Hungarian storage tender

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ERRA RES Committee Meeting
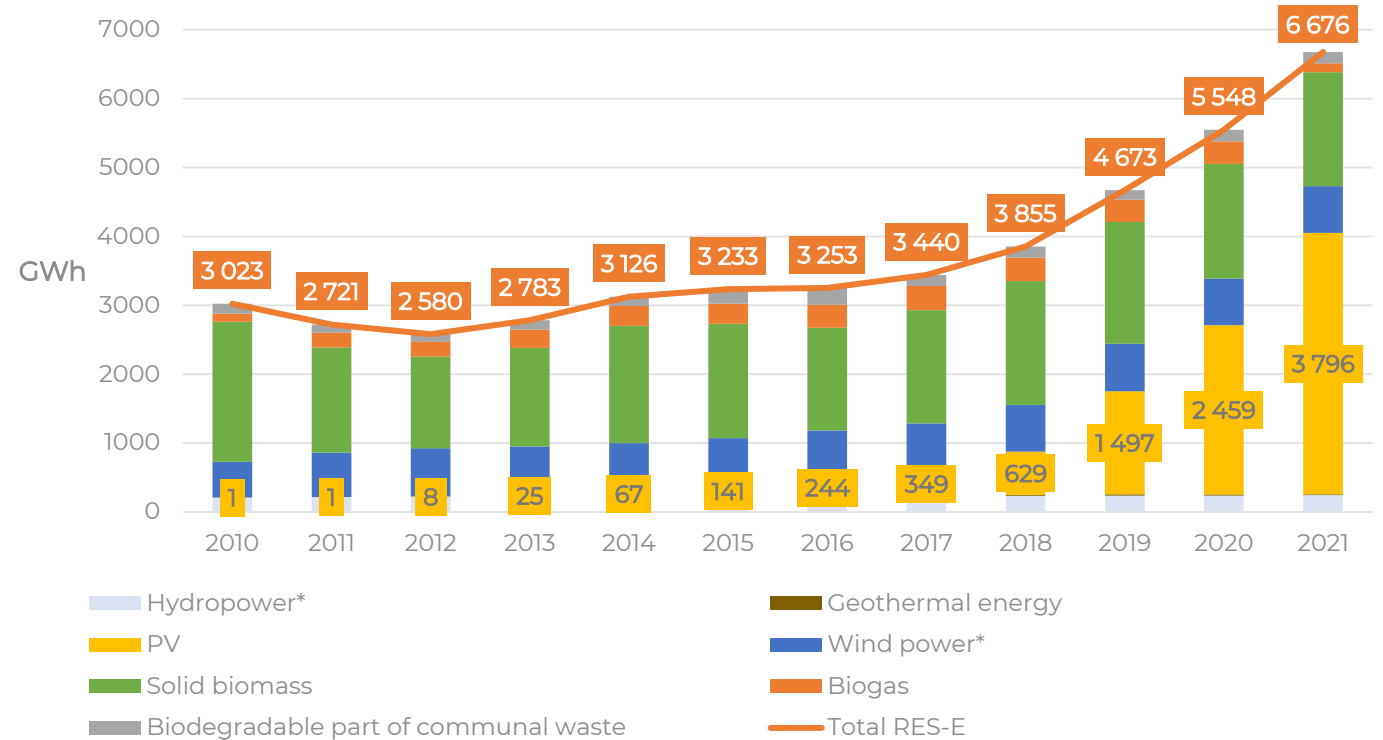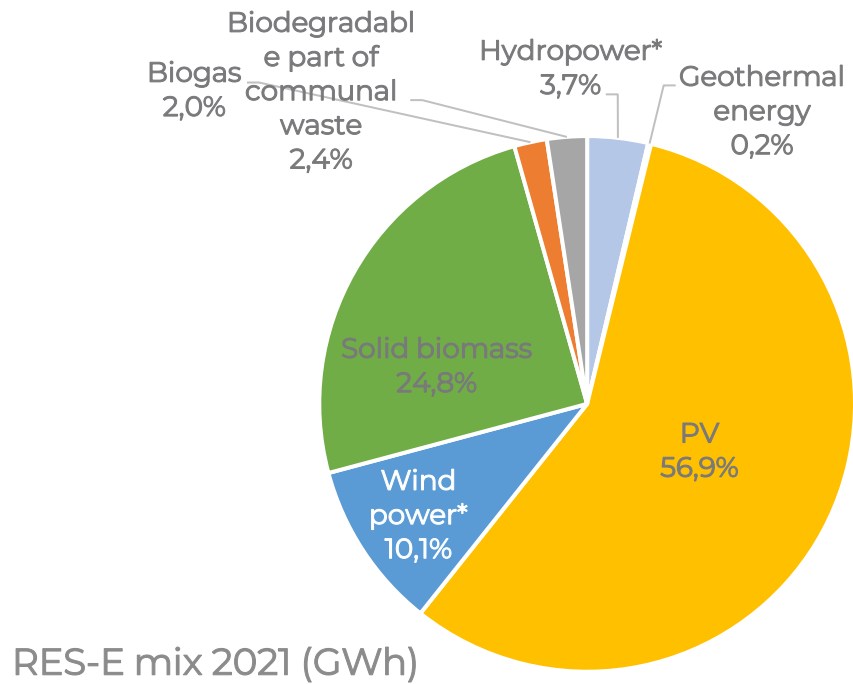
Budapest, 11th October 2023

