THURSDAY OCTOBER 2 (AFTERNOON) – SKB DEPOSITARY

In the afternoon we visit SKB (Swedish Nuclear Fuel and Waste Management Company). Nuclear power companies in Sweden jointly established SKB in the 1970s. SKB's assignment is to manage and dispose of all radioactive waste from Swedish nuclear power plants in such a way as to secure maximum safety for human beings and the environment.

14.30 Visit to Clab
Presentation of SKB and Clab (intermediate storage area).
-17.30 (approx.)
18.30 Dinner with local politicians and a lecture on "communication and public opinion work".
- 21.00 (approx.)

FRIDAY OCTOBER 3 – SKB REPOSITORY

SKB will safely take care of all the spent nuclear fuel and radioactive waste that arises during the operation of Swedish nuclear power plants. Learn about Swedish plans for taking care of nuclear waste material.

08:30 SKB Canister Laboratory, presentation and guided tour of the facility
10.30 Transport Simpevarpshalvön
11.15 Lunch at Sörågården
12.00 Arrival Urbergsentrén, presentation of SKB and visit to Äspö Hard Rock Laboratory
14.30 Presentation on PA work now and during the site investigation
15.30 Course summary
- 16.00 (approx.)

Transfer to Stockholm, via Ryan Air airport in Nykoping (Stockholm Skavsta) for any return flights (or perhaps a weekend off in Stockholm City?).
Examples of return flights to London:
- From Stockholm Skavsta (Nykoping) with Ryan air: Oct. 3rd 22.25 (arrival London Stansted 23.45)
- From Stockholm Skavsta (Nykoping) with Ryan air: Oct. 4th 09.50 (arrival London Stansted 11.50)
- From Stockholm Arlanda with Norwegian airlines: Oct. 3rd 20.50 (arrival London Gatwick 22.25)
- From Stockholm Arlanda with Scandinavian Airlines: Oct. 5th 15.00 (arrival London Heathrow 17.40)

## General Information

Course Fees & Online registration
The registration fee for this 2-week course is 2530 EUR (or 22.000 SEK or 2010 GPD) (excl. VAT). This includes participation on the course, lecture notes, lunch and refreshments on each of the ten lecture days.
Costs for hotel in England and Sweden (12 overnight stays, incl. breakfast) and bus transfers during the whole 2 week period, are charged at cost, at 1960 EUR (or 17.000 SEK or 1550 GPD) (excl. VAT).
Cost for flight between England (London Stansted) and Sweden (Gothenburg) on September 23rd and any return flight after the course are not included, i.e. are to be booked and paid directly by the participant.

Bookings can be made online at www.sp.se/confmeasure but must be done before August 25th.
Contact person for questions regarding booking is Britta Stålhammar, phone: +46 (0)10 – 516 54 41, mail: britta.stalhammar@sp.se, fax: +46 (0)33-10 69 73, SP Technical Research Institute of Sweden, Box 857, SE-501 15 BORÅS
Contact person for course contents is Viktoria Jonasson, phone +46 (0)10 – 516 56 39, mail: viktoria.jonasson@sp.se
Payment is required no later than September 1st. This includes both registration fee and costs for hotel etc as per above.
Cancellation Policy: In order to receive a refund, notice of cancellation must be received in writing by SP not later than 14 days prior to the commencement date of the event. All such cancellations are subject to a fee of 5 % of payments received by SP prior to cancellation. No refund is made for any notice of cancellation received after this 14 day period; however a substitute delegate may be named.
The organizers reserve the right to postpone or cancel the event due to unforeseen circumstances. In that case, participants will be informed on August 26th. The organizers are not liable for any expenses incurred by the delegate. This programme may be subject to change due to circumstances beyond the control of the organizers.

# APPLIED PROCESS MEASUREMENT TECHNOLOGY FOR NUCLEAR POWER PLANTS

## Programme, September 21 – October 3, 2014

**Welcome to this International training course, developed especially for engineers and students in the nuclear energy sector. During two weeks the focus is on measurement technology, but also on practical aspects of safety, several study visits and hands on experiments.**

CONTENTS

The course is focusing on applied measurements and safety for demanding applications in nuclear power plants, where there is a need of small uncertainties and reliable readings. This is a joint venture course offering a combination of state of the art technology, practical experience and insight in applied work procedures. The objective of this course is to support the participants in building competence in the area of measurement technology.
International Atomic Energy Agency (IAEA) defines competence as a mix of knowledge, skills and attitude. When planning this course our aim has been to apply this definition. The result is a course that offers an interesting mix of theory and practice, laws and rules of thumb, policies and technology. During the whole course we focus on process measurement technology.

TECHNICAL ORGANIZER IS:

SP Technical Research Institute of Sweden in Borås, Sweden in close cooperation with the following organizations:

UNIVERSITY OF CAMBRIDGE
FAGERBERG AKADEMIEN
okg - ett företag i E.ON koncernen
etec ELAJO TECHNICAL EDUCATION CENTER
SKB
KROHNE
Barsebäck

## PROGRAMME

### SUNDAY SEPTEMBER 21 – CAMBRIDGE
Check-in at hotel.

### MONDAY SEPTEMBER 22 – IFM (UNIVERSITY OF CAMBRIDGE)
The University of Cambridge is rich in history - its famous Colleges and University buildings attract visitors from all over the world. Part of the University's Department of Engineering takes a distinctive, cross-disciplinary approach, bringing together expertise in management, technology and policy to address the full spectrum of industrial issues.

