

A conceptual image showing a green leaf inside a light bulb, symbolizing clean energy. The light bulb is lying on its side, and the leaf is positioned as if it's the filament. A bright light source is visible at the top, creating a lens flare effect.

Nuclitalia and the Italian framework for a new nuclear

6ht of June, UniBo

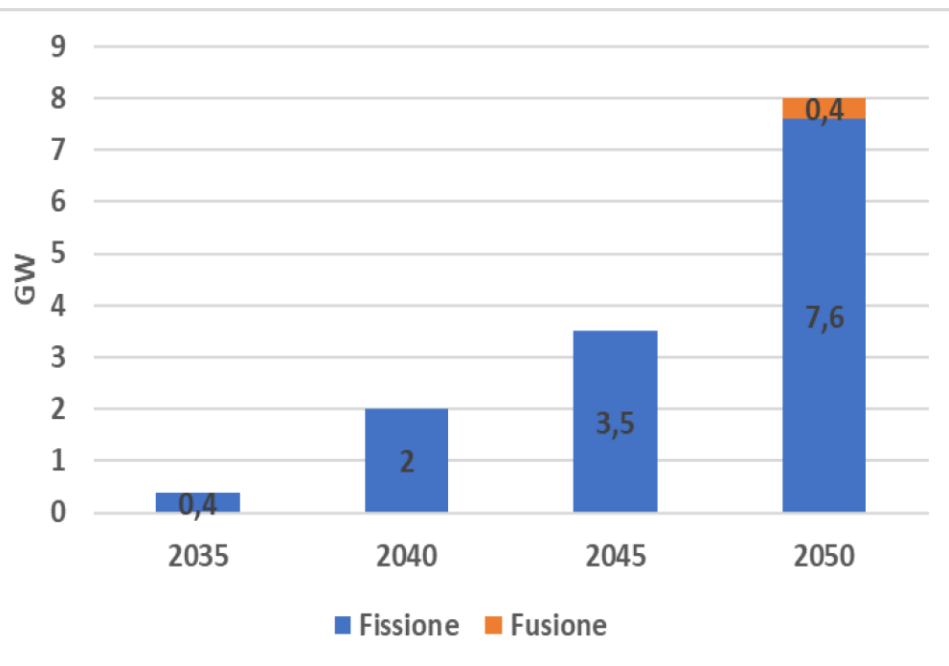
Nuclear Scenario in the update of «PNIEC 2024»



(Piano Nazionale Integrato per l'Energia e il Clima – *National Integrated Plan for Energy and Climate*)



PNIEC June 2024 – NUCLEAR «esplorative» scenario



HIGHLIGHTS

- **Nuclear Scenario** is just a «test one» that highlights the **potential role of Nuclear Energy** in «NET Zero 2050» ; **it is not included in the official plans** at this stage
- They set a «**conservative nuclear scenario**» of «**8 GW**», **11% of total energy demand**: this is **half of the value** of what would be considered profitable by the model itself (**16 GW, 22%**).
- **Nuclear Scenario (8 GW)** would **reduce use of natural gas** (from 11,5 to 4 TWh) and **bio-energies** (from 12,5 to 6 TWh)
- It considers that 1,3 GW out of the 8 GW would be used as co-generative mode (**16 TWh** of thermal energy for industry needs)
- **Nuclear scenario is quite challenging** for :
 - First SMR in 2035
 - Growing rate (8 GW in 20 years)
- Nuclear scenario get to Net Zero targets with **17 Billion € savings** in **comparison with scenario without nuclear**

NEWCO – A systemic approach to master the Italian nuclear program...

