

Éco-modernisme & Fission Liquide

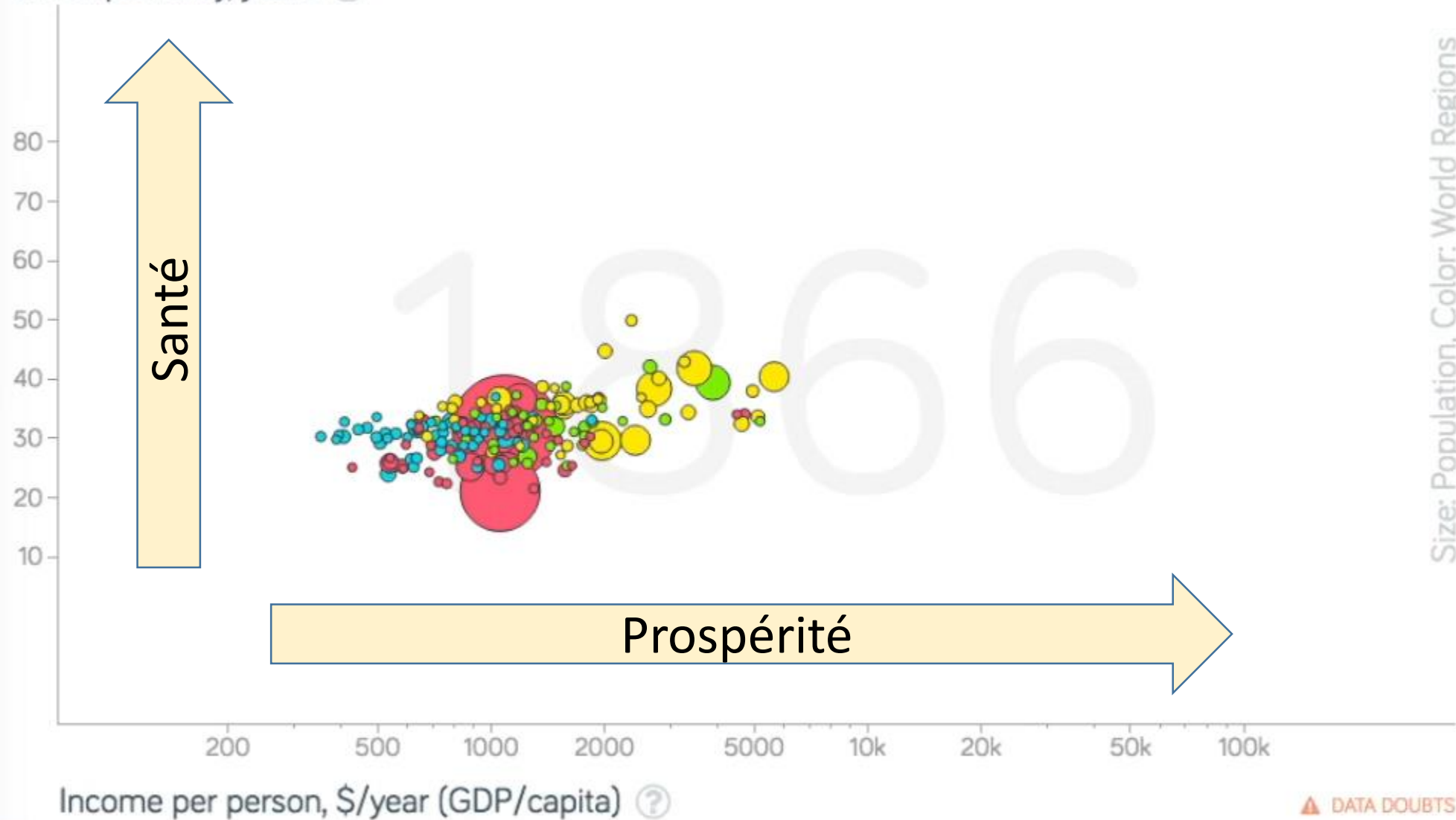
Arts & Métiers
ALUMNI

John Laurie

<http://fissionliquide.fr>

Lundi 9 janvier 2017

Life expectancy, years ?



Color World Regions ?



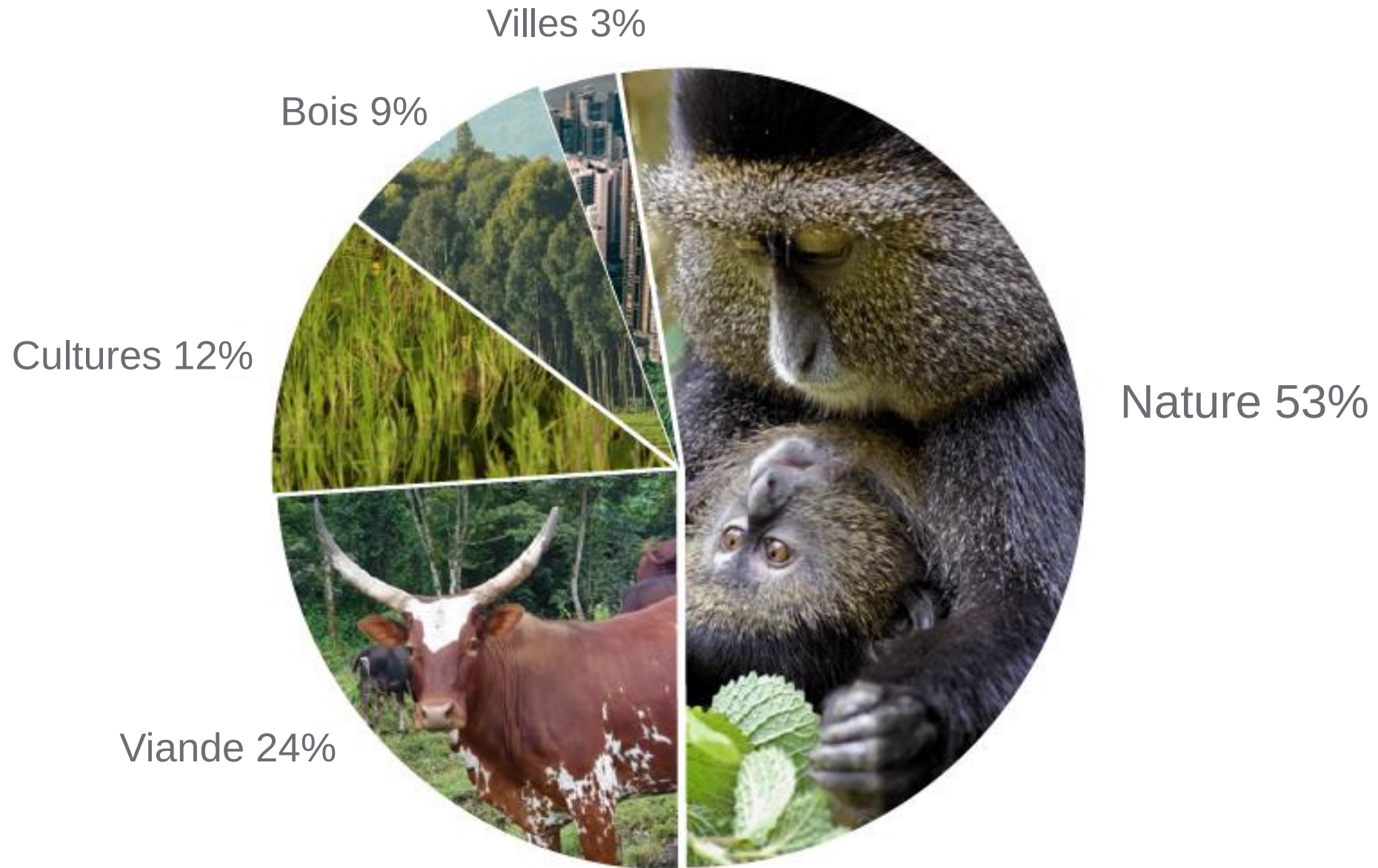
Find Search...

- ☐ Afghanistan
- ☐ Albania
- ☐ Algeria
- ☐ Angola
- ☐ Antigua and Barbuda
- ☐ Argentina
- ☐ Armenia

Size Population ?

