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THE CONGREGATE PROJECT
BULGARIAN PILOTS: BURGAS, DOBRICH, SOFIA

CONGREGATE

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EnEffect

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OBJECTIVE OF THE PROJECT

Enable and motivate municipalities to develop **public-private partnerships** in order to increase the share of renewable energy in the local energy mixes

- **National models** for systematic multi-level communication and an engagement campaign in support of building renovation are developed.
- **Policy recommendations** and **feasibility studies** for renewable energy cooperatives are developed

Support the implementation of national **long-term renovation strategies**

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THE PILOTS

Sofia

- The capital and the largest city in Bulgaria
- Over 1 300 000 inhabitants
- Over 860 municipal buildings
- Pilot site: Ivan Bogorov School

Burgas

- Situated on the Black Sea coast
- Over 200 000 inhabitants
- Over 200 municipal buildings
- Pilot site: Industrial and Logistic Park

Dobrich

- Municipality within a city
- Over 79 000 inhabitants
- Over 70 municipal buildings
- Pilot site: The main administrative building

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BURGAS PILOT CASE: BASELINE

Already installed PV plants.

Use of geothermal energy.

Just a few companies provided detailed information for the installed capacity and the load profiles.

Wastewater treatment plant nearby

Opportunities for cooperation

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Scope of activities	Applicable technologies	Participants	Commercial aspects	Regulatory issues
Electricity for own use	PV/other, batteries, energy management	Owners in a common entity, entity group	Governed by a contract for participation	Need to coordinate a change in a project design (electrical part)
Electricity for own use and exchange with the grid	PV/other, batteries, energy management, commercial measurement	Owners in a common entity, entity group	Contracts with energy trader and electricity distribution company are required	Need for Legal entity, party to the contracts
Virtual power plants	RES generation Digital environment	Investors	Development of a trading platform	Licensed energy trader and business model
Energy efficiency services	Combination of technologies for consumption, production and management	Owners in a common entity, entity group, ESCO	Contract for energy management, contracts with energy trader and electricity distribution company	Complete energy project; Legal entity party to the contracts
Provision of utilities	Combination of technologies for consumption, production and management	Municipality, Industrial Zone, PPP	Own governance structure	Licensing of production, distribution, trading

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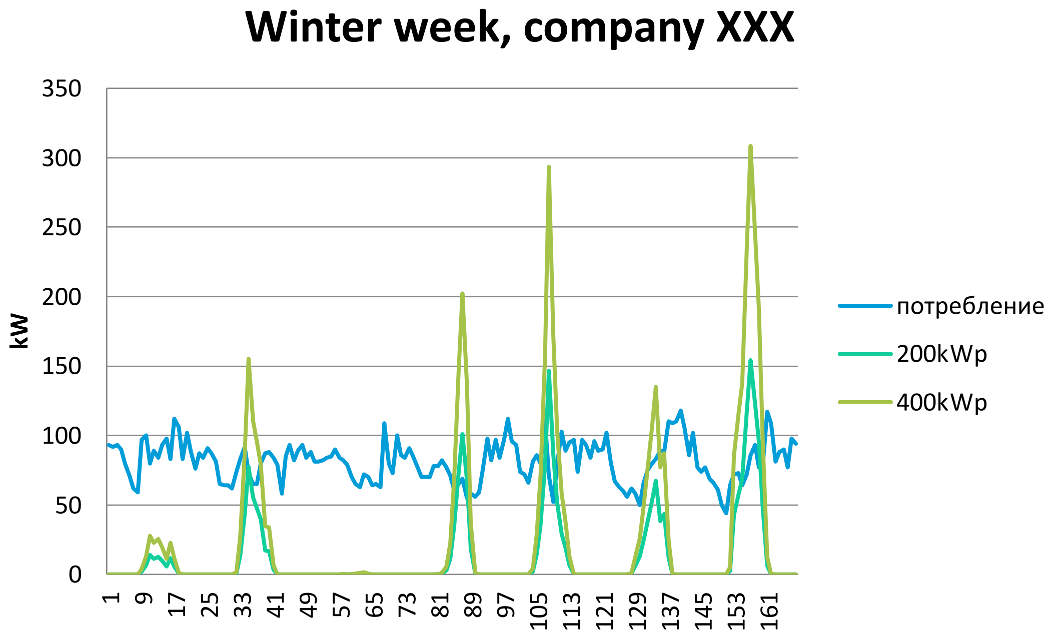
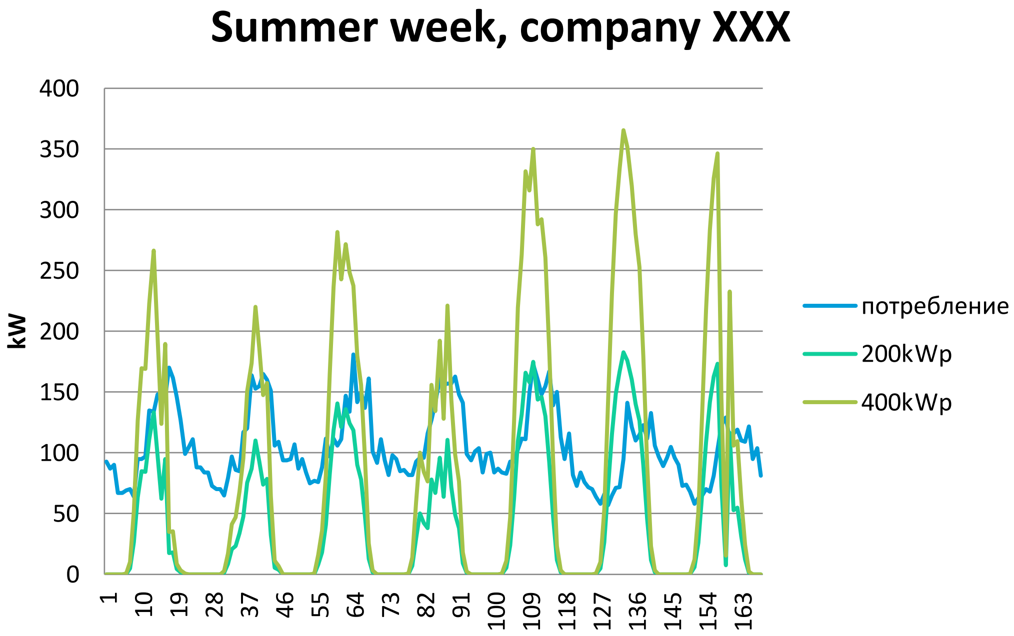
LOAD PROFILES





