Safety culture in new build projects

Teemu Reiman 25.2.2016

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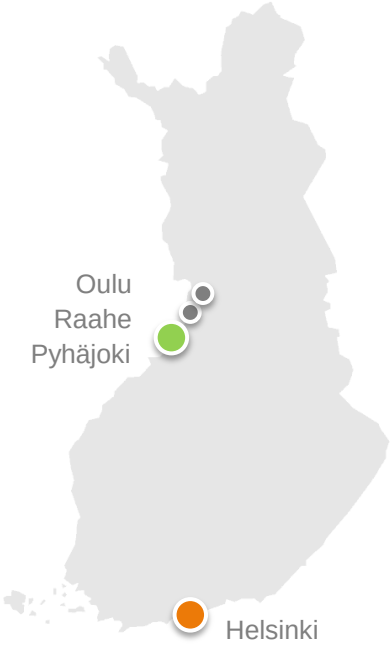
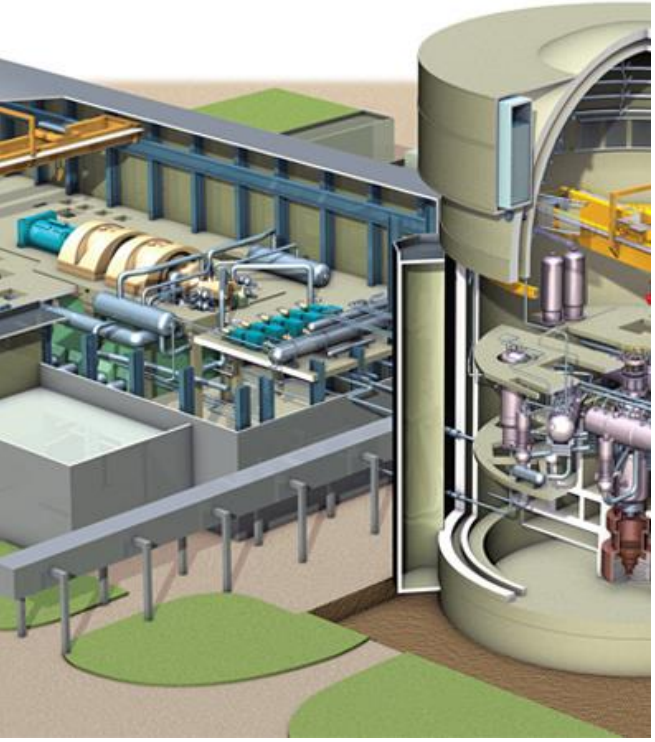
Facts about Fennovoima

- Established in 2007
- Currently employs approximately 250, in operation phase approximately 500
- Head office in Helsinki, local office in Pyhäjoki
- Fennovoima will build its Hanhikivi-1 (AES-2006) nuclear power plant on Greenfield site located in Pyhäjoki, Northern Finland
- The project is called FH1



Hanhikivi 1



- Plant supplier is RAOS Project Oy, which is the subsidiary of JSC Rusatom Energy International
- Chosen technology: Rosatom's AES-2006 pressurized water reactor
- Electric power of the plant is approx **1200 MW** and thermal power approx **3200 MW**
- Commercial operation for **60** years

9 TWh

Annual energy production of Hanhikivi 1 is 9 TWh.

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A decade of construction

Preparation phase

- Rosatom chosen as the plant supplier
- Environmental Impact Assessment EIA
- Supplement to the Decision-in-Principle DIP
- Preparatory works at the site begin

2013-2014

Infrastructure and licencing

- **Construction License Application**
- **Extensive construction work of infrastructure and auxiliary buildings**
- **Development of the organization**
- **Construction License**

