# WS Atkins plc

## Analyst and investor visit to ITER

2 October 2014



Plan Design Enable

# Uwe Krueger

Chief executive officer

ATKINS

# Simon Layzell

Project Director, ITER

# Today’s agenda

- Welcome
- Health and safety
- Atkins and ITER – project overview
- Site visit
- Our Energy business.

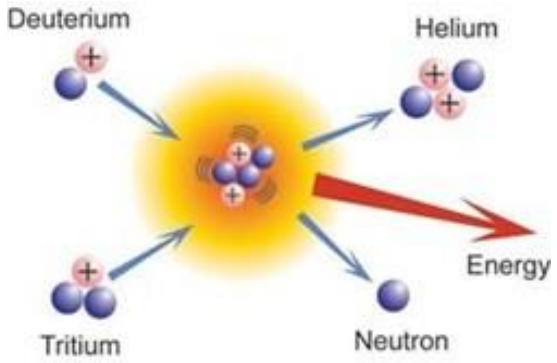
# The ITER programme

- International Thermonuclear Experimental Reactor
- A €15bn research & development programme to demonstrate the scientific and technological viability of controlled fusion for power production
- Involvement of parties representing over half of the world's population – the world's largest R&D project
- The world's largest nuclear fusion machine, in the south of France (Cadarache).

# The science of nuclear fusion

Limitless supply of fuel

- Deuterium is abundant
- Tritium can be bred from Lithium
- An enormous energy yield (250kg/year for 1GW)




- No high activity waste
- No chain reaction – stops if disturbed
- Fusion machines have been around since the 1950's but not on a commercial basis.

**http//www.iter.org : The Science**

# Development timetable

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2025 ITER operations
- Demonstrate fusion as a viable energy source
- Expose most of the physics at reactor conditions
- Test fusion technologies in an integrated system

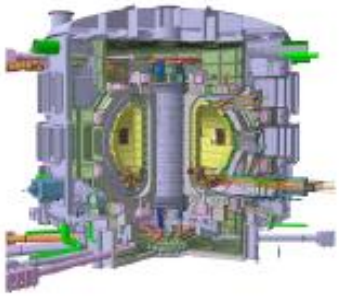
2035 Decision on DEMO

2045 DEMO operations
- Prototype fusion power station

2055 First commercial fusion power station

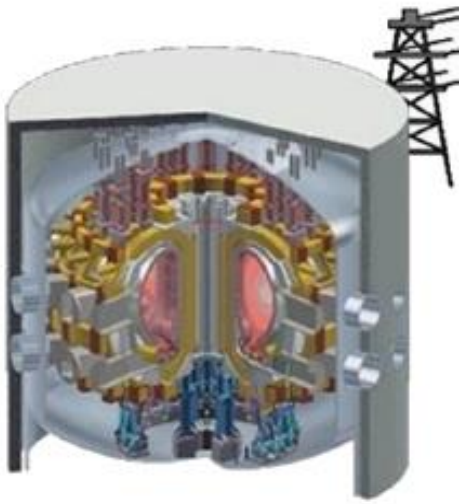
**JET**

*80 $m^3$*
*~16 $MW_{th}$*



**ITER**

*800 $m^3$*
*~ 500 $MW_{th}$*



**DEMO**

*~ 1000 - 3500 $m^3$*
*~ 2000 - 4000 $MW_{th}$*

# The ITER organisation

- Created in 1985 (Gorbachev & Reagan)
- It is an umbrella organisation (designer of fusion process plant, programme manager, future operator and license holder)
- There are 7 domestic agencies (DAs) – funding through ‘in kind’ delivery of engineering, equipment and construction services
- Fusion for Energy (F4E ) represents the EU.


