

# Engineering and R&D needs and supply in Finland

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Business from technology

## Background to Finnish situation

- 4 operating commercial nuclear reactors and 1 under construction
- 1 to 3 planned construction projects
  - 2 environmental impact assessment reports ready (3rd in fall)
  - 1 decision-in-principle application filed, 1-2 in preparation
- Nuclear energy education given mainly at 3 universities
  - Nuclear engineering: Helsinki and Lappeenranta Universities of Technology (TKK and LUT)
  - Radiochemistry: University of Helsinki (UH)
  - Some activities in other universities too
  - Other areas scattered over all universities
    - Material science, electrical engineering, automation etc.
    - not specific to nuclear
- A Finnish speciality in all technical areas is the close connection of students with industry, research institutes and authorities
  - Summer trainees
  - Diploma (Master's) thesis

## Education in Nuclear Engineering

- Academic level education is given by 2 technical universities
  - Master's level (basic degree, only recently B.Sc)
  - Diploma theses often done in nuclear companies, research institutes or authority (also at university)
- Graduate level is challenging
  - Small courses, only 2 professors
  - Visiting professors giving special courses on specific topics
  - Use of summer schools abroad
  - Doctor theses often made in national research programs or EU research projects
- Special course at professional level after graduation (MSc or DSc)
  - Specially applied to Finnish needs
  - For new staff and new recruits from other fields
  - Arranged by Ministry of Employment and the Economy, TKK, LUT, TVO and Fortum (NPP and FNS), Posiva, VTT, Radiation and Nuclear Safety authority (STUK)
  - 6 modules of 2-4 days during 6 months cover 'whole' area
  - So far arranged 5 times with 270 participants all together

## Fusion and plasma physics

- Fusion technology and plasma physics education at TKK and LUT (MSc & DSc)
  - Under graduates have special assignments
  - Summer schools for graduate students
  - Summer trainees at University and VTT
  - Work on European Experiments
- European programs to train professionals in fusion area
  - Example in remote handling PREFIT:
    - 3 years program
    - 2 Finnish, 2 British, 2 French students
    - rotating at each others institutes learning in an international environment
  - GOT (=Goal Oriented Training): 1st programs running, 2nd starting
- Big needs of experts worldwide in areas covering material science, automation, remote handling etc.

## Personnel in nuclear energy R&D

- Total number of experts in nuclear energy is about 800
  - Within next 10 years 25% of personnel will retire
- Research done at VTT, TKK, LUT, UH, STUK, FNS and GTK (Geological Survey of Finland)
  - Annual volume of research in fission and fusion ~200 ppy
- Transfer of knowledge has started
- Current situation in Finland attracts students and young professionals
- Nuclear companies confident that their needs can be fulfilled
- In the figure nuclear energy includes whole range, e.g. material science, automation, fusion etc.

