

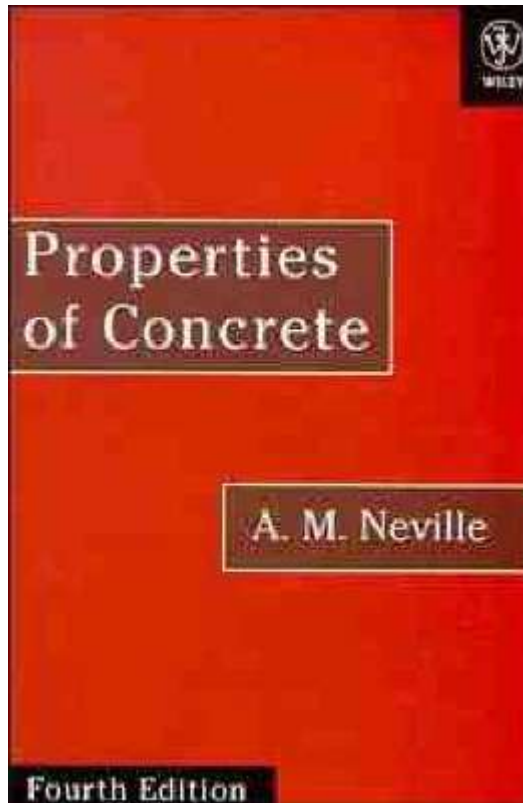
# Supporting the introduction of the EPR into the UK— experience from Hinkley Point and Sizewell

07 wrzesień 2017



# Adam Maciej Lisocki

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# Agenda

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1. Who are Amec Foster Wheeler?
2. Generic Design Assessment in UK
3. Nuclear codes
4. Hinkley C and Sizewell C.
5. Progress at Hinkley C.
6. UK Context and National differences (UK)

# Project Overview

## Overview of Scope



Purpose	Scope Areas			Workstream
Support in identifying and preparing all required licenses and permits (including comment on legislation)	Licensing and Permitting			Licensing & Permitting
Support to placement and administration of PV/EPC and SCC contracts. Support to integration across procurement.	Integrated Proceedings	Contract Administration		Supply Chain and IP
Support in establishing an "Intelligent Customer" and provision of temporary / transitional engineering support	Engineering Support	Site Infrastructure	Testing & Start-up	Technical & Engineering
Support in creating a credible nuclear operator	Capacity Building	Training Oversight		Capacity Building & Operational Readiness
Support to develop a pervasive safety, security, safeguards and environmental culture fit for a credible nuclear operator	Culture of Safety			Culture of Safety
Support in verifying the work of the international supply chain and enforcing nuclear safety and quality standards	Quality Assurance	Management System	Vendor & Supply Chain oversight	Quality Assurance & Quality Control & IMS
Scope, cost and schedule tracking	Program / Project Office			PMO

Key:

Active Scope Area

Not Yet Active Scope Area

# Tim Viney

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## Who?

- ▶ UK Context UKEPR™ EDF CEIDRE TEGG Aix en Provence
- ▶ ETC-C and RCC-CW AFCEN subcommittee member
- ▶ ETC-C UK Users' Group chairman
- ▶ Technical support to PGE EJ1 Sp. Z o.o. (Polska Grupa Energetyczna)
- ▶ Civil Engineering support to UKABWR Generic Design Assessment Hitachi GE
- ▶ Head of Profession for Civil Engineering for Amec Foster Wheeler Clean Energy

