



Low Carbon Ukraine

Policy advice on low-carbon policies for Ukraine

Policy Briefing #4

Supported by:



Federal Ministry
for the Environment, Nature Conservation
and Nuclear Safety

based on a decision of the German Bundestag

RES development in Ukraine – Stabilizing the support for renewables

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Berlin / Kyiv 2019

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 **Berlin
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Key Messages

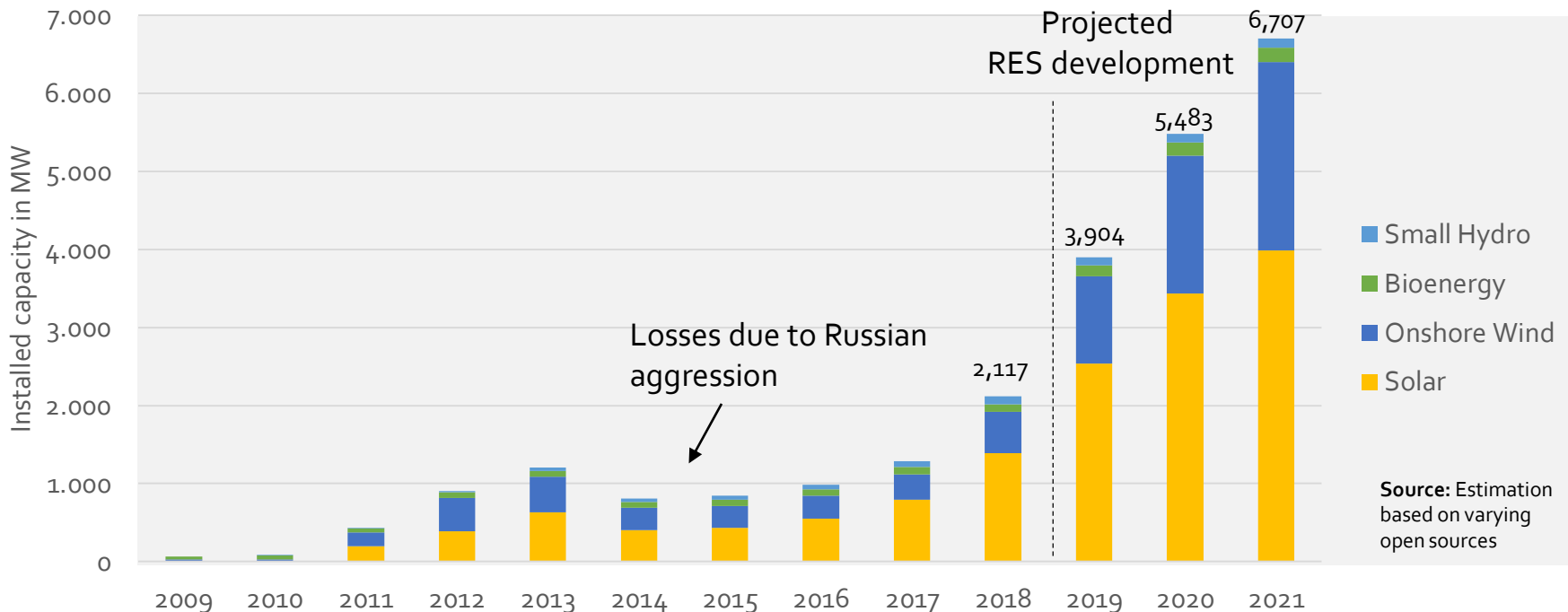
- 1 Since 2017 RES capacities are dynamically growing and are likely to cover around **7%** of Ukraine's electricity generation in 2021
- 2 This positive development towards the targets of the Energy Strategy 2035 comes at **excessive costs** as the Green Tariff is clearly above the generation cost of RES
- 3 Significantly cutting the FITs already in 2019 **would lead to relevant cost reductions for the period 2019-2030**. However, cost of electricity will rise if Ukraine wants to reach its RES targets
- 4 In order to keep costs low and to stabilize the RES development a **sound and future-oriented support scheme is required** that balances development and costs and takes into account geographical and grid aspects

Challenges

- Around **4.6 GW of new RES projects are expected** for the period 2019 – 2021. (This corresponds to approx. 46% of the RES that requested a grid connection according to Ukrenergo)
- According to the draft law No. 8449-д an auctioning system for RES should be introduced by 2020. However, the historically most active part of the market (1-5 MW Solar) **will be included in the new system by 2023 only** because of the envisaged transition period
- The combination of dynamic RES development of large RES projects and high FITs is likely to **further increase the cost for society**
- Historically, the **Green Tariff stimulated mainly large installations** (by 2018: 89% of installations > 1MW). Especially for these installations the Green Tariff exceeds the cost of generation
- In contrast, the development of small installations (except for household PV) is weak so that the **current support scheme fails to stimulate projects < 1MW**
- The fixed duration of FIT for small RES until 2030 **will stop investments in the next 3 years**

Dynamic RES expansion as seen in 2018 will continue

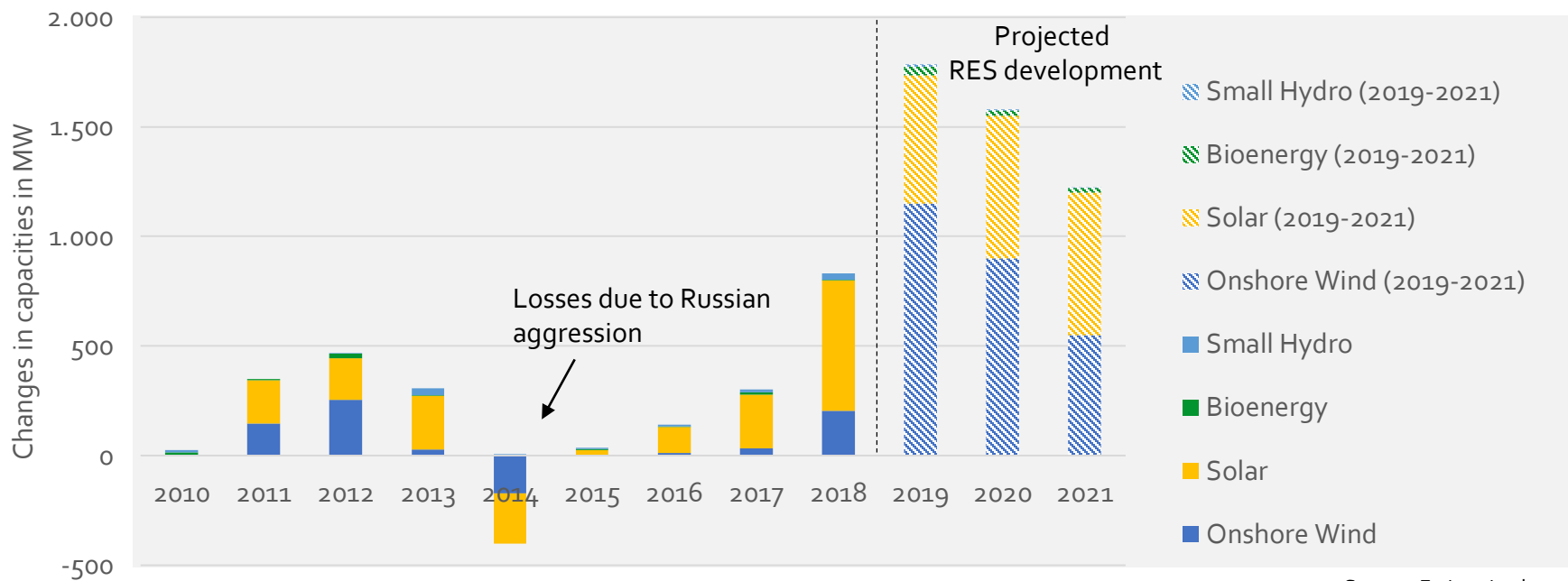
RES development until 2018 and projection until 2021 in MW