2015-2017

Construction phase

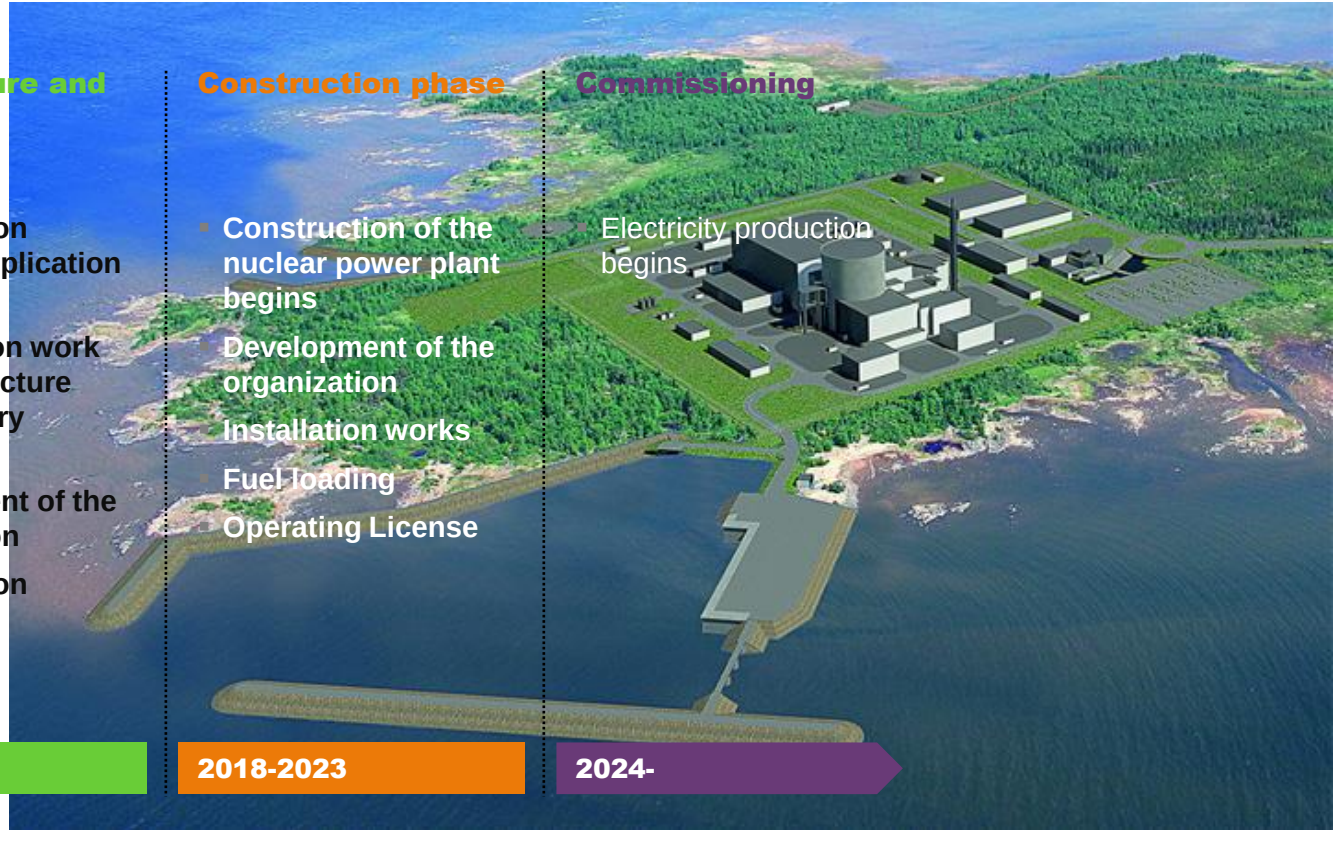
- **Construction of the nuclear power plant begins**
- **Development of the organization**
- **Installation works**
- **Fuel loading**
- **Operating License**

2018-2023

Commissioning

- Electricity production begins

2024-



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Background of Fennovoima's safety culture development

- Fennovoima has developed its safety culture from the beginning, with more activities each year
- After 2007, there have been significant changes in the ownership
- In 2013 the Russian company Rosatom was chosen as the plant supplier
- Fennovoima needs not only develop its own safety culture but also assure (as the future license holder) the safety culture of the Supplier
- Finally, Fennovoima is also growing very fast which creates its own challenges in terms of culture development
- Thus work was started in 2015 to form joint safety culture principles for the FH1 project together with the plant supplier

FH1 nuclear safety culture policy

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Fennovoima and RAOS are building together a nuclear power plant that must operate safely for at least 60 years. The top management of the companies are proud to undertake this challenge and recognize the vital importance of nuclear safety. To ensure nuclear safety, a strong nuclear safety culture is essential from the very beginning.

Top management is fully committed to a high level of safety culture and expects the same commitment from all participants in the project. **This means that nuclear safety has an overriding priority in all actions and decisions within the project.** To facilitate the priority of nuclear safety, the following safety culture principles have been set, which everyone is expected to follow:

1 Commitment (put safety first, take responsibility, and show a good example)

2 Awareness (know what you are doing and why)

3 Transparency (communicate and co-operate)

4 Continuous Improvement (take initiative and seek to learn more)

Fennovoima's Nuclear Safety Culture Program elements

1. **Establishment** of shared nuclear safety culture goals, expectations and structures.
2. **Facilitating** nuclear safety culture in Fennovoima as well as all other organizations performing safety critical work and/or having access to the construction site.
3. **Monitoring** of the nuclear safety culture.
4. **Continuous improvement** (preventive actions, corrective actions & review) of the nuclear safety culture and the NSCP.

=> FV Nuclear Safety Culture Program (v1. 2011, v2. 2013, v3. 2015) and NSCP Implementation Plan

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1.Establishing shared values and structures

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The first target aims at establishment of shared nuclear safety culture goals and expectations first for the FH1 program and then for the operation phase. It further aims at developing the structural features of the organization in a manner that they would adhere to and support the achievement of the safety culture goals.

