



DESIGN ASSESSMENT

AND SITE LICENSING OF THE EPR

FOR THE HINKLEY POINT C PROJECT

10/2016

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HINKLEY POINT C (HPC)



Final contracts signed for Hinkley Point C

- EDF signs with UK Government and Chinese partner CGN in London.
- Signings mark revival of new nuclear in UK and Europe.
- Construction phase for Hinkley Point C now fully launched.

Final contracts for the Hinkley Point C nuclear power station in Somerset have been signed today in London. The ceremony took place between the Secretary of State for Business, Energy and Industrial Strategy Greg Clark, EDF Chairman and CEO Jean Bernard-Levy and CGN Chairman He Yu. French Foreign Minister Jean-Marc Ayrault and the Administrator of the Chinese National Energy Administration Nur Bekri attended the ceremony.

The signing marks the end of the project's development phase following years of rigorous preparation and planning. It formally relaunches new nuclear construction in the UK and Europe and will provide a significant boost to the industry in Britain and France. The plant's two EPR reactors will provide reliable, low carbon electricity to meet the UK's future electricity needs. Their construction is a major step forward in the fight against climate

change. It is an essential part of EDF Group's strategy to be a leading long term investor and developer of low carbon electricity. It strengthens EDF's presence in the UK where it successfully operates 15 nuclear reactors, serving a wide range of customers and invests in a wide range of generation technologies.

Hinkley Point C will be competitive with all other future energy choices and it has been shown to offer consumers value for money. It will also have a long-lasting impact on industry, jobs and skills, creating thousands of high quality jobs and apprenticeships in Somerset and across the UK and France. Work to enable the British supply chain to compete for contracts for Hinkley Point C means that EDF now expects 64% of the project's value to be spent in the UK.

The signings also mark a new chapter in the longstanding partnership between EDF and CGN. Their joint experience in successfully constructing two EPRs at Taishan in China will bring direct benefits to the Hinkley Point C project. Agreements signed today will enable the development of nuclear power stations at Sizewell B in Suffolk and Bradwell B in Essex.

EDF and its partners are now fully dedicated to the successful construction of the Hinkley Point C project which is already well advanced. The EPR reactor design is approved by the UK regulator. Experience from other EPR projects has been fully integrated into Hinkley Point's planning and design. Early involvement with suppliers and preparatory work in engineering has taken place. Comprehensive agreements with trade unions are in place covering safety, quality and productivity.

