

THE ROLE OF SMALL, HOUSEHOLD SIZE POWER PLANT IN THE ELECTRICITY SUPPLY BY HUNGARIAN MUNICIPALITIES – OR WHAT IS THE AVAILABLE CAPACITY ON THE WAY OF THE LOCAL SELF-SUFFICIENCY ENOUGH FOR

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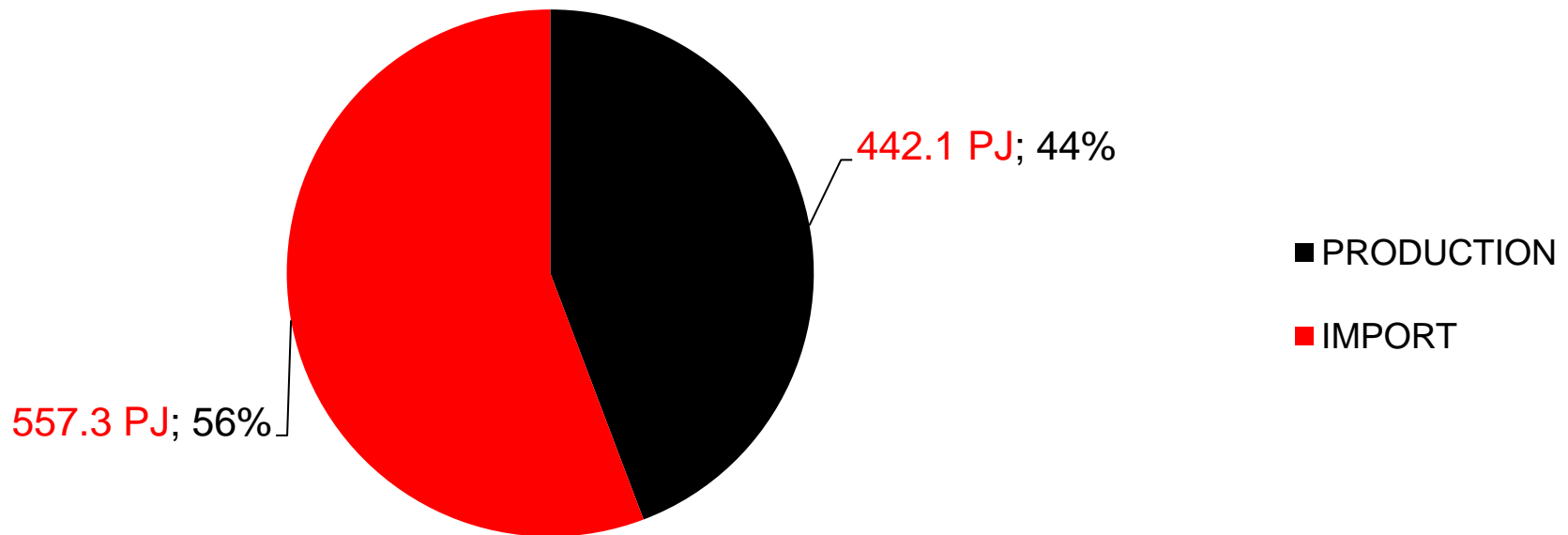
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ENERGY BALANCE

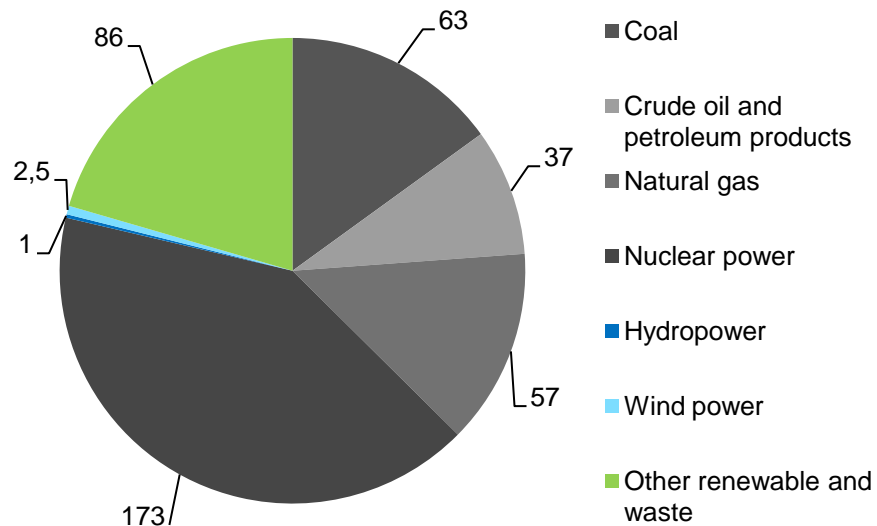
The primary energy consumption of Hungary in 2015 was 999.4 PJ, 420.2 PJ of which came from domestic production and 715.6 PJ was imported (from this later figure, the 158.3 PJ export has been deducted, and the 21.9 PJ change in the available stock has been added).



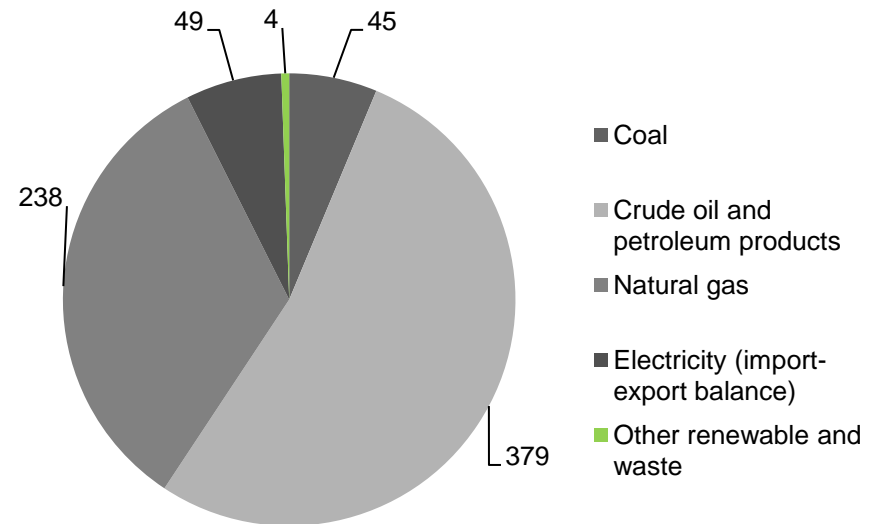
PERCENTAGE DISTRIBUTION OF NET PRIMARY ENERGY BALANCE IN HUNGARY IN 2015

ENERGY BALANCE

PRODUCTION (PJ)



