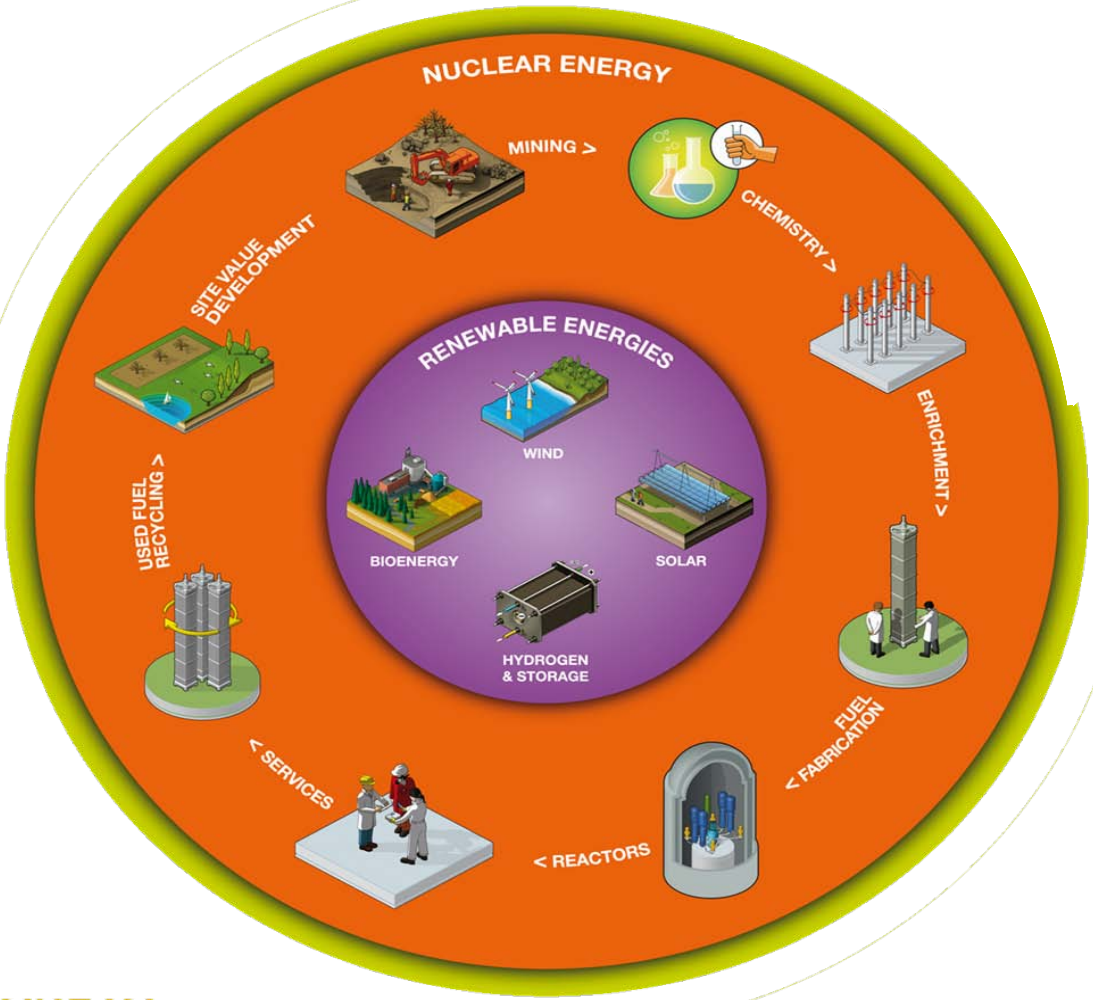
A canter around the nuclear jumps..

Robert Davies
Vice President New Build, AREVA UK

Cambridge MPhil
8th February 2012

AREVA

Who are we?
World leader in CO_2-free power generation



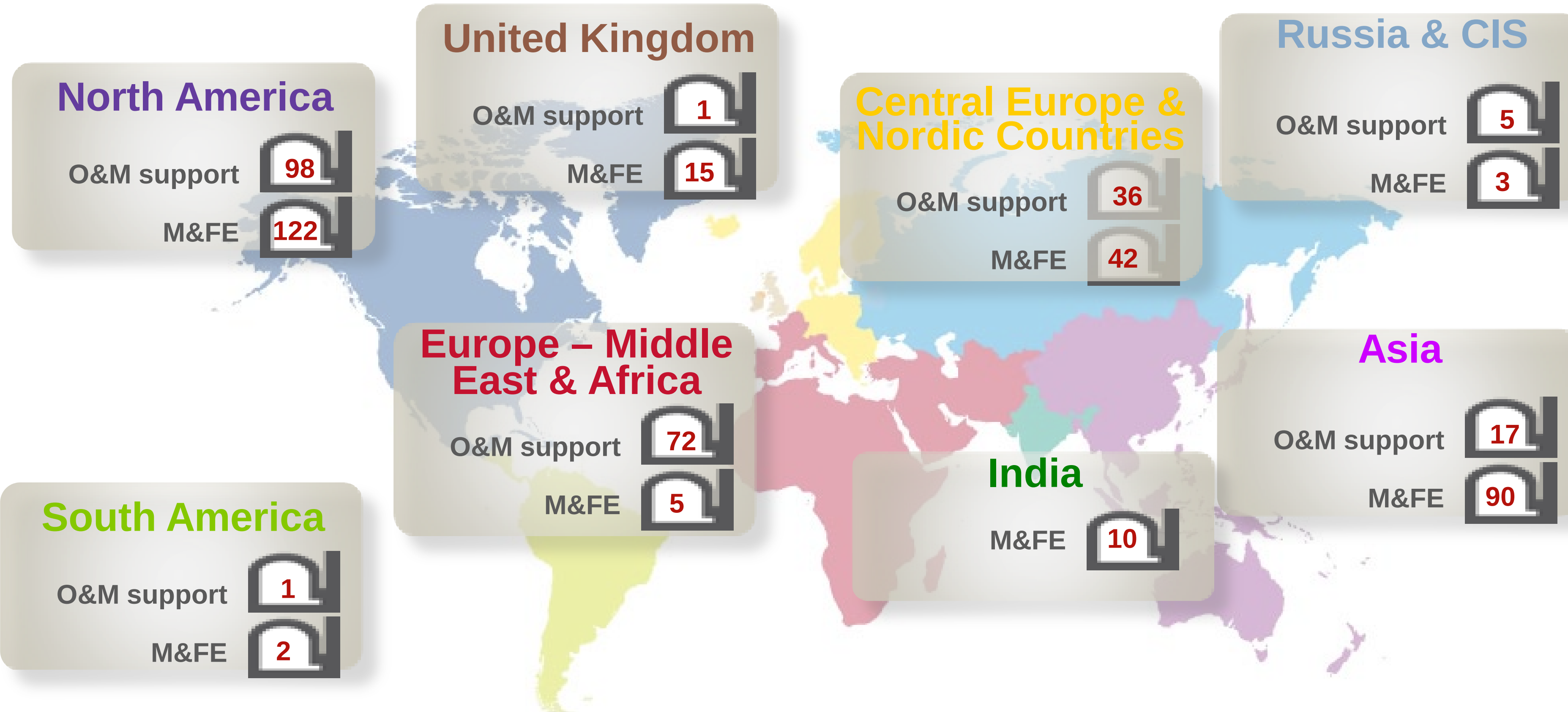
€9.1Bn in Annual Revenues
€44.2Bn in Backlog

