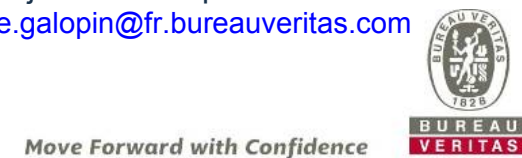




BUREAU VERITAS Services for the Nuclear Industry

Paulius Vasiliauskas - Head of Industry Sales & Development
paulius.vasiliauskas@lt.bureauveritas.com

Stephane Galopin - Nuclear Projects Development Director
stephane.galopin@fr.bureauveritas.com

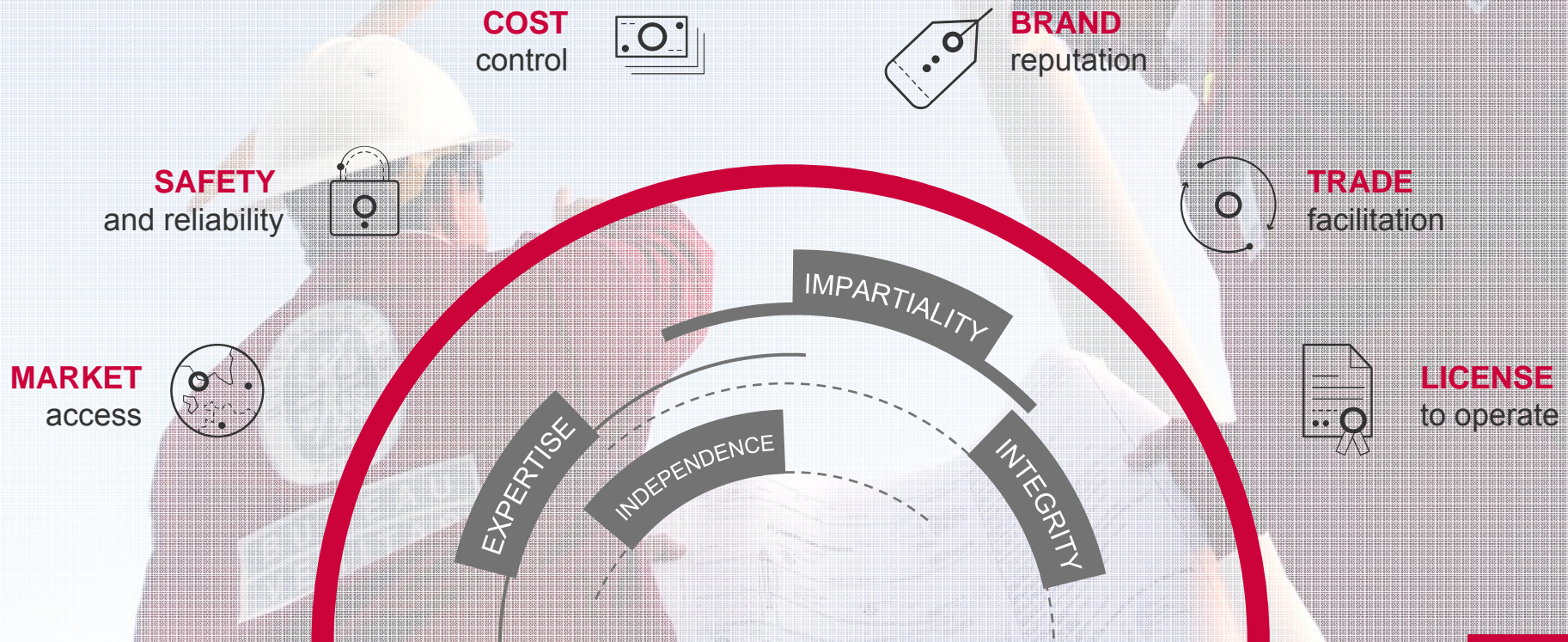




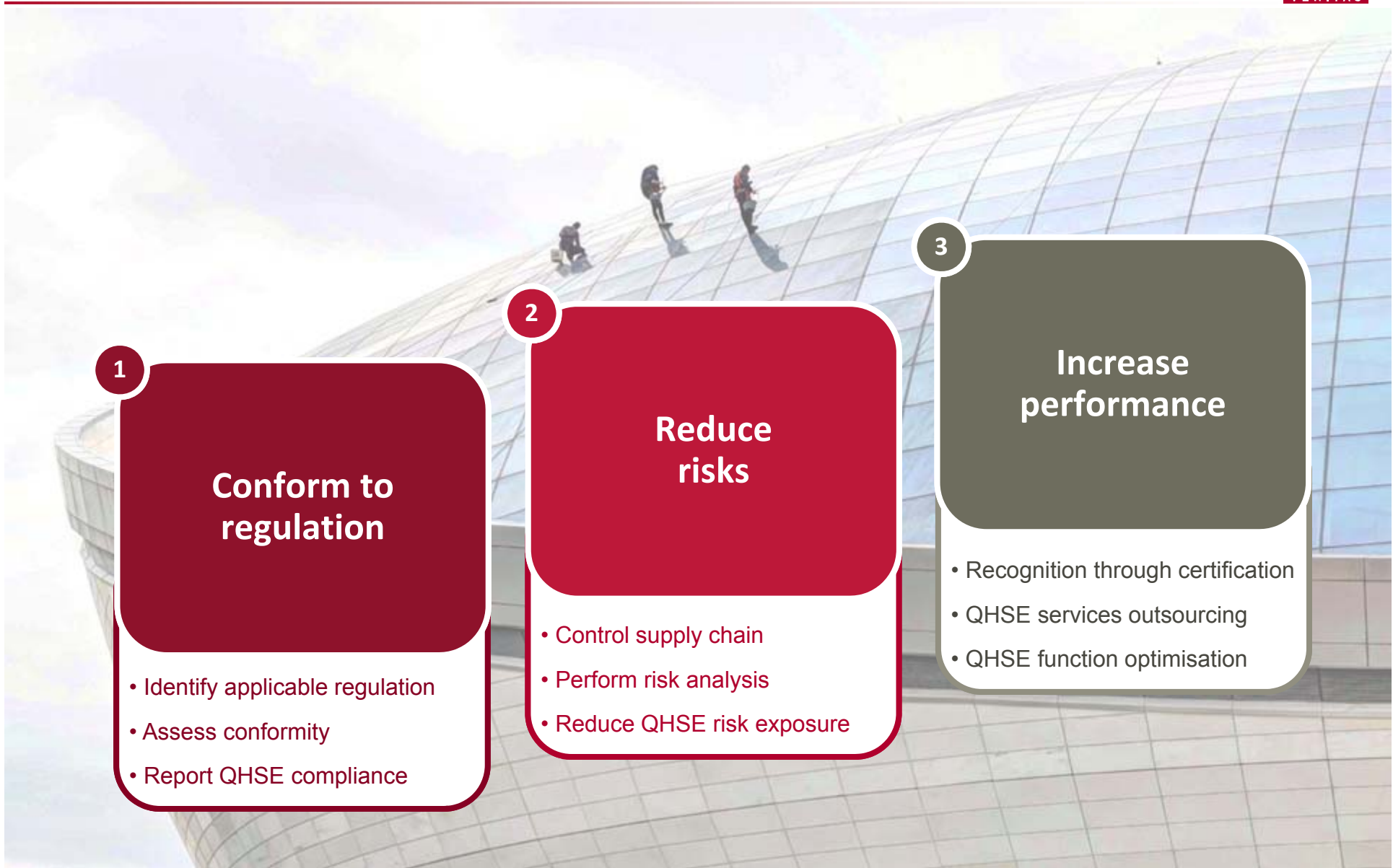
Bureau Veritas at a glance

What we do?

A LEADER OF THE TEST, INSPECTION AND CERTIFICATION MARKET



From Conformity to Performance



Our Assets



**Efficient
international
network**

**Recognized
technical
expertise**

**Skilled
employees**

**Regulations
& Standards
knowledge**

**Strong brand &
reputation built
over 180 years**

**Ethics,
Independence
& Impartiality**

**Broad services
portfolio**

**From standard
inspection to
global solutions**

**First class
laboratory
equipment**

