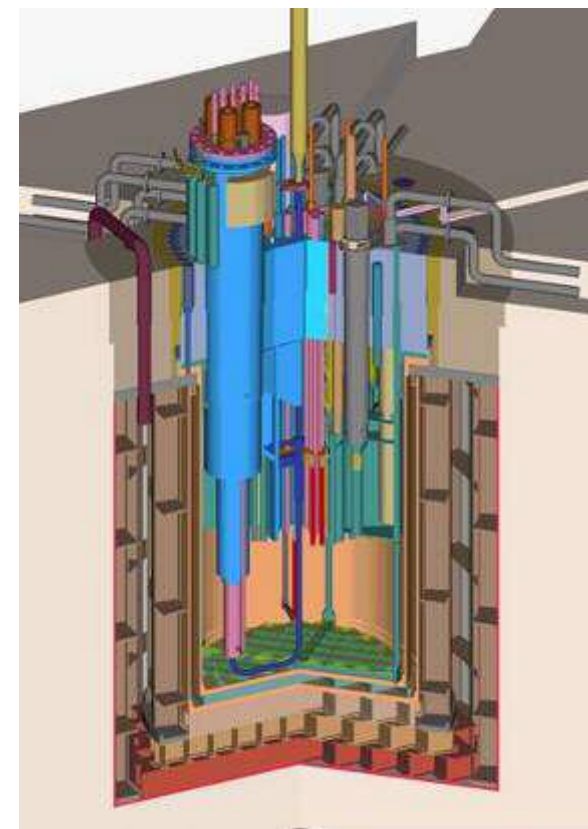
The eXperimental Accelerator-Driven Systems (XADS) in the 5^o FP of the EU



80 MW LBE-cooled XADS



80 MW Gas-cooled XADS



50 MW LBE-cooled XADS (MYRRHA)

NATIONAL POLICY ON THE ISSUE

- ➔ **ITALIAN LAW 99 , July 23 2009** - ITALY HAS PLANNED TO INTEGRATE ENERGY PRODUCTION ALSO THROUGH NUCLEAR SOURCE.
- ➔ **ITALIAN MINISTRY MSE (MINISTERO DELLO SVILUPPO ECONOMICO)** IS PURSUING A POLICY TO PRODUCE BY 2030 ALMOST 25% (15.000 MWEL) OF REQUIRED ENERGY FROM NUCLEAR SOURCE.
- ➔ **ENEL** HAS SIGNED AN AGREEMENT WITH EDF TO BUILD FOUR NEW EPR IN ITALY. ENEL IS ALSO INVOLVED IN FLAMANVILLE AND PELNY EPR CONSTRUCTION.

COMPANY POLICY FOR NEXT FUTURE

- ➔ **ANSALDO NUCLEARE** IS PARTICIPATING WITH WESTINGHOUSE IN THE DESIGN OF THE PASSIVE AP600 / A1000 NPP AS WELL AS IN THE CONSTRUCTION OF THE AP1000 IN CHINA BY DELIVERING THE CONTAINMENT VESSEL AND THE PRHR.
- ➔ **ANSALDO** IS SEEKING THE OPPORTUNITY TO GET INVOLVED IN NPPs ERECTION IN ITALY, INCLUDING ENEL'S EPRS.

ENVIRONMENTAL POLICY OF THE COMPANY

- ANSALDO NUCLEARE IS CERTIFIED ACCORDING TO INTERNATIONAL STANDARD ISO 14000 FOR ENVIRONMENTAL QUALIFICATION.**
- THE ACCELERATED DECOMMISSIONING JOB WHICH ANSALDO NUCLEARE IS PERFORMING ON ITALIAN NUCLEAR POWER PLANT IS ADDRESSED TO:**
 - Minimize Secondary Radiological and Chemical Wastes.
 - Minimize radiological doses to operators.
 - Maintain under control and minimize radiological aerosols.
 - Minimize transversal contamination among different Plant Areas during dismantling.

