



The Role of Croatian Energy Market Operator in Supporting Renewable Energy in Croatia –Experiences and Perspectives

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Structure:

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- **CURRENT RESULTS OF CROATIAN FEED-IN TARIFF SYSTEM**
 - **RES market development in Croatia under fit system from 1.7.2007. till 31.12.2020.**
 - **Installed capacity of all eligible producers in 2020. - HROTE**
 - **Projections of the existing incentive system till year 2034.**
- **NEW INCENTIVE SYSTEM THROUGH PUBLIC TENDERS AND MARKET PREMIUM**
 - **New support system based on tendering**
 - **Legislation defining new incentive support mechanism**
 - **New incentive support system based on tendering public tender**
 - **Results of the first auction under a feed-in premium scheme**
- **ENERGY STORAGE TECHNOLOGY – GREEN HYDROGEN**
- **FUTURE INCENTIVE SYSTEM FOR GREEN HYDROGEN**

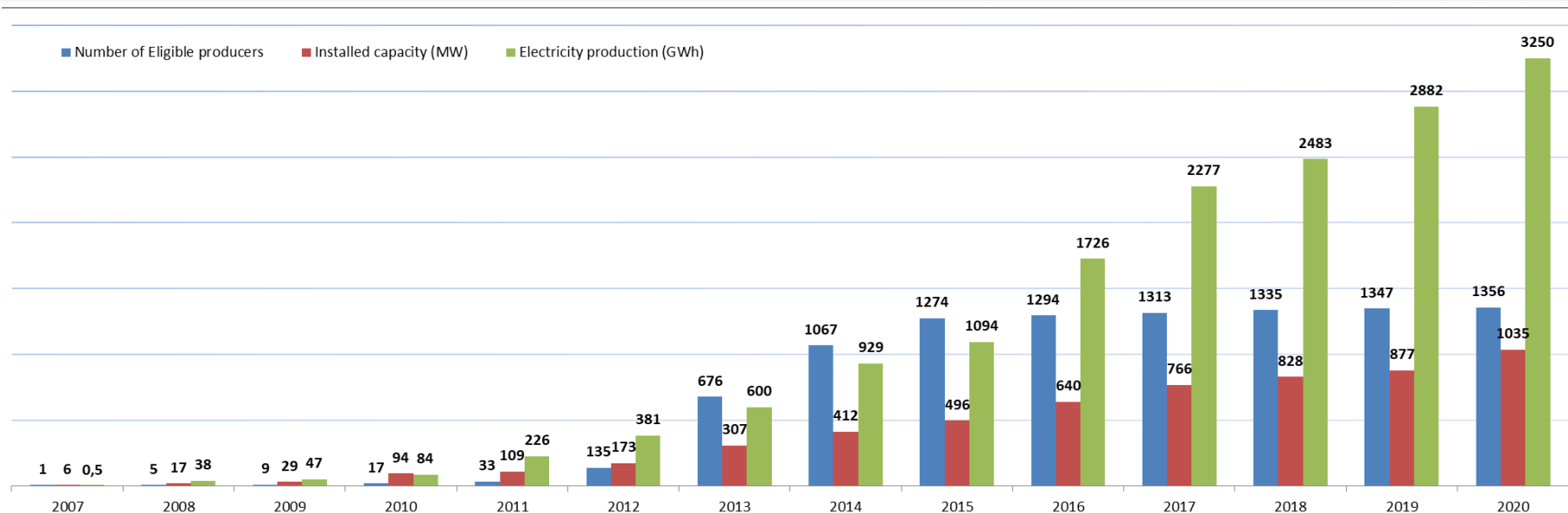
HROTE WAS ESTABLISHED ON 22nd March 2005

- Started operating on 4th April 2005
- Since 2007 HROTE is 100% Government owned company

Electricity Market Department and ECO Balancing Group Department	Gas Market Department	Renewable Energy And High Efficiency Cogeneration Department
<ul style="list-style-type: none">- Electricity Market Rules- Electricity market participants database- Day ahead market plan- Balancing energy settlement- ECO BG Electricity trading (yearly and quarterly auctions)	<ul style="list-style-type: none">- Gas Market Rules- Balance responsible parties register- Balancing energy market organization- Balancing energy prices calculation	<ul style="list-style-type: none">- Power purchase contracts with eligible producers- Collection of incentive fee and mandatory purchase price from suppliers- Guaranties of Origin Registry

