2018 ANNUAL REPORT

INDUSTRIAL ENERGY-RELATED TECHNOLOGIES AND SYSTEMS

A TECHNOLOGY COLLABORATION PROGRAMME UNDER THE AUSPICES OF THE INTERNATIONAL ENERGY AGENCY

IETS EXECUTIVE COMMITTEE SECRETARIAT 2019

INTERNATIONAL ENERGY AGENCY, IEA

BACKGROUND

Founded in 1974, the IEA was initially designed to help countries co-ordinate a collective response to major disruptions in the supply of oil, such as the crisis of 1973/4. While this remains a key aspect of its work, the IEA has evolved and expanded significantly.

The IEA examines the full spectrum of energy issues including oil, gas and coal supply and demand, renewable energy technologies, electricity markets, energy efficiency, access to energy, demand side management and much more. Through its work, the IEA advocates policies that will enhance the reliability, affordability and sustainability of energy in its 30 member countries and beyond.

Today, the IEA is at the heart of global dialogue on energy, providing authoritative analysis through a wide range of publications, including the flagship *World Energy Outlook* and the *IEA Market Reports*; data and statistics, such as Key World Energy Statistics and the Monthly Oil Data Service; and a series of training and capacity building workshops, presentations, and resources.

The four main areas of IEA focus are:

- Energy Security: Promoting diversity, efficiency, flexibility and reliability for all fuels and energy sources;
- Economic Development: Supporting free markets to foster economic growth and eliminate energy poverty;
- Environmental Awareness: Analysing policy options to offset the impact of energy production and use on the environment, especially for tackling climate change and air pollution; and
- Engagement Worldwide: Working closely with partner countries, especially major emerging economies, to find solutions to shared energy and environmental concerns.

INTERNATIONAL COLLABORATION THROUGH TECHNOLOGY COLLABORATION PROGRAMMES (TCP:S)

Through the Technology Collaboration Programme, the IEA provides a framework for international collaborative energy research, development and demonstration projects. It enables experts from different countries to work collectively and share results, which are usually published.

The IEA Technology Collaboration Programme is open to both IEA member and non-member countries. Typically, participants are governmental or energy technology entities representing governments, research institutes and universities, energy technology companies, and industry.

The breadth of the analytical expertise in the IEA Technology Collaboration Programmes (TCPs) is a unique asset to the global transition to a cleaner energy future.

To date, participants in the TCPs have examined around 2 000 energy-related topics, and carried out projects on socio-economic aspects of technology deployment, research to reduce greenhouse gas emissions, advancing demonstration of innovative energy technologies, contributing to benchmarks and international standards, and sharing information through hundreds of expert stakeholder events.

The TCPs involve over 6 000 experts worldwide who represent nearly 300 public and private organisations located in 55 countries, including a large participation by IEA Association countries, such as China, India and Brazil.

IETS – INDUSTRIAL ENERGY-RELATED TECHNOLOGIES AND SYSTEMS

IETS is a Technology Collaboration Programme dealing with new industrial energy-related technologies and systems. IETS was established in 2005 as the result of merging, revamping, and extending activities formerly carried out by a number of separate industrial IEA programmes: Process Integration, Pulp and Paper, Heat Exchangers and Heat Transfer. This was done to facilitate development of both industry-specific as well as cross-cutting technologies, and to ease participation by countries in a broad range of industrial areas.

The mission of IETS is to foster international cooperation among OECD and non-OECD countries for accelerated research and technology development of industrial energy-related technologies and systems. In doing so, IETS seeks to enhance knowledge and facilitate deployment of cost-effective new industrial technologies and system layouts that enable increased productivity and better product quality while improving energy efficiency and sustainability.

IETS will be evolving continuously with the aim to include a range of energy-intensive sectors, such as iron and steel, cement, non-metallic materials, aluminum, petrochemicals, chemicals and food, as well as manufacturing industries, and small and medium-sized enterprises.

Through its activities, the IETS TCP will increase awareness of technology and energy efficiency opportunities in industry, contribute to synergy between different systems and technologies, and enhance international cooperation related to sustainable development.

Additional information about IETS and its different activities can be found on the IETS website: www.iea-industry.org.

IETS WORK

The principal work of IETS is about identifying, observing, following and sharing work among countries and their organisations and industry clusters. This is done through defined projects, so called Annexes, in which experts from countries who choose to take part form a working group with an Annex Manager (also called Operating Agent in other IEA TCPs) in charge of coordinating.

As of December 2018, the IETS TCP had the following on-going Annexes (read more about them and their specific activities later in this report):

- Annex XI: Industry-based Biorefineries
- Annex XIV: Energy-efficiency in the Iron and Steel Industry
- Annex XV: Industrial Excess Heat Recovery – Technologies and Applications
- Annex XVI: Energy Efficiency in Small and Medium Enterprises (SMEs)
- Annex XVII: Membrane Processes in Biorefineries
- Annex XVIII: Digitalization, Artificial Intelligence and Related Technologies for Energy Efficiency and GHG Emissions Reduction in Industry

In addition, preparations were made for starting Annex XIX Electrification in Industry early 2019.