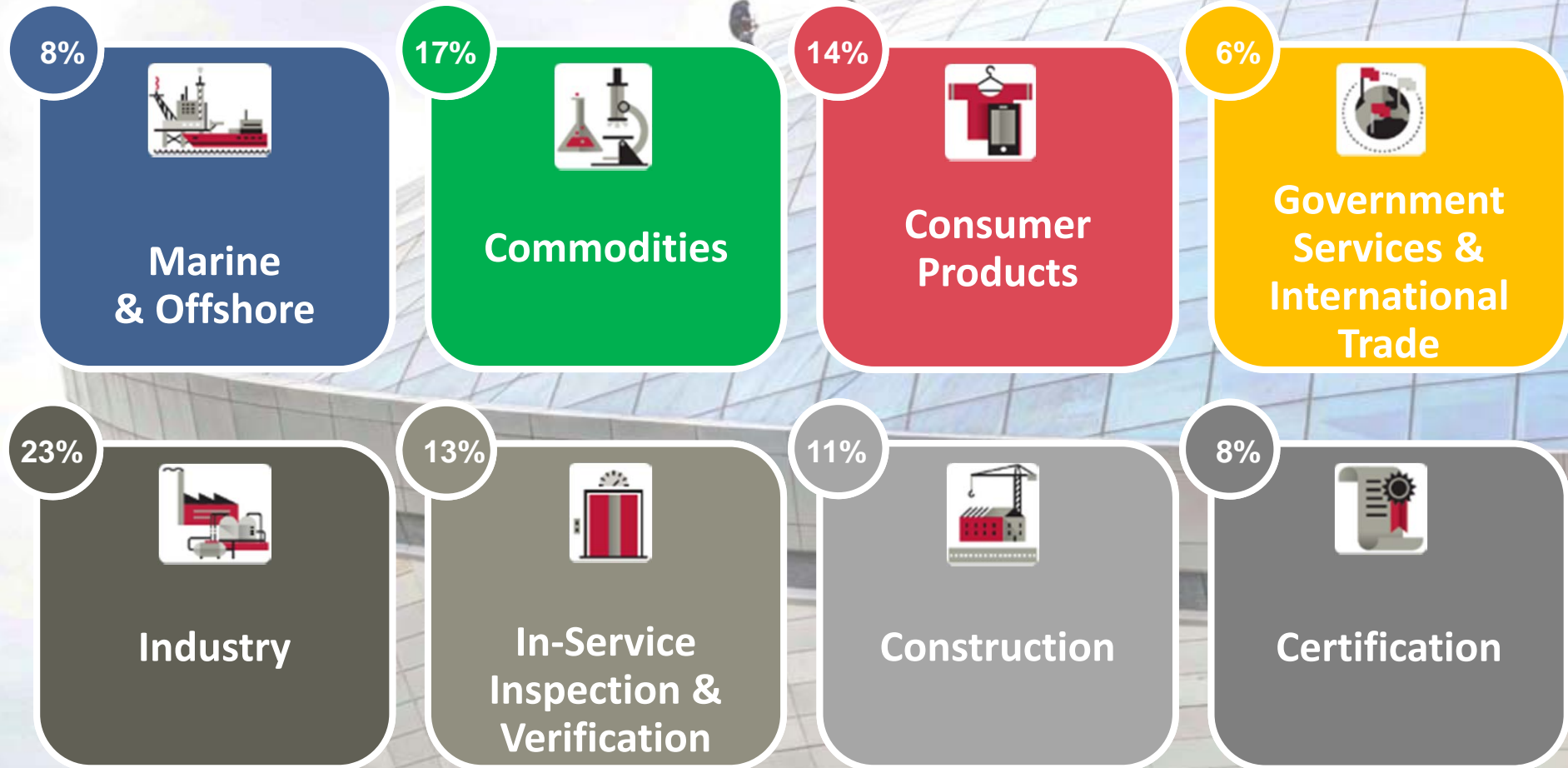
A large portfolio of businesses



2017 Revenue: €4.7 billion

75,000 employees

1,400 offices



A large and balanced portfolio of businesses



 Marine & Offshore	▶ Classification and certification of ships and offshore units
 Industry	▶ Risk management, quality assurance, quality control and asset integrity management of facilities and equipment
 In-Service Inspection & Verification	▶ Periodic inspection of equipment & facilities in operation
 Construction	▶ Conformity assessment of buildings and infrastructures
 Certification	▶ Certification of QHSE management systems and second party auditing services
 Commodities	▶ Commodities inspection and testing: oil & petrochemicals, metals & minerals, agriculture
 Consumer Products	▶ Testing, inspection and certification of consumer goods
 Government Services & International Trade	▶ Trade facilitation services

