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Research into the supply chain for the construction of nuclear power plants in Zeeland

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Annex A: Methodology

Annex B: International case studies

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List of Acronyms

ANVS – Authority for Nuclear Safety and Radiation Protection

BOP – Balance of Plant

BWR – Boiling Water Reactor

CI – Conventional Island

DoR – Division of Responsibility

FEED – Front-End Engineering Design

HSE – Health Safety and Environment

HVAC – Heating, Ventilation and Air Conditioning

IAEA – International Atomic Energy Agency

KCB – Kernenergie Centrale Borssele

KGG – Ministry of Climate and Green Growth

LNPP – Large Nuclear Power Plant

LTO – Long Term Operation

NI – Nuclear Island

NPP – Nuclear Power Plant

NSSS – Nuclear Steam Supply System

PWR – Pressurized Water Reactor

QA – Quality Assurance

SMR – Small Modular Reactor

VNO-NCW – Confederation of Netherlands Industry and Employers

Declaration of potential conflict of interest

The company Electrabel mentioned in this report is part of the same legal entity (Engie) as the employer (Tractebel) of some of the authors of this report. The inclusion of daughter companies of Engie in this report is based on objective and transparent criteria and does not represent any endorsement of their business by the authors.

No relationship exists between the employer of the other authors Technopolis and any of the firms identified in this report.

Summary (English)

This is the summary of the outcomes of a study on the supply chain for nuclear new-build in Zeeland. The study was commissioned by the Province of Zeeland, Impuls Zeeland and VNO-NCW Brabant-Zeeland and was conducted by Tractebel Engineering and Technopolis during the period July 2025 -and January 2026.

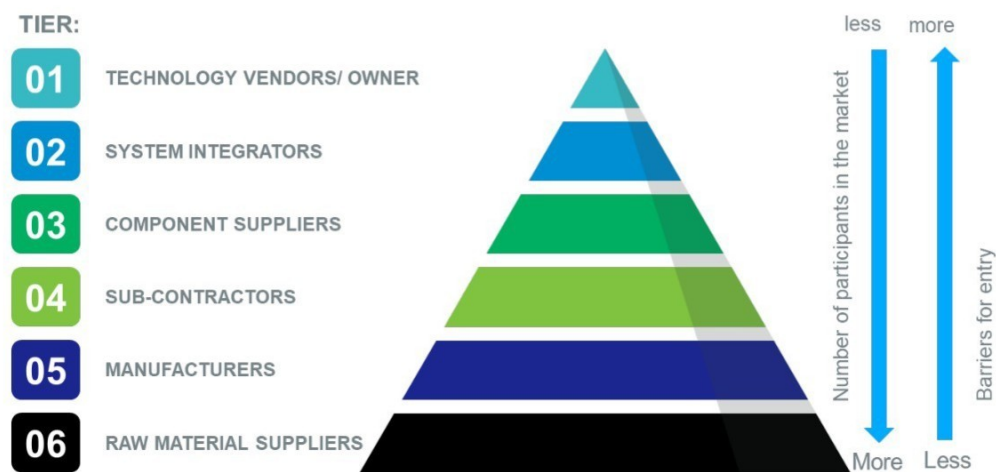
This study examines opportunities for Zeeland’s regional businesses in the context of the Dutch government’s plan to construct a large two-unit nuclear power plant, likely in Zeeland. While the focus is on large nuclear power plants, the study also considers Small Modular Reactors (SMRs) and explores potential business opportunities from the operational life extension of the existing Borssele nuclear power plant (KCB).

This report provides insights into the supply chain, supplier requirements, potential economic benefits, and lessons from international experience, and we present a roadmap for Zeeland to realise this potential. This information was gathered based on desk research, data analysis, case studies, interviews, and a workshop with regional stakeholders.

The Nuclear Supply Chain

Many Zeeland businesses without nuclear qualifications can still supply non-nuclear parts of a nuclear power station.

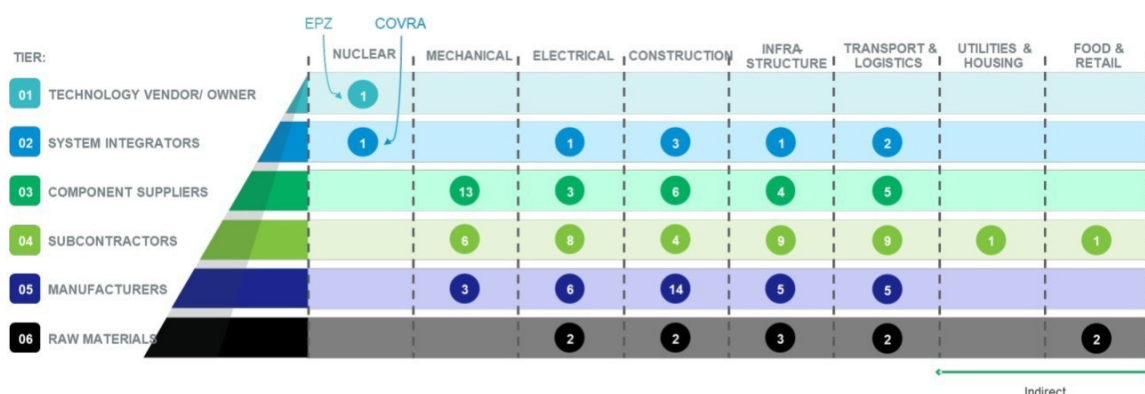
The nuclear supply chain can be visualised as a pyramid. At the top is the main contractor, usually a single company (the owner or technology vendor). Lower tiers supply directly or indirectly to the main contractor, with higher tiers involving more complex, integrated products and systems. Local companies can contribute to supporting activities such as transport, heavy lifting, site installation, and HSE support, sometimes under pre-qualification or vendor/owner supervision.



Opportunities for Companies in Zeeland

We identified 130 Zeeland businesses that could potentially supply nuclear projects, mostly fitting into tiers 3-4 of the supply chain and spread across sectors.

Opportunities are strongest in Construction, Infrastructure, and Transport & Logistics, and during early construction phases and site clearance/landscaping. Some components of new nuclear power plants cannot be sourced from Zeeland, due to complexity of the components and the special requirements and competencies needed to construct nuclear grade components.



As a first estimate, local involvement could account for roughly 15% of total plant costs.

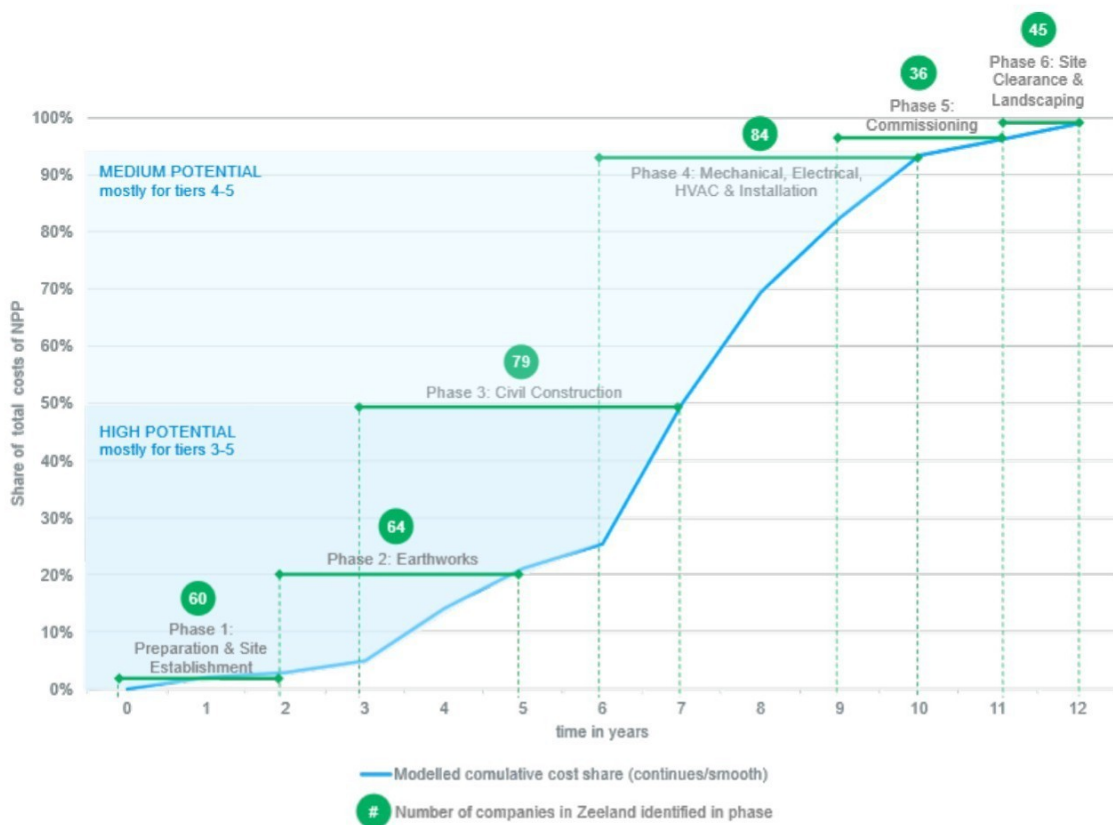
Potential local involvement varies per phase ranging from 2% in the commissioning phase to 48% in the earthworks and site clearance-phase. Actual localisation will depend on vendor selection, contracting models, and Zeeland businesses' capacity to handle large contracts. Further opportunities exist in spin-offs, including future SMRs, existing nuclear power plants in or near Zeeland and their decommissioning and long-term operations.

The direct economic potential for the business sector in Zeeland is roughly estimated to be between €3.1 and €4.6 billion over a 12-year construction period.

Direct economic benefits emerge from the direct supply to nuclear power plants, be it in construction or operation. This is comparable to the value of regional contracts at Hinkley Point C considering regional economic differences. The actual order size that can land in Zeeland will strongly depend on various factors, including the technology vendor chosen. This estimate should therefore be considered a first estimate based on best available data and assumptions at this stage of the nuclear new-build project in the Netherlands.

The indirect economic potential for the business sector in Zeeland is roughly estimated to be in the order of €1 billion.

This is a result of the regional spending of businesses directly involved in the supply chain and of on-site workers (living in Zeeland) or visitors. The estimate is based on comparison with nuclear new-build projects elsewhere and should be considered a first estimate.



Tendering Process and Requirements for Suppliers

An important barrier for Zeeland businesses entering the nuclear supply chain is the certification readiness.

Minimum requirements often include ISO 9001, with nuclear enhancements for items related to nuclear safety such as ISO 19443 or ASME NQA-1 alignment. Equipment related to nuclear safety requires nuclear design codes (ASME Section III, RCC-M/RCC-E) and Class 1E qualifications for electrical/I&C systems, depending on the technology vendor. Civil/structural works may require nuclear-specific codes and national variants may also apply. Businesses must also demonstrate strong safety culture, traceability, and successful audits, especially near safety-significant systems. Other important barriers include uncertainty surrounding the timeline of the nuclear power plants, and limited knowledge, experience, access to information, and investment capacity.

Higher localisation in the Dutch nuclear new-build program can be achieved by setting stricter tender requirements.

The programme is divided into an owner scope, covering site preparation and infrastructure, and a vendor scope, managed by technology vendors through tier-1 contractors. The owner scope is supervised by NEO NL, initially 100% state-owned, and all tenders must be carefully aligned to national and European procurement laws.

Roadmap

Based on the findings of the study, a localisation roadmap was developed. The roadmap has 4 action lines: Positioning, Informing, Connecting and Supporting. Each action line consists of 4-5 specific actions that we recommend implementing. This includes the establishment of a *Nuclear Delta* platform, sharing supply chain opportunities, matchmaking across the nuclear supply chain and subsidies or loans to help companies prepare to enter the supply chain.



Recommendations

Given the opportunities for Zeeland businesses in the nuclear supply chain, we recommend positioning Zeeland as a hotspot for nuclear energy and actively promoting its businesses in new-build projects. Stakeholders should be informed about nuclear developments, supply opportunities, and requirements, while businesses should be connected regionally, nationally, and internationally, and regional and national governments should align business support activities. Support should be provided to establish the right ecosystem for Zeeland companies to enter the nuclear domain, including further developing and implementing the proposed roadmap, backed by public and private investments. To facilitate this, we recommend establishing the **Nuclear Delta platform**, a public-private initiative bringing together businesses, government, and education institutions. The Province of Zeeland, Impuls Zeeland and VNO-NCW Brabant-Zeeland can play a part in this as well. Additionally, clear agreements with the national government should be made on conditions for hosting a new nuclear power plant, ensuring maximum economic benefit for regional businesses and reinforcing Zeeland's ambitions as a nuclear energy hotspot.

Samenvatting

Dit is een samenvatting van de resultaten van het onderzoek naar de toeleveringsketen voor de nieuwbouw van kerncentrales in Zeeland. Het onderzoek werd in opdracht van de Provincie Zeeland, Impuls Zeeland en VNO-NCW Brabant-Zeeland uitgevoerd door Tractebel Engineering en Technopolis in de periode juli 2025 - januari 2026.

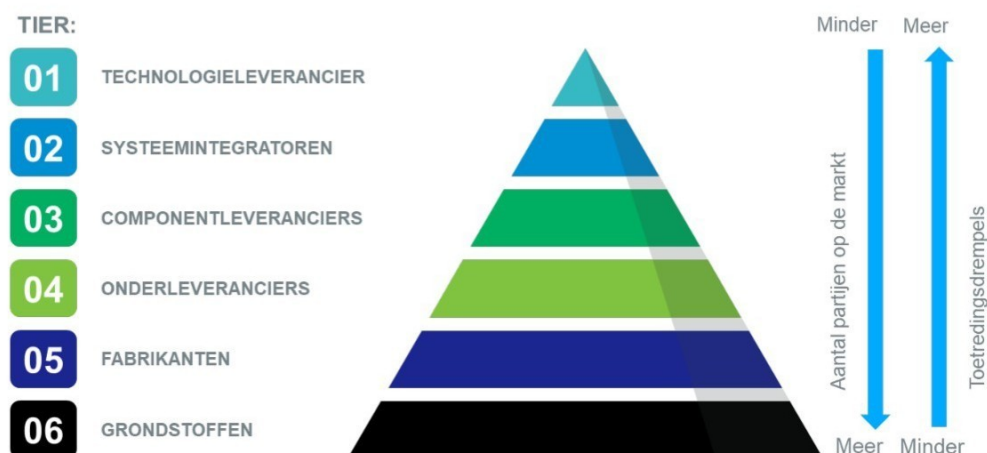
Dit onderzoek bekijkt de kansen voor regionale bedrijven in Zeeland in het kader van het plan van de Nederlandse overheid om een grote kerncentrale met twee reactoren te bouwen, waarschijnlijk in Zeeland. Hoewel de focus ligt op grote kerncentrales, besteedt het onderzoek ook aandacht aan Small Modular Reactors (SMR's) en onderzoekt het potentiële zakelijke mogelijkheden die voortvloeien uit de verlenging van de operationele levensduur van de bestaande kerncentrale Borssele (KCB).

Dit rapport biedt inzicht in de toeleveringsketen, de eisen aan leveranciers, de potentiële economische voordelen en lessen uit internationale ervaringen. We presenteren een routekaart voor Zeeland om dit potentieel te realiseren. Deze informatie is verzameld op basis van deskresearch, data-analyse, casestudies, interviews en een workshop met regionale stakeholders.

De nucleaire toeleveringsketen

Veel Zeeuwse bedrijven, ook zonder nucleaire kwalificaties, kunnen niet-nucleaire onderdelen aan een kerncentrale leveren.

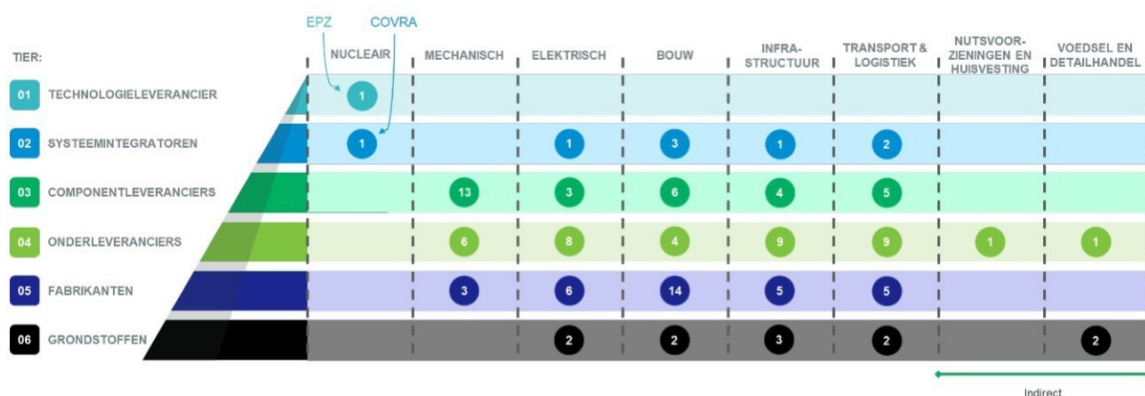
De nucleaire toeleveringsketen kan worden gevisualiseerd als een piramide. Aan de top staat de hoofdaannemer, meestal één bedrijf (de eigenaar van de kerncentrale of de technologieleverancier). Lagere niveaus (tiers) leveren direct of indirect aan de hoofdaannemer, waarbij hogere niveaus complexere, geïntegreerde producten en systemen omvatten. Lokale bedrijven kunnen bijdragen aan ondersteunende activiteiten zoals transport, zwaar hijswerk, installatie op locatie en HSE-ondersteuning, soms onder voorwaardelijke kwalificatie of toezicht van de technologieleverancier of eigenaar van de kerncentrale.



Kansen voor het Zeeuwse bedrijfsleven

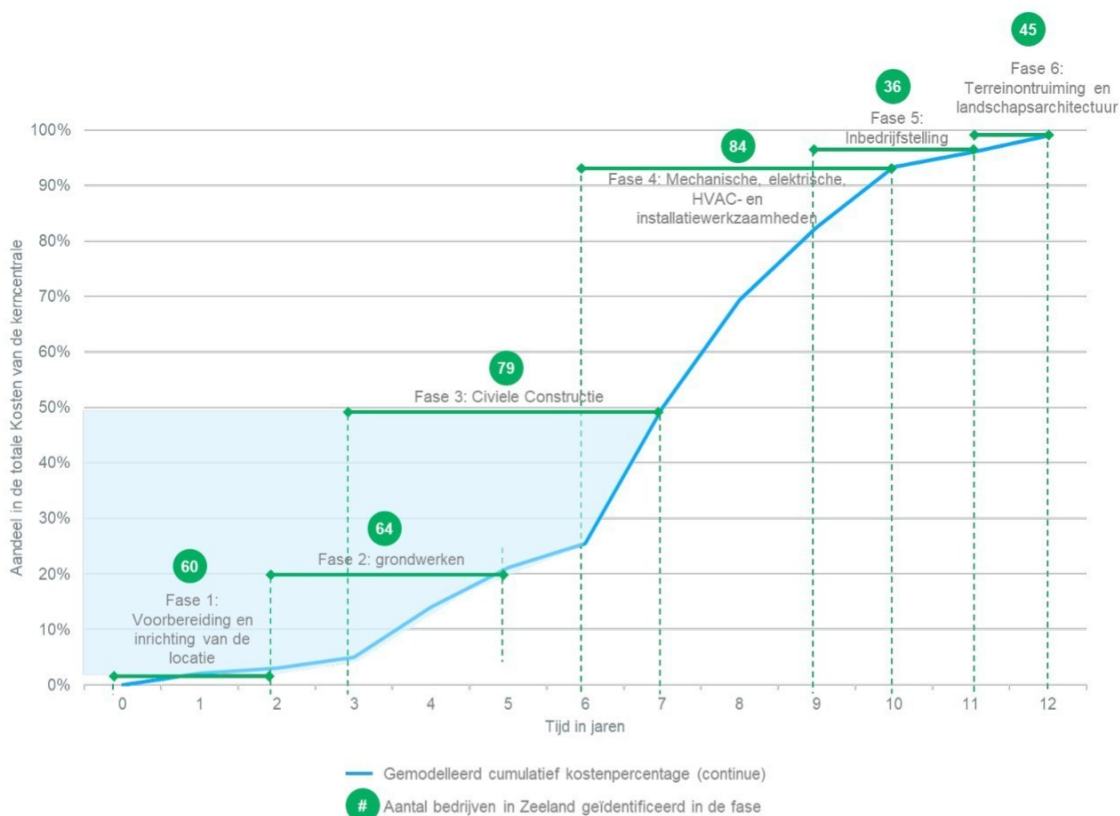
We hebben 130 Zeeuwse bedrijven geïdentificeerd die mogelijk kunnen toeleveren aan nucleaire projecten.

Deze bedrijven bevinden zich voornamelijk in de tiers 3-4 van de toeleveringsketen en zijn verspreid over verschillende sectoren. De kansen zijn het grootst in de sectoren Bouw, Infrastructuur, Transport & Logistiek, en tijdens de vroege bouwfasen en het bouwrijp maken/de ruimtelijke inrichting. Sommige onderdelen van de nieuwe kerncentrales kunnen niet in Zeeland worden geproduceerd vanwege de complexiteit van de onderdelen en de speciale eisen en competenties die nodig zijn om onderdelen van nucleaire kwaliteit te bouwen.



Op basis van een eerste ruwe schatting, zou lokale betrokkenheid ongeveer 15% van de totale kosten van de centrale kunnen omvatten.

Dit varieert per fase van 2% bij de inbedrijfstelling tot maximaal 48% bij grondwerken en ruimtelijke inrichting. De daadwerkelijke lokalisatie zal afhangen van de keuze van leveranciers, contractmodellen en het vermogen van Zeeuwse bedrijven om grote contracten aan te kunnen. Er zijn nog meer spin-off mogelijkheden, waaronder werkzaamheden voor toekomstige SMR's, bestaande kerncentrales, en hun ontmanteling en bedrijfsduurverlenging.



Het directe economische potentieel voor het bedrijfsleven in Zeeland wordt grofweg geschat op €3,1-€4,6 miljard over een bouwperiode van 12 jaar.

Directe economische voordelen vloeien voort uit de directe levering aan kerncentrales, zowel tijdens de bouw als tijdens de exploitatie. Dit is vergelijkbaar met de waarde van regionale contracten bij Hinkley Point C, rekening houdend met de regionale economische verschillen. De werkelijke omvang van de orders die in Zeeland binnenkomen, zal sterk afhangen van verschillende factoren, waaronder de gekozen technologieleverancier. Deze schatting moet daarom gezien worden als een eerste inschatting op basis van de best beschikbare data en aannames op dit moment van het Nederlandse nucleaire nieuwbouwproject.

Het indirecte economische potentieel voor het bedrijfsleven in Zeeland wordt geschat op ongeveer €1 miljard.

Dit is het resultaat van de regionale bestedingen van bedrijven die direct betrokken zijn bij de toeleveringsketen en van werknemers (die in Zeeland wonen) of bezoekers ter plaatse. Deze schatting is gebaseerd op vergelijkingen met nucleaire nieuwbouwprojecten elders en moeten gezien worden als een eerste inschatting.

Aanbestedingsprocedure en vereisten voor leveranciers

Een belemmering voor Zeeuwse bedrijven om toe te treden tot de nucleaire toeleveringsketen is de certificeringsgereedheid.

Minimale vereisten omvatten vaak ISO 9001, met nucleaire uitbreidingen zoals ISO 19443 of ASME NQA-1 voor systemen van belang voor de nucleaire veiligheid. Nucleaire apparatuur vereist nucleaire ontwerpcodes (ASME Sectie III, RCC M/RCC E) en Klasse 1E voor elektrische/I&C-systemen (afhankelijk van de gekozen technologieleverancier). Voor civiele/bouwkundige werken kunnen nucleair-specifieke codes vereist zijn, en er kunnen ook nationale varianten van toepassing zijn. Bedrijven moeten ook blijk geven van een sterke veiligheidscultuur, traceerbaarheid en succesvolle audits, vooral als hun werk of product relateert aan systemen relevant voor nucleaire veiligheid. Andere belangrijke belemmeringen zijn onder meer onzekerheid over de tijdlijn van de kerncentrales en beperkte kennis, ervaring, toegang tot informatie en investeringscapaciteit.

Een hogere lokalisatie in het Nederlandse programma voor de bouw van nieuwe kerncentrales kan worden bereikt door strengere aanbestedingseisen.

Het programma is onderverdeeld in een eigenaarsscope, die de voorbereiding van de locatie en de infrastructuur omvat, en een leveranciersscope, die door technologieleverancier via tier 1-aannemers wordt beheerd. Het eigenaarsscope valt onder de verantwoordelijkheid van NEO NL, dat aanvankelijk voor 100% in handen zal zijn van de Nederlandse Staat. Daardoor moeten alle aanbestedingen onder de eigenaarsscope afgestemd worden met de nationale en Europese aanbestedingswetgeving.

Roadmap

Op basis van de bevindingen van het onderzoek is een lokalisatie roadmap ontwikkeld. De roadmap bestaat uit vier actielijnen: positioneren, informeren, verbinden en ondersteunen. Elke actielijn omvat 4-5 specifieke acties die we aanbevelen. Dit omvat onder andere de oprichting van een *Nuclear Delta*-platform, het delen van kansen in de toeleveringsketen, het leggen van contacten binnen de nucleaire toeleveringsketen en subsidies of leningen om bedrijven te helpen zich voor te bereiden op toetreding tot de toeleveringsketen.



Aanbevelingen

Gezien de kansen voor Zeeuwse bedrijven in de nucleaire toeleveringsketen, raden wij aan om Zeeland te positioneren als een hotspot voor kernenergie en om Zeeland actief te promoten bij nieuwbouwprojecten. Regionale belanghebbenden moeten worden geïnformeerd over nucleaire ontwikkelingen, leveringsmogelijkheden en vereisten, terwijl bedrijven regionaal, nationaal en internationaal met elkaar in contact moeten worden gebracht en het rijk en de regio ondersteuning van bedrijven op elkaar moeten afstemmen. Er is ondersteuning nodig om het juiste ecosysteem te creëren voor Zeeuwse bedrijven om toe te treden tot de nucleaire sector, waaronder de verdere ontwikkeling en uitvoering van de voorgestelde roadmap. Daarvoor zijn publieke en private investeringen nodig. Wij raden aan om hiervoor het **Nuclear Delta-platform** op te richten, een publiek-privaat initiatief dat bedrijven, overheid en onderwijsinstellingen samenbrengt. Ook de provincie Zeeland, Impuls en VNO-NCW Brabant-Zeeland kunnen hier een rol in spelen. De acties van een dergelijk platform dienen nader afgestemd te worden of geïntegreerd te worden met reeds lopende initiatieven en vergen nadere afstemming met de provincie Zeeland. Daarnaast moeten er duidelijke afspraken worden gemaakt met het Rijk over de voorwaarden voor het huisvesten van een nieuwe kerncentrale, zodat regionale bedrijven economisch maximaal profiteren en de ambities van Zeeland als hotspot voor kernenergie worden versterkt.

1. Introduction

1.1. About this report

This report describes the outcomes of a study on the supply chain for nuclear new-build in Zeeland. The study was commissioned by the Province of Zeeland, Impuls Zeeland and VNO-NCW Brabant-Zeeland and was conducted by Tractebel Engineering and Technopolis during the period July 2025 -January 2026.

The context of this study is the ambition of the Dutch government to construct a large two-unit nuclear power plant, which will likely be located in Zeeland. Zeeland would like to have their regional businesses benefit from the construction of this power plant. The focus of this study is therefore on large nuclear power plants. However, the Dutch government is also exploring the potential of Small Modular Reactors (SMRs) for deployment in the Netherlands. Therefore, SMRs are also addressed in this study – albeit to a smaller extent. In addition, we also link to the life extension of the existing nuclear power plant in Borssele (the KCB), as this may also provide opportunities for businesses in Zeeland.

In this study we have explored the potential for businesses in Zeeland to enter the supply chain for nuclear new-build. In addition, we provide insights into the nuclear supply chain, the requirements for suppliers and the potential economic benefits. We also share insights from abroad and have developed a roadmap for Zeeland to best realise the identified potential for businesses in Zeeland.

1.1.1. Objectives

The **main objective** of this study is to assess the potential, characteristics, and requirements of the (nuclear) supply chain in Zeeland

Sub objectives are to:

- Identify and quantify the economic potential of nuclear-related activities (nuclear new-build) in Zeeland, based on a list of identified companies;
- Develop concrete proposals for agreements between Zeeland and the national government, focusing on joint opportunities to strengthen the region's socio-economic structure;
- Provide input to the government for setting firm conditions to ensure Zeeland's involvement in the nuclear supply chain;
- Prepare strategies to inform and engage existing or new regional companies in the nuclear supply chain

1.1.2. Reading guide

This introductory chapter provides background on the study, its context and on nuclear power plants. The second chapter describes the nuclear supply chain and its characteristics. The third chapter provides insights on the requirements for suppliers in terms of standards and certifications. In the fourth chapter the opportunities for businesses in Zeeland are identified, including the direct and indirect economic potential. Chapter five provides a localisation roadmap for Zeeland and provides suggestions for actions and how to organise localisation. It also shares options for conditions to set and negotiate with the Dutch government. In the final chapter we present our key conclusions and recommendations. In the annexes we provide information on the study's methodology, the findings from the international case studies that have been used in the report and more detailed information on the proposed regional conditions for the national government.

1.2. Developments in nuclear power in the Netherlands

1.2.1. Large Nuclear Power Plants (LNPPs)

The Netherlands plans to construct a (two-unit) large nuclear power plant (LNPP). The technology type of this LNPP will be a Gen-III Pressurized Water Reactor (PWR). Each unit will have a net output between 1,000 and 1,650 MWe. As part of this initiative, technical feasibility studies have been conducted with three potential technology vendors: Westinghouse (USA), EDF (France), and KHNP (South Korea), although KHNP has since withdrawn.

Four main sites for these NPPs are still being considered, of which two in Zeeland: Sloegebied 1 / 2 (Borssele, Zeeland), Terneuzen 1a/ 1b (Zeeland), Maasvlakte II, and Eemshaven 1a/ 1b/ 2 / 3. The sites in Zeeland are among the preferred sites of the Dutch government in case other sites score the same. It is therefore likely that Zeeland will host this new large nuclear power plant.

The Minister of Climate and Green Growth (KGG) informed Parliament on the status of the nuclear new build program in May 2025.¹ In her letter the Minister indicated that several tracks are to be followed in the process. A detailed timeline was not made available, the letter indicated that a target date of operation can be in late 2030s.

¹

[Voortgangsbrieff nieuwbouw kernenergie mei 2025 | Kamerstuk | Rijksoverheid.nl](#)

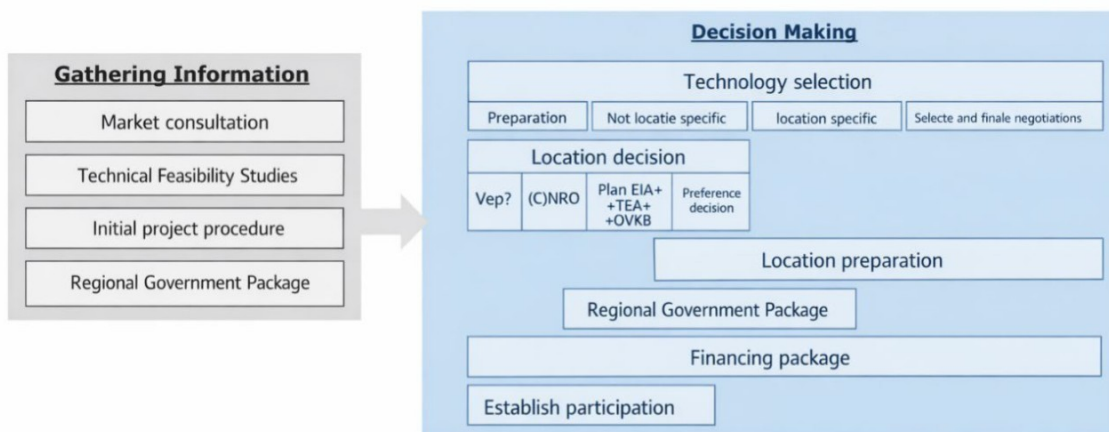


Figure 1: Project tracks of the Netherlands nuclear new-build programme¹

The new-build programme is separated in a *Data collection* phase followed by a 5-staged *Decision-making* phase. When all five stages of decision making are completed, the technology vendor² has a contract and can start to send guaranteed orders to all its suppliers.

²

The Technology Vendor supplies the reactor design and other nuclear technologies.

Decision-making stages	Current status	Major milestones	Target date
Vendor selection	Two technology vendors are currently pursuing the contract: Westinghouse and EDF	FEED (Front End Engineering Design) Studies Down selection based on a site-specific design Final EPC Contract	Final contract is expected around 2028 Intermediate dates not public
Site selection	7 possible locations in 4 geographical areas ³ . 3 locations in 2 geographical areas in Zeeland	Decision on preferred location Decision on final location	Summer 2026 Unknown
Site preparation	No information	Site layout plan Groundworks Construction infrastructure Handover to NPP building consortium	Post final site selection End date largely dependent on site selected, typically this takes between 2-3 years
Rijk-Regiopakket ⁴	Local benefits and compensation package, local terms and conditions of regional authorities	Preliminary package Final package (after vendor selection)	2026 2028
Financial package	General outline in October 2025's letter to parliament ⁵ Programme for the initial phase to be 100% state funded ⁶	EU approval on state funding of NEO NL Establishment of state-owned operating company NEO NL ⁷ Financing scheme	End 2025 February 2026 Unknown

In the May 2025's letter to Parliament a period of 2-3 years is mentioned as needed to determine the final technology vendor since the exact project scope will also be location specific. No further details were found on this planning in the public information given by the Minister to Parliament. The most reasonable estimate for the final technology vendor selection is therefore 2028.

Before this date, there will be engagement between suppliers and technology vendors, including activities such as supplier prequalification. Technology vendors may seek to strengthen their final bids by securing Letters of Intent or Memoranda of Understanding with local industry. However, it is unlikely that purchase orders will be issued by the technology vendor or the Zeeland supply chain until the government has selected the final technology vendor and the main contract has been signed.

³ [Samenvatting Concept-NRD - Nieuwbouw Kerncentrales](#)

⁴ [Rijk-Regiopakket | Kernenergie in Nederland](#)

⁵ [Voortgangsbrieven nieuwbouw kernenergie oktober 2025 | Kamerstuk | Rijksoverheid.nl](#)

⁶ [KPMG advice on Project Split oktober 2015](#)

⁷ [Kamerbrief over oprichting NEO NL B.V. | Kamerstuk | Rijksoverheid.nl](#)

Based on the above we have developed the following timeline for the preparation, construction and operation of the new large nuclear power plant in the Netherlands. In this timeline we have set the commissioning of this NPP at a slightly later period than officially foreseen, as we believe this is more realistic.

