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Policy advice on low-carbon policies for Ukraine

Policy Briefing #8

Supported by:

Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

based on a decision of the German Bundestag

RES auctions in Ukraine – Quota Sizing

Dr. Georg Zachmann & Elias Spiekermann

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Berlin Economics

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Key Messages

1. A RES share of 25% in electricity generation in 2035 (Energy Strategy 2035) calls for a Quota of around 500MW RES per year

2. In 2018 ~750MW of RES were installed, so that a more ambitious target (>25%) seems realistically achievable

3. Auctioning the same volumes every year establishes certainty and predictability for investors and the industry

4. Quotas are sensitive to (market) developments and target changes. To account for this, monitoring and regular revisions need to be introduced

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Challenges

- Ukraine is about to introduce an auctioning system. Therefore, total annual auctioning Quotas (also called "volumes") need to be defined

- To allow for a productive investment environment, Quotas should be based on long-term targets

- Quota Sizing faces a trade-off:
  - If volumes are above the market demand for RES slots the degree of competition will decrease and auctioned tariffs are likely to increase
  - If volumes are too low, RES targets and GHG-reduction targets might not be reached

→ One possible way to size Quotas is proposed in the following

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Approach to define Quotas

1. Two different scenarios are assumed:

   A) Based on minimum target of the Energy Strategy 2035: **25% RES** in total electricity generation in 2035

   B) Based on large combustion plant directive and additional assumptions: **Replacing of around 19GW TPP** by RES capacities

2. Scenarios are applied to the LCU **electricity system model** to find a feasible and efficient solution for the power plant park in 2035

3. Based on the model results for 2035 a **linear trend of RES capacities** is assumed and annual, national Quotas are derived

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Scenario Assumptions

Scenario 25: 25% RES in cross electricity generation in 2035

- Today´s conventional capacities remain constant until 2035
- 25% of RES in annual generation in 2035
- Yearly growth of biogas capacities: 30MW
- Nuclear and Hydro capacities are kept constant

Scenario Replace: RES capacities partly replace TPP capacities in 2035

- Until 2035 ~19GW of TPP are decommissioned; 5.7GW of TPP remain in the market*
- Endogenously determined share of RES
- Yearly growth of biogas capacities: 75MW
- Nuclear and Hydro capacities are kept constant

*(Based on large comb. plant directive and assumed lifetime of 45 years / +25 years after retrofit)

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Model Results – Installed capacities in 2035

Installed generation capacities in 2035, in GW

Power Plant	Scenario 25%	Scenario Replace
Solar	2.3	5.1
Wind	7.8	18.1
Biogas	0.5	1.3
Big Hydro	4.3	4.3
TPP	22.8	5.7
NPP	13.8	13.8
Total installed cap.	**51.5**	**48.3**

- No changes in Big Hydro and nuclear capacities assumed
- Decommissioning of TPP leads to strong RES capacity development
- Model results are used to derive annual Quotas

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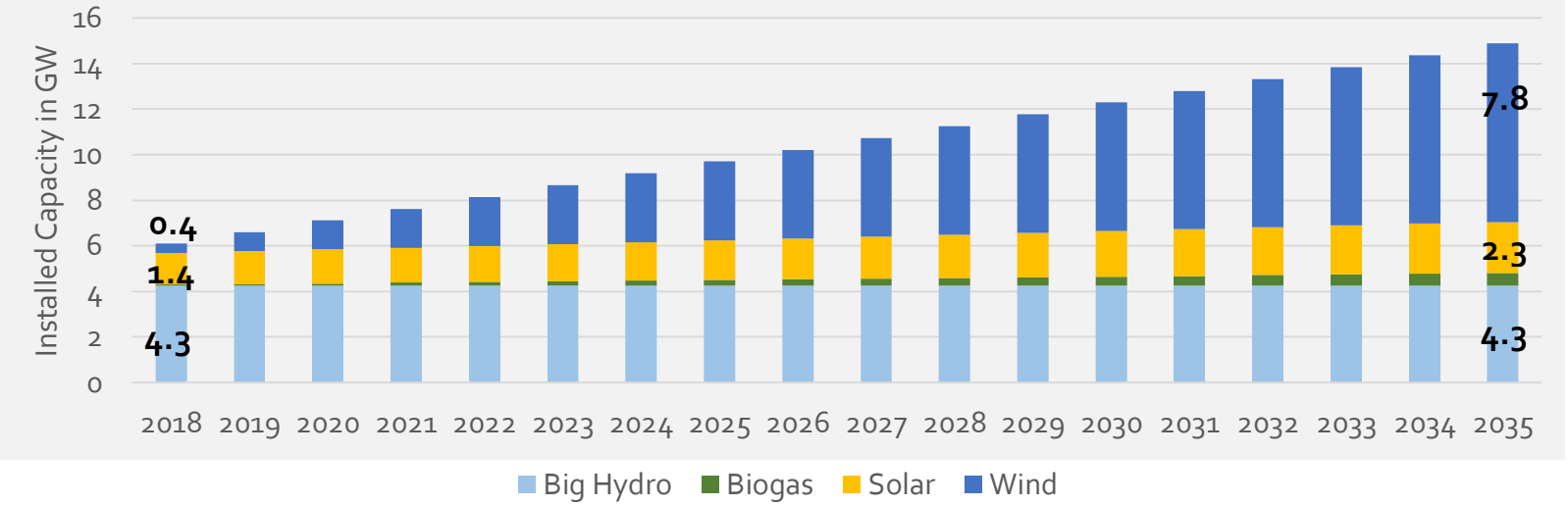
Model Results – Quota Sizing in the 25% Scenario