Industry - Scope of Activities



Oil & Gas

Nuclear, Power & Utilities

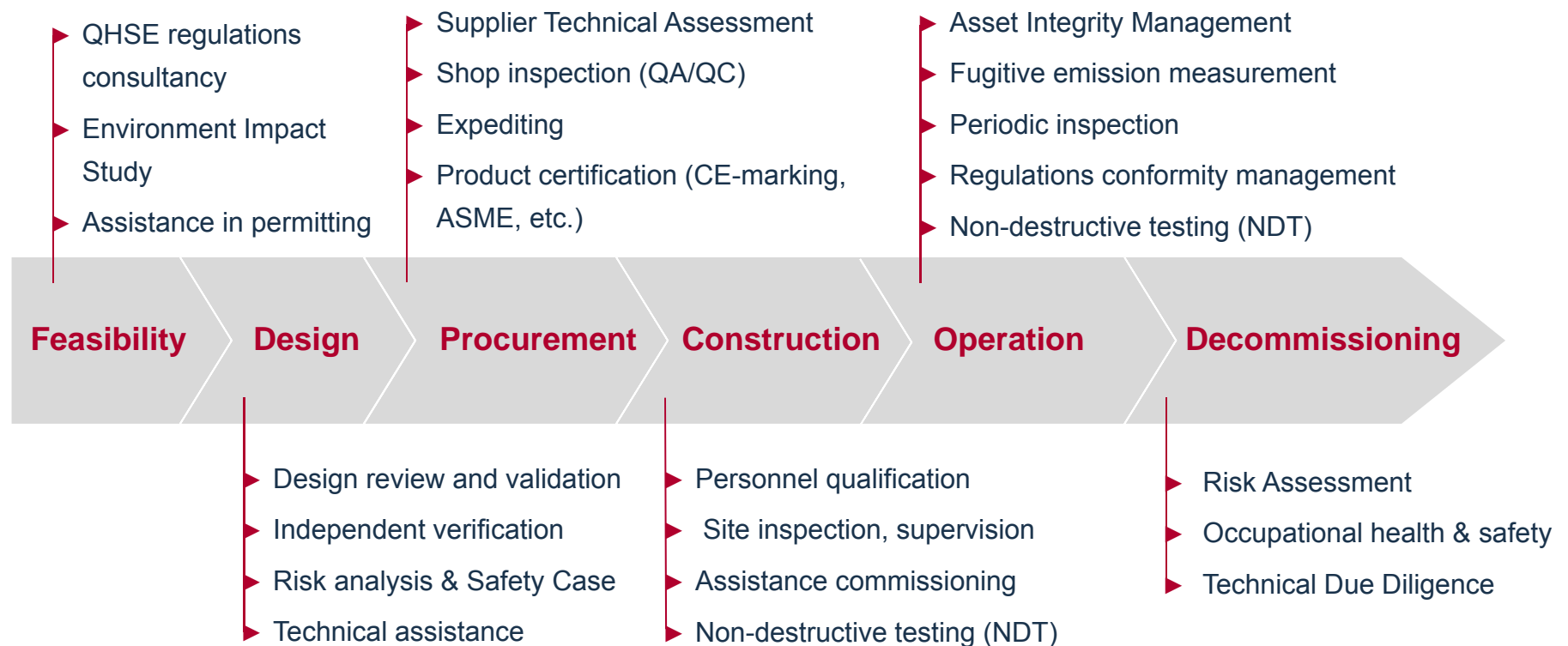
Manufacturing Industry

Process Industry

Mining & Minerals

Transport & Logistics

Bureau Veritas provides QHSE services covering whole life cycle (Capex/Opex) of industrial installations