**F4E (Barcelona)**

# Project organisation

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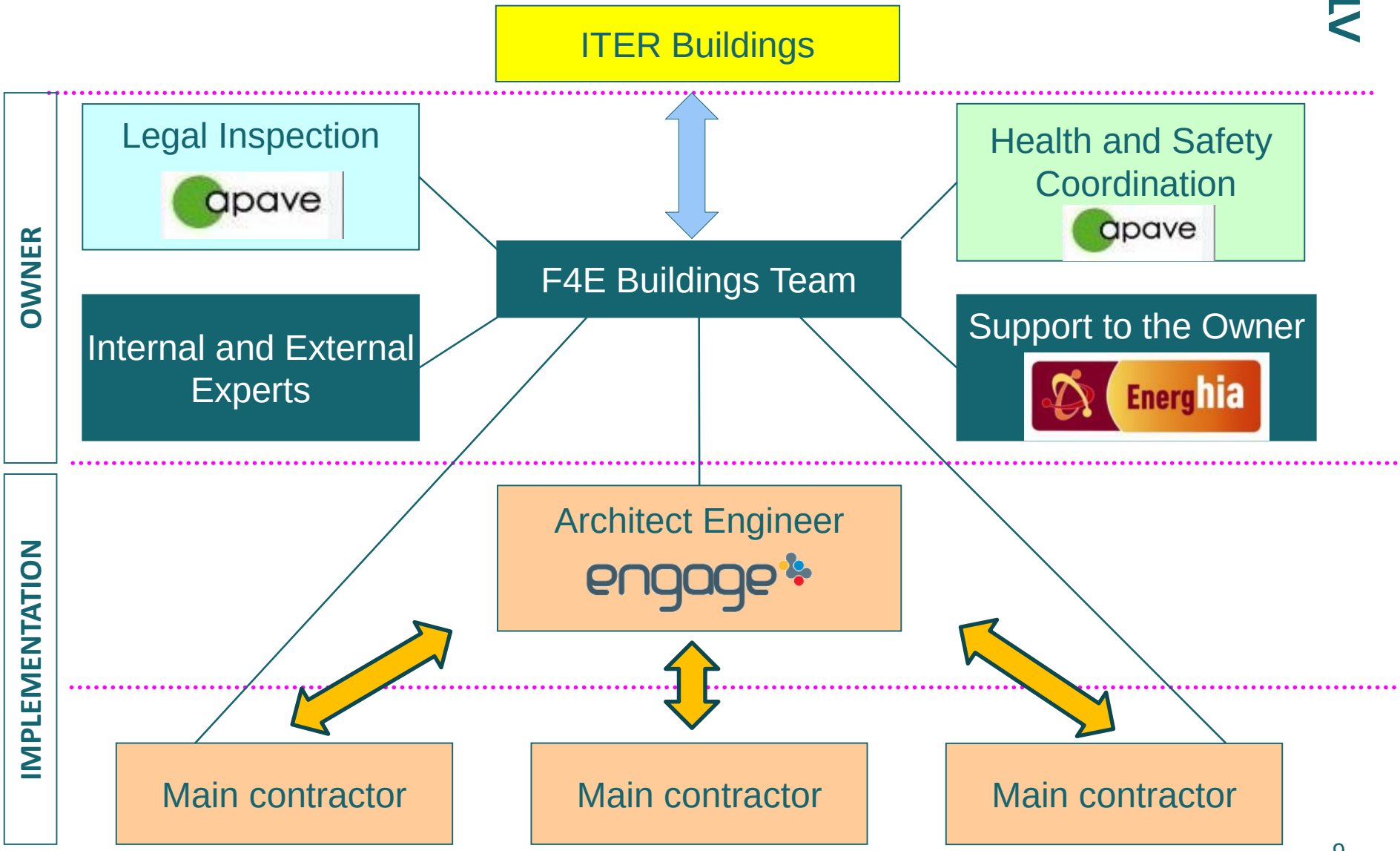

# Engage's customer


## F4E – EU domestic agency

- Responsible for 45% of the €15bn overall project
- Based in Barcelona with limited on site representation
- Provision of all 39 buildings and associated services (10% of project)
- Supported by owner's engineer (Energhia consortium).

# Engage
## A joint venture operation

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An equal partnership, international JV comprising:

- Assystem
- Atkins
- Empresarios Agrupados
- Iosis/Egis


engage

Architect engineer for the buildings, services and site infrastructure.

# Engage

## Designer and construction supervisor

- 39 buildings and structures - €1.5bn of capital spend
- Design stages:
  - Tender design
  - Construction design for nuclear buildings
- Design disciplines:
  - Civil & structural engineering
  - HVAC, electrical (HV, MV, LV), C&I, piping
  - Mechanical handling
  - Nuclear environment: seismic, blast, aircraft, confinement
  - Architecture
  - Permitting
- Support to the procurement process
- Construction management for the buildings, including services and site infrastructure
- Around €250m fee over nine years.