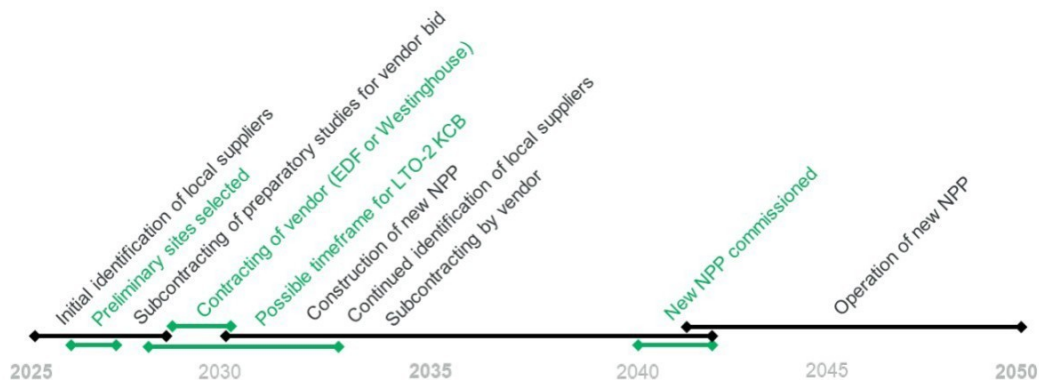


Figure 2: LNPP Program Timeline

1.2.2. Small modular reactors

Additionally, in terms of the Dutch government's current ambitions to include new nuclear power in its energy mix, it is currently investigating the potential of SMRs (Small Modular Reactors) for deployment in the Netherlands⁸. Province of Zeeland recently published research results on the future role of SMR's in Zeeland for industry and energy⁹.

In the Netherlands there is interest in SMRs in various regions and by some industrial sites. Companies such as Thorizon (molten salt reactor), Allseas and ULC Energy are involved in the development of SMRs in the Netherlands. These initiatives are still in an early stage of development. Thorizon and Allseas are collaborating with organisations and businesses in Zeeland to develop and test their SMR technologies. This provides opportunities for regional businesses to be involved in early stages of the supply chain for SMRs.

The Dutch government has launched an SMR Strategy that aims to provide direction to SMR developers and to develop a framework for the authorities on how to approve and support SMR initiatives in the Netherlands. Financing of the SMR initiatives has been left primarily to the market up until now.

⁸ [Kamerbrief over strategie voor Small Modular Reactors in Nederland \(October 2025\)](#)

⁹ [Provincie Zeeland onderzoekt rol van \(SMR's \(January 2026\)](#)

1.2.3. Life extension of the Borssele NPP

Long Term Operation (LTO) is the internationally used term for extending operation beyond the original design time frame, justified through ageing-management programmes and a comprehensive safety demonstration. Borssele completed an LTO project in 2012 that established operational end of life until end-2033 (60 years). The government has sent a revised nuclear energy act to parliament to remove the legally fixed end date of operations of the Borssele nuclear power plant of 31 December 2033 from the nuclear energy act. The intention is for Borssele to perform a further extension to its life, which is described as the LTO-2 project. If the LTO-2 project is succesful the end of life of the Borssele plant will be taken to 2053.

LTO programmes generate sustained, multi-year demand across the supply chain. Typical scopes include:

- Engineering studies, inspections and analyses;
- Component replacements and upgrades;
- I&C (Instrumentation and Control) and digital modernization;
- Civil and coastal/sea-defence enhancements;
- Fuel cycle and waste logistics.

1.3. Description of a typical PWR nuclear power plant

In this section we describe the working, parts and characteristics of a typical large nuclear power plant with a pressurised water reactor (PWR). A schematic overview of such a large NPP is provided in Figure 3.

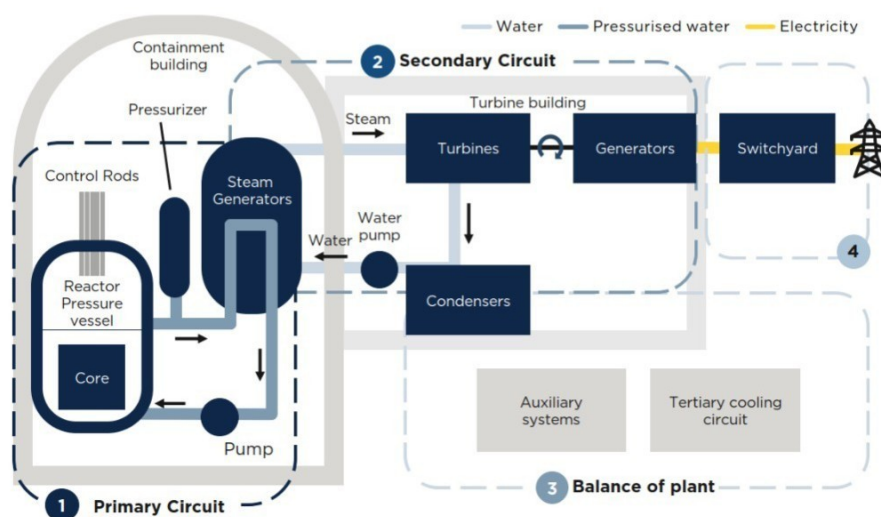


Figure 3: Diagram of a typical PWR large NPP (Business Sweden)

Legend: (1) Primary circuit / Nuclear Island; (2) Secondary circuit / Conventional Island; (3) Balance of Plant (BOP); (4) Switchyard.

In a PWR nuclear fuel is used to create a controlled nuclear fission reaction in the reactor core. The energy released in this nuclear reaction heats water in the reactor's primary circuit that is connected to reactor core. In a PWR the water in the primary circuit is maintained at high pressure (~150 bar) by a pressurizer to prevent the water from boiling. The heated water is pumped through the primary circuit to a steam generator where its heat is transferred to water at low pressure in a secondary circuit to produce steam (evaporation). The steam in the secondary circuit drives a turbine and generator. The latter produces electricity which is delivered to the grid. After passing the turbine, the steam in the secondary circuit has dropped in temperature and is condensed to water in the condenser and pumped back to the steam generator.

1.3.1. Nuclear Island / Primary Circuit

The containment building – also commonly referred to as the reactor building – houses the nuclear parts of the plant. This is the primary circuit and is also referred to as the Nuclear Island or the Nuclear Steam Supply System (NSSS). Apart from the NSSS the containment building also houses the associated safety systems.

The NSSS comprises of the reactor pressure vessel (RPV), steam generators (SGs), reactor coolant pumps (RCPs), the pressurizer, and the interconnecting primary piping. This nuclear island equipment constitutes the “heart” of the plant and is subject to the highest quality and qualification standards for design, fabrication, and inspection. For an extensive overview of typical nuclear industry abbreviations see¹⁰. For broader NI/BOP scoping guidance, see¹¹

1.3.2. Conventional Island / Secondary Circuit

The Conventional Island houses the secondary circuit which is separated from the nuclear parts of the plant. It contains the steam turbine, electrical generator, condenser, feedwater/condensate systems, and associated auxiliaries. Here, thermal energy from the steam exiting the steam generators is converted to mechanical shaft power via the steam turbine and then to electricity via the electrical generators. For context, only a limited number of suppliers worldwide provide large turbine-generator packages for PWRs - a supply-chain constraint that often shapes contracting strategy and schedule risk. Typical suppliers of turbine-generator packages include; Arabelle Solutions and GE Vernova etc¹².

At the recent *Made for Nuclear* event in Hilversum, EDF shared estimates of the material quantities anticipated for the EPR project. During the event, EDF also outlined the breakdown of the Conventional Island and highlighted potential opportunities for the local supply chain. See below an excerpt from what was presented.

¹⁰ [IAEA glossary of abbreviations and acronyms \(2015\)](#)

¹¹ [IAEA NG-T-3.4 Industrial involvement to support a National NPP programme](#)

¹² [NRG Pallas Localisation perspectives of a Netherlands nuclear new build project](#)

TABLE 1: CONVENTIONAL ISLAND - ESTIMATE OF MATERIAL QUANTITIES

Scope of supply	Estimate of material quantities
Building itself	• Steel structure: 7,300 tonnes • Concrete: 26,000 m³ • Reinforcement: 3,600 tonnes
Mechanical Equipment	• 130 heat exchangers • 100 pumps, from 10 L/h to 3,500 m³/h • 2,250 tonnes of pipes, from DN 8 to 1,400mm • 2,500 valves • 70 tanks, from 0.06 to 780 m³ • 3 handling cranes (from 20 to 300 tonnes) • 360 hoists/trolleys (from 0.1 to 12.5 tonnes)
Electrical Equipment	• ~190km of cabling • 6,300 sensors

1.3.3. Balance of Plant (BOP)

The Balance of Plant is generally defined as all plant systems outside the Nuclear Island and the Conventional Island. The BOP typically includes:

- Heat sink and cooling water systems (e.g., seawater intake/outfall, cooling towers, circulating water pumps), which remove waste heat from the condenser.
- Site and utility systems such as fire-fighting water, demineralized/chemistry systems for the secondary system, Heating Ventilation and Air Conditioning (HVAC), compressed air, drainage, and auxiliary boilers.
- Buildings and infrastructure beyond the scope of the nuclear and conventional islands (e.g., pump houses, warehouses, laydown areas, site roads).

This split is consistent with widely used cost and scope breakdowns in nuclear new-build studies, where (for example) seawater pump-house equipment is treated as BOP rather than part of the conventional island. However, the precise split between Nuclear Island, Conventional Island and BOP can vary by owner, technology vendor, and contract packaging. Many organizations, for instance, treat the turbine-generator as a dedicated package within the conventional island, with the balance of the conventional island handled separately.

As mentioned earlier at the recent Made for Nuclear event in Hilversum, EDF shared estimates of the material quantities anticipated for the EPR project. During the event, EDF also outlined the breakdown of the BOP and highlighted potential opportunities for the local supply chain. See below an excerpt from what was presented.

TABLE 2: BALANCE OF PLANT - ESTIMATE OF MATERIAL QUANTITIES

Scope of supply	Estimate of material quantities
Demineralization plant	• Capacity of providing 70 m³ /hr demineralized water for 2 EPRs • A reverse osmosis or ion exchange process • 3 storage tanks with capacities of 1,000 m³ and 4,500 m³
Underground galleries (which link the piping and cabling from the different buildings on the NPP)	• ~2km of galleries • Concrete: 19,000 m³ • Steelwork: 41 tonnes • Electrical and Mechanical equipment for the galleries: • ~16km of pipes (ranging from DN 25 to DN 800) • ~ 180 km of cabling
Pumping Station (Function to pump filtered sea water into the cooling system of the condensor)	• Concrete: 63000 • Reinforcement: 11800 ft • Secondary Steelwork: 67 tonnes • Mechanical Equipment: • 2 classified drum screens (diameter: 24 meters) • 46 pumps (1 m³/h to 30 m³/s) • ~14km of pipes (DN 8 to 900) • ~720 valves • 8 handling cranes (10 tonnes to 80 tonnes) • Electrical Equipment: • ~13km of cabling • 990 sensors

1.3.4. Switchyard / Electricity Grid Interface

The switchyard dispatches the electrical energy output from the generator to the national grid and provides the connection point for auxiliary power during startup, shutdown, or grid disturbances. In most contract schemes, the switchyard is part of the site's non-nuclear scope and is integrated with the transmission operator's requirements.

1.4. Supply chain considerations : why the split in parts of the NPP matters

Nuclear Island: NSSS and safety-class equipment. Long lead times, rigorous nuclear qualifications, and a concentrated vendor base. Work packages and early supplier engagement are critical to schedule¹¹.

Conventional Island: turbine-generator system. Few global suppliers: typically procured as a stand-alone package to de-risk interfaces and preserve performance guarantees.¹²

Balance of Plant: Broadest opportunity space for local/regional industry participation, given its similarity to large conventional thermal power plant systems and civil works; nevertheless, nuclear QA/QC and configuration control still apply.

With a few small exceptions for most work related to the CI and BOP no nuclear certifications are necessary from the supplier. Also similarities to conventional coal fired or natural gas powered plants exist in these areas and the mechanical systems present are similar to those used by the chemical industry.

1.5. Differences between the EDF and Westinghouse designs

1.5.1. EDF's European Pressurized Reactor (EPR)

EDF's Nuclear Power Plant proposed for the Netherlands is an EPR, European Pressurized Reactor. The EDF EPR is much larger in than the Westinghouse power plant in terms of power output but also in terms of footprint (area required on-site). The EDF design makes use of French and European codes and standards such as RCC-E and RCC-M. Figure 4 shows a typical site for an EDF EPR type nuclear power plant.

An EDF EPR nuclear power plant includes:

- **Reactor Building**, which houses all the primary heat and steam producing equipment (typically to the Nuclear Steam Supply System (NSSS) on a nuclear power plant).
- **Fuel Building**, this houses a fuel pool where fuel is stored after it is used in the reactor (or "spent" as it is referred to commonly). Fuel is also stored in the fuel pool during outages when the reactor is drained for inspections or maintenance.
- **Safeguard buildings**, these buildings house safeguard equipment which need to function in case of a plant failure. Typical equipment includes back-up electrical supplies, back-up pumps for providing additional cooling etc.
- **Diesel Buildings**, this is where diesel generators are stored for additional back-up power supply.
- **Nuclear Auxiliary building**, this building provides staff with an entry route to the reactor. In addition, this building houses sampling and chemical control equipment for the operation of the reactor.
- **Effluent Treatment Building**, this building is used for the treatment of resins and other effluents before they can be removed as waste.
- **Turbine Building or the Conventional island**, this is a building which houses the non-nuclear equipment which is used for electricity generation (steam turbine, electric generator etc).

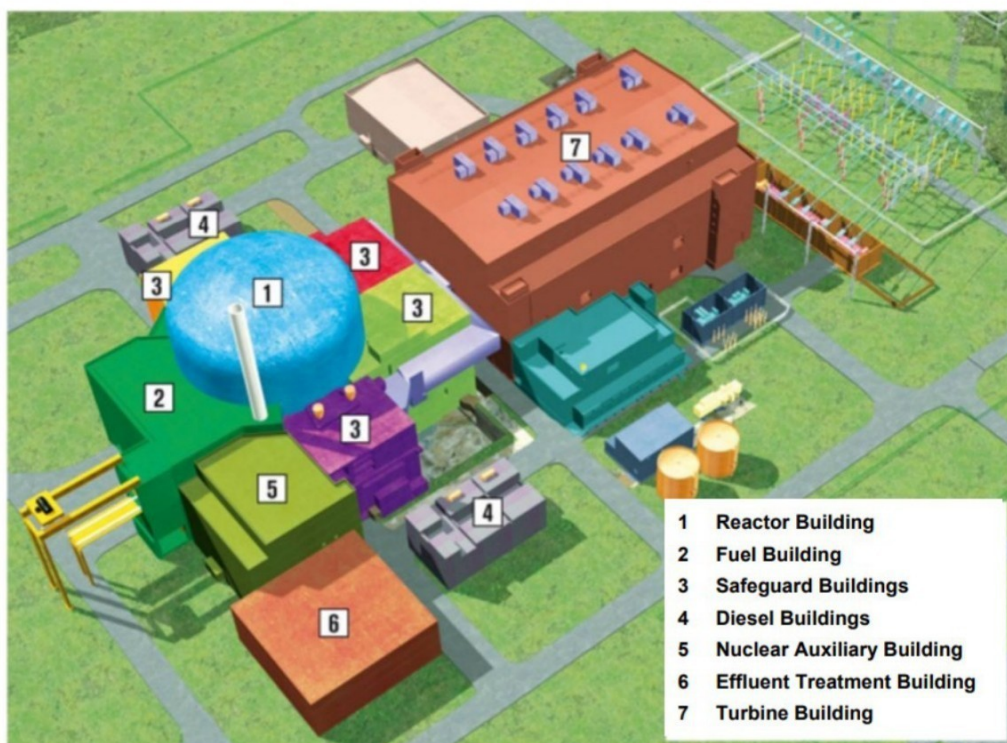


Figure 4: Illustration of a typical EDF EPR NPP layout¹³

1.5.2. Westinghouse's Advanced Passive 1000 (AP1000)

The Westinghouse AP1000 is smaller in terms of power output and footprint compared to EDF's EPR. While its output power is 60% of the EPR, the footprint of the AP1000 is according to Westinghouse almost 25% of a 1600 MWe PWR (similar to EDF's EPR).

Typically, the site of a nuclear power plant is three times larger during construction than when it is at final delivery. This is to accommodate areas for the earthworks, laydown areas etc. From the Westinghouse diagram on reactor footprint, it is expected that the EDF construction site will be much larger than the Westinghouse construction site.

¹³

[UK EPR PCSR report 1.2 General description of the unit](#)

AP1000® Reactor Footprint Comparison

Smallest footprint per MWe of any existing nuclear reactor, including many small modular reactor designs.

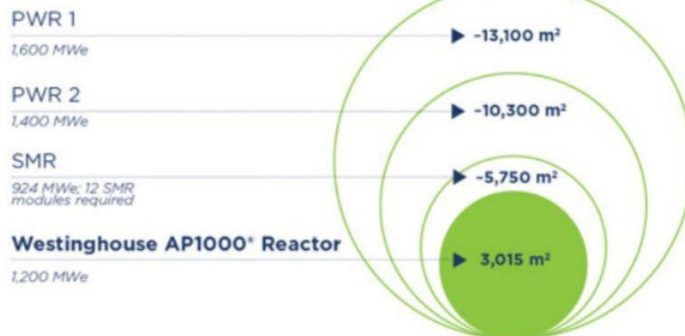


Figure 5: Westinghouse's AP1000 footprint comparison¹⁴

Westinghouse plants are designed according to American ASME codes and follow US NRC approach to licensing and safety standards. This is different than the European code systems that are used by EDF.

Figure 6 shows an illustration of a typical Westinghouse AP1000 nuclear power plant. A Westinghouse nuclear power plant typically includes the following:

- **Reactor Building** with shielding which houses the reactor pressure vessel and all other equipment for generating the heat and steam for electricity production (often referred to as the Nuclear Steam Supply System (NSSS)).
- **Turbine Building (or Conventional Island)**, this is a building which houses the non-nuclear equipment which is used for electricity generation (steam turbine, electric generator etc).
- **Diesel Generators**, in the case of an accident the PWR reactors need power to ensure certain safety systems can continue to operate to bring the reactor down in power safely, for this reason back-up diesel generators are included in the design.
- **Radiation waste building**, waste from operating the plant are treated here for storage. Depending on the type of waste this could mean treating, compacting and placing into metal or concrete drums for storage.
- **Auxiliary Building** this houses the main control room and the fuel handling area.

Both reactor designs will require similar components that can be partially supplied by the Zeeland industry. The primary differences are related to the certifications that will be required from a supplier in order to meet the quality requirements set by the technology vendor. Another difference is in the follow-up opportunities for a supplier that will be largest in countries developing a nuclear power plant using the same technology. Currently Westinghouse design plants are under development in Poland and Bulgaria and EDF design plants are under development in the United Kingdom and France.

¹⁴

Source: [westinghousenuclear.com/energy-systems/ap1000-pwr/economic-benefits/#:~:text=Two%20of%20the%20drivers%20of%20plant%20construction,economical%20nuclear%20power%20solutions%20across%20the%20world](https://www.westinghousenuclear.com/energy-systems/ap1000-pwr/economic-benefits/#:~:text=Two%20of%20the%20drivers%20of%20plant%20construction,economical%20nuclear%20power%20solutions%20across%20the%20world)

COMPONENTS OF A NUCLEAR POWER PLANT UNIT

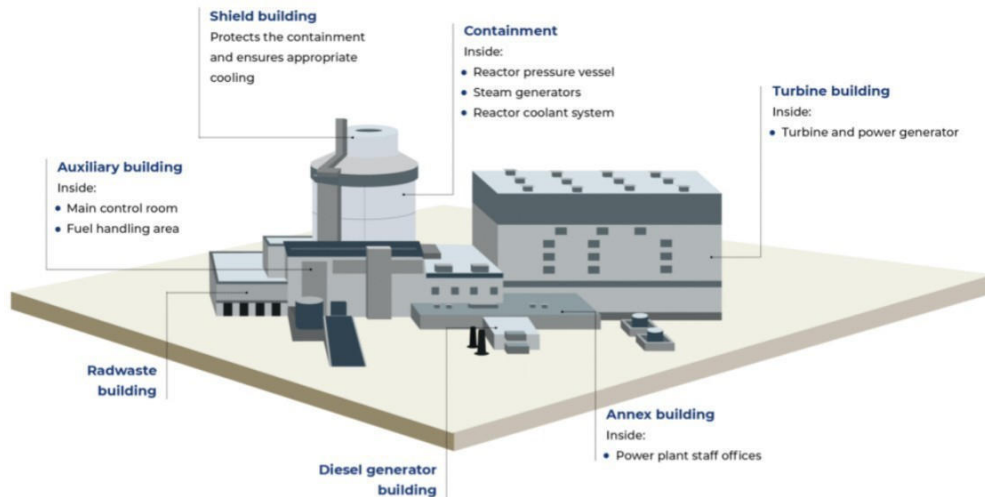


Figure 6: Illustration of a typical Westinghouse AP1000 NPP layout¹⁵

1.6. Small Modular Reactors (SMRs)

Small modular reactors (SMRs) are advanced nuclear reactors designed with factory-built modules and a nameplate capacity up to about 300 MWe per unit under the IAEA's widely used definition.¹⁶ The "small" and "modular" attributes matter as much as the power rating: modules and systems are intended to be fabricated in factories, shipped, and assembled on site, enabling series production and repeatable work packages.¹⁷

It is useful to distinguish two broad types of SMRs:

- **Light-water SMRs (SM-LWRs)** (e.g., GE Hitachi's BWRX-300, China's ACP100) which extend well-understood pressurized or boiling water technology into smaller, standardized plants.
- **Advanced Modular Reactors (AMRs)** (e.g., high-temperature gas, molten salt, liquid-metal designs) which are not only providing electricity but also high-temperature heat for hydrogen formation and other non-electric applications through high outlet temperatures and different coolants and fuel forms.¹⁸

¹⁵ Source: pej.pl/en/the-project/key-information/%5d

¹⁶ Note: Rolls Royce is an outlier SMR which is planned to have a maximum generating capacity of 470 MWe

¹⁷ iaea.org/newscenter/news/what-are-small-modular-reactors-smrs

¹⁸ nucleus.iaea.org/sites/INPRO/df21/slides/1.3-Subki.pdf

SMRs are innovative and being developed by various businesses. They are no longer purely conceptual, as some are under construction or even operational – albeit to a limited extent in Western economies. Notable operational or under-construction examples include:

- **China’s HTR-PM** (two HTGR modules driving a single 210 MWe turbine) entered commercial operation in Dec 2023 and has since been used for urban heating.¹⁹
- **China’s ACP100 (“Linglong One”)** recently (October 2025) completed its cold commissioning at Changjiang (construction started July 2021; nominal 125 MWe).²⁰
- **Russia’s** floating plant “**Akademik Lomonosov**” uses KLT-40S light-water reactors and has been in commercial operation since 2020 (net ~32 MWe per unit, providing electricity and heat in Pevek).²¹
- **Canada’s Ontario Power Generation (OPG)** is building the **BWRX-300** at Darlington; site preparation began, the construction licence has been issued, and OPG targets first unit to be in-service in 2030, with planning underway for three additional units on the same site.²²

Several Dutch SMR initiatives can be categorized as advanced modular reactors. They require a flexible supply chain that can cope with reactor designs that are still periodically changing. This presents strong opportunities for innovative SME companies that can work more in partnership or co-developer role rather than a traditional built to specification model as found for nuclear power plants or fully developed designs.

¹⁹ world-nuclear-news.org/Articles/Chinese-HTR-PM-Demo-begins-commercial-operation

²⁰ world-nuclear-news.org/articles/cold-testing-of-chinese-smr-completed

²¹ world-nuclear.org/nuclear-reactor-database/details/akademik_lomonosov-1

²² world-nuclear-news.org/articles/opg-gets-go-ahead-to-build-first-smr-in-canada

1.7. Comparison between large NPPs and SMRs

Apart from the size (footprint and power), there are some clear differences between large NPPs and SMRs. These differences are summarised in the table below.

Attribute	Conventional Gen-III/III+ LNPP	SMR-LWR	Attribute
Typical unit output power	~1.000–1.600 MWe per unit Multi-unit sites common	≤300 MWe per module (IAEA definition) Multiple modules to scale power possible	Module sizes vary (tens to a few hundred MWe) Many concepts target high-temperature heat as a priority.
Technology maturity	Commercial and broadly standardized in Western world Long operating record	Near-term commercial operation in Western world	Demonstrations ongoing in Western world
Delivery model	Predominantly site-built with increasing modularization High workforce demand on site	Factory-built modules shipped and assembled on site Lower peak site labor Strong repeatability across fleets	Similar modular intent, but many components are novel and require new qualification and specialized factories
Footprint & siting	Large multi-hectare sites with significant civil works and infrastructure Twin unit sites require typically a plot of 110 Ha to 130 Ha for construction	Smaller footprints 30-40 Ha depending on number of reactor units Siting can target constrained locations Assembly areas may be under weather-protected “canopies” (as an example see Rolls-Royce)	Often compact nuclear islands Footprint depends on coolant and thermal system Some micro-reactors are expected to have a footprint of 2 Ha or less. Siting optimized for industrial heat uptake
Certification and Quality requirements	Mature nuclear codes and standards apply. Example ASME, RCC-M/E/CW, ISO 19443	Significant overlap with LNPP codes for nuclear-class items ISO 19443 recommended for suppliers entering the chain	Additional or revised codes/guidance will emerge for new coolants/materials Existing standards provide starting points but new qualification is typical
Supply-chain opportunities	Strong roles in non-nuclear scopes: civil, grid connections, logistics, conventional systems Nuclear-class scope requires code/QMS compliance and audits	Module fabrication/ assembly, balance-of-plant, ports & heavy-lift logistics, QA/QC, fleet O&M services	R&D participation, materials/ component testing, process-heat integration (hydrogen, district heating), advanced analytics/digital twins

For more information on different types of SMR's and their potential role in Zeeland a separate study was published²³ for the Province of Zeeland. From the supplier perspective working for an SMR developer requires more flexibility. For large scale nuclear reactors as discussed primarily in this report the design of the reactor is not the First Of A Kind and there will be a clear specification that needs to be followed to the letter resulting in a clear deliverable and a clear delivery date. For SMRs the design is typically not fully finalized when interaction with suppliers take place. This presents opportunities for companies with design capabilities and requires a process than can cope with variations in the original specification and/or timeline for delivery.

A supplier for a conventional LNPP can also supply replacement parts to plants of the same design and for new plants using a similar design. For an SMR supplier there is no replacement market yet but a large potential for future growth since the required time and capital investment to develop, license and build an SMR should be significantly less than for a conventional NPP due to the modular design.

2. The Nuclear Supply Chain

2.1. The tier structure

A supply chain can be viewed as a pyramid. See Figure 7. At the top is the main contractor - usually the owner or technology vendor - responsible for integrating the most complex systems. As you move down the pyramid, suppliers provide more specific components or services with lower complexity and integration requirements. Higher-tier suppliers are fewer in number, have advanced capabilities, and face less competition. Lower tiers include many SMEs offering more common products and services, resulting in greater competition but lower entry barriers.

In nuclear projects, this tiered structure aligns each supplier's scope, technical demands, and regulatory exposure with their capabilities and capacity to manage risk. Higher tiers carry greater integration responsibility, contractual liability, and nuclear quality assurance obligations. Following IAEA guidance, owners and vendors at the top apply a graded approach, imposing stricter qualification and oversight where safety significance is higher.²⁴

²³ zeeland.nl/actueel/provincie-zeeland-onderzoekt-rol-van-small-modular-reactors-smrs-voor-toekomstbestendige

²⁴ IAEA doc No. NP-T-3.21

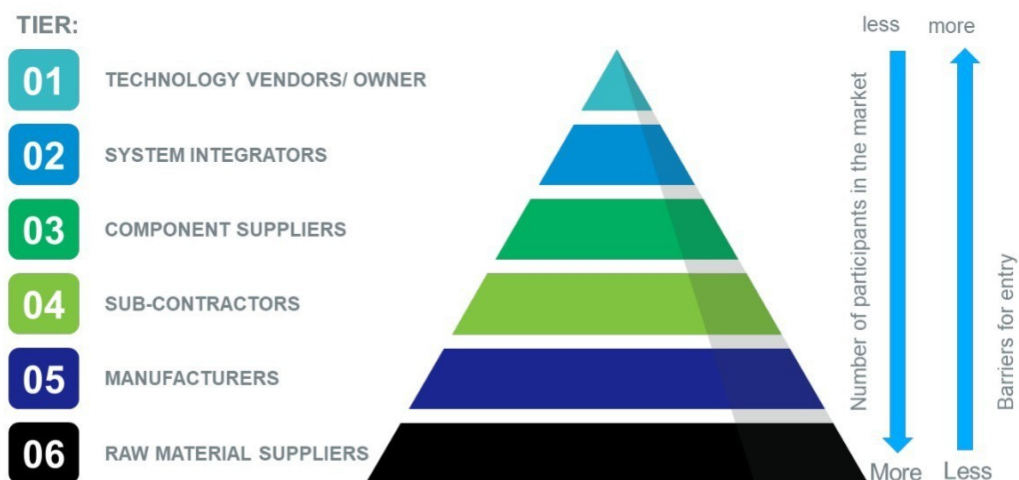


Figure 7: Illustration of a typical nuclear supply pyramid

In the nuclear supply chain, a supplier's tier is typically determined by proven nuclear experience, certified management systems, technical competencies, manufacturing depth, financial strength, and the ability to manage nuclear QA (including controls against counterfeit/fraudulent/suspect items).²⁵

Tier	What they do	Illustrative companies & Typical scope
<u>Tier 1:</u> Technology Vendor/ Owner	Tier 1 suppliers are prime contract holders responsible for major work packages. Depending on the delivery model, tier 1 may be the technology vendor leading an EPC consortia (vendor-led turnkey) or multiple tier 1s coordinated by the owner under multi-contract/EPCM. In vendor-led arrangements, the technology vendor provides proprietary reactor technology and typically integrates the Nuclear Island. Under EPCM/multi-contract, the owner's integration role spans several tier 1 packages, with the reactor vendor holding a tier 1 scope for NI supply as needed.	EDF for EPR Westinghouse for AP1000
<u>Tier 2:</u> System Integrators/ Large Work Package Owners	Deliver major systems or NPP sitewide packages under tier 1 governance, e.g. Conventional Island delivery; Mechanical, Electrical and HVAC (MEH) integration; large Civil Works for the NPP	Conventional Islands: Arabelle Solutions is a typical supplier for EDF's Conventional Islands MEH Integration: Altrad, Balfour Beatty Bailey, Cavendish Nuclear and Doosan Babcock for Hinkley Point C (EDF). Civil Works: Bouygues and Laing O'Rourke for Hinkley Point C (EDF). Bechtel for Polish newbuild project (Westinghouse)
<u>Tier 3:</u> Component Suppliers (OEMs)	Design & manufacture of equipment. For equipment in the Nuclear Island these suppliers typically have experience with supplying ASME/EN/IEC class equipment, e.g. steam generators, reactor coolant pumps, pressurizers, large valves, I&C cabinets	Framatome for steam generators and other components for the Nuclear Island Doosan Enerbility for reactor pressure vessels and steam generators Siemens Energy for steam turbines in the Conventional Island Curtiss-Wright for pumps and mechanical components in the Nuclear Island
<u>Tiers 4+:</u> Qualified Sub-Suppliers / Services	Supply materials, sub-assemblies, Non-Destructive Testing (NDT), machining, welding, coatings, temporary works, logistics, and site services. Many are SMEs with quality systems and certifications which are appropriate for their defined scopes.	Pipe suppliers, structural steel, rebar, specialty welding, NDT, module fabrication, logistics, etc.

2.2. Value, risk and requirements trickle down the nuclear supply chain

Risk and liability: Contract size, integrated scope, and warranty liabilities are highest at tier 1 and decrease down the tiers. However, nuclear QA and traceability requirements propagate in full via flow-down clauses, because the licensee must demonstrate that every safety-classified item meets design intent and is free of Counterfeit, Fraudulent and Suspect Items (CFSI).²⁶

QA/qualification intensity: As components move from commodity to safety-classified, suppliers undergo deeper qualifications (procedures, material pedigree, special processes, personnel qualification, surveillance). SMEs can enter at lower classification via a graded approach, then progress as they accumulate performance records.²⁷

Company size profile: Average enterprise size typically decreases down the pyramid: tier-1 vendors and tier-2 integrators are large multinationals; tier-3 includes global OEMs and several regional champions; tier-4 is a broad base of SMEs quality systems and certifications which are appropriate for their defined scopes (e.g., coded welding to RCC-M/ASME, safety-related cable installation). Beyond tier 4 no or less nuclearization is required. For more information pertaining to certifications etc., see Chapter 3.

2.3. Parallel sectoral supply chains support the project

Although conceptually one nuclear supply chain could cover all suppliers for a nuclear new-build project, in practice it is useful to break down the nuclear supply chain in parallel sectoral supply chains. This helps in analyzing and visualizing opportunities for businesses that are not typically working for the nuclear sector. In this study we have therefore developed the pyramid in Figure 8. Here the sector Utilities & Housing and Food & Retail are rather indirectly linked to nuclear-new build and not directly part of the supply to the NPP itself, rather to staff involved.

²⁶ IAEA doc No. NP-T-3.21

²⁷ IAEA doc No. NP-T-3.21

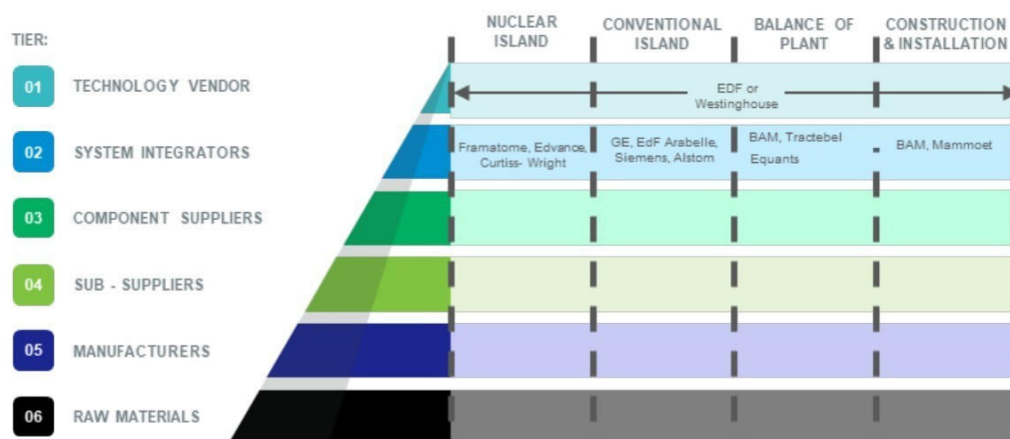


Figure 8: Sector supply chain pyramid for nuclear new-build

Important to note: the companies listed in this tier pyramid are national and international examples of companies currently active in the direct nuclear new-build supply chain. The list is not exhaustive. Information for Tiers 3 and below is available for the province.