Bureau Veritas accreditations in Europe

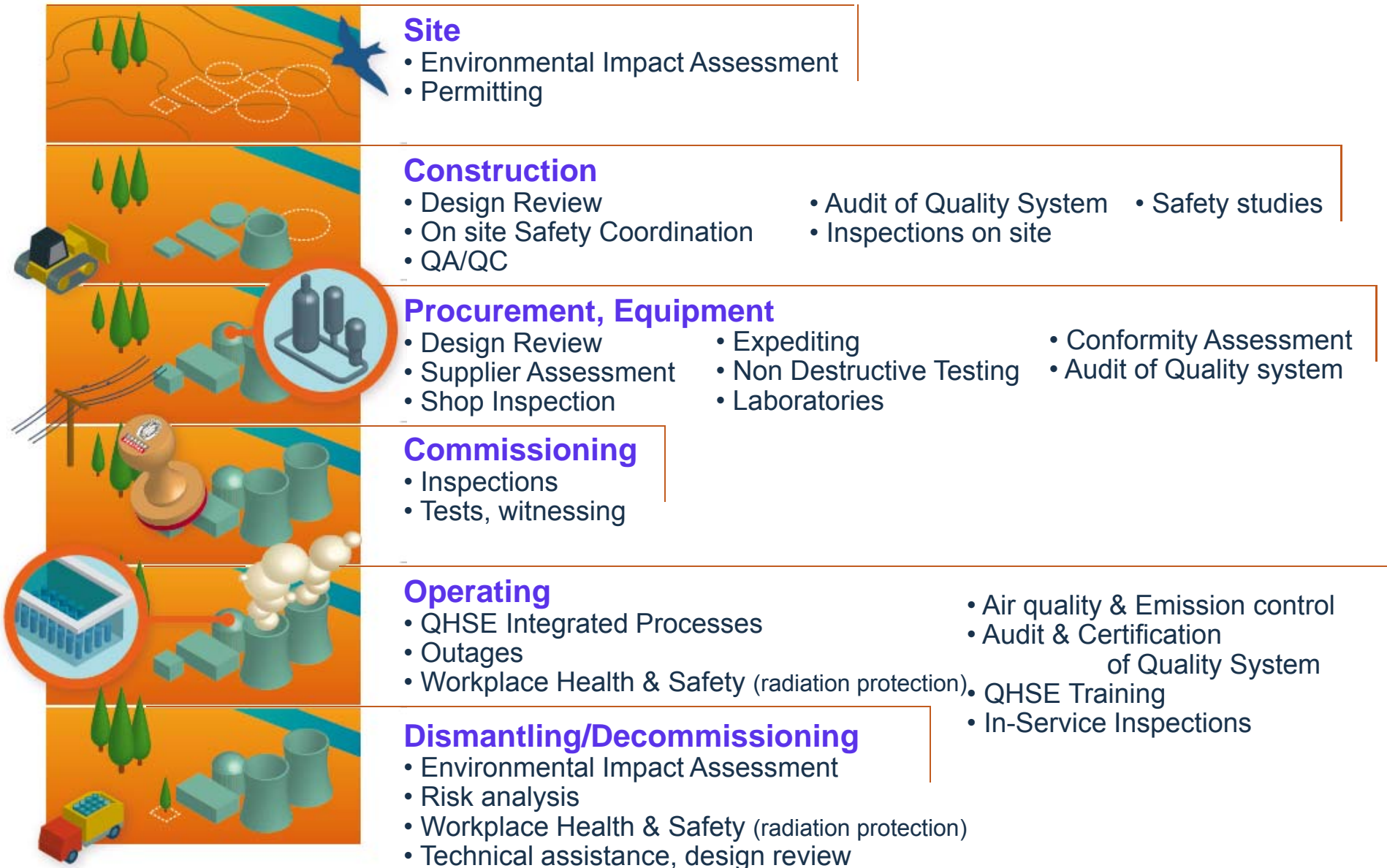


- ▶ Notified Body for **Pressure Equipment Directive 2014/68/EU** & Transportable Pressure Equipment Directive 2010/35/EU
- ▶ Notified Body for **Machinery Directive 2006/42/EC** and **Electromagnetic Compatibility 2004/108/EC**
- ▶ Notified Body for **Lift Directive 2014/33/EU**
- ▶ Notified Body for **ATEX Directive 2014/34/EU** and EXCB within the IECEx scheme
- ▶ Notified Body for **Personal Protective Equipment 89/686/EEC**
- ▶ Notified Body for **Radio Equipment Directive 2014/53/EU**
- ▶ Notified Body for **Construction Product Regulation 305/2011/EU**
- ▶ Third Party for **Low Voltage Directive 2014/35/EU**
- ▶ Accredited according to **ISO/IEC 17020 / 17021 / 17025 / 17065**
- ▶ Locally recognized for Certification of ready mix concrete plants
- ▶ ...



Nuclear Services & Resources

Support throughout all Nuclear LifeCycle



Bureau Veritas services for global nuclear projects



Resources in Europe & Russia



- North West Europe
- North East Europe
- France
- South West Europe
- South East Europe

North West Europe

2,500 people



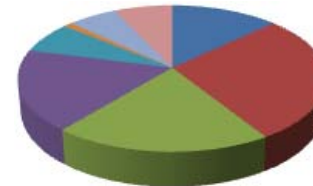
North East Europe

1,500 people



South West Europe

3,500 people



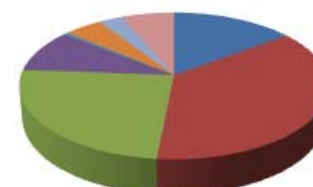
South East Europe

800 people



France

7,500 people



Russia/Ukraine/Belarus

500 people



- Commodities
- Consumer Products
- Government Services & International Trade
- Marine
- Industry
- In-Service Inspection Verification
- Construction
- Certification

Bureau Veritas in Lithuania



► Main activities:

- Industry & Facilities, Oil & Gas, Rail:

- Emission measurement
- Welding
- 2nd/3rd party inspection
- Nuclear Olkiluoto 3 project (Finland)

- Marine

- Certification

- Government Services & International Trade

► Established since 1994

► 2 offices: Vilnius and Klaipeda

► ~ 30 own employees + sub contractors



Bureau Veritas in Lithuania



An experienced partner in Lithuania's industry



Bureau Veritas nuclear background in Europe (New Build)



- ▶ **Hanhikivi 1 VVER**: QMS audit and certification, YVL training, Third Party Notified Body inspection, Technical Support Organisation mission for STUK
- ▶ **Akkuyu VVER**: Technical Support Organisation mission for TAEK
- ▶ **Hinkley Point C EPR**: licensee's certificate, trainings and quality / qualification support, Third Party inspection
- ▶ **Olkiluoto 3 EPR**: BUREAU VERITAS accredited by Finnish Radiation and Nuclear Safety Authority (STUK)
- ▶ **Flamanville 3 EPR** and Replacement components for EDF French fleet: BUREAU VERITAS accredited by the French Nuclear Safety Authority (ASN)
- ▶ **ITER and Jules Horowitz Reactor**: quality management system, inspection, conformity assessment, welding technical assistance
- ▶ **European Spallation Source**: Third party inspections
- ▶ **AREVA GB II plant**: Inspection activities for buildings and civil works

Bureau Veritas nuclear background in Europe (OPEX and D&D)



- ▶ **Sellafield/Magnox:** Quality Assurance, Design Verification, Materials Approval, Review of Quality Control and Inspection & Test Plans, Surveillance and Qualification
- ▶ **EDF French Fleet:** Environmental Impact Assessment, QA/QC and HSE services for post Fukushima Emergency Diesel Generators building programme
- ▶ **AREVA La Hague & CEA nuclear installations:** Building Integrity Assessment, Critical Reviews and Risk Analysis of life extension studies, Certification of waste after fuel reprocessing, Assessment of waste transportation devices
- ▶ **Zaporizhzhya NPP:** Expertise of damaged fuel assemblies
- ▶ **Koeberg NPP:** Second party inspection in Europe (replacement components)
- ▶ **QA/QC support to international projects** (Post Fukushima action plans, research installations, ATMEA, SMRs, EDGs...)
- ▶ **Technical assistance, Training & Expertise:** QMS (NQA-1/ISO 19443, GSR-3/GSR Part 2), Codes (ASME III, GOST, CE marking, European Norms), Local Nuclear Regulations, Radiation Safety & Protection, Nuclear Safety Culture, Counterfeit / Fraudulent and Suspect Items...
- ▶ **Tests & Laboratories**

A strong relationship with Nuclear Safety Authorities

► Historical recognition from worldwide Nuclear Safety and Radiation authorities

- ASN (France)
- STUK (Finland)
- ONR (United Kingdom)
- TAEK (Turkey)
- RTN (Russia)
- DAE (India)
- NRC (USA)
- ARN (Argentina)
- NNR (South Africa)
- SSM (Sweden)...