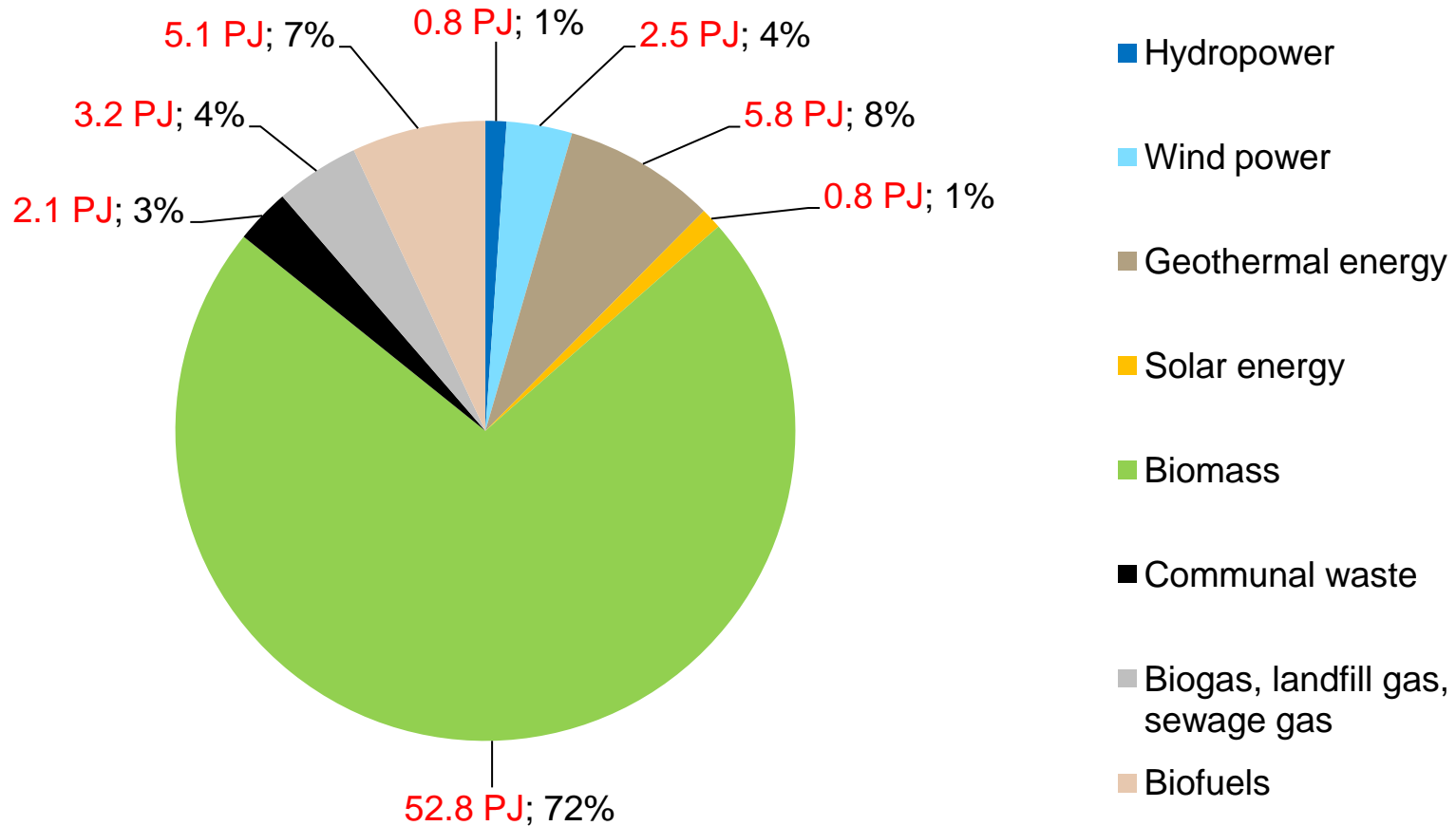
IMPORT (PJ)



