

FRAÎCHEUR DE PARIS

REFRESHING PARISIANS, STRENGTHENING
THE CITY'S RESILIENCE, ADAPTING PARIS TO
GLOBAL WARMING

fraicheur de ville



THE PUBLIC REFRIGERATION SERVICE

Fraîcheur de Paris develops and operates the **urban cooling network, the first in Europe** and the 11th in the world, by integrating ambitious objectives to support the City in its decarbonization and climate change adaptation process.

Fraîcheur de Paris meets the cooling needs of hotels, department stores, offices and museums in the capital. **10 production sites and 4 storage sites supply nearly 400 GWh/year of cooling to more than 730 buildings via 89 kilometers of networks.**

Fraîcheur de Paris is the successor to CLIMESPACE, an ENGIE subsidiary and concessionaire since 1991, and is jointly owned by ENGIE (85%) and RATP Group (15%). With 30 years of experience, it offers a sustainable alternative to traditional air conditioning solutions.

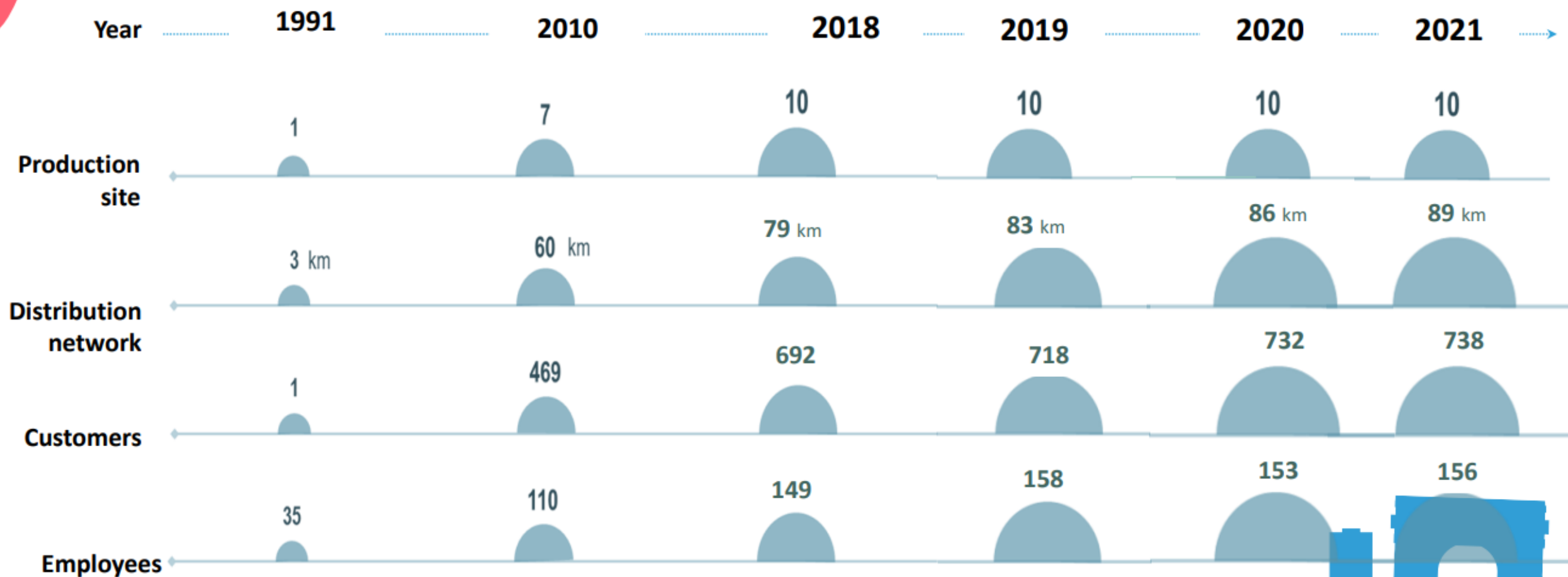
The public cooling service consignee is certified ISO 50001 (energy efficiency), ISO 45001 (health and safety) and ISO 14001 (environmental management). **The cooling utility is carbon neutral 2018 and the cooling network is 100% EnR&R certified since 2013**, thanks to the purchase of guaranteed origin electricity from existing renewable assets.

THE COLD NETWORK IS A TOOL FOR THE CITY TO ADAPT TO GLOBAL WARMING

- ▶ **By cooling buildings with fragile people** (schools, care homes, hospitals, etc.)
- ▶ Because it is **more beneficial to the environment** than stand-alone installations
- ▶ Because it reduces **the urban heat island effect**
- ▶ Because the City **can mandate the use of green and local electricity**