Supporting Nuclear Safety Authorities



- ▶ Why do Safety Authorities need support from external organizations?
 - Safety Authorities have limited budgets and resources, and might decide to focus on strategic issues (radioprotection, licensing, inspection of facilities in operation...)
 - Some Safety Authorities (in countries called “new comers”) have no or limited experience of new build programs

- ▶ What kind of support do they expect?
 - Lessons learned for future regulatory changes
 - Expertise on topics which do not directly belong to nuclear safety matters (materials, chemistry, technical expertise, ageing of civil works...)
 - Conformity assessment services when the nuclear law allows for such kind of support from external organizations (France, Finland, UK, Turkey...)
 - Design review
 - Inspection
 - Licensee certification

An experienced partner for the nuclear industry

E.P.C.s and Vendors



Utilities & nuclear facilities Operators





From EIA to Support to Waste Management

Nuclear Environmental Impact Assessment (EIA)

► For new NPP

- Site suitability
- EIA according to local regulation or practices/guides



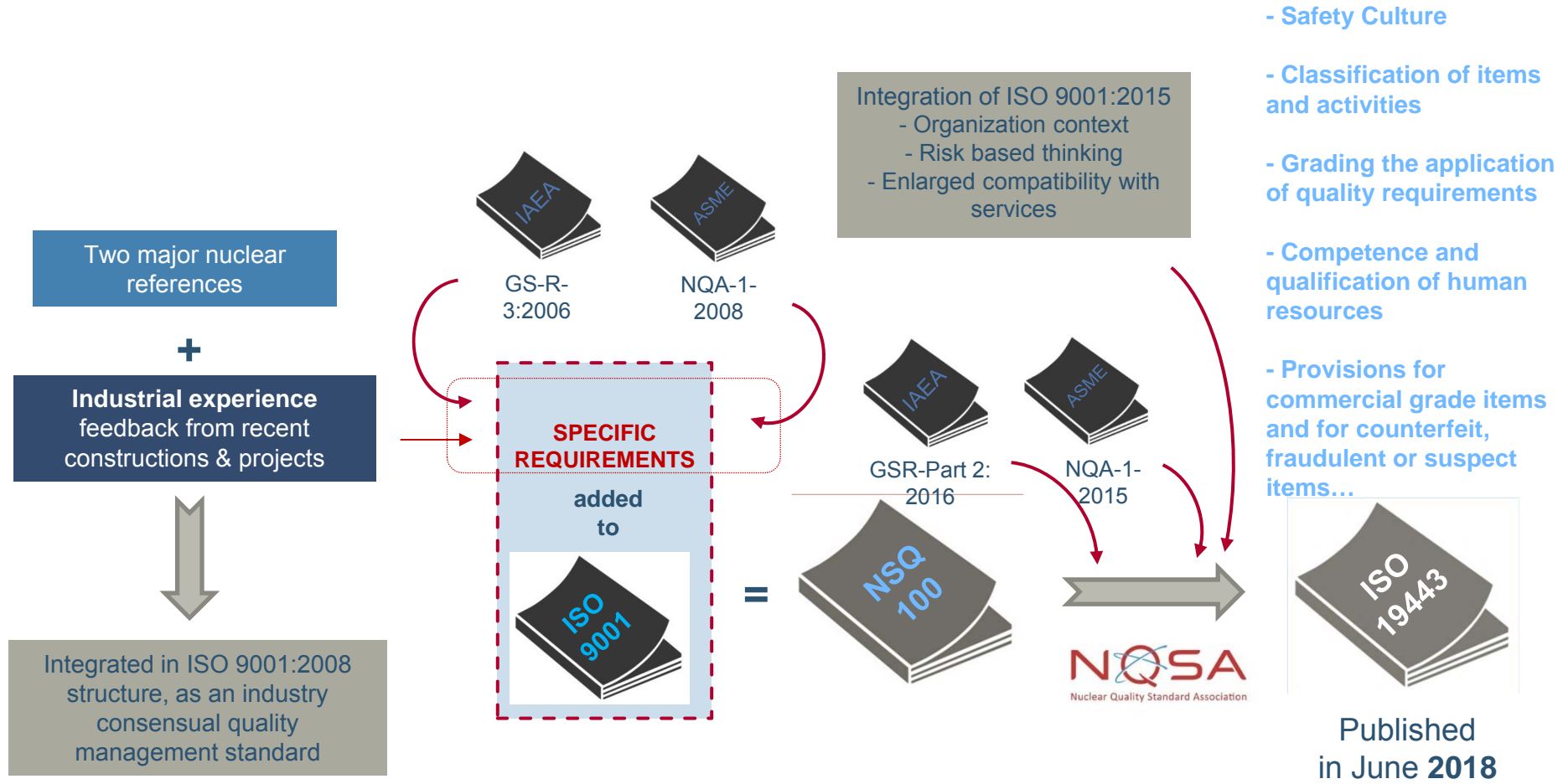
France: BV support for EIA including sanitary impacts in the frame of public debate and authorization process

Jordan: EIA by BV, TE, ACB for the 1st NPP in Jordan according to NUREG 1555



► Also for major modifications such as Steam Generators Replacement

Nuclear Quality Standard: ISO 19443



Conformity assessment of Civil Works

- ▶ From the design to the building phase. Includes Civil works and permanent equipment

- ▶ AREVA GB II plant: Inspection activities for buildings and civil works (soundness, personnel safety, earthquake, lightning, fire):
 - Drawings review (100%)
 - Calculation review (100%)
 - Foundations
 - Roads and networks
 - Concrete (equivalent to ACI code)
 - Structure (equivalent to AISC code)
 - Permanent equipment (doors, fire protection, cranes...)
 - Compliance with drawings (critical task)
 - Non conformity reports.

