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BOLIG+ an energy neutral multifamily building

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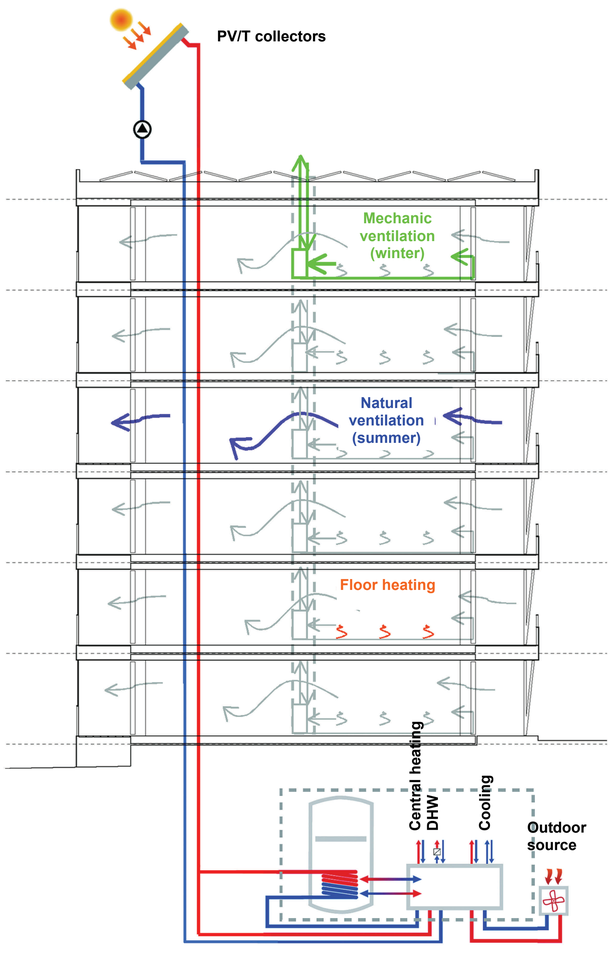
BOLIG+ is a set of rules for residential buildings of any scale, ranging from single family detached houses to blocks of flats. The five rules of BOLIG+ have been developed in cooperation by several Danish organisations and institutions in the BOLIG+ group, in order to facilitate the development of homes for the future. The set of rules can easily be extended to include other usages of the buildings as well. The five rules that a BOLIG+ building must follow are:

- *Energy neutral on an annual base, incl. electricity for appliances;*
- *Intelligent and user-friendly;*
- *Flexible in daily use and over time;*
- *Good and healthy indoor climate;*
- *High architectural quality and adaptation to local context.*

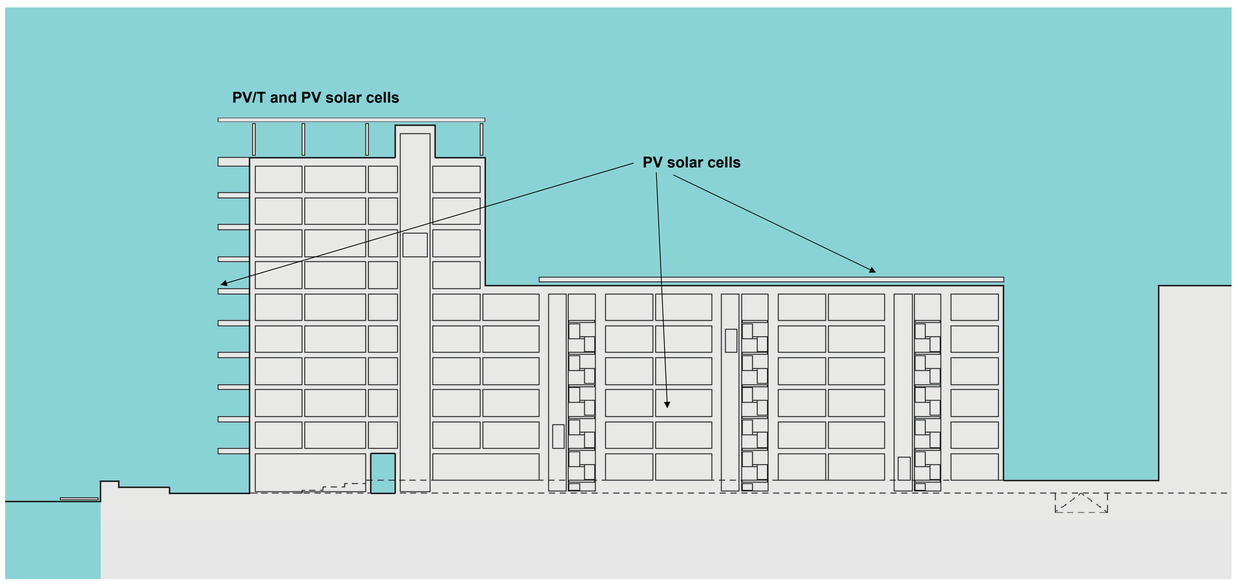
Energy rules

The calculated annual energy consumption must not exceed 35 kWh/m². The energy consumption covers space heating, ventilation, domestic hot water, distribution and production losses, electricity (multiplied by 2.5) for operating the building, and a potential sanction for excess heating. The target must be achieved without contribution from renewable energy.