Ownership

- ENEL (51%)
- Ansaldo (39%)
- Leonardo (10%)

Core activities

- Project requirements
- Technology selection
- Pre-qualification program
- Pre-Nuclear Safety Assessment
- Site screening
- Business model and scenarios
- Partnership & Financing Model

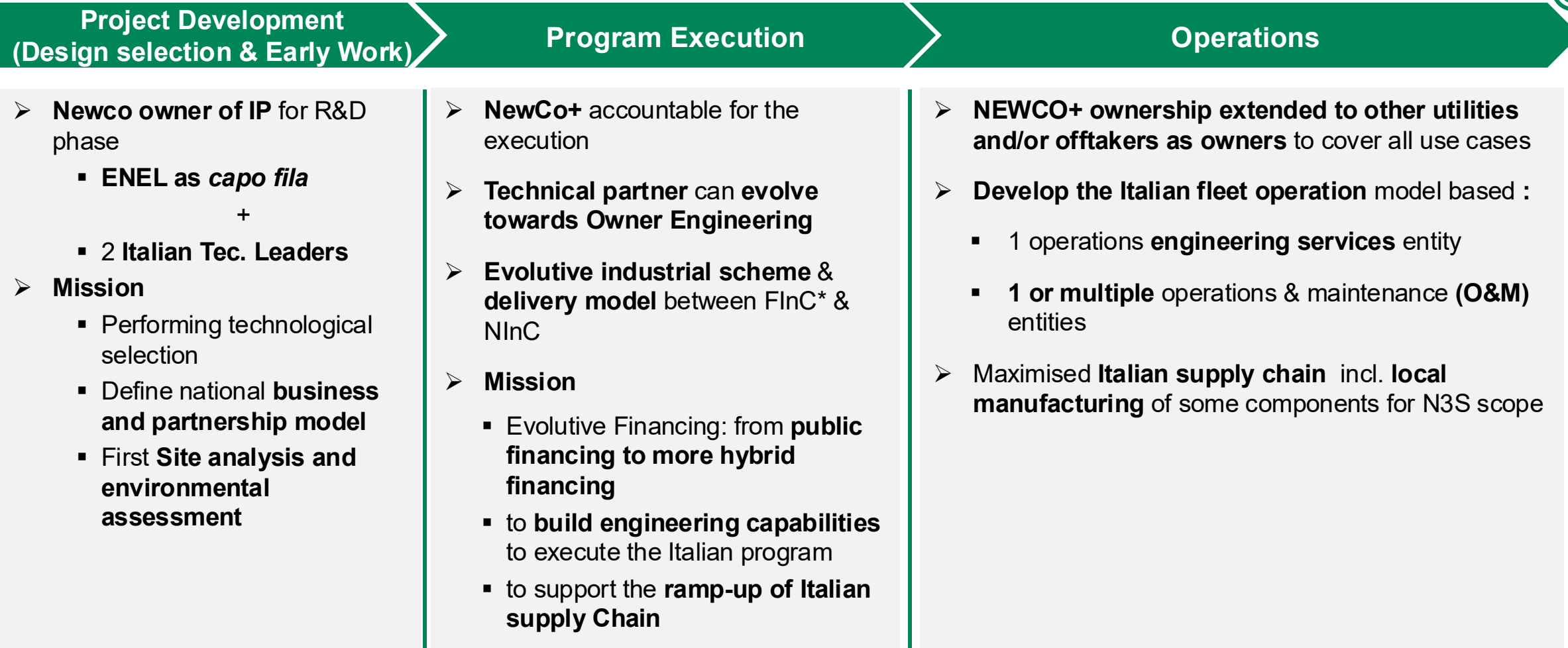


Mission

- Selecting Technologies for Italian ecosystem (technical, economics, Industrial)
- Italian supply chain readiness for the First-in-the-country Nuclear reactor