48,000 Employees Including:
- **740** Specialty Experts
- **2,700** Scientists & Researchers
- **6,500** in world's largest in-house EPC team

44 Manufacturing Sites in **5** continents

AREVA

360 Nuclear Reactors are served by AREVA



Operation & Maintenance (O&M) support for 257 Nuclear Power Plants
Mining and Front-End (M&FE) for 318 Nuclear Power Plants

Reference year: 2010

Helping Build Next-Generation Nuclear Capacity

Track Record:

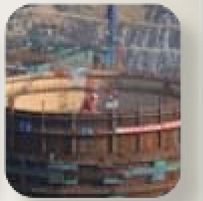
98 nuclear reactors delivered

4 ongoing EPR™ Construction Projects:

Olkiluoto 3 (Finland)

Flamanville 3 (France)

Taishan 1 (China)



Taishan 2 (China)

Support to Plant Completion:

Engineering, Procurement & Safety Upgrade

Angra 3 (Brazil)

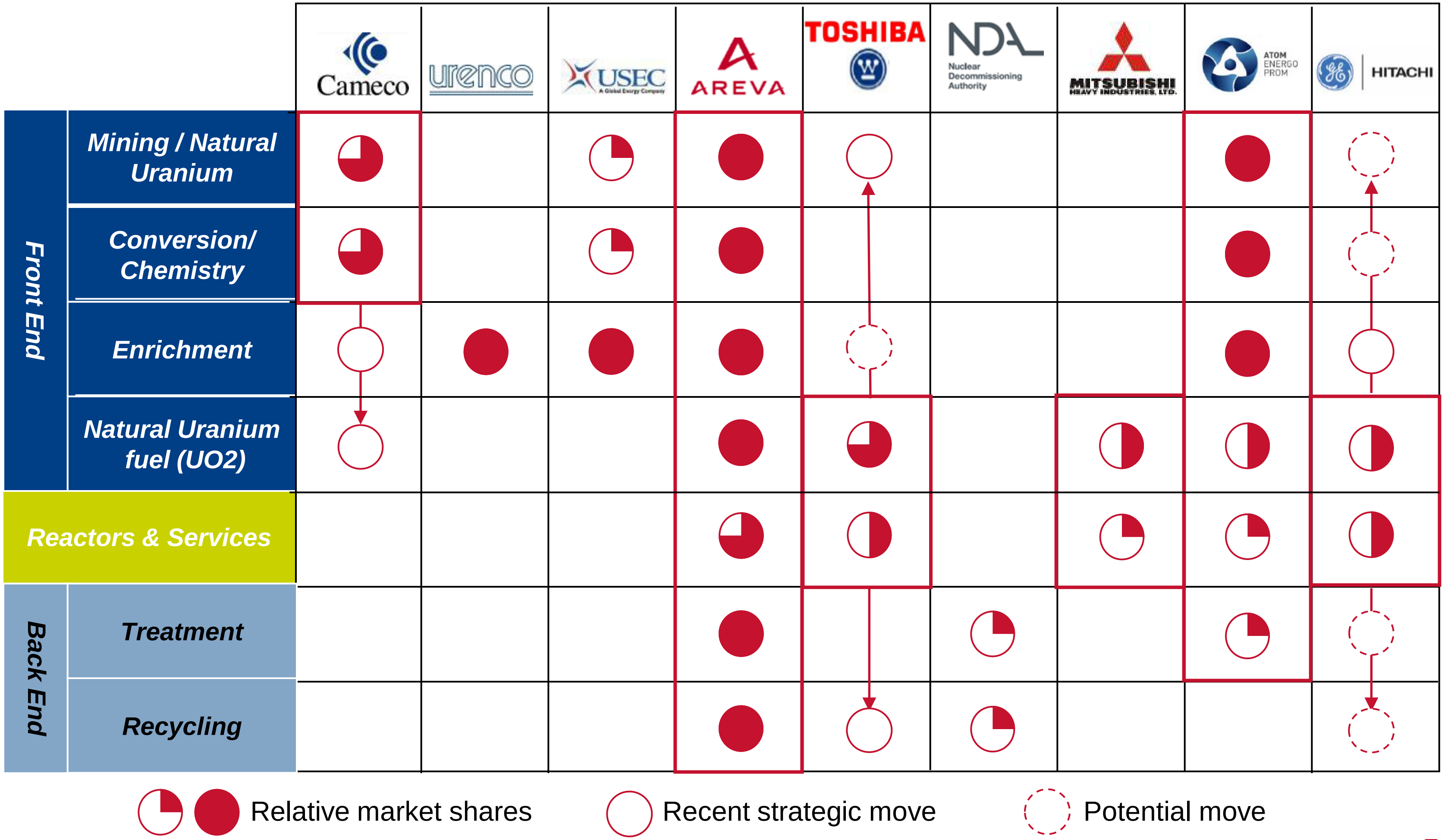
Bellefonte (U.S.)

Next EPR™ Project:

Hinkley Point (U.K.)

AREVA

Who does what in the nuclear world..



