

# AMEC plc Nuclear market trends presentation

New York: 25 October 2010



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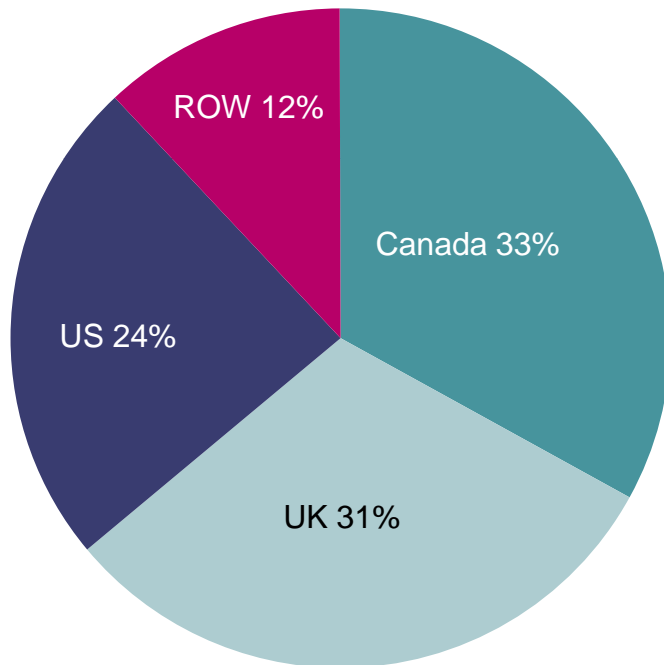
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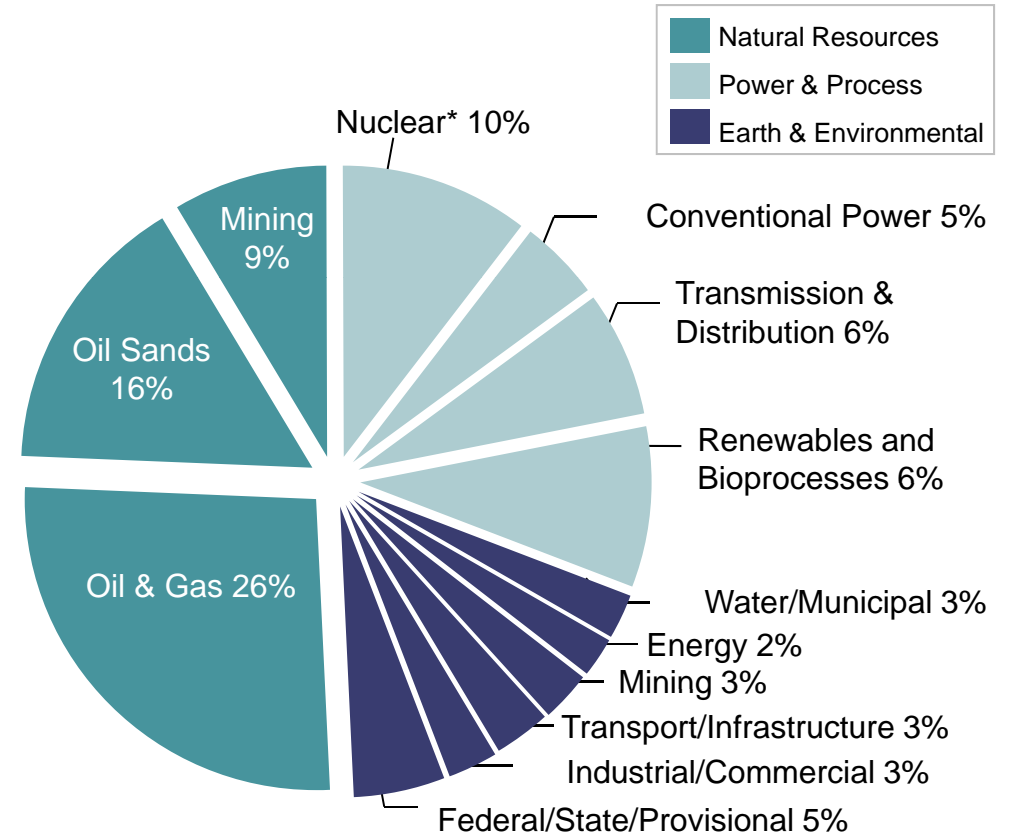
# AMEC by geography, division and core sector



Revenue by geography (2009)



Revenue by sector (2009)



De-risked business model; diversified sectors and geographies

\*Does not include the 'equity accounted' Sellafield decommissioning contract



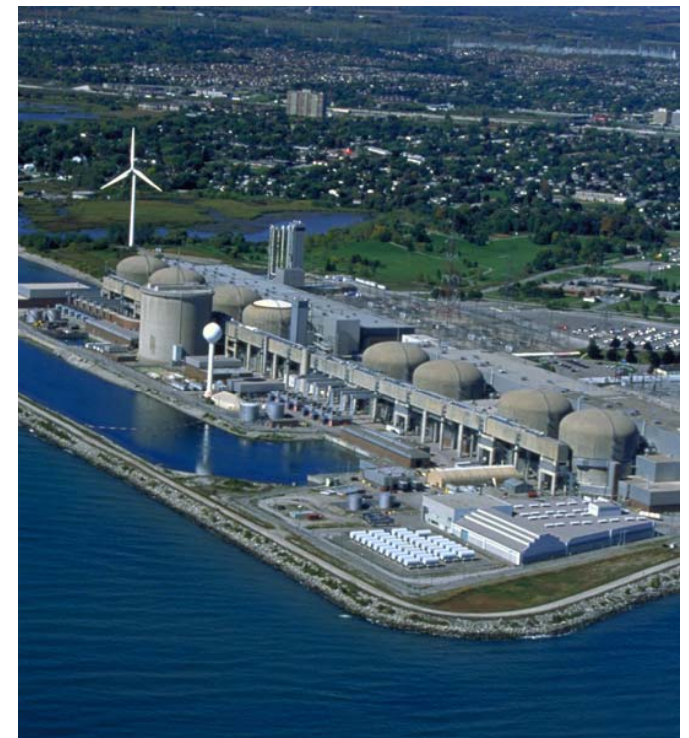
Focus on assured growth

\* Diluted EPS 2015

## Agenda

- Global nuclear market
  - Nuclear countries
  - Market drivers
  - Investment costs
  - Nuclear fuel cycle and AMEC's position
  - Growth in target segments
  - Challenges
- Case studies
  - US
  - Canada
  - UK
- AMEC's position and strategy

