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de la Transition
Énergétique

Dijon 23 > 25 juin 2026

Atelier SOLUTION

RESPONSE : Six years of creating and operating energy-positive neighborhoods in Dijon and Turku: what are the concrete results?

Proposé par : **Dijon métropole & EIFER**



European Institute
for Energy Research
by EDF and KIT

Animé par :

- Monjur Murshed
- Carmen Munoz-Dormoy
- Hadrien Rouchette
- Tatu Laajalehto
- Desislava Koleva
- Noelia Pérez





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Welcome and Introduction



Monjur Murshed
Primary coordinator of
RESPONSE, European
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Moderator



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Director of Sustainable
Development
Directorate in Gabrovo
Municipality, Bulgaria



Speakers

1. RESPONSE
project overview



2. Main outcomes from Dijon

3. Main outcomes from Turku

4. Main outcomes from 6 Fellow
Cities



5. Key impacts of
the project



Question &
Answer



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Overview of RESPONSE Project

Monjur Murshed



RESPONSE
Integrated Solutions for Positive Energy
and Resilient Cities



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RESPONSE Project

RESPONSE stands for "IntegRatEd Solutions for POsitive eNergie and reSilient citiEs"

Objective:

- Create Positive Energy Districts (PED)
- Offer tested and robust innovative solutions to reach carbon neutrality



A strong European collaboration transforming cities through Positive Energy Districts



What is a Positive Energy District? Why Cities Need PEDs?

A Positive Energy District (PED) is a neighborhood that produces more renewable energy than it consumes (annual basis) while improving quality of life and supporting climate neutrality.

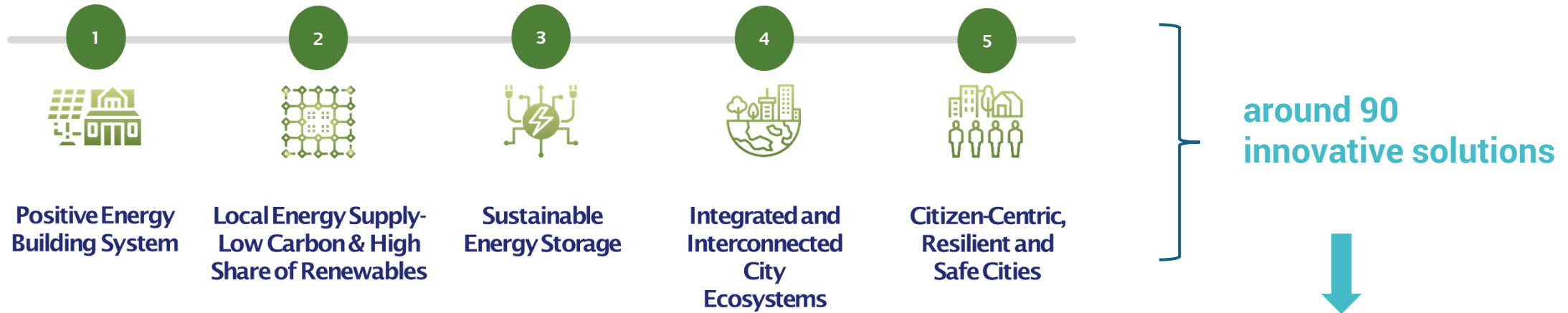


Europe's carbon neutrality ambition becomes tangible at district scale

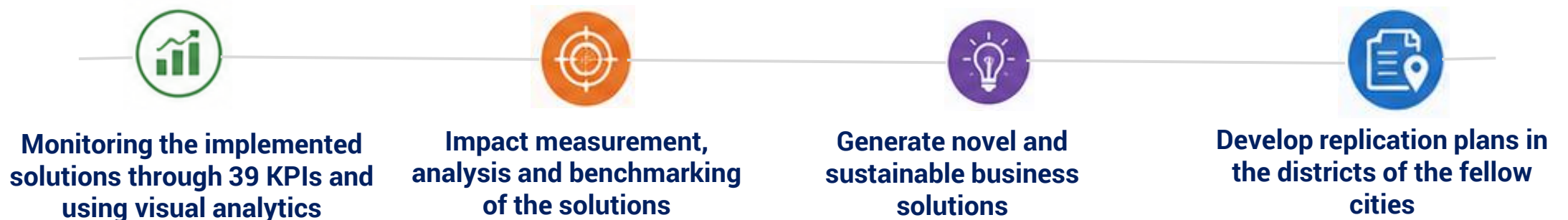


What RESPONSE Set Out to Achieve?

Through PEDs, RESPONSE has transformed **2 districts in Dijon** and **1 district in Turku** into **PEDs** by integrating smart building, renewable energy, energy flexibility, digital systems and citizen engagement.



