Carbon emissions: which contribution from balancing market?

Marina Bertolini, Assistant professor (rtdA) Department of Statistical Sciences

Growing Resilient Inclusive and Sustainable – GRINS
Spoke 6, WP1

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WP 1 – highlights – DSS work plan

WP 1 – Climate change mitigation and carbon emission reduction – Scenario analysis

Milestones	Period (quarters)	Years I	II	III
-Collection of available information on **carbon emission time series** (hourly/daily frequency) for **European countries** (total, by sector, by region)	1-4			
- Definition of an **online database of carbon emissions**, electricity generation (fossil and renewable sources), climate change mitigation policies in European countries	3-6			
- Estimation of seasonal and yearly Marginal Emission Factors (MEF) of the electricity demand and supply at different levels (total, by sector, by region).	5-8			
- Introduction of **mitigation policy indicators** in MEFs models to estimate their impact on marginal emissions. Evaluation of MEFs impact on companies' performance and risk when controlling for emissions and energy use.	7-10			
- **Scenario analysis on future MEFs** conditional to different emission mitigation policies related to different industries, at the national and regional level. **Indicators to evaluate the risk dimension** at different levels (total, by sector, by region, and at the company level)	9-12			

Marginal emission factors

Filippo Beltrami, Andrew Burlinson, Monica Giulietti, Luigi Grossi, Paul Rowley, Grant Wilson. ***«Where did the time (series) go? Estimation of marginal emission factors with autoregressive components»*** *Energy Economics, Volume 91, 2020, 104905.*

- Marginal emission factors estimated for UK and Italy;
- Prices from intra and infra day market

MEF allow to identify the carbon contribution of the marginal plant producing at a certain time of the day.

$\Rightarrow$ Under the GRINS project, we will further expand this approach to <u>other countries</u>

$\Rightarrow$ **Other expansions** are also one of the target of WP 1

The participation of small-scale variable distributed renewable energy sources to the balancing services market (1/2)