Zoom 100%

Les humains utilisent la moitié de la Terre



GREENPEACE

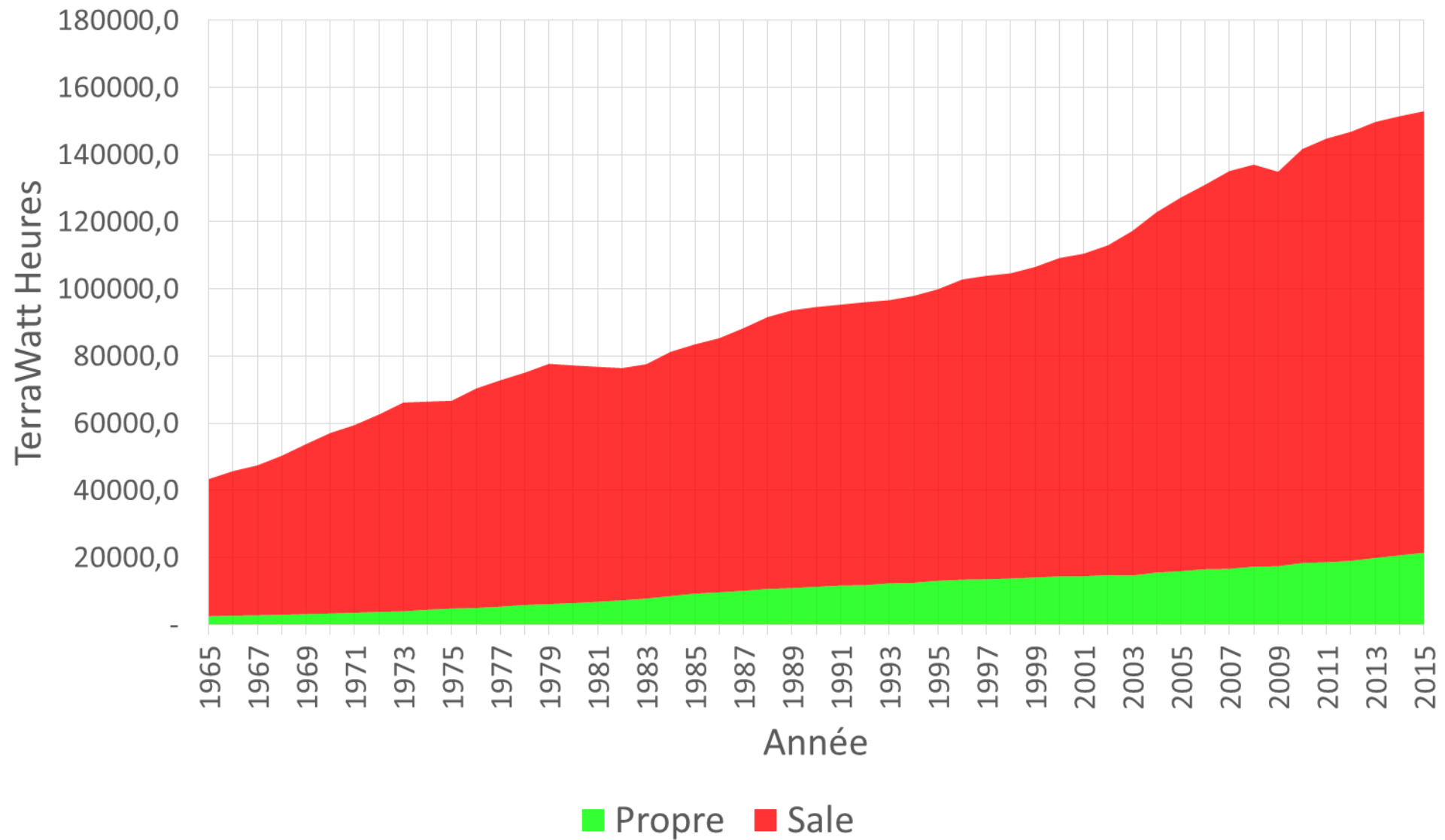


**Les Amis
de la Terre**



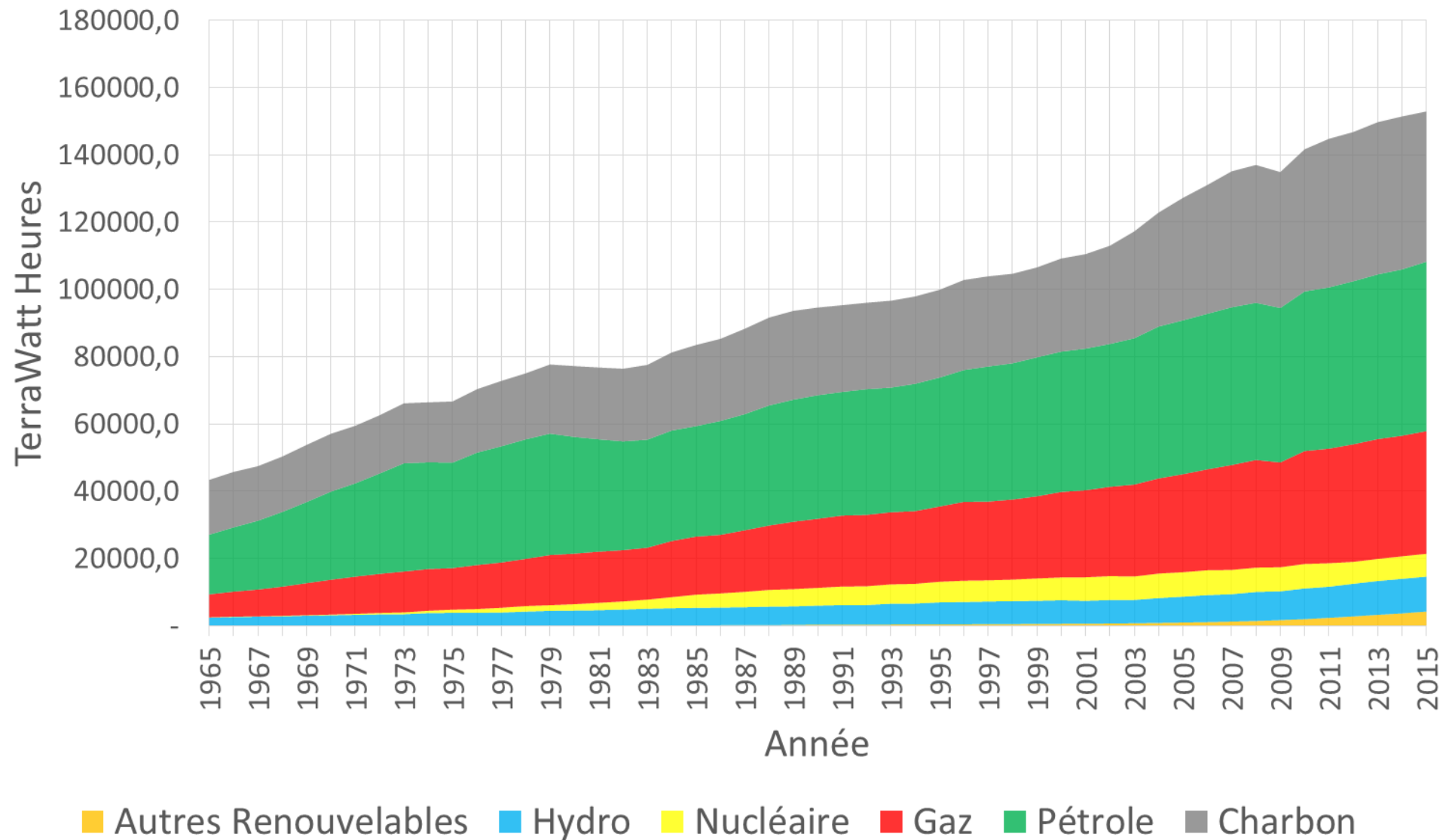
**Réseau
Sortir du nucléaire**

Consommation d'énergie primaire - monde



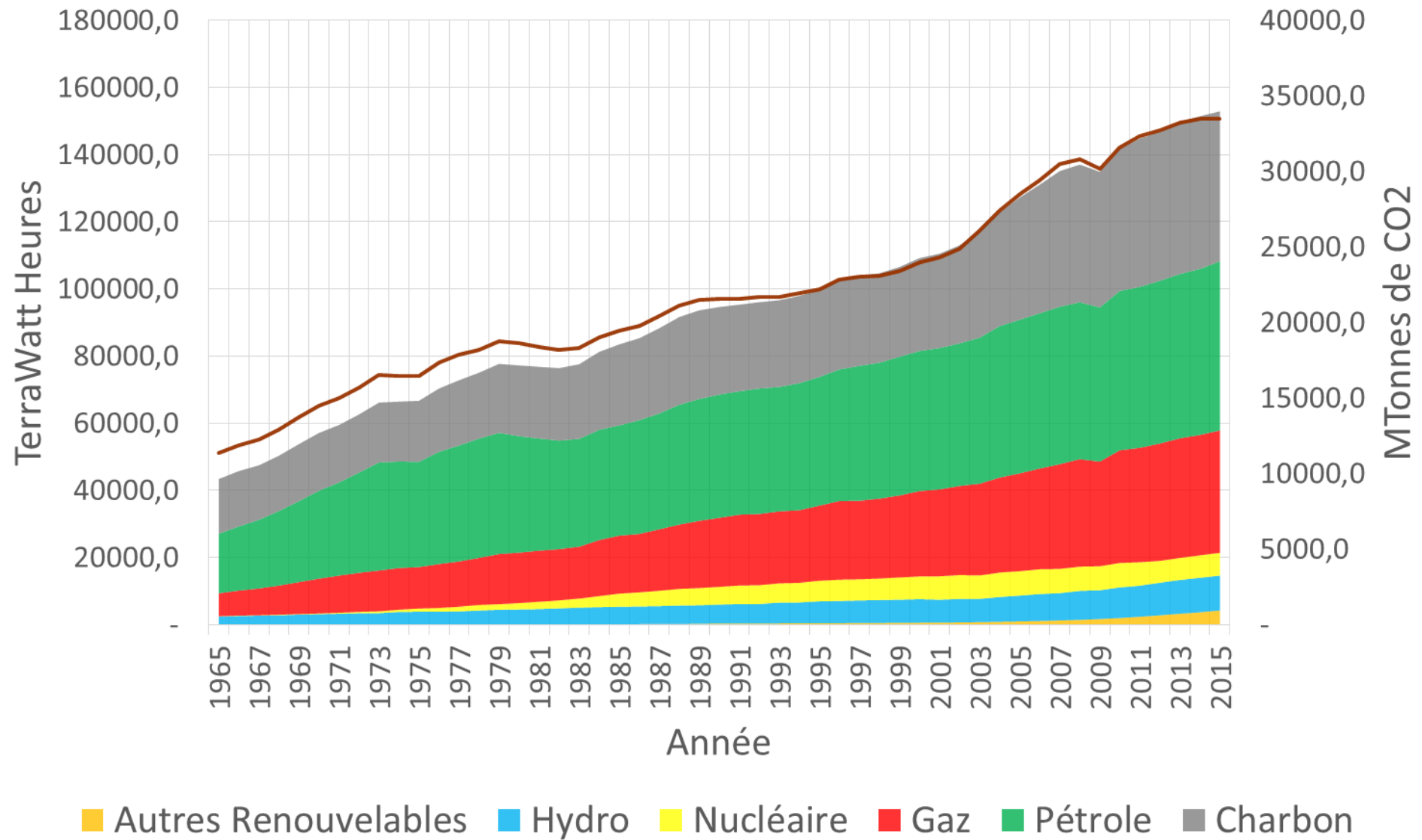
Source : [BP Statistical Review of World Energy Juin 2016](#)

Consommation d'énergie primaire - monde



Source : [BP Statistical Review of World Energy Juin 2016](#)

Consommation d'énergie primaire - monde

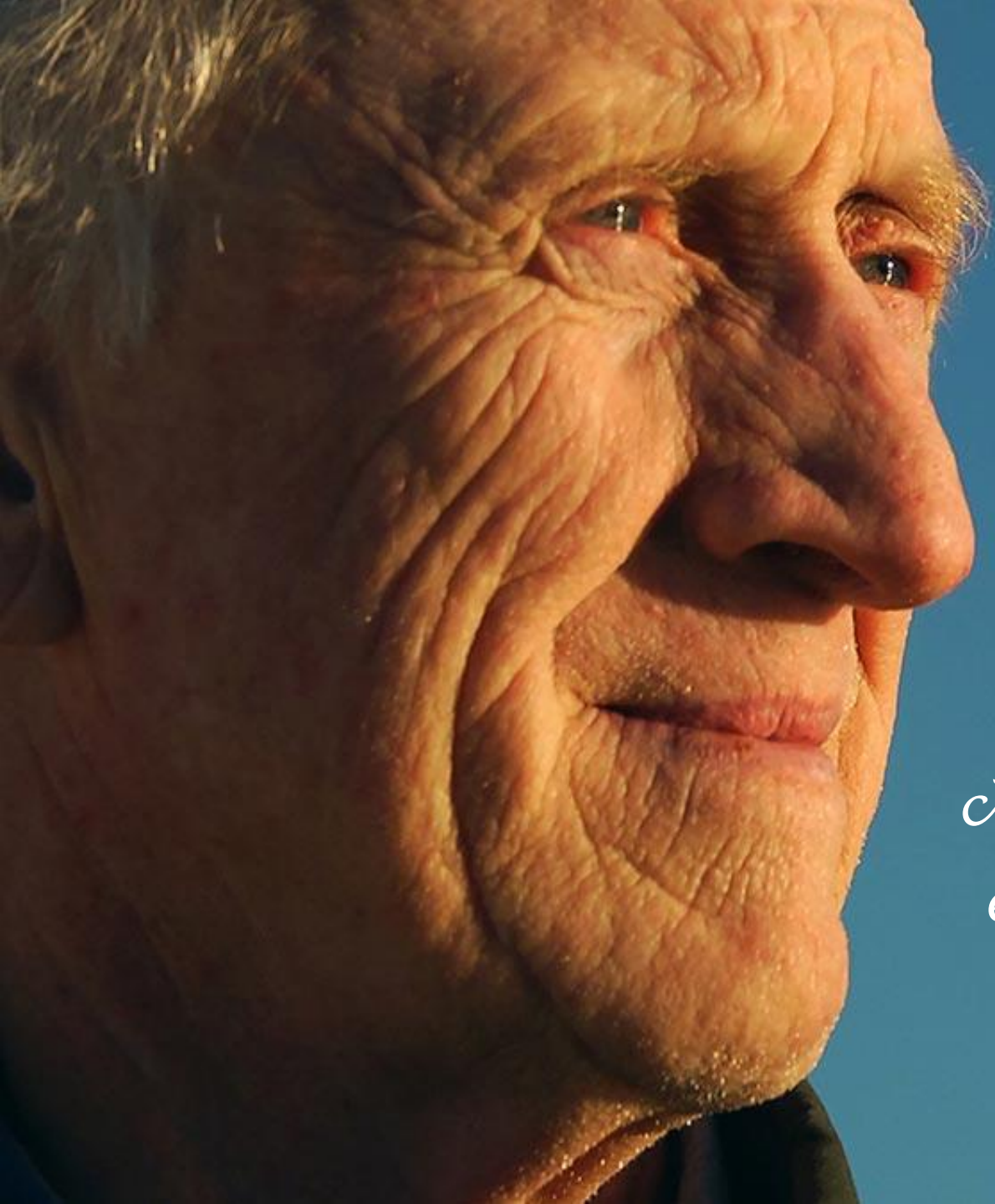


Source : [BP Statistical Review of World Energy Juin 2016](#)

Éco-modernisme



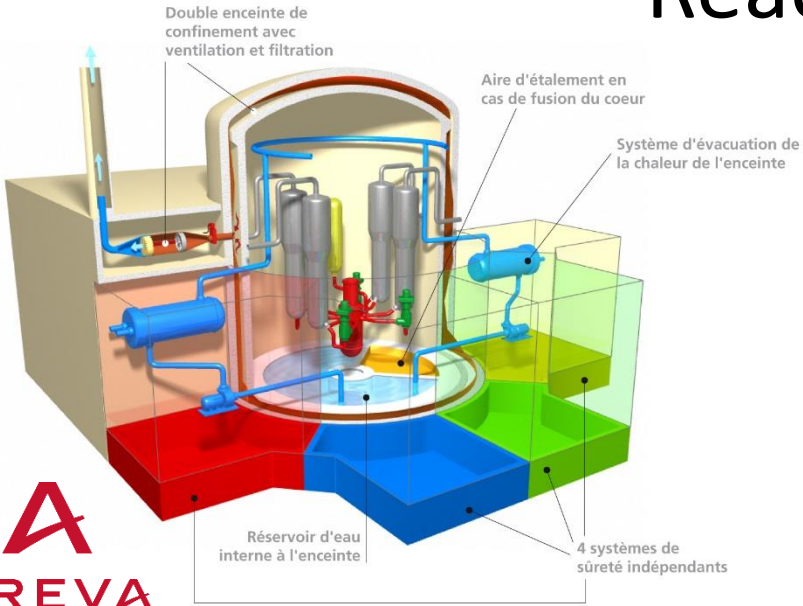
[\(lire le manifeste en français !\)](#)



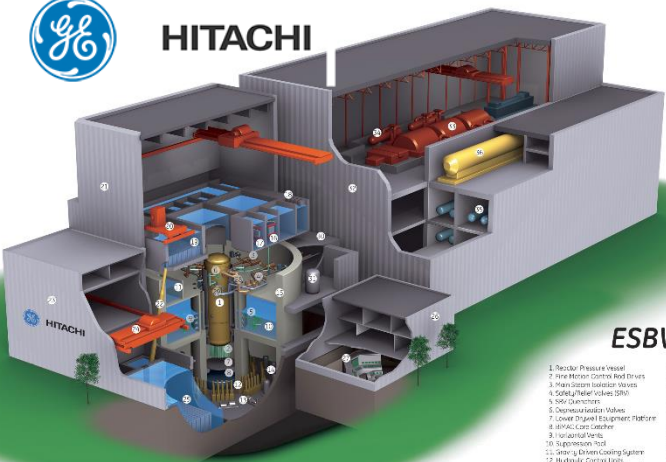
*« Peut-on être écologiste
et être pro-nucléaire ? »*

*« A la lumière du changement
climatique, peut-on être écologiste
et ne pas être pro-nucléaire ? »*

Réacteurs à Eau Pressurisée

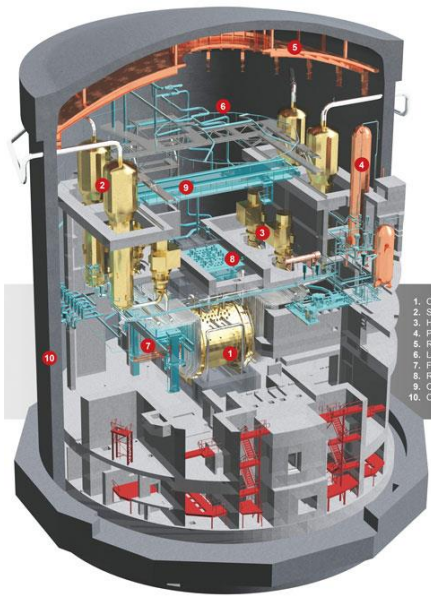


HITACHI



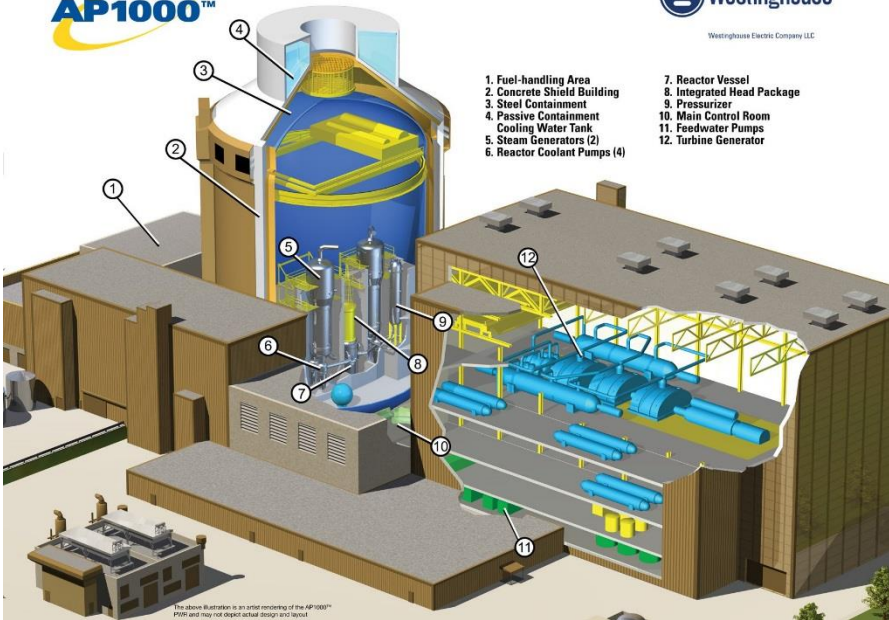
ESBWR

1. Reactor Pressure Vessel
2. Hot Motor Control Rod Drive
3. Hot Motor Control Rod Drive
4. Safety Relief Valves (SRV)
5. SRV
6. Desuperheater
7. Lower Head Equipment Platform
8. SRV
9. SRV
10. SRV
11. SRV
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97. SRV
98. SRV
99. SRV
100. SRV



1. Calandria
2. Steam Generators
3. Heat Transport Pumps
4. Pressurizer
5. Reserve Water Tank
6. Low Flow Spray
7. Fueling Machine
8. Reactivity Mechanism Deck
9. Overhead Equipment Crane
10. Containment