Source: AREVA estimates

AREVA

Harold Macmillan “Events my dear boy, events…”

Fukushima

et

la crise financière

In Europe, a few countries have made the headlines…

Germany: accelerated nuclear phase-out by 2022

- In line with the initial 2001 phase-out law
- Immediate closure of its 7 oldest nuclear power plants (NPP) plus Kruemmel NPP
- Remaining 9 NPP closing by end 2022

Belgium: confirmation of the nuclear phase-out decision made in 2003, “under conditions”

- Waiting for a new government, political parties have confirmed the 2003 phase-out decision.
- The 3 older NPP should be closed until 2015, the 4 others until 2025, *if substitution solutions are considered as* “effective”

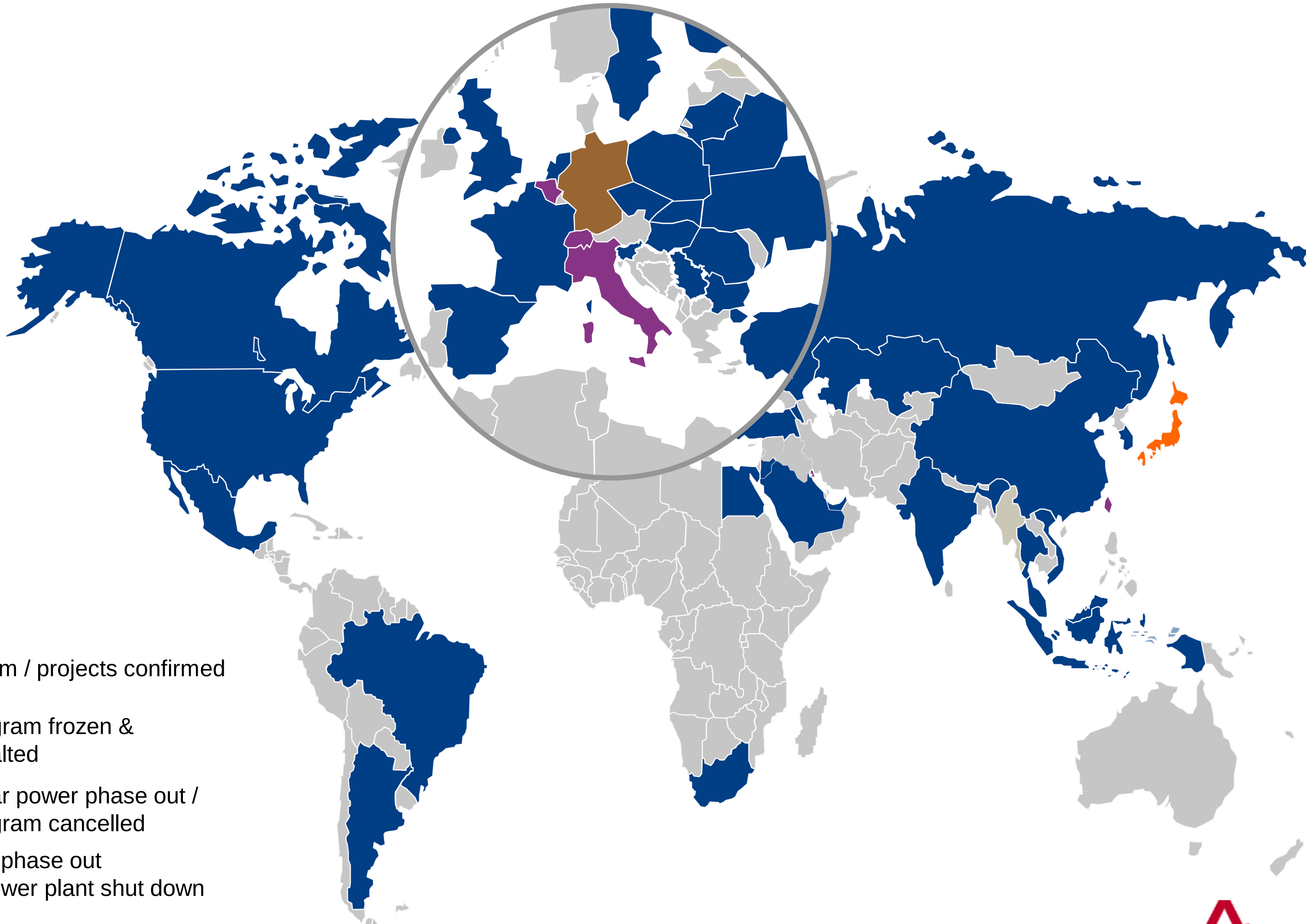
Switzerland : gradual phase-out by 2034

- Federal government opted for a a gradual phase-out, but will remain informed on the technical developments of nuclear.

Italy: new build plans abandoned, no modification of the existing situation

- No NPP in operation in Italy today

… but most countries have not rushed decisions



Nuclear program / projects confirmed

New Build program frozen & construction halted

Gradual nuclear power phase out / New Build program cancelled

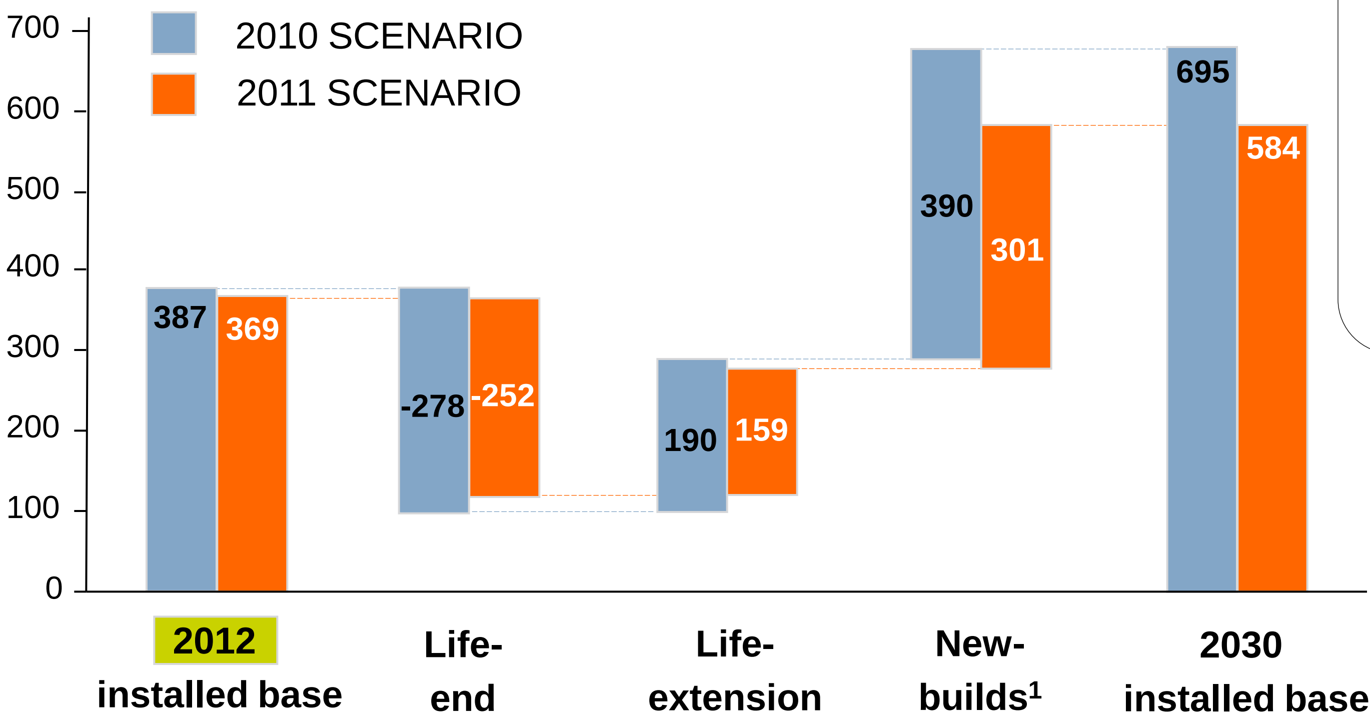
Nuclear power phase out with nuclear power plant shut down