**OPG's Pickering Nuclear Station**

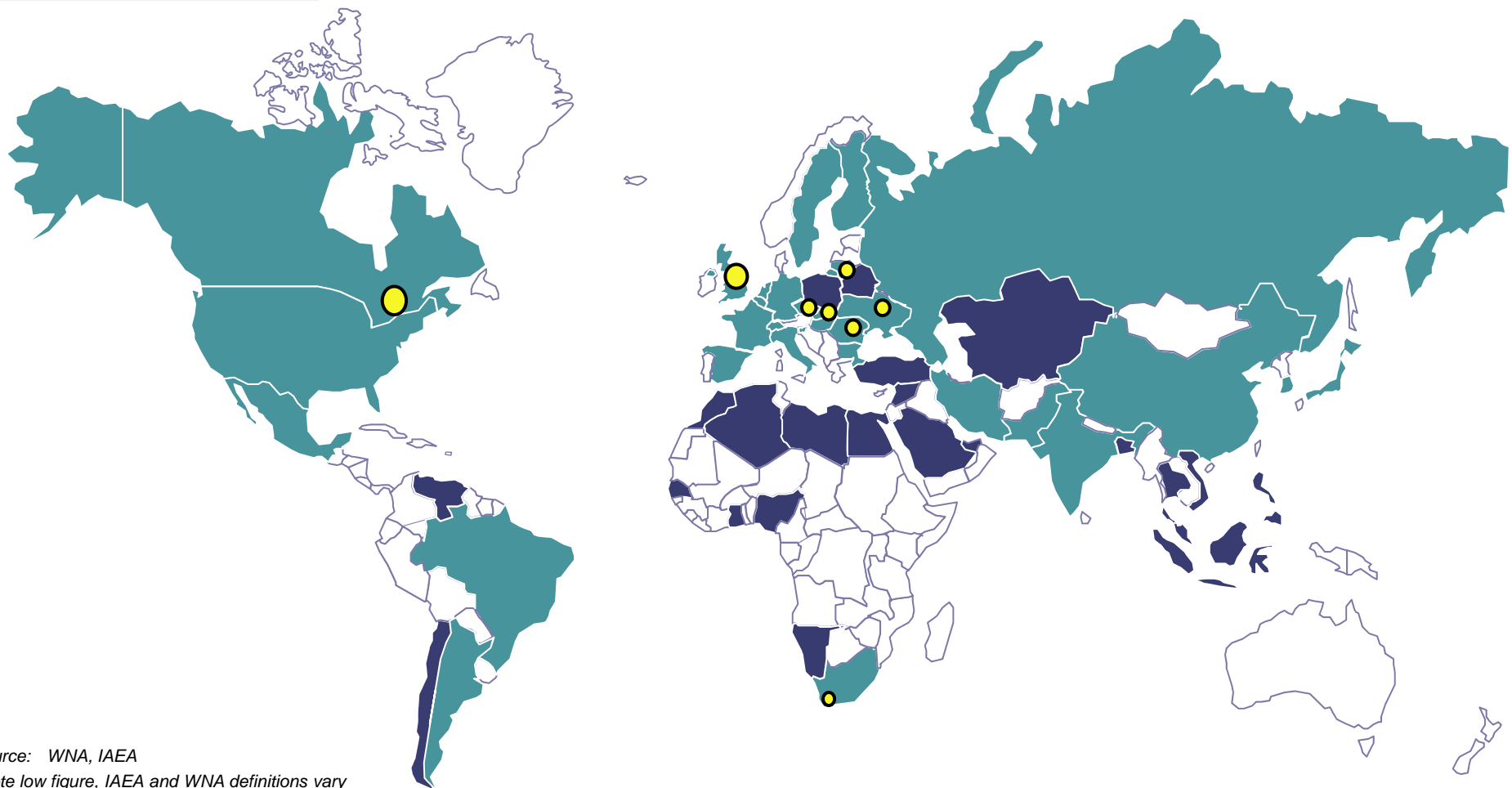


# Thirty countries with nuclear power, 20\* more possible



**2008 global electricity**  
Coal: 41%    Hydro: 16%  
Gas: 21%    Nuclear: 14%  
Others: 8%

- Nuclear countries
- Declared as interested
- AMEC nuclear presence

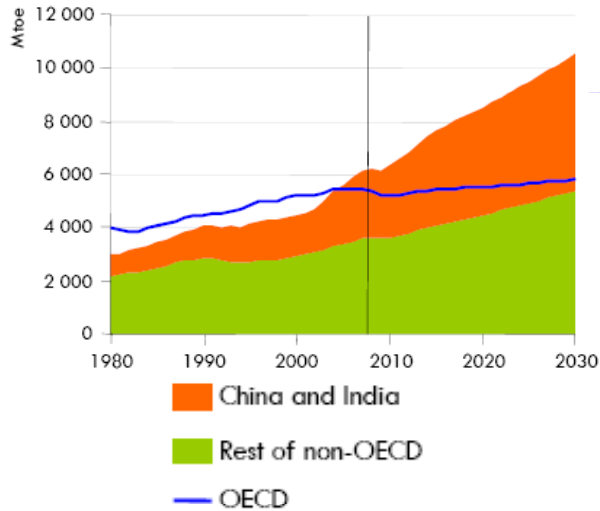


Source: WNA, IAEA  
\*Note low figure, IAEA and WNA definitions vary

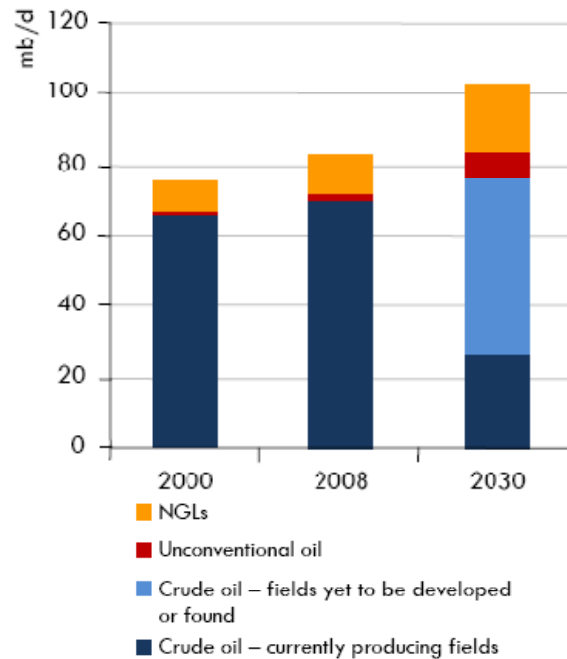
# Nuclear market drivers



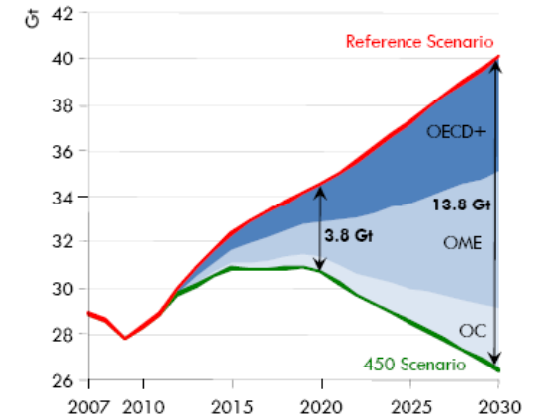
## Energy demand increasing



## Declining fossil fuel security



## Cuts in greenhouse gas emissions



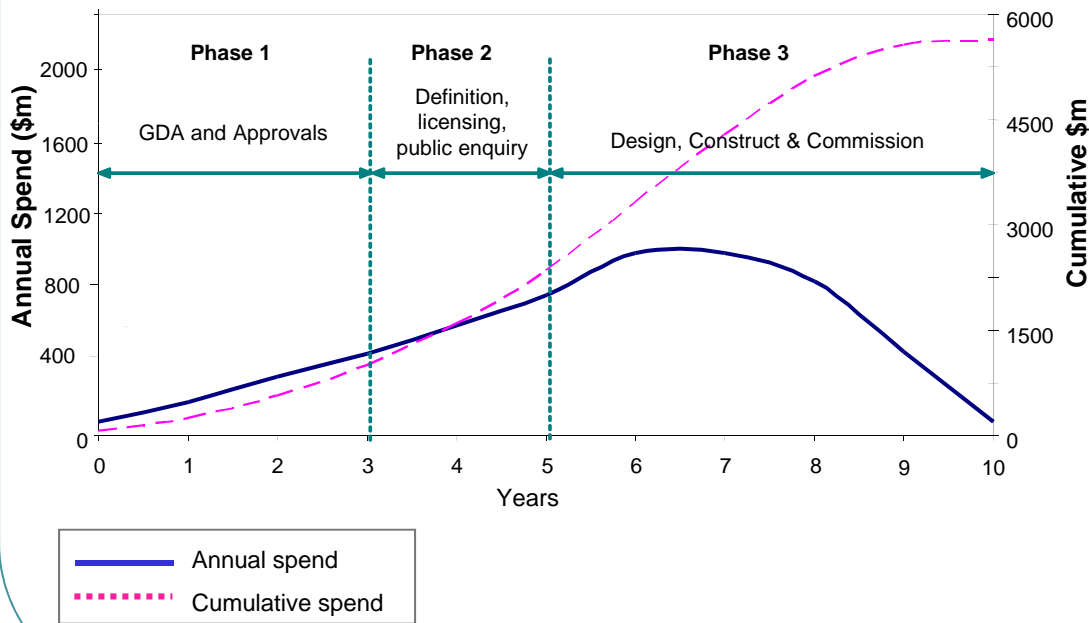
Challenge: more energy with less carbon and greater security of supply

Source: IEA

# Investment costs, timelines\*, and unit production costs

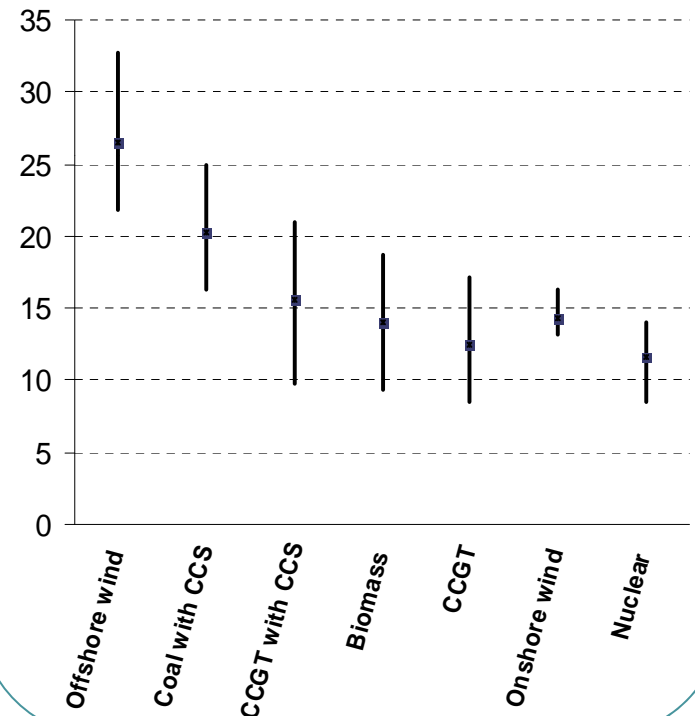


Typical spend profile for a nuclear power plant (\$m)



Source: Compiled from NIA published data

Comparison of cost of electricity<sup>1</sup>  
US¢/kWh



Nuclear is a competitive source of electricity

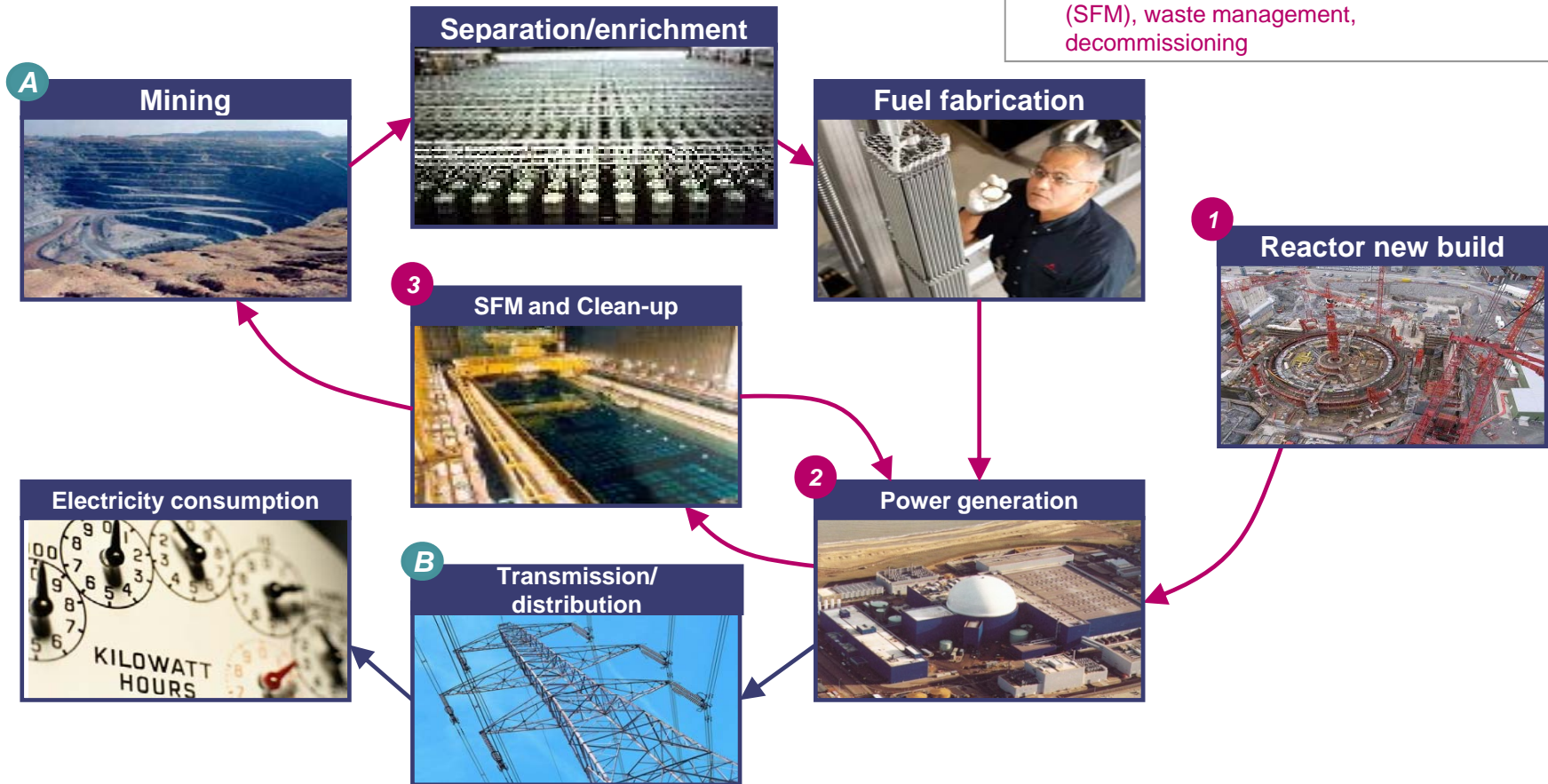
\* Approximate – for guideline only, using UK European Pressurised Reactor (EPR) <sup>1</sup> Parsons Brinkerhoff report 2010