# Buildings and infrastructure

## €1.5bn project within the €15bn programme

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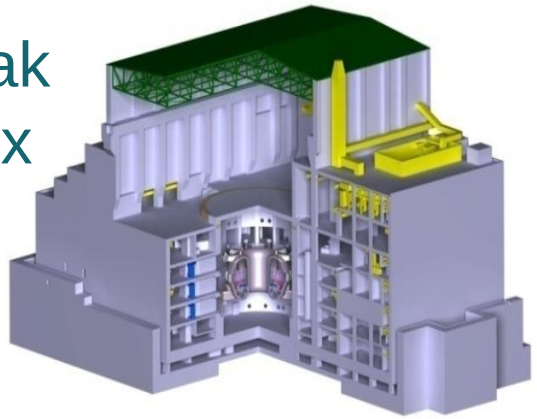
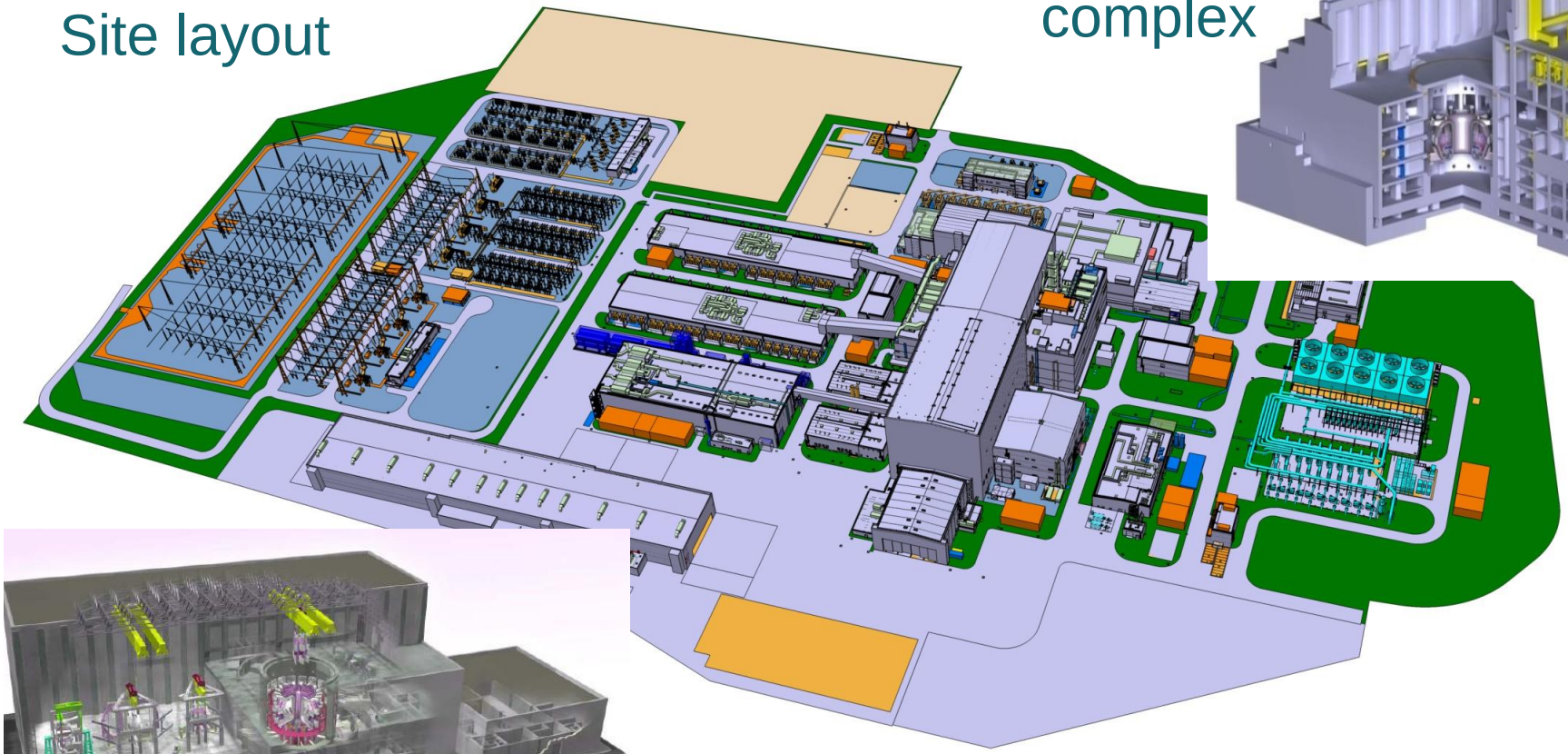
Tokamak complex



Site layout





View of Tokamak complex

# ITER buildings' project

Site dimensions: 1,000m x 400m

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# Construction of pit - March 2011

# Construction - July 2012

## Anti-seismic pit


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# Tokamak basement slab - April 2013


