



2020 ANNUAL REPORT

INDUSTRIAL ENERGY-RELATED
TECHNOLOGIES AND SYSTEMS

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

IETS EXECUTIVE COMMITTEE
SECRETARIAT 2021

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INTERNATIONAL ENERGY AGENCY, IEA

IEA - AT THE HEART OF GLOBAL DIALOGUE ON ENERGY

MISSION

The IEA works with governments and industry to shape a secure and sustainable energy future for all.

The IEA is at the heart of global dialogue on energy, providing authoritative analysis, data, policy recommendations, and real-world solutions to help countries provide secure and sustainable energy for all.

The IEA was created in 1974 to help co-ordinate a collective response to major disruptions in the supply of oil. While oil security this remains a key aspect of our work, the IEA has evolved and expanded significantly since its foundation.

Taking an all-fuels, all-technology approach, the IEA recommends policies that enhance the reliability, affordability and sustainability of energy. It examines the full spectrum issues including renewables, oil, gas and coal supply and demand, energy efficiency, clean energy technologies, electricity systems and markets, access to energy, demand-side management, and much more.

Since 2015, the IEA has opened its doors to major emerging countries to expand its global impact, and deepen cooperation in energy security, data and statistics, energy policy analysis, energy efficiency, and the growing use of clean energy technologies.

Source: <https://www.iea.org/about/mission>

AREAS OF WORK

IEA analysis is built upon a foundation of activities and focus areas including data and statistics, training, innovation and international cooperation.

- **Promoting energy efficiency**
The IEA helps governments improve standards, advising them on developing, implementing, and measuring the impact of efficiency policies.
- **Ensuring energy security**
IEA work on energy security ensures that markets remained well supplied, providing information to governments, and helping improve system resilience.
- **Programmes and partnerships**
The IEA works with governments, organisations and agencies around the world to deliver programmes focused on countries, regions or topics.
- **International collaborations**
The IEA works with a broad range of international organisations and forums to ensure secure, affordable and sustainable energy systems.
- **Promoting digital demand-driven electricity networks**
IEA work on digital, demand-driven solutions offering significant benefits to cost reduction, emissions abatement and enhanced energy efficiency.

- **Data and statistics**
Data collection has been at the heart of the IEA's work since the creation, with official energy statistics from more than 100 countries collected on a monthly or annual basis.
- **Training**
For more than four decades, the IEA has carried out training activities around the world on energy statistics, modelling, technology, energy efficiency and renewable policies.
- **Technology collaboration**
With about 40 research collaborations – including the IETS TCP - and about 6,000 experts, the technology programme provides the basis for international public and private research partnerships.
- **Global engagement**
Since 2015, the IEA has opened our doors to eight major emerging economies for a new era of international energy co-operation.
- **Industry engagement**
Meeting with various industry groups on a regular basis, the IEA gains precious insights on how policies shape real-world investments and actions.

Source: <https://www.iea.org/areas-of-work>

ABOUT THE IEA TECHNOLOGY COLLABORATION PROGRAMME (TCP)

Advancing the research, development and commercialization of energy technologies.

The Technology Collaboration Programme supports the work of independent, international groups of experts that enable governments and industries from around the world to lead programmes and projects on a wide range of energy technologies and related issues. The experts in these collaborations work to advance the research, development and commercialisation of energy technologies. The scope and strategy of each collaboration is in keeping with the IEA Shared Goals of energy security, environmental protection and economic growth, as well as engagement worldwide.

The breadth of the analytical expertise in the Technology Collaboration Programme is a unique asset to the global transition to a cleaner energy future.

These collaborations involve over 6 000 experts worldwide who represent nearly 300 public and private organisations located in 55 countries, including many from IEA Association countries such as China, India and Brazil.

Source: <https://www.iea.org/areas-of-work/technology-collaboration>

INDUSTRIAL ENERGY-RELATED TECHNOLOGIES AND SYSTEMS – THE IETS TCP

The IETS TCP 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 the IETS TCP 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.

