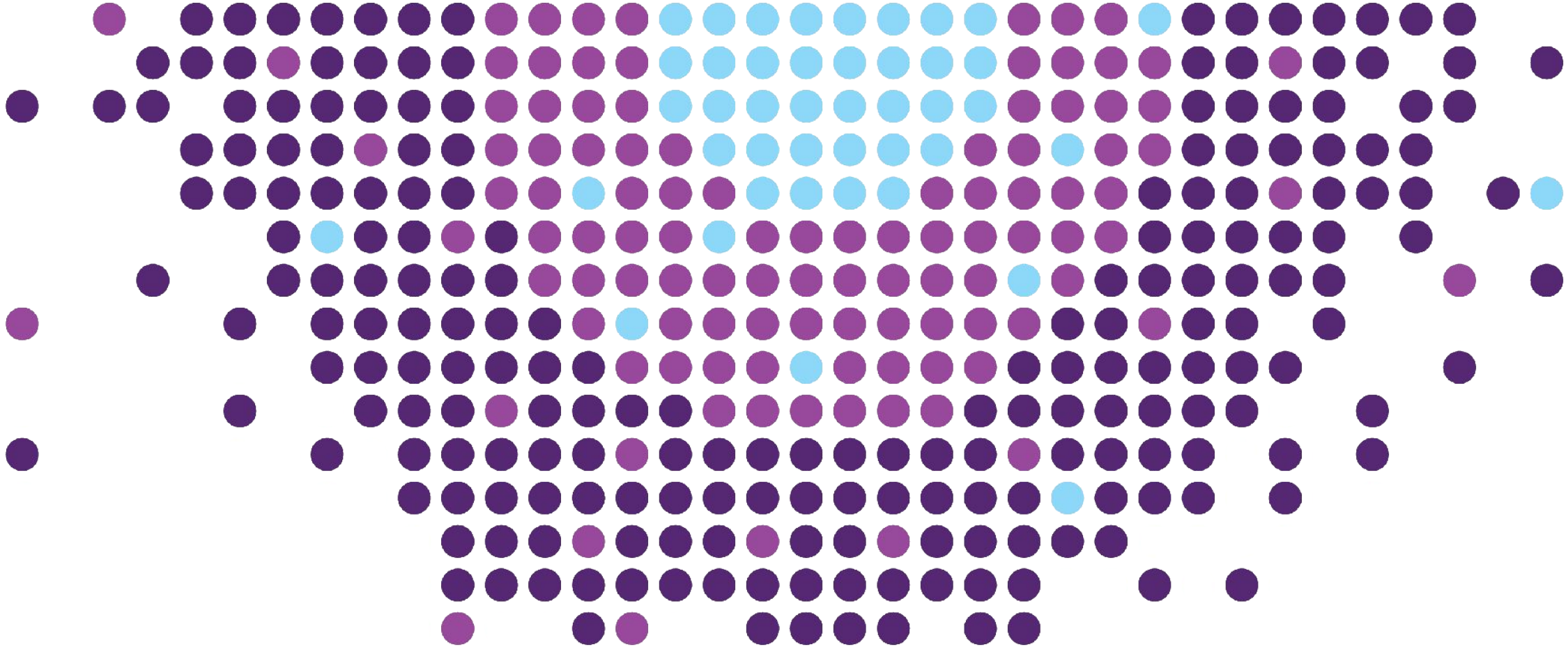

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Belgian Nuclear Research Centre

Pioneering Sustainable, Low Carbon High Value Molecule Production with a Gen IV Lead-cooled AMR

The LFR programme in Belgium

At Europe's heart

Our Belgian Nuclear Research Centre is based in Mol and Brussels. Our pioneering research is **internationally renowned**

At the forefront of progress

In 1952, we started to explore the possibilities of nuclear science and applications that could **significantly change the world**

Mirroring societal needs

- Climate change
- Circular economy
- Fight against cancer

Innovative nuclear energy production systems
Lead-cooled Small Modular Reactors (SMR)

Small
allows a flexible power generation for a wider range of users and applications

Safe
has increased passive safety thanks to the use of natural flow or gravity of the coolant

Less
reduces long lived radioactive waste production thanks to Lead technology

Better
has the advantage of increased fuel resource utilization

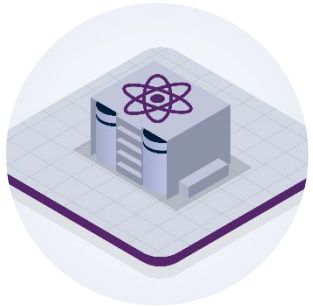
SMR-LFR Strategic Programme

Programme structure, scope and timeline

On 20 July 2023, the Council of Ministers approved the work plan (5 years) for the development of SMR LFRs including in total 39 deliverables

SMR 1
Technology

Establish the **conceptual design**, perform the **pre-licensing** and execute the **support R&D**