- The safety culture principles were established during 2015.
- A joint FH1 Nuclear Safety Culture Policy Statement
- A system of safety culture ambassadors was established
- Nuclear Safety Culture Working Group (with the Supplier and the main contractors)
- Definition of core, steering and support processes – including a nuclear safety awareness process

2. Facilitating and promoting safety culture

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The second target aims at facilitating and promoting the development of a healthy nuclear safety culture in Fennovoima as well as all other organizations performing safety critical work and/or having access to the construction site.

- Safety culture training to all employees
- Nuclear safety culture workshops (Safety Culture Day for the management team and Safety Culture Afternoon for the personnel)
  - Introducing the new principles and making visible commitments to them
- Intranet and email communications
- Posters and screensavers

3. Monitoring of safety culture

The third target aims at monitoring the level of safety culture and identifying its strengths and weaknesses. This monitoring focuses on Fennovoima as well as on all other organizations performing safety critical work and/or having access to the construction site.

- Handling of safety concerns and analysis of their apparent causes
- Safety culture survey and interviews
- Audits and internal reviews
  - Internal audits have safety culture as one topic
  - Fennovoima will start auditing safety culture in the supply chain during 2016

4. Continuous improvement, corrective actions and review

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The fourth target aims at continuously improving the safety culture program itself. It includes acute measures taken to correct identified deficiencies in safety culture as well as regular review of the goals and methods of the program against the current level of safety culture. The program review also takes into account findings on the safety culture of the Supplier and the supply chain.

- The annual implementation plan builds on the identified strengths and weaknesses in both safety culture and the previous year’s activities
- Benchmarking efforts to learn from other utilities experience as well as from research on safety culture

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Three main lessons about safety culture in the pre-operational phase

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- Systemic view on nuclear safety,
- communication of special characteristics of nuclear construction, and
- cultural dialogue.

Underlying all these three lessons is the need to better understand the unique nature of *safety culture in project settings*, and the unique requirements that projects set for nuclear safety.

Another underlying theme is the need for *nuclear safety awareness* among all participants of the project.

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Systemic view on nuclear safety

- Nuclear safety at any given time has its background, context and history.
  - It is rooted in the decisions made during the life-cycle of the plant (or even the life-cycle of the industry) as well as in the current structures, practices and values systems.
  - Development of culture is an important part of this context and history and it needs to be continually reflected
- Developing safety culture means developing the organizational preconditions, ways of working, structures, competence and tools, not only behavior.
  - These preconditions should allow good quality work but also support a nuanced view of nuclear safety itself.
  - This nuanced, or systemic view, of nuclear safety, is the essence of good safety culture
- Developing the systemic view – nuclear safety awareness – is a process where all the elements of the sociotechnical system need to be taken into account
  - Not only culture but other elements of the sociotechnical system such as social relations, power issues, tools, practices and also individual behaviour that builds and influences culture.
  - There is a danger that if we talk too much about safety culture per se, it becomes disconnected from nuclear safety – it hinders the systemic view on safety

Communication of the special characteristics of nuclear construction

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- Many organizations and individuals involved in an NPP construction project may not know how the construction phase affects nuclear safety of an operating plant.
  - For example, why certain methods need to be used, why it is important to document issues, why higher quality requirements are really needed
- Organizations that operate in the construction sector often associate safety only with occupational safety issues, not with nuclear safety.
  - Important to differentiate nuclear safety from occupational safety.
- Mistakes and non-optimal choices made during the design and construction phases can have consequences years, even decades later.
  - The same applies to good choices, e.g. conservative investments in severe accident situations management hopefully never pays off (in a visible way by being tested in an accident)

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Cultural dialogue

- It is important to work together with all the parties on the fundamentals of culture:
  - What does culture mean for the project,
  - why is safety culture important for nuclear safety,
  - what are the shared principles we require everyone to adhere to, and
  - what is critical for nuclear safety in the construction phase.
- There also needs to be a willingness to understand the reasons for the behaviour of the other parties
  - This goes for the national cultural differences but also occupational cultures, such as nuclear engineers and project managers.
- A cultural dialogue, however difficult and time consuming, is a must for a successful project execution in the nuclear field.
  - “know how to ask questions and build relationships that are based on mutual respect and the recognition that others know things that we may need to know in order to get a job done” (Schein 2013)

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Complex and dynamic projects require new ways of building safety culture

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- The “overriding priority of nuclear safety” is much more abstract yet also a difficult concept in a project phase
  - In the project world, the time horizon is much shorter and requirements for practical achievements much more acute than in the “operational world”
- Projects are inherently dynamic and changing, challenging the traditional focus of safety culture methods on careful analysis and evaluation
  - Action should dominate over analysis in safety culture development at complex and dynamic settings => action and analysis should be intertwined
  - However, at the same time a balance needs to be struck between the requirements of a project phase culture and the operation phase culture – the operation phase culture is based on the culture we build in the design and construction phase
- Building safety culture requires facilitating the organization’s understanding of nuclear safety, working with the relations inside and between organizations, building the organizational preconditions (management system, practices), and only lastly, some amount of explicit safety culture activities such as campaigns, posters, trainings etc.


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