Course on “Operation and safety of PWRs”  
C. Renault, P. Dumaz, JC. Klein, H. Grard, F. Fouquet (CEA) + Specialists (AREVA) + Specialists (EDF)

<table>
<thead>
<tr>
<th>Units and LO Statements</th>
<th>Responsibility / Autonomy</th>
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</thead>
<tbody>
<tr>
<td><strong>Unit 1 – Operation under normal conditions (18 hours)</strong></td>
<td><strong>Architecture and related operation of a PWR (EQF=7)</strong></td>
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</table>
| - Architecture and functional analysis of PWRs (primary and secondary components, containment building, auxiliary systems) | - Basic principle of PWRs  
  - Core physics  
  - Thermal-hydraulics  
  - 1300 MWe PWR architecture  
  - Function and design of safety equipment  
  - Comparison to other designs  
  - Normal operation  
  - Base load operation  
  - Start-up  
  - Shutdown  
  - Safety in operation. |
| - PWR normal operation  
  - Base load operation  
  - Start-up procedures  
  - Shutdown procedures | - Make safety study while referring to safety regulation |
| - PWR control aspects  
  - Load-follow operation  
  - Performance of control modes | - Use the most appropriate safety approach |
| - Safety in operation  
  - Regulation  
  - Protection systems and procedures  
  - Typical operational transients  
  - PWR core and fuel management  
  - Practicals on PWR simulator and training reactor. | - Get familiar with realistic PWR complex operation |
| Assessment criteria = to demonstrate mastery of basic nuclear reactor physics and operation | - Understand the main accident sequences and the role of operators |

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<tr>
<th><strong>Unit 2 – Safety in accidental conditions (12 hours)</strong></th>
<th><strong>Safety approach; Management of transient and accident operation (EQF=7)</strong></th>
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| - PWR safety approach  
  - Deterministic approach  
  - Probabilistic approach  
  - Calculation tools  
  - Practicals on PWR simulator and training reactor.  
  - PWR safety systems  
  - Accidental scenarios  
  - Loss of Coolant Accidents (LOCA)  
  - Steam Generator Tube Ruptures (SGTR)  
  - Steam Line Secondary Break  
  - Reactivity Initiated Accidents (RIA).  
  - Post-accident management (state-oriented approach)  
  - Innovative tracks of LWRs  
  - Burn-up, conversion ratio, materials and fuels | - Safety study rules.  
  - Safety methodologies.  
  - In situ analysis of reactor control.  
  - Realistic operational transients.  
  - Main accident sequences of a PWR.  
  - Loss of Coolant Accidents (LOCA).  
  - Steam Generator Tube Ruptures (SGTR).  
  - Steam Line Secondary Break.  
  - Reactivity Initiated Accidents (RIA).  
  - The TMI-2 accident.  
  - Initiators.  
  - Development.  
  - Consequences.  
  - Innovative designs. |

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<th>Skills</th>
<th>Knowledge</th>
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| - Understand basic principles of PWRs operation  
  - Be able to connect safety equipment with their function  
  - Understand the needs of safety regulation  
  - Link the safety needs to their related equipment | - Understand the main accident sequences and the role of operators |

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<td>Architecture and related operation of a PWR (EQF=7)</td>
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Recommended assessment methods: Written test and/or oral face to face interview

Course applicable (in part) for the following job profiles:

- 1.0.01: Nuclear Safety Manager
- 1.0.02: Safety Assessment Specialist
- 1.0.10: Safety Design Engineer
- 1.2.01: Design Manager
- 1.2.09. System Design Engineer
- 1.4.07. Licensing Manager
- 2.1.06. Engineering Manager
- 2.1.07. Operation Manager
- 2.2.01. Shift Engineer
- 2.2.02. Senior Reactor Operator/CRO
- 2.6.01. Safety and Security Manager