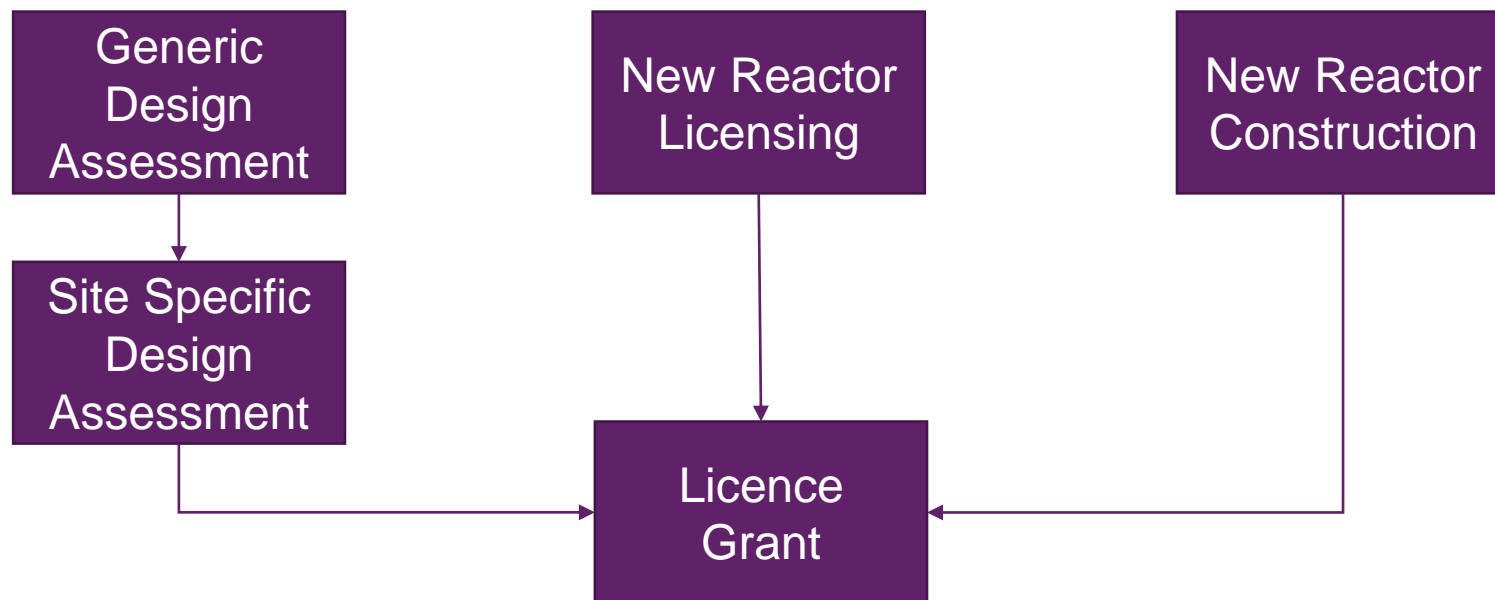
# Overview of the Generic Design Assessment (GDA) process

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- ▶ New designs which have been put forward by the Department for Energy and Climate Change (DECC) to support the UK Government's low carbon energy policy can be assessed by nuclear regulator Office of Nuclear Regulation (ONR) with Environment Agency (EA).
- ▶ GDA is voluntary and not a requirement.
  - ▶ Risk mitigation for Requesting Parties
    - ▶ Identification of regulatory concerns before site specific licensing assessment
- ▶ Requesting Parties (Reactor vendors or developers) for each design pay DECC/ONR to perform GDA on their design.
  - ▶ At the end of Step 4 the Requesting Party would like a Design Acceptance Confirmation (DAC) from ONR and a Statement of Design Acceptability (SoDA) from the Environment Agency.

# Licensing a new reactor design

- ▶ Licensing of a new NPP is split into four activities;
  - ▶ Design Assessment (Generic and Site Specific)
  - ▶ New Reactor Licensing (licensing of Site Licence Holder)
  - ▶ New Reactor Construction
  - ▶ Assessment of overall safety case (granting of licence)



# Sites of existing and proposed nuclear power stations in the UK

Sites of existing and proposed nuclear power stations in the UK



Source: DECC





# UK Regulator view on codes

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## Non prescriptive regulation

- ONR does not approve or specify nuclear codes and standards
- It is for the licensee (or GDA Requesting Party) to choose the standards and justify that they are RGP
  - But ONR provides advice to support uncertainty and guidance on our expectations
- Important RGP comes from the IAEA and the Safety Reference Levels from WENRA
  - There are also many other sources of RGP as outlined later

RGP – Relevant Good Practice. GDA – Generic Design Assessment



# More detail

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## Gaining confidence in codes

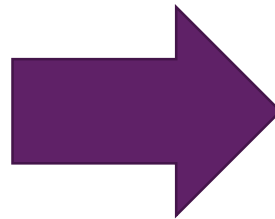
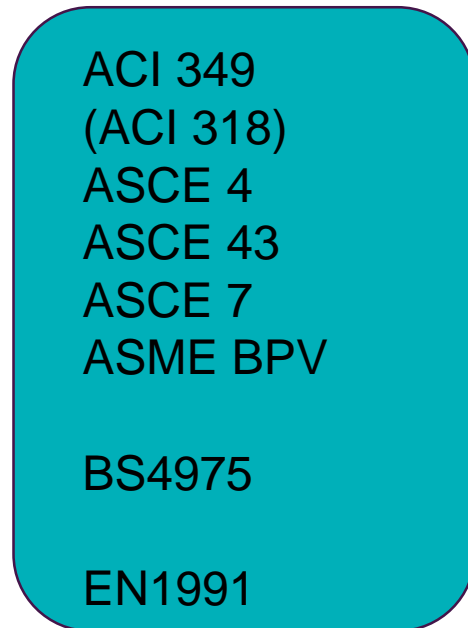
- Is it a code for nuclear applications (safety class 1 or 2)?
- Is it a nationally or internationally approved code?
- Is it an in-house code developed by the designer? If so what independent checks and challenges have been applied?
- Is the code unambiguous so that a consistent design will be obtained by different users?
- Does the code incorporate another country's legal requirements which will not apply in the UK?
- Does the code give similar results to a code we are familiar with?
- Are the results of the code acceptable?