The work of IETS is continuously proceeding and new Annexes are developing in order to meet the arising needs of the IETS members. The IETS ExCo has recently taken the strategic decision to start more long-standing annexes and continuously add new tasks to existing ones.

IETS MEMBER COUNTRIES AND SPONSORS

As of December 2018, the IETS TCP Member Countries and Contracting Parties were the following:

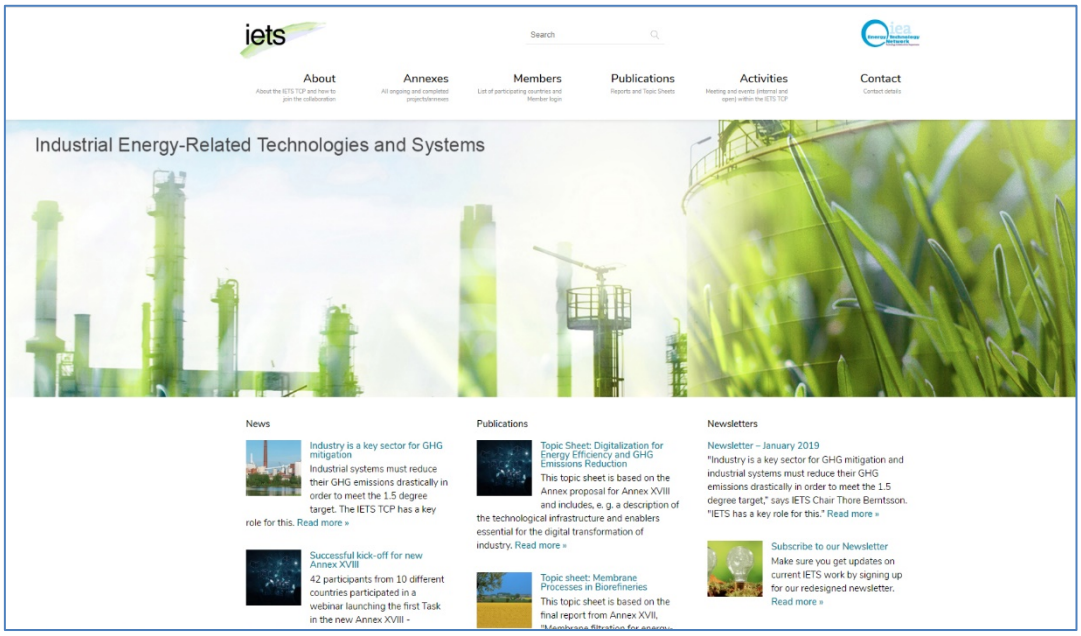
- Austria: Climate and Energy Fund of the Austrian Federal Government
- Canada: Natural Resources Canada (NRCan)
- Denmark: Danish Energy Agency
- France: ADEME - Agence de l'Environnement et de la Maîtrise de l'Énergie
- Germany: Forschungszentrum Jülich GmbH
- Netherlands: RVO Netherlands Enterprise Agency
- Norway: ENOVA SF
- Portugal: Instituto Superior Técnico, Technical University of Lisbon
- Sweden: Swedish Energy Agency
- United States: U.S. Department of Energy

The following organizations are Sponsors to the IETS TCP, i.e. they can participate in Annex Work and ExCo meetings but without the right to vote:

- Ricerca sul Sistema Energetico S.p.A. (RSE), Italy
- EURAC Research, Italy
- Universidad de la Costa, Colombia
- Central Research Institute of Electric Power Industry, Japan
- Limerick Institute of Technology, Ireland

WEBSITE: WWW.IEA-IDUSTRY.ORG

In June 2018, a new website was launched, focusing on the IETS projects, findings and collaboration activities. The website consists of an official layer containing background information about IETS, descriptions of Annexes, procedures for participation, lists of events, and publications for downloading.



The IETS website is also the forum for material being internally shared between participants within the TCP. There is a specific password protected section for the ExCo delegates through which meeting agendas, documents and minutes are shared. The IETS Secretariat acts as the webmaster, being responsible for general updates.

HIGHLIGHTS 2018

IETS is the only TCP exclusively for the industrial sector, and there is a big scope for further development. The industrial sector is one of the main sectors with enormous opportunities for energy efficiency, GHG abatement, sustainable power production, and more sustainable raw materials/products. It is well known that industrial energy savings are among the most cost efficient ways to reduce GHG emissions.

ATTRACTING NEW MEMBERS

During 2018, Canada and France have joined the IETS TCP as full members and the following five organizations have joined the collaboration as sponsors:

- Ricerca sul Sistema Energetico S.p.A. (RSE), Italy
- EURAC Research, Italy
- Universidad de la Costa, Colombia
- Central Research Institute of Electric Power Industry, Japan
- Limerick Institute of Technology, Ireland

Discussions about joining the IETS TCP are currently ongoing with representatives from both individual organizations and potential new member countries.