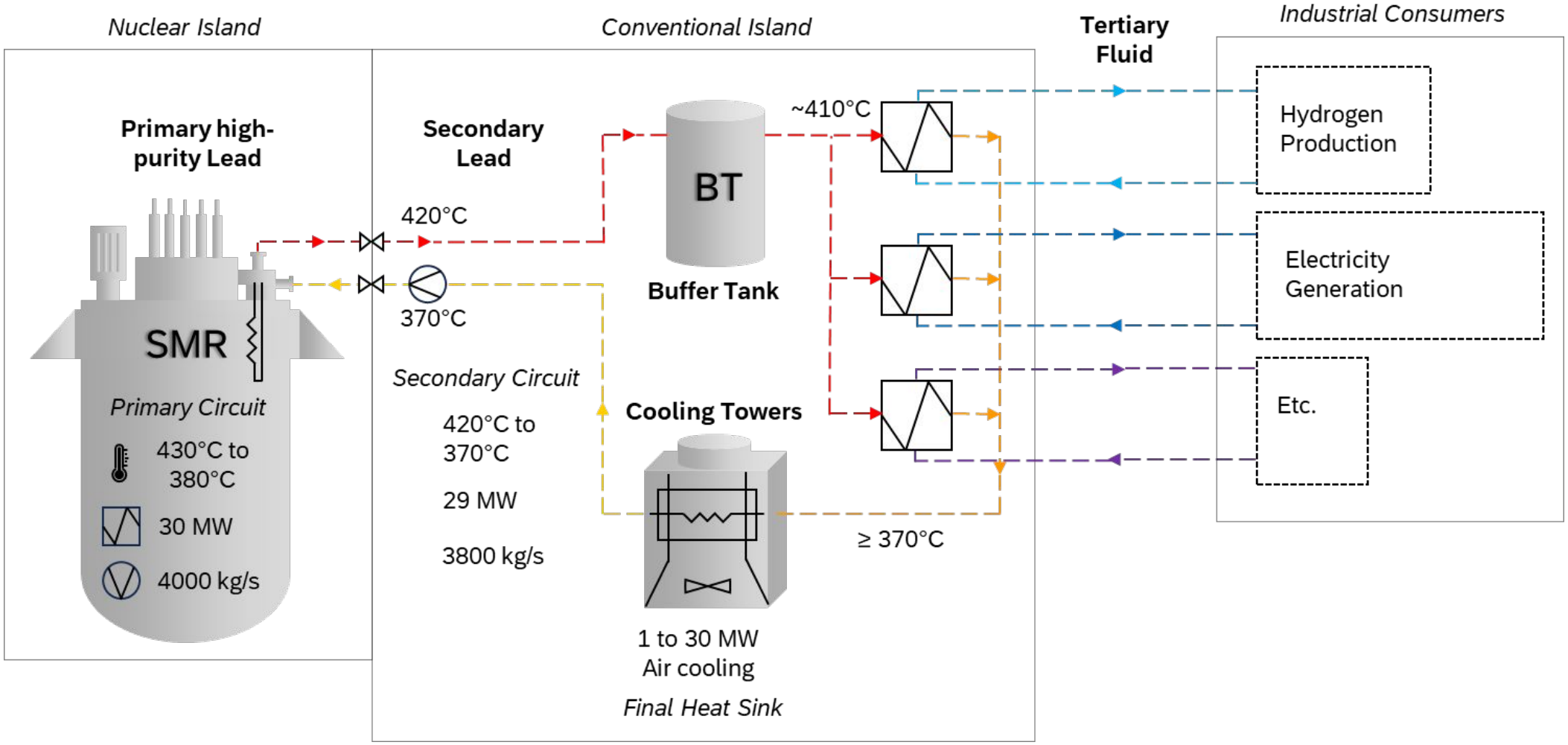
SMR 2
Industrialization

Enable the industrialization of SMR-LFR: facilitation of a **supply chain**

SMR 3
Integration

Perform studies for the integration of SMR-LFR systems into the Belgian **energy mix**

The LEANDREA Reactor



Sustainable, Low-Carbon High-Value Molecule Production

A dual challenge for Belgium

01

Decarbonising industry at unprecedented scale while keeping / restoring competitivity

02

Strategic security of energy and raw materials

- Geopolitical instability increases the urgency of strategic autonomy
- Belgium' industrial context makes these challenges more complex than elsewhere in Europe

An exceptional industrial profile — with matching needs

Belgium

One of the most industry-dense regions in Europe.

Sectors

Large presence of (petro-) chemical industry, refining, process and materials industry, logistics and transport.

24/7

Stable baseload power, process heat and molecular feedstock required.

Three pillars under pressure

01

Competitiveness

High energy costs and ETS pressure pose investment risks versus other regions and countries.

02

Strategic autonomy

Dependence on imported energy and molecules, geopolitical exposure.

03

Climate

Large industrial emissions and hard-to-decarbonise processes.

Why today's transition thinking is not enough

What are the today's system limitations?

Renewables are essential, but intermittent and limited	Electrification has physical limits in heavy industry	Hard-to-abate sectors (aviation, cement, steel…) require H_2 and CCU	Importing molecules displaces the problem — it does not solve it structurally

Integrated nuclear production of molecules

SOURCE

Lead-cooled AMR

High-temperature, low-pressure, modular reactor delivering both electricity and process heat.

