CIGRE UK Technical Conference 2025

Report of CIGRE Symposium Montreal and Latest Technical Development in SC A2

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Report of CIGRE Symposium Montreal and Latest Technical Development in SCA2

Content

- A Glance of CIGRE Symposium Montreal
- Highlights in Montreal CIGRE
- Latest Technical Development in SCA2
- Highlights among SCA2 papers

A Glance of CIGRE International Symposium

Montreal, Sep 29 – Oct 3, 2025

- This year's Theme: Grid Enhancement, Strategic Planning, Technological Innovation and Climatic Adaption for Resilient Future Energy Systems
- Supported by 11 Study Committees A1-3, (B1), B2-4, (B5), C1, (C2), C3-6, (D1), (D2)
- EHV & UHV, AC & DC Conferences are part of it
- 600 papers, 86 sessions
- Authors from 46 countries

Rates for CIGRE 2025

	Early bird Rate Until July 18	Regular Rate July 19 - September 1	Late Registration From September 2
CIGRE member	CAN$ 1,210.00	CAN$ 1,460.00	CAN$ 1,860.00
CIGRE non-member	CAN$ 1,550.00	CAN$ 1,850.00	CAN$ 2,250.00
Young engineer (under 35)	CAN$ 900.00	CAN$ 1,000.00	CAN$ 1,400.00
Student	CAN$ 325.00	CAN$ 325.00	CAN$ 325.00

No refund. No name change. Tax excluded.

Host: Hydro Québec

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A Glance of CIGRE International Symposium

Montreal, Sep 29 – Oct 3, 2025

- 6 Panels
  - ✓ **Business panel**
  - ✓ **CEO panel**
  - ✓ **CTO panel**
  - ✓ **Regulatory panel**
  - ✓ **Women in Energy panel**
  - ✓ **NGN panel**
- 11 Tutorials
- 7 Workshops
- 126 exhibitor booths
- 2 Technical Visits : Hydro power station, IREQ

Host: Hydro Québec

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Highlights of CIGRE International Symposium

Montreal, Sep 29 – Oct 3, 2025

- Conference Dinner
- Technical Visit
- 23 papers from the UK or with co-authors from the UK
- More than 10 participants from the UK

Host: Hydro Québec

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Latest Technical Development in SCA2

Montreal, Sep 29 – Oct 3, 2025

- Two A2 tutorials
  - ✓ **Guide on Transformer Maintenance**
  - ✓ **Effect of DC Bias on Power Transformers, Influence of Geomagnetically Induced Currents on Grid Operation**

- Seven A2 sessions with 53 papers
  - ✓ **A2-1 Renewable Energy Applications**
  - ✓ **A2-2 Asset Management**
  - ✓ **A2-3 Artificial Intelligence and Digitalization**
  - ✓ **A2-4 Arc Fault Containment**
  - ✓ **A2-5 Materials and Environment**
  - ✓ **A2-6 Monitoring, Testing and Diagnostics**
  - ✓ **A2-7 Modelling**