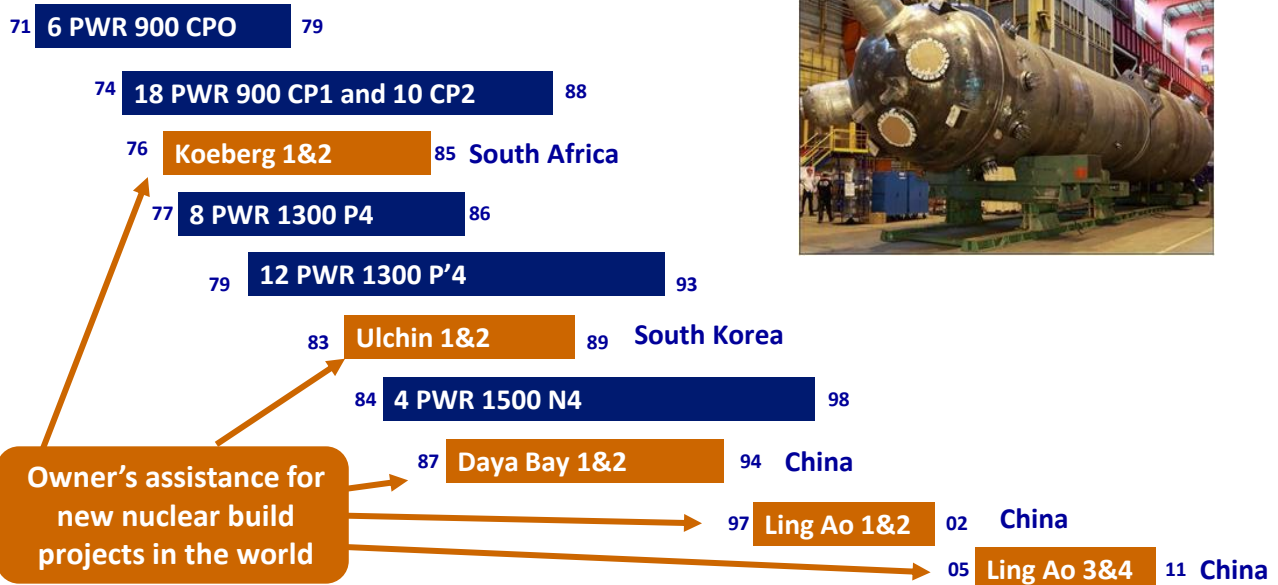


HPC Financial Investment Decision

- Shareholder agreements signed between all parties last week
 - EDF SA Board resolution to proceed with HPC passed in July 2016
 - UK Government agreed to proceed with HPC in September following examination of all aspects of the project
 - Procurement
 - Contracts in place to allow progression of construction
 - 90% of contract value now preferred bidder status
- Leads the way to:
- Develop 2 more EPR units in Sizewell C



A Long Journey which started in the 1970's



PWR: Pressurised Water Reactor
 CPO, CP1, CP2, P4, P'4, N4, EPR = technological series for French reactors
 EPR: European Pressurized water Reactor

- France
- EDF Architect Engineer
- Abroad
- EPR under construction
- UK: EPR Project

