CONSIDERATIONS RELATED TO PLANT LIFE MANAGEMENT FOR CERNAVODA – 1

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Cernavoda-1 NPP, the first CANDU 6 Unit in Eastern Europe, is one of the original five CANDU 6 plants and the first CANDU 6 producing over 700 MWe. CANDU Pressurized Heavy Water Reactors (PHWR) continues to play a significant role in electricity supply both in Canada and some offshore countries (Korea, Argentina, Romania). The commercial versions of CANDU® reactors were put into service more than 30 years ago.

While the first series of CANDU 6 plants (which entered service in the early 1980’s) have now reached the middle portion of their 30 years design life, the Cernavoda-1 was put into service on 2 December 1996. However, the Cernavoda-1 Plant Life Management should be an increasingly important program to Utility ("CNE – Prod") in order to protect the investment and the continued success of plant operation.

Over the past three years, NR (Institute for Nuclear Research – Romania) has been working with AECL – Canada on R&D Programs to support a comprehensive and integrated Cernavoda-1 Plant Life Management (PLiM) program that will see the Cernavoda-1 NPP successfully and reliably through to design life and beyond. The PLiM program has a focus on critical systems, structures, and components (CSSCs) and will be applied in three phases: Phase 1 – Planning (assessment and recommendations), Phase 2 – Life attainment implementation, and Phase 3 – Plant Life Extension (PLEx), also known as plant extended operation. The key activities during each phase are shown in Figure 1 and Table 1.

Figure 1: Elements of CANDU/Cernavoda-1 Plant Life Management
Table 1. The CANDU/Cernavoda-1 PLiM Multiphase Approach

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<th>Phases</th>
<th>Scope</th>
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<td><strong>Phase 1</strong>&lt;br&gt;PLiM Assessment and Recommendation Program</td>
<td>• Identification of major CSSCs&lt;br&gt;• Aging assessment studies &amp; R&amp;D of critical components&lt;br&gt;• Systems maintenance optimization studies&lt;br&gt;• Technology Watch planning&lt;br&gt;• Advanced technology development</td>
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<td><strong>Phase 2</strong>&lt;br&gt;PLiM Attainment Implementation Program</td>
<td>• CANDU plant specific detailed inspection and residual life assessment of key components&lt;br&gt;• Implementation plant monitoring and surveillance management programs&lt;br&gt;• Enhancement of plant inspection and maintenance&lt;br&gt;• Technology Watch implementation</td>
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<td><strong>Phase 3</strong>&lt;br&gt;PLiM Extension Program</td>
<td>• Replacement component strategies and planning&lt;br&gt;• Assessment of regulatory and safety related design changes for life extension&lt;br&gt;• Rehabilitation / Replacement programs for components identified in CSSC studies or from inspection in plant life attainment program</td>
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The schedule of each Phase are shown in Figure 2 using the in service date of 1983 as the basis. This schedule applies to three original CANDU 6 plants with an in-service date of 1983: Point Lepreau, Gentilly-2, Wolsong-1 and shortly thereafter (1984) the 4th original CANDU 6 Embalse NPP was declared in service. Cernavoda-1 is the 5th original CANDU 6 plant and was put into service on 2 December 1996 (on site activities were started in 1980).

![Figure 2: PLiM Schedule of CANDU 6 NPPs (with 1983 In-service Date)](image)

The paper will describe the elements of an integrated program, the multiphase approach defined for Cernavoda-1 PLiM and some activities including R&D aimed at addressing gaps in knowledge, improving plant monitoring, maintenance, and inspection of critical components (CSSC) and understanding the influence of various factors on service life.
REFERENCES
