

Mutualisation d'Achat au Service de l'Habitat Grand-Ouest

The Energiesprong movement in Pays de la Loire wave 1

Territorial cooperation for renovation:
1,458 renovated homes as a source of inspiration

**PART 1:
SUCSESSES AND
PROJECT SHEETS**

**PART 2:
LESSONS LEARNED AND
RECOMMENDATIONS &
CONCLUSIONS**

forthcoming

 Dressorts

 MASH
Centrale d'achat Hlm
GRAND OUEST

 USH
Pays de la Loire
Association régionale Hlm

 giga
regio
factory
by energie
sprong

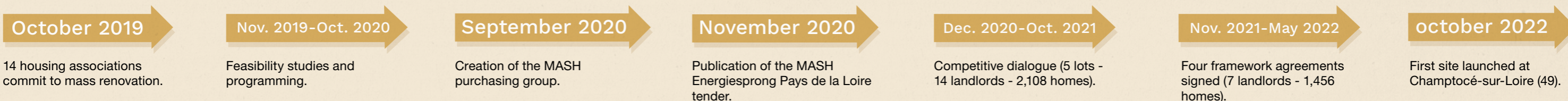
 Co-funded by
the European Union

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them.

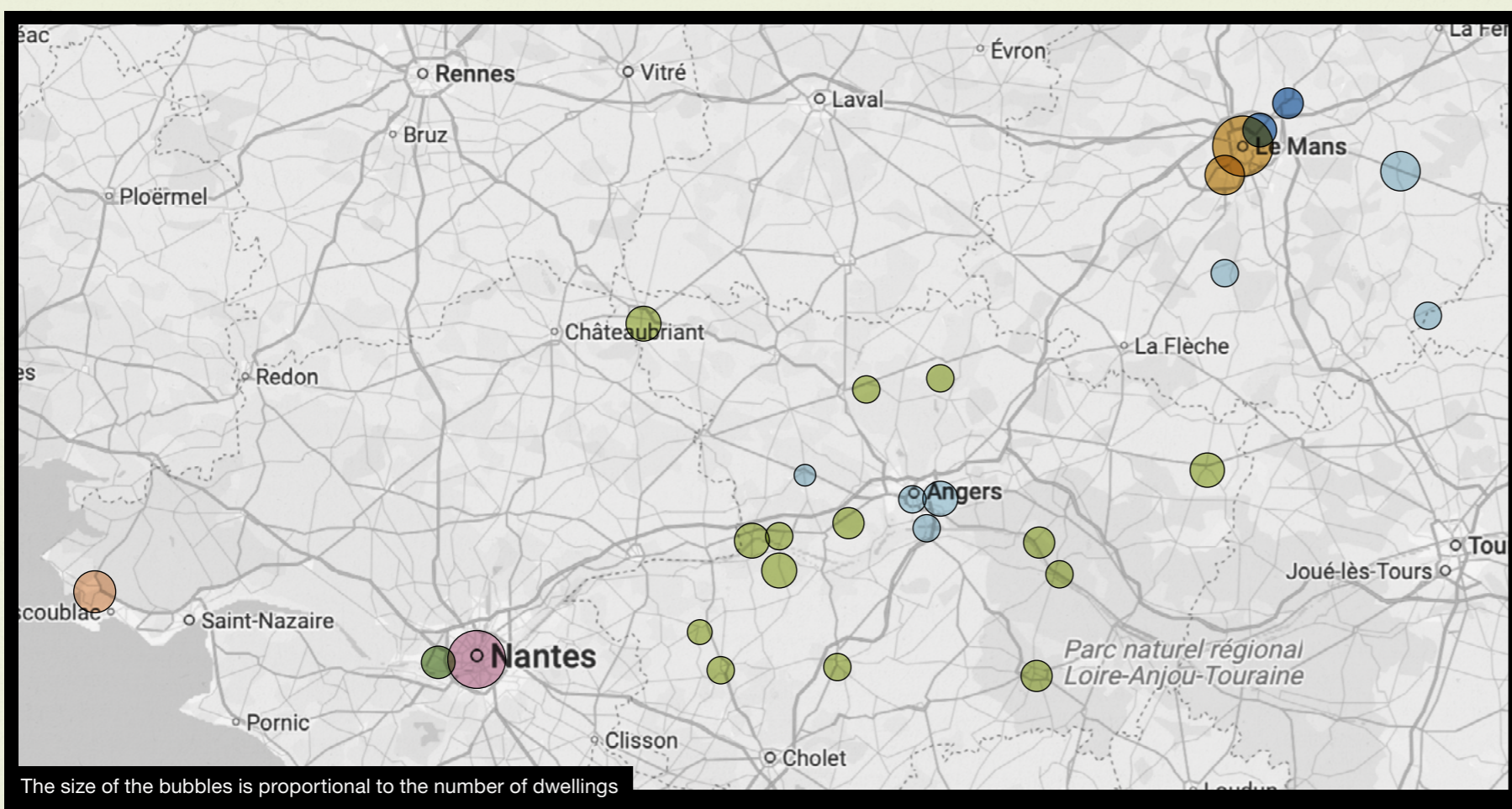
What is M.A.S.H.?

M.A.S.H. Grand Ouest for « Mutualisation d'Achat au Service de l'Habitat ». Created by the Union Sociale pour l'Habitat (USH) of Pays de la Loire, this cooperation tool unites HLM operators across the regions of Pays de la Loire, Normandy and Brittany to deliver France's first mass zero-energy (E=0) renovation market.

