

## Project Concept for a new task shared Annex within the DHC TCP

<b>Proposed Project Title</b>	<u>Hybrid Energy Networks</u> : District heating and cooling networks in an integrated energy system context
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<b>Date</b>	03. April 2017
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***Brief description of the proposed project, including the objectives and scope:***

Problem and situation: District heating and cooling (DHC) networks traditional have strong link to the electricity and the gas network via combined heat and power processes (CHP). However, in recent years, a new dimension of this interaction appears. This is related to a) an increasing share of volatile and non-controllable supply in the electricity networks such as PV and wind energy, requiring a higher flexibility in the energy systems to avoid decreasing power quality levels and transmission bottlenecks and b) an increasing penetration of coupling points between the networks, such as power-to-heat and power-to-gas technologies being able to provide a certain flexibility. This new dimension in turn offers some opportunities for DHC networks e.g. by integrating highly efficient heat pumps and storages, but on the other hand also imposes challenges due to a higher competition between the domains.

The aim of the project: This project aims at promoting the opportunities for DHC networks and at the same time overcoming the challenges with the help of an integrated approach, creating a “hybrid energy infrastructure, building upon synergies between electric distribution grids, district heating and cooling networks and gas grids. The diverse

- coupling points (e.g. combined heat and power (CHP) plants, fuel cells, heat pumps, electrolyses processes),
- storage technologies (thermal, electricity, gas...)
- time constants (from seconds to month) and
- scales (from individual to large scale systems, from distribution to transmission networks)

and other circumstances regarding energy generation and transformation can complement each other in case the network planning, design and operation is done in an integrated manner. As a consequence, synergies will be generated enabling measures that would not be possible when looking at the networks individually. The project takes the entire energy chain from production/generation via distribution/storage to end use into account.

The principle goals of the task shared Annex “Hybrid Energy Networks” are to:

- Create awareness for the advantages of the integrated system to the various stakeholders
- Provide a state-of-the-art overview of hybrid networks in terms of R&D projects, demonstrators and cast studies
- Support the planning, design and operation of the single domains by highlighting technological solutions and the synergy potentials of an integrated system as well as an integrated planning process.
- assess the possibilities and gaps in current methodologies and tools for planning, design and operation of the integrated system
- Evaluate non-technical barriers and enablers for hybrid networks such as business models, legal aspects and policy instruments

Methodology: The proposed task shared annex “Hybrid Energy Networks” could be separated into following subtasks (draft, a more detailed description will be made during the definition phase):

- A. Technologies and synergy potentials (assessment of coupling points, storages and other relevant technologies, applications areas and advantages of hybrid energy networks)

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- B. Tools and methodologies (for evaluating, planning, designing and operating hybrid energy networks, e.g. energy system simulation software, co-simulation approaches ...)
- C. Case Studies (existing R&D projects, studies, demo plants ...)
- D. Business models, legal aspects, Standards and policy instruments (Barriers and enablers for hybrid energy networks)
- E. Dissemination and Guidelines

**intended target audience (receptor):**

- Energy suppliers and network operators (heating, cooling, electricity, gas, others)
- policy makers, especially city authorities, regulative bodies and innovation Policy Makers
- Urban planners and investors for transforming existing/ implementing new energy infrastructure
- Component producers and engineering consultancies
- Storage operators and prosumers (e.g. facility managers for commercial and industrial buildings)

**Related ongoing and past projects (IEA DHC and other TCPs):**

The project relates to and builds upon the following previous DHC projects, in particular:

- DHC Annex XI projects: Plan4DE: Reducing greenhouse gas emissions and energy consumption by optimizing urban form for district energy and Smart use as the missing link in district energy development: a user-centred approach to system operation and management
- DHC Annex TS1: Low Temperature District Heating for Future Energy Systems
- EBC Annex 67: Energy Flexible Buildings
- DHC Annex TSX: Implementation of 4DH networks (suggested as new task share annex at the ExCo meeting in Mai 2017)

To scope with the required expertise and know how in the electricity network domain, it is planned to initiate a formal cooperation with the IEA TCP ISGAN. Here, a “moderate” cooperation is proposed, including:

- The OA of the annex “hybrid energy networks” will give a regular status report to the relevant ISGAN stakeholder, either by sending a short presentation, or in case of the need for deeper discussions, by personal appearance.
- The relevant ISGAN stakeholder will give written feedback to any relevant publications of the annex “Hybrid energy Networks” – in turn, the logo of both TCPs are used on the publication.

The details of the cooperation, especially with regards to the responsible persons (e.g. ExCo, Chairman or Operating Agent of the relevant Annex) needs to be agreed with the ISGAN ExCo. Within the IEA ISGAN the Annex 7: Smart Grid Transitions has already been identified as relevant. However, more details and projects will be identified during the development of the cooperation.

Further on, cooperation to other TCPs such as EBC, DSM, Hydrogen etc. will be investigated.

**Time planning:**

May 2017:	approval to start the definition phase (ExCo Meeting Hamburg)
June 2017:	start <u>definition</u> phase (international definition phase meeting/WS in Sep./Oct.) + Initiation of the cooperation with IEA ISGAN
Nov. 2017:	approval to start preparation phase (ExCo meeting in Vienna)
Jan. 2018:	start <u>preparation</u> phase
Jan. 2019:	start <u>working</u> phase (final annex text available)

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Jan. 2022:	start <u>reporting</u> phase		
June 2022:	end of the Annex		
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