



Canadian Nuclear  
Safety Commission

Commission canadienne  
de sûreté nucléaire

# Canadian Nuclear Safety Commission Oversight of Counterfeit, Fraudulent and Suspect Items

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Technical Meeting on Procurement Activities and on Counterfeit,  
Fraudulent and Substandard Items: Engineering, Regulatory and  
Safety Aspects of Procurement

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[nuclearsafety.gc.ca](http://nuclearsafety.gc.ca)

Canada 

# Objectives



- Summarize events with counterfeit, fraudulent and suspect items (CFSI) at Canadian nuclear facilities
- Describe the safety impact of CFSI and lessons learned
- Review regulatory framework addressing CFSI
- Describe the barriers in Canadian nuclear power plant (NPP) supply chains
- Describe Canadian Nuclear Safety Commission (CNSC) oversight of CFSI

# CFSI Events at Canadian Nuclear Facilities



## Burr Brown operational amplifiers

- January 2007: A Canadian NPP unknowingly purchased 50 CFSI Burr Brown operational amplifiers (op-amps)
  - Unauthorized distributor → vendor 2 → vendor 1 → licensee
- January 4, 2007: Texas Instruments (TI), who acquired Burr Brown in 2000, issued a letter stating that if electronics were not purchased from TI-authorized sources, there would be no assurance as to their authenticity
- 2008: 5 CFSI op-amps installed in two reactors
  - shutdown system 1 (SDS1) neutron overpower (NOP) amplifiers
  - reactor regulating system level zone control amplifiers

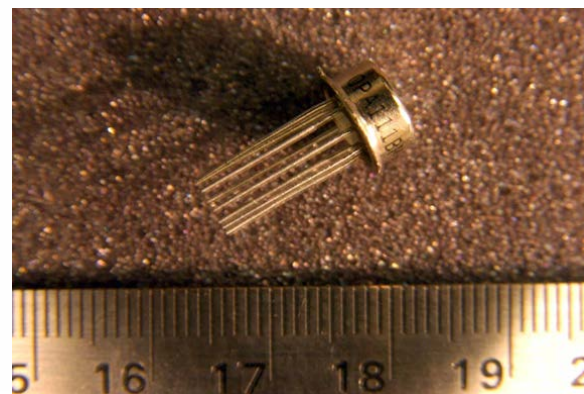
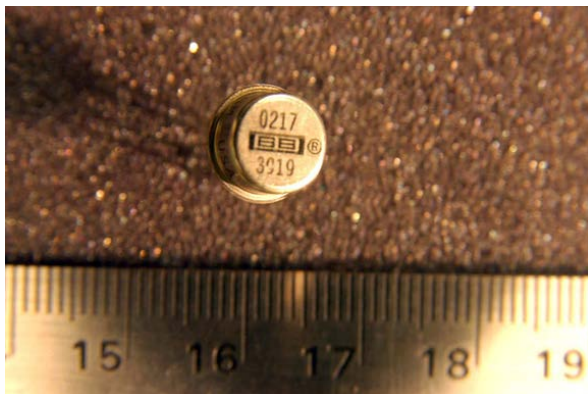


# CFSI Events at Canadian Nuclear Facilities



## Burr Brown operational amplifiers

- Amplifiers are tested every three weeks
- September 2008: an amplifier failed a routine safety system test
  - SDS1 NOP amplifier actuated at 121.8% full power (normal trip setpoint is 119.5%)



Pin 4 shorted with metal can (vs. pin 8 for OEM)