Furthermore the building must deliver the same amount of energy to the grid as it consumes over the year. The energy should at least be of the same quality (exergy) and usability as energy supplied by public grids. In reality this means that thermal energy bought from the local district heating grid during winter time can not be replaced by hot water e.g. heated by solar collectors during summer. Hot water does not have any value in the district heating grid during summer due to excess heat at this time of the year owing to the primary purpose for the district heating grid, which is the combined heat and power production.



Finally the household electricity demand must be part of the overall energy neutrality for the building. However, electricity for household appliances in the BOLIG+ definition has been limited to the optimum electricity consumption for a Danish standard household i.e. 1700 kWh per flat in a block of flats (2100 kWh per year in single family houses).



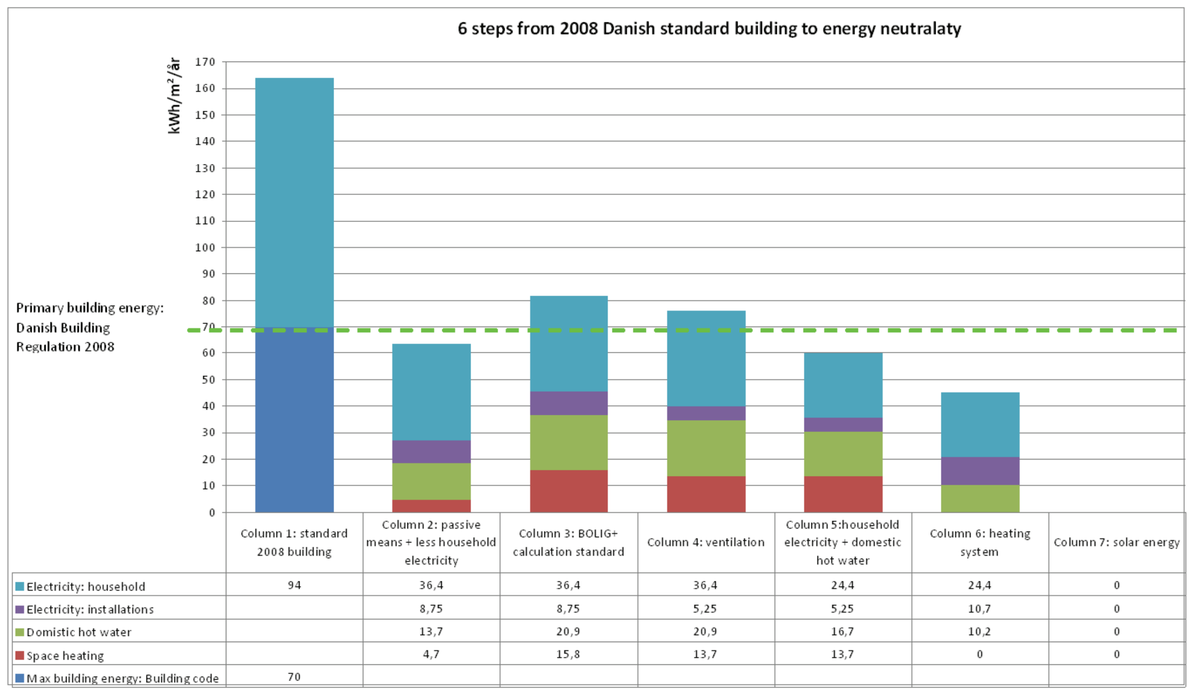
Winning project

The winner of the project contest was announced in September 2009. The winning team, TEAM+, consist of eight partners – architects, engineers and manufacturers.

The team utilise the following strategies in their energy concept to obtain energy neutrality:

- Considerable reduction of the energy demands compared with the Danish Building Regulations (2008) Low Energy class 1 (LE1) by means of passive measures and solar heating. An annual energy demand of 13 kW/m² compared with the LE1 demand of approximately 35 kW/m²;
- Reduction of the electricity consumption for light and appliances compared with country average;
- Intelligent systems provide help to users to minimise their consumption;
- Combination of mechanical and natural ventilation;
- Utilisation of a heat pump based on ambient air and solar energy;
- Utilisation of thermal solar heat in the form of PV/T collectors: 200 m² on the roof;
- Utilisation of PV: 600 m² (+200 m² PV/T) on the roof and 900 m² on the parapets.

The building will be constructed on ordinary market conditions as a combination of rented and owner occupied flats. The tower section of the building will be owner occupied while the low section will be rented flats. The building is planned to be ready for occupancy by the end of 2012.



	Column 1: standard 2008 building	Column 2: passive means + less household electricity	Column 3: BOLIG+ calculation standard	Column 4: ventilation	Column 5:household electricity + domestic hot water	Column 6: heating system	Column 7: solar energy
Electricity: household	94	36,4	36,4	36,4	24,4	24,4	0
Electricity: installations		8,75	8,75	5,25	5,25	10,7	0
Domistic hot water		13,7	20,9	20,9	16,7	10,2	0
Space heating		4,7	15,8	13,7	13,7	0	0
Max building energy: Building code	70						

BOLIG+: Danish Society of Engineers; Architects' Association of Denmark; The Energy Saving Trust; Danish Ecological council; Danish Building Research Institute, AAU; Danish Technological Institute