SBA
SMART BUILDINGS ALLIANCE FOR SMART CITIES

changeNOW
INTERNATIONAL SUMMIT FOR CHANGE
30 JAN - 1 FEB 2020 - PARIS GRAND PALAIS

SMART BUILDINGS & SMART CITIES
Challenges - Opportunities

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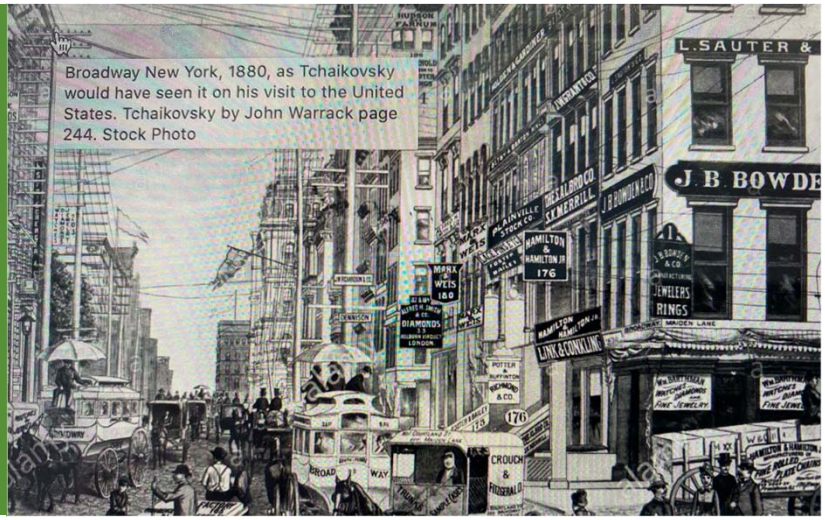
New York: The reference city of 20th century

1880

Electrification



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New York: The reference city of 20th century

1900/1910: Switch from carriage to Thermal car

Easter morning: 5th Ave, New York City

Source: US National Archives.

Source: George Grantham Bain Collection.

New York: Today…

Cities and buildings: Observation

Cities have grown

considering that resources were inexhaustible	Especially: Energy and Water but also sands and other materials - that is no longer the case …
considering that transportation was the solution to the lengthening of the distances	This has led to creation of Ghettos : where we are living, working, retailing, treating, teaching, … People in cities are spending more than 2 hours / transportation ▪ *Less time for themselves and social relation* ▪ *Higher costs and increased carbon footprint* ▪ *Cost of transportation + lost of time are balanced by increased cost of housings in cities*
mostly driven by financial purposes / very centralized	Instead of being at the center of the preoccupation Citizens have been rather considered as pawns

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CCities and buildings: Critical challenges

Economy

Cost of **housing/energy**: 25 % of European population in poverty

Cost of **Travel-time to work / Absenteism**

Energy & GHG Emissions

Urban Areas : 78 % of global energy consumption (Buildings & transport)
70% GHG Emissions

+ 10 % within last 10 years

Health & wellbeing

Major concern for citizen and stakeholders :
9 M. early death / Air **Pollutions**
➔ 63.000 France
➔ 500.000 Europe

Environment

Cars : 50 % of Cities' superficies

Global warming (+ 3°C / + 5°C… - 2100)

Water : 20 % water lost

Waste : > 70% global waste , + 70% / 1990 & +70% / 2050

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Cities and buildings: Limits are reached

THIS IS NO LONGER BEARABLE

WE NEED TO CHANGE

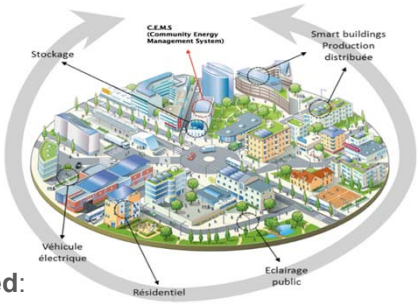
NOW

We have reached our limits : Environment / Social / Economic

We have to change

✓Our models

✓Our way of living



Radical changes are needed:

Activities & usages / Buildings / Mobility / Infrastructures /Urbanism

ENERGY is Crucial

The building's & Cities' energy challenges

The future will be a **full electric world** in which nearly all applications in daily life and at home will be **electrical**

Photovoltaic (PV)

will be standard on single- and double-family houses

Directive 2010/31/EU
– Nearly zero-energy buildings (NZEB) from 2020 on
→ Today PV is the cheapest way to fulfill this directive

Smart Grids

Buildings will be connected with the grid

By the replacement of nuclear and fossil fuel driven power plants with lots of volatile renewable generators the connection of all players in grid becomes mandatory

