

ENARD: RESULTS FROM THE FIRST 5 YEAR TERM OF INTERNATIONAL COLLABORATION IN ELECTRICITY NETWORKS

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ABSTRACT

The paper reports on the results and emerging policy messages to arise from ENARD, the IEA Implementing Agreement on Electricity Networks Analysis, Research and Development, through to early 2011, some 4½ years into its initial 5 year Term. During the 4½ years to date ENARD has delivered on all its key objectives, its membership has grown from 8 to 14 countries, three new Annexes have been established and the essential role of the Agreement has been recognised, in relation to the provision of timely, authoritative and unbiased information and advice to governments and regulatory bodies.

INTRODUCTION

The International Energy Agency (IEA) acts as energy policy advisor to its twenty eight OECD and associated member countries in Australasia, Europe and North America. Energy technology collaboration is pursued via a framework of more than forty “Implementing Agreements”, which enable experts from different countries to optimise R&D investment by working jointly on RD&D and information collation and dissemination [1].

The crucial role of electricity transmission and distribution (T&D) networks in the delivery of energy policy objectives was recognized via the establishment of ENARD, as the IEA Implementing Agreement on Electricity Networks Analysis, Research & Development, July 2006. Previous CIRE D papers, 2007 and 2009, have reported on ENARD’s developing programme-of-work [2,3]; the present paper reports on some of the key findings and emerging policy messages, towards the end of ENARD’s initial 5 year Term, as originally proposed.

ENARD

ENARD’s vision is to facilitate the uptake of new operating procedures, architectures, methodologies and technologies in electricity T&D networks, such as to enhance their overall performance in relation to the developing challenges of the “3Rs” of electrical power systems development, namely network Renewal, Renewables integration and network resilience, Figure 1.

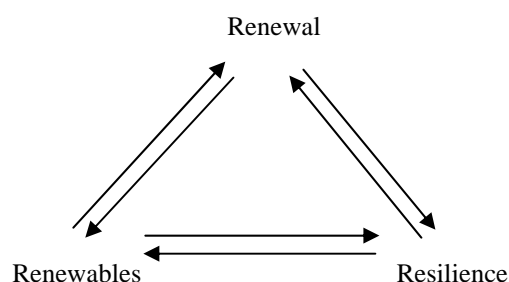


Figure 1: The 3Rs of Electrical Power Systems Development

A key objective of ENARD, from its very outset, was to create an intensified level of awareness amongst policy makers and decision makers of the importance of electricity networks in meeting energy policy objectives, the challenges to be addressed and the work in-hand, on a truly international basis, to address these. ENARD therefore provides a major international forum for information exchange, in-depth research, analysis and collaborative research and development (R&D), in support of this objective.

Organisational and Management Structure

Overall management responsibility for the Implementing Agreement is vested in an Executive Committee (ExCo), comprising representatives from each of the participating countries. The ExCo is responsible for overseeing the work within individual operational Annexes and for the ongoing strategic development of the Implementing Agreement. The ExCo works within the terms of a 5 year Strategic Plan and is also responsible for approving a Programme-of-Work, on a rolling annual basis [4,5]. A dedicated Secretariat supports the ExCo in the discharge of its duties. The ExCo reports upwards within the IEA’s management structure, via the End Use Working Party (EUWP), to the Committee on Energy Research and Technology (CERT), with the activities of ENARD and a number of complementary Implementing Agreements also being co-ordinated under the auspices of the IEA’s Electricity Co-ordination Group (ECG). It is the CERT which, via the IEA’s Governing

Board, ultimately provides high level policy advice to the OECD member countries and to the G8 [6].

ENARD was developed from the outset with the organizational and operational structure of a multiple Annex Implementing Agreement, Figure 2, with the provision for a series of discrete Annexes (or projects), to address particular areas of interest, within the overall structure of the Implementing Agreement.

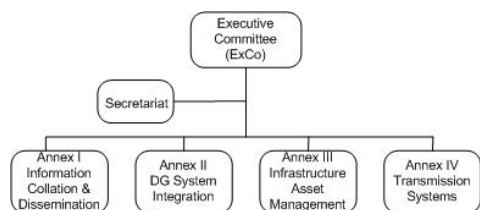


Figure 2: Organisational & Management Structure

To date, ENARD has succeeded in establishing the bases for a further three Annexes, over and above Annex I, which represents the original and ongoing Annex on Information Collation and Dissemination.

