



NUCLEAR SUPPLY CHAIN

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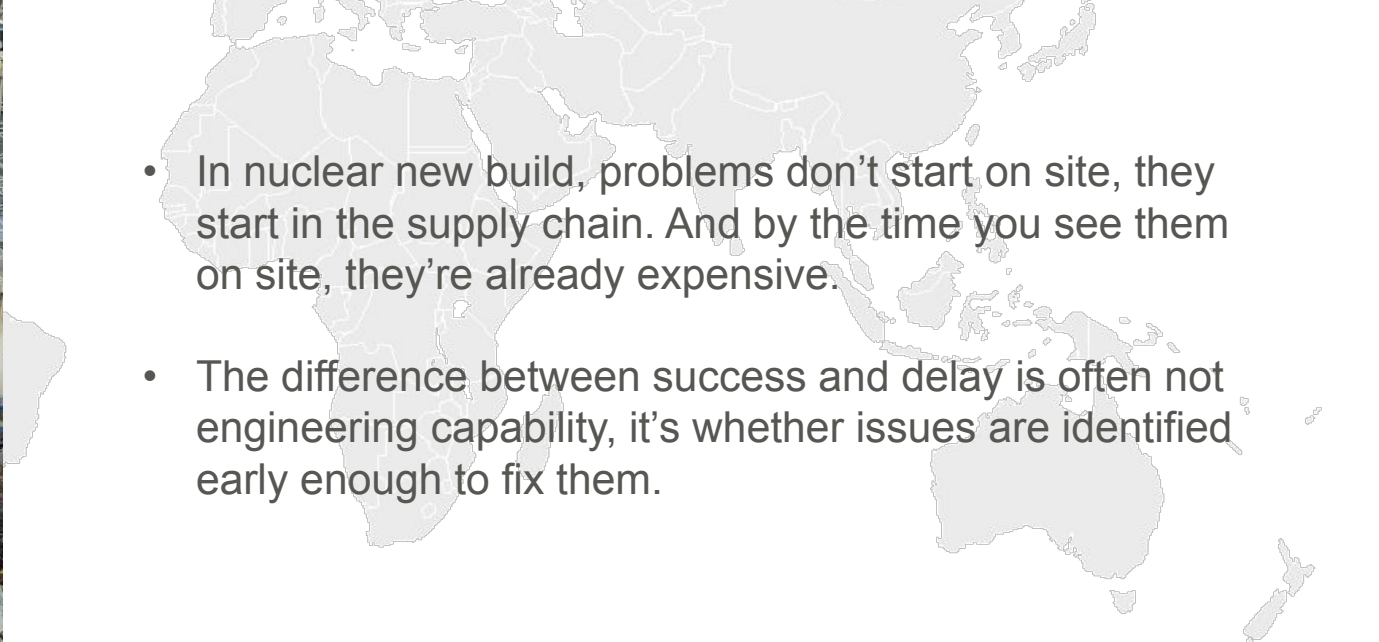


