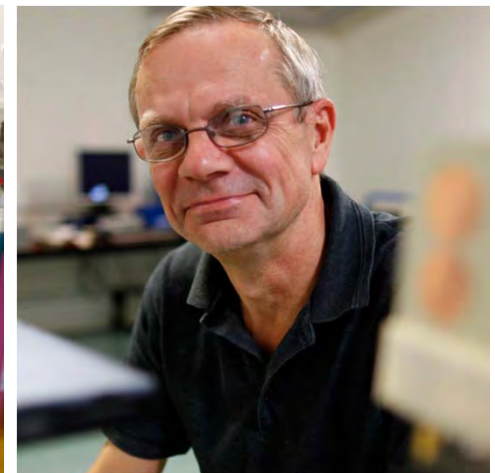
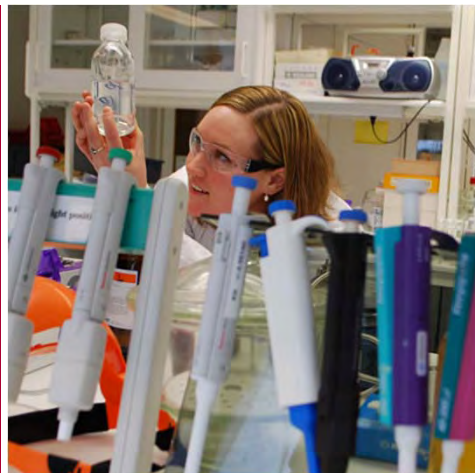
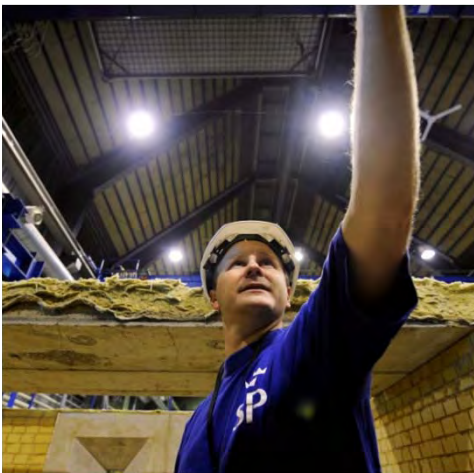




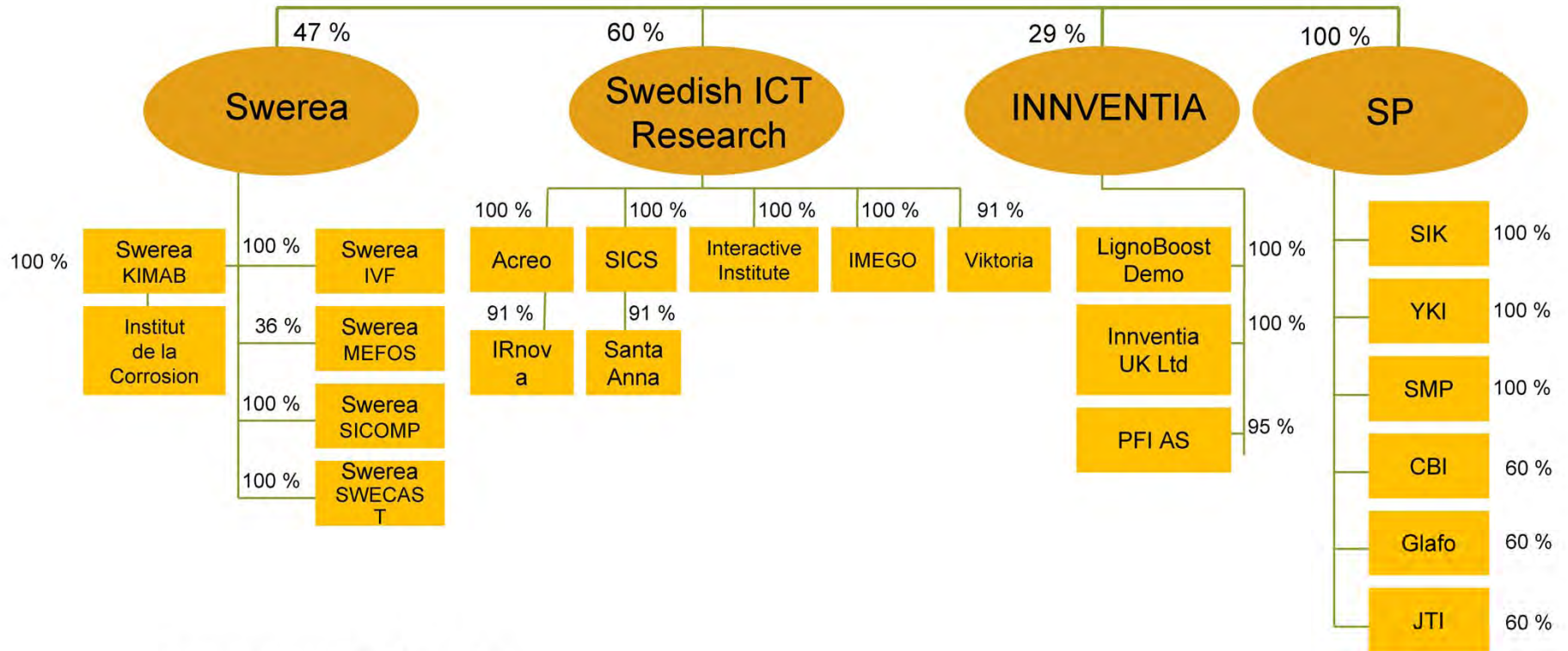
SP Technical Research Institute of Sweden is a leading international research institute. We work closely with our customers to create value, delivering high-quality input in all parts of the innovation chain, and thus playing an important part in assisting the competitiveness of industry and its evolution towards sustainable development.