THE IMPORTANCE OF NETWORKS

The visibility of IETS is also important in the member countries to enhance the cooperative aspect internally. As a TCP covering all kinds of industrial activities, implementing National Support Groups (NSGs) on the ExCo level provides delegates with a broader platform for discussions and dissemination nationally. In general, the idea with an NSG is its evaluating and advising function when it comes to assisting the country's ExCo representative in responding to inquiries of different character from the IETS Chair, Secretariat and the ExCo as the decision-making body if IETS. The NSG network is also important for the future work of IETS as it can enhance and spread the knowledge about IETS in relevant contexts in the IETS member countries and thus contribute to the concrete as well as overall strategic development of the IETS.

Reporting from the National Support Groups is a standing item on the Agenda for each ExCo meeting.

THE MATRIX

Since 2013 the IETS TCP has been mapping areas of interest and industry initiatives in the IETS Member countries respectively, resulting in a general picture of the sectors with most activities on one hand, and technology areas on the other. This compilation of these fields of interest, shared by several IETS Member countries, is now referred to as the Matrix.

The Matrix is continuously updated and is now used as a tool to identify areas of specific interest to the IETS TCP in order to start new activities.

CHANGES OF MEMBERS AND DELEGATES

Canada and France have joined the IETS TCP and Belgium has formally withdrawn.

Germany has a new alternate delegate, i. e. Gordon Kaußen from Forschungszentrum Jülich GmbH.

For a complete list of delegates and alternates, please refer to page 24.

COMMUNICATION

A new website, with a more user-friendly structure as well as a more modern look-and-feel, was launched in June 2018. The new IETS website was well received and attracted about 1400 visitors from all over the world during the time period 15 June – 31 December.

The IETS website is continuously updated with current information, e.g., regarding activities in and status updates from Annex work, seminars and conferences, news and new publications. Short summaries of the ExCo meeting minutes are also posted at the website.

During 2018, the ITS Secretariat has started producing fact sheets on important and relevant topics, based on Annex reports, workshop summaries etc. The following Topic Sheets have been produced and published, so far:

- No 1: Energy Efficiency in SMEs, based on the IETS Annex XVI article International study on energy end-use data among industrial SMEs (small and medium-sized enterprises) and energy end-use efficiency improvement opportunities, published by Patrik Thollander et al. in Journal of Cleaner Production 104 (2015) 282-296.
- No 2: The Role of Process Integration for Greenhouse Gas Mitigation in Industry, based on the report from the IEA Expert Workshop in Berlin on April 4 – 5, 2017.
- No 3: The Role of Industrial Biorefineries in a Low-carbon Economy, based on the report from the International Energy Agency (IEA) Bioenergy Technology Cooperation Programme (IEA Bioenergy) & IEA Industrial Energy-related Technologies and Systems (IETS) – Joint Workshop, Gothenburg, Sweden, 16 May 2017.
- No 4: Process Integration in the Iron and Steel Industry, based on the IETS Annex XIV Technical Report.
- No 5: Membrane Processes in Biorefineries, based on the final report from Annex XVII.
- No 6: Digitalization for Energy Efficiency and GHG Emissions Reduction, based on the proposal for new Annex XVIII.

Two newsletters were written and distributed online during the year. The Secretariat also supplied a two-page report for the vice Chair of Industry's report to the EUWP (Working Party on Energy End-Use Technologies – one of CERT's – the IEA Committee on Energy Research and Technology – four working parties).

The TCP also started a Twitter account in October in order to be more visible and achieve a wider dissemination.

EVENTS 2018

EXECUTIVE COMMITTEE MEETINGS

- 26th IETS ExCo Meeting in Paris, France, 28-29 May
- 27th IETS ExCo Meeting in Rome, Italy, 27-28 November

WORKSHOPS & WEBINARS

- In connection to the IETS ExCo meeting in May, a workshop titled "IETS activities and possible French interests" was held as an introduction to the French membership to the IETS TCP.
- In connection to the IETS ExCo meeting in November, a workshop on "Opportunities for international collaboration on RDI for energy saving and GHG mitigation in industry" was held together with a number of Italian stakeholders. The presentations and the subsequent discussion resulted in enhanced understanding and potential collaboration.
- In December 2018, a kick-off webinar for the "Annex XVIII on Digitalization, Artificial Intelligence and Related Technologies for Energy Efficiency and GHG Emissions Reduction in Industry" was organized by CanmetENERGY, Canada. Forty-two participants from ten different countries participated. The participants, already involved in the work or interested in joining, represent different types of organizations – industry, academia and government.
- During 2018, the planned Annex on Electrification in Industry, partly based on a meeting in Amsterdam in April with about 30 participants from industry and academia in several countries, has reached a finalizing stage of the scoping.
- Task 5 in Annex XI on Decision Support Systems (DSS) and Ex-ante Research on Industrial Biorefineries has organized the following webinars during 2018:
    - 1st webinar on introducing I-BIOREF software as one of the potential DSS on January 31st with 24 attendees from Austria, Canada, France, Germany, Italy, Netherlands, and Sweden
    - 2nd webinar on introducing ENPAC tool for scenario development and Prospective LCA tool, as well as detailed description of the proposed New Task on April 24 with 17 attendees from Austria, Australia, Canada, France, Ireland, Italy, Netherlands, and Sweden.
    - 3rd webinar on introducing I-BIOREF software to the Bioenergy Australia members on May 9.