CURRENT RESULTS OF CROATIAN FEED-IN TARIFF SYSTEM

RES MARKET DEVELOPMENT IN CROATIA UNDER FIT SYSTEM FROM 1/7/2007 TILL 31/12/2020



1/7/2007-5/6/2012
TS OG 33/07

6/6/2012-
31/12/2013
TS OG 63/12

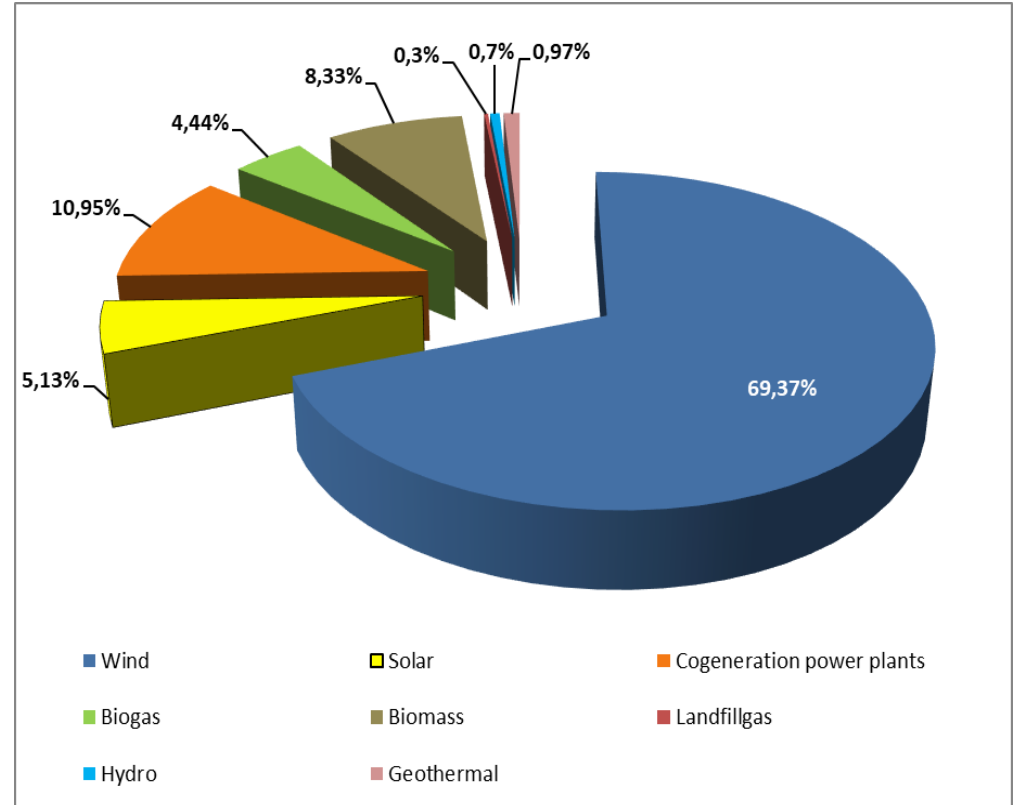
1/1/2014-
31/12/2015
TS OG 133/13

Renewable Energy Act (OG
100/15) 1/1/2016
FIRST BY LAWS 1/1/2019

LEGISLATION DEFINING
NEW INCENTIVE
SUPPORT MECHANISM

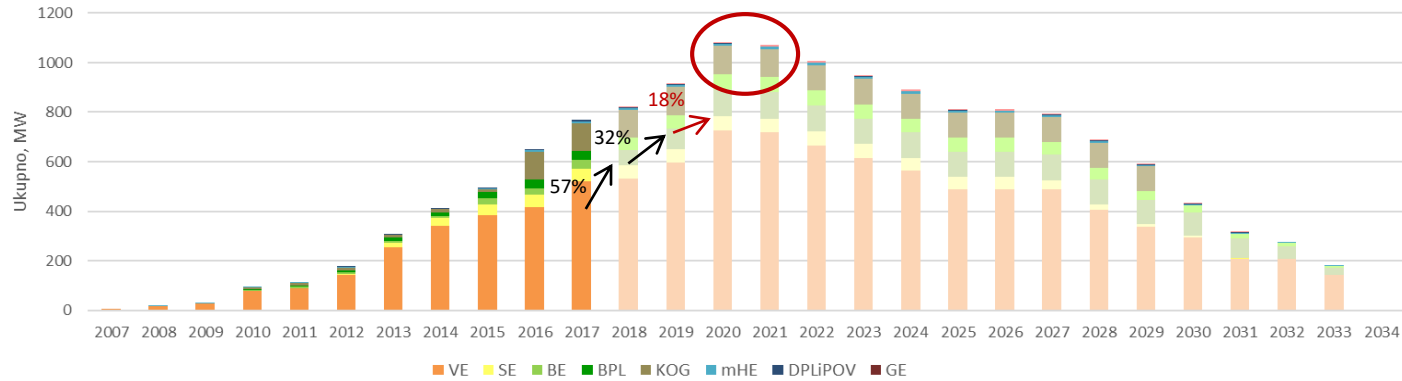
INSTALLED CAPACITY OF ALL ELIGIBLE PRODUCERS IN 2020 - HROTE

Technology (MW) /Year	2020
Wind	718
Solar	53
Cogeneration power plants	113
Biogas	46
Biomass	86
Landfillgas	3
Hydro	6
Geothermal	10
Total	1035

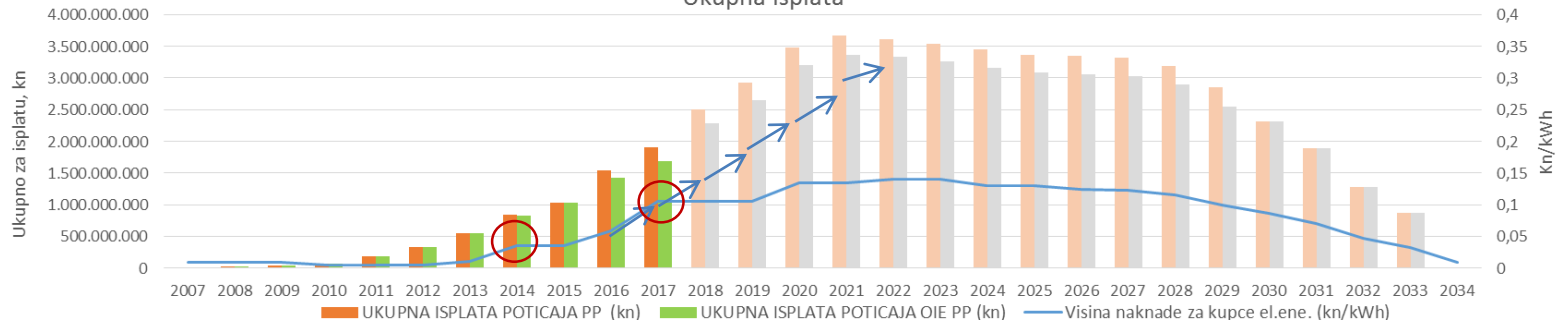


PROJECTIONS OF THE EXISTING INCENTIVE SYSTEM TILL YEAR 2034

Dinamika svih povlaštenih proizvođača u FIT-u



Ukupna isplata



NOTE: these projections dated from 2018.

NEW INCENTIVE SYSTEM THROUGH PUBLIC TENDERS AND MARKET PREMIUM

NEW SUPPORT SYSTEM BASED ON TENDERING

- **Tenders based on yearly quota (MW)** for selected power plant group set by responsible Ministry
 - Control of maximum volume
 - Protection of small power plants
 - Regional distribution
- **Technology specific tenders** – tenders by technology and power plant group defined in Regulation on the Promotion of the Production of Electricity from RES and HE cogeneration
- **Pay-as-bid price rule** – there is no uniform price
Awarding the lowest price offered by all producers who applied for the tender

LEGISLATION DEFINING NEW INCENTIVE SUPPORT MECHANISM

- Feed-in-tariff system ended on 31/12/2015
- Competitive bidding mechanism is defined by:

**Law on renewable energy and HE
cogeneration**

(Official Gazette 100/15, 111/2018,
131/2017, 123/2016)
1/1/2016

**Regulation on the Promotion of the
Production of Electricity from RES and HE
cogeneration**

(Official Gazette 116/2018, 60/2020)
1/1/2019

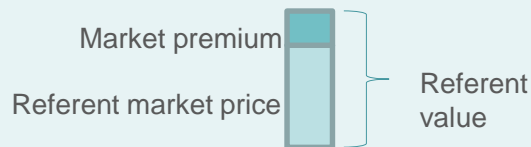
**Regulation on quotas for the Promotion of
the Production of Electricity from RES and HE
cogeneration**

(Official Gazette 57/2020)
15/5/2020

NEW INCENTIVE SUPPORT SYSTEM BASED ON TENDERING 1/4

Premium prices tendering

- HROTE announces tender for „**Referent value**”

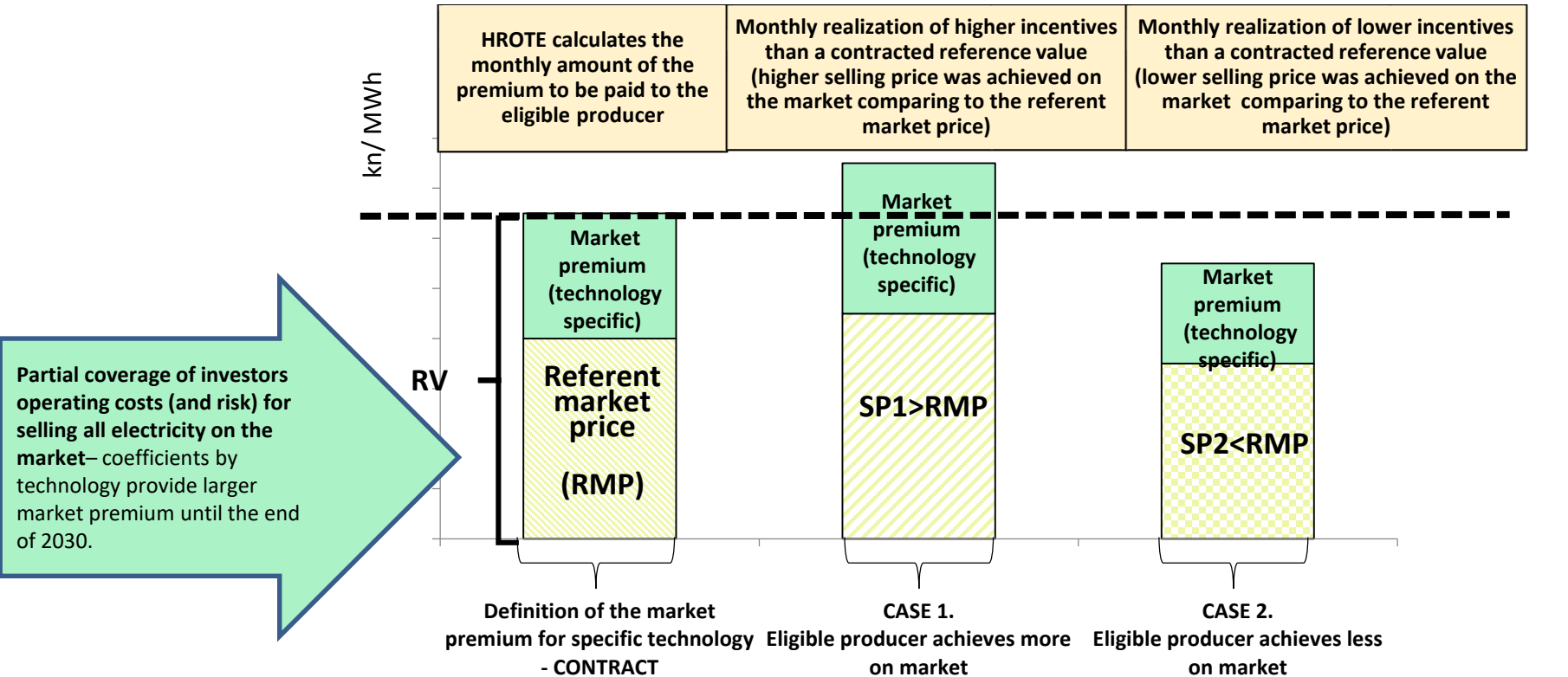


- HROTE determines **Referent market price** (calculated monthly) - an average of electricity prices on Croatian power exchange
- HROTE provides **Market premium payments** (calculated monthly)
- Producer sells electricity to electricity suppliers/traders