EC6



ROSATOM

VVER-1200



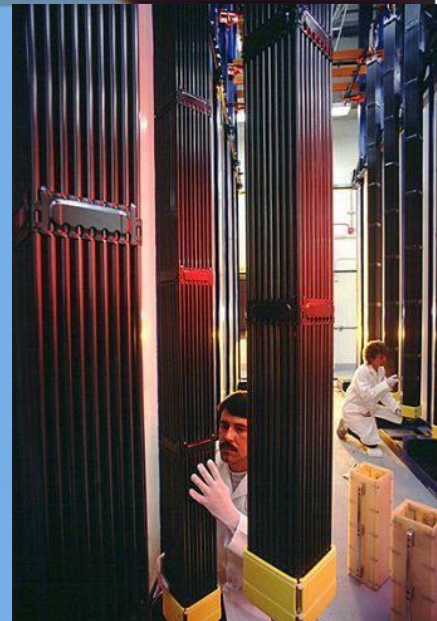




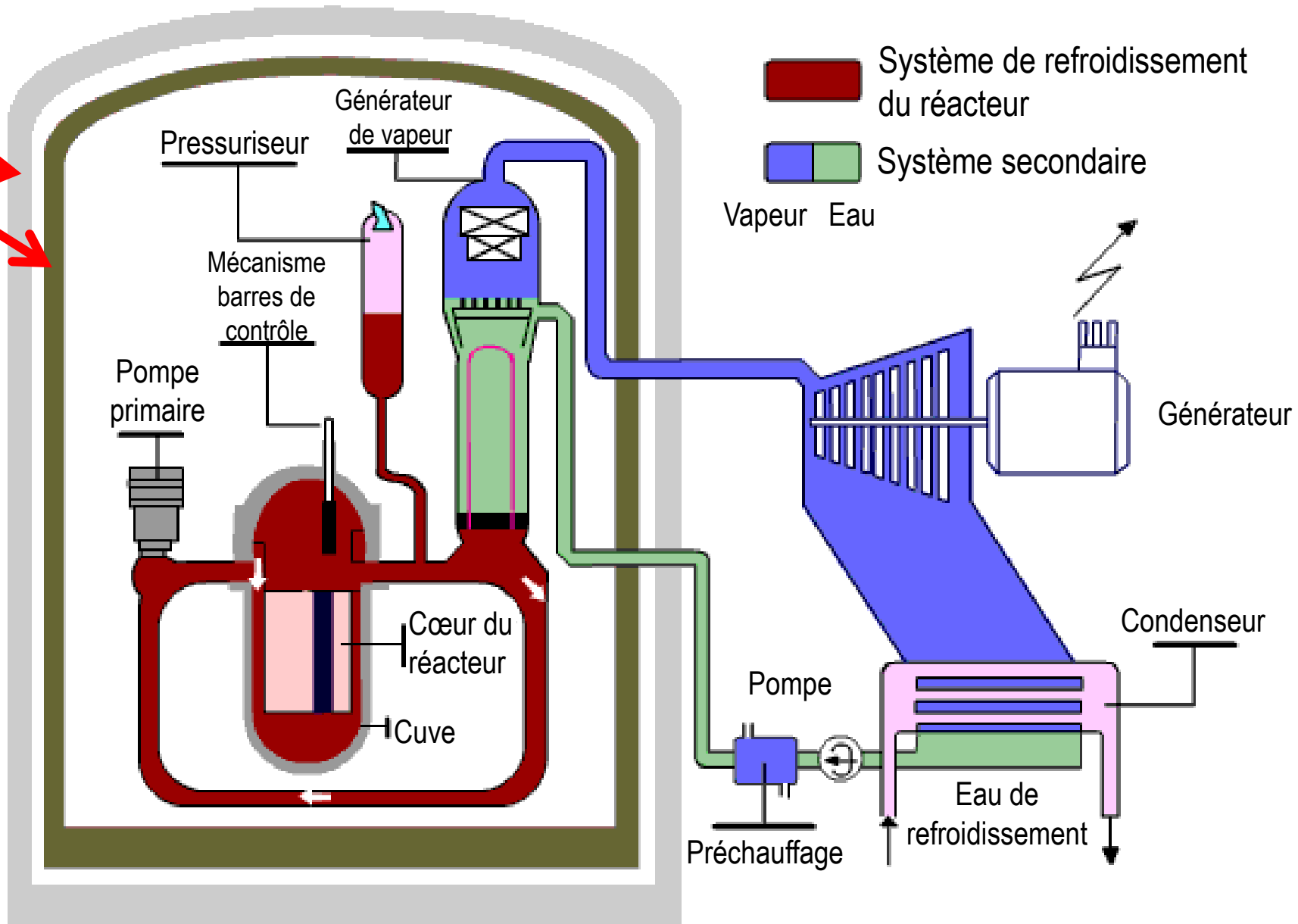
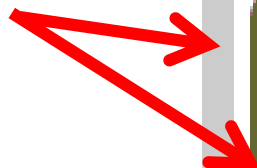
Crayon de combustible

Pastille

Assemblage de combustible



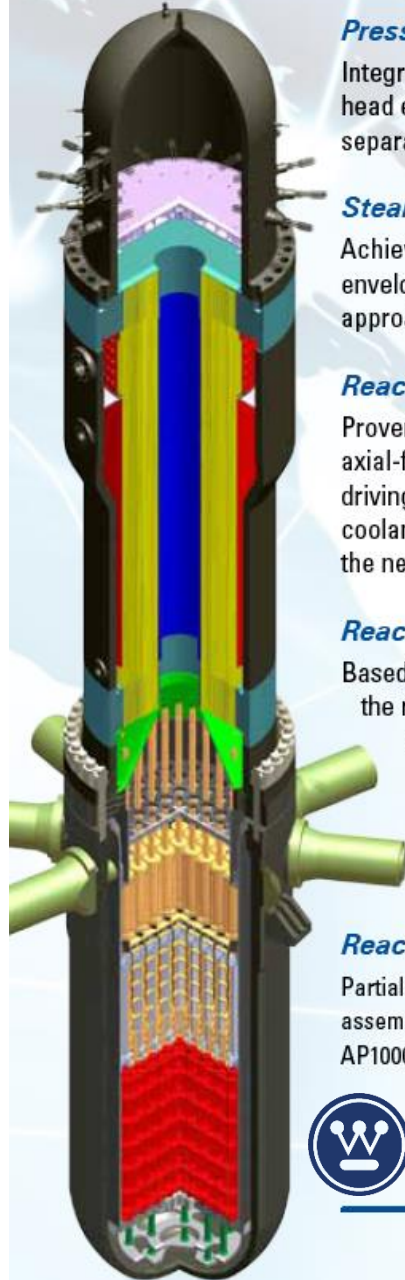
2 enceintes de confinement



Petits Réacteurs Modulaires



Westinghouse SMR



Pressurizer

Integration into reactor vessel head eliminates the need for a separate component

Steam Generator

Achieves a compact physical envelope with an innovative approach to steam separation

Reactor Coolant Pumps

Proven, horizontally-mounted axial-flow pumps provide the driving head for the reactor coolant system while eliminating the need for pump seal injection

Reactor Vessel Internals

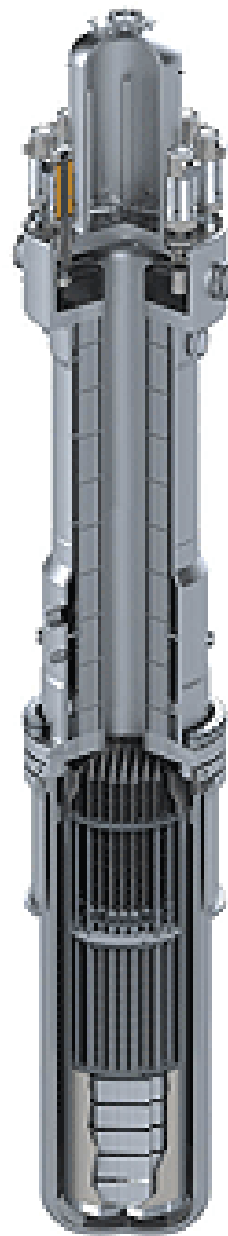
Based on the AP1000® design, the reactor vessel internals are modified for the smaller core and to provide support for the internal control drive rod mechanisms

Reactor Core

Partial-height of the 17x17 fuel assembly design used in the AP1000® reactor



Westinghouse



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NUSCALE POWER MODULE™

NATURAL
CIRCULATION
OF REACTOR
COOLANT
FLOW



CONDUCTION

Heat is transferred from the primary coolant through the walls of the tubes in the steam generator, heating the water (secondary coolant) inside them to turn it to steam.



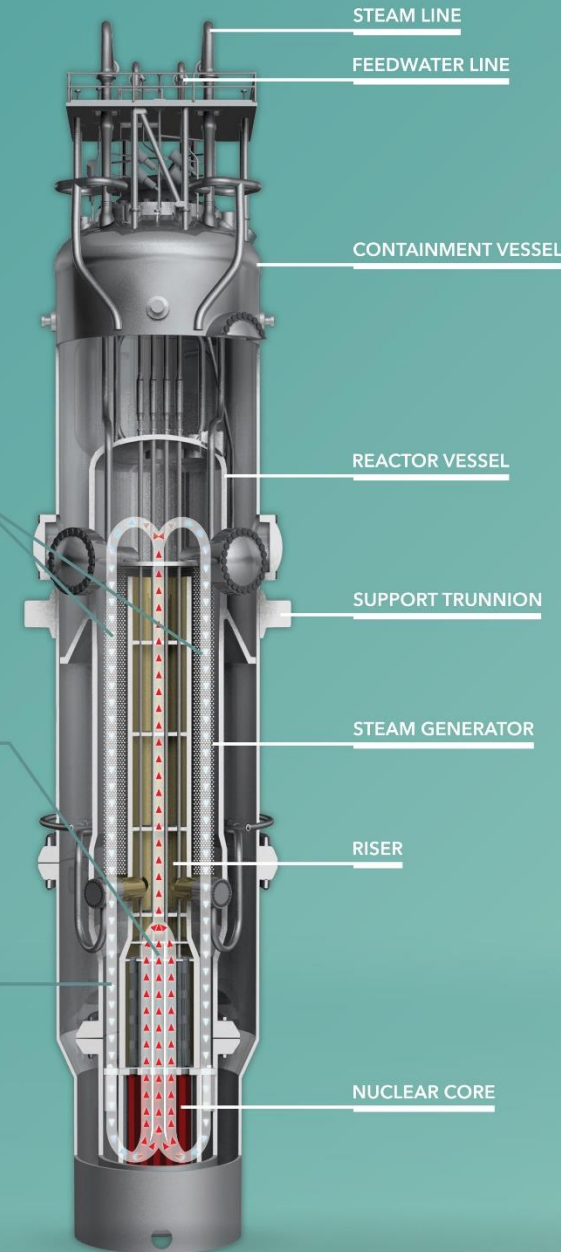
CONVECTION

Energy from nuclear reaction heats the primary reactor coolant causing it to rise by convection and natural buoyancy through the riser, much like a chimney effect.