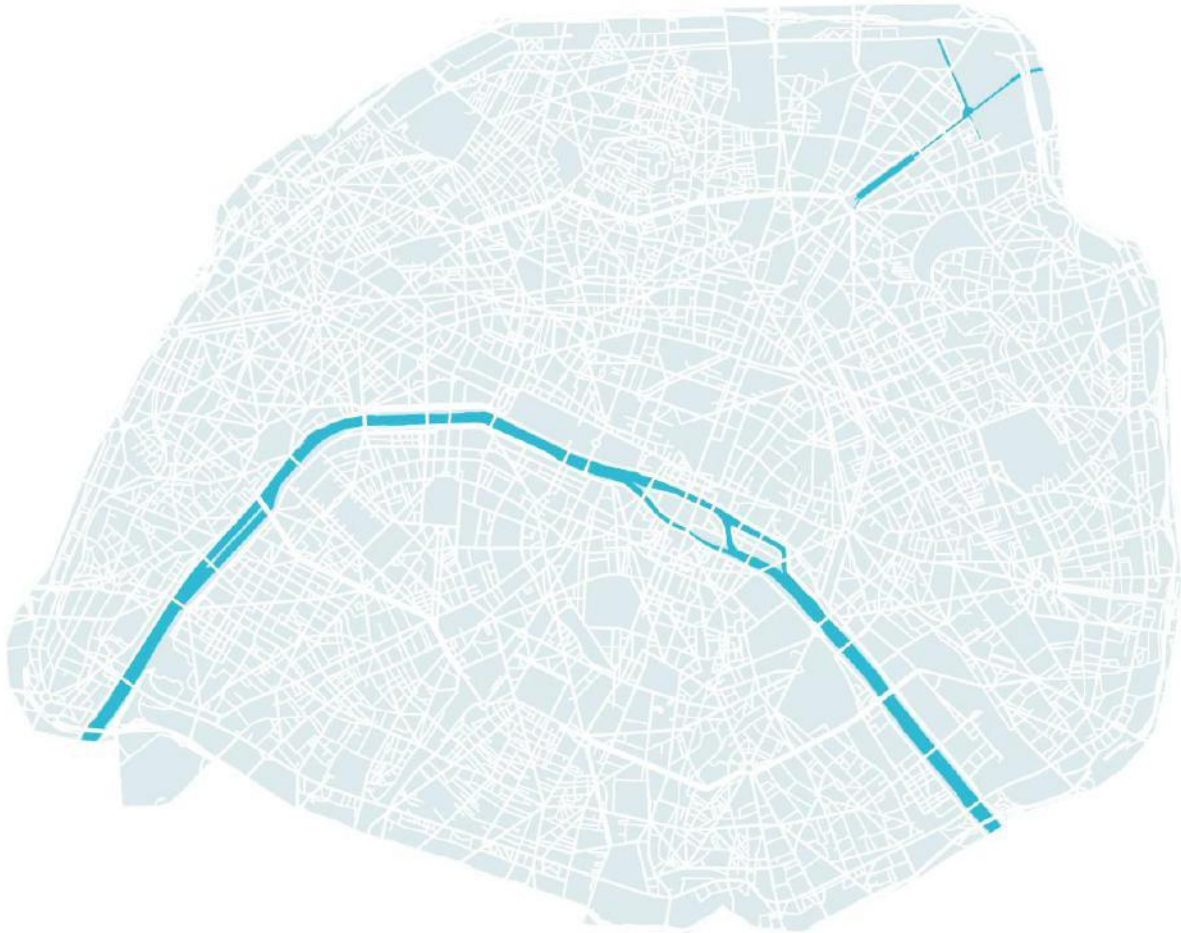


EVOLUTION OF THE DISTRICT COOLING NETWORK SINCE 1991

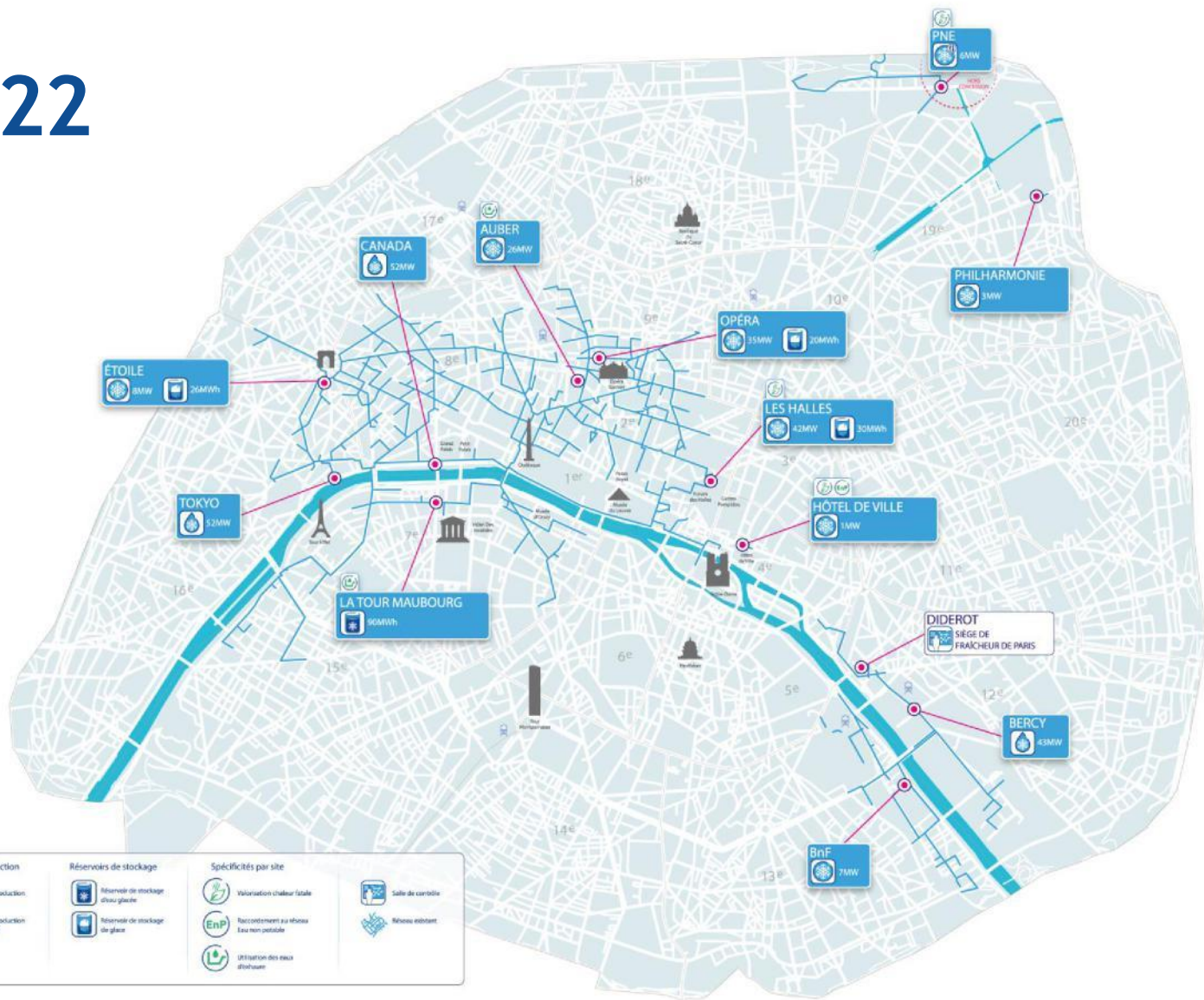


NETWORK DEVELOPMENT FROM 1991 TO 2042

1991



2022



Légende

Centrales de production	Réservoirs de stockage	Spécificités par site	
Centrale de production	Réservoir de stockage d'eau glacée	Valorisation chaleur fatale	Salle de contrôle
Centrale de production (Eau de Seine)	Réservoir de stockage de glace	Raccordement au réseau Eau non potable	Réseau existant
		Utilisation des eaux d'exhausteur	Réseau futur

Légende

Centrales de production	Réservoirs de stockage
Centrale de production	Réservoir de stockage d'eau glacée
Centrale de production (Défente Gaz)	Réservoir de stockage de glace
Centrale de production (Géothermie)	
Centrale de production (Boucle eau chaude)	
Centrale de production (Eau de Seine)	
Spécificités par site	
Valorisation chaleur fatale	Salle de contrôle
Raccordement au réseau Eau non potable	Réseau existant
Utilisation des eaux d'exhausteur	Réseau futur
Production locale électricité photovoltaïque	2022 Date de mise en service

Key Figures 2022



374,1 GWh/year cooling energy sold



467 MW of power contracted



738 customers



6 millions square meters of cooling in Paris



89 km round-trip underground network under your feet



269 MW of installed capacity



3 Seine water power plants



7 cooling tower plants



4 energy storage sites

NETWORK DEPLOYMENT 2042

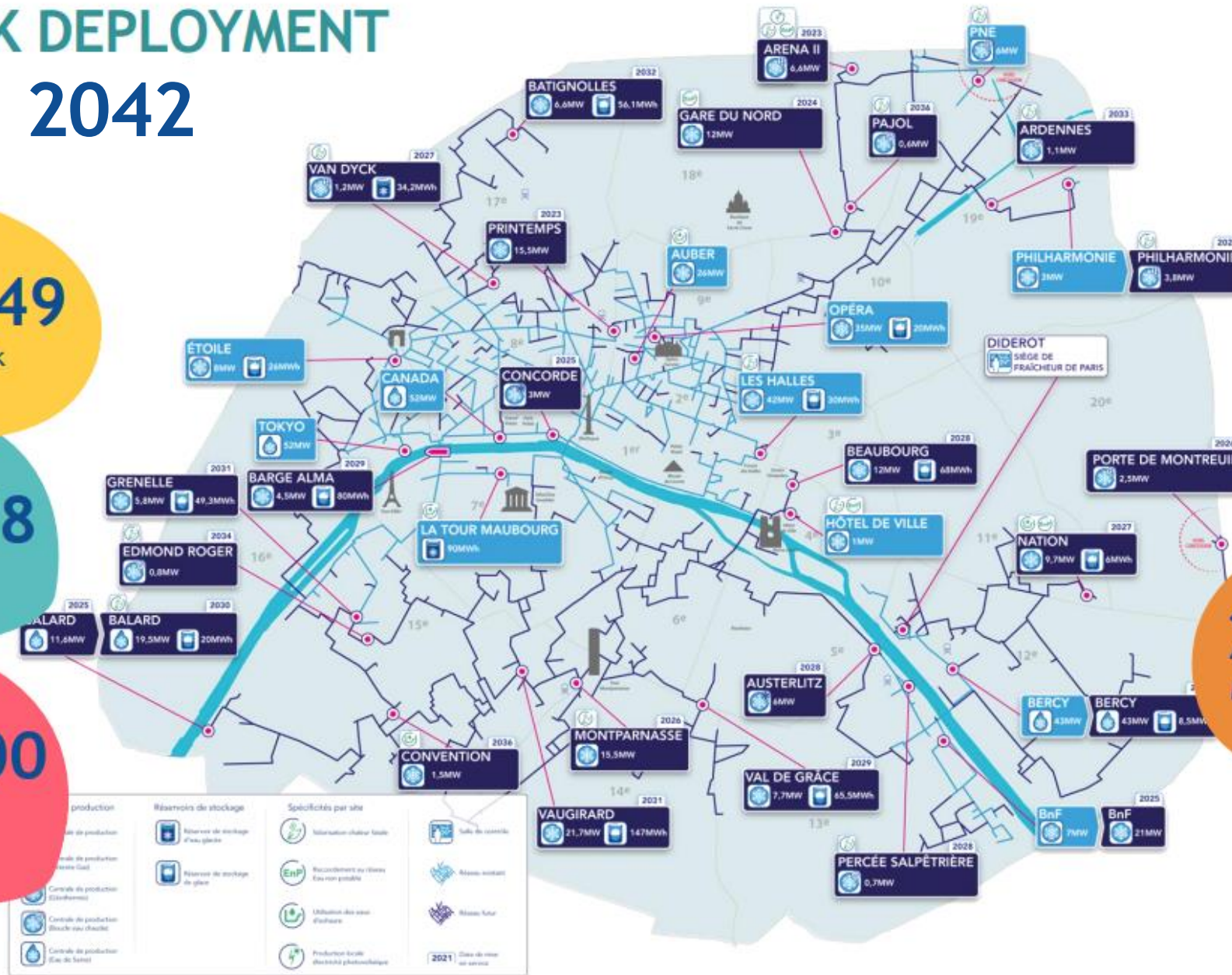
89 → 249
km of network

738 → 3058
Customers

450 → 1000
GWh/year

12 → 33
means of delivery

269 → 553
MW of production installed



SUBSCRIBERS TO THE DISTRICT COOLING NETWORK



Offices

Allianz
Axa
BNP Paribas REPM
Constructa
Crédit Lyonnais
GECINA
Generali
Groupama immobilier
Natixis
SCOR

Department stores

Beaugrenelle
Carrousel du Louvre
Forum des Halles
Galeries Lafayette

Museums, theaters

Le Louvre
Musée du quai Branly
Musée Grévin
Cité de la Musique
Salle Pleyel
La Philharmonie

Hotels

Le Bristol
Le FourSeasons Georges V
Le Peninsula
Le Meurice
Le Plaza Athénée

Official buildings

Assemblée nationale
Ministère de La Défense
Ministère de l'Ecologie
Hôtel de Ville de Paris



A NEW CONCESSIONAIRE FOR THE PARISIAN DISTRICT COOLING NETWORK



A New identity as of April 5th, 2022

CLIMESPACE



fraîcheur de ville



THE PROJECT AND THE SUBMISSION OF PROPOSALS/OFFERS



OFFERS EVALUATED ACCORDING TO DEFINED CRITERIA

The candidates' offers are evaluated according to 4 criteria scoring

▶ Criterion 1 : Technical and environmental quality (45%)

- > Development strategy and investment master plan
- > Energy and environmental performance
- > Quality of organization and resources

▶ Criterion 2: Competitiveness and economic and financial viability (30%)

- > Competitiveness of the tariff structure
- > Economic and financial viability of the offer

▶ Criterion 3: Contractual and legal commitments (15%)

- > Degree of acceptance and improvement of the draft contract
- > Robustness of the contractual mechanism: guarantees, insurance

▶ Criterion 4: Quality of relations with subscribers, users and the concession grantor (10%)

- > Relations with subscribers and users
- > Relations with the concession grantor and tilting period

But a relatively unknown scoring method...

(we only have half of the scoring system)



THE OFFER AT A GLANCE



13,350 pages, 27 binders
40 films, 1 brochure and 1 penguin



20,000 lines of code to create a
network modeling tool unique
in the Group



4 fridges
1 3D digital model of the
network in the city

2 years tender process



THE VISION FOR THE DEVELOPMENT OF THE PARISIAN COOLING NETWORK



FRAÎCHEUR DE PARIS



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THE COLD NETWORK OF TOMORROW WILL BE...