# CFSI Events at Canadian Nuclear Facilities

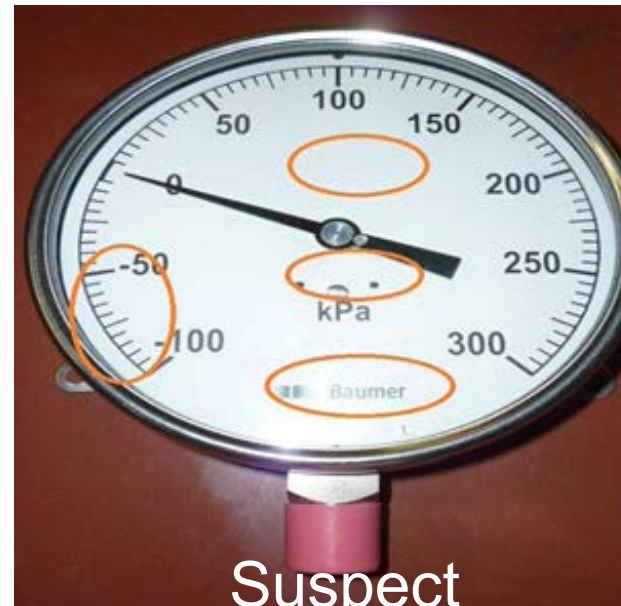


## Baumer pressure gauges

- Receipt inspection identified a Baumer gauge as suspect
  - part number on gauge did not match purchase order and packing slip
  - gauge markings inconsistent with Baumer gauges
  - poor quality printing on the face plate



Authentic



Suspect

# ***CFSI Events at Canadian Nuclear Facilities***



## **Baumer pressure gauges**

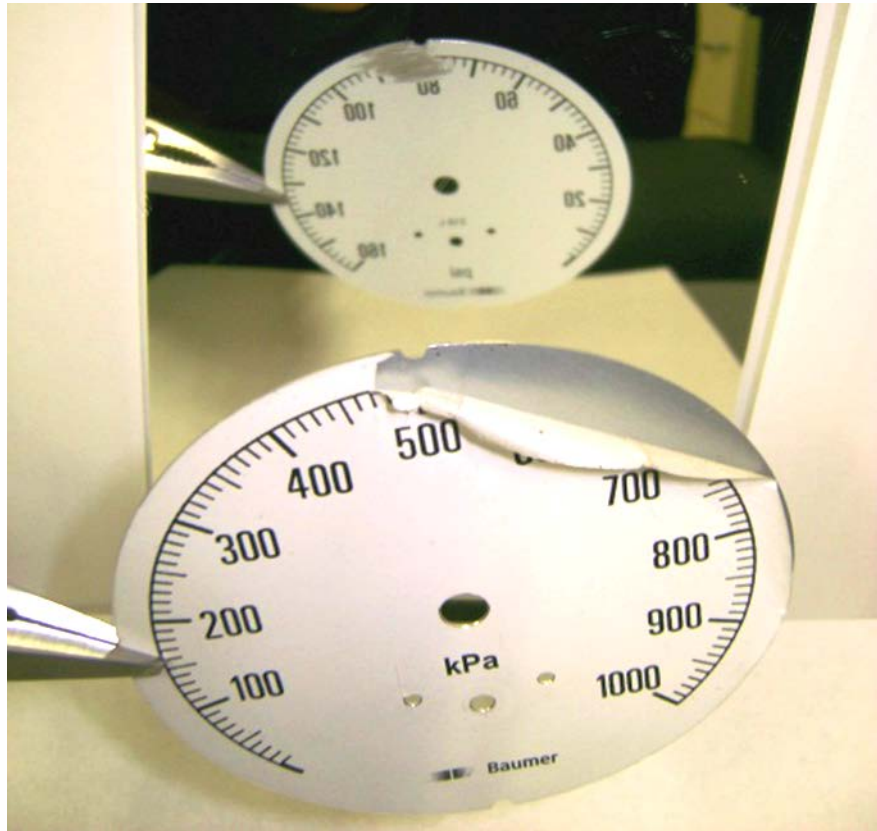
- March 2014: Six gauges shipped to Baumer for examination, and Baumer reported that
  - one was confirmed fraudulent
  - a face plate was reversed with 0-60 psi silk screen face plate facing inward
  - adhesive paper was printed with -100 to +300 kPa facing out
  - they appeared to have been previously used
- Extent of condition:
  - 19 fraudulent Baumer gauges were discovered in stock
    - gauges were modified (original scales in psi replaced by kPa scales)
  - 33 gauges from source distributor installed in field
    - two were found fraudulent