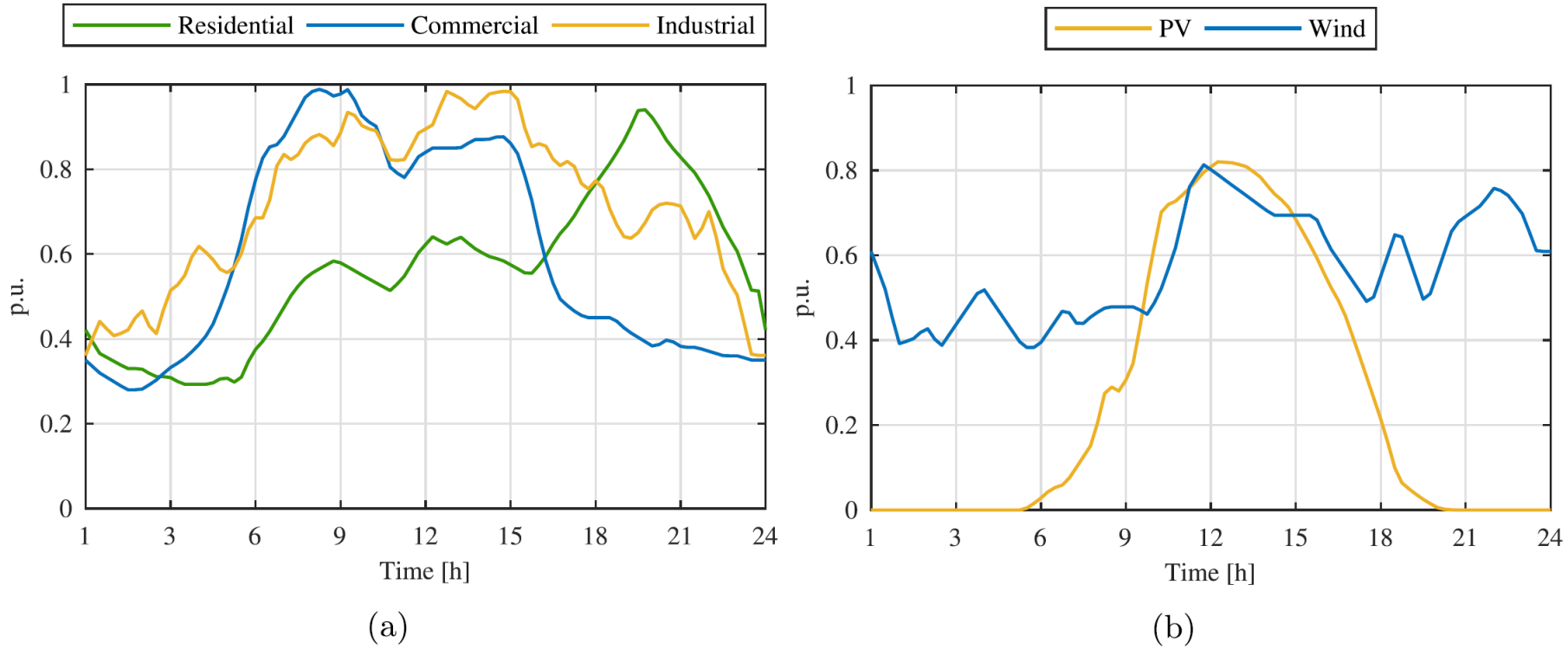
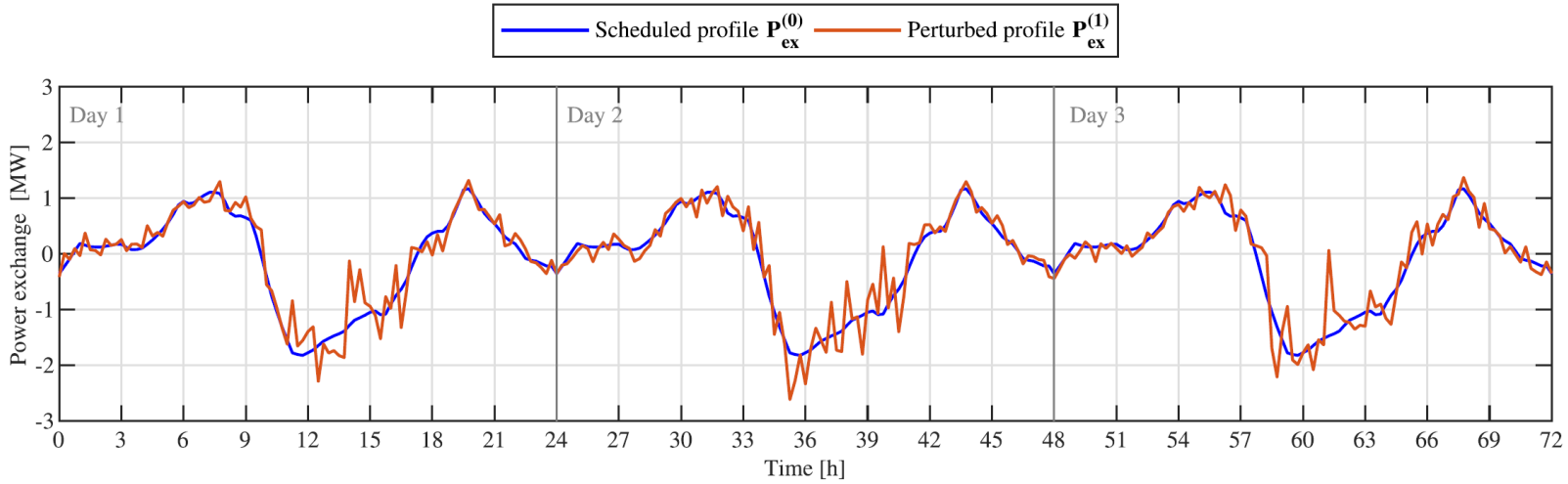
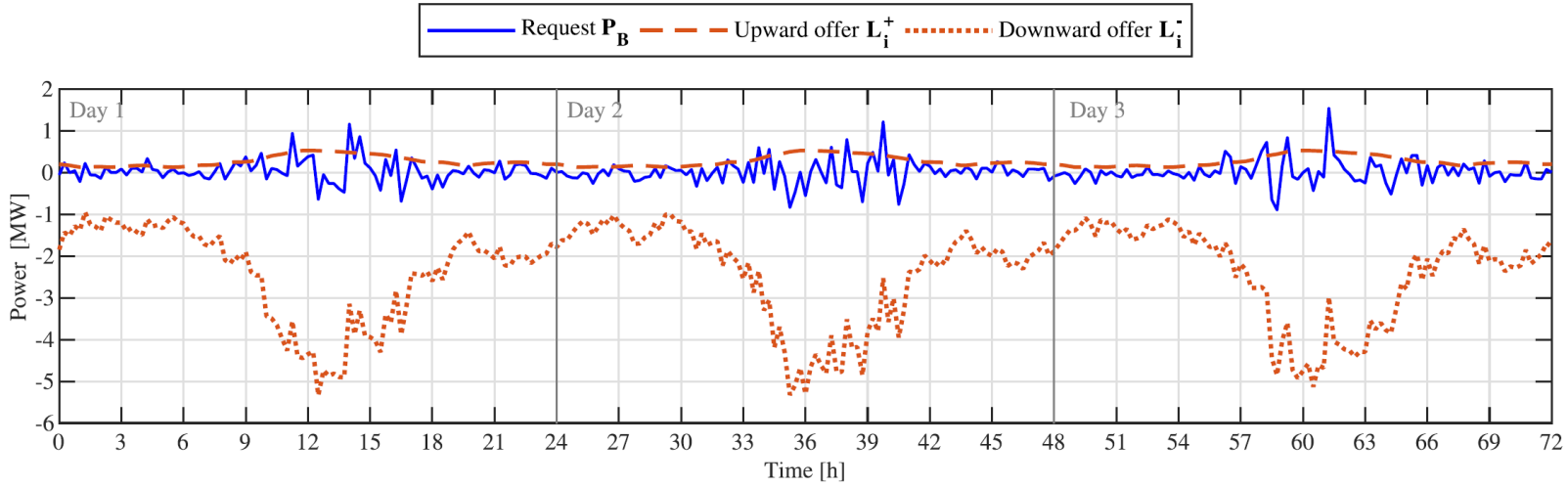


Fig. 2. Load (a) and generation (b) daily power profiles.

The participation of small-scale variable distributed renewable energy sources to the balancing services market (2/2)



(a)



(b)

Expansion of the concept of marginal emission factor

Renewable participation in the balancing market

Which impacts in terms of:

- Market prices?

Also included in the project **“Optimal management methodology for distribution network control in presence of energy communities as flexibility providers” (INCITE)** [PI: Massimiliano Coppo, DII] financed by the Levi Cases centre.

- Emission reduction?

⇒ Total and marginal changes will be estimated

Which is the value of CO2 reduction?

=> Some answers from CO2 markets

Thank you for your attention!

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PIANO NAZIONALE DI RIPRESA E RESILIENZA

Università degli Studi di Padova
dSS Dipartimento di Scienze Statistiche
Università di Padova
Via Cesare Battisti, 241 35122 Padova
https://www.stat.unipd.it/

Centro Studi di Economia e Tecnica dell'Energia "G. Levi Cases"
Università di Padova
Via Marzolo 9, 35131 Padova
http://levicases.unipd.it

Marina Bertolini
marina.bertolini@unipd.it