1

Deployed throughout the city

To maximize its coverage

4

Integrated

in its ecosystem to support the transformation of the city

5

Economically robust

to ensure accessibility to the service and guarantee its continuity

2

Open

to new uses to strengthen the resilience of Paris

3

Even more efficient

and environmental for an even more virtuous service



FRAICHEUR DE PARIS OFFER



FRAÏCHEUR DE PARIS



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1. THE CONTRACT AND ITS PHILOSOPHY



FRAÎCHEUR DE PARIS



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THE PHILOSOPHY OF THE CONTRACT

A roadmap drawn for the next 20 years

➤ The Master Investment Plan

A 20-year commitment in terms of number of subscribers, contracted power, network kilometers, subject to strong penalties if not achieved

➤ The performance indicators

65 indicators and penalized liabilities

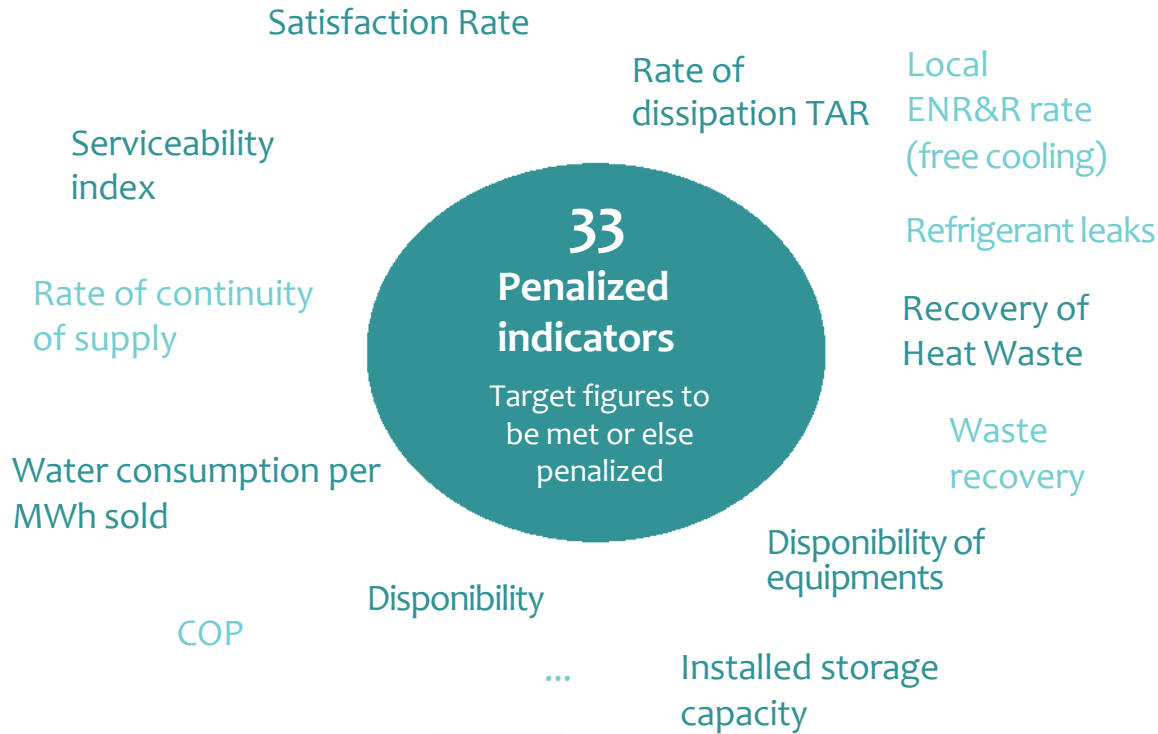
➤ A very present and conceding authority

- A monitoring and steering committee: 4 meetings per year
- Monthly, quarterly and annual reports
- A validation of all major files
- Extensive documentation shared with the City on the **City of Paris extranet**



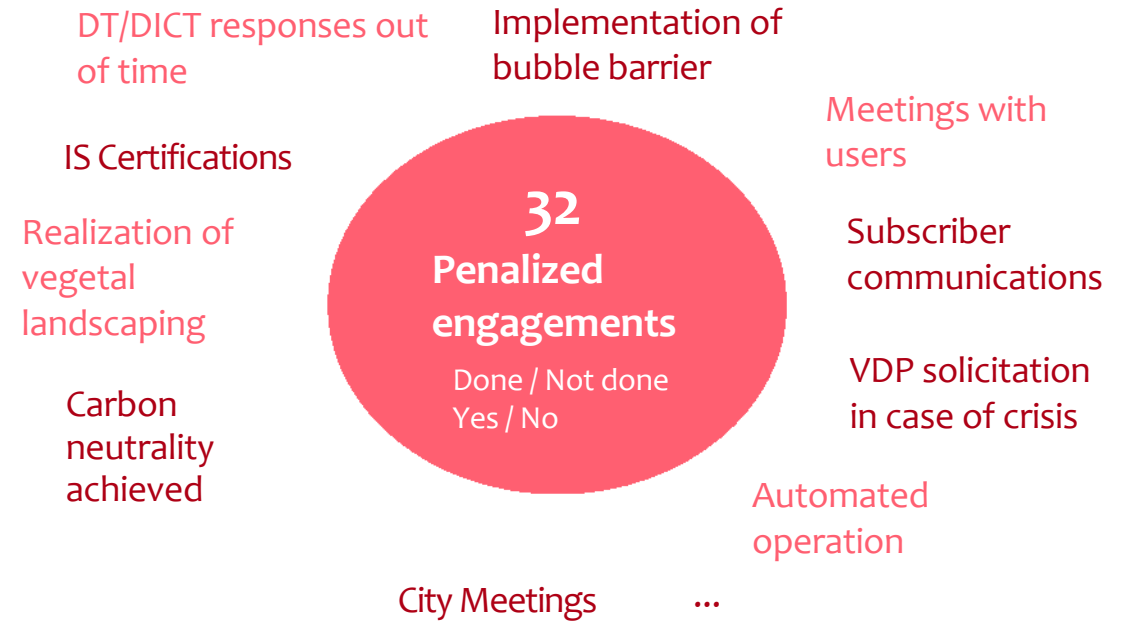
PENALIZED INDICATORS & COMMITMENTS

Annex 2 of the draft contract



Fixed penalty of 20 k€

In case of non-compliance with the **maximum threshold** of the annual ratio of consumption of water by the network per year of excess



Penalty of 50 €/response

beyond one hour following a DT / DICT / ATU request

2. THE DEVELOPMENT



FRAÎCHEUR DE PARIS



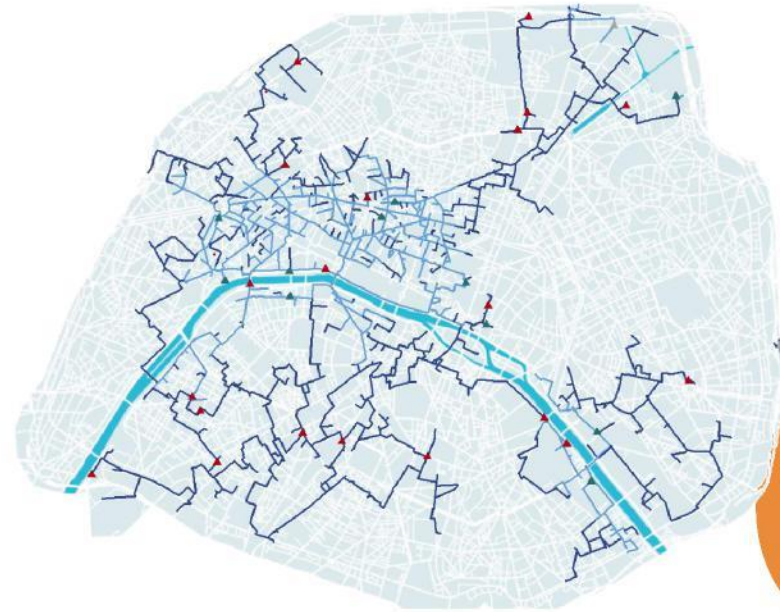
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NETWORK DEPLOYMENT

91 → 249
km of network

780 → 3058
Subscribers

450 → 1000
GWh/year



12 → 33
Means of production

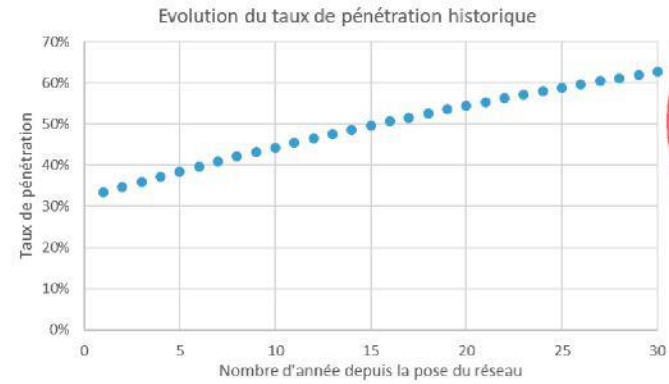
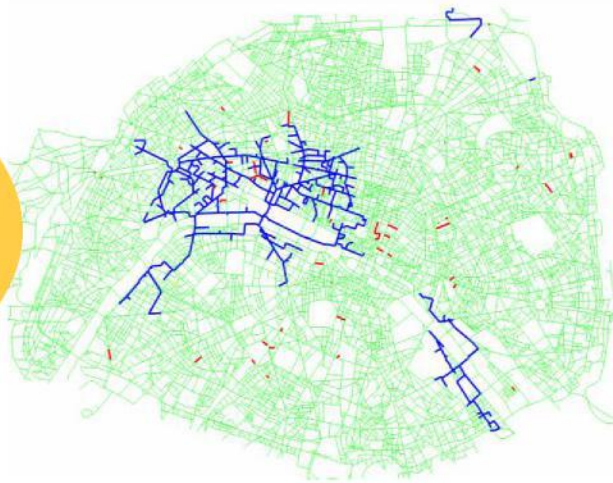
303 → 553
MW of production installed



ROBUSTNESS OF THE DEPLOYMENT

Simulations in NEMO for validation

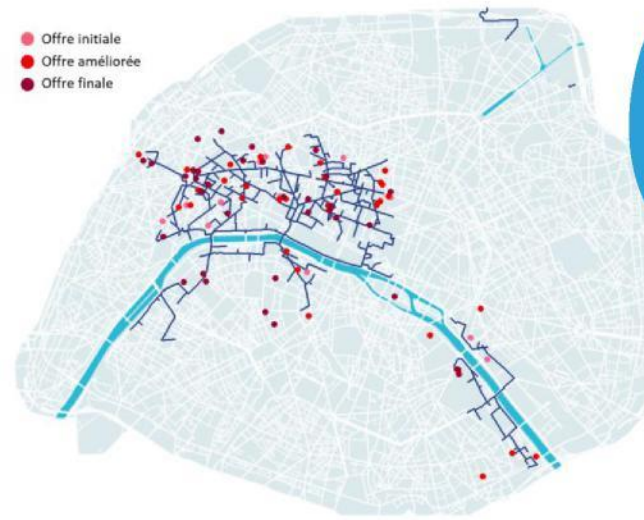
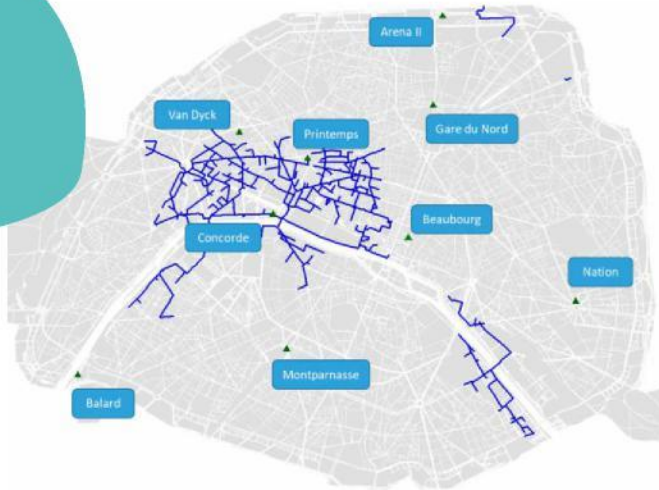
Passage constraints: study of 90 km of road