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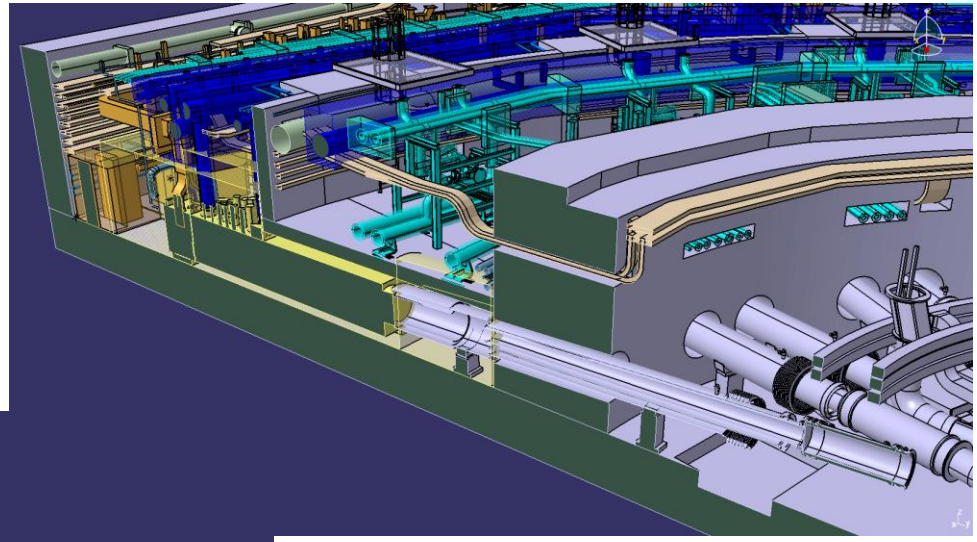
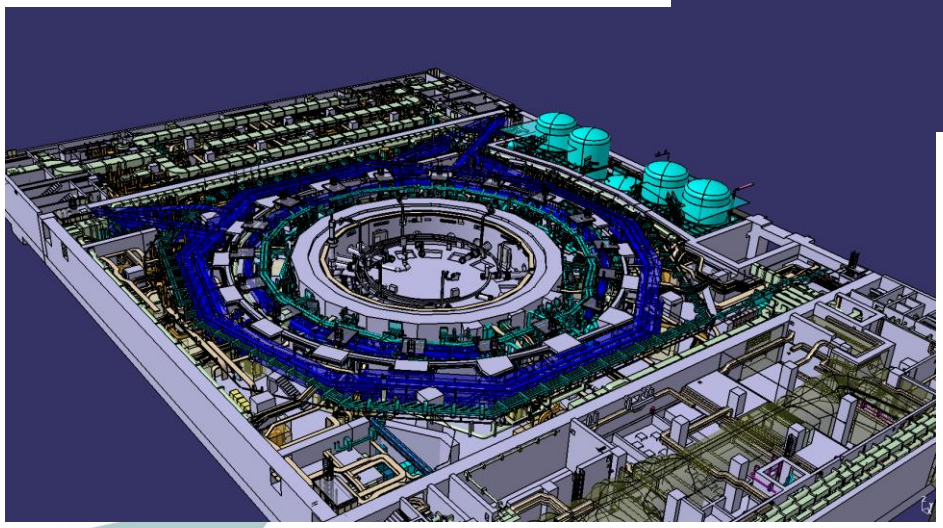
# Project complexity

- Health & safety
- Interfaces with a R&D project under development - configuration and change control
- Process integration
- Technical requirements
- Embedded plates – 80,000+ (forecast 110,000+)
- Multiple stakeholders
- Multiple cultures and languages
- French nuclear regulator
- Multiple contractors and interfaces.

# Key challenges

Technical change management





Process integration

# Interesting facts

- ITER Tokamak weighs 23,000 tons (3x Eiffel Tower)
- ITER produces 500 MW of output power for 50MW of input (Q=10). Current record 16MW
- Temperature of sun at its core is 15 million ºC, ITER temperature will reach 150 million ºC
- Steel frame buildings have a footprint of 29,000 m² and will incorporate 14,500 tons of structural steel
- 8km of underground tunnels for cables, pipes and other services.

# ITER – the future

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# Summary

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- The ITER programme will deliver the world's largest fusion machine
- As part of the Engage joint venture Atkins is responsible for the design, support to procurement and construction management
- This represents a €1.5bn project within the €15bn research and development programme
- The ITER project represents progress in our strategy to increase our involvement in new build projects
- It provides a showcase for our expertise with a global profile at the technical limits of our industry.