IMPACT OF PUBLIC OPINION / INFORMATION POLICY

ENERGY BLACK OUT OF SEPTEMBER 2003 AS WELL AS THE HIGH COST OF ELECTRICAL ENERGY IN ITALY HAS PROMOTED OPEN DISCUSSION ON NUCLEAR ENERGY OPTION IN ITALY



- Media and Specialistic Information Meetings have promoted large participation in the discussion at all levels.
- Universities, Research Centers and Industrial System have been involved in the information process.
- The choice is global and does not affect only the Specific National Policy.
- It is more positive and favourable the approach to Nuclear Energy Option in the Areas of Italy where a NPP was already in operation.
- Until few years ago it was almost impossible to open a fruitful discussion on the subject.
- It is possible, through a functional information policy, to get well justified opinions aimed to take care of a common primary problem as it is the Electrical Energy Production.

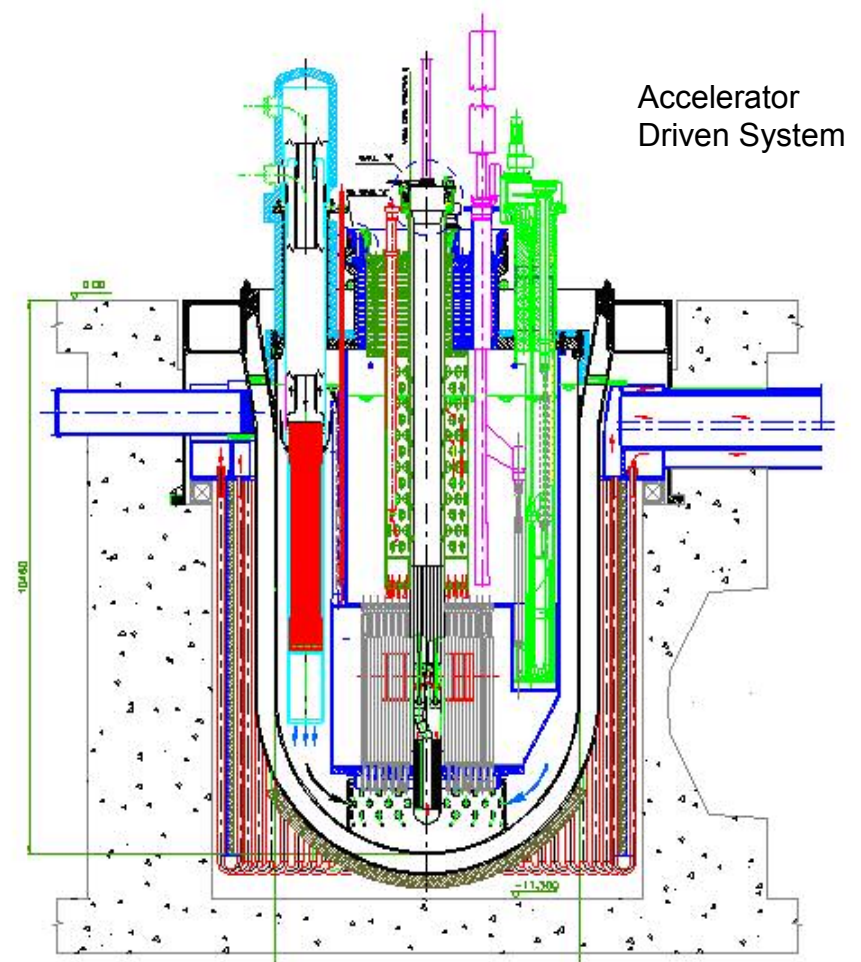
RESEARCH AND DEVELOPMENT STATUS

- In the frame of **Generation III**, addressing the Passive Technology in Nuclear Energy Production, ANSALDO NUCLEARE is finalizing detailed design for the **AP1000**.
- For the **GE SBWR (GEN III)**, also the prototype **component Isolation Condenser** has been fully designed by ANSALDO NUCLEARE.
- Alternative Structural Modules technology for realizing civil structures as well as **Mechanical Modules** have been studied in the **GEN III NPPs** and implemented in the associated detailed design.