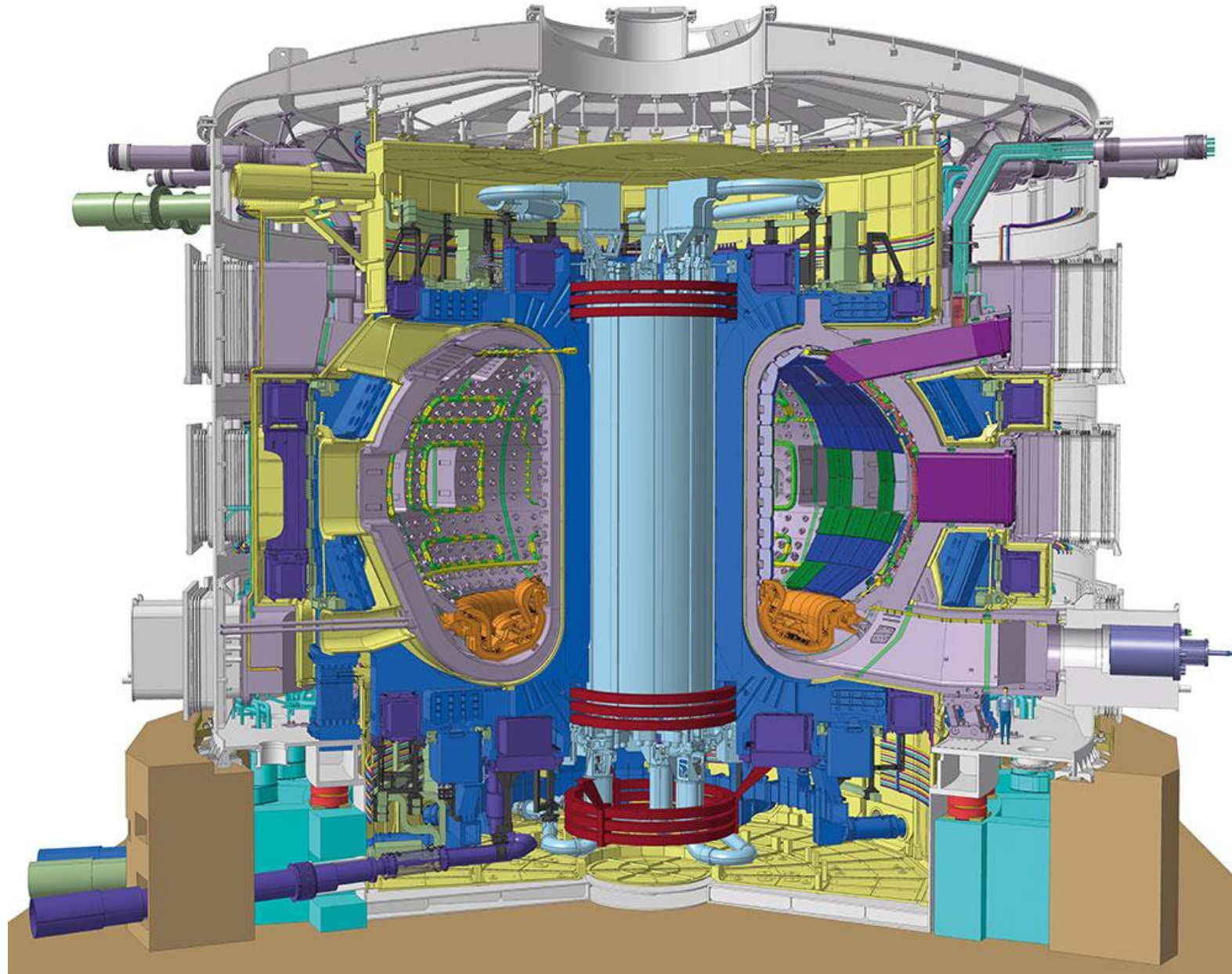
GRAVITY

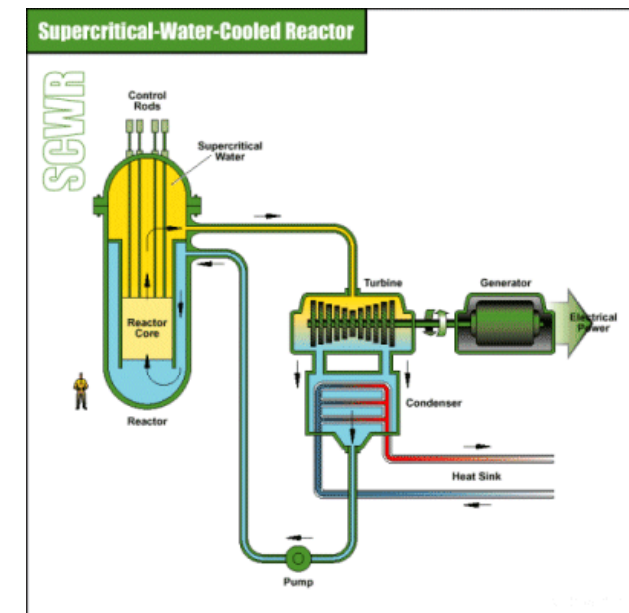
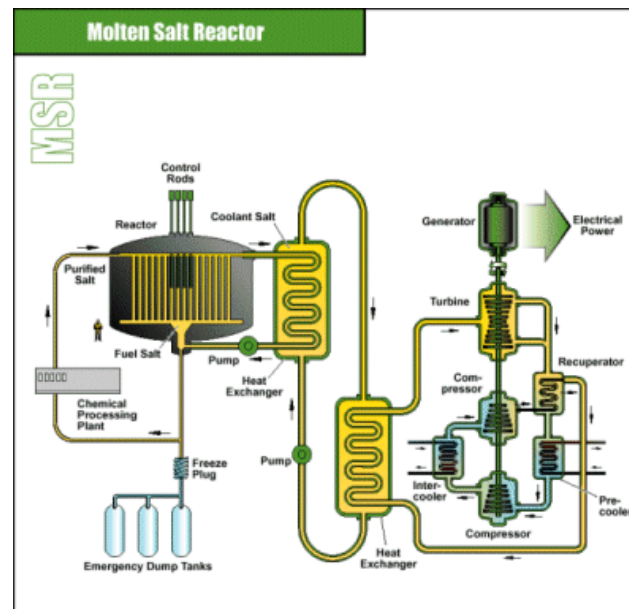
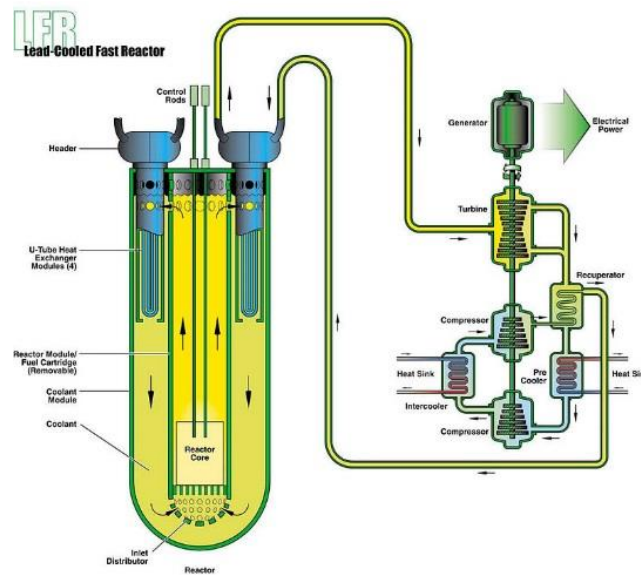
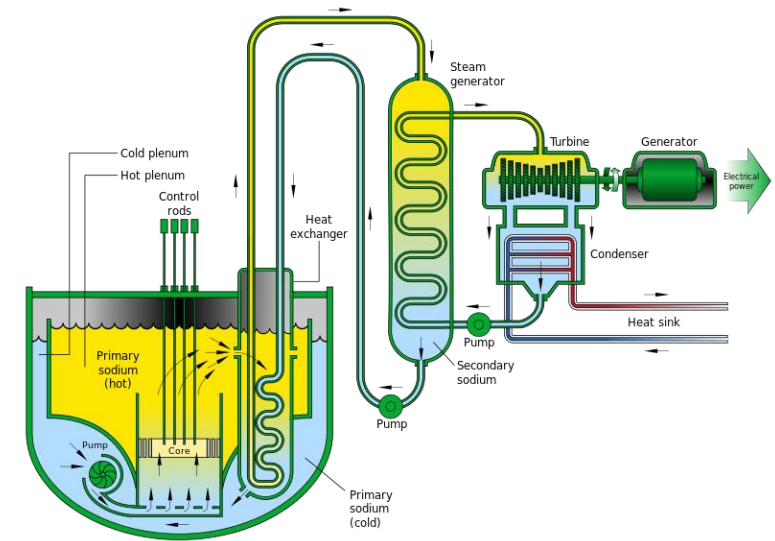
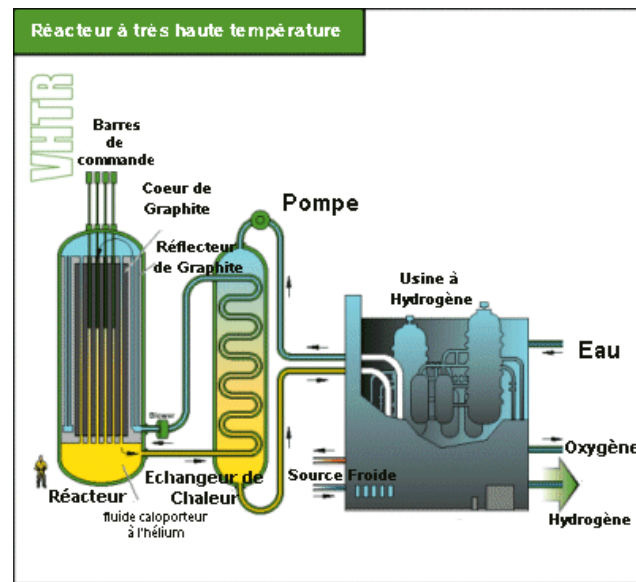
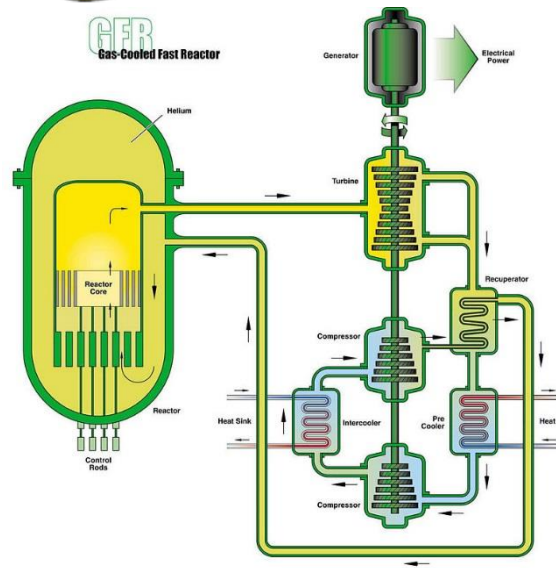
Colder (denser) primary coolant "falls" to bottom of reactor pressure vessel, cycle continues.



