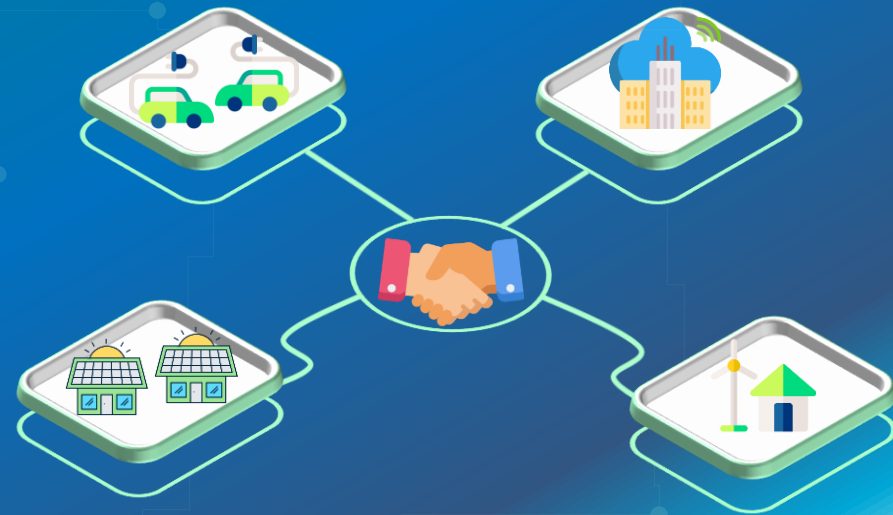


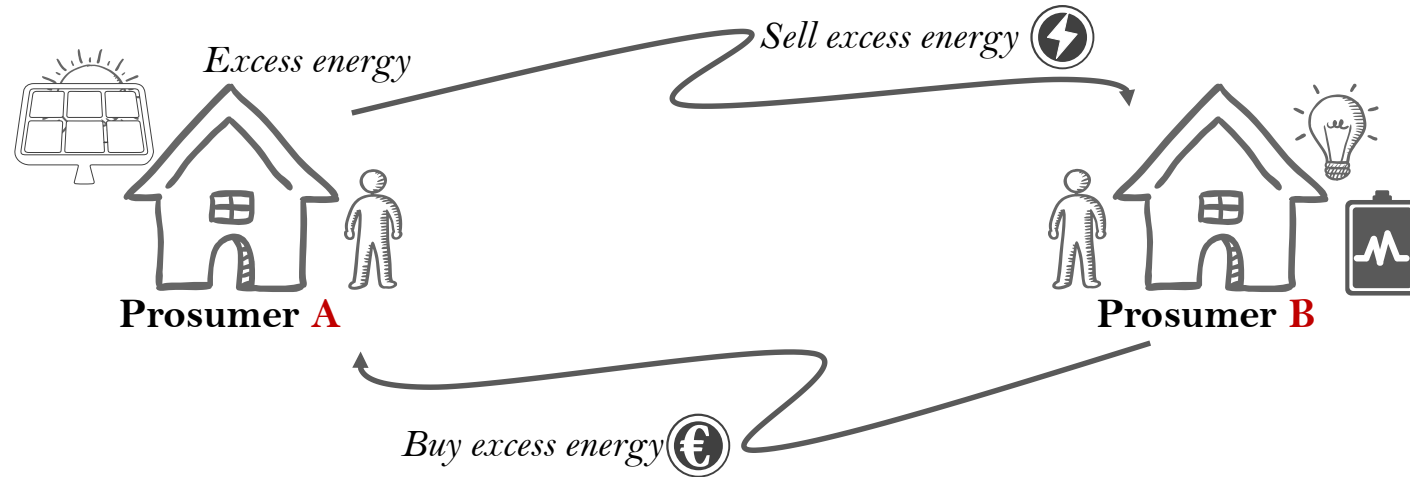
A Decentralized Local Energy Trading Platform Based on Blockchain Technology



Collaborative work
between IEPG & DBL

Blockchain application: *Peer-to-Peer (P2P) energy trading*

Allow direct communication & supply of energy between various prosumers with DERs within the energy system



Buy & Sell renewable energy at better rates from/to a peer (or neighbor)

What is new?!