Hinkley Point C 1&2

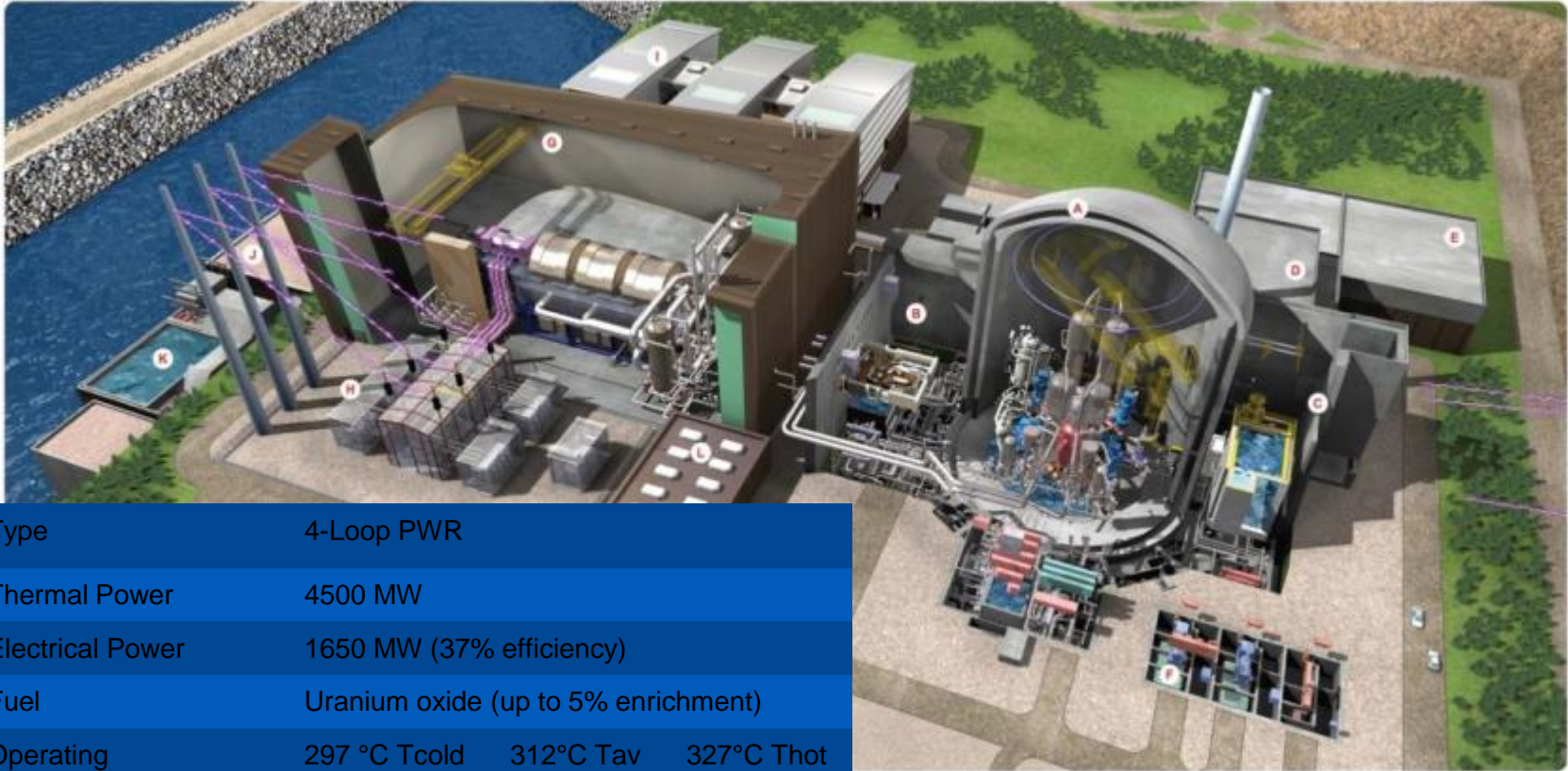
Sizewell



Worldwide Licensing Experience



The UK EPR™



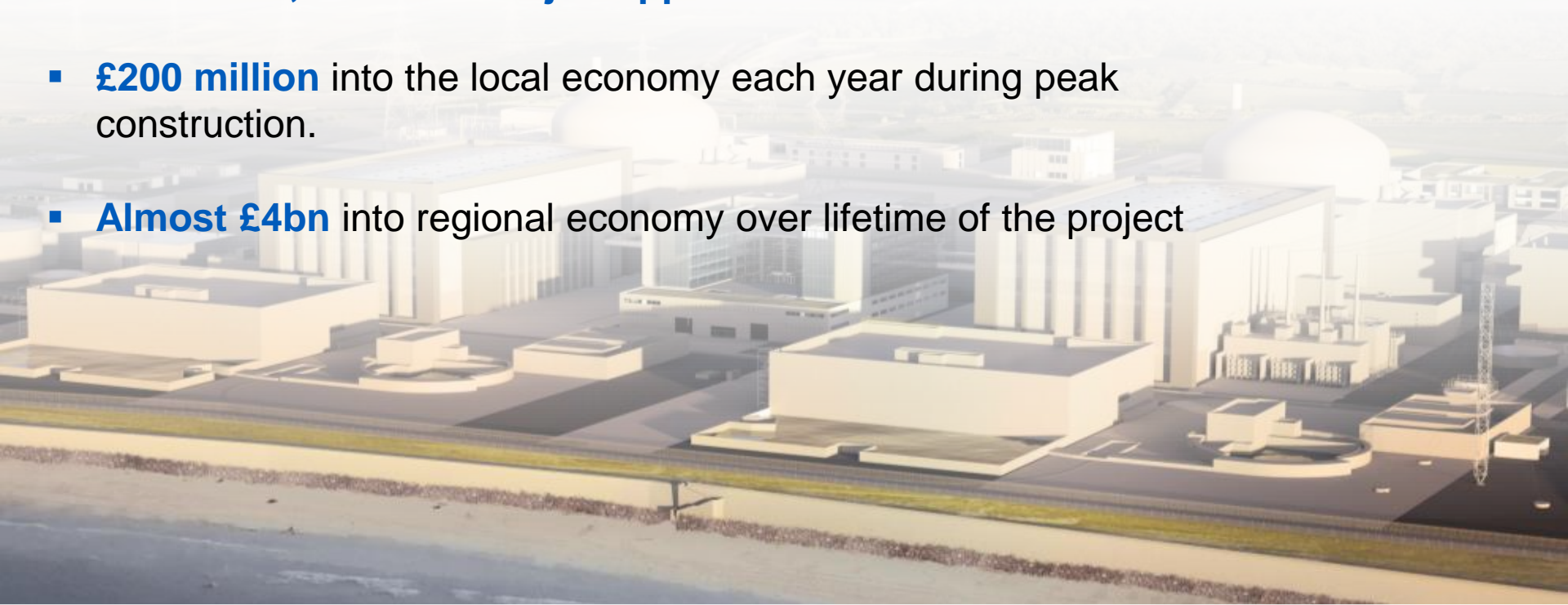
Type	4-Loop PWR
Thermal Power	4500 MW
Electrical Power	1650 MW (37% efficiency)
Fuel	Uranium oxide (up to 5% enrichment)
Operating Temperature	297 °C Tcold 312°C Tav 327°C Thot
Operating Pressure	155 bar (primary) 78 bar (SG)
Coolant Pumps	4x 10kV, 8.7MW, 28500m ³ /hr
Availability	91% - 14 day refuelling outage
Service Life	60 years (+ extensions)

- ✓ Evolutionary design
- ✓ Improved efficiency and safety
- ✓ Single turbine
- ✓ 900 operational staff
- ✓ Experience gained from Flamanville and Taishan projects.



