SEA Consulting

RECENT ENERGY CRISIS, CHALLENGES AND THE POTENTIAL ROLE OF DEMAND RESPONSE IN ALBANIAN POWER SECTOR

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2. Key characteristics of the Albanian power sector
3. Main Challenges
4. Potential role of demand response in Albania

1. The latest energy crisis and its impact on Albanian power sector

A Summary of energy crisis impact

- **What happened?**
  - Albania is dependent from imports even on very good hydrological years
  - The crisis had an Immediate impact on increasing electricity market (import) prices in Albania (reached 482 Euro/MWh in August 2022) - Import prices have followed market prices
  - Periods (such as beginning of April 2022, or September 2022) with the risk of power system close to collapse (water levels in Drini river cascade at critical low levels)
  - Security of supply was at stake
  - Huge expenses for electricity imports (constituting 10% of annual total budget expenses in 2022)
- **Who suffered the most?**
  - Consumers in the liberalized market (Large and SME's)
  - Consumers supplied by the Last Resort Supplier (FMF) – paid 3-4 times more than the pre-crisis level
  - Universal Service Supplier (FSHU) - as no change is made to the regulated prices of households and consumers connected to LV (0.4 kv)
  - Albanian Government – because had to subsidize the additional costs of FSHU and KESH

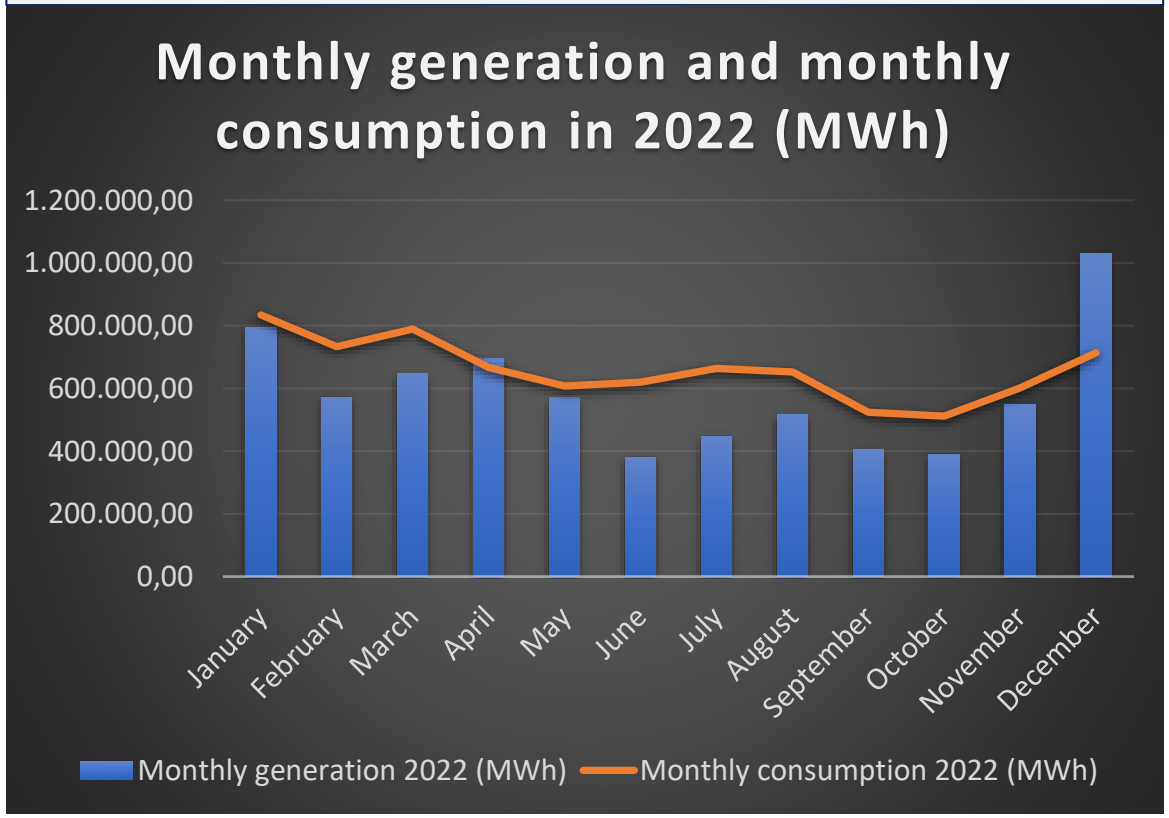
1. The latest energy crisis and its impact on Albanian power sector