IDEAS FOR NEW ANNEXES AND ACTIVITIES

The following ideas for new Annexes and activities were presented and further discussed during 2018 by the IETS country delegates:

PROPOSAL FOR A NEW TASK/ANNEX: ELECTRIFICATION IN INDUSTRY

Annex XIII, Application of industrial Heat Pumps was finished in 2014, but discussions has been going on and proposals for a continuation have been put forward since then. During 2017 a proposal for a continuation of the Annex under a broader name, focusing on electrification, was approved by the IETS ExCo. During 2018, this decision was reconsidered and it was decided that "Electrification in Industry" should be the name and contents of a completely new Annex.

The Netherlands has taken the lead in the planning and set-up of this Annex. The activities during 2018 have been focused on scoping.

The objective of this Annex would be to stimulate the development and optimal use of industrial electrification through:

- International network and information infrastructure for key stakeholders to exchange and disseminate knowledge in the area of industrial electrification including the relevant system aspects,
- increasing the understanding of conditions, drivers and policies for optimal industrial implementation,
- facilitate joint development of new knowledge and expertise on industrial electrification, and
- support and accelerate the deployment of electrification practices in the process industry.

EXPERT WORKSHOP: "DEEP DECARBONIZATION IN INDUSTRY"

The IETS TCP will organize an expert workshop on "Deep Decarbonization in Industry" in Vienna in October 2019, which will result in a report and other publications for wider dissemination.

ONGOING ANNEXES 2018

ANNEX XI: INDUSTRY-BASED BIOREFINERIES

Responsible author: Isabel Cabrita, DGEG – Directorate-General of Energy and Geology, Portugal

Annex members: Canada, Portugal, Sweden and the Netherlands.

Time schedule, Tasks 1-4: 1 March 2008 – 31 December 2016 (Final Report in November 2017)

Time schedule, new Task: 1 January 2018 – 31 December 2020. Proposed title: "Decision Support Tools and Ex-Ante Research for Evaluating Bioeconomy Transformation Strategies"

BACKGROUND

Annex XI has a multi-disciplinary approach to the concept of biorefineries integrated in industrial complexes, aiming at optimizing the energy efficiency in global terms and improving their environmental footprint. The approach is based on industry needs and its transformation towards biorefinery, combining the knowledge of industrial technologies with energy efficiency and biomass conversion processes. A new Task Force has been initiated to renew this vision and expand Annex XI activities.

Annex XI was launched in 2008 and was developed with the objective of sharing knowledge and experiences, as well as conducting research assessment-based studies and R&D projects to promote industry-based biorefineries.

So far, activities have been implemented to reinforce international cooperation and structure partnerships that led to optimizing the energy efficiency in existing and new integrated industrial plants. Past activities have included R&D on sustainability assessments, biofuels/bio-materials production technologies, and improvement of yields from thermo-chemical and biological conversion of biomass and waste materials.

DESCRIPTION OF ANNEX

Since being converted into a long-standing Annex in 2016, preparations for new Tasks have been made. The first new Task approved by the ExCo focuses on decision support systems (DSS) and ex-ante research. Its main objectives are: (a) understanding the complex decision-making challenges of industry related to bioeconomy transformation, (b) understanding energy implications as part of the overall biorefinery strategy decision considering ex-ante analysis; (c) sharing case studies addressed by DSS software that assist in complex decision-making; and (d) connecting ex-ante research with energy policy development.

ACTIVITIES DURING 2018

- Three webinars with short presentations of DSS softwares were organized:
    - 1st webinar on introducing I-BIOREF software as one of the potential DSS on January 31st with 24 attendees from Austria, Canada, France, Germany, Italy, Netherlands, and Sweden;
    - 2nd webinar on introducing ENPAC tool for scenario development and Prospective LCA tool, as well as detailed description of the proposed New Task on April 24 with 17 attendees from Austria, Australia, Canada, France, Ireland, Italy, Netherlands, and Sweden;

  - 3rd webinar on introducing I-BIOREF software to the Bioenergy Australia members on May 9.
- The new Task proposal was prepared and presented:
  - The new Task proposal was shared with the IEA Bioenergy Task 42 member countries on November 6;
  - The final approval of the new Task on DSS occurred during the ExCo meeting in Rome, November 27-28.