Past connection dynamics

LAND IDENTIFIED

For power plants



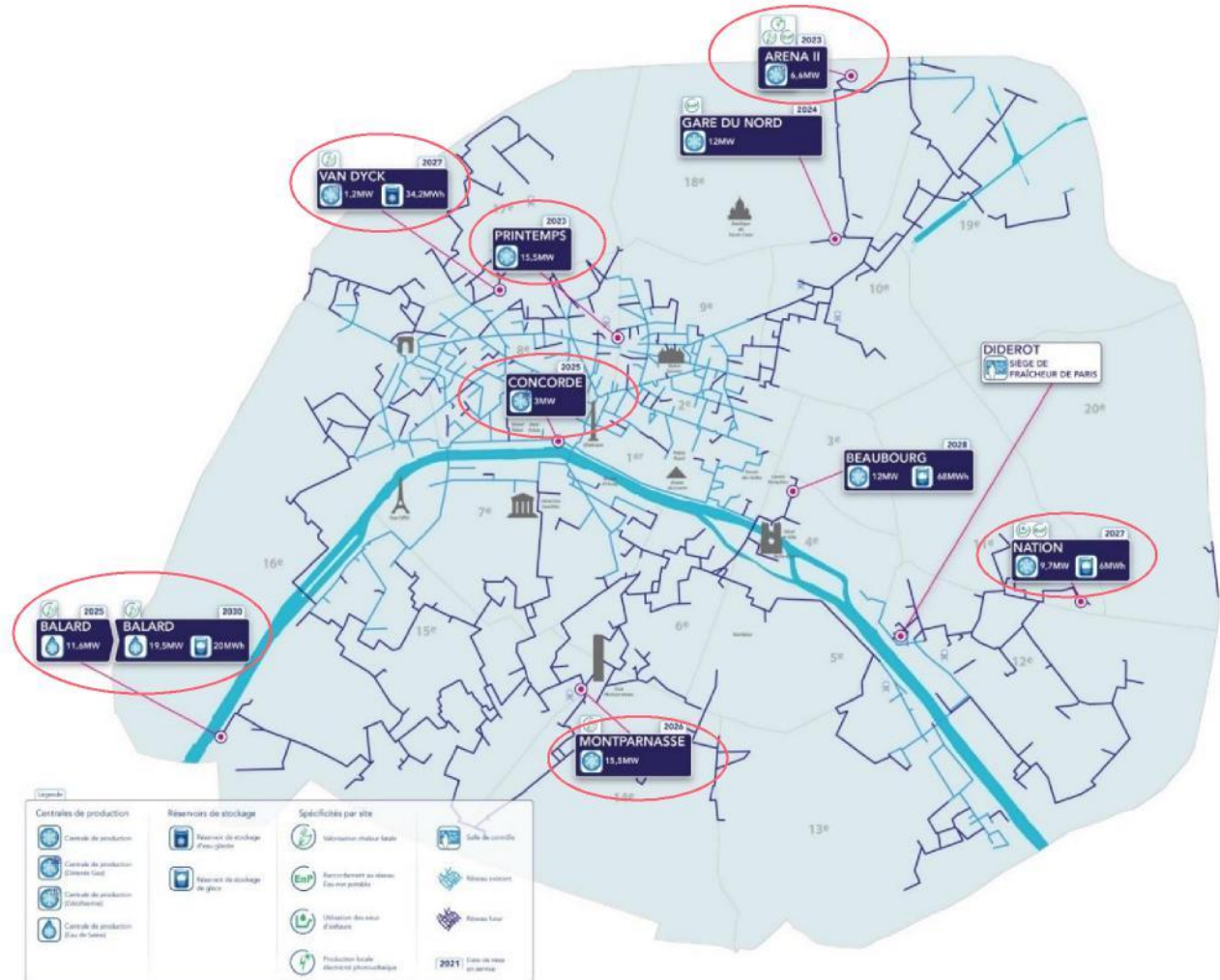
Letters of intent to connect

IDENTIFIED AND SECURED LAND OVER A 5-YEAR HORIZON

2022-2027 - SITES IDENTIFIED IN THE SHORT-TERM

7 new plants already identified and studied

- > Printemps – Bought in 2022
- > Arena II - 2023
- > Balard - 2025
- > Concorde - 2025
- > Montparnasse - 2026
- > Nation – RATP - 2027
- > Van Dyck – RATP - 2027



CENTRAL PLANT IN CONCORDE - 2025

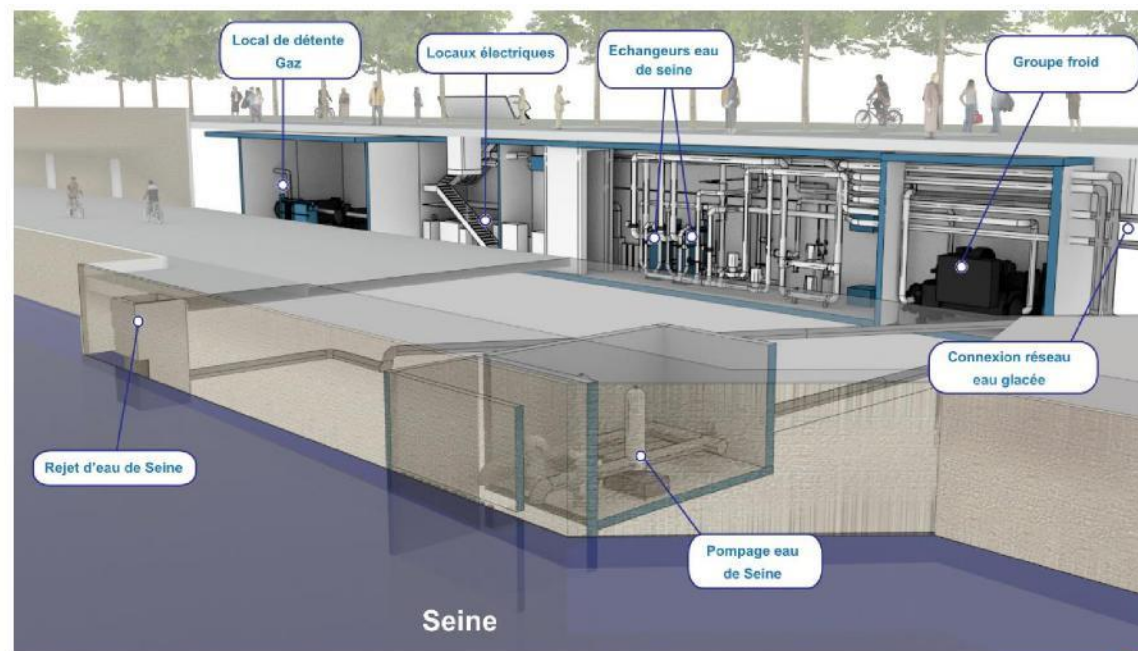
Innovative power plant with recovery of waste cold from GRTgaz pressure reduction stations

Characteristics :



3 MW

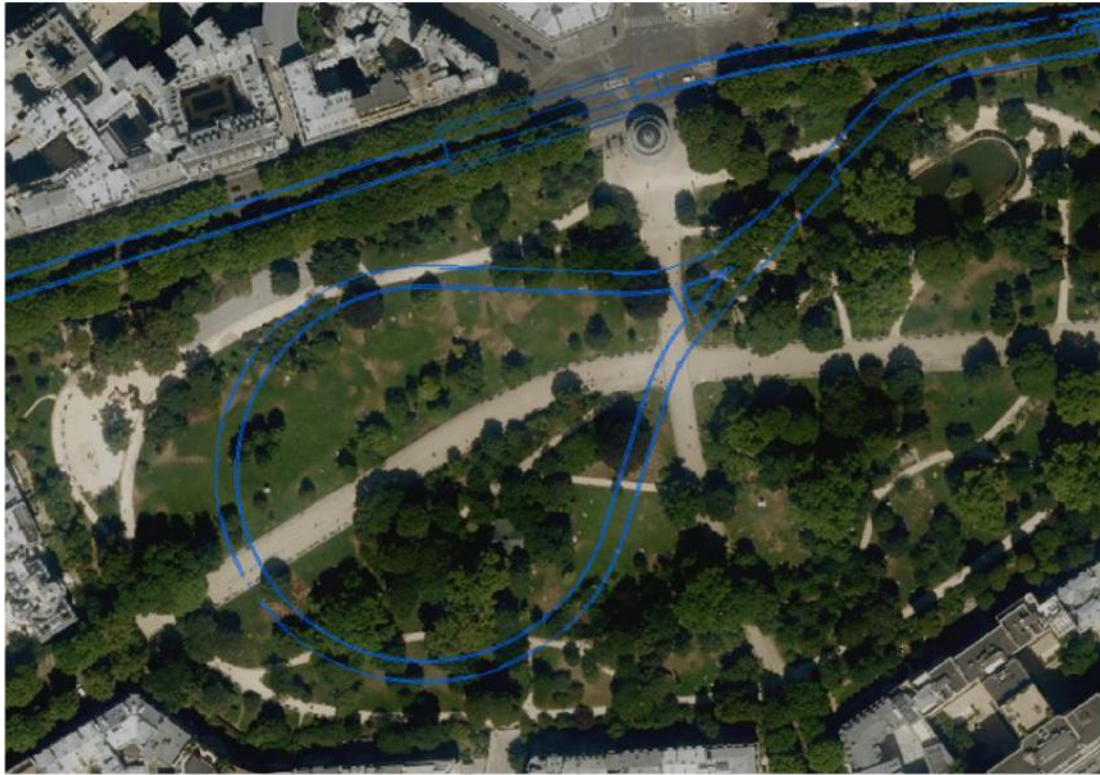
- > 3 MW of installed power
- > Recovery of waste cold from gas pressure reduction
- > Recovery of decarbonized electricity generated by pressure reduction turbines
- > Discharge : Seine River



