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Performance Assessment of Nuclear Knowledge Management Systems



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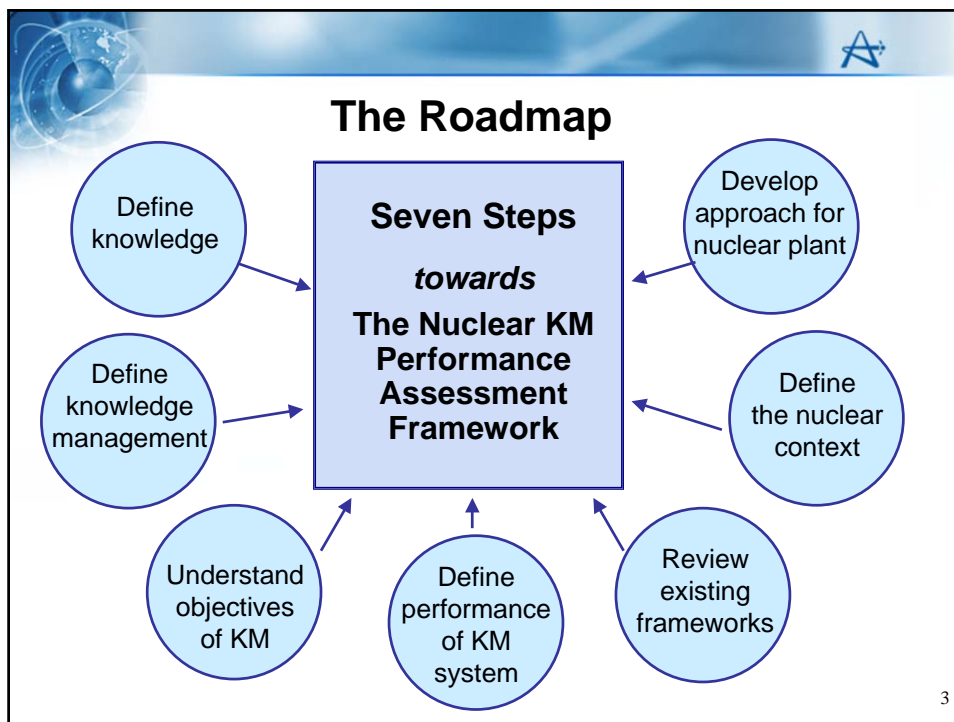
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Presentation Outline

- Knowledge and Knowledge Management
- Performance Assessment of Knowledge Management
- Existing KM Performance Assessment Approaches
- KM in the Nuclear Power Plant (NPP) Context
- Performance Assessment of KM in NPP Context
- AECL Initiatives for KM in CANDU Plants
- Conclusions and Future Work

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Definition of Knowledge:

- *'...information that is contextual, relevant and actionable...'* (Soliman and Youssef, 2003)

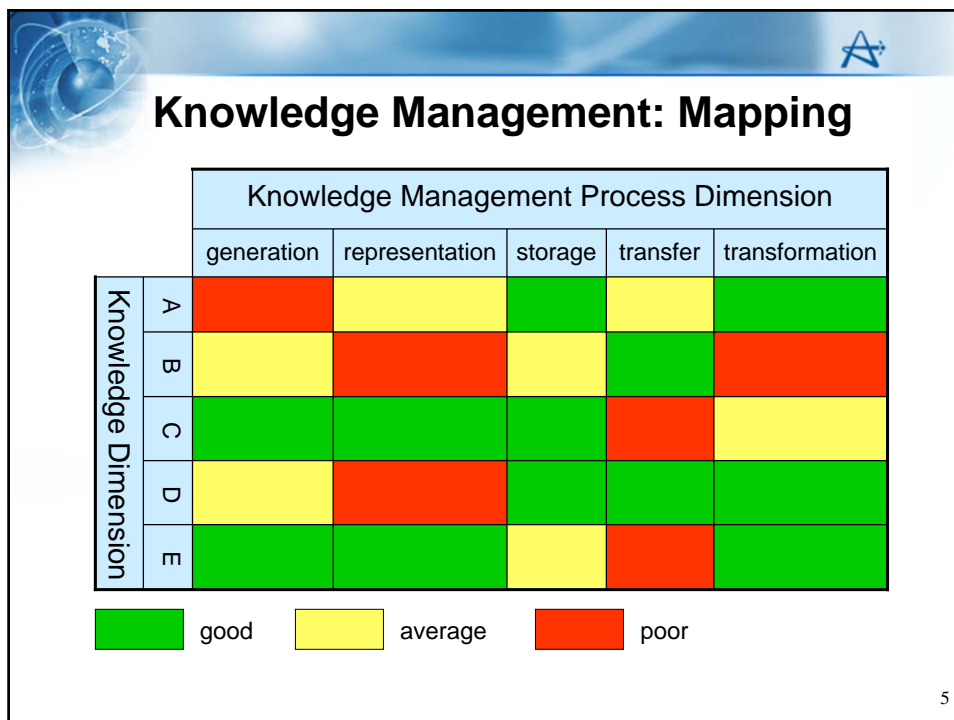
Types of Knowledge:

- A resource or a process (Assudani, 2005), at the individual, group or organization level (Hedlund, 1994), tacit versus explicit (Nonaka and Takeuchi, 1995), factual, conceptual, procedural, metacognitive (Anderson et al., 1998)



Definition of Knowledge Management:

- *'...managing the organization's knowledge through the process of creating, structuring, dissemination and applying it to enhance organizational performance...'* (O'Leary, 1998)

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- Knowledge Management: Objectives**
- Promote creating new knowledge and promote innovation
 - Reduce the cost of being effective and increase the pace of innovation
 - Preserve existing knowledge
 - Reduce the loss of IC from employees who leave
 - Increase collaboration and hence enhance the skill level of employees
 - Increase the productivity of workers by making knowledge accessible to all employees
 - Enable “pro-active” quality culture (knowledge helps staff do the right things, and do them right)
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Performance and Performance Assessment

- Numerous definitions of performance, with some agreement to understand performance as '*the level to which a goal is attained*' (Dwight, 1995)
- Performance assessment or measurement is therefore :
 - '*...the acquisition and analysis of information about the actual attainment of company objectives and plans, and about factors that may influence this attainment...*' (Kerssens-van Drongelen and Cook, 1997);
 - '*...the process of determining how successful organizations or individuals have been in attaining their objectives...*' (Sinclair and Zairi, 1995).