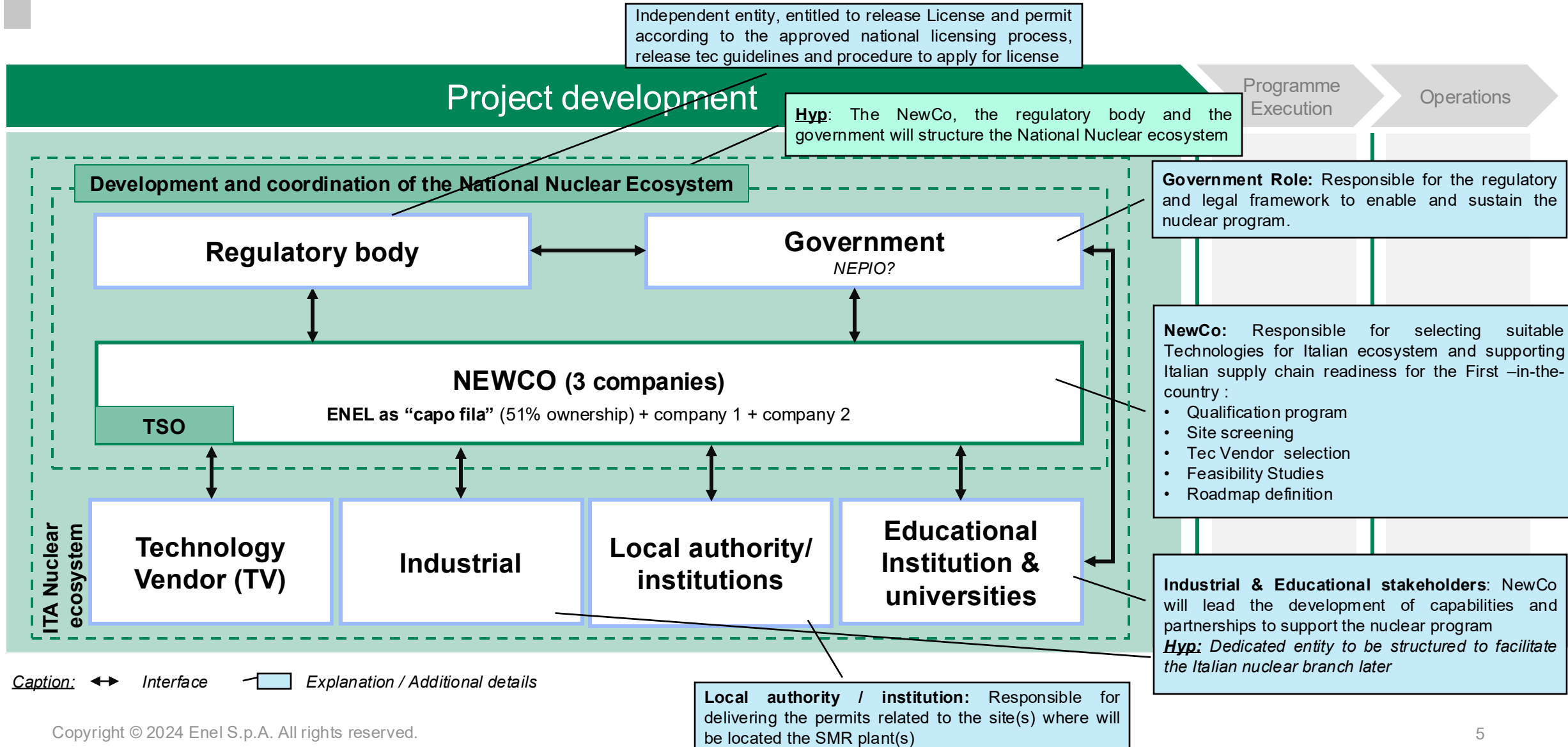
...with an evolutive approach and open organization...