- Growth rates for RES (especially Solar and Wind) have been accelerating since 2017, due to a rising gap between decreasing cost and fixed FITs
- Currently a large number of projects are in development and will be finished in the coming 3 years (the start of new projects is unlikely until new legislation is adopted)
- Due to FIT mainly variable RES are developed which pose additional challenges to the electricity system

RES development in Ukraine remains unstable

Changes in RES capacities compared to previous year in MW

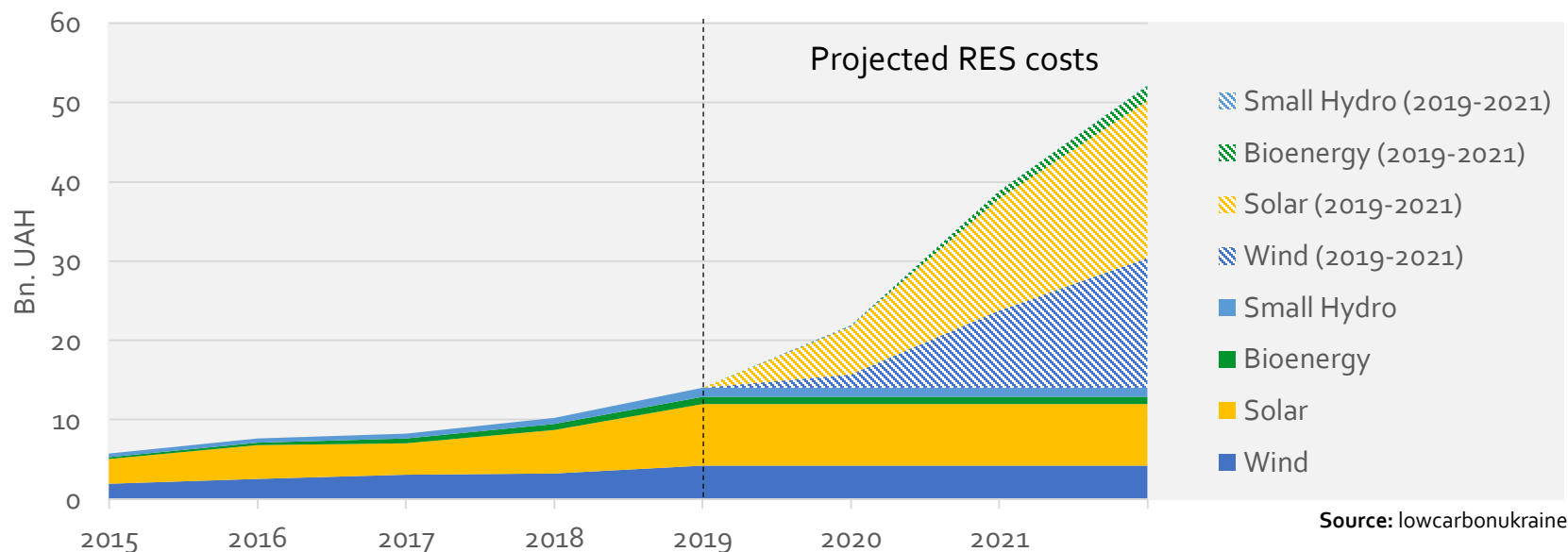


Source: Estimation based on varying open sources

- RES development in Ukraine does not follow a stable growth path
- One reason is the changing legislative situation. The unclear future of the support scheme and the stop of the FIT for small RES lead to decreasing growth rates
- This highlights the need to implement a sound support scheme that stabilizes the RES development at reasonable cost for society

RES development comes at high cost

Projected FIT costs of RES electricity for projects installed by 2021
(calculation based on draft law No. 8449-д adjustments)

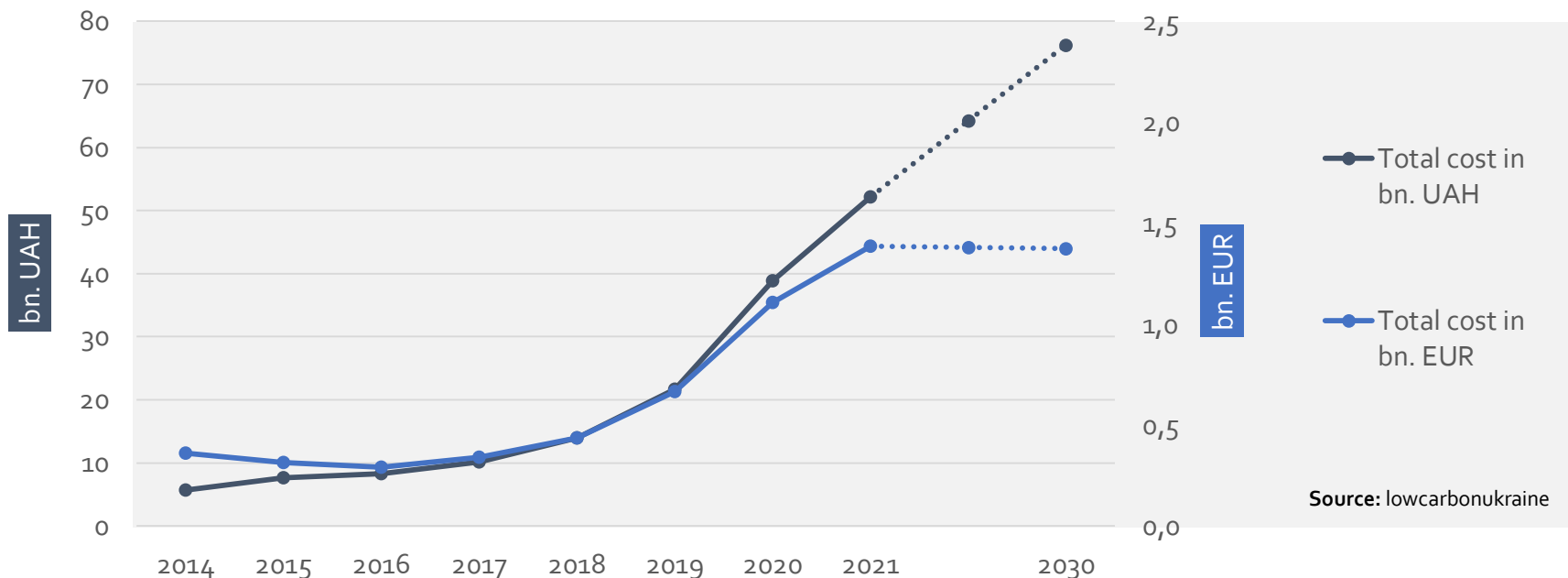


- Increasing RES installations supported by Green Tariff resulting in rising costs
- As the Green Tariff is guaranteed until 2030, costs will occur on an annual basis until 2030