Staten

100 %

RI  
SE



Organisationen Q4-2009

# About SP

2010

|                           |              |
|---------------------------|--------------|
| Owner SP Group            | RISE Holding |
| Net revenue (SEK million) | 1016         |
| Number of employees       | 1050         |
| Subsidiary companies      | 6            |
| Customers                 | 10 000       |



SP Technical Research Institute of Sweden



# About SP

2009

|                          |     |
|--------------------------|-----|
| Institution partnerships | 100 |
| EU-projects              | 60  |
| Ph.D. and Lic. Eng.      | 259 |
| Ph.D. students           | 69  |
| Adjunct professors       | 24  |
| Publications             | 915 |
| Peer review              | 273 |



SP Technical Research Institute of Sweden

## Vision

---

We are an internationally leading research and innovation institute focused on increasing the competitiveness and sustainability of industry

## Mission

---

We create, use and disseminate knowledge for the development and evaluation of technology, products and processes in a way that is internationally competitive

## Core values

---

Trust

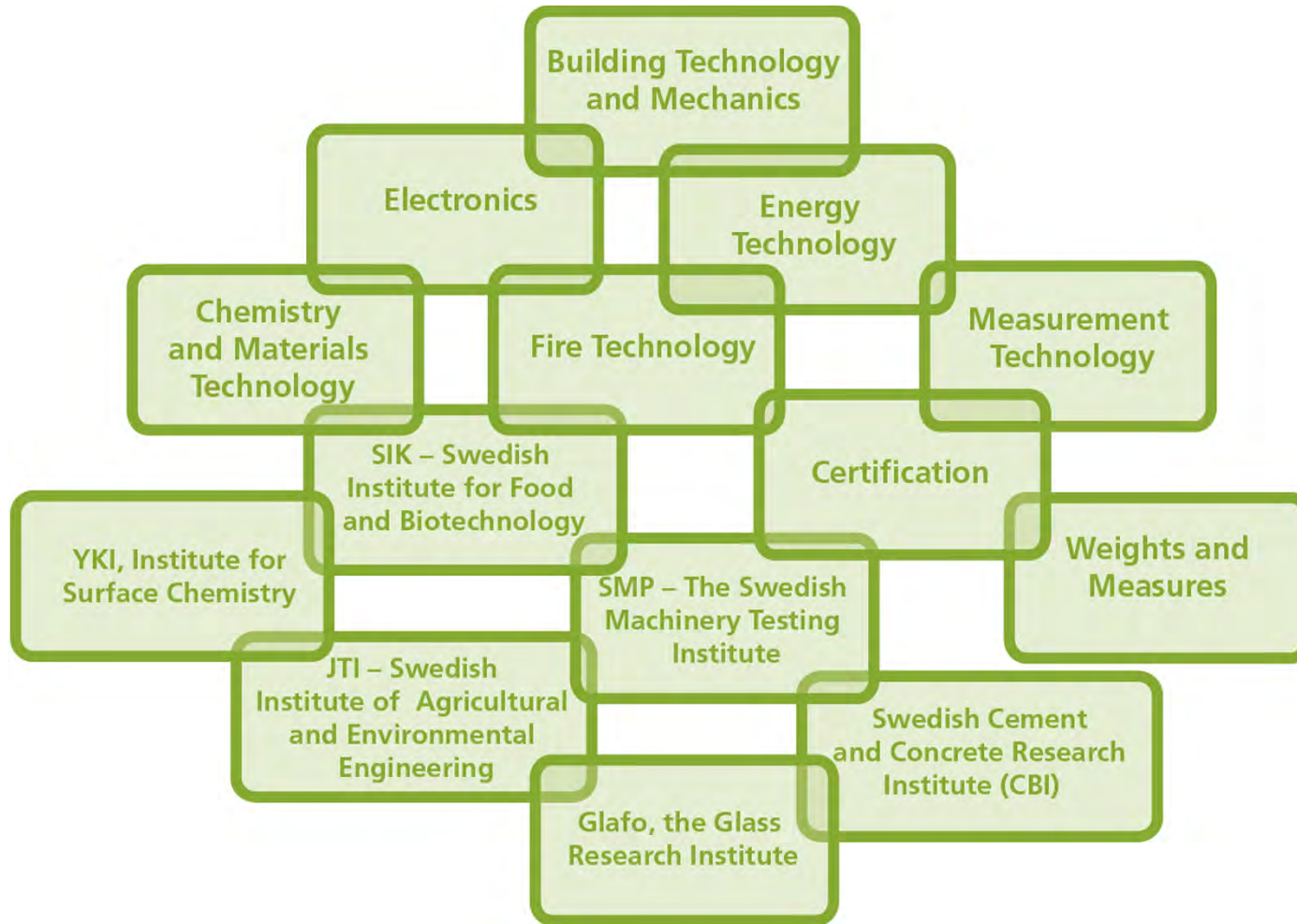
Innovation

Value Creation



SP Technical Research Institute of Sweden

# SP group organisation – a wide technical range



SP Technical Research Institute of Sweden

# Our Core Areas

## Nuclear



SP Technical Research Institute of Sweden



# Process of innovation

- 10 000 customers
- Wide technical range
- Experimental resources
- Strong research environments
- High scientific quality



SP Technical Research Institute of Sweden



## Our strategy is to

- establish long-term relationships with our customers and create value for them
- expand to raise our profile, strengthen our ability to run major complex projects and to reinforce our international status
- establish strong research and innovation environments
- strengthen our international profile
- develop into a leading international institute in the field of environmental and energy technology
- offer specialised evaluation, measurement and certification services
- ensure the highest quality of our staff



SP Technical Research Institute of Sweden

# We create value in collaboration



SP Technical Research Institute of Sweden

# Examples of customers and working partners



SP Technical Research Institute of Sweden

**Nuclear – some examples**



# Fire, Risk, Safety and Security

SP provides services for the protection of life, health, property and the environment, not only for industry but also for society as a whole. In this way, we contribute to the improvement of safety in many areas, such as building structures, vehicles, shipping, interior decoration, infrastructure, extinguishment, bio-fuels and so on.