Hungarian Energy and Public Utility Regulatory Authority

Clean energy, sustainable environment

RES targets at a glance

- Binding RES target for 2020 set by EU Directive 28/2009/EC: **13%** within final energy consumption => reached in 2020: **13.9%**

- RES target for 2030 according to draft NECP update (not an EU binding target): **at least 29%**

- Expected RES-E share in 2030: **31%** (2022p: 15.2%)

- RES-E growth would come mainly from the installation of:
  - **PV** : >5 GW => >12 GW
  - **Wind** : ~300 MW => >1 GW

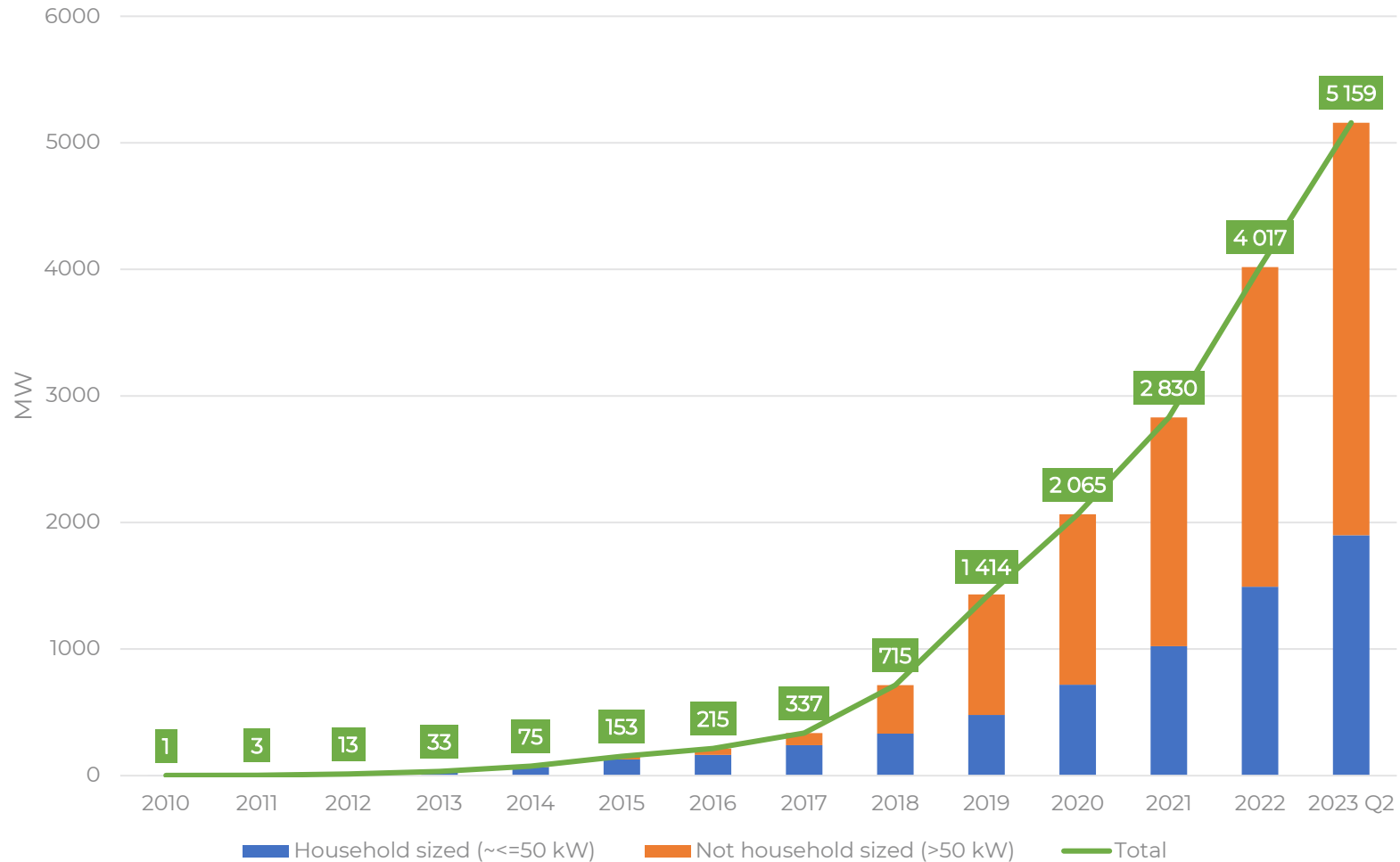- **Challenge: integration** of intermittent (mainly PV) capacities into the power system