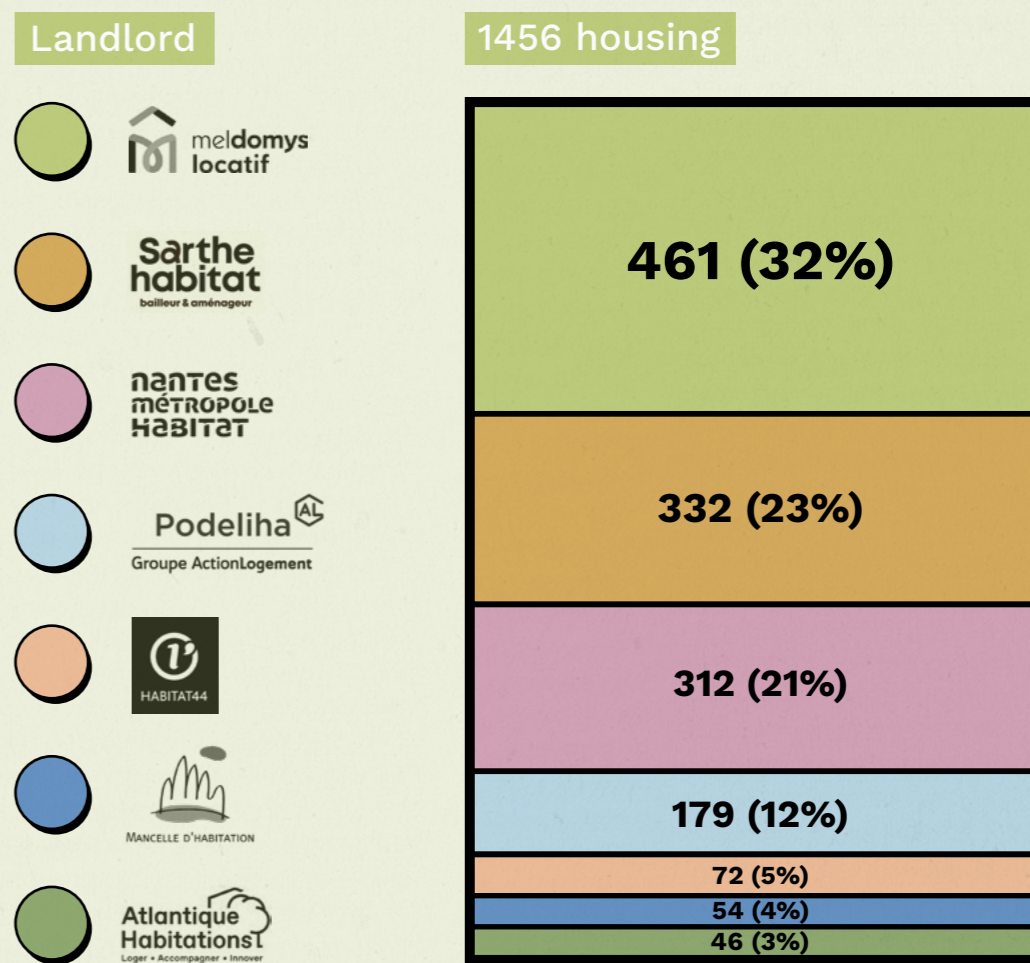
Key dates in the process



Map of housing by landlord



Distribution of housing



A massive renovation of social rental housing in the Loire region

4 framework agreements, 42 operations, et 1 458 renovated homes
7 landlords: 4 public housing offices and 3 social enterprises

3 winning consortiums across
3 departments

762 collective homes (including one 14-storey building)

696 individual homes
30-year guaranteed energy performance (E=0)

130 M€ million investment including 36.4 M€ million in public subsidies

A

The successes



01
clickable number

A SHIELD AGAINST UNCERTAINTY

A resilient, efficient model combining comfort and performance.

02

A BALANCED ECONOMIC EQUATION

designed for long-term sustainability, supported by strong partners.

03

A TRANSFORMATIVE TERRITORIAL PROJECT

Empowering and growing the local ecosystem.

C

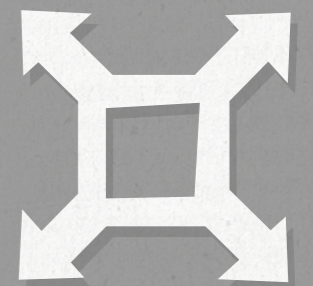
Lessons and Recommendations



D

Part 2

Conclusions: How to Scale Up



The successes



01

A shield against uncertainty

A resilient and effective model combining performance and comfort for residents.

Delivering on the E=0 promise

E=0 a long-term performance commitment that goes beyond the 2050 targets

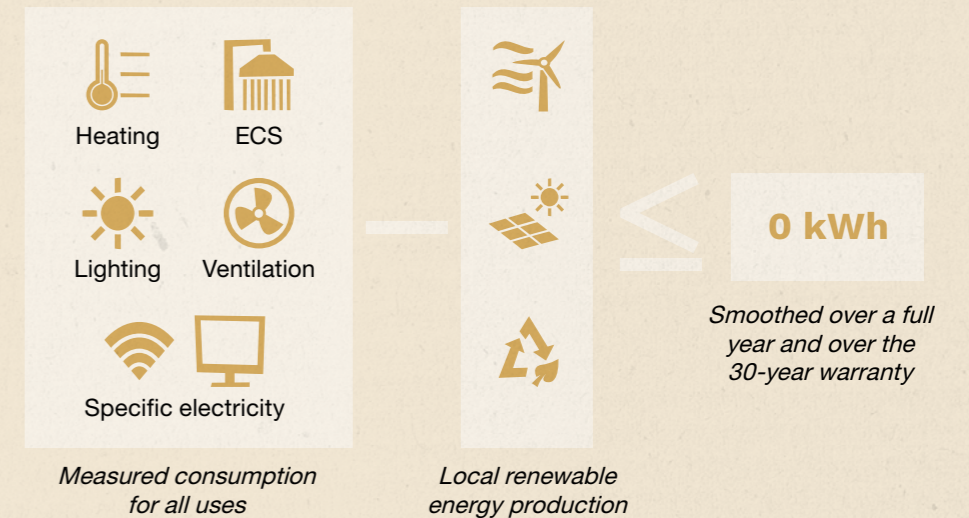


Social landlords are accelerating energy renovation to align with France's Climate and Resilience Law and National Low Carbon Strategy (SNBC) targets.

E = 0 kWh/year, definition :

E = real energy consumption (all uses) - local renewable production ≤ 0

- ✓ Performance commitment for all renovated housing and buildings
- ✓ 30-year performance guarantee
- ✓ Includes heating, hot water, ventilation, auxiliaries, and specific uses
- ✓ Based on actual occupancy conditions



100% of renovated and connected homes achieve guaranteed E=0 performance levels for 30 years — even the 14-storey Georges Gauthier building, a European first!

This success stems from the strong commitment of all stakeholders: bold decisions by landlords, efficient consortium solutions, high-quality prefabricated components, and precise on-site logistics. The objectives have been achieved thanks to the commitment of all project stakeholders: the strong decisions made by the project owners, the efficient solutions developed by the contractors' consortia, the industrial quality of the off-site prefabricated components and the logistics ensuring their transport and on-site assembly.