- Fire technology
- Risk and safety
- Nuclear



SP Technical Research Institute of Sweden

## Fire properties of cables

SP is a leading institute in testing and analysis of fire properties of cables. Eg. SP was the technical coordinator of the European CEMAC project where a new approach for interpolating test data was developed. The results are directly incorporated in new regulations by CENELEC\*

\*T. Journeaux, B. Sundström, P. Johansson, M. Försth, S. Grayson, S. Gregory, S. Kumar, H. Breulet, S. Messa, R. Lehrer, M. Kobilsek, H.D. Leppert, N. Abbot, *CEMAC – CE-marking of cables*, SP Report 2010:27, ISBN 978-91-86319-65-6, (2010).

SP perform reaction to fire tests according to EN 50399 and IEEE 383. SP took active part in the development of EN 50399\*.

\*GRAYSON, Steve, VAN HEES, Patrick, Vercellotti, Uberto, Breulet, Hervé and Green, Andrew "Fire Performance of Electrical cables - new test methods and measurement techniques, Final report of EU SMT project SMT4-CT96-2059 rapport", ISBN 0 9532312 5 9 Interscience Communications UK, 2000.



SP Technical Research Institute of Sweden

# Fire resistance

Testing and knowledge is offered on fire resistance of sealing system penetrations as well as e.g. doors and walls.

SP also offers advanced measurement methods for fire property investigations of materials, such as TPS (Transient Planar Source), TGA (Thermogravimetric Analysis) and DSC (Differential Scanning Calorimetry).

The internationally accepted model for time to short circuit for cables exposed to fire was developed by SP\*. SP also offers experimental testing of fire resistance of cables.

\* P. Andersson, P. van Hees, Performance of cables subjected to elevated temperatures, Fire Safety Science, Proceedings of the eighth international symposium, (2005).



SP Technical Research Institute of Sweden





# Seismic test of a switch gear cubicle at SP



SP Technical Research Institute of Sweden

# Test equipment at SP

## Multi Axes Shake Table (4-DOF):

- Horizontal, Vertical, ( Pitch, Roll)
- 1.2 x 1.2 m (can be expanded up to 2m)
- Weight of test object up to 2ton

## Test objects:

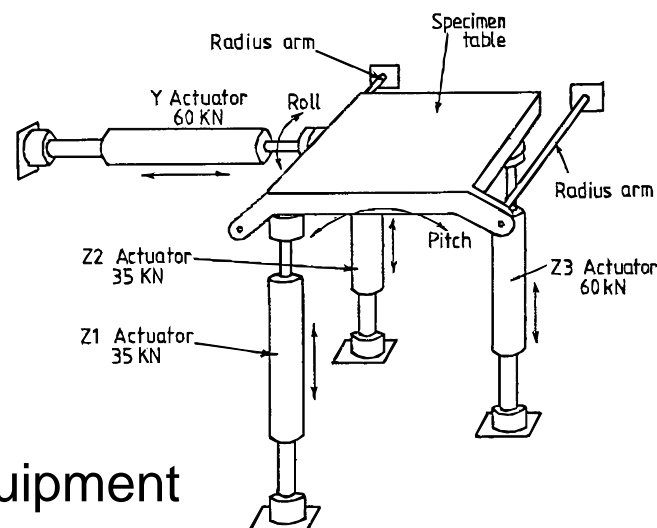
- Cabinets and cubicles with electronic equipment
- Batteries and racks
- Subracks
- Components (relays, contactors, ..)

## IEEE standards:

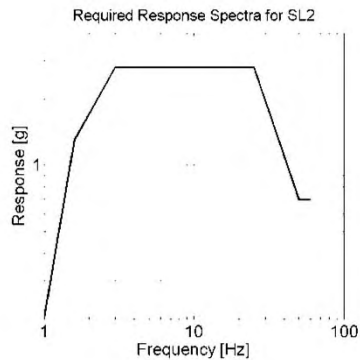
- IEEE 344
- IEEE C37.98
- IEEE 693

## Other standards

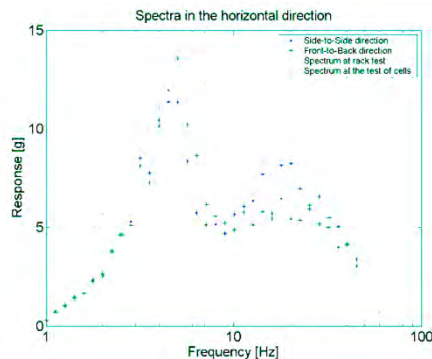
- IEC (60068-3-3, 60068-2-57, 60068-2-59, 60980, ...)
- Telecom (ETSI, Telcordia, NTT, ..)