# The nuclear fuel cycle and AMEC's position



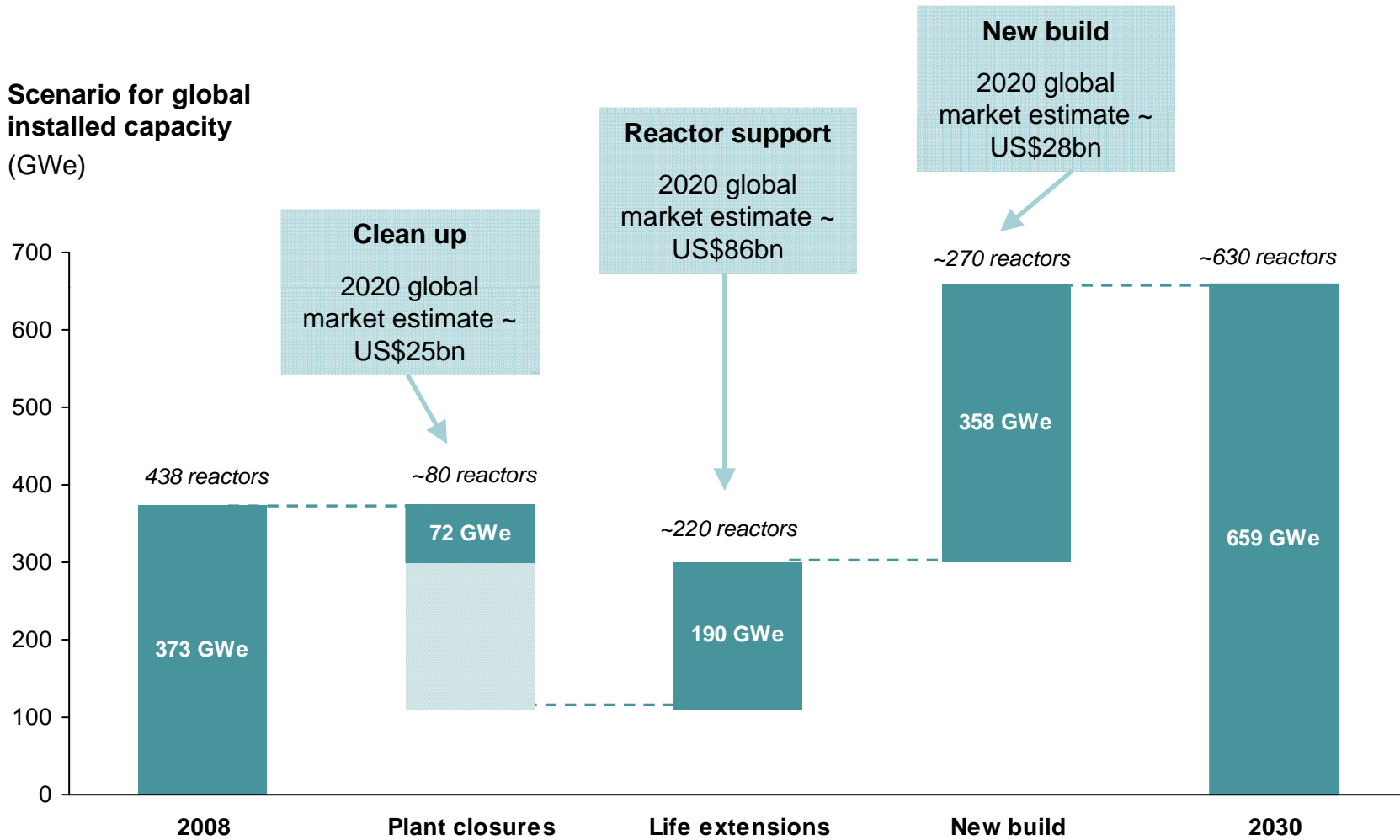
**Key**

AMEC nuclear segments:	Other AMEC sectors:
1 New build	A Mining
2 Reactor support	B T & D
3 Spent fuel management (SFM), waste management, decommissioning	





**Scenario for global installed capacity (GWe)**



Note1: Reactor support total includes opening reactor figure less closures. Life extension work will grow the market and potentially increase margins. Sources: AREVA (WNA, USDoE, World Energy Outlook) Market estimates from AMEC analysis.

# Challenges



- Public opinion
  - Safety, waste management, proliferation
- Limited talent pool
- New designs and supply chain capability
- liberalized and volatile electricity markets
- Cost
- Length of process

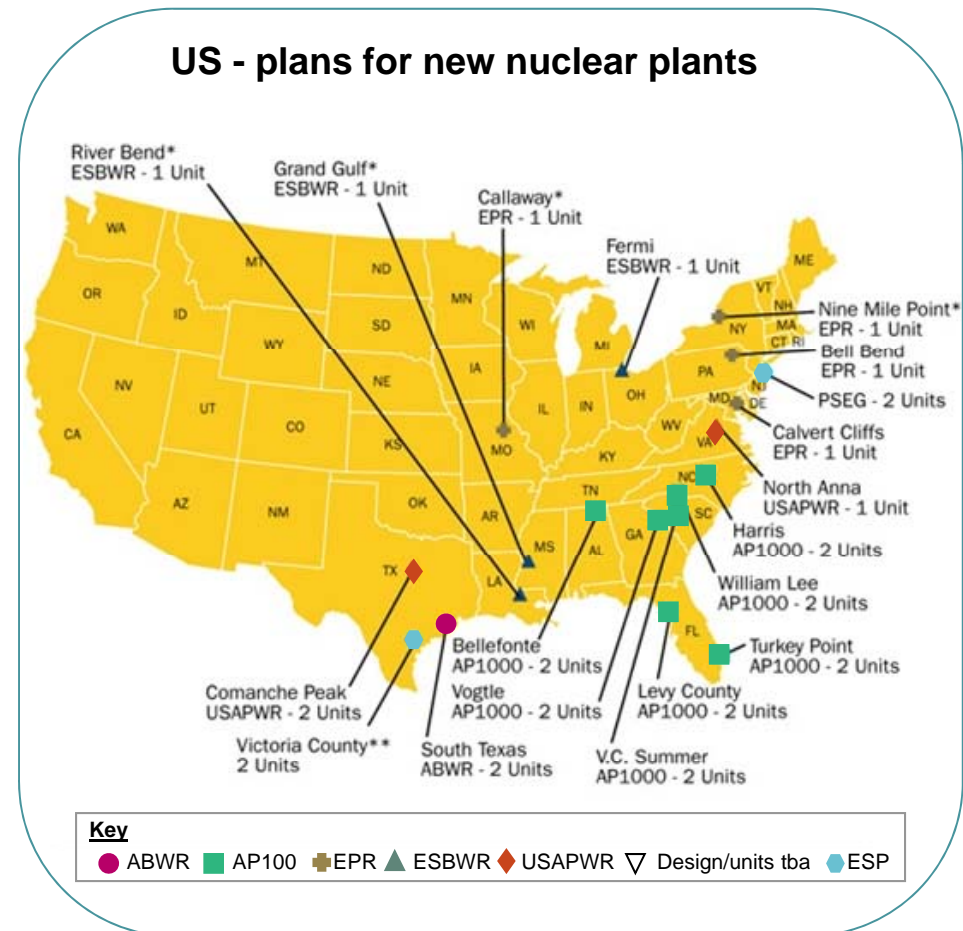


Must continue to address challenges to enable nuclear renaissance

# US - mature nuclear market

- Reactor support and life extension program
  - 104 existing nuclear reactors in 31 states
  - 90 per cent to be extended by 20+ years
- Federal decommissioning program (military and civil)
  - Well established M&O contracting model e.g. Savannah River
- New build program planned
  - Loan guarantee program
  - Tax credits
  - Liability limits

## US - plans for new nuclear plants



Activity across all three segments

Source: NRC website October 2010;

