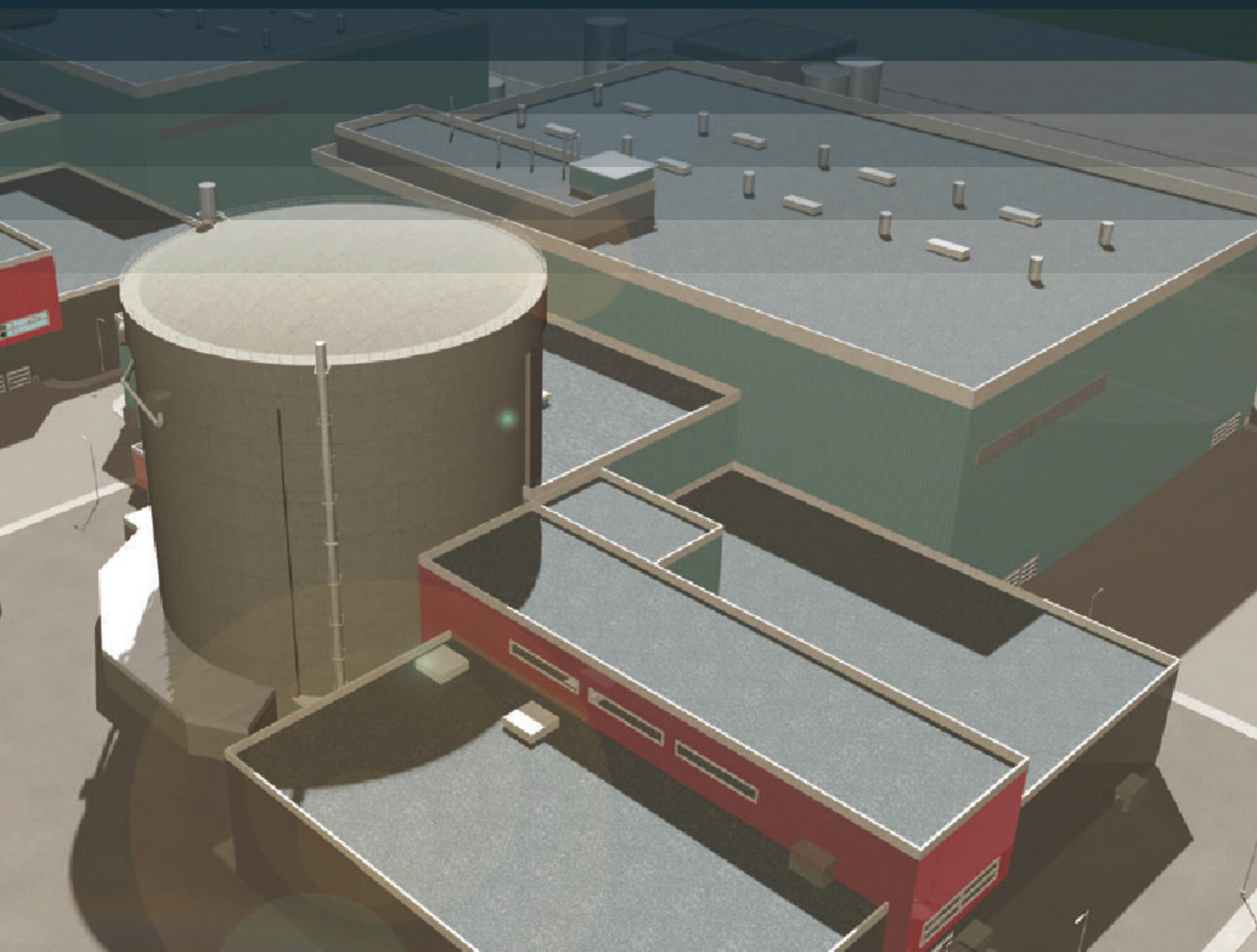


ENHANCED CANDU 6

Safe, dependable and clean energy solutions



The AtkinsRéalis Solution

AtkinsRéalis has over 70 years of global nuclear expertise, delivering nuclear technology products and full-service solutions to nuclear utilities around the world.