Global new Build

- **440 reactors in 30 countries, providing some 14% of world's electricity**
- **60 NPPs being constructed today, in 14 countries**
- **Of those, majority in China, then India, Russia…**
- **Consolidation of designs of vendors.**
- **Note:**
  - **In the 1980s, 218 power reactors started up, an average of one every 17 days.**
  - **So a realistic estimate of what is possible (but not planned at this stage) might be the equivalent of one 1000 MWe unit worldwide every 5 days in 2015.**

Our long term Nuclear Scenario has been revised

AREVA 2011 scenarios of 2012-2030 evolution of the global nuclear installed base (Net output in GWe)



Post-Fukushima scenarios by international institutions

790: WNA 2011 High
746: IAEA 2011 High
720: WEO 2011 450 ppm -5% [2]
613: WNA 2011 Reference
561: WEO 2011 New Policies -5% [2]
512: WEO 2011 Current Policies -5% [2]
501: IAEA 2011 Low
307: WNA 2011 Low

Nuclear fleet growth

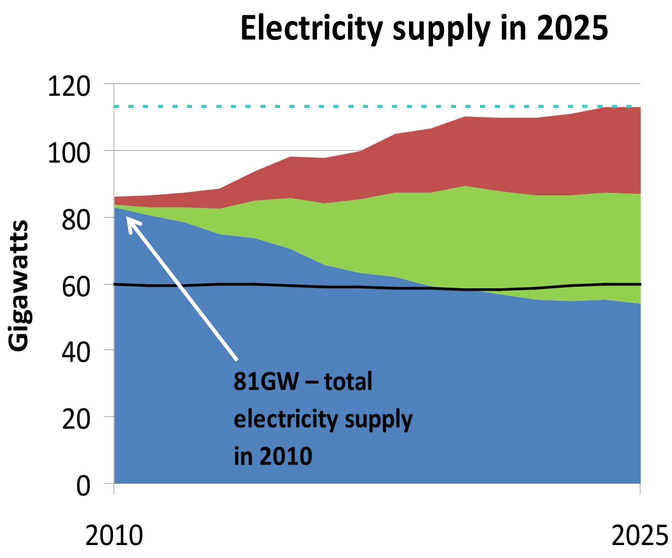
2010-2030: 2,1% CAGR

1990-2010: 0,7% CAGR

1. New orders are considered until 2023 and are commissioned by 2030 (assumption of 7 years between project launch and reactor commissioning)
2. WEO scenarios based on gross output corrected by minus 5% to get net output

The UK Need for Nuclear

- **UK needs 30-35GW of new electricity power generation over next 2 decades.**
- **UK Government drivers are :**
  - **"Secure, clean, affordable energy…**
  - **"Reducing carbon emissions by 60% by 2050..**



AREVA

UK is Europe's prime Nuclear Market

1. **Political.**
   - The strongest, the most aligned in Europe
   - Cross party political will to re-build the UK nuclear sector, a key component of UK re-industrialisation
2. **Public acceptance.**
   - Little affected by Fukushima, stronger in places, more polarised
3. **Both new build & back end.**
4. **New Build Investor Interest.**
   - Original 11 potential investors now 7 in 3 JVs
   - No other country has such interest.

> **"The programme will start with UK importing and finish with UK exporting"**

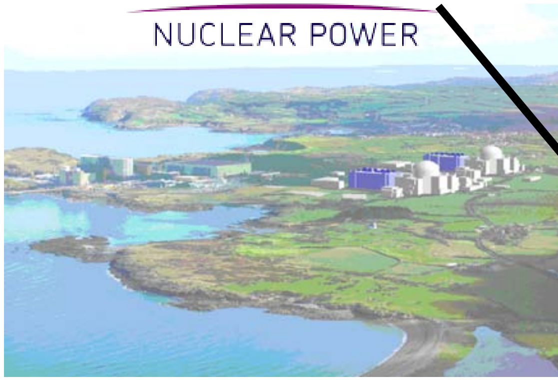
AREVA

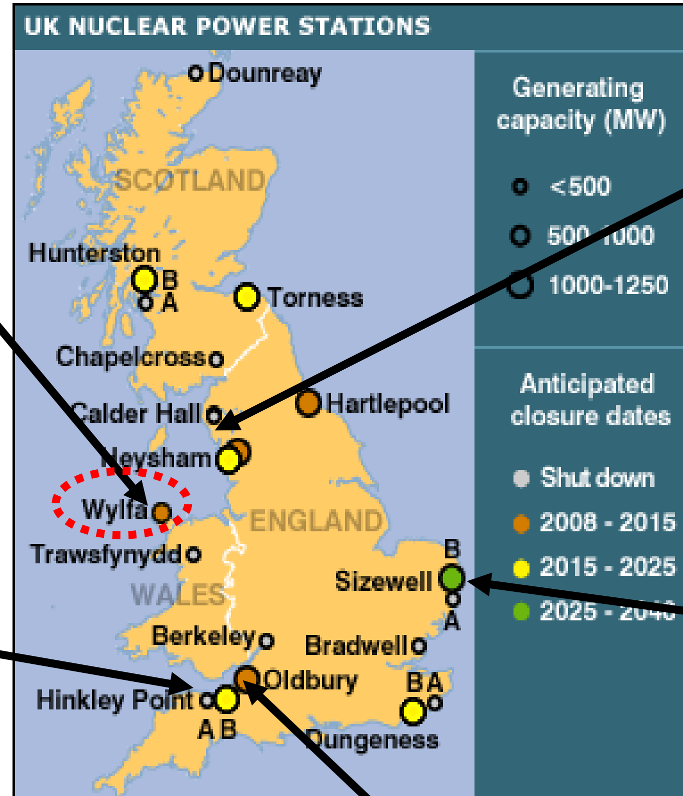
Investors : 6 investors in 3 JVs

1. **NNB GenCo :**
   - EDF Energy and Centrica,
   - Sites : Hinkley Point and Sizewell
   - 4 EPRs
   - Hinkley Point will be the 1st new build project
2. **Horizon Nuclear Power :**
   - E.ON UK and RWE npower
   - Sites: Wylfa and Oldbury
   - 4 EPRs or 5-6 AP1000 (“to deliver 6GWs plus of new nuclear by 2025..”)
   - Wylfa will be the 2nd new build project
3. **NuGen :**
   - GDF Suez and Iberdrola
   - Site: Moor Side