# Canada – nuclear is a pivotal part of energy mix



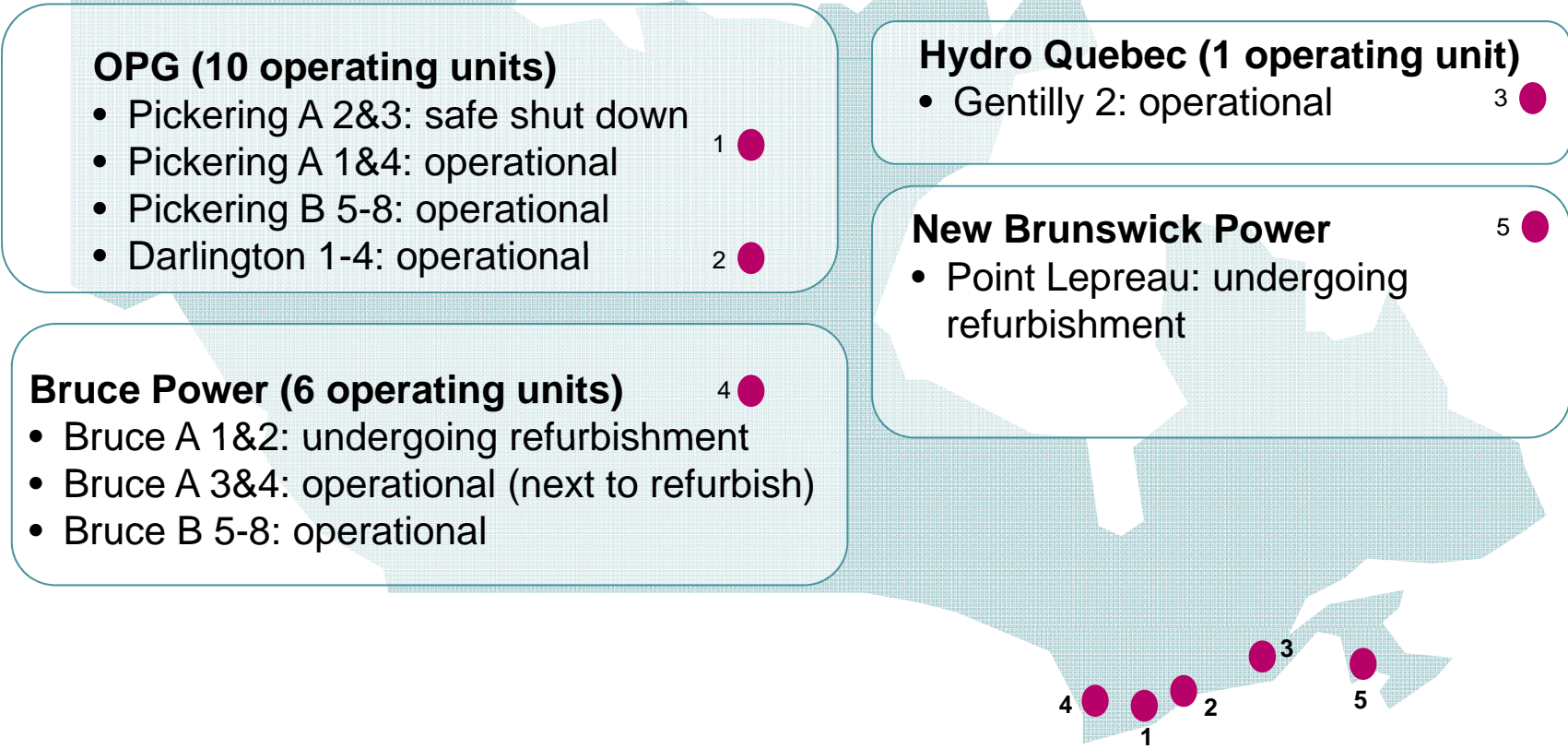
- Nuclear will continue to be key to Canada's economy and energy mix
  - Approx. 15 per cent of Canada's electricity from nuclear power (50 per cent in Ontario)
    - 17 reactors in three provinces provide over 12,600 MWe of power capacity
  - Committed to reducing emissions by 17 per cent by 2020
    - Ontario phasing out coal-fuelled power generation by 2014
    - Aging power facilities: 80 per cent power plants in Ontario to be replaced or refurbished in next 20 years
  - Canada produces over 50 per cent of the world's medical isotopes
  - Approx. 33 per cent of world's uranium found in Saskatchewan
- Refurbishment
  - 14 projects estimated at ~CDN\$28 billion are currently underway or have been announced
    - Ontario (~\$24 billion)
    - New Brunswick (~\$2 billion)
    - Quebec (~\$2 billion)

Canada is one of AMEC's core nuclear markets

# Canada - nuclear reactors existing and planned

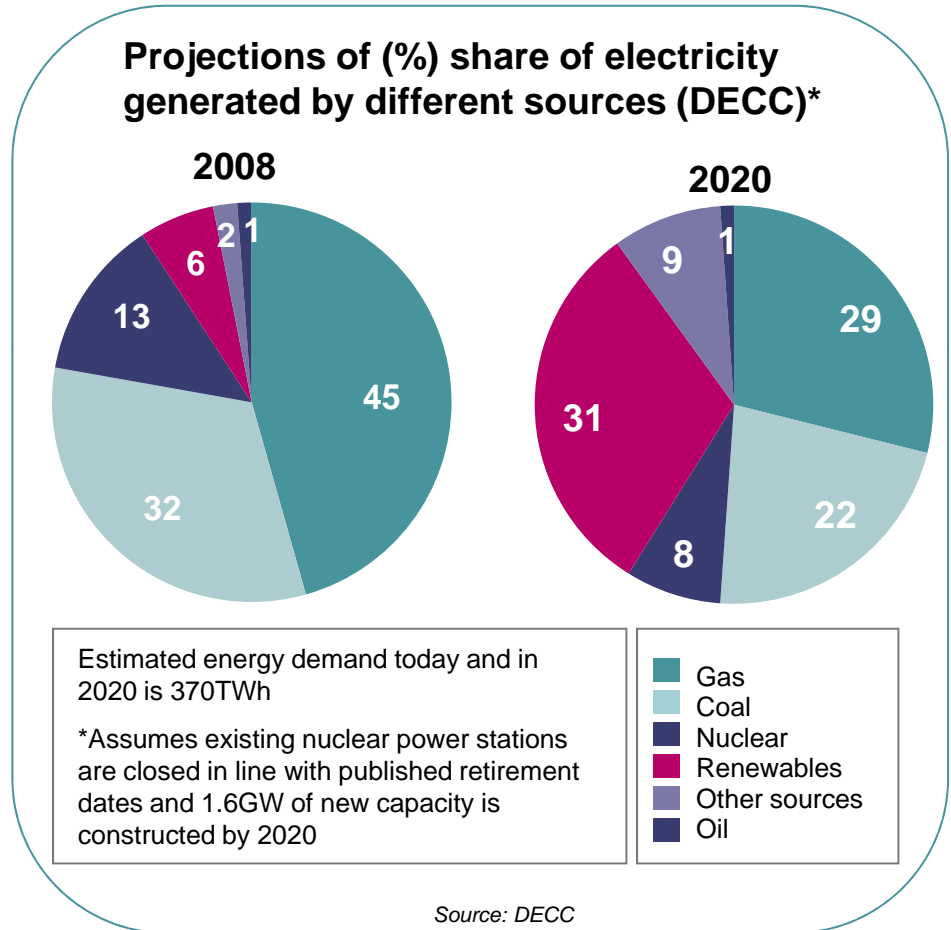


- 22 CANDU nuclear reactors, 17 operational as of 1 October 2010
- New build: 2 planned by 2020 in Ontario
  - 7 potential new builds in New Brunswick, Alberta and Saskatchewan



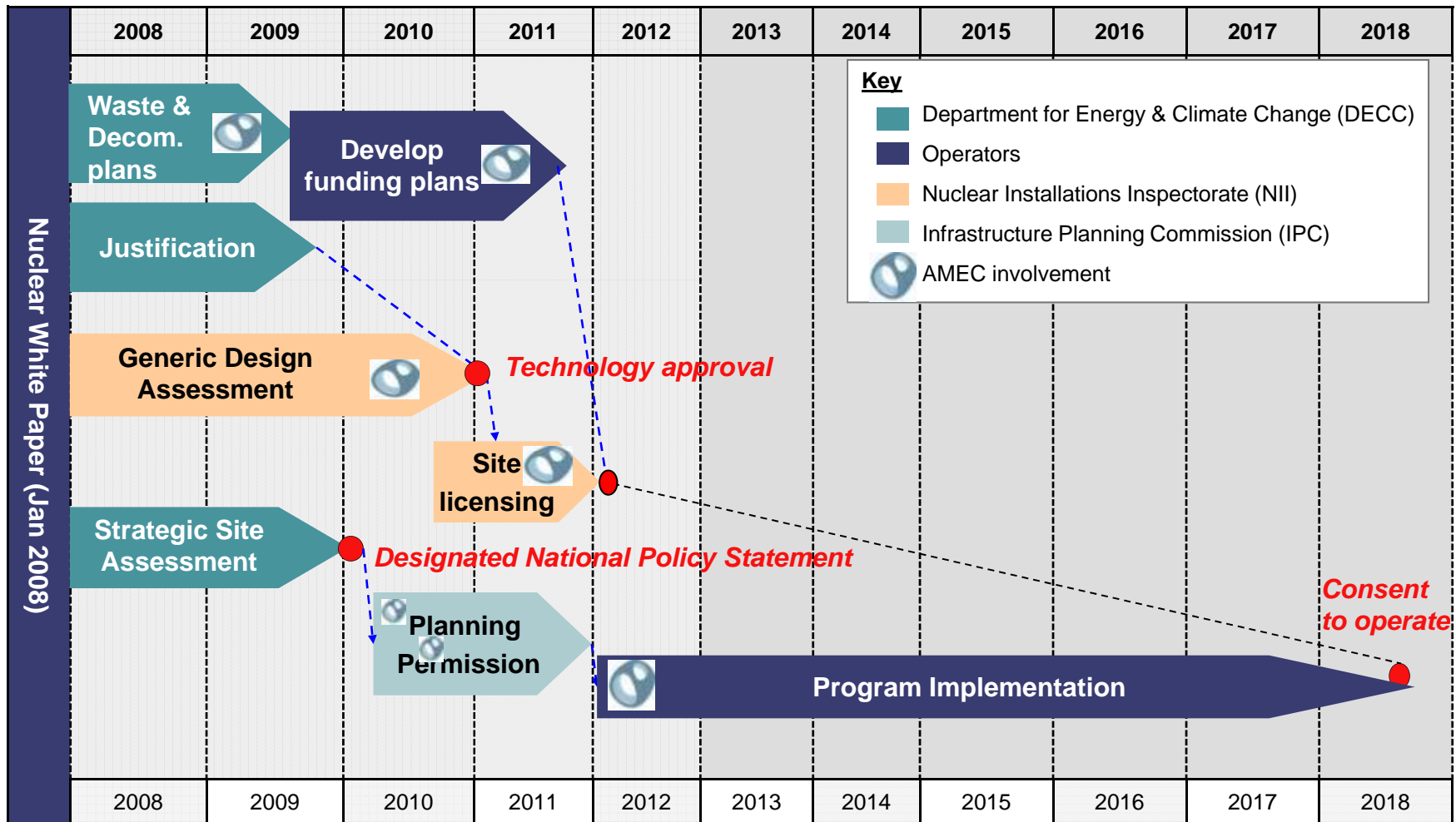
## UK – nuclear a key part of energy mix