- ▶ On site Health and Safety Protection Coordination (from design phase)



Equipment: Shop inspection

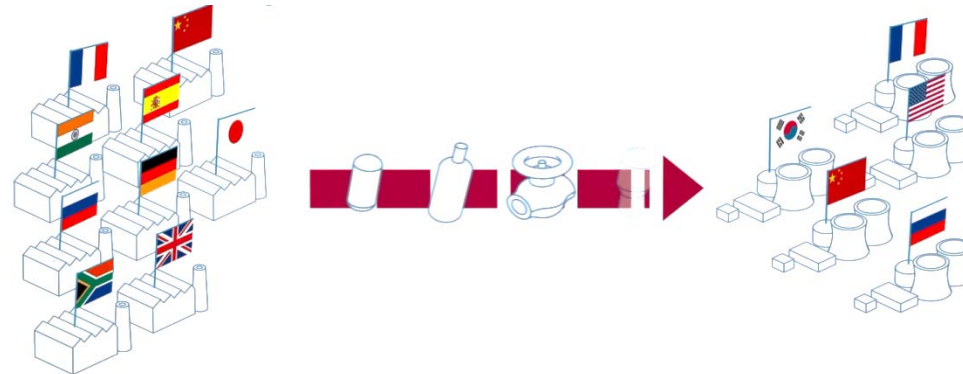
- ▶ Specific evaluation (audit) of subcontractors quality systems
- ▶ Approval of:
 - Forging, casting procedures on material production,
 - welding procedures and welding procedures qualifications reports/welders and operators qualifications/ NDT procedures
- ▶ Witnessing of manufacturing sequences of main components as reactor pressure vessel, steam generators, pressurizers and other components
 - Welding
 - Heat treatments
 - Forming,
 - ECT, RT, UT, PT, MT, Leak Testing, Visual Testing, Final Testing, Hydraulic Testing, marking and documentation
 - Pre Service Inspection (PSI)



Expediting Services

▶ Bureau Veritas provides Expediting services during all product process stages:

- Pre-manufacture
- Manufacturing
- Post-manufacturing



- ▶ Proactive approach to drive suppliers to stay on schedule
- ▶ Visits to sub-suppliers to ensure adherence to schedule
- ▶ Define and check product acceptance criteria
- ▶ Proofs that products & materials have arrived at the suppliers' facility
- ▶ Ensuring project milestones are met
- ▶ Verify information and shifts in schedule to project deadlines
- ▶ Provide final release of products and report on scheduled delivery
- ▶ Report on supplier risk to deliver on-quality, on-cost and on-time

Electrical and I&C



- ▶ Technical Centre in France specialized in Reliability, Availability, Maintainability, Safety, with competences in systems, software and hardware (15 experts and consultants)
- ▶ We participate in working groups led by French Institut de Maitrise des Risques, BNA (IEC 62380, ISO 26262), RCC-E, GRIF
- ▶ Bureau Veritas is accredited by Accreditation Body for the certification of the Functional Safety of Electrical/Electronic/Programmable Electronic Safety-related Systems (IEC 61508)
- ▶ Some of our references:
 - ELTA (Areva Group) – Barracuda Submarine program: Bureau Veritas reviewed and certified the functional safety of the submarine’s safety PLC: design and development, V&V cycle, review of calculations.
 - Schneider Electric – Barracuda Submarine program: Bureau Veritas assessed the safety case, the development process and the documentation of the software application of the steering gear.
 - TOTAL: Bureau Veritas certified High Integrity Pressure Systems (HIPS) against SIL functional safety requirements

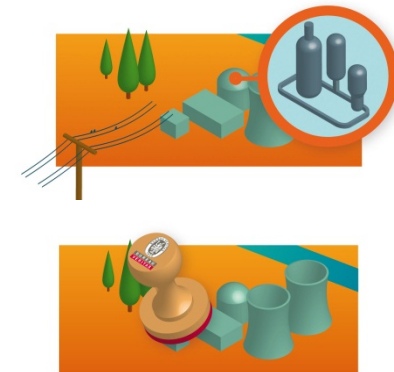
Installation follow-up (site inspection)

► Inspection during assembling of equipment

- Erection documentation review
- Erection inspection:
 - Welding
 - Non Destructive Testing



► Final testing, hydraulic test ,marking and documentation



Ageing of NPP, support to Life Extension studies

IAEA Safety Standards
for protecting people and the environment

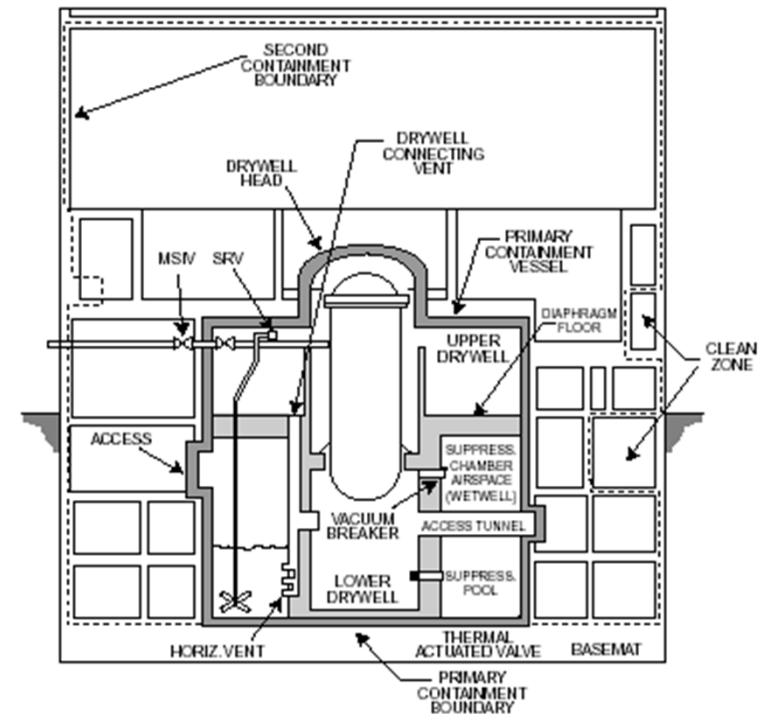
Ageing Management for
Nuclear Power Plants

Safety Guide
No. NS-G-2.12



► Building integrity assessment:

- Civil Engineering
- Pressure tests (decennial) / Fit for service
- NDT for concrete (radars)
- Building asset management inspections
- Critical Reviews and Risk Analysis of life extension studies (La Hague)



Decommissioning and Dismantling

▶ Radiation protection

- Extensive experience of working in radiological environments
- Surveillance and audits of supply chain