Our nuclear team brings its expertise to both the light water and heavy water reactor markets and as the steward of CANDU® nuclear technology, we solve technically complex challenges across the whole nuclear lifecycle from design and new build through asset management and from life extension and late life management through decommissioning and waste management.

Enhanced CANDU 6

Built on the proven success of CANDU® nuclear technology, and including the most recent safety and technical advances, the Enhanced CANDU 6® (EC6®) is a Generation III 700 MWe class nuclear power plant that builds on decades of successful commercial CANDU deployment with natural uranium fuel. The EC6 reactor is project ready for on- schedule construction and commissioning with high safety margins and reliable, economic and competitive electricity production. It is able to respond to daily cyclic load demands.

Ideal for minimizing costs required for grid and transmission enhancement, the EC6 benefits from the CANDU 6® experience of proven design, construction and operation. It has a heavy-water moderator and heavy water coolant in a pressure tube design and can be refuelled on power. CANDU reactors have some of the highest lifetime capacity factors among the world's reactors. In 2013, the EC6 successfully completed the third and final phase of the pre-licensing vendor design review by the Canadian Nuclear Safety Commission (CNSC). The CNSC has confirmed that there are no fundamental barriers to licensing the EC6 design in Canada.



Our Gen III Reactor Family

The EC6 is the first member of our Generation III reactor family. As such, it incorporates safety enhancements for Generation III reactor designs and meets the latest Canadian and international standards. It incorporates lessons learned from many years of operations feedback. It also incorporates lessons learned from event management at Fukushima.

The EC6 is the reference design for its sister product, the Advanced Fuel CANDU Reactor (AFCR), which has an optimized core for using recycled uranium or thorium fuel. The third member of the family, which also shares the same reference design, is a MOX-ready adaptation of the EC6, which has been optimized for mixed oxide fuels.

EC6 Generation III enhancements include:

- Extended plant life of 60 years
- Increased safety and operating margins
- Flexible fuel cycle capability
- Robust design against internal and external threats
- Inherent accident resistance
- Enhanced passive and active safety features for extended station blackout
- Enhanced core damage prevention and severe accident mitigation features by active and passive provisions

Designed with Customers in Mind

The EC6 incorporates strong operational utility experience from CANDU operators around the world. CANDU reactors use a unique technology designed to allow for on-power refuelling and online maintenance, and SmartCANDU® for equipment conditions monitoring.

Utilities in Canada, Asia, Europe and South America rely on CANDU technology to deliver higher lifetime capacity factors than competing technologies.

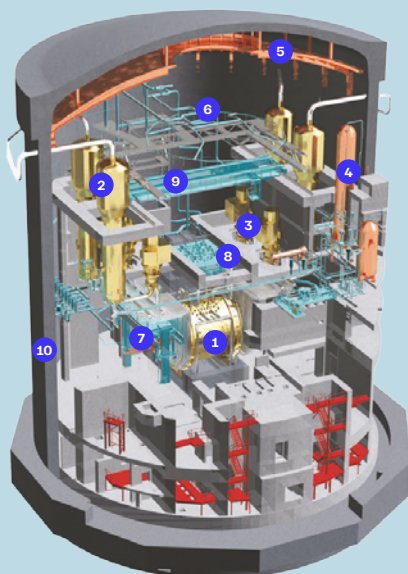
A Tradition of Continuous Innovation

The Generation III EC6 reactor builds on over 40 years of experience of delivering CANDU reactor solutions to a global operator base. The EC6 is ready for deployment to operators requiring high safety margins, on-schedule construction, high capability, economic competitiveness and operational reliability. The EC6 advances the CANDU design to a new level of performance, incorporating

fuel-related advantages while retaining the provenness of the reactor fundamentals. Features that benefit from this long track record of success include:

- Horizontal fuel channels
- On-power refuelling
- Fuel design that is simple, easy to handle and manufacture
- Separate low-pressure heavy water moderator
- Water-filled reactor vault
- Active and passive core cooling capability
- Two independent, fast-acting shutdown systems
- Inherent emergency cooling capability
- Accessible reactor building for on-power maintenance

The EC6 is designed for an average lifetime capacity factor of more than 92% for a 60-year operational life.