The IETS TCP 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 (SMEs).

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

IETS WORK

The principal work of the IETS TCP is about identifying, observing, following and sharing work among countries and their organizations 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 2020, the IETS TCP had the following ongoing 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 (on hold)
- 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
- Annex XIX: Electrification in Industry
- *Annex XX: Development of Industry Transition Roadmaps (starting up)*
- *Annex XXI: Decarbonizing industrial systems in a circular economy framework (starting up)*

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 2020, the IETS TCP Member Countries and Contracting Parties were the following:

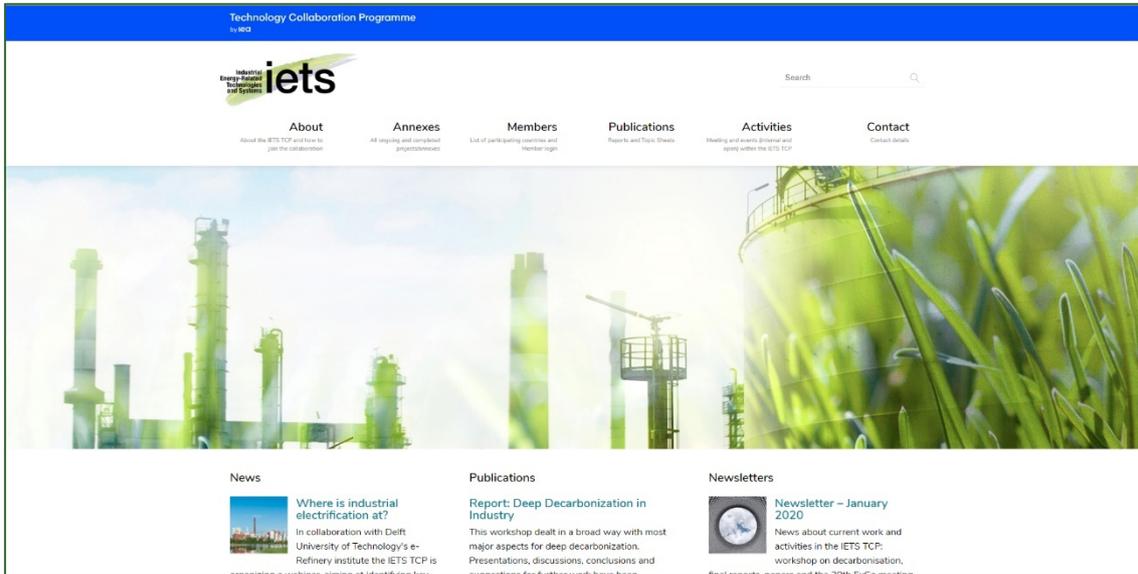
- Austria: Climate and Energy Fund of the Austrian Federal Government
- Canada: Natural Resources Canada (NRCan)
- Denmark: Danish Energy Agency
- France: ADEME - Agence de l'Environnement et de la Maîtrise de l'Énergie
- Germany: Forschungszentrum Jülich GmbH
- Italy: ENEA – Italian National Agency for New Technologies, Energy and Sustainable Economic Development
- Netherlands: RVO Netherlands Enterprise Agency
- Norway: ENOVA SF
- Portugal: Instituto Superior Técnico, Technical University of Lisbon
- Sweden: Swedish Energy Agency

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:

- Central Research Institute of Electric Power Industry, Japan
- Limerick Institute of Technology, Ireland
- Lucerne University of Applied Sciences and Arts, Switzerland
- VTT, Finland

WEBSITE: WWW.IEA-INDUSTRY.ORG

The IETS TCP website focuses on 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 2020

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 2020, both Lucerne University of Applied Sciences and Arts, Switzerland, and VTT, Finland, have joined the IETS TCP as sponsors.

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 the IETS TCP 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. The NSG network is also important for the future work of the IETS TCP as it can enhance and spread the knowledge about the TCP in relevant contexts in the IETS member countries and thus contribute to the concrete as well as overall strategic development of the IETS TCP.