Guaranteed purchase price tendering

- Only available for power plants up to 500kW
- HROTE (ECO balance group) is energy buyer
- „feed-in tendering”

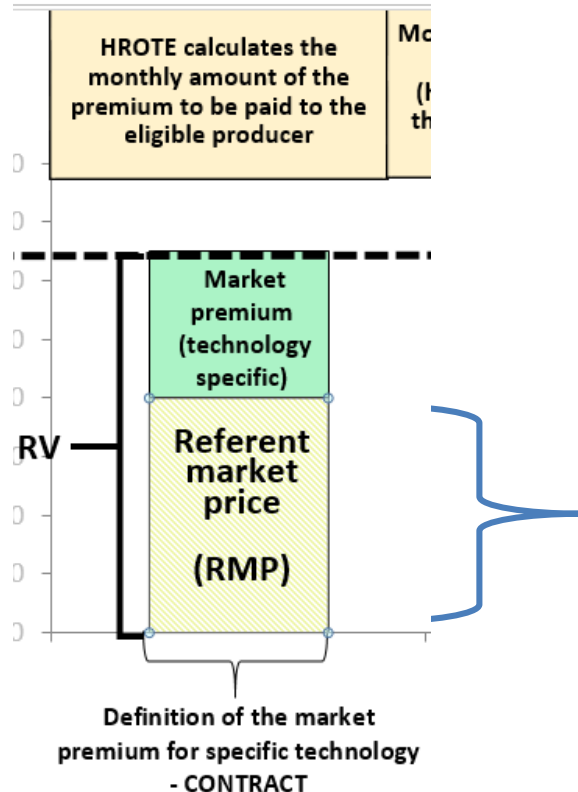
NEW INCENTIVE SUPPORT SYSTEM BASED ON TENDERING 2/4



RMP – referent market price (in regulation RTC) – monthly average market price of electricity [kn/MWh] – technology specific

RV – referent value (calculated as production cost of power plant) – corrected each year by the consumer price index ¹²

NEW INCENTIVE SUPPORT SYSTEM BASED ON TENDERING 3/4



For production plants from the group Solar, Wind and others, defined in Article 4 (1) of the Incentive Regulation, the reference market price is set as : $k_{SE, VE, ostali} \cdot RTC_{SE}$,

For the years 2019. i 2020. correction factors amounts:

$$k = 0,95$$

$$k_{SE} = 0,9$$

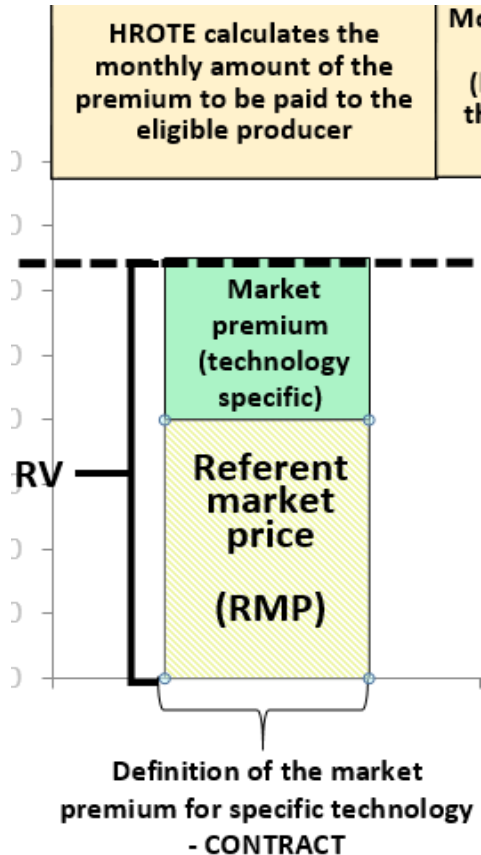
$$k_{VE} = 0,85.$$

Starting from the year 2021. , correction factors values are increasing each year for following amounts, considering the values from the previous year:

- correction factor k increases by the amount 0,005
- correction factor k_{SE} increases by the amount 0,01
- correction factor k_{VE} increases by the amount 0,015.

