

CAPEX vs FLEX: The optimal investment mix to integrate decentralized electricity production

Voahary ANDRIAMAROMANANA*

Axel GAUTIER†

Jean-Christophe POUDOU‡

Policy Brief

Key Message

Solar PV adoption in Wallonia is accelerating. But without the right incentives, local grids will see more frequent **inverter disconnections**, wasted clean energy, and rising costs for the grid. This problem can be addressed by investing in CAPEX (grid reinforcements) and in FLEX (batteries, smart charging, demand response). Our research shows that a large PV penetration creates **negative externality**: power injections by a prosumer raise the disconnection risk for others. For this reason, there is **too much CAPEX** and **too little FLEX**.

1. The Challenge: Overvoltage and Disconnections

On sunny days, simultaneous exports from many prosumers can push voltage above safe limits. Inverters then disconnect automatically to protect equipment and the grid.

Impacts:

- Lost renewable generation, forcing prosumers to buy grid electricity.
- Reduced confidence in rooftop solar investments.
- Unequal impact, households further from transformers face more disconnections.

This is a textbook example of **negative externality**: Each prosumer's production

increases the disconnection risk not only for him but also the others in the same neighborhood. Left unaddressed, the market will underinvest in flexibility and overbuild capacity, raising costs for the system.

2. Two Investment Paths: CAPEX and FLEX

CAPEX — Upgrading cables, transformers, and control devices. Effective but expensive and slow to deploy. **FLEX** — Shifting or storing electricity to avoid peak injections:

- Batteries to store excess solar and increase self-consumption.
- Smart EV charging to absorb midday generation.
- Demand response to run appliances during solar peaks.

A balanced mix of CAPEX and FLEX is essential for cost-effective integration of decentralized production units.

3. Why Current Incentives Fail

Current market design:

- Rewards oversized PV systems under net metering.
- Offers little or no return for flexibility investments that increase self-consumption.

*HEC Liège, University of Liège, vi.andriamaromanana@uliege.be

†HEC Liège, University of Liège, LCH and CORE, agautier@uliege.be

‡MRE, University of Montpellier, jean-christophe.poudou@umontpellier.fr

- Leaves DSOs relying on costly reinforcements as the default fix.

This misallocation is especially inefficient in areas with high solar penetration.

4. Policy Recommendations for Wallonia

In June 2025, Walloon Energy Minister Cécile Neven announced a plan to introduce **proportional compensation** for prosumers affected by disconnections, using objective and scalable tools. While this is a step forward, our results suggest that **preventing disconnections** through better incentives will be far more cost-effective than compensating for them.

Two complementary actions are essential:

1. **End net metering to create incentives for self-consumption and reinforce disincentive by adopting time-varying or dynamic export pricing.** Pay prosumers for exports based on time and grid conditions, not at a fixed retail rate. This promotes self-consumption, discourages oversizing, and reduces midday peaks.

2. **Subsidize flexibility where and when it has the highest value.** Target support for batteries, EV charging, and demand response to high-risk zones and peak congestion hours.

Combining these measures will:

- Reduce disconnection events and wasted solar production.
- Limit expensive and slow CAPEX projects.
- Encourage fairer cost-sharing between prosumers and non-prosumers.
- Strengthen public trust in the energy transition.

The Bottom Line

Wallonia's solar growth is an opportunity — but unmanaged, it will bring costly grid upgrades and frustrated prosumers. This is a collective-action problem. No household can solve it alone. By phasing out net metering and investing in targeted flexibility, the Region can turn today's externality challenge into a win-win: cleaner energy, lower costs, and a more reliable grid for all.