**BUREAU
VERITAS**

05/06/2026



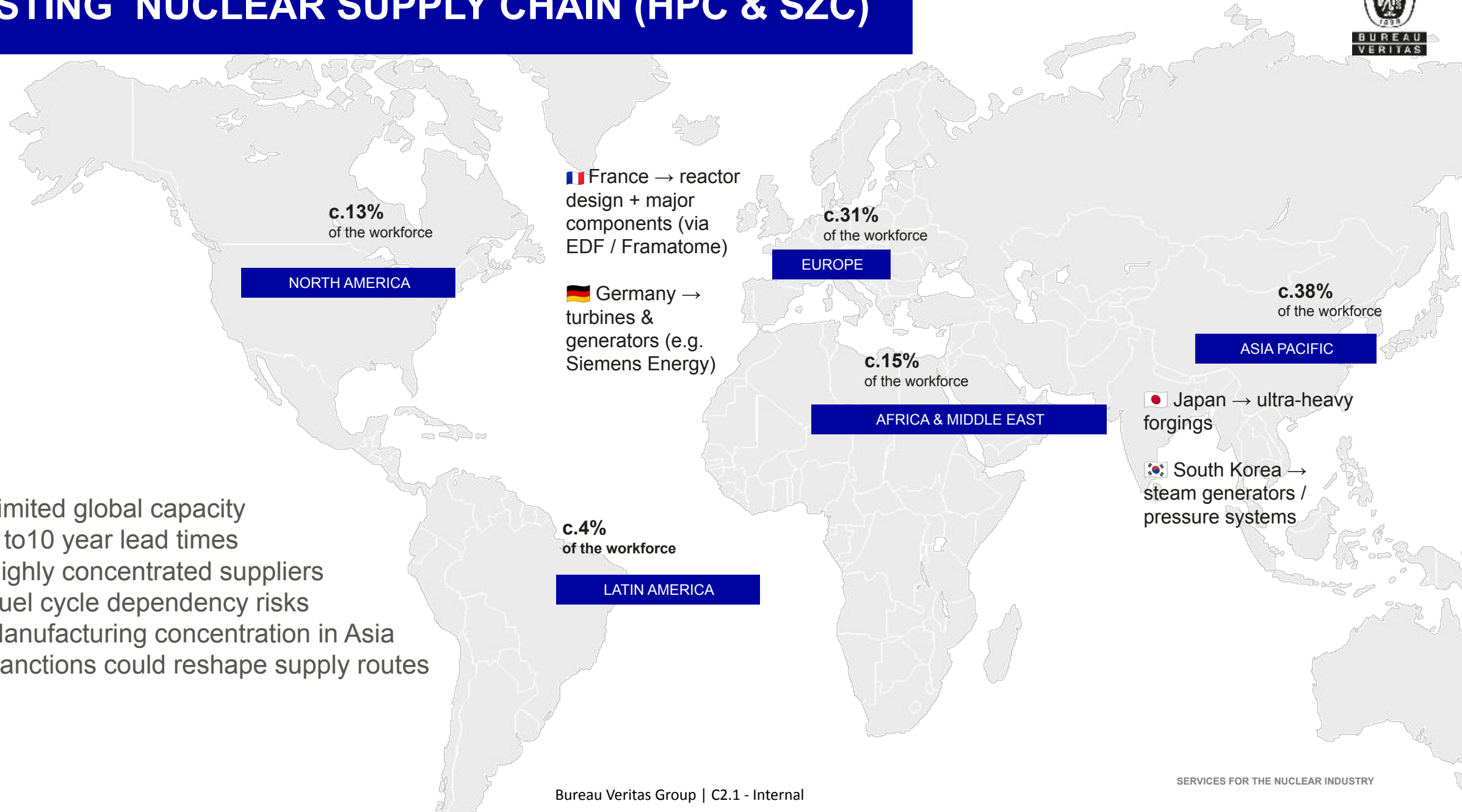
PROBLEMS DON'T START ON SITE



- In nuclear new build, problems don't start on site, they start in the supply chain. And by the time you see them on site, they're already expensive.
- The difference between success and delay is often not engineering capability, it's whether issues are identified early enough to fix them.

EXISTING NUCLEAR SUPPLY CHAIN (HPC & SZC)

- Limited global capacity
- 5 to 10 year lead times
- Highly concentrated suppliers
- Fuel cycle dependency risks
- Manufacturing concentration in Asia
- Sanctions could reshape supply routes



THE CHALLENGE: A GLOBAL, FRAGMENTED SUPPLY CHAIN

NUCLEAR SUPPLY CHAINS ARE:

- Global (forgings, valves, instrumentation, etc.)
- Multi-tiered (Tier 1 → Tier 3/4 suppliers)
- Highly specialised

KEY ISSUE:

Critical components are manufactured thousands of miles away from the project—and often outside the direct visibility of the project owner.

By the time a problem reaches site, it's no longer a manufacturing issue—it's a project delay.