RESEARCH AND DEVELOPMENT STATUS

- In the **Frame of Generation IV**, Italian Universities, National Research Center ENEA and ANSALDO NUCLEARE have been working together in the **International Program**.
- The largest Italian contribution has been addressed in studying the “**Liquid Fast Reactor-LFR**” Technology;
- ANSALDO NUCLEARE, is leader in the European Program of the Research Activity to develop the **Conceptual Design for the LFR ELSY NPP** (now identified as “LEADER NPP” in the 7° Program)



LFR DEVELOPMENT IN ANSALDO and IN EUROPE (next project)

Advanced nuclear systems for increased sustainability
FP7-Fission 2009 2.2.1

Conceptual Design for Lead Cooled Fast Reactor Systems (LEADER)

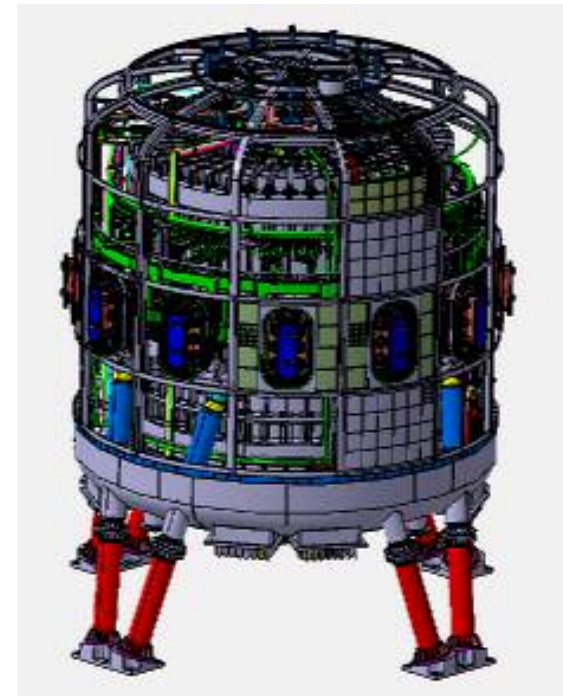
- ➡ 18 European Organization are preparing a proposal to answer to the EC call
- ➡ ANSALDO NUCLEARE is the Project Coordinator
- ➡ 3 year Project (2010-2013)

Research and Development Status

IN FUSION REACTORS ANSALDO IS WORKING SINCE THE END OF THE YEARS EIGHTIES FOR:

- Design for the Primary Heating Transfer System
- Prototype components (i.e. divertor and vessels) design and fabrication.
- Studies for IGNITOR Experimental Fusion Machine.