Electricity Domestic Generation and Consumption in Albania

Year 2022

Total Domestic Generation 7 TWh

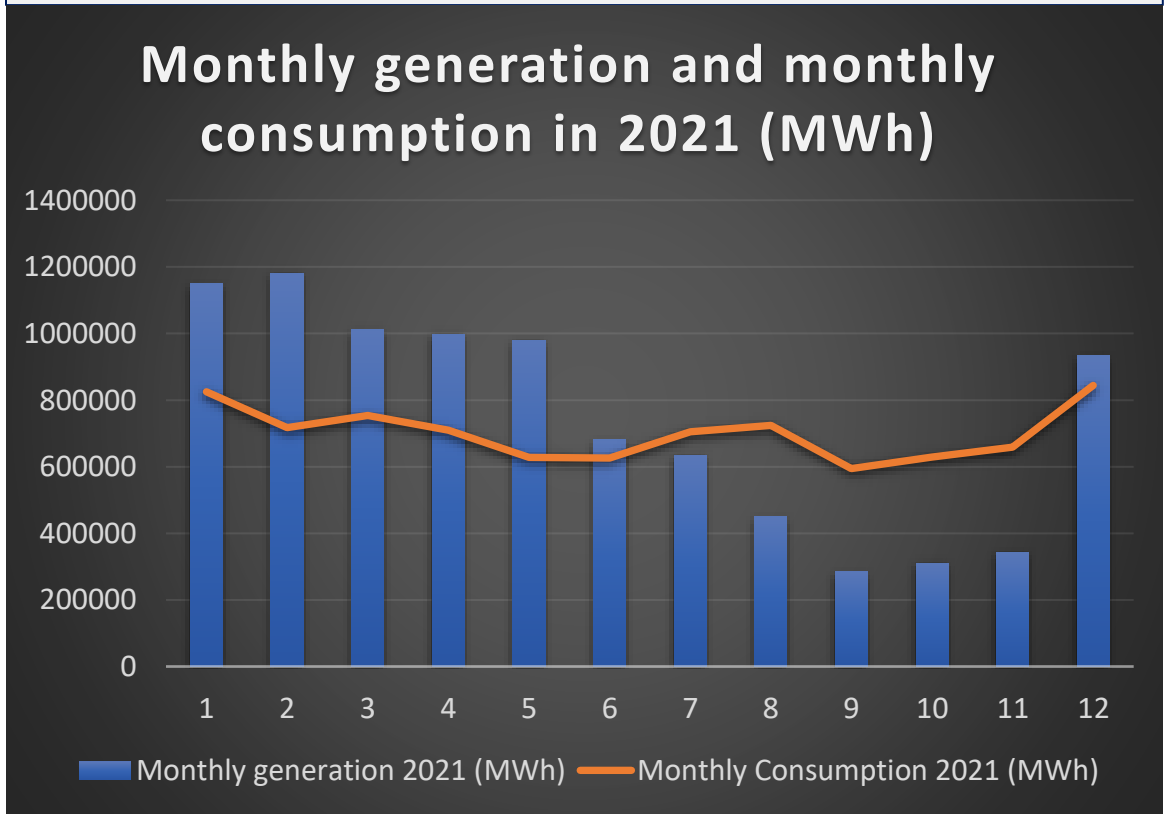
Total Consumption 7.9 Twh



Year 2021

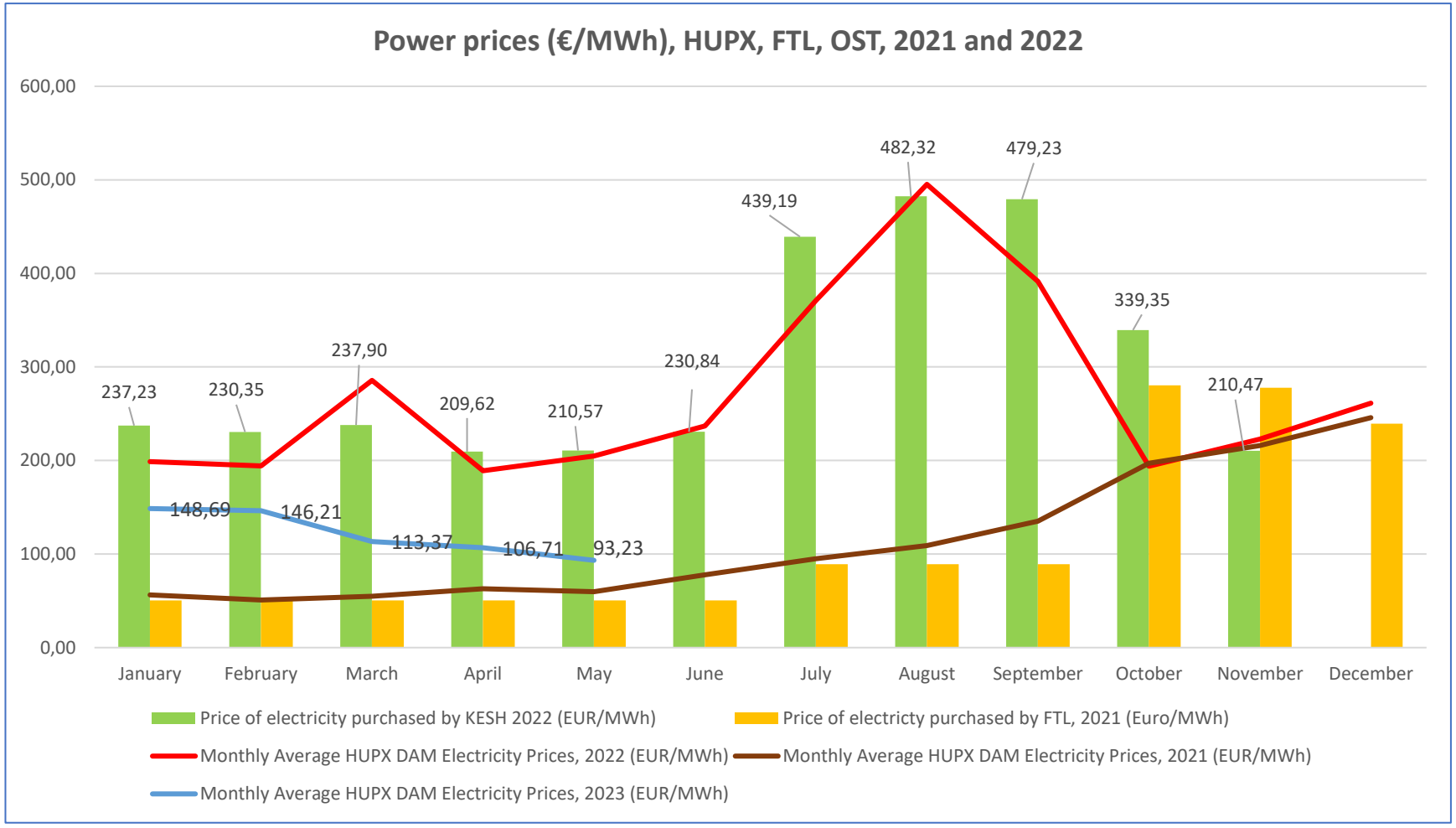
Total Domestic Generation 8.9 TWh

Total Consumption 8.4 TWh



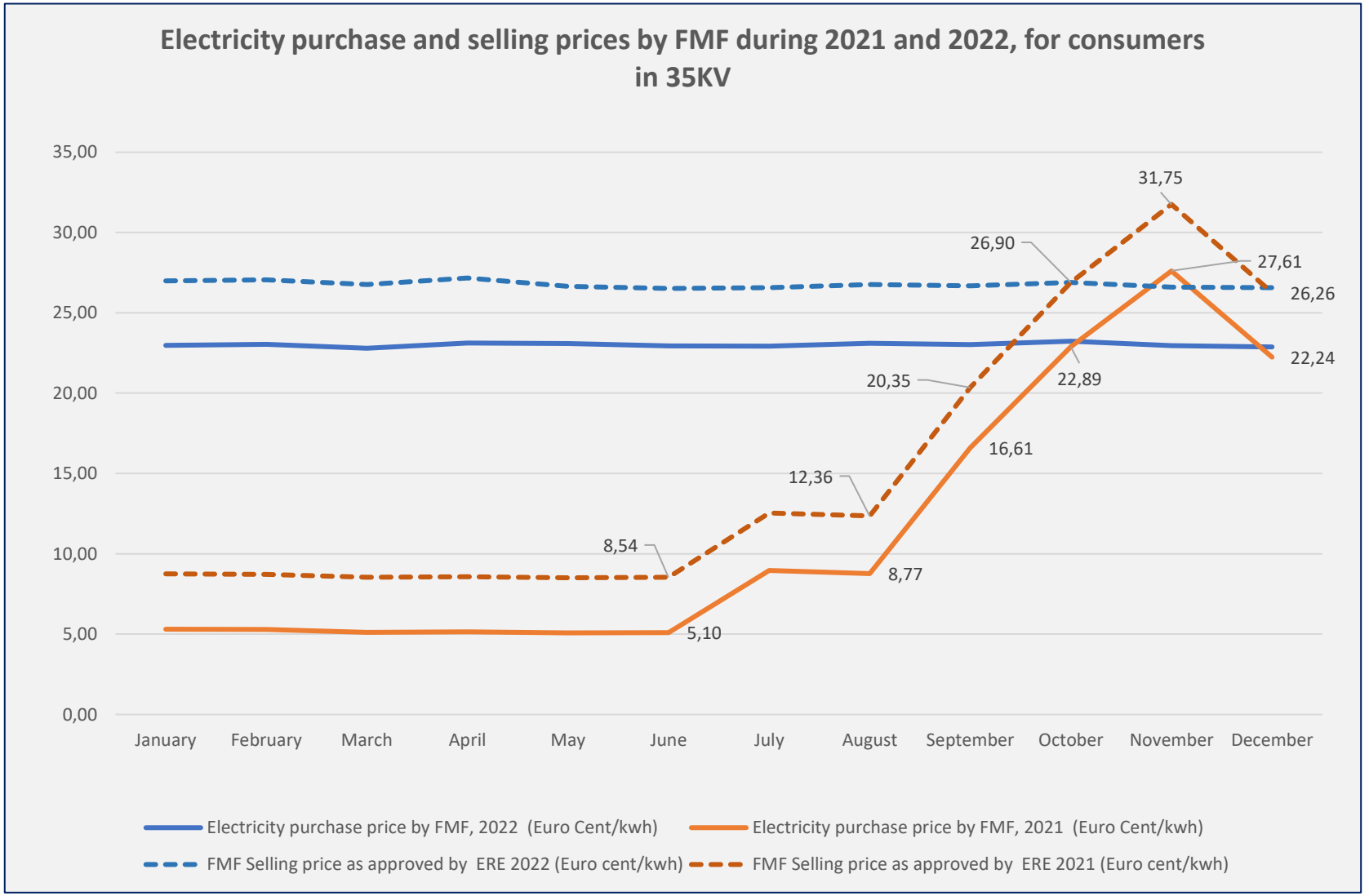
1. The latest energy crisis and its impact on Albanian power sector
Impact on electricity market prices in Albania (2021&2022)

- HUPEX prices reference for imports
- Impact on Albania was immediate
- Main importers / buyers
  - Free Market Supplier (FTL)
  - KESH
- Import prices have followed market prices



1. The latest energy crisis and its impact on Albanian power sector
Higher electricity prices for consumers supplied by the Last Resort Supplier

- Consumers supplied by the Last Resort Supplier were highly affected
- In 2021, in the last 4 months, prices went 3-4 times more than the pre-crisis level
- In 2022, prices remained high through the year, 3-3.5 times more compare to the pre-crisis level



1. The latest energy crisis and its impact on Albanian power sector

Financial impact (2021 – 2022)