NUSCALE
POWER™

La Fusion : ITER





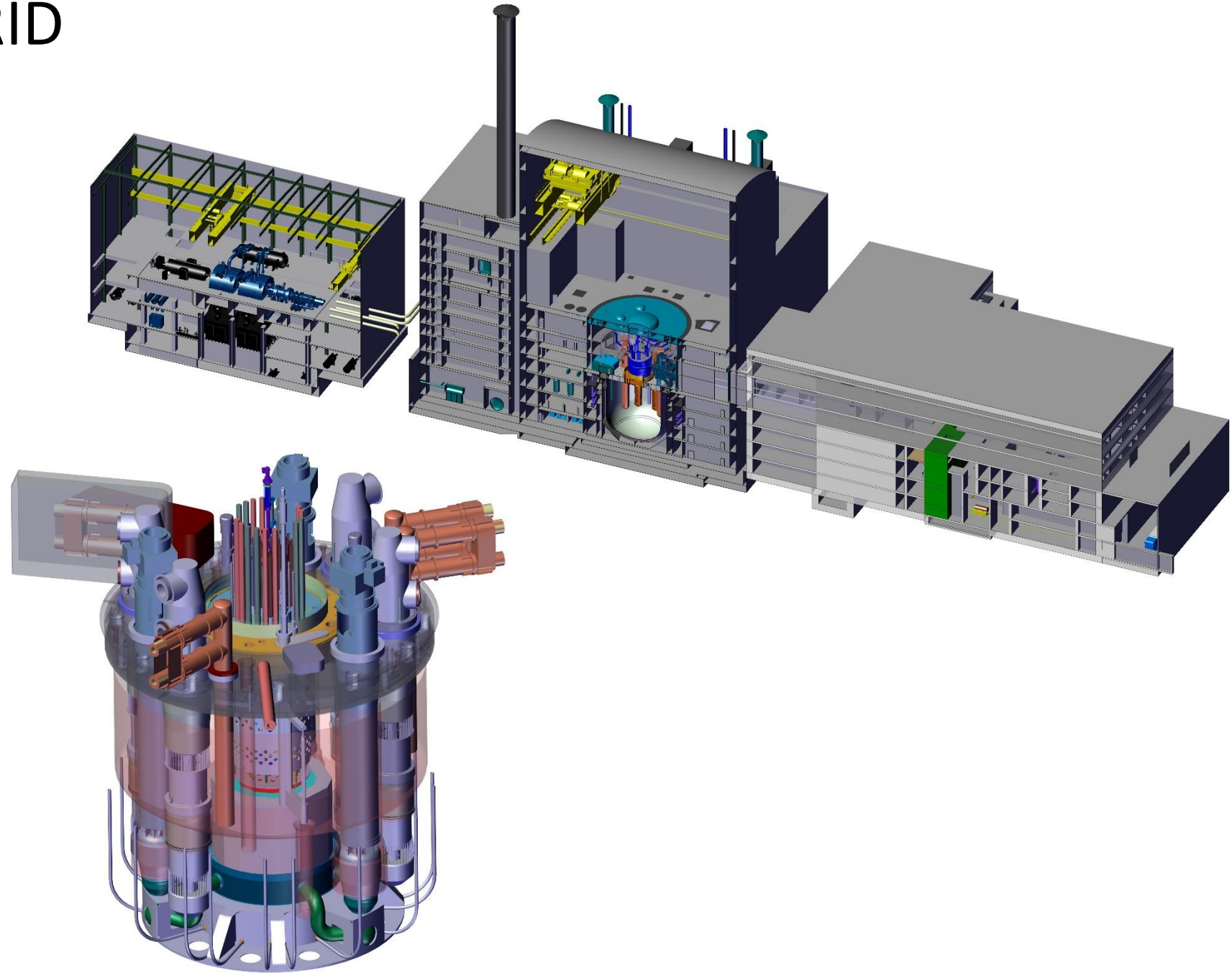


SAMOFAR



Kick-off meeting, August 24-25, 2015, Delft

La France : ASTRID



LES GÉNÉRATIONS DE RÉACTEURS NUCLÉAIRES



Faisabilité
industrielle



Déploiement

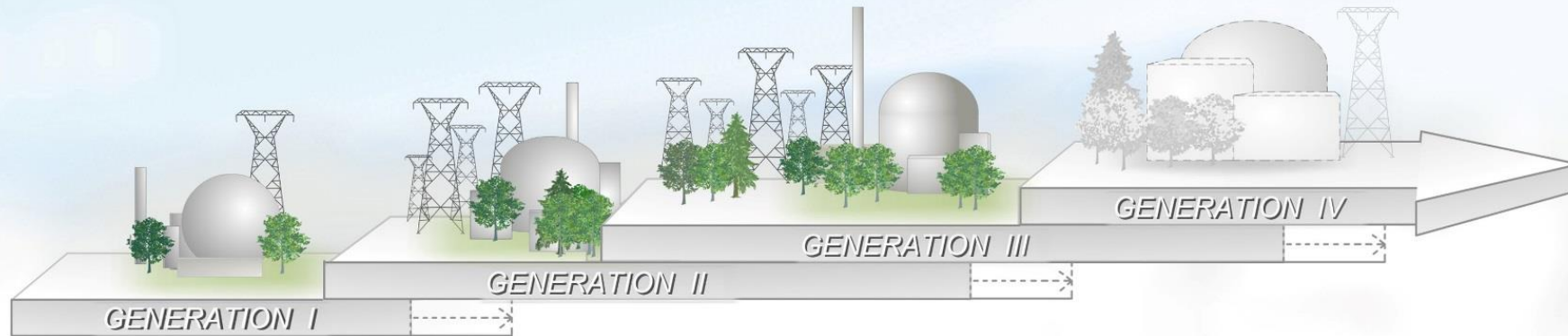


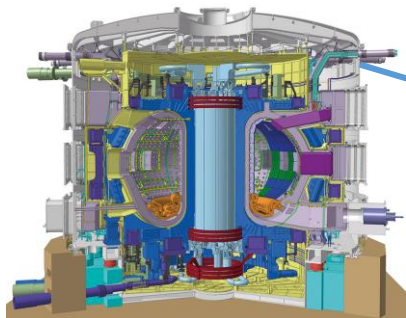
Optimisation



Durabilité

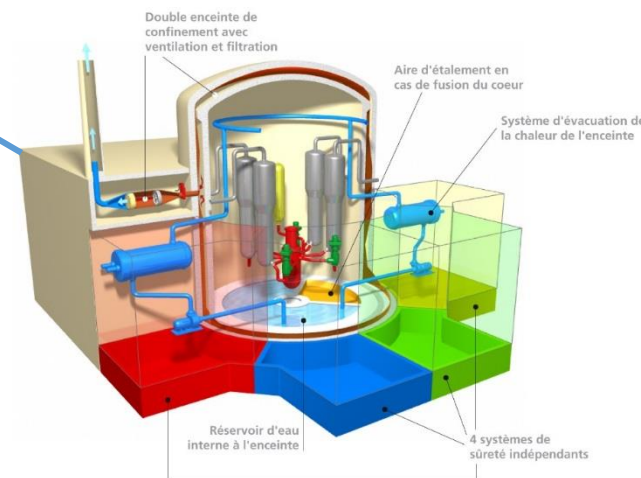
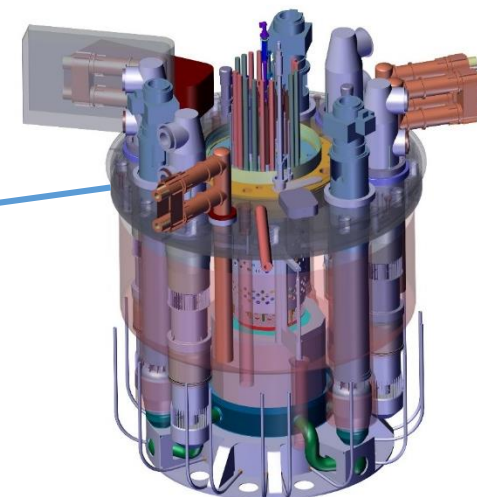
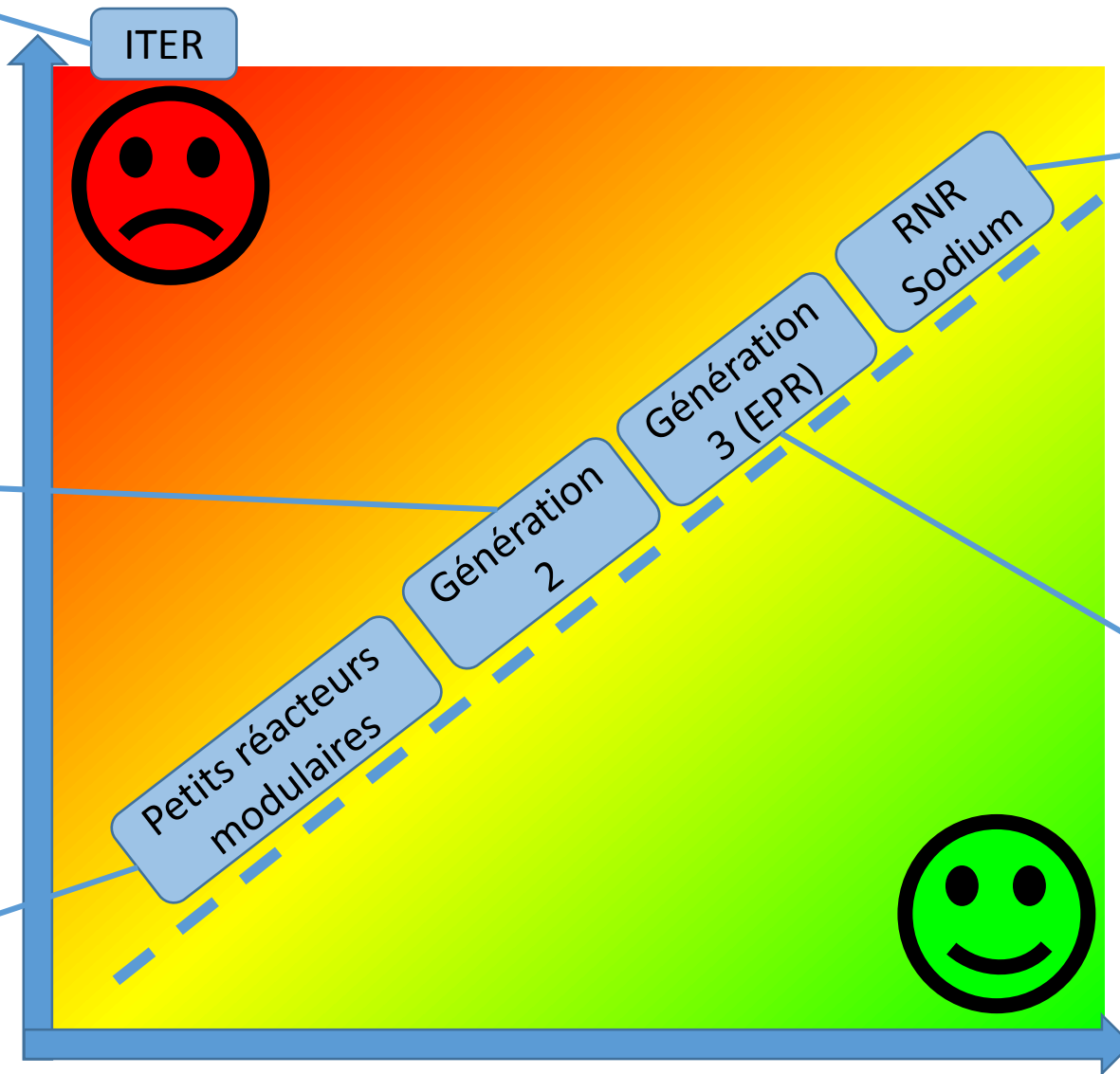
Coût





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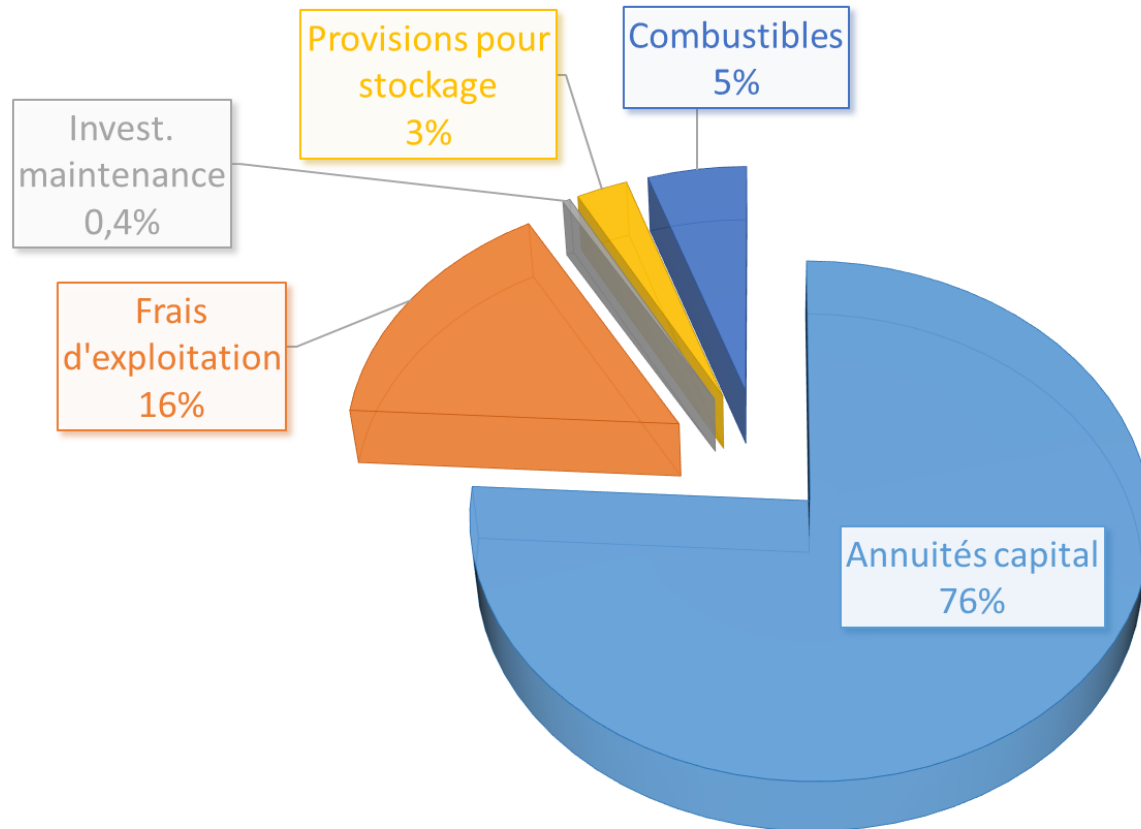
Coût



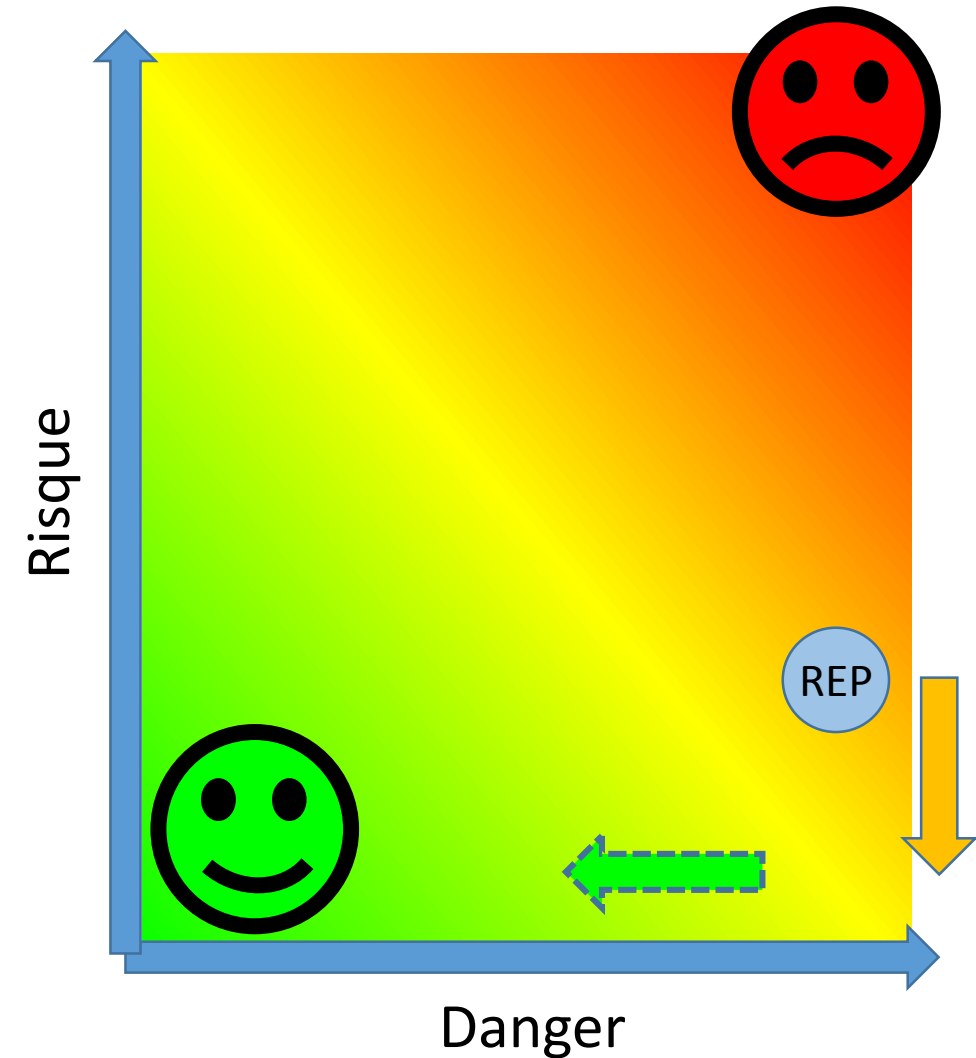
Valeur

Pourquoi le nucléaire est cher ?