At tier 1 level the vendor (or owner) will remain the contractor that integrates all products and services delivered in these sectoral supply chains. However, there can be different system integrators and component suppliers in these sectoral supply chains. How integration is done and what businesses will be involved at tier 2 and tier 3 level, will depend on how the project is compartmentalized and contracted which is at this stage still unknown.

These sectoral supply chains operate under different standards and lead-times but must be synchronized by the vendor/owner to avoid critical-path disruption, especially during handover from Civil Works to Mechanical, Electrical and HVAC works.²⁸

The table below provides a summary of key characteristics and typical examples of companies involved in those sectors for illustration purposes.

28

See: balfourbeatty.com/media-centre/latest/collaborative-new-joint-venture-to-deliver-engineering-and-support-services-works-at-hinkley-point-c/

Sectoral supply chain	Characteristics of companies involved in this sector	Illustrative companies & Typical scope
Nuclear	Depending on the safety significance, compliance with nuclear related codes and standards (e.g. ASME III/ RCC, ISO 19443). Nuclear related equipment typically carries the longest lead times.	Examples include suppliers who design and manufacture: steam generators, reactor pressure vessels, main coolant pumps, pressurisers. Typical Suppliers here include Framatome, Doosan Enerbility.
Mechanical	Companies supplying design and manufacture of mechanical related equipment. Typical equipment includes mechanical equipment for the conventional island or balance of plant. Codes and standards that are required for these equipment deliveries are the same/similar as those used for other industries; oil & gas or other power generation plant.	Examples include suppliers who design and manufacture: HVAC equipment, turbine generator sets, water and chemical storage tanks etc. Typical suppliers include Arabelle Solutions and GE Vernova.
Electrical	Companies who are working with supply of electrical equipment (such as motors, digital equipment, instrumentation and control equipment). Codes and standards for this equipment are the same/similar as those used for other industries.	Examples include suppliers of sensors, pumps, cabling, generators and switch gear. Typical suppliers include Siemens, ABB and General Electric.
Construction	These companies comply with the codes and standards relevant to the construction industry.	Typical suppliers include BAM.
Infrastructure	Infrastructure includes the sectors relevant to supply or design of systems for utilities (water, electricity and internet/ telephony)	Typical suppliers include BAM Infrabouw B.V, Sagro etc.
Transport & Logistics	These companies are involved in the transportation and delivery of equipment that will either be installed in the power plant or other materials and equipment that will be used for the construction activities. Depending on the nature of work suppliers may have to comply with one or more standards.	Examples include fuel transport companies for the delivery of diesel to the construction site. Mammoet for delivery and installation of large critical equipment.
Utilities & Housing	These companies must meet local requirements and standards for housing where applicable.	The need for housing could be partially be addressed by the tourism sector and needs to be considered in a wider perspective for careful alignment with the needs and wishes of local residents. During maintenance stops of the chemical industry and refineries temporary accommodation is already delivered
Food & Retail	These companies comply with standards relevant to the food and retail industry.	The need for catering can also be partially addressed by the existing tourism and catering firms as long as they have a will and possibility to scale up.

2.4. Phases in nuclear new-build to supply

The construction of a nuclear power plant can typically be described in six distinct phases. Figure 9 shows these phases and their typical durations. In total, the time from preparation to construction to operation takes about 12 years.

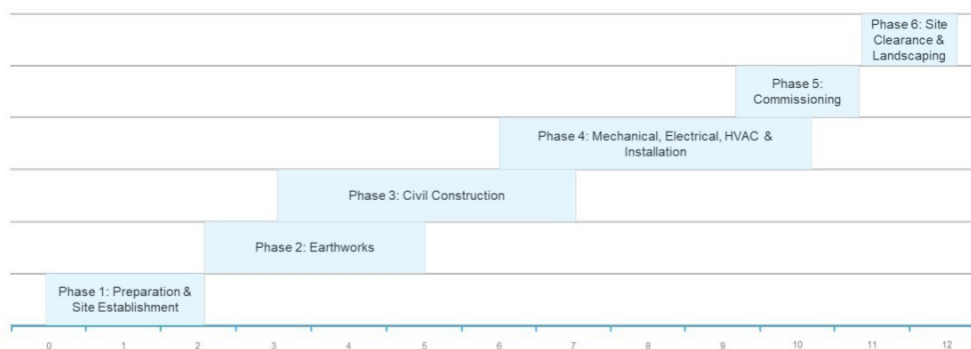


Figure 9: Timeline construction Nuclear Power Plant

In the following sections, we describe each phase in more detail, including supply chain opportunities in this phase.

2.4.1. Phase 1: Site Preparation & Site Establishment

Scope: In this phase the site is secured and prepared for construction. This includes the building of access roads, laydown areas, temporary offices and welfare, fencing and security, temporary utilities (power, water, data), logistics compounds (e.g., rail spurs, wharf upgrades where applicable), early drainage and erosion control. This phase also integrates early engineering (baseline surveys, environmental baselining, utilities routing) and associated developments under the owner's scope.

As an example, recent UK twin-unit programs established significant enabling works ahead of main civil works, with seasonal ground-investigation campaigns to de-risk foundation and flood-protection design inputs.

Supply-chain opportunities: High local participation potential in civil enabling works (roads, drainage, fencing), temporary works, security, welfare and construction vehicle or equipment hire; rail/port upgrades; baseline environmental surveys; QA for temporary utilities. Local tier-3/4 firms typically bid under tier-1 civils packages for these scopes. ²⁹

2.4.2. Phase 2: Earthworks (bulk excavation, ground engineering, dewatering)

Scope: This phase includes the bulk excavation for primary plant areas and engineered fills for main platforms; deep dig to formation; face support (soil nailing, shotcrete); dewatering via pumped well arrays; ground improvements; spoil treatment/reuse. The NRG PALLAS study cites ~5.5 million m³ excavation, ~31 m deep primary dig, ~98,000 m soil nails and ~32,000 m³ shotcrete as representative for the Netherlands benchmarked against Hinkley Point C and Sizewell C in the UK. ³⁰

²⁹ [Sweden's nuclear future – mapping the value chain - Business Sweden](#)

³⁰ [nrg-pallas-supplychain.pdf](#)

Where hydrogeology demands, deep dewatering may be complemented by cut-off walls (e.g., ~50 m deep perimeter plastic-concrete/diaphragm walls at Sizewell C to enable multi-million-m³ excavation below groundwater), with ground anchors tested under regulatory oversight.^{31, 32}

Supply-chain opportunities: Local geotechnical contractors (boreholes, lab/in-situ testing), dewatering specialists, shotcrete/soil-nailing crews, aggregate suppliers and materials labs; survey/monitoring providers; logistics (haulage). These are non-nuclear scopes accessible to regional firms compliant with general construction standards and project QA.³³

2.4.3. Phase 3: Civil Construction (Nuclear & Conventional Islands, Balance of Plant)

Scope: This phase concerns the core construction work of building the nuclear power plant infrastructure. This includes for example:

- **For the Nuclear Island:** The construction of basemat (foundation) and diaphragm walls, containment (liner rings, prestress systems) and nuclear auxiliary buildings.
- **For the Conventional Island and BOP:** the construction of the turbine hall, condenser/cooling systems, transformers/switchyard, service buildings, permanent drainage and roads.

To illustrate the typical scale of early works for a modern twin-unit nuclear power plant, such projects generally involve several million cubic metres of earthworks, over a million cubic metres of concrete, and hundreds of thousands of tonnes of reinforcing steel. These quantities reflect the magnitude of civil construction activities required during this phase for large Generation III reactor designs.

Supply-chain opportunities: Regional suppliers of formwork/rebar, ready-mix, precast elements, structural steel, façade & roofing, permanent roads/utilities, marine structures (e.g., wharf/tunnel portals) could play a role here. Many works in this phase (the civil scopes) are non-nuclear classified, providing strong entry points for local companies. However nuclear-adjacent civil elements will require robust QA and documentation.³⁴

³¹ heidelbergmaterials.co.uk/en/news-and-events/concrete-supply-for-main-works-at-sizewell

³² onr.org.uk/publications/corporate-publications/foi-releases/2023/02/sizewell-c-cut-off-perimeter-walls

³³ nrg-pallas-supplychain.pdf

³⁴ karnkraftssamordningen.se/wp-content/uploads/2025/11/Powering-the-Future-mapping-the-nuclear-value-chain_rev-Nov-2025.pdf

2.4.4. Phase 4: Mechanical, Electrical, HVAC (MEH) & Installation

Scope: This phase concerns the installation and integration of nuclear-classified equipment (nuclear steam supply system (primary circuit), safety-related pumps/valves, Class-1/2/3 piping), I&C systems (segregated architectures for primary vs. secondary circuit systems), electrical distribution, cabling and HVAC (containment/confinement functions, filtration). Sweden's value-chain mapping highlights strong domestic capacity in secondary circuit and grid scopes, with nuclear-classified items typically vendor-led.³⁵

The Sizewell C workforce profiles show peak labour during this phase of construction, with associated developments/site operations accounting for large shares early on (e.g., thousands engaged; at Sizewell C the total peak is projected at ~24,000 jobs; at Hinkley Point C ~26,000 jobs were supported nationally at the peak in 2025).^{36, 37}

Supply-chain opportunities: in this phase supply is needed of LV/MV switchgear, cabling, cable trays, HVAC equipment, ducts, non-nuclear pumps/valves; QA/QC services; documentation/LTQR management; testing and commissioning support. Nuclear-classified items in this phase require ISO 19443/NQA-1 supply-chain quality systems and qualification. OECD/NEA stresses design maturity and replication to reduce re-engineering and interface risk across the Mechanical, Electrical and HVAC systems.³⁸

2.4.5. Phase 5: Commissioning (cold & hot)

Scope: This phase concerns system turnover, pre-operational testing (cold), hot functional testing, fuel loading, initial criticality, staged power ascension and reliability runs before commercial operation. The duration of this phase depends on design maturity, pre-commissioning completeness, and regulator interactions but the typical duration is 18-24 months.³⁹

Supply-chain opportunities: In this phase supply is needed of instrument calibration; chemical/process services (water treatment); temporary operations crews and specialist test teams; training simulators; documentation/records control; independent third-party witnessing. Replication of procedures from a sister project (e.g., Sizewell C replicating procedures from Hinkley Point C) can compress schedule risk per OECD/NEA guidance.⁴⁰

³⁵ karnkraftssamordningen.se/wp-content/uploads/2025/11/Powering-the-Future-mapping-the-nuclear-value-chain_rev-Nov-2025.pdf

³⁶ acenet.co.uk/news/infrastructure-intelligence/hinkley-point-c-hits-peak-construction/

³⁷ nuclearsouthwest.co.uk/wp-content/uploads/2025/09/Socio-Economic-Brochure-2025.pdf

³⁸ OECD NEA: Unlocking Reductions in the Construction Costs of Nuclear: A Practical Guide for Stakeholders

³⁹ IAEA Document NP-T-2.7

⁴⁰ OECD NEA: Unlocking Reductions in the Construction Costs of Nuclear: A Practical Guide for Stakeholders

2.4.6. Phase 6: Site Clearance & Landscaping

Scope: This phase concerns the removal of temporary works and plant; complete landscaping, reinstatement and environmental compliance close-out; handover of permanent operations facilities. Spoil and materials management must follow permits and environmental plans (segregation of topsoil/subsoil; compaction requirements; runoff controls).

Supply-chain opportunities: Regional suppliers could potentially be used for reinstatement, landscaping, waste management, minor civil works; facilities fit-out; digital/ICT migrations from temporary compounds to permanent operational facilities.⁴¹

3. Requirements for Suppliers

3.1. Investments required to become a supplier

To become a nuclear supplier many investments may be necessary. These include capital investments for new machines, attracting additional personnel, financing costs, research and development costs, procuring nuclear quality materials and more. These types of investments are company specific and will depend on the type of product or service to supply to the nuclear new build program. In this section of the report, we present a quantitative and qualitative overview of certification costs, training costs, quality management system costs of key activities in the nuclear new build construction programme. The report describes general certifications and sector specific certifications. We will treat them at individual, corporate and product level and mention specific nuclear standards where relevant.

3.2. Contracting organisations and tender guidelines

The Dutch nuclear new-build program will be divided in the owner scope and vendor scope (see Figure 10), each with a different client a tier 1 level who will issue tenders. The owner scope will include preparations and developing the site (groundworks, gas/water/light infrastructure, roads, security perimeter, etc.). In the owner scope the program will be under the supervision and responsibility of NEO NL, which during the initial phase be 100% state owned. After the preparation and site development, the project will be handed over to the vendor (EDF or Westinghouse). The vendor scope concerns all works related to the Nuclear Island, Conventional Island (turbine island) and the Balance of Plant. The Switchyard may be part of the vendor scope or may remain under the responsibility of the owner scope. After the handover by NEO NL, the technology vendor will activate its suppliers to start construction of all buildings on the site.

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karnkraftssamordningen.se/wp-content/uploads/2025/11/Powering-the-Future-mapping-the-nuclear-value-chain_rev-Nov-2025.pdf

Orders resulting from the owner scope to be contracted by NEO NL will likely start in 2026.

Orders resulting from the vendor scope will start when the technology vendor has been selected. The contracting authority for this phase remains to be defined.

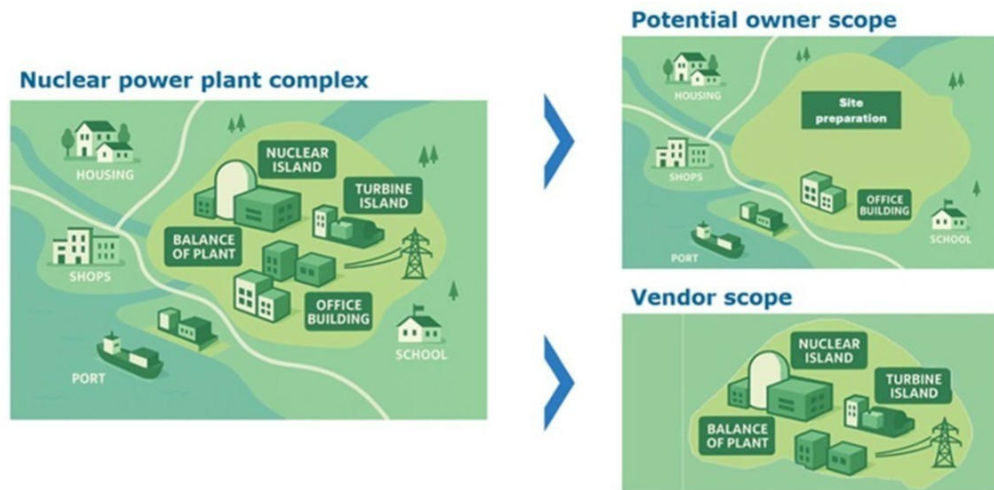


Figure 10: Visualisation of the difference between the potential owner scope and vendor scope in the construction of a nuclear power plant complex | Source: NEO NL Presentation: FME webinar 16 Oct 2025

The exact subdivision of owner scope and vendor scope will depend on the details of the final contract and are expected to follow the general stages from the IAEA. Types of contracts can vary, a few examples of common contracts are listed below:

- **Turnkey EPC (single point of contact):** Vendor/EPC assumes most design–procure–build–commission scope; owner retains non-delegable duties as licensee plus programme governance and intelligent-customer oversight.⁴²
- **Split-package / “island” EPC:** Vendor(s) take nuclear island (NSSS) and turbine island packages; owner leads civil/BOP integration and coordinates interfaces.⁴³
- **Multi-contract (owner-managed lots):** Owner breaks the plant into work packages (design, civil, mechanical, I&C, etc.), holds most integration risk, and leans on an Owner’s Engineer/TSO for oversight.⁴⁴

For more detail into possible financing and contracting options we refer to the study performed by KPMG for the Dutch government⁴⁵.

⁴² IAEA-TECDOC-1750/Rev. 1 CONTRACTING AND OWNERSHIP APPROACHES FOR NEW NUCLEAR POWER PLANTS

⁴³ nucleus.iaea.org/sites/connect/MSNpublic/Pages/nct/site/index.html

⁴⁴ Invitation and evaluation of bids for nuclear power plants. — Vienna : International Atomic Energy Agency, 2011. p. ; 30 cm. — (IAEA nuclear energy series, ISSN 1995–7807 ; no. NG-T-3.9)

⁴⁵ [KPMG report Project Split October 2025](#)

3.2.1. Owner scope tenders: NEO NL issued tenders

As NEO NL is initially 100% state-owned⁴⁶ it will be most likely obliged to follow national and European laws on tender procedures. The size of the tender package dictates which procedure must be followed (see Figure 11).

Table of Threshold Amounts and Designated Procedures under European Thresholds

Type of Assignment	Threshold Amount Excluding VAT	Designated Procedure
Supply of service	Up to € 50,000,--	Single tender negotiated (one-on-one)
	From €50,000,-- to the relevant European threshold	Multiple tender procedure, Art. 1.14 Public Procurement Act 2012
	With a clear cross-border interest, Art. 1.7, part b in conjunction with 1.9, third paragraph, sub b in conjunction with 1.18 Public Procurement Act 2012	National tender (publication), Art. 1.11 in conjunction with 1.22 Public Procurement Act 2012 in conjunction with Art. 11 Public Procurement Decree
Work	Up to € 150,000,--	Single tender negotiated (one-on-one)
	From € 150,000,-- to € 1,500,000,-- From € 1,500,000,-- to the European threshold	Multiple negotiated procedure, Art. 1.14 in conjunction with 1.22 Public Procurement Act 2012 in conjunction with Art. 11 Public Procurement Decree
	With a clear cross-border interest, Art. 1.7, part b and 1.9, third paragraph, sub b jo 1.18 Public Procurement Act 2012	National tender (publication), Art. 1.11 in conjunction with 1.22 Public Procurement Act 2012 in conjunction with Art. 11 Public Procurement Decree

Figure 11: Tender limits⁴⁷

Assignments can be published through national or European procedures. They all have to be published on public tender portals: TenderNed for national procedure and Tenders Electronic Daily for European tenders. When an assignment is lower than the national tender limit, the national government has the option to directly approach a single relevant company (EOVP) or multiple relevant companies (MOVP). In those cases, the companies are typically selected from a prequalified potential supplier list. For tenders related to the energy supply the limits for the European tenders are higher. While tender limits generally apply, they can be waived in specific cases, such as when national security considerations come into play.

⁴⁶ [Kamerbrief over oprichting NEO NL B.V. | Kamerstuk | Rijksoverheid.nl](#)

⁴⁷ <https://www.rijksoverheid.nl/documenten/circulaires/2024/11/29/circulaire-grensbedragen>

The advantage of small tenders is a higher flexibility, less administration and less international competition. Multiple SMEs have voiced their concerns surrounding the high barrier to entry with these tenders. The advantage of the European tenders is that the market is transparent and that a company in Zeeland can easily bid for a project in any EU member state. This could be especially interesting to larger companies with international ties or ambitions to expand globally. A quick search for “nuclear” on the European tender portal⁴⁸ indicates >2.000 tenders, which showcases the scale of the international market.

Large scale tenders are usually less accessible to local companies. They cannot meet criteria on certification, annual turnover or demonstrated experience on reference projects, or have trouble in assessing the risks related to the tender.

Example of hard to meet requirements for regional businesses under large scale tenders from the Bulgarian nuclear new-build program

This example concerns requirements for suppliers for the construction of the nuclear island with AP1000 technology. Five companies had expressed interest to Kozloduy NPP-New Builds PLC for this tendering procedure. They were presented with the following requirements:

“Applicants are required to demonstrate construction experience and commissioning of at least two nuclear units commissioned, to have solid experience in nuclear and turbine island of at least two units or have supplied and installed equipment for two units within the last 15 years. Applicants interested in the project should be able to demonstrate at least 6 billion dollars in turnover and profit for the five years period from 2018 to 2022.”

These are requirements that only large and specialised businesses can meet, clearly showing very limited potential for Zeeland businesses to be involved in these types of tenders directly – potentially only as subcontractor who relies on the capacities of the main contractor for such a contract.

A small scale and specific tender has less restrictive demands and is easily accessible to local companies. As an example we show an English translation of an awarded tender from the Polish nuclear new build program in Figure 12. Typically such a tender will be awarded primarily on price.

General information	
Sponsor's company:	PEJ SP. Z O.O.
Ordering party:	
Record number:	AU-000190
Awarding procedure no:	POST/K/REG/PN/2024/074/MG
Name:	Rental of pressure coffee machines with service and successive delivery of coffee beans and machine cleaners
Publication date:	2024-10-29 08:30
Winner selection criteria	
Ladies and Gentlemen, I would like to kindly inform you, that the proceedings entitled "Rental of pressurized coffee machines with the service of service and successive delivery of coffee beans and cleaning agents express" (procedure no.: POST/K/REG/PN/2024/074/MG), was completed by selecting the bid Contractors: AQUA SOLUTION sp. z o.o., 28 Tadeusza Kościuszki Street, lok. LU3, 30-105 Cracow.	

Figure 12: Example - Tenders unrelated to nuclear experience

The most relevant and interesting tenders for the industry in Zeeland will fall in between the two categories and will require some experience with using advanced technology or certification, meaning that few companies qualify and tenders will be awarded on quality, not just on price. As an example we show a translation of an ongoing tender for removing unexploded munitions from the seabed near a proposed NPP site in Figure 13.

General information	
Sponsor's company:	POLSKIE ELEKTROWNIE JADROWE SP. Z O.O.
Ordering party:	Polskie Elektrownie Jądrowe
Province:	MAZOWIECKIE
Awarding procedure no:	POST/S/REG/BEZP/RAM/PN/2026/010/3PO
Name:	THE PROVISION OF OVERSIGHT AND TECHNICAL ADVISORY SERVICES ONBOARD SURVEY VESSELS
Description of awarding procedure:	Scope of services covers: Client Representative service onboard the survey vessels performing services of: (1) detection, identification and safe removal and neutralization of unexploded ordnance (UXO) and other hazardous materials from the seabed, and (2) geological research of the seabed, in the strip intended for the construction of infrastructure of a nuclear power plant with a maximum power of up to 3750 MWe, located in the Choczewo municipality.
Assortment group:	
Test mode of awarding procedure:	No
Awarding procedure type:	Open
Legal type:	Non-public
Automatic exclusion of bidders, who have not submitted Yes an offer or attachments:	

Figure 13: Example - Tenders requiring specialised skills but unrelated to nuclear

Higher localisation can be achieved by ensuring that requirements/specifications are not excessive for the job to be tendered, by publishing small tenders in the local language only, looking at environmental effects related to the transport to and from the project site and requiring local certification and experience with local regulations and by splitting large tenders into smaller packages.

Tendering advice for a potential supplier

The national government has created a support website for businesses to show them the typical steps in a national or European tender procedure⁴⁹. As general guidance always examine first if your company meets the minimum requirements before starting any bid preparation. If not all minimum requirements are met consider looking for a partner firm for a joint submission or do not submit. Tender preparation can be a time intensive process. Always examine carefully the scoring mechanism and have a colleague not involved in writing review the bid prior to submission and do not wait till the last second for submission. National tenders are published on TenderNed⁵⁰. European tenders are published on Tenders Electronic Daily (TED)⁵¹.

3.2.2. Vendor scope tenders: EDF or Westinghouse issued tenders

The future technology vendor will issue tenders according to its own internal guidelines and the requirements of their contract with the Dutch government or NEO NL. The details of the contract are not yet set. Therefore no information is yet available on how tenders will be issued.

⁴⁹ ondernemersplein.overheid.nl/product-dienst-en-innovatie/opdrachten-en-aanbestedingen/stappenplan-meedoen-aan-een-aanbesteding/

⁵⁰ tenderned.nl/cms/nl

⁵¹ ted.europa.eu/TED/main/HomePage.do

However, both potential technology vendors have their own general supplier portal with information for suppliers. Supplier portals have two roles, they are used to create a pre-qualified supplier list and are used to announce new tenders by the technology vendor. In order to qualify as a supplier for either a company would have to meet pre-determined criteria and accept company policies on for example technical competence, certifications, annual turnover, ethics, diversity, environment, safety performance record and others. The complexity of the requirements will vary for the product or service requested. For a NPP new-build project additional local supplier portals can be made – which may be the case for the Netherlands. An overview of general and project specific supplier portals of EDF and Westinghouse is provided in Table 3. In this table, the website for Hinkley Point C has the most information. Sizewell C and PEJ are the most interesting from a business perspective as these projects are in an earlier stage of development.

For businesses interested in supplying to nuclear new-build projects it may be interesting to already register as supplier to understand requirements and to be visible to these tier 1 suppliers. The starting point for this registration would typically be contact with a sales representative from EDF or Westinghouse, as direct registration is not possible without prior invitation.

TABLE 3: OVERVIEW OF SUPPLIER PORTALS OF EDF AND WESTINGHOUSE

Portal	Website owner	Website
All Suppliers (existing fleet)	EDF	EDF.fr/en/the-EDF-group/dedicated-sections/suppliers
All Suppliers (existing fleet)	Westinghouse	westinghousenuclear.com/suppliers/
Suppliers Polish NPP program	PEJ	pej.pl/en/for-suppliers/
Suppliers SZC	Suffolk Chamber of Commerce	competefor.com/sizewellc/
Suppliers HPC	Somerset Chamber of Commerce	hinkleysupplychain.co.uk/

The existing nuclear power plants in and near Zeeland have their own supplier requirements. They will act as owner at tier 1 level and procure products and services. The websites of EPZ and Electrabel/ENGIE (see Table 4) give a detailed overview of general contract conditions and specific safety and security requirements for working on the site of their nuclear power plants. These include the need for a preapproved health and safety plan and that the work can only be done by preapproved employees in possession of valid identification and additional requirements for work in radiological areas. Typical requirements are not difficult to meet by a well-prepared supplier and are in line with chemical industry requirements but will require additional preparation time ranging from about 2 weeks for a worker requiring a VOG and a simple work permit to a period of several months for projects involving production audits by third parties. Typically, it is not possible for site work to replace worker A by worker B at the last minute, if worker B has not put on the original employee list. Potential business opportunities for companies from Zeeland at these plants can be related to decommissioning, maintenance, regular operation and replacement of obsolete systems related to long term operation/license to operate programs (LTO).

TABLE 4: OVERVIEW OF SUPPLIER PORTALS OF EDF AND WESTINGHOUSE

Operator	NPP	Website
EPZ	Borssele	epz.nl/wie-wij-zijn/leveranciers/
Electrabel/ ENGIE	Doel/ Tihange	engie.be/nl/leveranciers/voorwaarden/production

3.3. Key elements of standards and certifications

3.3.1. Introduction

The British standards institute issued an easy-to-read brochure⁵² on the importance of standards and how standards can be of use to SME. From this we included three key items in this introduction.

- Standards are documents that contain agreed-upon guidelines that help everyone do things the best way — whether it's making a cup of tea, building a bridge, or building a nuclear power plant;
- Certification is a formal process where an independent, accredited body assesses your organization to verify that you meet all the requirements of a specific standard. If successful, you receive a certificate that shows you're officially compliant. This is often referred to as third-party certification;
- Standards play a vital role in public procurement. Governments often require suppliers to meet recognized standards — for example, in quality, safety, or sustainability — to ensure reliable, responsible delivery of services and infrastructure.

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bsigroup.com/siteassets/pdf/en/insights-and-media/insights/brochures/uk-ks-nsb-thght-nss-ot-nsp-mp-standardseducation-0025.pdf

In the nuclear field specific more strict standards exist for systems, structures and components and quality assurance with a relation to nuclear safety (typically found in the nuclear island of a nuclear power plant). For most parts of the nuclear power plant (conventional island, balance of plant and the non safety related items in the nuclear island) the same standards apply as for conventional industry. Well known nuclear technical standards have been developed by ASME⁵³, KTA⁵⁴ and AFCEN⁵⁵ (the RCC codes). Access to KTA standards is free of charge, the other require a paid subscription. The most well known standards provider for conventional industry and service providers is ISO⁵⁶. Others will be mentioned in the remainder of this chapter.

Typically large organization found in the top tiers of the supply chain have many different certifications. For a smaller SME in a tier 4 or lower certification in a key technical area related to their product or to quality assurance can bring a competitive edge to a tender procedure.

3.3.2. Version of the standards

Standards are always under development, the version of a standard is indicated by the year behind the standard code. As an example, ISO 9001:2015 refers to the 2015 version of quality management standard ISO 9001 for instance. In all contract documents between clients, technology providers, inspection agencies, regulatory body, etc. the year of the standard should be explicitly identified to avoid non-conformities. The process takes about 10 years from a draft standard by a committee of experts, to an official standard published by the committee, to a harmonized standard accepted by the European Union, to an adaption of a European requirement into national law. For the example in question a new version of the ISO 9001 standard is expected to be published by ISO in 2026, which will be then referenced to as ISO 9001:2026.

3.3.3. Harmonized standards

It is highly recommended that harmonized standards⁵⁷ should be used when available, these have been approved by the European Union as meeting the essential safety requirements for use on the single European market. This greatly facilitates the conformity assessment but is not mandatory and conformity assessment can also be done through other means. As the nuclear power plant construction start is a few years away it is also recommended to look at standards that are not yet active but will become active soon. Important recent developments are the updated **ISO9001:2026** and the European Machinery Regulation (**EU**) **2023/1230 (“Europese Machineverordening”)**.

⁵³ [asme.org/certification-accreditation/nuclear-component-certification](https://www.asme.org/certification-accreditation/nuclear-component-certification)

⁵⁴ [kta-gs.de/welcome_engl.htm](https://www.kta-gs.de/welcome_engl.htm)

⁵⁵ [afcen.com/en/content/4-about-afcen](https://www.afcen.com/en/content/4-about-afcen)

⁵⁶ [iso.org/sectors/energy/nuclear-energy](https://www.iso.org/sectors/energy/nuclear-energy)

⁵⁷ For a current overview of all harmonized standards see: single-market-economy.ec.europa.eu/single-market/goods/european-standards/harmonised-standards_en

3.3.4. Standards available free of charge

Recently Dutch government decided that access to all standards that are included in the national law on construction “Bouwbesluit” and in other laws should be available free of charge. These can be accessed through the Netherlands standards institute NEN⁵⁸.

3.4. General certifications for all sectors

Certifications may be required at 3 different levels, the individual level, the corporate level and the product/service level.

3.4.1. Individual certifications

3.4.1.1. WORKPLACE SAFETY AND SECURITY SCREENING

In Dutch law there are many regulations to protect the safety and well-being of workers at their worksite⁵⁹. A key part of these are the ARBO requirements. In order to guarantee that ARBO requirements were met at construction sites industry created the VCA certification system. The system also sees wide use in chemical industry. It is a method by which companies can show that they have taken the necessary preparation and training steps to work safely at a site. Typically it is a prerequisite in the offer stage before any work may be done at a construction site or chemical plant and it is supplemented by a site specific training to explain client company specific aspects (alarm procedure, evacuation route) and a work permit system related to the specific task. The course is available in many different languages and is inexpensive.

For an individual worker working at the future NPP construction site in Zeeland the following certificates are expected to be required for most activities: the B-VCA or VCA VOL (workplace/construction site safety) and the VOG (declaration of good behaviour). These certificates are required for working on most construction sites in the Netherlands and will already be available for most existing workers at relevant businesses in Zeeland. In the study's survey, 69% of the respondents noted that they have the VCA VOL certification. Some areas of nuclear construction (for example security system design or nuclear fuel storage) may be designated as a confidential and of national security interest and will require a detailed individual VGB security screening by the authorities, we estimate this will be at VGB-B level (similar to Pallas and Reactor Institute Delft) and to affect <100 people out of the thousands working on the site.

⁵⁸ [/connect.nen.nl/portal/Registreren/Vrij-Beschikbare-Normen](https://connect.nen.nl/portal/Registreren/Vrij-Beschikbare-Normen)

⁵⁹ business.gov.nl/regulations/working-conditions-employees/

TABLE 5: WORKPLACE SAFETY AND SECURITY SCREENINGS

Certificate	For whom	Needed for:	Training time	Training, exam, certificate cost 2025	Validity (years)
B-VCA	workers	Construction site access	1 day	€219 ⁶⁰	10
VCA-VOL	team leader	Construction site access	1 day	€229	10
VOG	all	Construction site access, access to commercial confidential information	none	€41	2 (estimate)
VGB-B	Key personnel handling confidential information	Access to strictly confidential information related to national security	none	€776	5 (estimate)

The B-VCA, VCA-VOL and VOG are not expected to be significant barriers for companies in Zeeland to become active as nuclear suppliers.

VGB-B can be difficult to obtain, the most common cause for this is if workers have lived abroad for more than a month in the 10 years preceding the application, depending on the exact country of residence.⁶¹

3.4.2. Corporate Certifications

3.4.2.1. WORKPLACE SAFETY

The individual level certifications of VCA are matched by corporate certificates as listed below. VCA-P is comparable to VCA** with additional requirements for petrochemical industry. Cost of the certification process will depend on details of the company (size, complexity, number of locations) and can range from 1,000-10,000 euros (including internal costs to develop or adapt management systems). The recommendation is to ask for at least 3 quotations from different accrediting organizations. We consider it likely that VCA** company level certification or an international alternative will be requested during medium and large tenders related to civil engineering and construction. The same VCA system is used in Belgium. Certificates from France (MASE), Germany and Austria (SCC) are also acceptable. For smaller civil construction tenders VCA* or no company certification could be acceptable.

⁶⁰ For current prices see for instance: vcanederland.nl/vca-cursus/ or arbocentrum.nl/vca-cursus/

⁶¹ For details see the website of the AIVD: aivd.nl/onderwerpen/veiligheidsonderzoek

TABLE 6: WORKPLACE SAFETY CERTIFICATIONS

Certificate	For whom	Needed for:	Time and cost	Validity (years)
VCA*	SME/subcontractors	Construction site access	Company specific	3
VCA**	Larger firms >35/ main contractors	Construction site access	Company specific	3
VCA-P	Specific for petrochemical safety standards	Construction site access	Company specific	3
VCO	Specific for clients hiring contractors	Construction site access	Company specific	3
VCU	Specific for employment agencies delivering temporary personnel	Construction site access	Company specific	3

3.4.2.2. MANAGEMENT SYSTEM CERTIFICATES (NON-NUCLEAR)

What is a management system?⁶²

“A management system is the way in which an organization manages the interrelated parts of its business in order to achieve its objectives. These objectives can relate to a number of different topics, including product or service quality, operational efficiency, environmental performance, health and safety in the workplace and many more.