Renewable electricity mix and consumption

MEKH

RES-E mix 2021 (GWh)

- Geothermal energy 0,2%
- Hydropower* 3,7%
- Biodegradable part of communal waste 2,4%
- Biogas 2,0%
- PV 56,9%
- Solid biomass 24,8%
- Wind power* 10,1%

GWh

Year	Total RES-E	PV
2010	3 023	1
2011	2 721	1
2012	2 580	8
2013	2 783	25
2014	3 126	67
2015	3 233	141
2016	3 253	244
2017	3 440	349
2018	3 855	629
2019	4 673	1 497
2020	5 548	2 459
2021	6 676	3 796

Legend:
- Hydropower*
- PV
- Solid biomass
- Biodegradable part of communal waste
- Geothermal energy
- Wind power*
- Biogas
- Total RES-E

* Normalised data

Source: SHARES Eurostat
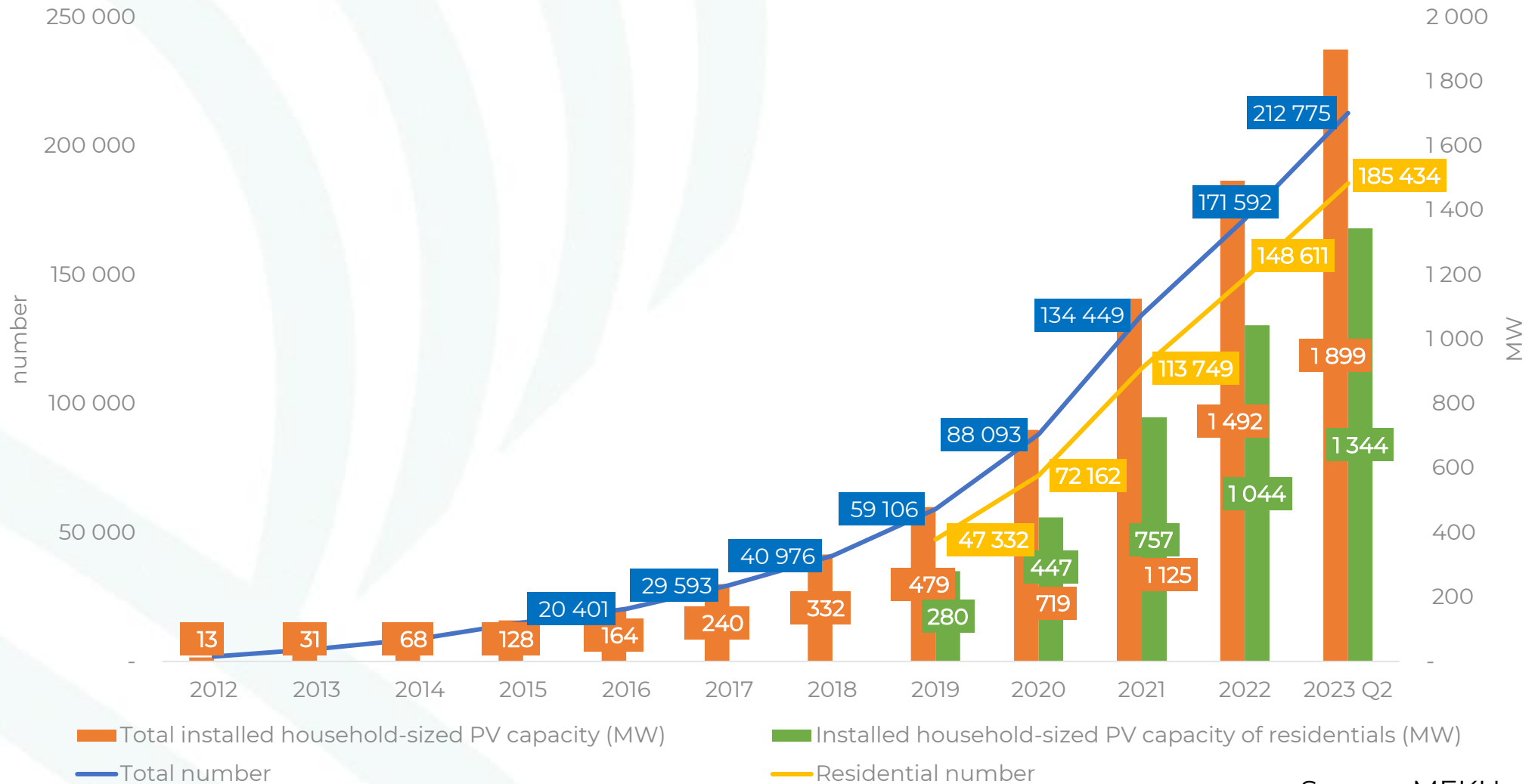
PV power plant capacities* in Hungary

