FLUX 50 FIVE – 05/05/2022

DE ROL VAN DC-NETTEN IN LOKALE ENERGIEGEMEENSCHAPPEN

dr. ir. Giel Van den Broeck
CTO & Founder DCINERGY

WHY DC IN LOCAL ENERGY COMMUNITIES?

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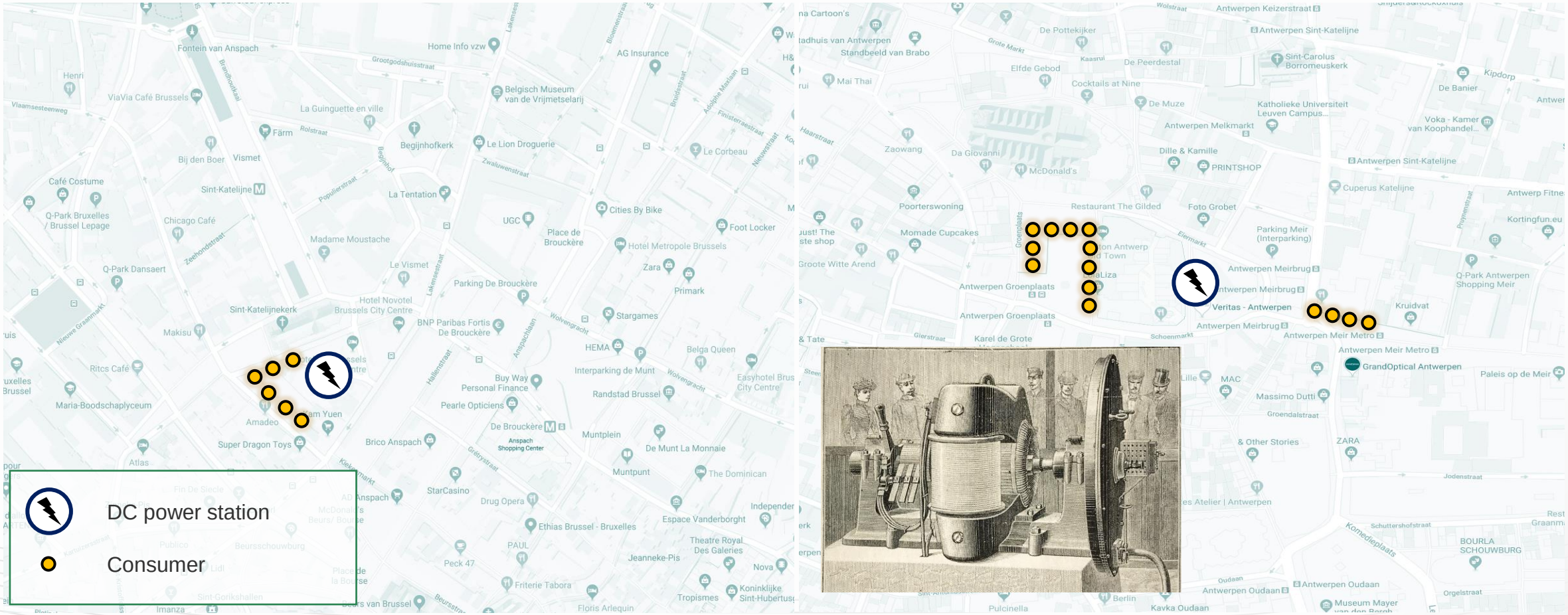
Back to the future