FINAL TARGET 



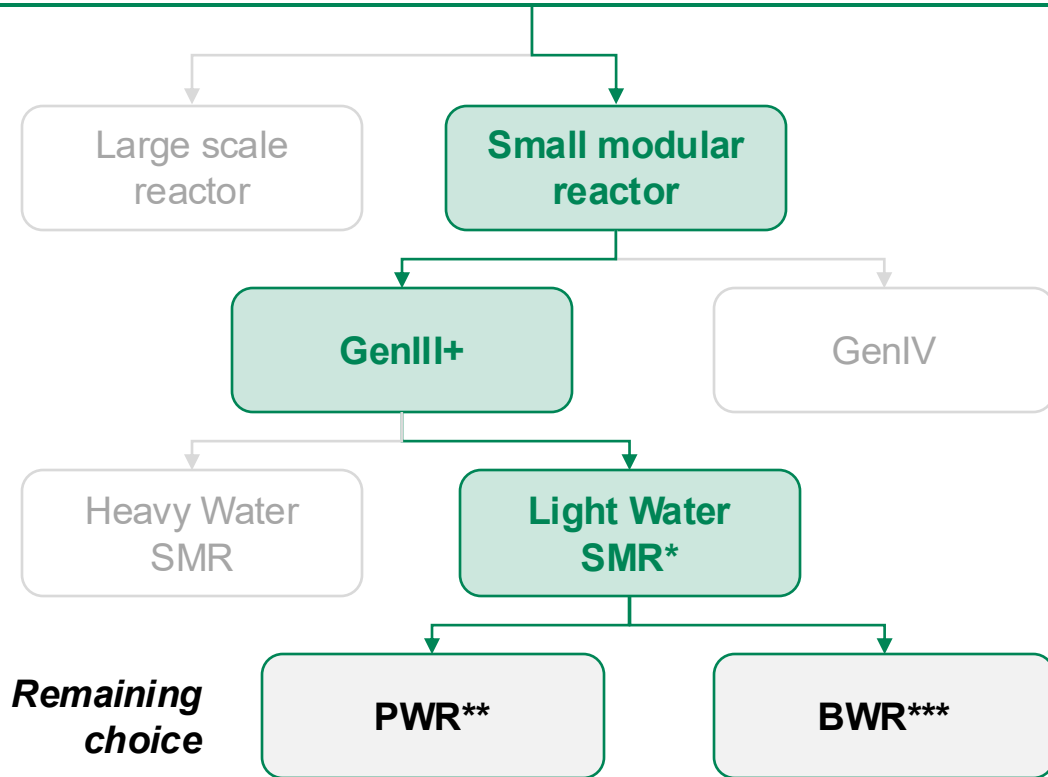
* FInC – *First-in-the-Country*

...and interfaces to develop National program



Assumption: LW-SMR is the preferred technology for the Italian target as per PNIEC 2024

Which technology for the Italian nuclear renaissance ?



Remaining choice

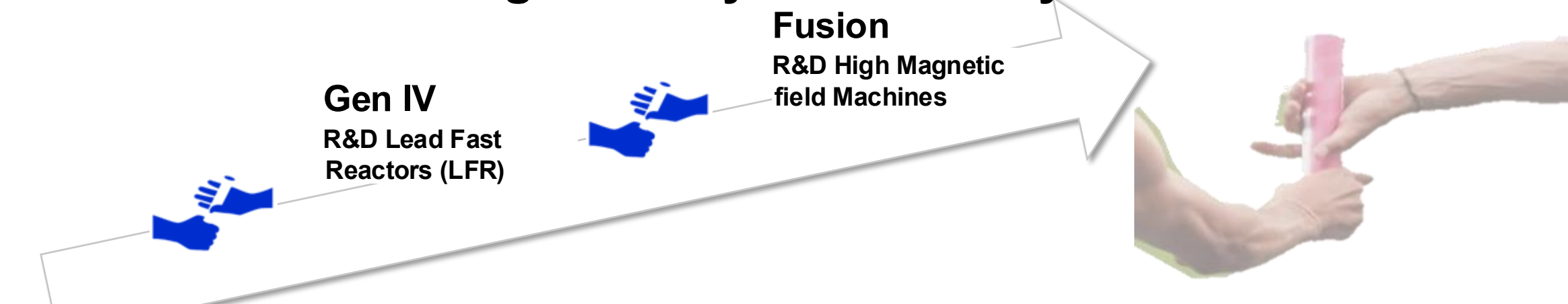
Rationale

- Higher acceptance
 - Lower upfront capital per unit
 - Easier integration to the grid
 - Reduced construction time
- Higher TRL
 - Proven technology
 - Mature and available design documentation
- Technology rarely adopted in EU
 - No O&M experience in ITALY for heavy Water reactors
- Load following capability
 - CAPEX/OPEX

*TRL: Technology Readiness Level
 **Pressurized Water Reactor
 ***Boiling Water Reactor

Next step: perform a technical, economical and industrial **due diligence** of the shortlisted technologies as part of the **next programme phase**

Our vision: technological relay and maturity level watch



SMR III+ (LWR type)

Overcoming the still unsolved challenges of a specific technology at a high level of maturity (SMR III+): **engineering development, supply chain qualification and confirmation of cost target (5 M€/MW at full capacity) in the next 3 years**, subsequent construction of a demonstrator prototype of a complete plant in Italy with a public-private financing mechanism (with an economic-technological-regulatory sandbox function)

