Institute for Energy Economics and Financial Analysis

The vulnerability of lignite in a net-zero future

The case of Gacko II in BiH

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Introduction

Three types of policy intervention are governing the green transition – and none, by design, favours coal/lignite generation:

- Subsidies (cash, preferred financing to incentivise green projects);
- Penalties (polluter pays principle: CO2, 'forced' technology upgrades: BREF);
- Bans (enforced expiry of select technologies, with at best a gradual phase out).

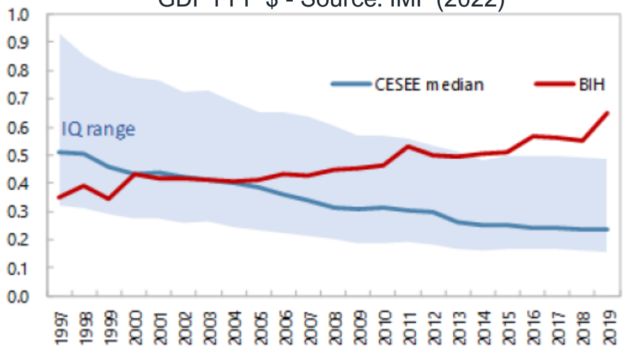
Against such a backdrop, it would be foolhardy to insist investing on technologies which are at a regulatory disadvantage today and are particularly vulnerable to future policy and market developments.

The key insight here is that developing a thermal plant would be riskier from day one – all else being the same – than developing a modern, sustainable set of RES alternatives that benefits from day one from existing policies, has documented beneficial health effects for the local population, and that can look forward to benign policy and market developments.

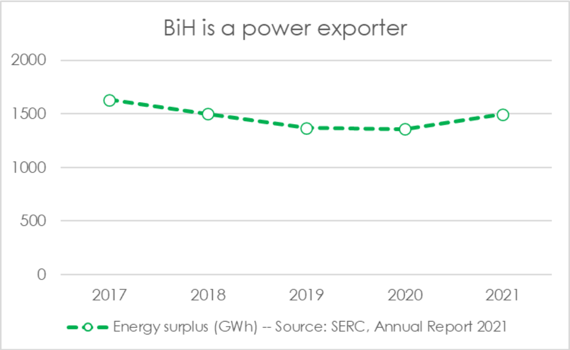
Case study: Gacko II and RES alternatives
Context and background

- Why more fossil fuels, given the context?

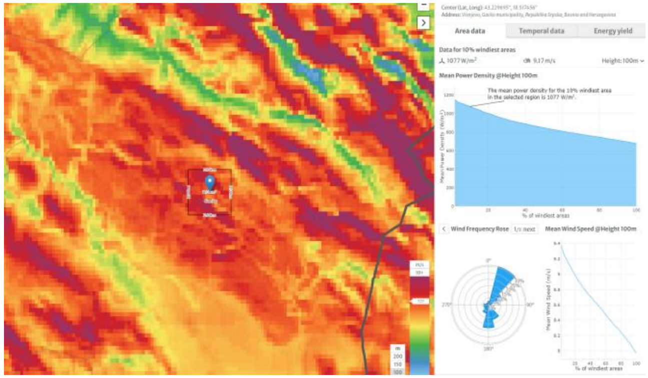
Emissions intensity of output – Mt of CO2 per GDP PPP $ - Source: IMF (2022)

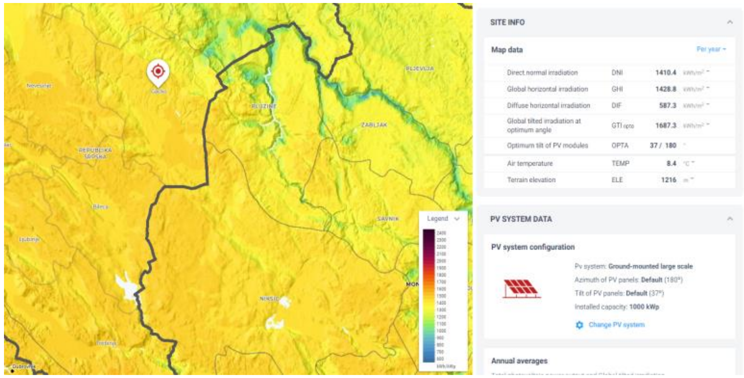


- How much 'replacement' power is truly needed?