* Only those PV capacities are shown on the diagram, which have produced electricity in the end of the respective years

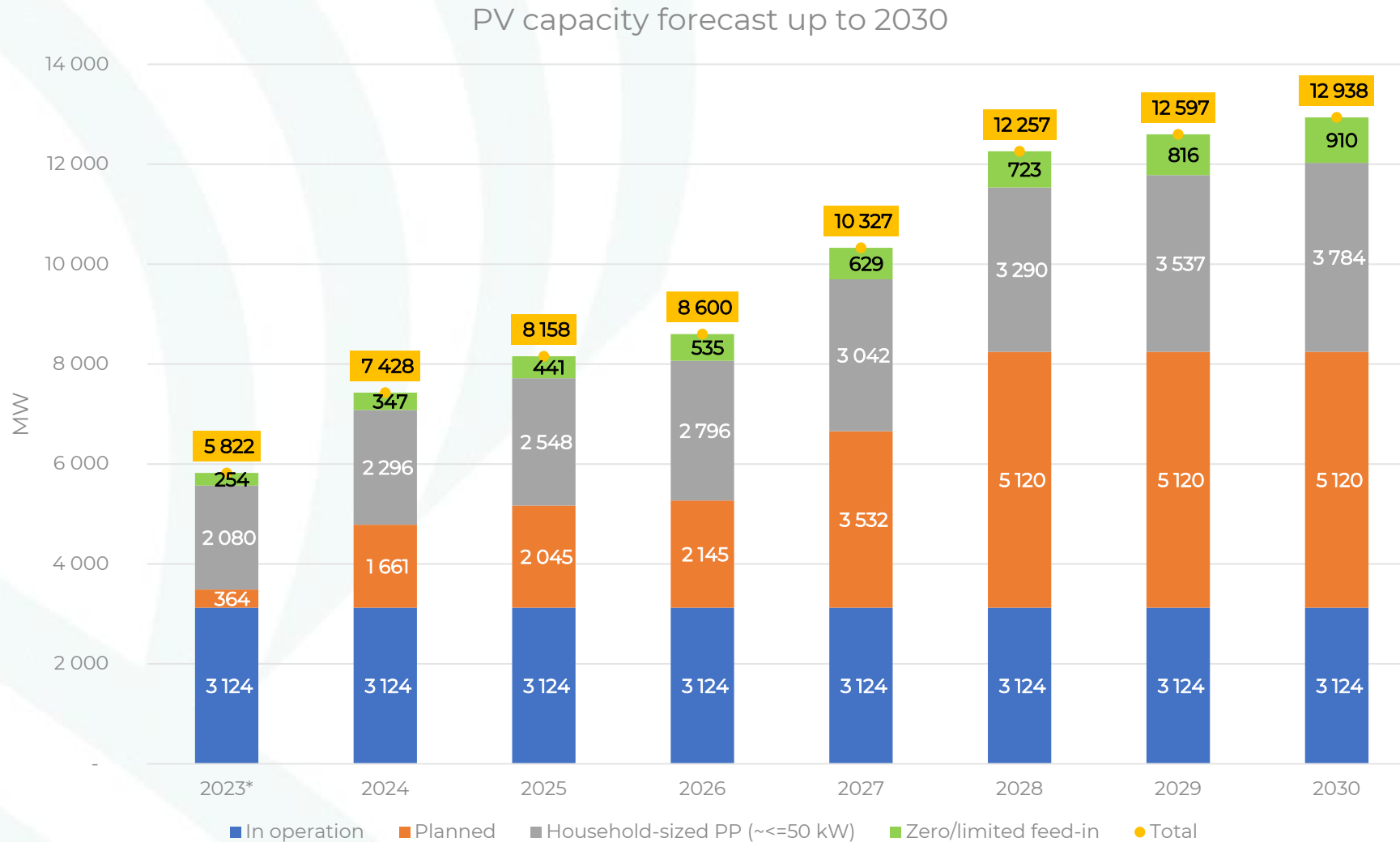Source: MEKH

Household-sized PV in Hungary

Number and installed capacity of household-sized PV

Source: MEKH

Legend:
- Total installed household-sized PV capacity (MW)
- Installed household-sized PV capacity of residentials (MW)
- Total number
- Residential number

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PV uptake estimation up to 2030

PV capacity forecast up to 2030

* TSO data for 2023 available until the end of August

Source: MAVIR (TSO), dynamic scenario

Problems:

- Skyrocketing PV capacities => scarcity of flexibility options => high costs for the TSO to procure balancing capacity and energy => rising network charges for electricity consumers

