2017-07-14

DRAFT

Project Plan for the CEN and CENELEC Workshop on REEMAIN Methodology for Resource and Energy Efficient Manufacturing (CEN-CLC/WS REEMAIN)

(approved during the CWA Kick-off meeting on 2017-07-13)

1. Status of the Project Plan

The Project Plan was approved in the CWA kick-off meeting. The draft Project Plan follows the requirements of CEN Guide 29[1].

2. Background to the Workshop

Resource and Energy Efficient ManufacturINg (REEMAIN)[2] project is a 4-year research project funded by the European Commission[3], which combines cutting edge knowledge and experience from production processes, energy simulation software tools, energy and resource planning and renewable energy and storage to develop and demonstrate a methodology and platform likely to boost the efficiency of both energy and material resources.

The project has four main focus areas:

1. Innovation on the use of resources (energy and materials) at the factory, including the optimization of the production-process-product, a seamless integration of renewable energy systems, and the recovery of wasted energy with environmental performances to be measured within a life cycle approach.

2. Decision making tool to support factory owners in the complex tasks of analysis, decision and planning the best strategies to drive their factories towards resource efficiency and minimal environmental and cost impact.

3. Demonstration activities in three different factories (SCM foundry in Italy, Bossa textiles in Turkey and Gullon biscuits in Spain)

[1] ftp://ftp.cencenelec.eu/EN/EuropeanStandardization/Guides/29_CENCLCGuide29.pdf
[2] http://www.reemain.eu
[3] This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement nº 608977

4. Dissemination at the European and International levels together with a strong support for standardization activities and collaboration within the IMS (International Manufacturing Systems) framework through the IMS MTP Project iProSPER.

Within the REEMAIN framework the intelligent employment of renewable energy technologies and resource saving strategies consider energy purchase, generation, conversion, distribution, utilization, control, storage, re-use in a holistic and integrated way.

- See more at: http://www.reemain.eu/About/About.kl#sthash.8EzMIUoM.dpuf.

Under REEMAIN Project, a scientific and technical methodology will be developed that ensures seamless implementation of energy efficiency measures and technologies while considering the efficient use of resources, i.e. material, personnel, machine capacities, and corresponding technologies within the factory. The resulting methodology for planning and controlling the technologies is aiming for minimal emission and cost-effectiveness within the factory with respect to external as well as internal, ecological and economical influences. This methodology will also aim to explore and introduce emerging concepts of industrial sustainability ratings and eco-labelling schemes (e.g. BREEAM New Construction: Industrial, ITACA Industry and DGNB Existing industrial buildings).

The target is to achieve that the factories are fully resource efficient and evolve towards zero-carbon emissions through generation of a scientific organizational methodology for planning and control the efficient use of resource technologies, i.e. energy generation, material waste and re-use of emissions and cooling water use, resources within and around the factory.

This generic methodology builds up resource networks that are capable of highly adaptable resource capacities, using energy and material storage as well as flexible job models with available quality, ecological and factory housing models.

The aim is to link both resources (energy and material) to ensure the evolution towards zero-carbon/neutral manufacturing.

Implementation plans and guidance, i.e. workbook for resource efficient manufacturing, of the resulting methodology targeting shareholders, planners and technicians. The linkage of energetic and material use within and around the factory to form a structured coordination of resource “cooperation” will be validated using a lightweight LCA.

Throughout the REEMAIN Project two main activities are being developed related to standardization, which provides the benefits of harmonization and dissemination of standards to the project in general and its results in particular. The first activity related to standardization has been the search for and analysis of the existing standards and on-going developments relevant to the project in order to introduce aspects that enable interoperability, dissemination of results in the standardization community and related benefits with a view to ease the introduction of REEMAIN outputs in markets.

As a result of this standardization analysis and keeping in mind the REEMAIN Project methodology, the following four standards have been identified as reference for this Workshop:

Standard	Technical Committee
EN ISO 14040:2006 Environmental management - Life cycle assessment - Principles and framework (ISO 14040:2006)	CEN/SS S26 Environmental management
EN 16212:2012, Energy Efficiency and Savings Calculation, Top-down and Bottom-up Methods*	CEN/CLC JWG 4 Energy efficiency and saving calculation
EN 16231:2012, Energy efficiency benchmarking methodology	CEN/CLC JWG 3 Energy Management and related services - General requirements and qualification procedures
EN ISO 50001:2011, Energy management systems - Requirements with guidance for use (ISO 50001:2011)	CEN/CLC JWG 3 Energy Management and related services - General requirements and qualification procedures
ISO 17743:2016, Energy savings - Definition of a methodological framework applicable to calculation and reporting on energy savings	ISO/TC 301 Energy management and energy savings

ISO 50015:2014, Energy management systems - Measurement and verification of energy performance of organizations -- General principles and guidance	ISO/TC 301 Energy management and energy savings
ISO 50047:2016, Energy savings - Determination of energy savings in organizations	ISO/TC 301 Energy management and energy savings
*EN 16212 has largely been updated with ISO 17743, ISO 50015 and ISO 50047.	

