

## ABSTRACT

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### Title

Opportunities for the housing sector for producing and distributing electrical energy

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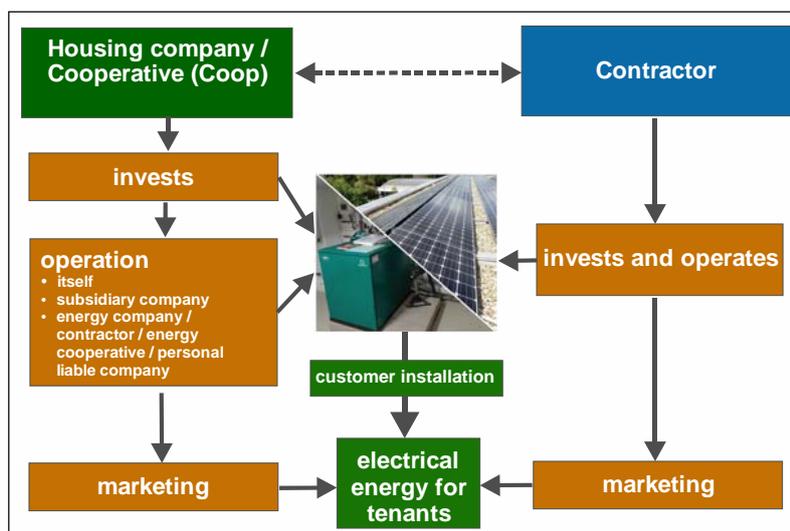
### Background

Multi-family housing usually offers good preconditions for generating electricity by using combined heat and power or photovoltaic devices. However, feeding the electricity produced directly and fully into the public grid is rarely cost-effective. Selling the electrical energy to tenants in the immediate neighbourhood might increase the profitability for the operator and, at the same time, reduce the tenants' household energy bills. With this a range of aspects have to be considered.

### Research issues

The research project deals with the implementation of "Mieterstrom" (where tenants are buying electricity produced on site through either photovoltaics or combined heat and power and delivered without using public grids) throughout the institutional housing sector. Expert interviews with decision makers from the housing and the energy sector were conducted, covering organisational, legal (rental law, energy and tax regulations) and technical framework conditions, and any practical solutions already developed. Furthermore, an online survey targeting housing providers as well as a set of comparative calculations were carried out.

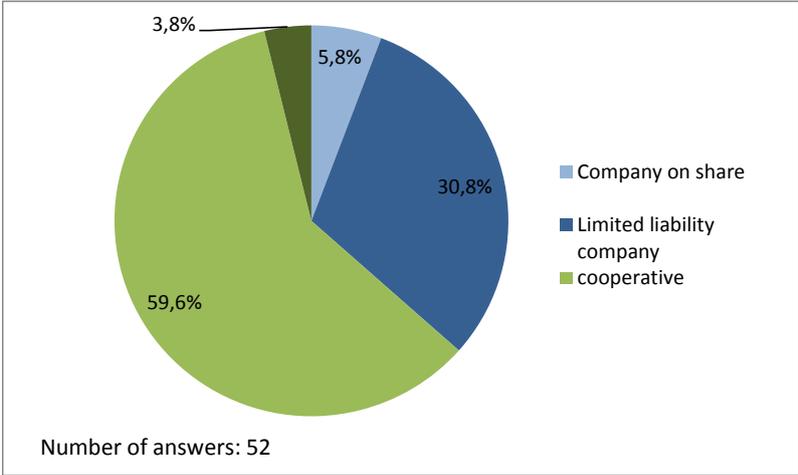
The final report describes different possible models for generating and distributing electrical energy including advantages and disadvantages. Direct electricity marketing via the housing company is still relatively uncommon; creating a subsidiary company or cooperating with an energy company is a frequent solution. The development of smart electrical metering is a technical challenge in order to allow consumers a free choice of their electricity provider.



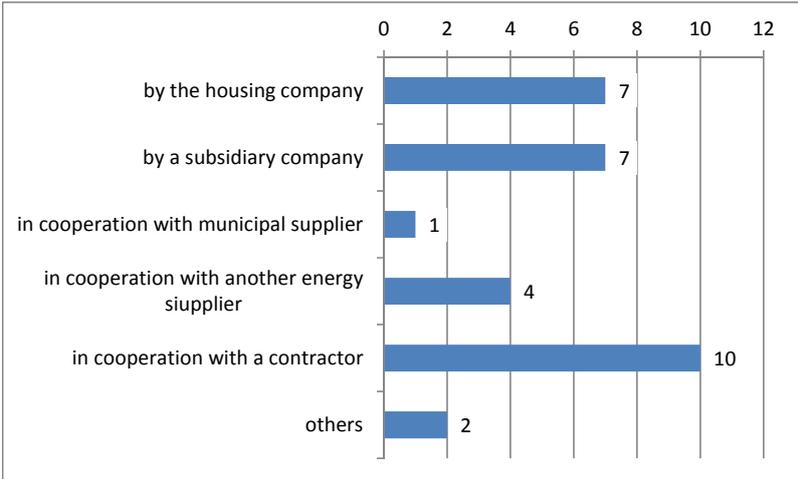
Picture 1: Different models for managing and selling "Mieterstrom"

The expert interviews illustrate the housing companies' approach towards providing "Mieterstrom". All housing companies have expressed an interest in "Mieterstrom" because they see potential to develop a new business area. This will serve both climate goals and tenants' interest in stable heat and electricity prices. All housing companies agreed that there are challenging framework conditions they have to cope with when delivering "Mieterstrom". Together with these experts, we have developed conclusions for improving the framework conditions as well as recommendations for an extensive rollout of "Mieterstrom".