- UK energy demand forecast to be 370TWh in 2020
  - Reducing emissions by 34 per cent by 2020 requires shift in energy mix
- Nuclear key part of UK energy mix
  - 10 plants currently operational
  - Aging nuclear fleet: 8 will close by 2025
  - Life extension opportunities
- New build: 8 sites approved, 6 plants planned, 2 operational by 2020
  - Privately funded - utilities
- Decommissioning program based on US contracting model
  - Government funded – Nuclear Decommissioning Authority (NDA)



Nuclear new build required to help fill UK's 'energy gap'

# UK - new build process

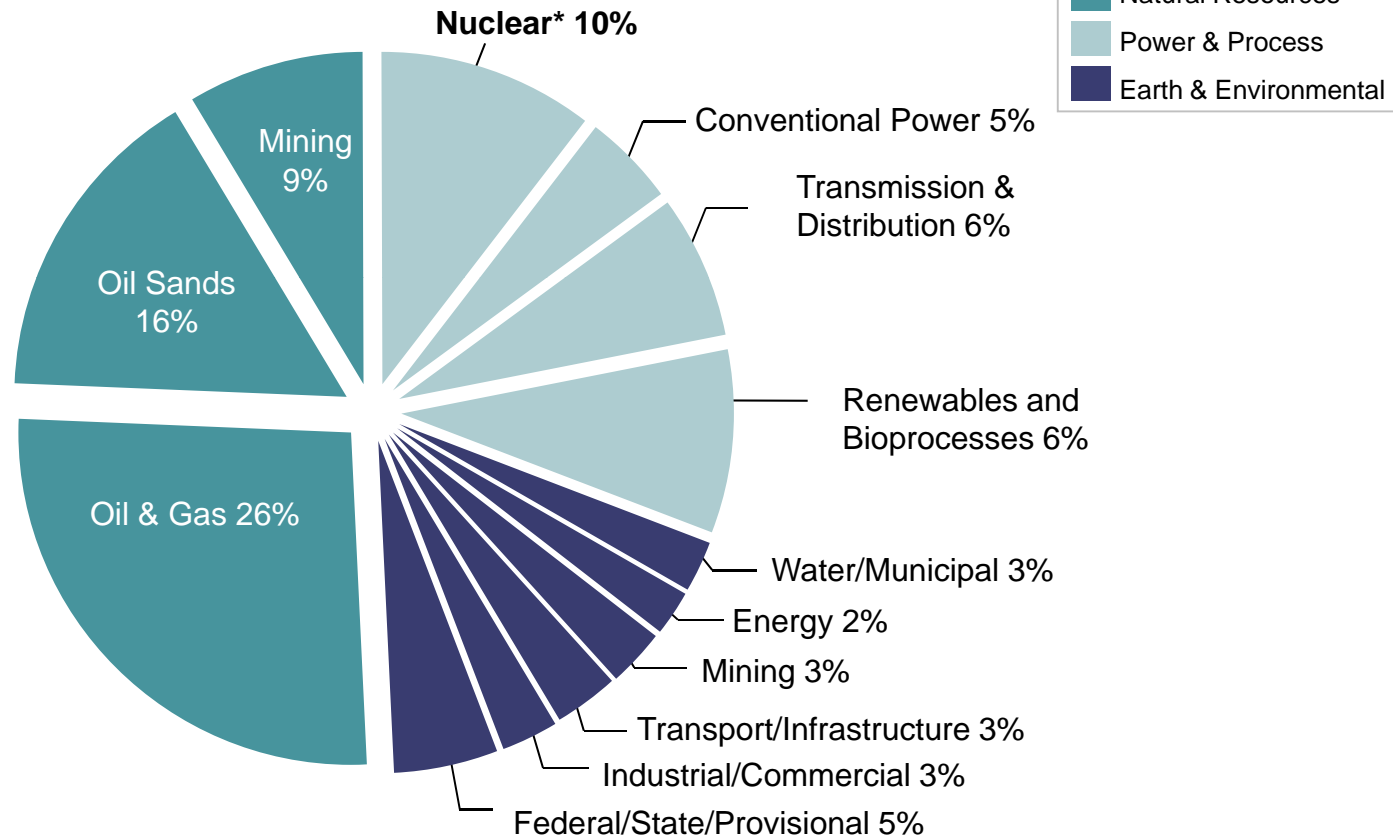


Typical 5yr decision and consents

Typical 5yr construct / commission



### AMEC 2009 revenue by sector



Nuclear a focus for growth in Vision 2015 and beyond

\*Does not include the 'equity accounted' Sellafield decommissioning contract

## New build

- Establish AMEC as the utilities' independent nuclear technology partner
- Assure the licensing, delivery and safe operation of the reactor and associated systems

## Reactor support

- Defend and grow leading position as the independent nuclear expert for existing reactors in current geographies
- UK, Canada, Central & Eastern Europe

## Clean up

- Establish AMEC as a major UK nuclear clean up contractor (Tier 1) and long term partner to Nuclear Decommissioning Authority (NDA)
- Pursue international growth priorities

A position in all three segments is a competitive advantage

# AMEC – implementing nuclear strategy



## New build

- Partnered with OPG in Canada as the Owner's Engineer
- Partnered with EDF in the UK as the Architect Engineer
- Partnered with Cernavoda in Romania as the Owner's Engineer
- Contract with Belarusian Government, support for reactor purchase negotiations
- Pursuing Owner's Engineer positions in Czech Republic, Poland, Switzerland
- Support to US NRC on an Evaluation Model for the Next Generation Nuclear Plant
- Support to UK NII on reactor generic design assessments (non-EPR)

## Reactor support

- Largest technical consultant in support of OPG and Bruce Power in Canada
- AMEC comprises over 80% of the integrated team Project Management Team for Bruce Units 1 and 2 Refurbishment
- Largest supplier of engineering and technical services to EDF's current UK reactor fleet
- Positioned with EDF as a key program & Project Management partner (prime contract)
- Extending our support services across a broader European footprint (eg support to existing reactor at Cernavoda, Romania)

## Clean up

- Owners of Sellafield SLC (as part of NMP), strong partnership relationship with NDA
- Sellafield's largest technical services framework consultant
- 5 year contract with utility CEZ (Czech) for the management of active waste at their nuclear power plant in Dukovany
- Contracts through EBRD for 'Project Management Units' at Chernobyl and Ignalina (Lithuania)
- Partnered with Energy Solutions for Dounreay, UK bid

## Partnering in key geographies

- Nuclear renaissance is under way
  - Long-term upward cycle – driven by climate change and security of supply
  - Opportunities in domestic markets and internationally
  
- AMEC has a clear nuclear growth strategy
  - Long-term partnering approach with customers and other major global suppliers
  - Selective geographic focus - where we can leverage existing strong relationships
  - Maintain and grow nuclear technical knowledge of plant and processes
  - Focus on synergies from three segments

AMEC positioned to engineer the change

## Questions

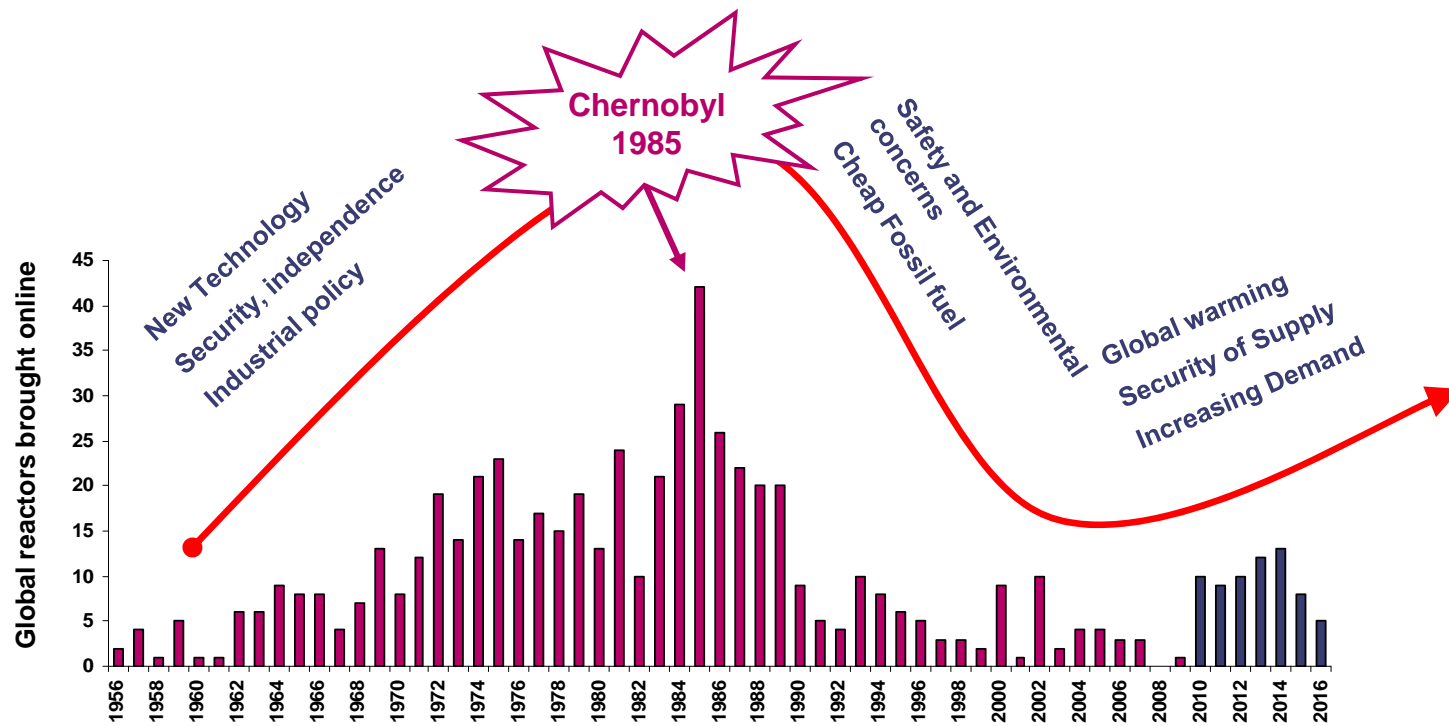
Investor and analyst dinner: October 2010