An energy shield for tenants

Tenants benefit from 50% to 70% lower energy bills

Amid energy price volatility, tenants are protected long-term from rising utility bills. Energiesprong renovations drastically cut heating needs through high-performance insulation and off-site prefabrication, with results guaranteed for 30 years.

9,2%

A household is said to be in a situation of energy vulnerability when energy expenditure linked to its housing represents more than 9.2% of its disposable income.

16,8% → 28,9%

The share of vulnerable households is 16.8% in 2021, but when applying the increase in energy prices between 2021 and 2024...

...the share of vulnerable households increases to 28.9% in 2024.

Source : INSEE, Analyses Pays de la Loire, janvier 2025

Comfort is not overlooked, with pleasant ambient temperatures all year round, high-performance hot water and ventilation systems, and simple, optimised equipment control and maintenance.

« Comfort is great — heating is even across the room. I compared my bills: I saved €32 between March 2023 and March 2024. » Mr Coubard, tenant in Bécon-les-Granits, Meldomys

A Second Life for Buildings

By renovating social housing to near-new standards, buildings achieve DPE A or B energy labels and a lifespan extended by at least 30 years.

Beyond energy performance: improved comfort, air quality, acoustics, balconies, and refreshed communal areas.

Architectural quality revitalises neighbourhoods - combining thermal performance, comfort, and low carbon impact.

Résidence Georges Gauthier (Sarthe Habitat)



Résidence Moulin du bois (Atlantique Habitations)



Crédit : ALTYN



▲ Common parts of résidence Georges Gauthier (Sarthe Habitat)



▲ Common parts of résidence Moulin du Bois (Atlantique Habitations)

« Our agency adopts a frugal and eco-responsible approach aimed at profoundly transforming the appearance of existing buildings while preserving their architectural and social qualities and history. We see prefabrication for renovation as an optimised tool for renovating certain types of buildings in response to climate and social emergencies. Each project has its own specific characteristics, and therefore requires a process that must be rethought and adapted. Wood, a bio-based, low-carbon and recyclable material, forms the structure of our prefabricated modules. It offers multiple architectural interpretations, with different species, finishes and assemblies, in combination with other materials such as metal, terracotta or plant fibre panels, composites and others. Wood, a noble and high-quality material, changes the identity of buildings and urban spaces. Feedback and appreciation from residents encourage us to continue along this path. The 'second life' of buildings is transformed into a 'new life' for residents. » **Renée Floret-Scheide**

« Responding to residents' needs was the guiding principle behind the Moulin du Bois renovation project. To achieve this, we combined nine full days of consultation with residents with a proven operating procedure at Atlantique Habitations. Tenant surveys enabled us to first identify needs and incorporate them into the programme, which was then put to a majority vote by the tenants. Once this programme was approved, we conducted individual visits to adapt the general programme to each dwelling as necessary. The strengths of this project are its high thermal comfort in both winter and summer, and the extension of the balconies with a doubled surface area, which allows for new uses that are greatly appreciated by residents. Our aim was to show that social housing can be attractive, efficient and forward-looking, with the idea of giving the building a second lease of life that meets the comfort standards of new housing. »

Virginie Leroy, Atlantique Habitations.



▲ Enlargement of existing balconies from 90 cm to 180 cm in depth, résidence Moulin du Bois (Atlantique Habitations)

Works Delivered at Record Speed

These neighbourhood transformations are carried out in record time, in accordance with Energiesprong's specifications: thanks to the use of industrialised solutions, such as prefabricated facades and energy modules, construction projects take between one week and a few months, depending on the scale of the operation and the number of homes involved. This industrial approach makes it possible to carry out comprehensive renovations involving major works, affecting all aspects of the building while significantly limiting disruption for occupants. The speed of Energiesprong renovations is a strategic asset for social landlords, as it helps to accelerate the energy transformation of their housing stock in order to meet the ambitious decarbonisation targets set by the National Low Carbon Strategy and the Climate and Resilience Act.



Time savings for façade insulation thanks to off-site prefabrication

Moulin du Bois project (46 collective housing units)

Factory-prefabricated timber-frame façades installed on site in just 50 days. This would have taken around 120 days using traditional techniques.

Georges Gautier project (IMH R+9 to R+14 with 251 dwellings)

Prefabrication of FOB panels installed in 4 months on 3,360 m² of façades up to 28 m high. In comparison, traditional external wall insulation was installed in 14 months on 5,885 m² of façades on buildings over 28 m high.

« On the Energiesprong Pays de la Loire construction sites (lots 4 and 5), we apply the Lean Management method, which is based on meticulous planning, rigorous flow management and rapid problem solving, ensuring greater productivity while meeting quality and safety requirements. This approach reduces costs and lead times. » **Jérémy Robert**, Directeur ALTERESCO

« Renovation while occupied was already part of our daily routine: with a different tenant in each property we renovate, there is no room for improvisation; everything must be planned in advance before opening the door to the property. We had therefore developed a whole kit of tools and a LEAN process, including the development of a digital solution called RéhApp, enabling us to understand each refurbishment project in order to offer the best quality of service to our customers and tenants. This allows us to renovate each house in less than three weeks. » **Christophe RENAUD**, Directeur Régional Adjoint Bâtiment Spie Batignolles