RESPONSE also developed:

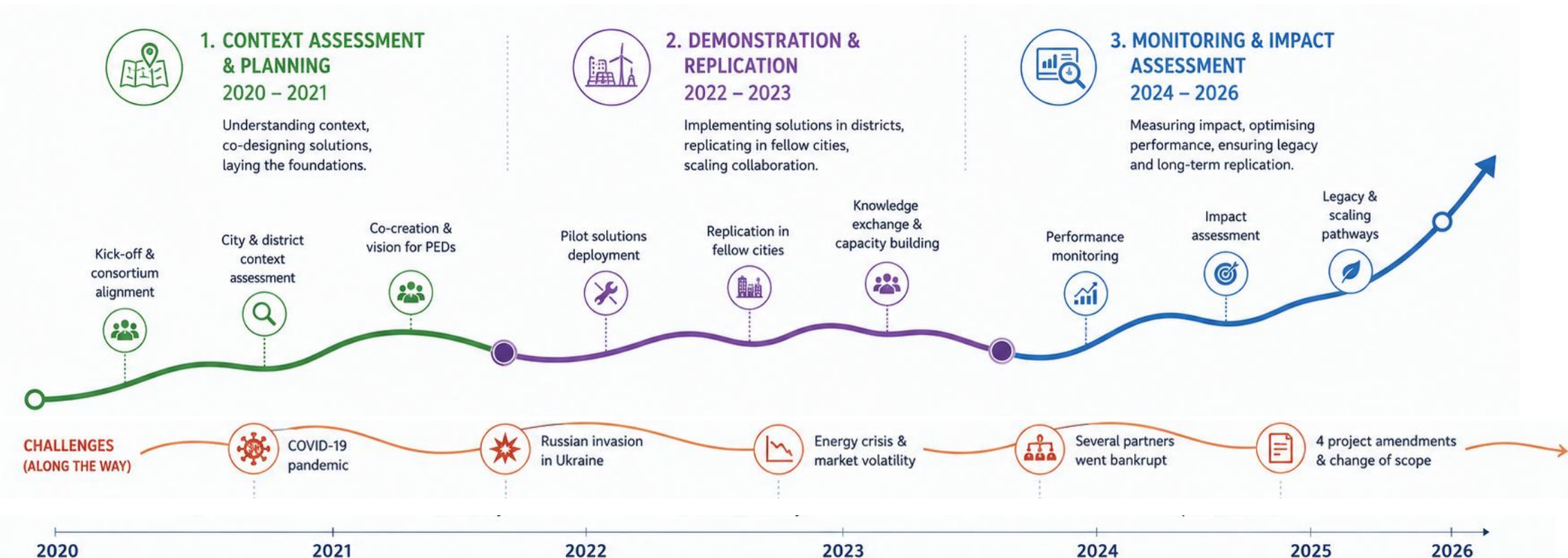




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RESPONSE Transformation Journey: 6 years of Collaboration, Innovation and Resilience





Lighthouse Cities: Real Districts became Living Laboratories



Climate
neutral by
2029



Climate
neutral by
2050

6 Fellow Cities developed Replication Pathway based on the experience of Dijon and Turku



Climate
neutral by
2050



Key Lessons for Future Climate-Neutral Cities

1. **From Research to Reality:** 6 years of action transformed technical concepts into functioning Positive Energy Districts.
2. **Holistic Integration is crucial:** Integration matters more than isolated technologies. PEDs are not just solar panels; they are the combination of smart buildings, efficient grids, and smart mobility. Therefore, **real challenge lies in coordination and finding trade-offs.**
3. **Replication is key:** Replication requires adaptable frameworks. The learning model adopted by the 6 Fellow Cities ensures the solutions are scalable across diverse European contexts.
4. **Context is vital:** A solution that works in a Lighthouse City may be too complex or costly elsewhere, so cities often favor simpler, locally appropriate options.
5. **Citizen engagement** must start early; benefits should be clearly explained. RESPONSE fostered a sense of community ownership, making the energy transition socially acceptable and economically feasible.

5 RESPONSE cities have received EU Mission Cities label



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Main Outcomes from Dijon

Carmen Munoz-Dormoy

Hadrien Rouchette



RESPONSE in Dijon: Challenge

- 3 schools, stadium, and the sports center
- 5 residential buildings owned by social housing providers Grand Dijon Habitat and Orvitis
- 2,400 residents and 24 municipal sites impacted by the project

Two aspects that convinced the European Commission:

- Early 70s district in renovation into an ecodistrict
- addressing a **population in vulnerable conditions**





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RESPONSE in Dijon: Final Results



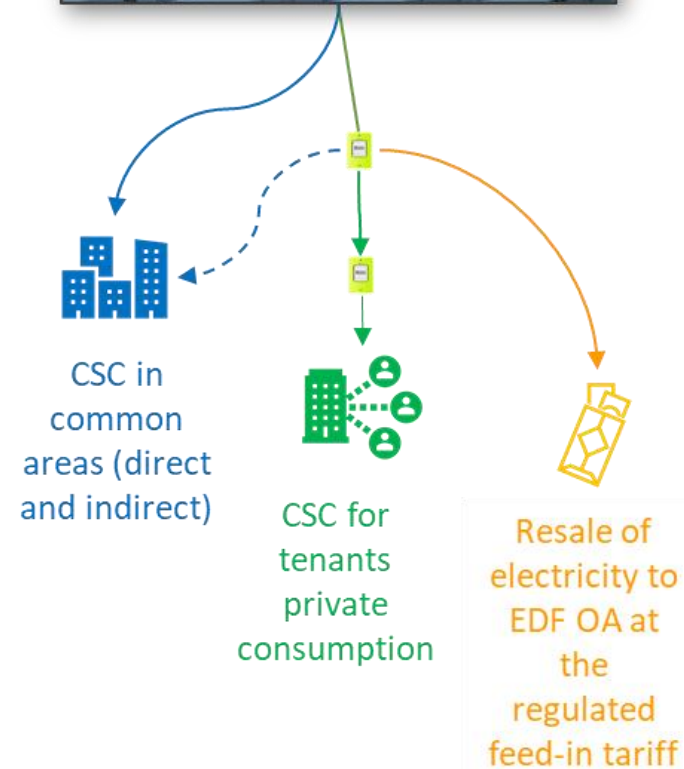
Results in May 2025-Apr 2026 (in comparison with 2019):