DOMESTICALLY PRODUCED AND IMPORTED ENERGY RESOURCE BALANCE OF HUNGARY IN 2015

HUNGARIAN TRANSMISSION SYSTEM OPERATOR COMPANY LTD – MAVIR'S STATISTICAL DATA FOR 2015

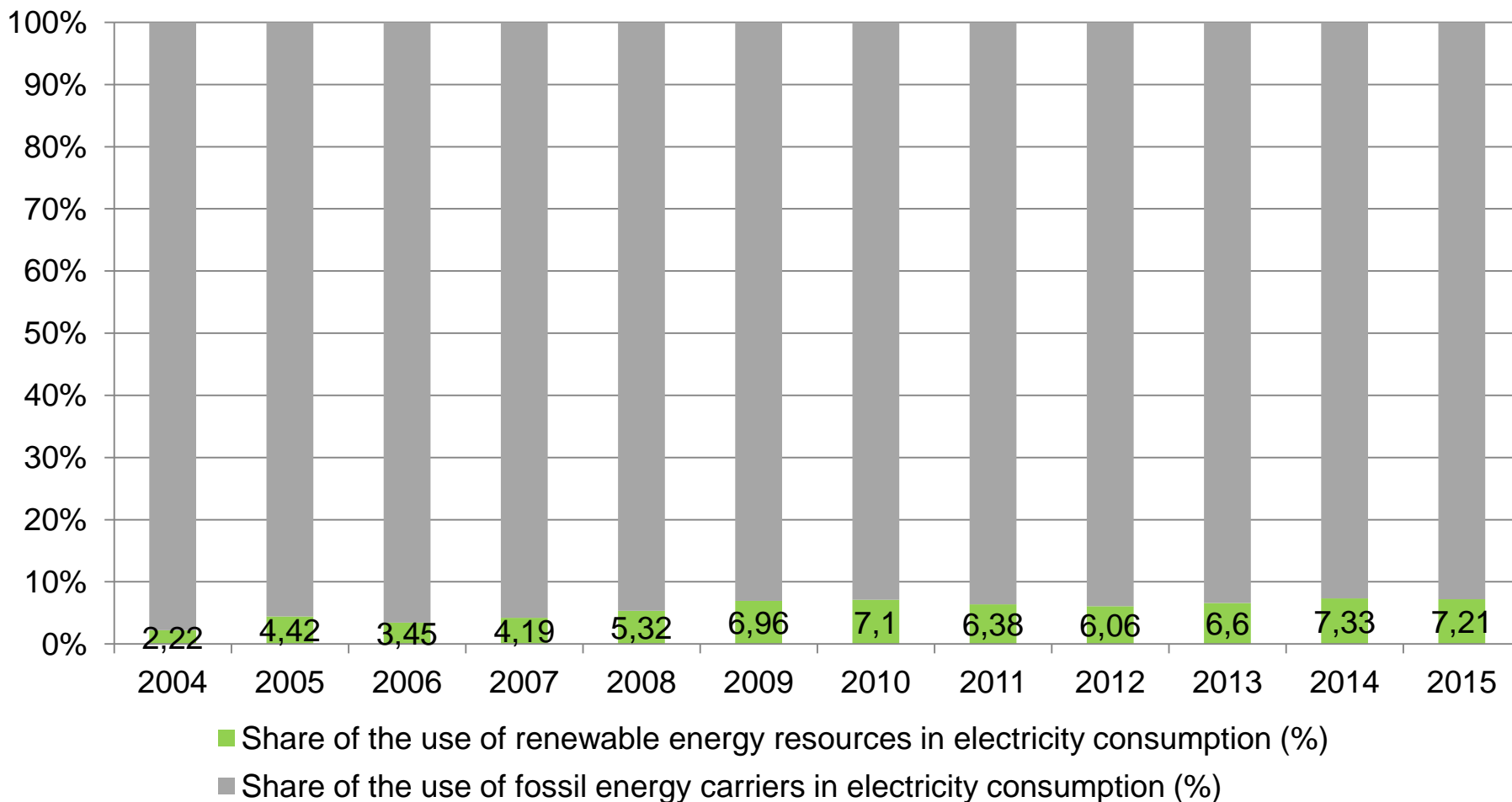
RENEWABLE ENERGY BALANCE



QUANTITY AND PROPORTION OF RENEWABLE ENERGY RESOURCES UTILIZED IN HUNGARY IN 2015

HUNGARIAN TRANSMISSION SYSTEM OPERATOR COMPANY LTD – MAVIR'S STATISTICAL DATA FOR 2015

PROPORTION OF RENEWABLE ENERGY SOURCES IN THE ELECTRICITY CONSUMPTION



CHANGES IN THE PROPORTION OF ELECTRIC POWER GENERATED FROM RENEWABLE ENERGY RESOURCES WITHIN THE GROSS ELECTRIC POWER CONSUMPTION BETWEEN 2004 AND 2015

THE PURPOSE OF THE TESTS

- Establish a settlement ranking based on the degree of energy self-sufficiency from locally renewable energy sources

Including:

- The amount of electricity produced in the category of small, household size power plant – settlements



Categories of power capacity of the power plants in the Hungarian electricity system (Hungarian Transmission System Operator Company Ltd):

MAVIR basically distinguishes between small power plants below 50 MW and large power plants with a capacity of 50 MW or more.

MAVIR distinguishes the below sub-categories in the categories below 50 MW:

- 0,5-50 MW,
- 0,05-0,5 MW,
- Small power plants with a capacity below 0,05 MW

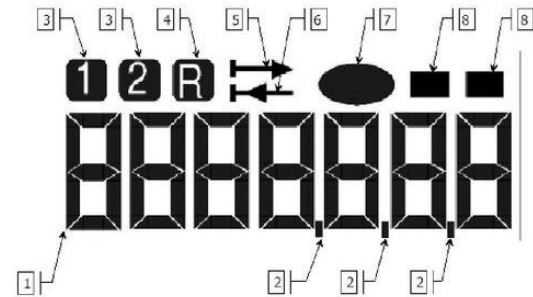
HUNGARIAN TRANSMISSION SYSTEM OPERATOR COMPANY LTD – MAVIR'S STATISTICAL DATA FOR 2015.



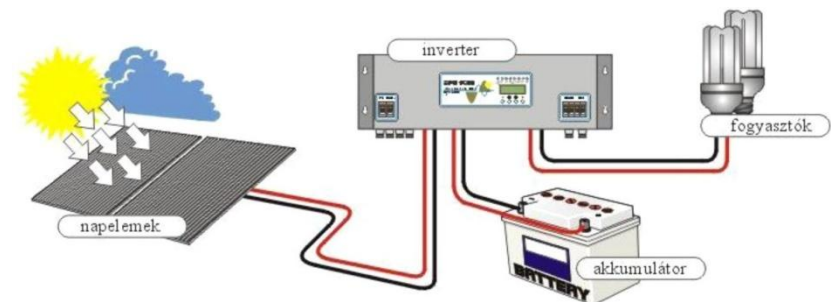
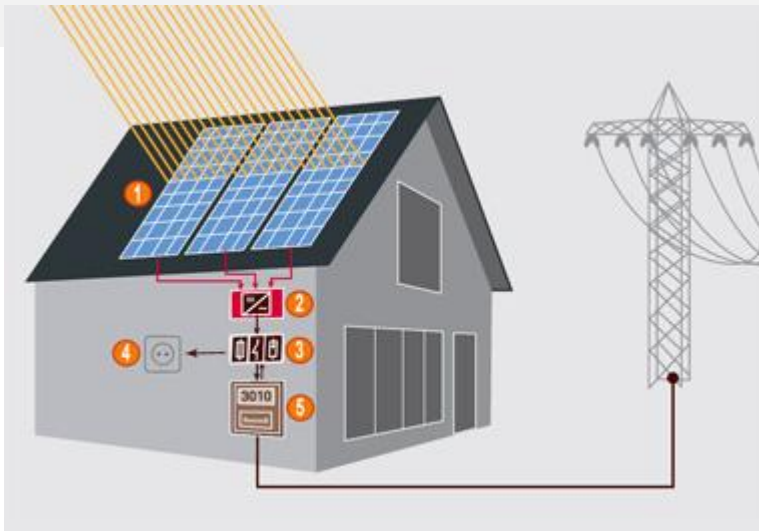
- *Act LXXXVI/2007 on electricity and Gov. Decree 273/2007 (Oct 19) on the enforcement of the Act* introduced the term household-scale small power plant (HMKE).
- Any electricity-generating equipment is categorized as HMKE if it is connected to a communal low-voltage network, or the private or connecting cable network, and the nominal capacity of the power plant does not exceed 50 kVA or the capacity that is available for the user. This approximately fits small power plants with 50 kW installed capacities at the maximum.