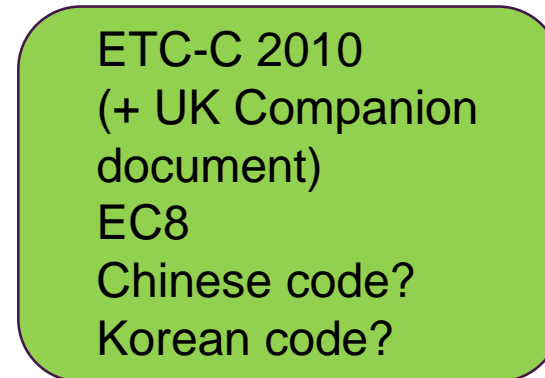
# Civil Engineering Nuclear codes in UK

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Pre - EPR



Now added  
(2017)



# Hinkley C Project

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# Sizewell C Project

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# Underground Gallery concrete at Hinkley

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# Jetty Construction at Hinkley

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# 'UK Context'

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It is based upon Eurocodes, European Standards, **French standards** and other recognised guidance, but specifies additional criteria to be used for the EPR™. This reflects that some Eurocode rules should be amended and/or extended to apply to the specific demands placed on nuclear structures. These additional criteria have been developed within the French nuclear industry over the past decades.

## **Construction standards and practices tend to be based on**

- ▶ National (historic methods)
- ▶ Local materials
- ▶ Local skills
- ▶ Professional opinion



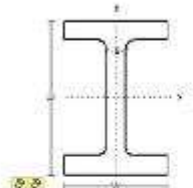
# National differences

## UK

- ▶ Nuclear buildings are usually clad (like OL3)
- ▶ Cast-in or mechanical anchors only
- ▶ GGBS and PFA supplied in separate silos for concrete
- ▶ You can add water to mixes at the point of delivery
- ▶ UK section sizes

British Universal Columns and Beams  
Properties of British Universal Steel Columns and Beams

[Sponsored Links](#)



Properties of some British Columns and Beams according BS 4

Designation	Dimensions					Static Parameters			
	Depth h (mm)	Width b (mm)	Web Thickness s (mm)	Sectional Area (cm <sup>2</sup> )	Weight (kg/m)	Moment of Inertia		Section Modulus	
						I <sub>x</sub> (cm <sup>4</sup> )	I <sub>y</sub> (cm <sup>4</sup> )	W <sub>x</sub> (cm <sup>3</sup> )	W <sub>y</sub> (cm <sup>3</sup> )
UB 137 x 76 x 13	137	76	4	16.5	13	473	55.7	74.5	14.7

- ▶ Rebar – BS4449 – no harmonised European Standard
- ▶ Detailing of reinforcement



# EN 206

**BS EN 206:2013+A1:2016**  
Incorporating corrigendum May 2014



BSI Standards Publication

**Concrete — Specification,  
performance, production and  
conformity**

BS 8500-1:2015+A1:2016



BSI Standards Publication

**Concrete – Complementary  
British Standard to  
BS EN 206**  
Part 1: Method of specifying and  
guidance for the specifier

bsi.

BS 8500-2:2015+A1:2016



BSI Standards Publication

**Concrete – Complementary  
British Standard to  
BS EN 206**  
Part 2: Specification for constituent  
materials and concrete

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British Standard BS 8500-2:2015+A1:2016

# Reinforcement Steel

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## Different approval bodies:

- ▶ AFCAB NF A 35-080-1



- ▶ CARES BS4449



- ▶ Modified by UK Companion document

# UKEPR™ Current detail issues

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## **ETC-C derived for Nuclear Island structures only (Safety Classification 1) – being used on Underground Galleries**

- ▶ Corner detailing – French or UK practice?
- ▶ Undersea intake tunnels – Nuclear Safety Classified structures (the first in the world?) – not in ETC-C
- ▶ Intake structures – subject to wave action – Norwegian code?
- ▶ Turbine Hall – not safety classified – design to EC8 (how?)
- ▶ Current text (ETC-C 2010) does not take into account changes in EN1090 and EN206

## ***AND THE FUTURE....***

- ▶ Generic Design acceptance ends in December 2022

# Dziękuję Państwu!

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