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SCENARIO 1

- Individual solutions – Business As Usual

  - Advantages
    - Established solution, everybody is doing exactly this
  - Disadvantages
    - Covers low percentage of the actual consumption
    - High share of energy to the grid
    - A lot of fees still exist
    - Not suitable for all (large consumer - small roof and vice versa)

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Scenario 2

- Cooperation within the Industrial zone

  - Advantages
    - Higher percentage of the produced energy is used on site
    - Reduction of additional fees
    - Constant electricity price over a long period of time
  - Disadvantages
    - Regulations still not supporting energy cooperatives
    - Leading partner is required
    - Additional expenses for design and construction
    - Need of load balancer

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SCENARIO 3

- Cooperation within the Industrial zone and connection to anaerobic plant

- Advantages
  - Almost full use of the produced energy on site
  - Constant electricity price over a long period of time
  - Better balancing through the anaerobic plant
  - Even lower fees
- Disadvantages
  - Regulations still not supporting energy cooperatives
  - Additional expenses for design and construction

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Comparison of the results

- Final price in scenario 3 - 287 BGN/MWh (annual appreciation of 1.4% for the first 10 years).
- Only in case of market energy price below 210 BGN/MWh (excluding fees), which is hardly possible, it is more profitable to keep the BaU scenario.
- Cooperative or individual solutions, comparison:

Company XXX, existing PV plant with 515 kWp	Standard contract (2021)	Standard contract (2022)	Contract with the cooperative	Members of the cooperative
Price of the energy from the PV, BGN/MWh	344	344	344	287
Price of the purchased energy, BGN/MWh	226	235	197	0
Price of sold energy, BGN/MWh	-183	-246	-188	0
Average annual price, BGN/MWh	**388**	**333**	**354**	**287**

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CONCLUSIONS AND RECOMMENDATIONS

- There is still a lack of ready-to-implement contractual and legal models for cooperation.
- At this stage, the leading role of the initiator of the cooperation, around which the different actors can unite, is crucial.
- The price levels achieved are competitive with the current electricity prices.
- The efficiency of investments can be significantly increased by the implementation of 'smart' solutions.
- The possibility of balancing the loads through the anaerobic plant allows maximum utilisation of the produced energy on site.