- High financial pressure on OSHEE sh.a. and KESH sh.a. and Government of Albania
- The price pressure was not passed on to households and customers connected to 0.4kv.

Electricity imports purchased by public companies, 2021- 2022

Period	Quantity (MWh)	Average price (€/MWh)	Value excluding VAT (€)
2021	1,305,688	189.80	**247,836,916**
2022	1,460,962	305.34	**446,082,853**
TOTAL	**2,766,650**	**250.81**	**693,919,769**

2. Key characteristics of the Albanian power sector

A Summary of key characteristics

- **Albania is a net importer country since 1998** (except for 2010, 2018 and 2021)
  - Generation meets or exceeds consumption during rainy season (March-April-May) when electricity prices are low due to similar rainfall in the whole region
  - Consumption exceeds generation during summer (dry and hot months in the whole region, summer and winter)

- **Albania is highly dependent from weather conditions**
  - Total installed capacity in 2022 is 2,614 MW, and 95% is from hydro resources
  - However, domestic electricity generation is 99% from hydro resources

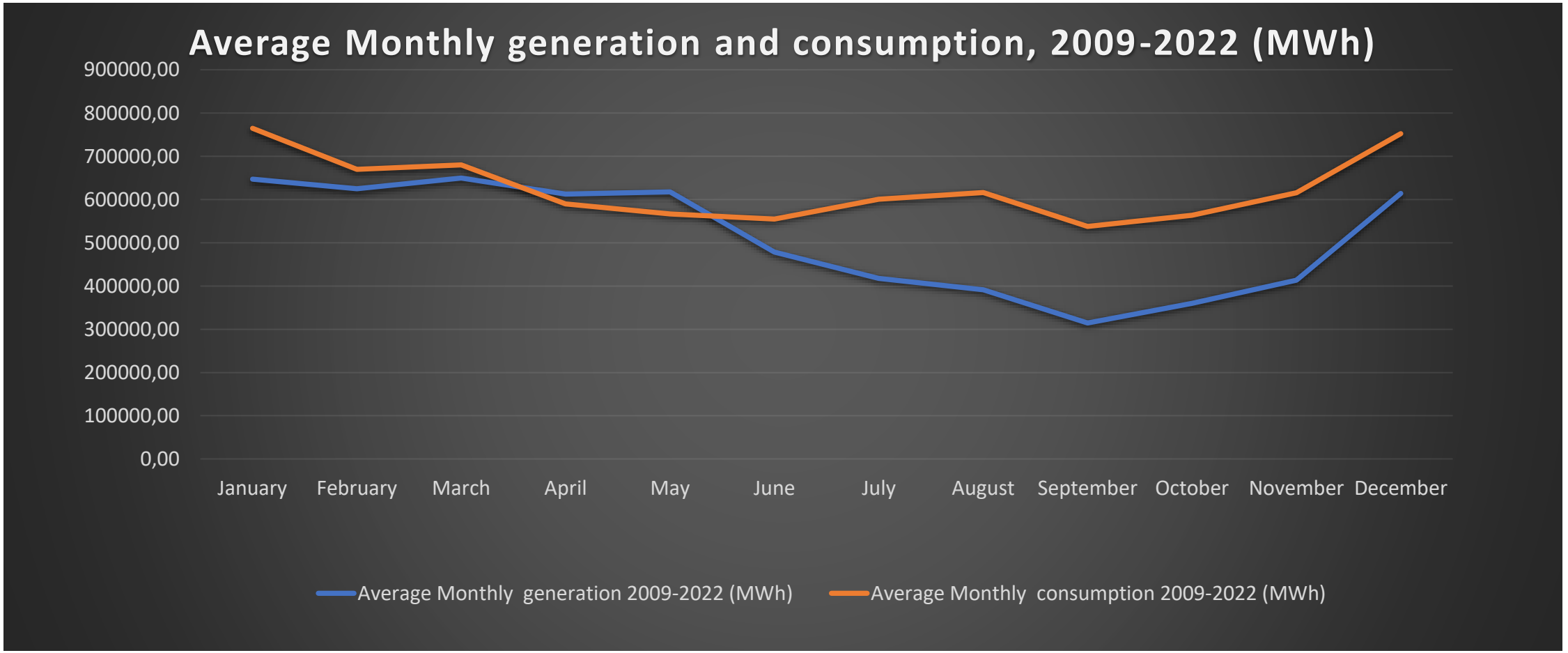
2. Key characteristics of the Albanian power sector