WHAT HAPPENS WHEN IT GOES WRONG - 1

Olkiluoto 3 (Finland)

- First EPR project in Europe
- Originally planned: 2010 operation
- Actual: ~12+ years delay

Key issues:

- Poor quality control in supply chain
- Substandard components requiring rework
- Inadequate oversight of subcontractors
- Incomplete design at construction start

Evidence:

- Problems included non-compliant forgings and concrete issues
- Delays driven by planning, supervision, and workmanship failures

KEY MESSAGE:

Many of these issues were not design failures, they were execution and supply chain visibility failures



WHAT HAPPENS WHEN IT GOES WRONG - 2

Flamanville 3 (France)

- Original cost: ~€3.3bn
- Latest estimates: up to ~€19bn
- Delay: over a decade

Key issues:

- Manufacturing defects in reactor pressure vessel steel
- Large-scale welding defects (100+ welds needing repair)
- Late-stage regulatory interventions

Evidence:

- Steel anomalies and safety concerns in critical components
- Massive cost escalation and repeated delays due to rework

KEY MESSAGE:

These were not unknown risks -but issues were discovered too late



WHAT HAPPENS WHEN IT GOES WRONG - 3

V.C. Summer (USA, abandoned)

- Supply chain immaturity & QA breakdown

Key issues:

- Massive **quality issues, delays, and contractor failures**
- Construction halted after billions spent
- Root causes included:
 - Inexperienced contractors
 - Poor quality execution and planning

Evidence:

- Rigorous **supplier and contractor qualification**
- Early **capability audits (nuclear vs non-nuclear experience)**
- Stronger **oversight of engineering and fabrication processes**

KEY MESSAGE:

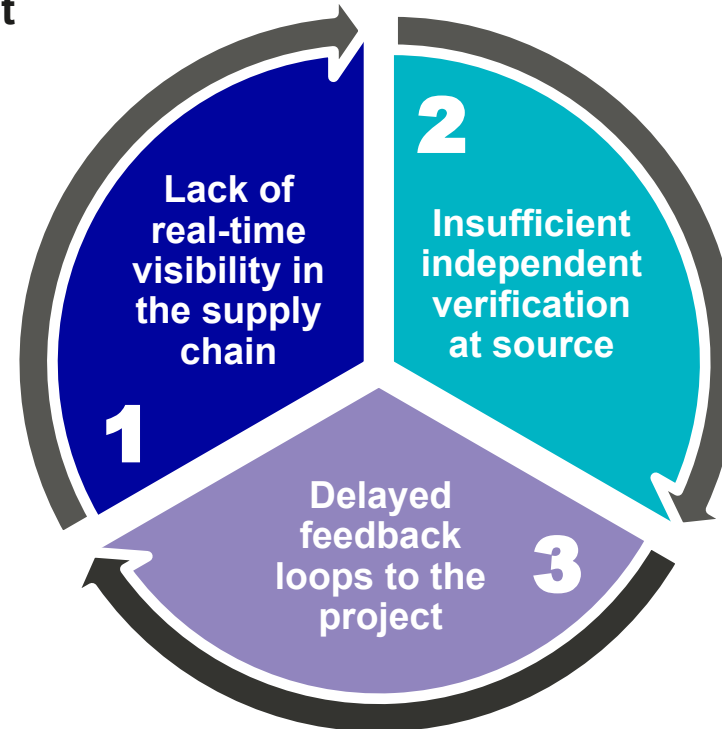
Using
non-nuclear-exper
ienced suppliers
without deep
oversight leads
to systemic QA
failure



THE ROOT CAUSE

These projects didn't fail because the industry lacks capability. They struggled because problems were detected too late—when they were hardest and most expensive to fix.

Three root causes:



REDUCING THE RISK

1. Manufacturing

- Have your inspectors located near manufacturing hubs worldwide
- Ability to deploy rapidly across regions

2. Early intervention

Inspection during:

- Material production
- Fabrication
- Assembly

Not just final acceptance

3. Speed of response

Issues identified days or weeks after occurrence - **not months later on site**

OUTCOME:

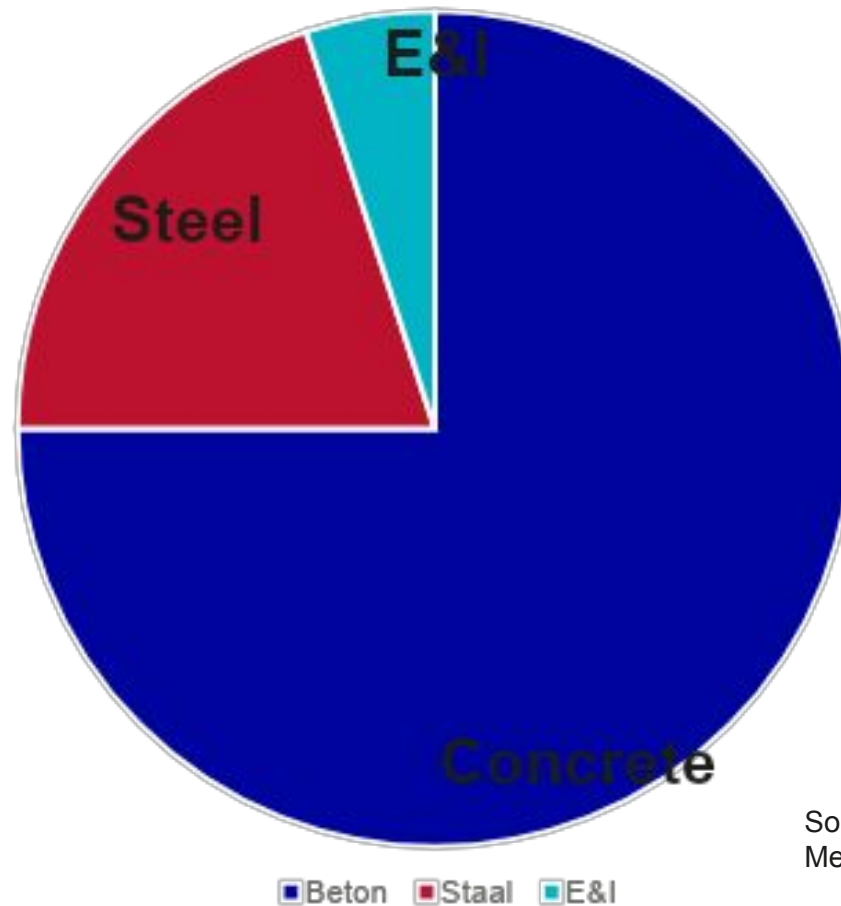
- **Reduced rework**
- **Reduced schedule risk**
- **Increased confidence for investors and regulators**



A NUCLEAR POWER PLANT

Percentage of material in a nuclear plant

Concrete	75%
Steel	20%
E&I	5%



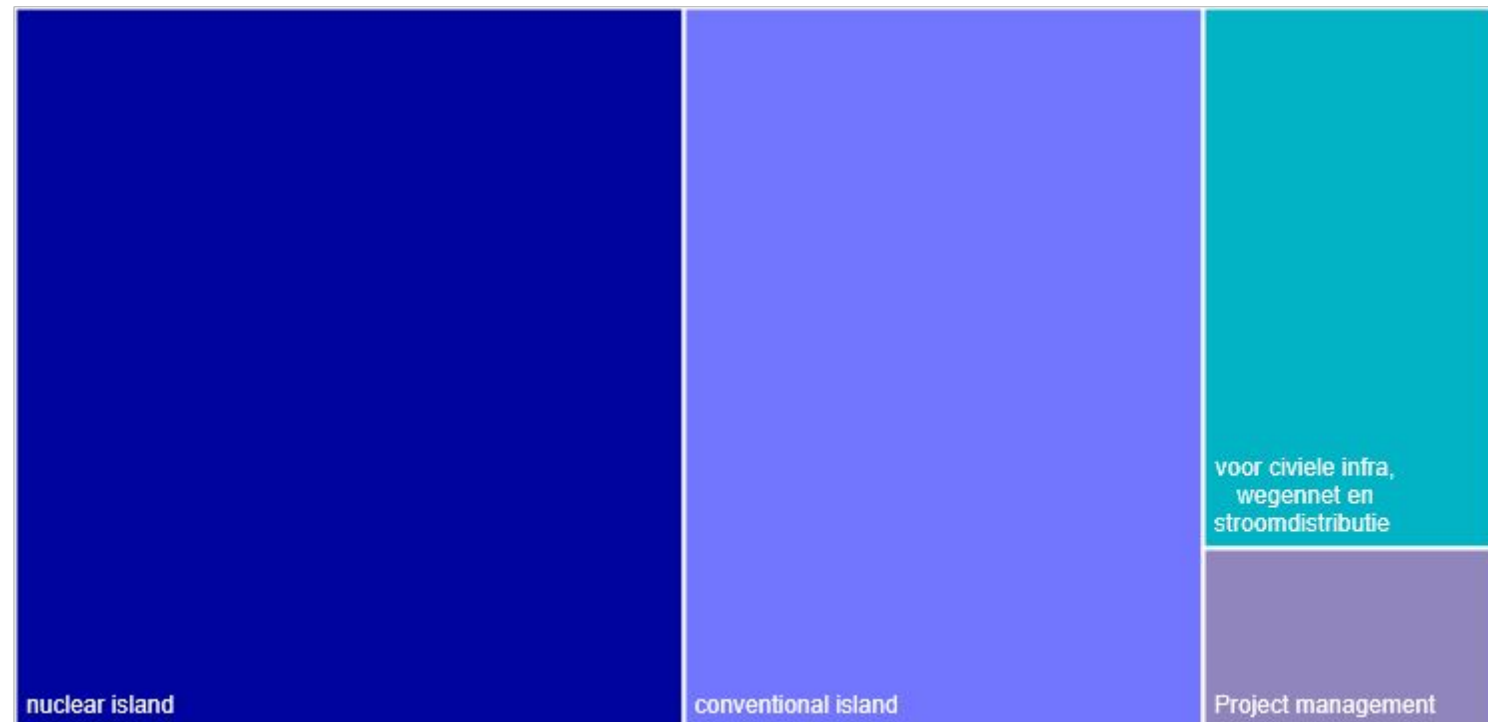
Source: Peterson, 2005
Metal And Concrete Inputs For Several Nuclear Power Plants

