

Obsolete equipment – How can we extend the life of nuclear analogue I&C systems?

Methods, actors and legal
aspects

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How to handle obsolete equipment

- 2014 ENSRIC decided to investigate what options there are for handling obsolete I&C equipment
- The first project was to look west and see how they do it in the US
- The findings were interesting and therefore it was decided that a follow up project was needed, this time pointed at Europe.

The project

- This three parted project have been carried out by
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 - Caroline Falconer, Vattenfall AB

What options are there?

- **Repair** – change component
- **Refurbish** – proactive way of securing the function by for ex cleaning
- **Re-manufacturing** – With the help of original documentation the OEM or third party supplier provides the equipment
- **Re-design** – when some parts needs to be exchanged
- **Re-engineering** – when original requirements are known
- **Reverse engineering** – when the original requirements are not known, at least not all of them
- **Replace** – find the old parts somewhere else (Ebay, shut down factory etc) and qualify it for nuclear use



There is no universal definition and not a clear line between them!

Suppliers

- The idea of using reverse-and re-engineering comes from the military and aviation industry.
- We have met with OEMs, small scale third party vendors and large scale third party vendors



Refurbished PMC tester

One solution fits all?

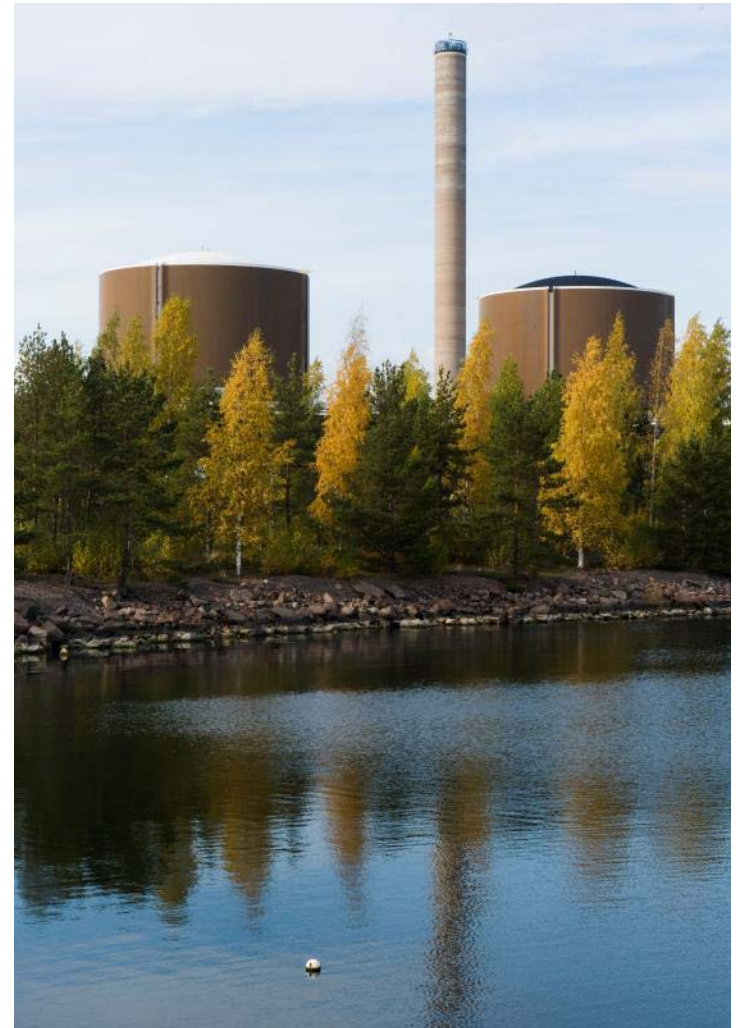
- There are no simple roadmaps or clearly defined solutions, but there are a lot more options than we expected!



Cloned card from SPHEREA

Where to start?

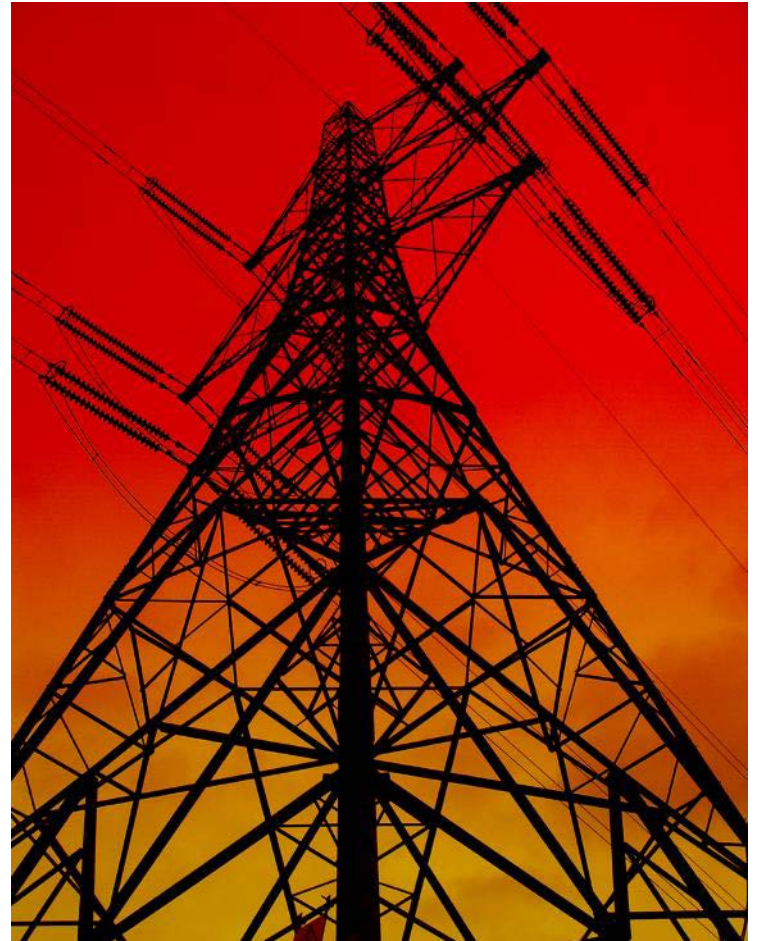
- Several of those we have talked to could provide analysis and suggest strategies
- EPRI and EPRI equivalence
- COTS – Commercial off the shelf
- 3D-printing



Loviisa NPP, picture from Fortum

The importance of a strategy

- Have a clear view on the status of your equipment
- Prioritize
- POMS/RAPID/PEREN could help you with your own inventory as well as showing other members inventories.
- NUOG and E-NUOG
- Documentation



Picture from Vattenfall

Timing

- One aspect of choosing is timing
 - Near end of life – short payoff
 - statistics
 - Plan for the future
- What are the consequences of doing nothing?



Forsmark, NPP, picture from Vattenfall

Conclusions

- See the bigger picture
- Don't do more than enough
- Reversed or re-engineering are options that should be evaluated **together** with other alternatives
- It all depends on the prerequisites and the function of the equipment



OKG NPP, picture from Uniper

Conclusions

- Questions to ask
 - Is it safety related or not?
 - How much of the original documentation could be found and how correct is that?
 - How much is known about the original requirements and requirements that have been added?
 - For how long should the solution last?