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Dobrich: Baseline

Hourly consumption available

Repair of the roof needed

No other municipal buildings with different profile nearby

Electrical installation of the building in poor condition

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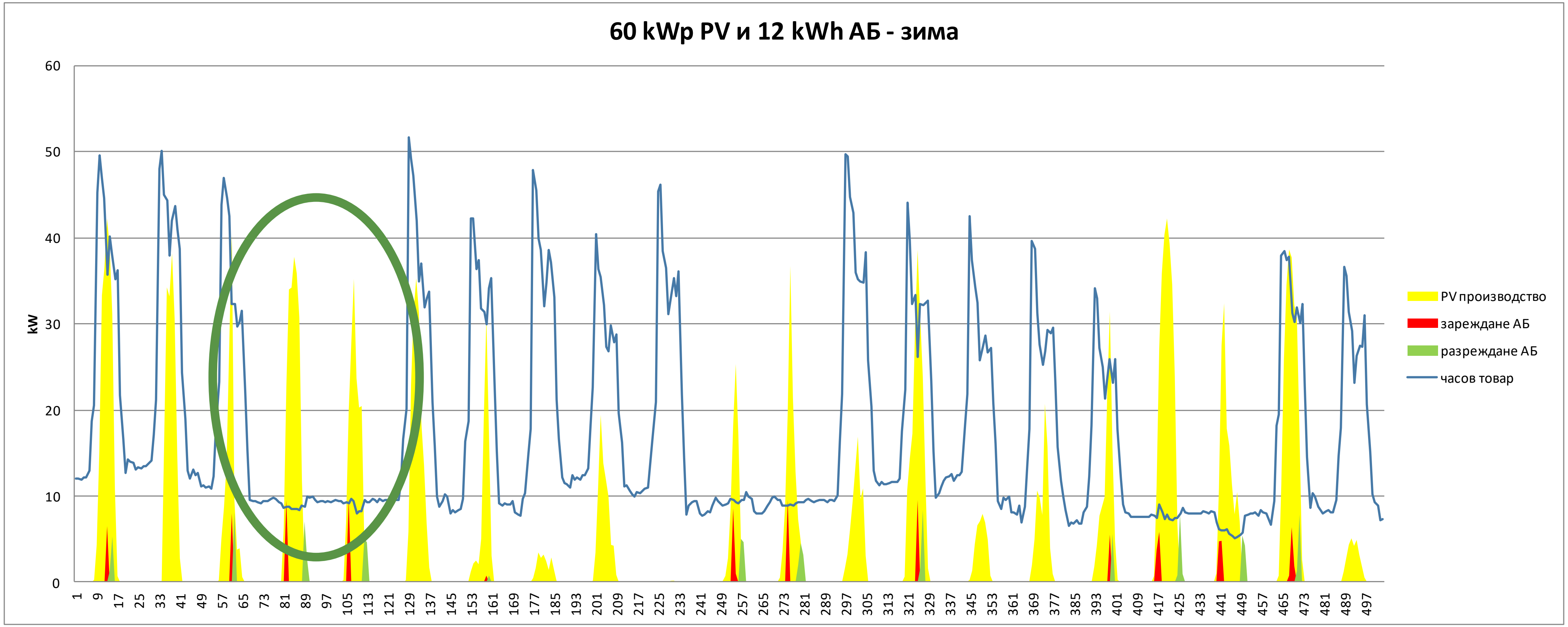
LOAD PROFILES – WINTER (60 KWP)



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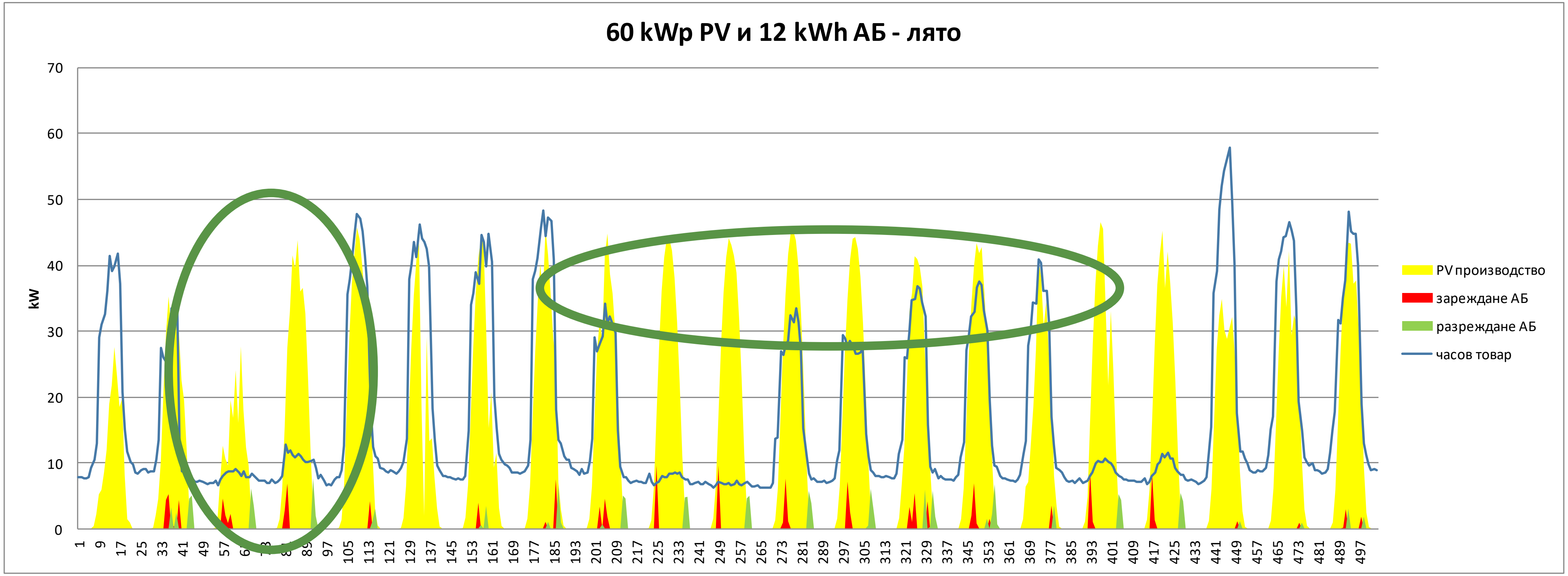
LOAD PROFILES – SUMMER (60 KWP)