Assumption on future exchange rate EUR-UAH: 2019: 32.1; 2020: 34.0; 2021: 35.7

Cost trend depends on the development of the exchange rate

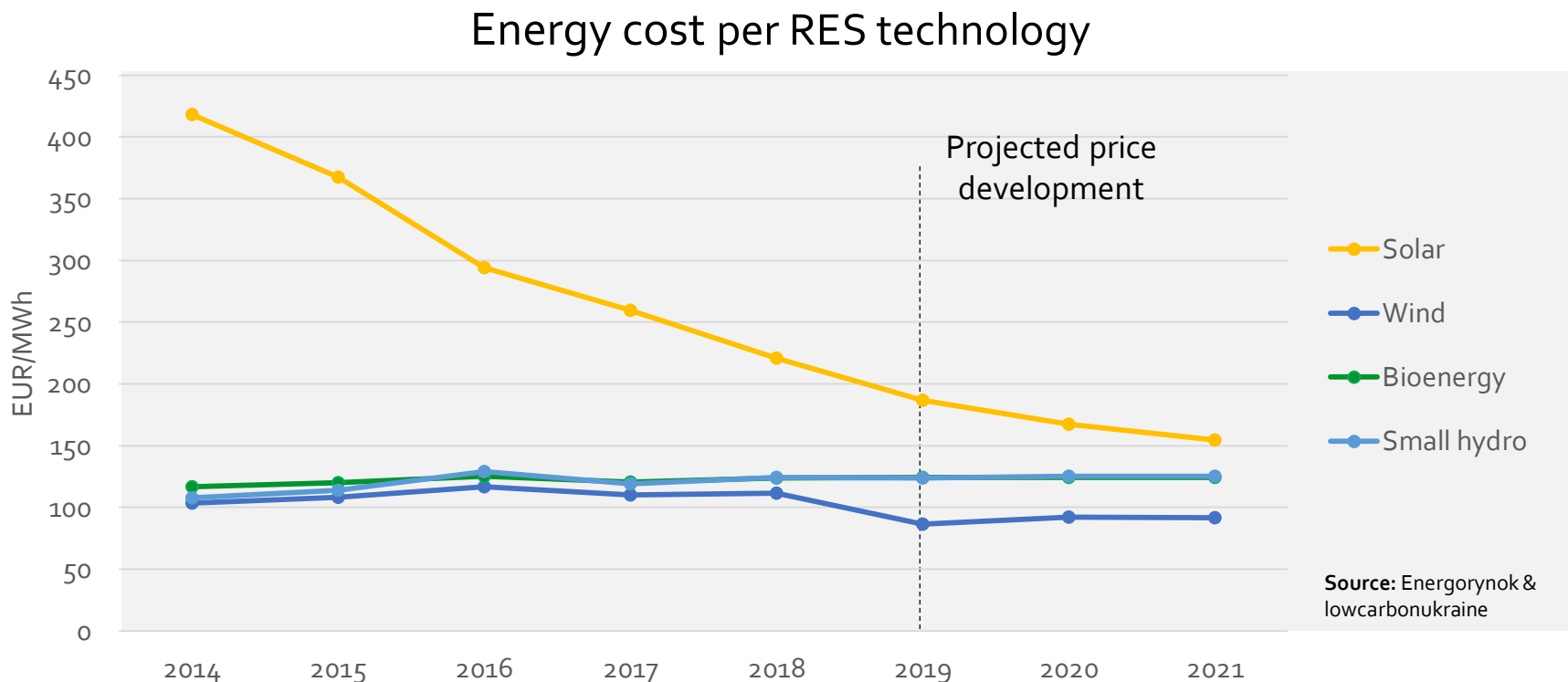
Estimated FIT costs of RES electricity in EUR and UAH



- Tariff is stated in EUR so that a potential future depreciation of UAH against the EUR will increase the actually paid subsidies in UAH (see also back-up slide no. V)

Assumption on future exchange rate EUR-UAH:
2019: 32.1; 2020: 34.0; 2021: 35.7, ... , 2030: 55.5

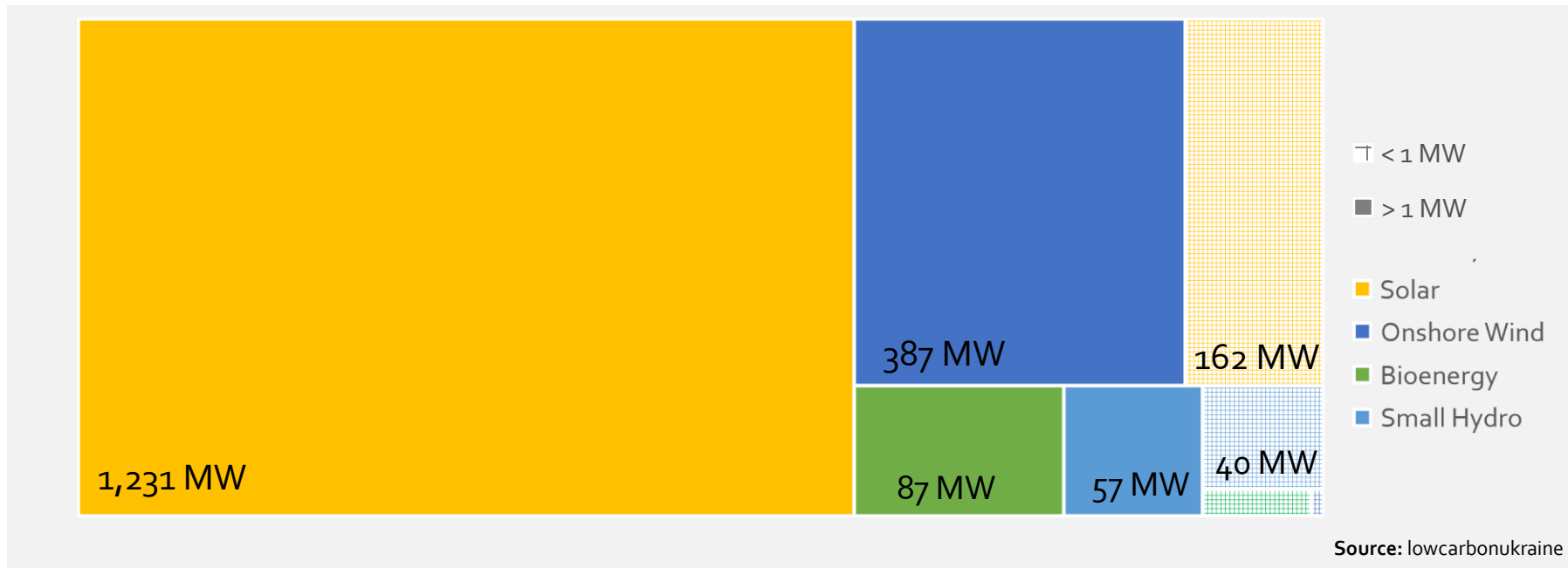
However, costs of RES are decreasing



- Total sum paid by Energorynok to RES divided by the total electricity of RES sold to Energorynok
- The average price decreases for Solar but stagnates for the other technologies
- However, because of the dominance of Solar in the RES generation mix, overall average price for RES decreases as well