After the year 2030. all correction factors will have value 1.

NEW INCENTIVE SUPPORT SYSTEM BASED ON TENDERING 4/4



Reference value (RV) of electricity is adjusted each year in relation to the determined corrected reference value of electricity from the previous year by applying the Average Annual Consumer Price Index published by the Central Bureau of Statistics.

NEW INCENTIVE SUPPORT SYSTEM BASED ON TENDERING PUBLIC TENDER (GBER)

**Regulation on quotas for the Promotion of the
Production of Electricity from RES and HE
cogeneration**
(Official Gazette 57/2020)
15/5/2020

Power plant classification	Quotas (MW)
PV 50 kW <x≤ 500 kW	50
HYDRO 0 ≤ 50 kW	4
HYDRO 50 kW <x≤ 500 kW	5
BIOMASS 50 kW <x≤ 500 kW	6
BIOMASS 500 kW <x≤ 2 MW	8
BIOGAS 50 kW <x≤ 500 kW	7
BIOGAS 500 kW <x≤ 2 MW	8
TOTAL	88

**General block
exemption
Regulation
(GBER) = Public
call published
29/7/2020**

Power plant classification	Quotas (MW)
PV 50 kW <x≤ 500 kW	210
PV 500 kW <x≤ 10 MW	240
PV >10 MW	625
HYDRO 0 ≤ 50 kW	4
HYDRO 50 kW <x≤ 500 kW	10
HYDRO 500 kW <x≤ 10 MW	10
WIND > 3 MW	1.050
BIOMASS 50 kW <x≤ 500 kW	6
BIOMASS 500 kW <x≤ 2 MW	20
BIOMASS 2 MW <x≤ 5 MW	15
GE > 500 kW	20
BIOGAS 50 kW <x≤ 500 kW	15
BIOGAS 500 kW <x≤ 2 MW	30
Inovative Technology*	10
TOTAL	2.265

*State Aid Program for granting of a market premium for the rest of remaining quotas is still in the process of notification by EU Commission