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# Mike McNicholas

Design and Engineering
Managing Director

# We deliver the design of the UK's largest most critical infrastructure projects – with scale and complexity

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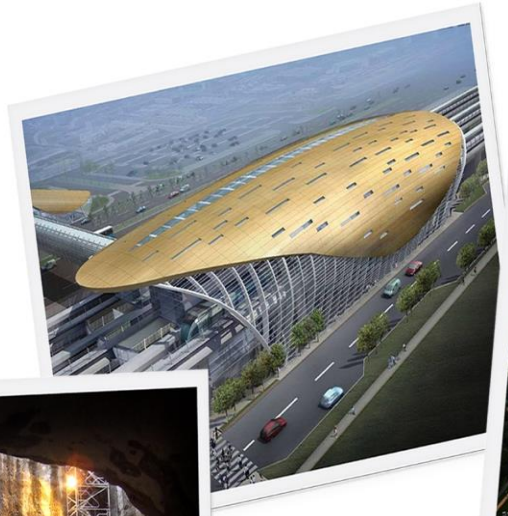
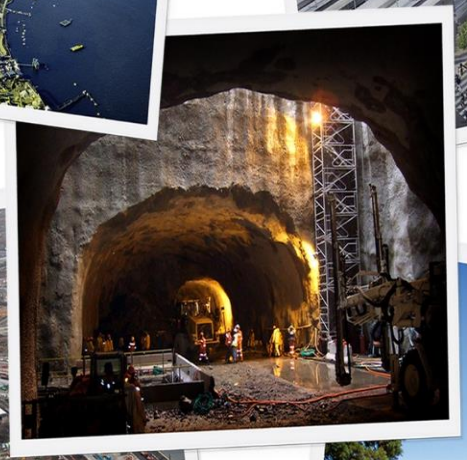
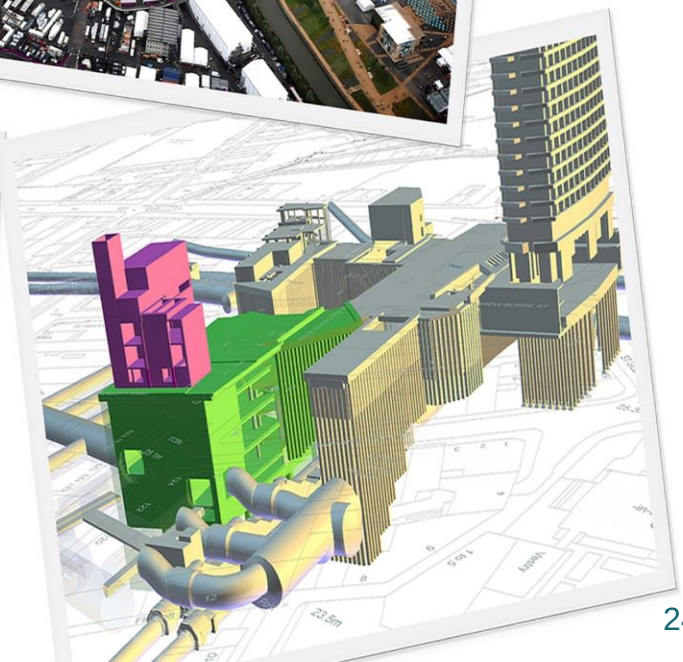
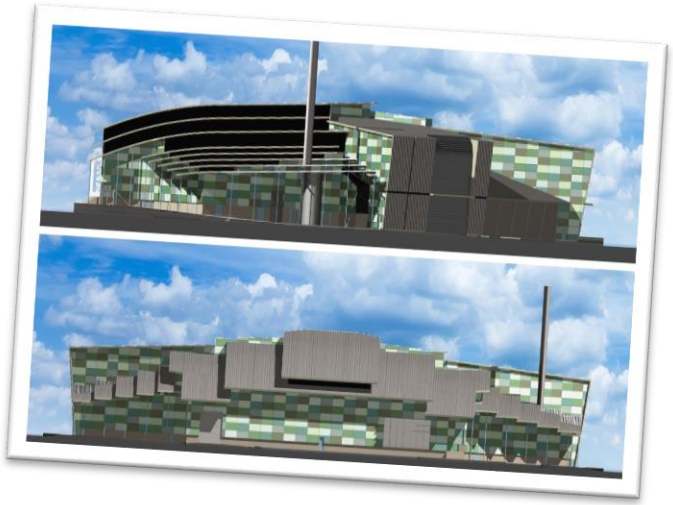
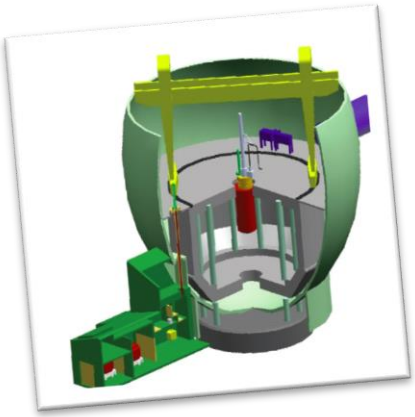