- Electricity exchange is measured with electronic energy meters for the individual phases, from which the quantity of electricity drawn from and introduced to the network in the settlement period can be read in each direction.



- Production systems connected to the communal network can be developed either as equipment feeding the network or being capable of isolated operation; of these two, the latter one is more wide-spread.



11 Development of the installed capacity of household-scale power plants by energy resources, 2008–2015

Energy source (MW)	2008	2009	2010	2011	2012	2013	2014	2015
Thermal methane	0	0	0	0	0.04	0.04	0.04	0.206
Natural gas	0.12	0.06	0.09	0.05	0.07	0.09	0.19	0.257
Biogas	0	0	0.05	0.07	1.18	0.31	0.16	0.165
Hydropower	0.02	0	0.04	0.04	0.09	0.06	0.06	0.064
Wind power	0.01	0.06	0.1	0.13	0.25	0.4	0.5	0.603
Solar energy	0.36	0.46	0.99	2.88	12.52	31.21	68.13	127.569
Total HMKE capacity	0.51	0.58	1.26	3.17	14.15	32.1	69.08	128.863

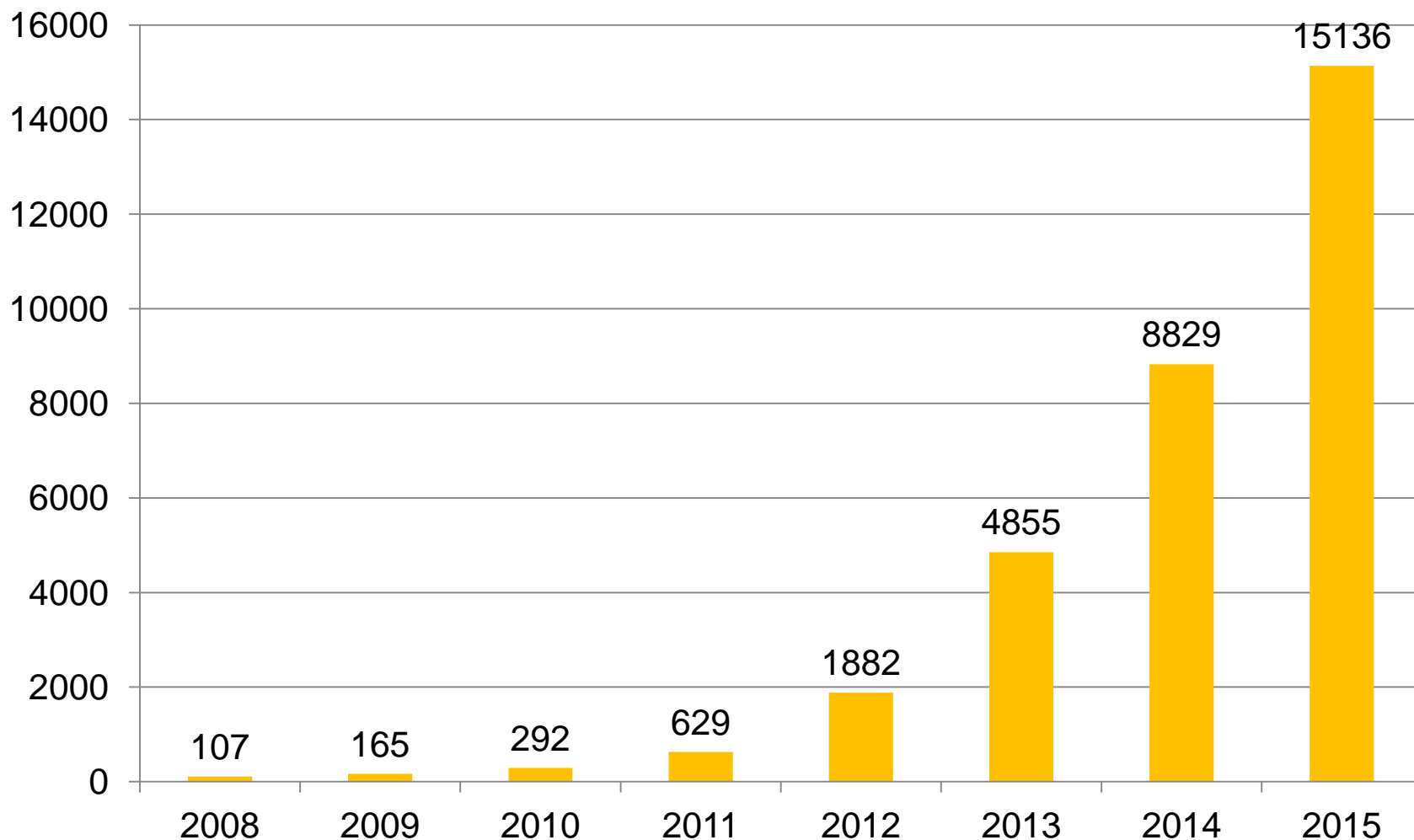
(MAGYAR ENERGETIKAI ÉS KÖZMŰ-SZABÁLYOZÁSI HIVATAL - HUNGARIAN ENERGY AND PUBLIC UTILITY REGULATORY AUTHORITY – MEKH'S REGULATIONS PERTAINING TO HOUSEHOLD-SCALE SMALL POWER PLANTS, 2015)

Development of the number of household-scale power plants by energy resources, 2008–2015

Power station type (piece)	2008	2009	2010	2011	2012	2013	2014	2015
Thermal methane	0	0	0	0	1	1	1	6
Natural gas	6	3	4	3	4	6	9	14
Biogas	0	0	2	3	8	9	5	6
Hydropower	1	0	2	2	3	3	3	3
Wind power	1	9	15	20	41	52	56	61
Solar energy	107	165	292	629	1882	4855	8829	15136
Total HMKE number	115	177	315	657	1939	4926	8903	15226

(MAGYAR ENERGETIKAI ÉS KÖZMŰ-SZABÁLYOZÁSI HIVATAL - HUNGARIAN ENERGY AND PUBLIC UTILITY REGULATORY AUTHORITY – MEKH'S REGULATIONS PERTAINING TO HOUSEHOLD-SCALE SMALL POWER PLANTS, 2015)

Development of the number of household-scale solar power plants by energy resources, 2008–2015



(MAGYAR ENERGETIKAI ÉS KÖZMŰ-SZABÁLYOZÁSI HIVATAL - HUNGARIAN ENERGY AND PUBLIC UTILITY REGULATORY AUTHORITY – MEKH'S REGULATIONS PERTAINING TO HOUSEHOLD-SCALE SMALL POWER PLANTS, 2015)

The total quantity of electricity supplied to Hungary's 3155 settlements amounted to 35,760 GWh in 2015, of which 74.709 GWh represented the quantity of electricity produced by household-scale power plants.