▶ Measurement

- Identification, characterization and inventory of waste streams
- Partnership with facilities and workshops licensed for sampling and processing of low level wastes
- Quality control of processes for handling hazardous materials
- Accredited laboratories

▶ Risk and Conformity assessment

- Risk assessment and evaluation of deplanting / demolition methodologies and processes
- Monitoring and documentation review

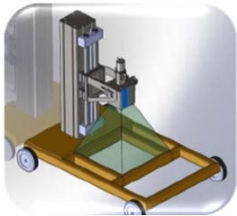


Support services for Waste Management



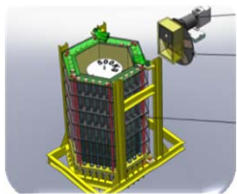
▶ Waste management

- Waste studies and identification of relevant waste treatment processes
- Surveillance and audits of organizations generating nuclear waste



▶ Nuclear Measurement

- Radioactive Waste inventory and characterization
- Development of measurement methods and technologies for on site measurement
- QC of Radioactive waste packages by nuclear measurement



▶ Nuclear Transport

- Design review of waste packages and conformity assessment with approved transportation specifications





NC Digital:

- **Digital conformity assessment tool for nuclear pressure equipment**
 - 2 contracts signed with EDF
 - Successful tests in Framatome St Marcel plant
- **New development steps (2018/2020)**
 - Extension to Nuclear In Service and Shop inspections (with tablets)



Smart glasses:

- **Remote Expert Solution**
 - Check manufacturing and maintenance of Nuclear containers and casks
 - Check traceability of sources at suppliers site before shipment



Drones:

- **Partnership with technology provider to develop inspection procedures on 3 use cases :**
 - Internal inspection of reservoir and tanks on NPP sites
 - Supervision of civil works
 - Radiation mapping of facilities under dismantling



THANK YOU



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on social networks



Business Case: Sellafield Decommissioning



- ▶ Currently 60 FTEs (2014 → 2018...)
- ▶ £25M contract from the Nuclear Decommissioning Authority (NDA) and the Site License Companies (SLCs) to provide Inspection & QA services for all NDA sites on Quality Grades 1 and 2 equipment, covering:
 - Quality Assurance
 - Design Verification, Materials Approval
 - Review of Quality Control and Inspection & Test Plans
 - Weld procedure welder qualification
 - Surveillance during fabrication in UK, Europe, USA and Far East
 - Review and endorsement of Manufacturing Records
 - 100,000 man-hours per year
- ▶ Extensive network of inspectors in the UK, Europe and Worldwide performing shop and site inspection for new construction equipment – nuclear grade and conventional equipment



Sellafield Ltd



Magneox



LLW Repository Ltd



National Nuclear Laboratory



Westinghouse

Business Case: Nuclear Wastes Certification



► Role of Bureau Veritas:

- Act as an independent 3rd party performing a level 2 check for AREVA's foreign customers:
 - Level 1 check: Areva NC's QC department
 - **Level 2 check: Bureau Veritas**
 - Level 3 check: Nuclear Safety Authorities

► Our scope of work:

- **BEFORE residues are generated:**
 - We qualify facilities by making sure they are suitable for producing compliant residues
- **DURING reprocessing**
 - On line monitoring of processes (no direct measurement on the process)
 - QMS audits
- **AFTER reprocessing**
 - Review of final Quality Records of the residues and CERTIFICATION of each compliant residue (glass canister, ...)
 - Review of nuclear material accounting books: CERTIFICATION of accounting books of each client

► 20 years of experience in certification of waste issued by fuel reprocessing

Business Case: Olkiluoto 3 Project (1/3)