TWO LANDS MADE AVAILABLE BY RATP

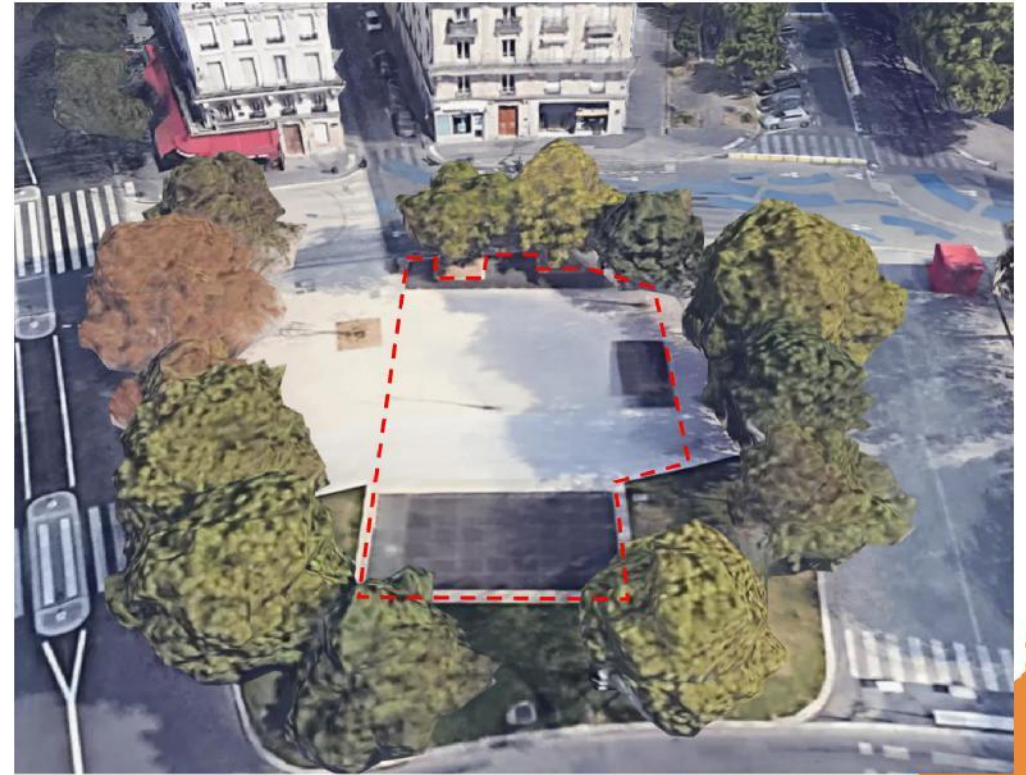
Van Dyck

Former subway turnaround loop under the Monceau park



Nation

A beautiful area in the station and under the square



LA BARGE ALMA

A UNIQUE VEGETATED FLOATING STORAGE

4,5 MW

Of direct power supply

15,5 MW

Of indirect power

80 MWh

Of storage capacity



3. CUSTOMERS & PRICING

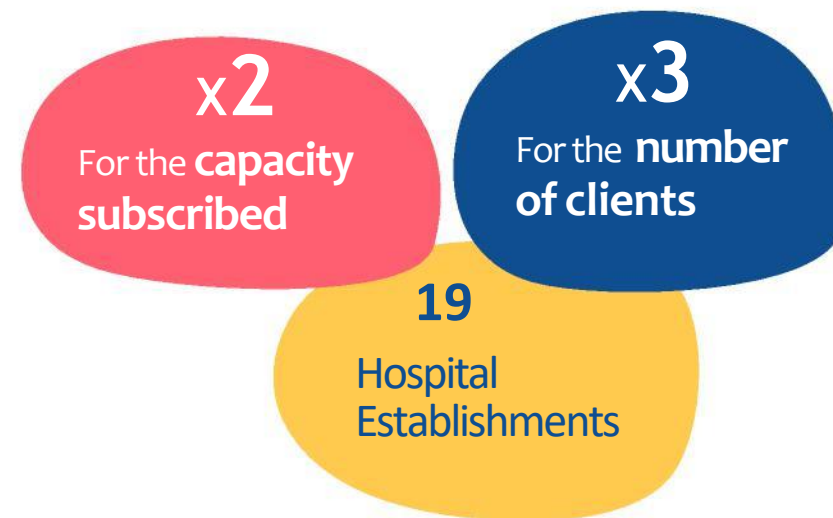


A COOLING NETWORK THAT IS OPEN TO ALL

▶ A historical "business" market still in strong development



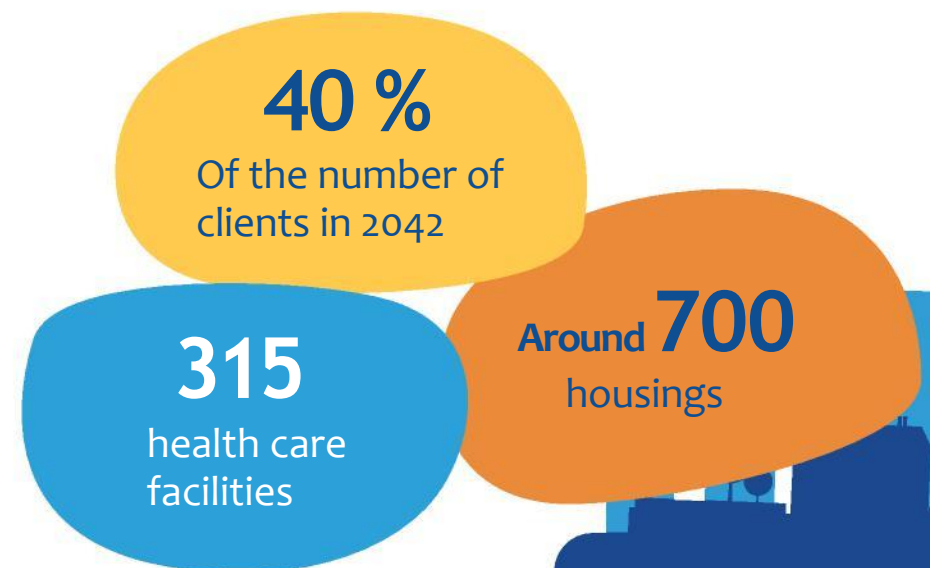
- > Offices
- > Hotels
- > Data centers
- > Health Establishments
- > Cultural Establishments
- > Medium and Large businesses



▶ The creation of a new consumer market synonymous with opening up

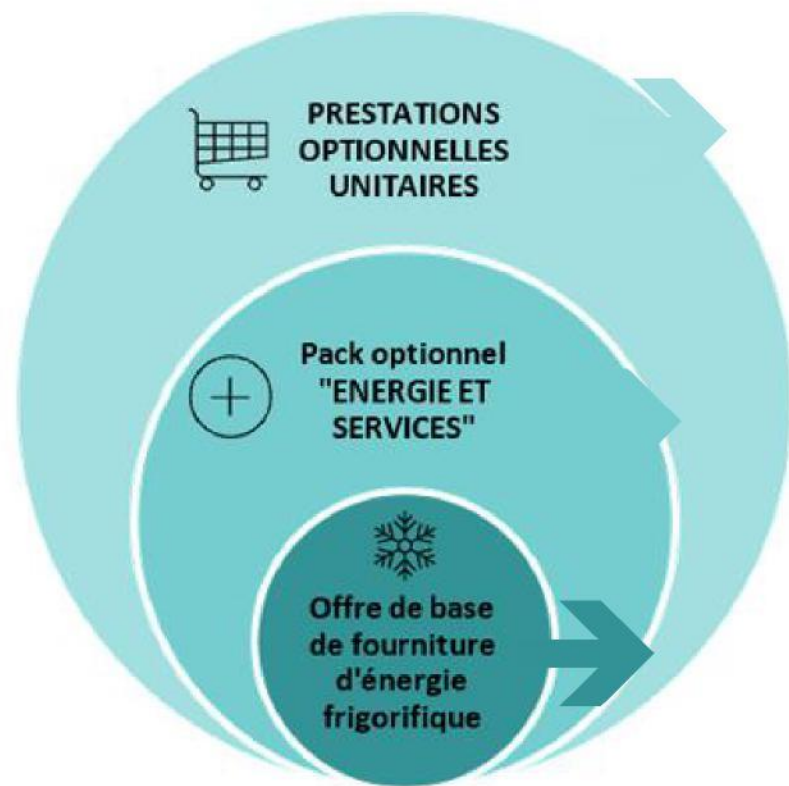


- > Retirement homes
- > Nurses and schools
- > Small businesses
- > Housings
- > Temporary sites open to the public