E-Mobility

Future cars will be electrical

All car manufacturers are designing their new cars as electric vehicles

Heating

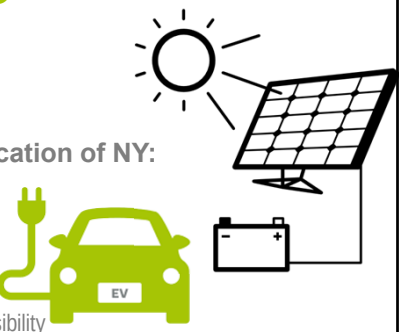
Heating will be electrical

From 2025 on heating systems based on combustion will be forbidden

Source : hager group

The electricity challenge

Before 1880 → **Transportation of electricity was in DC**
Promoted by Edison and supported by several patents



In 1882 → **AC has been selected for the electrification of NY:**
Promoted by Tesla - Transportation at High voltage was the major motivation of this choice

In 2020 → **Context has changed :**

- Transportation in DC at High Voltage becomes a possibility
- 41% of electricity in 2030 will be renewable (DC Native)
- All electronic devices are in DC.
  Double conversion = loss of energy and additional material / Converters
- EV and electrical storage is in DC

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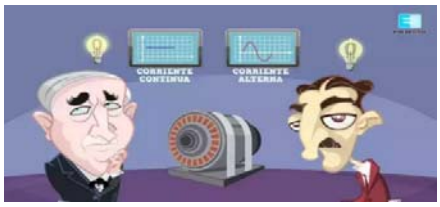
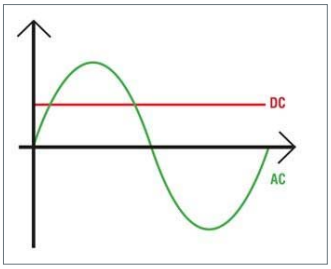
Why DC instead AC



Three basic characteristics of DC

1. **Simple:** No frequency, No phase, No amplitude
2. **Stability:** No periodic changes, No zero crossings
3. **Efficiency:** No reactive efficiency, High transmission efficiency



Three scenarios of DC application

1. **Long distance transmission:** Submarine Cable, Urban Underground Cable;
2. **High reliability power supply:** Data center, Electronic production line;
3. **High-precision control:** High-speed train, Electronic equipment control.

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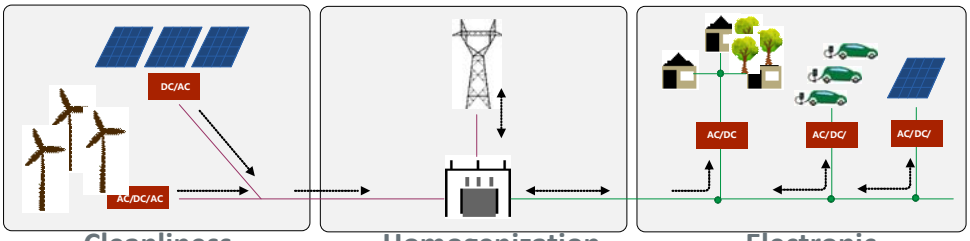
Why DC instead AC

Driving force:

From the both sides of **supply** and **demand**, distributed power supply and DC load promote the development of DC power distribution technology.

2050 Non-water renewable energy	Distribution Network loss	Generalized DC load
43.4%	15%	50%



Cleanliness Homogenization Electronic

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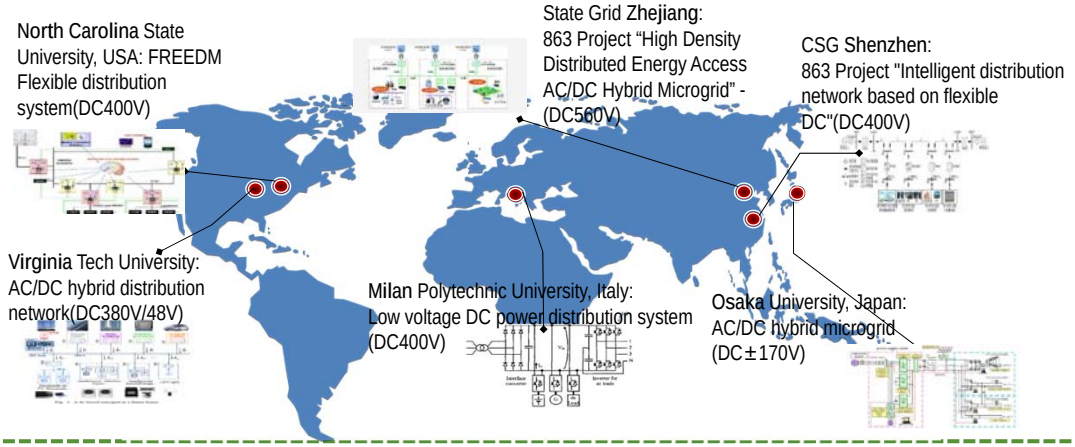
Why DC instead AC

Advances in DC research:

simultaneous research at home and abroad, supply-side leading demand, equipment leading applications, and industry leading civilian use.



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DC: Worldwide initiatives

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DC: a reality even in France

Example of Chateauneuf sur Loire

- H2020 Project
- Production of local energy / PV and Wind
- H2 Storage
- DC Distribution powering
- Outdoor public lighting (500 meters and 1 km in project) using same electrical network as in AC
- Residential Building and public Building for specific application (Lighting, IT,..)