A decentralized local energy trading platform

1 Market structure

- **Pool-based structure** with **uniform pricing** mechanism
- **Short-term** for **time-ahead** allocation & operation
- Fully **decentralized** market operates **without** a **market operator**.
- Similar to wholesale markets, it can accommodate **different market products** with **intertemporal constraints**

2 Market Clearing

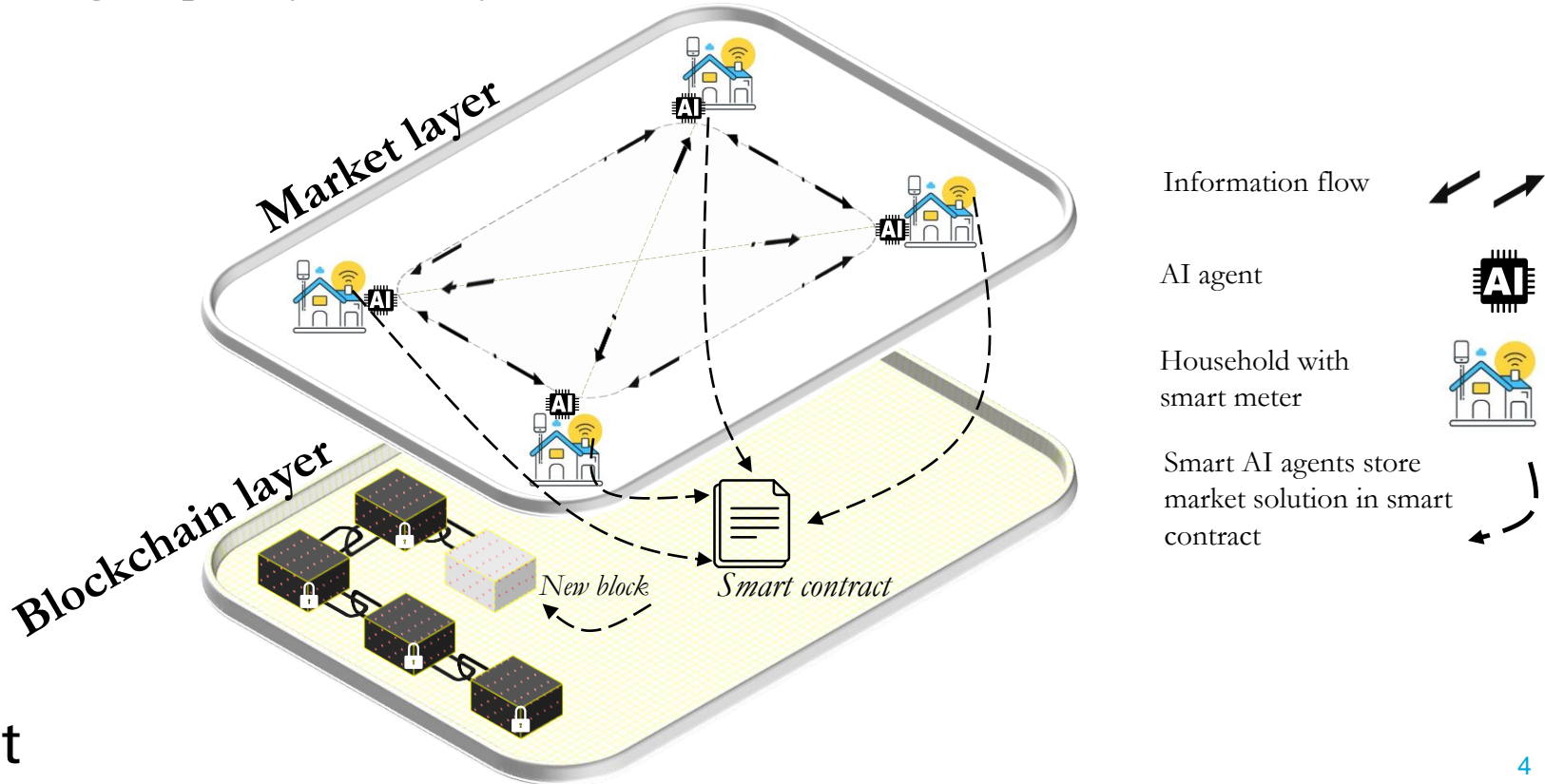
- Propose a **novel fully decentralized** market clearing approach based on **AI optimization** algorithms that can handle different market products

3 Blockchain integration

- **Integrate** the P2P market with a blockchain layer
- Making it **fully decentralized**, more **secure** with **fast settlements** & **cutting intermediaries costs**