The level of complexity of the system will depend on each organization’s specific context. For some organizations, especially smaller ones, it may simply mean having strong leadership from the business owner, providing a clear definition of what is expected from each individual employee and how they contribute to the organization’s overall objectives, without the need for extensive documentation. More complex businesses operating, for example, in highly regulated sectors, may need extensive documentation and controls in order to fulfil their legal obligations and meet their organizational objectives.”

Tenders related to the new build program as a part of the owner scope can have as a requirement to have one or more of the below certifications or an acceptable international alternative. It is considered likely that ISO 9001 or an alternative will be mandatory and the ISO14001 and ISO27001 can give an advantage in a tender procedure. In the study’s survey, 71% of the respondents noted that they have the ISO 9001 certification.⁶³

⁶² Management system definition taken from ISO: <https://www.iso.org/management-system-standards.html>

⁶³ The Dutch government has published information on ISO standards on ondernemersplein.overheid.nl/product-dienst-en-innovatie/opdrachten-en-aanbestedingen/iso-en-nen-certificering-voor-uw-bedrijf/

The CO₂ performance ladder and safety culture ladder are not used by foreign companies. These could be requested in the owner scope for local tenders, but are less likely to be included in European tenders above the tender limit of 223,000 euros. The concept of safety culture is very relevant for developing quality management systems to nuclear quality management systems.

TABLE 7: MANAGEMENT SYSTEM CERTIFICATIONS

Standard	Topic	Needed for:	Cost 1 st certification	Cost recertification every 3 years
ISO 9001	Quality management	Likely tender requirement	€1,500-€6,000 ⁶⁴	€1,000-€10,000
ISO 14001 or BRL 7000	Environmental management	Optional tender requirement	€2,000-€10,000 ⁶⁵	Company specific
ISO 27001	Information Security	Optional tender requirement	> €6,000 ⁶⁶	Company specific
CO ₂ Performance ladder	Sustainable development	Alternative requirement to ISO 14001	Company specific	€65-€6,000 depending on annual turnover
Safety Culture Ladder	Safety Culture Ladder	Optional tender requirement	€5,000-€15,000 ⁶⁷	€500-€4,500 annual fee

For most certifications there are several different providers available, for example (DEKRA, KIWA, LRQA, DNV, and many more), We recommend companies to request a quotation from a number of auditing firms and to discuss with the auditing firm a scope that is best suited to the individual needs of a company. Costs will depend on number of employees, number of locations, and the level of maturity of in house procedures and management systems and existing certificates. The referenced costs for ISO certification in the table are from smaller suppliers, the more well known suppliers do not provide cost estimation on their website and may cost more. A larger certification agency has better possibilities to provide more specialized certifications and more knowledge on international systems used outside Europe and is best suited to companies manufacturing advanced products or delivering complex services. A smaller certification agency has less overhead and can be better suited for an SME enterprise that is looking at a cost effective, flexible and quick way to get a required certificate for a specific tender.

⁶⁴ eurocert-egc.com/zertifizierung/iso-zertifizierung/kosten-der-iso-9001-zertifizierung/

⁶⁵ online-iso.nl/iso-14001-2/hoeveel-kost-iso-14001-certificering/

⁶⁶ nestor-security.nl/services/compliance-certificering/iso-27001/

⁶⁷ nieuwhuisconsult.nl/nieuws/wat-zijn-de-kosten-verbonden-aan-certificering-volgens-de-safety-culture-ladder

3.4.2.3. MANAGEMENT SYSTEM CERTIFICATES (NUCLEAR ISLAND)

A quality management system (QMS) such as ISO 9001:2015 is a structured framework that helps organizations design, manage, and improve the processes that impact product quality. Its core purpose is to improve operational efficiency and reduce waste while consistently delivering products or services that meet customer expectations. A nuclear quality management system adds additional responsibilities to guarantee nuclear safety to the above definition.

A nuclear quality management system is all of the above in a nuclear context to ensure that nuclear safety requirements are met. Conformity with a nuclear quality management system is proven by independent audits to one of the internationally established systems. It is typically only needed for items with a direct relation to nuclear safety (mostly found in the nuclear island).

Tenders related to the new build program as a part of the vendor scope can have as a requirement to have one or more of the below certifications. Three different certification systems are in place: ISO, ASME and KTA. Which certification system is used will depend on the NPP's design or the vendor or owner who sets out the tender.

TABLE 8: MANAGEMENT SYSTEMS: NUCLEAR ISLAND

Standard	Topic	Needed for:	Cost 1 st certification	Cost recertification every 3 years
ISO 19443	Nuclear Supply Chain Quality management (EDF)	Products with a relation to nuclear safety (mostly in nuclear island)	€50,000-€70,000	€50,000-€60,000
ASME NQA-1	Nuclear Quality Management (AP1000, Doel, Tihange) (Westinghouse, Electrabel)	Products with a relation to nuclear safety (mostly in nuclear island)	€50,000-€70,000	€50,000-€60,000
KTA 1401	General requirements for the Quality Assurance (legacy equipment Borselle)	Products with a relation to nuclear safety (mostly in nuclear island)	€50,000-€70,000	€50,000-€60,000

The ASME NQA-1 standard is much older than ISO 19443 and is used in many nuclear power plants worldwide for parts of the equipment, including Doel and Tihange in Belgium. Quality assurance in the French RCC codes is not treated as a separate code or standard but as a section in every subject code (RCC-M, RCC-E). Nuclear reactors of an originally German design (currently Borssele, and some reactors in Switzerland, Spain and Sweden) use the KTA code in their original design basis. It is becoming obsolete due to the German phase out from nuclear power, but KTA is recognized in the nuclear industry as a high-quality standard and is of relevance for Long Term Operation projects for the Borssele nuclear power plant.

Only one supplier identified in Zeeland is known to have a valid certification in one of these nuclear quality management systems.⁶⁸

The Belgian nuclear power plants and EPZ in have worked on alternative methods to qualify equipment in case an ASME NQA-1 or KTA 1401 certificate is not available.

Costs of nuclear management system certificates

The direct costs of the ASME NQA-1 certificate for quality assurance are 4,250 US Dollars per certificate and an advance deposit of 11,000 US Dollars for the ASME audit committee. A one-off purchase of the related standard costs 395 US dollars and the comparison with ISO9001 costs 50 US dollars (based on the obsolete 1993 version).⁶⁹

For a manufacturing company a product certification is also required, for example the N stamp for a nuclear component, doubling the above cost. To manufacture according to the ASME code the relevant section of the code will need to be purchased. The best way to do this is to have a digital license⁷⁰. A key functionality to include in the subscription is the redline features that highlights changes from year-to-year versions of the norm. A typical manufacturing company will already have a subscription with NEN that will need to be expanded with ASME standards. Costs are company specific depending on the number of norms selected and the number of users selected. Companies part of an international group may have alternative options to access the standards through an international parent company. A typical additional subscription is estimated to be 1,000-5,000 euros per year. A one-off purchase (not recommended) of a complete paper set of the ASME BPVC code (2023 version) costs 22,244.63 euros⁷¹.

As the certification process is complex, organizations will typically hire consultants to assist them in the process to prepare their management documents and work processes in a format that is acceptable to ASME. Costs of this can range from 5,000-20,000 euros depending on the complexity. The latest 2024 version is typically not the version selected for a new project, as this has not yet been harmonized with the American nuclear regulator NRC or sub suppliers are still using older versions. We expect that the ANVS and the technology vendor will follow NRC's endorsement to use the ASME NQA-1 versions of 2022, 2019, 2017.⁷²

⁶⁸ A central register exists for ASME certified companies (Certificate Holder Search): caconnect.asme.org/directory/. For ISO19443 or KTA1401 accredited companies no such register exists.

⁶⁹ The costs are based on the ASME price guide: asme.org/certification-accreditation/asme-certification-process/price-guide

⁷⁰ See: connect.nen.nl/portal/abonnementen

⁷¹ See: normadoc.com/media/brochure/341-code-asme-bpvc.pdf

⁷² See: nrc.gov/docs/ML2317/ML23177A002.pdf

We expect costs of ISO-19443 certification to be of the same order of magnitude. As a rough estimate costs to obtain ASME NQA-1 certification plus an N certification for a medium size manufacturing company (50-250 employees, 1-3 locations) already having an ISO9001 certificate and having a baseline access to national standards through NEN connect is expected to be an initial investment of around 50,000-70,000 euros and an annual upkeep of 15,000-20,000 euros reflecting the annual subscriptions and the re-evaluation after 3 years.

3.4.3. Field specific certifications: Electrical engineering

3.4.3.1. INDIVIDUAL LEVEL

In order to reduce and avoid the risk of electricity to persons or as a potential fire source every country has national requirements on how to work safely on electrical systems. In the Netherlands the standards developed by the national standards organization NEN in this field have been put in the national construction code “Bouwbesluit” and are therefore legally required.

National legal requirements for working on electrical equipment follow indirectly through the ARBO law that designates the following national standards NEN-1010 (installation of low voltage system), NEN-3140 (operation of low voltage system) and NEN-3840 (high voltage systems). In this system an employer can designate one of his electrical engineers (EE) in the role of VOP, VP, AVP, IV in case the employee is sufficiently qualified. Qualification is done by having followed relevant courses and having enough work experience at a lower level. The validity of the certificate is not dictated by law, but typically a refresher course is done every 2-3 years.

TABLE 9: INDIVIDUAL LEVEL CERTIFICATIONS - ELECTRICAL

Competence level (NEN 3140, 3840)	For whom	Training time	Training, exam, certificate cost
Voldoende Onderricht Persoon (VOP)	EE under supervision of VP	1 day	€200-€500 ⁷³
Vakbekwaam Persoon (VP)	Trained EE independently working on electrical installations	1 day	€200-€1000 ⁷⁴
Aangewezen Vakbekwaam Persoon (AVP)	Leading of VP and VOP	-	Work experience as certified VP
Installatie Verantwoordelijke (IV)	Final responsible for electrical installation	1 day	€500 ⁷⁵

⁷³ For example: arbocentrum.nl/nen3140-cursus/

⁷⁴ For example: [NEN 3140 Vakbekwaam Persoon cursus | Elektrovakopleidingen](http://NEN%203140%20Vakbekwaam%20Persoon%20cursus%20|%20Elektrovakopleidingen)

⁷⁵ For example: de-opleider.nl/cursus/installatie-nen-3140-iv-wv-nen-3140

The certification schemes for the different roles are aligned with ISO/IEC 17024. The Dutch energy sector has created a more detailed certification scheme through Stipel⁷⁶. This is mandatory for all work required by the national grid operators (*netbeheerders*) and recognized in industry and also combined with a complete safety instructions and risk assessments⁷⁷. It is not yet known if the Stipel framework or an alternative will be mandatory for the new nuclear power plant. The price range for a course varies greatly. Online only courses are cheaper than classroom equivalents that take more time to apply the theory in real world situations.

The technology vendor and its international higher tier suppliers are expected to have limited or no personnel with the required Dutch NEN-3140 and NEN-3840 certifications and limited experience with a system design according to NEN-1010. This presents opportunities for sufficiently developed companies from Zeeland to provide services to the technology vendor and its international higher tier suppliers. It will also present a risk that experienced personnel (AVP and IV level) will be drawn away from existing companies due to the required work experience to develop an individual employee to this level.

3.4.3.2. PRODUCT/SYSTEM LEVEL

In the previous section individual certifications were addressed. A tender invitation to supply an electrical system or a machine will include technical requirements for the system itself. Based on the origin of the request it is expected that suppliers will follow Dutch electrical codes sometimes in combination with requirements from the country of origin of the original design.

At product/system level NEN 1010 or international alternatives will be required. NEN 1010 is related to NEN-EN-IEC 60204-1, the Dutch version of IEC 60204-1. IEC stands for International Electrotechnical Commission, an independent organization that is recognized by most developed countries, including the United States and France.

TABLE 10: PRODUCT / SYSTEM LEVEL DIFFERENCES IN STANDARDS

International harmonized standard	Netherlands	United States	France
IEC 60204-1	NEN 1010	NFPA 79	NF C15-100

⁷⁶ See: www.stipel.nl

⁷⁷ See: www.beviag.nl

For every product several technical standards exist that are the easiest way to prove conformance with relevant EU directives (primarily low voltage and machine equipment)⁷⁸. In case only non-harmonized standards are mentioned in a tender specification a significant effort will be required to demonstrate that the product is allowed to be used in the European market. In case a tender specification mentions a version of the standard that is not valid for current conformity assessment (for instance a different year) it is recommended to ask questions on this before submitting a bid, as this can be a small oversight or a deliberate choice.

American electrical standards (Westinghouse)

The standards system used in the United States (UL) and Canada (CSA) uses different concepts compared to the electrical standards system used in the rest of the world (IEC). These differences are too complex to shortly summarize in this report. We refer to a presentation made at Industry event 2018 by Technische Unie/Sonepar aimed at Dutch companies wanting to export to the United States and Canada that highlights key differences and a top 12 of most common problems found by European inspectors⁷⁹ on export equipment to the USA market.

- Designed to the wrong standards;
- Incorrect distances of electrical parts in the power supply circuit;
- Wrong choice and sizing of components;
- Use of UL 1077 protections instead of the correct protections for outgoing circuit;
- Use of UL 508 manual motor starters instead of the correct cut-off circuit protections;
- Problems in assessing the right enclosure in the right environment;
- Power supplies and transformers. (preference for Listed Components instead of Recognized components, preference for industrial components instead of Class 2 certified equipment);
- Errors in type plates, wiring diagrams and warning stickers;
- Retrieving certificates not possible (e.g. wiring material);
- Wrong choice of protections for AC drives;
- Transformer protection not according to standards;
- Grounding problems.

Westinghouse electrical requirements will need to be adapted into specifications that can be used in the European framework. The unfamiliar American standards present a high barrier of entry into the market for Zeeland companies. It is at the same time also a strong opportunity for companies in Zeeland that have suitably qualified and experienced electrical engineers familiar with the different systems and that are currently importing or exporting electrical and electronic equipment from the USA or Canada. The opportunities will also appear in Poland where a Westinghouse design will be adapted to the European requirements.

⁷⁸ ec.europa.eu/docsroom/documents/62994 lists about 1000 standards for various electrical equipment and their validity in April 2025 in conformity assessment.

⁷⁹ See: technischeunie.nl/images/content/Industrie-Event-2018-UL-V001-Geurt.pdf

3.4.3.3. CORPORATE LEVEL

For performing work on electrical installations, it is not mandatory by law for a company to have a recognized or certified level of competence on handling electrical equipment. Recognition is based on self-certification, where certification relies on an external auditor. Typically, certification is an efficient way to show compliance with legal requirements. It also often required as a part of a tender process. The following corporate level certification/recognition exists:

- **Install Q Recognized:** The recognized level ("Erkend") is managed by INSTALL Q⁸⁰ for the electrical engineering installation sector. Recognized companies are listed in public registers⁸¹. Recognized level is sufficient for private sector or work for small businesses, but public tenders require either certification or nothing at all. Typical cost is 139 euros per year per recognized sector and a 279 euros initial entry fee. A recognized company could be subcontracted by a certified company for less complex tasks of the installation works for the new build program;
- **BRL6000 Certified:** Certified companies follow additional standards compared to recognized companies. The certification is issued by an independent accredited third-party company which brings additional cost. Relevant for the new build program will be BRL6000-02 (electrical installations up to 3*80 A) and BRL6000-03 (electrical installations from 3*80A and higher). BRL6000-02 or BRL6000-03 is certifies to deliver electrical installations that are completely in line with all legal requirements ("*Besluit bouwwerken leefomgeving*" or BBL) and the various NEN standards referenced in the BBL. Given the complexity of a nuclear new build, we expect that BRL6000 certification will be a mandatory requirement in tenders related to the installation work of the nuclear new build.

3.4.3.4. NUCLEAR ISLAND SPECIFIC ELECTRICAL REQUIREMENTS

For application related to nuclear safety specific electrical design codes are used. These take into the need for a robust and diverse design to guarantee a control of the nuclear reactor under all conditions. These codes also take into account the harsh conditions such as radiation.

RCC-E (EPR only)

The French organization AFCEN has developed the code RCC-E. The code was developed with the following goal: to set design and construction rules for electrical equipment of PWR Nuclear Islands and it is applied in the EPR design of technology vendor EDF. The code is available in French and English.

The code costs 1,000 euros for a paper version of the 2022 version or 950 euros annual subscription. To correctly apply the code a training course would be necessary. Courses on how to apply RCC-E are organized by SICA Nucleaire in Fuveau (France) in French and in English.

⁸⁰ See: installq.nl/erkennen

⁸¹ See: centraalregistertechniek.nl/ and echteinstallateur.nl/.

No companies in the Netherlands or Zeeland have been identified that use this code. The code is relevant only for specific systems in the Nuclear Island building. Other systems in the Nuclear Island building or systems in other buildings will not use the nuclear code but will rely on conventional electrical codes.

IEEE 308/Class 1E (AP1000 only)

In the Westinghouse design there are references to concepts in electrical engineering that are not used in Europe. The electrical power systems that are most relevant to nuclear safety are designated “Class 1E” and follow specific requirements according to standard IEEE 308. The standard costs 68,43 euro. Suppliers for this type of equipment are primarily based in the United States. We list two example suppliers below.

TABLE 11: SUPPLIERS OF IEEE 308/CLASS 1E STANDARD

Company name	Class 1E product portfolio	Company name
Leonardo DRS	Nuclear instrumentation, sensors ⁸²	Leonardo DRS
Ametek solidstate controls	UPS solutions, legacy equipment no longer available from OEM ⁸³	Ametek solidstate controls

For more insights into class 1E electrical equipment in nuclear power plant⁸⁴. For a company performing electrical installation work in the nuclear island for the Westinghouse it is recommended to have a good understanding of both the American and European standards for electrical engineering.

IEEE/IEC 60780-323:2016 Qualification process (AP1000/EPR/existing reactors)

This standard is listed in the report as an example of a standard that is valid for all nuclear reactors and that is called a dual logo standard. Currently few of these dual logo standards exist in the nuclear field. The standard describes the basic requirements for qualifying electrical equipment important to safety and interfaces (electrical and mechanical) that are to be used in nuclear facilities. The principles, methods, and procedures described are intended to be used for qualifying equipment, maintaining and extending qualification, and updating qualification, as required, if the equipment is modified. The qualification requirements in this standard, when met, demonstrate and document the ability of equipment to perform safety function(s) under applicable service conditions, including design basis events and certain design extension conditions, and reduce the risk of environmentally induced common-cause equipment failure.

Qualifying electrical equipment as fit for nuclear use is relevant in replacement projects where the OEM product is no longer available (typically found in an existing NPP) and it is also relevant for SMR developers that use new electrical components or systems that are not yet used in the nuclear industry.

⁸² [Nuclear Instrumentation and Controls \(I&C\)](#)

⁸³ solidstatecontrolsinc.com/applications/nuclear

⁸⁴ nuclearelectricalengineer.com/class-1e-definition/

The process for qualification is outlined in: IEC/IEEE International Standard IEEE/IEC 60780-323-2016 - Nuclear facilities -- Electrical equipment important to safety – Qualification that costs /271 Euros.

This dual logo standard applies to all electrical equipment important to safety in accordance with IAEA terminology including Class 1E equipment in accordance with the IEEE classification scheme (Westinghouse) and Classes 1, 2 and 3 in accordance with IEC 61226 classification scheme (EDF).

IEEE Nuclear Power Electrical Equipment Certification Program (unknown)

In 2022, IEEE launched the initiative for a certification program for both class 1E (IEEE) and Important to Safety Components (IEC) to decrease the effort by suppliers of nuclear instrumentation to serve the global market.⁸⁵ No information on the global nuclear industries acceptance of the program was found.

3.4.4. Field specific certifications: Mechanical engineering

Westinghouse will follow ASME section III as the basis for their mechanical design and EDF will follow RCC-M. Both systems guarantee nuclear safety but have large differences in the philosophy of their design. RCC-M is aligned with European manufacturing standards for conventional industry and will require little technical changes to an existing design and manufacturing process. ASME follows design rules not always aligned with European requirements and safety critical designs need to be verified by an ASME registered professional engineer (P.E.). The training and certification for RPE is not available in the Netherlands.

⁸⁵

See: standards.ieee.org/products-programs/icap/programs/npee/

3.4.4.1. WELDING

There are large differences between the ASME and RCC codes.⁸⁶ A key difference exists in the method of welder qualification; the European scheme uses EN ISO 9606 and the ASME scheme uses ASME section IX. An experienced welder who is certified according to the European EN ISO 9606 will need training and certification before he/she is allowed to make AWS or ASME welds. The costs for this training are estimated to be 500-1,000 euros for a given type of weld. Accreditation for the welding training providers is handled by the foundation NIL⁸⁷. The larger welding training providers organize trainings to all relevant worldwide standards. The nuclear new build programme will lead to an increased demand for qualified welders. As this expertise is already in high demand from other industry it can be considered a no regret action to stimulate education and training in the welding area at vocational schools in Zeeland, such as Scalda Next. For large projects in nuclear and other industries it can be a tender requirement to have an International Welding Expert available for the project to take the role of welding coordinator (according to standard EN ISO 14731). An example training⁸⁸ for a qualified and experienced professional welder to reach this highest level takes 1,5 years (1 day per week) and costs 12750 Euros.

3.4.4.2. PRESSURE EQUIPMENT

All pressure equipment (except nuclear pressure equipment) must be compliant with European pressure equipment directive (PED) rules. As the EDF design is from France it is already in line with European rules. The Westinghouse design uses ASME codes that are not fully harmonized with the PED, but can be used within the PED with some precautions or additional requirements. Similar to electrical equipment there is a list of harmonized standards for technical certifications related to pressure equipment⁸⁹ that are the easiest method to prove conformance with the PED. Other methods are available to proof conformity but these require more effort and will cost more and take more time.

⁸⁶ The key technical differences for a typical nuclear weld are highlighted in: twi-global.com/technical-knowledge/published-papers/comparison-between-asme-and-rcc-m-requirements-for-welding-and-ndt. This publication is very technical and useful for a supplier when preparing an offer. For a more general starting point LRQA prepared an overview document of the main different codes related to welding: inspectioncasl.com/wp-content/uploads/2023/02/LRQA-CASL-Welding-Certification-Guide.pdf

⁸⁷ See: nil.nl/

⁸⁸ Example: lasinstituut.nl/lasopleiding/iwe/

⁸⁹ single-market-economy.ec.europa.eu/single-market/goods/european-standards/harmonised-standards/pressure-equipment_en (>300 Harmonized standards as of January 2026)

For potential sub suppliers to Westinghouse it will be relevant to follow training on the harmonization of PED and ASME to better understand different concepts in the code. Concepts from both codes such as design pressure, test pressure, maximum design pressure are otherwise easily mistaken. This can lead to difficult or impossible to manufacture purchase specifications or to specifications that overly conservative due to superimposed safety margins from both codes. Trainings are available from accreditation firms in pressure equipment and start at 500 euro for 1 day introduction to the basics of both systems.⁹⁰ Given the complexity of the topic a multiple 2- till 4-day course is recommended which will cost more.

3.4.5. Certifications overview

The table below gives an overview of commonly encountered certifications in the nuclear island and conventional island of nuclear power plants as discussed in this section. The list is not exhaustive.

Discipline	type	Certifications			
Workplace safety	individual	B-VCA	VCA-VOL	VCA-VIL-VCU	
Workplace safety	company	VCA*	VCA**	VCU	VCA-P
Security	individual	VOG	VGB-A	VGB-B	VGB-C
Management System Certifications (non-nuclear)	company	ISO-9001	ISO-27001	SCL	
Management system certifications (environmental)	company	ISO-14001	BR-7000	CO2 PL	
Management System Certifications (nuclear)	company	ASME-NQA1	ISO-19443	KTA-1401	
Electrical engineering (non-nuclear)	individual	VOP	VP	AVP	IV
Electrical engineering (non-nuclear)	company	INSTALL-Q recognized	BR-6000 certified		
Electrical engineering (non-nuclear)	system	IEC-60204-1	NEN 1010	NFPA-79	
Electrical engineering (nuclear)	system	RCC-E	IEEE 308	Class 1E or IEC 61226	IEEE/IEC 60780-323
Mechanical engineering/ pressure equipment (nuclear)	system	ASME Section III	RCC-M	RND	
Mechanical engineering/ pressure equipment (non-nuclear)	System	PED	ASME Section VIII	WBDA	EN-ISO-13445

⁹⁰

For example: [ASME BVP Code and PED Requirements - CIS GmbH](#)

Discipline	type	Certifications			
Mechanical engineering (nuclear)	individual	ASME RPE			
Welding	system	EN-ISO 9606	ASME Section IX		
Welding	individual	EN-ISO 14073			

4. Lessons from abroad

In recent years, in various countries throughout the world, plans for new large-scale nuclear power plants have been presented. A requirement for many countries is that the local economy also benefits from and during the construction of new nuclear power plants. Experiences from recent localization programs in these other countries can provide valuable input to a potential localization program in Zeeland.

This section provides a concise overview of localization programs in the United Kingdom and Poland. It is composed of a short background on the nuclear programs in both countries followed by lessons learned. Annex B contains the complete case studies of the localization programs in the United Kingdom and in Poland.

4.1. United Kingdom

TABLE 12: UK NUCLEAR POWER PROGRAM

Name of localization program	Hinkley Point C Supply Chain & Local Engagement Programme
Country	United Kingdom
Type of NPP being built	Two EPR™ (European Pressurized Reactor) units, large-scale Generation III+ PWRs – 2 × 1,630 MWe (3,260 MWe total)
Timeframe of the program	- Construction start: March 2017 - Expected commissioning of Unit 1: 2029–2030 (scenarios) - Expected commissioning of Unit 2: approx. 1 year after Unit 1 (early 2030s)
Key characteristics / activities in the program	- Robust supplier engagement program (supplier portals, meet-the-buyer events, training packages). - Strong emphasis on regional SME participation (Somerset and South West). - Supply chain mapping, capability building, and strict nuclear-quality compliance support. - Transparent publication of work packages and build schedules via EDF and regional supply chain offices.
Relevance to Zeeland	Demonstrates how a mature new-build project structures supplier engagement, intermediary organizations, and capability-building to support local content.

Hinkley Point C (HPC) is the first new nuclear power station in the UK in over a generation, located in Somerset, England. It comprises two EPR™ Generation III+ reactors, with a combined planned output of 3,260 MWe. Construction officially began in March 2017 after the nuclear site licence was granted in 2012 and government approval was confirmed in 2016.

4.1.1. Localization Approach and Key Activities

The UK has developed one of the most mature nuclear localization ecosystems in Europe, centred around the Hinkley Supply Chain Programme led by EDF and regional partners. Key elements include:

- **Strong supplier engagement and regional development:** EDF actively encourages UK companies to participate in the HPC supply chain through:
 - A dedicated Hinkley Supply Chain Registration Portal;
 - Supplier capability assessments;
 - Tier 1 contractor visibility of local business capabilities;
 - Clear communication on work packages, build updates, and schedules.
- **Capacity building for SMEs:** Local and regional businesses receive:
 - Access to training, quality assurance support, and nuclear standards guidance;
 - Information days and “Hinkley Ready” programs;
 - One-to-one meetings with Tier 1 contractors through Meet-the-Buyer events.
- **Sector diversification and consortium formation:** Many SMEs form consortia to provide combined capabilities - for example, the Somerset Larder, a consortium of regional food suppliers winning major onsite catering contracts.
- **Transparent procurement structure:** EDF publishes
 - Work package information;
 - Build schedules;
 - Reference and training materials;
 - Guidance for achieving nuclear qualification

This transparency helps suppliers plan qualifications and investments early.

4.1.2. Relevance to Zeeland

Hinkley Point C offers several best practices that Zeeland can draw from when designing its own localization strategy:

- **Establish a dedicated intermediary supply-chain office** connecting developers, Tier 1 contractors, and local SMEs (similar to the UK regional supply chain hubs);
- **Create early-stage capability mapping** of local businesses to assess readiness and target training;
- **Provide targeted nuclear-quality support programs**, including certification readiness, safety compliance, and documentation training;
- **Use consortium building** to help smaller companies compete for large work packages;

- **Ensure high transparency**, including publication of procurement timelines, work packages, and certification requirements;
- **Host supplier days and meet-the-buyer events** as consistent mechanisms for stakeholder engagement.

4.2. Poland

TABLE 13: POLISH NUCLEAR POWER PROGRAM

Name of localization program	Polish Atomic Energy Program (PAP Program)
Country	Poland
Type of NPP being built	Westinghouse AP1000 reactor - Large-scale pressurized-water reactors, Generation III / III+
Timeframe of the program	• Start of program: 2014 • Construction period for the first NPP: 2026-2035 • Anticipated start of operational phase of the first NPP: 2036
Key characteristics / activities in the program	The localization program is in the early stages (the development is in the preparatory phase). However, the program is composed of research, information session, supplier days, conferences, support programs and the development of a platform aimed to support to localization.
Relevance to Zeeland	How to best approach the localization and what is important to consider

The objective of the Polish Nuclear Power Program (PNP Program) is the construction and commissioning of nuclear power plants based on large-scale, Generation III (+) pressurized water reactors. The total installed nuclear capacity ranges from ca. 6 to ca. 9 GWe. The nuclear energy program was launched in 2014. In 2022, the Council of Ministers adopted a resolution on the technology selection for the first nuclear power plant. Westinghouse was chosen and a Cooperation Agreement defining the principles of cooperation in the preparation of the construction process of the first nuclear power plant in Poland was signed. It is expected that the start of the commercial operation of the first reactor of this nuclear power plant is in 2036.

There have been localization targets set for the development of the new nuclear power plants in Poland in the PNP Program since the planning phase for nuclear new-build. For the first nuclear power plant, the target is to have local industry involved for 40% of the value for the first unit. For the following new nuclear power plants, this figure increases to 70% of the value of the units. PEJ is responsible for the involvement of the domestic industry during the construction of the new nuclear power plants.

As the construction phase of new nuclear power plant in Poland is in early stage, activities related to the localization program are not fully developed yet. However, several best practices from Poland can be of interest for localization in Zeeland:

- Develop the localisation approach together with the technology vendor;
- Categorise local businesses according to their size and experience due to their different capabilities and required types of support;
- Set up (non-)financial support programmes for local businesses to support them in developing needed competencies and to getting required certification;
- Set up an intermediary office to support the contracting of local and regional businesses, following the British model. Work includes bridging the technology vendor/owner with the local and regional businesses, the provision of information and support throughout the tender process;
- Transparency and timely provision of information is important for local businesses. For instance, the technology vendor could publish a schedule of purchasing procedures for the next 2-3 years;
- Create an audit and advisory program for more experienced businesses to assess infrastructure, staff, and existing certification and suggest necessary actions to become a supplier for the nuclear industry;
- Develop a definition for local content and a methodology to measure it;
- Supplier days are a way to both inform, activate and support local businesses.

For more information of the development of new nuclear power plants and the localization program in Poland, please see Annex B.

5. Opportunities for businesses in Zeeland

The construction of a new nuclear power plant in Zeeland opens opportunities for companies in Zeeland. These developments could also lead to other opportunities, such as in the nuclear sector the development of SMRs, in other sectors or abroad. This chapter provides an overview of the different opportunities for companies in Zeeland that have been identified in the study.

5.1. Supply opportunities

There is ample opportunity for companies from Zeeland to contribute to the construction of the nuclear power plant. This refers to opportunities both during the different phases of the construction of the nuclear power plant as well as for the supply of the different components of the nuclear power plant.

As indicated in Chapter 2, the construction of nuclear power plants can be divided into multiple parts: the Nuclear Island, the Conventional Island, the Balance of Plant, and the Civil Works (this includes the Switchyard).

The Technology Vendors EDF and Westinghouse have different designs for the reactors and provide different services and support for the construction and operation of the new nuclear power plants. Similarly, there will be differences in the contracting arrangement between the owner and the vendor resulting in potential differences in the scope split or Division of Responsibility (DoR) (see section 3.2). The extent to which there will be opportunities for Zeeland will be dependent on the selection of the technology vendor.

The construction of a nuclear power plant follows a timeline across different stages and is path-dependent (see Chapter 2 and Figure 9). For instance, before any other work can start, the site preparation and earthworks should take place. Following these preparatory activities, the foundations and the actual construction of the nuclear power plants can take place. The IAEA report *Project Management in nuclear power plant construction*⁹¹ estimates site preparation to take between 18-24 months, with excavation (earthworks) requiring an additional 12 months.

The actual potential for companies from Zeeland lies at the intersection of the construction (and operation) components and project phases. The extent to which specialized expertise and capabilities are required varies across these dimensions.

Some components of the new nuclear power plants cannot be sourced from Zeeland, due to complexity of the components and the special requirements and competencies needed to construct nuclear-grade components (e.g. clean rooms, certifications, a network of specialized suppliers) that companies from Zeeland do not have. The same holds true for the different phases of the construction and operation of a nuclear power plant. For instance, only a select group of suppliers can provide equipment for the Nuclear Island such as the reactor pressure vessel, steam generators and main coolant pumps.

In the following sections, we will provide a general overview of the potential for the different components and the different project phases. We will highlight characteristics that determine where there are opportunities and where the potential is limited.

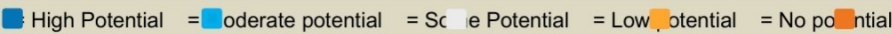
5.1.1. Potential per component

Table 14 sets out the potential per component of new large nuclear power plants. In addition to that, it describes to which extent that there are barriers to entry and whether there exist opportunities for businesses in Zeeland. Below, an elaboration per component is provided.