COST OF NPP

Cost per NPP part

■ nuclear island
 ■ conventional island
 ■ voor civiele infra, wegennet en stroomdistributie
 ■ Project management

Nuclear island	45%
Conventional island	35%
Civil, energy distribution, service roads	15%
Project management	5%



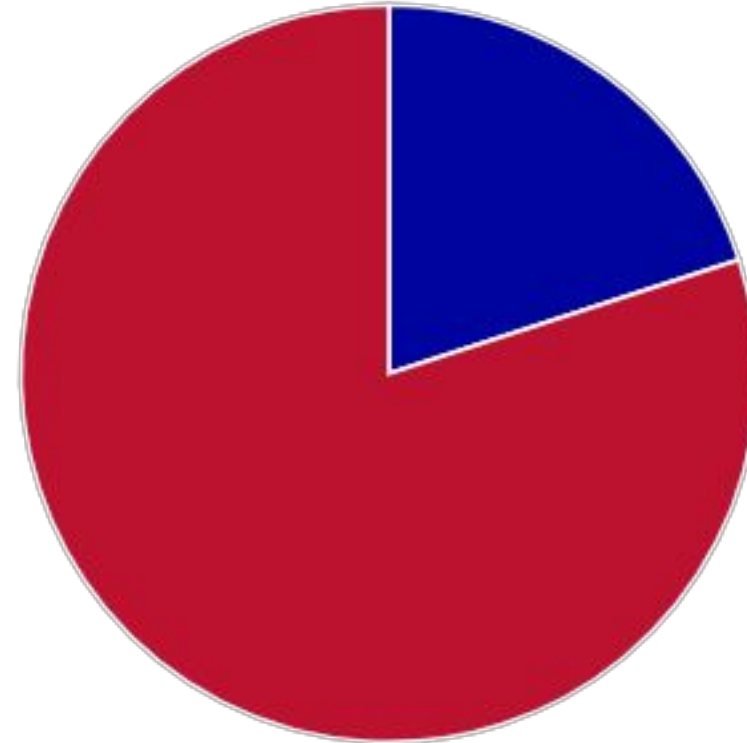
Source: OECD 2000
Reduction of Capital Costs of Nuclear Power Plants

GRADED APPROACH

Typically, 20–30% of all systems and components within a nuclear power plant fall into one of the ITSN categories (“Safety Class” or “systems important for safety”).

About 70–80% of the installations have no direct implication for nuclear safety and fall into a lower class; examples of these are office, transport, and auxiliary systems.