## **Appendix**

- Opportunities by nuclear segment
- Developments in Europe and North America
- How a nuclear plant works
- Reactor technology
- AMEC team

# Opportunities nuclear renaissance



438 reactors operational  
56% are more than 25 years old

Western industrial decline, Far Eastern construction continues

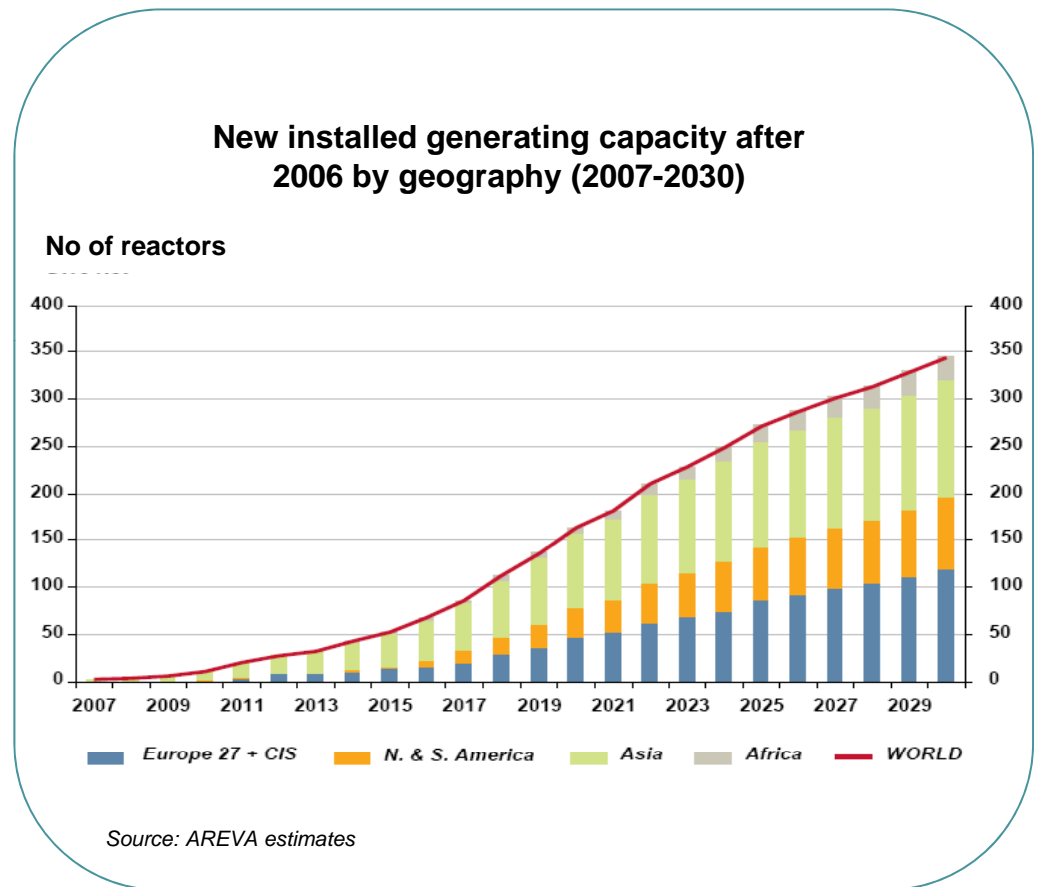
54 reactors under construction  
148 ordered or planned  
342 proposed

Source: WNA April 2010

# Opportunities new build



- 6 countries dominated nuclear market historically - represent 90 per cent of installed capacity
- Asian countries will generate most growth into the future



Beginning a new and long-term cycle

# Opportunities reactor support



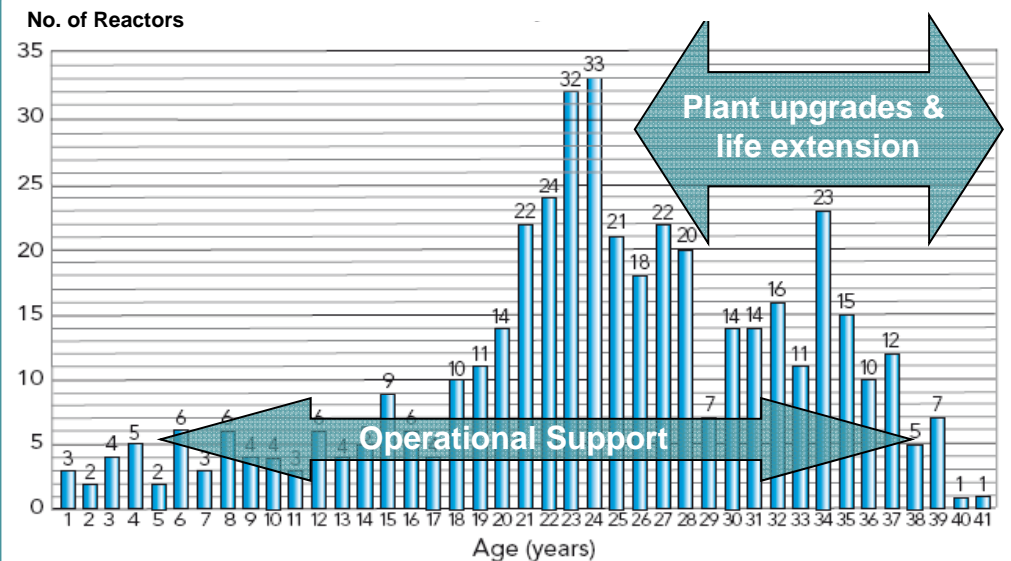
## Maintaining and extending existing fleet

- Significant number of reactors to be supported and extended

## Services

- Lifetime support
- Operational performance
- Reactor servicing

Number of operating reactor units by age (Jan 08)



Note: The age of a reactor is determined by its first grid connection.  
Source: IAEA (2008a).

More than 40 per cent of the fleet is more than 25 years old

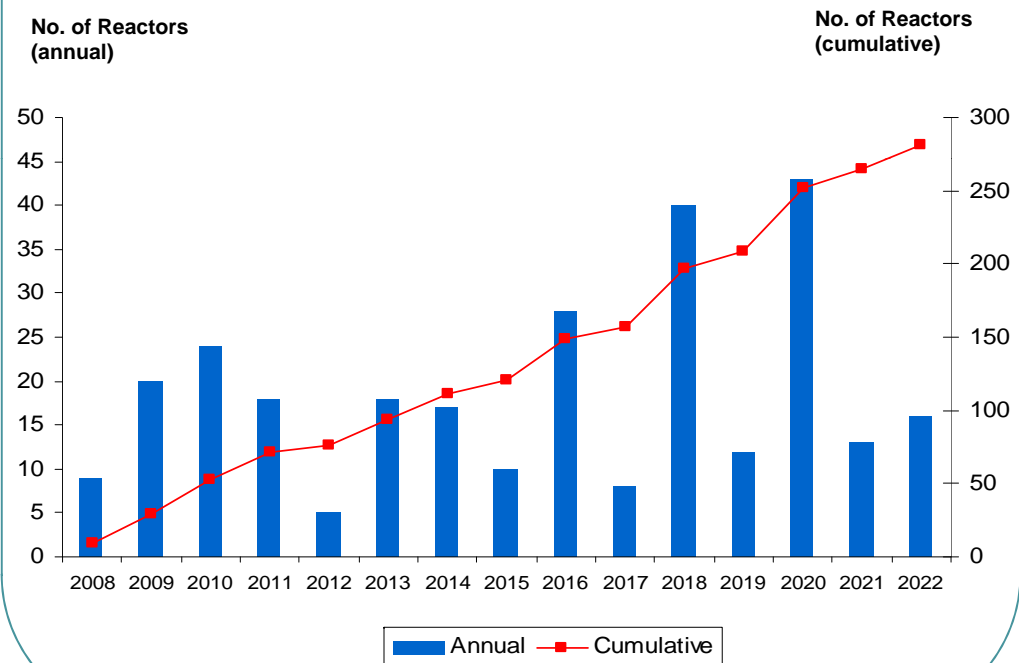
## Completing the life cycle

- Driven by regulatory requirements
- UK/US has the most developed clean up sector
  - UK: Sellafield / Dounreay / Magnox

## Services

- Decommissioning
- Waste Management
- Environmental
- Radiological

### Anticipated reactor closure dates



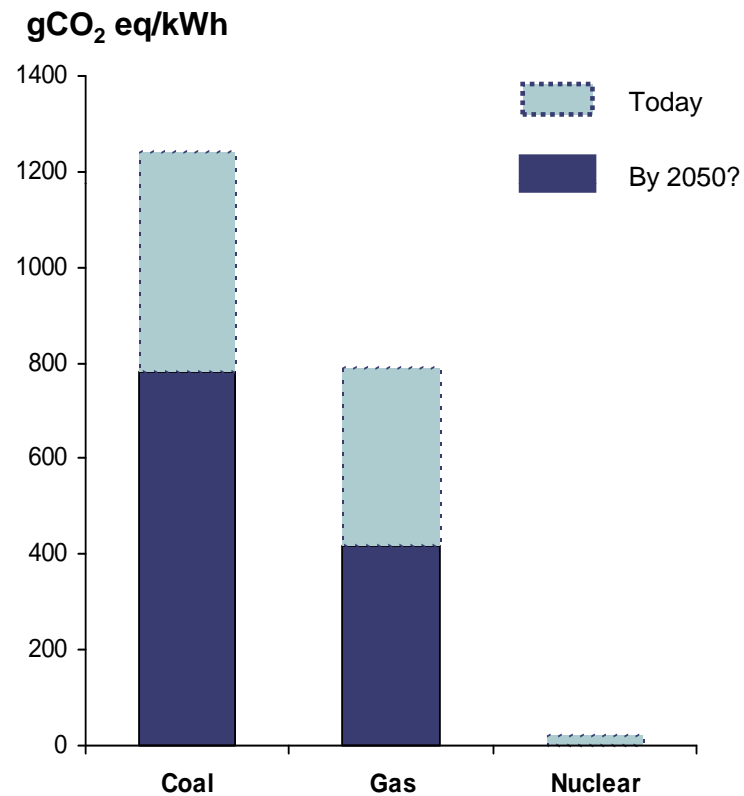
Some 250 reactors are anticipated to close in the next 15 years

Source: WNA & AMEC

# Nuclear increasingly competitive source of clean energy

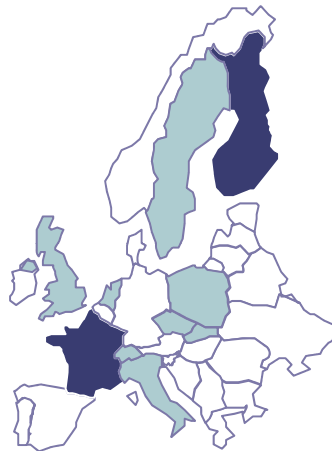
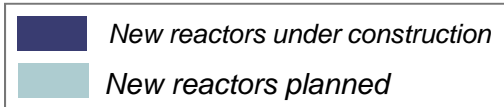


Comparison of greenhouse gas emissions



Source: IAEA 2006, Paul Scherrer Institute 2003

# Renaissance - Europe ahead of North America



## Europe

- Primary drivers are real security of supply concerns and strong environmental support across EU
- Olkiluoto 3 under construction in Finland, Flamanville 3 under construction in France
- Six reactors planned in UK, sites identified, consortia formed
- Feasibility studies by ENEL/EDF in Italy
- Tenders for two reactors issued in Czech Republic.