⁹¹

IAEA, 2012, *Project Management in Nuclear Power Plant Construction: Guidelines and Experience*
Retrieved from: [.iaea.org/publications/8759/project-management-in-nuclear-power-plant-construction-guidelines-and-experience](https://www.iaea.org/publications/8759/project-management-in-nuclear-power-plant-construction-guidelines-and-experience)

TABLE 14: POTENTIAL BUSINESS OPPORTUNITIES PER COMPONENT

Component	Potential	Main reasons
Nuclear Island	High Potential	High barriers to entry • Strict design and qualification controls. • Requires specialized knowledge and competencies, experience with nuclear materials, nuclear safety culture, documentation, and oversight. • Integrated supply chain. Opportunities • Partnering with nuclear OEMs and undertaking targeted qualification programs under the graded safety-classification framework.
Balance of Plant	Medium Potential	Medium barriers to entry • Generally contains non-radioactive equipment. • Designed, manufactured, and tested to mainstream industrial codes and standards under ISO-based quality management rather than nuclear-specific. Opportunities • Experience and competencies in other regulated sectors can be translated credibly when specifications, interfaces, and documentation are clearly defined. • Nuclear safety functions can be delivered through a graded safety-classification approach, with heightened QA/QC, applicable nuclear codes, and oversight by nuclear-experienced engineers.
Conventional Island	Medium Potential	Medium barriers to entry • Requires non-radioactive media and equipment. • Governed primarily by mainstream power-industry codes and standards. • Requires conformance with the project's seismic/environmental envelopes, documentation, and QA/QC expectations defined by the Architect-Engineer. Opportunities • Standard practice for experienced Dutch firms (existing competencies for regulated sectors).
Civil Works	Low Potential	Low barriers to entry • Site preparation, earthworks, foundations, structural concrete and steel for conventional and auxiliary nuclear buildings, roads and utilities, temporary works, and materials supply should be designed and developed through general structural and geotechnical building standards. • Nuclear-island civil structures with higher safety significance require specialized nuclear civil design and execution. • Dependence on Architect/Engineer. Opportunities • Dutch companies have ample experience in developing non-nuclear civil structures. • Partnerships with nuclear-experienced designers/constructors. • Material supplies for construction such as concrete and steel. • General services needed during construction activities; HSE experts etc.
		

The relative size of the different components and their associated costs vary substantially. As a result of the different factors that influence the total cost, such as design choices, scope, etc., cost estimates are often presented as a percentage of the total cost. To reflect this, the cost ranges for the different components, based on literature and expert insight, are as follows (see Figure 14)⁹²:

- Nuclear Island: 34-40%
- Conventional Island: 14-19%
- Balance of Plant: 10-25%
- Civil Works (incl. Switchyard): 22-36%

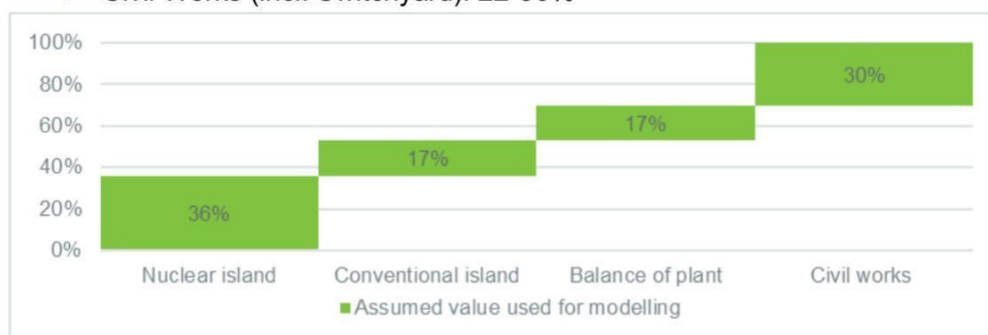


Figure 14: Cost ranges per component

If we consider the estimated cost of €20-30 billion for a new nuclear power plant and use the values in Figure 14, the different components will cost the following:

TABLE 15: ECONOMIC POTENTIAL FOR COMPANIES IN ZEELAND

	Low estimate	High estimate	Potential for Zeeland
Total Cost	€20,000M	€30,000M	(section 4.1)
Nuclear island	€7,200M	€10,800M	Low potential
Conventional island	€3,400M	€5,100M	Moderate potential
Balance of plant	€3,400M	€5,100M	Moderate potential
Civil works (incl. Switchyard)	€6,000M	€9,000M	High potential

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World Nuclear Association. 2020. *World Nuclear Supply Chain*. Retrieved from: [world-nuclear.org/information-library/economic-aspects/economics-of-nuclear-power](https://www.world-nuclear.org/information-library/economic-aspects/economics-of-nuclear-power)
 NEA OECD. 2015. *Nuclear New Build: Insights into Financing and Project Management*. Retrieved from: [oecd.org/content/dam/oecd/en/publications/reports/2015/08/nuclear-new-build_g1g59258/9789264241749-en.pdf](https://www.oecd.org/content/dam/oecd/en/publications/reports/2015/08/nuclear-new-build_g1g59258/9789264241749-en.pdf)
 NRG PALLAS (2025). *Localisation Perspectives of a Netherlands Nuclear Newbuild Project*. Final report. World Nuclear Association WNA, "Economics of Nuclear power"; NEA "Unlocking Reductions in the Construction Costs of Nuclear (2020); NEA "Reduction of Capital Costs if Nuclear power Plants" (2000)

As indicated in Table 15, the highest potential for companies in Zeeland can be found in the *Civil Works*, followed by the *Conventional Island* and the *Balance of Plant*. Given the high level of uncertainty, we do not place a figure on the potential for Zeeland in euro per component. Examples of the amount of materials needed for the construction of a new nuclear power plant are provided in Section 1.3. This can shed light on the required inputs per component in relation to the projected costs.

5.1.1.1. NUCLEAR ISLAND

Examples of components

- Reactor pressure vessel;
- Steam generators;
- Reactor coolant pumps;
- Pressurizer;
- Piping

Barriers to entry

The Nuclear Island is the component where safety significance is the most stringent (e.g., *Safety Class 1/2, Seismic Category I*). Especially, the reactor pressure vessel, the steam generators and reactor coolant pumps are subject to strict design and qualification controls and audited QA systems (e.g., *ASME Section III/RCC-M, Class 1E/IEC 61513; ISO 19443, ASME NQA-1*). Other aspects that should be accounted for are certifications and processes that should be followed. There are relatively few companies in the Netherlands that have experience in adhering to these standards. In the survey, only 1 company mentioned that they possess ASME NQA-1.

The development and construction of the components of the Nuclear Island requires specialized knowledge or capacity and experience with nuclear materials (control), nuclear safety culture, documentation and oversight. Companies supply components for the nuclear island have developed these capabilities, and sometimes assets, throughout a longer timeframe. Examples include regulatory and quality risks, such as control of counterfeit/suspect items (CSFI) and commercial-grade dedication, for which specialized procedures need to be developed and become standard within the business operations of a company

As a result of the specificity of the products and components, the supply chains can be characterised as strongly integrated and interdependent. The technology vendors typically have long-term relations with established nuclear OEMs throughout the world. For instance, EDF has a long-established relationship with Framatome for the Nuclear Island equipment and Bouygues for construction activities. Westinghouse has similar relationships with Bechtel for construction of its nuclear plants.

Opportunities

Dutch suppliers, including those from Zeeland, are unlikely to lead Nuclear Island work packages without partnering with nuclear OEMs and undertaking targeted qualification programs under the graded safety-classification framework. Both a mature nuclear safety culture, documentation, and oversight and specialized products are needed.

5.1.1.2. BALANCE OF PLANT (BOP)

Examples of components

- Heat sink and cooling water systems;
- Demineralization plant;
- Underground galleries;
- Heating Ventilation and Air Conditioning (HVAC).

Barriers to entry

As mentioned earlier, the BOP covers plant systems outside the nuclear island and the conventional island. The equipment used on the BOP is not too dissimilar to that used on other thermal power plants, although the size of equipment can often be much larger (e.g., *Seawater coolant pumps*). Most of these components therefore can be designed, manufactured, and tested to mainstream industrial codes and standards (EN/NEN, IEC/IEEE as applicable) under ISO-based quality management rather than nuclear-specific codes rather than nuclear specific code requirements. In some cases, components of the BoP can have nuclear safety functions (e.g., essential service water or emergency ventilation). For these, components more stringent requirements exist.

Opportunities

These are all competencies and capabilities that apply to other regulated sectors, such as oil & gas, pharmaceutical and conventional power sectors. When specifications, interfaces, and documentation are clearly defined these companies can credibly deliver these components.

In case, nuclear safety functions are relevant a graded safety-classification approach applies, with heightened QA/QC, applicable nuclear codes, and oversight by nuclear-experienced engineers can be performed by Dutch companies.

5.1.1.3. CONVENTIONAL ISLAND

Examples of components

- Steam turbine;
- Electric generator;
- Condenser;
- Feedwater/condensate systems;
- Associated auxiliaries (electrical and mechanical).

Barriers to entry

The conventional island makes use of components and systems that are common to conventional thermal power plants that operate on the Rankine cycle.⁹³ An example of such a plant is the Moerdijkcentrale (also known as *CCGT Moerdijk II*). These systems handle non-radioactive media and are governed primarily by mainstream industry codes and standards (e.g., EN/Eurocodes for structures; IEC/IEEE for controls; API/ASME for rotating equipment and pressure parts).

Participation requires conformance with the project's seismic/environmental envelopes, documentation, and QA/QC expectations defined by the Architect-Engineer (including interface control with the nuclear island and grid).

Opportunities

While core OEM packages (the turbine-generator itself) are typically supplied by a small number of global vendors, NL suppliers can credibly deliver major sub-packages and services such as condensers and heat-exchange equipment, large-bore piping and valves, pumps and auxiliaries, HVAC and water-chemistry systems, steelwork, erection, and O&M support. Dutch companies can leverage existing competencies from power generation, oil & gas, and process industries.

5.1.1.4. CIVIL WORKS

Examples

- General support buildings,
- Nuclear-island, conventional island and BOP civil structures,
- Foundations,
- Sewer works, water supply works, drainage,
- Roads.

⁹³

The Rankine cycle refers to the process where heat is used to boil water into steam. The steam subsequently drives a turbine that generates electricity.

Barriers to entry

General structural and geotechnical building standards cover the requirements for most of the site preparation, earthworks, foundations, structural concrete and steel for conventional and auxiliary nuclear buildings, roads and utilities, temporary works, and materials supply (cement, concrete, rebar, fabricated steel). The design and execution should follow EN Eurocodes with Dutch National Annexes and geotechnical standards (NEN-EN 1990/1992/13670; NEN 9997-1; NEN-EN 1998-1/NPR 9998).

Nuclear-island civil structures require typically higher safety significance (e.g., prestressed inner containment and steel liners) and specialized nuclear civil design and execution and tools.

Opportunities

Dutch companies have ample experience in developing non-nuclear civil structures. The non-nuclear civil structures typically require expertise and competencies that many Dutch companies have, as regular civil construction requires these standards to be followed. The potential is strong, especially the site preparations and conventional buildings

For nuclear civil structures, contributions are most likely arranged through materials supply (e.g., concrete, steel), fabrication/erection, and joint ventures under an experienced nuclear A/E. The exact opportunities will depend on the Nuclear A/E-defined documentation and interface control (code compliance, material qualifications, QA records).

For the companies, targeted upskilling of workers, certification alignment, and partnerships with nuclear-experienced designers/constructors that embed the required seismic/quality culture from the outset is needed. These aspects will be covered in following sections.

5.1.2. Potential per phase

Like the previous section, we will describe the potential per construction phase of new large nuclear power plants. In addition to that, it describes to which extent that there are barriers to entry and whether there exist opportunities. Below Table 16: Potential per phase, an elaboration per component is provided.

TABLE 16: POTENTIAL PER PHASE

Phase	Potential	Main reasons	Example Local Opportunities
Preparation & Site establishment		Barriers to entry - Scale and coordination. - Specialized work. - Construction management at high quality levels through the adoption of ISO based QMS (e.g., ISO 9001). Opportunities - Non-nuclear and early civil works are usually in the owner scope. - It is mostly non-nuclear civil construction work.	BAM/ VolkerWessels/ Heijmans for civils & site infra Boskalis for marine access Zeeland logistics (Damen/North Sea Port, Verbrugge terminals)
Earthworks		Barriers to entry - Technically demanding. - Experience with geotechnical control, traceability and integration with marine works. Opportunities - A large labor & plant demand is expected, and joint-venture provide opportunities.	Kier–BAM precedent at Hinkley Point C; Dutch earthworks fleets & some accredited labs; Zeeland sand/aggregate supply chain (subject to vendor specification)
Civil Construction		Barriers to Entry - Barriers to entry depend on the scope of the work. Ranging from conventional expertise to nuclear certification. Opportunities - Conventional Island well suited to Dutch firms. - Nuclear Island concrete requires nuclear-grade practices (AFCEN/ASME requirements and ISO 19443 adoption).	Dutch civil contractors on Conventional Island. Targeted participation on Nuclear Island after qualification.
Mechanical, Electrical, HVAC & Installation		Barriers to Entry - Barriers to entry depend on the scope of the work. Ranging from conventional expertise to nuclear certification. Opportunities - Conventional Island, Balance-of-Plant (fire systems, water treatment, auxiliary systems, switchyard) is accessible. - Nuclear Island equipment manufacturing & installation is vendor-qualified and highly specialized.	HV substations and grid works via Dutch EPCs with TenneT processes. Local Mechanical, Electrical and HVAC manufacturers and installers on Conventional Island and BOP packages after supplier qualifications especially for non-safety related equipment.
Commissioning		Barriers to Entry - Experience, procedures and licensee oversight. - Nuclear QA. - Access to proprietary methods/tools. - Radiation protection training. Opportunities	Local participation in BOP systems testing, documentation support, temporary staffing under technology vendor supervision.

Phase	Potential	Main reasons	Example Local Opportunities
		- Vendor-led integration, cold/hot functional tests, fuel load, initial criticality, power ascension. - Support for commissioning BOP is possible locally.	
Site Clearance & Landscaping		Barriers to Entry - Requires experience with waste management and Health, Safety and Environment (HSE) compliance. Opportunities - Clean up of the non-nuclear areas of site and demobilization. - Environmental restoration. - Final landscaping prior to operations.	Regional contractors for clean-down, hard/soft landscaping and perimeter works.

High Potential
 Moderate potential
 Some Potential
 Low potential
 No potential

5.1.2.1. PREPARATION & SITE ESTABLISHMENT

Description of activities

The preparatory work and site establishment refer to the development and construction of the infrastructure of the site. This includes transport routes (or roads) to and from site, erecting site fencing, as well as bringing the necessary utilities to site such as electricity or temporary power, water, telecoms, sewerage, providing temporary site offices and accommodation, etc.

A large part of this work can be carried out by local suppliers and does not require significant certification as it is non-nuclear civil construction work. It should be noted that much of the work is highly specialized. The quantity of work to be carried out simultaneously requires a large work force that will be required to conduct the work. It thus makes sense that partnership between larger, experienced companies (that can coordinate all activities) and local companies are formed. In addition to that, the management and coordination of the activities needs to follow quality management standards, such as ISO 9001.

Although the work is owner's scope, it is typically performed in collaboration with the technology vendor and/or a tier-1 company/ies to ensure that site preparation meets the needs of the Technology Vendors or construction companies. An example of this would be the development of sufficient area for laydown areas or warehousing or the infrastructure to access the site.

5.1.2.2. EARTHWORKS

Description of activities: The earthworks activities are related to the large-scale excavation for the reactor and supporting infrastructure. This includes stabilizing the surrounding soil, managing ground water and setting up the building platforms and structures on which the main infrastructure will be built.

The earthwork activities are accessible to experienced Dutch heavy-civils companies. The activities are technically demanding but do not generally require nuclear-specific certification. Companies should have experience with geotechnical control (i.e., monitoring the soil conditions to make sure that the foundations are suited to nuclear safety and design requirements), documenting of the compaction and testing for traceability. Finally, there should be a strong integration with the marine works. In the case of Westinghouse, the ASME-NQA1 certification might be required.

The Hinkley Point C Kier–BAM JV executed enabling works and large-scale earthworks (5.5 million m³ excavation, roads, terracing). This illustrates the type and scale of early works suitable for Dutch contractors.⁹⁴

5.1.2.3. CIVIL CONSTRUCTION

Description of activities

Civil construction spans the construction of the Nuclear Island (reactor building, fuel handling, safety-related structures), the Conventional Island and BOP (turbine building, administration, workshops, water treatment, fire protection) as well as the non-nuclear civil works.

The potential for Dutch companies is mixed. It is high for the Conventional Island and the BOP scopes and the non-nuclear civil works. Dutch contractors have developed strong capabilities and gained expertise and experience for these aspects via other sectors and the construction of conventional thermal power plants. Nuclear Island concrete is achievable for local firms that qualify for nuclear codes (e.g., AFCEN RCC-CW for civil works and RCC-M⁹⁵ interfaces for embedded mechanical features), and invest in welding qualifications and NDE procedures, material traceability, and concrete program qualifications. It should be noted that there are some differences between the vendors: EDF/Framatome uses RCC codes, whereas Westinghouse uses ASME/NQA-1.

5.1.2.4. MECHANICAL, ELECTRICAL, HVAC & INSTALLATION

Description of activities

The *Mechanical, Electrical, HVAC & Installation* activities refer to the supply and installation of supporting systems. For the Conventional Island systems and Balance-of-Plant systems examples include: water treatment, conventional HVAC, fire systems, auxiliary piping, electrical distribution, and grid connection assets including switchyards. For the Nuclear Island it includes reactor systems and classified components.

⁹⁴ [Kier BAM joint venture agrees £203 million contract in final form for Hinkley Point C | Koninklijke BAM Groep / Royal BAM Group](#)

⁹⁵ [RCC-M](#)

There is clear potential for Dutch suppliers for equipment for Conventional Island systems and BOP systems, especially for non-safety related equipment. For the Nuclear Island equipment, there is much less potential, as it is dominated by vendor-qualified, nuclear-grade suppliers.

Dutch participation can increase as companies adopt nuclear QA programs (ASME NQA-1 or ISO 19443), align to vendor standards (RCC-M/ASME III), and complete specific pre-qualifications. Grid interconnection design and compliance must follow TenneT GCC processes and EU grid codes.

5.1.2.5. COMMISSIONING

Description of activities

The commissioning activities refer to process of operationalizing and testing the NPP. During the commissioning, different components will be integrated into the nuclear power plant. It is a process that requires technical skills, experience and expertise as checks will be performed to see if the plant has been built according to its design and whether the components meet operational and safety requirements (e.g., experience, procedures and licensee oversight; nuclear QA; access to proprietary methods/tools; and radiation protection training). Procedures and records are made for the operational phase, including maintenance.

Local firms can participate in BOP commissioning (procedures, instrumentation checks, documentation), which typically will be performed under vendor/tier 1 supervision. The commissioning activities for the nuclear activities will likely be performed by the Vendor or Tier 1 supplier.

5.1.2.6. SITE CLEARANCE & LANDSCAPING

Description of activities

Site clearance and landscaping is the final step before the NPP can become operational. It refers to the removal of construction materials and structures. The nuclear power plant premises should be free from hazards, and ready for operations. This also includes landscaping activities. These activities require experience with waste management and HSE compliance

There is potential for the cleanup of the non-nuclear areas of site and demobilization, environmental restoration and the final landscaping prior to operations for regional contractors.

5.2. Potential suppliers from Zeeland

During the study we have identified 130 companies in Zeeland that could potentially supply nuclear power plants. This is not an extensive list of companies but is expected to cover a large majority of companies in Zeeland that could supply products and/or services directly during the construction or operation of a nuclear power plant. Indirect suppliers, such as companies in the sectors Food & Retail (e.g. catering) and Utilities & Housing (e.g. hospitality), have been covered only to a small extent. We expect that more companies could indirectly benefit from the construction of a nuclear power plant, but these will not be direct suppliers within the scope of the study and are therefore not included in the list.

The identified companies are located across Zeeland as can be observed on the map of Figure 15 (left panel). Most companies are in Walcheren and Zuid-Beveland – the parts of Zeeland most closely located to Borssele – followed by Zeeuws-Vlaanderen – in which Terneuzen is located. We see clusters of companies near the larger cities of Zeeland (Goes, Middelburg, Vlissingen and Terneuzen) and its ports (the ports of Vlissingen and Terneuzen, collectively known as the North Sea Port).

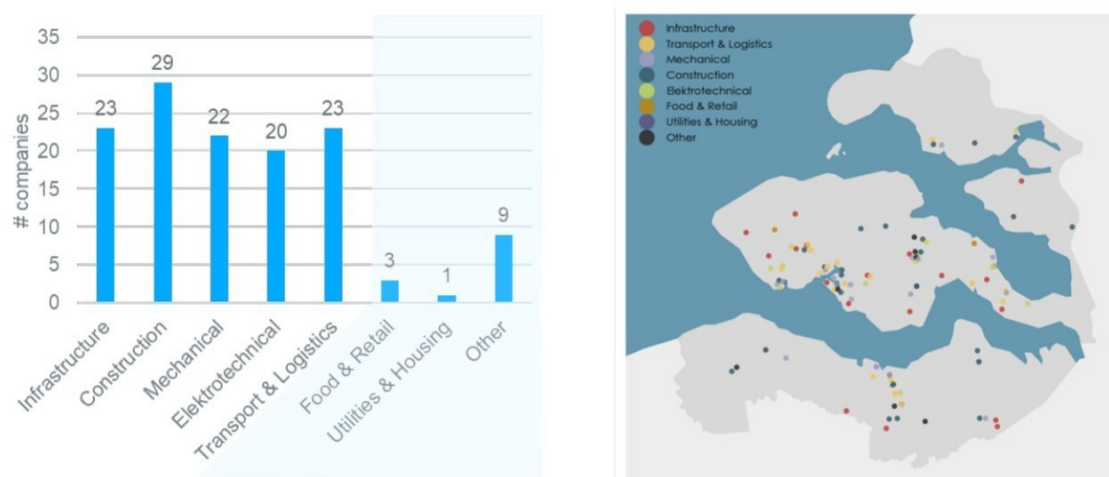


Figure 15: Sector classification and locations of identified companies

The distribution of identified companies over sectors is provided in Figure 15 (right panel). The largest group of identified companies (29) is in the construction sector. These include construction companies and companies that can supply scaffolding, metal works, concrete etc. Between 20-23 companies have been identified in the sectors Infrastructure (companies in earthmoving, ground works, road construction, utilities, cabling etc.), Transport & Logistics (companies in heavy lifting, cranes, terminals, transport etc.), Mechanical (companies in mechanical engineering, welding, pumps, hydraulics, piping etc.) and Elektrotechnical (companies in IT/automation, elektrotechnical systems, security systems, installation etc.). A detailed sectoral breakdown is shown in Figure 16.

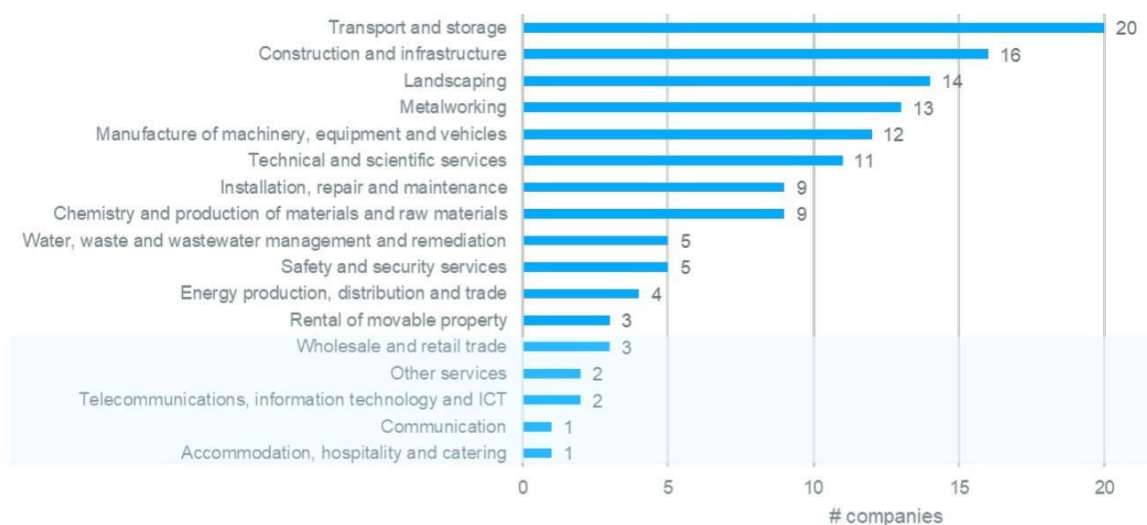


Figure 16: Detailed sectoral breakdown of identified companies

The identified companies in Zeeland are mostly positioned in tiers 3-5 based on our assessments, as visualized in Figure 17. In this figure we map companies per sector, as this links well to different types of work streams during the construction phase of a nuclear power plant. Only a few companies in Zeeland have the capabilities, reputation and size to potentially act as tier 2 suppliers within their specific area of work – these may be directly contracted by NEO NL or the technology vendor for specific work streams or act as consortium lead for these works (depending on the contracting model). Most identified companies will act at the intermediary tiers (tiers 3-5). At these tiers competition is higher and products and services are less unique, but being local can be of added value – especially for works in Construction, Infrastructure, and Transport & Logistics. At the lowest tier (tier 6) products and services will be generic and competition can be fierce. However, being local may again be a competitive advantage in terms of costs and transport times. Although raw materials are mostly commodities, for some raw materials being local is a fundamental necessity. This is the case for concrete – of which enormous amounts are needed (in the order of 100,000 m³). For Hinkley Point C, four concrete batching plants were constructed to provide the nuclear concrete.⁹⁶

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hinkleysupplychain.co.uk/2019/10/11/hinkley-point-c-news-update-october-2019/

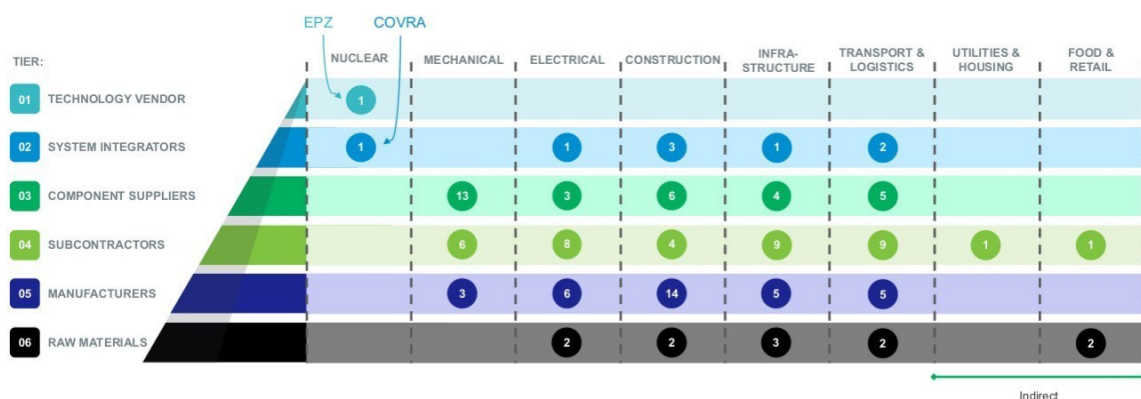


Figure 17: Mapping of identified companies across the tiers of the supply chain based on our assessment (no existing supply chain)

Only a few companies in Zeeland have nuclear expertise. These include EPZ (owner) and COVRA (part of the nuclear sector), and two others in mechanical engineering and certification.⁹⁷ It is therefore unlikely that companies in Zeeland will be significantly involved in any of the *nuclear works* related to the construction of nuclear power plants. Companies that lack nuclear expertise can however supply plenty of other products and services if they meet the required specifications and certifications. For parts that are not safety critical or are not used in the nuclear island, these specifications and certification are not too much different from what is common in other strongly regulated sectors or on other construction sites.

The identified companies are best positioned for work related to the first four phases of the construction of a nuclear power plant. In addition, quite some businesses seem well positioned to be involved in long-term operation, for instance of the current nuclear power plants in Borssele and Doel. We have assessed for each company in which phase of the lifetime of a nuclear power plant – from construction to operation to deconstruction – it could deliver any of its products or services. We have mapped this in Figure 18 across 10 phases. Many companies in Zeeland can supply in more than one phase. In the short-medium term (until 2035), phases 1, 2, 3, 7 and 8 are likely to take place in or near Zeeland. Phases 4, 5, 6, 9 and 10 are likely to take place in the long term (beyond 2035) in Zeeland, although some work in phase 9 can be expected in the short-medium term in the Netherlands and Flanders (Doel and Petten).

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EPZ has been assessed at tier 1 as it will lead the owner scope for maintenance and long term operation activities. COVRA has been assessed as tier 2 as it is an unique integrated service provider who takes over responsibility and care of the waste of EPZ's nuclear power plant.

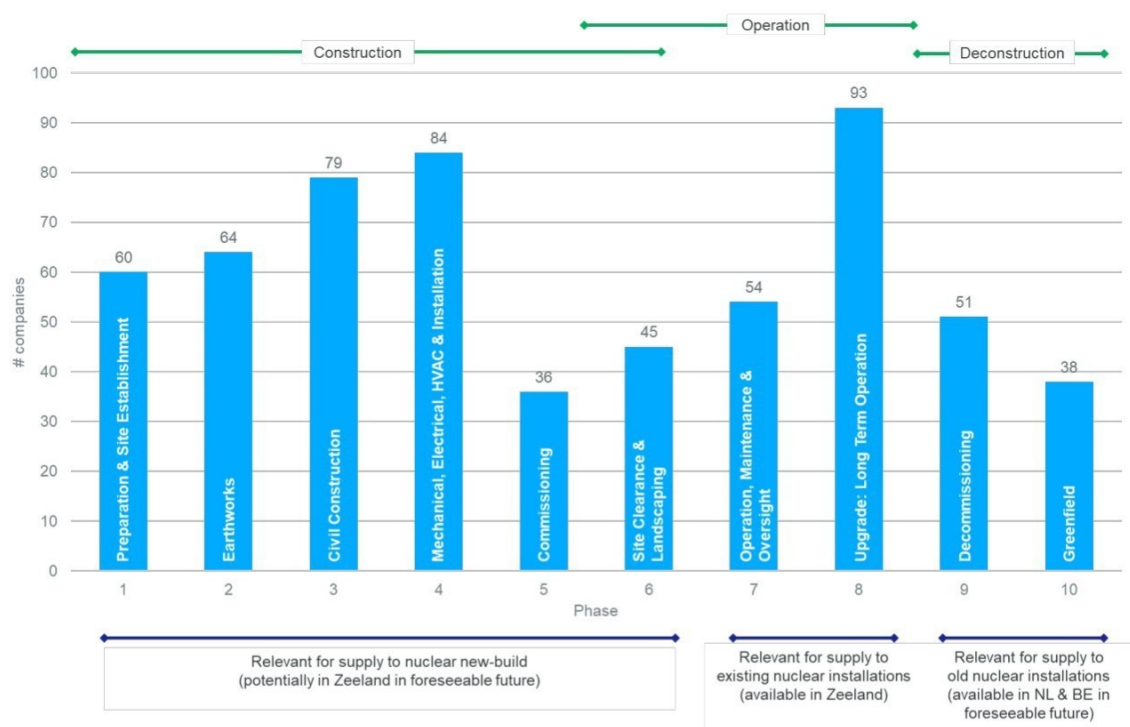


Figure 18: Mapping of identified companies across phases in the lifetime of a nuclear power plant

These potential suppliers have received a survey, which 35 respondents have filled out. 80% of these companies was an SME (with less than 250 employees), and most of companies were active in Construction and Infrastructure (29%), Other services (17%) or Transport and Storage (14%).

More than 2/3rds of the respondents indicated that they are very interested in supplying (the construction of) new nuclear power stations. It should be noted that there may be a bias, since the companies that are already interested in the nuclear supply chain are more likely to respond to such an invitation. Nevertheless, these enthusiastic 'drivers' are also useful to get other companies that may be somewhat more cautious on board.

5.3. Direct economic potential for businesses in Zeeland

Direct economic benefits emerge from the direct supply to nuclear power plants (large NPPs and SMRs), be it in construction or operation. This includes supplying NEO NL, the technology vendor (EDF or Westinghouse), the operator (e.g. EPZ) or any of their subcontractors for the main works in lower tiers of the supply chain. Regional businesses can supply goods, services and personnel. In this section we assess the economic potential of businesses in Zeeland for being such a direct supplier.

Before diving deeper into the economic potential for businesses, we want to highlight one key impact for the Zeeland economy: sustaining and creating jobs. The construction of a nuclear power plant requires a large amount of on-site labor. This will not only be new jobs, as some of the workers involved in construction are already working with any of the suppliers, but it will involve new recruitment as well. This has implications on the labor market in Zeeland and is a factor in the growth of companies (influencing direct economic potential) but also for wider spending in the Zeeland economy (influencing indirect economic potential). Technopolis recently studied the human capital effects of nuclear new-build in the Netherlands.⁹⁸ Based on data from Hinkley Point C and Sizewell C, it is expected that at the peak of construction 5.600 FTE are involved. These are not unique individuals; over the full construction period 15.000-25.000 workers are expected to work on-site. Not all involved in the construction will be in Zeeland, some – for instance in management or design roles – will work remote from elsewhere in the Netherlands or abroad, with perhaps some visits to the construction site.

5.3.1. Zeeland potential

The potential for a business to enter the nuclear supply chain depends foremost on the characteristics (and ambitions) of the company. *Does the company have required competencies, certification and track? Does the company have sufficient size to capture a meaningful role and to deal with the complexity needed?* In this study, we have not analyzed the potential at individual business level, but rather at the level of Zeeland. What is the global potential for Zeeland businesses to enter the nuclear supply chain. We call this the Zeeland potential.

The potential for regional businesses to enter the nuclear supply chain differs per sector and tier. We have identified businesses in Zeeland across the nuclear supply chain. Based on this distribution – and considering the types and sizes of companies – we have assessed the Zeeland potential per sector and tier. This is visualized in Figure 19, which also includes the potential for indirect supply by businesses in the sectors Utilities & Housing and Food & Retail.

⁹⁸

Technopolis Group (2024). Human Capital voor kernenergie. Een inventarisatiestudie over vraag en aanbod naar human capital voor de kernenergiesector en een roadmap met acties als input voor de HCA Kernenergie.

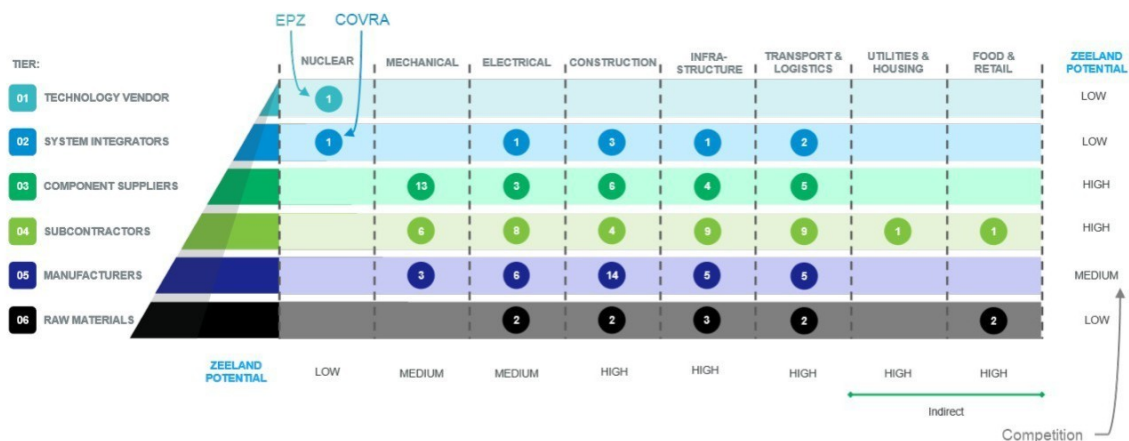


Figure 19: Global potential for businesses in Zeeland per sector and tier

The Zeeland potential is assessed high for businesses in Construction, Infrastructure and Transport & Logistics: they have the highest global potential for direct supply to nuclear new-build. These sectors can cover work streams that directly benefit from local presence and are therefore more likely to be sourced locally. We have identified various companies in Zeeland in these sectors that could provide relevant products and services. For the sectors Mechanical and Electrical we have identified fewer companies in Zeeland. These products and services benefit less from the local dimension (unless urgent repair works are needed) and competition may be faced with larger national and international companies (especially those with specialized products and services for nuclear installations). We have assessed the Zeeland potential for these sectors as medium. In the nuclear sector, specialized businesses are needed – these are not sufficiently present in Zeeland. Therefore, the Zeeland potential for businesses operating in the nuclear sector is considered low: not many businesses in Zeeland will likely play a meaningful role in any of the nuclear-specific works (e.g. related to the Nuclear Island or systems impacting safety in the Primary Circuit).