- **↓ -71% GHG emissions** in building use
- **↓ -38% final energy consumption**
- **↓ -78% fossil gas use** for heating
- **26% electricity consumption supplied by self-consumption**, including:
 - 52% for schools
 - 21% for residential buildings



RESPONSE in Dijon: Main Outcomes (1)

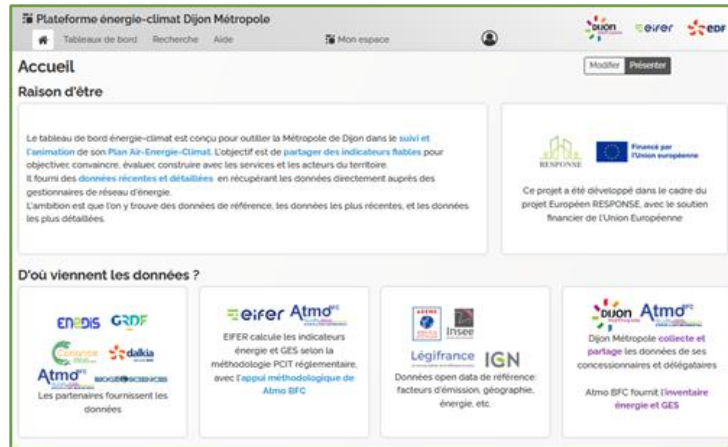
Self consumption operation in residential buildings





RESPONSE in Dijon: Main Outcomes (2)

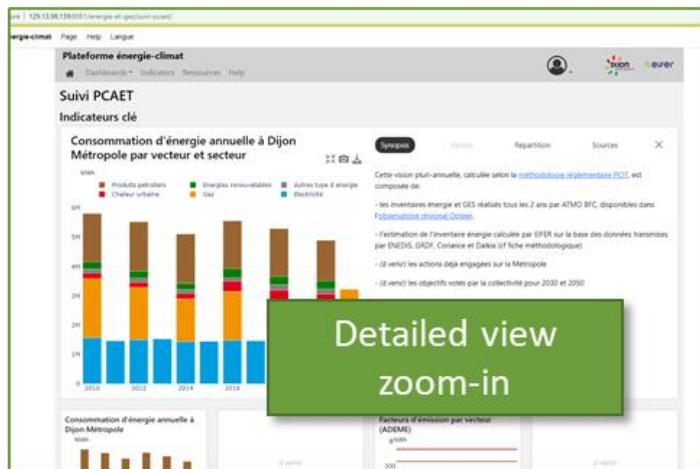
Climate-energy platform



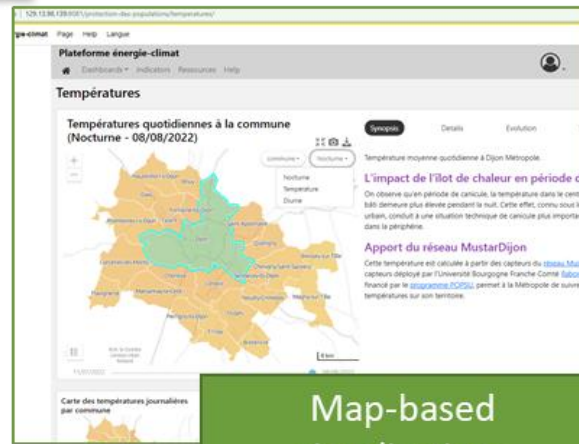
- Collect, analyze and interpret data
- Prepare for action
- Track, monitor and report
- Turn data into compelling narratives