WORK PLANNED FOR 2019

- Positioning of the new Task through discussions with partners, including Portugal, Sweden, Finland, and Netherlands;
- Creating of a Task Force composed of Canada, Sweden, and Portugal to rethink and renew the Annex XI vision and related activities;
- Creating a formal liaison with IEA Bioenergy Task 42;
- Planning initial activities to identify interested country experts by spring 2019, leading to the initial Task meeting planned for September 2019.

During 2019, there will also be an ExCo decision on a new Annex manager.

CONTACT DETAILS

Annex manager:
Isabel Cabrita, DGEG – Directorate-General of Energy and Geology.
E-mail: isabel.cabrita@dgeg.pt

Task managers:
Marzouk Benali, CanmetENERGY – Natural Resources Canada
E-mail: marzouk.benali@canada.ca

Paul Stuart, Chemical Engineering Department – Polytechnique Montreal
E-mail: paul.stuart@polymtl.ca

ANNEX XIV: ENERGY-EFFICIENCY IN THE IRON AND STEEL INDUSTRY

Responsible author: Mikael Larsson, Swerim, Sweden

Annex Members: Sweden, and discussions with, Finland, France, Italy, Australia and Japan.

Time schedule, Tasks 1-3: 1 January 2011 – 31 May 2014

Time schedule, new Tasks: To be discussed at the next ExCo meeting in May 2019

DESCRIPTION OF CURRENT TASKS

This Task on energy efficiency in the steel industry is a continuation and a broadened approach on working on energy efficiency in the steel industry. It will focus on applied studies for resource efficiency, training and dissemination and method development.

So far, an activity in the area of training and dissemination has been approved by the IETS ExCo, involving an international course on process integration in steelmaking.

ACTIVITIES DURING 2018

An international course on process integration in steelmaking was held in Liège, Belgium, September 2018

The execution of the course were made in Liège, Belgium. "Successful application of process integration in industry" 3-5 September 2018, Liège, Belgium. The venue attracted 32 participants from industry and Universities. Students were also offered possibility for course credits to be included in their graduate and undergraduate studies. Totally 7 PhD students took the final assignment to get the student credits (5 ECTS credits). 2 students got 3 ECTS credits for only making part of the assignment.

An electronic and paper copy course lecture material was derived. The course was also recorded making it possible to take the course on-line. Link to the Sapii course delivery, Liège, Belgium 3-5 September 2018: https://vimeo.com/album/5425521 (The password is: **sapii**)

Additional discussions with partners have been conducted. Partners in delivery of the course have been addressed. Additional contacts have been taken with University of Wollongong and Bluescope in Australia which have an interest in participating if the annual fee can be arranged.

WORK PLANNED FOR 2019

In order to start Subtask B. Methodology development and Subtask C. Applied Process integration studies on Energy efficiency, resource efficiency and greenhouse gas mitigation, partners need to sign a formal contract. During 2019 work will focus on establishing the contract.

CONTACT DETAILS

Annex manager:

Mikael Larsson, Swerim, Sweden
E-mail: mikael.larsson@swerim.se

ANNEX XV: INDUSTRIAL EXCESS HEAT RECOVERY – TECHNOLOGIES AND APPLICATIONS

Responsible author: Thore Berntsson, CIT Industriell Energi, Sweden.
Annex Members: Austria, Canada, Denmark, France, Germany, Norway, Portugal and Sweden.
Time schedule: 1 October 2016 – 30 September 2018 (Task 2)

BACKGROUND

Despite political pressures, energy consumption in the world has increased by over 30% in the last twenty years. Without a change in policy, further increase of the use of fossil fuels and the related emission of CO_2 is unavoidable in the years to come. Only the development of breakthrough technologies can result in a serious improvement of energy efficiency as required by the energy goals set by the different nations.

Industrial energy use accounts for a third of the total energy used in society. In energy-intensive basic industries, such as chemicals, petroleum refining, iron and steelmaking, and pulp and paper, energy systems are the backbone of the manufacturing process and crucial to profitability and competitiveness. Hence, activities that promote efficient energy use with low environmental impact will be crucial for the future development, implementation and sustainability of these industrial processes. Changes in the efficiency and environmental performance of critical energy systems can significantly impact the cost of production. The diverse and widespread use of energy systems across industrial sectors creates numerous opportunities for energy efficiency improvements with potentially broad international impacts. Industries and processes are where the greatest potential energy benefits are to be gained.

DESCRIPTION OF ANNEX

The Annex takes on a multi-disciplinary approach to the concept of excess heat recovery integrated in industrial complexes, aiming at the optimization of energy efficiency in global terms. The approach is based on industry needs and application, combining the knowledge of industrial technologies with energy efficiency and cost-effectiveness.