The Zeeland potential also depends on the tier in which businesses operate. The lower the tier, the stronger the competition and the harder it may be to enter the supply chain as a local supplier – especially for smaller businesses. Therefore tier 6 has a low Zeeland potential – with also few relevant businesses. In tier 5 we have found more relevant businesses in Zeeland, and we assess the Zeeland potential as medium. Some of the identified businesses in tiers 5 and 6 in Zeeland, especially suppliers of concrete, benefit strongly from being local and will individually have a high potential for delivering directly to nuclear new-build. Overall, we assess that businesses in tiers 3 and 4 have the highest potential to be direct suppliers. Here we have identified various businesses of sufficient size that could potentially capture a position in the nuclear supply chain. They will still face competition, but these products and services can potentially be localized/subcontracted by higher tier suppliers to various businesses in Zeeland. For tiers 1 and 2 fewer businesses were identified, which results in a lower Zeeland potential. However, larger businesses in these tiers are individually well-positioned to capture a position in the supply chain as they offer more unique products or services or have a more integrated offering on which they can compete.

5.3.2. Estimated direct economic potential

It is nearly impossible to estimate the exact costs of a new nuclear power plant. Given the high complexity and unique circumstances of each new-built project, the costs and duration of the construction can differ substantially. It is therefore difficult to pinpoint the direct economic impact of the construction and operation of the new plants on the province of Zeeland.

This section uses literature and expert insights to estimate the direct economic potential for businesses in Zeeland. The estimates are based on previously realized nuclear plants.

To quantify the potential for the Zeeland business sector, we made estimates based on literature and the Zeeland potential. These estimates were made per phase of the construction of a nuclear power plant. Based on various breakdowns in literature⁹⁹, we modelled the cost of the construction of a nuclear power plant per phase of construction. This is shown in Figure 20. We see highest potential for businesses in Zeeland to be involved in the first three phases of construction. We have identified quite some businesses in Zeeland in these phases in tiers 3-5. In these phases products and services are needed that can be sourced locally and in which being local is an advantage. A large part of the work is non-nuclear in these phases. In phase 4, we see a medium potential for businesses in Zeeland, as this involves work that benefit less from the local dimension and in which stronger competition can be expected. In phases 1-3 about 30% of the construction costs of a reactor are made, while 60% of the construction costs are made in phase 4.¹⁰⁰ Businesses in Zeeland have the potential to capture a part of these costs.

⁹⁹ World Nuclear Association. 2020. *World Nuclear Supply Chain*. Retrieved from: [world-nuclear.org/information-library/economic-aspects/economics-of-nuclear-power](https://www.world-nuclear.org/information-library/economic-aspects/economics-of-nuclear-power)
NEA OECD. 2015. *Nuclear New Build: Insights into Financing and Project Management*, Retrieved from: [oecd.org/content/dam/oecd/en/publications/reports/2015/08/nuclear-new-build_g1g59258/9789264241749-en.pdf](https://www.oecd.org/content/dam/oecd/en/publications/reports/2015/08/nuclear-new-build_g1g59258/9789264241749-en.pdf)
NRG PALLAS (2025). *Localisation Perspectives of a Netherlands Nuclear Newbuild Project*. Final report. World Nuclear Association WNA, "Economics of Nuclear power"; NEA "Unlocking Reductions in the Construction Costs of Nuclear (2020); NEA "Reduction of Capital Costs if Nuclear power Plants" (2000) Idaho National Laboratory (INL) - USDOE Office of Nuclear Energy (2024). *Meta-Analysis of Advanced Nuclear Reactor Cost Estimations*. <https://doi.org/10.2172/2371533>

¹⁰⁰ Note that in 20 phase 3 ends in year 7, in which also phase 4 has started. The total cost share of a nuclear power plant in year 7 (50%) is thus a combination of costs from phases 1, 2, 3 and partly 4.

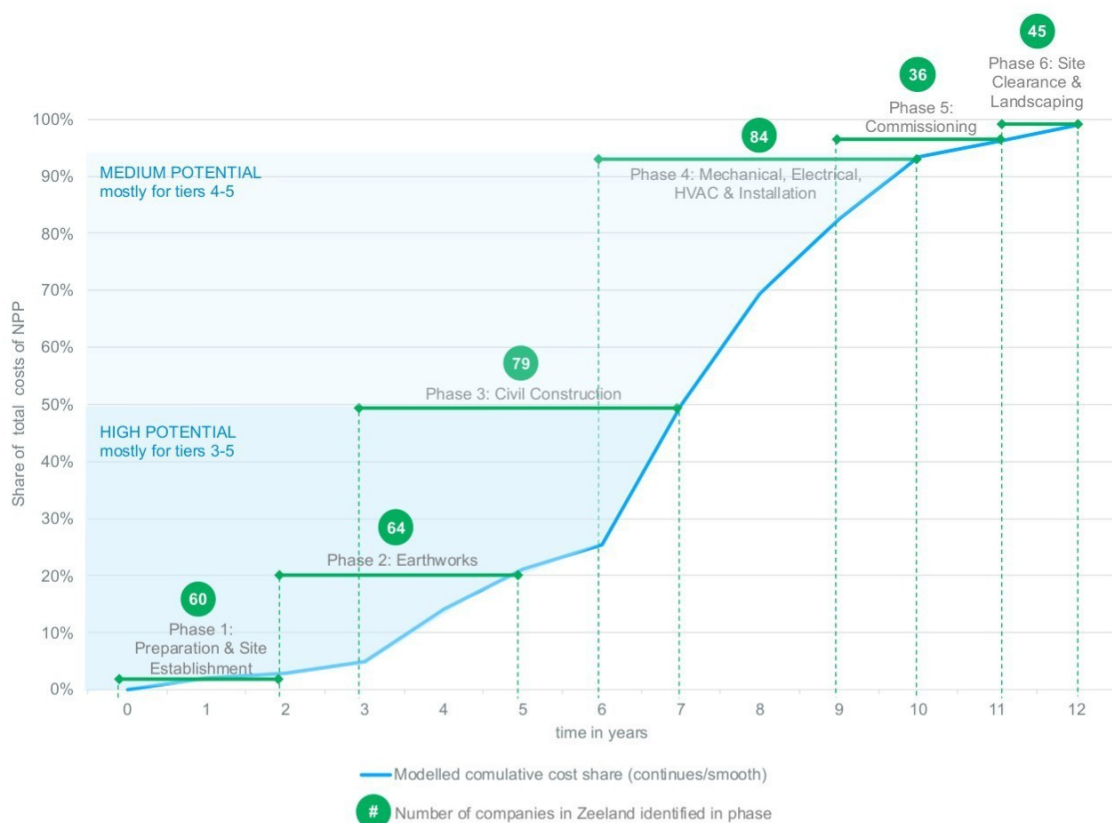


Figure 20: Global potential for businesses in Zeeland per phase of construction¹⁰¹

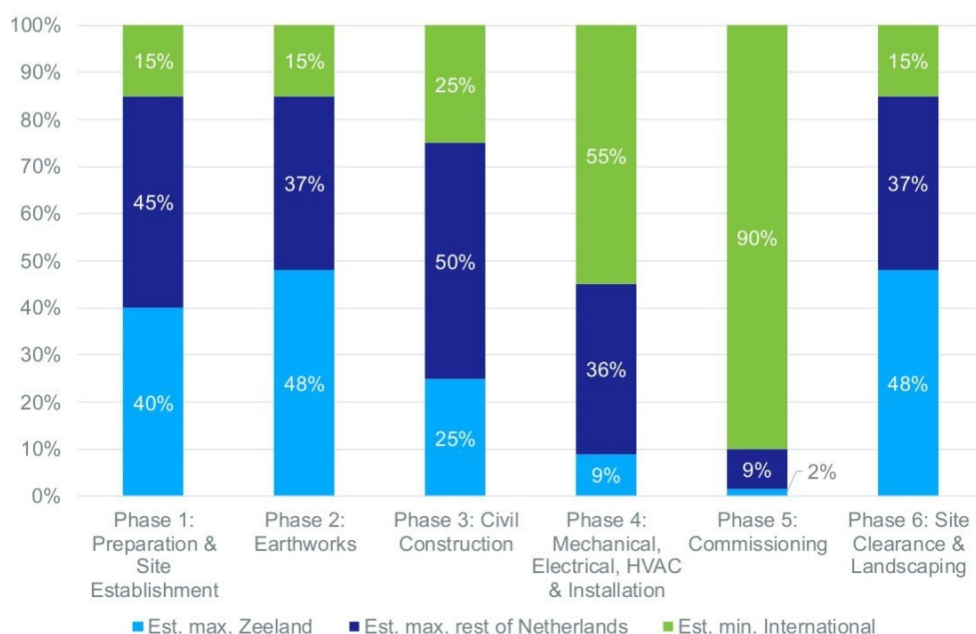


Figure 21: Rough estimated distribution of regional, national and international involvement in the supply chain for the construction of a nuclear power plant

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Note that the figure includes double counting of companies: the same company can have potential to be involved in multiple phases.

The total cost of a new nuclear power plant (with two reactors/units) is estimated to be €20-30 billion.¹⁰² Based on the cost distribution per phase (Figure 20), the assessed Zeeland potential per phase and the roughly assessed share of work that can be captured by businesses in Zeeland (Figure 21) we estimated the potential order value that could theoretically be captured by businesses in Zeeland. These roughly estimated order values are provided in Table 17. The table shows that even though the highest global potential for businesses in Zeeland is given to phases 2 and 6, these do not provide the highest order value. Instead, phases 3 and 4 would provide the highest potential order value for businesses in Zeeland.

TABLE 17: ESTIMATED DIRECT ECONOMIC POTENTIAL

Phase	Est. share total costs NPP ¹⁰³	Assessed share NL ¹⁰⁴	Zeeland potential ¹⁰⁵	Assessed max share Zeeland ¹⁰⁶	Est. max Zeeland potential cost share NPP ¹⁰⁷	Est. max potential order value (low) ¹⁰⁸	Est. max potential order value (high) ¹⁰⁹
Phase 1: Preparation & Site Establishment	3%	80-85%	Medium/High	40%	1.4%	€277M	€416M
Phase 2: Earthworks	4%	80-85%	High	48%	2.0%	€397M	€595M
Phase 3: Civil Construction	20%	50-75%	Medium/High	25%	5.0%	€1,007M	€1,510M
Phase 4: Mechanical, Electrical, HVAC & Installation	60%	30-45%	Medium/Low	9%	5.4%	€1,074M	€1,611M
Phase 5: Commissioning	9%	10%	Low	2%	0.1%	€28M	€43M
Phase 6: Site Clearance & Landscaping	3%	80-85%	High	48%	1.5%	€301M	€451M
Total	100%	-	-	-	15%	€3,084M	€4,626M

¹⁰² Ministerie van Klimaat en Groene Groei. (2025). Voortgangsbrief nieuwbouw kernenergie mei 2025. <https://open.overheid.nl/documenten/52194d47-a35a-4d7c-86bd-3a4d310b200b/file>

¹⁰³ Values based on average from different sources. Due to rounding the total adds not up to 100%.

¹⁰⁴ Based on assessments in NRG PALLAS (2025). Localisation Perspectives of a Netherlands Nuclear Newbuild Project. Final report.

¹⁰⁵ Assessments made by study team from data used in Figures 19, 20 and 21

¹⁰⁶ Calculated from data in column 3 and 4. Assuming in column 3: High = 60%, Medium/high = 50%, Medium = 40%, Medium/low = 30% and Low = 15%.

¹⁰⁷ Calculated by multiplying data in column 2 with data in column 5.

¹⁰⁸ Calculated by multiplying the lower end of total costs for a two-unit NPP (€20B) with the data in column 6.

¹⁰⁹ Calculated by multiplying the higher end of total costs for a two-unit NPP (€30B) with the data in column 6.

In total, we roughly estimate that maximally 15% of the costs of a new nuclear power plant could potentially land in Zeeland. This translates to a maximal order value of about €3.1-€4.6 billion over a 12-year construction period. This is a rough theoretical estimate, assuming that the assessed theoretical potential of businesses in Zeeland is reached. These figures are quite sensitive to various practical factors. Nevertheless, they are comparable to the value of local contracts that have been signed for Hinkley Point C in the South West of England (larger economy than Zeeland) so far, which amounts to £5.3 billion (~€5.8 billion) in 2025.¹¹⁰

The actual order value that can be captured by businesses in Zeeland can both be higher and lower than we estimated due to the following factors:

- **Total costs of a new nuclear power plant:** the costs for a nuclear power plant may be higher in practice than foreseen. This may increase the total order value for businesses in Zeeland. This would not affect the cost share for Zeeland.
- **Cost distribution over phases:** certain construction phases may be more costly than theoretically foreseen. For instance, the construction site is below sea level which may require more costs in phases 1 and 2 than in the literature used. This may increase the cost share in phases 1 and 2, which could result in a higher cost share for Zeeland and a higher total order value for businesses in Zeeland.
- **The amount of localization by the technology vendor, NEO NL or other tier 1 suppliers:** less localization would reduce the share of Zeeland businesses in each phase and lower the total cost share and total order value for businesses in Zeeland. A different supply chain approach between technology vendors (with likely more localization by EDF than Westinghouse) may strongly influence the involvement of regional businesses.
- **The technology vendor chosen:** apart from a different supply chain approach, each technology vendor has also a different design for a nuclear power plant. Westinghouse's design is much smaller than EDF's design and has different parts. The more 'efficient' design of Westinghouse may result in less work in certain phases of construction, for instance in phases 1-3 due to smaller dimensions. This may reduce the cost share for Zeeland and the total order value for businesses in Zeeland.
- **The contracting/delivery model chosen:** the contracting or delivery model that is used for the construction of a new nuclear power plant may influence the potential and success of businesses in Zeeland to enter the nuclear supply chain. For instance, when a 'Turnkey' approach is chosen, it is more likely that regional businesses will find it more difficult or the conditions less favorable to be part of the nuclear supply chain.
- **The absorptive capacity of businesses in Zeeland:** the construction of a nuclear power plant is a large project, with also large subcontracts. Most of the identified businesses in Zeeland are SMEs. Whether these businesses can absorb the potential share of work (depending in the contracting/delivery model chosen) may affect the involvement of regional businesses.

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EDF (2025). Driving Growth. Hinkley Point C Socio-economic Impact Report 2025.

5.3.3. Opportunities resulting from direct economic potential

Entering the nuclear supply chain provides several direct opportunities for businesses in Zeeland that go beyond turnover and revenue. These are strategic and operational benefits such as:

- an extended network of new and future clients, partners and suppliers;
- knowledge, expertise and track in a new sector that can help businesses position better for future work and expand their activities into the nuclear construction or energy domain;
- certification that can be used and help position better for future work in similar high-quality, high-safety and regulated sectors;
- a well-trained and upskilled labor force with qualifications to work in similar sectors; and in some cases it can spur; and
- further growth of their business in terms of headcount and production capacity (equipment).

In addition, being part of the nuclear supply chain provides also spin-off opportunities. These require further action and business development to seize. Spin-off opportunities are opportunities elsewhere: in other sectors or in other regions. The following spin-off opportunities have been identified:

- **Opportunities in the nuclear sector:** businesses that supply to the new build of nuclear power plants are also well-positioned to supply to (the construction of) SMRs (for which supply chains are still in development), long term operation of existing nuclear power plants (such as for the nuclear power plant in Borssele), the decommissioning and dismantling of nuclear reactors (such as in Petten, Dodewaard or Doel) and for repair and maintenance works at exiting nuclear power plants in Zeeland and Flanders.
- **Opportunities in sectors that are similar in terms of certification, quality and safety culture:** these include sectors such as chemicals, pharma, energy, defense, critical infrastructure etc.
- **Opportunities abroad:** business that supply to (the construction of) nuclear power plants in Zeeland could also supply to nuclear power plants just across the border in Flanders/Belgium. Belgium has renewed ambitions in nuclear and is conducting a long-term operations program for Doel 4, preparing the construction of the MYRRHA reactor in Mol, the decommissioning of reactors in Doel and Tihange, and has interest in SMRs.
- **Opportunities emerging from collaboration:** the network and collaborations developed while supplying for nuclear new-build in Zeeland can be used to develop consortia for the development or construction of SMRs or for further collaboration in other projects.

5.4. Indirect economic potential for businesses in Zeeland

Indirect economic benefits result from the supply of products and services that do not directly contribute to the construction or operation of a nuclear power plant. It concerns companies outside the primary supply chain, that indirectly support the construction and operation activities. Under indirect economic benefits we also include induced economic benefits: those that result from the spending of workers whose employment is directly or indirectly related to the construction or operation of a nuclear power plant in Zeeland.

Various recent studies have estimated the indirect regional economic benefits of the construction and operation of a nuclear power plant using economic models.¹¹¹ This has been done both for nuclear power plants from EDF¹¹² and Westinghouse¹¹³. These studies show differences both due to different cost structures, different regional economic structures and slightly different methodologies and definitions. Nevertheless, they provide some insights into the indirect economic potential resulting from investments in nuclear new-build. These studies show that one euro of direct regional impact in the construction of a nuclear power plant results in 0.22-0.99 euro indirect economic impact (including induced impact) in terms of gross value added. The lower end is based on the impact on a region (Suffolk county)¹¹², while the higher end is based on the impact on a large country (Canada)¹¹³ – the impact for a US state is in between these ends^{114, 115}. We consider it therefore likely that the indirect economic benefit for Zeeland is more comparable to the lower end.

Following these figures at the lower end, we estimate the indirect economic potential for Zeeland to be of the order of €1 billion, based on our assessment of direct economic potential for Zeeland in section 4.3. This figure is also sensitive to various factors, most importantly delays in the construction time, as this would prolong the period in which companies and workers involved in the construction of a new nuclear power plant spend money in the Zeeland economy.

¹¹¹ Including: E4 Carolinas (2024). The Economic Impact of the Nuclear Industry in the Southeast United States. A Regional and State-Level Analysis; Menon Economics (2024). Economic Impact of a Nuclear Power Plant in Halden Municipality; Oxford Economics (2025). The Economic Impact of Sizewell C. A Report for Sizewell C Ltd.; and PwC (2024). The Economic Impact of a Westinghouse AP1000 Reactor Project in Canada.

¹¹² Oxford Economics (2025). The Economic Impact of Sizewell C. A Report for Sizewell C Ltd.

¹¹³ PwC (2024). The Economic Impact of a Westinghouse AP1000 Reactor Project in Canada.

¹¹⁴ E4 Carolinas (2024). The Economic Impact of the Nuclear Industry in the Southeast United States.

¹¹⁵ The geographical size matters: it is likely that in a larger area more companies are located that can indirectly supply services or products related to the construction or operation of a nuclear power plant. Also induced economic effects can be more widespread when companies across the area are involved.

TABLE 18: INDIRECT ECONOMIC POTENTIAL

Region	Technology vendor	Level	Indirect regional economic impact per euro direct regional economic impact from construction of an NPP
Suffolk ¹¹⁶	EDF	Region	€0.22
Canada	Westinghouse	Country	€0.99
Georgia	-	State	€0.88
N. Carolina	-	State	€0.86
S. Carolina	-	State	€0.75
Tennessee	-	State	€1.05
Virginia	-	State	€0.68
Average	(Mix)	(Mix)	€0.78

5.4.1. Opportunities emerging from indirect economic potential

The construction and operation of a nuclear power plant will provide opportunities to businesses not directly involved in the nuclear supply chain. These are indirect opportunities, or rather spill-over effects to other parts of the Zeeland economy. These spill-over effects are highest in the construction phase, due to the many on-site workers and required ancillary investments.

The following spill-over opportunities have been identified:

- **Housing and accommodation:** the many on-site workers and visitors should be accommodated near the construction site. This will increase the demand for hotel rooms, temporary accommodation and longer-term housing. Given the already strong tourist economy in Zeeland, more hotel rooms are needed – likely new, well-located hotels will need to be constructed. Temporary accommodation may be realized on near-site campuses. Longer-term housing will be mainly rental property, which should after the construction phase of a nuclear power plant be repurposed for other uses, including housing for operational personnel. The construction of housing and accommodation should be done sustainably: keeping future use in mind and the effects on local communities. This will create opportunities for the Construction and Infrastructure sectors, but also for the Utilities & Housing and Food & Retail sectors (which include accommodation, hospitality and catering services).

¹¹⁶

This is considered most comparable for Zeeland in terms of regional dimension in combination with technology vendor.

- **Construction/expansion of (public) facilities:** the many employees that will work-on site during the construction of a nuclear power plant will live (part-time) with or without their families in Zeeland. They will use local facilities in healthcare, education, retail, catering, and utilities (water and energy). This will require expansion of these facilities to accommodate increased demand. Also, some (new) businesses may (re)locate in Zeeland, which requires new or expanded industry parks/estates. This will create opportunities for the Construction, Infrastructure, Utilities & Housing and Food & Retail sectors. It may also create additional jobs in the public sector (given that several of these facilities are public services).
- **Expansion, improvement or construction of infrastructure:** during the construction of a nuclear power plant many transport movements (including commuting) will take place to and from the construction site. This requires that roads and rails have the capacity to accommodate this increased traffic. Roads, rails, waters and related infrastructure may also need to be improved or adapted to meet the needs for transportation of (large) parts and (heavy) equipment to the construction site. This will create opportunities for the Infrastructure and the Transport & Logistics sectors.
- **Transport:** transport will increase near the construction site. This includes the transport of workers, parts and equipment within Zeeland, between North-Brabant and Zeeland, and (for some parts and equipment) from sea. Public transport, such as bus and train connections, to the construction site need to be improved or changed, parking facilities need to be developed, port infrastructure and services may need to be improved and traffic control and management at peak moments are required. This will create opportunities for Transport & Logistics sectors in Zeeland. At the same time, many businesses may be affected by face traffic jams, temporary roadblocks etc. that may introduce costs – especially to the Transport & Logistics sector.
- **Landscape modifications:** the construction of a nuclear power plant below sea level may require wider modification to dikes and water management in Zeeland to ensure safety at the site of the nuclear power plant. In addition, landscape modifications may be needed to compensate communities and other businesses for nuisance caused by the construction site, such as light pollution, noise pollution, skyline destruction, vibrations etc. This may create opportunities for the Infrastructure and Construction sectors.
- **Food and retail:** the many on-site workers that will be in Zeeland will spend money on living expenses and leisure activities in Zeeland. Indirectly Food & Retail sector (mostly SMEs, incl. leisure) will thus benefit from the construction of a nuclear power plant.

In addition, the presence of a nuclear power plant may be of added value to energy intensive industry (electricity and heat) and could help Zeeland in developing a nuclear hotspot. This may be useful for hydrogen production and further innovation in nuclear energy, such as in SMRs. The nuclear new-build may thus indirectly support further industrial developments in Zeeland in the longer term.

5.5. Costs for businesses in Zeeland

Participation in the nuclear supply chain offers opportunities for Zeeland businesses, but these come with different types of costs. The costs of entering and operating in the nuclear supply chain varies strongly depending on a company's role in the supply chain (tier level) and on the certifications and capabilities they already possess.

First, there are the costs that arise before a company decides to participate in a tender. These mainly relate to gathering information about the market and business development activities, such as attending (industry) conferences, participating in networking events or joining relevant associations. This also includes building relationships with potential partners and clients (higher tiers). These costs are mainly in-kind and can be relatively high for SMEs. However, the knowledge and networks that come from these activities are also valuable beyond the nuclear supply chain, and might generate opportunities that benefit the companies in other sectors as well. 26% of the companies indicated in the survey that they are already preparing for supplying to the nuclear power plants. The costs that they indicated fall under this first category. They mainly mention keeping themselves up to date, for example through participation in information sessions and working groups.

This is followed by the costs of participation in the tender process, which includes time and resources to prepare detailed proposals, documentation and financial plans in line with the tender specifications. These costs are incurred without any guarantee of securing contracts. This is however an common investment for most companies that can absorb projects of the size of such tenders. The investment needed will differ on the role of a business in the tender: smaller roles (and thus smaller budgets) generally require smaller efforts (and thus smaller investments) in the tender process.

If a tender is successful, there are one-time start-up costs to meet all requirements to execute the work. This may include external audits, specialized facility upgrades, and the recruitment and training of qualified personnel.

Once they are active in the nuclear supply chain, companies face ongoing recurring costs. These include periodic audits, certification maintenance, continuous training, and updates to quality assurance and compliance systems. These costs are more predictable but do represent a long-term financial commitment.

As an indication of typical costs for ISO 19443 quality certification are:

- Typical Consultancy Fee for Guidance on ISO 19443 Certification: € 25,000
- ISO 19443 Certification Costs: €10,000

5.5.1. Willingness to invest by regional businesses

Most of the businesses that answered the study's survey, would be willing to invest to join the nuclear supply chain (65%). There is a broad range of types of investments that these companies are willing to make. Most companies (over 70%) are willing to invest in necessary certification, procedures and knowledge, personnel, and in collaboration with other parties. Less companies (about 40%) are willing to invest in business development, the development of new products or services, and production capacity.



Figure 22: Survey response to the question: What kind of investments would your company be willing to make/is your company making in order to be able to supply new nuclear power plants? (N=34, multiple choice)

In interviews, some companies indicated that investments in certification, procedures, knowledge, personnel, and collaboration are seen as common and necessary to maintain operations, comply with regulations, and reduce risk. Such investments are often perceived as unavoidable costs of doing business and are often done after the contract is awarded, and the company is thus sure of earning back their investment. On the other hand, investments in business development, new products or services, and production capacity are more forward-looking and uncertain, as they require firms to commit resources without guaranteed demand or returns. This higher level of risk and longer payback period might make companies more cautious, which results in a lower willingness to invest in these activities. Most of the companies are willing to invest, but 29% of them mention in the survey that limited investment capacity (resources) to enter new sectors or increase capacity, is to some extent a barrier to supply to new nuclear power plants.

6. Roadmap for business support and localization

6.1. Localisation roadmap to prepare businesses entering the nuclear supply chain

Based on the findings of the study we have developed a localization roadmap. The aim of the roadmap is:

- to prepare and better position businesses in Zeeland for entering the nuclear supply chain, and
- to help businesses in Zeeland capture the opportunities that new nuclear power plants (incl. SMRs) will offer.

To realize this, the roadmap goes beyond the scope of businesses in Zeeland alone. It contains actions that will involve both private and public organizations (incl. regional education institutions) in Zeeland. Collaboration among these organizations should strengthen the positioning of Zeeland in the nuclear energy domain.

Key in this roadmap is the establishment of the *Nuclear Delta* platform. This platform brings together interested businesses, governments/agencies (Province of Zeeland, Impuls Zeeland, involved municipalities) and education institutions (HZ University of Applied Sciences and Scalda) in Zeeland. The platform will have a key role in the execution of the roadmap. *Nuclear Delta* will serve as a platform that will:

- **Position** Zeeland as a hotspot in the field of nuclear energy and position its businesses in the supply chain for nuclear new-build.
- **Inform** business and other stakeholders in Zeeland about nuclear energy developments, nuclear supply opportunities and requirements.
- **Connect** businesses regionally, nationally and internationally across the nuclear supply chain and align regional and national support activities.
- **Support** businesses and stakeholders in Zeeland and establish the right ecosystem conditions to venture into the nuclear energy domain and supply chain.

These activities have been translated into a coherent set of action lines for the localization roadmap. Each action line has 4-5 strategic actions that we recommend the *Nuclear Delta* platform and its stakeholders to implement. These actions are mapped for the short-medium term and long term in the roadmap presented in Figure 23. For each action we have indicated which stakeholder should have a leading or large role in the implementation of the action. More details on the actions and action lines are presented in the following sections.



Figure 23: Localization roadmap

6.1.1. Action line 1: Positioning

This action line is aimed at better positioning Zeeland and its businesses in the nuclear energy field and supply chain by bringing together relevant public and private actors into a *Nuclear Delta* platform. This platform can represent and advocate the interest of Zeeland businesses and stakeholders to key players in the nuclear supply chain. This action line should contribute to position Zeeland as a hotspot in the field of nuclear energy.

We recommend the following actions:

- **Action 1.1: Establish the Nuclear Delta platform (Public Private Partnership).** The Province of Zeeland and Impuls Zeeland should take the initiative to start discussions with involved public and private partners in Zeeland to establish this flagship organization that can represent Zeeland and its businesses on the national and international stage. It will require collaborative action between business, education and government to form a light organization that can execute the roadmap and give substance to the ambition to become a nuclear energy hotspot in Zeeland.

- **Action 1.2: Develop a supplier portal (website) to showcase potential suppliers in Zeeland.** This should be a website in Dutch and English in which higher tier suppliers can easily identify and get in touch with relevant companies. It will also serve as international marketing of the capabilities available at businesses in Zeeland for the construction of nuclear power plants, including SMRs (for which international supply chains are emerging). This action is best picked up by *Nuclear Delta*.
- **Action 1.3: Position Zeeland in internationalization programs to market Zeeland as an international nuclear energy hotspot.** Internationalization is already organized through the ROMs and NFIA. Impuls Zeeland, involving *Nuclear Delta*, should use these programs to position Zeeland as an international nuclear energy hotspot to attract new businesses and investments, and to position businesses in Zeeland better for supply. This may require additional internationalization activities under Nuclear Delta/ this roadmap.
- **Action 1.4: Develop/support innovation projects related to SMRs in Zeeland.** The supply chain for SMRs is currently in development, which could provide first-movers an advantage even if they are not part of existing supply chains for nuclear power plants. Being involved in innovation/development projects for SMRs could help in building a supply relation with SMR developers/vendors like Thorizon and Allseas and could create a local ecosystem around these SMR projects that would better position Zeeland suppliers for future involvement. Impuls Zeeland is already involved in these projects and could initiate this action further in collaboration with the Province of Zeeland.
- **Action 1.5: Align activities of Nuclear Delta with (supply chain) activities at national level.** At the national level the Ministry of KGG has started some supply chain activities with the Made for Nuclear event and supply chain study. Activities at regional level by Nuclear Delta should be aligned with activities at national level (Ministry of KGG or NEO NL) to avoid duplication of efforts, reinforce each other's activities and to ensure that the interests of Zeeland are sufficiently covered in national activities. This is to some extent already done by Impuls Zeeland, which is currently leading a national working group on the nuclear supply chain with other Regional Development Agencies.

6.1.2. Action line 2: Informing

This action line is aimed at gathering and sharing information and insights on nuclear developments, supply opportunities/needs, supplier requirements, and regional capabilities within the *Nuclear Delta* platform. It also includes public outreach and sharing information with external stakeholders.

We recommend the following actions:

- **Action 2.1: Inform regional businesses and stakeholders about developments and opportunities regarding nuclear new-build (PWR and SMR, in the Netherlands and Flanders).** Businesses in Zeeland have expressed a strong interest in staying informed about the developments and opportunities regarding nuclear new-build in the Netherlands and Flanders/Belgium. Through newsletters and events from *Nuclear Delta* businesses and other stakeholders in Zeeland can stay informed from a knowledgeable and trusted partner. This action requires *Nuclear Delta* to stay informed and build up intelligence from decision and policy makers, market players (incl. vendors, SMR technology developers and suppliers). This action should be taken up by *Nuclear Delta*.
- **Action 2.2: Provide information to regional businesses on how to become a supplier.** SMEs in Zeeland would benefit from information on how to become a supplier in the nuclear supply chain. This would include concrete information on qualifications (e.g. required certifications, norms, safety standards etc.), procurement processes, procurement platforms, (expected) selection criteria, purchasing conditions and more. These may differ per contracting organization (vendor, supplier, SMR/PWR, Dutch/Flemish etc.). This information should ensure that businesses in Zeeland qualify in time to capture a position in the supply chain and that they can position themselves well vis-à-vis potential consortium partners and competitors. This action is best taken up by *Nuclear Delta*.
- **Action 2.3: Provide information on concrete supply chain opportunities to regional businesses.** Under this action *Nuclear Delta* would liaise between higher tier suppliers (regional, national or international) and regional suppliers by sharing concrete supply chain opportunities. They will act as a single-point-of-contact for localization by helping to identify possible regional suppliers through sharing concrete opportunities within *Nuclear Delta's* business network. This will help especially SMEs that have limited capacity for business development and who may otherwise not find their way into the nuclear supply chain.
- **Action 2.4: Showcase the potential and capabilities of businesses and stakeholders in Zeeland for the (international) nuclear energy sector.** To contribute to promoting Zeeland as a nuclear energy hotspot, it is important to showcase the capabilities and the potential of businesses and stakeholders in Zeeland for the nuclear energy sector. This can be through external communications, marketing and attending conferences, trade fairs, events or trade missions. This could help the international business development of SMEs and should also help position Zeeland in the emerging SMR supply chain. It should put businesses in Zeeland on the radar of larger and higher tier suppliers/customers. This action is best taken up by *Nuclear Delta* in close cooperation with businesses, possibly with support of VNO-NCW Brabant-Zeeland.

- **Action 2.5: Run a public communication/awareness campaign.** This action is different from the other actions, as it targets the general public to inform them about nuclear developments in Zeeland and raise awareness for the opportunities that these will bring to the region. It should help in gaining public support for Zeeland as nuclear hotspot, managing reputation of involved businesses and supporting in attracting talent to meet the demand for human capital at regional businesses. A low-barrier local contact point for questions and concerns could be part of this action. *Nuclear Delta* could fulfill this role, but likely the Province of Zeeland is best placed to take up action for their citizens.

6.1.3. Action line 3: Connecting

This action line is aimed at connecting businesses regionally, nationally and internationally across the nuclear supply chain and aligning activities of actors at national and regional level.