Designed with Dijon Métropole departments and partners

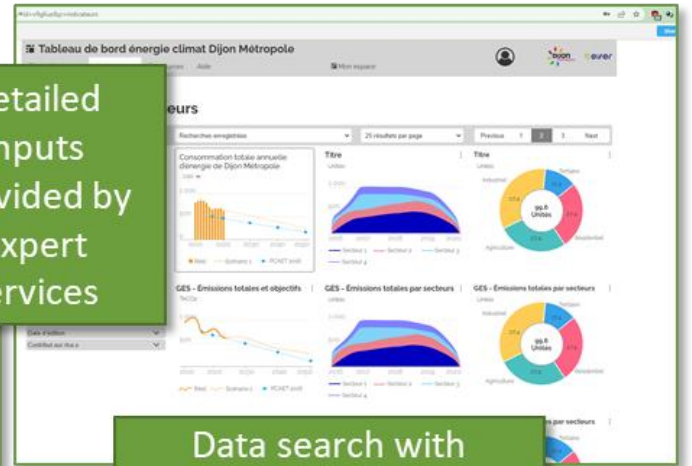


Detailed view zoom-in



Map-based visualizations

Detailed inputs provided by expert services

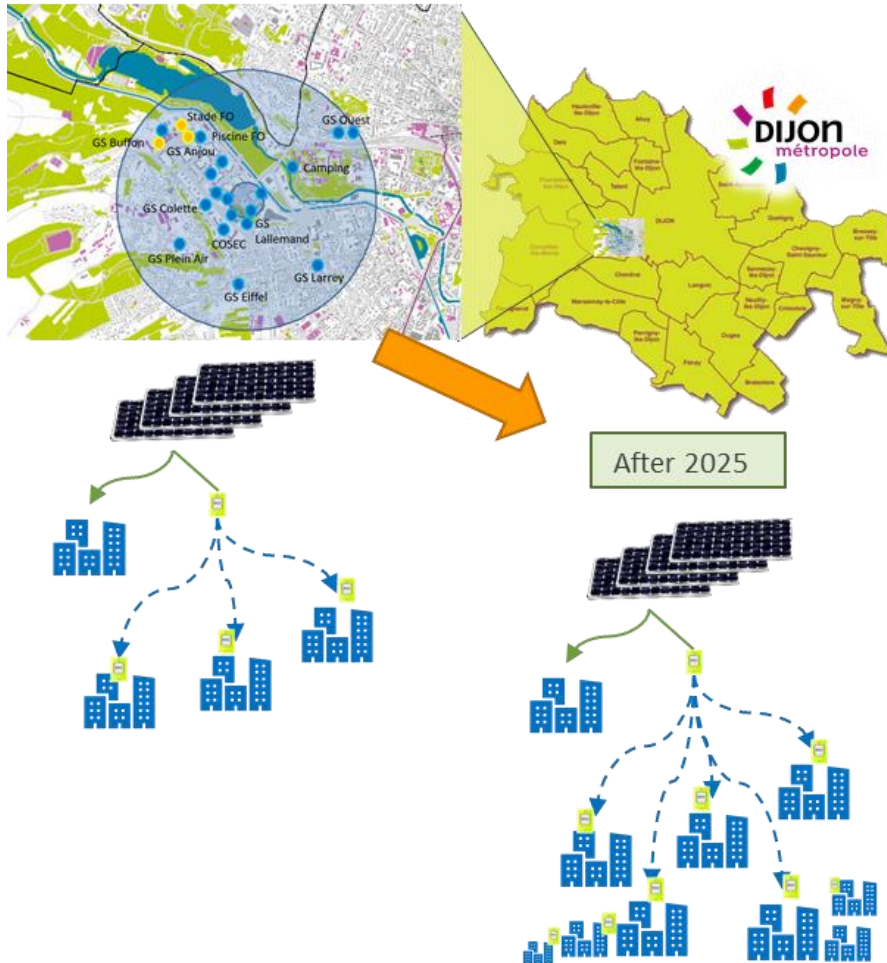


Data search with preview to create customized dashboards



RESPONSE in Dijon: Main Outcomes (3)

Ongoing replication at city scale



- Tested collective self-consumption (CSC) on City of Dijon assets through RESPONSE, building technical and organizational know-how.
- Scaled up to a metropolitan flagship project: the Zénith parking PV installation (1 MWp).
- Overcame regulatory limits (1 km perimeter) through innovative legal and technical setup.
- Achieved national impact, leading to an adapted regulatory framework now applicable to all French cities.



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Main Outcomes from Turku

Laajalehto Tatu



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RESPONSE in Turku: Student Village PED