The second main activity related to standardization in the REEMAIN project is the introduction of new technologies and innovations in the standardization field in order to ensure that both REEMAIN's outputs get the benefits of standardization process and standardization gets the benefits of R&D projects.

3. Workshop proposers and Workshop participants

The Workshop proposer is UNE, the Spanish National Standards Body as a partner of REEMAIN consortium responsible for the standardization aspects. Other partners of REEMAIN are: Fundacion Cartif (CARTIF- Spain) , Integrated Environmental Solutions Limited (IES - United Kingdom), De Montfort University (DMU - United Kingdom), Galletas Gullon SA (GULLÓN – Spain), Bossa Ticaret ve Sanayi Isletmeleriturk Anonim Sirketi (BOSSA – Turkey), Accademia Europea per la Ricerca Applicata ed il Perfezionamento Professionale Bolzano (Academia Europea Bolzano) (EURAC – Italy), R2M Solution Srl (R2M SOLUTION – Italy), Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung e.v (FRAUNHOFER – Germany), Youris.com (YOURIS – Belgium), Solera gmbh (SOLERA gmbh – Germany), Est Enerji Sistem Teknolojileri Sanayi ic ve dis Ticaret Limited Sirket (EST ENERJI – Turkey), Ikerlan S.COOP. (IKERLAN –IK4 – Spain), Centro di Ricerca e Innovazione Tecnologica srl (CRIT – Italy), SCM Group spa (SCM GROUP SPA- Italy), Dr. Jakob Energy Research gmbh & co. kg (JER – Germany) which has been invited to participate in Workshop.

Participation in the Workshop is open to anyone, and the opportunity to participate is widely advertised in advance by its proposers and by CEN and CENELEC and their member bodies.

The REEMAIN project will circulate the invitation to the kick-off meeting to already identified stakeholders from related and impacted sectors such as: Industry, University, Consulting, R&D, Standardization, etc.

Simultaneously, CEN and CENELEC publish the CWA Project Plan "REEMAIN Methodology for Resource and Energy Efficient Manufacturing" and invitation through the CEN and CENELEC channels.

4. Workshop scope and objectives

This Workshop aims to develop a CEN-CENELEC Workshop Agreement on Methodology for Resource and Energy Efficiency Manufacturing consisting of a developed and verified methodology for enabling a resource efficient production. The methodology will consider aspects of development, engineering, production, reconfiguration and residue-free elimination. The result will be a guide for users to identify efficiency potentials and how to implement the methodology within their organisations.

The methodology can be used to guide the day-to-day operations of a factory. It will also describe how to carry out a form of 'lightweight LCA' (such as carbon foot-printing) that can be used to compare the environmental impacts of different strategies for resource and energy efficient manufacturing.

The aim is to enable stakeholders to internalize the rules and behaviors that drive resource and energy efficient manufacturing, by helping them to 'see' opportunities to reduce waste and ensure sustainability. What is envisaged is not a development of a value-stream mapping, but it may be analogous to VSM since it will help managers to make abstract concepts such as embodied energy and resource efficiency more tangible as they plan and control the operations of a factory.

Finally, REEMAIN methodology will take into account the following different industrial resource and energy efficiency assessment methodologies and approaches and will be the glue between the different methods and a tool for decision making, i.e. how to use them in order to develop efficiency measures:

4.1 LIFE CYCLE ANALYSIS (LCA)

Life cycle assessment (LCA) is a tool that can be used to measure the impact of a product, process or activity throughout its life-cycle. It is a well-established analytical method to quantify environmental impacts, and has been applied to various manufacturing industries. For example Fiez et, al. (2015) applied it to cement production, Yacout et, al. (2016) used LCA to conduct a 'cradle to gate' analysis of acrylic fibre production, Roy et, al. (2009) reviewed the application of LCA to food products manufacturing while the Cabeza et al., (2014) & Abd Rashid et al., (2015) provide reviews of LCA studies for buildings assessments. According to another review article about the application of LCA in the industry, LCA has been applied to the production of plastics, detergents, automobiles, agriculture, mining, biofuels, energy, oil and gas extraction and wastewater treatment (Jacquemin et al., 2012). Conducting an LCA involves four steps: goal and scope definition; inventory analysis; life-cycle impact assessment (LCIA); and interpretation. The framework for LCA is conceptually depicted in Figure 1, and its procedures and principles have been standardized in ISO14040.