# Example: Seismic verification of a battery rack



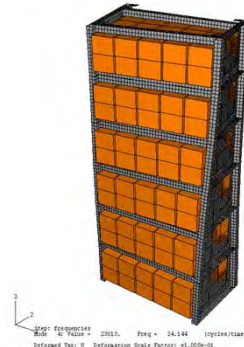
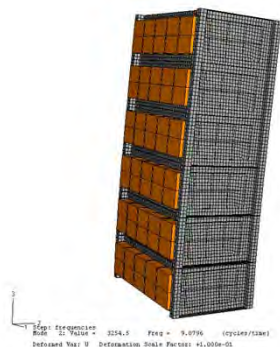
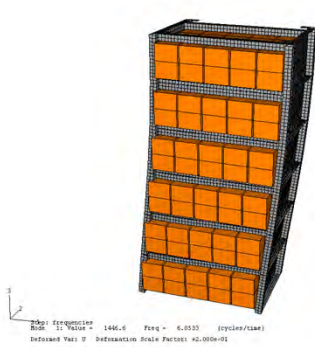
Of safety reasons the cells were filled with glycol when the rack was tested. The mechanical strength of the rack was then verified, but not the electric function of the cells.



During the test of the rack, secondary spectra were measured at the rack and these spectra used at a test of with aged cells filled with acid (placed in a stainless tray). During this test the electric function was monitored.

# FE calculation

A FE-model of the rack was established and material properties (stiffness, damping etc) determined from the real test. A new FE model (with the same material properties as in the first model) was then used for calculations of a much bigger rack (too heavy for SPs test rig) so the big rack could be verified.





# Electronics and ICT

Electronics and ICT – Information and Communication Technology – assists the development of modern technology in leading-edge electronic applications. With extensive test resources, our research is concentrated on communication technology, microwave technology, dependable systems and robust electronics.

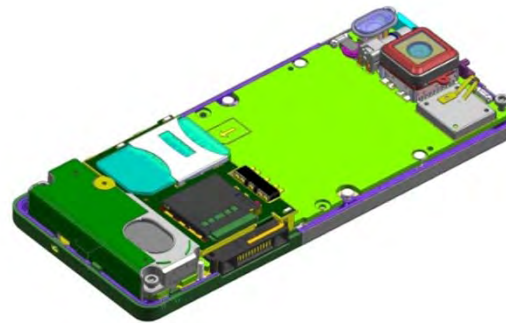
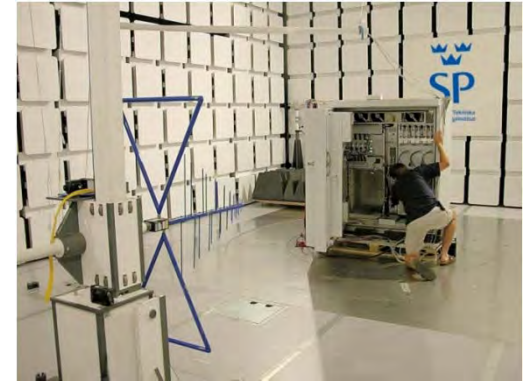
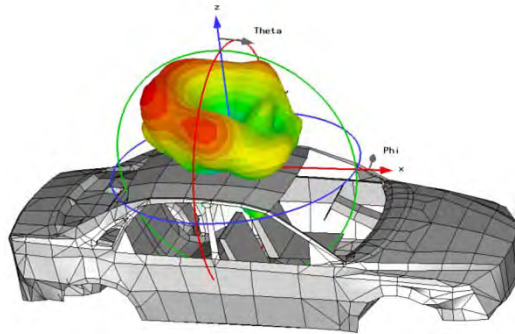
- EMC
- Communication systems
- Microwave technology
- Product safety - electronics
- Dependable systems - electronics
- Robust electronic systems



SP Technical Research Institute of Sweden

# EMC

- EMC testing
  - Vehicles
  - Vehicle components
  - Radio
  - Generic industrial products
- Radio testing
- Calibration services
  - Antennas
  - Field probes



- Research
  - Wireless communication technology
  - EMC
  - Measurement technology
  - Electromagnetics