# CFSI Events at Canadian Nuclear Facilities



## Baumer pressure gauges



# ***CFSI Events at Canadian Nuclear Facilities***

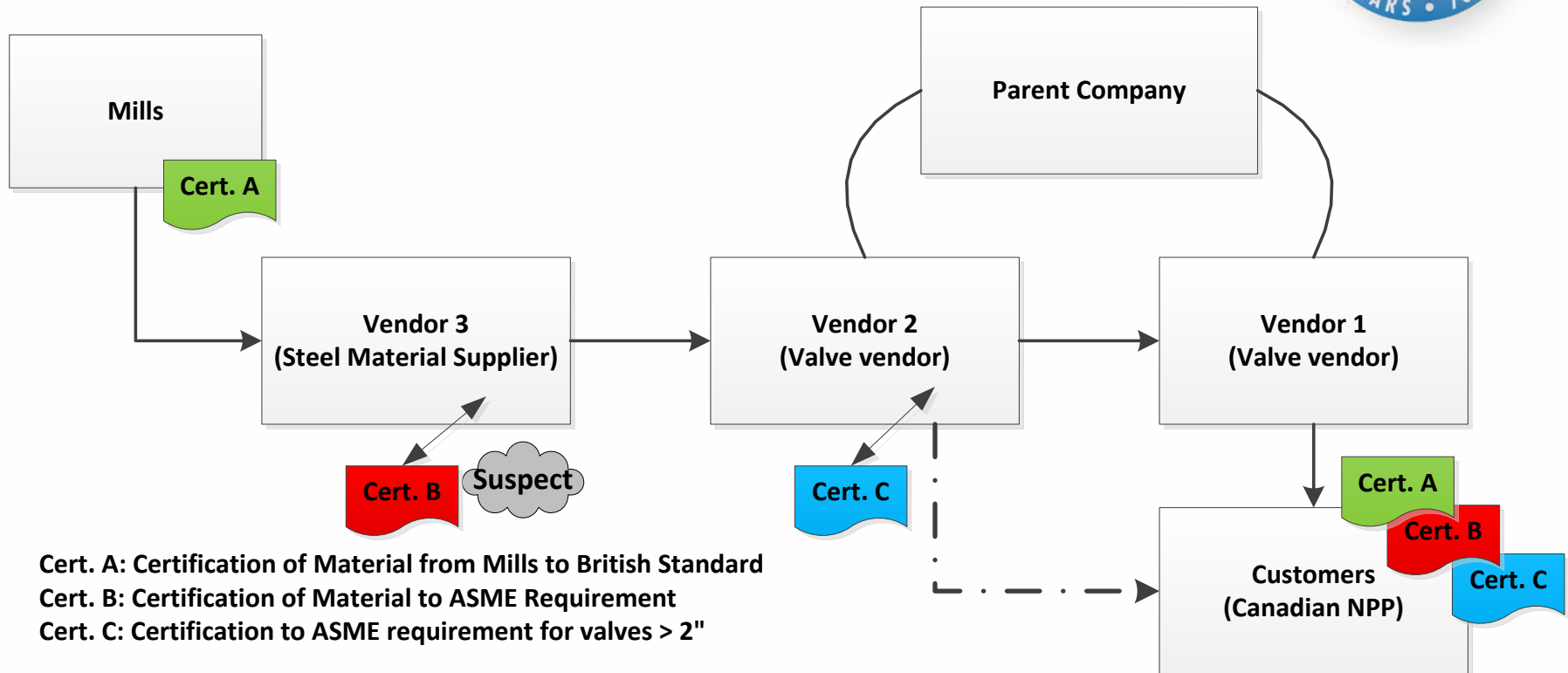


## **Newman Hattersley valves**

- Some Newman Hattersley Ltd. (NHL) nuclear class valves, of diameter equal to or less than 2 inches, manufactured between 2001 and 2011 have fraudulent material test reports
- March 2015: Licensees submitted preliminary event reports to the CNSC
  - materials contained in valve assemblies (connectors, discs, bonnets, plugs and stems) and component parts supplied by vendor did not meet the required material specifications
  - vendor 1 (NHL) notified licensees through a formal disclosure letter
  - valves supplied by vendor 1's sister company, vendor 2
  - vendor 2 was made aware that “there were discrepancies as to the material properties stated on certain test certificates” provided by a third party material supplier (Vendor 3)