Electricity is provided by three universal service providers in the country:

- E.ON Energiaszolgáltató Kft.
- ELMÜ-ÉMÁSZ Energiaszolgáltató Zrt.
- Dél-magyarországi Áramszolgáltató Zrt. (DÉMÁSZ)

The data relating to the territory of ELMÜ-ÉMÁSZ are incomplete, we and therefore only the data for 2014–2015 could be used within the period from 2008 to 2015.

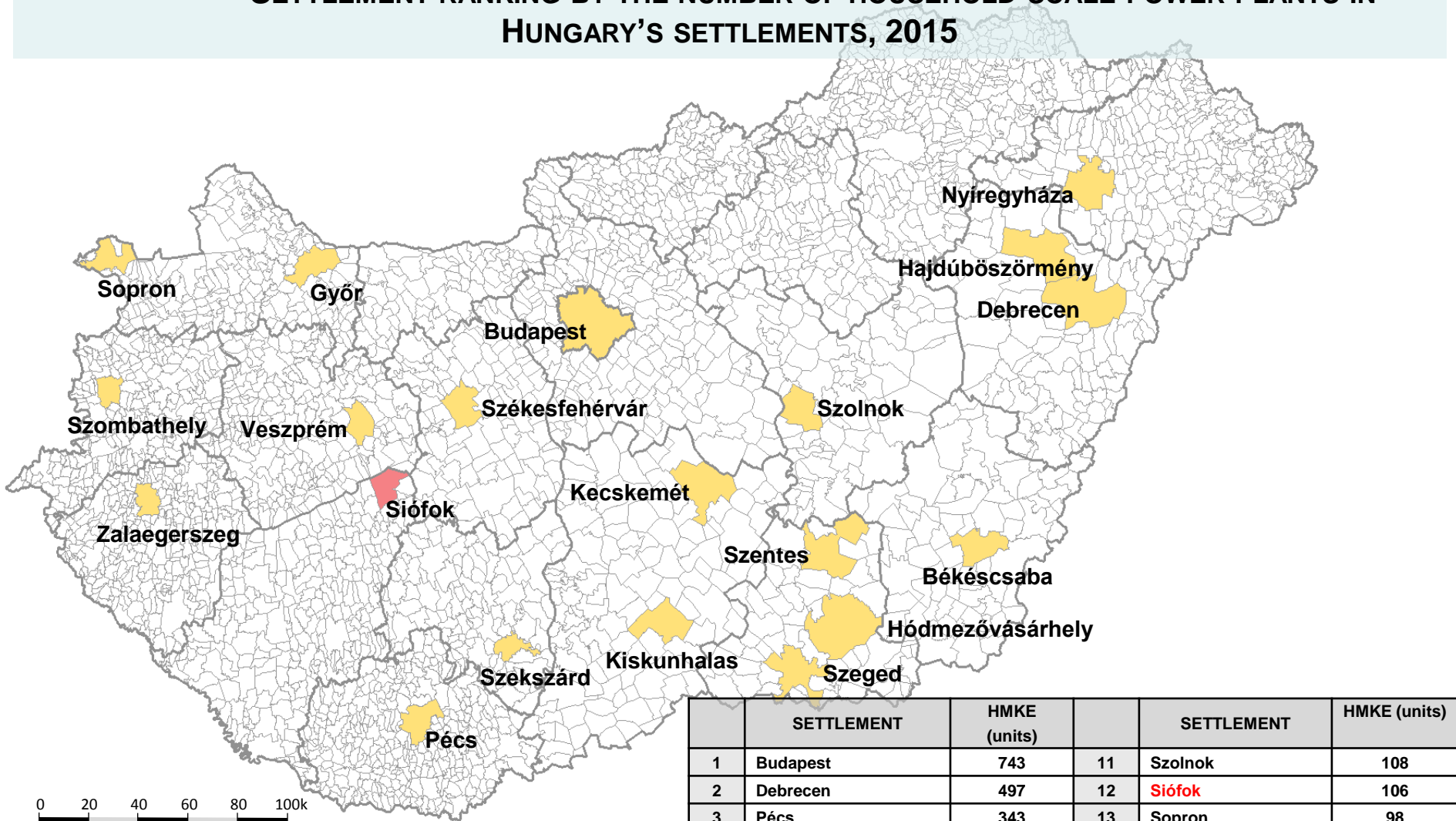
The screenshot shows the JRC CM SAF Photovoltaic Geographical Information System - Interactive Maps interface. The map displays Hungary with a red pin indicating a location. The right-hand panel shows the 'Performance of Grid-connected PV' settings, including radiation database, PV technology, installed peak power, estimated system losses, and various mounting and tracking options. The 'Calculate' button is visible at the bottom.

	HMKE units	Total HMKE capacity (MW)
Installed capacity in Hungary end of 2015	15,226	128.863
Data available for the tests	13,616	117.843
Deficit	1610	11.02

In 2015, there were operating household-scale small power plants in 1759 of Hungary's 3155 settlements. The altogether 13,616 HMKE units were run in the 1759 settlements with 117.843 MW total installed capacity.