The main objectives of Task 2 are:

- To enhance international collaboration in the field of industrial excess heat usage.
- To create a platform within IEA for sharing experiences and findings in R&D projects in the four areas
    - In-depth evaluation and inventory of excess heat levels
    - Methodology on how to perform an inventory in practice
    - Possible policy instruments and the influence on future use of excess heat
    - Technology Development
- To improve the knowledge in participating countries of technical and economic potentials for industrial excess heat usage, internally and externally, of experiences of and results from inventory studies in different types of industry and different countries.
- To exchange experience of conducting inventory studies.
- To enhance knowledge about consequences for the performance, economically and in terms of sustainability, of industrial excess heat projects of different possible future developments of policy instruments and to identify future plans or trends for policy instrument development in participating countries.

The participants in Task 2 are:

Austria: Technische Universität Wien (TUW), AEE - Institut für Nachhaltige Technologien (AEE INTEC), Austrian Institute of Technology (AIT), and Energieinstitut an der JKU Linz
Canada: Natural Resources Canada – CanmetENERGY
Denmark: Weel & Sandvig
France: Agence de l'Environnement et de la Maîtrise de l'Énergie (ADEME), and Centre Technique des Industries Aérauliques et Thermiques (CETIAT)
Germany: Fraunhofer Institute for Physical Measurement Techniques IPM, Freiburg
Italy: Eurac Research
Norway: SINTEF
Portugal: Instituto Superior de Engenharia de Lisboa (ISEL), Instituto Superior Técnico (IST), and the National Group for Process Integration (GNIP)
Sweden: Linköping University (LiU), Chalmers University of Technology, and Faculty of Engineering Lund University (LTH)

ACTIVITIES DURING 2018

- Annex meeting in Vienna, 23–24 January 2018
- Workshop in Vienna about pinch methodology, 25 January 2018
- Skype meeting, 12 April 2018
- Skype meeting, 18 June 2018
- Final Annex meeting in Graz, 1–2 October 2018
  (In connection with the ISEC conference 3–5 October)

The Final Report is completed, but is yet to be approved and published. The two internal reviewers, Claus Börner, Germany, and Brian Elmegaard, Denmark, have received the report in early 2019.

WORK PLANNED FOR 2019

- For 2019, planned work is initiation and start of Task 3. The Task Manager for Task 3 is planned to be Rene Hofmann, TU Wien, Austria, with support from Thore Berntsson, CIT, Industriell Energi, Sweden. One aim is to have a formal proposal for Task 3 ready at the ExCo meeting in Paris, May 2019.

CONTACT DETAILS

Annex Manager:
Thore Berntsson, CIT Industriell Energi, Sweden.
E-mail: thore.berntsson@chalmersindustriteknik.se

ANNEX XVI: ENERGY EFFICIENCY IN SMALL AND MEDIUM ENTERPRISES (SMES)

Responsible author: Patrik Thollander, Linköping University, Sweden

Annex Members: Germany, Norway and Sweden and organizations in Colombia, Italy, Ireland and Japan.

Time Schedule initial Tasks: 1 January 2012 – 30 June 2015

Time Schedule new Tasks: 1 January 2018 – 31 August 2019

DESCRIPTION OF THE ANNEX

The objective of this Annex is to enhance practical and scientific knowledge of improved energy end-use in industrial SMEs, through specific studies of:

- Energy end-use efficiency policies with emphasis on energy efficiency networks towards industrial SMEs
- Review of scientific publications towards industrial SMEs

The structure and planned outcome of the new Tasks (5 and 6) are as follows:

5. Energy end-use efficiency policies towards industrial SMEs with emphasis on energy efficiency networks
    i. Overview of energy end-use policies and programs in the participating country including subsidies, administrative polices, energy audit checks, investment funds, networks, general information campaigns including self-scanning, and benchmarking methods, i.e. possibility for SMEs to compare their energy use
    ii. Feedback and outcomes. Overview of the experience, e.g. difficulties met during implementation of the program/policy with major emphasis on energy efficiency networks.
6. Review of scientific publication on energy end-use efficiency and industrial SMEs
    i. Literature review of policy programs and industrial SMEs
    ii. Literature review of barriers to and drivers for energy efficiency and SMEs

ACTIVITIES DURING 2018

- Regular meetings (online)
- One submitted abstract for the ACEEE Industry Summer Study
- One submitted journal publication

WORK PLANNED FOR 2019

- Finalize Task 5, deadline August 2019.
- Present Task 5 at the ACEEE Summer Study in Portland, August 2019
- Initiate Task 6
- Submit one scientific paper for Task 6 during the first quarter of 2019
- Annex meetings every other month (online) for the whole year.