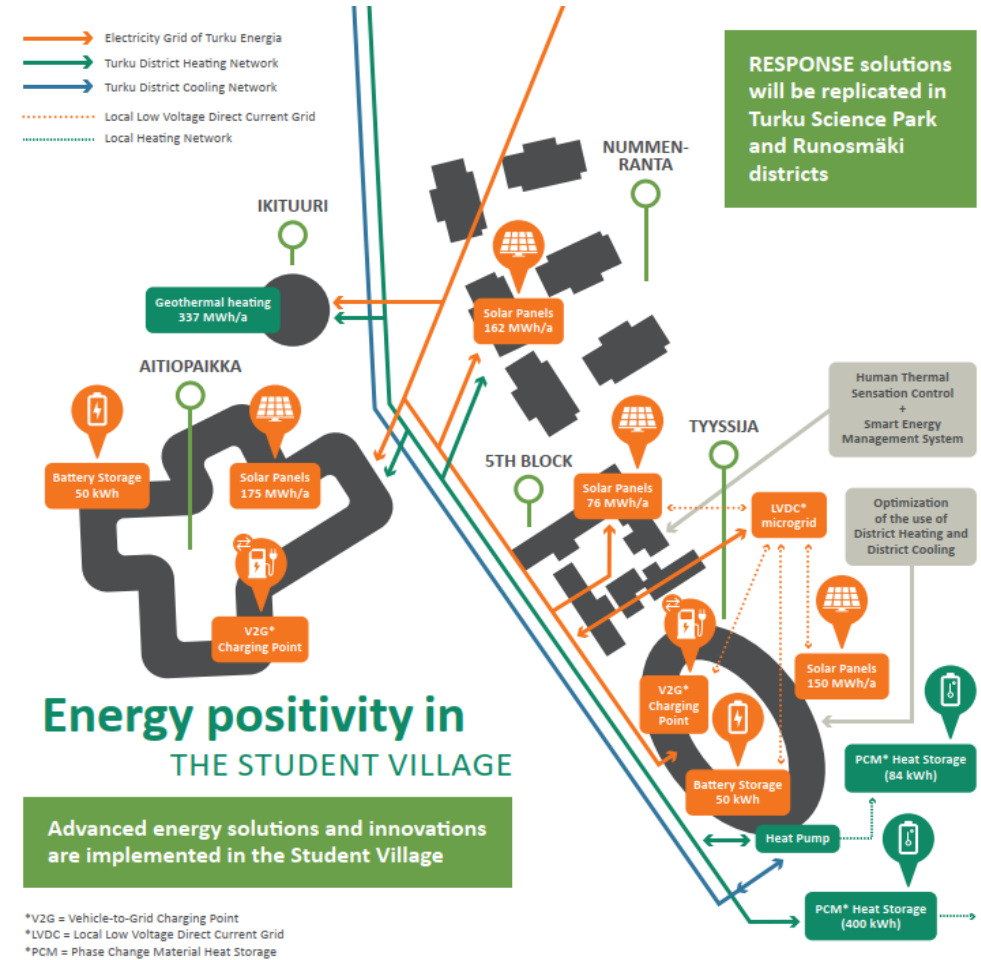
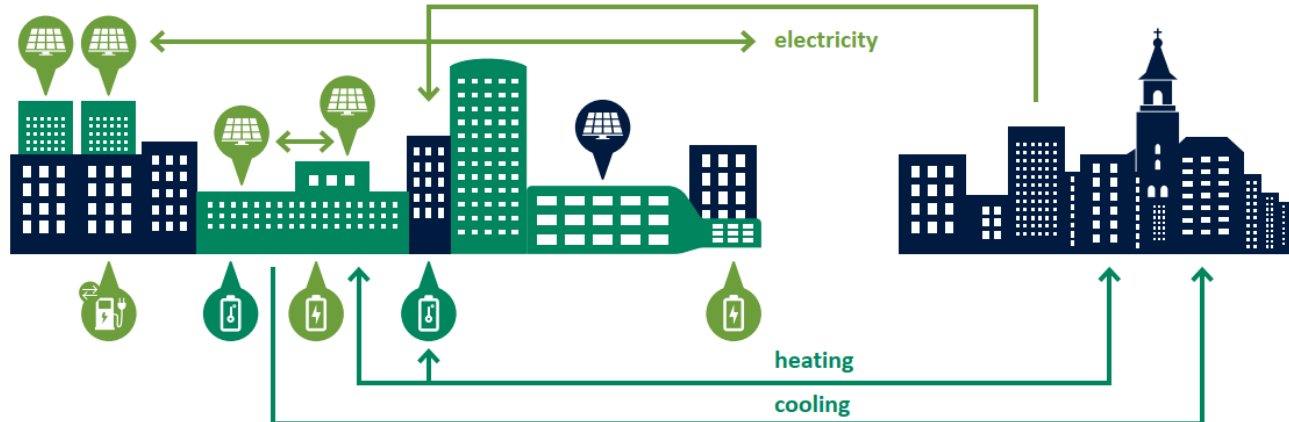
- Consists mainly of student and family housing provided by the Turku Student Village Foundation (TYS), the largest single student housing project in Finland, home to 3 500 students
- 13 PED buildings from 1970s, 2004-8, 2011, 2019 and 2021 that accommodate single occupancy and family apartments, office, gym, restaurant and grocery store
- 12 of those equipped with PV systems producing nearly 550 000 kwh/year
- Upcycling heat pump delivers heating/cooling 5 225 916 kwh/year
- Geothermal well contributes with another 330 000 kwh/year of produced heating





RESPONSE in Turku: Final Results

- **261 tCO₂eq/year** reduction of building energy related greenhouse gas emissions within positive energy block
- **1624 %** increase in locally produced renewable energy
- **900 dwellings** supplied with PV-generated electricity
- **2880 MWh** waste heat recovered within the positive energy block





