

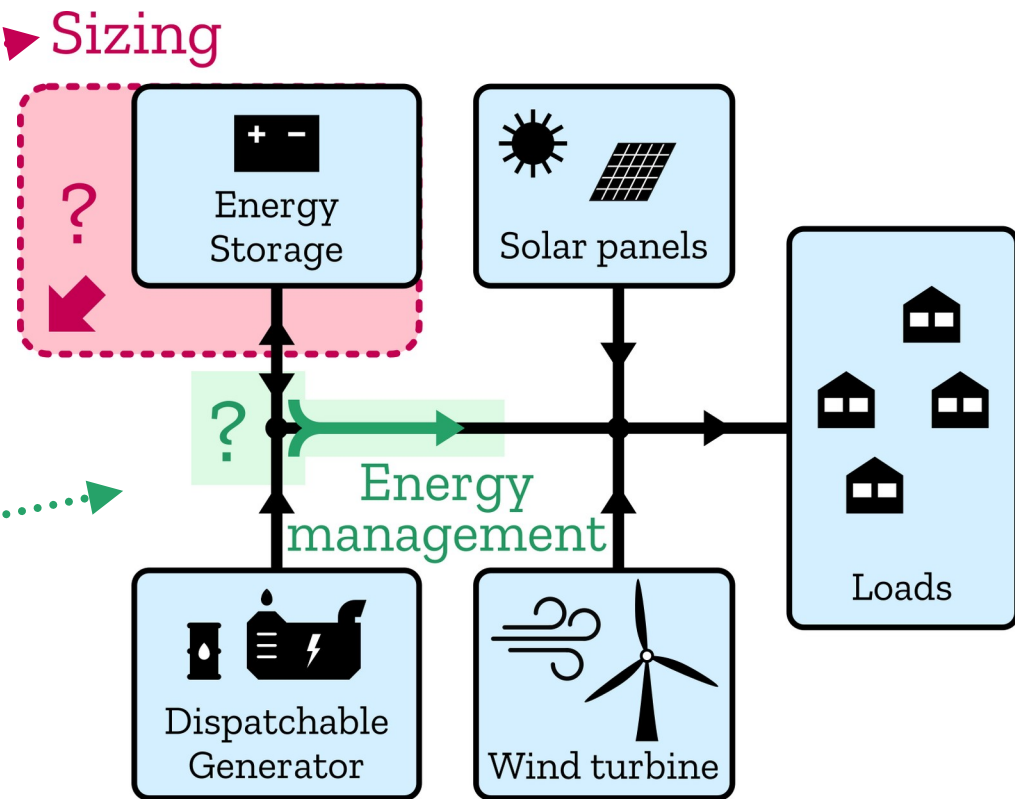
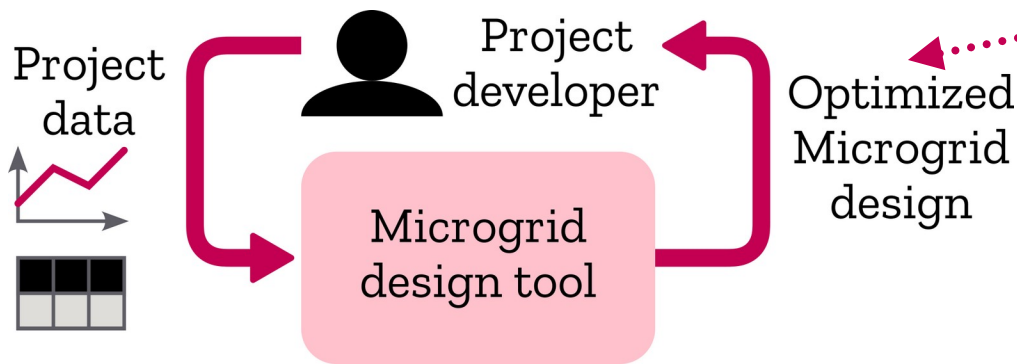


Optimal microgrid sizing: impact of ✦anticipative✦ operation? (i.e. perfect foresight)

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Microgrid design is a joint *sizing & operation optimization*