1

Technological Screening

SMR (LWR) identification among the western ones: Nuward (France), AP300, Nuscale, BWRX (USA), Rolls Royce (UK)

2

Technological / Commercial Partnership

Partnership agreement, technology transfer and commercial rights to the leading Italian industrial entity

3

Design to Cost

Co-development of some modules of the selected technology by the Italian industry (Security Systems, BOP), target 3-5M€/MW

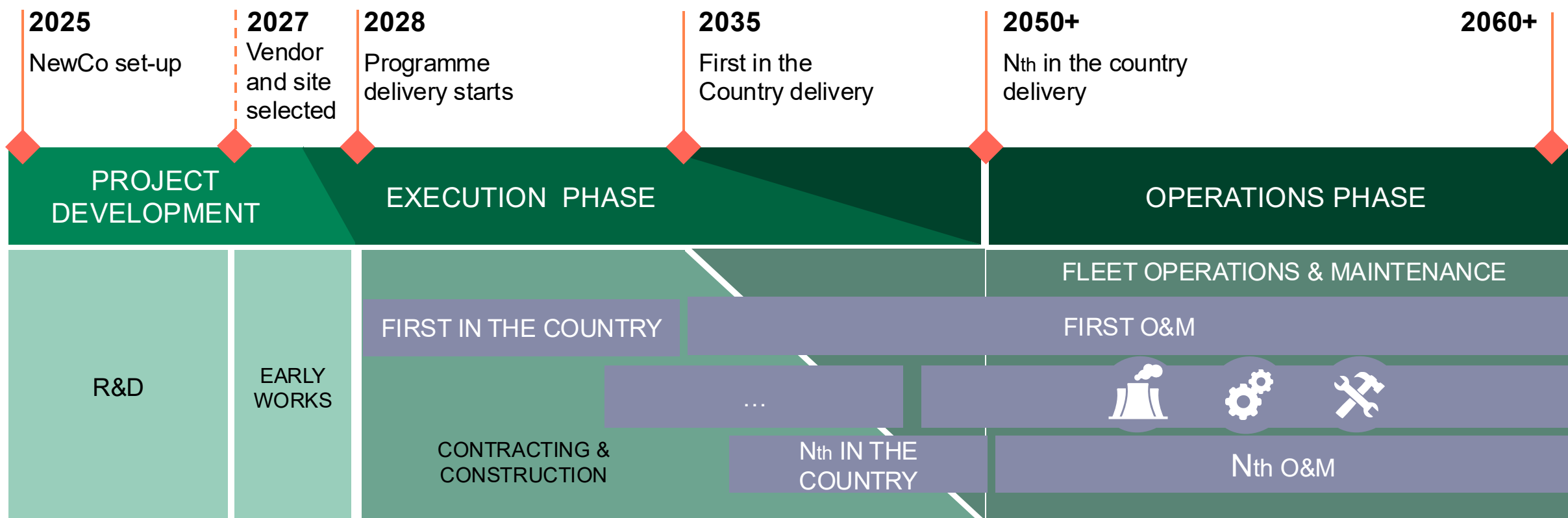
4

Licensing & Regulatory

Adequate definition of the regulatory system, in line with the new implementation criteria of the SMR and in collaboration with the European authorities

NEWCO - High level roadmap

Overall project according to PNIEC 2024 targets



Methodology adopted: EPRI - *New Build Nuclear Plant Development and Technical Assistance* and IAEA - «milestone approach»

We are working on a methodology to select Technology...



IAEA IRIS DATABASE

Sorting criteria

SMR with higher TRL
AMR with higher Italian R&D and supply chain involvement

Reference:

- Public data
- Official publication
- Vendor declaration



PROPOSED TECHNOLOGIES

Tec & Economics data compared by Topic area (A) e questions (D):

- A1) Italian system (D.n9)
- A2) Maturity grade (D.n14)
- A3) Funcionality (D.n12)
- A4) Safety approach (D.n3)

Reference:

- National safety Authorities database
- NDA and deep dive with Vendors
- Scientific publication/engineering docs



Ranking to identify best options for italian energy system

Final report available to start technical and economical due diligence with vendors

Ranking methodology based on

- EPRI - *New Build Nuclear Plant Development and Technical Assistance*
- IAEA – *Nuclear reactor technology assessment for near term deployment*

Let's talk about...