Hinkley Point C – 2 EPR 1,650 MW units

- EPR design capable of generating **7% of the UK's electricity**
Will supply 5 million homes
- Avoids the emission of **9 million tonnes** of CO₂ a year.
- At least **25,000 different job opportunities**
- **£200 million** into the local economy each year during peak construction.
- **Almost £4bn** into regional economy over lifetime of the project



HPC Project Values & Disciplines

The basis for construction excellence

Our CORE DISCIPLINES

for a successful project

Our Nuclear New Build

Values

> HUMILITY

Recognising there is always opportunity to learn from others and improve

> RESPECT

Valuing people, safety, the environment, and the rules under which we operate

> SOLIDARITY

Being one team, working closely together and helping each other

> POSITIVITY

Being an 'energizer' and focussing on solutions when faced with challenges

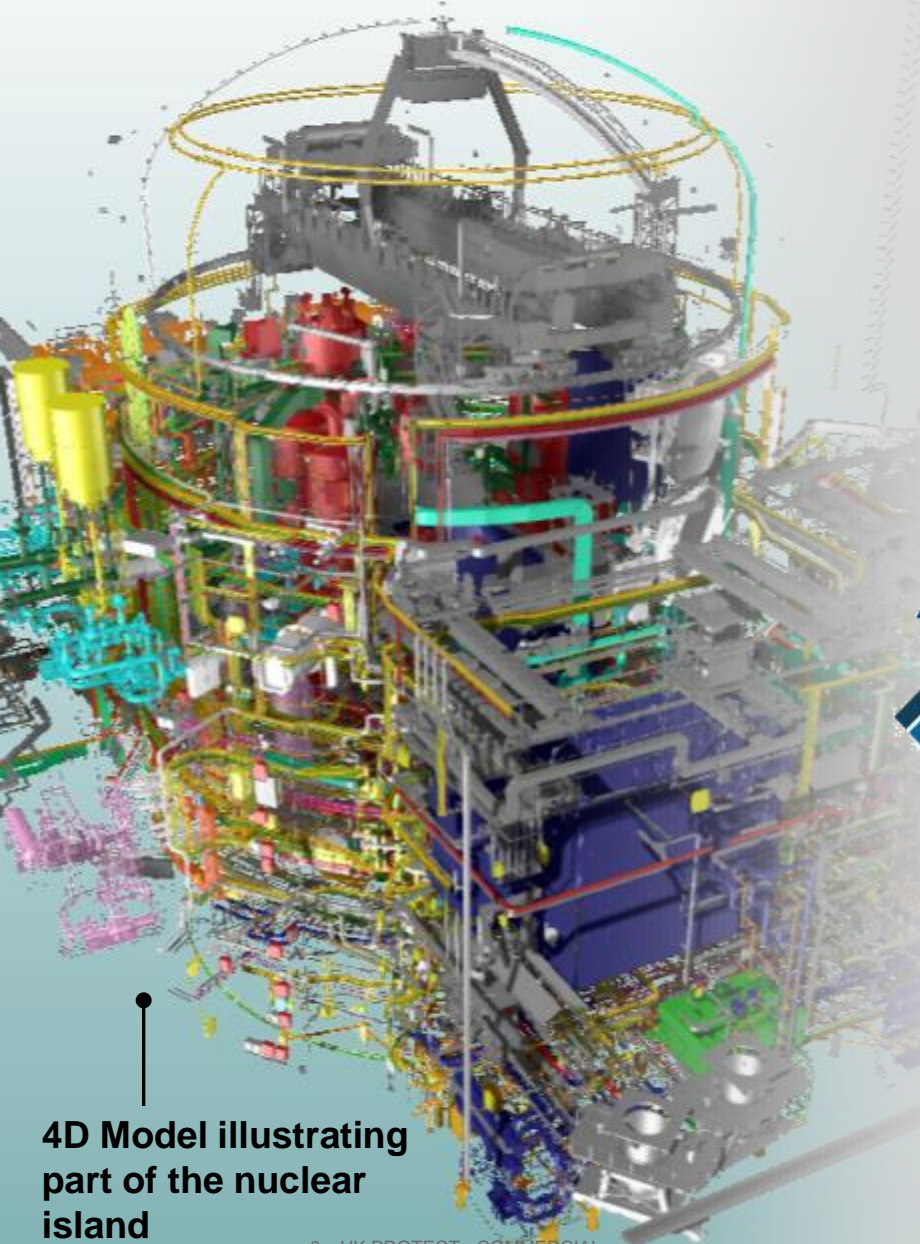
> CLARITY

Knowing how far we've come, how far we've got to go and how we're going to get there

