Study Committee C5

Electricity Markets & Regulation

Paper 10603_2022

Policy and Regulation for Energy Storage Systems (ESS) in Energy Markets. A Case Study of Russia

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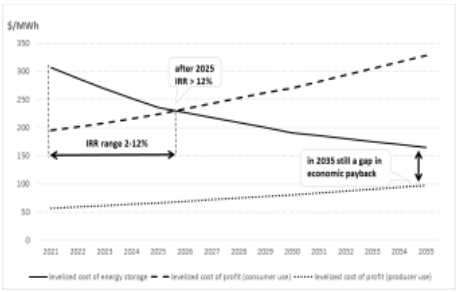
Motivation

- The growing share of RES induces using technologies to improve the reliability of power systems operation such as energy storage systems (ESS)
- ESS become popular and can benefit in different use cases: in front of the meter, behind the meter, RES+ESS projects, transmission and distribution
- Energy market should be prepared to the new technology (ESS) and resolve regulatory barriers
- As new technology ESS can improve efficiency of market actors' business activities and give competitive advantage, but economics should be properly researched by cost-benefit analysis

Regulatory barriers for ESS in Russia

- Lack of government support and government development strategy
- Energy market conservativeness, meaning how fast the new technologies could be adapted to the regulation
- Up to date in the legislation of the Russian Federation, there are definitions of load, network and generation equipment. At the same time, there is no definition of the energy storage systems
- Low integration with energy markets and the obligation to obtain permits (licenses) for the ESS exploitation

Battery ESS cost-benefit analysis



- BESS use case as a producer is economically unprofitable (unsubsidized capacity price auction payoffs only O&M costs)
- BESS use case as a consumer can already payoff with a relatively low interest of 3%
- In about 4-6 years the economic feasibility of investing in BESS will rise mainly because of expecting capital cost reduction

IRR in dependence of CAPEX level and start year of the project				
Year of corresponding CAPEX level	**2021**	**2023**	**2025**	**2027**
CAPEX, $/kWh	450	389	337	304
IRR	3%	8%	13%	16%

Proposed regulation for ESS

- Giving a legal definition of ESS in a way they can be used in different use cases
- Determine pre-qualification requirements for ESS to enter the wholesale market: at least 5 MW (equal to other generation equipment), ability to continuously produce electric energy with the nominal capacity for at least 4 hours
- To remove any participation barriers should be stated that ESS can directly participate in electricity and capacity markets
- Establish new type of participant of the wholesale market – prosumer, that will feature a new way to assemble its delivery points (separately or mixed energy-consuming, generating equipment and storage equipment)

Conclusion

- The core idea of regulation is making ESS solutions available to all market participants and making ESS useful for the entire energy system
- Regulation should be non-discriminatory, balanced, neutral and ensuring fair competition between different technological solutions
- Proposed regulation eliminates the main uncertainties and market barriers to participation with ESS in the wholesale and retail markets

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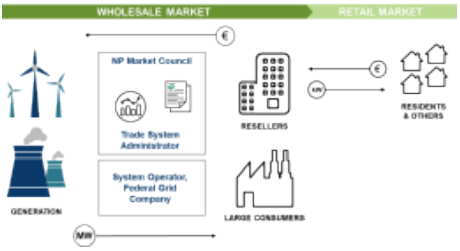
continued

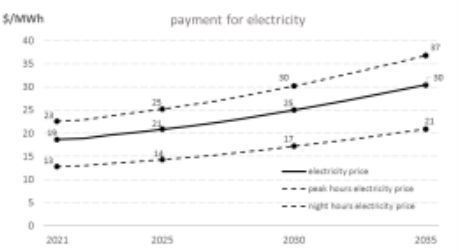
The Russian electricity markets overview

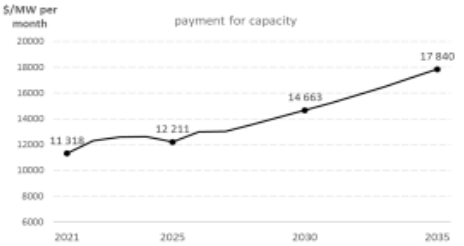


- Two-layer structure markets operate in Russia: wholesale electricity market and regional retail markets
- Electricity and capacity and ancillary services are traded
- All consumers except residential ones (households) buy electricity and capacity at competitive (market) prices
- The electricity market includes day-ahead (LMP model), bilateral contracts, and balancing sectors. Most part of the electricity is sold in the day-ahead market. Capacity is traded by bilateral contracts or at market prices
- The yearly wholesale market turnover is more than 1000 TWh and 25 billion US dollars

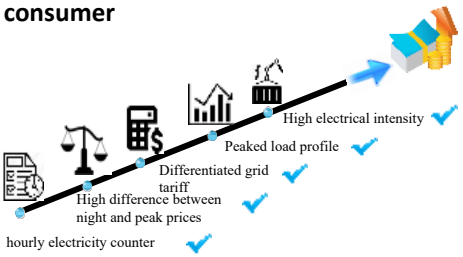
BESS cost-benefit analysis approach

- Battery energy storage systems (BESS) have been selected for the cost-benefit analysis as most popular and energy efficient solution
- The economic efficiency of the BESS mainly depends on the level of capital cost expenditures and also on operational costs and technical parameters of BESS





Conditions when BESS benefits to consumer



BESS technical-economical parameters	Unit	Value
Eletricity	MWh	4
Capacity	MW	1
Efficiency	%	90
Life-span	years	15
CAPEX (2021 year)	$/kWh	450
OPEX	%CAPEX	5
Capital structure (equity/ debt)	%	80/20
Discount rate	%	10
Levelized Cost of Storage (LCOS)	$/MWh	450

Discussion

- Except producer and consumer use cases BESS can be used for ancillary services – should it be then subsidized?
- One of the main assumption for the cost-benefit analysis is the annual rate reduction of capital cost of 5-7%. It is based on a trend of past years. Will it be continued?