Preliminary studies

First run - Comparison by nuclear reactor type

Nuclear Technologies capability to meet the PNIEC 2024 targets



PNNS – Topic area



Technology



ENEL TOOL

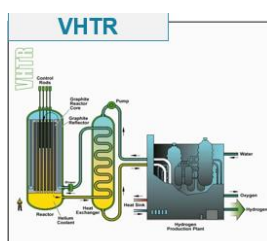
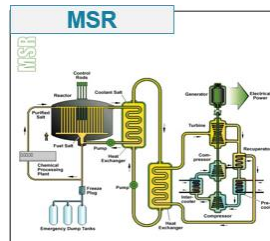
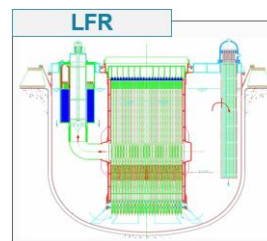
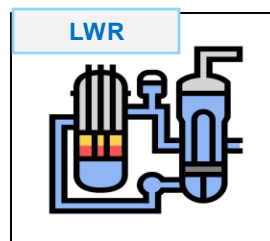


Outcome

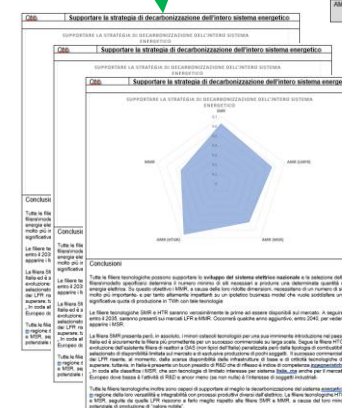
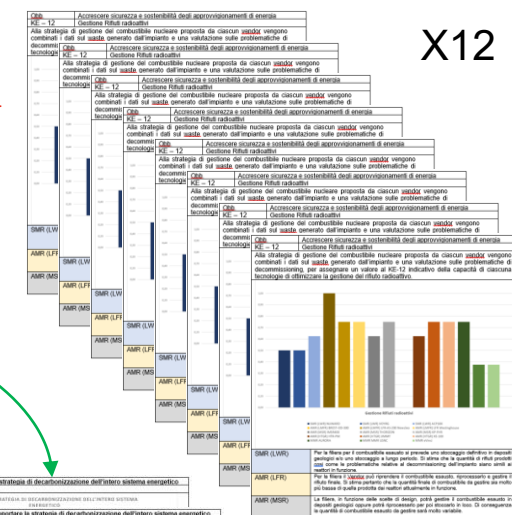
1° Support to the ITALIAN decarbonization strategy

2° support to a national system with high penetration of renewable sources

3° Support to the national strategy to improve resilience, security and sustainability of generation mix



- ✓ 15 Technologies
- ✓ 870 INPUTS DATA
- ✓ 58 KEY TOPIC
- ✓ 12 KEY ELEMENT
- ✓ 3 TOPICS
- ✓ IAEA Datasae
- ✓ NEA\OECD Dashboard
- ✓ IAEA Methodology



First run – Technologies ranking

ENEL and Ansaldo preliminary study – Technologies capability to meet PNIEC2024 targets