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 and the technology and system areas of highest interest. 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 used as a tool to identify areas of specific interest to the IETS TCP in order to start new activities.

EXTENSION GRANTED

During 2020, the IETS TCP applied for and was granted an extension by the Committee on Energy Research and Technology (CERT). The extension is for five years from 1 March 2021 to 28 February 2026, provided that the TCP incorporates the Framework for the Technology Collaboration Programme into its Implementing Agreement by 28 February 2022.

NEW LEGAL TEXT

The IEA Governing Board approved a new Framework, i.e., a high-level document that provides the legal basis for the TCPs, in April 2020. For all TCPs, this caused the need to amend the Implementing Agreement (or Legal Text) to incorporate new Framework. For the IETS TCP, a draft Legal Text was developed by the IEA Legal Office, together with the IETS Chair and Secretariat, and discussed at the ExCo meeting in November. A final version of the new Legal Text was up for unanimous decision by the IETS ExCo in December and will be implemented in terminology, procedures, documents etc. during 2021.

The new Legal Text includes improvements in four areas:

- Adopts recommended language to enhance clarity.
- Brings consistency across all TCPs in structure and terminology.
- Implements new engagement tools for TCPs.
- Simplifies administrative processes and procedures.

The Implementation Agreement/Legal Text is a detailed agreement on the specific terms and conditions of participation:

- Details of Executive Committee.
Responsibilities, membership, voting rules, procedures.
- Details of Tasks (formerly called Annexes)
Process for establishing and joining, contents.
- Rights and responsibilities of Participants
Financial obligations, dispute settlement.
- Secretary and Task Operating Agents (formerly called Annex Managers)
Designation process, legal rights and responsibilities.
- Process for new Participants to join the TCP.
Approval requirements, necessary paperwork, administrative steps.

CHANGES OF MEMBERS AND DELEGATES

Former Swedish delegate Svante Söderholm has been replaced by Fredrik Backman, also from the Swedish Energy Agency.

For a complete list of delegates and alternates, please refer to page 27.

COMMUNICATION

The IETS website is the main communication channel – in addition to personal meetings – and attracted about 3600 visitors from all over the world during 2020. The 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.

In 2018, the EITS Secretariat started producing fact sheets on important and relevant topics, based on Annex reports, workshop summaries etc. The following Topic Sheets were produced and published during 2020:

- Topic sheet no 9, June 2020: A review of energy efficiency policies for manufacturing small and medium-sized enterprises from around the world, based on the result from Annex XVI – Energy Efficiency in SMEs.
- Topic sheet no 10, June 2020: Decision Support Tools and Ex-Ante Research for Evaluating Bioeconomy Transformation Strategies, based on the proposal for a new task in Annex XI – Industry-based Biorefineries.
- Topic sheet no 11, November 2020: Deep Decarbonization in Industry, based on the Executive Summary of the Final Report compiled and published after the workshop in October 2019.

Two issues of the IETS Newsletter were distributed online to about 110 subscribers and posted at the IETS website. The Secretariat also supplied an Annual Brief 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).

To increase visibility and dissemination, news, reports etc. are also posted on Twitter and LinkedIn.

EVENTS 2020

EXECUTIVE COMMITTEE MEETINGS

- 30th IETS ExCo Meeting online, 27-28 May
- 31st IETS ExCo Meeting online, 24-25 November

WORKSHOPS & WEBINARS

2020 was a very special year, severely impacted by the world-wide Covid-19. To begin with, most physical events were cancelled or postponed. On the positive side, digital events have been gathering a larger number of participants, giving more stakeholders the opportunity to engage in discussions.

One example of this is our industry workshop, which finally took place in December, with representatives from the IEA End-Use Working Party and a number of TCPs, as well as from industry and academia. The format - knowledge sharing and "speed dating" - proved to be successful.