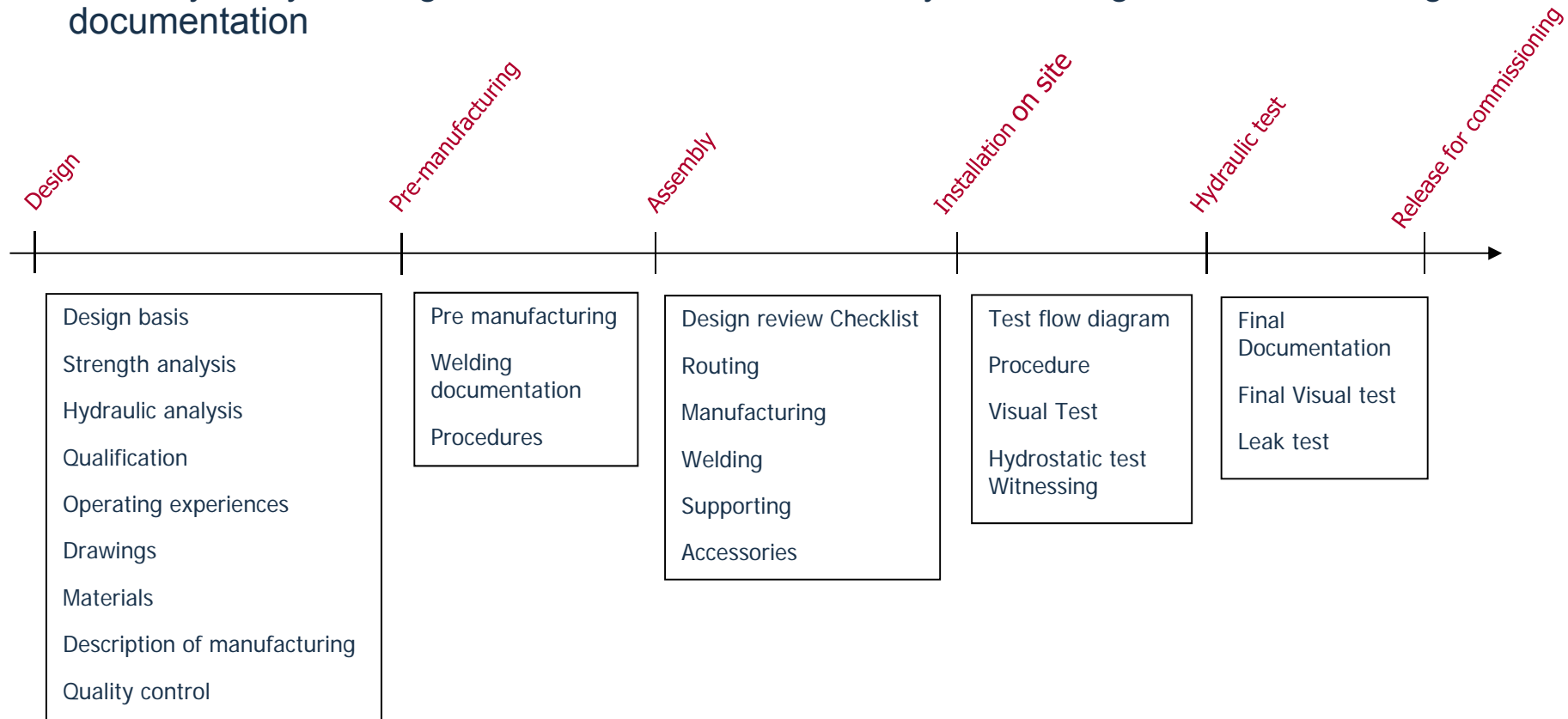


- ▶ Up to 40 FTEs (2005 → 2018...)
- ▶ Since 4 May 2005, BUREAU VERITAS is accredited by FINAS and COFRAC (acc. to ISO 17020), and approved by STUK (acc. to YVL guides) as Authorized Inspection Organisation for regulatory Third Party Inspection of nuclear mechanical and pressure equipment
- ▶ Client: Finnish OL3 operator **TVO**
- ▶ Our role includes:
 - Design review and approval of construction plan documentation (France)
 - Monitoring of manufacturing in workshops (Europe)
 - Assessment of plant erection (Finland)
 - Pressure tests of the lines (Finland)
- ▶ Technical scope:
 - Initially, limited to **Safety Class 3 & 4 (+ QC2*)** nuclear equipment as well as EYT equipment (non nuclear). Mechanical equipment (vessels, tanks, heat exchangers, pumps, valves, piping, structural steelwork...) and HVAC
 - **27 May 2009**: STUK approval for **operation in Safety Class 1 & 2** nuclear equipment inspection (excluding heavy components of the reactor coolant system)

Business Case: Olkiluoto 3 Project (2/3)



- ▶ Around 170 valves, pumps, tanks construction set of plans reviewed
- ▶ More than 400 piping constructions plans reviewed (30,000 piping isometric drawings and 25,000 support drawings reviewed, 200 stress calculation reports reviewed)
- ▶ 3,000 tons of piping inspected
- ▶ A dedicated team of calculation engineers in charge to review pressure dimensioning, piping flexibility analysis, fatigue calculation review, FE analysis, welding and manufacturing documentation

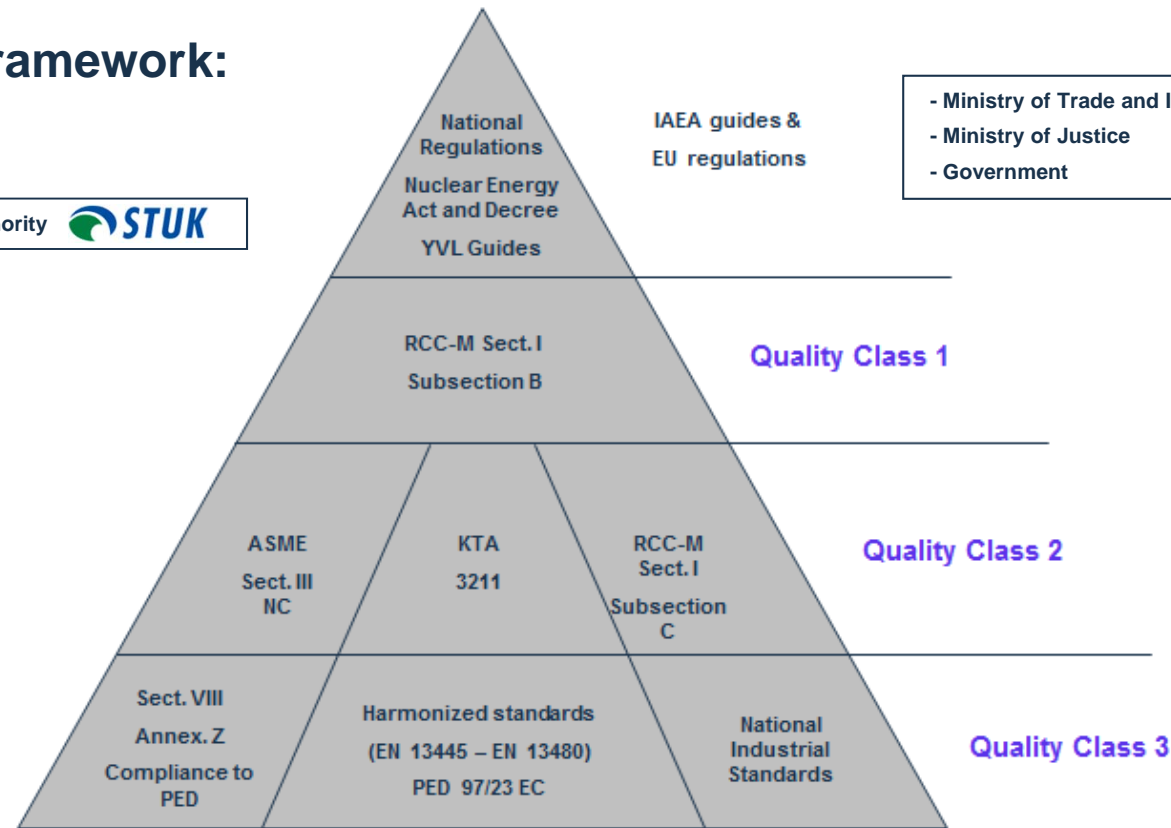


Business Case: Olkiluoto 3 Project (3/3)



► Regulatory framework:

Radiation and Nuclear Safety Authority 



- Ministry of Trade and Industry
 - Ministry of Justice
 - Government 

- Finnish Acts and Decrees + YVL guides – (STUK – Radiation and Nuclear Safety Authority)
- European Directive: PED 97/23 CE (European Directive for pressure equipment)
- Construction Standard: ASME III (RCC-M notwithstanding the rules), European harmonized norms: EN13445, EN13480, EN287, EN15614, EN473, EN10027/10028, EN10217...
- Client Specifications (written by CFS AREVA/SIEMENS and approved by STUK and/or TVO): Project Specifications, Material specifications, Construction Plan process for Nuclear Island or Turbine Island Piping