- RES: why onshore wind and solar PV?





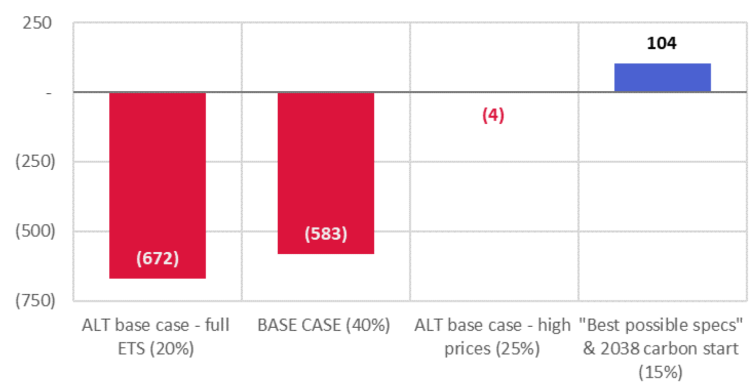
Modelling Gacko II

		BASE CASE	Best specs & carbon 2038 start	ALT base case - high prices	ALT base case - full ETS
NPV & WACC					
WACC	%	7%	5,5%	7%	7%
NPV @ WACC	EUR mln	-583	104	-4	-672
Construction					
Capex	EUR mln	525	473	525	525
Capacity at completion	MW	350	350	350	350
Fixed and variable O&M costs					
Fixed O&M	€ / MW/ year	50000	45000	50000	50000
Variable O&M	€/ MWh	4,8	4,3	4,8	4,8
Carbon intensity	tCO2/ MWh	1,0	1,0	1,0	1,0
Fuel cost	€/ GJ	3,0	1,8	3,0	3,0
Energy efficiency	%	40%	42%	40%	40%
Costs and revenues					
Carbon price start	Year	2030	2038	2030	2030
Carbon price scenario		Medium	Medium	Medium	High
Carbon start scenario		Gradual	Gradual	Gradual	Full
Power price scenario		Medium	Medium	High	High
Power price floor	Sensitivity	Yes	Yes	No	No

- The BASE CASE assumes a gradual phase-in of carbon prices, coupled with high (but not the highest) power price levels
- In the “high prices” scenario Gacko II captures the highest power prices and benefits from gradually increasing carbon prices, while the “full ETS” scenario sees Gacko II bearing the impact of full ETS from 2030
- The “Best possible specs” & 2038 carbon start scenario is the only scenario that exhibits a positive (albeit small) NPV for the project. This scenario assumes that carbon prices do not become a part of BiH’s power market until 2038, allowing for the asset to earn carbon price-free revenues for ten years

- The Bureau of Public Relations of the Government of the Republic of Srpska (RS) recently announced that Czech company Witkowitz is considering investing 521 million € in the construction of 350 MW unit at Gacko, to replace the existing unit Gacko I
- Our DCF analysis shows that Gacko II will not be profitable and would quickly become a stranded asset under several scenarios and even with generous assumptions favouring lignite generation
- The project ought to fail to attract adequate financing since it would earn insufficient returns in the most optimistic case, more likely than not lose money

NPV by scenario (EUR mln)



Vulnerability timeline
What is the true cost of financing Gacko II?

2023 to 2028

From FID to commissioning

Current extraordinary power prices should not be used as justification for the project, as these will not persist and will equally benefit alternative plants.

The main economic, regulatory and technical (completion) risks are exacerbated by financial risks. Some of these risks are unsystematic (asset-specific) requiring a premium on standard discount rates.

2028 to 203X

Operations commence

Many of the risks faced have different drivers to a large extent and therefore they are additive. For example, both delays in construction and adverse policy outcomes can occur at the same time.

Any adverse event in the early years of the project would add to the pressure on the asset to make up the cash flow deficit versus planning estimates.

2030? 2035? 2038?