Several other projects in progress

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DC: How to move forward?

Difficulties and challenges in building DC

Standard

Lack of design standards, testing standards, acceptance criteria.

Product

Product have not yet been marketed and serialized.

Coordination

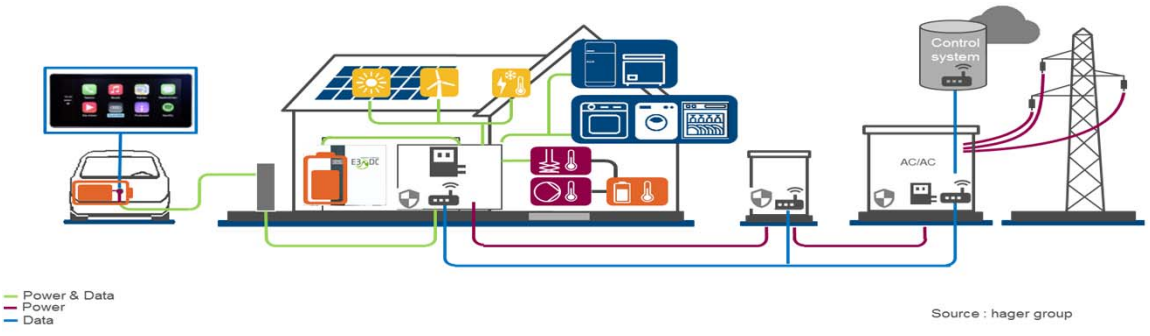
Different industries have different views, Lack of coordination.

Understanding

Public awareness of safety and stability, Professional ability improvement.

Vision of the global ecosystem

Grid evolution & offers



Source : hager group

Why should we move partially to DC global ecosystem?

Switching to DC will pull:

- Production and storage of renewable energies **DC**
- Electrical vehicles **DC**
- Electrical storage (H2 or Li-Ion) **DC**
- Micro-Grids (local production, storage and distribution) and emergence of mow carbon districts/territories
- Electrification in non electrified areas (reduced cost & increased efficiency)
- Simplification of electrical distribution (Low Voltage) : Less cables (PoE …), less protections, less converters, standardization of plugs : USB 3.1-C

Digital: an opportunity to support changes

- ➔ Every citizen
- ➔ Every building
- ➔ Every mobility
- ➔ Every territory and their equipment & infrastructures

WILL BE CONNECTED

#LET'S COMBINE DIGITAL TRANSITION AND ENERGY TRANSITION AND DEPLOY AT THE SAME TIME :

- *ENERGY EFFICIENCY SOLUTIONS*
- *DIGITAL INFRASTRUCTURES*
- *DC NETWORK*

Towards Micro-Grids: Energy/Water/Waste

In complement or as alternative to centralized networks migrate to:

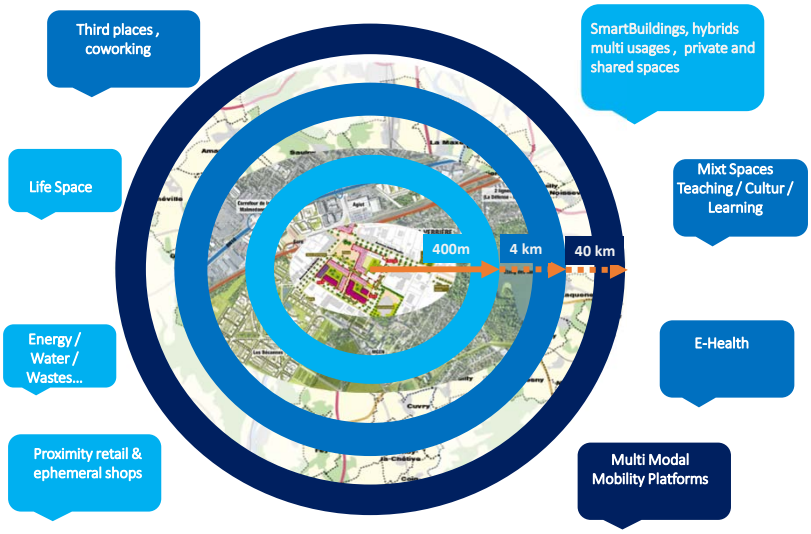
- Local production and storage of energy:
  2 networks AC/DC
- Local storage and treatment of rain/grey waters:
  2 Networks Drinkable/Grey water
- Local storage and treatment of organic wastes:
  Compost/CH4

#Recreate the Village of 21st century
#Rebuild the city above the city
#Reinvest the territories

Almost all services/activities within:

- 400m/4km: in urban areas
- 4km/40km: in rural areas

Services & activities closer to the users
District, Village, City, Territory



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Tomorrow ...

Buildings: plural, hybrid, multi-usage, scalable, service oriented

Cities: more diversity, proximity and frugality

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Thank You for Your Attention

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