Host: Hydro Québec

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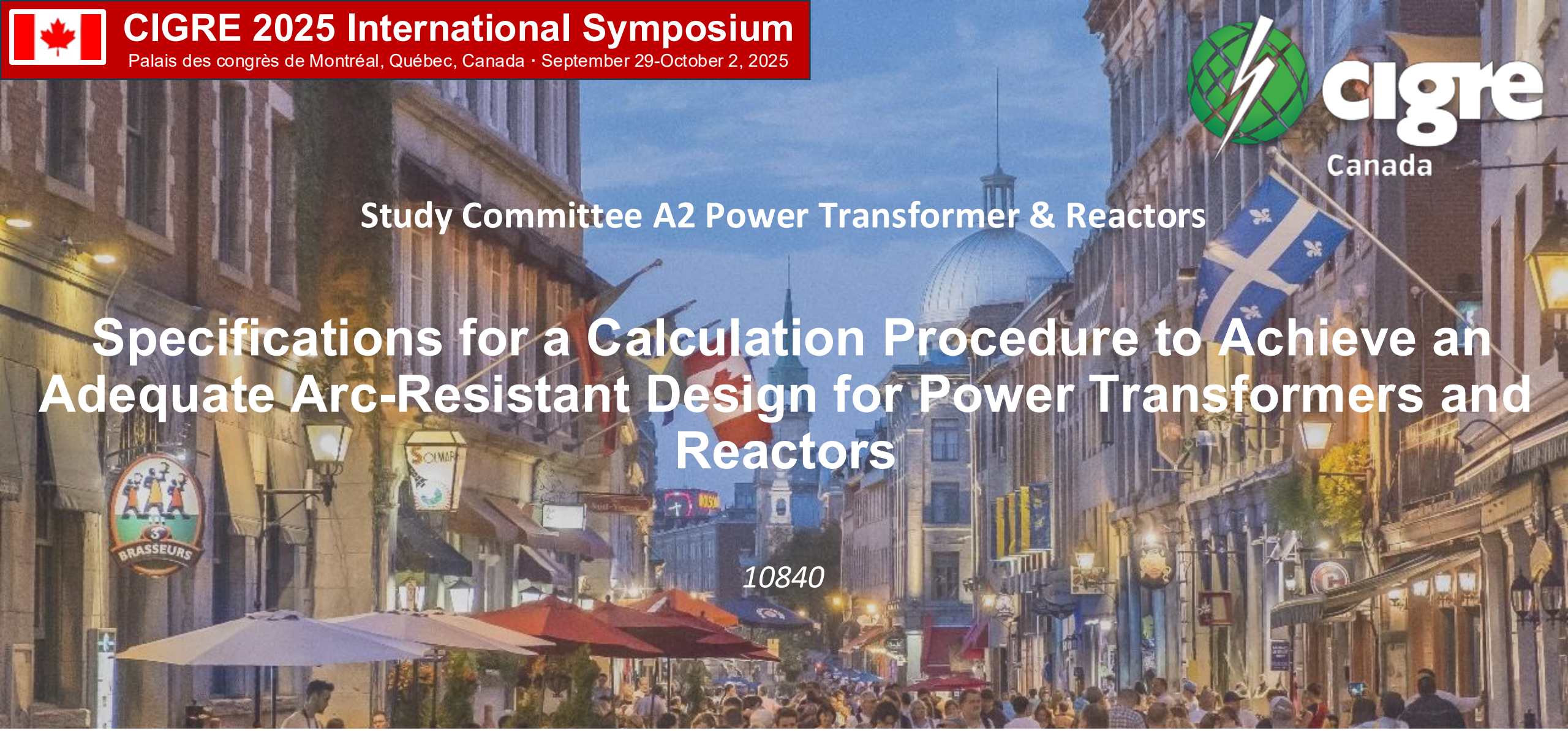
CIGRE 2025 International Symposium
Palais des congrès de Montréal, Québec, Canada · September 29-October 2, 2025



Study Committee A2 Power Transformer & Reactors

Specifications for a Calculation Procedure to Achieve an Adequate Arc-Resistant Design for Power Transformers and Reactors

10840

The University of Manchester

Summary of paper 10813 in A2-5 Materials and Environment Session

Arc resistance specifications for power transformers were introduced in 2007, formulated in response to low-impedance internal arcing events and aimed at preventing tank rupture.

Table I: Design energy levels

Voltage class (kV)	72.5	145-170	245	330-765
Design energy E (MJ)	2	4	8	20

$$P_d = F \cdot P_s + P_h$$

$$P_d = F\left[100\sqrt{\frac{1}{4}+\frac{kE_{arc}}{100C}}-50\right] \rightarrow P_s = 100 \cdot \sqrt{0.25+\frac{5.6\cdot 10^{-6}\cdot E_{arc}}{C}}-50$$