- Network congestion, bottlenecks in certain regions

Possible solutions:

- Grid development

- **Storage:** individually or aggregated

⇒ storage tender, support households to deploy PV+storage facilities

- For the transition phase: new CCGT capacity

- Possibly DSM, virtual power plants, energy communities

High costs of balancing capacity allocation

MEKH

Quantity and cost of balancing capacity allocation

Quantity and cost of aFRR capacity allocation
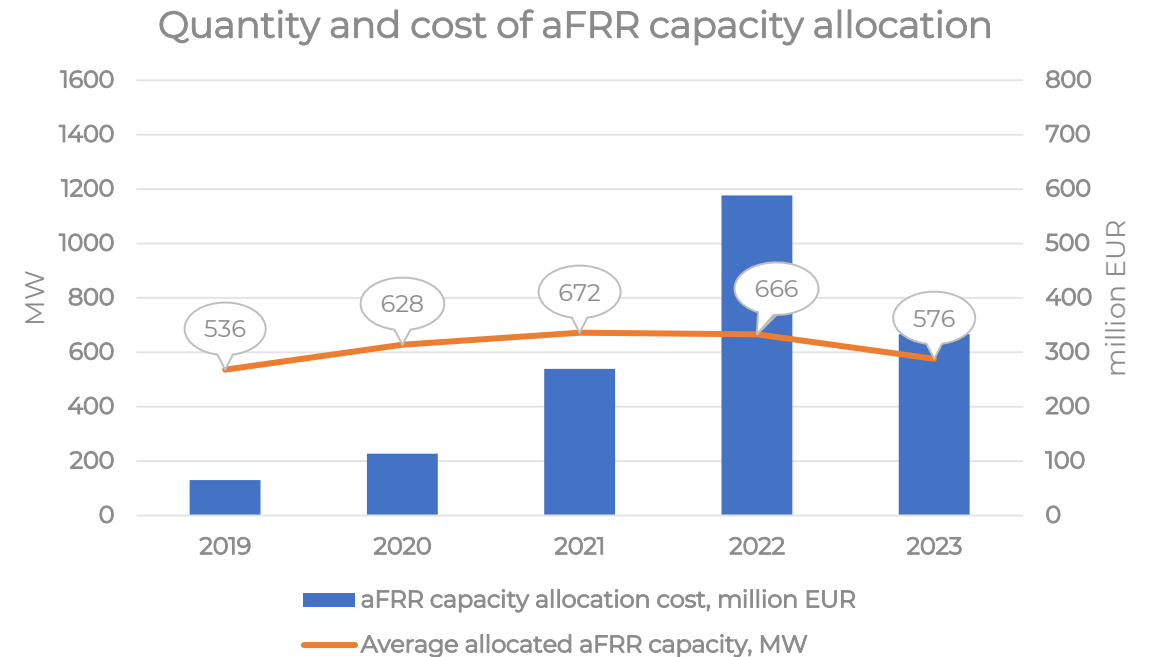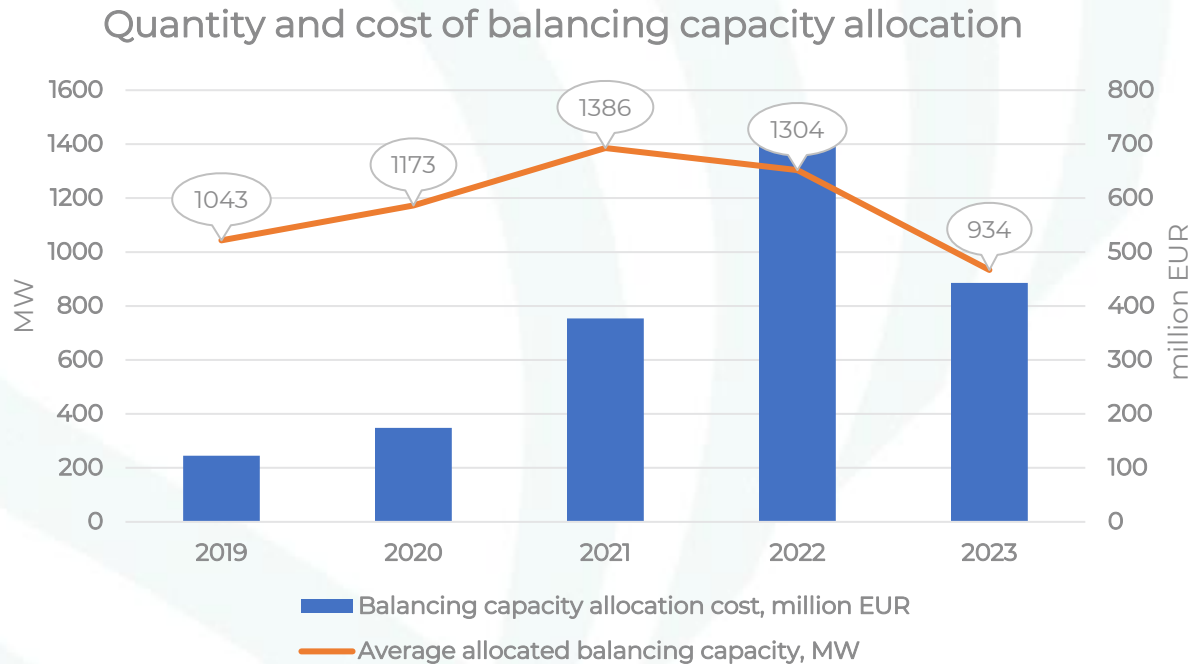
Source: MEKH database filled out by MAVIR (TSO)