SP Technical Research Institute of Sweden

# SP environmental durability

- Tools

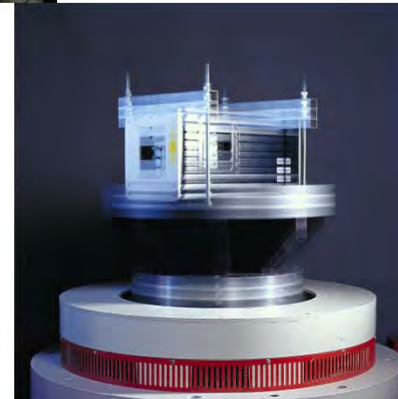
Heat/cold/humidity

- climate chambers
- climate cabinets
- combination chamber



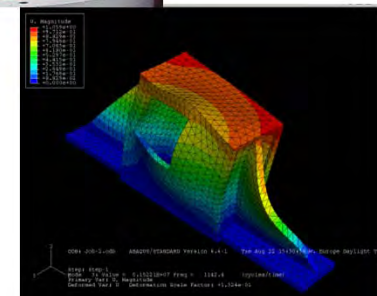
4 shakers

- 5-2000 Hz
- 50 kN kg
- m+p control and software
- Dactron control software



Software

- Data acquisition
- CAD Rhinoceros
- FEM Abaqus

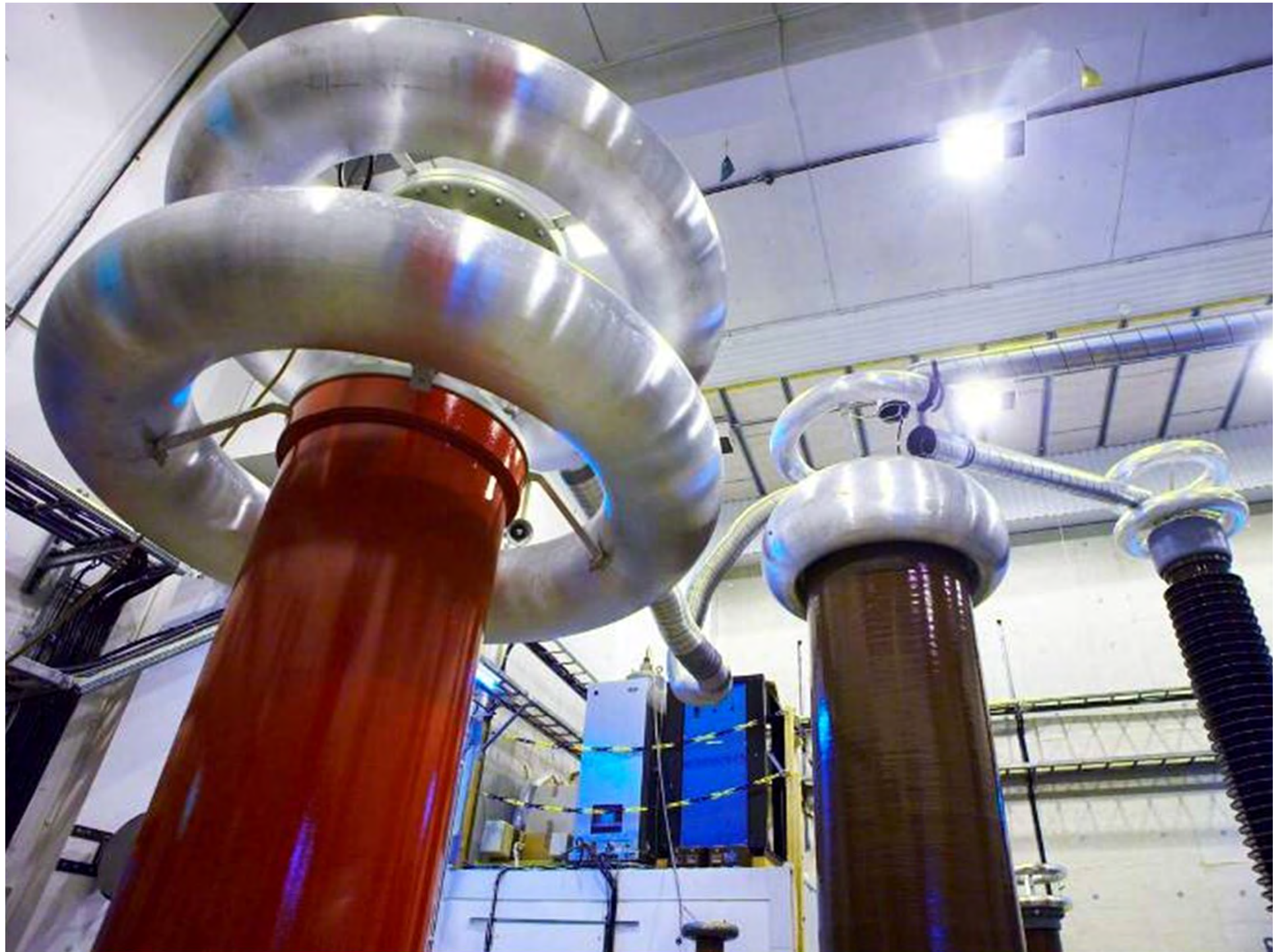


# SP environmental durability

- Competencies
  - Specification of environmental load
  - Environmental specification
  - Testing according to
    - IEC standards
    - ISO standard
- Knowledge about TBE/KBE (Technical regulations for electrical equipment/ Quality and control regulations for electrical equipment)  
[http://www.okg.se/templates/WidePage\\_1009.aspx](http://www.okg.se/templates/WidePage_1009.aspx)







# Building and Construction

SP is involved in the entire chain, from outline design, detailed design, construction, and building operation and management, to demolition and re-use of all types of buildings and civil engineering structures. We provide the construction sector with services ranging from testing, advanced calculations and investigations to pure research projects.

- Building physics and indoor environment
- Constructions
- Materials in buildings
- Building products
- Supporting structures
- Efficient use of energy



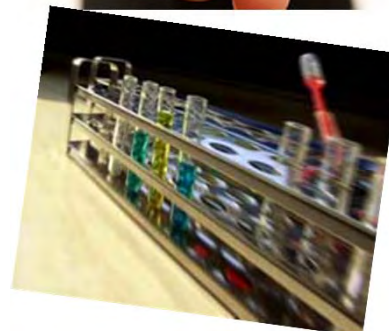
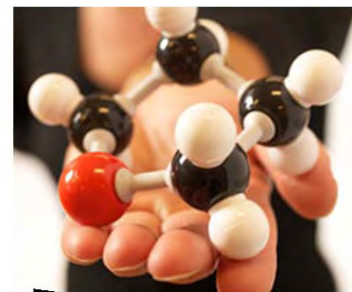
SP Technical Research Institute of Sweden



# Materials Technology and Chemistry

We are assisting industry in achieving a competitive edge by value-adding problem-solving and customer-oriented research and development. Our areas of strength are chemical analysis, characterisation of materials, structure and material design, applied colloid chemistry and surface chemistry, formulation, and controlled release.

- SP medTek – medical materials technology
- SP Scandinavian Coatings Centre (SCC) – surface deposits, paints, and varnishes
- SP PackTek – packaging technology
- SP Plast och Gummi – plastics and rubbers
- SP Biolab – recyclable materials, compostability
- SP Codirect – controlled release of active components
- Mechanical properties
- Polymer materials – plastics, rubber etc



SP Technical Research Institute of Sweden

# Measurement Technology and Calibration

We assist industry in solving measurement problems, calibrate measuring equipment and operate an extensive programme of training and/or continuation training in measurement technology.