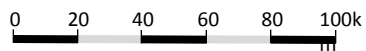
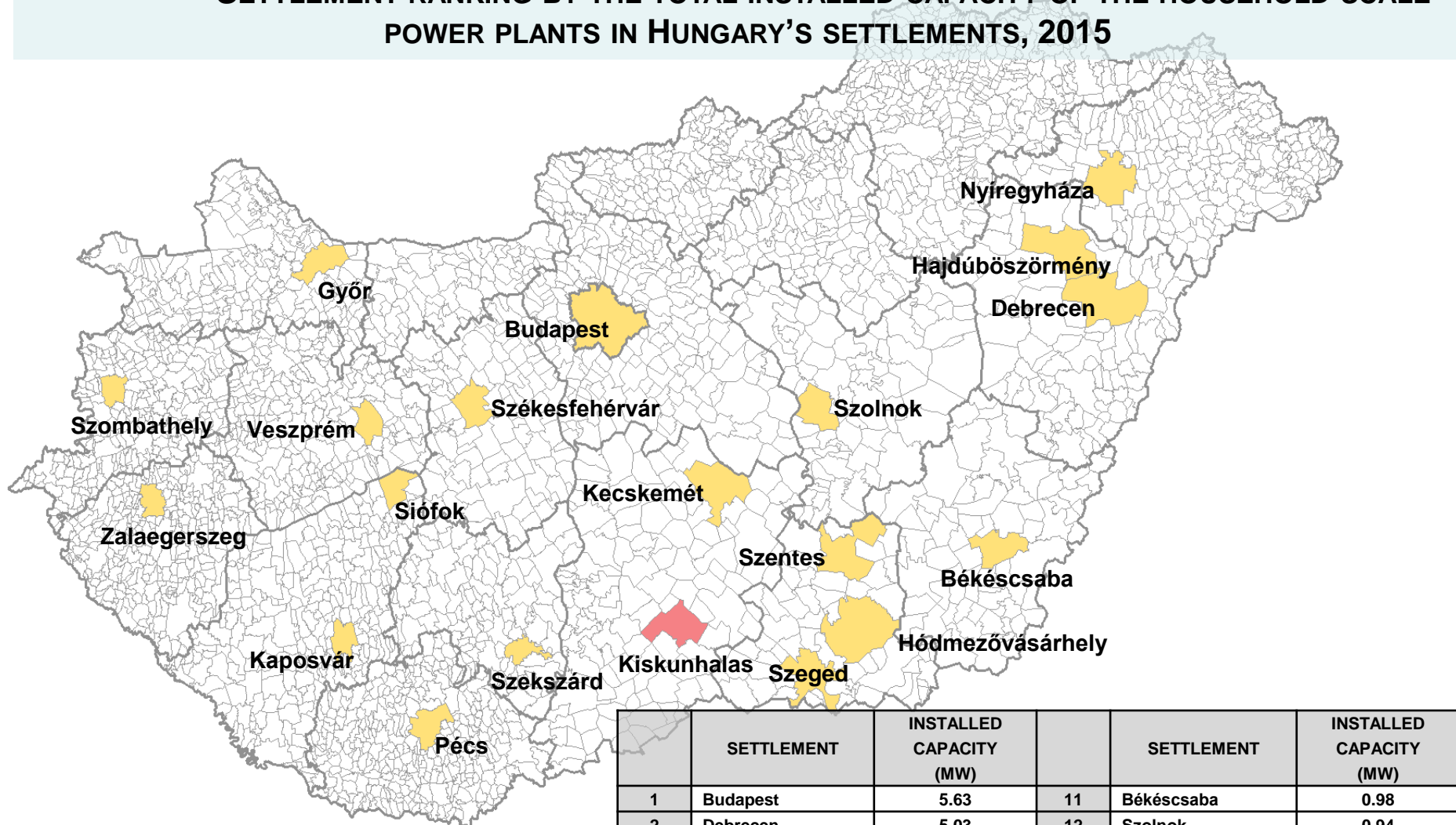
The electricity demand of the 1759 settlements with operating HMKE units was 34,056 GWh in 2015, of which 129.627 GWh is the quantity of electricity that can be generated with household-scale power plants in view of the above-mentioned calculations. This volume of generated electricity can satisfy 0.38% of the existing electricity demand.

SETTLEMENT RANKING BY THE NUMBER OF HOUSEHOLD-SCALE POWER PLANTS IN HUNGARY'S SETTLEMENTS, 2015



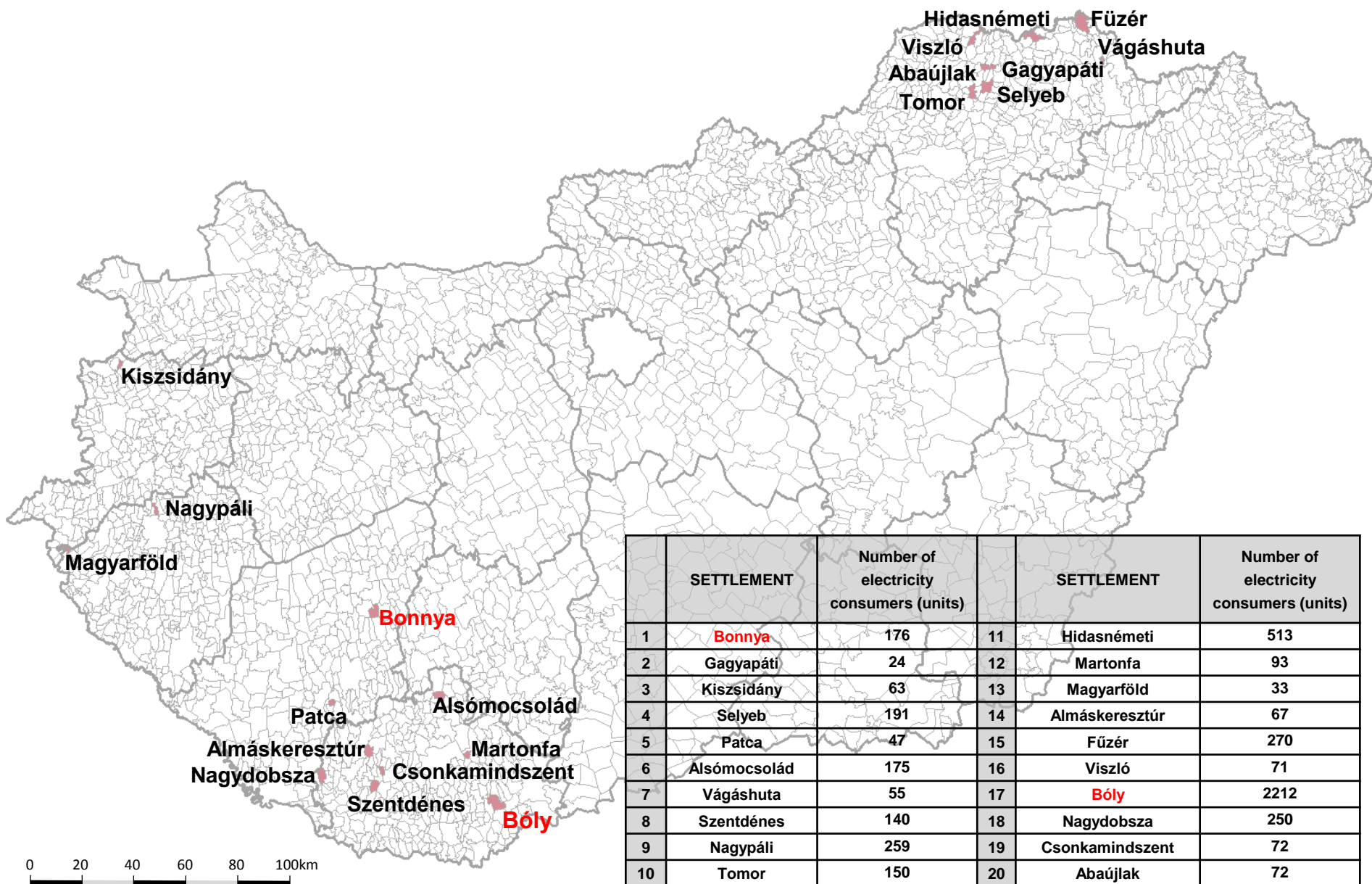
	SETTLEMENT	HMKE (units)		SETTLEMENT	HMKE (units)
1	Budapest	743	11	Szolnok	108
2	Debrecen	497	12	Siófok	106
3	Pécs	343	13	Sopron	98
4	Szeged	295	14	Hódmezővásárhely	95
5	Nyíregyháza	223	15	Veszprém	88
6	Győr	186	16	Szekszárd	80
7	Kecskemét	161	17	Zalaegerszeg	79
8	Székesfehérvár	144	18	Hajdúböszörmény	76
9	Szombathely	131	19	Kiskunhalas	75
10	Békéscsaba	109	20	Szentés	73