COÛT / MWH EPR FLAMANVILLE



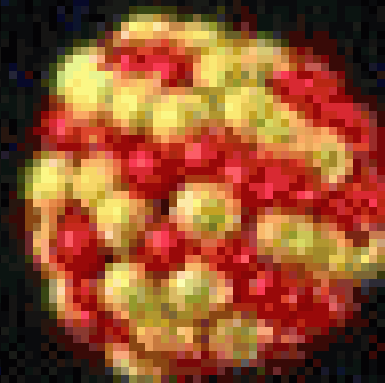
Source : <http://negawatt.org>



accelerated
neutron



uranium





Temps après la fission (échelle logarithmique) →

Protons

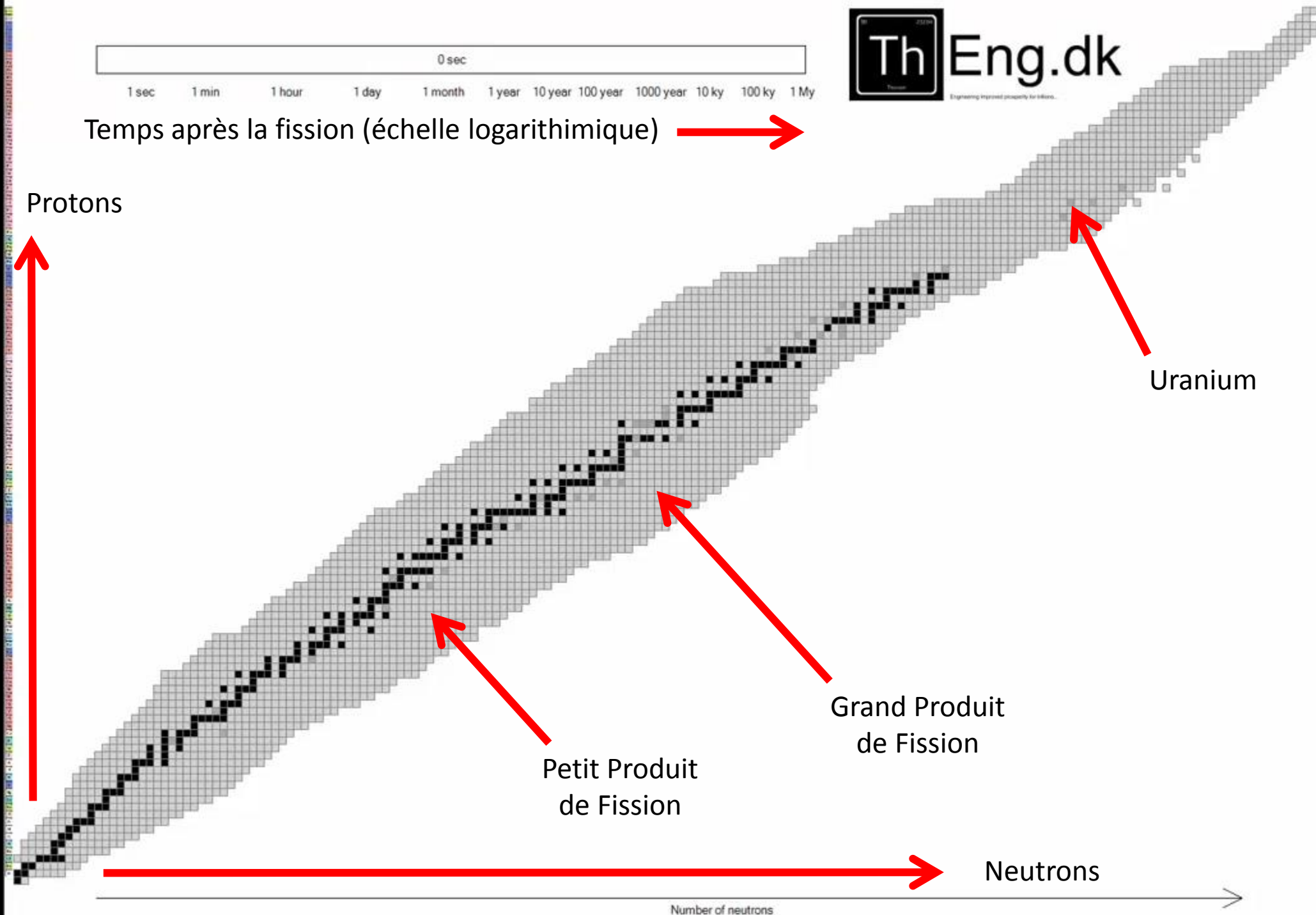
Uranium

Grand Produit
de Fission

Petit Produit
de Fission

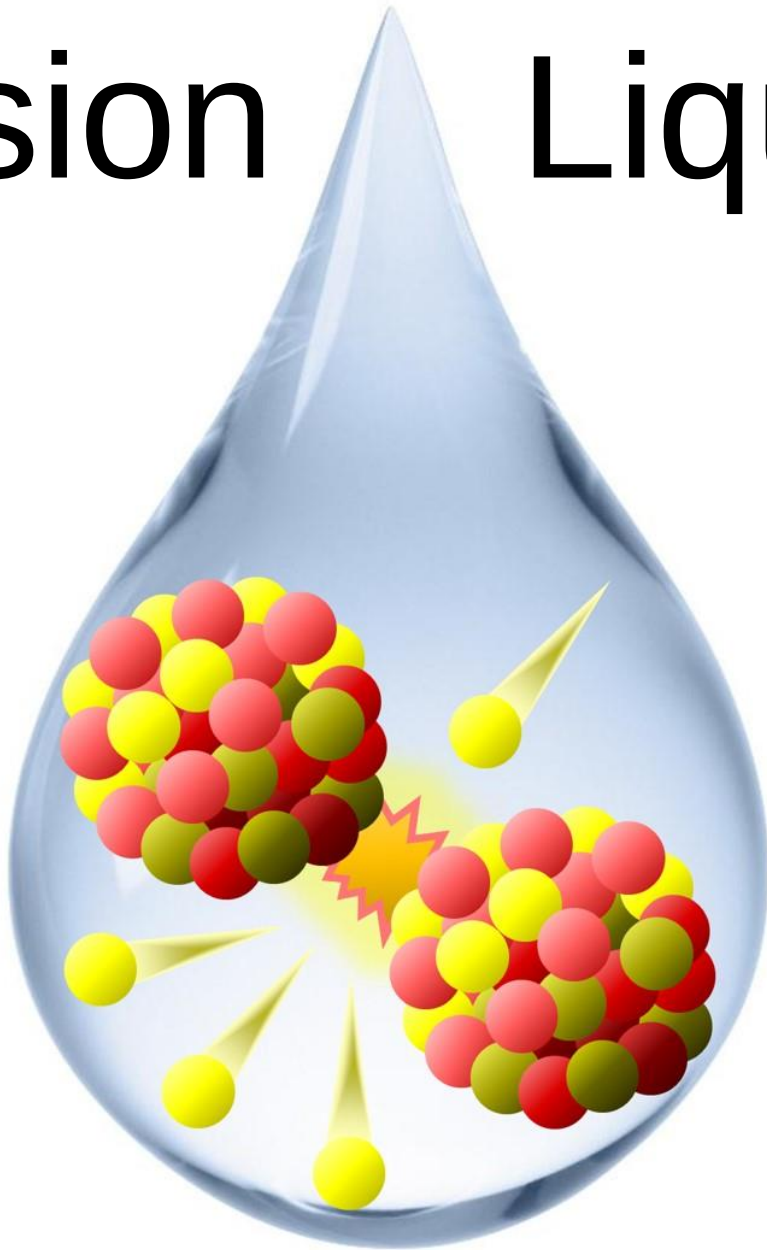
Neutrons

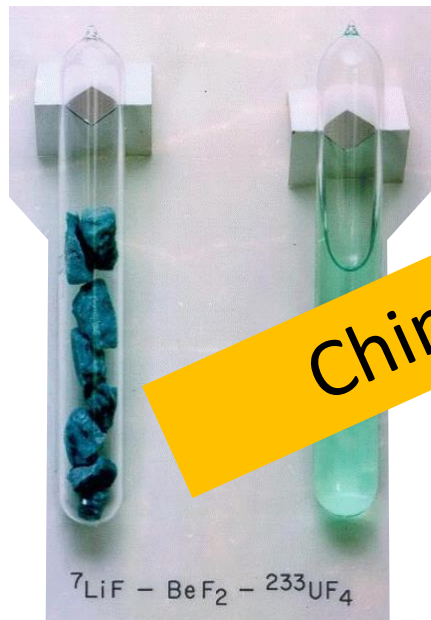
Number of neutrons



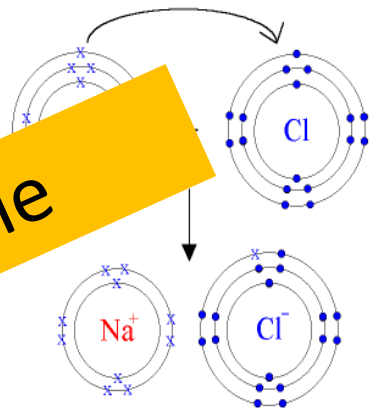
Fission

Liquide

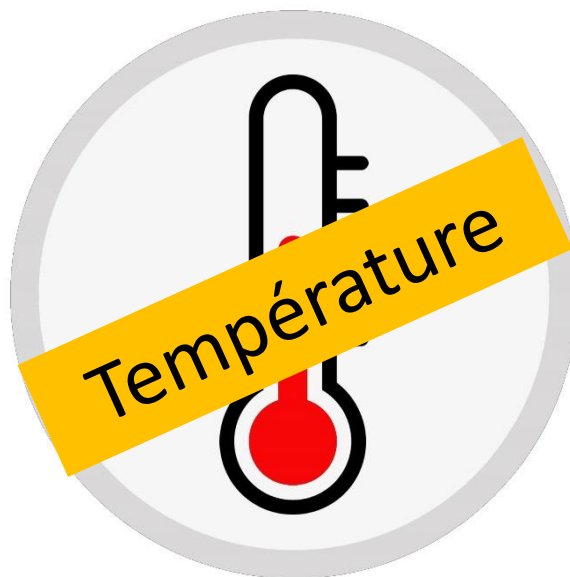




Chimie



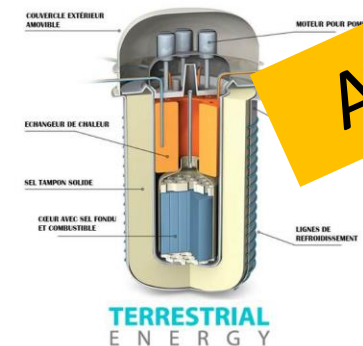
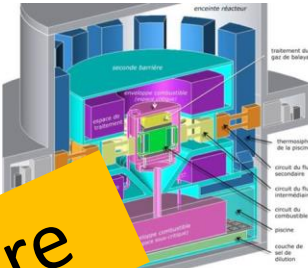
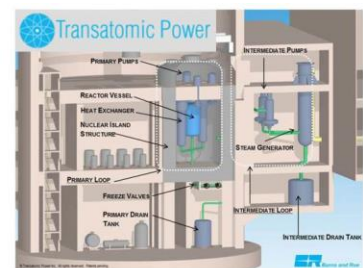
Liaison
Ionique