## Canada

- Renaissance was signalled by the return to service project for Bruce units 1 and 2 (Canada)

## US

- Primary drivers weaker, but growing security and environmental concerns
- Vogtle granted federal loan guarantee; short lists for others
- In Georgia, preliminary construction is taking place at the Alvin Vogtle Nuclear Plant under a Limited Work Authorization (LWA) agreement with the NRC. Duke Energy and others in negotiation with suppliers

Source: WNA, AREVA

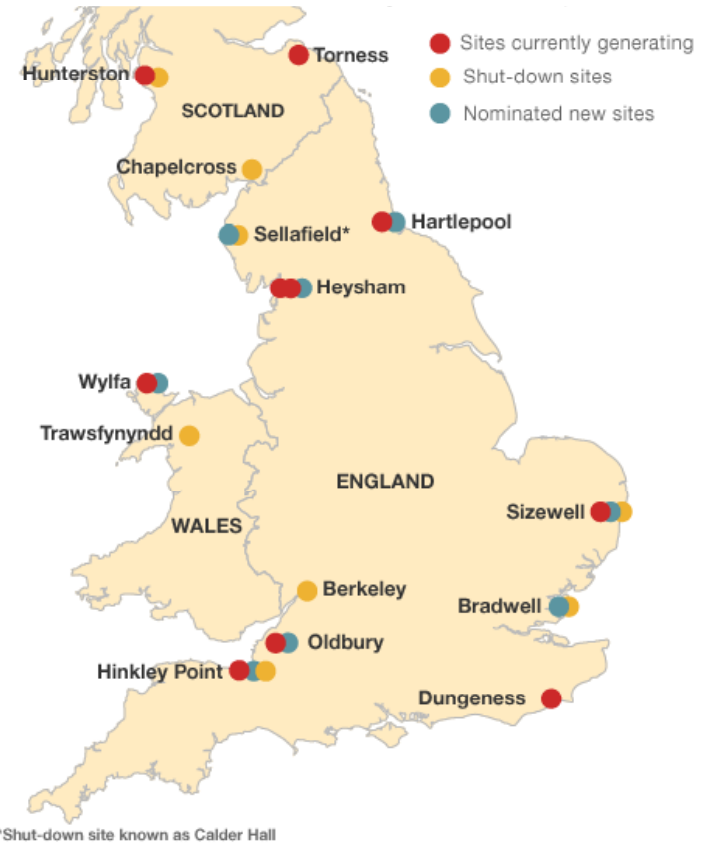
# UK - committed to new build



## UK government approved 8 'new build' sites

1. Bradwell, Essex, NDA sold to EDF Energy
2. Hartlepool, Durham, EDF Energy
3. Heysham, Lancashire, EDF Energy
4. Hinkley Point, Somerset, NDA sold to EDF Energy
5. Oldbury, Gloucestershire, NDA sold to Horizon\*
6. Sellafield, Cumbria, NDA sold to Iberdrola/SSE/GDF-Suez
7. Sizewell, Suffolk, EDF Energy
8. Wylfa, Anglesey, sold by NDA to Horizon\*

## Nominated sites for new build



Nuclear energy required to fill UK's 'energy gap'

\*RWE npower & EON UK  
Source: DECC, Oct 2010

# Europe is investing - France



## Flamanville 3



All photos copyright AREVA

# Europe is investing - Finland



## Olkiluoto 3



All photos copyright AREVA

## U S – existing nuclear plants

- Nuclear generates 20 per cent of electricity
  - Record nuclear electricity production 2009: 799 billion kWh
  - Strong public support – 74 per cent in favor
- Industry investing: extensions and new build
  - 22 new reactor licences being considered
  - 5 design certifications in progress
  - Renewed interest in small scale reactors
  - Site preparations started
  - 4-8 reactors in commercial operation 2016-2018
- Administration support nuclear energy expansion
  - Expanded loan guarantee program
  - Tax credits to nuclear manufacturers

104 Nuclear power plants in 31 states





Source: NEI.