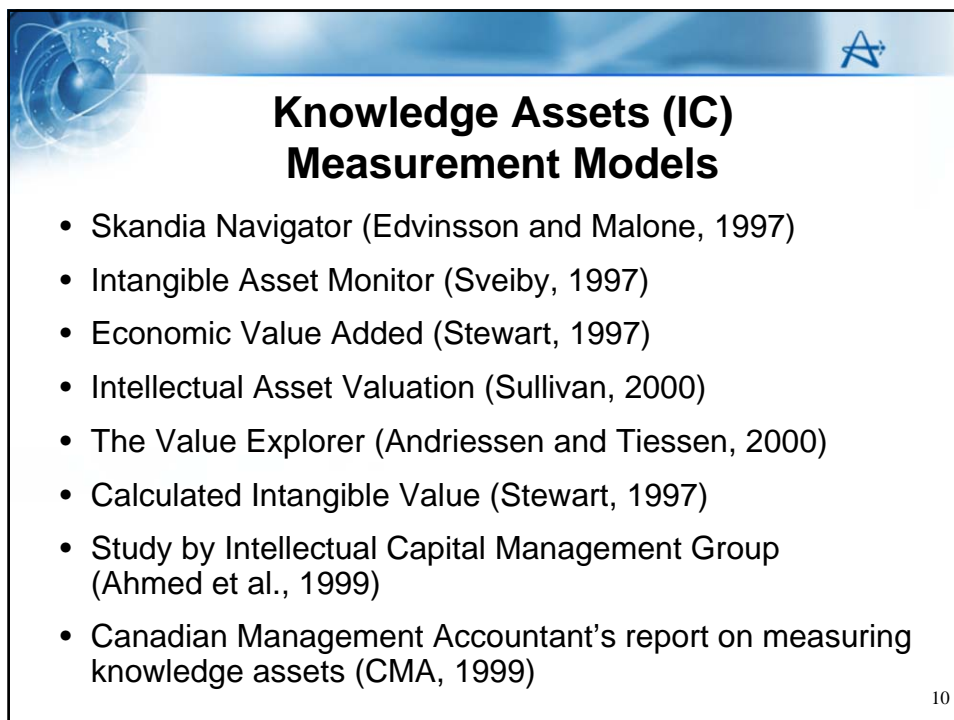
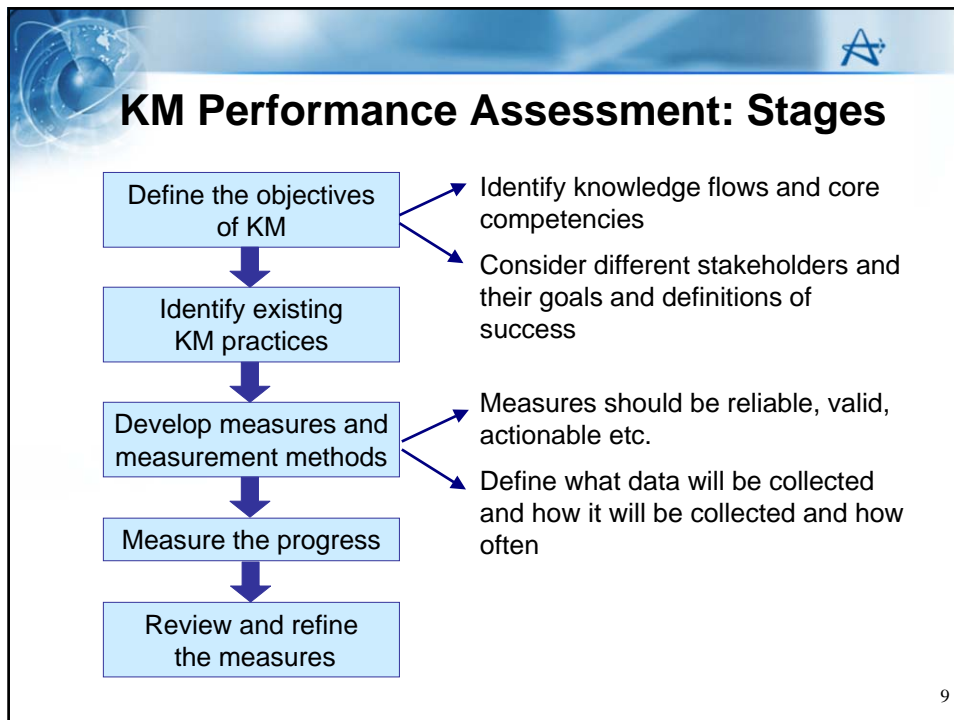
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KM Performance Assessment: Objectives

- Evaluate existing knowledge management practices
- Identify the areas in need of improvement
- Provide vital feedback needed for designing or improving knowledge management system
- Ensure KM supports informed decision making (all levels)
- Support the alignment of knowledge management objectives with corporate strategy and value creation
- Communicate management goals or priorities
- Promote and motivate desired behaviour of employees (motivate knowledge sharing etc.)
- Stimulate learning and innovation

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Example KM Assessment Approaches

- *The Knowledge Management Performance Scorecard* by de Gooijer (2000)
- *Knowledge Management Assessment Tool (KMAT)* by Arthur Andersen
- The International *Most Admired Knowledge Enterprises (MAKE)* Award conducted by Teleos and The KNOW Network
- *Knowledge Management PAS 2001: A Guide to Good Practice* by British Standards Institute
- *Frid Framework™ for Enterprise Knowledge Management* released by Canadian Institute of Knowledge Management
- *KM Roadmap to Success* by American Productivity & Quality Centre
- *Interim KM Standard AS 5037(Int)* issued by KM Standards Australia
- *European Guide to Good Practice in Knowledge Management* by European Standardisation Committee

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The KM Performance Scorecard