A Summary of key characteristics

- **Steady increase of electricity consumption -** during the last 30 years
  - Average annual growth rate (CAGR) for last 15 years is 2.6%
  - Power consumption growth has followed GDP growth
  - Annual average electricity demand growth rate expected between 2.4 and 4.7% until 2030
- **Albania has experienced capacity growth since 2007 -** Annual average growth rate of 3.75% during the last 15 years
  - Installed capacity in 2007 was 1,505 MW -> In 2022 was 2,614 MW)
  - Growth mainly due to private investments in hydro generation, (average annual growth of 26.4%)
  - Annual average growth of new capacities is expected around 10% until 2030 - this is expected to diversify the generation portfolio

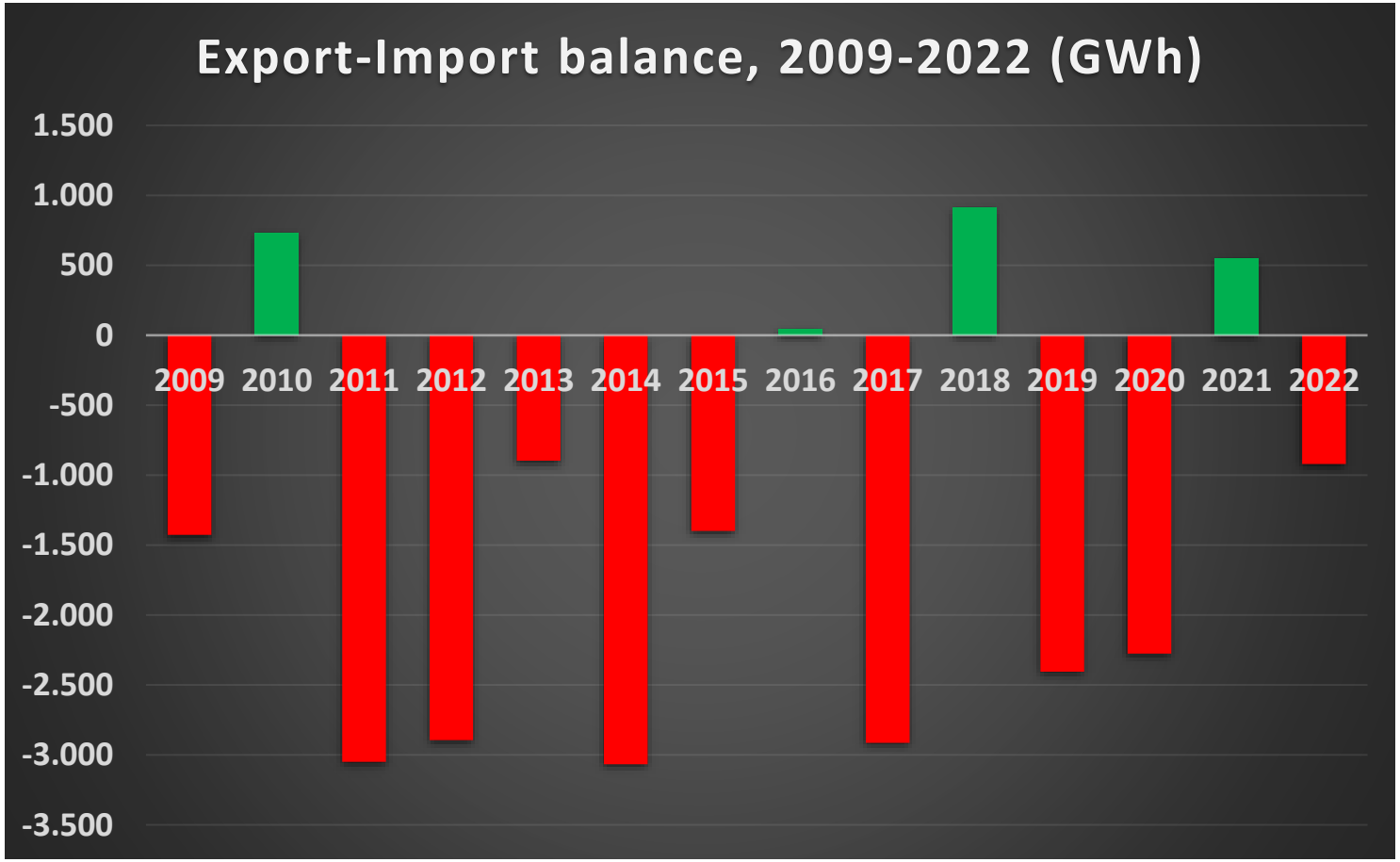
2. Key characteristics of the Albanian power sector