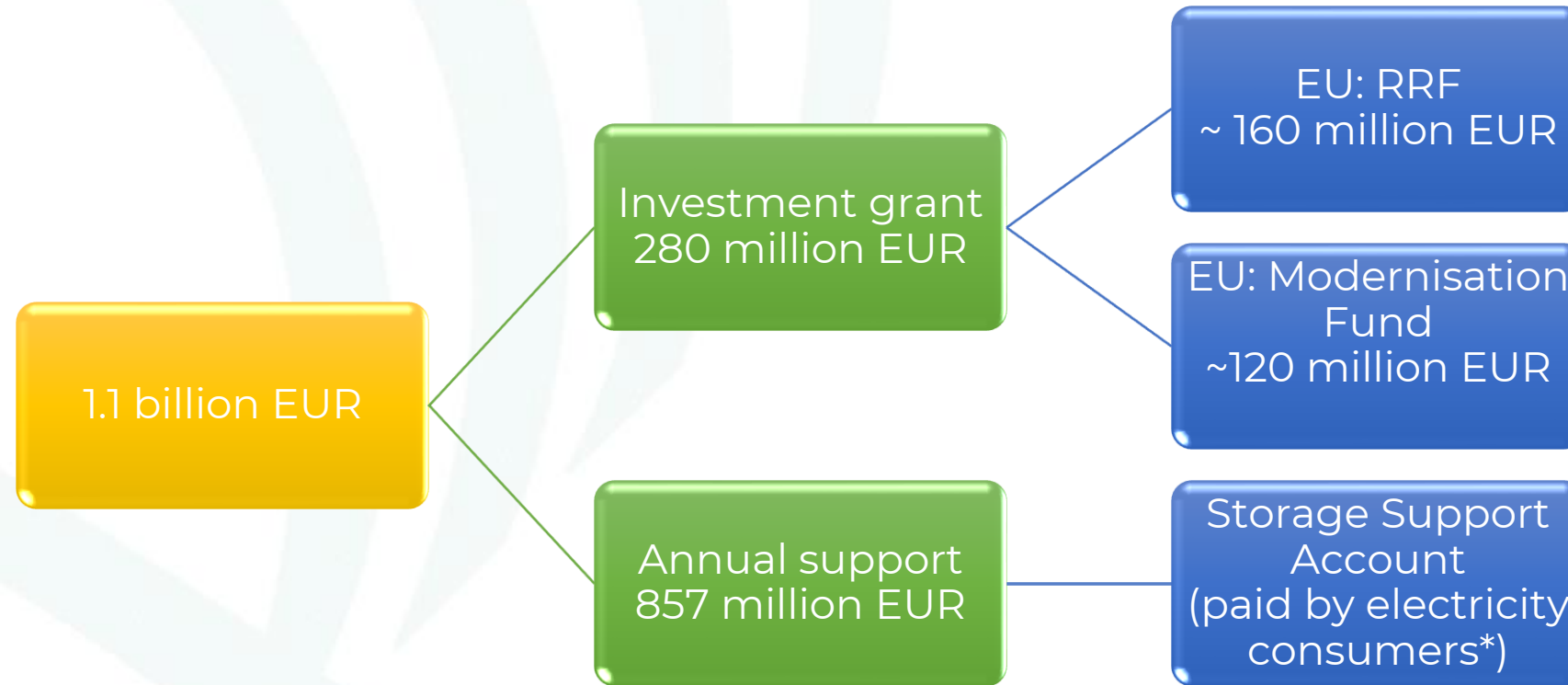Note: data for 2023 available until August

Why storage?