The experts' opinion was supplemented by means of an online survey which had been completed by more than 100 housing companies. About half of the participating companies had already installed electricity generators while 20 housing companies even offer "Mieterstrom". This happens frequently in cooperation with partners, however, the range of models is quite wide. Most of the companies are satisfied with the rate of participation among tenants and want to continue offering "Mieterstrom". Regular changes to legal regulations were named as the primary obstacle, which chimes with the findings from the expert interview.



Picture 2: Legal form of the companies participating in the online survey that are producing electrical energy



Picture 3: Frequency of different operating models for "Mieterstrom" noted in the online survey

Calculating the impacts of power generation at estate or building level, taking into account the German energy saving ordinance (EnEV) and the renewable energy heat law (EEWärmeG), shows that local power plants have a noticeable impact on the energy balance. This subsequently lowers the energy performance levels of the building envelope while the calculations also show that the tenants' heating costs are significantly influenced by the degree of thermal insulation within the building.

	V 1	V 2	V 3	V 4	V 5	V 6	V 7	V 8	V 9	V 10	V 10a	Var 10b	V 11
	EnEV 2014 reference	EnEV 2014 without solar heat	like V2, with PV	like V2, with cogen	Eff-house 70 without solar heat	like V5, with solar heat	like V 5, with PV	like V5, with cogen	like V5, with vent. + heat recovery	like V5, with heat pump and PV	like V5, with heat pump without PV	like V10, from 2016	Eff-house 55 with cogen+heat recovery
Output of heat generator [kWh/(m <sup>2</sup> <sub>WFA</sub> )]	92,3	74,5	78,8	92,7	61,4	66,9	65,5	74,4	60,3	83,1	83,1	83,1	42,7
Final energy demand fuel [kWh/(m <sup>2</sup> <sub>WFA</sub> )]	94,8	84,7	89,7	102,0	69,5	67,6	74,1	81,8	68,2	0,0	0,0	0,0	47,1
Final energy demand electricity [kWh/(m <sup>2</sup> <sub>WFA</sub> )]	2,9	2,2	2,2	2,0	2,0	2,5	2,1	1,9	6,9	24,9	24,9	24,9	6,5
Primary energy demand [kWh/(m <sup>2</sup> <sub>WFA</sub> )]	105,4	89,1	88,9	88,6	73,8	72,9	73,5	72,9	69,1	34,3	59,7	25,7	57,6
Primary energy demand [kWh/(m <sup>2</sup> <sub>A<sub>WFA</sub>)]</sub>	74,4	62,9	62,7	62,5	52,1	51,4	51,9	51,5	48,8	24,2	42,1	18,2	40,7
Greenhouse gas emissions [kg/(m <sup>2</sup> <sub>WFA</sub> )]	31,5	21,7	21,6	25,8	18,0	17,8	17,9	20,9	16,8	8,8	15,4	8,8	15,3

Picture 4: Energy balance parameters and greenhouse gas emissions calculated for different versions of a multi-family house with 17 units, considering different possible electricity generators (parameters related to the living area)

“Mieterstrom” will only be successful if its profitability is guaranteed. In order to answer the question of the profitability through considering case studies and examples, different energy supply models have been economical assessed. There is evidence that a combined delivery of heat and electricity will offer financial relief to tenants and at the same time can offer an attractive profit for the heat and electrical energy providers. Contractors can achieve a higher profit margin than housing companies when delivering both heat and electrical energy. If contractors partially pass on that benefit to tenants, they can often beat local prices by a considerable margin. Commissioning a contractor, therefore, might be an interesting option for housing companies. The calculations also show that a participation rate of 70% among tenants generates the optimal profit margin for the supplier when a calculation model of unit counters with virtual metering points is applied.

Participation rate	100 %	70 %	50 %	30 %
<b>Profit margin housing company</b>	5.793 €	6.226 €	3.850 €	178 €
<b>Costs for all tenants</b>	61.206 €	62.157 €	62.791 €	63.424 €
<b>Cost relief compared to new heating system</b>	1.948 €	997 €	363 €	-270 €
<b>Cost relief compared to old heating system</b>	8.568 €	7.617 €	6.983 €	6.350 €

Picture 5: Results of the profitability calculations when the housing company provides “Mieterstrom” and from the tenant’s point of view

Finally, a number of suggestions are made in order to improve the framework conditions, for example excluding housing companies that offer “Mieterstrom” from the scope of the energy management legislation, defining “Mieterstrom” as self-supply, facilitating improved tax regulations for housing companies, or making “Mieterstrom” part of the formal running costs.

## Conclusion

“Mieterstrom” is a possibility to achieve profitability for electrical generators in buildings and to reduce the tenants costs for electricity. For the implementation a concept should be developed considering the individual targets of the company. The legal framework conditions and public funding require a stable, medium-term planning horizon. This has come up as the most important recommendation to policy makers to support “Mieterstrom” and consequently renewable and highly efficient energy generation. This was emphasised by all the experts we interviewed as well as those participating in the online survey. On top of that, the implementation of metering concepts with unit counters and virtual metering points must be simplified - to date, these often have to be negotiated with the grid operators.

## Project parameters

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Short title: Electricity generation in the housing sector. Wohnungswirtschaft und Stromerzeugung

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