We recommend the following actions:

- **Action 3.1: Regional networking between businesses and stakeholders through Nuclear Delta platform.** *Nuclear Delta* should serve as a platform in which regional businesses and stakeholders can share information, network and connect, and collectively prepare for opportunities in nuclear new-build and the nuclear energy sector. Larger businesses in Zeeland can help smaller businesses to enter the nuclear supply chain by connecting them to their consortia or by subcontracting works regionally. This regional consortium building at lower-level tiers requires regional businesses to connect and interact. The *Nuclear Delta* platform can be instrumental in this regard and create early collaboration and trust between regional businesses and stakeholders. Similarly, governments and education providers can better understand the needs of businesses through connections in the *Nuclear Delta* platform and align their support and offering to those needs.
- **Action 3.2: Facilitate matchmaking across nuclear supply chain (nationally and internationally).** To enter the nuclear supply chain it is important for businesses in Zeeland to know other (larger/higher tier) national or international businesses to partner with or who are already in the supply chain. Match-making events can support consortium building and positioning Zeeland businesses in the nuclear supply chain for nuclear new-build as well as for SMRs. International matchmaking can include visits or trade missions in which representatives from *Nuclear Delta* visits other countries, regions or partner organizations with or without some businesses or stakeholders from Zeeland. This action is best taken up by *Nuclear Delta* in close cooperation with businesses, with support of Impuls Zeeland or VNO-NCW Brabant-Zeeland. The vendor could also play a role here.

- **Action 3.3: Liaise with NEO NL, vendor and potentially tier 1 suppliers to match supply needs with regional suppliers.** As vendors are already preparing their supply chains and NEO NL will be one of the first to contract work, it is useful to directly liaise with these organizations at tier 1 level to understand their needs in terms of supply and to match those with regional suppliers from Zeeland. Nuclear Delta could act as a liaison or broker to help NEO NL, vendor and potentially tier 1 suppliers realize local economic impact and meet their localization requirements (assuming that these will be required by the national government) by guiding them to suitable businesses in Zeeland. This action is best taken up by *Nuclear Delta* with support of Impuls Zeeland.
- **Action 3.4: Connect activities at regional and national level.** The national government and potentially other regions (like Noord-Brabant) may also organize activities to connect businesses in the nuclear energy domain and to facilitate matchmaking for nuclear new-build and SMR development. It is important to connect and align these activities, agree on roles and task divisions and to set up a referral approach between each other. This should avoid duplication of efforts, but more importantly avoid an overly complex and ineffective stakeholder field to navigate for NEO NL, vendor and other (higher tier) suppliers at national or international level. This action should be taken up by *Nuclear Delta* with a leading role for government organizations such as Impuls Zeeland (who is currently aligning supply chain activities between Dutch Regional Development Agencies) or possibly the Province of Zeeland.

6.1.4. Action line 4: Supporting

This action line is aimed at supporting businesses and establishing an ecosystem that will help businesses and organizations in Zeeland to further venture into the nuclear energy field.

We recommend the following actions:

- **Action 4.1: Provide subsidies or loans to help prepare businesses for entering the nuclear supply chain.** Entering the nuclear supply chain can require significant investments for SMEs in certification and business development without any certainty of contracting. These upfront investments can withhold SMEs to timely prepare for entering the nuclear supply chain and may affect localization in Zeeland. To help regional SMEs enter the nuclear supply chain, the Province of Zeeland, NEO NL or the Ministry of KGG could provide conditional loans for certification (to be paid back if contract in nuclear supply chain awarded) or could partly subsidize participation in trade missions or international events. These subsidies could be coordinated for regional businesses through *Nuclear Delta* to create a one-stop-shop for businesses interested in exploring opportunities for nuclear new-build and in the nuclear energy domain.

- **Action 4.2: Launch a regional (recruitment) campaign to attract technical talent to Zeeland and to increase the number of technical students in Zeeland.** The (technical) labor market and the effect of nuclear new-build on the labor market is a key concern for businesses in Zeeland. Zeeland already deals with a shortage of technical talent. Several actions at national level have been taken to increase technical talent nationwide. Additional regional action may be taken with the national government to attract technical talent to Zeeland and to increase the number of technical students in Zeeland. A regional recruitment campaign could bundle efforts for local businesses and reduce individual recruitment costs for businesses. *Nuclear Delta* could organize this in close cooperation with businesses, regional education institutions and national initiatives.
- **Action 4.3: Acquire investments to strengthen the technical educational ecosystem in Zeeland to cater to human capital needs for nuclear new-build.** Regional businesses have raised concerns about the technical educational ecosystem in Zeeland: technical education has reduced over the past decades in Zeeland and should improve. *Nuclear Delta* could, together with regional education institutions, acquire investments to strengthen the education ecosystem in Zeeland. This would include expanding the Nuclear Academy to more relevant technical domains, increasing technical education in Zeeland, and liaising with technology vendors and regional education providers about specific training and competence centers for nuclear new-build.
- **Action 4.4: Plan construction of infrastructure, housing and public facilities programmatically.** The construction of a nuclear power plant can affect the capacity of regional businesses in infrastructure and construction. This could affect other necessary infrastructural projects and the construction of houses, for example. Programmatic planning of construction of infrastructure, housing and public facilities could avoid this, while at the same helping regional businesses develop capacity for nuclear-new build (before construction of an NPP) and avoiding a strong reduction of demand beyond the construction phase of a nuclear power plant. This action should be taken by the Province of Zeeland together with municipalities, the national government and in consultation with regional businesses. *Nuclear Delta* could act as a platform to facilitate this.

6.2. Organisation to execute the localisation roadmap and foster business support

In the roadmap in the previous section, Nuclear Delta is at the core of many of the actions. This platform organization does not exist yet, but an organization is needed to execute the roadmap and to foster business support. In this section, we outline a potential organizational structure for the Nuclear Delta, as well as a rough indication of the associated costs.

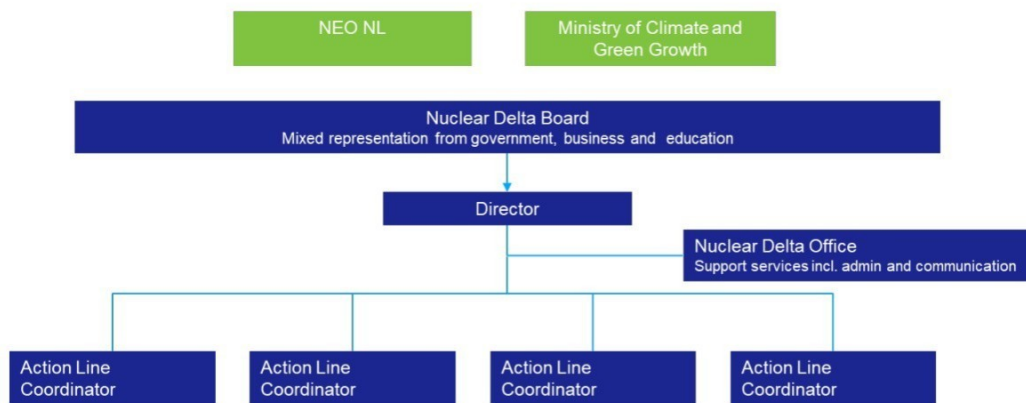


Figure 24: Proposed organisational structure for Nuclear Delta

A proposed organizational structure for Nuclear Delta is indicated in Figure 24. This structure was developed based on the following set of principles that are distilled from the needs for the platform that follow from the roadmap:

- **Nuclear Delta should be a Public Private Partnership, with collaborative action between businesses, education and government.** These different sectors should be represented in the Nuclear Delta Board, that meets a few times a year to discuss progress and the direction of the activities of the platform. Businesses, educational institutes and government should also take part in the execution of the different action lines, based on their interests and strengths.
- **Nuclear Delta should have a clear figurehead,** that would be able to serve as an ambassador for the platform and thereby the region. It makes sense that this figurehead would be the Director of the organization. The Director could also serve as a Program Manager of all action lines and as a Coordinator for one of the action lines of the roadmap.
- **The platform should be structured based on the action lines of Positioning, Informing, Connection and Supporting in the roadmap.** Each of these action lines should have their own Action Line Coordinator, in charge of coordinating (and to some extent implementing) the activities in the action line. Platform members should take part in the action lines that they are interested in and can contribute to their implementation.
- **Nuclear Delta should be a 'light' organization that can execute the roadmap in coordination and collaboration with other stakeholders.** The platform should have a Director and Action Line Coordinators that coordinate the activities in the four action lines, but these will not need to be full-time positions. Additionally, while there is a need for an 'office' that can provide support services in the realm of admin and communication, especially at the inception of the platform, this will also be a limited role given the size of the organization. Keeping the organization mean and lean will allow for low costs and greater flexibility to change.

- **Organizations should have the opportunity to formally be a part of Nuclear Delta**, to allow them to benefit from the platform in external communication. While many activities of the platform should not be limited to its members and open to externals, allowing organizations to state that they are a part of Nuclear Delta, will allow for better positioning nationally and internationally. Additionally, having members will strengthen the position of the platform and will allow for active participation of members. A membership fee could cover some of the costs of the platform and should reflect the value added to members.
- **Nuclear Delta should allow for combining efforts by the organizations involved and building off their existing strengths.** The Action Line Coordinators should allow for improved coordination of activities that are already being undertaken, instead of aiming to initiate all new activities themselves. For instance, Impuls Zeeland is already working on internationalization, and the platform shouldn't develop similar activities in parallel but instead keeping up to date with what Impuls is doing and communicating needs to Impuls as well as outcomes and opportunities to its members.
- **Coordination with the national level is very important to avoid duplication of efforts.** Nuclear Delta should maintain close contact with the key players at the national level (Ministry of Climate and Green Growth and NEO NL) where possible. These stakeholders could be involved more closely and formally – if needed – in an Advisory Board or Stakeholder Panel of Nuclear Delta.

6.2.1. Indication of costs

With the Director functioning as Director as well as Action Line Coordinator, Nuclear Delta would need to staff five positions. Our assumption is that the Director's position would require 0.5 FTE, the three Action Line Coordinators 0.4 FTE (each) and the Office Support roughly 0.2 FTE (likely to be a bit more at the start and less later). All these positions could be hired externally (contracting), but especially for the Action Line Coordinators and the Office Support, it makes sense to have these seconded from the Province of Zeeland, Impuls Zeeland or VNO NCW Brabant Zeeland. For the calculations in Table 19, we are assuming the Director is externally hired through any of the organizations in the Nuclear Delta Board, while the other positions seconded as in-kind contributions. Such an approach would reduce costs and avoid setting up a legal entity for Nuclear Delta.

TABLE 19: INDICATION OF YEARLY PERSONNEL COSTS FOR NUCLEAR DELTA

Cost specification	Annual costs	In-kind	In-cash
Director and Action Line Coordinator (0,5 FTE)	€150,000 ¹¹⁷		x
3 Action Line Coordinators (0,4FTE each)	€120,000 ¹¹⁸	x	

¹¹⁷ Assuming an hourly rate of around €140

¹¹⁸ Assuming a monthly gross salary of around €6.000 and an employer cost factor of around 1.4.

Cost specification	Annual costs	In-kind	In-cash
Office Support (0,2 FTE)	€8,000 ¹¹⁹	x	
Total personnel costs	€278,000		

Aside from personnel costs, there will also be operational costs. Given the size of the organization, the overhead and office costs (paper, printer, pens etc.) will be relatively low. We have estimated these costs at around €5.000 a year. For the office housing, it would be ideal if the platform could be housed in the offices of the Province of Zeeland or Impuls Zeeland. Locating Nuclear Delta there would provide legitimacy and support for the platform, while keeping the housing costs relatively low. For communication activities, we are estimating a budget of around €50.000. The required budget for communication activities can differ widely based on the scale and scope of the communication activities. A full public communication and awareness campaign will likely be much more expensive than what is budgeted here, but it should be sufficient for targeted campaigns aimed at businesses or a regional recruitment campaign to attract technical talent to Zeeland. An additional €50,000 is budgeted for events, such as matchmaking and networking events. The roadmap also foresees subsidies or loans to help prepare businesses for entering the supply chain, mainly by supporting upfront investments in certification and business development. For this, the estimated budget is around €100,000 a year.

6.3. Localization conditions to negotiate with Dutch government

Supplying new nuclear power plants offers companies several strategic advantages. To ensure that those opportunities are maximized and the risks are mitigated, localization agreements need to be negotiated with the Dutch government. To construct these conditions, first the opportunities and threats to businesses in Zeeland must be understood.

6.3.1. Opportunities

In Chapter 5, we outlined the opportunities for businesses in Zeeland. The possible construction of new nuclear power plants offers opportunities for Zeeland businesses to increase turnover, discover new markets, strengthen their position in both regional and national/international chains, and potentially scale up. Regional medium-sized enterprises can include local small businesses as subcontractors, creating strong regional supply chains. Forming consortiums is a logical step, for which existing networks among Zeeland companies provide a solid foundation.

¹¹⁹

Assuming a monthly gross salary of around €2.500 and an employer cost factor of around 1.4

6.3.2. Threats

There are also threats which lessen the positive impact of the power plants, or may have negative consequences.

There is a risk that Zeeland companies will not benefit from the arrival of new nuclear power plants. The construction of new nuclear power plants will bring a lot of activity to Zeeland and will therefore also change the current market dynamics in Zeeland. Large national and international players may temporarily enter the market, making it difficult for smaller local companies to remain competitive in both their sectoral market and the labor market. It may be particularly difficult to compete with larger companies that can offer better salaries or other benefits in terms of employment conditions and available personnel. In this study's survey, companies were asked about their main barriers to supply to the nuclear power plants. Their main barriers are a lack of appropriate training and education, lack of necessary knowledge, experience and access to information, and a lack of familiarity with the nuclear sector and certification. This lack of nuclear experience and knowledge, combined with uncertainty regarding the exact location and the timeline, is slowing down companies' efforts to prepare for the opportunities offered by supplying new nuclear power plants in Zeeland. Interest varies from company to company; many are cautious and want more information before they can position themselves. This is particularly true for small and medium-sized companies in the lower tiers (4-6) that are not yet active in the nuclear sector. As a result, companies run the risk of falling behind competitors who are quicker to make decisions or who can leverage existing networks and knowledge.

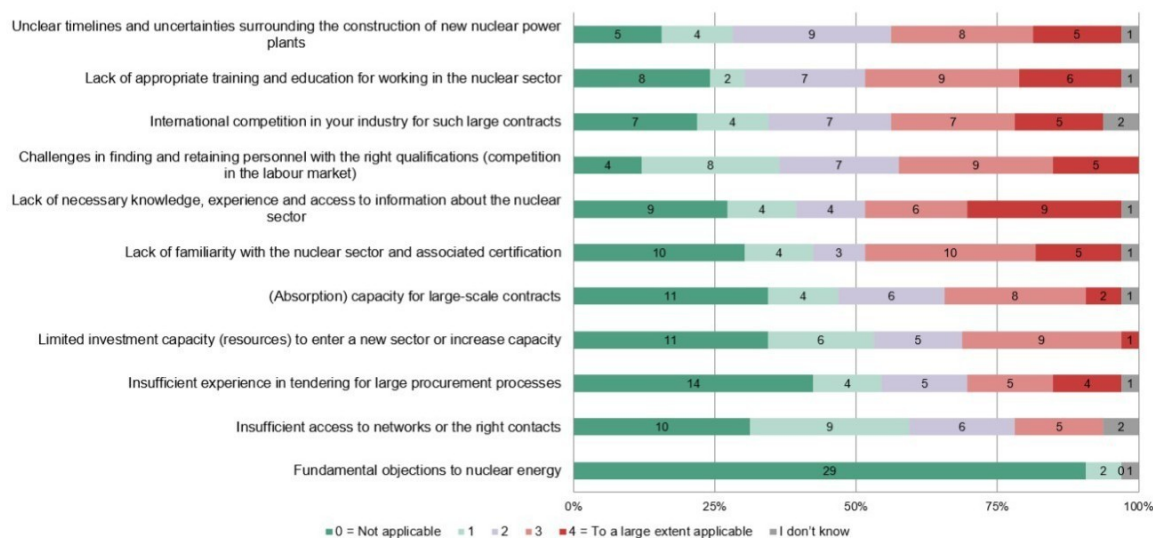


Figure 25: Survey response to the question: To what extent do the following barriers to supplying new nuclear power plants apply to your company? (N=32)

There is concern within the business community that the technology supplier will bring its existing supply chains along, both for construction and maintenance, causing local companies to miss out on opportunities. The extent to which this will happen depends on contractual agreements and the ability of the regional supply chain to meet the needs of NEO NL and the technology vendor. Strategic considerations, capacity in the existing supply chain and logistical costs/challenges will mean that some of the work will be localized in any case. Technology suppliers cite percentages of 50-70% localization, but they do not consider Zeeland to be local, but rather the whole of the Netherlands and possibly also neighboring countries such as Belgium.

The way in which NEO NL and technology vendors (tier 1) and tier 2 suppliers will place orders in the supply chain may also pose a threat. If a lot of risk is placed on subcontractors and there is no partnership but only procurement, the conditions for SMEs may be unfavorable. As a result, they may decide not to participate in the supply chain for new nuclear power plants, which means they will not be able to benefit from these developments.

Apart from the risk that Zeeland companies will not benefit from the arrival of new nuclear power plants, there is also the threat that they will experience various burdens. For example, there will be pressure on infrastructure and facilities in Zeeland. Heavy traffic on roads could lead to additional costs and logistical inconvenience for businesses, even if they do not directly benefit from the construction. At the same time, limited grid capacity in Zeeland could hamper the implementation of projects and affect the availability of energy for other sectors. There will also be less capacity available at Zeeland companies for other civil engineering contracts in Zeeland. This could lead to delays in other (new) civil engineering projects in Zeeland or to the introduction of competition in the Zeeland market. After the construction of new nuclear power plants, there may also be a temporary surplus of capacity among companies in heavy equipment, infrastructure, building and construction in Zeeland. The planning of civil engineering contracts is therefore important for Zeeland companies and civil engineering projects in Zeeland.

6.3.3. Possible localization conditions

Based on these opportunities and threats, we suggest a list of 13 localization conditions that the Province of Zeeland can put forward to the Dutch government.

- **NEO NL will establish its head office or its supply chain office/industry desk in Zeeland.** This office will open before construction begins (during the planning phase) and will be permanently staffed. Having the head office in Zeeland provides the province with more jobs, and can have a positive effect on the reputation and familiarity of NEO NL with local businesses and communities.

- **The Dutch government includes conditions in the requirements and assessment criteria for tenders for the construction of nuclear power plants that promote localization and reduce negative local impacts.** Require – if legally possible – an ambitious but realistic minimum percentage of localization for the Netherlands and Zeeland, require Dutch certification (such as VCA), include “social and economic impact for the Netherlands and the region” as a criterion, require Dutch to be the working language for certain activities and consultations.
- **The Dutch government invests in education in Zeeland.** Investments in the further expansion of the Nuclear Academy, and the (re)introduction and expansion of technical education programs in Zeeland, such as skilled workers in the construction, infrastructure, metal and electrical sectors. A strong focus should be on both attracting students and qualified teaching staff. This closely aligns with ongoing actions and ambitions to develop a Nuclear Campus in Zeeland.
- **The Dutch government supports companies in forming consortia together with a regional partner in Zeeland.** For example, through facilitation, co-financing of events or knowledge sharing. This can be done in collaboration with Impuls Zeeland.
- **The Dutch government invests in the Nuclear Delta in Zeeland.** A strong nuclear (innovation) ecosystem in Zeeland focused on energy: education, knowledge, government and business closely linked and organized by an organization that could be named Nuclear Delta.
- **The Dutch government imposes requirements on the technology vendor about providing training, with structural reinforcement measures for current education.** To relieve the burden on the region, the supplier can set up local training centers that should be integrated in the existing educational infrastructure in Zeeland (Hogeschool Zeeland, Scalda and University College Roosevelt), for example to teach basic safety requirements in construction.
- **The Dutch government facilitates companies that want to develop activities in the (international) nuclear market and are not yet active in this market by means of a nuclear energy desk.** Such a desk could be in addition to or an expansion of the Netherlands Foreign Investment Agency (NFIA) desk, in which various Dutch Regional Development Agencies (including Impuls Zeeland) are already involved.
- **The Dutch government prioritizes investments in grid capacity for Zeeland to tackle grid congestion and prevent future restrictions.** A stable energy grid, with sufficient capacity to supply consumers and businesses in Zeeland and to accommodate the energy generated by nuclear power plants and wind farms.
- **The government is investing in Zeeland's business climate in a timely manner.** A program to safeguard and strengthen Zeeland's business climate for companies in a timely manner. This also includes investments in infrastructure, housing and facilities that bring broader social-economic benefits.
- **The government introduces requirements that enable (regional) SMEs to compete in tendering procedures for technology vendor and NEO NL.** These include dividing contracts into smaller lots and requiring certification at the start of work, rather than at the tendering stage.

- **The government will appoint an independent regional representative for Zeeland companies during the construction of new nuclear power plants.** This representative will be the point of contact for local companies and will liaise on their behalf with NEO NL, technology suppliers, the government (national and regional) and public authorities (incl. ANVS and Impuls Zeeland). This is linked to *Nuclear Delta* in the roadmap.
- **The government works towards a realistic schedule for the construction of new nuclear power plants, considering the need to inform companies at an early stage about tenders, timelines and requirements.** There is still too much uncertainty for companies to invest and prepare for nuclear new-build. Companies need time to take advantage of opportunities in a timely manner. If the government wants Dutch SMEs to benefit from the construction of new nuclear power plants, clear and early information provision to companies is essential.
- **The government makes funding available to SMEs for obtaining certification.** For SMEs, certification has a relatively high impact on their costs. Investing in certification in advance when contracts are not certain is a risk. By offering vouchers, loans or subsidies (similar to the approach in Poland), that risk can be partially covered and the government can encourage SMEs to qualify in good time.
- **The government is taking measures to avoid delays in the construction of the nuclear power plant or stalling civil projects in other sectors** (e.g. public infrastructure, housing construction).

7. Conclusions and recommendations

7.1. Main conclusions

This report has described the nuclear supply chain and the potential for businesses in Zeeland to capture a position in this supply chain. Based on the previous chapters we can draw several main conclusions related to (1) opportunities, potential and benefits for businesses in Zeeland, (2) barriers and costs for businesses in Zeeland, and (3) lessons from abroad.

Opportunities, potential and benefits:

- Even for businesses without nuclear qualifications, there are plenty of opportunities to become a supplier for nuclear power plants. Requirements and certifications that companies already possess to work on non-nuclear infrastructure projects will suffice for many of the works on the non-nuclear parts of the nuclear power plant. Nevertheless, some businesses may need to invest in certifications or improving internal processes to meet high requirements that follow from safety provisions for nuclear installations.

- Technology vendors maintain mature supply chains for equipment and engineering services with high nuclear safety significance – such as the design and manufacture of reactor pressure vessels, steam generators, and reactor coolant systems. While these packages are typically sourced through established tier 1 and tier 2 suppliers, there is meaningful scope for local companies to contribute to supporting activities, including transportation, heavy lifting and rigging, site installation, and HSE support. Depending on the scope, some of these support functions may require pre-qualification or certification and, in certain cases, will be performed under the close supervision of the technology vendor or a higher-tier supplier.
- There are further opportunities for businesses in Zeeland that will enter the nuclear supply chain in the form of spin-offs in Zeeland, the Netherlands and Flanders, such as supplying future SMRs (potentially already at the development and testing stage) and existing nuclear power plants, decommissioning and dismantling of nuclear reactors and long-term operations of nuclear power plants.
- We have identified 130 businesses in Zeeland that could potentially enter the nuclear supply chain based on their product and service offerings. These companies are located across Zeeland and are quite evenly spread over different sectors. Most of them would be in tiers 3 and 4 of the supply chain.
- The potential for Zeeland businesses to supply to nuclear power plants is generally highest in:
 - Construction, Infrastructure and Transport & Logistics sectors;
 - Tiers 3 and 4; and
 - The first three phases of construction as well as the last phase of site clearance and landscaping.
- The direct economic potential for the business sector in Zeeland is roughly estimated to be between €3.1 and €4.6 billion over a 12-year construction period. This is comparable to the value of regional contracts at Hinkley Point C considering economic differences. The actual order size that could materialize in Zeeland will strongly depend on various factors, including the technology vendor chosen.
- The indirect economic potential for the business sector in Zeeland is estimated to be in the order of €1 billion. This is a result of the regional spending of businesses directly involved in the supply chain and of on-site workers (living in Zeeland) or visitors. There is a large margin of error in this number and it could be significantly higher if the construction is delayed or if the total project costs increase.
- The potential for localization in Zeeland is estimated to be 15% of the costs of a nuclear power plant. The potential for involvement of local businesses in the supply chain differs strongly per construction phase, and is estimated to range from a maximum of 2% in Commissioning to a maximum of 48% in Earthworks and Site Clearance & Landscaping. These estimates are strongly influenced by various practical factors, such as the technology vendor, the contracting/delivery model and the absorption capacity for large contracts by businesses in Zeeland.

Barriers and costs:

- The main requirements for suppliers is certification readiness. Minimum expectations typically include ISO 9001, with nuclear specific standards (such as ISO 19443 or 10 CFR 50) and for equipment, mandatory nuclear codes, qualifications, and supplier audits. Requirements increase with proximity to safety-significant systems and may vary by buyer, making early clarification essential.
- Cost drivers for participation in the supply chain include upgrading quality systems and obtaining the required certifications, training staff and building the right skills, and testing and qualifying products or services. Additional costs come from setting up proper documentation and traceability systems, taking part in supplier pre-qualification and audits, upgrading facilities and equipment where needed, and investing time and resources in preparing and submitting bids.
- Most Zeeland businesses (65%) in the survey show willingness to invest in entering the nuclear supply chain. The highest willingness is for investments in certification, procedures, knowledge, personnel, and collaboration. These are widely seen as necessary and lower risk, since they are often undertaken once a contract is secured. Willingness to invest is lower for higher-risk, forward-looking investments, such as business development, new products or services, and production capacity. These investments require upfront commitment without guaranteed demand and have longer payback periods, making companies more cautious.
- Many companies indicated that there is a risk that Zeeland businesses may not fully benefit from the construction of new nuclear power plants, which is lowering their willingness to invest. Large national and international players may enter the market temporarily, making it harder for local companies to compete for contracts and skilled labor. Combined with uncertainty about the project location and timeline, this may discourage Zeeland businesses from making the investments needed to enter the nuclear supply chain.
- Limited investment capacity remains a barrier for some companies: 29% of surveyed companies report constrained resources as a (partial) obstacle to entering new sectors or expanding capacity for nuclear projects.

Lessons from abroad:

In Chapter 4, Lessons from abroad were provided. In that section recent projects in the United Kingdom and Poland were covered. Below is a summary of key take aways from those projects which are applicable to Zeeland:

- Establish a dedicated intermediary supply-chain office to link developers, Tier 1 contractors and SMEs
- Conduct early capability mapping and provide nuclear-quality and certification support to prepare local companies for tendering
- Ensure transparent procurement, including early publication of work packages, timelines and qualification requirements
- Develop tailored support programs (training, financial instruments, advisory services) and promote SME consortium formation to increase competitiveness
- Co-design Zeeland's localization strategy with the technology vendor and define measurable local-content targets

7.2. Main recommendations

Given the opportunities and potential for businesses in Zeeland to have a role in the supply chain for nuclear power plants, we recommend to:

- Position Zeeland as a hotspot in the field of nuclear energy and position its businesses in the supply chain for nuclear new-build.
- Inform business and other stakeholders in Zeeland about nuclear energy developments, nuclear supply opportunities and requirements.
- Connect businesses regionally, nationally and internationally across the nuclear supply chain and align regional and national support activities.
- Support businesses and stakeholders in Zeeland and establish the right ecosystem conditions to venture into the nuclear energy domain and supply chain.

To these ends, we recommend further developing and implementing the proposed roadmap in Chapter 6 and to initiate required decision-making. This will require investments from national and regional government organizations, but the private sector should also provide contributions to the execution of the action lines (which can be small service or event based, partly subsidized, or in-kind for regional businesses).

To execute the roadmap, we recommend establishing the *Nuclear Delta* platform in Zeeland. This is a public-private platform that brings together businesses, governments/agencies and education institutions in Zeeland that are interested in entering the nuclear supply chain or in the booming nuclear energy domain. The Province of Zeeland, Impuls and VNO-NCW can play a part in this as well. Its governance structure should reflect the four action lines, have a clear figurehead and have a 'light' organization.

In addition, we recommend agreeing with the national government on clear conditions for hosting a new nuclear power plant in Zeeland that will benefit the regional business community and Zeeland's economy. We have proposed a list of conditions to consider in section 6.3.3. These conditions should support the previous recommendations. It should help reaching most of the identified economic potential for businesses in Zeeland and contribute to the ambitions of Zeeland to become a hotspot in the field of nuclear energy.

Annex A: Methodology

This study was conducted using a mix of qualitative and quantitative research methods.

- **Desk study:** The foundations for the study were laid in desk research, using various reports, technical documentation (e.g. regarding certification), conference materials, policy documents and websites referenced throughout the report.
- **Consultation of Tractebel's experts:** internal technical experts within Tractebel were consulted to provide input for and review sections of the report.
- **Interviews:** 10 interviews were conducted with companies in Zeeland – within and outside the nuclear sector. An overview of interviewed stakeholders is provided at the end of this Annex.
- **Data science:** data science methods were used to review and expand an existing list of relevant companies in Zeeland. This list was turned into an excel database by adding information on sectors, phases, locations, and tiers. This database was used for several analysis in the report. More information on this approach is provided later on in this Annex.
- **Company survey:** a survey among identified businesses in Zeeland was conducted. In total 35 companies completed the survey. An overview of the survey response statistics is provided at the end of this Annex. The survey addressed interest, potential, certification, barriers/challenges and needs of companies in Zeeland to enter the nuclear supply chain.
- **Validation workshop:** a physical validation workshop with companies in Zeeland was organised to validate preliminary findings, inform companies and to gather input (actions, needs, barriers etc.) for roadmapping.
- **Tractebel's Quality Passport tool:** companies participating in the validation workshop were invited to fill-out Tractebel's Quality Passport tool to give them insights in the extent that their quality procedures and certifications are aligned with the needs of the nuclear sector. In total 7 companies filled out this tool and received information on where they can improve. An overall analysis was made and used in the report.
- **Case studies:** two international case studies in the UK and Poland were conducted using desk study and interviews to collect insights from two foreign nuclear new build programmes and their localization activities.
- **Road mapping:** using the findings from the study and inputs from the validation workshop and case studies roadmapping was conducted to create a roadmap for business support and localization.

Construction of a list of companies that could potentially supply to nuclear power plants and associated database

During the study we have identified 130 companies in Zeeland that could potentially supply nuclear power plants. These companies were identified in three steps:

- First, an initial list of companies was compiled by Impuls Zeeland. This list was extended with companies in Zeeland that are known to supply COVRA, EPZ and Doel. For this we have used interviews and Tractebel's internal knowledge.
- Second, we used a list of almost all companies in Zeeland to web scrape their websites and to check with a large language model whether the content of these websites match any of the identified components, services and capabilities that are required during the construction and operation of a nuclear power plant. This led to a further extension of the list of companies. We also used data science methods to identify the location of companies for geographical mapping.

Lastly, we reviewed the list of companies and removed any companies that seem to have a low potential to supply to nuclear reactors. Companies of self-employed professionals (ZZP/eenmanszaken) were mostly removed from the list. Characteristics of companies were added based on the available data and assessments by the team, for instance allocation to specific tiers and sectors. This resulted in a database that was used for further analysis during the study.

Consulted stakeholders

Organisation	Consultation
Applus+	Workshop
Bormstaal	Interview
Cordeel	Workshop
COVRA	Interview
De Hoop Beton Mortel	Workshop
De Hoop Terneuzen	Interview
Delmeco	Workshop
EPZ	Interview and workshop
Equans	Interview and workshop
EVS BV	Workshop
H4A	Interview
Impuls Zeeland	Steering Group
Kiwa	Workshop
Konitec	Interview
Liftal Hijstechniek	Workshop
Mourik	Workshop
Overlasko	Workshop
Ovet Shipping	Workshop
P. van Eijzeren	Interview
Paree	Interview
Provincie Zeeland	Steering Group
Sagro Decom	Interview
Schelde Exotech	Interview and workshop
Syndus	Workshop
TMS Industrial	Workshop
Van de Velde	Workshop

Verbrugge	Interview
VNO-NCW Brabant-Zeeland	Steering Group
Wielemaker	Workshop

Survey response statistics

The survey was completed by 35 participants. The survey link was shared with 132 possible participants (a completion rate of 27%).

- The sectors that were most represented are construction and infrastructure (29%), followed by other services (17%) and transport and storage (14%).
- 80% Of the respondents worked at a SME (<250 employees). Most of the respondents worked at a company with 5-50 employees (43%) or 51-250 employees (31%).
- There was a 50/50 division in whether the company is part of a larger national or international group of companies (49% yes versus 51% no)
- The majority of the responding companies was active on a regional level (69%) and a national level (63%). Almost half of them were active in the Benelux (46%), a third in Europe (29%) and a quarter internationally beyond Europe (26%)
- The majority of the companies (69%) had already supplied to the nuclear sector, either within the last ten years (49%) or before that (20%). For 31% of the companies, this supply chain was new to them. Those companies were asked if they had specific experience in other regulated sectors. Most of them did, with chemistry/pharmacy (45%) and energy incl. oil and gas (45%) being the most common sectors.

Annex B: International case studies

Overview of cases and lessons

In this Annex we provide the results of two international cases that we conducted to learn from lessons abroad related to localization. In the following sections cases on Hinkley Point C (UK) and Poland are presented in more detail. At Hinkley Point C EDF is constructing a twin unit EPR and in Poland Westinghouse is contracted to build an AP1000. These are also the technology vendors and designs that are considered in the Netherlands. Furthermore, both new-build projects are in a different stage of development, allowing to learn from recent experiences at pre-construction as well as mid-construction phases in two different countries (with different dynamics).

