

Andrei Goncearuc^{1,2,*}, Nikolaos Sapountzoglou¹, Cedric De Cauwer¹, Thierry Coosemans¹, Maarten Messagie¹, Thomas Crispeels²

* Corresponding author e-mail: goncearuc.andrei@vub.be

¹ ETEC Department & MOBI Research Group, Vrije Universiteit Brussels (VUB)

² BUTO Department & MOBI Research Group, Vrije Universiteit Brussel (VUB)



Summary

- Quantification framework of **V2G-enabled frequency containment reserve** (FCR) services, for the business model of a CPO.
- Investigation of additional financial factors and their integration into the currently existing CPO business model.
- Profitability evaluation** of V2G-enabled FCR for a CPO.

Method

- The **V2G** technology is able to extend the list of CPO value propositions with **FCR** services [1-2] and increase its revenues as follows:

$$R_{FCR} = FCR_{Bid} * \sum_{y=1}^Z (K_y * N_y * (CR_y - UR_y)) * T$$

- Profitability evaluation by the means of EBIT, EBITDA (+margins), ROI.
- Four different V2G EVSE pricing methods.

Results

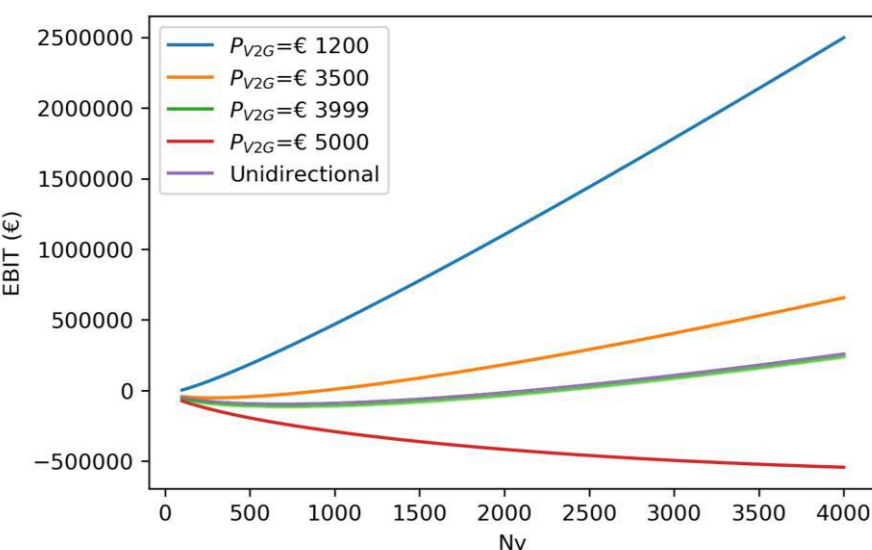


Fig. 1: CPO EBIT in function of number of EVSE

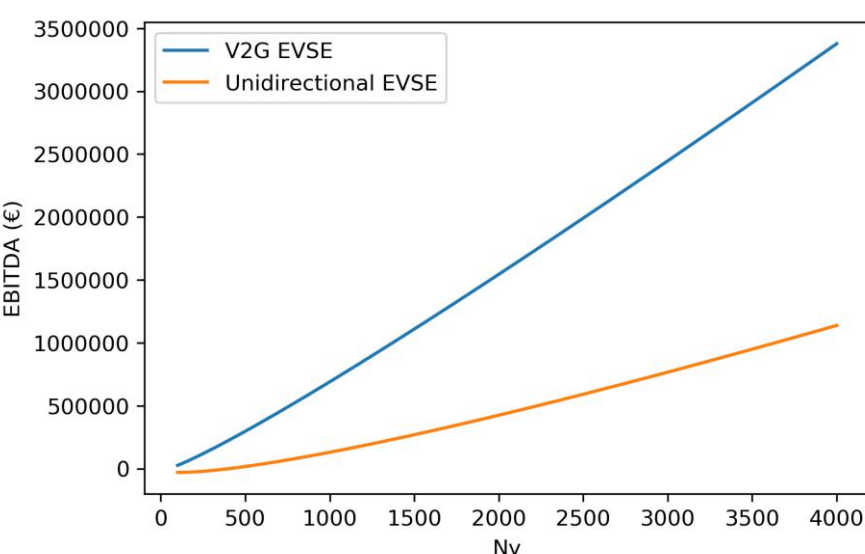


Fig. 2: CPO EBITDA in function of number of EVSE

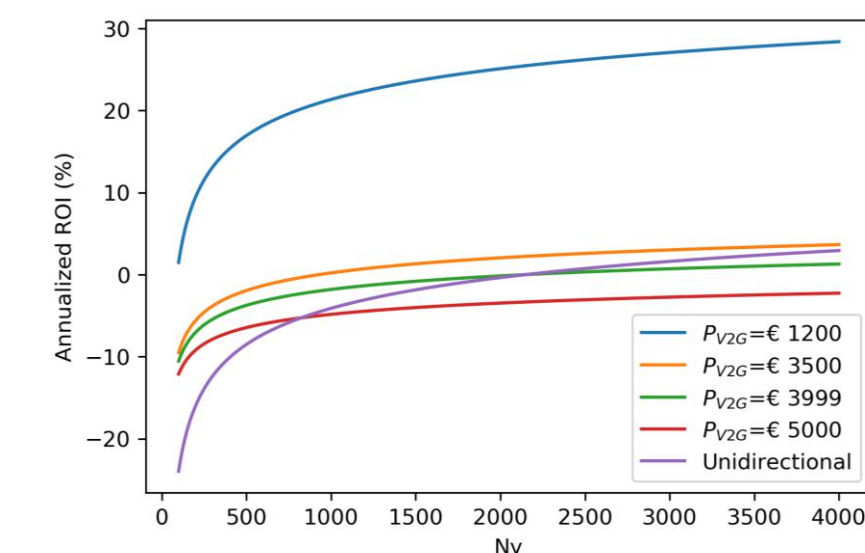


Fig. 3: CPO ROI in function of number of EVSE

- Negative **EBIT** trend for low N_y values
- Decrease of **V2G EVSE price** to **€ 3 999**, equalizes the EBIT with the one of the traditional CPO.
- The equalization of uni- and bidirectional EVSE prices would boost CPO EBIT.

- CPO business model is **capital intensive** (EVSE network with long writing down periods).
- CPO providing V2G-enabled FCR services outperforms the traditional one in **EBITDA** terms

- Capital-intensive industry with low EBIT margin >> relatively **low ROI**.
- The lower capital cost for V2G allows to create a **high 30 % ROI**

Conclusions

Price of V2G EVSE is an important profitability factor:

- Current** V2G EVSE market price: **€ 5 000**, the traditional CPO business model is more profitable than the CPO with V2G-enabled FCR services.
- Break-even: € 3999**, equal profitability with the traditional CPO business model (C.P.)
- Estimated price: € 3500**, higher profitability
- If the V2G EVSE reaches the current level of prices of **unidirectional EVSE (€ 1200)**, the CPO business model with V2G-enabled FCR services would strongly outperform the traditional CPO business model in terms of profitability.

V2G-enabled FCR services allow the CPO to reach the profitability faster, but the less capital-intensive unidirectional EVSE can generate a higher ROI on bigger network sizes.



References

- [1] Elia, <https://innovation.eliagroup.eu/innovation-pillars/market-facilitation/>, accessed on 2022-03-14
- [2] Elia, <https://www.elia.be/-/media/project/elia/elia-site/electricity-market-and-system---document-library/balancing---balancing-services-and-bsp/2019/2019-design-note-fcr-for-2020.pdf>, accessed on 2022-04-02