The successes



02

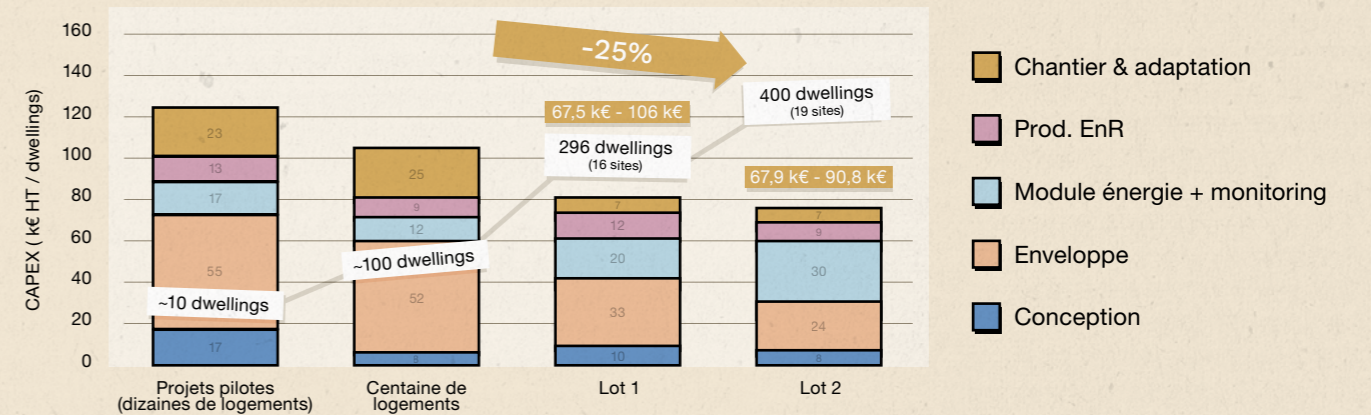
A Balanced Economic Equation

A model designed for long-term sustainability, supported by strong partners

Volume + Industrialisation = Lower Costs

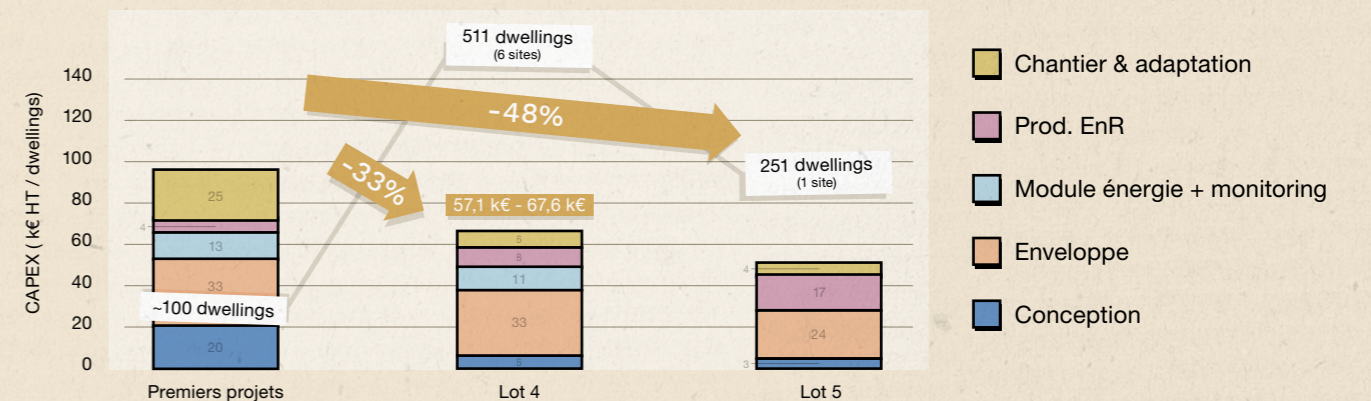
Despite Covid and inflation, renovation costs fell sharply: - 25% lower investment costs for individual homes compared to early French pilots.

Price trends for EnergieSprong renovations of individual homes in France



-33% (Lot 4) and -48% (Lot 5) investment costs vs. first French collective projects

Price trends for EnergieSprong renovations of multi-unit housing in France



Despite unfavourable conditions during the tendering and design phases (Covid, then the war in Ukraine, resulting in a materials crisis and inflation), there has been a significant reduction in CAPEX for individual projects, although there is still room for improvement and this is expected for future projects. CAPEX for collective housing renovations is very close to the target price and confirms the relevance of Energiesprong renovations for medium and even high-rise residential buildings.

...but we mustn't stop now that we're on the right track.

The first wave of renovations carried out by MASH Grand Ouest has significantly reduced the cost of Energiesprong renovations in individual and collective housing. This trend will become even more pronounced in future mass markets:



Expected reduction in R&D costs for future projects

This first large-scale demand at the regional level has led to a technological breakthrough and the amortisation of R&D costs across a large number of homes. R&D requirements will be lower for similar future projects, so costs will continue to fall now that the solutions have been proven, particularly for similar local markets.



Optimised selection and better knowledge of housing to avoid additional costs

Wave 1 of MASH has made it possible to better determine the characteristics of housing suitable for off-site processes, which will enable future projects to optimise the selection of buildings in order to avoid driving up the costs of a grouped project with unsuitable operations. Better knowledge of the existing condition (structural and soil diagnostics in particular) from the outset of the competitive bidding process will prevent the collective from encountering unpleasant surprises or difficulties when assembling solutions on site, which can lead to additional costs and delays.



Technical optimisations to further reduce costs

Initial avenues have already been identified by the groups to further reduce costs, such as simplifying the insulation of the upper gables of facades or cladding around joinery, etc. The trend is set to continue with new projects that are geographically close and as suitable as possible for off-site solutions (accessibility, architectural simplicity), in order to maintain the interest of companies, give them sufficient visibility of future orders, and thus benefit from the achievements of this first wave. In 2025, landlords in the Loire region are preparing a second wave of mass renovations using an off-site approach, encouraged in particular by the positive feedback from this first wave. Other regions could follow suit.

« For Wave 2, we'll continue to reduce renovation costs by optimising programmes and scaling up proven industrialised processes. » Axel David

Key financial partners to secure housing organisations commitments

In order to secure a sufficient volume of housing in terms of quantity and duration despite the still high prices of Energiesprong renovations, thereby enabling the sector to scale up, substantial funding was required.

The USH des Pays de la Loire and landlords worked throughout the pre-operational phase of the project to mobilise financiers around this regional initiative. The unprecedented scale in terms of volume, energy ambition, local job creation and protection against energy poverty convinced a wide range of financiers:

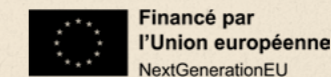
The Banque des Territoires has developed a specific loan offer dedicated to the project, consisting of a set of loans: Long-Term Loan, Boosted Eco-Loan, Improved PAM Loan.



The Energiesprong Pays de la Loire project was selected as a winner of the MASSIRENO call for proposals, a national government initiative aimed at supporting massification/innovation as part of the economic recovery plan.



It has been described as an operation of strategic importance for 'Promoting energy efficiency' included in the European Regional Development Fund (ERDF) program for 2021-2027.



Its role in structuring the region's economic dynamism also enabled it to gain the support of the Pays de la Loire Region from the outset of the initiative.