- Based on Balanced Scorecard developed by Kaplan and Norton (1996) for assessment of firm's performance
- Adapted for the purpose of knowledge management performance assessment by de Gooijer (2000):
 - *The Knowledge Management Performance Scorecard* maps the objectives for knowledge management across the balanced scorecard's key result areas (financial performance, internal business processes, customers, growth)
 - *The Knowledge Management Behavior Framework* identifies seven levels of knowledge management skills (assessment of how individuals adopt the knowledge management tools)

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Knowledge Management Assessment Tool (KMAT)

- Developed by Arthur Andersen and described by Jager (1999)
- Collaborative and qualitative benchmarking tool for knowledge management performance assessment:
 - Collaborative benchmarking – a group of firms share knowledge about a particular activity, all hoping to improve based upon what they learn
 - Qualitative benchmarking – comparison of processes or practices, instead of numerical outputs
- Five components of the tool: leadership, culture, technology, measurement, and process

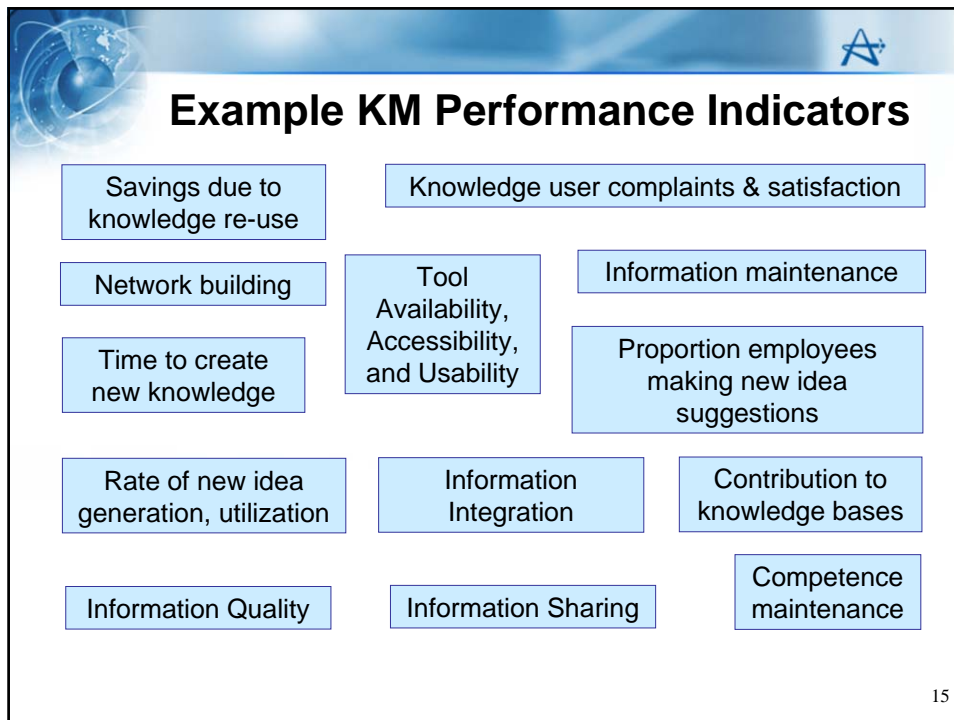
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The Most Admired Knowledge Enterprises (MAKE) Award

- Annual international award for best practice knowledge-driven organizations in Asia, Europe, North America, India and Japan
- Rates companies against eight KM performance dimensions:
 - Creating a corporate knowledge-driven culture
 - Developing knowledge workers through senior management leadership
 - Delivering knowledge-based products/solutions
 - Maximizing enterprise intellectual capital
 - Creating an environment for collaborative knowledge sharing
 - Creating a learning organization
 - Delivering value based on customer knowledge
 - Transforming enterprise knowledge into shareholder value



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Examples Why KM Important to NPPs

- a complex technology base (design and OM&A infrastructure)
- long technology & plant life cycles, high capital intensiveness
- a need for life-cycle asset management strategies that are knowledge-driven (i.e. economic and risk informed decisions)
- dependence on multi-disciplinary technologies, expertise
- competing operational objectives (safety, production, cost)
- an ongoing need for simultaneous and integrated coordination of many complex physical and human systems
- potentially high hazards must be managed to low tolerable risks
- a regulated industry environment (safety, EQ, & NQA compliance)
- configuration management consistency must be maintained between "design basis" and "real plant state" and "documentation"