Development of RES capacities between 2018 and 2035, in GW



Resulting annual Quotas		
Wind	Solar	Biogas
~ 440 MW	**~ 50 MW**	**~ 30 MW**

- High employment of Wind capacities because of relatively high capacity factors for Wind in Ukraine → relatively cheaper compared to Solar

(Note: RES structure is based on assumptions – higher shares of Solar are possible)

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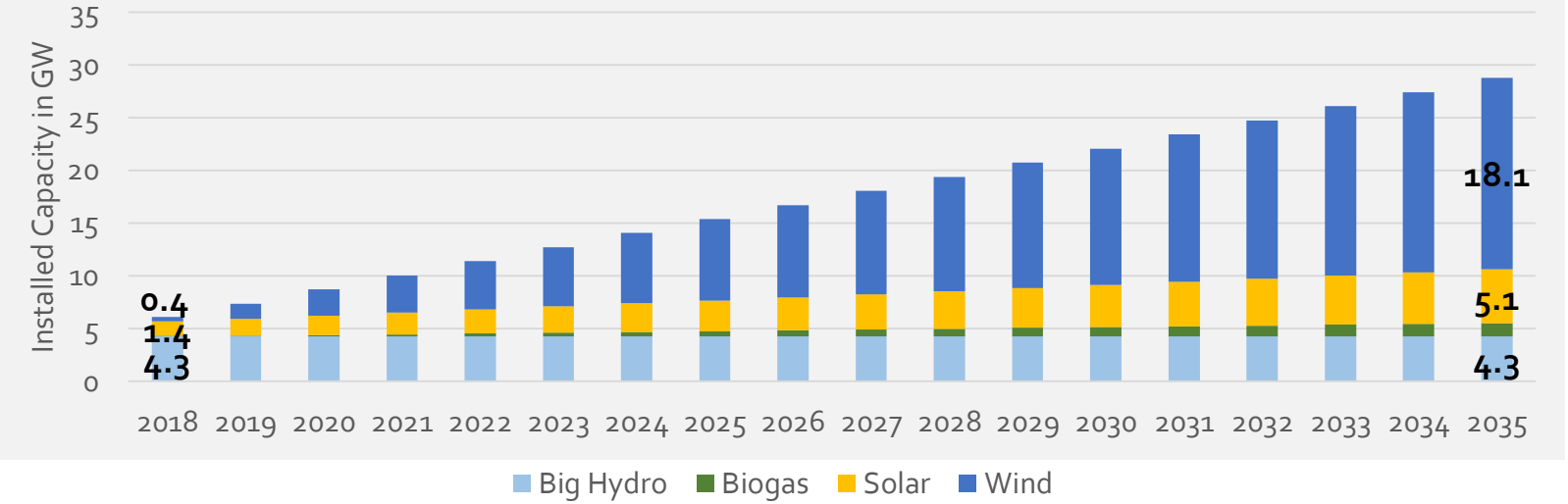
Model Results – Quota Sizing in the Replacing Scenario

Development of RES capacities between 2018 and 2035, in GW



Resulting annual Quotas		
Wind	Solar	Biogas
~ 1,050 MW	**~ 220 MW**	**~ 75 MW**

- **48%** of total electricity generation is based on RES in 2035 – again with high shares of Wind