# CFSI Events at Canadian Nuclear Facilities



# CFSI Events at Canadian Nuclear Facilities



## Newman Hattersley valves

- Dec. 2016: licensees submitted detailed event reports to the CNSC
  - Vendor 3 was used to qualify the pedigree of material received from commercial steel mills to meet the nuclear requirements of ASME III
  - Vendor 3 was using two material testing laboratories to provide heat treatment and chemical and mechanical property analyses
  - Vendor 3's employee misrepresented information on material test certificates used to manufacture nuclear class valve parts
    - material only sent to one of the two laboratories for testing
      - test certificates with failed test results were modified to achieve a pass against code specifications
      - populated test data onto duplicated certificates of second laboratory for material not sent for testing



# ***CFSI Events at Canadian Nuclear Facilities***



## **Newman Hattersley Valves**

- Issue spanned from 2001 to 2013, when Vendor 3 was removed from Vendor 2's approved suppliers list
- All four operating NPPs (19 reactors) have affected valves installed
  - total of 740 valves installed
  - 376 valves and valve-parts in stores
- No failures of installed valves due to material defects
- Mitigating actions by vendors and licensees, with concurrence by regulatory and statutory bodies



# CFSI Events at Canadian Nuclear Facilities



- Miscellaneous CFSI detected during the receiving inspection and were not installed in the facility
  - water, oil and gas valve (January 2013)
    - incorrect markings, material and document
  - integrated circuit module (February 2013)
    - fraudulent ISO 9001-2000 certificate
  - pressure gauge (February 2013)
    - gauge did not match description on certificate



# Safety Impact & Lessons Learned



- CFSI impact on safety
  - potential failure of item to perform its function when called upon during normal operation, abnormal conditions or accident conditions
- Electric Power Research Institute (EPRI) report, *Counterfeit and Fraudulent Items – Mitigating the Increasing Risk*
  - vigilant inspections to detect CFSI include the following:
    - verify the **authenticity of certification or test results** provided by entities other than the supplier, by contacting the entity that provided the certification or test result
    - implementation of this type of precaution may have led to much earlier detection of the **fraudulent certifications** in the Republic of South Korea

# Addressing CFSI in the CNSC Regulatory Framework



- IAEA TECDOC-1169
  - An effective management system (including quality assurance) is essential to prevent introduction and installation of CFSIs in nuclear facility
- CNSC regulations:
  - an application for a licence in respect of a Class I nuclear facility ... shall contain ... the proposed **quality assurance (QA)** program for the activity to be licensed
  - an application for a licence to construct a Class II nuclear facility shall contain ... the proposed **QA** program for the design and construction of the nuclear facility
  - an application for a licence in respect of a uranium mine or mill ... shall contain ... in relation to the activity to be licensed ... the proposed **QA** program for the activity
  - certify a model of a radiation device after receiving an application that includes ... the **QA** program that was followed during the design of the device and that will be followed during production of the device



# Addressing CFSI in the CNSC Regulatory Framework



- QA criteria key for detecting and preventing CFSI:
  - potential suppliers shall be **assessed** on the ... ability to provide a **technically adequate** ... product or service; ... **management system; supply history**; and oversight of **supplier's supply chain**
  - examination of **received items** shall be performed to establish that ... the item received is in keeping with the purchasing documents ... the specified packaging and shipping requirements have been maintained during shipping ... identification and markings are in accordance with applicable codes, specifications, purchase orders, and drawings
  - in addition to the examination, there shall be evidence that the item received was **fabricated, tested, and inspected** prior to shipment, in accordance with the applicable code, specification, purchase order, or drawings
  - records shall be **traceable** to the related items

# CNSC Regulatory Documents



- **REGDOC-3.1.1, *Reporting Requirements for Nuclear Power Plants***
  - discovery of counterfeit, fraudulent or suspect items during the conduct of licensed activities
  - came into effect in January 2015
- **REGDOC-3.1.2, *Reporting Requirements for Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills***
  - under development
  - identical CFSI reporting requirement to REGDOC-3.1.1 planned
- **REGDOC-2.1.1, *Management Systems***
  - under development
  - will provide clarification on existing management system requirements for addressing CFSI