Mainly large RES projects are profiting from the Green Tariff

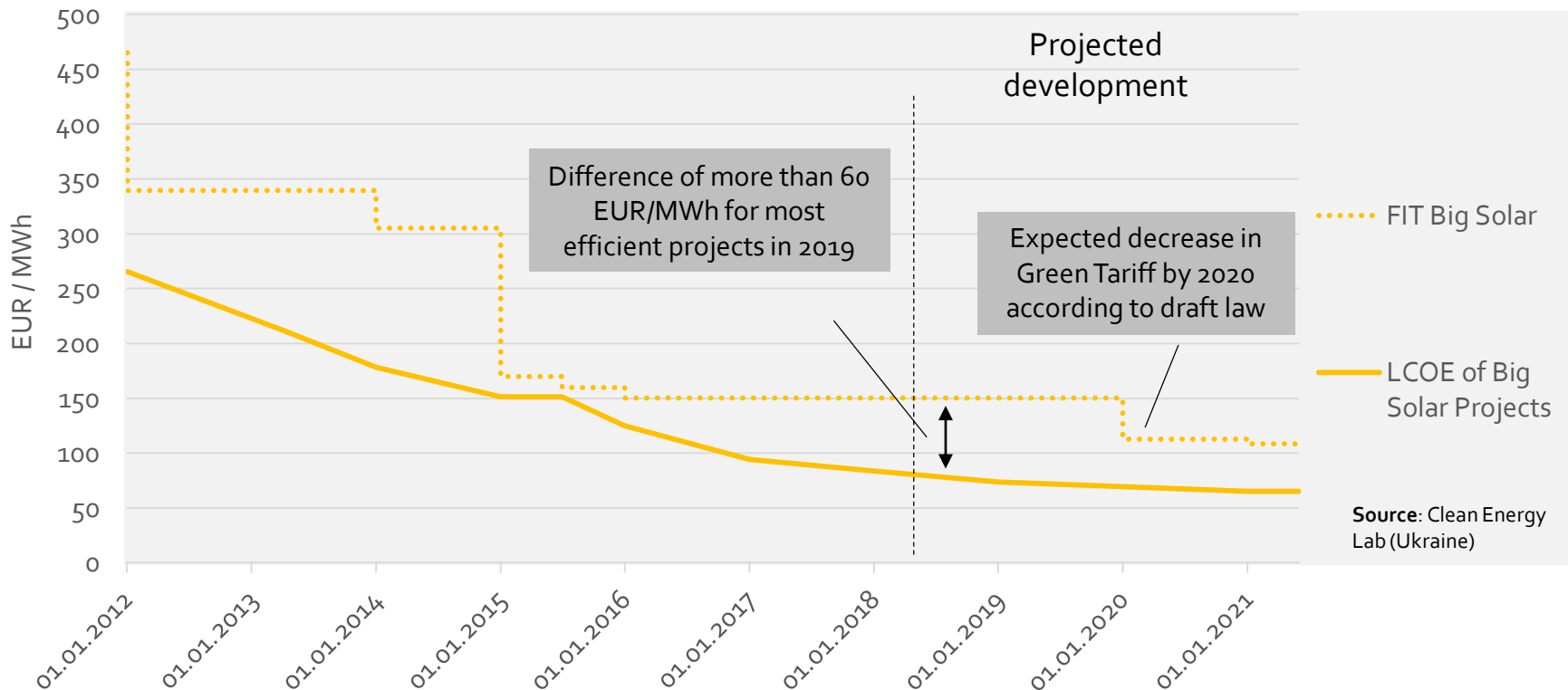
Structure of RES capacities under Green Tariff by 11M 2018 in MW



- RES projects above 1 MW are dominating the renewable landscape in Ukraine. Household installations represent the biggest share of small installations
- Also for 2019-2021 the majority of new capacities is assumed to be 1-10 MW (Example: 1MW Solar equals the size of approx. 2 football pitches)

Current difference between LCOE and FIT allows for high profits

Levelised costs of electricity (LCOE) and 2019 FIT according to the draft law in EUR/MWh for big ground-mounted Solar projects in Ukraine



Note: LCOE calculations are based on several crucial assumptions (see next slide)

FIT could be reduced without affecting the break even of projects

- Given the assumed LCOE, Solar subsidy levels could be decreased without affecting the break even of RES projects
- This would reduce costs for society and increase the efficiency of subsidies
- Same holds for Wind projects (but not for Bioenergy)

Underlying assumptions of FIT vs. LCOE consideration:

- A) Changes in Green Tariff rates as proposed draft law No. 8449-Д
- B) Support is provided for 20 years (and not until 2030)
- C) LCOE for ground-mounted big Solar projects (avg. 15.7 MW in 2018)
 - Average annual capacity factor for new plants 2018: 15.2%
 - CAPEX: 700€/kW // OPEX: 10€/kW // degradation rate: 0.65%/a
 - WACC (2018): 10.9% // debt-to-equity-ratio: 0.7 // cost of debt: 7%; equity cost: 20%
 - Infl. Ukraine (2018): 11.5% with decreasing trend // Infl. EU around 2%
 - Increase in WEM price to around 60€/MW by 2030 // further devaluation of UAH

Scenarios for RES cost calculations (1)

Scenario A: Baseline

➤ Green Tariff follows the pathway as indicated by the current law

Scenario B: Draft law

➤ Green Tariff follows the pathway as indicated by the draft law No. 8449-Д

Scenario C: LCOE

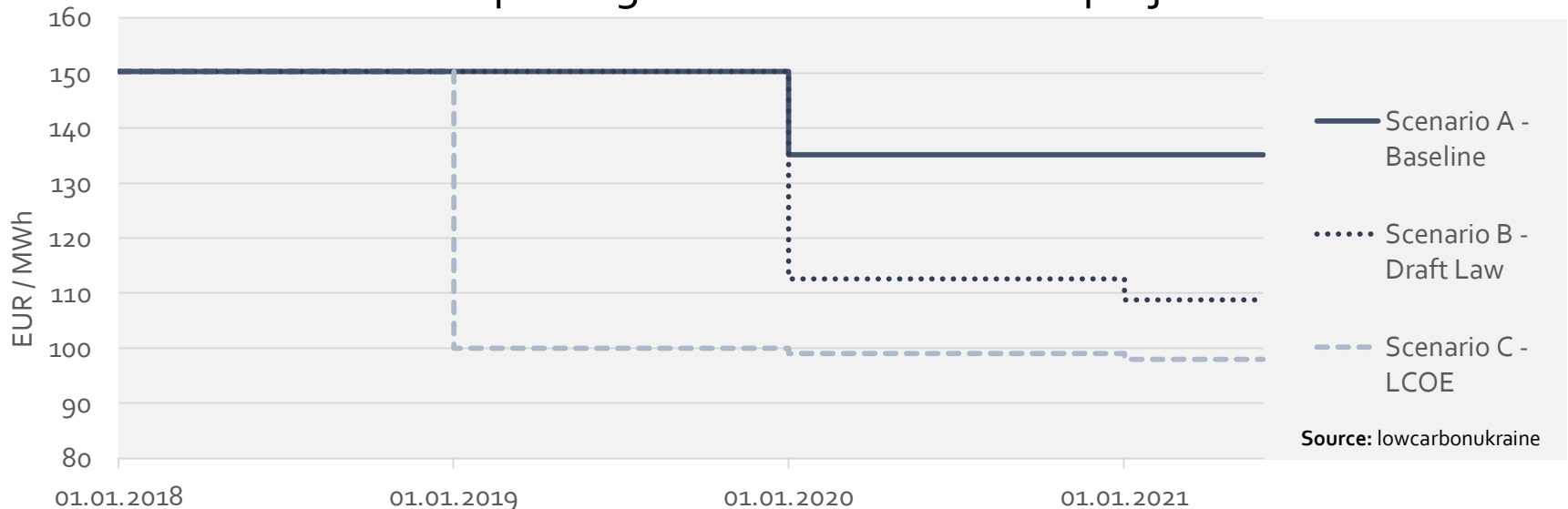
➤ Green Tariff is set slightly above LCOE

Assumptions:

- Volume of RES installations is constant and not affected by Green Tariff adjustments between scenarios
- Development: + 1.8 GW in 2019, + 1.6 GW on 2020, + 1.2 GW in 2021 (Total: 4.6 GW)
- Power demand increases by 1.5% annually
- Capacity factors for new RES are average and do not account for regional differences
- Effect of premium for locally produced equipment is not taken into account

Scenarios for RES cost calculations (2)

