

VONOVIA

Capital Markets Day

Energy Innovation Center

September 27, 2022

Energy Innovation @ Vonovia

Key Element for an Economically Feasible Energy Turnaround

- Our portfolio must be **climate neutral by 2045**.
- In order to achieve **decarbonization in an economically feasible way**, we need to go beyond the technologies available today when it comes to energy generation, storage and distribution.
- There is an increasingly large **gap** between **generation and consumption** of renewable energies. Volatility is adding another challenge.
- To solve the technical and economic challenges the sector not only needs subsidies but also **innovation**:
 - **Generation**: economically feasible and efficient energy generation (improved PV, high-power heat pumps, etc.)
 - **Storage**: both short-term and seasonal – electricity also for heating (thermal storage, H2 storage, electricity storage, etc.)
 - **Distribution**: Intelligent sector coupling for maximum efficiency (energy management systems, AI, etc.)
 - **Consumption**: Reduced consumption and increased efficiency (smart radiators, serial refurbishment, etc.)
- Vonovia is aware of its responsibility as the market leader and conducts research in all of these segments. The focus in these efforts is the **Urban Quarter**, where we can bring about the most meaningful change.



Synergy Potential across Electricity, Heating, and Mobility

Sector Coupling in Urban Quarters

Today: Separate

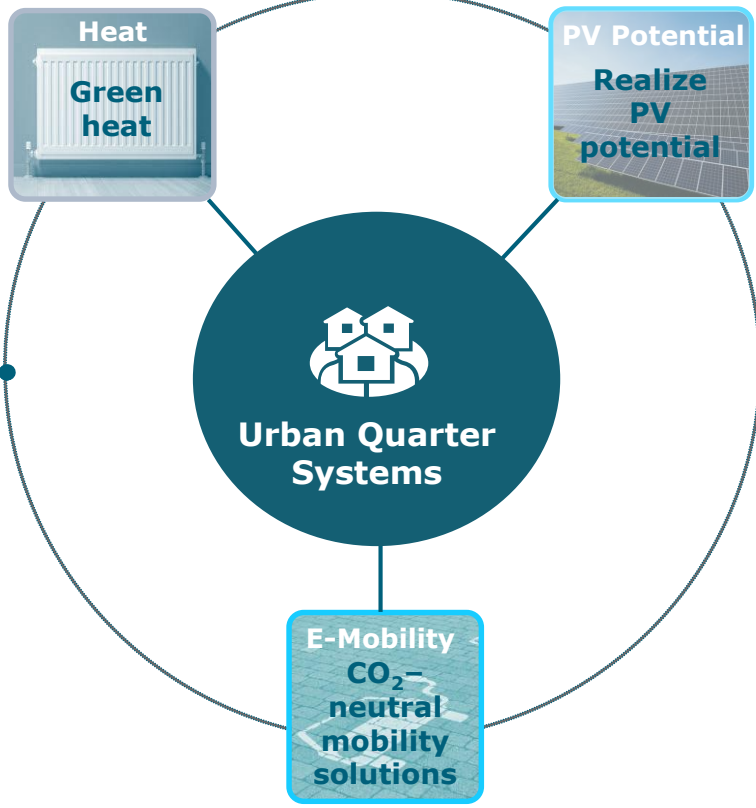


E-mobility as a flexible consumer and storage device

Decentralized electricity to reduce dependence on grid

- 1. Reduction through increased efficiency
- 2. Generation of green heat via renewables

In the future: Interconnected in Urban Quarters



The intelligent connection of energy consumption, generation, and storage in an urban quarter increases decentralized energy independence.

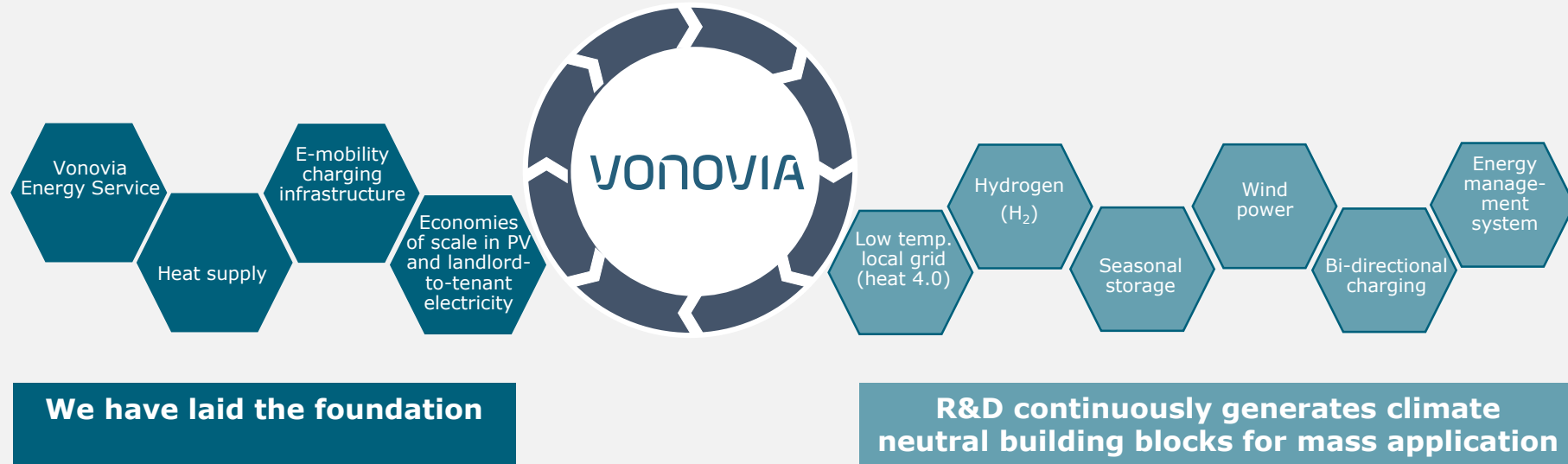
Basic Technologies Are Already Available