SETTLEMENT RANKING BY THE TOTAL INSTALLED CAPACITY OF THE HOUSEHOLD-SCALE POWER PLANTS IN HUNGARY'S SETTLEMENTS, 2015

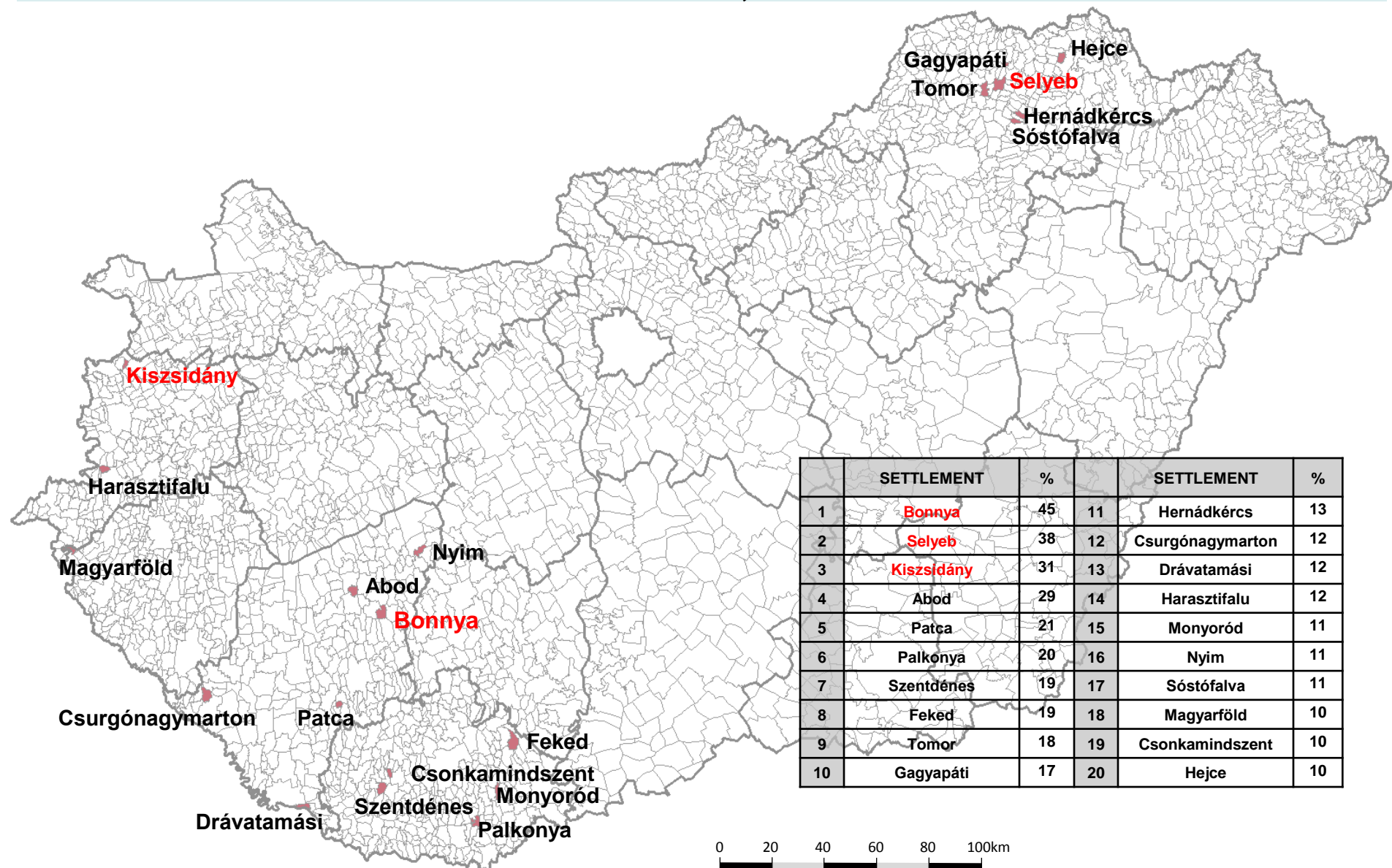


	SETTLEMENT	INSTALLED CAPACITY (MW)		SETTLEMENT	INSTALLED CAPACITY (MW)
1	Budapest	5.63	11	Békéscsaba	0.98
2	Debrecen	5.03	12	Szolnok	0.94
3	Szeged	3.02	13	Hódmezővásárhely	0.93
4	Pécs	2.42	14	Siófok	0.87
5	Nyíregyháza	1.85	15	Zalaegerszeg	0.86
6	Győr	1.45	16	Hajdúböszörmény	0.81
7	Kecskemét	1.33	17	Szekszárd	0.75
8	Székesfehérvár	1.18	18	Veszprém	0.71
9	Kiskunhalas	1.09	19	Kaposvár	0.68
10	Szombathely	1.09	20	Szentés	0.65

SETTLEMENT RANKING BY THE NUMBER OF HOUSEHOLD-SCALE POWER PLANTS IN PROPORTION OF THE TOTAL NUMBER OF ELECTRICITY CONSUMERS IN 2015