- 1 Put nuclear safety first alongside industrial safety and respect for the environment.
- 2 Be part of one team, with one purpose and one incentive.
- 3 Start only when you are sure you won't have to stop.
- 4 Learn as much as possible from the experience of others.
- 5 Manage the risks created by interfaces.
- 6 Create realistic cost, risk and time estimates.
- 7 Build as designed and document as built.
- 8 Embrace strong project control: it is the basic discipline of a project.
- 9 Every problem on site was caused much earlier and was avoidable.
- 10 The client takes the risk on and off site and hence must be in control.

The real engine of a great project is a team of skilled, qualified and experienced people, motivated to work together with trust and to the highest standards, not for themselves, but for the success of the project.

Scale of the Construction Site



4D Model illustrating part of the nuclear island



3 Million
Tonnes of Concrete

5.6 MILLION
M³ of earth to be moved

4000 km
electrical cabling

UK businesses set to secure **64%** of the total construction spend

Readiness On-Site



Batching Plant 1 - Complete



NI Civils Mock Up - Complete



Earthworks - Mobilised

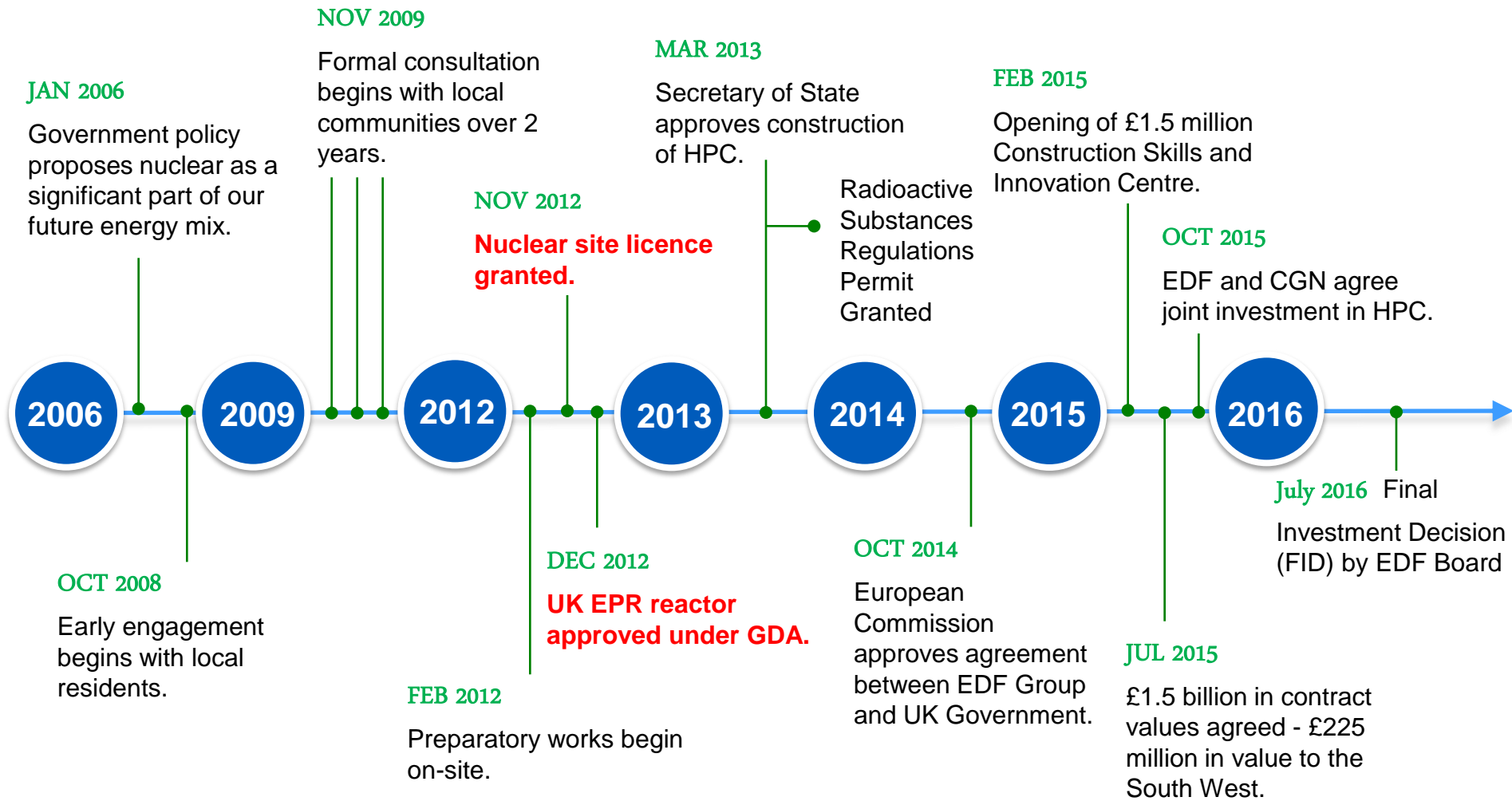


Holford Culvert - Complete



Our Journey So Far....

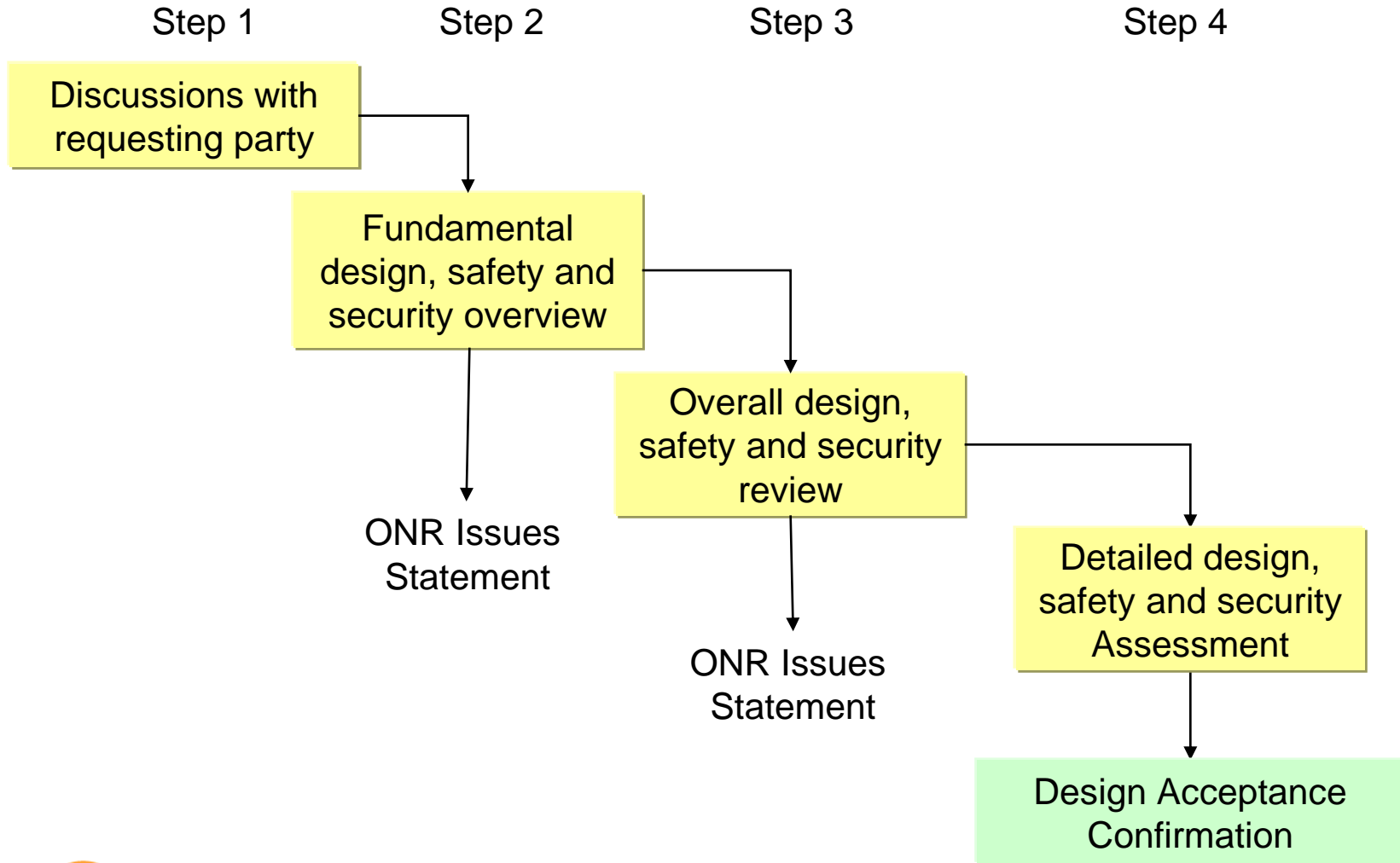
Hinkley Point C will be the first nuclear power station to be built in the UK in a generation