OUTPUT 01
Carbon-free power

Baseload electricity to the grid.

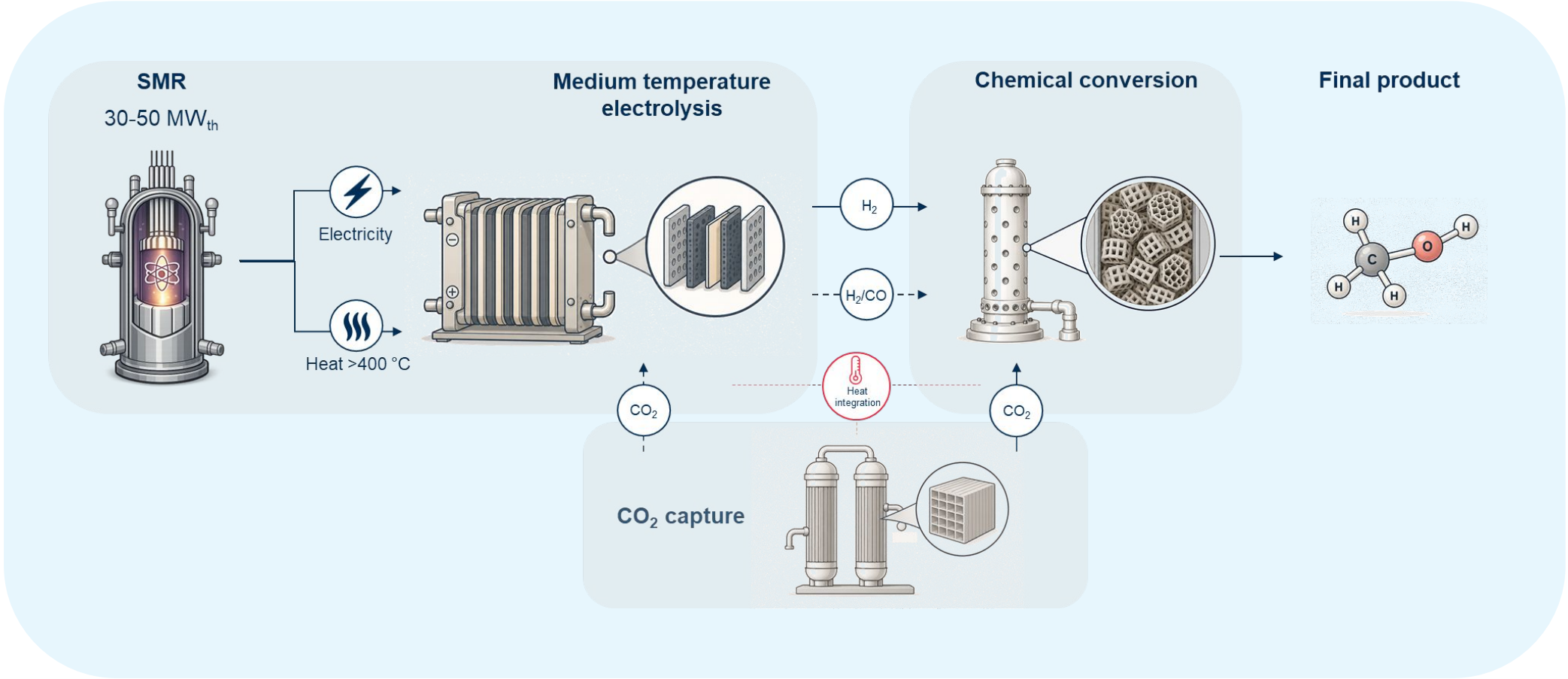
OUTPUT 02
Hydrogen and syngas

High-efficiency H_2 and/or syngas via process heat.

OUTPUT 03
Methanol & derivatives

CO_2 conversion into circular molecules.

AMR for molecule production



Societal value

Not merely a technology project — a strategic infrastructure choice.

Reinforces climate policy, industrial competitiveness and strategic autonomy at once

Strategic, unique infrastructure choice — not a single-technology bet

Anchors Belgium as frontrunner in the emerging European SMR alliance

Why a lead-cooled modular reactor

High outlet temperatures (±400–550 °C) suited to industrial applications

Inherent safety: low/atmospheric pressure and stable coolant

Modular construction enables co-location near industrial clusters

Low water demand — fits the Belgian context

Closed-cycle operation: efficient fuel utilisation, less dependence on uranium, less radioactive waste

A manageable path towards industrial deployment

01

System analysis & TEA

PATHS2050 system analysis and techno-economic assessment as steering instruments.

02

Pilots

Pilot installations (ton-scale) at VITO and SMR demonstrator at SCK CEN.

03

Scale-up

Stepwise scale-up to industrial application (kton-scale) with consortium partners.

04

Decision gates

Industry engaged from day one; explicit go/no-go decisions per phase.

SCK CEN
Belgian Nuclear Research Centre

Foundation of Public Utility

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