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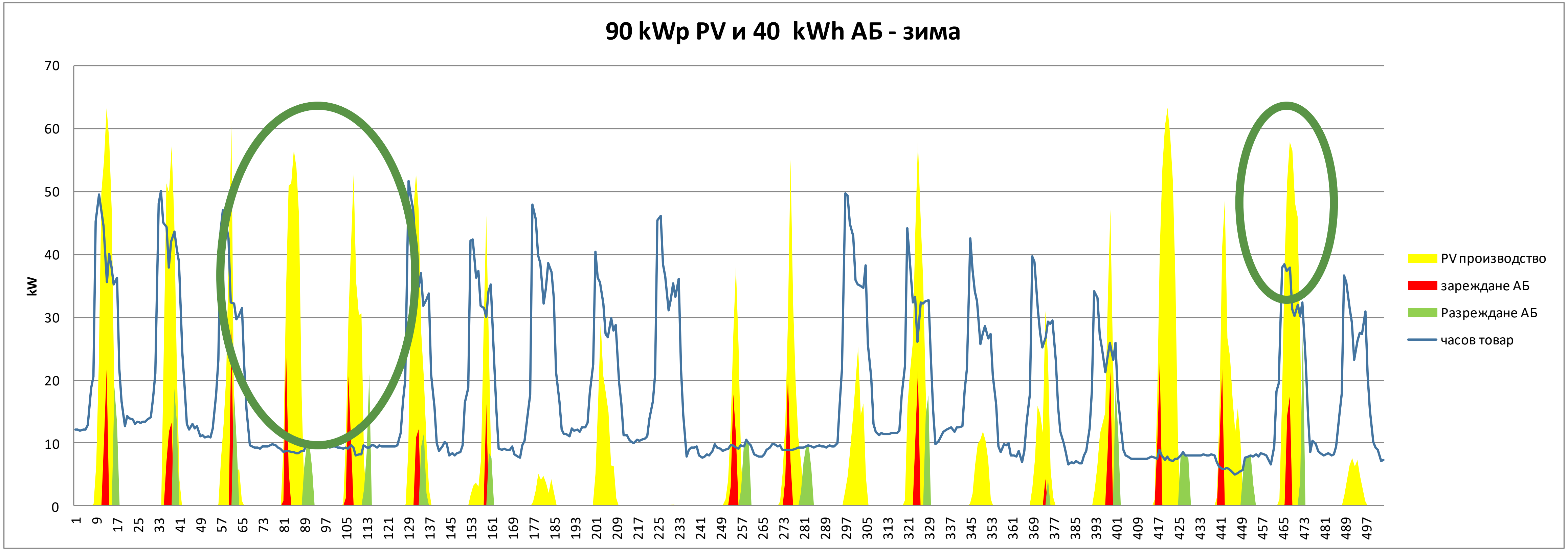
LOAD PROFILES – WINTER (90 KWP)