4.2 ENERGY ANALYSIS

Energy analysis is based on the first law of thermodynamics and makes use of the fact that energy and mass are conserved quantities. The energy balance is the core concept in energy management within industry and is the most widely applied method currently used in practice.

4.3 EXERGY ANALYSIS

Studies based on mass and energy balances exclude any notion of resource consumption since we know that during mass and energy transformations, both matter and energy are always conserved. Additionally, energy flows are not completely defined by their quantity alone, as their quality is equally important (Khattak et al., 2015). Exergy (a thermodynamic quantity based on the second law of thermodynamics) is consumed during transformations and can be used to account for the quality as well as the quantity of mass and energy flows. The consumption of resources results in exergy destruction which can rightly be regarded as a form of waste.

The exergy of a thermodynamic system is defined as “The maximum theoretical useful work (shaft work or electrical work) obtainable as the system is brought into complete thermodynamic equilibrium with the thermodynamic environment while the system interacts with this environment only” (Tsatsaronis, 2007). It is a property of both the system and the environment when both are considered as part of a composite system (Bakshi et al., 2011). Exergy can be calculated for both energy and mass flows, representing variation of a flow from equilibrium, at which state the flow ceases to possess any useful potential. The fact that exergy can be used to model both mass and energy flows on a common unit basis, whilst considering their quality in addition to quantity gives exergy analysis an advantage over the use of mass and energy balances when analysing natural resource flows. As a result, the method is quite mature in the field of environmental science and has been applied to a range of industrial systems as well.

4.4 PINCH ANALYSIS

Pinch analysis is a graphical method which was originally developed in 1982 for finding optimal solutions in heat exchange networks (Klemes and Kravanja, 2013). Originally developed only for analysing systems involving heat flows, later versions also include mass pinch and water pinch analysis (Aziz et al., 2016).

4.5 VALUE STREAM MAPPING (VSM)

Detailed description of VSM, and its strengths and limitations will be highlighted.

4.6 DISCREET EVENT SIMULATION (DES)

DES will be described and currently available software platforms will be surveyed. If possible, the resource networks methodology will be linked to the simulation platform and its strengths/limitations will be identified.

4.7 CONTINUOUS SIMULATION

A survey of continuous simulation platforms for measuring energy and resource efficiency will be provided.

4.8 ANALYSIS USING IES – VE

This section will be based on the methodology used by the IESVE based REEMAIN tool. This particular tool is designed by IES which is one of partners of REEMAIN project

4.9 COMPARISON OF THE APPROACHES AND APPLICATION TO INDUSTRY

From the identified strengths and limitations of each approach, their suitability for the industry will be discussed and compared.

5. Workshop programme

The working language during the Workshop is English. The CWA will be drafted and published in English.

The estimated duration of this workshop is 6-8 months. During the Workshop lifetime, several face-to-face and on-line meetings are foreseen depending on the project evolution.

The programme to reach the CEN-CENELEC Workshop Agreement entails the following steps:

1. Organisation of the kick-off meeting

2. The kick-off meeting is organized on 13th of July 2017, at the premises of CEN-CENELEC Meeting Center, to plan the CEN-CENELEC Workshop Agreement. The kick-off meeting will:

- approve the Workshop Project Plan;
- discuss the first draft of outline of the CWA;
- select the project team, Workshop chair and designate the Secretariat;
- solicit for source documents from the different participating countries.

3. The project team will review source documents, compare these with the results of the different work packages (WP) in the REEMAIN project, especially WP4 Towards zero-carbon/neutral manufacturing, and prepare the first draft for workshop consideration.

5. An internal reviewing period, including a webconference for coordination, will be carried out to allow the inclusion of comments from Workshop participants and to ensure that consensus is reached on the content.

. The Workshop Secretariat will organize a CEN-CENELEC Workshop plenary meeting for all registered participants for last resolution of comments and internal approval of the CWA for public comment phase.

6. The proposers will organize a 60-day Public comment phase. 7. A second and final plenary meeting for registered Workshop participants will be organised for the resolution of the comments received during the 60-day public comment phase if any, and fpr approving the final draft of the CWA.