Carbon prices enter stage, cash flows suffer

“The costs for complying with air pollution regulation and, importantly, the limited export opportunities because of the EU’s carbon border adjustment contribute negatively to project economics.” Enervis-Agora EW (2021)

Most of the negative impact on cash flows occurs after 2030, coinciding with of some form of carbon pricing entering the picture.

2040 and beyond

Financial and market risks sum up, asset stranded

RES penetration increases and Gacko II developers have to sustain the additional combined impact of shorter life, lower load factors and power prices than originally planned.

Even if the perspective developers of Gacko II deem the probability of such negative occurrences very small, they ought to heed the large exposure to its potentially devastating consequences.

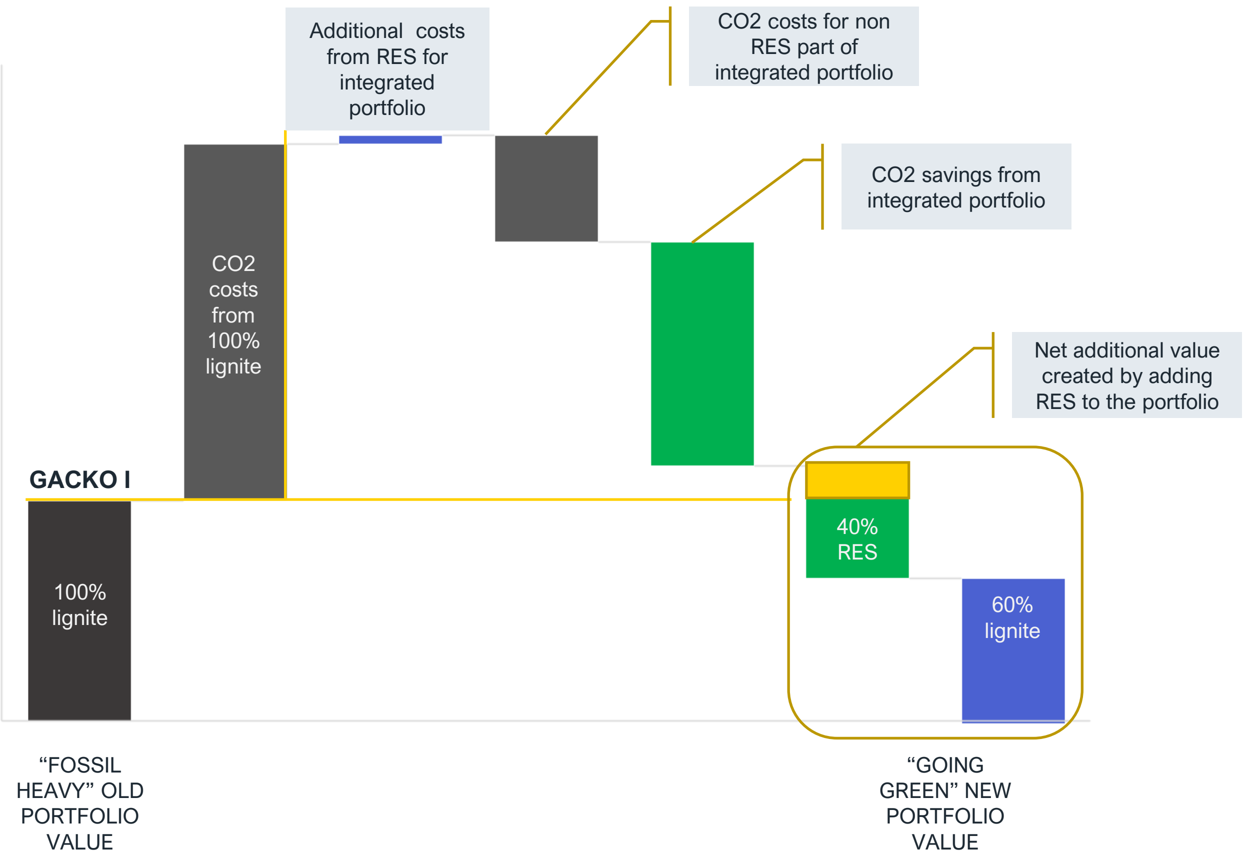
Modelling a realistic portfolio with RES alternatives

Solar PV and onshore wind developments offer safer, higher returns and cleaner power for BiH

We calculate that a RES portfolio comprising 115 MW solar and 115 MW wind would cost € 264 mln (about half the cost of building Gacko II), take 2 years to build, and contribute an amount of energy roughly equal to 40% of Gacko I's output for 2021 (1,5 TWh).