International Case Study: Hinkley Point C

Name of localisation programs	Fit4Nuclear: Fit For Nuclear Get Into Nuclear The Hinkley Supply Chain: Home - Hinkley Supply Chain
Country	United Kingdom
Location	Hinkley Point near Bridgwater, UK
Type of NPP being build	Two EPR™ (European Pressurized Reactor) units, large-scale Generation III+ PWRs – 2 × 1,630 MWe (3,260 MWe total)
Timeframe of the programme:	- Construction start: March 2017 - Expected commissioning of Unit 1: 2029–2030 (scenarios) - Expected commissioning of Unit 2: approx. 1 year after Unit 1 (early 2030s)
Key characteristics of/activities F4N the programme	- Fit For Nuclear (F4N) is a unique service to help UK manufacturing companies get ready to bid for work in the nuclear supply chain enabling companies to measure their operations against the standards required to supply the nuclear industry. - The program takes an in-depth look at the following areas within the organisation, Strategy and Leadership, Design and Project Management, People Excellence, Process Excellence, Health and Safety Culture and Quality Management and helps companies to develop a clear and focussed action plan to sustain, and continually seek to improve their processes to meet the high standards required by the nuclear industry. - Ownership of the program was transferred from AMRC (part of Sheffield University) to Nuccol Ltd in 2024. Due to this transfer older websites are no longer accessible. - Aimed at companies with >10 employees and >1.6 Million GBP annual turnover. Pre Entry Steps - Capability questionnaire - Business excellence self-assessment Entry into the F4N programme - Site verification visit. - Business action plan. - Sector Specific Knowledge Assessment - Sector Specific Knowledge Transfer Modules - Pre-grant visit. - F4N granted & ongoing support.
Key lessons learned	- Robust supplier engagement program (supplier portals, meet-the-buyer events, training packages). - Strong emphasis on regional SME participation (Somerset and South West).

	• Supply chain mapping, capability building, and strict nuclear-quality compliance support. • Transparent publication of work packages and build schedules via EDF and regional supply chain offices.
Relevance to Zeeland	Demonstrates how a mature new-build project structures supplier engagement, intermediary organizations, and capability-building to support local content.

BACKGROUND ON THE COUNTRY

Hinkley Point C (HPC) is the first new nuclear power station to be built in the United Kingdom in more than a generation, marking a major milestone in the country's long-term energy strategy. Located on the Bristol Channel in Somerset, England, the project is being developed by EDF and its partners as part of the UK's commitment to delivering low-carbon, reliable, large-scale electricity generation.

HPC consists of two EPR™ Generation III+ reactors with a combined planned output of 3,260 MWe, enough to supply electricity to approximately 6 million homes. This new generation of reactors integrates enhanced safety systems, improved efficiency, and a long operational lifespan.

The development process formally began with the granting of the nuclear site licence in 2012. Extensive regulatory reviews, supply-chain preparations, and financing arrangements followed, culminating in the UK Government's final approval in 2016. Full construction commenced in March 2017, and HPC has since become one of the largest and most complex infrastructure projects in Europe - driving innovation, skills development, and regional growth across the UK.

LOCALIZATION APPROACH AND KEY ACTIVITIES

The UK has developed one of the most mature and structured nuclear localization ecosystems in Europe, anchored by the Hinkley Supply Chain Programme. This programme, led by EDF in collaboration with regional bodies such as the Somerset Chamber of Commerce and the Heart of the South West LEP, aims to maximize UK industrial participation while developing long-term nuclear capabilities.

Below is a more complete and enriched description of the key components.

Strong Supplier Engagement and Regional Development

EDF has established a robust, transparent, and highly structured engagement model to bring UK suppliers into the HPC project. Key initiatives include:

- A dedicated **Hinkley Supply Chain Registration Portal**, enabling companies to showcase capabilities and receive visibility from Tier 1 contractors.
- Detailed **supplier capability assessments** to match UK firms with upcoming work packages.
- Regular briefings to Tier 1 and Tier 2 contractors to highlight local business potential and encourage subcontracting within the region.
- Continuous communication through **work package descriptions, construction updates, and procurement schedules**, helping suppliers plan investment and training activities early.

These initiatives have resulted in thousands of UK companies securing contracts, significantly boosting regional economic impact.

Capacity Building for SMEs

Local and regional SMEs benefit from a wide range of development opportunities designed to raise their capabilities to nuclear standards:

- Access to training programmes, including quality management, nuclear safety culture, and ISO/ASME certification guidance.
- “Hinkley Ready” programmes offering practical support to help SMEs understand nuclear requirements and compete for contracts.
- Extensive information days, workshops, and technical seminars.
- Meet the Buyer events facilitating direct one-to-one meetings between SMEs and Tier 1 contractors, helping companies align their services with project needs.

These initiatives ensure that local businesses not only participate in HPC but also gain long-term skills to compete in future nuclear projects such as Sizewell C.

Sector Diversification and Consortium Formation

To meet the scale and complexity of nuclear work packages, many SMEs form consortia to combine capabilities, share risk, and present unified bids. A well-known example is the Somerset Larder, a consortium of regional food producers delivering large-scale catering services for the HPC workforce. Similar consortium models have emerged in civil engineering, logistics, and specialist technical services.

This approach broadens participation and enables smaller companies to access major infrastructure opportunities.

Transparent Procurement Structure

EDF follows a strongly transparent procurement philosophy to support supplier readiness and long-term capability building. The company publishes:

- Comprehensive work package descriptions
- Forward build schedules and milestone updates
- Reference documents, technical standards, and training materials
- Step-by-step guidance for nuclear qualification, enabling suppliers to plan early for required certifications

This clarity gives suppliers the confidence to invest in training, equipment, and partnerships—while aligning their development with project timelines.

Investment cost in the program

The team explored the costs of initiatives of a regional nuclear supply chain program by studying awarded tenders by the UK government related to the nuclear supply chain, in particular to HPC. We did not find how the cost of this program was shared between the parties involved such as the technology provider, government and tier 1/tier 2 suppliers.

Contract name	Size of contract (GBP)	Date	Details
SME Business Support for Hinkley Point C Supply Chain	3 Million	23 June 2017	The Contract has 2 Elements: A - Nuclear SME Supply-Chain Business Support To support SMEs in the contract area to recognise, prepare for, and win business from nuclear opportunities in the UK and across the globe. The service should help SMEs to address issues, real or perceived, of capacity, competency and confidence as well as different regulatory or process requirements so that they are prepared to exploit opportunities for business growth offered by the nuclear industry. B - Nuclear South West Inward Investment Expertise To will advise and support NSW IIG in promoting the South West as a long-term proposition for inward investors, working to stimulate growth and productivity; raising the profile of the region and creating jobs across the area. The service will work with companies of all types and sizes, and both existing and new investors, across the 3-LEP area.

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- [2] **Nuclear Industry Association UK:** [Home - Nuclear Industry Association](#)
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- [4] **ONR on HPC:** [Hinkley Point C | Office for Nuclear Regulation](#)
- [5] **EDF website HPC:** [Hinkley Point C | EDF](#)
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- [9] **National Skills Academy for Nuclear:** [Home - nsan](#)
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International Case Study: Poland (PEJ)

Name of localization program	Polish Atomic Energy Program (PAP Program)
Country	Poland
Type of NPP being build	Westinghouse AP1000 reactor - Large-scale pressurized-water reactors, Generation III / III+
Timeframe of the program	• Start of program: 2014 • Construction period for the first NPP: 2026-2035 • Anticipated start of operational phase of the first NPP: 2036
Key characteristics of/activities in the program	The localization program is in the early stages (the development is in the preparatory phase). However, the program is composed of research, information session, supplier days, conferences, support programmes and the development of a platform aimed to support to localization.
Relevance to Zeeland	How to best approach the localization and what is important to consider
Key lessons learned	• Establish an intermediary supply-chain office to bridge local companies with the vendor, share timely information, and activate firms through supplier-day engagement. • Provide differentiated support for companies of all sizes, including financial programs, training, audits, and certification assistance. • Develop the localization strategy jointly with the technology vendor, supported by clear local-content definitions and long-term procurement transparency.

Background of the country

The goal of this section is to understand where Poland was before they decided for nuclear new build. First, a description of the policy/decision-making context related to the nuclear new build will be presented, focusing on the decision, the main reasons as well as the extent to which there is a nuclear supply chain in place.

The objective of the PNP Program is the construction and commissioning of nuclear power plants based on large-scale, Generation III (+) pressurized water reactors. The total installed nuclear capacity ranges from ca. 6 to ca. 9 GWe. The plans for and construction of the first nuclear power plant are ongoing. There are plans for an additional nuclear power plant.

Policy and decision making process

The first formal step towards building new nuclear power plants was a resolution on 13 January 2009 for the development of a nuclear-power program in Poland.¹²⁰ This decision was later that year supported through the 2030 Energy Strategy of Poland. This strategy introduced nuclear power as part of the electricity mix. A period of consultations with the public and preparations followed.

The Ministry of Climate and Environment is responsible for nuclear power policy and strategy in Poland. The Nuclear Energy Department of the Ministry of Climate and Environment is the so-called Nuclear Energy Program Implementing Organization (NEPIO).

In 2014, Poland launched its nuclear energy program. The Council of Ministers adopted the Polish Nuclear Power Program (PNP Program) in January 2014.¹²¹ In 2020, the PNP Program was updated. The main differences included a more detailed planning, a clearer structure for financing, but most importantly increasing the ambition from 6 to 6-9 GWe.

In 2022, the Council of Ministers adopted a resolution on the technology selection for NPP1. Westinghouse Electric Company was chosen and a Cooperation Agreement defining the principles of cooperation in the preparation of the construction process of the first nuclear power plant in Poland was signed.

The project company Polskie Elektrownie Jądrowe Sp. z o.o. (Polish Nuclear Power Plants Ltd.) (PEJ) is in charge of the nuclear power plants since 2021.

Rationale for building new power plants

The reasoning to build new nuclear power plants is based on three aspects. Nuclear power provides:

- Energy security;
- Climate and the environmental benefits;
- Economic benefits.

Finally, large nuclear power plants units fit the energy infrastructure, which now serves the GW-scale coal power plants. This means that relatively moderate grid reinforcement are needed.¹²²

¹²⁰ Resolution of the Council of Ministers No. 4/2009 of 13 January 2009

¹²¹ Resolution No. 15/2014 of the Council of Ministers of 28 January 2014 on the multi-annual programme referred to as the Polish Nuclear Energy Programme, Dziennik Ustaw (Official Journal of Laws of the Republic of Poland) (Dz. U.) poz. 502 (Programme)

¹²² IEA (2022), Poland 2022, IEA, Paris

[iea.org/reports/poland-2022](https://www.iea.org/reports/poland-2022), Licence: CC BY 4.0

Timeline

The 2020 PNP Program sets out the timeline for the preparations and development of the new nuclear power plant(s). In 2021, the technology for both NPP1 and NPP2 would be selected. The location decision and contracting of the technology provide and the main EPC contractor would occur in 2022. Construction for NPP1 would last until 2033 for the first reactor and for the second and third reactor, respectively 2035 and 2037. The construction of NPP2 would last until 2043 for the third reactor, after commissioning the first reactor in 2039.

As mentioned, in 2022 Westinghouse Electric Company was chosen as the technology provider and the plant would be built at the Lubiatowo-Kopalino site. As of writing (2025), there are delays in the preparations and development of NPP1. The first reactor of NPP1 would start commercial operation in 2036, with the second and third starting respectively in 2037 and 2038.¹²³ Construction would be finalized a year before the commissioning of the reactors.

Nuclear tradition and / or supply chain

Poland does not have nuclear power plants. In the 1980s the process of construction of nuclear power plants started, however these plans were abandoned in 1990.¹²⁴ There have been two research reactors, of which one is still operational. The first research reactor was the EWA reactor (TANK WWR type of 1 MWe). The EWA reactor has been decommissioned. The second operational reactor is the MARIA reactor. The MARIA reactor is part of the Institute of Atomic Energy in Swierk.

Several Polish companies have been involved in nuclear power projects, throughout the EU, but also in other parts of the world. According to catalogue "Polish Industry for Nuclear Energy 2019" from the Ministry of Climate around 70 companies already had provided services or supplied products for nuclear power projects in the last ten years.¹²⁵

Localisation

There have been localization targets for the development of the new nuclear power plants in Poland in the PNP Program since the start of the plans to build new nuclear power plants. For the first nuclear power plant, there are targets to have local industry involvement for 40% of the value for the first unit. For the following new nuclear power plants, this figure increases to 70% of the value of the units. PEJ is responsible for the involvement of the domestic industry during the construction of the new nuclear power plants.

Activities

¹²³ pej.pl/en/the-project/key-information/

¹²⁴ IEA (2022), Poland 2022, IEA, Paris [iea.org/reports/poland-2022](https://www.iea.org/reports/poland-2022), Licence: CC BY 4.0

¹²⁵ gov.pl/web/suomi/polish-industry-for-nuclear-energy-2019

Given the timeline of the development of the nuclear power plants in Poland, most of the activities so far are related to the preparatory phase. In 2026, the framework to set out the cooperation between PEJ and the Westinghouse-Bechtel consortium will be made clear. As mentioned, in 2022 a decision on the technology vendor was made. The technology decision is a major deciding factor on the extent to which localization can take place. After this decision, different types of activities have been organized.

The initial activities therefore focused mainly on research and surveying. An important aspect was researching the already existing nuclear capabilities of Polish companies. In 2016, the report *Polish Industry for Nuclear Energy* was published. This report provided an overview of Polish enterprises that had gained nuclear experience in past 10 years and other companies that had the expertise and competencies for the nuclear industry. This overview provided insight into the extent to which Polish industry could supply different components of a new nuclear power plant. The overview was updated in 2019 and in 2021 as well.

Similarly, several reports also researched the extent to which Polish companies were interested in participating in the construction of the new nuclear power plants.

In 2024, a more elaborate report called “*Ile Polski w atomie? Local content programu energetyki jądrowej*” (How Much Poland in the Nuclear Power Program? Local Content) was developed by the Polski Instytut Ekonomiczny. This report aimed to research the topic of local content: how much of the construction can be performed by Polish companies? It first sets out the legal context (EU and WTO regulations) and the policy framework. Following that, it describes several measurement methods on how to measure the amount of local content. In addition to that, the report describes the perspective of Polish companies trying to enter the nuclear sector. The report classifies the Polish companies in four segments: local observers, sleeping giants, new professionals and market leaders, based on their size and nuclear experience. Finally, it provides an elaborate set of recommendations on how to increase localization.

Examples of recommendations include:

- Create financial support programmes for local companies to develop competencies and get certified. Information on these programmes should be readily available;
- Establish a clear definition and methodology for measuring the level of local content;
- Keep the trade-off between localisation and the overall costs in mind. Generally, the higher the local content, the higher the costs (e.g., economies of scale)
- Set up an intermediary office to support contracting of local and regional companies, following the British model. Work includes bridging the technology vendor/owner with the local and regional companies, sharing information and supporting the companies throughout the tender process. Smaller companies do not always have experience in applying for funding.
- Legal support in forming consortia can help smaller companies to join consortia
- The Technology Vendor should publish a schedule of purchasing procedures for the next 2-3 years.
- Create an audit and advisory program for more experienced companies to assess the infrastructure, staff, and existing certification and suggest necessary actions to become a supplier for the nuclear industry.

During this same period, several trainings, workshops, technical seminars were given. For instance on quality requirements or specific components (e.g., nuclear piping systems). Several report and manuals were also published¹²⁶. Similarly, international promotion took place via workshops with the nuclear industry in other countries (e.g., UK), bilateral trade missions or summits and Polish presence at the World Nuclear Exhibition in Paris.

Following the technology vendor decision several concrete activities have taken place to increase the localization during the construction of the nuclear power plant. First, several so-called *Supplier days* have taken place. These *Supplier days* are focused on informing companies that want to join the construction of the new nuclear power plants. The objective is to support companies already involved in the nuclear industry, but also to inform and activate non-nuclear companies. They are hosted by PEJ in collaboration with Westinghouse, Bechtel and the Chamber of Commerce for Energy and Environmental Protection (IGEOS) and local authorities. The two-day events are divided into one day of presentations and discussions on a new nuclear power plant, the progress of the construction, how to enter the supply chain, procurement procedures and which barriers exist. For instance, during one of the Supplier Days information was shared on quality requirements: that for work on the Balance of Plant compliance with ISO 90001 standards is needed, but that for work on the Nuclear Island additional certifications are required. The second day is more focused on individual meetings with the companies to provide detailed answers to their questions and doubts. The first *Supplier Days* were held in 2023. At the end of 2025, the 8th edition took place. There are more events to follow.

In addition to the Supplier Days, in November 2025 a conference *Nuclear – opportunities and engagement of Polish industry (Atom – perspektywy i udział polskiego przemysłu)* was held. The goal of the conference was to inform companies. Topics that were covered during the conference include tender procedures, certifications, quality requirements and other relevant factors.

PEJ made an agreement with Pomorska Specjalna Strefa Ekonomiczna (PSSE) to collaborate on wider aspects surrounding the development of the new nuclear power plants. Through the collaboration, they will identify economic, educational and investment areas to promote. Examples include training and competency building opportunities, such as internships and training programs for students and pupils, to develop the workforce as well as real estate market analysis.

At the end of 2025, the Industrial Development Agency (ARP) launched a programme called Nuclear without Barriers (*Atom bez barrier*). This programme provides financial instruments to support local companies that want to join the construction, but need financial support to obtain the required certificates (*NQA-1, ASME, ASME III, ISO 6527, 7385, 8107, IEC and IEEE in the field of nuclear standards and the ACI CODE-349-23*). The Polish companies can use the certification loans to finance the process. The loan can be between 300k-1,000k PLN (70k-240k EUR) with a repayment period of 7 years and an interest rate based on the WIBOR 1M rate.

Finally, PEJ has developed a platform for suppliers¹²⁷ as well as the Polska Platforma Jądrowa (PPJ) (Polish Nuclear Platform)¹²⁸. The PPJ will be the main platform that focuses on localization. The PPJ was launched in 2025. The PPJ has the objectives to inform and support the localization of the work, provide networking opportunities for groups to establish business relations within thematic areas, facilitate education, facilitate collaboration, provide information on the regulations surrounding the construction of the new nuclear power plants. Results and impact

As mentioned, the construction of the new Polish nuclear power plant is in the early stages. Therefore, little results have been achieved. The results of the activities are expected in the coming years. Nevertheless, a first group of Polish companies have reached the completion of the first stage of NQA-1 compliance.¹²⁹ Following the first milestone, the Polish companies need to finish two additional phases. PEJ coordinates the standardization process. Similarly, a first group of Polish companies has been awarded contracts to provide services for the development of the new nuclear power plants.¹³⁰ According to PEJ, 180 Polish contractors have been awarded contracts with a total value of 780 million PLN (185 million EUR)¹³¹. For instance, Elektrotim S.A. was awarded a 160 million PLN (38 million EUR) contract to provide the power infrastructure, including a 110/15kV power station and the supporting infrastructure.¹³²

Lessons learned

- The decision on the Technology Vendor is an important milestone for localization. Following this decision, actions can be developed. It is important to develop the localisation approach together with the Technology Vendor – also to balance the costs with the local content;
- Local companies can be categorised according to their size and experience. The different types of companies have different capabilities and (known and unknown) needs. They thus require different types of support;
- Create financial support programmes for local companies to develop competencies and get certified. Information on these programmes should be readily available;

¹²⁷ pej.pl/en/for-suppliers/

¹²⁸ polskaplatformajadrowa.pl/

¹²⁹ pej.pl/en/press-center/news/more-polish-companies-have-completed-the-first-stage-of-compliance-with-global-standards-for-the-nuclear-industry/

¹³⁰ pej.pl/en/press-center/news/pej-westinghouse-places-first-orders-related-to-the-nuclear-power-plant-in-pomerania-with-polish-suppliers/

¹³¹ The status of the EJ1 project implementation and the investor's activities in terms of the local supply chain – PEJ Supplier Days 2025 Retrieved from: polskaplatformajadrowa.pl/wp-content/uploads/2025/07/PEJ_Supplier-Day_2025.pdf

¹³² pej.pl/dla-mediow/aktualnosc/polskie-elektrownie-jadrowe-i-elektrotim-s-a-z-umowa-na-zapewnienie-zasilania-rezerwowego-potrzeb-wlasnych-oraz-placu-budowy-pierwszej-elektrowni-jadrowej-w-polsce/

- Set up an intermediary office to support contracting of local and regional companies. Work includes bridging the technology vendor/owner with the local and regional companies, sharing information and supporting the companies throughout the tender process. Smaller companies do not always have experience in applying for funding. Transparency and timely provision of information is important for local companies. An example of the activities could be to publish a schedule of purchasing procedures of the Technology Vendor for the next 2-3 years.
- Create an audit and advisory program for local companies to suggest necessary actions to become a supplier for the nuclear industry.
- It is important to define local content and a methodology to measure it.
- Supplier days are a way to both inform, activate and support local companies.

Annex C: Quality Passport Supply Chain Report

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Report

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INTERNAL

Client:
Project: Nuclear supply chain study of Zeeland
Subject: Quality Passport Nuclear Supply Chain Report: Analysis for Netherlands 2025
Comments:

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* This document is fully electronically signed on 2026 02 09.

Quality Passport Nuclear Supply Chain Report
Analysis for Netherlands 2025

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Appendix A: Auxiliary Source Data

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1. Abstract

This report is based on the results from participants of the Zeeland Supply Chain Event held on 18 November. Companies that completed the Quality Passport tool received personalized reports analysing their individual performance. The purpose of this document is to evaluate the potential of the Dutch nuclear supply chain by assessing the readiness of participating companies' quality management systems to meet nuclear industry requirements.

Overall, the test results of the Dutch companies present a high level of compliance to the nuclear industry requirements. On average, Dutch companies scored above the global population of nuclear and non-nuclear companies that have completed the Quality Passport questionnaire. In some cases, some non-nuclear companies achieved results comparable to or even better than established nuclear suppliers. This indicates that for many organizations, adapting to nuclear standards may not require major structural changes but rather some corrective actions on particular areas.

Nevertheless, certain areas specific to the nuclear industry will require new processes to be implemented. The rationale behind these requirements is explained in detail in this report.

2. Methodology

This report analyses the results of the Quality Passport questionnaire completed by participating Dutch companies. The questionnaire evaluates each company's quality management system against the requirements of the nuclear industry.

The analysis aggregates the responses at a group level, ensuring individual company details remain confidential. Additionally, the group's results are compared with the global dataset of companies that have completed the Quality Passport internationally.

The objective of this assessment is to identify common areas for improvement within the sample and to provide recommendations that are relevant and applicable to the group as a whole.

The questionnaire is divided in several areas or modules in which the companies' Quality Management System (QMS) is evaluated through a series of questions. This evaluation is based solely on the responses that the company itself introduced in the questionnaire and have not been audited by Tractebel.



Figure 1: Areas of evaluation of a QMS

This questionnaire is based on a summary of generic and common requirements of nuclear sector documents like 10CFR50 App.B - ASME NQA-1 -ISO 19443; in reference to the requirements of IAEA GSR Part 2.

It is not its purpose, and cannot as it is designed, evaluate any kind of components or services technical quality.

It is to be noted that the reduced sample of participants may influence some of the results obtained.

Below it can be found a brief description of the main aspects evaluated for each module.

1. Quality System and Organization

The quality management system must ensure proper control of bids and tenders, including clear definition of roles and responsibilities, oversight of technical reviews, and management of configuration, changes, and amendments.

2. Administration of Orders

Roles and responsibilities must be defined and supported by an organizational chart. Documentation of the Quality Assurance System, along with relevant certificates and qualifications, has to be maintained and accessible through the QAS.

3. Design Control

Design and calculation tools, as well as related documentation, must be controlled. Responsibilities for reviews should be clearly assigned. It includes the management of inputs, outputs, changes, configuration and amendment management must be ensured.

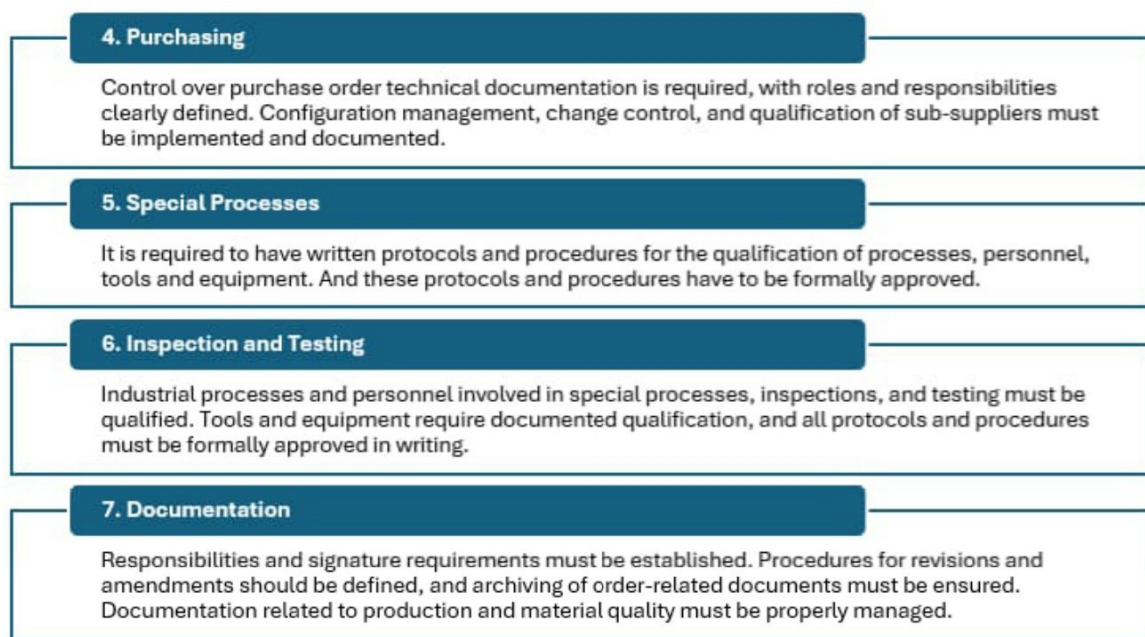


Figure 2a and 2b: Summary of main aspects of each area of evaluation

3. Profile of Participating Companies

Seven Netherlands-based companies participated by completing a questionnaire, and their responses were evaluated in this report. Both with previous nuclear experience and without it. Nearly all companies declare to have a QMS compliant with ISO9001.

The sectors from which these companies come from are varied:

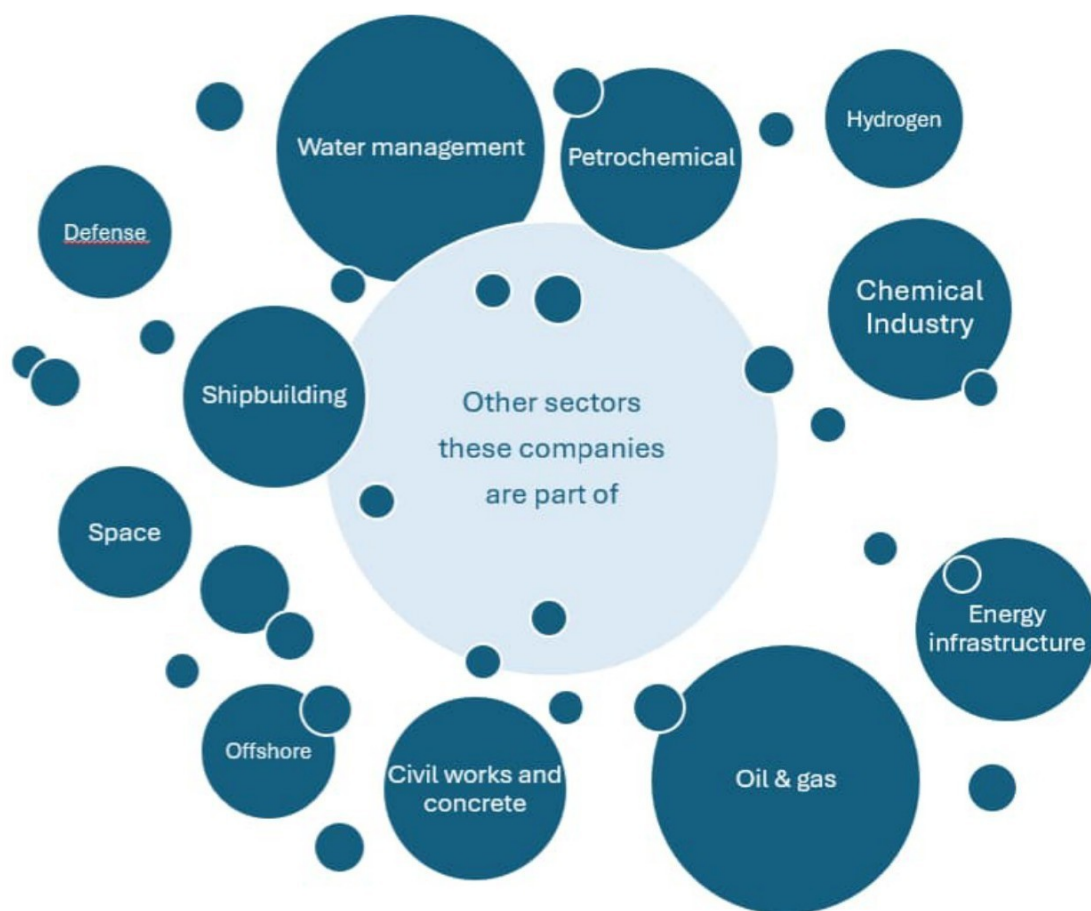


Figure 3: distribution of company sectors. Size of the bubbles represents the incidence of companies being part of a given sector

The participant companies can offer a range of products and services necessary for the nuclear industry. Below it can be found a non-exhaustive list:

				
Safety & Lifting Solutions	Specialized Equipment & Components	Maintenance & Lifecycle	Construction & Installation	Testing & Certification
- Lifting equipment - Cranes - PPE safety-related - Services on safety inspections	- Special products - Heat exchangers - Pressure vessels - Vacuum systems - Pumps and parts	- Services - Repairs - Refurbishments & replacements - Equipment maintenance - Dismantling of equipment	- Installations - Concrete - Major nuclear construction projects - Renovation programmes on operational sites	- Testing - Inspection - Certification (Non-Destructive Testing)

Figure 4: portfolio of products offered to the nuclear industry by the participant companies

4. Global Evaluation of Results

>75%
Level of compliance
across Dutch companies



The current Quality Management Systems (QMS) of the assessed companies demonstrate strong alignment with nuclear industry requirements, achieving an overall compliance rate above 75%. Notably, one non-nuclear company reached an impressive 95% compliance with the nuclear standard.

When compared to the global dataset, Dutch companies consistently outperform the international average across all evaluated areas. While non-nuclear companies generally exhibit more areas requiring attention than those with prior nuclear experience, these differences are minor and not significant.

5. Performance Breakdown Across Modules

We consider interesting to evaluate how a sample of companies is doing on certain areas because commonalities among them show general trends that can become an opportunity for shared actions. Also to discriminate if responses are anecdotal or a general point of attention.

The analysis highlights areas where companies excel and where challenges remain. Strong results were observed in Quality System and Organization, Purchasing, Special Processes, and Documentation, reflecting robust management practices. Conversely, greater difficulties were noted in Administration of Orders, Design Control, and Inspection and Testing, indicating opportunities for improvement in these modules.



Figure 5: Performance results per area of evaluation for the participating Dutch companies

Overall, companies tend to encounter more challenges in the Administration of Orders module. These difficulties are evident among both nuclear and non-nuclear organizations. General guidelines to address these issues will be outlined in the next section.

Additional areas of concern include the Design Control and Inspection and Testing modules. For these modules, non-nuclear participants show a slightly higher incidence of challenges compared to their nuclear counterparts. These and other particular challenges for non nuclear companies will be discussed in detail below.

6. Practical Guidance for Identified challenges

The assessment of the Dutch companies indicates that further enhancement is possible in the administration of orders. A focused effort to improve traceability and strengthen measures against CFSI is recommended, as these are essential requirements under quality management system standards for the nuclear industry.

The responses to the questionnaire indicates missing or insufficiently defined processes that could weaken traceability and CFSI prevention. For example, without a documented tender analysis process, departmental reviews and record-keeping cannot be assured. Similarly, the absence of formal procedures for document transmission, or the reliance on mixed paper and software systems, compromises the ability to maintain complete and accessible traceability, for example, when there are several locations involved.

In addition, during the transmission of technical documentation the lack of translation validation introduces risks that contractual and quality requirements may not be correctly implemented. These conditions create vulnerabilities that can affect compliance, traceability, and risk of CFSI.

To address these gaps: formal processes for tender analysis, document transmission, translation validation, and comprehensive software-based document management should be implemented. These measures would ensure accurate information flow, strengthen traceability, and reduce the risk of counterfeit or fraudulent items entering the supply chain.

6.1. Focused Recommendations for Non-Nuclear entities

Non-nuclear organizations entering or working alongside the nuclear sector often face unique challenges in adapting their processes to meet stringent industry standards. They are affected, as well as the nuclear companies are, by the recommendations for the module of Administration of Orders discussed in the previous section.

In addition to this, strengthening practices in areas such as Quality System and Organization, Design Control, Special Processes and Inspection and testing can significantly improve compliance and operational reliability for the non-nuclear companies.

The following recommendations provide practical steps to help bridge these gaps and build a robust foundation for nuclear-quality requirements

Quality System and Organization module

Companies have to ensure that quality assurance within the organization is fully documented. The structure of the quality assurance function and its documentary system has to be clearly described in a dedicated quality assurance manual. This helps define responsibilities and processes, making them accessible for effective oversight.

Design Control module

Maintaining strict control over design specifications and drawings issued by the OEM or its authorized agent is essential to guarantee compliance with all required standards and specifications. Special attention has to be paid when execution involves multiple sites or large, multi-activity organizations, as clarity of responsibility becomes even more critical in these contexts.

Special Processes & Inspection and Testing modules

A systematic approach to documenting qualification processes has to be implemented. Whether performed in-house or subcontracted, it has to be ensured that personnel responsible for final inspections and testing—internally or at supplier premises—are properly identified, trained, and qualified. If subcontractors cannot meet these requirements. Qualified personnel would have to be assigned by the contractor to perform these tasks under equivalent conditions and procedures before accepting goods or services.

Appendix A: Auxiliary Source Data

The annexes include anonymized and aggregated source data, which serves as the basis for the conclusions presented in this report

Company code Name	Country	Nuclear	Other sectors	Success ratio
Company A	Netherlands	Nuclear	Oil & Gas and Chemical	76%
Company B	Netherlands	Non-Nuclear	Chemical Industry	79%
Company C	Netherlands	Non-Nuclear	Offshore, Shipbuilding	86%
Company D	Netherlands	Nuclear	Power industry, Oil & Gas, Water	95%
Company E	Netherlands	Non-Nuclear	Polysilicon/solar, petrochemical, defence, space, hydrogen, oil & gas exploration	95%
Company F	Netherlands	Nuclear	Construction Materials	98%
Company G	Netherlands	Nuclear	Petrochemical industry, Energy Infrastructure and Water Management.	100%

Table 1: Ratio of overall compliance to nuclear Quality Management System per company (anonymized)

Country	1.Quality system and organization	2.Administration of orders	3.Design control	4.Purchasing	5.Special processes	6.Inspection and testing	7.Documentation
Netherlands	9%	33%	9%	2%	7%	8%	6%
All countries	11%	36%	21%	13%	15%	16%	12%

Table 2: Ratio of compliance-failure of a group of companies aggregated per region and per module