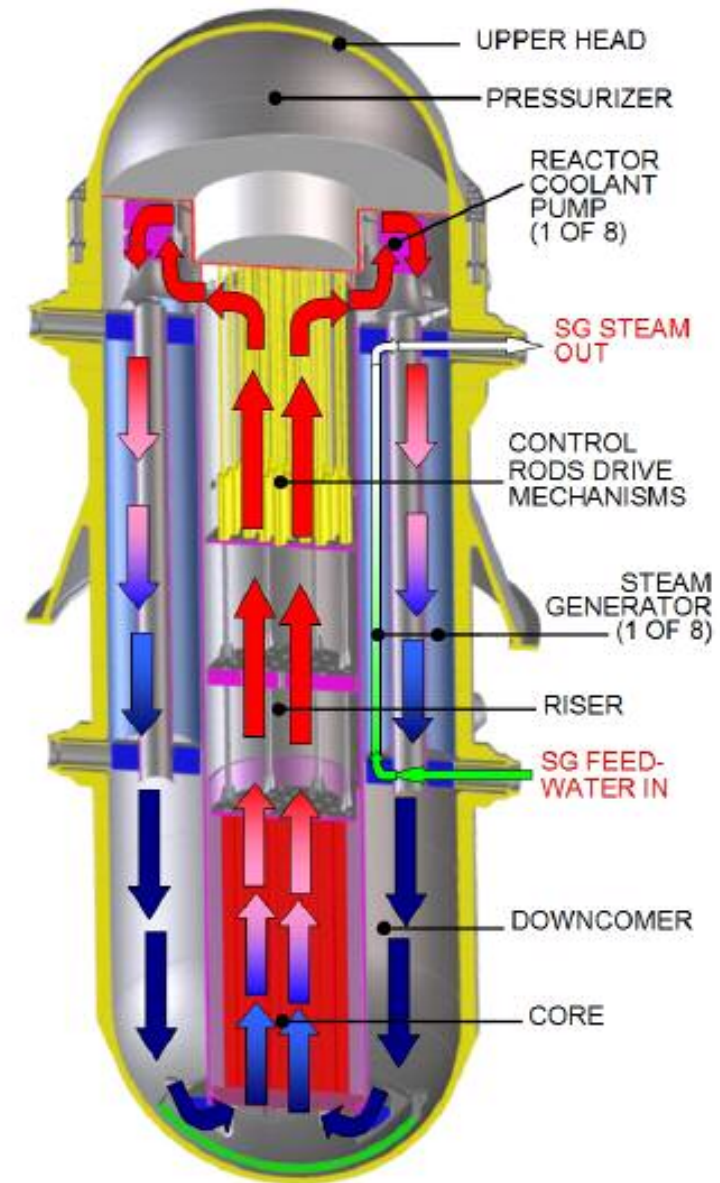
IGNITOR Machine Design



IRIS Innovative Design

IRIS is innovative in design employing an integrated primary system that incorporates all main primary circuit components within a single vessel.

i.e. - The core with control rods and their drive mechanisms, eight helical coil steam generators with eight associated fully-immersed axial flow pumps, and a pressurizer.



IRIS integral primary system

Partnership with the EUROPEAN AND NON EUROPEAN COMPANIES

- ➔ **FOR PASSIVE PLANT TECHNOLOGY DEVELOPMENT IN EUROPE, ANSALDO NUCLEARE IS WORKING TOGETHER WITH WESTINGHOUSE WITH EUROPEAN UTILITIES AS EDF, EON, RWE, NOK.**
- ➔ **FOR FUSION REACTOR, IN THE CONSORTIUM EFET, ANSALDO IS IN COOPERATION WITH ALL THE MAJOR EUROPEAN PARTNERS (AREVA, AMEC, SIEMENS, EMPRESARIOS).**
- ➔ **FOR WASTE TREATMENT IN LITUANIA, ANSALDO NUCLEARE IS IN PARTNERSHIP WITH BABCOCK & NOELL AS WELL AS NUKEM.**

**Partnership with the
European and Non European
Companies**

Superphoenix NPP



→ **IN THE FRAME OF SUPERPHOENIX DECOMMISSIONING, ANSALDO NUCLEARE IS WORKING WITH AREVA IN THE NPP DISMANTLING PROCESS.**

→ **FOR DECOMMISSIONING PROJECT IN LITUANIA, ANSALDO NUCLEARE IS IN PARTNERSHIP WITH AMEC AND NUKEM.**

Ignalina NPP



Partnership with the European and Non European Companies

- ➔ FOR THE US AP1000 PASSIVE TECHNOLOGY, ANSALDO NUCLEARE IS IN PARTNERSHIP WITH WESTINGHOUSE.
- ➔ FOR THE CANDU TECHNOLOGY, ANSALDO NUCLEARE WORKS IN STRONG RELATIONSHIP WITH THE CANADIAN AECL; UNITS 1&2 IN CERNAVODA HAVE BEEN ERECTED IN CONSORTIUM WITH AECL.



Cernavoda NPP – Candu 6 - PHWR

**Partnership with the
European and Non European
Companies**



CONCLUSION

Ansaldo Nucleare has always worked in Partnership
with **European and Non European Nuclear Companies**
in order to develop together specific
Innovative Technologies
(Decommissioning or Waste Management)
or to **build NPPs** (Cernavoda)
or to perform **Services Activities** (PLEX Embalse)



**This approach makes better the Ansaldo Nucleare Product
and helps in getting primarily the Customer Satisfaction**

Thanks for your attention!