GENERIC DESIGN ASSESSMENT



GDA Process - Office for Nuclear Regulation (ONR)



The GDA Process

- **Step 1** - initial discussions between the Requesting Parties (RP) and the Regulators where they agreed the requirements and how the process was applied
- **Step 2** - was an overview of the fundamental acceptability of the proposed reactor design concept that identified design aspects or safety shortfalls that could prevent construction in the UK
 - i.e. a review of the “**claims**”



The GDA Process

- **Step 3** - was a safety and security review of the proposed reactor design. This included an examination of the design at system level and analysing supporting arguments made by the design companies
 - i.e. a review of the “**arguments**” to support the claims in Step 2
- **Step 4** - was a thorough and detailed examination of the **evidence**, on a sampling basis, guided by the safety analysis and including inspection of security plans
 - The Areas "sampled" were identified by the Regulators during Step 3 based on their perception of the topics that were most important to examine.



GDA

- The key documents of the UK EPR™ GDA Submission are:
 - A Safety, Security and Environment Report (SSER)
 - A Design Reference Configuration
 - A Submission Master List
- Public Involvement
 - Quarterly reports, with performance metrics published by ONR
 - Public comments via dedicated Regulator & RP websites
- Benefits from viewpoint of Requesting Party
 - Requested design changes identified before construction starts
 - Transparent process helps give public confidence in design
 - Informs RP of UK Regulatory framework and practices



GDA – Facts and Figures

- The totality of GDA
 - 56,000 man-days of effort over 5.5 years to deliver
 - £32m of regulator assessment
 - The overall submission consists of more than 4000 documents
 - 2200 PCSR references
 - 440 PCER references
 - 1100 supporting references
 - Posing and responding to 1765 technical queries
 - More than 600 technical meetings across 17 technical areas



GDA Design Changes

- Throughout GDA, modifications were proposed to resolve issues identified during analysis and assessment
- The GDA Design Reference (DR) has been updated throughout the 4 step process and more latterly during the resolution of the GDA Issues
- The DR also recognises significant design changes introduced at FA3 that EDF/AREVA want to appear in the UKEPR design reference.



GDA

- At the end of Step 4 (2011), the Regulators provided their assessment reports plus **GDA Issues** and **GDA Assessment Findings**
- **GDA Issues** were concerns not satisfactorily addressed in Step 4 of GDA which required resolution before a full **Design Acceptance Certificate** was issued.
 - GDA Issues were the responsibility of the RP (EDF/AREVA)
- **GDA Assessment Findings**
 - GDA AF are the responsibility of the future licensees
 - The GDA provided a total of 713 AFs, which are linked to specific HPC Project Milestones



GDA Conclusions

- GDA involved a “thorough, wide ranging, exhaustive and challenging” assessment against the ONR Safety Assessment Principles
- GDA is a robust process which has shown the UK EPR is safe, secure and environmentally acceptable for construction in the UK
- GDA achieved its intention to improve safety and reduce regulatory risk
- Significant UK context design changes have been identified
- GDA PCSR forms 70% of the initial HPC site specific PCSR
- EPR remains the only reactor design to complete GDA process