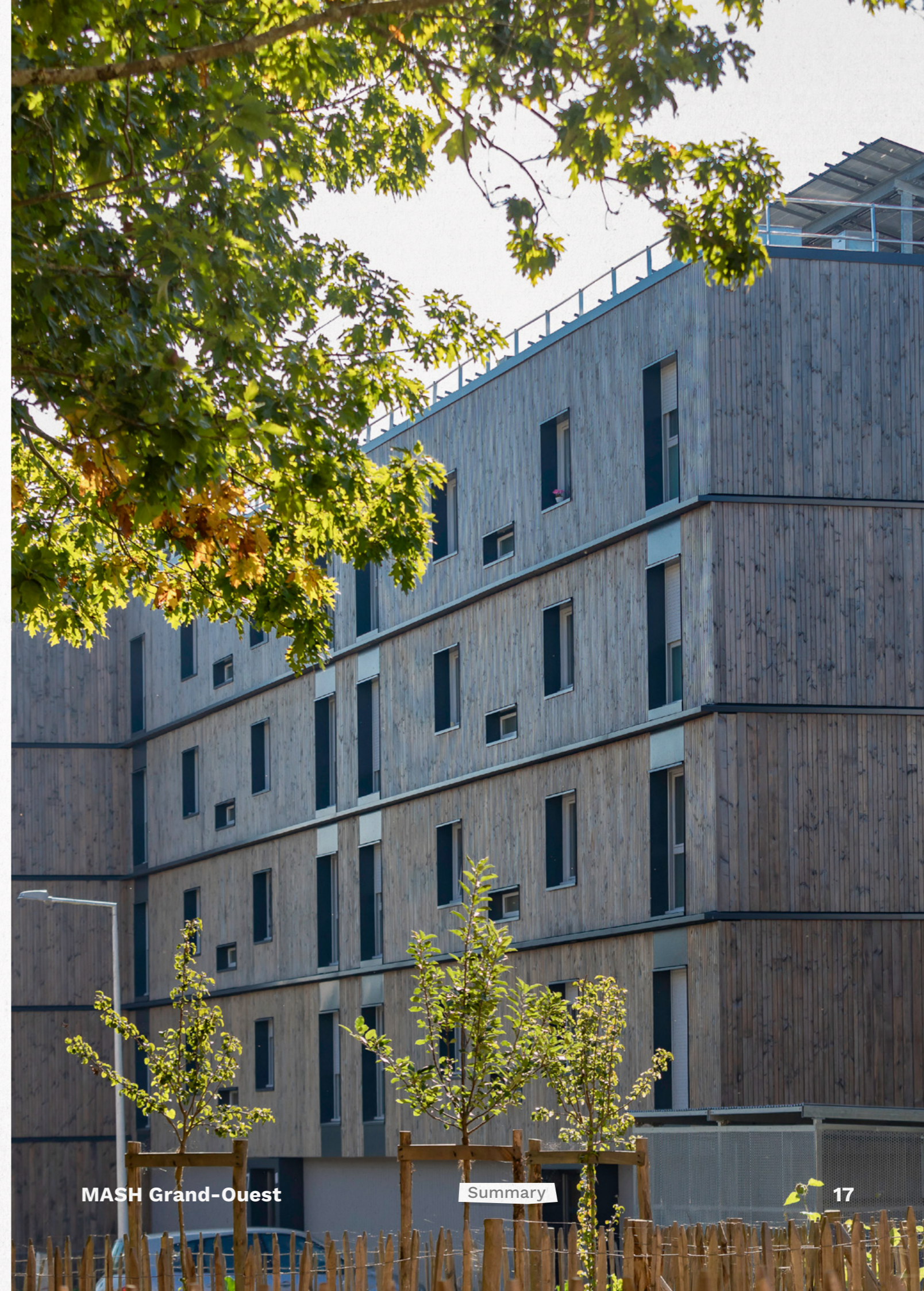
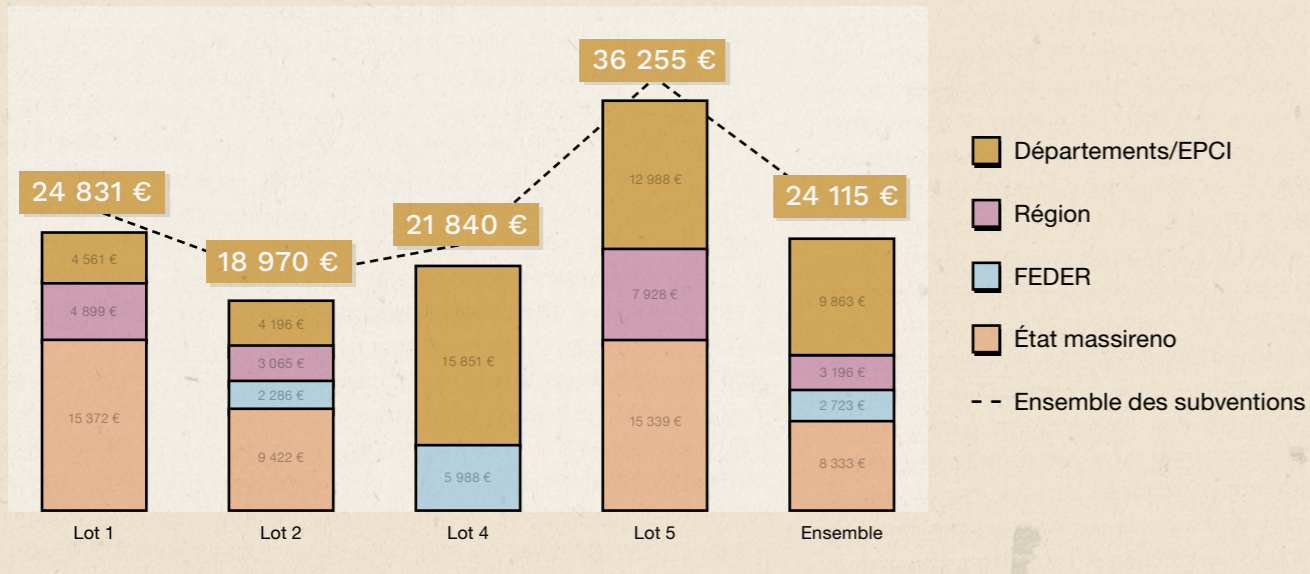


Finally, the departments and metropolitan areas involved in these projects, which usually finance the renovation of social housing, have also offered specific assistance for this innovative project.



Ultimately, a genuine public policy was developed around this project, which made it possible to achieve a better economic balance across all operations in this first wave and to reassure lenders committed to their decisions in favour of innovative projects requiring significant investment.