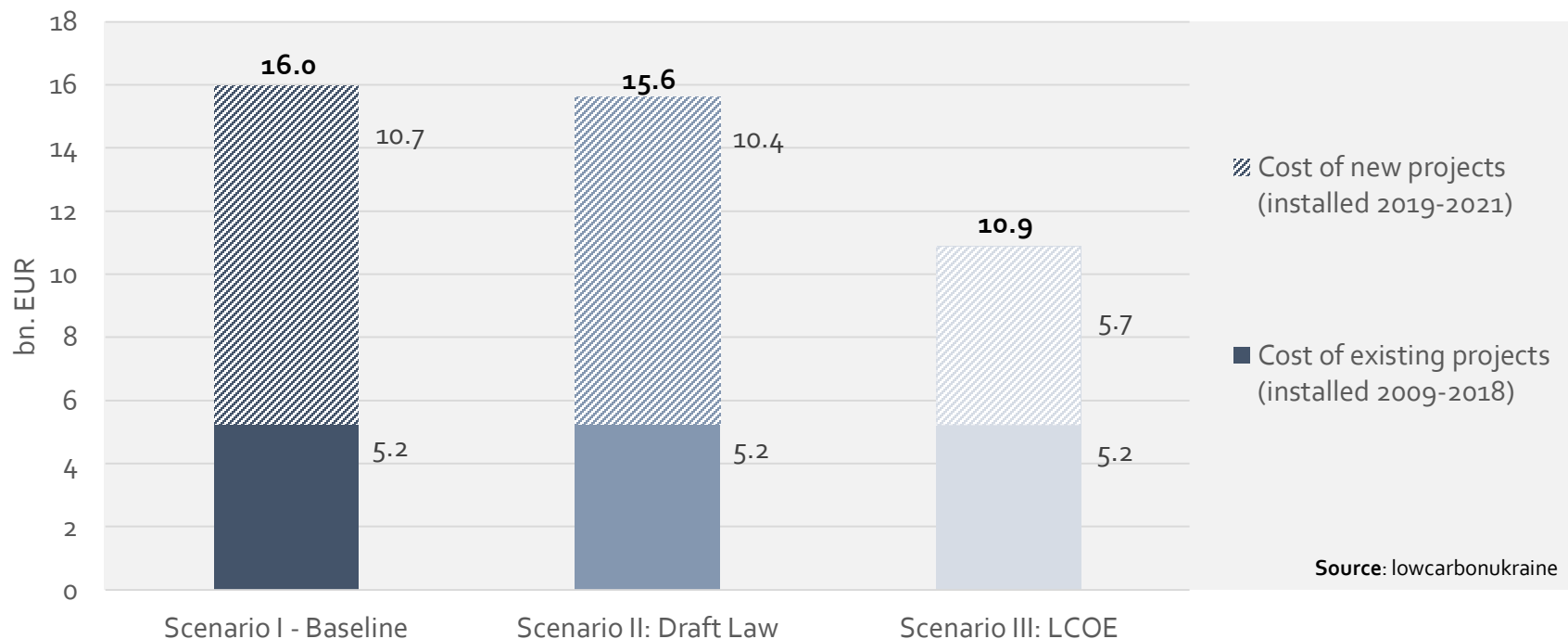
Development of FITs according to three scenarios – Example of ground-mounted Solar projects



- In scenario C, “average” LCOE are assumed to account for suboptimal location and project-size (costs are above most efficient LCOE)
- FIT-scenarios for Wind, Bioenergy and Small Hydro behave similar

Adjusting the Green Tariff allows for significant cost reductions

Total cost of Green Tariff scenarios between 2019 and 2030 in bn. EUR

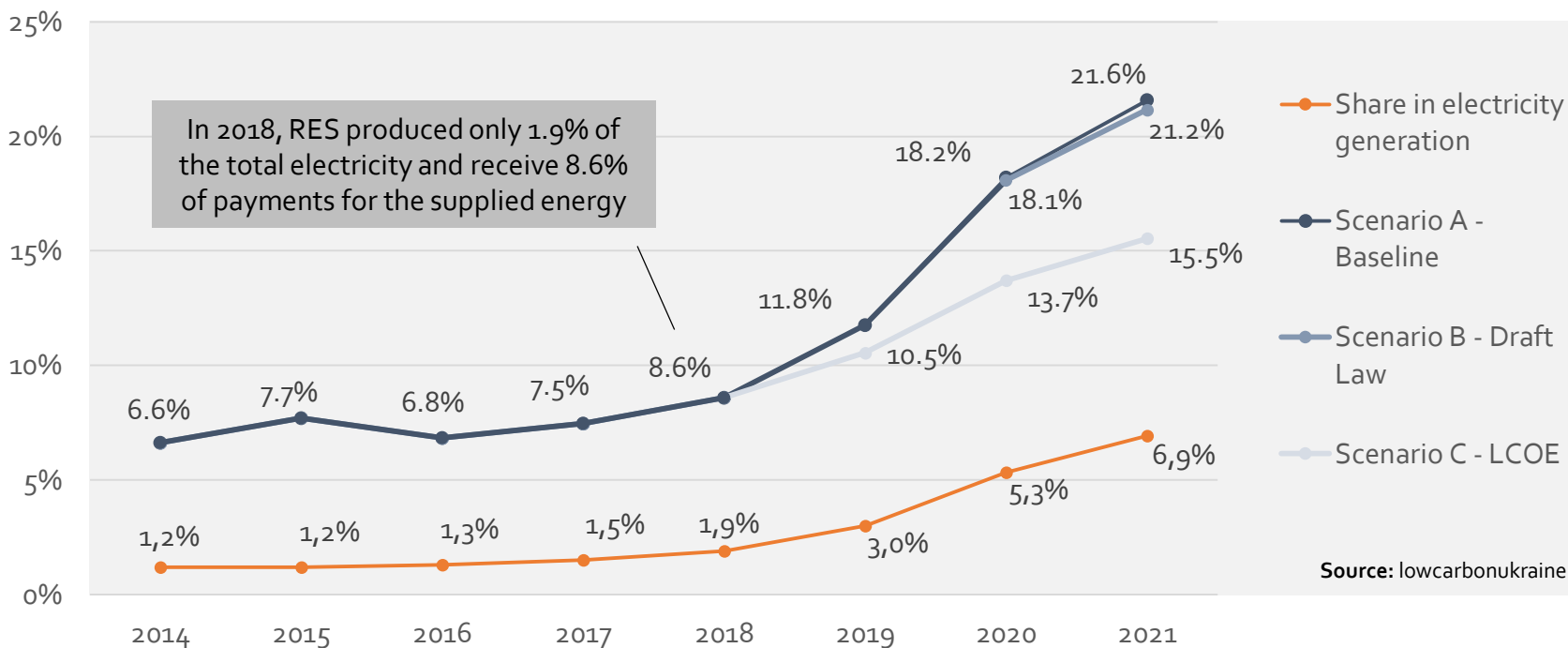


- Immediate adjustment to the Green Tariff for new projects towards the LCOE for Wind and Solar projects could save around 5 bn. EUR until 2030

Note: For Solar cost calculation only Green Tariff for large projects assumed
→ Slight underestimation of costs in all scenarios

