

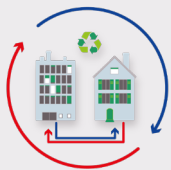
# Energy issues leading to 5GDHC concept

## About 5GDHC

In contrast to **traditional ones**, the 5<sup>th</sup> generation of district heating and cooling (5GDHC) is an intelligent thermal grid based on a **low-temperature loop** combined with **heat pumps** located at the user's premises, which bring the temperature to the required level.

It allows **the exchange of energy** between consumers and **the recovery of cold and heat** emitted by supermarkets, data centers, factories, offices, etc.

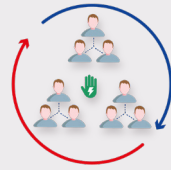
## 5GDHC defined by 5 principles



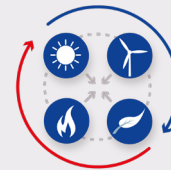
**Closing the energy loop**



**Using low-grade sources for low-grade demand**



**Decentralized & demand-driven energy supply**



**An integrated approach of energy flows**



**Local sources as a priority**



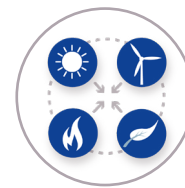
The low-temperature of the ambient loop is usually brought up or down to meet the consumer needs thanks to heat pumps which consume electricity.

**BUT**

Peak loads on the thermal grid will create or aggravate **peak loads on the power grid**, usually covered by **fossil fuels**.

**Electricity costs are rising**

**x 5** between January 2020 and September 2022\*



Therefore, one of 5GDHC key principle is to have **an integrated approach of energy flows (in particular electric and thermal)** to shift or shave peak loads (through demand-side management, thermal storage, etc.)

## The other solution is to locally produce the electricity needed



The grid will benefit from a decentralized low-carbon electricity



The installation can also supply other electricity uses of the district



And participate even more to national objectives on the installation of renewable energy.



It's an economically safe choice which will protect the grid from electricity costs raise and is highly subsidised by most European countries, especially those behind the target sets by the EU.

# Which solutions for producing local renewable electricity?

Solar being the easiest solution, which enables to valorise unexploited spaces like roofs, D2Grids project decided to focus on this technology.

## How can a 5GDHC grid benefit from the best practices of solar energy?



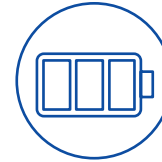
### Solar energy solutions

- **Power-to-heat**  
Self-produced renewable electricity to supply :
  - The electric installations of the 5G grid (heat pumps)
  - Other uses of the district: housings, stores, electric mobility, etc.
- **Thermal/ PVT hybrid solar panels to produce domestic hot water in addition to heating from the grid**



### Smart monitoring & control

- **Intelligent and real time balance** between demand and supply to allow for various operational models:
  - Providing green electricity to heat pumps in the thermal grid to other consumers
  - Selling surplus energy to electricity grid operators
  - Storing energy to balance fluctuations



### Storage facilities

- **Optimizing the local use** of the energy produced and distribution to other consumers and producers through storage:
  - Thermal storage
  - Electric storage

## Governance: who can produce the needed renewable electricity?

The thermal grid owner or operator being the producer of the electricity is the most straightforward solution (like Glasgow and Plymouth pilote sites).

However, 5G is intended to encourage consumers to be "prosumers": they can also be producers of the electricity, and sell it to the 5G grid, as the Social Housing Organisation Seqens is doing it in Paris-Saclay.



### Good to know:

European countries have various legal framework for sharing energy

#### Ex.1 Self-consumption in France



- **Individual self-consumption** when the consumer is the producer
- **Collective self-consumption** for 2+ players:
  - **Restricted collective self-consumption** when the consumption is shared between consumers of the same building;
  - **Extended self-consumption** when the actors are not all in the same building, but within a perimeter of 2km.