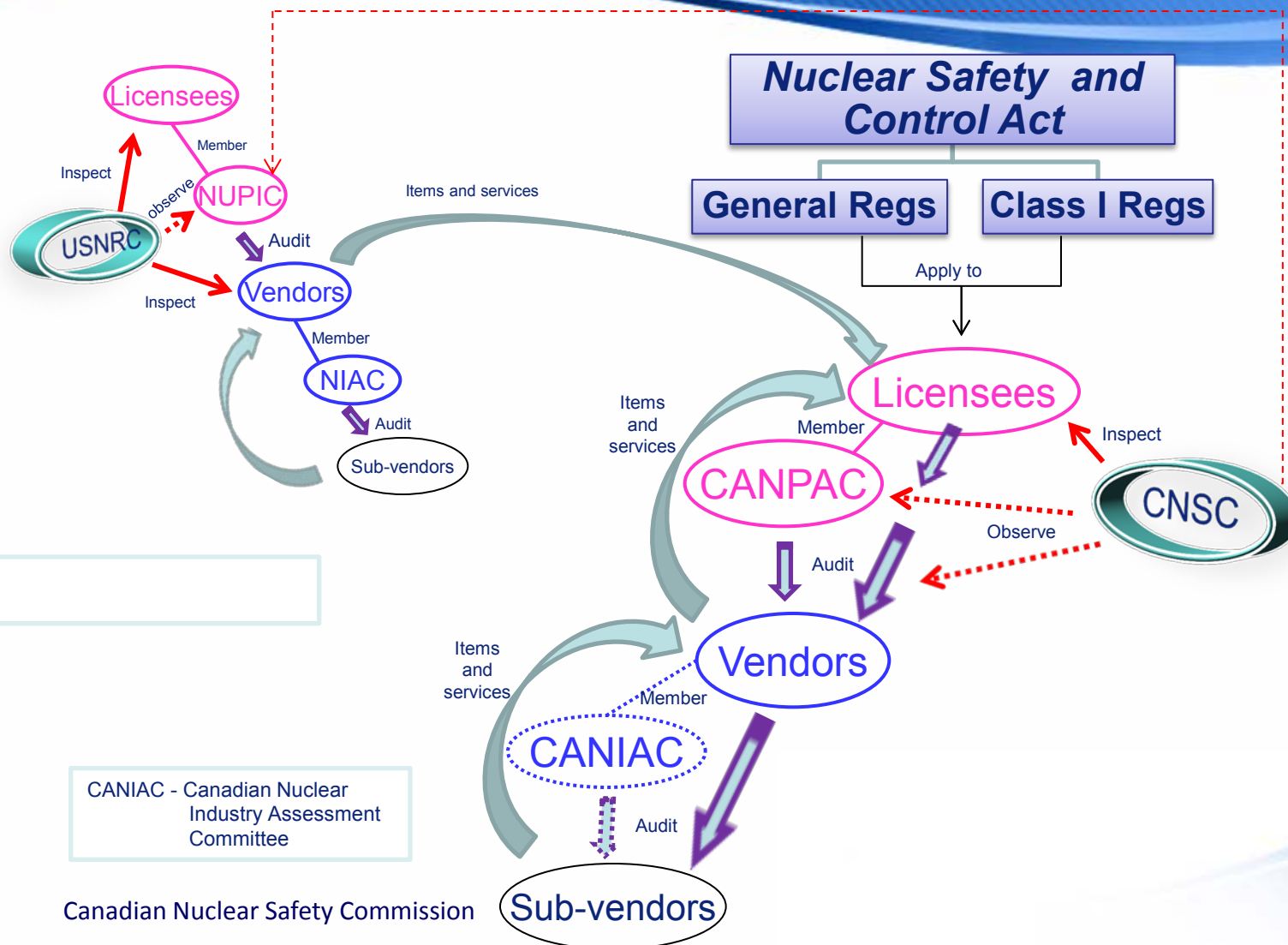
# Defensive Barriers in Canadian NPP Supply Chains



- Canadian NPP supply chain participants:
  - Nuclear Procurement Issues Committee (NUPIC)
    - members include all domestic U.S. nuclear utilities and several international members (including Canada)
    - audits suppliers to ensure that products received will perform their intended functions
  - CANDU Procurement Audit Committee (CANPAC)
    - a program under CANDU Owners Group Inc. (COG)
    - members are Canadian, Korean and Romanian NPPs
    - audits supplier quality programs to the requirements of CSA N286; audit includes CFSI
- CNSC has observer status at both NUPIC and CANPAC bi-annual meetings
- Incorporating CFSI requirements into CSA N299, *Quality Assurance Program Requirements for Supply of Items and Service for Nuclear Power Reactors*
  - Target publishing date Q3 2016