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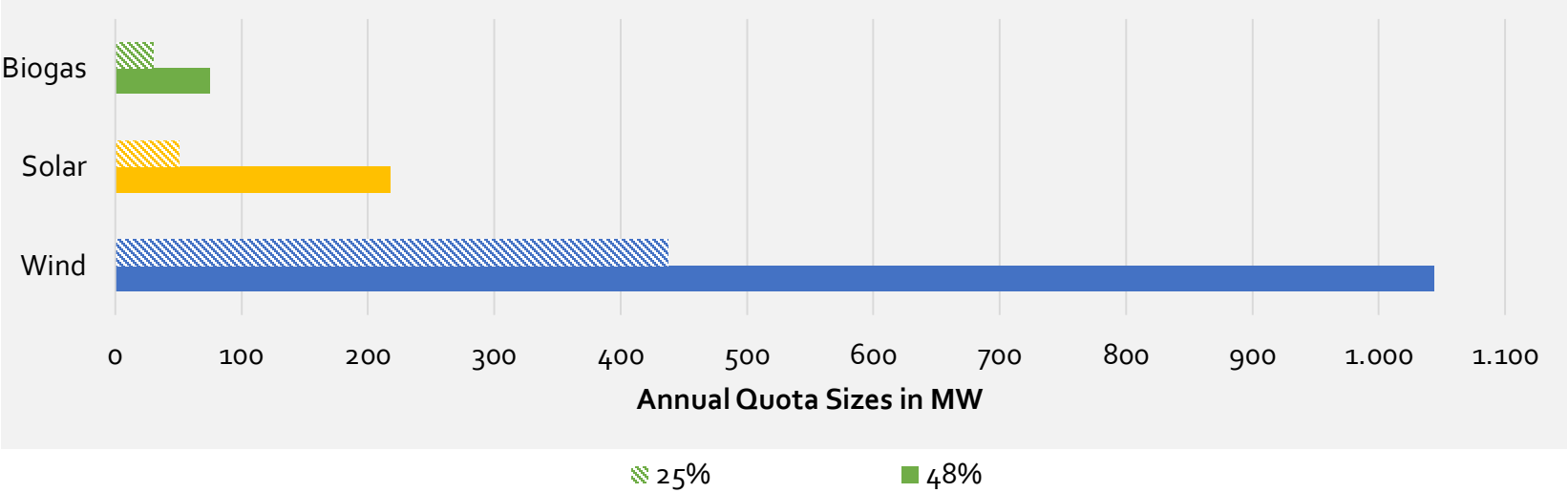
Model Results – Dominating position of Wind

Annual national Quotas for both scenarios, in MW



- Optimal regional distribution of RES can be achieved by choosing an incentive driven approach (see Policy Paper on "Curtailment Charges")
- An optimal development path for RES is following a linear trend (see slides 11-12)

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Sizing Annual Quotas – Example of Germany and Turkey

Germany (fixed capacities with compensation mechanism for different location qualities – called Reference Yield Method)

- 2018 auctions: ~0.6GW Solar/ ~2.7GW Onshore Wind/ ~0.2GW Biogas
- 2019 auctions: ~1.5GW Solar/ ~ 6.7GW Onshore Wind/ ~0.2GW Biogas
- Quota sizes differ as the market conditions are changing and Germany is still in a learning phase

Turkey (fixed capacity in predefined areas are auctioned)

- Adjustment of the current auctioning design is expected in 2020
- Winner-takes-it-all auctioning (1GW divided in 4 projects)
- 2017 auctions: 1GW Solar / 1GW Onshore Wind
- 2018 auctions: 1GW Solar/ 1GW Offshore Wind
- 2019 auctions: expected: ~1GW Solar/ ~1GW Onshore Wind/ X GW Offshore Wind