# We excel in projects of scale and regulatory complexity - bringing our cross industry learning to the nuclear market





# We work across the nuclear market

New Build | Decommissioning | Generation | Fuel

# How do we create a winning proposition

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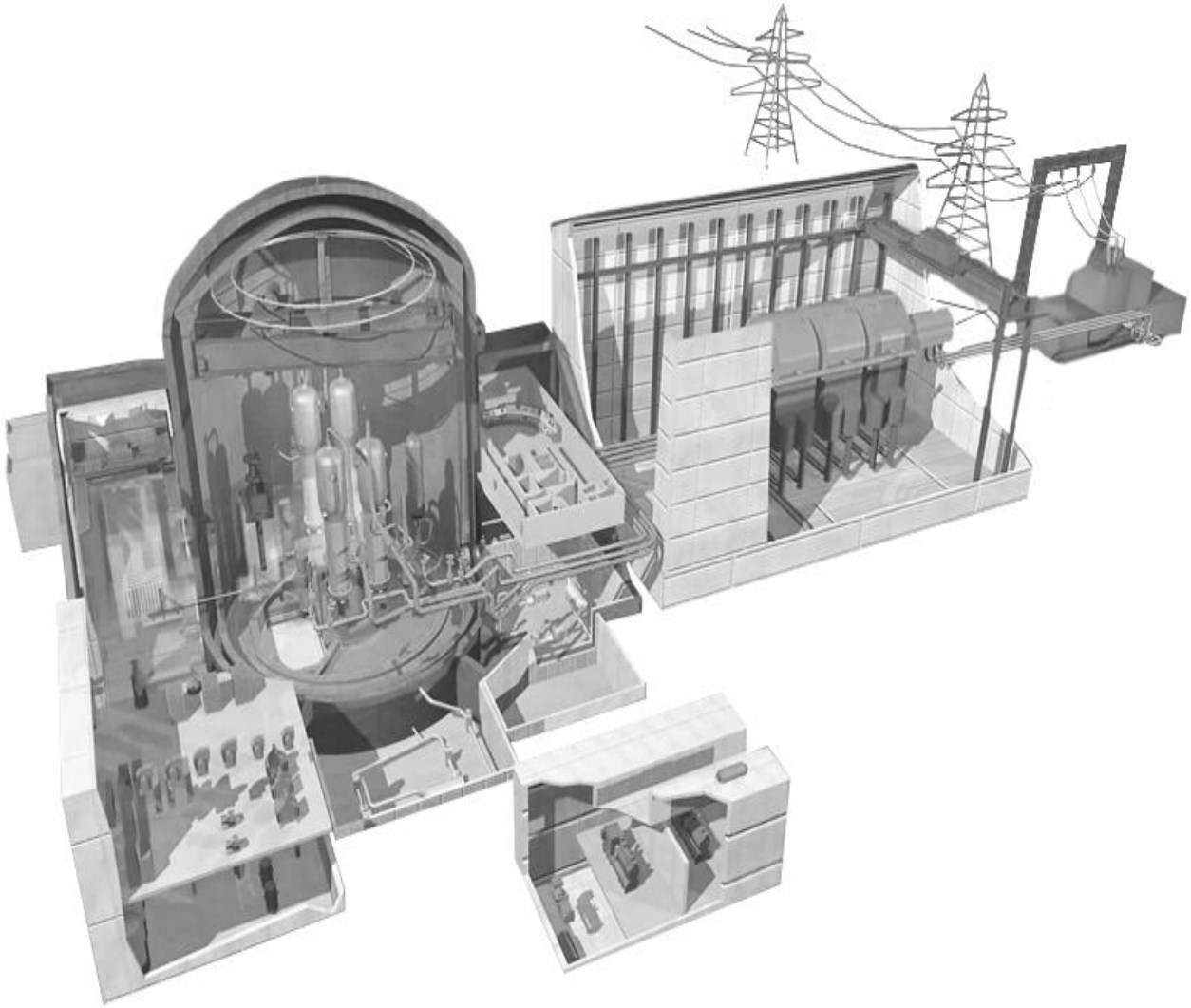
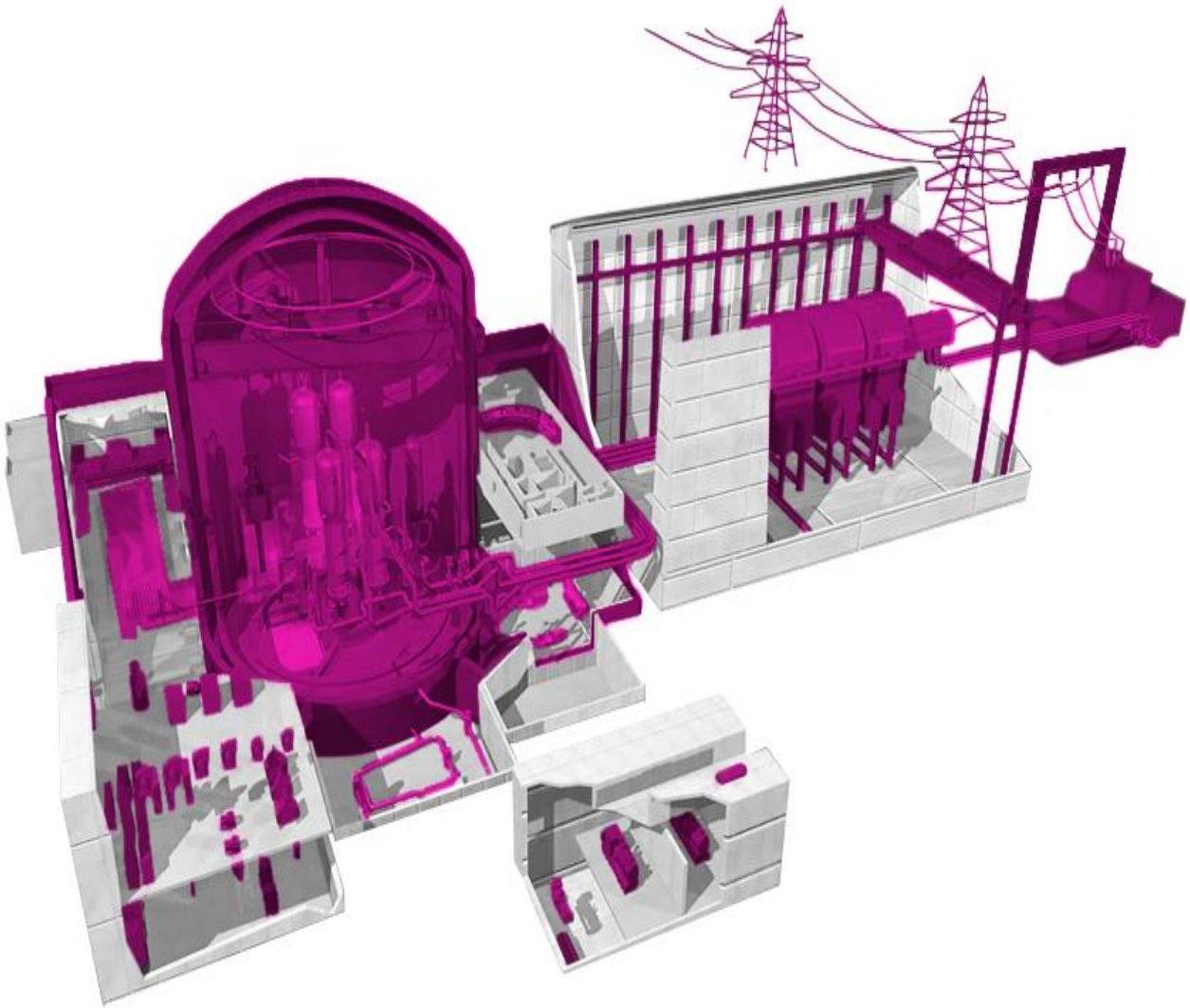