- Research and innovation
- Calibration services
- Development of measurement technologies
- Test/Certification of measuring instrument



SP Technical Research Institute of Sweden



# SP International workshops on Feed Water Metering and Thermal Power

2007 – London

2008 – Tokyo

2009 – Washington DC

2011 – Paris



Participants and speakers from around the world

Flow meters (new technology, Venturi, fauling)

Temperature sensors (installation, vibration)

ISO standards & Uncertainty (GUM)

Traceability (calibration resources)

R&D (meter technology, calibration methods)

Testing and verification

Properties of water and steam



SP Technical Research Institute of Sweden

## Washington DC, 2009



**55 participants from 12 countries  
(incl US NRC, SSM and IRSN)**

**Flow meters (new technology, Venturi, fauling)  
Temperature sensors (installation, vibration)  
ISO standards & Uncertainty (GUM)  
Traceability (calibration resources)  
R&D (meter technology, calibration methods)  
Testing and verification  
Properties of water and steam**



SP Technical Research Institute of Sweden

The poster features a blue header with the title 'Metering of Feed-water flow, temperature and thermal power in Nuclear Power Plants'. Below the header is a large, textured image of a nuclear reactor core. At the bottom, the event details are listed: 'Washington DC, USA October 27-29, 2009', 'Organised by SP Technical Research Institute of Sweden and', and logos for NIST, PTB, and AIST.

Metering of  
Feed-water flow, temperature  
and thermal power  
in Nuclear Power Plants

Washington DC, USA  
October 27-29, 2009

Organised by  
SP Technical Research Institute of Sweden  
and

NIST PTB AIST

# EMRP Call 2009

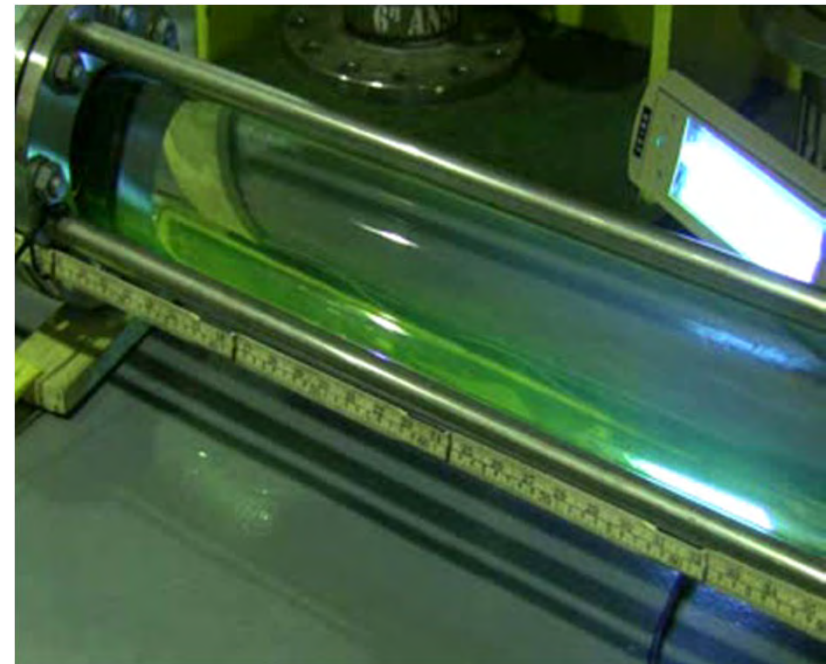
to advance measurement science  
and technology in the field of **Energy**