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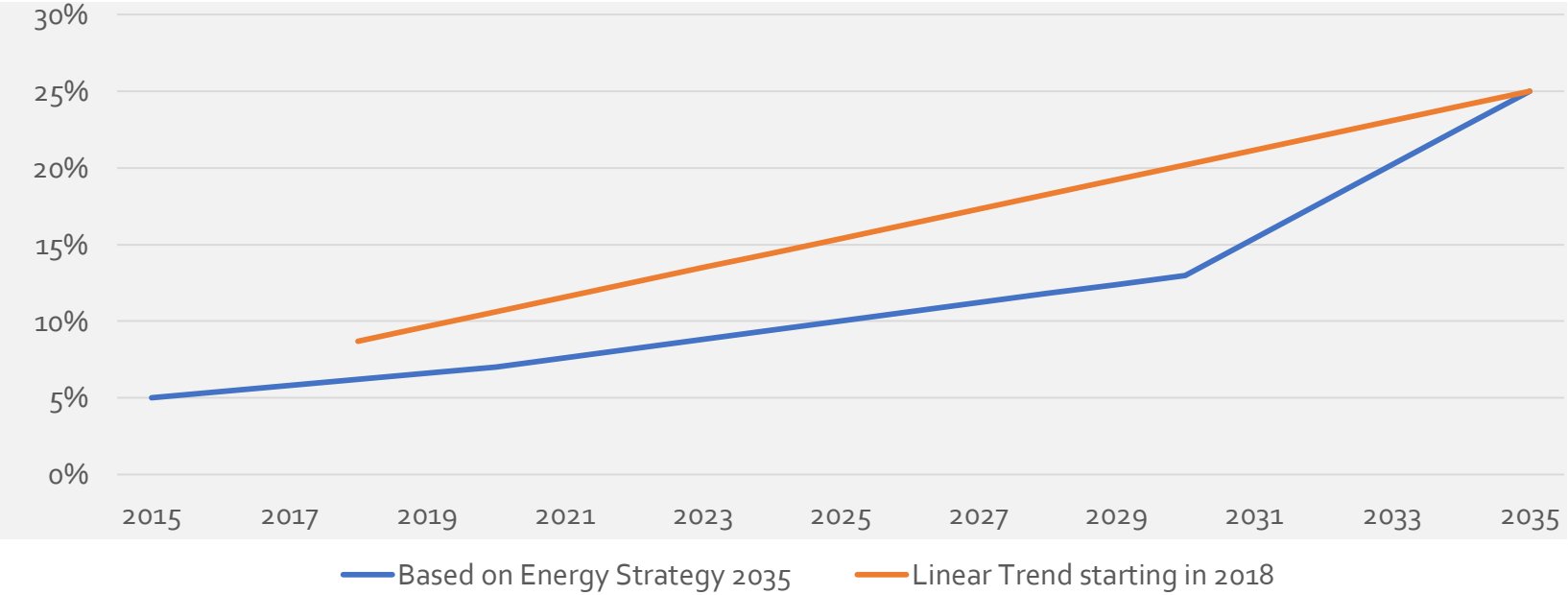
Choose Steady RES Development Over Unsteady One

RES development until 2035 (in % of total electricity generation)



- According to the Energy Strategy 2035, RES development growth in the Ukraine is supposed to increase over time (here, the base line development is depicted)
- Compared to a linear and steady trend this development will deter deployment in the near future and lead to a massive pressure for deployment in the 2030s
- In addition, the todays (2018) growth rate of RES in the Ukraine is already higher than proposed by the Energy Strategy 2035

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Benefits of a steady RES development

A steady RES development (as indicated by the orange line) is superior to a development of changing speeds:

- Constant Quotas will support a smooth development of orders and employment in the RES production and construction industry
- It allows for constant learning effects that will further reduce costs of RES
- It is a clear and reliable message to the market and its participants about the future RES development that allows for long-term planning
- This increases the investment security and reduces capital costs

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Policy recommendation

- **A RES target for 2035 above 25% in electricity generation will be achievable and should be focused**
- **Constant Quotas will allow for a linear development of RES that reduces costs and is beneficial for the industry as well as employment**
- **We propose not to apply regional Quotas but to establish a incentive driven approach based on Curtailment Charges**
- **Once introduced, Quotas need to be adjusted regularly to balance a) the set targets and b) the efficiency of the auctioning mechanism**

  (Quotas above the market demand will lead to higher auctioning prices)
- **Annual Quotas have to be broken down to several dates within one year**

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Implemented by:

Berlin Economics

Project Leader
Dr. Georg Zachmann
zachmann@berlin-economics.com

Project Manager
Simon Unterschütz
unterschuetz@berlin-economics.com

www.lowcarbonukraine.com
Tel.: 030 2064 34 64 – 0

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Back-up I: Applied Model & Assumptions (a)