… it is about the whole integrated solution

# This is what Energy does…



## ……. process, plant and equipment

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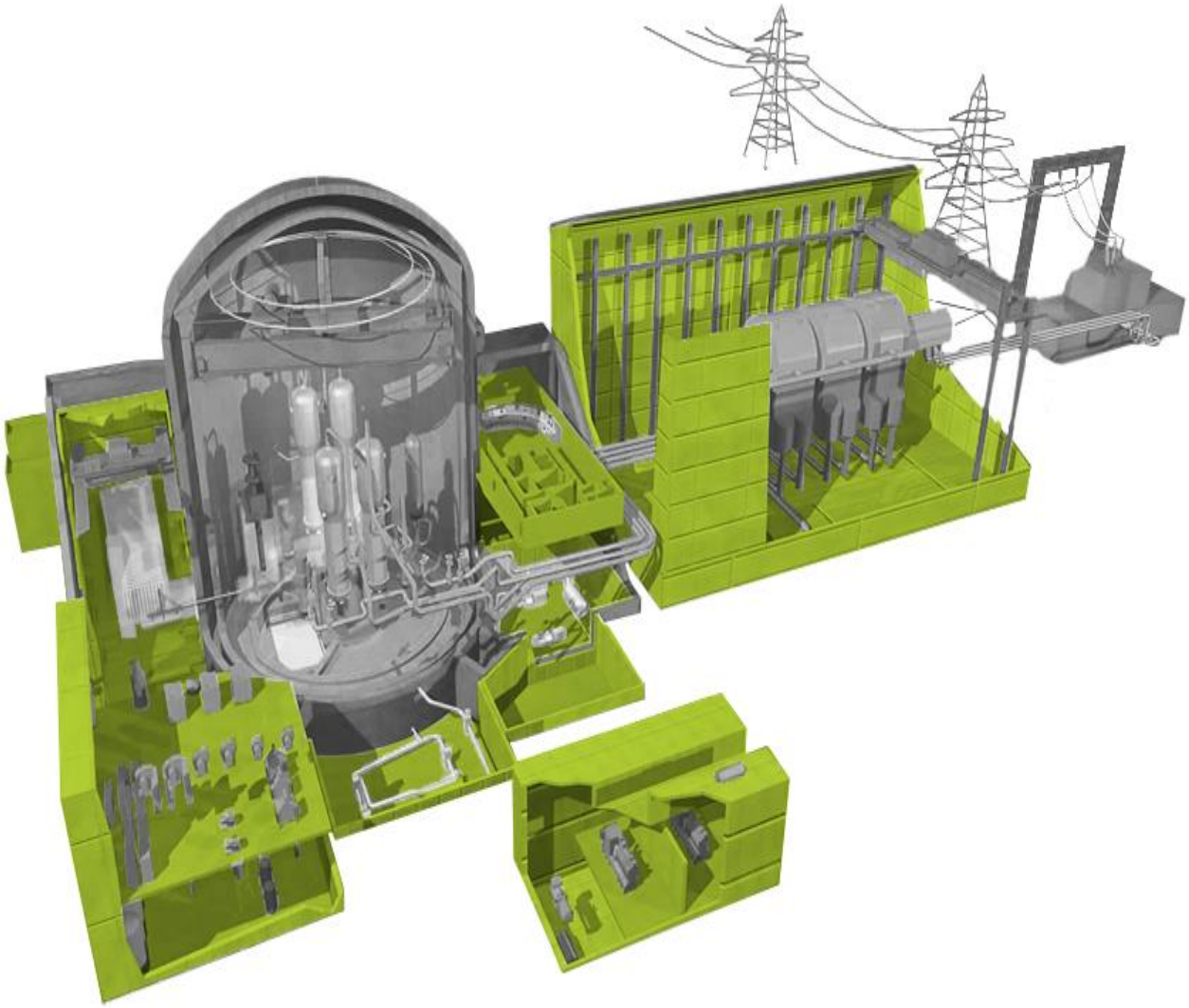
# This is what D&E does…