AN OPTIMIZED AND FLEXIBLE "BASE + OPTIONS" SERVICE

For a solution adapted to each situation



“Over-the-counter” services

Complementary packaged services

The **basic service** of Fraîcheur de Paris

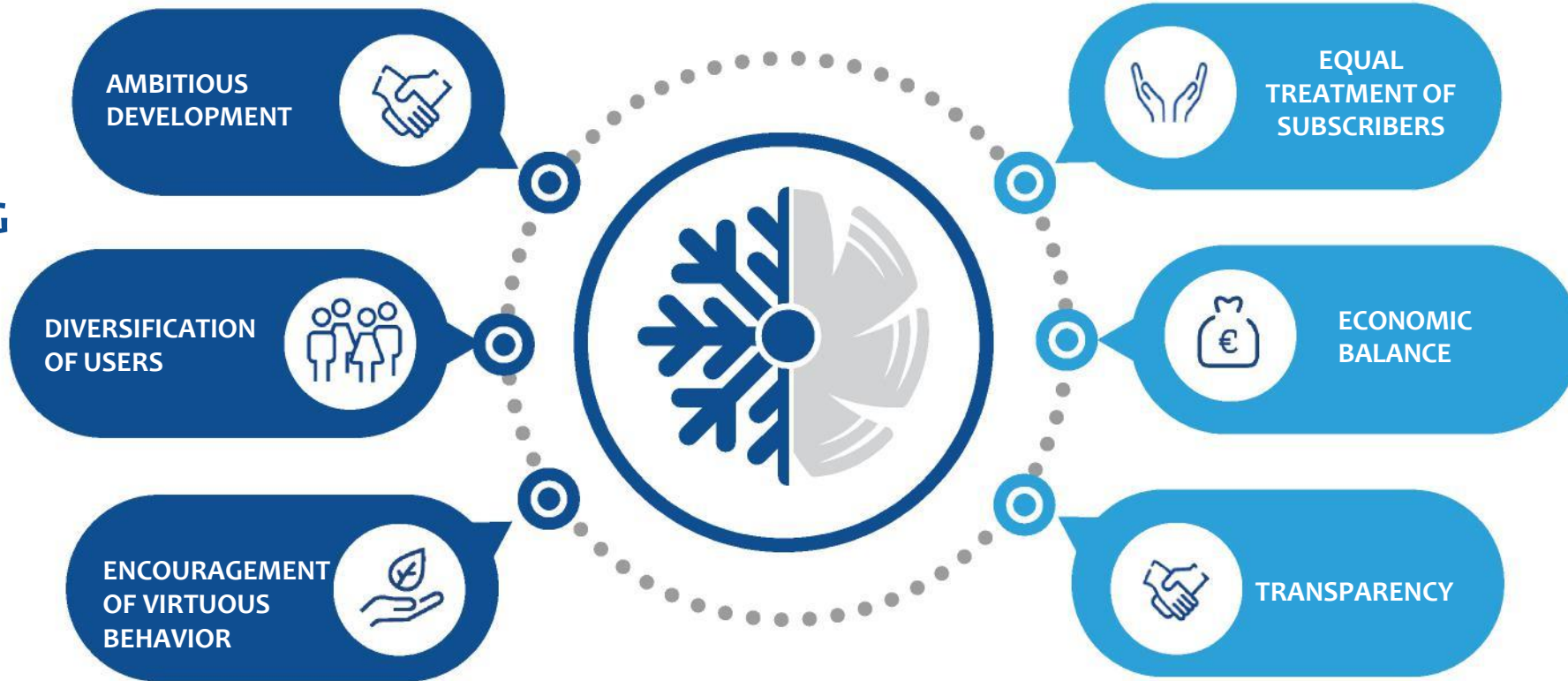
Pack « Energy and Services»
a level of service
equivalent to the basic service
of the previous concession
+ 4 new features

Streamlined basic and **high-tech** services that are **simpler** and more **affordable** to meet the cooling needs of future 'consumer' subscribers.



PRICING TO MEET A NUMBER OF CHALLENGES

OUR UNDERSTANDING OF KEY ISSUES



PREREQUISITES TO BE TAKEN INTO ACCOUNT

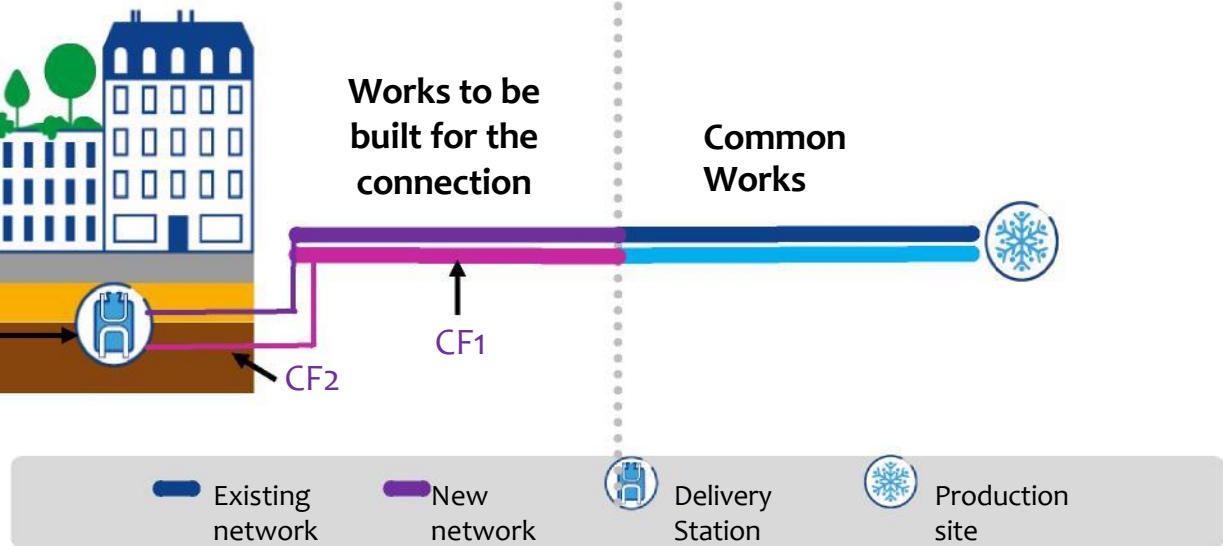


THE MAIN TARIFF TERMS

CONNECTION TARIFF
CF + CR

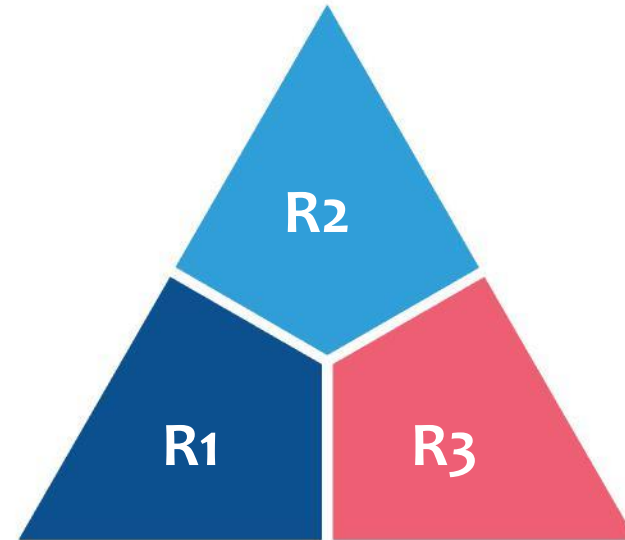
Connection Fees:
 Contribute to the work required for connection

Connection rights:
 Contribute to common works



Proportional to the subscribed capacity
 €/kW
 R22, R23, R24, R25

Proportional to energy consumption
 €/MWh



Proportional to water consumption
 €/m³

Seeking balance in the final bill around 40% subscription and 60% dependent on consumption

PRICING ADAPTED TO THE MAJOR ISSUES

AMBITIOUS DEVELOPMENT



- A **competitive connection tariff**: -20% compared to 2021
- A **competitive average MWh supply rate**: -14% compared to 2021
- A system **adapted to large accounts**
- Solutions for **flexibility** of the subscribed power

DIVERSIFICATION OF USERS



- A price list **dedicated to small customers**: schools, small businesses, housing...
- **Coverage of the cost of connections** for public places: schools, media libraries, nurseries, etc.
- Features **adapted to hospitals**

ENCOURAGEMENT OF VIRTUOUS BEHAVIOR



- A **connection tariff depending on the cooling surface intensity**
- An **energy supply tariff**, depending on the actual full power hours
- A volume supply tariff depending on the **effective delta T** of the subscriber



4. THE PRODUCTION



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VALORIZE WASTE HEAT

A COMPROMISE BETWEEN ENVIRONMENTAL, ENERGY AND ECONOMIC ASPECTS

- Waste heat is not directly recoverable, because it is rejected at 20°C and must reach 60°C to be used
- 4 simple solutions for valorization
 - On-site consumption for buildings hosting cooling plants (11 installations)
 - Heating/Cooling production solutions in hotels (6 installations)
 - In the hot water loops of the district heating network (4 installations)
 - Inter-seasonal heat storage (3 installations)

3,7 %

of thermal waste recovered
at the end of the
concession

674 GWh

Recovered over
the duration of
the concession

67 000

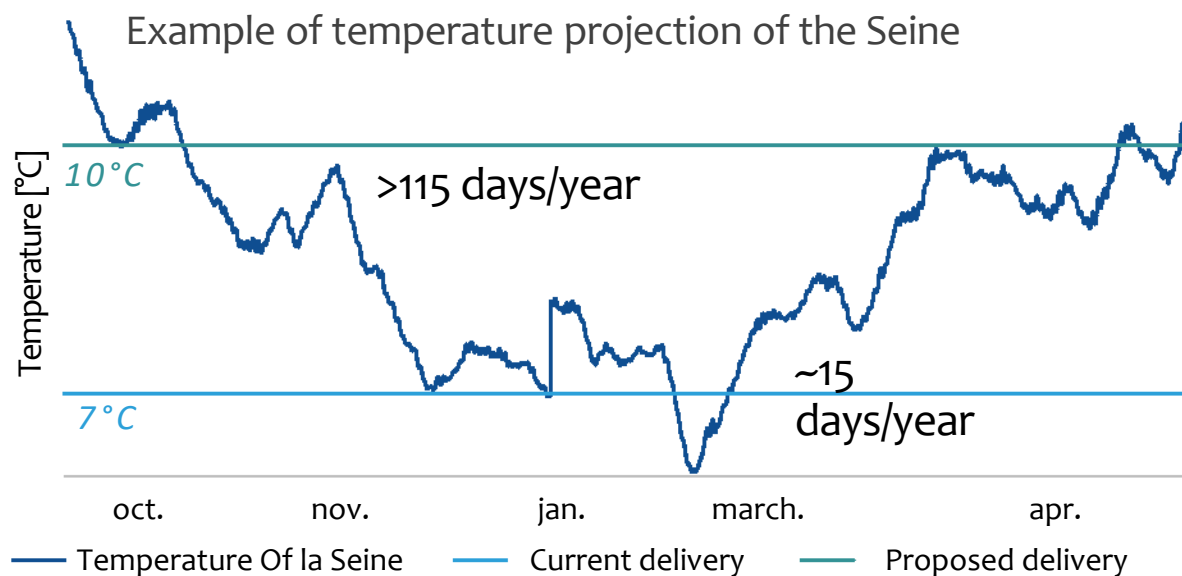
Equivalents heated
housing units for 1 year



MAXIMIZE THE SHARE OF FREE-COOLING

TWO LEVERS IMPLEMENTED FROM THE BEGINNING OF THE CONCESSION

- Extended free-cooling, increase of the delivery temperature over the winter period by 7 to 10 °C



- New sources, in addition to the Seine:
 - Non-drinking water
 - Groundwater

11 %
of free-cooling

120 GWh
Of saved electricity
=
1 year

R3 Tariff (volume)

Adapted according to the
reduced ΔT over the free-
cooling period

4 NEW SOLAR PARKS DEDICATED TO THE COOLING NETWORK

- **4 solar parks** will be built between **2022 and 2025**
- **3 different project developers**
- **1 solar park in Ile de France**, close to the location of consumption, with a participative and citizen financing

Our strengths:

- > Signed contracts
- > Implementations made from the beginning of a new concession