1. Calandria
2. Steam Generators
3. Heat Transport Pumps
4. Pressurizer
5. Reserve Water Tank
6. Low Flow Spray
7. Fuel Machine
8. Reactivity Mechanism Deck
9. Overhead Equipment Crane
10. Containment

Advanced Safety & Environmental Features

The EC6 incorporates the inherent safety features of globally deployed CANDU reactors that have safely operated for decades. The EC6 core design features fuel-related safety enhancements and safety performance required of Generation III reactors.

Consistent with the concept of defence in depth, the EC6 provides a series of inherent and engineered features, equipment and procedures to prevent accidents and to ensure appropriate accident mitigation. The EC6 maintains multiple physical and flexible barriers to confine radioactive material at specified locations and, ultimately, within the containment.

Following traditional CANDU reactor design practice, the EC6 incorporates two passive, fast-acting shutdown systems that are physically and functionally independent of each other. EC6 safety systems are designed to ensure reactor shutdown, remove decay heat and prevent radioactive releases during events and accidents. The principles of separation, diversity and high reliability apply to the design, including shutdown systems, emergency core cooling system and containment systems.

The traditional emergency water supply system has been upgraded to become the emergency heat removal system (EHRS), operating as the engineered safety feature for loss of heat sink events, such as a main steam line break. The EHRS can be used as an alternate heat sink for residual decay heat following postulated low probability accidents that render normal heat sinks unavailable. High degrees of redundancy within systems ensure safety functions can be carried out.

CANDU reactor design has inherent safety features as defences against severe accidents. A cool and low-pressure moderator provides a passive heat sink to absorb decay heat from the fuel for postulated conditions arising from beyond design basis accidents (BDBAs). A large volume of water in the calandria vault that surrounds the calandria vessel provides the second passive heat sink and can further slow down or arrest severe core damage progression.

The EC6 design provides a dedicated severe accident recovery and heat removal system (SARHRS) to minimize the risks of severe accidents.

Furthermore, the EC6 design also provides a dedicated severe accident recovery and heat removal system (SARHRS) to minimize the risks of severe accidents. This system, which includes gravity-driven, passive water supply lines and a pump-driven recovery circuit, is designed to arrest and contain any severe core damage within the calandria vessel and ensure that the containment integrity is maintained following a BDBA. The fixed pump-driven recovery circuit is backed up by the capability to connect emergency mobile equipment.

For security and physical protection, the EC6 design encompasses the required response to potential common mode events, such as fires, aircraft crashes and internal and external threats. CANDU reactor operation results in very low emissions, minimizing environmental impact.

Fuel

The EC6 uses natural uranium as fuel, permitting fuel cycle independence and avoiding complex issues of enrichment. Using natural uranium increases a country's energy independence, as fuel can be manufactured locally. Technology transfer for localizing fuel manufacture is simple and has been achieved very successfully in a number of countries.

CANDU fuel is safe, technically capable, economical and reliable. Dependable CANDU fuel fabrication capability is being delivered locally to operators across the globe.

Track Record of International Success

The last seven CANDU reactors have been built ahead of or on schedule and ahead of or on budget – the best track record of any nuclear vendor in the world. We are backed by a strong Canadian and international supply chain that has helped deliver successful CANDU reactor projects to our global customers.

Each twin reactor EC6 build saves up to:



13 million

tonnes of CO₂ emissions/year
when displacing **traditional coal**

Up to



6 million

tonnes of CO₂ emissions/year
when displacing **natural gas**

In 2013, the EC6 reactor successfully completed its third and final pre-licensing vendor design review by the Canadian Nuclear Safety Commission, confirming there are no fundamental barriers to licensing the EC6 design in Canada.



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