



AI and digital twins: application in the energy system



3rd United Nations Virtual Worlds Day

Session 2

Housing, Energy and Climate: Building Resilient Communities with AI, Digital Twins, and Spatial Technologies



Digital twins and AI: transforming energy systems

Digital twin: real-time digital representation of physical systems integrating data and predictive analytics

Enables:

- Real-time monitoring of grids, buildings, assets
- Predictive maintenance and failure detection
- Scenario simulation (demand peaks, renewable variability)

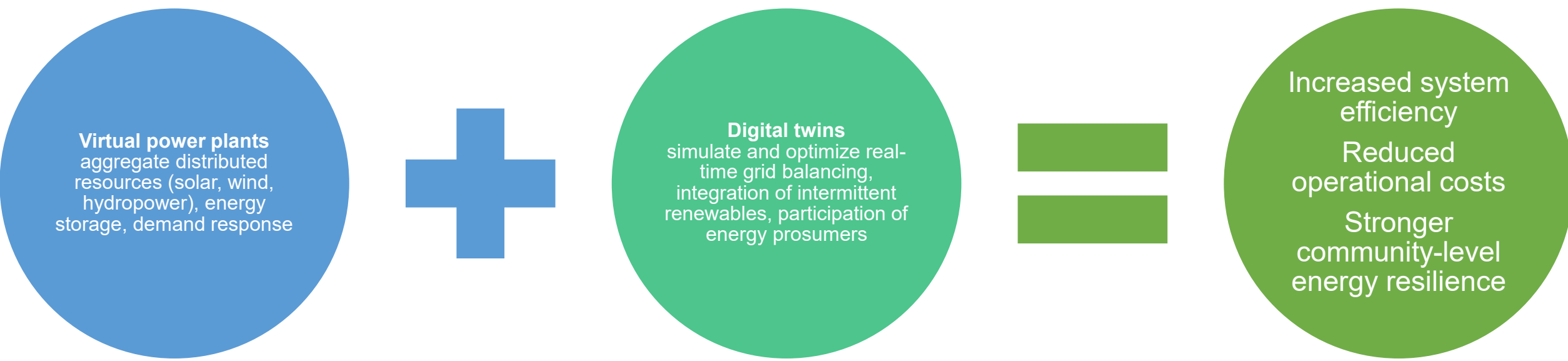
... enhanced by AI:

- Forecasts demand and supply fluctuations
- Optimizes system performance in real time
- Supports decision-making in complex environments

Result: smarter, more agile, and data-driven energy systems



Digital twins and virtual power plants: system approach



Virtual power plants
aggregate distributed
resources (solar, wind,
hydropower), energy
storage, demand response



Digital twins
simulate and optimize real-
time grid balancing,
integration of intermittent
renewables, participation of
energy prosumers



Increased system
efficiency
Reduced
operational costs
Stronger
community-level
energy resilience

From energy systems to cities, housing, and climate

The real breakthrough comes from integrating AI and digital twins across the full energy value chain: from generation to end-use.

Cities

- Integrated digital twins for energy, transport, built environment
- Better urban planning and system coordination

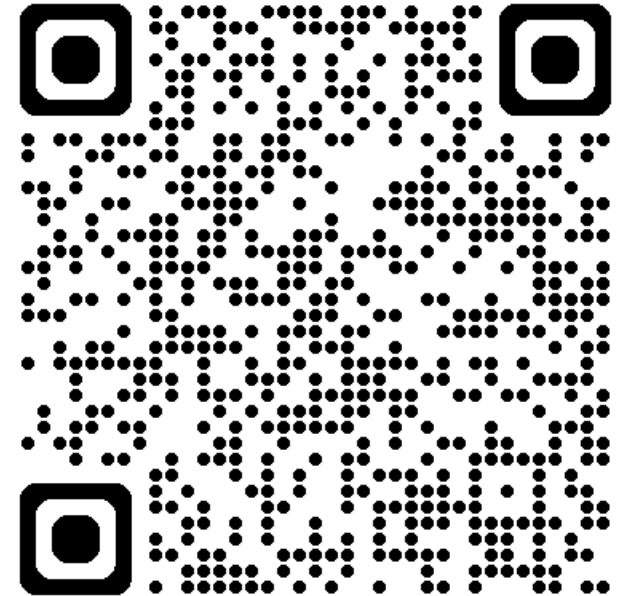
Housing

- Building-level digital twins improve energy performance
- Optimize consumption and empower users

Climate

- Scenario testing for policy and investment decisions
- Direct contribution to emissions reduction

See UNECE work in the area





Thank you!

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