ÉNERGIE PARTAGÉE - SIP'ENR

Etrechy
2022
5 GWh/year
73 €/MWh

ENGIE GREEN

Alaric
2022
37 GWh/year
47,45 €/MWh

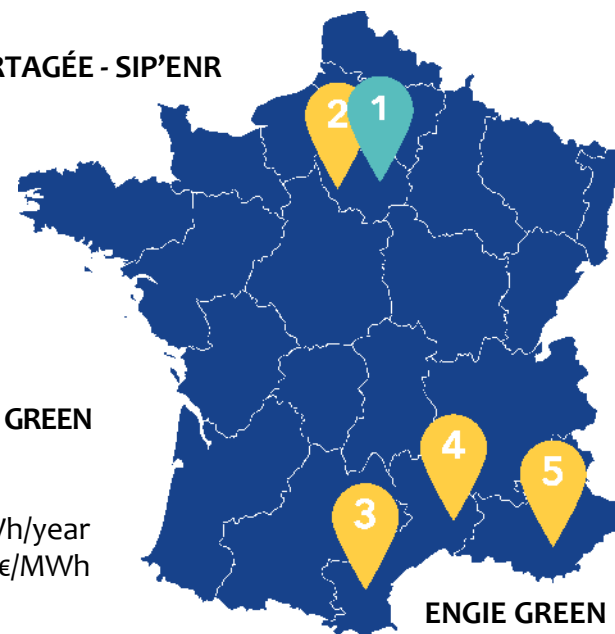
THE PARIS COOLING NETWORK

VOLTALIA

Château Raymond
2023
31 GWh/year
46,55 €/MWh

ENGIE GREEN

Jasse de Malmont
2025
87 GWh/year
48,50 €/MWh



5. THE DISTRIBUTION



FRAÎCHEUR DE PARIS

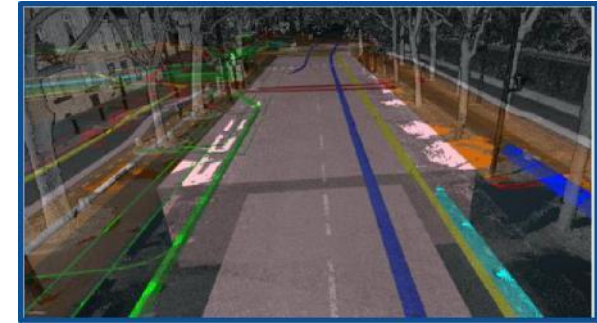


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NEW TOOLS FROM THE DESIGN PHASE TO THE COMPLETION OF THE WORK

AN INTEGRATED DESIGN WITHIN FRAÎCHEUR DE PARIS

Tools for design and project



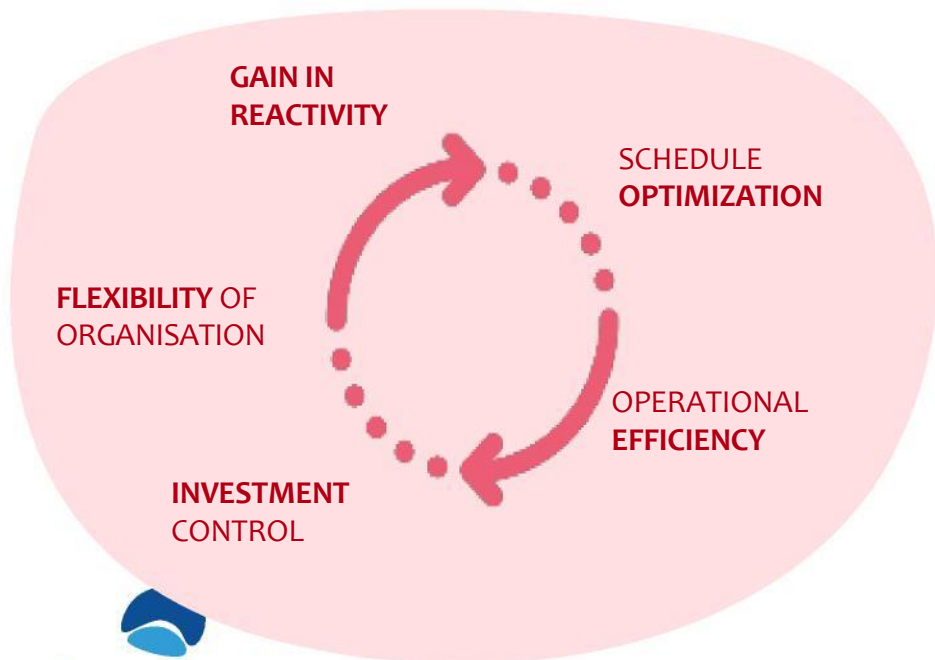
Use of **CITIES** and **NETWORKS 3D**

- Make the design more reliable and optimize the routes
- Locate third-party networks with a geometric quality
- Anticipate potential site problems



Development of an algorithm to **qualify the impact of the construction site**

- **Optimize** the route
- Determine a **suitable period** for the work
- Implement **compensatory measures**
- Inform well in advance about possible nuisances



FLEXIBILITY OF ORGANISATION

GAIN IN REACTIVITY

SCHEDULE OPTIMIZATION

OPERATIONAL EFFICIENCY

INVESTMENT CONTROL



FRAÎCHEUR DE PARIS



NEW TOOLS FROM THE DESIGN PHASE TO THE COMPLETION OF THE WORK

CONSTRUCTION SITES INTEGRATED INTO THE URBAN SPACE

➤ Reinforcement of the **communication** to local residents with **digital tools**

➤ « **Jungle Bungalow** » a living base integrated into the urban space and connected to public networks

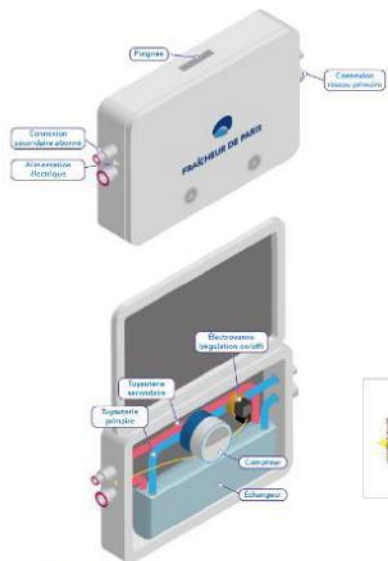


MEANS OF DELIVERY FOR ALL SUBSCRIBERS

10 kW, 20 kW, 50 kW, 200 kW or more ... to each power subscribed there is a dedicated means of delivery.

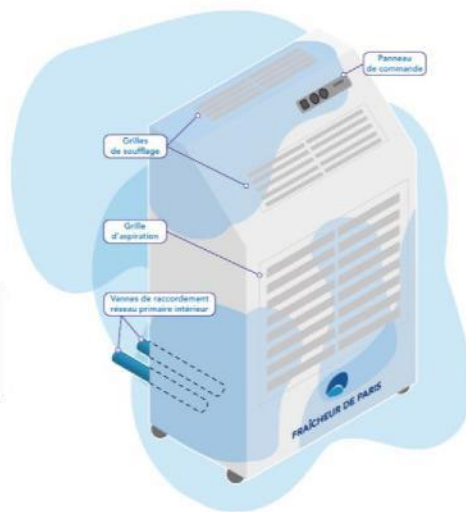
COOL'box

- Residential and commercial shops
- 2 modules: 10 and 20 kW



Cooling module

- Nursery, school, etc.
- 20 kW
- 400 m²
- Absence of secondary



Cold terminal

- Events and public domain
- 100 kW



6. THE ENVIRONMENT



FRAÎCHEUR DE PARIS



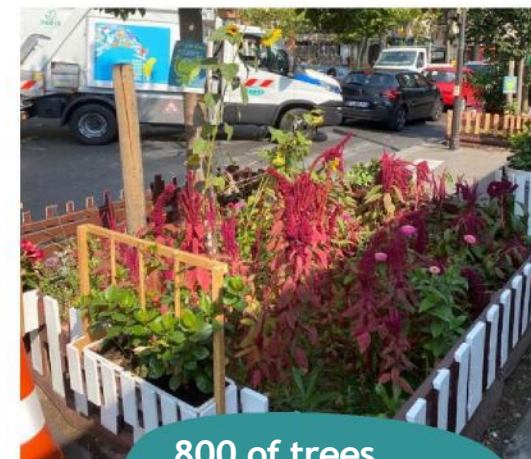
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GREENING OF PUBLIC SPACE



2023 - Les Halles 500m²

New sites -
« Land boost »



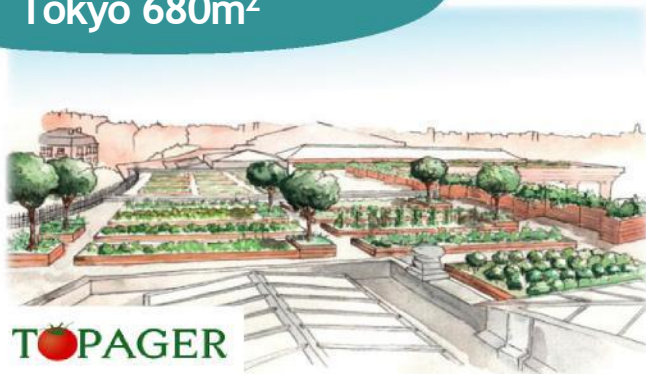
800 of trees
≈ 1200m²

4 km of
pathways ≈ 1600m²



VER
TUO

2024 - Palais de
Tokyo 680m²



200 m² of
planters



PRESERVING THE SEINE BY COLLECTING WASTE

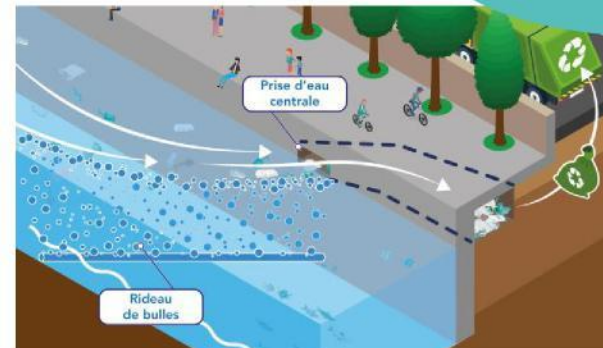
TRAPPING AND RECOVERING WASTE IN THE SEINE