PNSS TOPICS



Selected Technologies



ENEL TOOL



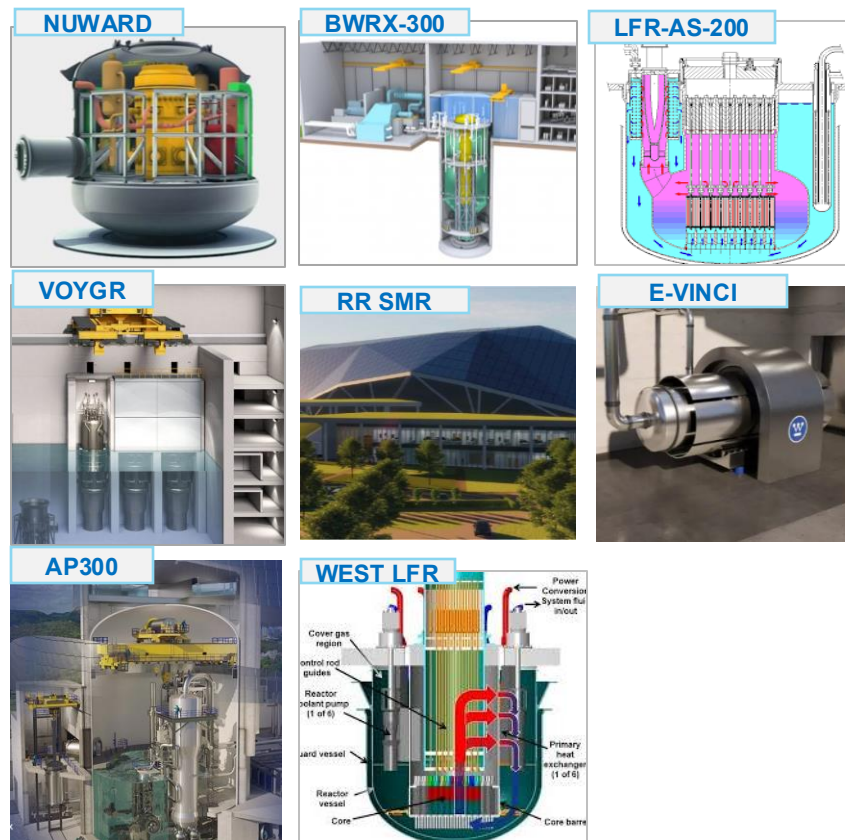
OUTCOMES

1° **Functionality**

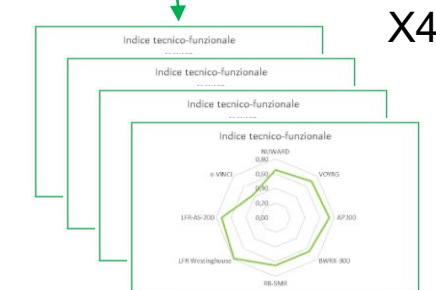
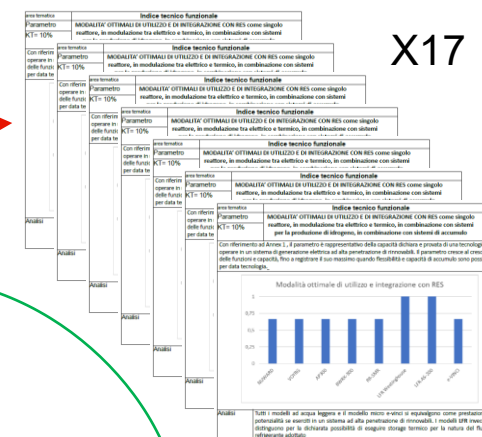
2° **Maturity grade**

3° **Follow –up and involvement of National industrial system**

4° **Safety approach**



- ✓ 8 Technologies
- ✓ 288 INPUT DATA
- ✓ 36 KEY TOPIC
- ✓ 4 PNSS TOPICS
- ✓ IAEA Datas
- ✓ NEA\OECD Dashboard
- ✓ IAEA Methodology
- ✓ EU SMR pre-partnership



SMR - Modeling SMR deployment into Italian system



SCOPE

1. **Breakdown of overall cost of SMR vs Large NPP** to highlight difference, uncertainties, margin of improvements, risks and lack of details
2. **Simulate SMR deployment in Italy** (Electricity production only) as per PNIEC 2024
3. **Analysized decarbonization effect**
4. **Report/positon papaer** for ENEL group decision-makers on Nuclear Option for the italian system

METHODOLOGY

1. **Collecting referenced studies on NPP cost** (CAPEX, OPEX, FUEL, decommissioning) and performing **sensitivity analysis vs capacity factor and WACC**.
2. **Modeling italian time-consuming daily curve** according to PNIEC 2024 target with and without SMRs.
3. **Analyze reduction of fossil fuel consumption with SMR**
4. **Adoption of Data drive approach** and analysis based on international validated methodology (es. PNIEC, IEA).