NUCLEAR SITE LICENCE



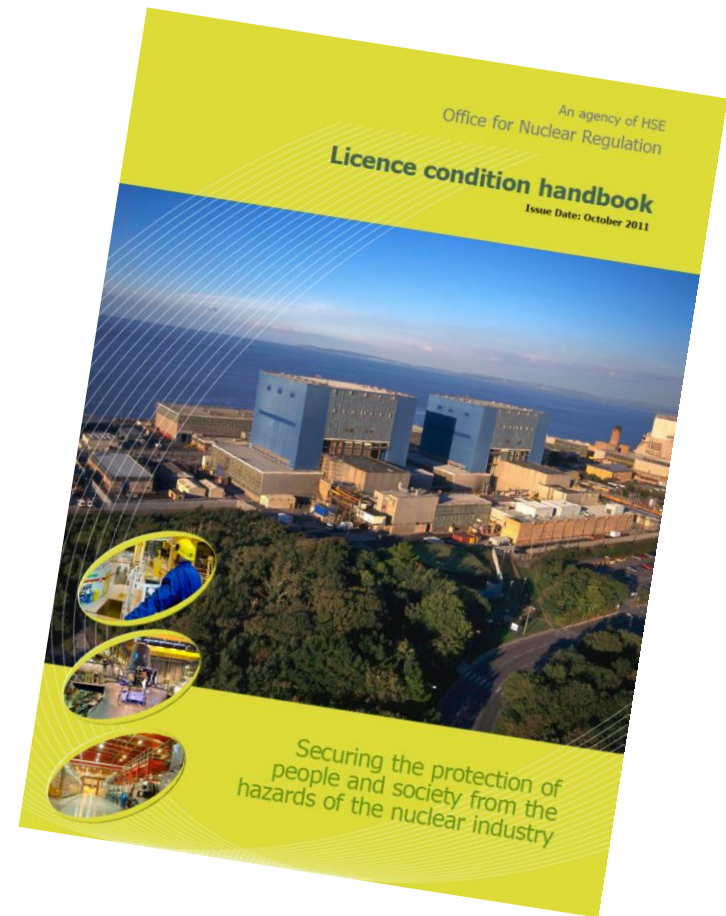
Site Licencing - Background

- Nuclear Installations Act 1965 (NIA 65) provides for regulation of Nuclear Sites
- Nuclear Site Licence (NSL) granted to corporate body for a unique site covering Construction, Operation and Decommissioning
- Office of Nuclear Regulation (ONR) regulates using a “standard” set of 36 Licence Conditions (LCs) that give “powers” to ONR to grant permission (“consent”) to undertake certain activities
- The conditions set out the general safety requirements to deal with the risks on a nuclear site.
- ONR uses its licensing powers by assessing safety cases and inspecting sites for licensing compliance.
- Law requires to reduce risks As Low As Reasonably Practicable (ALARP)
- Goal setting and generally non prescriptive approach
- Owner needs Licence in order for ONR to permission start of First Safety significant construction
- ONR will Grant a NSL after Assessment and Intervention



Key Licence Conditions

- Documents and records
- Incidents on site
- Training
- Emergency arrangements
- Suitable qualified and experienced persons
- Safety documentation
- Periodic review
- Management systems
- Radiological protection
- Construction or installation of new plant
- Commissioning
- Modifications on existing plant
- Control and supervision of operations
- Inspection, maintenance and testing
- Radioactive waste management
- Decommissioning
- Organisational capability



Overall expectations

The Licensee will have to demonstrate that:

- It has the right organisational capability to lead and manage for safety
- The Site is suitable and it has adequate control over it
- It understands the hazards and risks of the activities it proposes to carry out
- It has a suitable schedule of safety submissions leading through to the Pre-Construction Safety Case



ONR's Role during Licensing Process

- Pre NSL application ONR is in advisory role
- From application ONR is moving towards regulatory role
- Intervention is ONR interaction to **'achieve a desired outcome'** – in this case, judging if a company is capable of being a Nuclear Site Licensee
- 4 Strands of intervention:
 - Organisational Capability
 - Licence Condition Compliance
 - Safety Report and substantiation
 - Licensing and Legal Due Process



General approach

- Develop a Safety Management Prospectus
 - Define the organisational structure and governance to achieve safety
- Define and implement core capability, Nuclear Skills 'Baseline' and employment model
- Establish Design Authority, Internal Challenge function and Shadow Nuclear Safety Committee
- Identify and appoint Compliance Owners that will develop NSL Compliance arrangements
- Define and establish governance associated with Licence application



NSL Timeline for HPC

- Project Manager appointed & work started Sept 2009
 - Formal Application July 2011
 - NNB GenCo ready to receive an NSL Nov 2012
 - NSL Granted Nov 2012
 - NSL in Force Dec 2012
-
- First new Licence granted for a generation
-
- Forward work programme in place for maintaining and developing the NSL arrangements supported by a schedule of Compliance Assessment.



NSL Summary

- NSL granted in 2012 and is in-force today
- ONR cost up to granting – £9.2m (09/2009 – 11/2012)
- Benefits of early granting are:
 - Confirmation of the capability of the Board and organisation to be a Licence Holder
 - Increased regulatory confidence in NNB GenCo
 - Confidence in the Integrated Management System
 - Demonstrated capability to develop NSL arrangements
- Compliance with the NSL has been checked and confirmed as high
- Forward programme to maintain and develop NSL arrangements



THANK YOU