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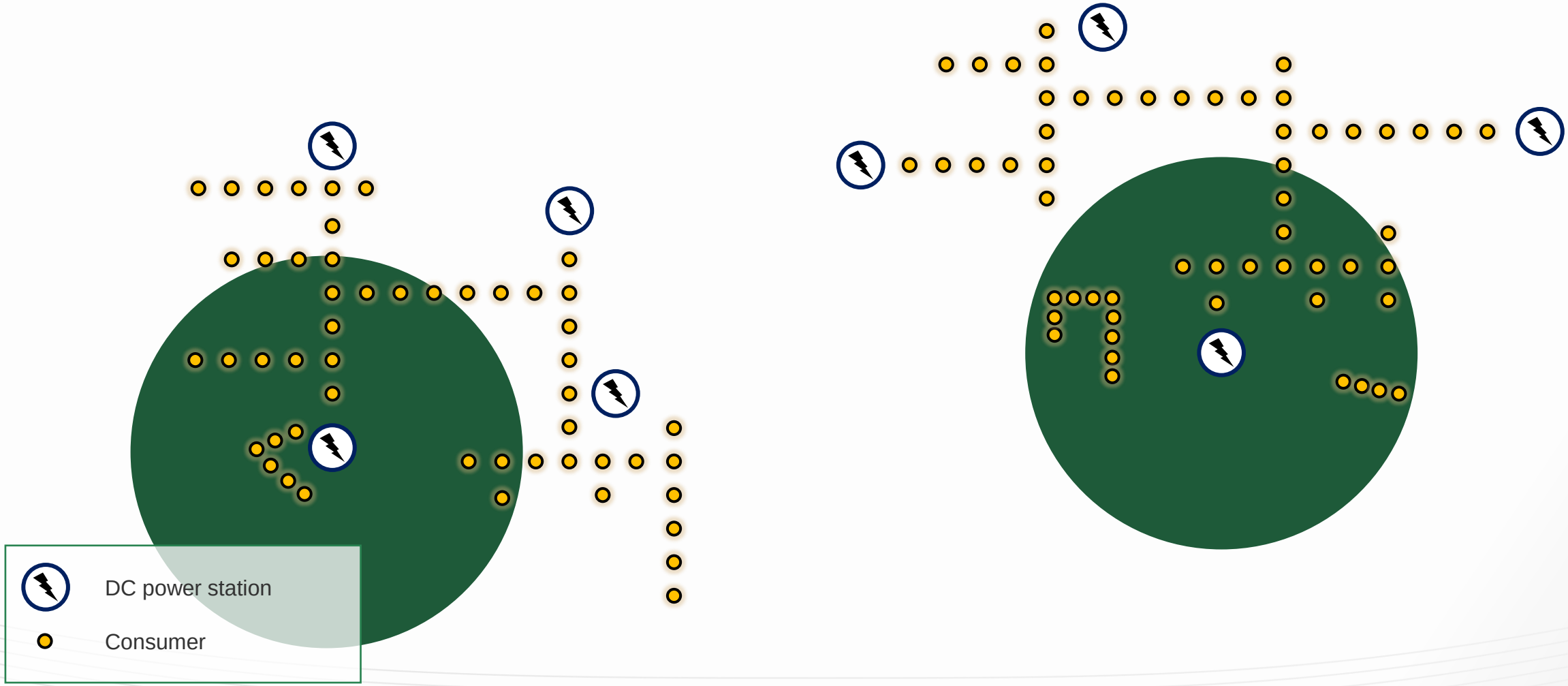
However, the economical range of DC systems was limited to half a mile



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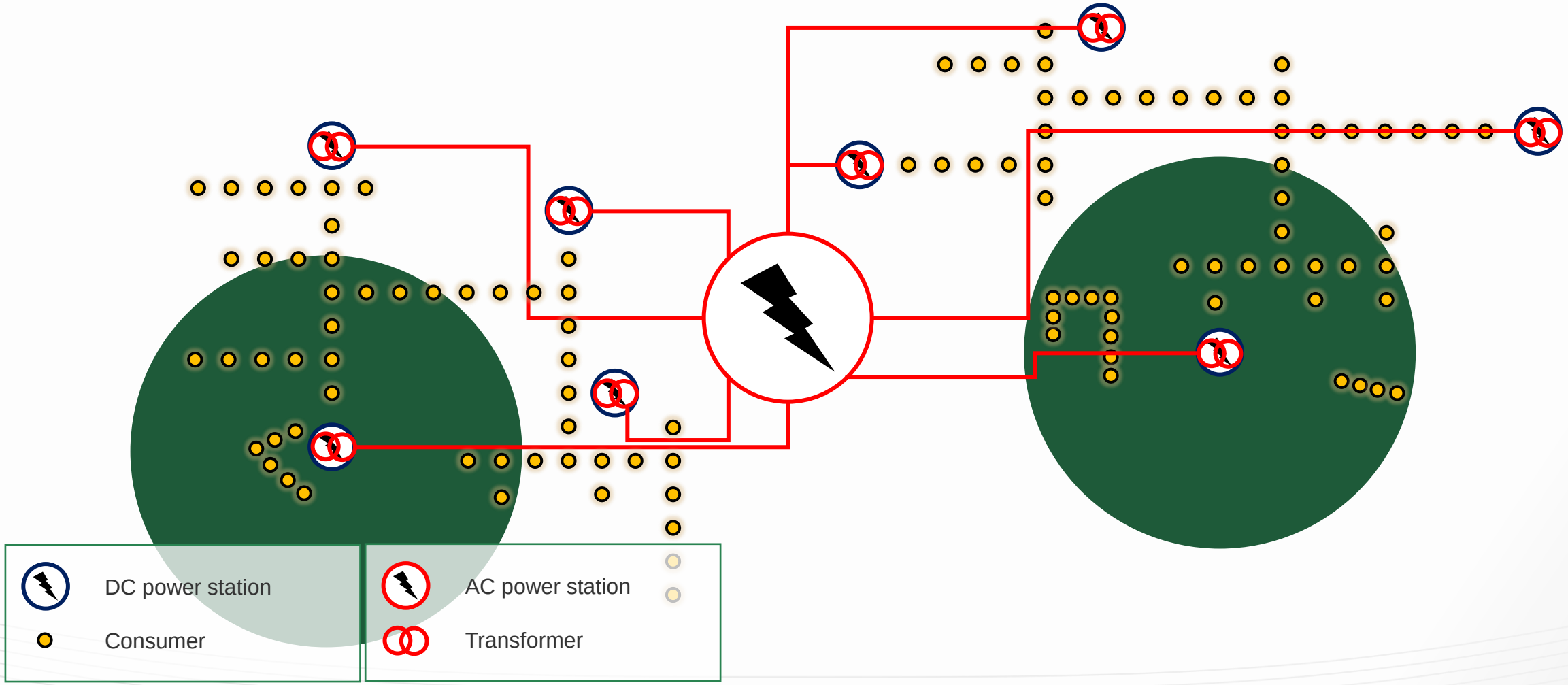
AC enabled centralization by economies-of-scale