9. When the consensus is met, the CWA will be sent to the CEN-CENELEC Management Centre for publication.

The following table presents an intended work schedule:

Activities	**Intended Dates**
Workshop Kick off meeting CWA open to any interested party	13th of July (30 days for information)

	Brussels – CEN Premises
Opening of formal registration to CEN-CLC/WS REEMAIN	14th of July
Circulation of the 1st draft presented in KoM to the workshop participants for comments/Preliminary Commenting period[a]	3rd week of July
Draft CWA "REEMAIN's Resource and Energy Efficiency manufacturing Methodology" for internal reviewing period	4th week of July
Internal review period for commenting	From 4th week of July to the 1st week of September
Webconference for reviewing comments received and their inclusion in the draft CWA	2nd week of September
1st CEN-CENELEC Workshop Plenary meeting for registered participants for last resolution of comments and internal approval of the CWA for public comment phase.	1st th REEMAIN WS Meeting 4th week of September 2017 Rimini – Italy
Public comment phase on Draft CWA	October – November 2017 60 days
2nd CEN-CENELEC Workshop Plenary meeting for registered participants for resolution of comments if any and approval of the final draft CWA.	December 2017 Madrid – UNE premises
Publication CEN-CENELEC Workshop Agreement "REEMAIN's Resource and Energy Efficiency manufacturing Methodology"	January-February 2018
a – The WS secretariat will provide the latest version of the draft CWA to each organization registered in the WS when becoming a WS member.	

6. Workshop structure

The following hold the responsibility of the workshop.

6.1 CEN Workshop Chairperson

A proposal for the chairperson will be made by the Workshop proposers; he/she or any other candidate nominated during the period of publication of this Project Plan or at the Kick-Off will be approved at the Kick-off meeting by the parties present. His / her responsibilities include:

- Chairing the CEN Workshop meetings,
- Monitoring the progress of the CWA,
- Interface with CCMC regarding strategic directions, problems arising, external relationships, etc.
- Guides the work towards consensus.

6.3 CEN Workshop Secretariat

The CEN Workshop Secretariat is providing the formal link to the CEN system. The following main activities will be carried out by the Workshop Secretariat:

- Is responsible for administrative tasks of the CEN Workshop Agreement
- Forming the administrative contact point for CWA project,
- Makes and follows up on action lists,
- Ensures that the Workshop Agreement follows the directives,
- Administrating the liaison with relevant CEN/TCs, if applicable.

7. Resource requirements

All costs related to the participation of interested parties in the Workshop's activities have to be borne by themselves. There is no fee for registered participation in the Workshop.

The REEMAIN project (funded under the European Union Seventh Framework Programme) will contribute to the drafting of the CWA. UNE will provide the Workshop secretariat subject to formal approval of the Project plan at the kick-off meeting.

8. Related activities, liaisons, etc.

The following are related activities with regard to standardization and R&D projects which are linked to this CWA:

8.1 CEN/CLC JWG 3 "Energy Management and related services - General requirements and qualification procedures".

8.2 CEN/CLC JWG 4 "Energy efficiency and saving calculation".

These two working groups are responsible for the main related standardisation documents identified, which are also a reference for the REEMAIN methodology. They have been consulted about the feasibility of the CWA through CEN/CLC/BT Sector Forum "Energy Management" (SFEM), and they will also be invited to participate in the workshop and will have the possibility to make comments.

REEMAIN project was also presented at the SFEM meeting in November 2016 and this draft project plan was circulated to SFEM members until mid-April. No objections were raised and some members expressed an interest to join efforts on the methodology development.

8.3 iProSPER

Under the framework of the Intelligent Manufacturing Systems (IMS) program, REEMAIN has formed a "Manufacturing Technology Platform (MTP) project extension" that links REEMAIN to other research efforts and organizations in Europe and the USA.

The collaborative platform is called iProSPER and it stands for the International Program for Sustainable Production and Energy Reduction.

IMS is an industry-led, international business innovation and research and development (R&D) programme established to develop the next generation of manufacturing and processing technologies through multi-lateral collaboration. IMS is associated with the World Manufacturing Forum.

In iProSPER, REEMAIN connects to three leading universities and one industrial in the USA. From Europe, REEMAIN links to five additional partners (2 industrials, 2 universities and one RTO) which connect project activities to several additional FP7 projects and research efforts in the USA. Activities will include joint workshops, the exchange of best practices and aspects related to non-competitive research such as KPIs, methodologies and lessons learned from pilot activities. The platform will remain open to new members.

- See more at:

http://www.reemain.eu/News/Articles/IProSPER-Ready-To-Launch.kl#sthash.iP60EzPF.dpuf
http://www.iprosper.eu/home/

9. Contact points

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