refinements to the design pressure equation

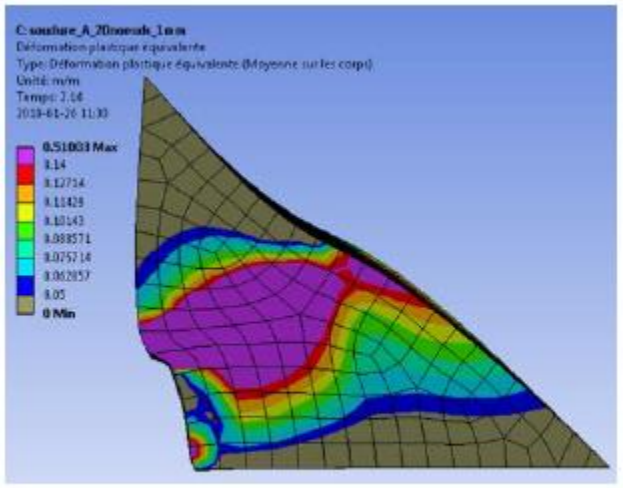


Figure 8: Example of the attainment of rupture in a weld

The rupture criterion used is based on a strain-based approach, predicting failure when the equivalent plastic strain exceeds the ultimate plastic strain over a specified area.

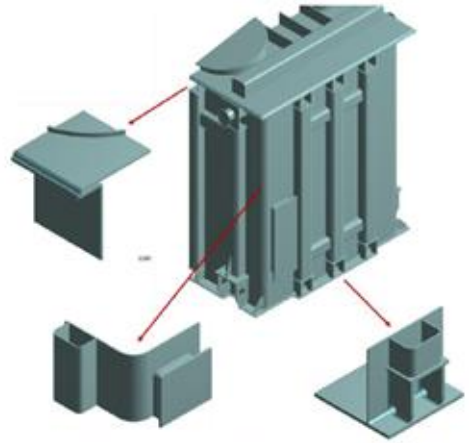


Figure 3: Relationship between a global model and possible submodels

The updated arc-resistant specification aims to standardize practices among manufacturers and provide utilities with a means to validate arc-resistant designs !

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Study Committee A2 Power Transformer & Reactors

Standard Approach Towards Power Transformers' Sustainability through a Joint Industrial Project

10813

MANCHESTER 1824
The University of Manchester

Summary of paper 10840 in A2-4 Arc Fault Containment Session

This paper introduced a joint project by multiple tens industrial partners including OEM, material providers and component providers, to develop a standard approach to quantify sustainability of transformer products, carbon footprint, water consumption, recycle, lifetime, social responsibility aspects are all considered by this project. The discussion has touched on if the environmental impact will be included into the total ownership calculation in the future.

- Highlight the importance of adhering to relevant standards, such as the 14067 standard for reporting approaches,
- Emphasize the importance to create clear process for data collection, calculation, and validation methodologies for life cycle inventories (LCI) and life cycle impact assessments (LCIA)
- Emphasize the importance of considering realistic best and worst-case scenarios when interpretating & scoring LCA results.

Table 2 – controversial topics

Topic / Term	Potential Challenge	DNV Guidance
Functional Unit (40-year RSL)	Not all transformers operate for 40 years; some OEMs might prefer different baselines.	Mandated as a default benchmark. Deviations must be declared and justified.
System Boundaries	Disagreement over what's "in scope" — e.g., auxiliary systems, packaging.	Must cover full EN 15804+A2 stages. Substation-level connections are excluded.
Data Quality and Primary Data	Not all suppliers have access to high-quality primary data or third-party verification.	Use primary data where possible. Else, use justified secondary sources with traceable metadata. Incentives for verification in tenders.