Température



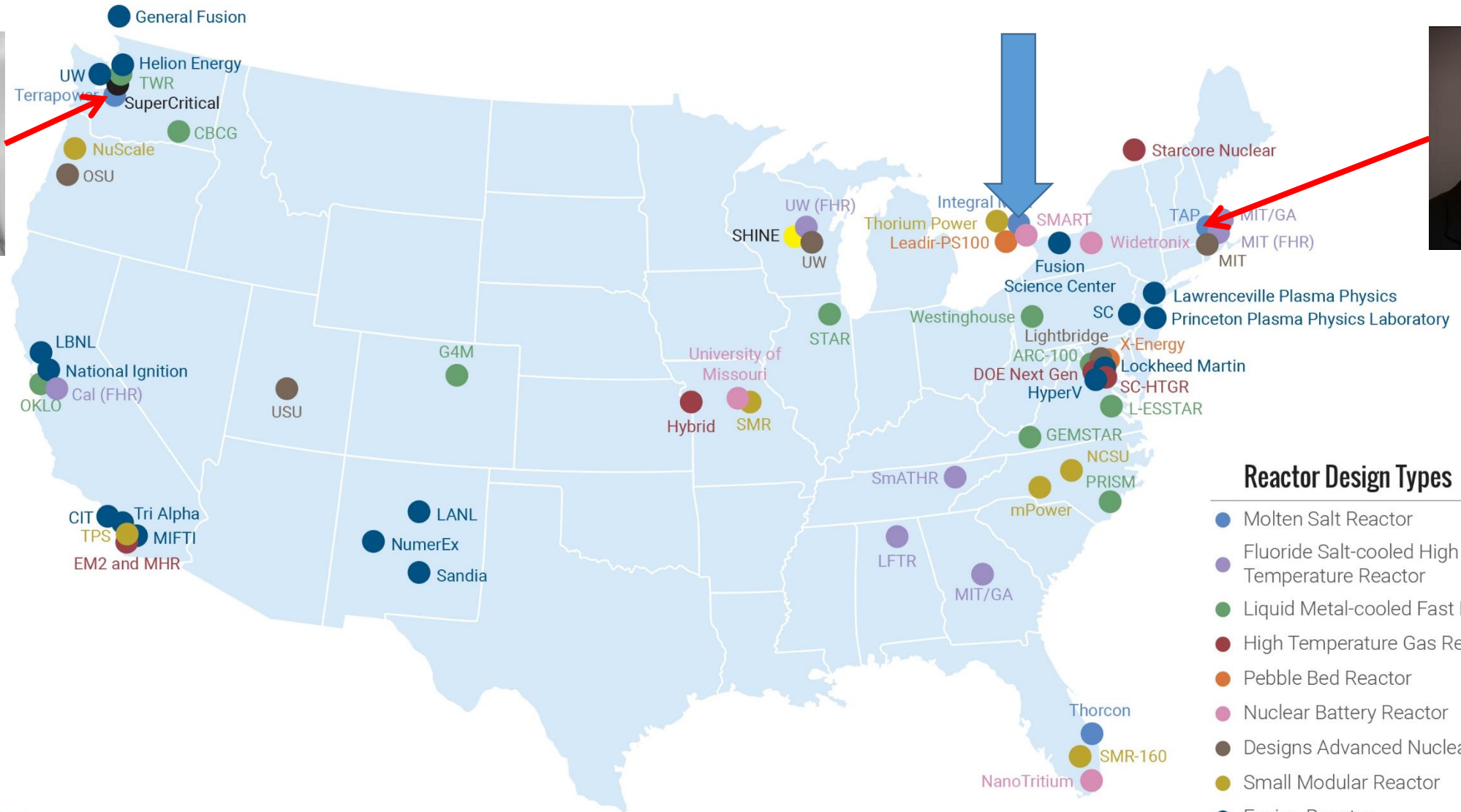
Pression



Architecture



Modularité



TERRESTRIAL ENERGY

COUVERCLE EXTÉRIEUR
AMOVIBLE

MOTEUR POUR POMPE

ECHANGEUR DE CHALEUR

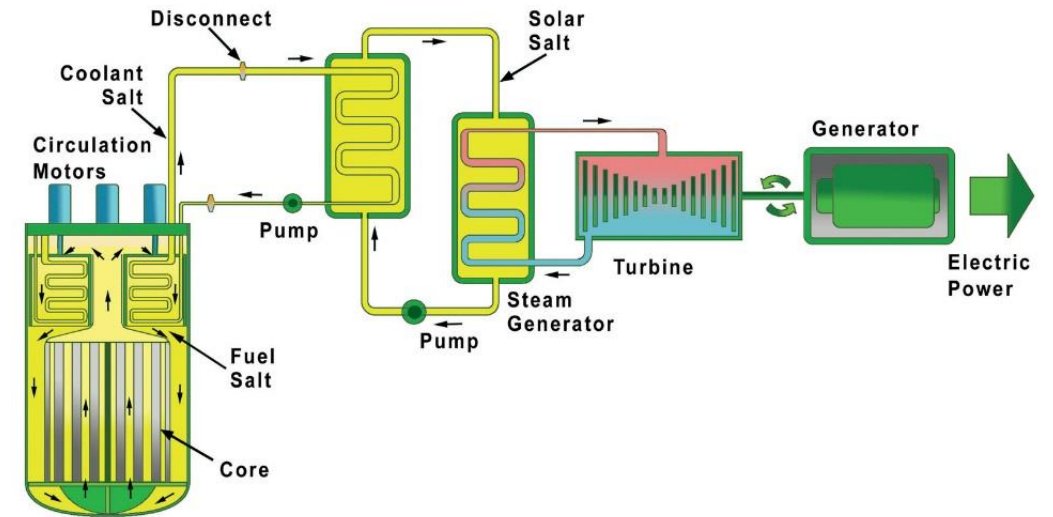
DOUBLURE EN ACIER

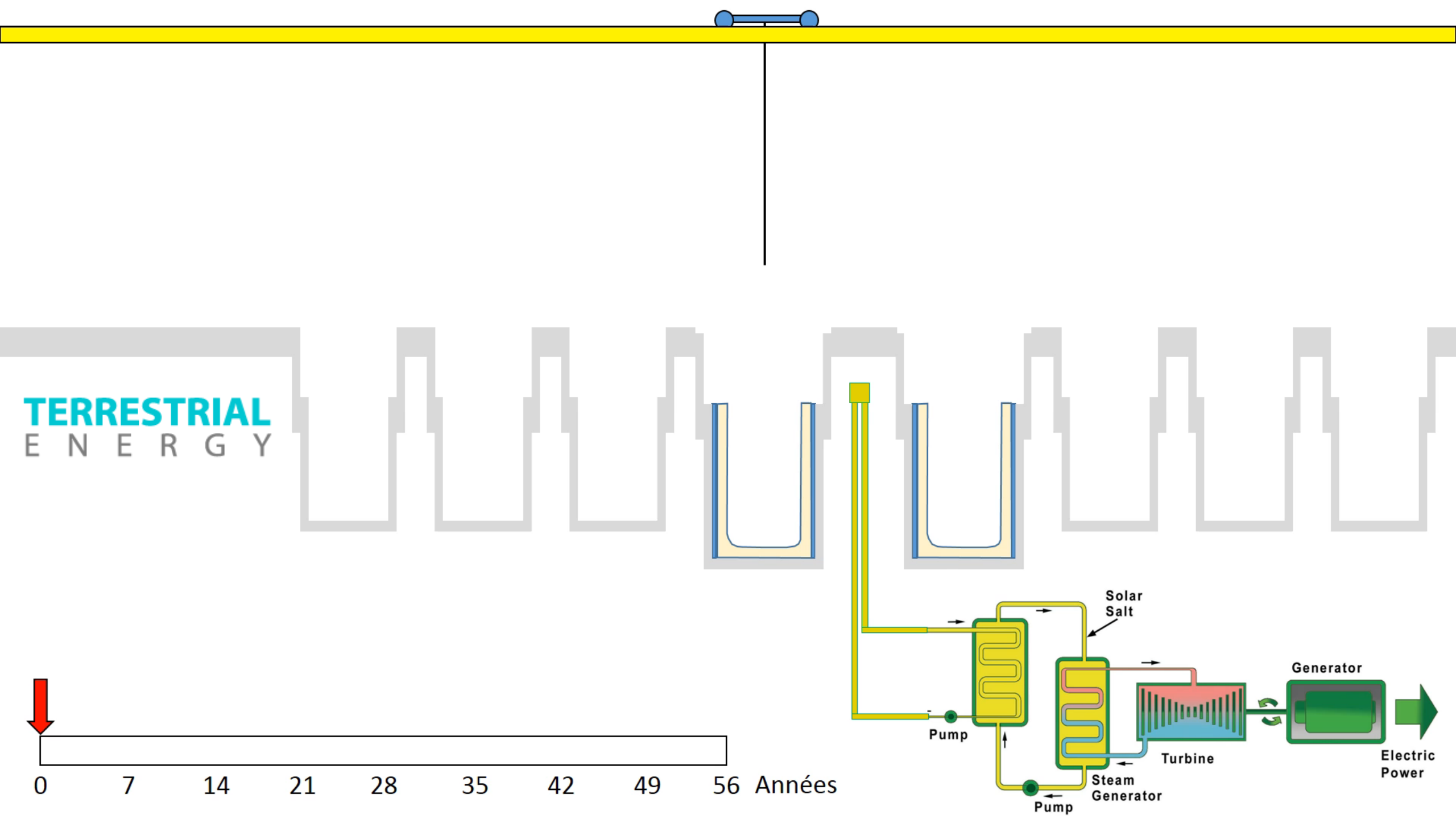
SEL TAMPON SOLIDE

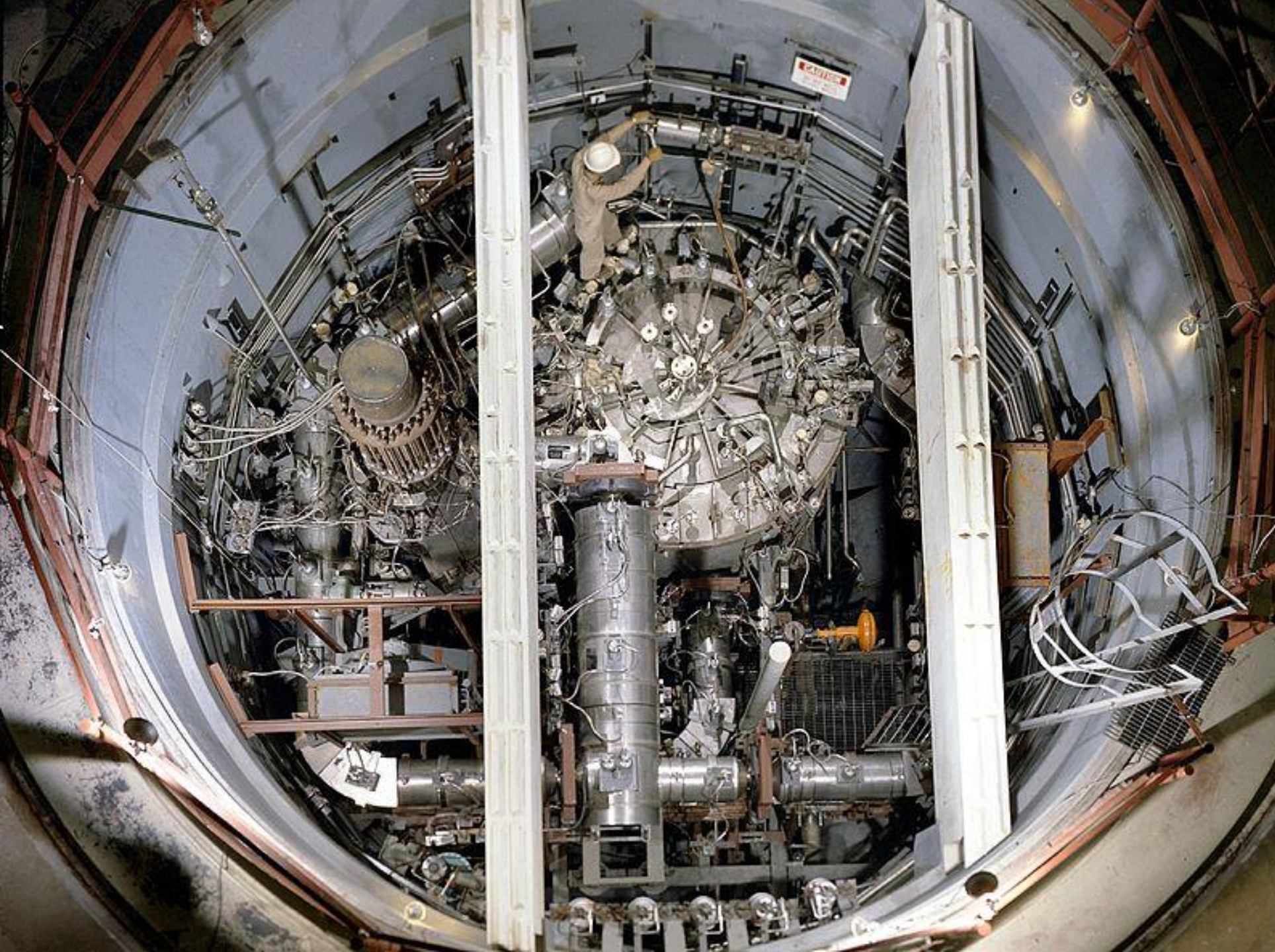
CŒUR AVEC SEL FONDU
ET COMBUSTIBLE

LIGNES DE
REFROIDISSEMENT PASSIF

Unité cœur

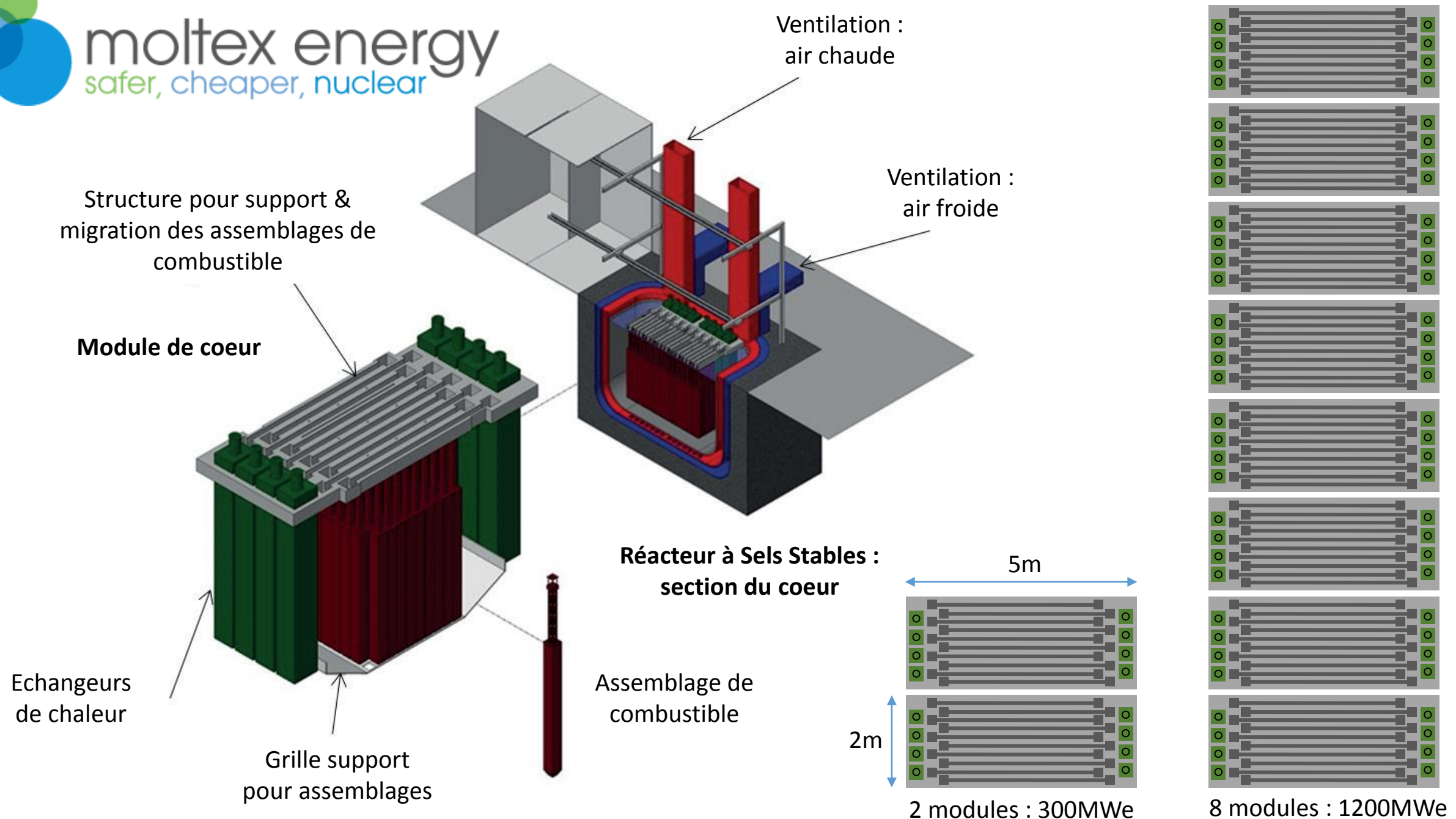


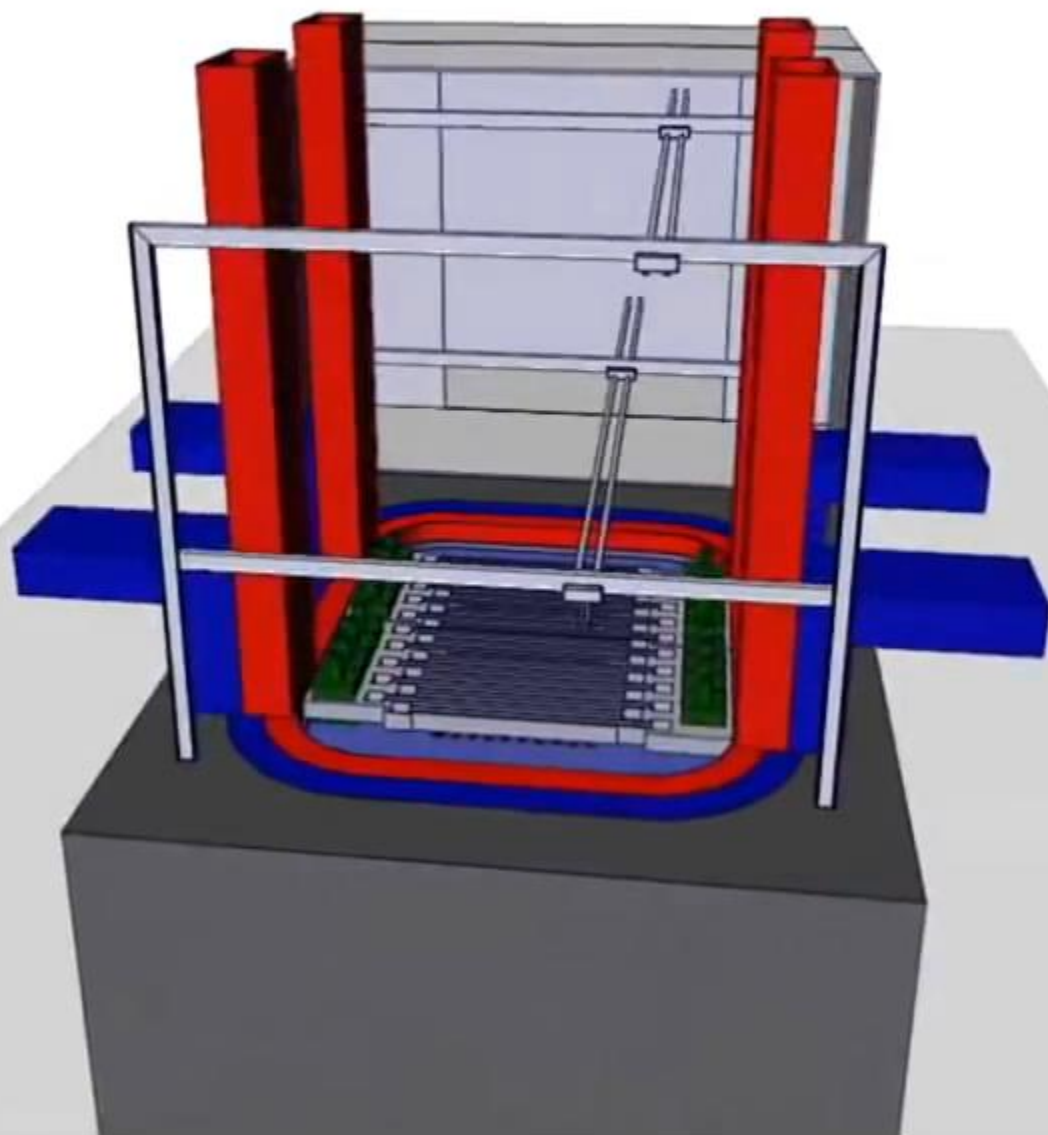


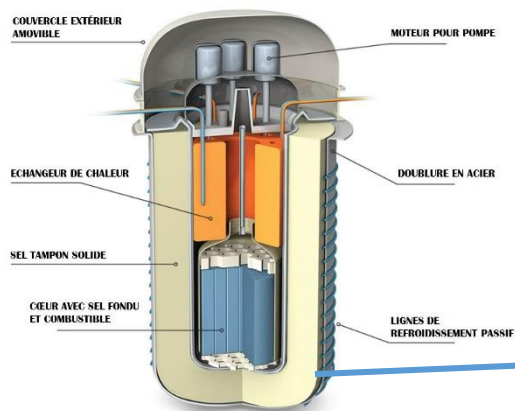


 **OAK
RIDGE**
National Laboratory

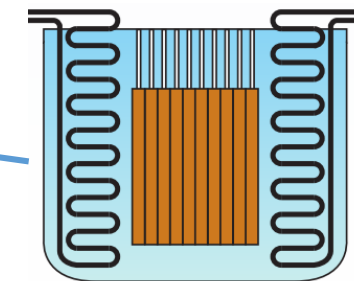
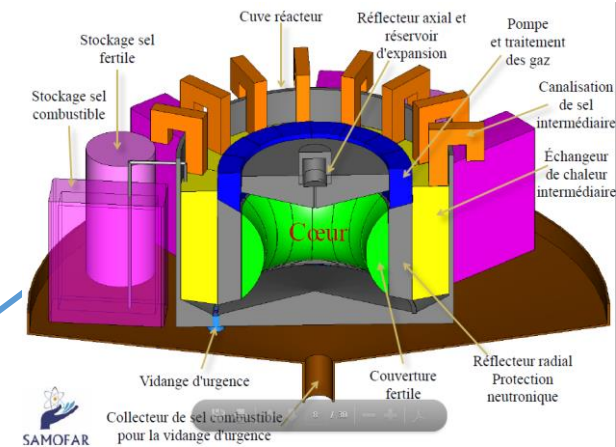
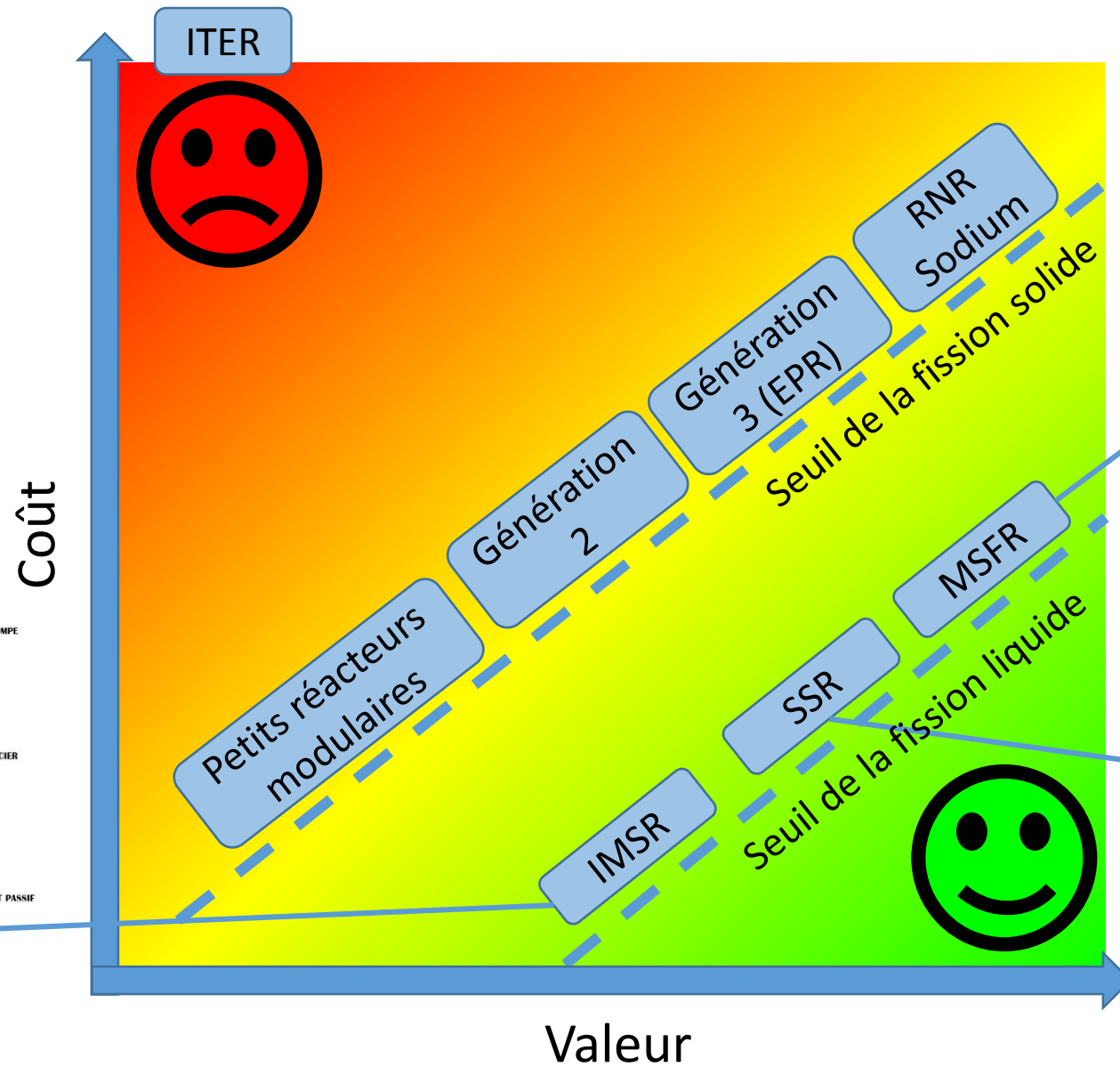