Share of RES in generation costs can be significantly reduced

Share of RES in generation costs compared to RES share in electricity generation

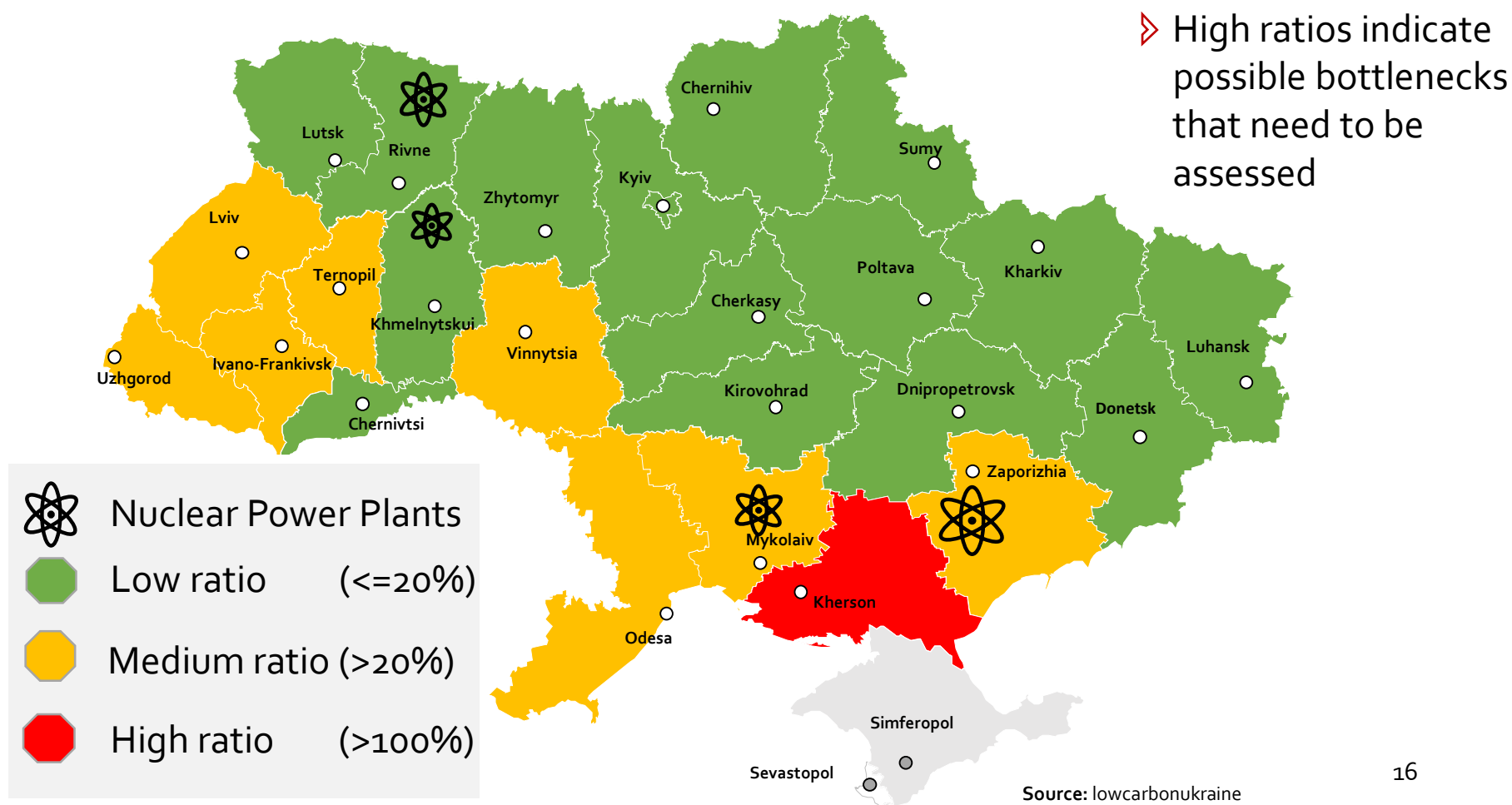


- Adjustment of Green Tariff towards LCOE would allow for a proportionate development of share of RES in power costs and in electricity generation

Assumption: Average annual increase of conventional electricity generation: 1.5% and increase of the price of conventional power mix: 3.5%

Need for guiding the location selection of RES to avoid rising system costs

How much of the hourly average demand (per oblast) can be covered by peak RES capacities



Policy recommendation (1)

- The already high cost of the support policy for RES cannot be undone, but:
A prompt **adjustment of the Green Tariff** towards the LCOE **will allow for significant cost reductions until 2030** compared to the adjustments supposed in the draft law (No. 8449-Д)
- The envisaged **transition period** (auctions for Solar > 1MW and Wind > 3MW only in 2023) **bears additional costs** and might further increase electricity prices
- However, tariff reductions with **unchanged support period (currently until 2030) will stop the market** development of RES
- Annual costs for RES support can be decreased by choosing longer support period: **The longer the support period – the lower the tariff can be set**

Policy recommendation (2)

- Support system should seek **to minimize full system cost** (e.g., network and balancing cost)
- Thereby, it should also **stimulate small and distributed generation**, close to energy consumption to reduce power losses and grid extensions.
- To **boost small RES**, diversification of FIT, tax reductions, low interest loans from state banks and incentives for self-consumptions can be adjusted)
- One leverage to **minimize network cost is to control for the geographical distribution** of RES
- Support system should **allow for a reliable and stable RES development** to reach the set 2035 targets



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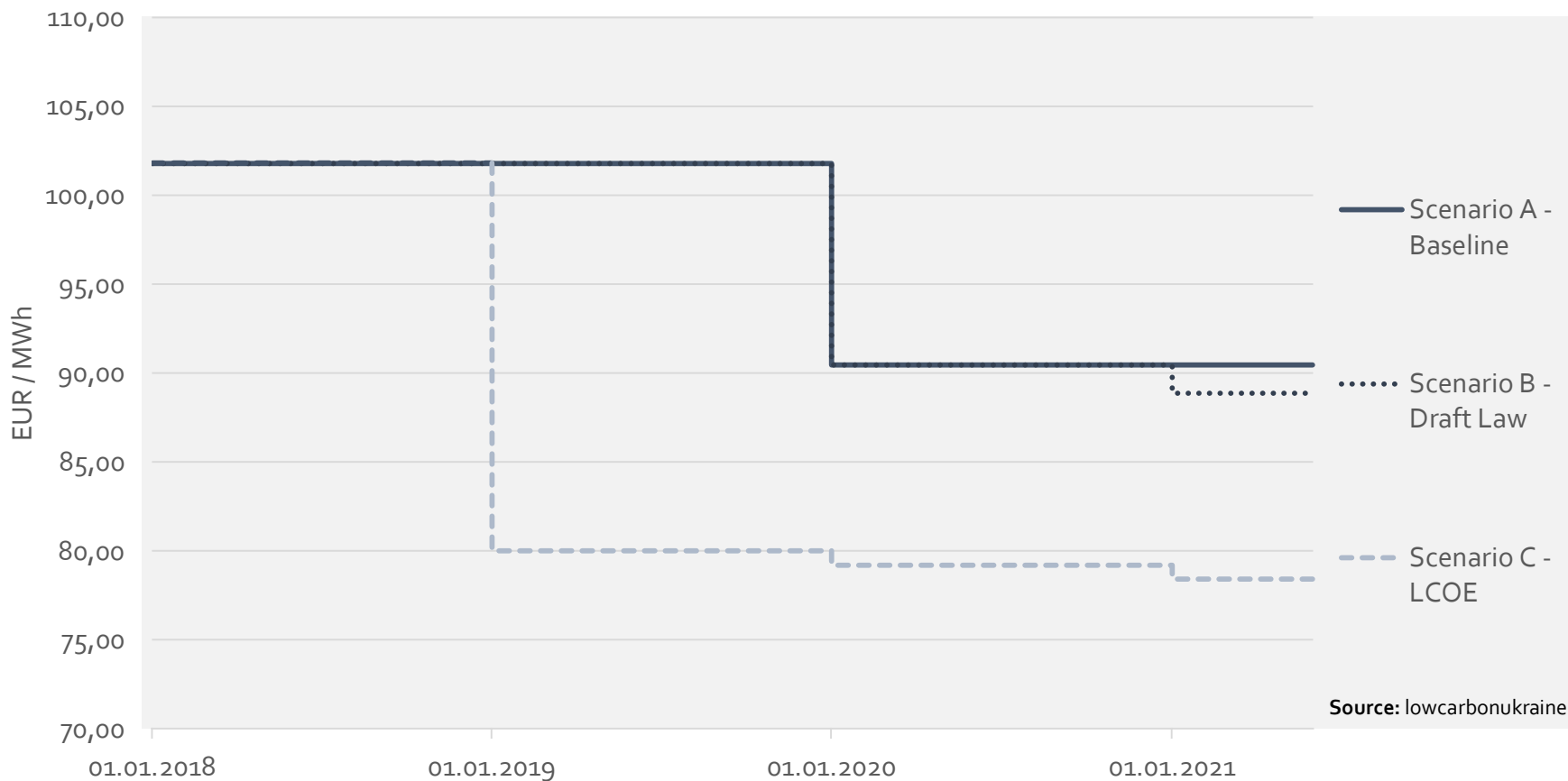
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Back Up I – LCOE and FIT