EUWP Industry workshop – a matchmaking event

On December 9-10, the IETS TCP gathered about 70 people from 20 countries to discuss possible collaboration activities. During the first half-day session, ongoing Swedish projects and activities in the IETS working areas were presented. During the second, representatives for five TCPs presented their ongoing work in related areas. Having a common goal – the deep decarbonization in industry – the main aim of this workshop was to identify key areas for collaboration between IETS TCP and other IEA TCPs.

The event was organized and hosted by the IETS TCP, together with the EUWP Vice-Chair for Industry and the IEA Secretariat. Notes and presentations from the event are available for download at the IETS website.

Joint webinar on Process Integration

On November 30, a webinar organized as a joint effort between the IETS TCP and the energy section of EFCE (European Federation of Chemical Engineering), was held, aiming at discussing the role of process integration for deep decarbonization and energy transition in industry and to identify needs for further international work.

The webinar targeted a discussion on the role of process integration for the energy transition with four keynote speakers and with a discussion session around the following four topics:

- New methods for process integration in the context of energy transition towards low emissions, high share of renewables and novel technologies.
- Strategic planning of complex integrated industrial systems, taking industrial symbiosis, circular economy and future conditions into account with ex-ante based scenarios.
- The importance of digitalization and databases for industrial energy system examples like the one developed in IETS Annex XV on industrial excess heat.
- Risk mitigation in the development and the operation of integrated industrial systems.

NEW ANNEXES TO BE STARTED 2021

The following ideas for new Annexes and activities were presented and further discussed during 2020 by the IETS country delegates:

PROPOSAL FOR A NEW ANNEX: ROADMAPS/ ROADMAP/TRANSITION PLAN FOR THE DECARBONISATION OF INDUSTRY

A proposal for a new Annex, partly based on the findings in the international expert workshop on Deep Decarbonization in Industry, held in October 2019, has been put forward by France. This initiative, with the purpose of sharing national roadmapping experiences and providing an analysis of existing practices, was approved and will have a kick-off early 2021.

PROPOSAL FOR A NEW ANNEX: INDUSTRIAL SYMBIOSIS IN A SUSTAINABLE (RENEWABLE & CIRCULAR) ECONOMY

A proposal for an Annex on “Industrial Symbiosis in a closed carbon cycle economy”, has been put forward by Austria. This initiative was further developed during 2020 and will start during 2021. The general objectives of Task 1 are:

- to develop the annex as a platform for exchange
- to identify and align information, knowledge, definitions, approaches and methodologies
- to broaden awareness and knowledge regarding the system impacts
- to facilitate international meetings to share experiences

ONGOING ANNEXES 2020

ANNEX XI: INDUSTRY-BASED BIOREFINERIES

Responsible authors: Marzouk Benali, Natural Resources Canada/CanmetENERGY and Paul Stuart, Polytechnique Montréal/EnVertis Inc (CA)

Annex Members: Austria, Canada, Portugal and Sweden

Time period addressed by this report: 1 January 2020 – 31 December 2020.

DESCRIPTION OF ANNEX

The main objective of Annex XI is to promote systems analysis and decision support systems related to identifying sustainable industry-based biorefineries, and in our activities, we seek particularly to collaborate with other Tasks in IETS and across the IEA.

The recent reorientation of the Annex reaffirmed its initial mission considering the “biomass agnostic” bioeconomy, but now with an increased emphasis on seeking deep decarbonisation of various sectors of the industry through the integration of biorefineries, to ultimately achieve net zero GHG emissions. As the bioeconomy continues to evolve, innovative solutions need to be found considering, for example, (1) specific challenges of the implicated sectors and cross-sectoral value chains being created in the bioeconomy, considering near-term and longer-term policy landscapes; (2) advanced energy analytical methods for sites transforming to the bioeconomy, especially in support of identifying long-term strategic approaches to achieving net zero GHG emissions, (3) potential synergies between upstream and downstream stakeholders across bioeconomy value chains, and new forms of industrial symbiosis especially through digitalization; and (4) identification of opportunities for new circular bioeconomy value chains.