Safety classed Important for Safety Nuclear



■ Safety classed ITSN ■ Non nuclear

IMPORTANCE TO SAFETY (NUCLEAR)

Further differentiation within ITSN

Within the ITSN-classified systems, further subdivisions are often made:

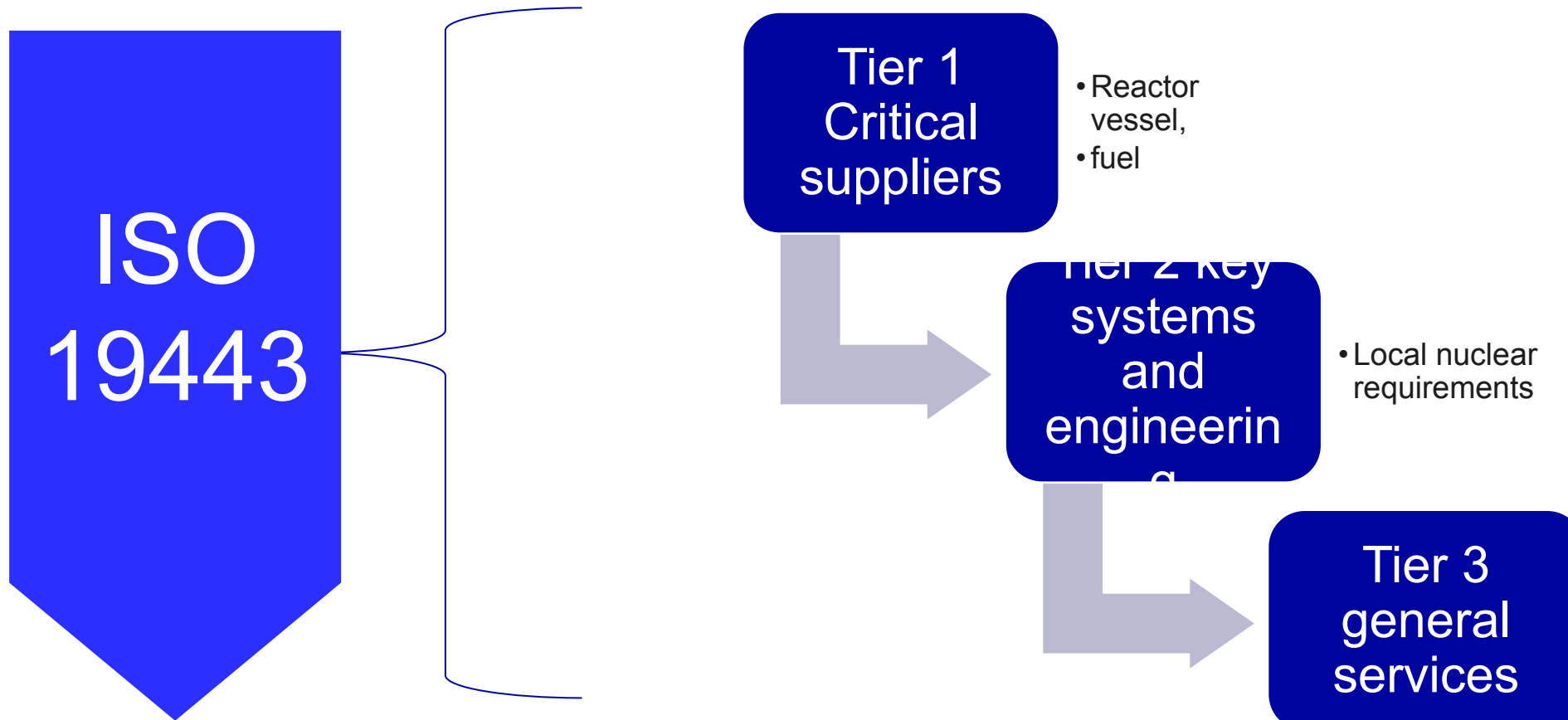
- Safety Class 1 (most critical for nuclear safety, such as reactor vessel and containment): 1–5%.
- Safety Class 2/3 (important but indirect/supporting): roughly 15–25% combined.
- Non-safety ("commercial grade" / not directly relevant to safety): ~75–80%.