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Status of KM in Canadian NPPs

- Growing awareness of importance of and dependence on effective KM (aging NPP fleet, attrition rates)
- Growing awareness that KM has many components and should be viewed as a system and managed strategically
- Supporting IS infrastructure and KM tools are diverse and degree of integration improving but limited in some areas
- Utilities not always able to determine effectiveness of KM and to identify key areas in need of improvement
- Process/procedures better aligned to utilize KM system.
- Implementation of IS infrastructure improvements slower than expected due to complexity and diversity of systems

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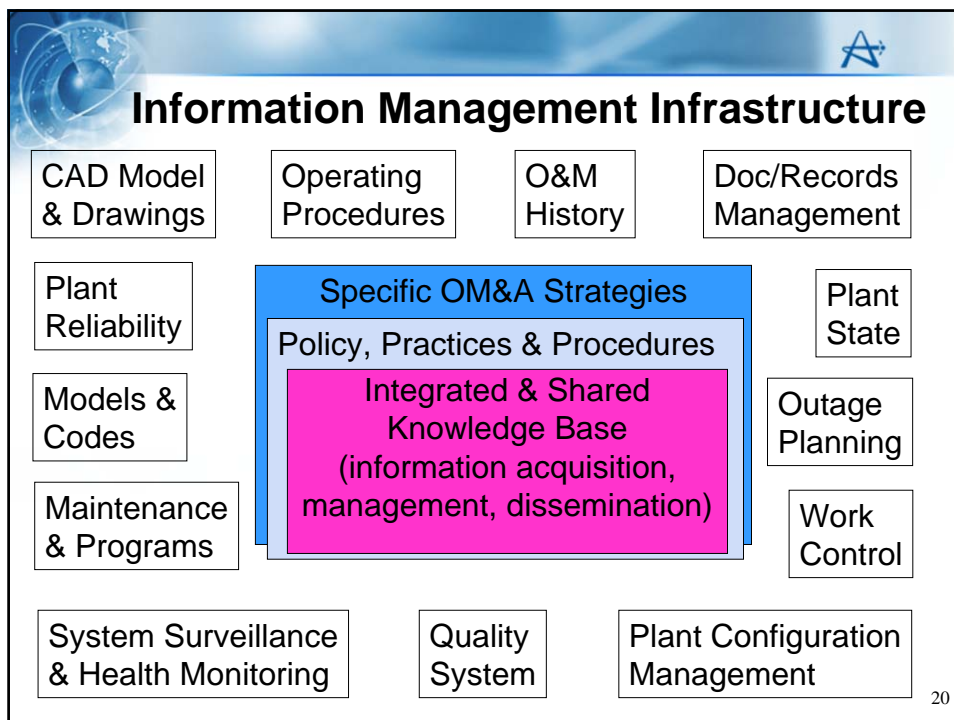
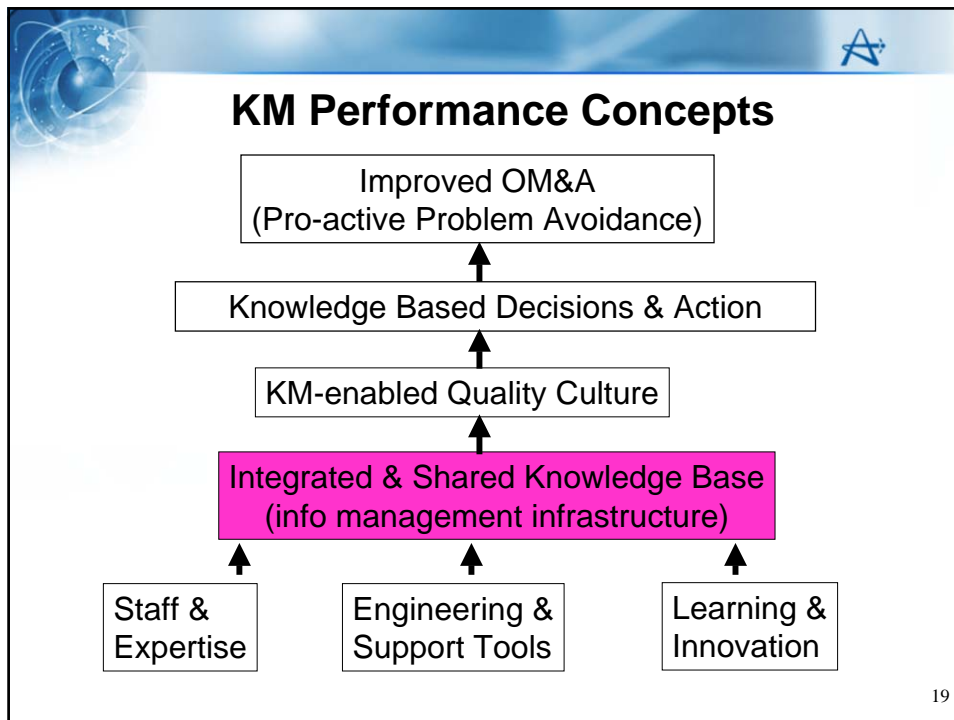