3 JVs and Chosen Sites

HORIZON NUCLEAR POWER





NU'GEN

EDF

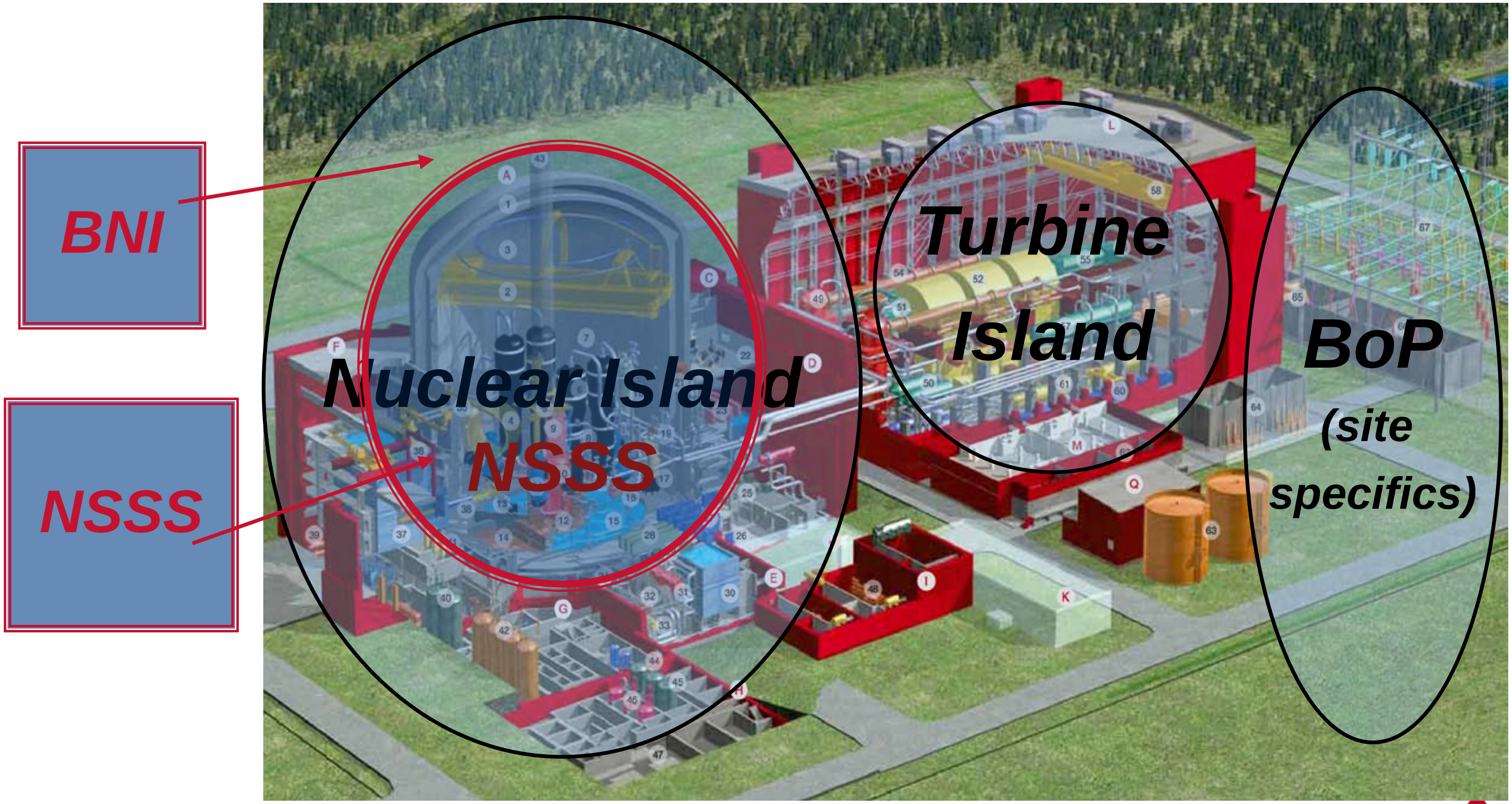
EDF

HORIZON NUCLEAR POWER

AREVA

The Plant

The main components of a plant contract are:
Nuclear Island (NI) + Turbine Island (TI) + Balance of Plant (BoP)