- Increase the flexibility of the power system

- **Decrease the actually high costs of balancing reserves**

- **Fast flexibility option but limited in time** => participation mainly in hourly balancing markets

  - Gas power plants will be used mainly as longer flexibility option

- The storage facility is buying electricity when it is cheap and sells it in times of high market prices => **lower risk of price volatility and negative prices on wholesale power markets**

Support of electricity storage facilities

- State aid notification to EU in August 2022
  - Electricity storage grant and revenue compensation system
- Commission approved it in June 2023
- Estimated budget: **EUR 1.1 billion** (approximately HUF 436 billion)
- Support the installation of at least **800 MW/1600 MWh** of new electricity storage capacity
  - 1st tendering round: 440 MW/880 MWh
- Storage capacity should be **active in the wholesale and balancing markets**
- **2 forms of aid:**
  - **Direct investment grants:** 350.000 EUR/MW, but max. 45% (disbursed in HUF)
  - **Annual support:** based on a monthly calculated revenue compensation, 2-way CfD, should cover the residual funding gap for 10 years

Storage tenders

- 2 storage tender rounds planned:
  - **1st round: Q3 2023** (tender call to be published soon)
  - **2nd round: Q2 2024**
- Projects to be completed **until 2026-2027** (in 36 months), if not met, sanctions (5-10% monthly reimbursement of investment aid)
- Investment grant and annual support to be allocated in the same tender procedure
- Selection of beneficiaries: **least cost criterion**, starting with the lowest bid (for annual support, EUR/kW/year), until the tendered investment grant is exhausted
- **Pay-as-bid:** the annual support will correspond to the amount offered by successful bidders
- The specific investment grant will be equal for all projects (350 000 EUR/MW, max. 45% aid intensity)
- **Minimum and maximum price thresholds** planned for annual support bids
  - The minimum bid is planned to be 10% of the maximum bid

Funding of storage support scheme

MEKH

```
1.1 billion EUR
├── Investment grant
│   280 million EUR
│   ├── EU: RRF
│   │   ~ 160 million EUR
│   └── EU: Modernisation Fund
│       ~120 million EUR
└── Annual support
    857 million EUR
    └── Storage Support Account
        (paid by electricity consumers*)
```

* Who are not entitled to universal service, mainly industrial consumers

Who will be responsible for what?

Government
- Organise and manage storage tenders
- Monitoring of storage facilities

MEKH (Regulator)
- Determine the methodology of the benchmark revenue (in MEKH Decree)
- Update of methodology
- Monitoring of storage facilities

MAVIR (TSO)
- Administration of Storage Support Account
- Determine the monthly levy for consumers
- aFRR accreditation of storage facility

Eligibility – general rules

- **Beneficiaries: undertakings active in the energy sector in Hungary**, e.g. energy traders, aggregators, power plants, industrial consumers

- **All electricity storage technologies** will be eligible

- Newly installed or repowered storage capacities

- **1st round opened only to domestic projects**, later rounds opened to foreign projects if cross-border balancing capacity exchange is established

- **„Application windows":** technology groups with different technical lifetimes
  - Unused budget in any technology group can be reallocated to other groups
  - Maximum price would be the same for all groups => lower budget for groups with longer technical lifetime (less applications expected there)

Nr. of application window	Maximum lifetime	Indicative budget in 1st round
1.	<11 years	~103 million EUR
2.	11-29 years	~44 million EUR
3.	30+ years	~13 million EUR

Eligibility criteria (set in each tender)

- **Minimum requirement: at least 2 MWh power storage for 1 MW capacity** (can be higher but additional storage capacity won't be remunerated)

- *aFRR accreditation from the TSO* => the storage facility should be able to provide balancing services
  - Individually (from 5 MW) or
  - As part of an aggregator (in order to facilitate small storage facilities under 5 MW)

- Performance bond (EUR/kW)

- **At least a 10-year operation** of the storage facility will be required

- *Anti-concentration rule* in each tender round:
  maximum investment aid limit of ~32 million EUR for each single legal entity or group* participating in the tender
  => at least 5 independent beneficiaries will thus receive support

* The support provided for legal entities belonging to the same group should be aggregated

Revenue compensation

- **Revenue compensation**=
Monthly supported net income – Reference net income

- Calculated *on a monthly basis* by the TSO=> annual support is the sum of monthly revenue compensations

- *Monthly supported net income:* determined based on winning bids

- *Reference net income:* benchmark revenue based on MEKH Decree **(not the real revenue of the storage facility!)**, charging costs are deducted

- 2-sided CfD:
  - If revenue compensation > 0 : **support paid to the storage facility**
  - If revenue compensation < 0 : **storage facility has to pay**

- No compensation can be paid in the given month if the cumulative aid would exceed the present value of the investment cost (by applying a 10% yearly discount rate)

- The compensation period starts from the physical completion (aFRR accreditation) of the project and **lasts for 10 years**

- **But compensation can be paid only from 1 January 2026, the earliest!** (even if the storage facility is built earlier)

Benchmark revenue calculation (MEKH)

- MEKH organised **market consultations** and studied the European experience in order to establish a reliable benchmark