Membership and Participation

Membership of the Implementing Agreement is on a national basis. Each participating country is represented on the ExCo by a Delegate and/or Alternate, and with one voting right per participating country. At time of writing, January 2011, fourteen countries are participating in ENARD, namely Austria, Belgium, Denmark, Finland, France, Italy, Netherlands, Norway, South Africa, Spain, Sweden, Switzerland, UK and USA.

All ENARD participating countries participate in Annex I and also support the ENARD Secretariat. Thereafter, participation in the subsequent Annexes is entirely at the discretion of the participating countries, with the various operational Annexes therefore having their own discrete make-up of participants. Individual countries designate specific entities, or “National Experts” to participate in the individual operational Annexes.

ANNEX I – INFORMATION COLLATION AND DISSEMINATION

Annex I serves as the central information exchange forum and with all member countries participating. It also crucially serves as the definition Annex for the development of the associated series of follow-on R&D Annexes.

Responsibility for the delivery of the Annex I work programme is vested in the Annex I Operating Agent (EA Technology, UK), who works in close collaboration with the series of Annex I National Co-ordinators, as designated by the participating countries.

Annex I discharges an essential and central role within the operation of the overall Implementing Agreement, principally via its information sub-task activities and via the organisation and delivery of an ongoing series of topical Workshops, and with further supporting activities in terms of representation, outreach and general communication.

ANNEX II – DG SYSTEM INTEGRATION

A major consideration in the development of Annex II was to address the challenges associated with accommodating a very significant penetration of Distributed Energy Resources (DER) as Distributed Generation and, in particular, in facilitating the transition from today’s passive distribution networks into the active distribution networks of tomorrow.

The scope of Annex II is to address DG system integration into low and medium voltage networks including technical, economical, organizational and regulatory aspects. AIT, Austria, discharges the Annex II Operating Agent role.

ANNEX III – INFRASTRUCTURE ASSET MANAGEMENT

Annex III was established following on from the joint ENARD/CIRED Workshop, held May 2007, on the theme of Managing an Ageing Infrastructure. It addresses the challenges associated with the management of increasingly ageing T&D asset bases within the participating countries and beyond, via the exchange of information and data in relation to the ageing, degradation, failure and end-of-life characteristics of the asset base and the complementary development of new asset management techniques and methodologies. EA Technology (UK) discharges the Annex III Operating Agency role.

ANNEX IV – TRANSMISSION SYSTEMS

Annex IV was formally adopted by the ENARD ExCo, September 2008, with the aim of establishing a long term vision for developments in transmission systems beyond 2020. Annex IV addresses the main barriers towards the necessary development of transmission capacity, with the objective of identifying the most promising solutions in relation to both current and anticipated operational, planning, technological and market requirements. Annex IV also aims to address the specific R&D activities required, for the realisation of its vision. The Annex takes an overall system view, with transmission considered within the context of the wider electricity system as a whole and as a key enabler in the efficient operation of generation resources in a well functioning electricity market. SINTEF Energy Research (Norway) and RSE SpA (Italy) jointly discharge the Annex IV Operating Agency.

INFORMATION DISSEMINATION

Information Dissemination is handled via a number of mechanisms and means, with details of the principal dissemination pathways being described below. The ENARD web-site, www.iea-enard.org, serves as the principal public facing dissemination outlet for ENARD's various publications and outputs.

Topical Series of Annex I Workshops

As previously noted, a particular feature of Annex I has been the organizational and delivery of a series of topical Workshops, with 9 such Workshops having been organized and delivered to date. The Workshops have usually been held over a period of one and a half days and have comprised a series of presentations from recognized industry/policy/research leaders, followed by open discussion and debate. The Workshops have intentionally been open to all those with an informed professional interest in the field and have typically attracted a participant base of some 40 to 50 persons, drawn from the ENARD participating countries and beyond.

Full sets of Proceedings have been documented for these Workshops and with copies of the majority of these now posted on the ENARD web-site.

Joint ENARD/IEA Grid Policy Workshop "Electricity Grids – a key enabler in the delivery of a sustainable energy policy"

This joint ENARD/IEA Grid Policy Workshop was organized and delivered as the major public facing dissemination event, in ENARD's present 5 year Term. The Workshop, held in Paris, France, April 2010, was attended by 85 delegates from 19 countries, and provided a series of high level regional perspectives on the crucial importance of electricity networks and presented the emerging policy messages and highlights, from ENARD's first 4 years of operation.