FLAMANVILLE 3

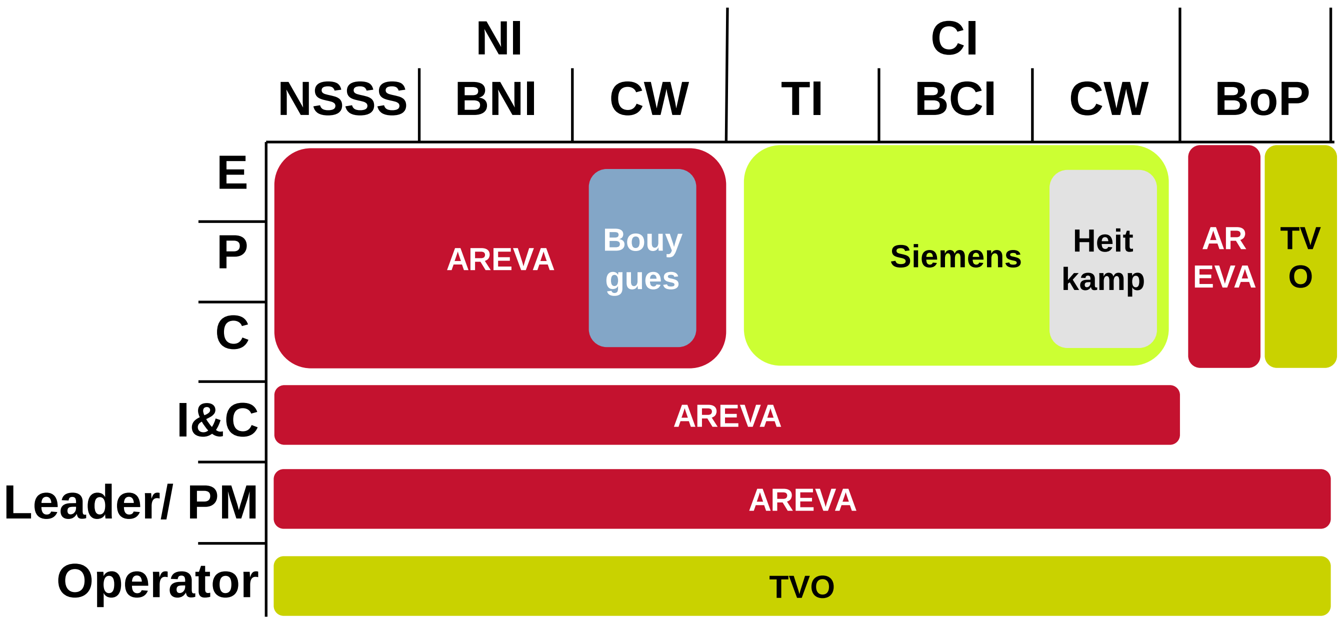
AREVA provides the NSSS (EPC) and the I&C

	NI			CI			
	NSSS	BNI	CW	TI	BCI	CW	BoP
E / P / C	AREVA	EDF	Bouygues	Alstom	EDF	Bouygues	EDF
I&C	AREVA						
Leader / PM / Operator	EDF						

Industrial Structure - OL3

OLKILUOTO 3

AREVA is the leader of the consortium and responsible for the NI (EPC) with Bouygues as subcontractor for the Civil Works



Possible Hinkley Point Industrial Scheme (personal, not an NNB view)

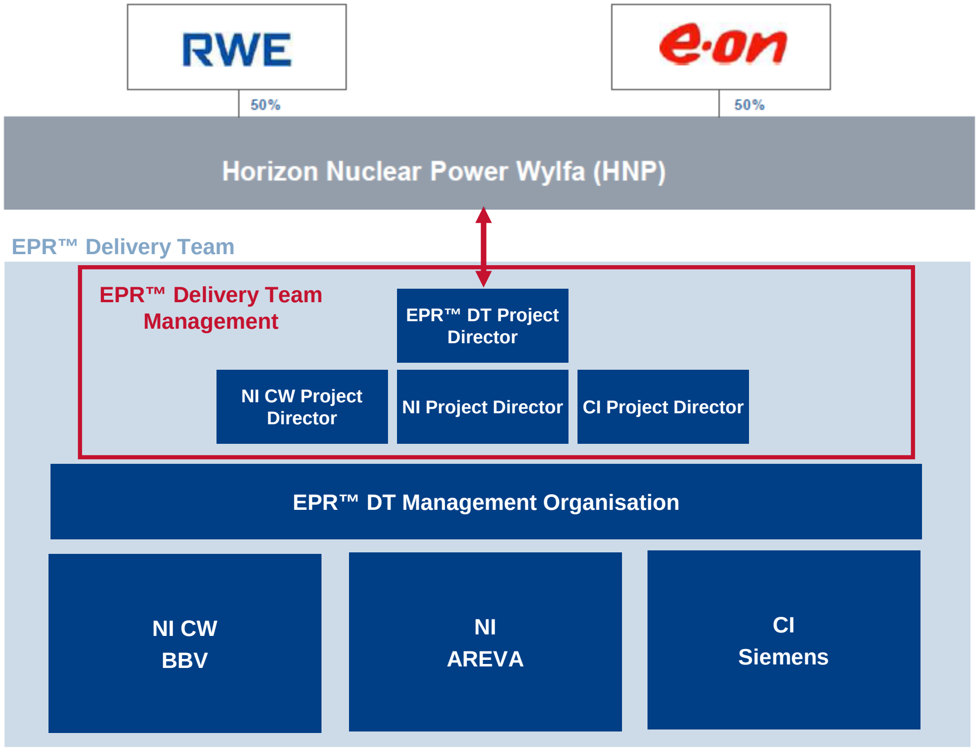
	Nuclear island (NI)			Conventional island (CI)			
	NSSS	BNI	CW	TI	BCI	CW	BoP
E	AREVA	Sofinel	?	Sie or Alst	EDF	?	EDF
P		?			?		?
C							
I&C	AREVA / ++						
Project management	EDF						