Subventions moyennes par lot des opérations Energiesprong Pays de la Loire (€ par logement)



The successes



03

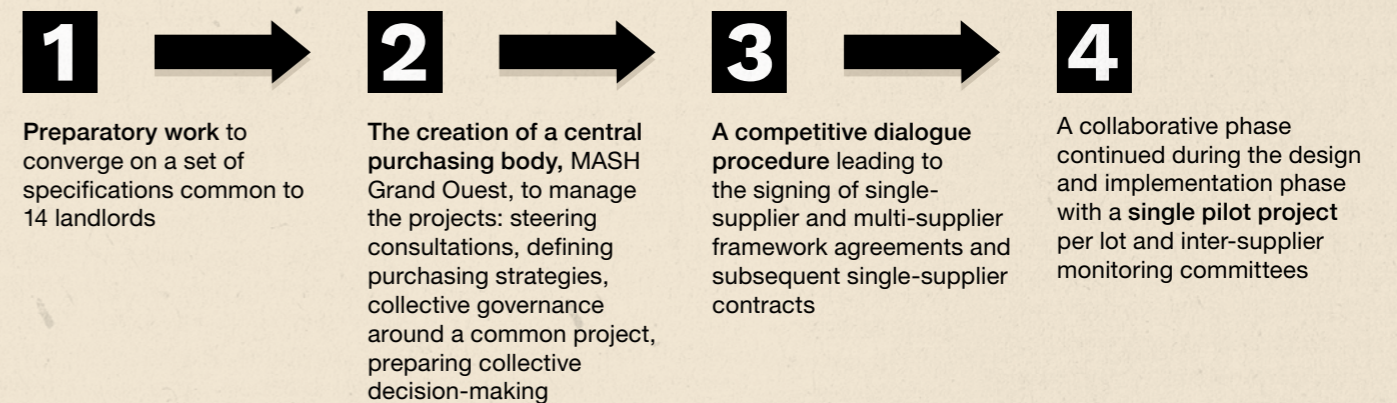
A regional project driving transformation

A model that stimulates and strengthens the local ecosystem

A multi-donor organisation never before experienced to renovate

It was necessary to pool the needs of several social housing providers in order to achieve a sufficient volume of work to enable large-scale energy renovation using industrialised processes and solutions. The dynamic of a collective of social housing developers formed by the USH des Pays de la Loire, which had never been tried before, was a source of innovation in the management of the process, requiring agility, cooperation and a step aside from all stakeholders.

Several steps had to be taken to bring this project to fruition:



▲ Lot 4 pilot project: visit to the first wood panel in lot 4 for the Moulin du Bois operation at the LCA Construction Bois factory

The result is a conviction that ‘together we can achieve more’:



Accelerated skills development for social landlords in the Loire region in the implementation of comprehensive performance contracts



A culture of collaborative projects driven by the strength of the Hlm collective in the Pays de la Loire region



A dynamic that is giving rise to new inter-social landlord projects for the region



A nationally recognised approach that promotes the mass renovation of high value-added housing

B. Madelaine : « It was rewarding to work as three landlords on Lot 2 – the collaboration created motivation and learning opportunities. »

Preparatory work ahead of the markets with local stakeholders...



In 2019, Fibois Pays de la Loire, Novabuild and Atlansun created the Collectif Réhabilitation Energiesprong Pays de la Loire (Pays de la Loire Energy Renovation Collective) with the aim of:

- Innovating in renovation by drawing inspiration from off-site concepts and industrialisation
- Enriching the region with what has been done elsewhere in France or Europe
- Promote exchanges between companies and project owners in order to jointly develop a working framework that takes into account the key success factors for the sector in the process
- Facilitate the structuring, in particular through networking, of groups of companies likely to respond to future markets in the region
- Promote exchanges and the sharing of experiences between members and showcase the work carried out by its members
- Monitor developments in energy rehabilitation

Together with the Energiesprong France team and the MASH Grand Ouest landlords, the collective organised around ten monthly clubs in 2019-2020 to enable companies to be ready to respond to MASH contracts.

Find the workshops on the [youtube channel](#)



« At Novabuild, we decided to set up these Pays de la Loire rehabilitation clubs with Fibois and Atlansun because we are convinced that the energy and environmental transition in the building sector can only be achieved through a collective and structured increase in the skills of local companies. In order to bring about lasting, pragmatic change in practices, we must first and foremost support a change in attitudes within our sector, which is sometimes still too entrenched in ways of working that are no longer in tune with the urgency of the current situation in the face of climate change and its consequences. We therefore felt it was essential to mobilise professionals in the region, encourage dialogue, share best practices and create synergies between players in the sector, in order to prepare them to respond effectively to the zero-energy renovation market. It is thanks to this collective dynamic based on cooperation that we will be able to meet the challenges of sustainable construction in the Pays de la Loire region together. We have a duty to support renovation stakeholders in designing projects that are equal to the challenges of tomorrow and take into account environmental, social (control of use) and economic (economic sustainability of projects and development of local industries) issues. »
Juliette Lavis, directrice de transition Novabuild

In addition, the Energiesprong France team, led by the social and solidarity enterprise Ressorts, supports the development of commons: free, open-source tools and resources to facilitate cooperation between actors in the housing value chain. This includes cooperation between demand-side players (various project owners and their project management assistants), supply-side players (architects, design offices, construction companies, maintenance providers, manufacturers, distributors) and between supply-side and demand-side players. It is funded by the public authorities to accelerate the sector's ecological transition.

The Energiesprong France team, in conjunction with regional organisations such as Novabuild, Fibois Atlantique and Atlansun, supports inter-regional and international cooperation in particular.



▲ Tour of Energiesprong-renovated housing, Vaulx-en-Velin

To inspire and provide feedback to local stakeholders, it has organised several study trips to the Netherlands, where the Energiesprong initiative originated, to enable them to meet their Dutch counterparts.



▲ Factory tour, Netherlands

It has also launched two innovation competitions to identify innovative solutions aimed at scaling up guaranteed zero-energy renovation on a 'small scale' based on common technical challenges and housing types proposed by sponsoring project owners.

It is interesting to note that young and innovative companies from the Pays de la Loire region that won these innovation competitions led by the Energiesprong France team have been included in consortia bidding for and winning these large-scale renovation contracts.

The rise in power and skills of regional sectors in a project that combines regional economic development, social progress and ecological ambitions can become a reality, but it cannot be improvised.

Having contractors who agree and commit collectively in a region to ambitious and unified performance standards, in conjunction with local authorities and economic sectors, powerfully demonstrates what the territorialisation of ecological planning can be.