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But times have changed…

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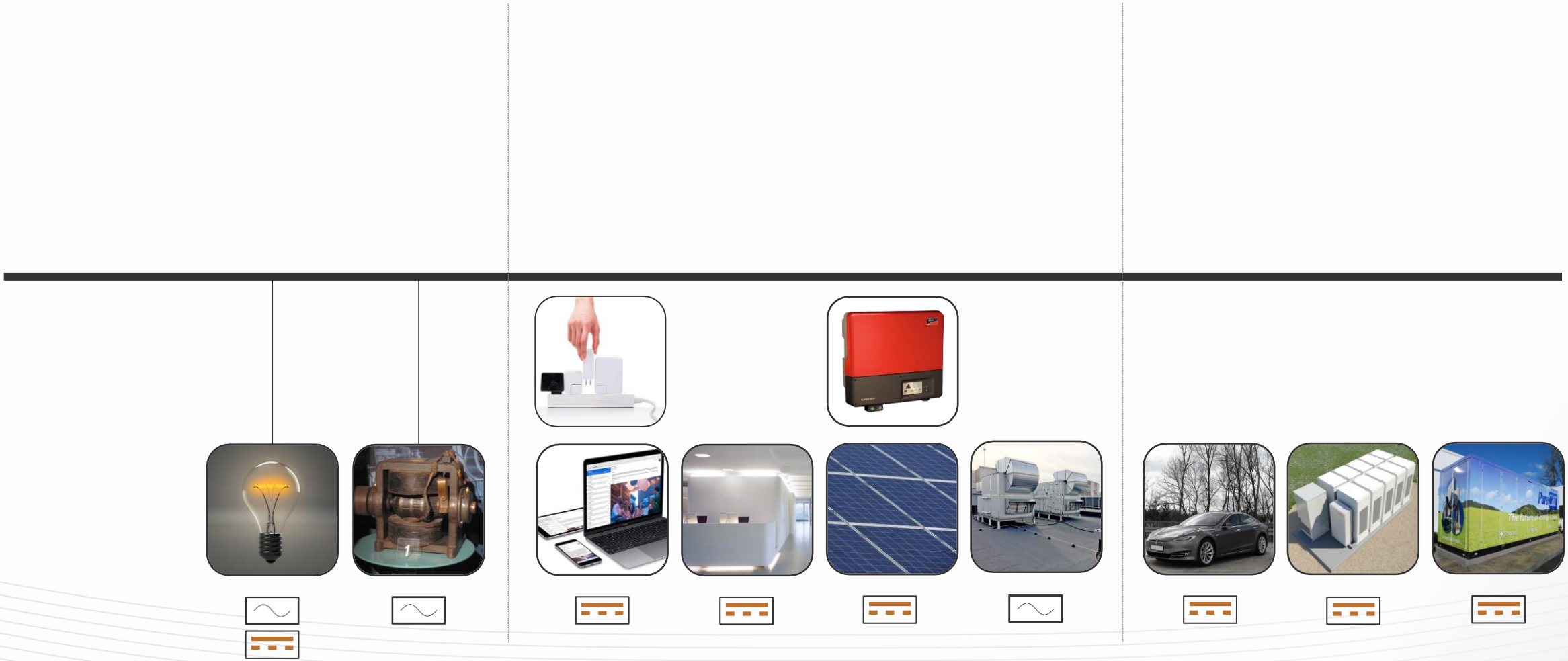
DC for an electric future