AREVA provides the NSSS (EPC) and the I&C

Scope AREVA

Probable Wylfa Industrial Scheme

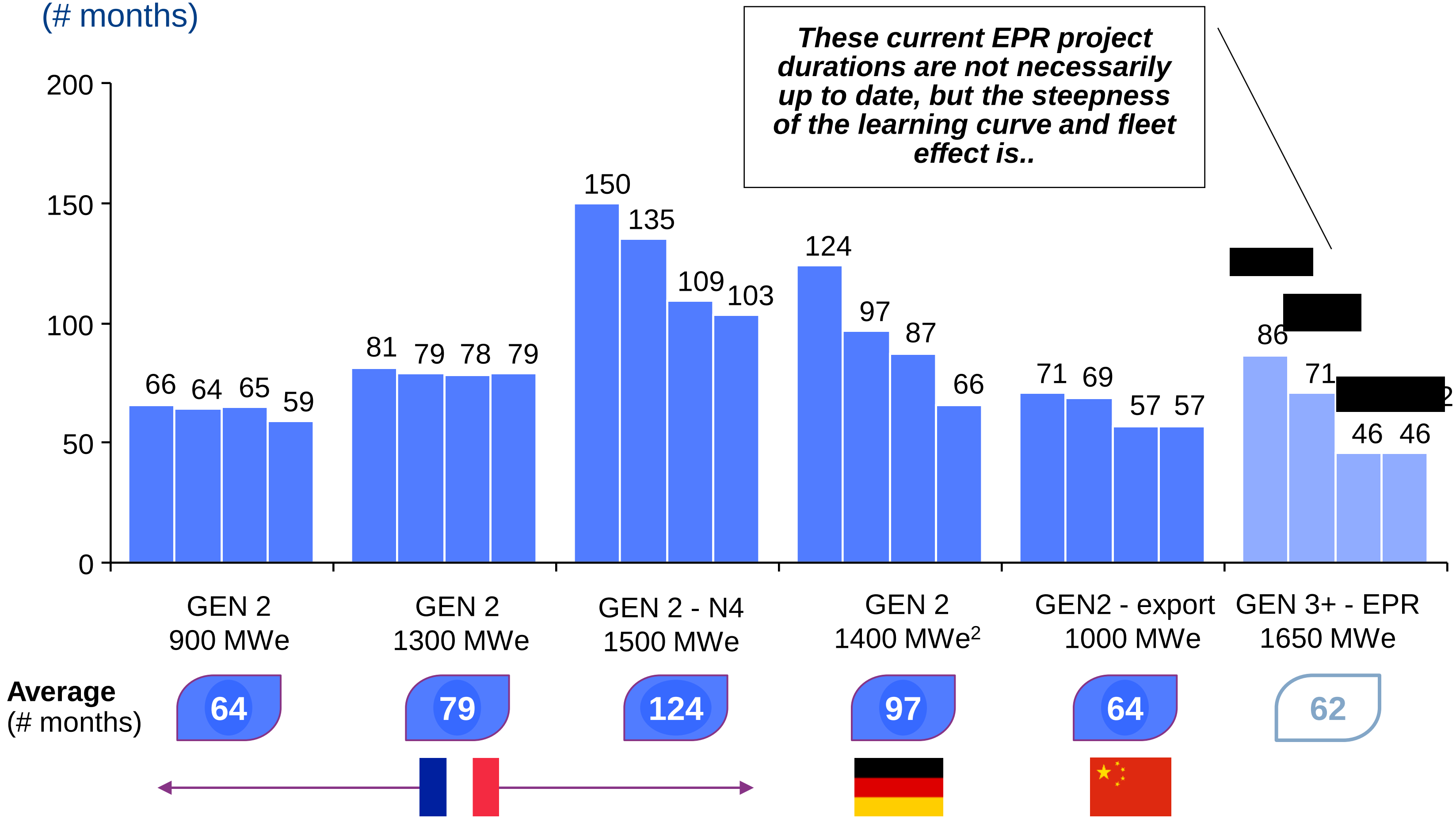
- AREVA leads the EPR Delivery Team, responsible for the EPC delivery of 2 EPRs.
- AREVA is the lead partner, with Siemens and BBV.
- Within the EPR DT, AREVA is responsible for the NI, BBV for the NI CW and Siemens is responsible for the CI. The BoP is divided between AREVA and Siemens.



Significant benefits from Return on Experience already observed on projects under construction

Construction duration: first concrete pour and start-up of nuclear operations[1]

(# months)



Source: IAEA; AREVA; EDF; CGNPC

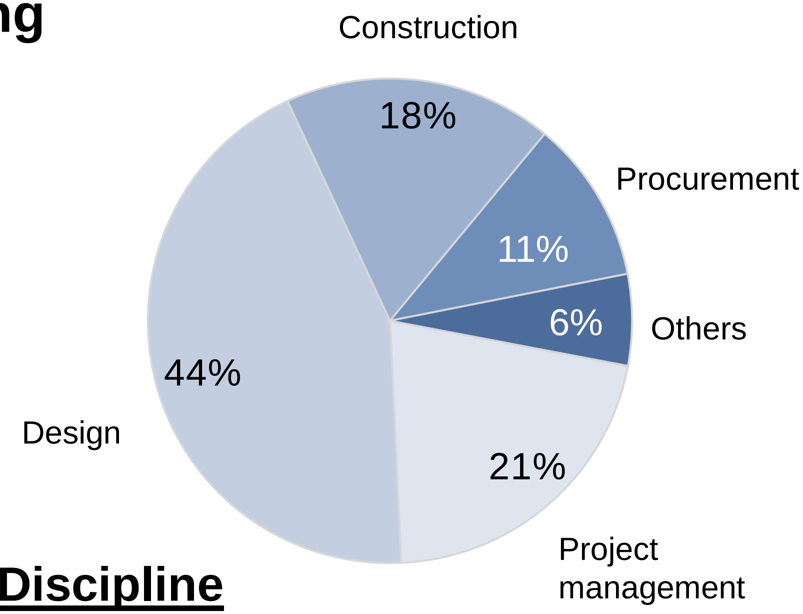
1. Dates for start-up of nuclear operations are identical to start of fuel loading dates for first four units per technological steps

2. First 3 plants are pre-KONVOI designs (Brokdorf, Grohnde, Philippsburg 2) and fourth plant refers to the average of the 3 KONVOI units started simultaneously

AREVA

Experience from 5 EPR Projects

- **More than 1,000 Experience feedbacks in the data base coming from 4 current projects (5 EPRs) plus our work on currently operating plants**