This can be achieved by optimally connecting with European best practices, with the support of the Energiesprong France team's public interest facilitator, so as not to reinvent the wheel. It can also be achieved by working with actors at the national level, when this is the appropriate scale of action: for example, on the co-development of financing solutions adapted to these projects.



▲ Presentation of prototype at the Energiesprong innovation competition

...which has enabled the emergence of players in industrialised renovation

The consultation phase with companies for the Energiesprong Pays de la Loire contracts led to the formation of consortia of industrialised renovation players:

10 consortia of companies in the application phase


8 consortia selected in the bidding phase (competitive dialogue)

3 winning consortia with different profiles

The awarding of the contract to the 3 winning groups has boosted investment in the local economy: around 75% of subcontractors are from the Pays de la Loire region

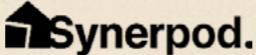




Lot 1 : 75% Lot 2 : 87% Lot 4 : 73% Lot 5 : 57%

SOGEA CONSORTIUM - TITULAIRE LOT 1

Representative				
Joint contractors	REDCAT Architecture	LIONEL VIE Architecture	SYMOE Studies in thermal, energy, renewable energy	QUADRIM Operations and maintenance Performance monitoring

« Sogea, which has been involved in large-scale MGP projects for Meldomys for several years, saw Lot 1 Energiesprong as the logical continuation of this partnership, in line with the same philosophy of mass renovation, with greater ambitions, more work and a more innovative industrialised approach. We partnered with both local project managers and project managers already involved in the Energiesprong movement, with whom we designed a comprehensive renovation solution, including lightweight metal-framed façades. To manufacture them, we decided to open our own manufacturing plant near Angers, so that we could control production, with the help of Vinci Construction Group's craftsmen. This first batch allowed us to experiment with this new and innovative trade, encouraged by our management, and which our workers are very satisfied with. » Pierre Morin, Directeur de travaux, SOGEA ATLANTIQUE BTP






AGIR CONSORTIUM - LOT 2

Representative	 Prefabrication POD Industrialised HVAC module and monitoring		
Joint contractors	 Energy performance Studies HVAC, monitoring energy	 Project management design	 ENR system Monitoring of performance
Subcontractors	 Facades and construction work		

« AGIR was originally a group of entrepreneurs, a collective force, but above all a group sharing the same values and vision for our development. Thanks to the trust placed in us by investors in the Loire region, particularly the Union Sociale pour l'Habitat des Pays de la Loire, we were able to launch an off-site industrial sector focused on energy efficiency in housing. » Sébastien Fournier, co-founder, SYNERPOD

« The MASH Lot 2 project allowed us to take the use of LEAN tools and processes one step further, completely industrialising and massifying the renovation process: digital surveying of existing structures using 3D scanning, digitisation with the development of a parametric design tool, industrialisation, off-site manufacturing, lean production, logistics kitting and collaboration with a logistics specialist. At Spie batignolles, we refer to this as the BTP 4.0 approach. » Christophe RENAUD Deputy Regional Director, Construction, Spie batignolles

ALTYN CONSORTIUM - LOT 4 et 5

Representative	 Groupe Allyn Project management TCE Performance commitment			
Joint contractors	 groupe Allyn General contractor	 Architecture Design of industrial façades	 Fluid and renewable energy Monitoring and energy coaching	 groupe Allyn Energy management Plan of action and verification

« Le groupe ALTYN s'intéresse à la démarche Energiesprong depuis son lancement en France, en raison de ses fortes synergies avec les missions d'ALTYN : qualité architecturale, délais optimisés, approche Hors-Site, Lean et garantie de performance énergétique.

Être opérateur sur les Lots 4 et 5, c'est l'occasion pour nous :

- D'accompagner nos Maîtres d'Ouvrage sur une opération ambitieuse avec une compréhension fine de leurs besoins
- De consolider notre offre-type pour rénover le patrimoine de logements collectifs de manière massifiée
- De déployer dans un cadre robuste nos produits, process et outils
- De collaborer, challenger et animer le tissu d'opérateurs Hors-Site locaux et nationaux.

Cette vague 1 constitue pour nous une assise forte pour pouvoir envisager, demain, de futures opérations qui pourront être déployées avec un fort niveau de maîtrise, des gains financiers, et la capacité d'opérer rapidement avec des équipes et un savoir-faire bien en place. » Jérémie Robert, directeur général, ALTERESCO



This is concrete proof that large-scale renovation can and must be supported by a network of dynamic and innovative local businesses.

« The fact that SMEs and local players won the majority of the MASH contract lots in the Pays de la Loire region clearly shows that in France, as elsewhere in Europe, renovating using off-site solutions and energy performance guarantees does not mean closing the market to SMEs and reserving it for large national or international groups. **This is concrete proof that large-scale renovation can and must be supported by a network of dynamic and innovative local businesses.** Companies of all sizes can diversify their activities by capitalising on their expertise to deliver guaranteed energy performance. Some are trying their hand at being agents for the first time, others are positioning themselves as solution providers, others are diversifying their business lines, and some are doing all three.

This situation is not the result of chance, but of **collective structuring and preparation**, particularly through the Energiesprong Renovation Club, which has helped to raise the profile of the Loire market. Supporting SMEs in developing their skills, helping them to organise themselves into groups and offer competitive, industrialised technical solutions is working. It is not by scaling back ambitions that we support regional economic development, but rather by providing **long-term visibility, with clear intentions aligned with the climate and social emergency**, and by building a **collective framework for cooperation**. Organising to succeed rather than fearing to try. This is excellent news for the local economy, for employment and for the energy transition, as it demonstrates that innovation and performance can emerge from the region, in close proximity to the needs of residents and social landlords. »

It is not by scaling back ambitions that we support regional economic development.

Sébastien Delpont, director of Energiesprong France

And innovative renovation solutions with high added value

« With its unprecedented ambition and systemic approach, the MASH programme has brought about a genuine paradigm shift in renovation practices. It demonstrates that an off-site strategy, combined with intelligent pooling of purchases, makes it possible to industrialise the renovation process while optimising costs, deadlines and architectural and technical quality. MASH has acted as a technological catalyst by stimulating the emergence of new products and industrial players, both in façade components and integrated energy production solutions, helping to structure a regional and national sector dedicated to industrialised renovation. » Pierrick Martin, CEO at Hors Site Conseil

Façades

► Lot 1

The prefabricated façade solution developed by Sogea and its partners consists of a metal frame, OSB board, rock wool, vapour barrier and extruded polyurethane. The finishes can be customised, but for Lot 1, which is mainly located in an area along the Loire River, a mineral façade coating from the manufacturer STO was chosen. For the first phase of MASH Grand-Ouest's Energiesprong project, more than 9,200 m² of these façades were manufactured at the Sogea factory dedicated to Lot 1.