DESCRIPTION OF CURRENT TASKS

- A Steering Committee was established to identify and develop new Annex XI Tasks and other activities, in collaboration with other Annexes and Tasks. The Steering Committee currently consists of Paul Stuart (CA), Marzouk Benali (CA), Bettina Muster (AT), Isabel Cabrita (PT), and Thore Berntsson (SE).
 - The Steering Committee was expanded in 2020 to include Austria represented by *AEE - Institute for Sustainable Technologies*.
 - A series of virtual meetings was held by the Annex XI Steering Committee during 2020 to reaffirm its new vision and mandate, as well as to develop a three-year action plan.
 - The scope of three proposed Tasks has been defined, in addition to the Tasks “Decision Support Systems and Ex-Ante Research” that was formally approved by the IETS ExCo in November 2019. The new Tasks and the proposed leadership are as follows:
 - Technology pathways towards net zero emission biorefineries
 - Lead: Bettina Muster-Slawitsch, AEE-INTEC (AT)
 - Co-Lead: Paul Stuart, Polytechnique Montréal (CA)
 - Artificial intelligence for biorefinery transformations
 - Lead: Marzouk Benali, NRCan/CanmetENERGY (CA)
 - Circular economy and biomass-oriented industrial symbiosis

- Lead: Isabel Cabrita, Directorate-general of energy and geology (PT)
- The “Decision Support Systems (DSS) and Ex-Ante Research” Task was promoted to academia, industry and IEA Bioenergy to explain its role in:
 - Supporting the development and usage of tools and software for the strategic evaluation of industrial biorefineries in case studies.
 - Understanding the complex decision-making needs of industry and government related to setting bioeconomy strategies.
 - Becoming aware of decision support system software tools that exist.
 - Understanding the role of ex-ante research in the development of DSS tools.
- Presentation of the Annex XI was made at the 30th IETS ExCo meeting held on May 28th, 2020.
- On May 28th, 2020, preliminary discussions on potential cooperation between Annex XI and Annex XVII were initiated with Frank Lipnizki, Manager of Annex XVII.
- A presentation of the Annex XI vision and activities was given at the 9th Nordic Wood Biorefinery Conference held virtually on October 13-15, 2020.
- On November 9th, 2020, a meeting was organized with the IEA Bioenergy Task 42 lead team. Potential synergies were identified in the areas DSS and the circular economy in the context of biorefinery.
- Presentation of the Annex XI overview and the path forward was made at the IEA End-Use Working Party.

WORK PLANNED FOR 2021

- There is a suggestion to change the to “**Industry-based Biorefineries towards sustainability**” to better reflect the new vision and mandate set in 2020.
- In 2021, the emphasis of Annex XI will continue to be:
 - The Steering Committee will continue to be active, clarifying the vision and elaborating the strategic plan for Annex XI, resulting in the establishment of new Tasks
 - Initiate Task on DSS Ex Ante
 - Explore initiating 1 or 2 new Tasks of the 3 identified
- On January 26th, 2021, Annex XI members participated in the Annex XVII workshop, with the goal of identifying future synergies.
- Planning and organizing a two-day workshop with the Chair of the IETS TCP entitled “Future Scenarios and Strategic Decision-Making for Industry Transformation: Powered by Systems Engineering”.
 - Day 1 (April 15th, 2021) will explore the complexity of decision-making in a context of deep decarbonization of the industry.
 - Day 2 (May 6th, 2021) will emphasize on approaches and tools that can be envisioned to address this context focusing more on the industrial biorefineries.
 - List of 200 invitees was established including IETS delegates, IEA Bioenergy members, government organizations, academia and industry.
 - Intended to lead to the kick-off of new Task on DSS Ex Ante
- Following fruitful discussion in the Annex XI Steering Committee:
 - Two future Tasks were merged: “*Site-level energy analytics for biorefinery integration*” and “*Energy and GHG intensity of biorefinery value chains*”, and a merged Task created entitled “*Technology pathways towards net-zero emissions biorefineries*”.
 - Austria and Canada will seek to initiate this new Task in 2021.
- Webinar on circular bioeconomy and industrial symbiosis is being planned for June 2021.