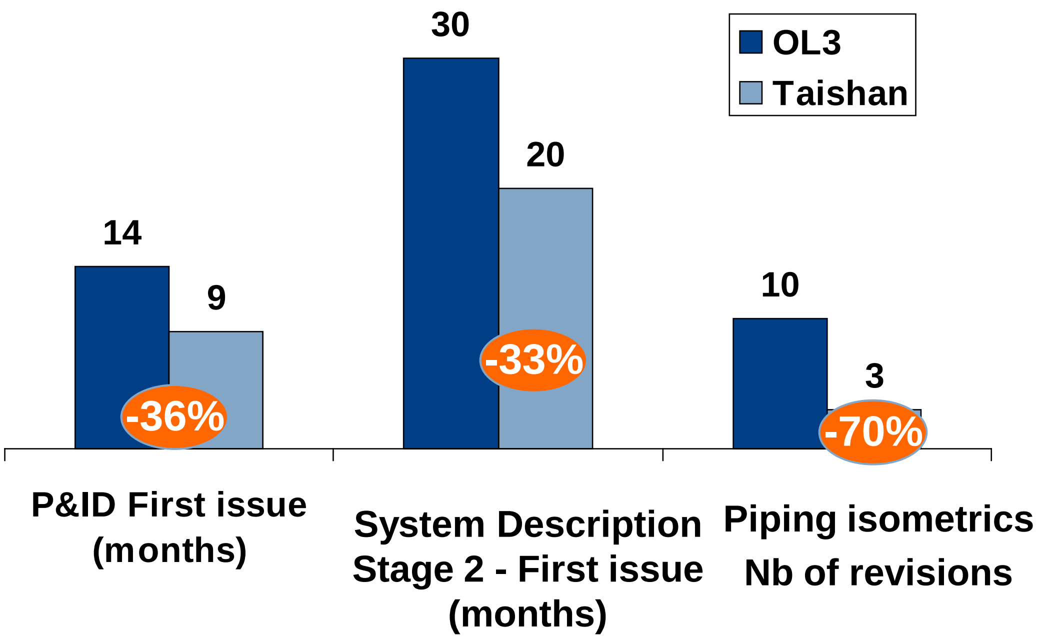


Experience by Discipline

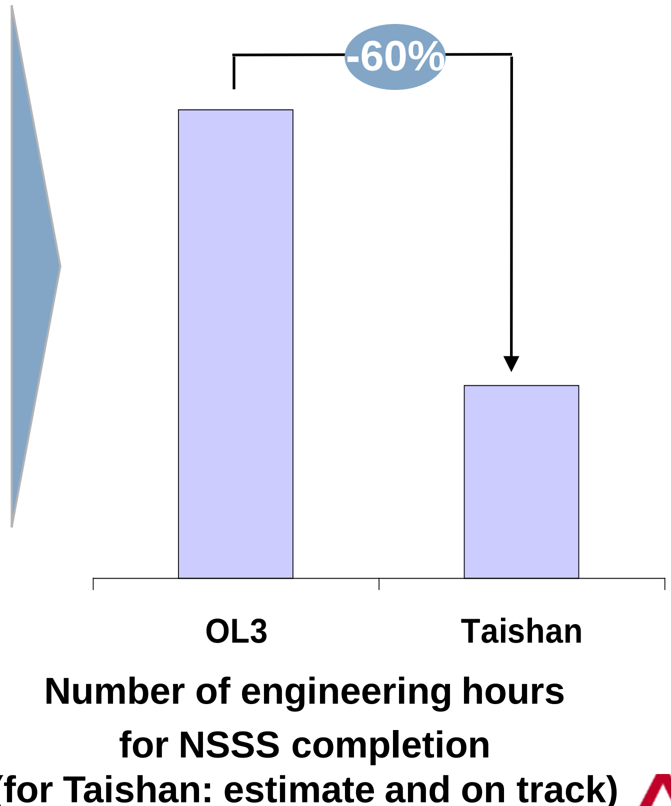
Example of Engineering Experiences Gained
Standardization of early engineering activities

System activities:
Input data for other disciplines ready earlier and better defined

- **P&ID : Important input for layout in order to validate Civil Works (CW) interfaces**
- **DSE stage 2 : important input for I&C**



NSSS engineering standardized



AREVA

Example of Construction Experiences Gained.

This shows how improvements to Construction have significantly reduced Construction time, as reflected in the HNP offer.

1 - 6 m

Base Slab

Solving the OL3 concrete problem

Poured in one batch

2 - 6,5 m

Containment Base

Optimising the concreting plan & design

3 - 6,5 m

Containment Wall

Solving the OL3 specific welding problem. Solving the liner construction problem

4 - 4,5 m

Dome lifting- RPV installation

Solving the OL3 polar crane problem

5 - 19,5 m

Primary eqpt installation to Fuel loading

On time delivery of equipment

Validated I&C architecture

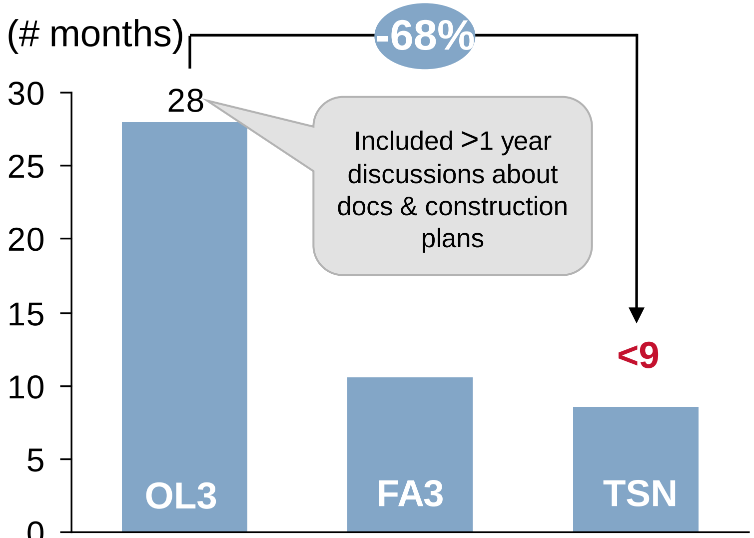
<u>Improvements planned into Taishan</u>

Each of the above Construction improvements have been incorporated into AREVA UK bid..

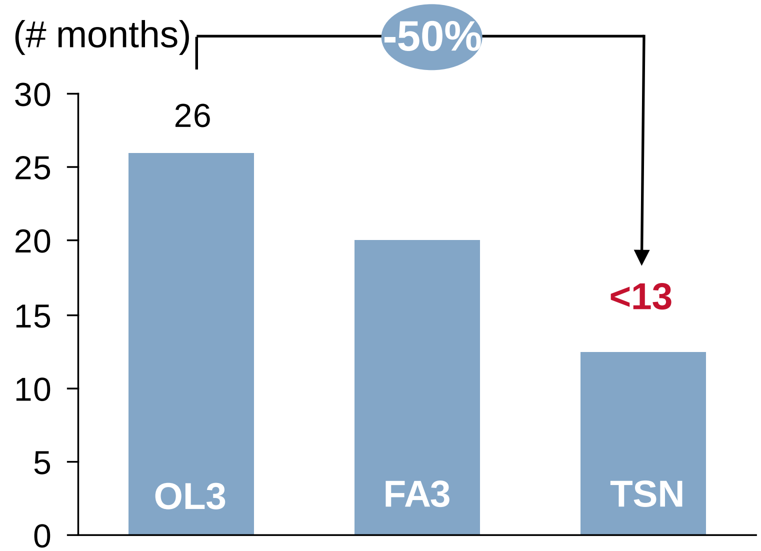
AREVA

Example of Procurement Experiences gained

Delivery time core catcher protection layer[1]



Delivery time core catcher cooling structure[1]



1- Delivery time: from contract to delivery

Touchstones to Success..

1. Design – must meet UK Regulatory Codes and Standards,
2. Programme - meets national standards inc national Regulatory controls (properly resourced),
3. Global Supply Chain - competitive, ready and meets the high quality standards required of the host country,
4. National construction supply chain with good, reliable productivity
5. Skills in country to meet : Regulation, in-country testing etc, Construction, Operations.
6. Project Management Team, with actual experience, that reflects this is a large complicated, heavily regulated construction project, then it is a nuclear project.

Do not re-design, do not add bells and whistles,

Maximise the fleet effect.

AREVA

Discuss..