We start with LCOE estimates for solar PV and onshore wind in BiH and we estimate the costs of fossil fuel and renewables generation. We then sum the expected cash outlays from 2025 to 2045. We derive the present value of these costs using an assumed 3% discount rate.

The integrated "going green" portfolio will save over 20 million tons of CO2 (and the associated costs) over a 20 year period. The larger the proportion of RES in the portfolio, the bigger the savings from not having to pay for carbon.



Key messages

- DO NOT build Gacko II (or any other fossil fuel plant)
  - Economics do not add up, it is bad for the environment and public health, very risky and hard to finance, its timing is particularly bad
- DO consider a rapid phase-out of Gacko I
  - Reduce exposure to the risk of being left behind, and certainly do not sink any more money into it. Help the environment and public health (especially locally)
- DO build a strong portfolio comprising solar PV and onshore wind, the sooner the better
  - It will accelerate the phase-out of Gacko I, it offers safer returns and cleaner power
- DO plan to invest additional resources in RES
  - It is better and much cheaper in the long run: decarbonisation, decentralisation and digitalisation are on your side!

“The future of the future is the present”

Marshall McLuhan

Thank you

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Appendix

Methodology and select inputs for the integrated RES portfolio analysis

- We follow Weiss-Murphy*, who used the approach to compare the carbon emissions and total system costs of slower versus accelerated renewables deployment scenarios.
- We start with the LCOE calculation for solar PV and onshore wind in BiH, and we use several estimates for the running costs of fossil fuel (ranging from 50 to 60 €/MWh, a conservative estimate). We assume that RES (today more expensive than fossil fuel generation) will have the same running cost as fossil fuel in 2040, implying a 1,5% y/y reduction in RES costs until then.
- We benchmark our capex and opex assumptions to IRENA (2019) and to Enervis (2021). We assume a load factor of 34% for onshore wind and of 19% for solar PV. We use a WACC of 7%. We build a “going green” portfolio comprising 65% wind and 35% solar PV (energy basis), for a total of 230 MW, capable of generating 0,6 TWh per annum.
- We compare its costs to a BAU “fossil heavy” scenario. We sum the expected cash outlays for 20 years for either scenario, from 2025 to 2045. We derive the present value of these costs using an assumed 3% discount rate.
- The BAU “fossil heavy” scenario means continuing to generate with a 100% lignite portfolio (we ignore the contribution of hydro in this analysis since we want to compare fossil and new RES). We calculate a present value for costs under the BAU “fossil heavy” scenario of €1,17bln.
- The “going green” scenario represents the present value the costs of switching to a large percent (min = 35%) of RES in the next couple of years. It is a boundary estimate, as this analysis is a simplified analysis. It is slightly higher than the corresponding cost for the BAU scenario, and it is equal to €1,21 bln.
- It should be no surprise that the “going green” scenario is more expensive, since we do not consider the sunk capital costs of fossil fuels, and because higher renewables costs occur earlier and so are discounted less. However, under such a scenario many risks would be strongly mitigated (eg fuel price risks, regulatory, climate risk).
- Next, we incorporate our identified key risks/uncertainties, namely carbon prices. Regarding carbon prices, we estimate a present value for carbon costs under the BAU “fossil heavy” scenario of €1.9 billion. We assume a carbon intensity of 1.0 ton CO_2/MWh and we use the same carbon price forecasts as we used in our DCF analysis, derived from Enervis and TYNDP 2020 scenarios.
- The cost of carbon is an additional cost only to the BAU “fossil heavy” scenario, since RES do not have to pay carbon costs
- We calculate that the integrated “going green” portfolio (60% lignite, 40% RES) will save over 20 million tons of co2 (and the associated costs) over a 20 year period. The larger the proportion of RES in the portfolio, the bigger the savings from not having to pay for carbon.

* https://www.bu.edu/ise/files/2017/04/BU-ISE-Seminar-Hurry-or-Wait-Dean-Murphy-Jurgen-Weiss.pdf