Albania is a net importer of electricity



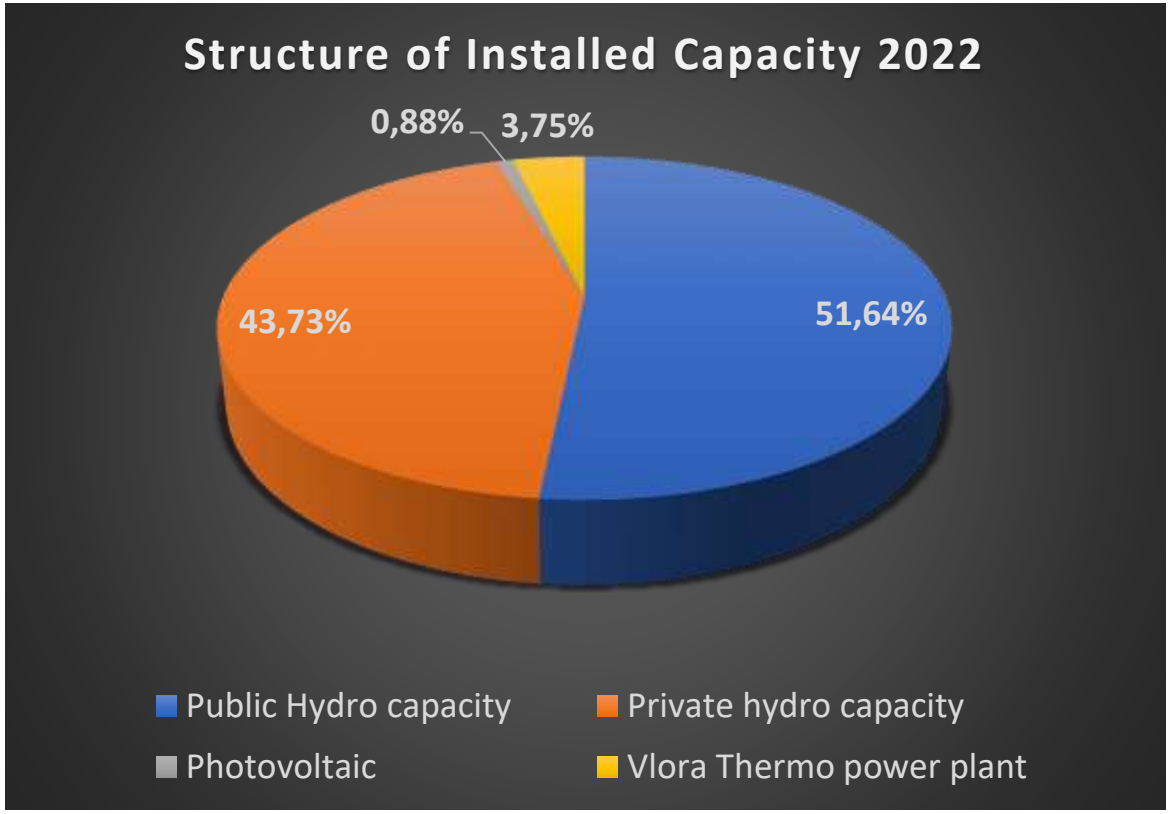
2. Key characteristics of the Albanian power sector
Albania is a net importer of electricity

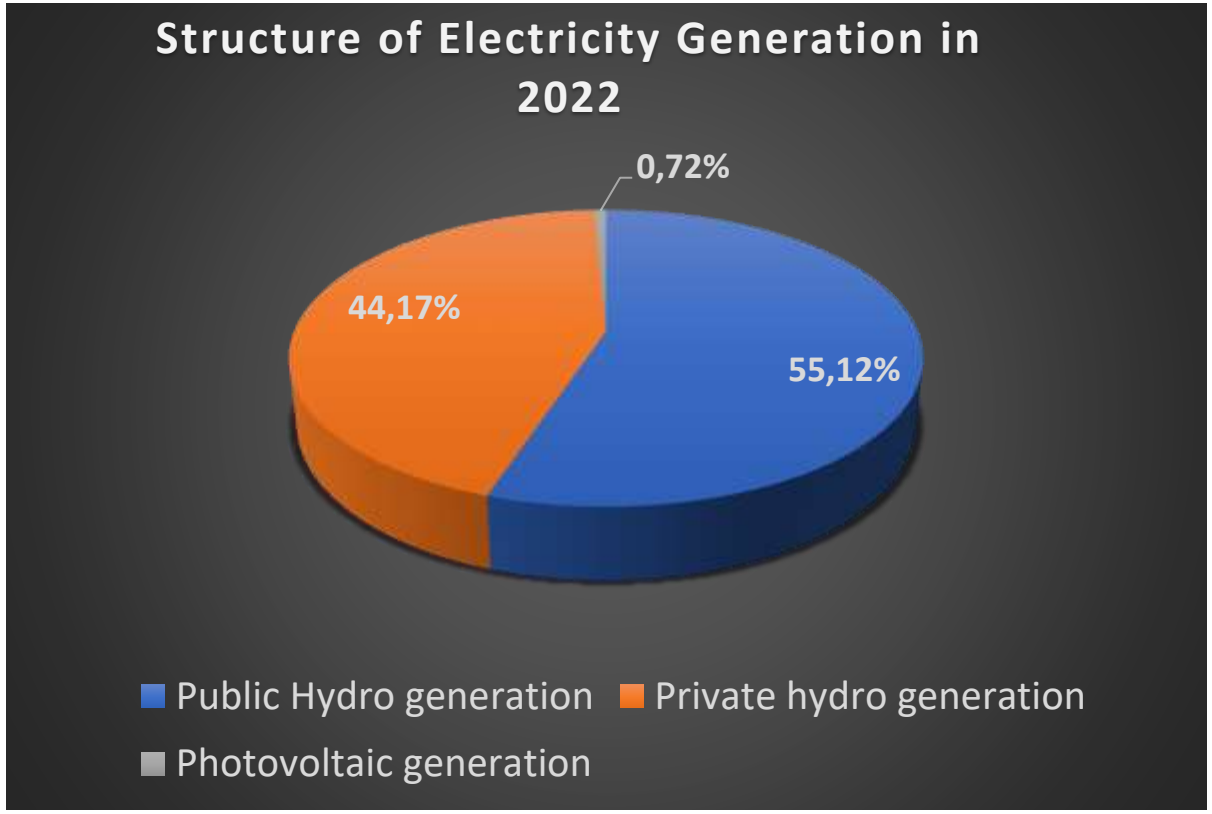
- **Export-Import balance** during 2009-2022
  - Only 2010, 2018 and 2021 Albania is a net exporter
  - Electricity imports to cover domestic consumption varies from 30-50% to the total consumption since 1998



2. Key characteristics of the Albanian power sector
Power generation mainly from hydro resources (99%)

- **Albania is highly dependent from weather conditions**
  - Total installed capacity in 2022 is 2614 MW, and 95% is from hydro resources
  - However, domestic electricity generation is 99% from hydro resources





2. Key characteristics of the Albanian power sector

Capacity growth and planned new capacities

- **2007-2022 generation capacity growth**
  - Installed capacity in 2007 was 1,505 MW -> In 2022 was 2,614 MW
  - Annual average growth rate of 3.75% during the last 15 years
  - Growth due to private investments in hydro generation, (average annual growth of 26.4%)

Planned New Capacities (2023-2030)

- 336 MW are expected to start operation during 2023 period
  - PV, 255 MWp
  - HPP, 81 MW
- Several projects under way (principle approval to be connected to HV);
  - PV, 895 MWp
  - Eolic, 274 MW
  - Floating Thermo Power plant 130 MW
- Annual average growth of new capacities is expected around 10% until 2030.
- This is expected to diversify the generation portfolio