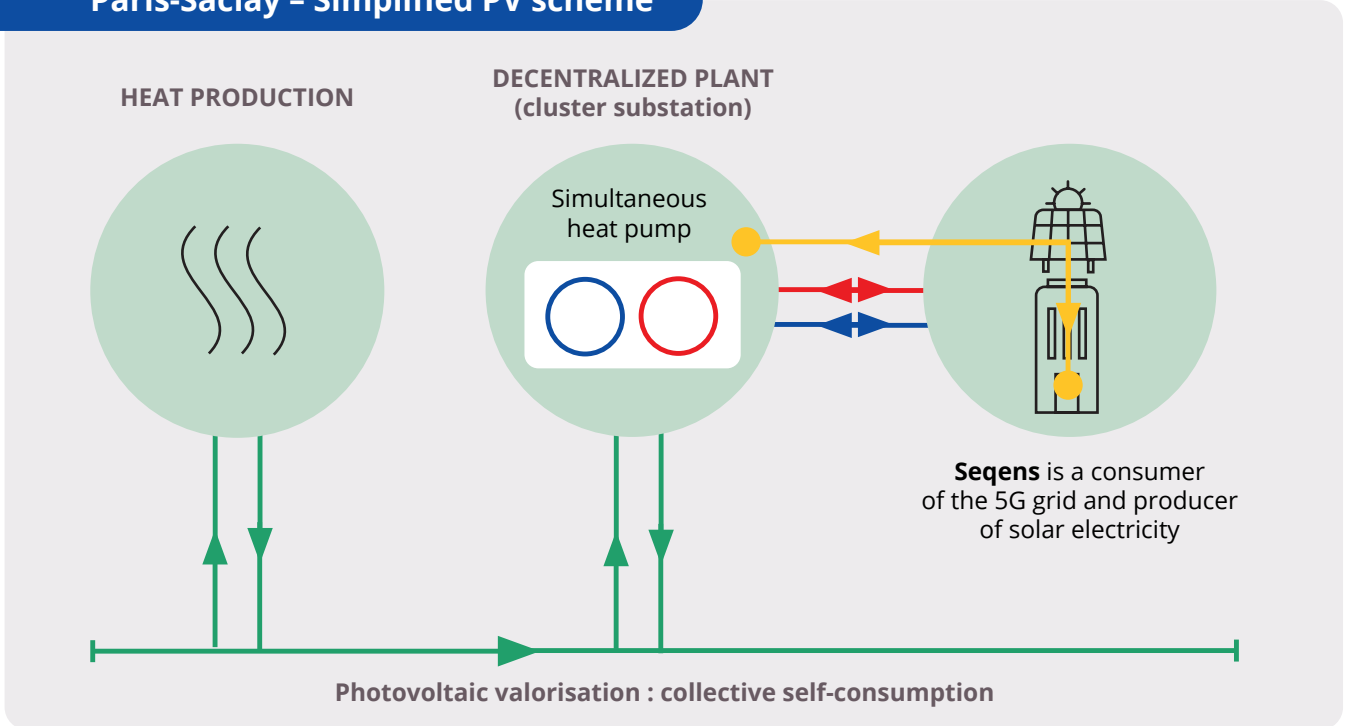
#### Ex. 2 Energy sharing in Belgium



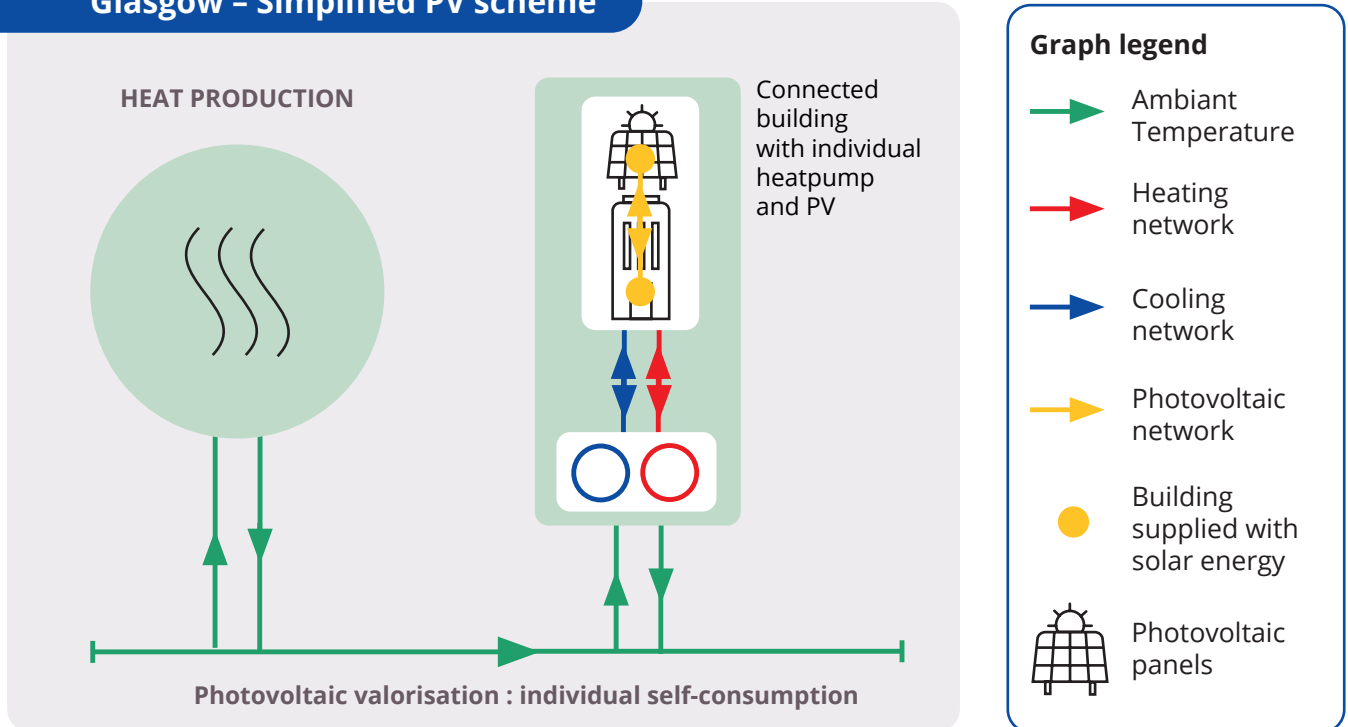
- **Energy sharing** when energy producers:
  - Collectively own the production through an energy community;
  - Share energy for free.
- **Energy selling** when 2 or more peers share energy through payment:
  - Peer2Peer one-to-one
  - P2P one to many (all peers need to have the same energy supplier).

# And concretely on the pilot projects?

## Paris-Saclay – Simplified PV scheme



## Glasgow – Simplified PV scheme



# Renewable energy is an essential key for 5GDHC projects

## For having an integrated approach of energy consumption

### To reduce GHG emissions and energy costs



**Have a complete and holistic view of energy consumption at a territory scale**

Include the best practices for production, distribution, storage, and management of local renewable electricity in 5GDHC grids.



**Create a local energy community with low carbon emissions**

- Carbon intensity reduced at its lowest for a sustainable quality of service
- Making consumers become prosumers furthermore



**Curb energy costs on the long-term**

- Investments that provide a long-term visibility / predictability
- Protect the territory community from costs evolution