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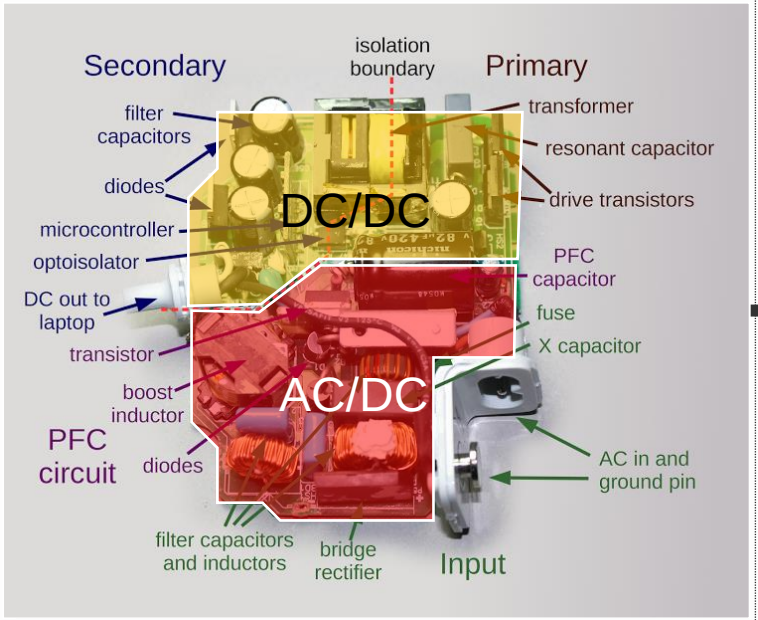
DC for a power electronics based future



