Business ecosystem for SMR Technologies

EcoSMR

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EcoSMR

- Aims to improve the readiness of Finnish actors to compete on the global SMR market.
- By networking current providers, identifying competence gaps and learning emerging market needs.
- Analyses potential use cases like district heating, large industry heat demand and combined heat and power CHP.
- Thus being able to create targeted knowledge that drives product service development and customer understanding.
What are small modular reactors?

• By definition ”small” is 300 MW electric or smaller

• Modular, as in standardized modules
  • Many reactor modules potentially in a power plant
  • Reactor module may come from a factory, facility around the reactor may be from local supply

• Nuclear reactors
  • Low-carbon energy supply
  • Different reactors for different end uses
  • Supply of electricity, heat for cities or industry
Opportunities for subcontractors

Compared to large nuclear power plants:

• Smaller, but more components
• Aim for standardized designs
• Supply chain can be sustained better

Reactors from a factory, facility and its integration may be more flexible
Finnish energy system
need for clean heat

Electric power fairly clean and cheap

Future electrification, interconnected market may yield need for new electricity

- For nuclear SMRs may be the future go-to if mass production happens

Most of the remaining fossil fuels are CHP (district heating) and industrial use (steel, refinery, cement)

- Coal CHP in large cities already being replaced, new law banning coal puts up a tight deadline

Non-electric application of nuclear energy?
Licensing and building a small modular reactor

Currently the process of licensing and building a SMR itself is similar to the process of a big nuclear power plant, and the needs are the same. In addition there are business needs e.g.

- public acceptance in cities if the SMR is placed close by
- agreeing with the regulator on a graded approach e.g. in case of a low pressure reactor
- coordinating of collaboration between cities to get the price down by constructing several SMR’s in a series
- involvement of Finnish suppliers
Why be at the front?

- Several First of a Kinds already coming:
  - CNNC district heating reactor operational by November 2020
  - NuScale reactor just passed Phase 1 of US NRC evaluation
    - License by the end of 2020, first SMR in Idaho by 2026
  - Chinese high temperature reactor first criticality during this year
- Need international reference (pref. in Western country), use case, potentially adaptation
  - E.g. CNNC DHR400 international deployment would need containment
  - Similar situation historically: VVER reactors to Loviisa
- First users would benefit in future international deployment
  - Expertise for consulting, supply chain experience
Business potential in World

- National Nuclear Laboratory
  - 65-85 GW by 2035
  - 300B-450B €
  - Electricity only

- Heat market
  - EUROPairs project
  - ~100 GW market in EU alone with current technology
  - More with non-LWR technology
Ecosystem’s opportunities in Finland

- VTT has positive experience from creating and running ecosystems in Finland
- VTT has performed safety and feasibility studies on SMRs as well as some information dissemination
  - Potential for new applications as well as need for established supply chains
- Finnish actors have experience in large NPP supply chain
  - Can be applied for SMRs
- VTT can provide knowledge and international networks, from cross-disciplinary fields/industries
- VTT can be the ecosystem hub
  - Facilitator of activities
  - Assist in development (technology innovation project) formulation – for any interested companies
"The ecosystem is the environment – the space of actors - where a company operates or intend to operate. Here it find customers with specific needs, knowledge creators to learn from, and partners to form business networks with. Here is also finds competitors and other actors serving the same end user needs. Understanding the dynamics of the ecosystem, helps an actor to identify and develop its role in the system now and in the future".

Source: M. Simons, VTT
Ecosystem for SMR of nuclear facilities

Global SMR market is growing fast

Customer need is such that no-one is able to solve by acting alone

Increases the amount of opportunities with broader contact network

Support in searching for market requirements, partners, best business practices, research activities, funding options, joint marketing channels & actions
Co-creation of new businesses
- new offerings – technologies, tools, services
- new business models
- joint marketing and offering

R&D&I projects
- joint projects with consortium
- company specific
- generating project ideas and funding (BF, EU, or Shared Benefit)
Ecosystem functioning for SMR technologies

Business & co-innovation

- Semi annual Meeting
- RT 1
- RT 2
- RT 3
- RT 4

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Learning & knowledge sharing

- Semi annual Meeting
- RT 1
- RT 3
- RT 4

Meeting:
- Presentations
- Group working
- New topics for RT work

Round table working:
- Around different themes
- Companies’ benchmark and develop models, views, approaches
- Research integrated

Integration of results

SMR Business Day
- Open
- Outside specialists and company presentations
- Networking

Meeting:
- Presentations
- Group working
- Learning from RT work

SMR Business Day

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Ecosystem evolution from Exploration to Exploitation / R&D view

- **Exploration**
  - Delivery *HOW?*
  - Customer partnerships
  - R&D&I *WHAT?*

- **Exploitation**
  - Renewal through co-creation
  - Systemic solutions
Ecosystem evolution from Exploration to Exploitation / R&D view

Delivery HOW?

Level of productization

Exploitation

Sales

Systemic solutions

Answers

Questions

R&D&I WHAT?

Customer partnerships

Exploration

Solution readiness
Ecosystems & Business Finland funding instruments

Ecosystem – knowledge creation & sharing

Co-creation project

NOW

Research topic, WP1, WP2, WP3...

R&D projects

Co-innovation project 2 years

Company own project

SME project

Company project

Company project

SME subcontracting

Research subcontracting
Research project supports Company projects

- WP 1: Mgmnt
- WP 2: SMRx
- WP 3: BM&E
- WP n: nn
- WP n: Expl and Dissemination

Subcontracted confidential development and research

Company R&D projects

SME project

Company project

Company project

FACILITATION

Topics, data, cases, experiences

Expertise & research

CONFIDENTIAL

COLLABORATION

PUBLIC

Research project
Research project supports Company projects

CONFIDENTIAL

- Subcontracted confidential development and research
- Company project
- SME project
- Company project
- Company project

FACILITATION

- Topics, data, cases, experiences
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COLLABORATION

PUBLIC

- WP 1: Mgmnt
- WP 2: SMRx
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Common research topics that connect activities
Steps for companies

- **1\textsuperscript{st} phase:** Co-Creation Project aims at getting together interested participants (public workshops) to identify needs and way forward. VTT can as facilitator.

- **2\textsuperscript{nd} phase:** Co-Innovation Project multiple year (forum for generation of R&D and business opportunities together). Business Finland can also support (2+ years, via company applications).

- Need to hear expressions of interest from industry, associations etc. International participants are also allowed.
Summary

- VTT has an ecosystem vision for 2018-2020
  - Strong international business opportunity
  - Business Finland project(s)
  - SMR project activities (H2020 etc) exploited for this development

- Ask from Companies their view and goals
  - How do you see your role in this ecosystem?
  - Is nuclear business already part of your PSS portfolio?
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