## Next steps:

### Strengthening the synergies between DHC and electricity networks

**As a result of the 2<sup>nd</sup> capitalisation call**, the D2Grids consortium is now also working on better integration of electrical demand and local renewable electricity production capacities, to improve the decarbonisation of 5GDHC grids.

GreenFlex is the leader of this new “Capitalisation Work Package”, which is composed of 7 partners from the initial consortium (Mijnwater B.V, Asper Investment Management, Clyde Gateway, Open University, Construction21, VITO and GreenFlex) and 3 new partners (Scottish Water Horizons, LLC & Associates Lawyers and the french social housing company Seqens).

The consortium has worked to **demonstrate the technical, legal, economic and organisational relevance of integrating local renewable electricity and heat production with local needs for heating, cooling, and electricity** (from buildings, urban structures or even charging stations for electric vehicles) while also considering the associated possibilities for better flexibility (reducing peak demand or utilising storage).

## D2Grids project

The D2Grids project aims to develop a generic technology model for 5th generation district heating and cooling grids, to create a solid business plan, to promote this new generation of smart local energy grids, train professionals for its deployment, and demonstrate the technology through impactful pilot investments in: Paris Saclay (FR), Bochum (DE), Brunssum (NL), Glasgow (SC) and Plymouth (EN).

It is an Interreg North-West Europe (NWE) project that runs for **more than 5 years** (2018-2023).