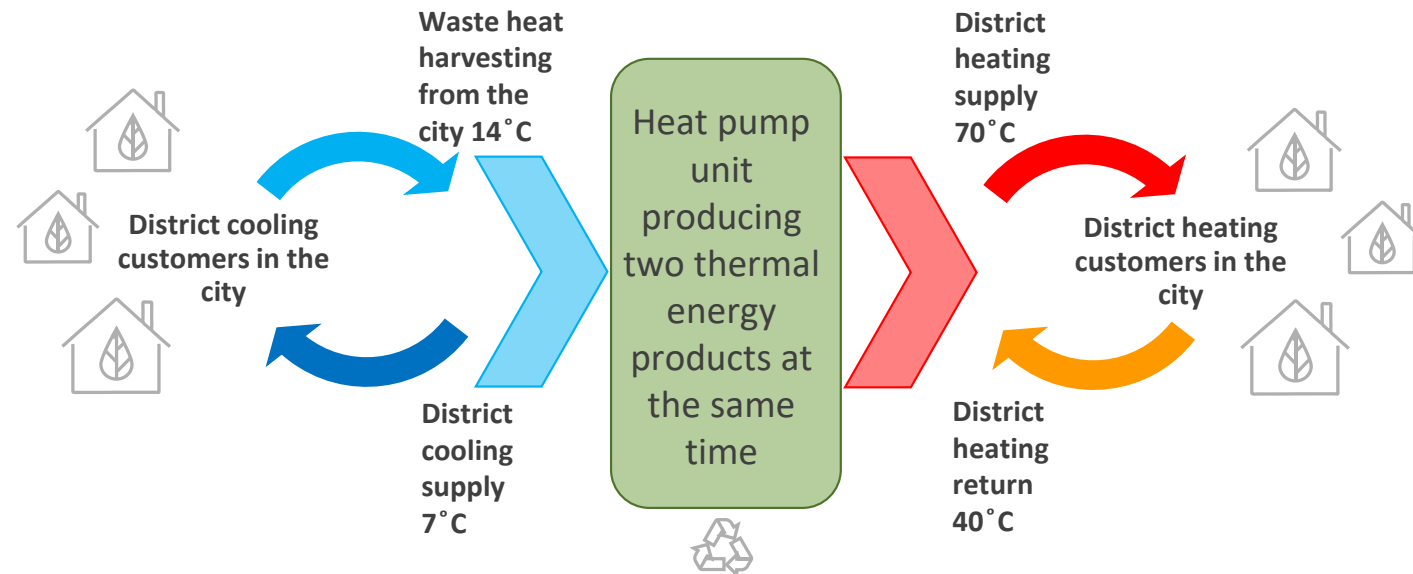
1. System-level Waste Heat Integration

- District cooling waste heat upgraded by heat pump
- Two-way connection to district heating & cooling networks
- 80% of PED renewable energy from this system

2022 – 2025

Waste heat utilized:
3 900 MWh

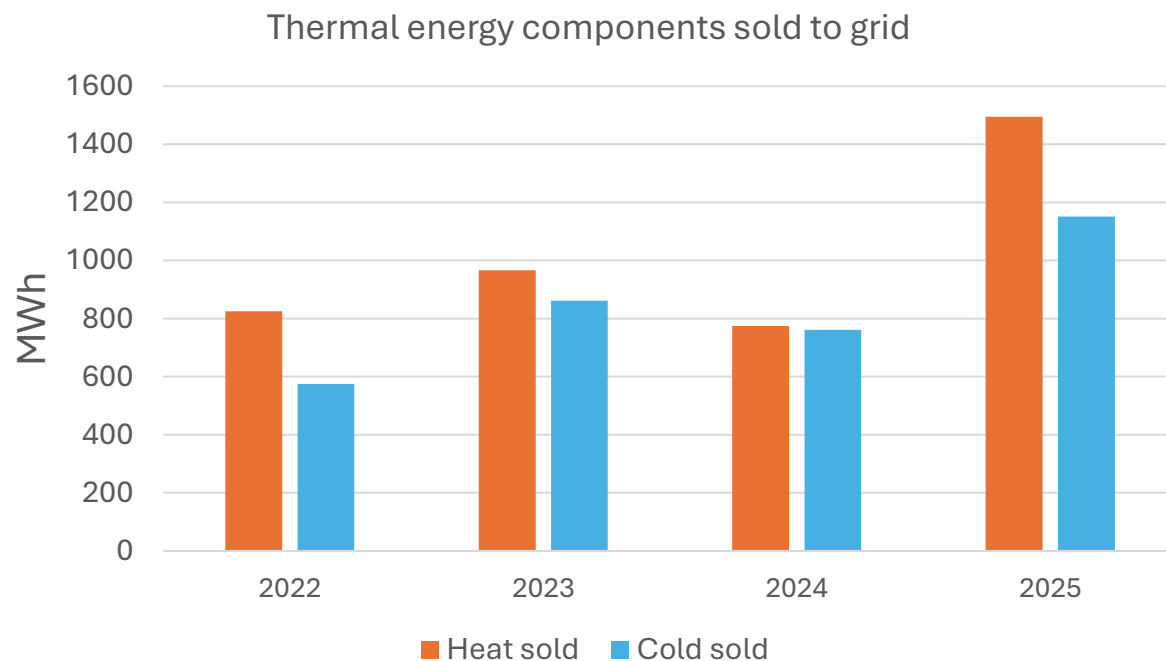
Thermal energy generated:
10 100 MWh





2. Prosumer-based District Energy Market

- Dynamic hourly pricing for district heating & cooling
- Buildings can buy and sell thermal energy
- New incentive for flexibility and waste heat use