Graded approach and ITSN

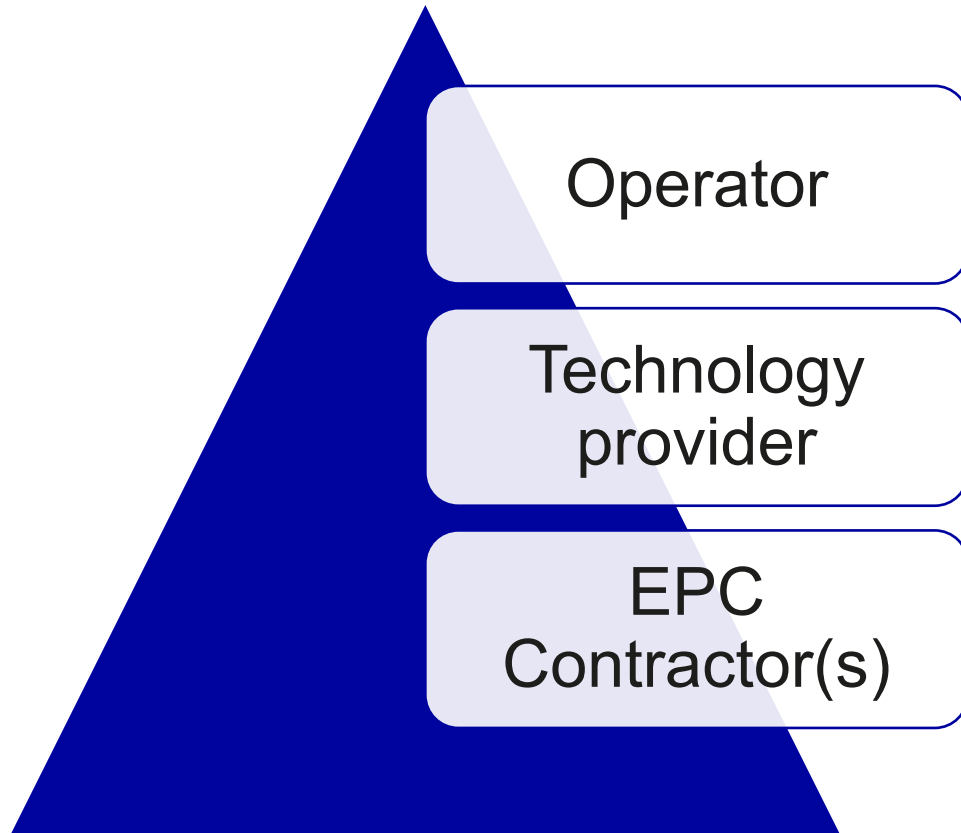
The higher the percentage of ITSN in a part of the project, the stricter the supervision, engineering requirements, and regulatory commitment for that part will be, in accordance with the "graded approach" philosophy. ITSN is therefore the leading factor in determining the extent to which an activity is subject to the most extensive nuclear supervision and quality assurance.

In summary: in an NPP, roughly 20–30% of all equipment and systems fall under ITSN, and for that relatively small volume, these determine the strictest requirements within the graded approach.

NUCLEAR SUPPLY CHAIN



THE REQUIREMENTS OF THE NUCLEAR VALUE CHAIN



Operator

The operator holds the license.

Technology provider

The supplier of the reactor vessel and the control system.

Engineering, Procurement & Construction contractor

Reactor building design, supply chain selection via graded approach

IAEA CORE COMPETENCE

IAEA core competence

- Nuclear safety & security competencies
- Engineering & technical competencies
- Regulatory & licensing competencies
- Project management & quality assurance



NUCLEAR SUPPLY CHAIN SUPPORT



BV GLOBAL INSPECTOR NETWORK



3,349

438 c.13%
of the workforce

NORTH AMERICA

1,065 c.31%
of the workforce

EUROPE

513 c.15%
of the workforce

AFRICA & MIDDLE EAST

1,291 c.38%
of the workforce

ASIA PACIFIC

132 c.4%
of the workforce

LATIN AMERICA

IN THE NUCLEAR & ENERGY TRANSITION

**WE ARE
THE
TRUSTED
PARTNER**

PRESENCE ALL ALONG THE LIFE-CYCLE



DESIGN



PROCUREMENT



CONSTRUCTION



EXPLOITATION



ASSET
MANAGEMENT



DISMANTLING



400+

Nuclear experts

160+ France / 100+ UK



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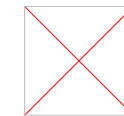
**Nuclear centers
of expertise**

France / UK / US
/ China



200+

Nuclear clients



Nuclear references in

20+

countries



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