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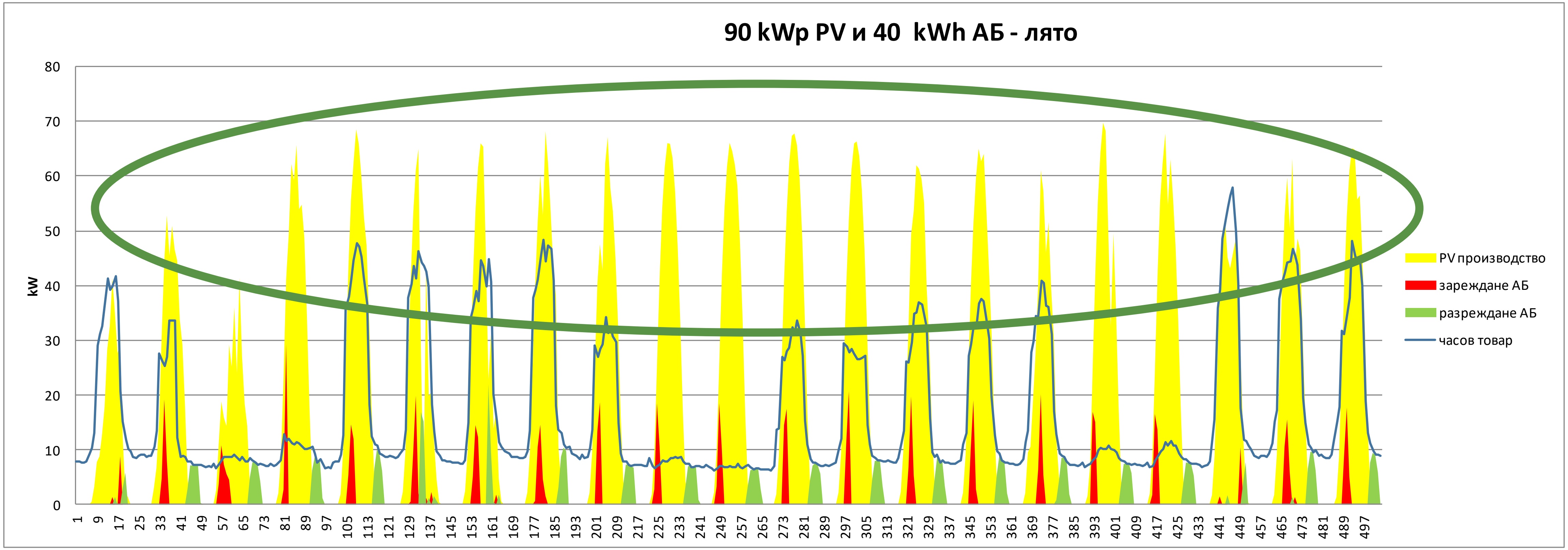
LOAD PROFILES – SUMMER (90 KWP)



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SCENARIO 1 – BAU

- 60 kWp:
  - 39% of the total consumption covered by the PV
  - 69% of the energy generated by the PV is used in the building
  - Batteries can decrease the energy used from the grid by 3 to 5 %
  - Simple payback – 3,7 year (4,2 years with batteries)
- 90 kWp:
  - 46% of the total consumption covered by the PV
  - 53% of the energy generated by the PV is used in the building
  - Batteries can decrease the energy used from the grid by 7 to 13 %
  - Simple payback – 4,1 year (4,1 years with batteries)

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SCENARIO 2 – ENERGY COOPERATIVE

- 60 kWp:
  - Investment distribution – municipality/private (58%/42%)
  - 6% dividends for private investors
  - 27% profit for the private investors (10 years)
  - Simple payback for the municipality – 2,7 years
- 90 kWp:
  - Investment distribution – municipality/private (38%/62%)
  - 7% dividends for private investors
  - 32% profit for the private investors (10 years)
  - Simple payback for the municipality – 2,3 years

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ATTRACT THE INVESTORS

- Profit – 27% (60 kWp)
- Profit – 32% (90 kWp)

Year	10 investors provide 40 000 BGN		10 investors provide 90 000 BGN	
	capital, BGN	dividends, BGN	capital, BGN	dividends, BGN
1	4000	1 123	9000	2 751
2	4000	1 123	9000	2 751
3	4000	1 123	9000	2 751
4	4000	1 123	9000	2 751
5	4000	1 123	9000	2 751
6	4000	1 123	9000	2 751
7	4000	1 123	9000	2 751
8	4000	1 123	9000	2 751
9	4000	1 123	9000	2 751
10	4000	1 123	9000	2 751

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Assumptions

- Load profiles – based on 2017 as considered the most accurate
- Solar data – PVGIS
- Average annual price of electricity – 140 EUR/MWh (taxes not included)
- Investment costs – based on market research

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SOFIA: RESEARCH PHASE

Drone photography and potential assessment of over 860 municipal buildings

The municipality shortlisted 38 buildings.

EnEffect reduced to 12.