- **Benchmark <u>net</u> revenue calculation**

  - Methodology in *MEKH Decree*

  - **Net revenues from wholesale and balancing markets** are taken into account

  - **Fixed costs of charging are deducted from revenues**

    - Fix and capacity based distribution fees for medium voltage connection

- To be updated regularly and in extraordinary cases by MEKH (see later)

Wholesale market revenue

- This is an **energy arbitrage**:
  - Buying electricity at times of high renewable generation and low prices => charging
  - Selling electricity at times of relatively low renewable generation and high prices => discharging

- **Assumptions**:
  - 1 storage cycle (that is energy arbitrage) / day
    => 2 hours for charging and 2 hours for discharging
  - no selling (discharge) of electricity if income doesn't cover variable costs

- Calculation:
  - **Daily wholesale market revenue** =
    (daily wholesale selling price * discharged energy) – (daily wholesale buying price * charged energy)
  - **Discharged energy** = energy output/cycle =
    nominal storage capacity * SoH * discharge efficiency (90%) * DoD (80%) * availability factor (95%), where
    - **State of Health (SoH):** the ratio of the real and the available storage capacity, according to yearly metering of TSO; if <70%, no revenue compensation is paid until SoH is restored (deadline: 1 year)
    - **Depth of Discharge (DoD):** the capacity that is discharged from a fully charged battery, divided by battery nominal capacity
  - **Charged energy** = discharged energy / roundtrip efficiency (81%)

Balancing market revenue

- **Revenues from hourly or shorter period products of the <u>aFRR balancing market</u>** are taken into account

- **Assumption**: storage bids for 10-20 hours/day, depending on the liquidity of the intraday market

- 50-50% upward/downward balancing capacity bids

- *„Success factor"* of bids on aFRR capacity tenders: ratio of the quantities allocated and actually offered (under a given price threshold) => impact on income calculation (upward/downward)

Components:

+ Income from upward regulation capacity allocation

+ Income from downward regulation capacity allocation

No net revenue from sale of balancing energy, assuming that income = variable charging costs

Update of benchmark, monitoring

- Benchmark revenue composition fixed for 1 year at least

- MEKH will monitor the behaviour of storage operators
  - Bidding patterns on the balancing capacity market
  - Frequency of their activation as balancing energy provider

- MEKH will update the revenue benchmark at least every 2 years (1st review in 2027, applicable for 2028)

- Extraordinary review in following cases:
  - Reference net income deviates in average more than 20% from the realised net income in given year
  - **On request of project owners** (>50% of investors or representing >50% of supported storage capacity) => 90% reimbursement of damage in case of unrealistic benchmark for the first two years (2026-2027)

- **Regular monitoring** is essential for reviews
  - Monthly reports to MEKH on real revenues and costs

Solar Energy Plus Programme 2024

- **Investment support** to be announced by Government in early 2024

- ~ 192 million EUR (75 billion HUF) budget

- **Max. 65% aid intensity**

- **Household sized PV + storage**

- Max. 4 kW PV + storage of max. 8 kWh capacity
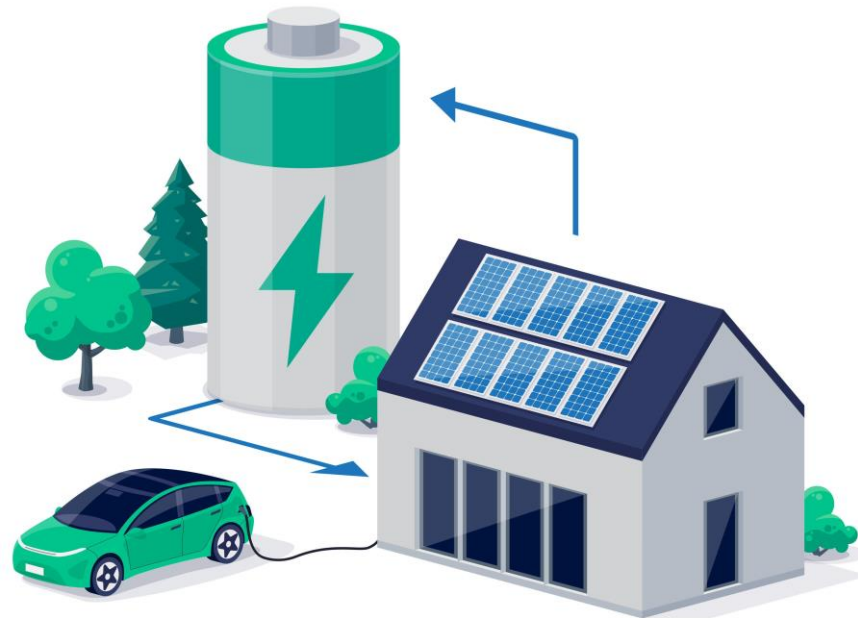
Thank you for the attention!

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Hungarian Energy and Public Utility Regulatory Authority
Clean energy, sustainable environment

MEKH