New capacities connected to HV (planned or in construction phase)	HPP (MW)	PV (MWp)	Eolic (MW)	Floating Thermo Power Plant (MW)	Total
Installed capacity expected to start during 2022-2023 (connected to HV)	81	255			**336**
Approval in principal to connect in HV	20.54	895.5	274	130	**1,320.04**
Total	**101.54**	**1150.5**	**274**	**130**	**1,656.04**

2. Key characteristics of the Albanian power sector

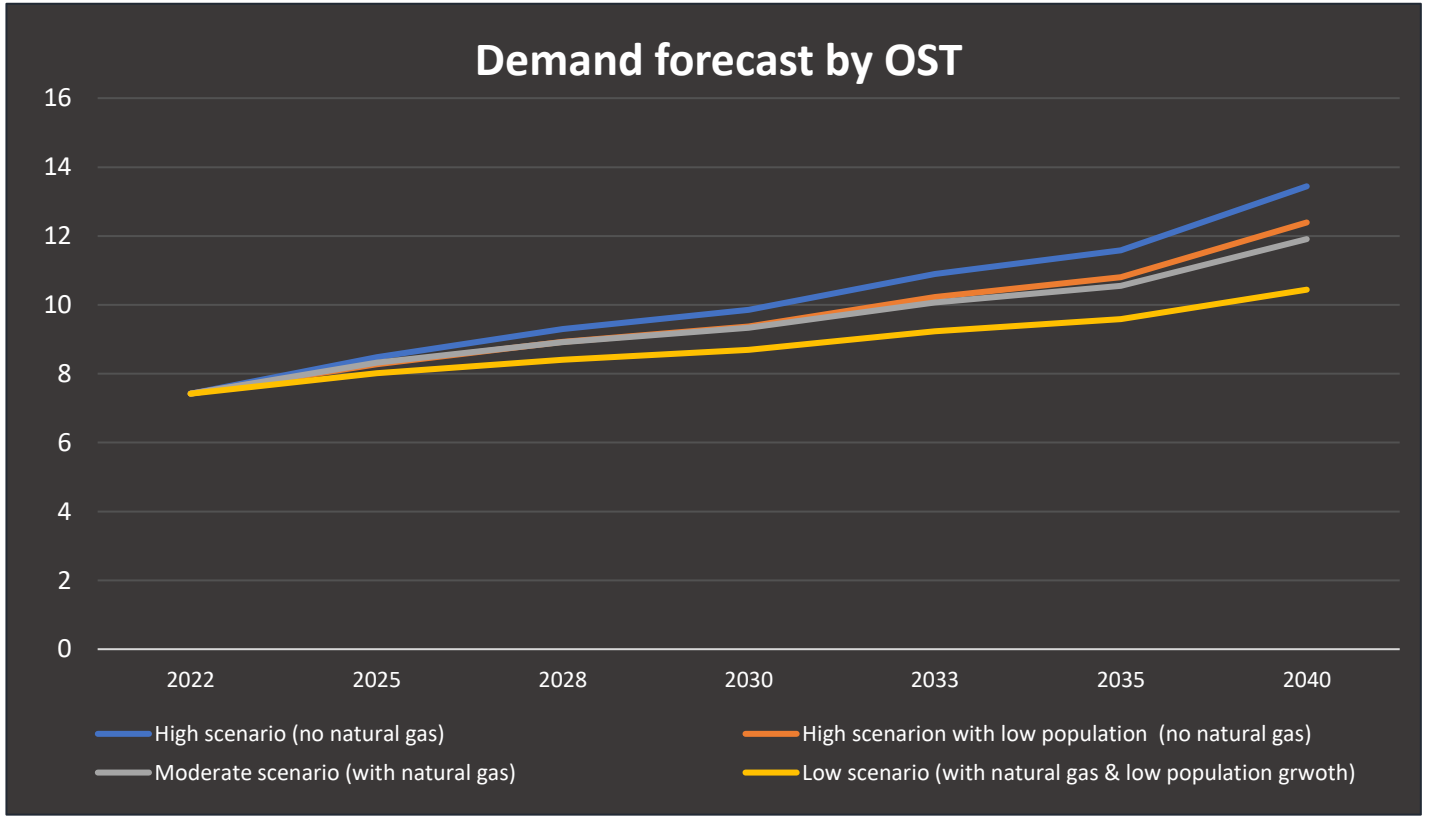
Electricity consumption growth and demand projections

- Steady increase of electricity consumption during the last 30 years
  - Average annual growth rate (CAGR) for last 15 years is 2.6%
  - Power consumption has followed GDP growth

- **Four scenarios developed by OST (in 2022)**

scenario	Average annual growth rate	
	until 2030	2030 - 2040
High (no natural gas)	4.7%	3.6%
High with low population (no natural gas)	3.7%	3.2%
Moderate (with natural gas)	3.7%	2.7%
Low (with natural gas & low population growth)	2.4%	2%

- Annual average demand growth rate expected between 2.4 and 4.7% until 2030.



3. Main Challenges

- **Security of Supply -** Is and will remain an important challenge for the Power system of Albania due to portfolio of technologies of generating resources
- **Affordability –** has been an issue and was exacerbated during the recent energy crisis

Measures considered

- **Diversification of the portfolio of technologies** of the generating resources through:
  - **RES**, acceleration of new generation capacities (PV and wind farms) by simplifying procedures
  - **Gas to power**, by building baseload thermal power production capacities with natural gas (Vlora Power plant, and probably additional CCGT capacity)
- **Interconnection and transmission capacity -** need to cope with the upcoming increase of RES (generation capacity is expected to increase from 2.6GW to at least 4.2GW in 2030)
- **Market liberalization** and market integration
- **Energy Efficiency**

4. Potential role of demand response in Albania

- Efficient market prices are formed by interactions between the supply side (the sellers) and the demand side (the buyers)
- If most of retail customers (mainly small and medium customers) are exposed to prices that are fixed for relatively long periods they:
  - have no incentive to vary their consumption in response to actual market conditions,
  - cannot provide a natural price-led response, reflecting their real-time valuation of energy supply
- Giving rise to a market failure - often referred to as the "wholesale-retail disconnect"

- Demand response and EU Electricity Directive 2019/944 – Chapter III, that anticipates Active customers (Article 15), A dynamic electricity price contract (Article 11), Demand response through aggregation (Article 17)

4. Potential role of demand response in Albania
Demand Response programmes

- Price-based programmes - Non-dispatchable Demand Response
  - Time-of-Use pricing (TOU)
  - Critical Peak Pricing
  - Real-time Pricing
- System-based programmes - Dispatchable Demand Response
  - Direct load control
  - Interruptible/Curtailable programmes
  - Demand Bidding
  - Emergency demand response
  - Capacity market and Ancillary services market

4. Potential role of demand response in Albania

Current situation of demand participation in power market in Albania

- **Measures taken so far** and measures considered to deal with challenges in the power sector in Albania – mainly from the supply side
- **Consumers in Liberalized market** – DR programs have started in large consumers following HUPX hourly prices.
- **Consumers supplied by the Last Resort Supplier (FMF)** – pay a fixed price within a month
- **Consumers with regulated price:**

- Businesses connected to medium and low voltage – pay a yearly fixed price, and peak hour price
- Households – pay yearly fixed price (in fact since 2015 the price of electricity is the same, 8.5 euro cent/kwh)

- **Fixed regulated rates** are seen as a major barrier to a price-responsive demand.