The municipality chose 1

Район	Описание	Адрес	Тип покрив	Площ на покрива (кв.	Клас	Ефективност	Година-въвеждане в експлоата	Начин на отопление	Използвани горива за отопление	Получени актове за общинск собтсвено
Връбница	ДГ 42 "Чайка"	1229 ж.к. Връбница 1, София	плосък	1 673,58	1	+90%	1979			да, публично общинска
Връбница	140 средно училище „Иван Богоров"	ул. „Дико Илиев" 9, 1326 ж.к. Обеля 2, София	плосък	2 502,12	1	+90%	1987			да, публично общинска
Връбница	82 ОДЗ "Джани Родари"	ул. "Дико Илиев" №7, 1326 ж.к. Обеля 2, София	плосък	1 169,23	2	80-90 %	1987			да, публично общинска
Искър	89 ОУ д-р Христо Стамболски	ул. „5025-та", 1592 ж.к. Дружба 1, София	плосък	1 326,38	1	+90%	1969	Централно топлоснабдяване (ТЕЦ)	Топлинна енергия от централизирано топлоснабдяване	да, публично общинска
Искър	Дом на културата Искър	бул. „Кръстю Пастухов" 23, 1592 Дружба, София	скатен/плосък	1 556,11	2	80-90 %	1953	Централно топлоснабдяване (ТЕЦ)	Топлинна енергия от централизирано топлоснабдяване	да, публично общинска
Искър	69 СУ "Димитър Маринов"	ул. „5027-ма", 1592 ж.к. Дружба 1, София	плосък	1 627,12	2	80-90 %	1963	Централно топлоснабдяване (ТЕЦ)	Топлинна енергия от централизирано топлоснабдяване	да, публично общинска
Искър	Столична община - район Искър	бул. „Кръстю Пастухов" 18, 1592 ж.к. Дружба 1, София	скатен	486,18	1	+90%	1970	Централно топлоснабдяване (ТЕЦ)	Топлинна енергия от централизирано топлоснабдяване	да, публично общинска
Искър	ДГ №36 „Пеперуда" Сградата е била в основна реконструкция от 01.08.2019 г. до 31.08.2020 г.	ул. „Иван Арабаджията" 40, 1592 ж.к. Дружба 1, София	плосък	1 343,60	2	80-90 %		топлоенергия	Топлинна енергия от централизирано топлоснабдяване	да, публично общинска
Лозенец	120 основно училище „Георги Раковски", София	пл. „Папа Йоан Павел II" 7, 1421 ж.к. Лозенец, София	скатен	1 281,88	2	80-90 %				не е предоставен общинска
Лозенец	35 СЕУ „Добри Войников"	пл. „Добри Войников" 16, 11164 ж.к. Лозенец, София	плосък	2 261,91	2	80-90 %				не е предоставен общинска
Люлин	12-ти ДКЦ	ул. „Иван Бойчев" 17, 1324 ж.к. Люлин 9, София	плосък	1 594,77	2	80-90 %	1973			да, частна общинска
Люлин	40 СОУ „Луи Пастьор"	ул. „Иван Бойчев" 17, 1324 ж.к. Люлин 9, София	скатен/плосък	2 331,62	1	+90%	1984	Централно топлоснабдяване (ТЕЦ)	Топлинна енергия от централизирано топлоснабдяване	да, публично общинска
Люлин	12-ти ДКЦ (база 2)	ул. „проф. д-р Александър Станишев" 17, 1343 ж.к. Люлин 2, София	плосък	681,96	2	80-90 %				да, частна общинска
Люлин	90 СОУ Генерал Хосе де Сан Мартин	ул. "Стефана Клинчарова"№ 3, 1343 ж.к. Люлин 2, София	плосък	3 264,69	2	80-90 %	1976	Централно топлоснабдяване (ТЕЦ)	Топлинна енергия от централизирано топлоснабдяване	да, публично общинска
Младост	81 СУ „Виктор Юго"	ул. „Бъднина" №3	плосък	3 258,94	2	80-90 %	1981	Централно топлоснабдяване (ТЕЦ)	Природен газ	да, публично общинска