► Lot 2 Agir Consortium

Spie Batignolles opted for a solution using prefabricated, man-portable crates with openwork panels. Using 3D scanning and a parametric design tool, Spie determined the appropriate crate sizes for each house. This solution:

- Complies with current techniques and does not require ATEX certification
- Is easy to implement, even in neighbourhoods with limited space for manoeuvring machinery
- Can be adapted to any house geometry, while offering a standardised solution
- Is easily replicable throughout the country and can be manufactured in local workshops (such as ESATs).

The small façade panels designed by Spie batignolles are made of wood, using commercially available rafters, and are insulated with glass wool. The openwork panels are manufactured by the logistics company IDEA, which palletises one kit per house before organising delivery to the site for installation by Spie Batignolles.



► Lot 4 & 5 Consortium AltyN

Wood-frame façade (FOB) designed by Atelier Floret-Scheide, ALTYN and their industrial partners OSSABOIS, LCA and SYBOIS.

This is a 250 mm complex incorporating structural wood elements, fire protection elements (adapted according to the building's classification), insulation (bio-based), cladding, joinery, blinds and guardrails.

It is a standardised solution that can be deployed in a similar way on all projects, while incorporating the necessary adaptations.

The cladding is modular and can be composed of wood, metal or mineral elements, depending on the architectural project. Certain peripheral elements, such as sunshades or balconies, must be fixed separately but in a coordinated manner. They can also be produced off-site.

These solutions comply with DTU 31.4 and the CSTB's RAGE guide.

On Georges Gauthier, the wood façade was installed on the R+9 and R+10 buildings, a first in Europe!

- ▲ Résidence Georges Gauthier (Sarthe Habitat)
- ▲ Résidence Bretonnière (Nantes Métropole Habitat)
- ▲ Résidence Bois Rochefort (Habitat 44)

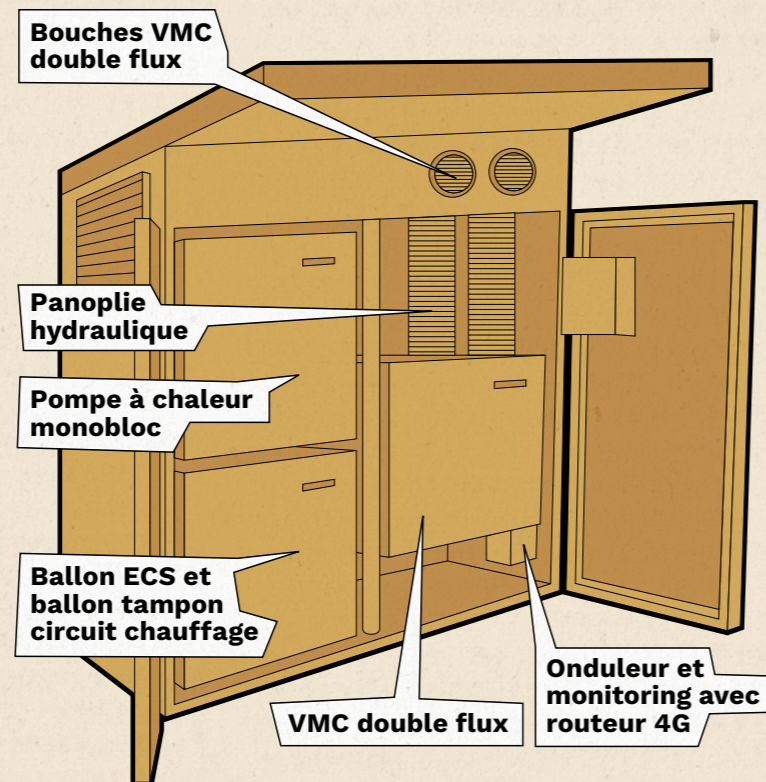
Synerpod's EnerPOD

EnerPOD is a prefabricated module (off-site) in Vendée, quickly deployable, consisting of:

- A silent heat pump
- A hot water tank
- A dual-flow CMV
- An energy performance measurement and control system
- A 100% renewable energy supply

Other useful features can be integrated (charging for soft mobility, backlit awning, connected letterbox, planter, etc.). Inspired by the best practices in the naval and automotive industries, the monitoring system includes a comprehensive service that provides remote supervision of equipment, energy coaching for users, and predictive maintenance.

It is usually placed outside the dwelling and allows maintenance workers to carry out repairs without entering the dwelling, with cladding that matches that of the external insulation solutions.



▲ EnerPOD



▲ The EnerPOD XL, which supplies 10 homes in Savigné

And other carbon-free heating solutions

District heating system

► Moulin du bois

- **Before renovation:** Heating provided by the NADIC district heating network (1 substation for both buildings), hot water provided by individual gas water heaters, gas pipes for gas cookers.
- **After renovation:** Heating unchanged, hot water connected to the district heating network, switch to electric cooking.
- The Bellevue-Chantenay heating network transports heat through the Bellevue district, located west of the Nantes metropolitan area, mainly from a biomass boiler (55% renewable energy in 2023, target of 84% by 2043).



▲ Biomass boiler room, operated by Cléa, a subsidiary of Dalkia, which supplies the Bellevue-Chantenay network

Wood-fired boiler room

► Georges Gauthier

- **Before renovation:** Heating provided by communal electric underfloor heating at green tariff rates, hot water provided by individual electric water heaters, electric cooking.
- **After renovation:** Heating production via 1 wood-fired boiler room (2 pellet boilers, each with a capacity of 250 kW), creation of one substation per building (3 substations in total), collective loop and emission via hot water radiators with a CIC kit per dwelling, DHW production connected to the substations with semi-storage and collective loop.



Wood-fired boiler room

► Bois Rochefort

- **Before renovation:** heating provided by 1 communal natural gas boiler, hot water provided by individual gas water heaters, cooking with gas.
- **After work:** heating provided by a wood-fired boiler room (1 x 150 kW pellet boiler + 1 x auxiliary gas boiler), creation of an additional substation, DHW production connected to the substation with semi-storage and communal loop, switch to electric cooking.