Additional Innovations Are Necessary

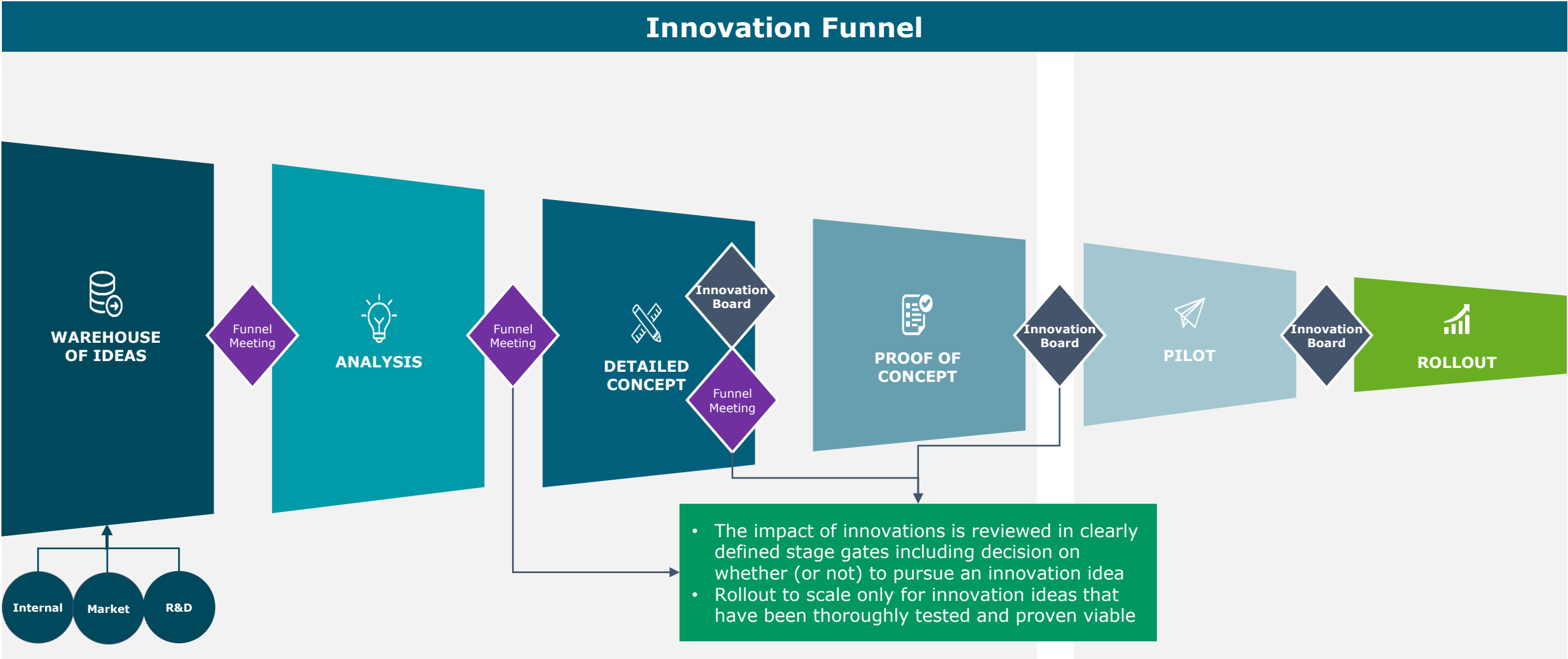
Roadmap to climate neutrality:



1. Electricity is the basis for CO₂-free energy: **We maximize deployment of PVs.**
2. Urban Quarters form the basis of interconnected energy supply: **We apply economies of scale to modular energy concepts in urban quarters.**
3. Planning ahead for investment cycles: **We're laying the foundation for 2045 through economically viable solutions – we think of electricity and heat as one already today.**