## Power Plant Metrology

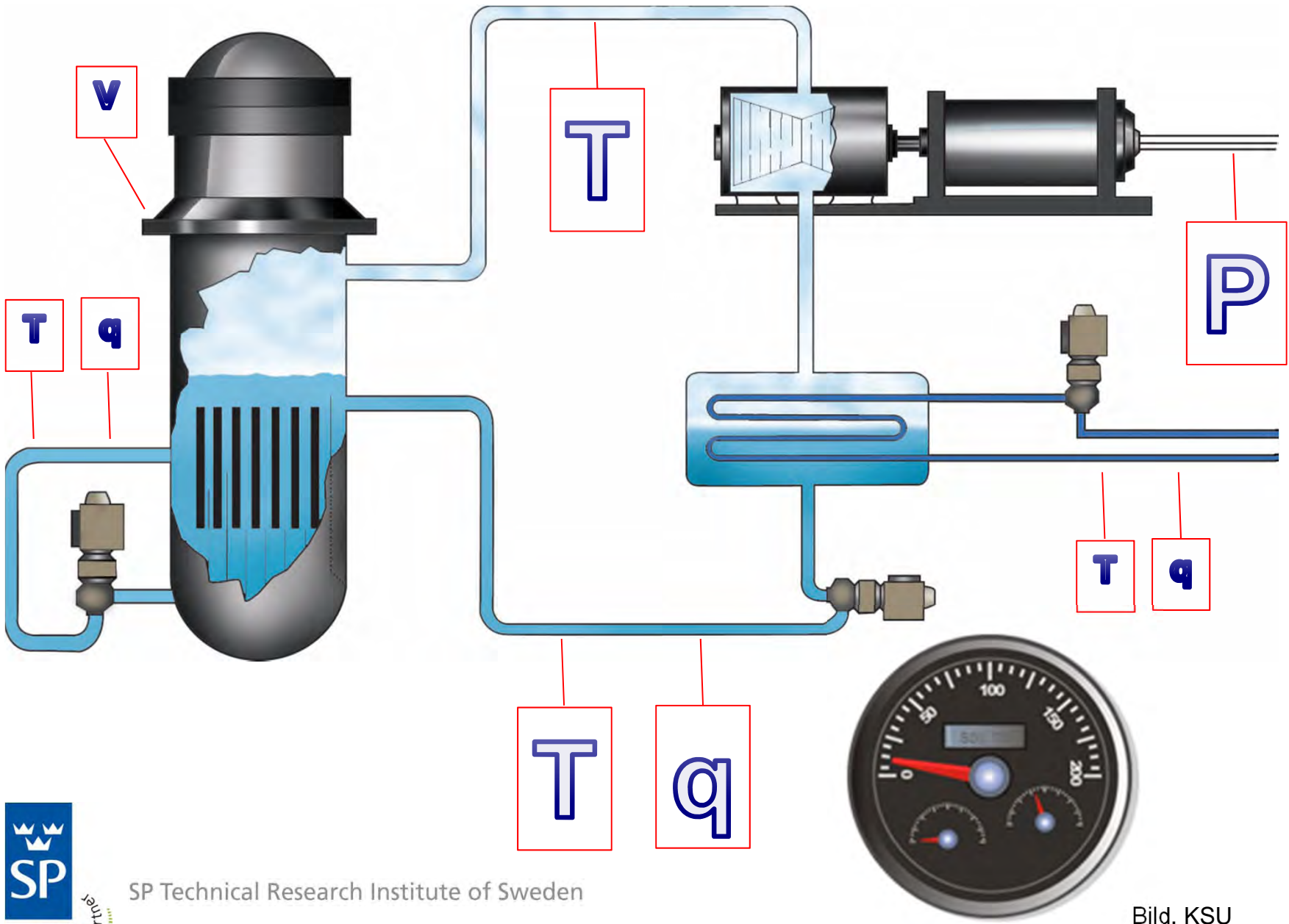


- High temperature turbines
- Thermal power control
- High power electricity



SP Technical Research Institute of Sweden

# MUR



SP Technical Research Institute of Sweden

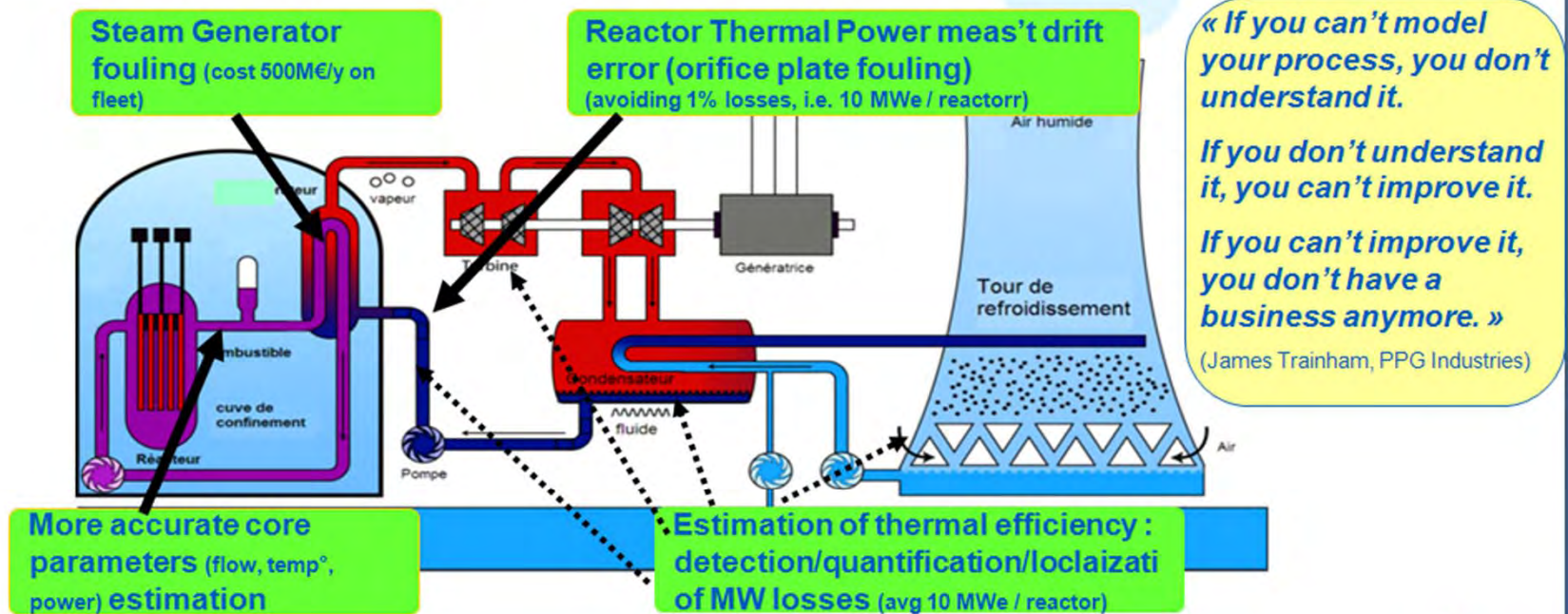
Bild. KSU



# Increased use of modelling/simulation : for monitoring and measurement purposes

Need = to gain access to un-measured or unsatisfactorily measured process parameters for better plant operation

Solution = to add physics-based equations to measurements + uncertainties for a more accurate description of process/component behaviour