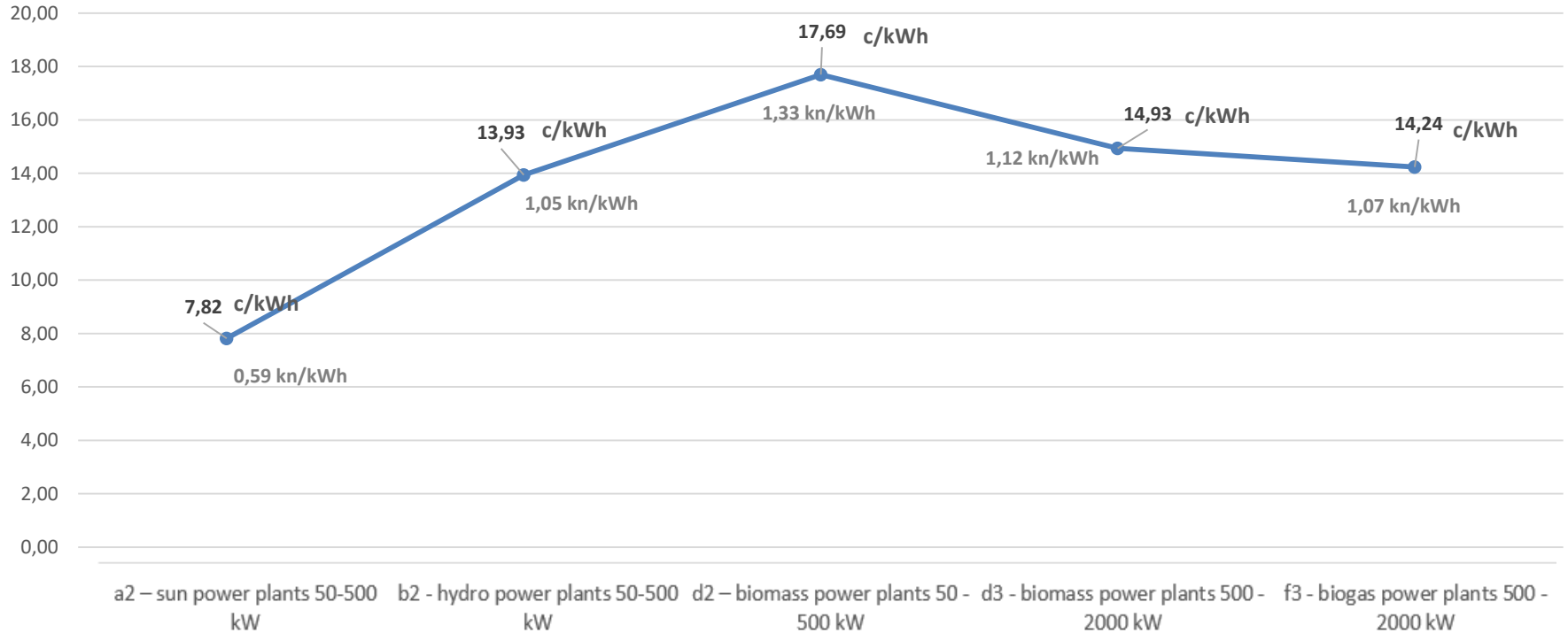
RESULTS OF THE FIRST AUCTION UNDER A FEED-IN PREMIUM SCHEME 1/2

	a2 – sun power plants 50-500 kW	b1 – hydro power plants do 50 kW	b2 - hydro power plants 50-500 kW	d2 – biomass power plants 50 - 500 kW	d3 - biomass power plants 500 - 2000 kW	f2 – biogas power plants 50 - 500 kW	f3 - biogas power plants 500 - 2000 kW	TOTAL
Public tender quota, MW	50	4	5	6	8	7	8	88
Total number of received offers	75	0	10	8	5	2	7	107
Total connection power from received offers, MW	19,3		1,9	3,0	6,8	0,7	9,7	42
Number of winning bids	57		4	3	2		5	71
Total connection power of all winning bids, MW	13,4		0,9	1,3	2,1		7,7	25,5
The share of the connection power of the winning bids in the total connection power of all received bids, %	69,3%		47,4%	45,0%	30,9%		79,5%	61,4%
The share of the connection power of the winning bids in the total quota from public tender, %	26,8%		18,4%	22,5%	26,3%		96,8%	29,0%
Winning bid with minimum referent value, kn/MWh	469,00		1040,00	1320,00	1120,00		1049,98	
Winning bid with maximum referent value, kn/MWh	630,00		1050,00	1330,00	1120,00		1079,99	
Average referent value of all winning bids, kn/MWh	586,19		1045,00	1326,67	1120,00		1067,77	

Only for two groups of power plants (d3 and f3) has been announced premium price tendering (under GBER)

RESULTS OF THE FIRST AUCTION UNDER A FEED-IN PREMIUM SCHEME 2/2

Average referent value of all winning bids



ENERGY STORAGE TECHNOLOGY – GREEN HYDROGEN

- **Present** - Portfolio of RES projects under HROTE ECO BG Group dominated by wind energy – large hourly, diurnal and monthly variability as all WPPs operate in a very similar wind regime
- **Future** – Wind and solar energy are seen as key technologies for decarbonisation of the electricity system in Croatia
- Domination of wind and solar means even greater variability of energy generation – leading to more expressed volatility of electricity prices on the market
- **One of the key stabilizing elements – energy storage**
- One of the prospecting energy storage technologies – **green hydrogen** produced from excess RES
- The site selection for wind and solar energy gets new challenges – resources, grid issues, environmental aspects...(traditional elements) + **vicinity to the gas network (new element)**

FUTURE INCENTIVE SYSTEM FOR GREEN HYDROGEN

- Currently no support for green gas (hydrogen) envisaged in the regulation
- EU State-aid guidelines does not prevent geographically specific support – but it must be worked out in tiny details: Who gets support? When does it get? Why does it get? State aid programming required.
- The path might be:
 - proof of technical concept and benefits to the system
 - clarification of financial side – the costs and benefits of the green hydrogen as a storage solution
 - implementing arrangements and business models workout
 - (legal) framework development, including State-aid program
- HROTE as public and implementing institution interested in the Danup-2-gas project results – but the key pressure should come from the interested industry who seeks a new business opportunity

Questions?





Thank you for your attention



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