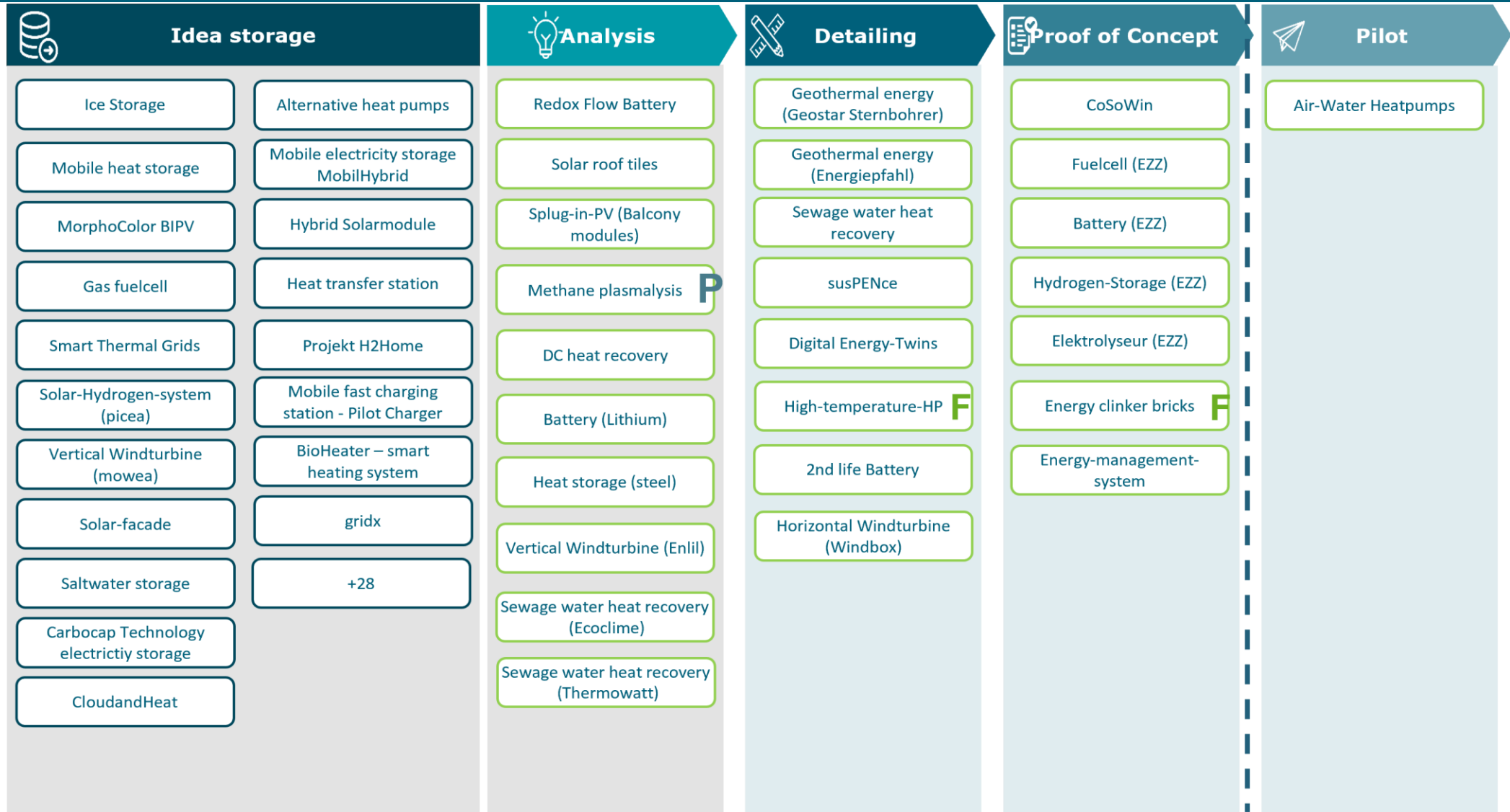


Stringent Innovation Process with 5 Decision Gates



Energy-Funnel

Overview of Current Ideas and Projects



Energy Innovation Center in Bochum Weitmar

Initial Research Success already during Planning Phase

- The EZZ in Bochum-Weitmar is the first **Energy Research Hub** for the residential portfolio.
- During mild winters, **all of the required heating** and up to 25% of the electricity need can be generated and consumed on-site by using innovative technologies (electrolyzer, fuel cell, electricity and H2 storage).
- The research objective is to **identify scalable, ecological business models** and technology combinations for our quarters.
- The construction phase already yielded some relevant **additional research results**: For example, contrary to the original planning, Vonovia built the first low temperature grid including transfer stations that are supported by high-power heat pumps. This allows flow temperature levels that work for existing radiators, eliminating the need to replace them.



Political decision-makers visit the EZZ

From left to right:

- **Ina Scharrenbach** (Minister for Home Affairs, Municipal Affairs, Building and Digitalization of the State of NRW)
- **Prof. Dr. Andreas Pinkwart** (former Minister of Economic Affairs, Innovation, Digitalization and Energy of NRW)
- **Mona Neubaur** (Minister for Economic Affairs, Industry, Climate Protection and Energy of the State of NRW)
- **Serdar Yüksel** (Member of the State Parliament of NRW)
- **Oliver Krischer** (Minister for the Environment, Nature Conservation and Transport of the State of NRW)
- **Alexander Rychter** (Director of VdW Rheinland Westfalen)

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