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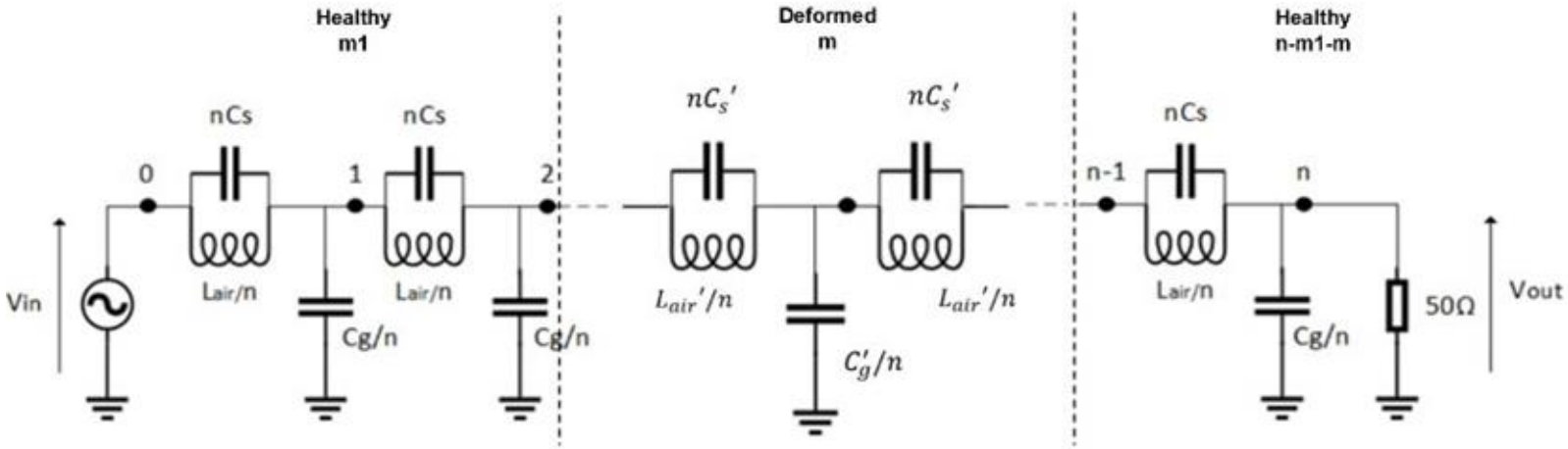
Study Committee A2 Power Transformer & Reactors

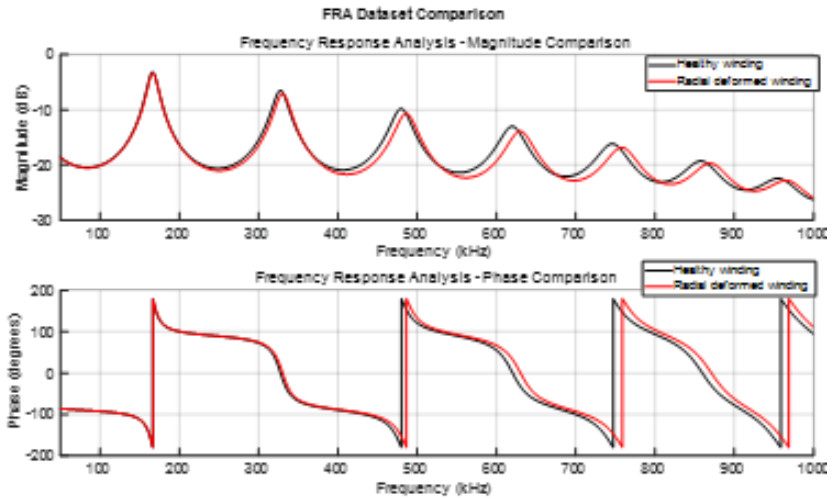
Analytical Derivations and Physics-based Modelling of a Deformed Winding and its FRA features

10905

MANCHESTER 1824
The University of Manchester

Summary of paper 10905 in A2-7 Modelling Session





$$f_k' = \frac{1}{2\pi\sqrt{L_{air}C_s}} \frac{1}{\sqrt{1+\frac{(1+D)^2 * a^2}{(k\pi)^2}}}$$

Resonant Frequencies

$$f_{ok}' = \frac{1}{2\pi\sqrt{L_{air}C_s}} \frac{1}{\sqrt{1+\frac{(1+D)^2 * a^2}{\left(\frac{2k-1}{2}\pi\right)^2}}}$$

Quasi- Anti- Resonant Frequencies

Winding Deformation Factor: $D = \frac{m}{n} * (P_r - 1)$

- $\frac{m}{n}$ represents the deformation length
- $(P_r - 1)$ represents the deformation severity

Spacing Coefficient: $a = \sqrt{\frac{C_s}{C_g}}$

- Related the winding type

Order of Resonances: k

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