## ……. buildings and infrastructure

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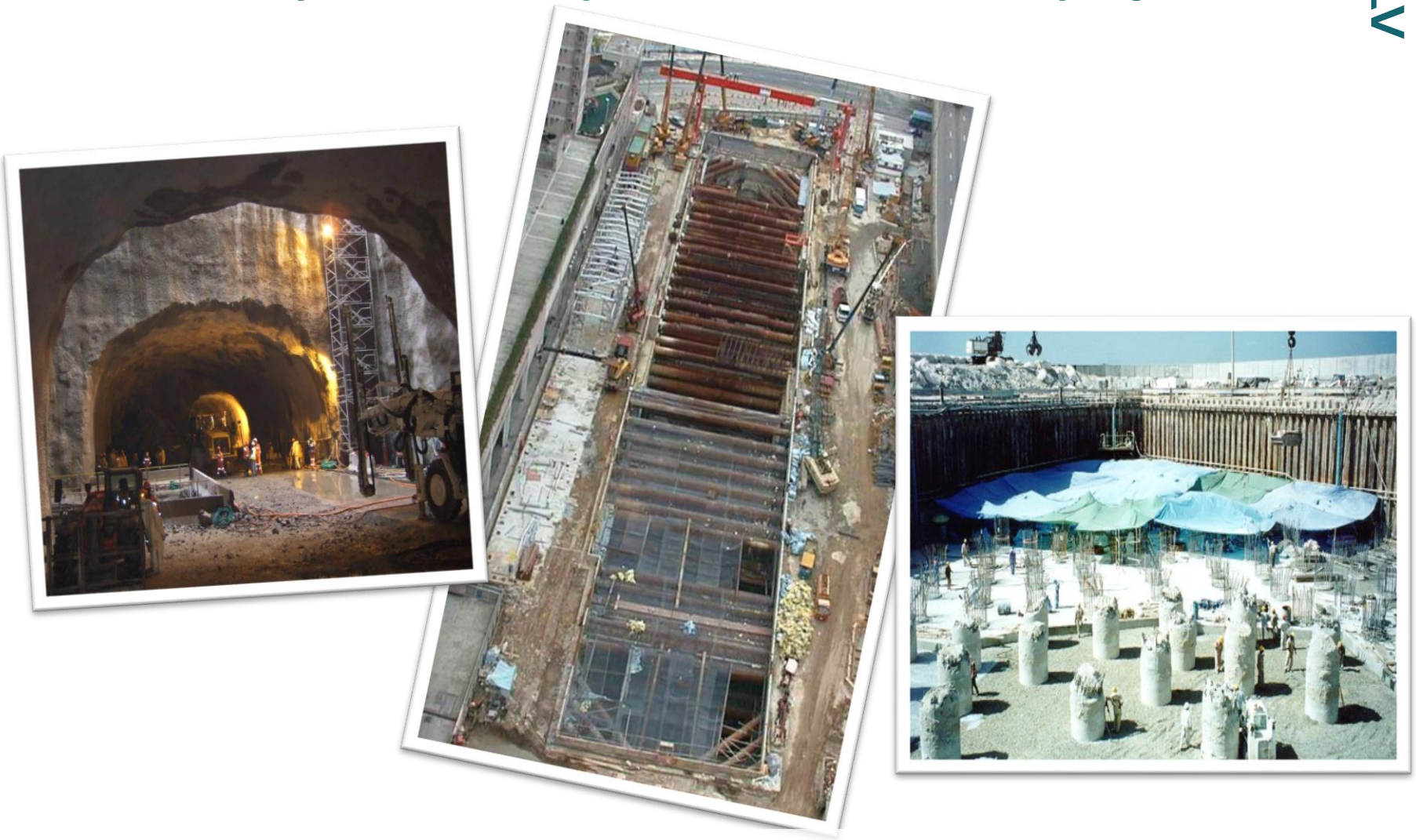
It can be the hidden structures - the tunnels and caverns that connect the plant - the early works that unlock the programme



……. getting to regulatory compliance more quickly, smartly and predictably

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# Laurent Schmeider

F4E project manager for site, buildings and power supplies

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