- 7 TSO regions (without Crimea/ temporarily occupied and uncontrolled territories)
- Regional transmission network model
- Curtailment of RES allowed
- Conventional capacities :
  - TPP (See next slide: scenario specific assumptions)
  - NPP (Today´s capacities are kept running – retrofits needed)
- RES capacities:
  - Solar (Model decides about capacities based on costs and grid bottlenecks)
  - Wind (as Solar)
  - Biogas (exogenously assumed: yearly capacity growth of 30MW in 'Scenario 25' and 75MW in 'Scenario 48')
  - Big Hydro (Todays capacities are fixed until 2035 => underestimation of BH potential)

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Back-up II: Applied Model & Assumptions (b)

- Regional capacity factors based on wind speeds and solar radiation of 2018
- No CHP power generation taken into account (the part of generation is supplied by other conventional or RES power plants)
- Demand development based 3.5% GDP growth p.a. and total increase in electricity prices of 40% until 2035 (see back-up)
- Total electricity generation = demand + network losses + export
  - In 2018: Network losses + exports amount to ~6% of total elect. Demand
- For Quota Sizing, a linear capacity development for RES is assumed until 2035

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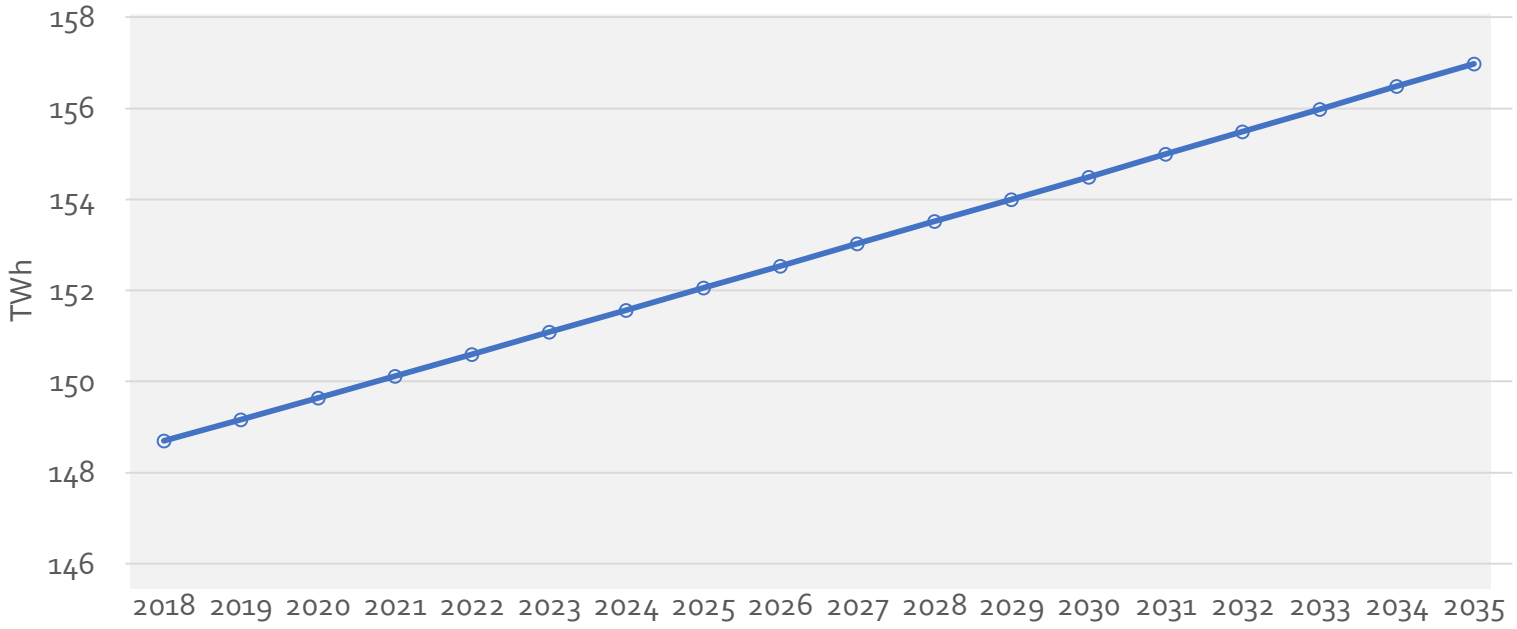
Back-up III: Development of electricity demand

Electricity demand development under intermediate growth assumptions



- With real GDP growth of 3.5% p.a. (in line with IMF forecast);
- Electricity price increase of 40% in total until 2035;
- Ukraine's electricity consumption would only grow marginally - plus 6% in total - until 2035