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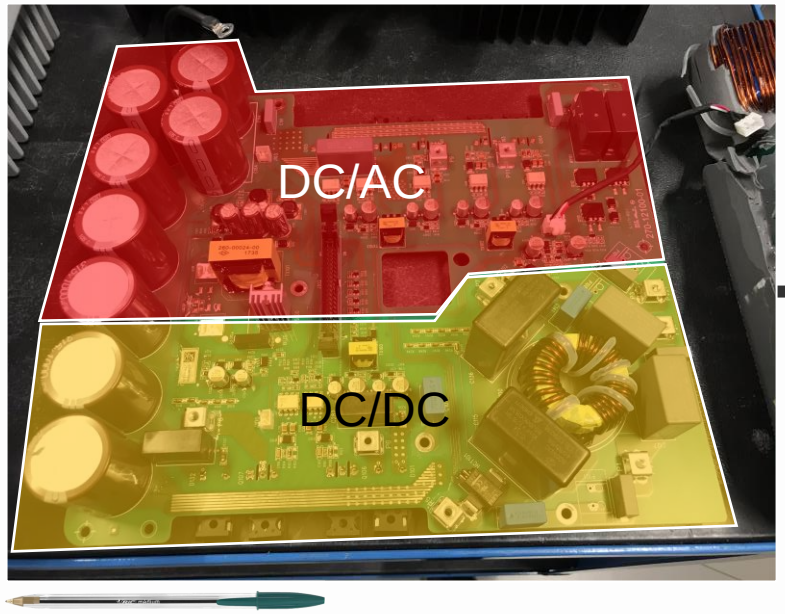
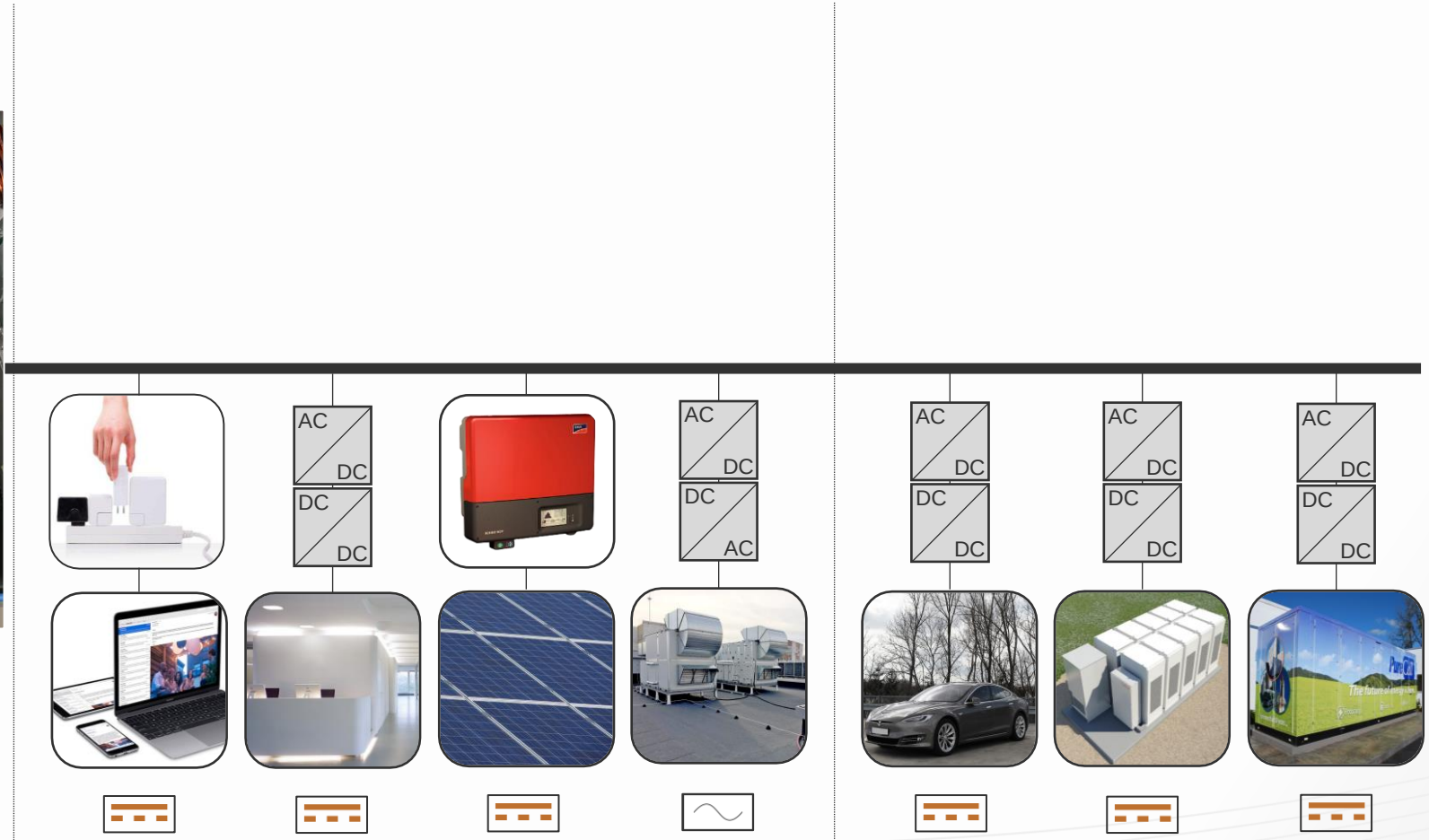
…both at the load and the generation side