- Organize virtual meetings to launch certain of the proposed new Tasks.
- Organize a joint webinar with IEA Bioenergy Task 42 and IETS-Annex XVII.
- Prepare technical reports for the IETS ExCo.

CONTACT DETAILS

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

Responsible author: IETS Secretariat

Annex Members: N/A

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

Time schedule, new Tasks: Put on hold

DESCRIPTION OF CURRENT TASKS

This Annex was put on hold at the IETS ExCo meeting in May 2019.

ACTIVITIES DURING 2020

Discussions aiming at a restart, based on the IETS Survey of technologies and the IEA Iron and steel technology roadmap. A workshop together with IEA Secretariat, Annex Manager and country experts, with the following objectives, was planned:

- To present research and development work in participating countries
- To identify areas of common interest
- To identify possible collaboration activities

WORK PLANNED FOR 2021

Workshop according to the planning will be held.

CONTACT DETAILS

Annex manager:

Vacant, please contact the IETS Secretariat for more information.

ANNEX XV: INDUSTRIAL EXCESS HEAT RECOVERY – TECHNOLOGIES AND APPLICATIONS

Responsible author: René Hofmann, AIT, Center for Energy and TU Wien, Austria

Annex Members: Austria, Canada, Denmark, France, Norway, Portugal and Sweden and sponsor organization Switzerland.

TIME SCHEDULE: 1 NOVEMBER 2019 – 31 OCTOBER 2021 (TASK 3) 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 CO₂ 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 findings from **Task 2** lead to a number of areas of future work for **Task 3**. Thus, the present Annex XV, Task 3 will broaden the scope and include some new aspects, which may not be considered separately for changed framework conditions within an industrial environment.

The identified Subtasks of **Task 3** are:

- **Subtask 1:** Combination of methods for excess heat identification and quantification
- **Subtask 2:** Consequences for excess heat levels of future changes in industrial energy systems
- **Subtask 3:** Operational aspects in industrial energy systems
- **Subtask 4:** Opportunity and risk assessment for excess heat projects
- **Subtask 5:** Compilation of innovative excess heat projects

The main objectives of **Task 3** 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 five areas included,
- to improve the knowledge in participating countries regarding the combination of methods for excess heat identification and quantification,

- to address to operational aspects, e.g. monitoring, control
- to exchange experience about risk minimization in excess heat projects
- to broaden awareness about consequences for excess heat levels of future changes in industrial energy systems
- to enhance knowledge about consequences for the performance, economically and in terms of sustainability, of industrial excess heat projects of different possible future innovative developments to identify future plans or trends in participating countries.

The participants in **Task 3** 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, DTU, (new partners starting 2021)

France: Greenflex

Norway: SINTEF

Portugal: Instituto Superior de Engenharia de Lisboa (ISEL), Instituto Superior Técnico (IST), and the National Group for Process Integration (GNIP)

Sweden: Chalmers University of Technology, (Alfa Laval since 2021)

Switzerland: Lucerne University of Applied Sciences and Arts

ACTIVITIES DURING 2020 AND PLANNED FOR 2021

In the first reporting year, the contributions of the individual participants were collected and analyzed. In total, the participants provided information on rd. 30 projects. The result of this analysis is available in the form of a Contribution Matrix, which sorts and clusters the available projects. The Contribution Matrix now allows the identification of synergies as well as gaps that should be addressed in the further course of the projects. The Contribution Matrix, the description of the competences of the participants as well as detailed project descriptions were made available to the participants on a common sharepoint. In addition to international project management, the sharepoint is also used for networking and the exchange of information between the participants.

- Annex Q1 Meeting, Skype, 28 January 2020:
- Annex Q2 Meeting, Skype, 2 April 2020
- Annex Q3 Meeting, Skype, 25 and 26 June 2020
- Annex physical workshop was planned in spring 2020 in Vienna and will be postponed due to COVID-19.

