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Procurement of Electrical Power Transformers:

Quality assurance of present and future insulation systems

KPN project

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Project idea

- **Objectives:**
  - ✓ Develop test techniques and protocols for ranking and verifying quality and ageing performance of insulating materials and systems to be used for transformers.
  - ✓ Develop basis for diagnostic schemes (GOT) to be used for transformers in service (improve for old, establish for new).
- **What is the significance of this?:**
  - ✓ Establishing a good internationally accepted test standard for paper will protect the end users interests.
  - ✓ High temperature materials will be more extensively used and need to be tested and qualified.
  - ✓ New insulation systems require adjustments and development of diagnostic schemes (GOT).
- **Today's situation:**
  - ✓ No standard exists for thermal endurance of conductor insulating paper.
  - ✓ New environmentally friendly materials with improved thermal properties and reduced flammability
    - ✓ Need for more compact transformers – larger power with same footprint (higher operating temperatures).
    - ✓ Hybrid insulation is less vulnerable for bubble initiated breakdown during overload.
    - ✓ Need for diagnostic schemes and test standards for new systems.
- **Goal for project:**
  - ✓ Establish internationally accepted test methods: from R&D via CIGRÉ to IEC.
  - ✓ Establish improved diagnostic methods for todays transformers.
  - ✓ Establish diagnostic methods for new insulation systems.

Project plan

- **Project activities**:
  - ✓ Establish partitioning curves for ageing markers in old and new insulation systems using existing test rig.
  - ✓ Ageing experiments of combinations of solid/liquid insulations at service relevant temperatures.
  - ✓ Evaluate possibilities and relevance for accelerated ageing tests.
  - ✓ Standardized test protocols for cellulose and new materials.
  - ✓ Collaboration on test method development within CIGRE.
- **Expected results**:
  - ✓ Basis for procurement of compact, high temperature transformers.
  - ✓ Recommended test and diagnostic methods for today's and tomorrow's materials.
- **Project details**:
  - ✓ Duration: 4 years
  - ✓ Budget: 15-20 MNOK with 60% from Research Council
  - ✓ Potential partners: Utilities, manufacturers