CONTACT DETAILS

Annex manager:

Patrik Thollander, Division of Energy Systems, Linköping University, Sweden
E-mail: patrik.thollander@liu.se

ANNEX XVII: MEMBRANE PROCESSES IN BIOREFINERIES

Responsible author: Frank Lipnizki, Lund University, Sweden
Annex Members: Austria, Denmark, Germany, Portugal and Sweden.
Time Schedule initial Tasks: 1 January 2014 – 30 June 2017
Time Schedule new Tasks: 1 April 2019 – 30 March 2021

DESCRIPTION OF ANNEX

The transition of our society from a society largely dependent on fossil-based materials to a climate-smart society based on biomass does not only mean a change in the raw material base, but it will also require that new production concepts in the form of biorefineries are developed.

Within the concept of biorefineries membrane processes have been identified as a key separation technology due to their high selectivity and low energy consumption. While the design and operation of membrane processes in other industrial sectors, e.g. the dairy industry, is well established, the design, integration and operation of membrane processes in biorefineries is largely empirical. The fact that process streams in biorefineries contain a large variety of components increases further the complexity.

The first part of the Annex focused exclusively on biorefineries based on lignocellulosic biomass, while the second part of the Annex will transfer, exchange and extend the existing knowledge of the industrial and academic partners with regard to the energy-efficient use of membrane technology to the overall concept of biorefineries based on different renewable resources ranging from algae to agricultural residuals. The accessible knowledge will be mapped and structured and potential knowledge gaps will be identified together with the necessary actions to close those.

Thus the objectives of the extended IETS Annex are the development of energy-efficient and sustainable concepts of biorefineries utilizing the opportunities of membrane technology to produce biochemical, biofuels and energy based on renewable resources by:

- Maintaining and extending the current Annex network of industrial and academic experts by focusing on the integration and optimization of membrane processes in the overall concept of biorefineries.
- Mapping and structuring the current knowledge and experience related to membrane processes in biorefineries and identifying knowledge gaps and measures required to overcome those.
- Extrapolating and adding to the current guidelines for design and optimization of membrane processes in the overall concept of biorefineries.
- Extending the focus to emerging membrane processes and the membrane processes within the water loop of biorefineries.

The dissemination of the results will take place during Annex meetings, seminars with industrial participation, presentations at conferences and publications for the general public and scientific community. Furthermore, the results will be publically available on the webpage of the Annex.

WORK PLANNED FOR 2019

- 8 April, Kick-off Meeting Annex XVII, Båstad, Sweden

CONTACT DETAILS

Annex manager:

Frank Lipnizki, Department of Chemical Engineering, Lund University, Sweden
E-mail: frank.lipnizki@chemeng.lth.se

ANNEX XVIII - DIGITALIZATION, ARTIFICIAL INTELLIGENCE AND RELATED TECHNOLOGIES FOR ENERGY EFFICIENCY AND GHG EMISSIONS REDUCTION IN INDUSTRY

Responsible author: Mouloud Amazouz, CanmetENERGY, Natural Resources Canada

Annex Members: Under development. Discussions with Austria, Canada, Denmark, France, Portugal, Netherlands and Sweden and organizations in Finland, Italy and Switzerland.

Time Schedule Tasks 1: 1 November 2018 – 30 November 2019

DESCRIPTION OF ANNEX

This Annex seeks to advance knowledge and development of digitalization, artificial intelligence and related technologies to improve the economic and environmental performance of targeted energy and GHG-intensive industries. The initiative would seek to assemble a network of academic, research labs, IT providers and process industry stakeholders to cooperate on the availability, quality and use of data (quality, quantity, location, operational, energy, etc.); to align capacity; and inform decision-making relevant to the targeted sectors;

The objective of this Annex is therefore to stimulate the adoption and digitalization technologies for energy efficiency improvement and GHG emissions reduction in the process industries. To achieve this objective, the Annex sub-goals are:

- To create an international network and information infrastructure for stakeholders to exchange knowledge in the area of digitalization technologies
- To facilitate joint development of new knowledge and expertise on Digitalization
- To support and accelerate the deployment of digitalization practices in the energy-intensive process industries.

ACTIVITIES COMPLETED DURING 2018

- Further development of proposal and scope for Task 1
- Kick-off webinar was held in December. Forty-two participants from ten different countries have attended. So far, more than ten organizations from eight countries have expressed their interest to participate to Task 1.

WORK PLANNED FOR 2019

The plan for Task 1 consists of four meetings over the next year starting from April 2019, and has the objective of establishing the scope of subsequent Tasks. Subsequent Tasks will last about three years. The objectives of the are: (1) to map the emerging areas of digitalization including a consistent vocabulary and identifying pertinent areas of application, and (2) to identify the interests of Task 1 participants as well as potential future participants, relative to the emerging areas. The Annex will seek to identify 3-4 Tasks and Task Managers to follow-up this first short Task.

The outcomes of Task 1 will highlight the needs, actions and opportunities of applying digitalization, artificial intelligence and related technologies to support energy-intensive process sectors. A white paper will be also delivered and will help to establish the objectives, the scope and direction of future tasks in the Annex.