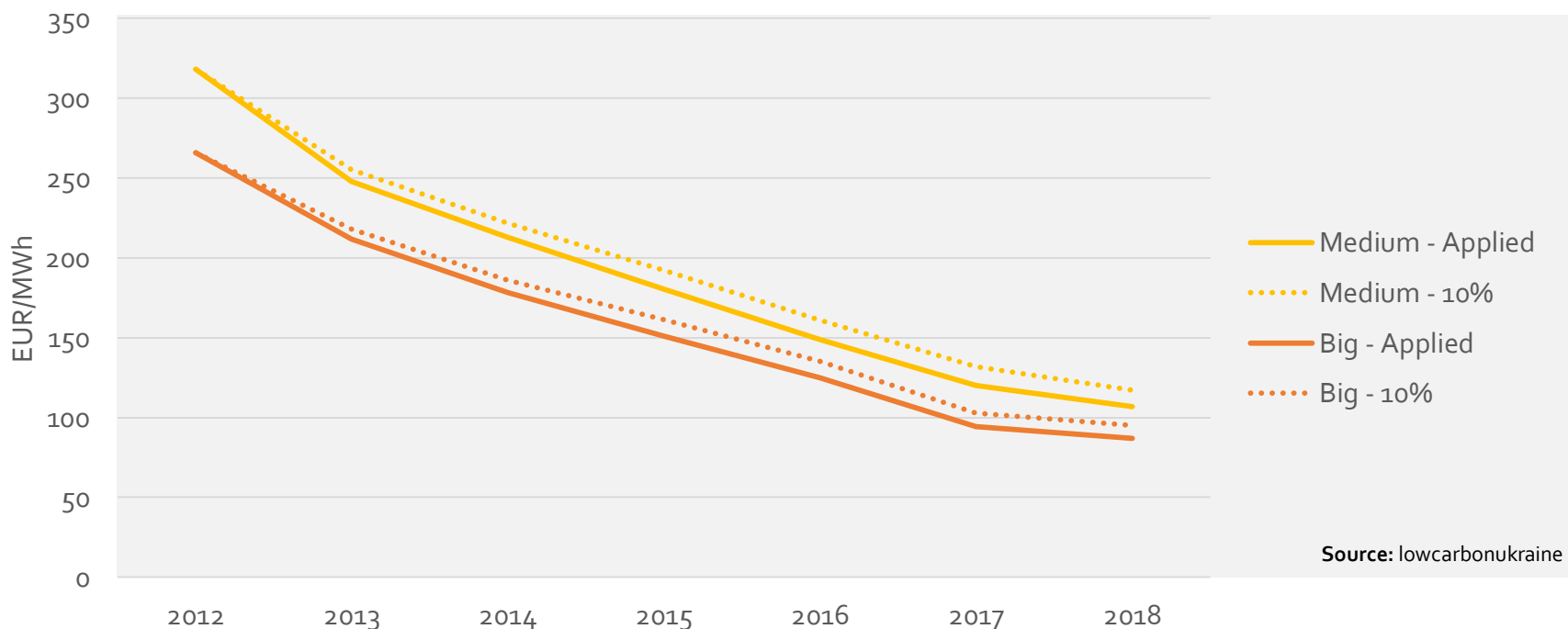
Levelised costs of electricity (LCOE) vs. FIT in EUR/MWh
(Wind > 2MW of single generator)



Back Up II - Sensitivity Analysis: Impact of cost-of-debt on LCOE

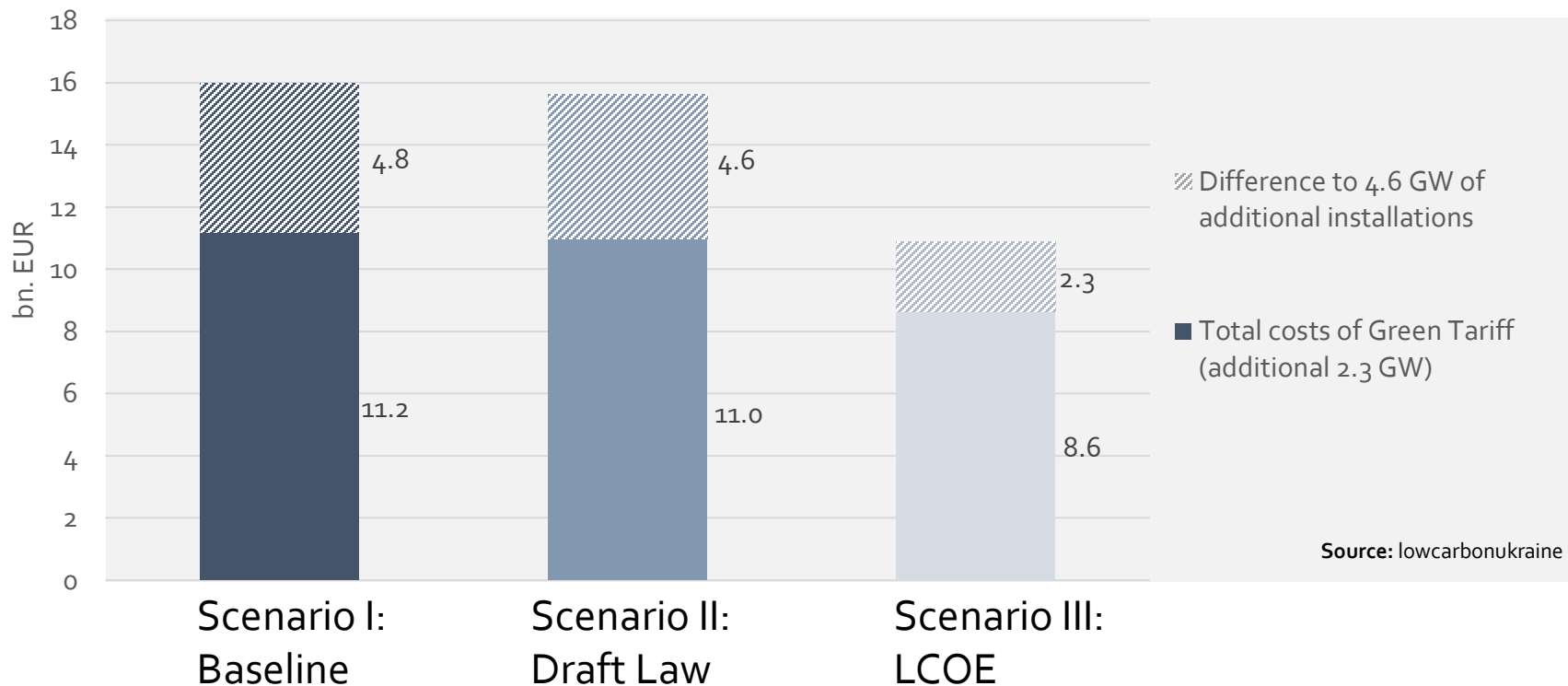
	2012	2013	2014	2015	2016	2017	2018	2019
Applied	10,00%	9,00%	8,50%	8,00%	7,50%	7,00%	7,00%	7,00%
New	10,00%	10,00%	10,00%	10,00%	10,00%	10,00%	10,00%	10,00%