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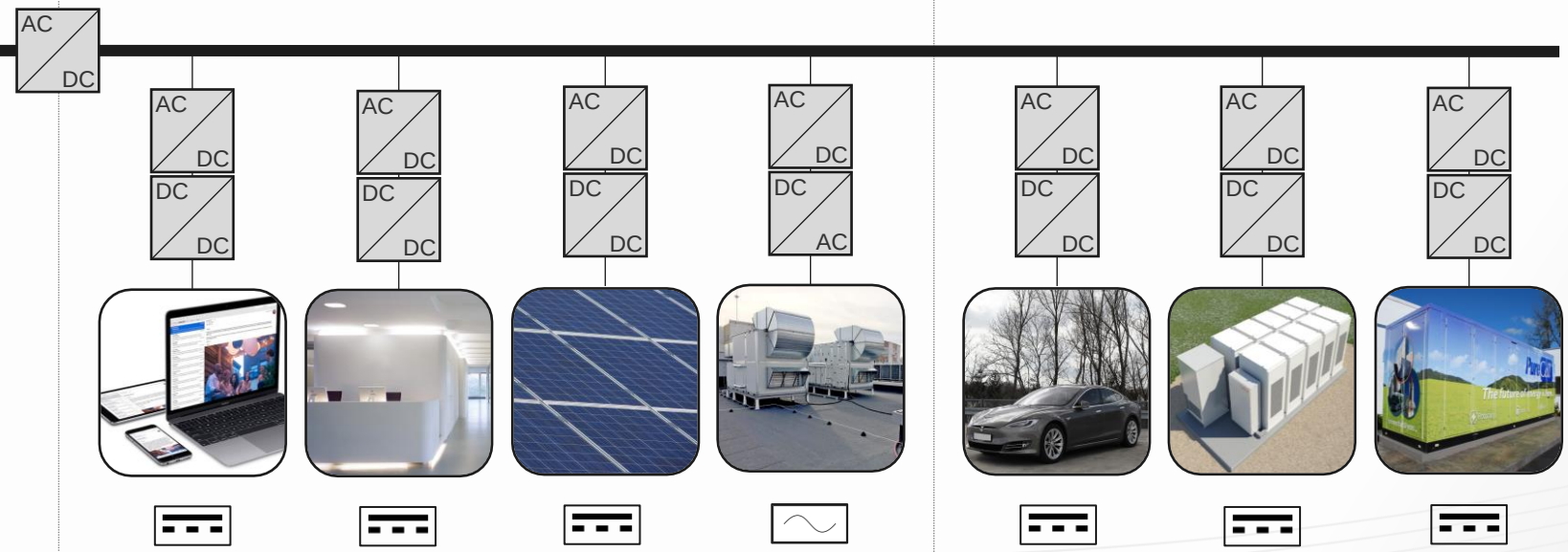
DC systems yield the lowest number of power conversion steps

Why DC distribution systems?

- Increased compatibility
  - Efficiency gains (5-15%pt savings)
  - Reliability improvement
  - Upfront cost savings (-30%)
  - Material resource savings
- Increased power transfer capability
  - Upfront cost savings
  - Material resource savings



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DC technology is favored in a variety of applications

Source: https://www.quadranet.com

Datacenters

Running on $380V_{DC}$

- 10% efficiency gains

(ABB, Green.ch datacenter, 1 MW)

- 15% less upfront capital cost
- 33% less floor space occupied
- Increased availability

Source: Arda Power

Commercial buildings and districts

Running on $+/-380V_{DC}$

- Reduce the number of converters
- Less conversion losses
- Able to operate in islanding mode
- Able to provide ancillary services to the AC grid

Source: DC Industrie

Industry

Running on $600V_{DC}$

- DC improves immunity and grid stability
- 40% less copper consumption
- Able to operate in islanding mode

Source: Direct Current BV

Street lighting

Running on $+/-350V_{DC}$

- Copper conductor savings
- Feeder length up to 4 km reduces the number of AC connection points
- LED driver becomes more reliable

Source: A. Jhunjhunwala, "The people's grid," IEEE Spectrum, vol. 54, no. 2, pp. 44–50, Feb. 2017.

Electricity access - Rural electrification

Running on $48V_{DC}$

- 4000 households in India
- 125W solar panel, lead-acid battery and a controller
- LED lighting, DC ceiling fan and smartphone charger

Source: Airbus

All-electric aircraft

Running on $270V_{DC}$

- Hydraulic actuators are going electric (Boeing 787 - Airbus A380)
  - Weight reduction
- DC systems reduce the number of components
  - Weigth and reliability improvement