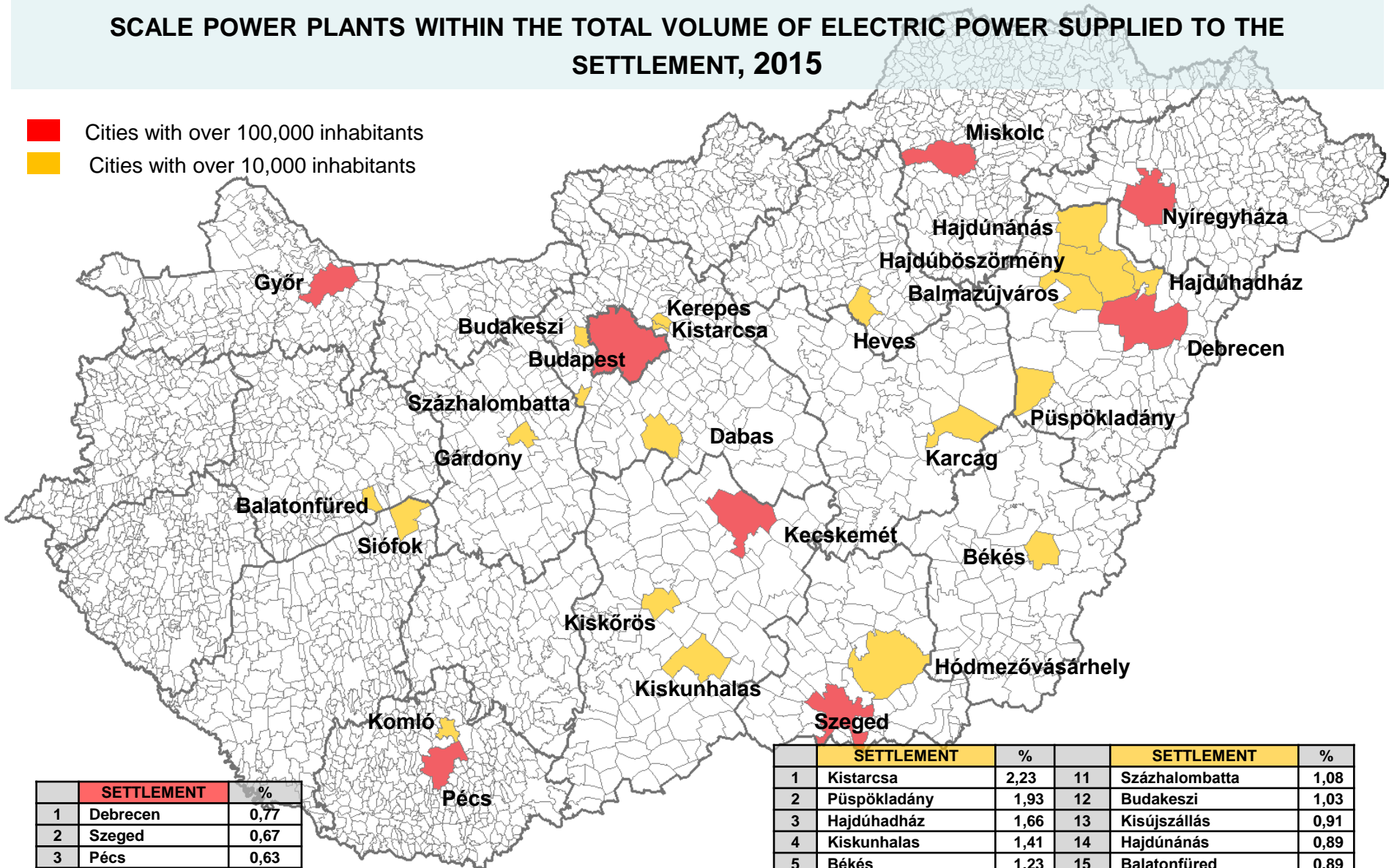


SETTLEMENT RANKING BY THE PROPORTION OF THE ELECTRICITY PRODUCED BY HOUSEHOLD-SCALE POWER PLANTS WITHIN THE TOTAL VOLUME OF ELECTRIC POWER SUPPLIED TO THE SETTLEMENT, 2015

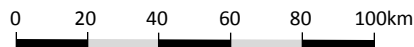


SETTLEMENT RANKING BY THE PROPORTION OF THE ELECTRICITY PRODUCED BY HOUSEHOLD-SCALE POWER PLANTS WITHIN THE TOTAL VOLUME OF ELECTRIC POWER SUPPLIED TO THE SETTLEMENT, 2015

- Cities with over 100,000 inhabitants
- Cities with over 10,000 inhabitants



	SETTLEMENT	%
1	Debrecen	0,77
2	Szeged	0,67
3	Pécs	0,63
4	Nyíregyháza	0,46
5	Kecskemét	0,29
6	Győr	0,25
7	Budapest	0,09
8	Miskolc	0,05



	SETTLEMENT	%		SETTLEMENT	%
1	Kistarcsa	2,23	11	Százhalombatta	1,08
2	Püspökladány	1,93	12	Budakeszi	1,03
3	Hajdúhadház	1,66	13	Kisújszállás	0,91
4	Kiskunhalas	1,41	14	Hajdúnánás	0,89
5	Békés	1,23	15	Balatonfüred	0,89
6	Hajdúböszörmény	1,16	16	Gárdony	0,85
7	Heves	1,15	17	Dabas	0,84
8	Siófok	1,14	18	Kerepes	0,83
9	Kiskőrös	1,09	19	Balmazújváros	0,81
10	Komló	1,08	20	Hódmezővásárhely	0,79

- In summary, it can be ascertained that among Hungarian settlements the quantity of electricity produced in the category of the smallest, household-scale power plants remaining below the nominal capacity of 50 kW reaches 45% of the annual electric power demand in settlements with a few hundred inhabitants.
- In settlements with more than 10,000 inhabitants, this ratio exceeds 2%, and in the largest settlements it exceeds 0.8%, however, in the case of Budapest, the largest settlement with 2 million inhabitants it is only 0.09%.
- The investment performance of household users, as well as the institutional and corporate segments has been encouraged only by the savings offered by renewable energy resources, principally solar energy. In the light of these remarkable and promising results, it can be legitimately assumed that the provision of production subsidies to this smallest power plant category would foster the achievement of Hungary's renewable energy targets.
- Nevertheless, the Renewable Energy Subsidization System (METÁR) introduced on 1 January 2017 still does not support household-scale small power plants, and therefore they remain under the scheme of balance settlement.



Thank you for your kind attention!