Crucially, the workshop stimulated discussion in terms of the future role and development of electricity networks, in meeting energy policy and sustainable economic development objectives. The conclusions and recommendations have now been carried forward, as inputs to the development and formulation of ENARD's proposed follow-on 5 year Term.

The complementary Workshop publication [7] has been made available in both printed form and, in electronic form, via the ENARD web-site.

Publications

ENARD's principal publications in the public domain are as described below.

Workshop Profiles and Topical Briefing Sheets

A series of Workshop summary profiles and topical briefing sheets have been developed and published in the public domain, via the ENARD web-site. The individual Workshop profiles relate to the nine topical Annex I Workshops, as described above. The topical briefing sheets address a series of specific T&D network related issues, of interest to ENARD's key stakeholder groups.

Reports

Selected reports and associated publications have also been published in the public domain, via the ENARD web-site, with further publications anticipated, as the individual Annexes progress through to the completion of their respective work programmes.

Newsletter

The ENARD Newsletter is produced on a twice yearly basis and distributed via electronic mailings, to an ever growing circulation list. It is also posted on the ENARD web-site.

EMERGING HIGH LEVEL POLICY MESSAGES

Over the past 4½ years, ENARD has established itself as an authoritative source of unbiased information, data and advice on electricity network issues and, as such, has developed a close working relationship with its individual national participants, the IEA Secretariat and various industry and associated forums.

The ongoing work programme activities within its series of operational Annexes have already produced various specific conclusions and recommendations in their respective areas.

Various high level policy messages have also emerged from the overall programme-of-work, complementing and supporting the Annex specific findings. The more significant of these are now identified as below, for consideration and use by appropriate senior level personnel within governments, policy making bodies, regulators, the electricity industry and its associated power engineering supply base.

- The crucial and essential role of electricity networks in meeting overall energy policy objectives has been clearly identified by the work to date and due consideration should be given to this, within the development of overall energy policies.

- There is an associated clear requirement for investment in the future development, operation and management of networks to accommodate a significant proportion of variable renewable generating resources, particularly wind power.

- Electricity networks play a crucial and essential role in the realization of electricity market and trading arrangements, with consequential large scale societal benefits.

- Such requirements to accommodate and facilitate the trading of electricity, extend well beyond the previous purely functional design brief of electricity networks and systems and this must be recognized and properly addressed, in their future planning and development.

- It is anticipated that a significant new generation of “active” consumers (“prosumers”) will emerge, who will routinely generate (produce) electricity at the household level and increasingly adopt a new generation of “smart” appliances and electric vehicles, which will impose consequential demands on electricity networks to accommodate and facilitate such developments.

- There is a clear role for the development of a complementary utilization base, via a policy of “intelligent electrification”.

- The effective management of the variability, associated with renewable generation resources, will increasingly require the adoption of a truly holistic approach, with a combination of solutions methodologies and technologies being deployed, as appropriate.

- There is a crucial role for the development, adoption and implementation of a suite of new technologies and operational measures, in order to satisfy the demands for the efficient and reliable future development of electricity systems.

- The development of electrical energy storage systems, HVDC, FACTS and electric vehicles are all likely to play a significant role in satisfying the requirement for such new technologies.

- Various specific market and regulatory challenges must be addressed, in order to fully realize and exploit the potential of such solutions methodologies and technologies.

- Notwithstanding such developments as described above, the associated challenge of operating, maintaining and renewing an ageing T&D network asset base, whilst still maintaining quality and security of supply, must be properly addressed in the coming years.

- The adoption of risk based approaches, to effectively manage and address risk has the potential to make a significant contribution to the optimization of investment in network asset management.

FUTURE DEVELOPMENTS

At time of writing, ENARD is some 4½ years into its initial 5 year Term, as originally proposed. For administrative reasons, in relation to the management of the wider portfolio of Implementing Agreements as a whole at the IEA Secretariat, this initial Term has now been extended by 7 months, to run through to February 2012.

The ENARD ExCo is therefore presently considering the development of a new Strategic Plan, to cover ENARD’s proposed follow-on 5 year Term, as to be formally requested via the IEA Secretariat. The ENARD ExCo has also welcomed the development of the International Smart Grids Action Network (ISGAN), within the framework of IEA Implementing Agreements and, as such, is currently exploring the most appropriate options for engagement with this initiative.

ACKNOWLEDGEMENT

The support of the ENARD ExCo is acknowledged in the preparation of this paper. ENARD functions within a framework created by the International Energy Agency. The views, findings and publications of ENARD do not necessarily represent the views or policies of the IEA Secretariat or of all its individual member countries.

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