# Performance testing of instruments

1. Measuring errors and uncertainty



2. Mechanical and climatic environment



3. EMC – electromagnetic compatibility



4. Weather protection - IP class



5. Corrosion



6. Safety and reliability



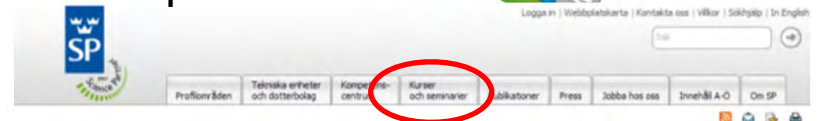
7. Endurance







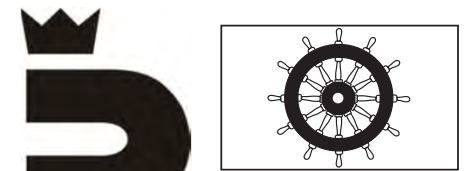
www.sp.se



SP Technical Research Institute of Sweden

# SP Certification

- ISO 9001 Quality, several areas
- ISO 14001 – EMAS Environment, all areas
- OHSAS 18001/AFS 2001:1 Health, all areas
- NFS 2005, 2008 CO2 Emissions
- SS 62 77 50/EN 16 001 Energy
- PEFC – FSC Quality / Forest and wood
- ISO 13485 Quality / Pharmaceutical
- BRC - ISO 22000 Quality / Food
- SQAS Quality / Transport and chem



SP Technical Research Institute of Sweden



# Competence platforms

# SP Zero Emission Buildings

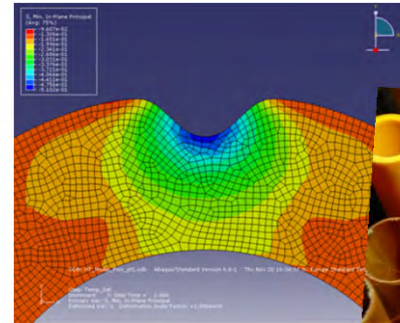
A leading international centre for research, innovation and knowledge transfer about energy-efficient sustainable buildings.



SP Technical Research Institute of Sweden

# SP Pipe Centre

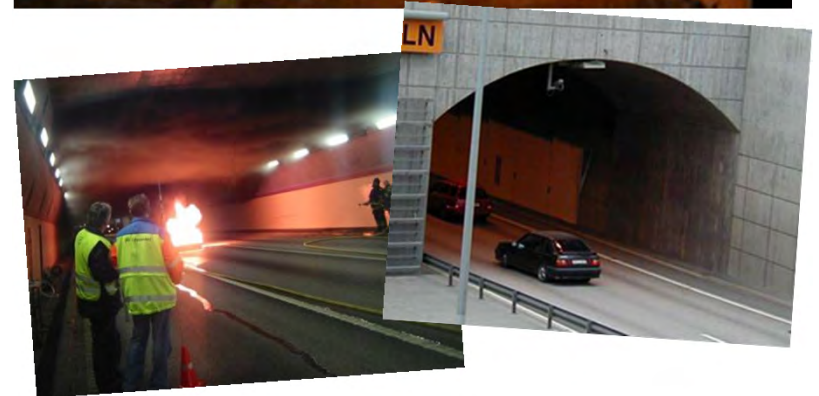
Sweden's leading competence centre for pipes and pipe systems.



SP Technical Research Institute of Sweden

# SP Centre for Safety in Tunnels and Underground

A leading international competence centre for research, innovation and knowledge transfer for underground structures.



SP Technical Research Institute of Sweden



# SP Woodmetrics

A leading international centre for the development of new measurement technologies to improve the efficiency of the wood manufacturing industry.



SP Technical Research Institute of Sweden

# SP Wise Measurements for Smart Grids

A leading research and innovation environment within quality assured measurement technology for Smart Grids.



SP Technical Research Institute of Sweden

# SP Heat Pumping Technology

SP Heat Pumping Technology is the leading international research environment in the field of heat pumping technology including heating, cooling and airconditioning for homes, offices and industry.



SP Technical Research Institute of Sweden



# SP Systems Analyses

A leading international competence centre for research, innovation and knowledge transfer within the system area.

We prepare scenarios, status reviews and analyses of the use of energy and resources in areas such as energy-efficient building design, foodstuffs, renewable energy and future motor fuels, smart grids and sustainable waste and recycling/re-use systems.



SP Technical Research Institute of Sweden



# SP INTERMAT

SP Intermat (Interfacial Materials Centre for Cleantech Applications) is a leading international centre for Clean Tech by applying basic surface chemistry to technical issues in the sectors of renewable energy and renewable materials.



SP Technical Research Institute of Sweden

# SP Biofuels

A centre for promoting innovation in the production and use of liquid and gaseous biofuels.



SP Technical Research Institute of Sweden

# SP Battery and Electric Hybrid Systems

A competence centre offering collective expertise in the field of battery and hybrid systems.



SP Technical Research Institute of Sweden



# SP New Constructions at Sea

The overall aim is to provide more efficient shipping by developing and presenting techniques for using lightweight materials in ship construction.

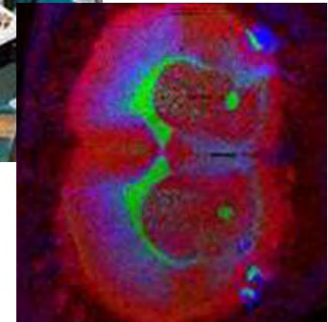


SP Technical Research Institute of Sweden



# SP MedTek

A leading competence centre for medical materials technology, especially concerning production, characterisation and chemical analyses, and contact between surfaces and tissue.



SP Technical Research Institute of Sweden