CONTACT DETAILS

Annex Manager:

Mouloud Amazouz, CanmetENERGY, Natural Resources Canada

Email: mouloud.amazouz@canada.ca

Task 1 manager:

Paul Stuart, Polytechnique – Montréal, Canada

Email: paul.stuart@polymtl.ca

IETS EXECUTIVE COMMITTEE MEMBERS 2018

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Delegate: Elvira Lutter, the Climate and Energy Fund of the Austrian Federal Government: elvira.lutter@klimafonds.gv.at

Alternate: Rene Hofmann, AIT Austrian Institute of Technology GmbH: Rene.Hofmann@ait.ac.at

BELGIUM

Delegate: Angélique Léonard, University of Liège: a.leonard@ulg.ac.be
Alternate: Gilles Tihon, Service Publique de Wallonie. gilles.tihon@spw.wallonie.be

CANADA

Delegate: Eric Soucy, CanmetENERGY: eric.soucy@canada.ca
Alternate: Fiona Zuzarte, Office of Energy Research and Development: fiona.zuzarte@canada.ca

DENMARK

Delegate: Brian Elmegaard, DTU - Technical University of Denmark: be@mek.dtu.dk
Alternate: Jan Sandvig Nielsen, Weel & Sandvig Energy and Process Innovation: jsn@weel-sandvig.dk

FRANCE

Delegate: Thomas Gourdon, ADEME: thomas.gourdon@ademe.fr
Alternate: Youmna Romitti, CETIAT: youmna.romitti@cetiat.fr

GERMANY

Delegate: Claus Börner, Forschungszentrum Jülich GmbH: c.boerner@fz-juelich.de
Alternate: Gordon Kaußen, Forschungszentrum Jülich GmbH: g.kaussen@fz-juelich.de

NORWAY

Delegate: Marit Sandbakk, ENOVA SF: marik.sandbakk@enova.no

Alternate: Anne Merethe Kristiansen, ENOVA SF: anne.merethe.kristiansen@enova.no

PORTUGAL

Delegate: Clemente Pedro Nunes, Instituto Superior Técnico, Technical University of Lisbon: pedronunes@gml.pt
Alternate: Isabel Cabrita, DGEG – Directorate-General of Energy and Geology: isabel.cabrita@dgeg.pt

SWEDEN

Delegate: Svante Söderholm, Swedish Energy Agency: svante.soderholm@energimyndigheten.se
Alternate: Thore Berntsson, CIT Industriell Energi: thore.berntsson@chalmersindustriteknik.se

THE NETHERLANDS

Delegate: Maurits Clement, Netherlands Enterprise Agency: maurits.clement@rvo.nl

UNITED STATES

Delegate: Isaac Chan, US Department of Energy: isaac.chan@ee.doe.gov
Alternate: Bob Gemmer, US Department of Energy: bob.gemmer@ee.doe.gov

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COORDINATORS 2018

IETS EXECUTIVE COMMITTEE CHAIR

Thore Berntsson, Sweden: thore.berntsson@chalmersindustriteknik.se

IETS EXECUTIVE COMMITTEE VICE CHAIR

Clemente Pedro Nunes, Portugal: c.pedronunes@tecnico.ulisboa.pt

IETS EXECUTIVE COMMITTEE SECRETARIAT

Heléne Johansson, Sweden: helene.johansson@chalmersindustriteknik.se

Per-Åke Franck, Sweden: per-ake.franck@chalmersindustriteknik.se

ANNEX MANAGERS (ACTIVE ANNEXES)

ANNEX XI: INDUSTRY-BASED BIOREFINERIES

Isabel Cabrita: isabel.cabrita@dgeg.pt
DGEG – Directorate-General of Energy and Geology, Portugal

ANNEX XIV: ENERGY-EFFICIENCY IN THE IRON AND STEEL INDUSTRY

Mikael Larsson: mikael.larsson @swerim.se
Process Integration Department at Swerim, Sweden

ANNEX XV: INDUSTRIAL EXCESS HEAT RECOVERY

Thore Berntsson: thore.berntsson@chalmersindustriteknik.se
CIT Industriell Energi, Sweden

ANNEX XVI: ENERGY EFFICIENCY IN SMALL AND MEDIUM ENTERPRISES (SMES)

Patrik Thollander: patrik.thollander@liu.se
Division of Energy Systems, Linköping University, Sweden

ANNEX XVII: MEMBRANE FILTRATION FOR ENERGY-EFFICIENT SEPARATION OF LIGNOCELLULOSIC BIOMASS COMPONENTS

Frank Lipnizki: frank.lipnizki@chemeng.lth.se
Department of Chemical Engineering, Lund University, Sweden

ANNEX XVIII: DIGITALIZATION, ARTIFICIAL INTELLIGENCE AND RELATED TECHNOLOGIES FOR ENERGY EFFICIENCY AND GHG EMISSIONS REDUCTION IN INDUSTRY

Mouloud Amazouz: mouloud.amazouz@canada.ca
CanmetENERGY, Natural Resources Canada

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