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TECHNICAL REPORT

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Report on the development of cogeneration

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REPORT ON THE DEVELOPMENT OF COGENERATION

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IEC TR 63388 has been prepared by IEC technical committee 5: Steam turbines. It is a Technical Report.

The text of this Technical Report is based on the following documents:

Draft	Report on voting
5/243/DTR	5/244/RVDTR

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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- withdrawn,
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REPORT ON THE DEVELOPMENT OF COGENERATION

1 Background

1.1 Task following SMB decision

Following the Standards Management Board (SMB) decision 141/10, IEC Technical Committee 5 (Steam Turbine) was tasked to lead a joint working group with related IEC and ISO committees to explore potential standardization opportunities.

SMB decision 141/10reads as follows:

> SMB decision 141/10 – SMB AhG 30: Co-generation – IEC involvement in joint work with ISO
>
> The SMB, further to having taken decisions confirming IEC's commitment to providing support to the areas of cogeneration technology within its area of competence in particular aspects related to electrical power generation, decided to instruct IEC TC 5 to be the primary point of contact, to follow this activity in coordination with TC 45 and TC 105.
>
> The SMB requests AhG 30 to submit a final report and recommendations on future work and any future activities by end July 2011, and decided to disband the SMB AhG 30 after submission of the report.
>
> Based on the AhG recommendations, SMB will then communicate an IEC perspective on this matter to ISO.

With the above SMB decision, IEC Technical Committee 5 established Joint Working Group 16 (Cogeneration Combined Heat and Power (CHP)) in 2012-09.

After IEC/TC5/JWG16 was established, working steps were proposed (see 5/168/AC) as follows:

No.	Working step	Remarks
1	Complete an overview on standards related to CHP technology.	Also include standards if they only partly cover CHP aspects
2	Clarification of status and application experience of Manual CWA 45547	Efficiency of CHP solutions is in focus for all applications. The Manual CWA 45547 from 2004 could be a basis for an IEC standardization project. There might be valuable feedback available from application of the Manual.
3	Screening of world-wide applied alternative methods for determination of CHP efficiency	
4	Clarification of the need for standards dealing with aspects different to efficiency such as safety, performance and installation. A differentiation between residential / commercial mass products and power plants should be considered. It should be identified where the current standardisation activities are going on in ISO or IEC and where the need for new coordination between IEC / ISO TCs is suggested.	Consider the different needs for the residential, commercial and industrial needs including the different power sizes. EN 50465:2008 GAS APPLIANCES – COMBINED HEAT AND POWER APPLIANCE OF NOMINAL HEAT INPUT INFERIOR OR EQUAL TO 70 KW? IEC62282 Fuel Cell Technologies Germany: FW308 July 2011 Status per 03-2012: The common aspects of safety related control are already covered by other IEC and ISO standards on Functional Safety. No additional aspects for standardization with respect to CHP identified. The common aspects of application of gas and oil valves are covered by other IEC and ISO standards. No additional aspects for standardization with respect to CHP identified.
5	Clarification if there is any other product/solution specific standardization need in the area of CHP	Possible aspects are also grid parallel operation of the CHP.
6	Update necessary liaisons with other TCs within IEC or ISO	IEC TC45 Nuclear instrumentation? IEC TC105 Fuel cell technologies? ISO TC192 Gas Turbines? ISO TC208 Thermal turbines for industrial application (steam turbines, gas expansion turbines)? Other TCs?
7	Prepare Proposal of standardization Work Item (PWI) for voting in TC5 and relevant other TCs	Proposal might include the target to align the context of the new IEC standard in a way that it later – as an EN IEC standard – can be harmonized with the EC Directive 2004/08 (Combined Heat and Power (CHP) Directive).
8	Clarification of which other IEC or ISO standards have to be adapted, when new IEC standard in CHP efficiency becomes valid. Preparation of requests to other TCs for adaptation/update of other standards.	Chapters on CHP efficiency in other standards for individual applications should be replaced by a reference on the new IEC standard. In C-type standards describing the efficiency of a certain technology relevant to CHP a reference on the new IEC standard on CHP efficiency should be included.
9	Clarification with CEN/CENELEC on withdrawal of Manual CWA 45547	

This technical report is intended to address the above items 1, 3, 4, 5, 7, and 8.

Other items will be addressed depending on the outcome of this report.

1.2 Scope

This document, which is a technical report, introduces the widely used technical scheme of cogeneration (also known as combined heat and power (CHP)), and gives the corresponding cases. The technical schemes of cogeneration covered in this technical report can be divided into two categories. One is cogeneration based on steam turbine, which is generally applied in thermal power plants; The other is cogeneration based on other prime movers, such as fuel cell, micro gas turbine, internal combustion engine, Stirling engine, ORC, etc.

This document gives some cases of cogeneration, mainly including:

- CHP based on extraction turbine;
- CHP based on back pressure turbine;
- Low-vacuum heating mode;
- LP cylinder steam bypassed heating mode;
- CHP based on steam turbine with synchro-self-shift clutches;
- Gas-steam combined cycle CHP;
- Micro gas turbine CHP;
- Stirling engine CHP;
- Fuel cell CHP; and
- ORC CHP.

The characteristics, components and technical requirements of these technical schemes are introduced in this document.

By collecting existing standards of CHP, this document also identifies the gaps of CHP standardization and put forward a roadmap for future CHP standards.

This document is prepared based on limited expert resources. Thus, some cogeneration cases could not be covered in this document, such as:

- Solar cogeneration; and
- Internal combustion engine cogeneration.

1.3 Purpose

Based on the decision of the SMB, the purpose of this document is to briefly introduce the technical characteristics and requirements of different cogeneration schemes, analyse the standard status and standard gap, put forward roadmap and suggestions for the development of cogeneration standards in the future.