Описание	Наличие на енергийно обседва	Година на обследван	Потребление на ел. енергия за 2021 г. [kWh/год	Разходи за ел. енергия [лв./год]	Потребление на ел. енергия за 2020 г. [kWh/год	Разходи за ел. Енергия [лв./год	Потребление на ел. енергия за 2019 г. [kWh/год	Разходи за ел. енергия [лв./год
ДГ 42 "Чайка"	не		има фактури, ще се сумират	има фактури, ще се сумират	26964,00	7 550,02 лв.	има фактури, ще се сумират	има фактури, ще се сумират
140 средно училище „Иван Богоров"			65409,00	18 464,36 лв.	67470,00	17 575,39 лв.	91770,00	20 761,36 лв
82 ОДЗ "Джани Родари"	да	2018	36645,00		38084,00	11 139,36 лв.	46507,00	
89 ОУ д-р Христо Стамболски	да	2005	има фактури, ще се сумират	има фактури, ще се сумират	има фактури, ще се сумират	има фактури, ще се сумират	18118,64	4 529,66 лв.
Дом на културата Искър	да	2008	има фактури, ще се сумират	има фактури, ще се сумират	7582,00	1 471,78 лв.	41664,00	10 148,00 лв
69 СУ "Димитър Маринов"	да		има фактури, ще се сумират	има фактури, ще се сумират	има фактури, ще се сумират	има фактури, ще се сумират	37658,00	7 908,00 лв.
Столична община - район Искър	да	2008	89581,00	22 696,32 лв.	103953,00	22 445,00 лв.	97326,00	20 426,41 лв
ДГ №36 „Пеперуда"	да	2020	44342,00	11 677,34 лв.	1804,00	608,34 лв.	29100,00	6 356,68 лв.
120 основно училище „Георги Раковски", София								
35 СЕУ „Добри Войников"								
12-ти ДКЦ	не		176878,00	51 452,90 лв.			227409,00	41 790,89 лв
40 СОУ „Луи Пастьор"	да	2012	54501,00	15 820,43 лв.	62291,00	17 702,07 лв.	85575,00	17 702,07 лв
12-ти ДКЦ (база 2)								
90 СОУ Генерал Хосе де Сан Мартин	да	2013			52201,00	12 183,00 лв.		
81 СУ „Виктор Юго"	да	2020	135485,00				169803,00	

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SOFIA: BASELINE

Ivan Bogorov school

No summer consumption, the energy may be used in other municipal buildings, based on contract with energy trader or through direct cable.

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LOAD PROFILES - SUMMER

Covers about 50% of the consumption of the building

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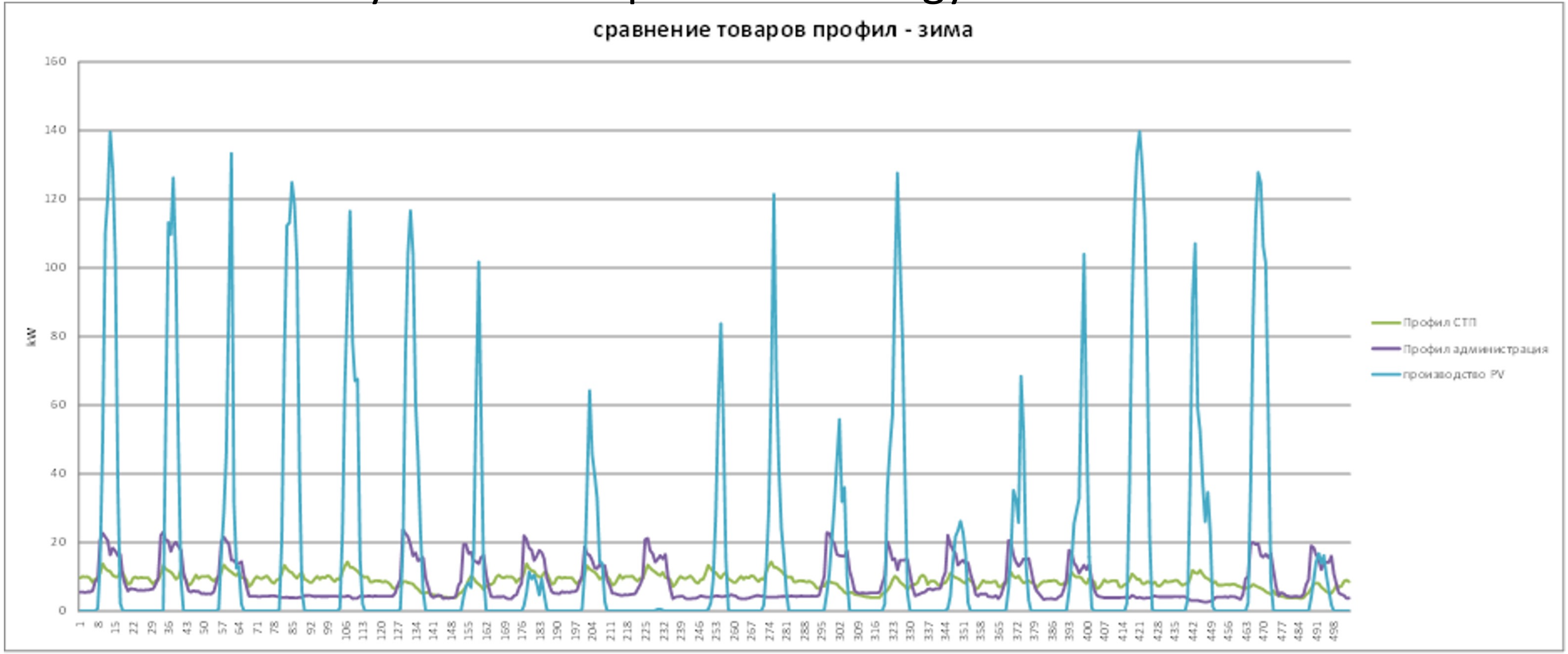
LOAD PROFILES – WINTER