4. Potential role of demand response in Albania

Current situation of demand participation in power market in Albania

- **Households:**
  - **Are the biggest group in terms of total electricity consumption** – consume around 50% of the total
  - **Pay a yearly fixed price** – that has been the same since year 2015
  - **Are also the main contributors to the daily peak load** – pick load happens during 6-8 p.m. when people usually get back to their homes
- **There is potential for improving the range between minimum and peak consumption through Demand Response programmes**
- **Potential benefits of bringing household demand to respond to market signals:**
  - Help optimize the use of generation, transmission and distribution infrastructure;
  - Reduce needs for costly new investments.
  - Help the integration of RES (wind and solar)
  - Individual consumers will benefit from reduced energy costs

4. Potential role of demand response in Albania

Potential Demand Response programmes for households in Albania

- **Time of Use Pricing (TOU)** – such as day/night tariff or Critical Peak Pricing (Example Kosovo, North Macedonia using day/night tariff)

- **Direct load control** - where a third party (the aggregator) directly takes over the consumption of a specific appliance on the end-user's premises (usually heating appliances)
  - The couple "aggregator-consumers" - can provide DR either on a continuous basis on the wholesale energy market or dispatch reliable demand-side resources on balancing, ancillary services and capacity markets.
  - ALPEX start of operation in April this year – can facilitate the use of this type of DR programme

4. Potential role of demand response in Albania

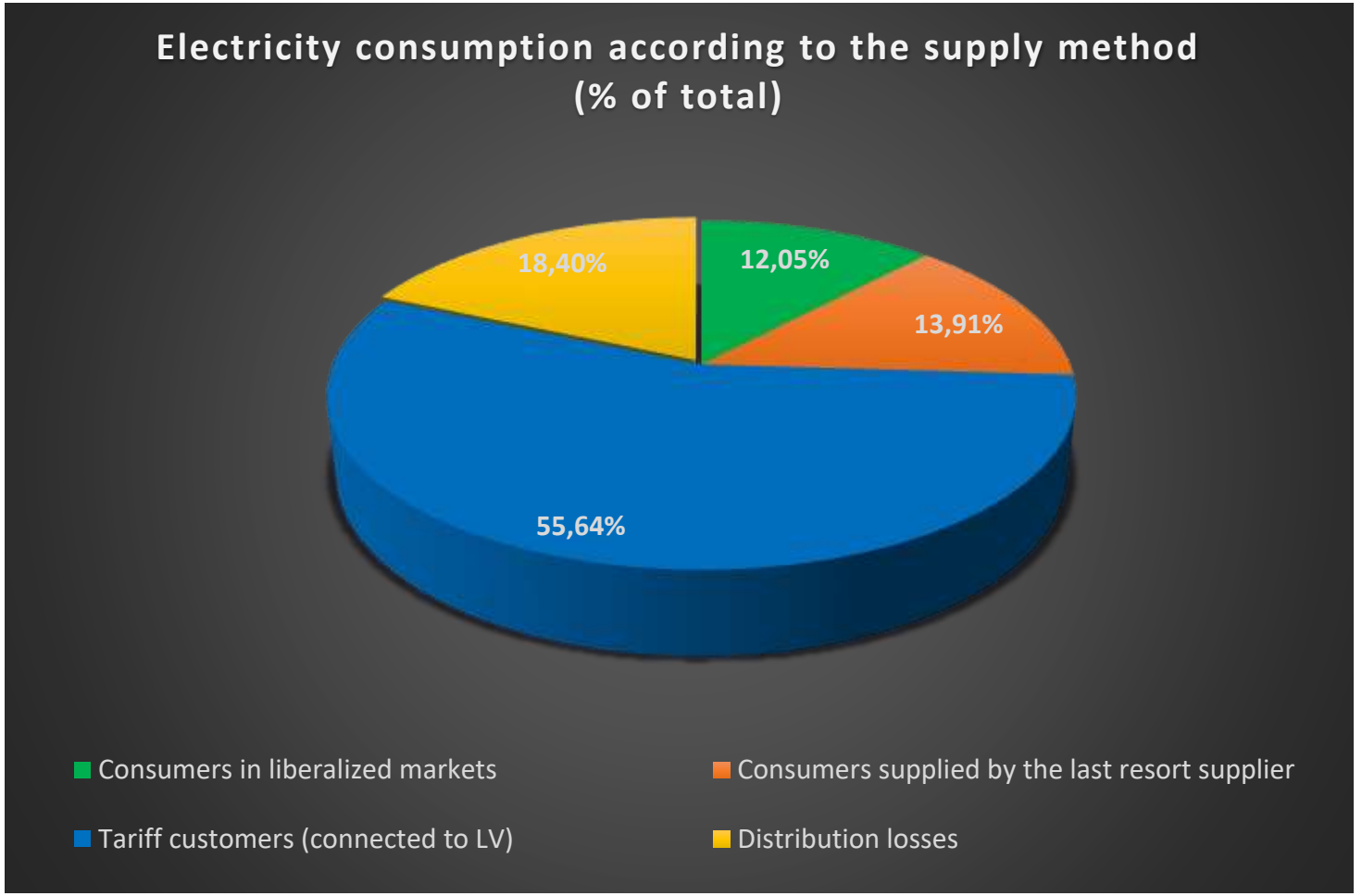
Challenges of application of DR programmes

- Consumers awareness and acceptance of the DR programmes - many consumers are not aware of the benefits of DR or may be resistant to changing their energy consumption habits.
- Investments in advanced metering infrastructure and control technologies - require significant investments and coordination among multiple stakeholders.
- Regulatory Framework - market rules and regulations need to be adapted to accommodate the flexibility provided by demand response.
- Data Privacy and Security - is crucial to gain consumer trust and comply with data protection regulations.
- Financial Incentives - designing appropriate financial incentives is critical to the success of DR programs (financial benefits should outweigh the costs or inconveniences associated with participation)

Addressing these challenges requires collaboration among policymakers, regulators, utilities, technology providers, and consumers.