In the project year 2020, the proposed work is to start, continue and deepen according to the legal text of Task 3. The Annex Manager for Task 3, René Hofmann, AIT and TU Wien, Austria, will be supported by Thore Berntsson, CIT Industriell Energi, Sweden. The aim was to deepen the recently established matrix of project contributions of the individual subtasks. Therefrom, the project work and all detailed research questions in the individual subtasks with each group associated will be elaborated and answered regarding: Methods combination, Consequences for future changes, Operational aspects, Risk assessment.

In the project year 2021, the ongoing activities in Subtasks 1 to 5 will be extensively deepened. On the basis of the comprehensive project list, detailed questions relating to the individual subtasks within the legal text will be discussed in deep-dive sessions during a one week Web-meeting. This will provide an excellent basis for the Annex XV group to draw conclusions from different viewpoints and will enable to

learn from all projects of the participating countries. Beginning in the summer, work will then start on the Synthesis Report, which will reflect the findings from the ongoing project Annex XV Industrial Excess Heat.

Planned Meetings:

- Annex Q1 Meeting, Skype, 18-19 January 2021:
- Annex Q2 Meeting, Skype, Deep Dive Sessions 22, 26, 27, 28, 29 April 2021
- Annex Q3 Meeting, Skype, before summer 2021
- Annex Q4 Meeting, Skype, in autumn 2021

CONTACT DETAILS

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

Responsible author: Patrik Thollander, Linköping University, Sweden

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

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

Time Schedule new Tasks: 1 January 2018 – 29 February 2020

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 outcome of 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 policies, 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 2020

- Presented the Final Report together with the work and results from the Annex to the IETS ExCo in May 2020. (The report was then revised after comments from the IETS ExCo.)

WORK PLANNED FOR 2021

- Finalize the final report for approval and publication at the IETS website.

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ANNEX XVII: MEMBRANE PROCESSES IN BIOREFINERIES

Responsible author: Frank Lipnizki, Lund University, Sweden

Annex Members: Austria, Denmark, Germany, France, Italy, Netherlands, Portugal and Sweden.

Time Schedule initial Tasks: 1 January 2014 – 30 June 2017

Time Schedule new Tasks: 1 April 2019 – 30 March 2022

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 publicly available on the webpage of the Annex.

ACTIVITIES DURING 2020

- 30 January, Presentation of Annex during the workshop on „Nexus: Energy Water & (Bio)Industry – Technological solutions towards industrial resource efficiency?“ Vienna, Austria.
 - 9-10 February, Representation of Annex during European Membrane Society Council Meeting, Paris, France.
 - Virtual meeting of Sub-tasks groups and sub-tasks leader to co-ordinate and map.
 - 5- 11 December 2020, Representation of Annex and co-ordination meetings during International Congress on Membranes and Membrane Processes (ICOM), online.
-

WORK PLANNED FOR 2021

- 28 January, Annex Workshop, online.
 - 8 February, Representation of Annex during European Membrane Society Council Meeting, online.
 - 23-24 March, Representation of Annex during German Society for Membrane Technology (DGMT) Conference “Membranes for protection of the climate and resources”
 - 7 May, Annex Meeting, online.
 - 12-16 September, Representation of Annex and co-ordination meetings during Euromembrane 2021, Copenhagen, Denmark.
 - Virtual meeting of Sub-tasks groups and sub-tasks leader to summarise and update task activities.
-

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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: Austria, Canada, Denmark, France, Germany, Portugal, Netherlands, Italy and Sweden and sponsor organizations in Finland (VTT) and Switzerland (EPFL).