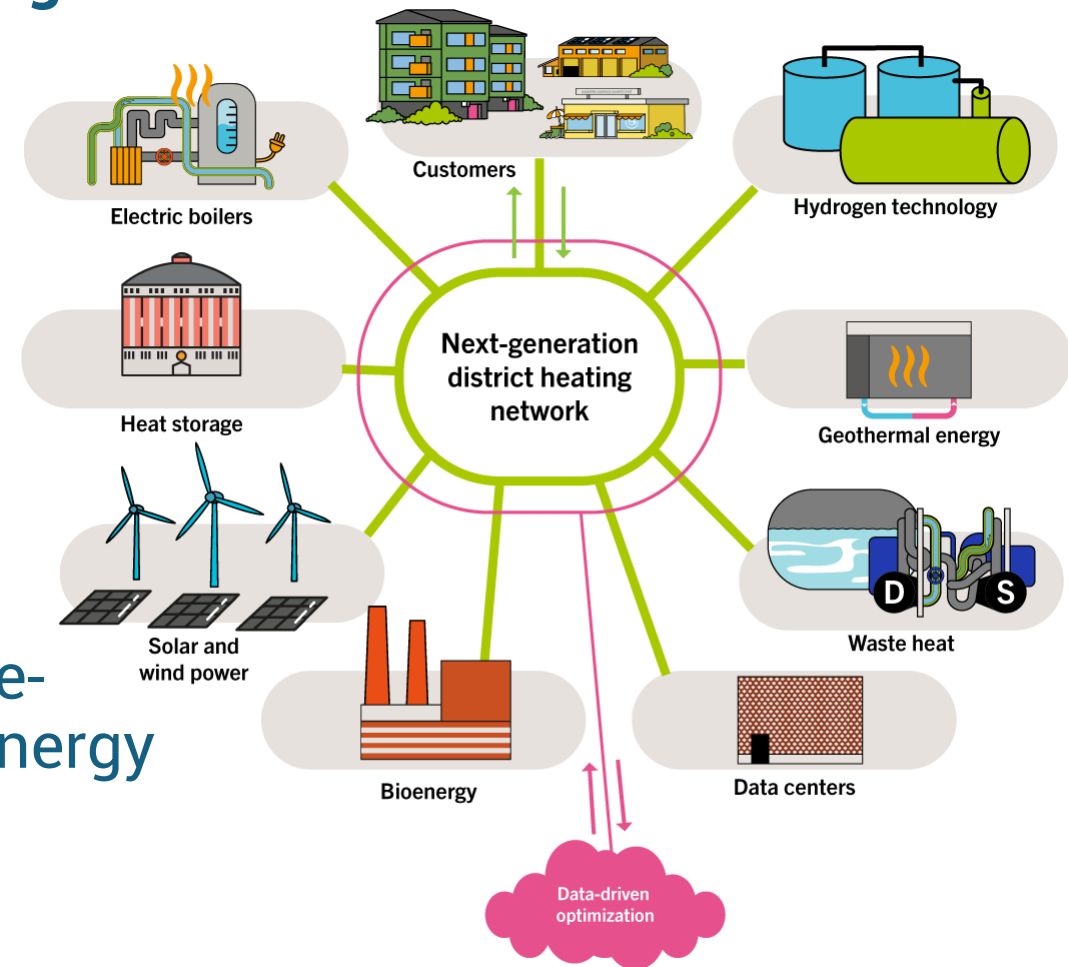
Reduced operational costs of building heating

- E.g. Tyysija building 50% reduction (2024)



3. Replication and Scale-up of Successful Energy Efficiency Measures

- Opportunities and impacts of utilizing district heating return water in Turku Energia's operating environment
 - Experimenting with hybrid storage solutions for district heating and cooling
- Leading to good progress on climate goals and aiming for climate-positivity by producing renewable energy also for the needs of other areas, not just Turku.





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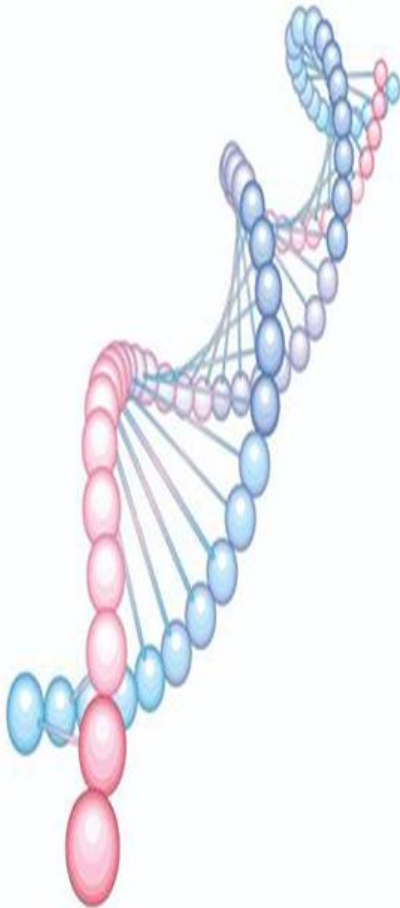
Main Outcomes from Fellow Cities

Desislava Koleva, PhD

**Director of Sustainable Development Directorate in Gabrovo
Municipality, Bulgaria**



Path from the Lighthouse to Fellow Cities



1. Lighthouse cities have demonstrated around 90 innovative solutions across 5 axes

2. Fellow cities have performed feasibility studies for 30 of the innovative solutions based on:

- lessons from LHCs
- local conditions
- changing priorities and situation in FCs

3. Fellow cities have created replication plans and bold city vision for 2050



Replicated Innovative Solutions by the Fellow Cities

Innovations	Name of the FC
Solar PV Innovations: Conventional PV vs. advanced PV systems	All FCs
Smart public lighting	Botosani, Severodonetsk
Community engagement	Zaragoza, Botosani, others
Collective self-consumption	Brussels
Predictive thermostats	Ptolemaida
Digital tools	Brussels, Severodonetsk
Mobility solutions	Severodonetsk, Ptolemaida, Botosani
DHC solutions	Brussels, Ptolemaida
Energy and building management	Gabrovo, Botoşani



Overall Conclusions

The replicability of the solutions is highly dependent on the local situation:

- Maturity of existing infrastructure (IT infrastructure, existing EV fleet, existing DHC networks, etc.)
- Budget availability, subsidy applications and cost-effectiveness in the local context: Some innovative elements are too expensive compared to conventional alternatives.
- High feasibility for conventional solar PVs and retrofitting solutions
- Lack of technical capacity and expertise in Digital and smart systems solutions
- Citizen engagement is difficult to achieve



Example: Replication in Gabrovo

The Positive Energy District (PED) in Gabrovo includes:

- Municipality of Gabrovo Administrative building with a total floor area of 7 870 m²;
- Orlovets Sports Hall, a multi-functional (sports and culture) facility, with total area of 8 879 m²;
- Diagnostic – Consultative Centre, a medical building with a total area of 5 559 m²;
- Municipal parking with built-up area of 2400 m².