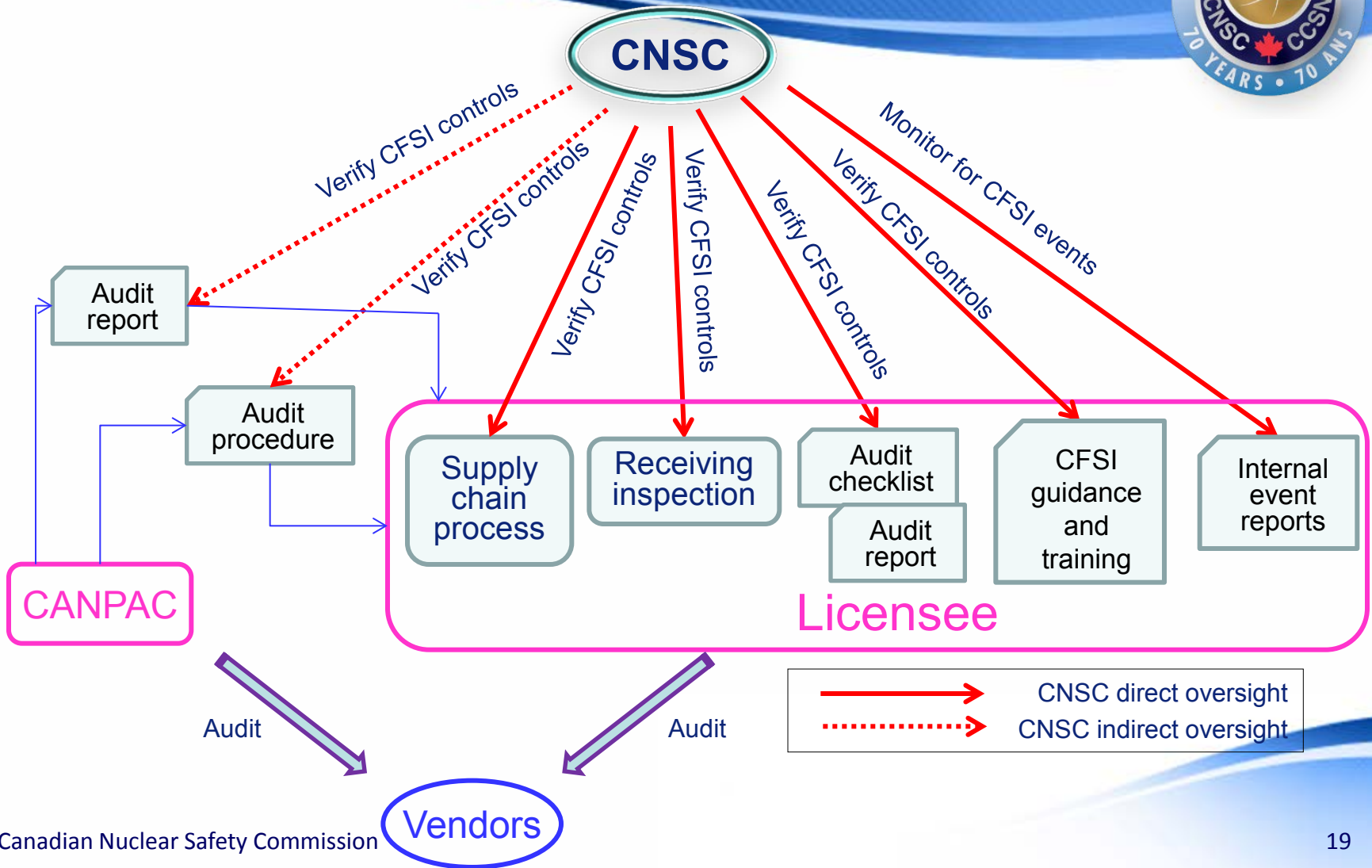


# Overview of Stakeholders' Activities



CANIAC - Canadian Nuclear Industry Assessment Committee

# CNSC Oversight of CFSI



# Summary



- QA cornerstone to detect and prevent CFSI
- CNSC has explicit regulatory requirements for QA
- Regulatory requirements for CFSI
- Oversight of supply chain





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# *Thank you!*



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