Time Schedule Task 1: December 2018 – March 2020

Time Schedule Tasks 2-4: January 2021 – December 2022

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 2020

- Virtual meeting on January 13, 2020, to discuss Task 4 (Road mapping the implementation of digitalization in the energy-intensive process industries). Paul Stuart and Daiane Piva, co-leads of task 4, have invited the other task co-leads and annex champions to review and improve the presentation of the task scope activities, objective and deliverables.
- Virtual meeting on March 2020 with tasks co-leads and annex manager, to discuss the status of the three new task proposals development, updating of the list of potential participants and path forward plan development.
- Virtual meeting on April 29, 2020 to present the final report on task1, discuss the status of the development of the three new tasks, the list of potential participants and develop a plan to solicit more members. Fifteen persons including task co-leads and annex champions have attended the meeting.
- Presentation of the annex XVIII overview at the 30th IETS ExCo Meeting, May 28, 2020.
- Presentation of the annex XVIII overview at the webinar on digitalization and AI in the Swedish industry on October 20, 2020 by Mouloud Amazouz and Paul Stuart.
- Submission of a draft version of the final report of task 1 for review by IETS ExCo.

- Presentation of the annex XVIII overview at the IEA End-Use Working Party Webinar on Deep Decarbonization in Industry on December 10, 2020.
- List of 250+ potential participants to the new three tasks. The list includes contacts from 16 countries (members and non-members) representing private companies, universities and research centers.

WORK PLANNED FOR 2021

- Finalize Task 2, 3 and 4 proposals and submit them for review by IETS ExCo.
- Organize virtual meeting for the preparation of an information webinar to recruit additional participants to the new tasks.
- Finalize the information webinar presentations.
- Organize and deliver two identical information webinars.
- Follow-up with interested participants to the tasks for official involvement.
- Organize virtual meetings for the selection of projects within the new tasks and to form the teams for each project.
- Organize meetings for the official launch of each task and selected projects.
- Present the annex overview to the IETS ExCo meetings.

CONTACT DETAILS

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ANNEX XIX - ELECTRIFICATION IN INDUSTRY

Responsible author: Leonie Beekman, TNO, Netherlands

Annex Members: In Task 1, there has been active participation from diverse research groups in the activities and online webinars and workshops.

Time Schedule Task 1: September 2019 – November 2020

Time Schedule Task 2: Q1 2021-Q1 2023

DESCRIPTION OF ANNEX

The Annex aims to be a platform for enhancing collaboration between countries in the area of industrial electrification. The focus of the Annex is on the system aspects of industrial electrification rather than on the technologies within each specific pathway or process. As such, the Annex aims to foster the creation of “critical mass” in the area of industrial electrification. Early 2021, Task 2 is starting with drafting a more detailed workplan and identification of the final group of participants. Objective of Phase 2 is to build and strengthen the international ecosystem of industrial electrification with a focus on system impact. Task 2 will facilitate exchange of knowledge and lessons learned, increase awareness and international collaboration. It entails taking stock of technologies for electrification of industry, sharing and aligning insight and methodologies, identify best practices, broaden awareness by facilitating sharing.

ACTIVITIES COMPLETED DURING 2020

- Identification of common activities, research questions, and interests
- Webinar 1
- Preparation of draft version of plan for discussion during the workshop
- Workshop
- Desk research, identification of overlap areas with other annexes and IEA-TCPs from IEA
- Webinar 2
- Formulation of a multi-year plan
- Compilation and presentation of a Final Report from Task 1
- Dissemination of final results

WORK PLANNED FOR 2021

- Define detailed workplan of Task 2
- Identify final group of participants of Task 2
- Kick-off meeting of Task 2
- Synthesis of state of the art of electrification technologies and used definitions from provided projects
- Online meeting to discuss state of the art of electrification technologies and used definitions

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About the IETS Annual Report

This report has been prepared and published by the IETS Secretariat 2020. For further information, please contact helene.johansson@chalmersindustrietechnik.se, or visit the IETS website at www.iea-industry.org.

The IETS TCP is part of a network of autonomous collaborative partnerships focused on a wide range of energy technologies known as Technology Collaboration Programmes or TCPs. The TCPs are organised under the auspices of the International Energy Agency (IEA), but the TCPs are functionally and legally autonomous. Views, findings and publications of the IET TCP do not necessarily represent the views or policies of the IEA Secretariat or its individual member countries.