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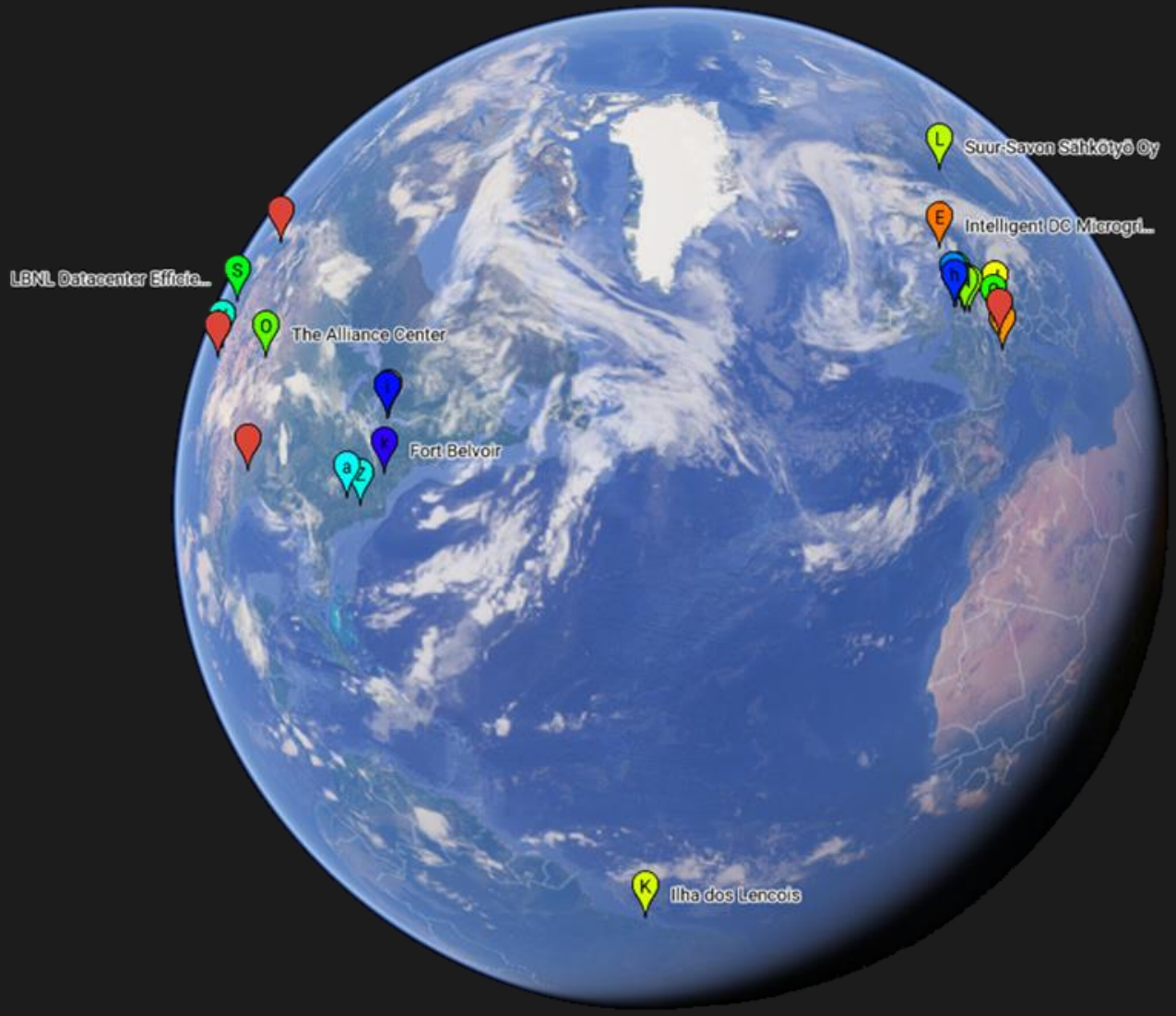
DC microgrids worldwide



https://map.dcinergy.com

DC projects in Flanders

	BIDC	MultiDC	SELFIE	Green Energy Park	ReSourced	oPENLAB
Project type	ICON	ICON	Ontwikkelings-project	Multiple projects	EU Urban Innovation Action	Horizon Europe
Power level	100 kW	10 kW-500 kW	1-2 MW	Up to 1 MW*	100 kW-1 MW*	10 kW-1 MW
Applications	Building-level, bipolar DC grids	Industrial applications	Local energy communities	DC EV charging and storage	Local energy communities	Local energy communities
Location	Genk	Multiple locations	Keiberg-Vossem	Zellik	Zwevegem	Genk
Project partners	KU Leuven, VITO, ABB, Imtech Belgium, Th!nk E	Project Coordinator: Flanders Make, KU Leuven	Interleuven, i.LECO, Powerdale, De Watergroep, Branch, Imtech, Dcinergy,	ABB, Bluways International, Imtech Belgium, Powerdale, Power Pulse, Priva Building Intelligence, SDM Projects, Scholt Energy Control, VDL Bus Roeselare, VUB	Leiedal, Zwevegem, de provincie West-Vlaanderen, Universiteit Gent, Flux50, VITO en REScoop.eu	Project Coordinator: VITO (see previous presenter)

* estimate

Met steun van: AGENTSCHAP INNOVEREN & ONDERNEMEN, Vlaanderen is ondernemen, EUROPEAN UNION European Regional Development Fund, flux50 ENERGISING THE FUTURE