On annual base only 15% of the produced energy is used onsite



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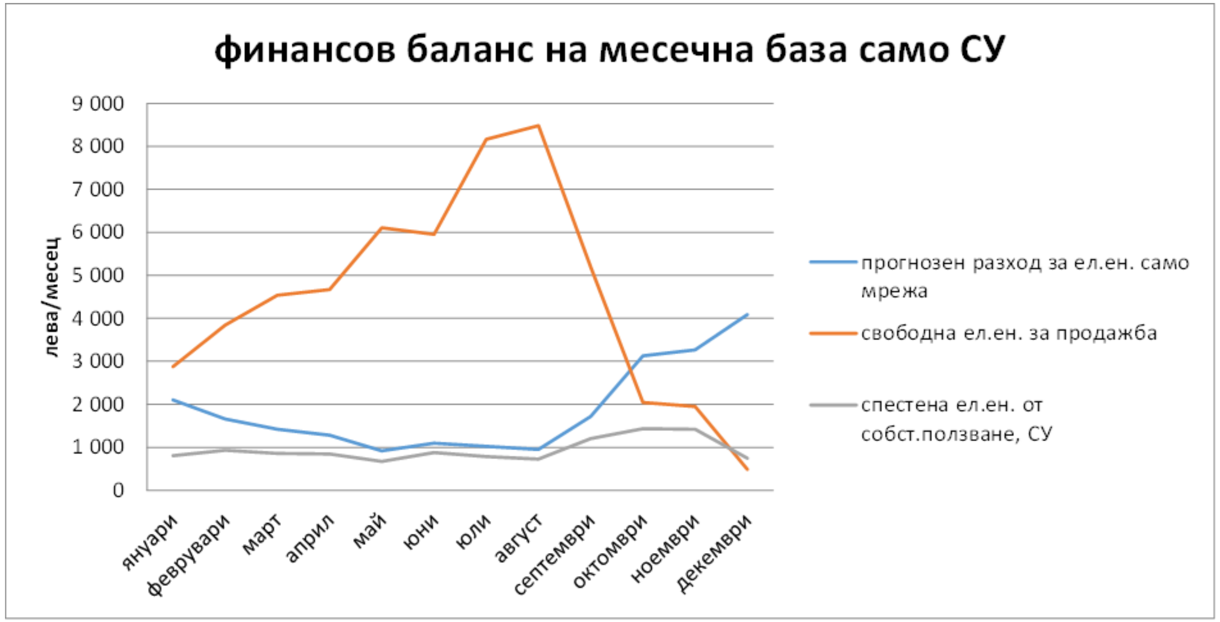
SCENARIOS

1. Covering part of the school needs and selling the surplus
2. Covering part of the school and the kindergarten needs an selling the surplus



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ATTRACT THE INVESTORS

- Profita – 63% (supplying only the school)
- Profit – 47% (supplying the school and the kindergarten)

Year	Supplying only school		Supplying school and kindergarten	
	capital, BGN	dividends, BGN	capital, BGN	dividends, BGN
1	30 000	19 070	30 000	14 173
2	30 000	19 070	30 000	14 173
3	30 000	19 070	30 000	14 173
4	30 000	19 070	30 000	14 173
5	30 000	19 070	30 000	14 173
6	30 000	19 070	30 000	14 173
7	30 000	19 070	30 000	14 173
8	30 000	19 070	30 000	14 173
9	30 000	19 070	30 000	14 173
10	30 000	19 070	30 000	14 173

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CONCLUSIONS AND RECOMMENDATIONS

- There is still a lack of ready-to-implement contractual and legal models for cooperation.
- RE installations for own needs have limited effect and batteries are not solving this issue.
- Energy cooperatives allow to share the financial risk, providing a good return for investors relative to current bank deposit rates.
- If electricity prices are higher than assumed, the municipality can offer better terms to the investors.
- The municipality should establish its own unit to control and manage energy flows in the building and to communicate with traders and investors.
- The efficiency of investments can be increased by the implementation of 'smart' solutions.
- Another municipal building with different load profile nearby (sport facility) can significantly increase the effect of the PV plant.
- Priority should be given to using the energy produces for own needs

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THANK YOU FOR YOUR ATTENTION

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