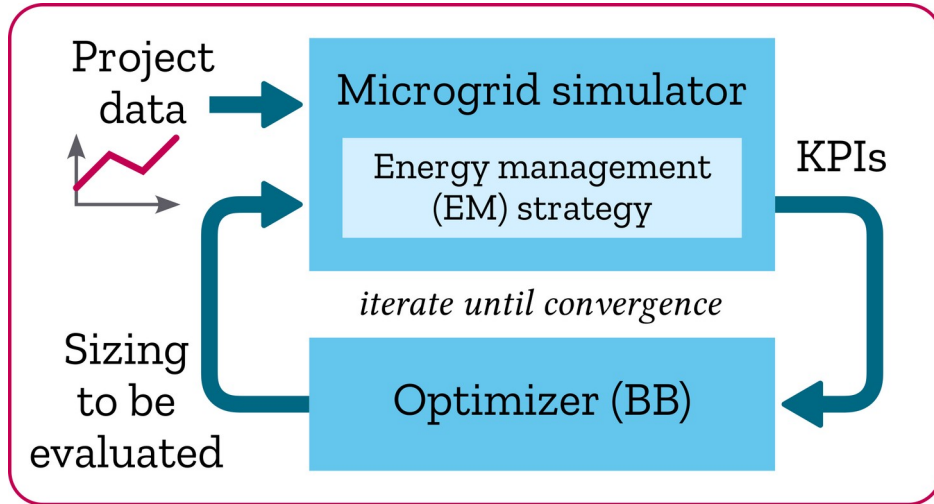


Ex.: min *Cost* s.t. *load is satisfied*

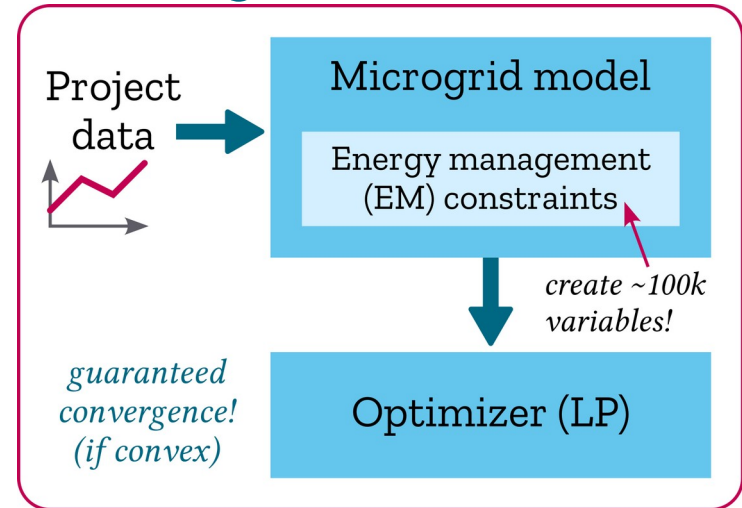
- Operation model needed for lifecycle performance evaluation
 - this “imaginary” operation is **anticipative** in some models

The two classical formulations are different in nature and hypotheses

Blackbox optimizer +
Operation simulator



All-in-one Math. Program
with Algebraic model



- Non anticipative
- Suboptimal (if using rule-based operation)

*Anticipativity is
the key difference*

- Anticipative (Perfect foresight)
- (Over)-optimal

From same data, two different designs and real-life load satisfactions

1) Design methods min *Cost* such that *load shedding* = 0.0 %

	Generator	Battery	Solar PV	Wind
Rule-based oper. + Blackbox optim	1577 kW	4767 kWh	1970 kW _p	1250 kW
All-in-one Linear Program	1154 kW	5131 kWh	2037 kW _p	1240 kW

Data: PVGIS + Ouessant island load (peak 1707 kW) for 365 days @ 1h timestep + PVGIS

2) Real-life performance eval.

	Load shedding	LCOE
Non anticipative (RB) operation	0.00 %	172.3 €/kWh
	0.23 %	171.3 €/kWh

→ *anticipative All-in-one model yields subpar performance!*

Tools: Microgrids.X

Microgrids.jl

- Julia based
- Simulation model with rule-based operation
- **Blackbox** optimization

open source MIT license

<https://pierreh.eu/Microgrids-X/>
<https://github.com/Microgrids-X/Microgrids.jl>

Microgrids.JuMP

- Julia/JuMP based
- **Algebraic** (linear) model
 - with usage-dependent lifetime effect on annualized cost for battery and generator

to be released