09.00 Registration at IFM (UNIVERSITY OF CAMBRIDGE)
09.30 Measuring instruments & nuclear power
10.30 Basics - the SI system
11.00 Traceability and uncertainty
12.00 Lunch
13.00 Measurement instruments in safety applications
14.00 Flow meters
-16.30 (approx.)

### TUESDAY SEPTEMBER 23 – IFM (UNIVERSITY OF CAMBRIDGE)
09.00 Electrical measurements
11.00 Temperature and pressure
12.00 Lunch
13.00 Measuring radiation – traceability chain
-14.00 (approx.)
Transfer to London Stansted
Flights to Gothenburg, Sweden from London Stansted with Ryan air: 18.35 (arrival City Airport 21.30)
Transfer from Gothenburg City Airport to city of Borås. Check-in at hotel.

### WEDNESDAY SEPTEMBER 24 – SP BORAS
SP Technical Research Institute of Sweden is a leading International research institute. With a staff of 1300 researchers and engineers and a range of laboratories, SP holds extensive experimental resources, many of which focus on different aspects of risk & safety and energy. Instrument testing and Calibration are examples of services in Measurement Technology, which also includes responsibility for most of Sweden's National Laboratories.

09.30 Welcome to SP laboratories – an introduction
10.00 Climate simulations and environmental functional tests
11.00 Measurement technology
12.00 Lunch
13.00 Tour of the laboratories
-16.00 (approx.)

### THURSDAY SEPTEMBER 25 – SP BORAS
09.00 Fire testing
10.30 Environmental and Work Environment - certification of management systems
11.30 Lunch
12.30 EMC – electromagnetic compatibility
13.30 Corrosion and experiences of problems at nuclear power plants
-16.00 (approx.)

### FRIDAY SEPTEMBER 26 – FAGERBERG AKADEMIEN (morning)
Since many years Gustaf Fagerberg AB has been a major supplier of valves and instrumentation to the nuclear industry. An important part of these deliveries are QA related documents and services regarding material strength calculations, material certificates and traceability issues for incorporated parts.
Transfer to Göteborg (Gothenburg).

09.30 Flow control valves
10.30 Valve positioners
11.30 Nuclear QA-requirements
12.30 Lunch
- 13.30 (approx.)

### FRIDAY SEPTEMBER 26 – RINGHALS NPP (afternoon)
Transfer to Vattenfall Ringhals NPP.
Ringhals is owned jointly by Vattenfall and E.ON Nuclear Sweden AB. Ringhals consists of four reactor units and is one of few nuclear power plants to have both boiling water and pressurized water reactors.

14.30 Visit to Ringhals Visitors Centre
- 16.30 (approx.)
Transfer to Göteborg (Gothenburg).
18.30 Dinner with KROHNE and Fagerberg Akademien.

### SATURDAY SEPTEMBER 27 – GOTHENBURG
Day off for rest and shopping

### SUNDAY SEPTEMBER 28 – GOTHENBURG
Transfer to Oskarshamn.

### MONDAY SEPTEMBER 29 – ETEC OSKARSHAMN
ETEC is a private technical school where training courses for automation technicians and I&C engineers are conducted on a regular basis. A unique laboratory with mid-scale pumps, tanks, instruments and control valves is available for the students for practical experiments.

09.00 Flow, temperature and pressure measurement experiments
12.00 Lunch
13.00 Flow, temperature and pressure measurement experiments
- 16.00 (approx.)

### TUESDAY SEPTEMBER 30 – ETEC OSKARSHAMN
Flow controller and measurement experiments.

09.00 Flow control experiments
12.00 Lunch
13.00 Automation systems and computers
- 16.00 (approx.)

### WEDNESDAY OCTOBER 1 – OKG NPP
This day we will visit the largest BWR in the world. OKG was founded in 1965 and today owns and operates three nuclear reactor units – Oskarshamn 1, 2 and 3 – which together account for 10% of the total electricity generation in Sweden. Learn about instrumentation working practice and applied measurement technology at OKG. Meet and discuss with local technicians, engineers and management on site.

08.30 Presentation of OKG
10.00 Guided tour of unit 3, OKG (with guide and engineers)
11.30 Lunch
12.30 Presentation of the technical department
14.00 Presentation of possible professions at a Nuclear Power Plans after University studies
Panel discussion with engineers at the power plants
- 16:00 (approx.)

### THURSDAY OCTOBER 2 (MORNING) – OKG NPP
Meeting with the health and safety group at OKG. Learn about their praxis on radiation measuring instruments and what systems they apply to assure safety for workers in the plant.

09.00 Visit to OKG Health and Safety group
10.30 Safety Culture
11.30 Lunch
12.30 Guided tour of radiation laboratory, OKG