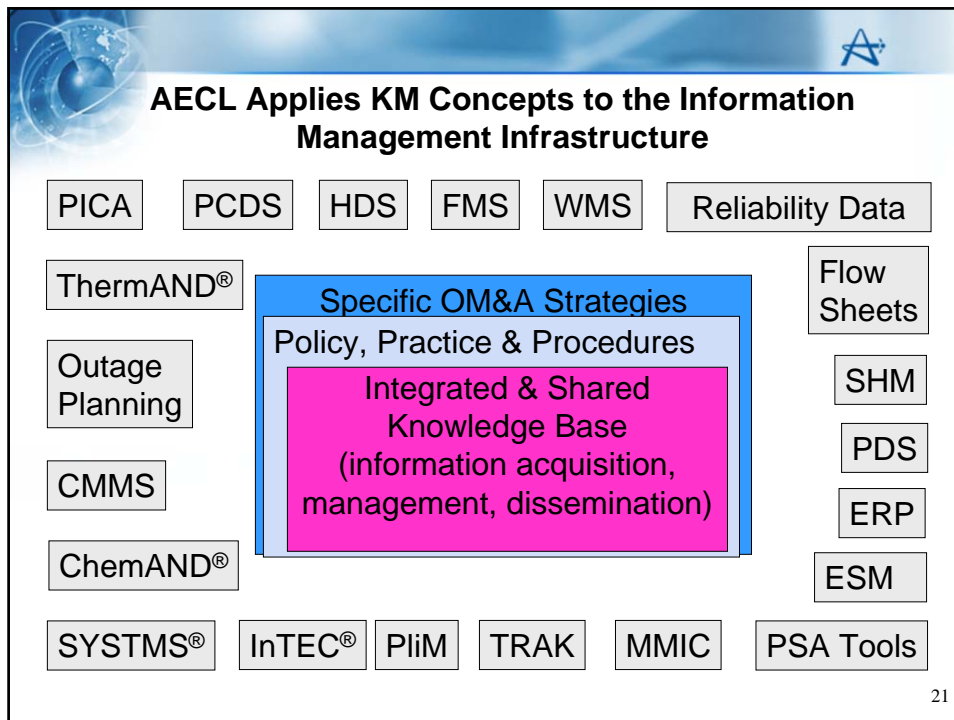
Specific Objectives for CANDU

AECL Working to enhance the “Integrated and Shared Knowledge Base” in our plants:

- Achieve a more integrated support relationship with stations by developing new KM support tools that leverage both designer & utility expertise for O&M
- Enhance Design, EPC&C tools so they can be carried forward into plant operations and maintenance phase
- Develop/deliver new KM tools for in-station O&M use
- Provide guidance/support to establish & maintain an effective KM System (e.g. KM performance assessment initiatives)

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Conclusions & Future Work

- The need to approach to KM in nuclear plants as a strategic corporate system is becoming recognized
- AECL working with plants to improve KM systems
- An NPP KM performance assessment tool is needed
- General KM performance assessment frameworks exist, but these are not tailored to needs of nuclear plants
- We need to look at how they can be adapted for NPPs
- AECL supporting thesis research in this area... currently developing initial NPP KM benchmark survey.

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