820 m²
Vegetated rafts



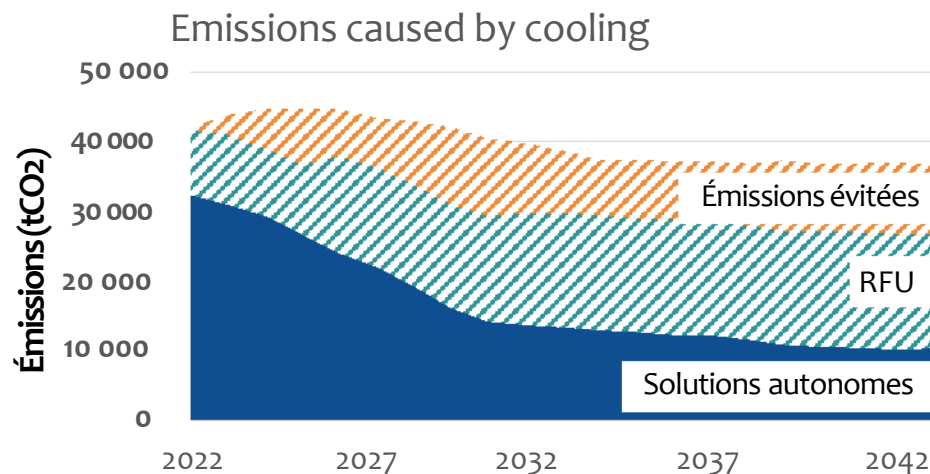
100 tons
of waste recovered per year

(3 tons are currently collected
by the Seine water plants)

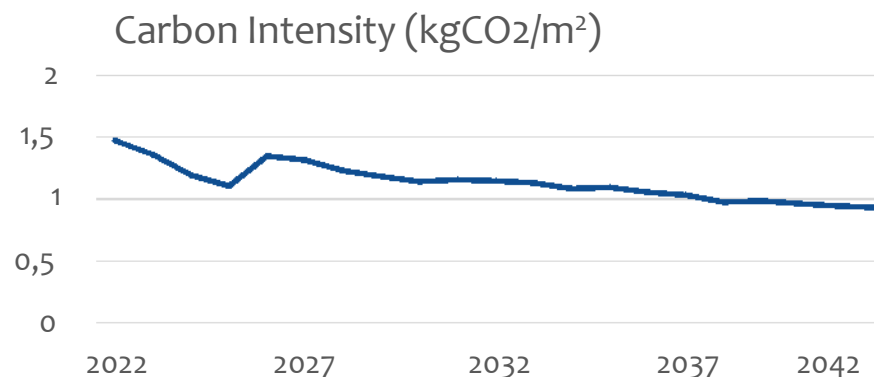


CONTAIN AND OFFSET CARBON EMISSIONS

- A network that **supports Paris' carbon strategy**: the development of the network avoids the growth of stand-alone solutions whose emissions are 4 times higher
- The projected carbon footprint increases ..
- ...but it **decreases in intensity** (-30% to 2040)
- Emissions are **offset**, thanks to certified actions carried out in France or elsewhere, on carbon reduction or sequestration



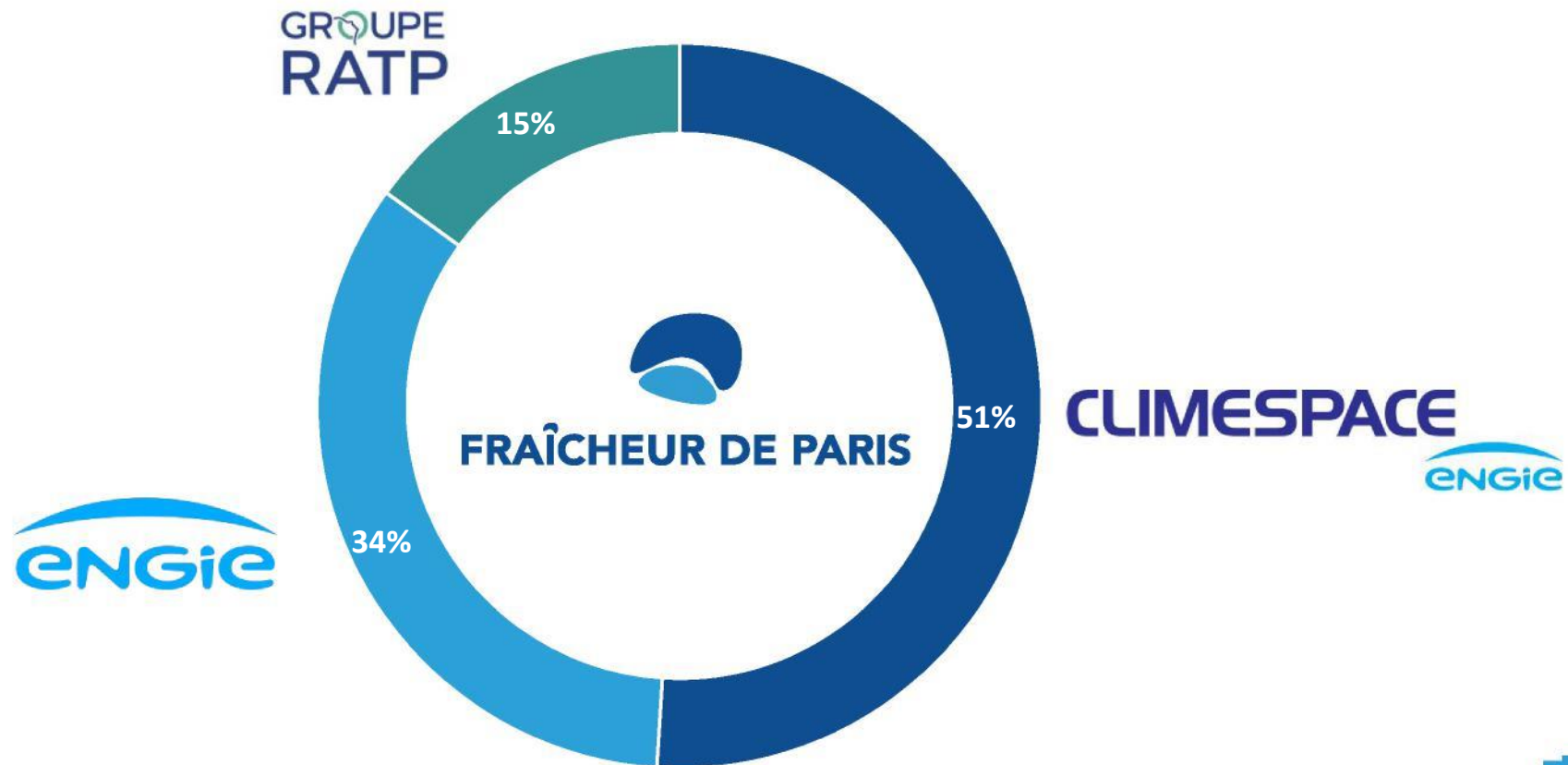
300 000 t
of CO₂ offset for a
period of 20 years



7. FINANCIAL STRUCTURE



SHAREHOLDING FRAÎCHEUR DE PARIS



CROWDFUNDING TO DEMOCRATIZE THE SERVICE

PARISIANS AS ACTORS IN THE ECONOMIC DEVELOPMENT



SAS ENERFIP
621, rue Georges Méliès
CA Center
34 000 Montpellier
Web : www.enerfip.fr

Climespace
3 Boulevard Diderot
75012. Paris

A Montpellier, le 09 Mars 2021

Objet : Lettre d'intention pour la mise en place d'un financement participatif avec Climespace relatif au projet de réseau froid de Paris.

Madame, Monsieur,

Dans la continuité de nos échanges, nous vous confirmons par la présente notre intérêt de mettre en œuvre notre solution de **financement participatif** dans le cadre du projet de réseau de froid de la ville de Paris, pour lequel vous êtes candidats à l'appel à projet.

Notre plateforme, agréée Conseiller en Investissement Participatif (C.I.P) par l'Autorité des Marchés Financiers (AMF) est à même d'intermédiaire plusieurs typologies de collectes en financement, tel que la loi du 1^{er} Octobre 2014 et les amendements suivants le prévoient.

Nous nous engageons ainsi à vous accompagner sur le projet de réseau de froid de Paris, et notamment sur la partie extension et « verdissement », sur lequel vous souhaitez intégrer du financement participatif si vous êtes lauréat.

Le financement participatif, si la candidature de Climespace est retenue, serait exécuté dans les modalités suivantes (elles sont pour l'heure, indicatives) :

- Taux d'intérêt : 4 à 6 % annuel,
- Maturité : 5 ans,
- Amortissement annuel du capital
- Montant : 5 à 8 millions d'euros,
- Cibles : Paris pendant 1 mois, puis Île de France 1 mois et éventuellement France entière.
- Investissement maximum par souscripteur : Pendant les 2 premières semaines plafond à 50 000 € par souscripteur (pour permettre à plus de riverains de participer, et levée du plafond au bout de deux semaines).
- Période de collecte visée : Lancement à la fin du premier trimestre 2022, pendant 3 mois,
- Communication (la stratégie sera à affiner) :
 - o 3 x 50 000 bulletins d'information dans les boîtes aux lettres dans les 3 arrondissements les plus impactés par les travaux (13 ième, 15 ième, 19 ième),
 - o 3 réunions publiques dans les 3 arrondissements les plus impactés par les travaux (13 ième, 15 ième, 19 ième),
 - o 3 Webinaires virtuel
 - o 3 communiqués de presse, etc...

> 4 M€ with ENERFIP

> 5 % Interest rate

> Reserved for Parisians, for 1 month

> Support of ENGIE Finance if the operation fails

THE MAIN BENEFITS OF THE PARTNERSHIP WITH RATP

At first, we thought of putting pipes in the RATP tunnels, but in fact, we realized that there are already subways inside...

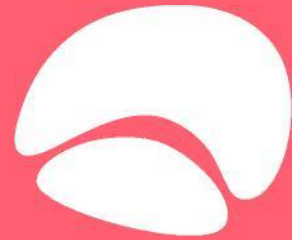
- > A key urban player in the Paris area benefiting from an **excellent relationship with the city of Paris**
- > The extension of a **pre-existing privileged relationship** with the AUBER power plant
 - > Available land: **3 locations for future production plants already validated** and proposed in the offer
- > Inclusive dimension of cooling with several metro stations soon to be cooled by the network
- > **Development of a trusting partnership relationship** between 2 major players, as well as local authorities



A power plant hidden under a Parisian park in a subway turnaround loop



Future cool point



FRAICHEUR DE PARIS