4. Potential role of demand response in Albania
Electricity consumption according to the supply method

- **Consumers in liberalized market** consumed only 12.5% of total in 2022
- **Consumers supplied by FMF** consumed around 14%
- **Tariff customers** are the biggest group with around 56% of total consumption, where Households constitute 70%
- In fact, tariff customers group is bigger, because most of the distribution losses are consumed by this group (mainly households)
- In total **households**, including losses, **consume around 50%** of total electricity consumption in Albania



4. Potential role of demand response in Albania

Current regulated electricity prices in Albania

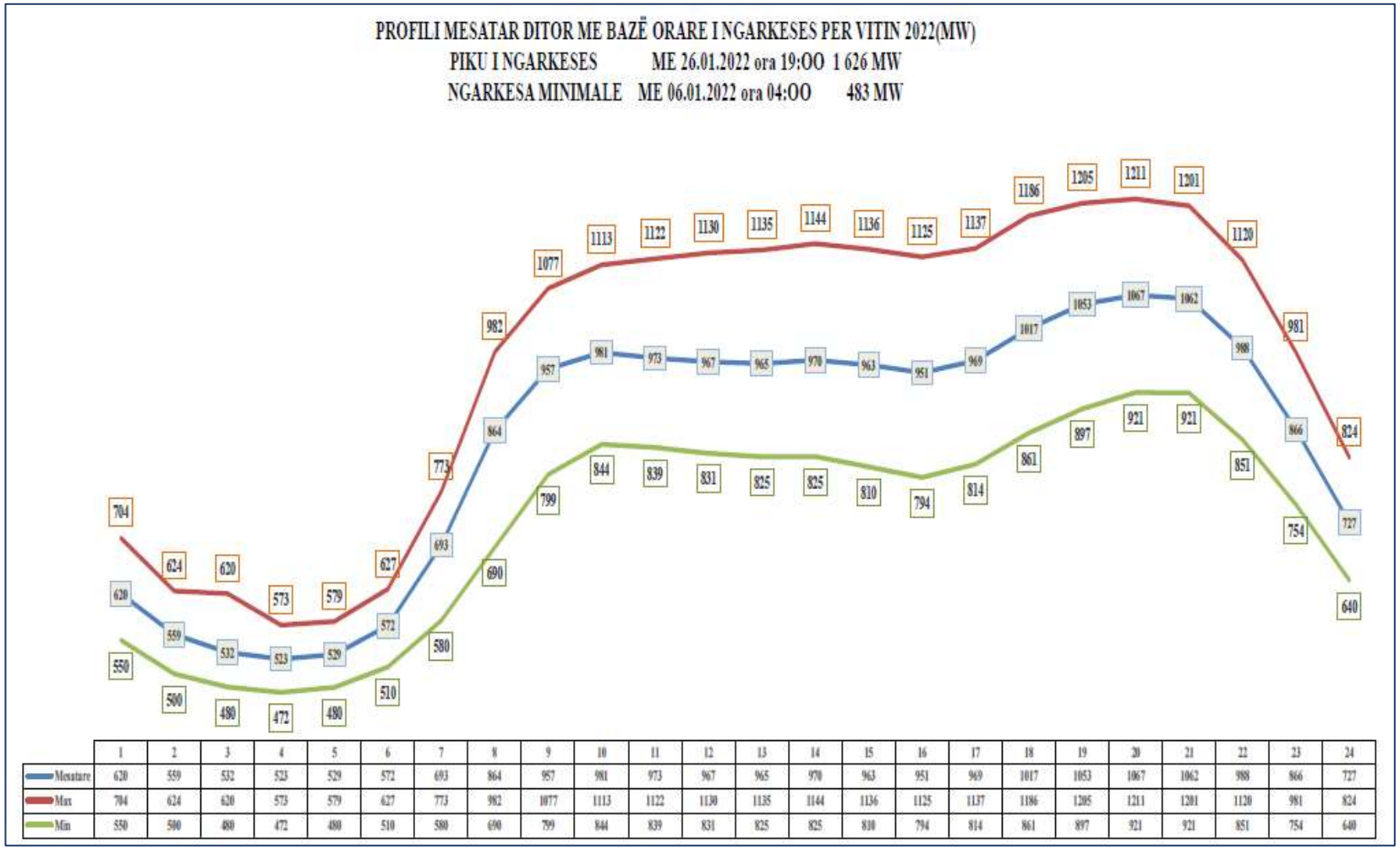
- **All customers connected to LV (0.4 KV) pay a regulated yearly fixed price** (that have not changed since 2015)
- **Households** pay a fixed price – 8.26 Euro cent/kwh and consume 70% of the electricity in the LV
- **All other customers in LV,** mainly small businesses, pay peak and off-peak prices, which is fixed during a year.

Regulated electricity prices in Albania, from 1 January - 31 December 2023		
Description	**Price of active energy (Euro cent/kWh)**	****Price of active energy in pick hours (Euro cent/kWh)**
*** Sale price for customers in 20 kV**	9.57	11.00
*** Sale price for customers in 10/6 kV**	9.57	11.00
*** Bakery and flour production in 10/6 kV**	6.17	7.10
*** Sale price for customers connected to TM and measure in TU**	10.78	12.43
Customers in 0.4 kV	12.17	14.00
Bakery and flour production in 0.4 kV	6.61	7.60
Cult/religious community objects	8.26	
Households	8.26	
Price for electricity consumption in common areas (staircase lighting, pumps, elevator	8.26	
**** Customers who have fulfilled the legal and/or technical conditions for entering the liberalized electricity market are not subject to these prices***		
*****The peak hours during which the price for consumed energy at the peak will be applied are :***		
- For the period 1 November - 31 March from time 18:00 up to 22:00		
- For the period 1 April - 31 October from time 19:00 up to 23:00		

4. Potential role of demand response in Albania

Hourly daily average load profile for 2022 in Albania

- Required load drops significantly after midnight
- Almost doubles during the day (from 9 a.m. until 10 p.m)
- Peak loads is between 6 and 8 p.m.
- There is potential for improving the range between minimum and peak consumption through Demand Response programmes



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Mesatare	620	559	532	523	529	572	693	864	957	981	973	967	965	970	963	951	969	1017	1053	1067	1062	988	866	727
Max	704	624	620	573	579	627	773	982	1077	1113	1122	1130	1135	1144	1136	1125	1137	1186	1205	1211	1201	1120	981	824
Min	550	500	480	472	480	510	580	690	799	844	839	831	825	825	810	794	814	861	897	921	921	851	754	640

THANK YOU!