Impact of cost-of-debt on LCOE for medium and big Solar projects



Back Up III - Sensitivity Analysis: Realization quota of 50%

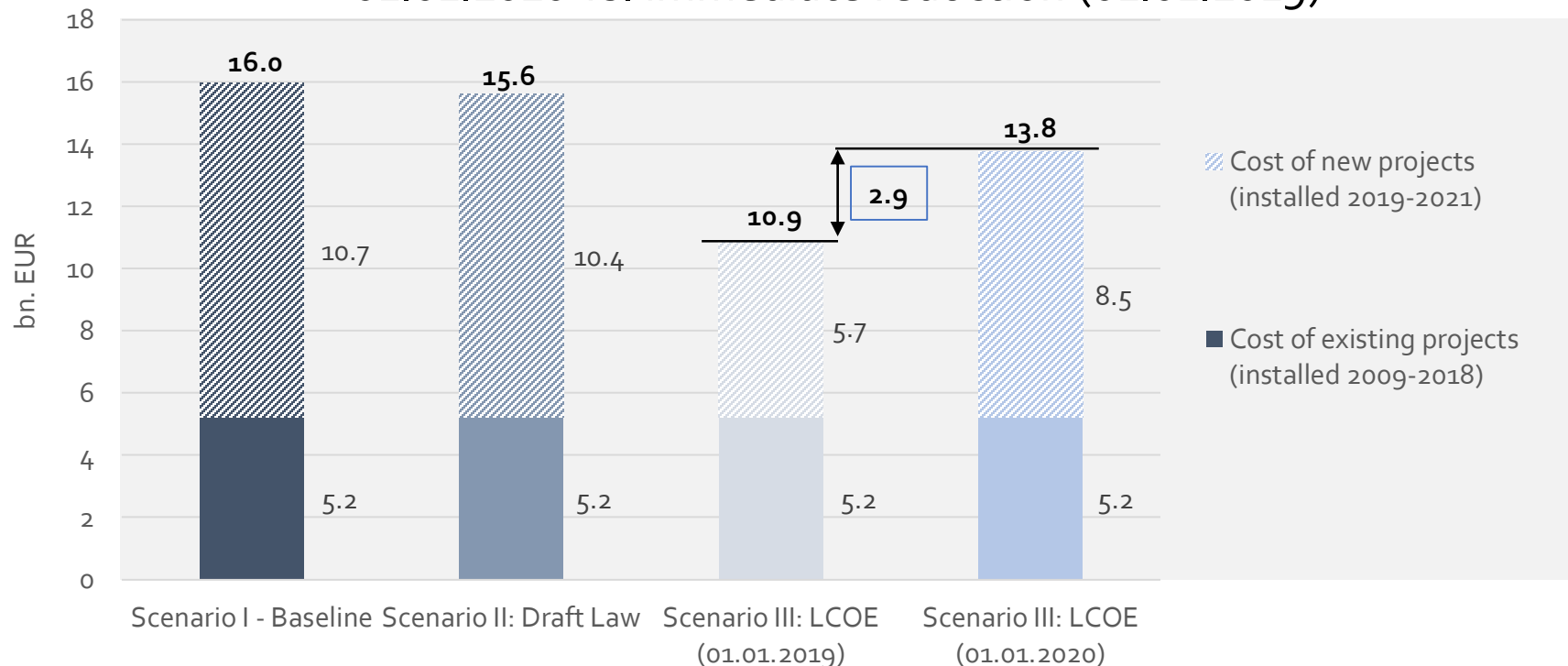
Aggregated total cost of Green Tariff scenarios between 2019 and 2030 in bn. EUR if only 50% of the RES projects are realized (2.3GW)



- If only half of the assumed projects between 2019 and 2021 are realized under the Green Tariff, the total costs until 2030 would be significantly reduced
- However, a major part of the costs is generated by the existing RES installations

Back Up IV - Sensitivity Analysis: FIT reduction in 2020

Introduction of the Tariff Reduction in Scenario III: Reduction to LCOE by 01.01.2020 vs. immediate reduction (01.01.2019)

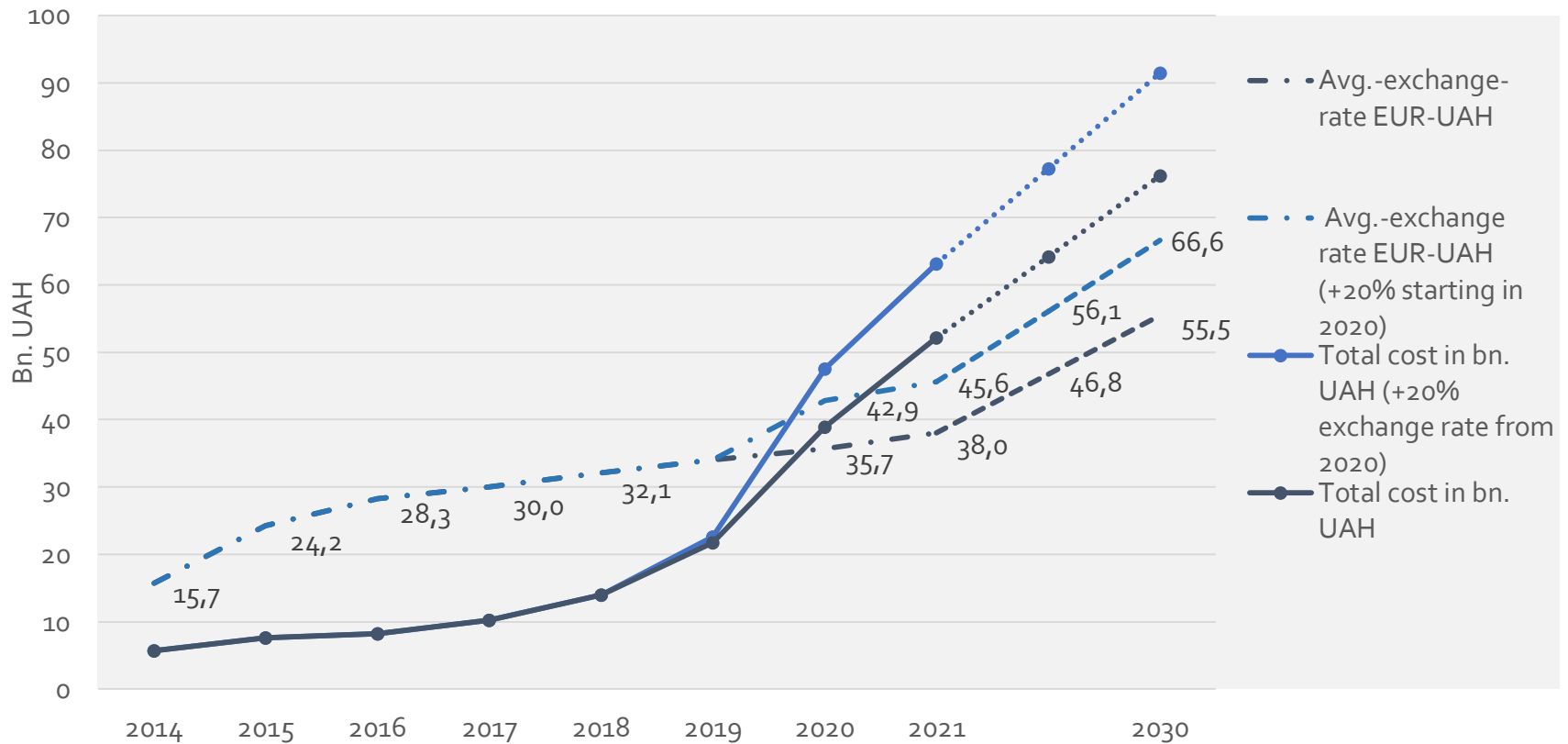


- Given the predicted RES development, an adjustment of the Green Tariff towards the LCOE by 01.01.2020 will sum up to additional 2.9 bn. EUR until 2030 compared to immediate reduction

Note: Tariff adjustments in Scenario I and II are scheduled for 01.01.2020
 → no changes for these scenarios in this sensitivity analysis

Back Up V - Sensitivity Analysis: Exchange rate

Impact of changing exchange rate: Depreciation of UAH against EUR by 20% compared to originally assumed rate



➤ 20% depreciation of UAH against the EUR leads to an increase in total costs of the Green Tariff System of approximate 15 bn. UAH per year between 2022 and 2030.