

<b>EU Training course on “I&amp;C systems, including digital systems, electrical and communication systems”</b>	
<b>Duration</b>	1 W
<b>Content</b>	<p>The module will present the different technologies (and evolution) adopted for the Instrumentation and Control System in nuclear facilities (in particular in NPP). It will specifically refer to reactor protection system and reactor control system, physical layout of their parts and related physical and functional interfaces.</p> <p>Functional requirements, system and component requirements (redundancy, independence, diversification, separation, environmental and seismic qualification, etc.) will be presented, discussed and shown in terms of implementation, justification and evaluation from the NRA. It will include findings and examples of regulatory experience.</p> <p>Specific focus will be given to application of microprocessor based technology in control and protection systems of NPP reactors. The issues related to qualification of software of the digital technology and concept of back-up systems for major protection functions will be presented and discussed.</p> <p>The experience of licensing of Olkiluoto for I&amp;C system will be included.</p> <p>Reliability aspects and their impact on the safety assessment will be discussed. Licensing evaluation of protection and control system will be also addressed and discussed.</p> <p>The electrical, electronic and communication systems adopted in nuclear installations will be presented and discussed.</p> <p>The course will include the overview of conception and requirements of:</p> <ul style="list-style-type: none"> <li>- normal and emergency DC and AC power systems; external and internal electrical energy sources; safety classification, environmental and seismic qualification, aging management; etc.</li> <li>- control and protection system architecture and lay-out, sensors, transmitters, cabling, logic centres and actuation devices, reliability and redundancy, qualification requirements, etc.</li> <li>- communication lines under normal operation and emergency conditions.</li> <li>- testing and periodical inspection of electrical, electronic and communication systems.</li> </ul> <p>The training activity will address also the content of SAR report and regulatory evaluation (assessment) approach and steps for licensing and authorization including auditing and inspection activities. Practical application and examples will be elaborated.</p>
<b>Achievements</b>	<p>The attendees will attain the knowledge and learning of key aspects concerning the I&amp;C system in NPP, the issues related to use of digital or analogue technology for I&amp;C systems (protection and control), electrical and communication systems requirements in NPP, including the needed evaluation to be performed by the NRA during the licensing process.</p>