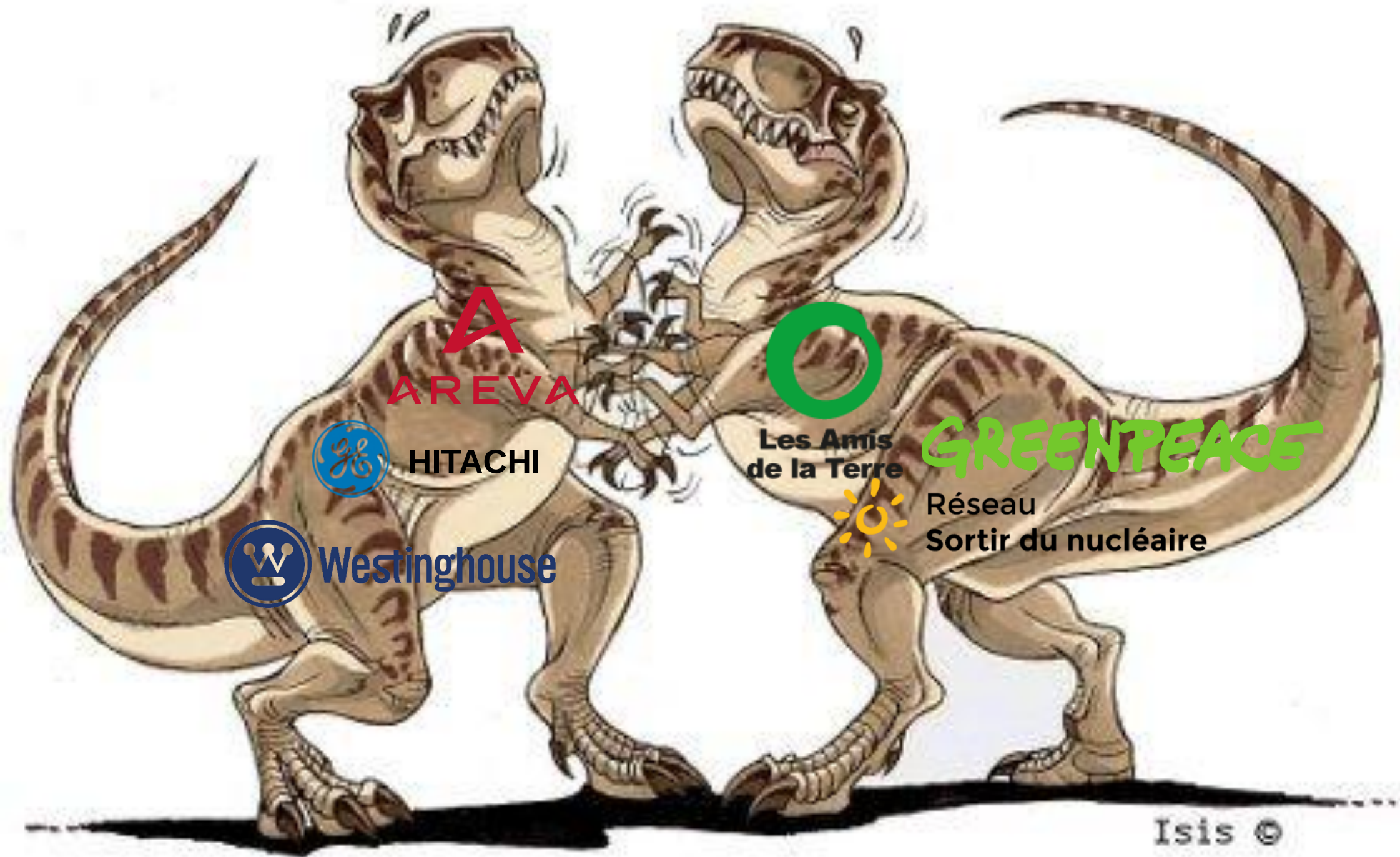




TERRESTRIAL
ENERGY



moltex energy
safer, cheaper, nuclear



A
AREVA



HITACHI

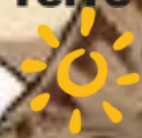


Westinghouse



**Les Amis
de la Terre**

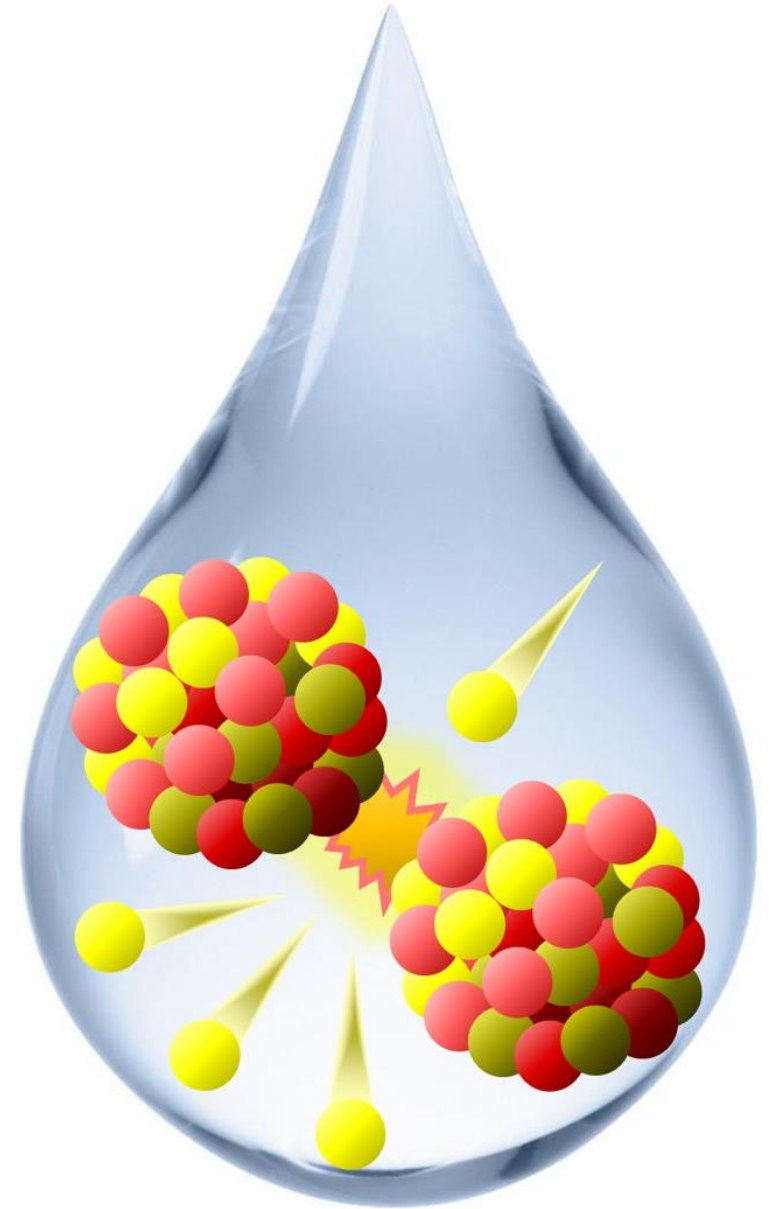
GREENPEACE



**Réseau
Sortir du nucléaire**

Isis ©

Un partenariat pour l'avenir

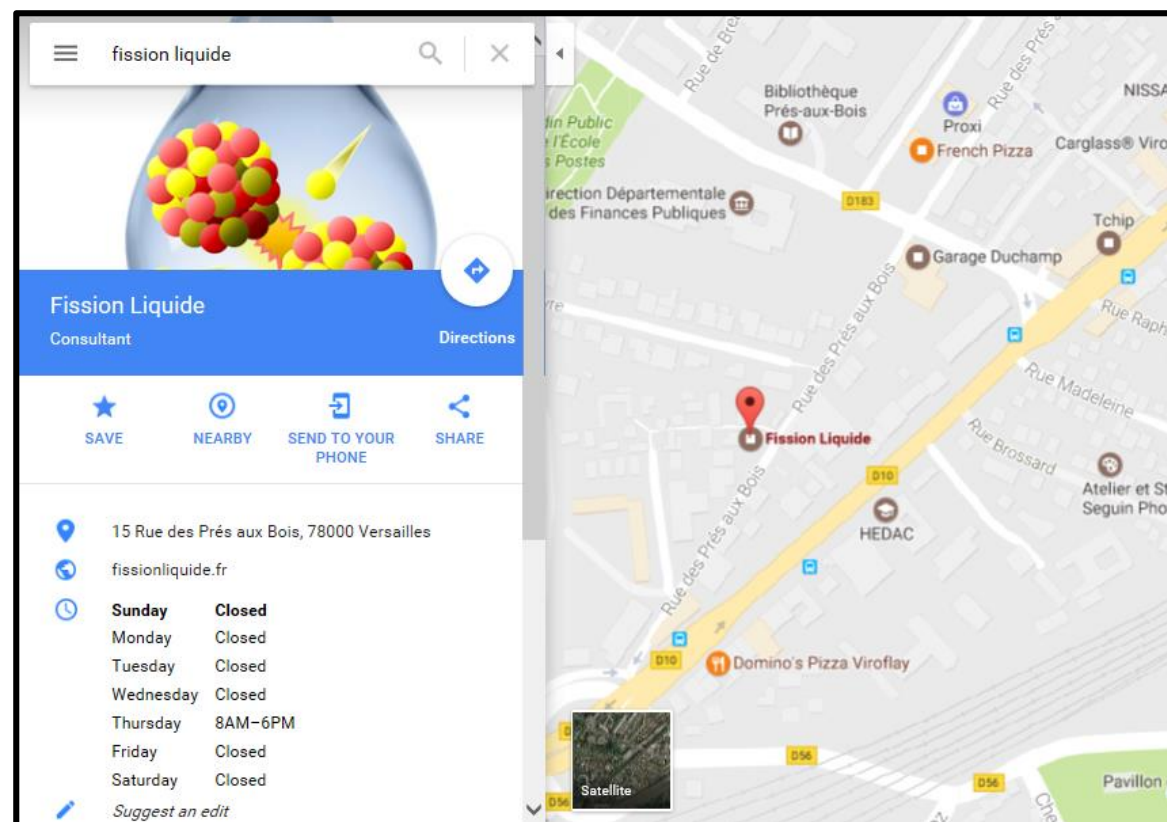




Fission Liquide

La première entreprise française dédiée aux réacteurs à sels fondus.

- Mission : Connecter les parties prenantes dans cette technologie
- Offre : Conseil indépendant, bilingue français / anglais
- Création : 1^{er} janvier 2017
- Siège : Versailles



Pour en savoir plus :



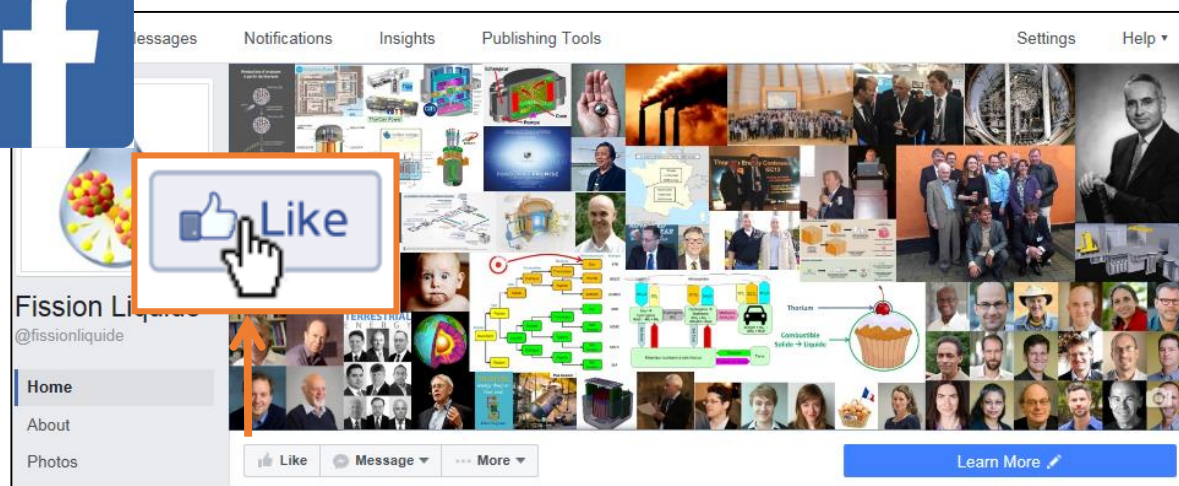
Fission Liquide

La fission liquide et le thorium pour un climat stable et une prospérité énergétique

Recherche



<http://fissionliquide.fr>



<https://www.facebook.com/fissionliquide>



<http://youtube.com>



<https://twitter.com/FissionLiquide>