Example: Results in Gabrovo

Expected results from replication in Gabrovo:

- **4 259 MWh/year** reduction of consumed energy
- **8 204 MWh/year** reduction of consumed non-renewable energy
- **1 797 MWh/year** on-site generation of renewable energy
- **1 768 tons/year** reduction of CO2 emissions

Main challenges during the Project:

- Closure of the district heating plant in the city, which affected three of the buildings in the PED.
- National decision for reduction of the usage of natural gas for heating, which affected one of the buildings in the PED.



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Key Impacts of the RESPONSE Project

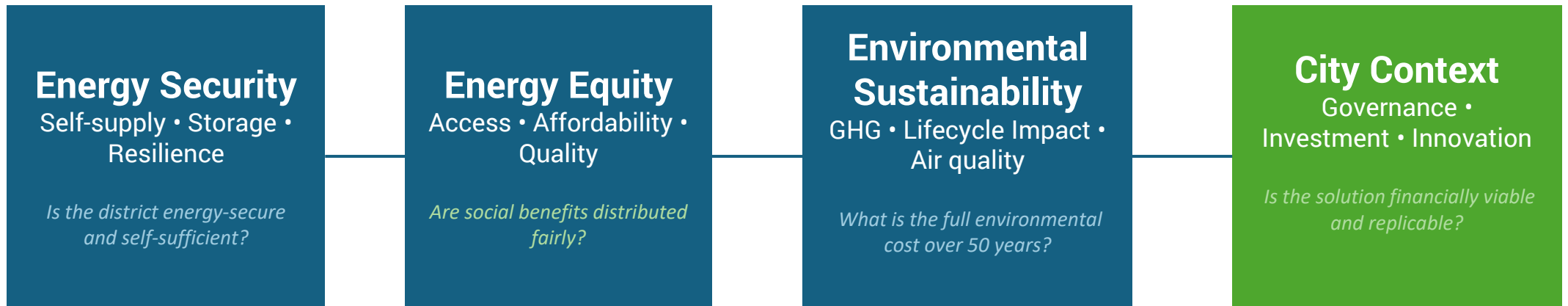
Noelia Pérez



Measuring Impact Beyond Energy Production

- **Energy figures alone do not tell the full story.**

RESPONSE assessed impact through four interconnected dimensions, consistently applied across both LHCs:



- **What this enables**

- A like-for-like comparison of solutions across Dijon and Turku
- Evidence that other European cities can use to decide what to replicate, under which conditions, and in what order





What are the Evidence from Dijon and Turku?

Environmental

PEB level (block scale)

Dijon PEB1

-48% PE
-41% GHG

Carbon payback ~1.9yr

Turku PEB

-34% PE
-19% GHG

Carbon payback ~2.8yr

Building level (best case each city)

Dijon PEB2_B2

-45% PE
-40% GHG

Franche Comté carbon payback ~2.6yr

Turku B1

-48% PE
-25% GHG

Aitiopaikka carbon payback ~1.9yr

50yr LCA (full lifecycle) – distinct from Dijon's operational monitoring results

Economic

€11–24M

Net Present Value – Turku (50yr)

7–8 yr

investment payback
across all scenarios tested

IRR 19–22% • B/C up to 11:1

Social

Where impacts really occur

Concentrated in manufacturing supply chains – not in city operation

Per euro invested

Most solutions deliver net positive social value, regardless of investment scale

Key lesson

Accurate cost inventories are essential – incomplete baseline data underestimates the benefits of renovation

Key finding: *Integrated combinations – RES + efficiency + smart management – consistently outperform single-solution deployments across all dimensions*





Can Other Cities Do It? What Have We Learned About Replication?

FINDING 01

Legal conditions: YES

- ▶ **France & Finland:** fully enabling regulatory framework for all RESPONSE solutions
- ▶ **6 EU countries:** neutral to moderately supportive
- ▶ PED development feasible: local self-consumption, DHC infrastructure, EV + air quality plans

FINDING 02

Real barriers: technical & organisational

- ▶ **Regulatory fragmentation:** V2G, battery storage, energy communities – national frameworks lag innovation
- ▶ **ICT interoperability:** open standards exist (OCPP, Modbus, IEC 61850) but inconsistent manufacturer implementation
- ▶ Open ICT specifications are as decisive as technical feasibility

FINDING 03

5 Fellow Cities already replicating

Gabrovo • Brussels • Zaragoza • Ptolemaida • Botosani

- ▶ **30+ feasibility studies**, each adapted to local infrastructure, priorities and budget
- ▶ Decision-support roadmap for any European city – which solutions to prioritise, in which order and under what conditions – is on the way

Key lesson: *Technical feasibility alone is not enough.* Interoperability, open ICT specifications and supportive regulation are equally decisive for successful replication across Europe.



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Round Table Discussion



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Question & Answer Session



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Closing Remarks



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Thank You Very Much!



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