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DC for local energy communities

STRENGTHS	• Save on **power conversion equipment** Reduced capex, increased efficiency, reduced footprint • Transfer **more power** across the same cable infrastructure (depending on the selected voltage level) • Ability to operate in both grid-connected and **islanding mode with a seamless transition** • **Modular** to scale-up and adapt to growing system needs. **Back-up power** (UPS) available throughout the system • **Autonomous control and power management**, even in the absence of communication	• Only a limited number of rapid, resettable **protection devices** (typ. solid-state) are available on the market today • **Field experience, training and course material** is relatively limited • Unanticipated **soft costs** related to design, commissioning, maintenance and operation	**WEAKNESSES**
OPPORTUNITIES	• Deployment of **EV charging stations** with battery storage for peak shaving and direct solar integration • Applications near commercial readiness: **Solar, battery, EV charging, LED lighting, IT equipment**	• Equipment specifications (e.g. voltage levels) are still primarily **vendor-specific**. A globally accepted standard for the DC voltage is still under development → catch 22. • Still **reconversion to AC** required to power legacy equipment (HVAC, appliances). It's a matter of certification and manufacturer effort, rather than a technical barrier. • The GREI (AREI) is not a threat	**THREATS**

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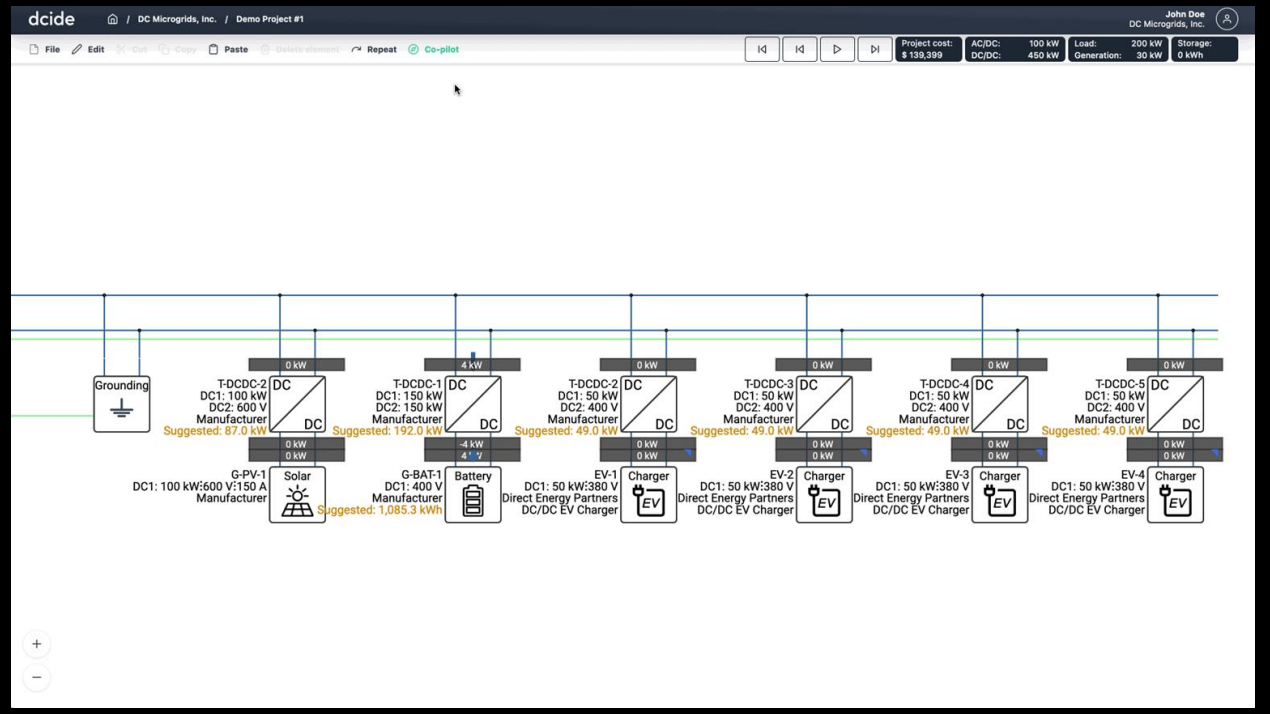
dcide

DC Integrated Design Environment

Helping you connect the DC dots with a co-pilot by your side



Check out https://www.directenergypartners.com

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