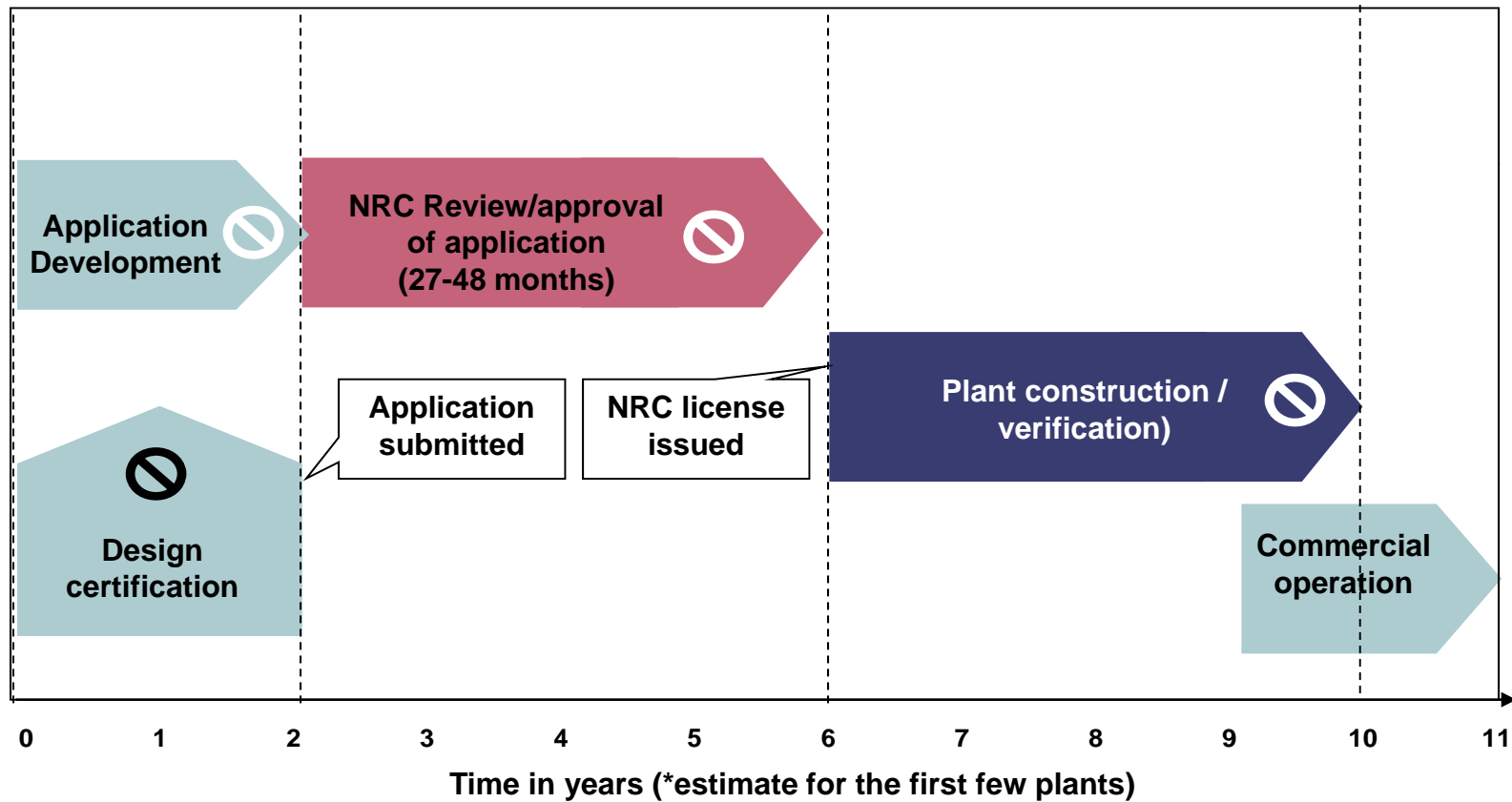
# US – new build licensing process



**Key**

-  Opportunity for public consultation
-  Opportunity for public hearing

Illustrative – diagram of US licensing process

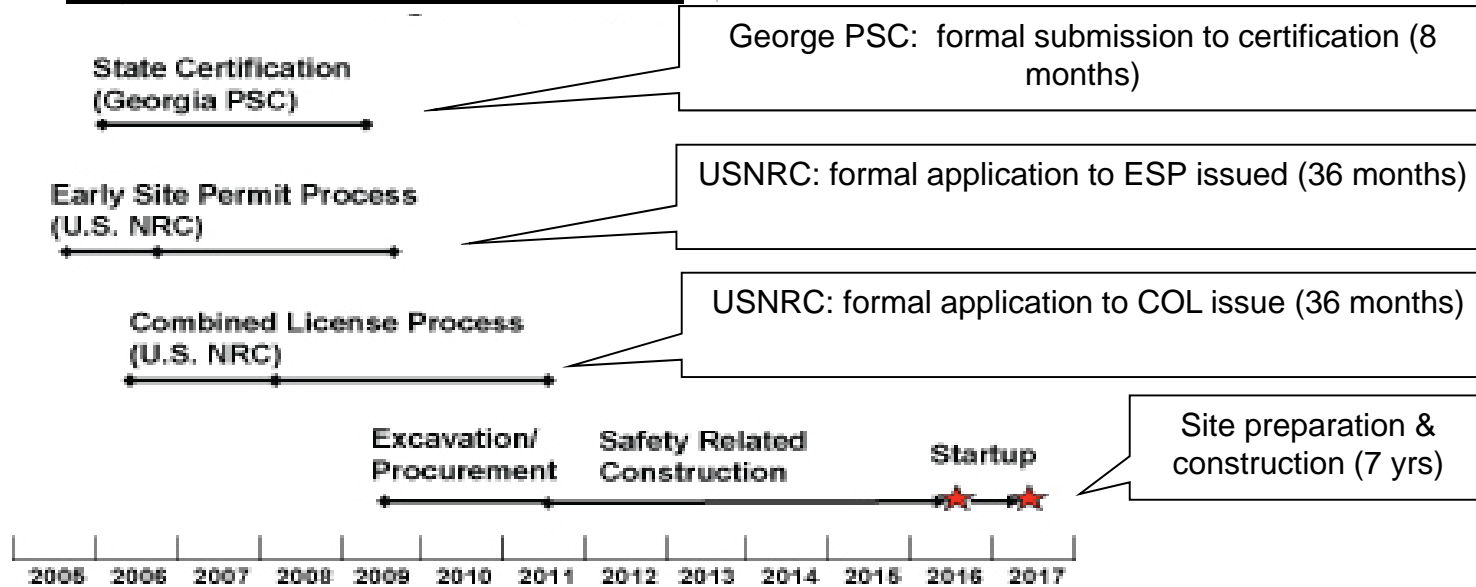


Source: NEI

# US – new build construction timeline



## Vogtle 3 & 4 construction schedule



Modular Assembly Building, Aug 2010



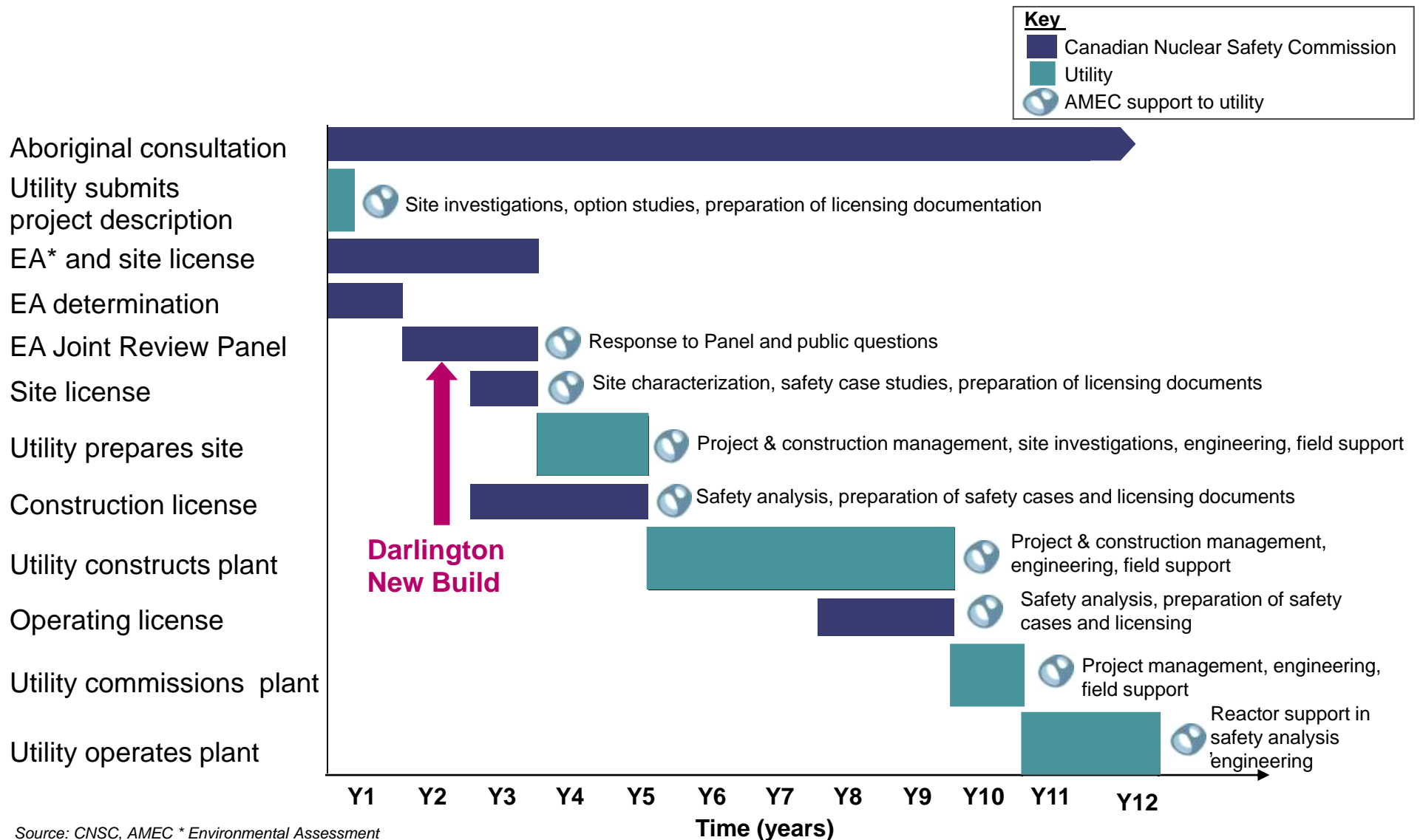
Containment Vessel Assembly, Aug 2010



Containment vessel plate on site, Sept 2010

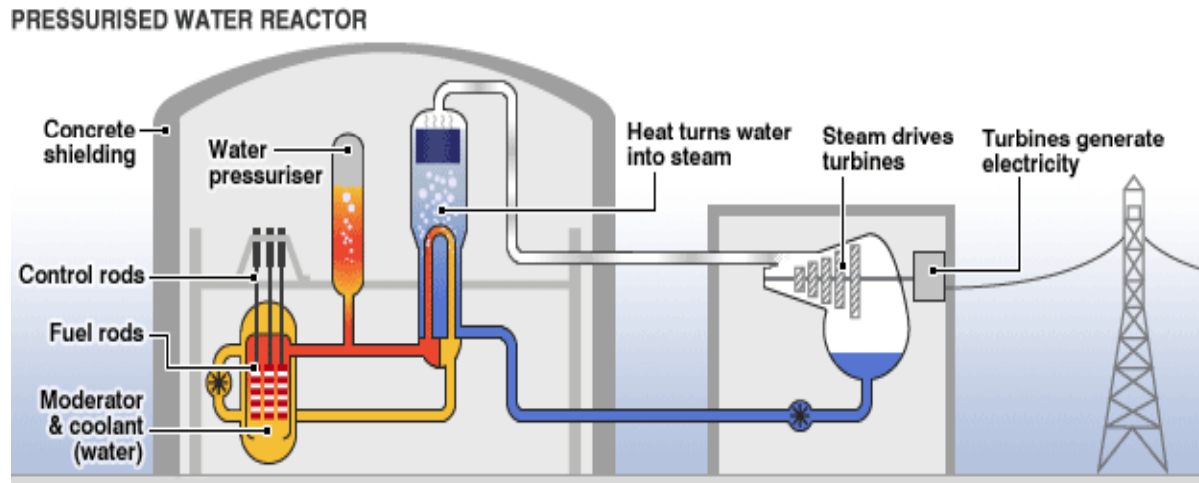
Source: NEI/Southern Nuclear Operating Co.

# Canada - new build licensing process



Source: CNSC, AMEC \* Environmental Assessment

# How a nuclear power plant works



**NUCLEAR ISLAND**

**CONVENTIONAL ISLAND**

Source: BBC news website

## Reactor types

- Nuclear Reactors are classified by several methods:
  - By type of nuclear reaction
    - Nuclear fission, nuclear fusion, radioactive decay
    - All commercial reactors are based on nuclear fission
  - By type of coolant
    - Pressurized water reactor (PWR); boiling water reactor (BWR); liquid metal cooled reactor; gas cooled reactor
  - By type of moderator material
    - Graphite moderated reactors; water moderated reactors; light element moderated reactors
  - By generation
    - Gen. I reactor; Gen. II (most current nuclear power plants); Gen III reactor (evolutionary improvements of existing designs) Gen IV reactor (technologies still under development)

# Technology

**Diablo Canyon (PWR)**



- Nuclear fission reactors produce heat through a controlled nuclear chain reaction in a critical mass of fissile material



**Superphenix (FBR)**



**Igana Verde (BWR)**



**Ignalina (RBMK)**



**Torness (AGR)**



**Sizewell A (Magnox)**



**Quinshan (CANDU)**

### Current reactor designs



AP1000



EPR 1000



ACR 1000



ASBWR/ESBWR



ASBWR/ESBWR

Russia

VVER

Korea

KNP 1400



**Samir Brikho** was appointed Chief Executive of AMEC plc in October 2006. Since then, Samir has led the transformation of AMEC into the leading supplier of high-value consultancy, engineering and project management services to the world's natural resources, nuclear, clean energy, water and environmental sectors. Prior to his role at AMEC, Brikho was a member of the Group Executive Committee of ABB Ltd., Switzerland, Head of the Power Systems Division and Chairman of ABB Lummus Global.



**Mike Saunders** is President of AMEC Power & Process Europe. Prior to joining AMEC, Mike was Senior Vice President of Strategy and Integration at Westinghouse following the acquisition by Toshiba. Immediately before this he was Senior Vice President for the Global Nuclear Fuel Business and has extensive experience of the nuclear industry having managed nuclear licensed sites in the UK, Europe and the US

## AMEC's team



**Charles Gordon** is currently Director, Corporate Development & Performance for AMEC nuclear in Canada. He provides strategic, quality assurance and day-to-day operations support. Charles has over 30 years experience in a variety of fields related to nuclear safety and business management.



**Sue Scholes** is Director of Communications for AMEC plc and has responsibility also for investor relations. Sue joined AMEC in 2007 from Brambles Industries plc, where she was Head of Investor Relations. She is a Chartered Management Accountant and has previously held finance roles for GKN, Esso and Cadbury Schweppes.



**Nicola-Jane Brooks** manages investor relations for AMEC plc. Since joining AMEC in 2006, Nicola spent a year working for the CEO, and was previously with the Corporate Strategy and M&A team.