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KeepCool II

Assessment of energy savings related to sustainable summer comfort – Input for national Energy Efficiency Action Plans (EEAP)

The objective of this work package is to make use of the know-how developed within KeepCool I and II and give support to the national institutions preparing the EEAP (Energy Efficiency Action Plan) under the Directive on energy end use efficiency and energy sevices.

This will be done by developing an approach for a bottom-up assessment of the energy savings related to sustainable summer comfort solutions. The main results of the work package will be:

- "Benchmarks" (typical values) of energy savings
- Relation to single or packaged technical measures of sustainable summer comfort
- Application to typical building types

The approach developed under this project for assessing energy savings from sustainable summer comfort solutions could also be applied for other technical measures in the building sector. Therefore this work packages is strongly interlinked with projects dealing with bottom-up assessment of energy savings under the EEE-ESD such as the already running IEE-project EMEEES.

Determination of the reference base cases

The EEE-ESD specifies that "Energy savings shall be determined by measuring and/or estimating consumption, before and after the implementation of the measure [...]. In a bottom-up approach for the assessment of energy savings the energy consumption before the implementation of the measure determines reference base case. The determination of the reference base case is one of the major challenges for every energy savings calculation. The base case definition integrates market and/or stock values and probably introduces the main source of uncertainty in the calculation of the energy savings. The approach of this project consists of the following subtasks:

- Definition of 15-20 standard building types with typical energy consumption values that for the moment do not apply but would be suitable for the implementation of sustainable summer comfort solutions. The building types will differ according to
    - use of the building (office buildings, school building, hotels, residential buildings etc.)

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  - technical characteristics (quality of façade, share of window area, thermal mass, cooling system, lighting system etc.)
  - new construction resp. refurbishment of existing building

- Calculation of energy consumption in the defined standard building types serving as reference base cases: The quantitative assessment will be done partly by building simulation (TRNSYS or other equivalent tools) and partly – where the effort of a comprehensive building simulation can be avoided – by simplified calculation methodologies (monthly balance approach).
- Uncertainty analysis: An uncertainty analysis will be performed on the reference energy consumption of the different typical reference base cases as defined above. Uncertainty spreading of reference consumptions will also be supported by existing audit campaign, as the STEGVIS-STIL (audit program in Sweden), or useful results from other IEE projects as EL TERTIARY or AUDITAC. In the long run, there is the possibility to check the appropriateness of the selected reference base cases by means of comparing them with results from the energy certificates, if this information is gathered in a structured way in a given country (here there is a link to the IEE project DATAMINE).

Selection of technical solutions to suitable for a quantitative assessment

Based on the definition of typical reference base cases all the technical measures analysed and disseminated under KeepCool I and II will be reviewed in order to select the solutions for which enough knowledge is available to assess the cooling load cut or cooling consumption reduction when applied in a particular building. The main selection criteria are:

- empirical information on the energy saving effect of a given solution;
- availability of (simulation) methodologies to calculate the effect of a given solution;
- expected volume of the energy saving effect.

For solutions led apart for lack of information, precise description of the information gaps will be made available to enable future progress. Standardisation gaps will also be highlighted where relevant.

In a second step selected technical solutions for sustainable summer comfort will be grouped into typical packages, since very often these technical solutions are not used as stand-alone measures but in combination with other measures.

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Evaluation of energy savings and normalisation for external parameters

The task consists of the following sub-tasks:

- Because not all sustainable summer comfort solutions are applicable to all building types, in a first step, there will be defined feasible combinations of both ("scenarios").
- In a seconds step the energy savings will be calculated for the selected combinations ("scenarios"). The quantitative assessment will be done partly by building simulation (TRNSYS or other equivalent tools) and partly – where the effort of a comprehensive building simulation can be avoided – by simplified calculation methodologies (monthly balance approach). The evaluation results in benchmarks for typical energy savings of a given (package of) sustainable summer comfort solution compared with a typical reference base case, where this solutions have not been applied.

Since the EEE-ESD specifies that "Energy savings shall be determined [...] while ensuring adjustment and normalisation for external conditions commonly affecting energy use." in a third step for each measure, main factors of variation ("external conditions") will be quantified, keeping in mind the uncertainty bands identified in the base case in order to avoid useless calculations. This process will enable to keep only useful external conditions and to establish simplified parametric laws.

Outcomes of this work package:

- Definition standard building types that may serve as typical reference base cases;
- Development of a list of sustainable summer comfort solutions for which a quantitative assessment of their effects is feasible;
- Benchmarks (typical values) of energy savings of a given (package of) sustainable summer comfort solution compared applied to a typical reference base case building.

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