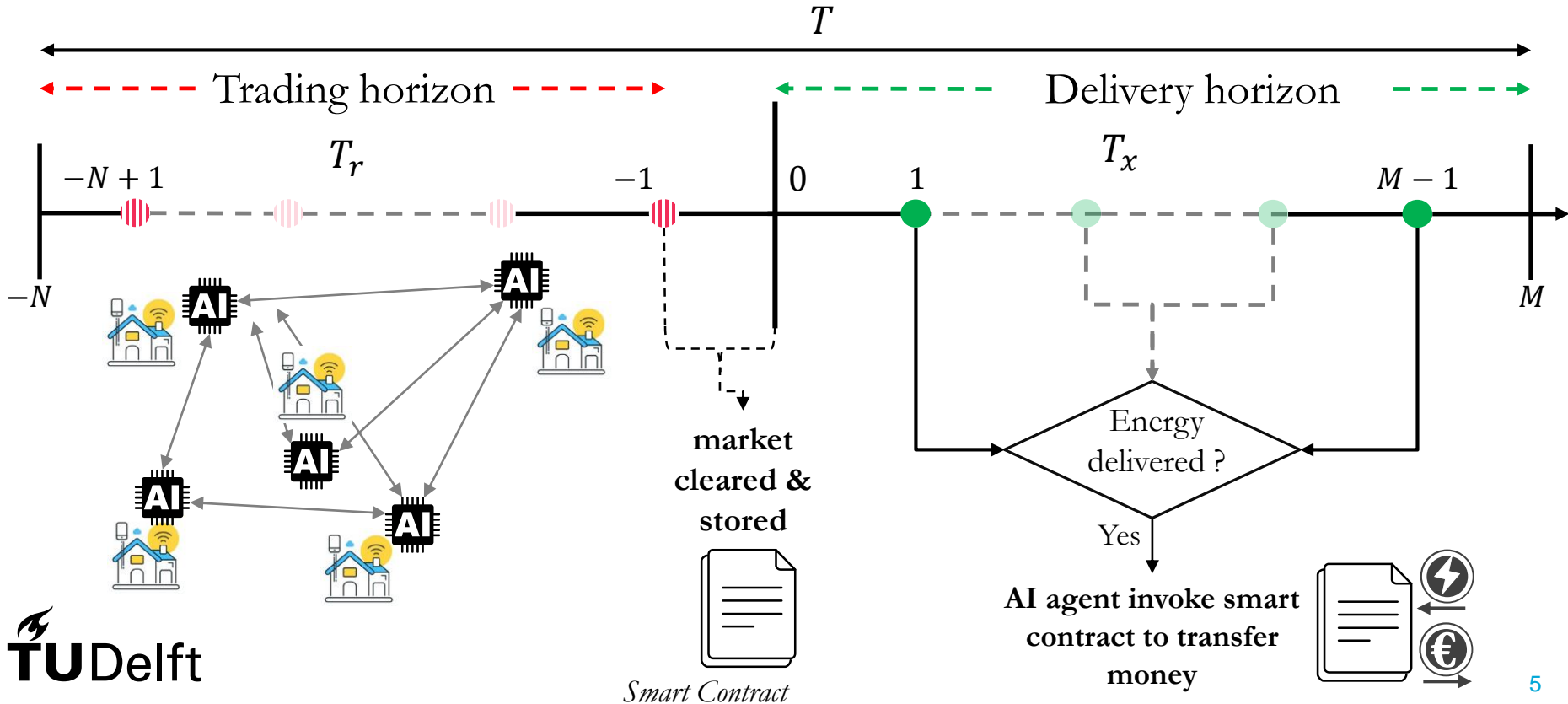
Proposed P2P energy trading platform

A decentralized local energy trading platform that **enables prosumers** (peers) to trade among each other, while **guaranteeing** the **privacy & security** of their identities, as well as their **market offers**.



Proposed P2P energy trading platform: *Market layer*

Short-term market for time-ahead allocation & operation...

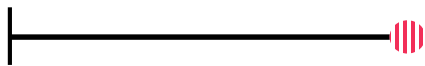
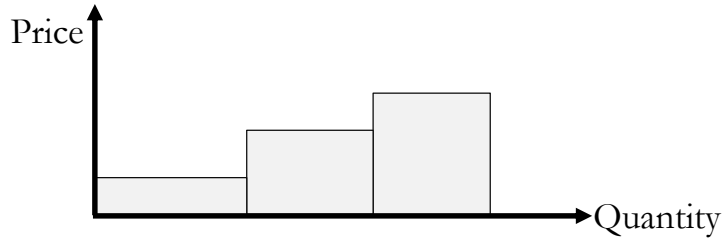


Proposed P2P energy trading platform: *Market layer*

Prosumers can present 2 kinds of market products

Single Products

Time independent bids with different price levels for the energy to buy/sell

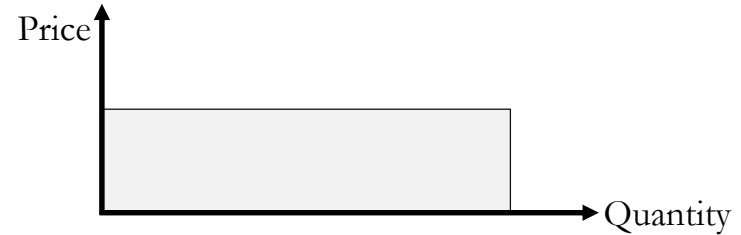


Supply bid valid for a single period

$Min \leq Activated \text{ (sold / bought) amounts} \leq Max$

Multiple Products

Intertemporal & time dependent on more than one time period



Supply bid valid for consecutive periods

$Activated \text{ (sold / bought amounts)} = Max$

Proposed P2P energy trading platform: *Market layer*

The structure of decentralized markets requires an efficient **decentralized optimization algorithm** that enables the involved parties to cooperatively **clear the market** while **maximizing** their own **benefits**

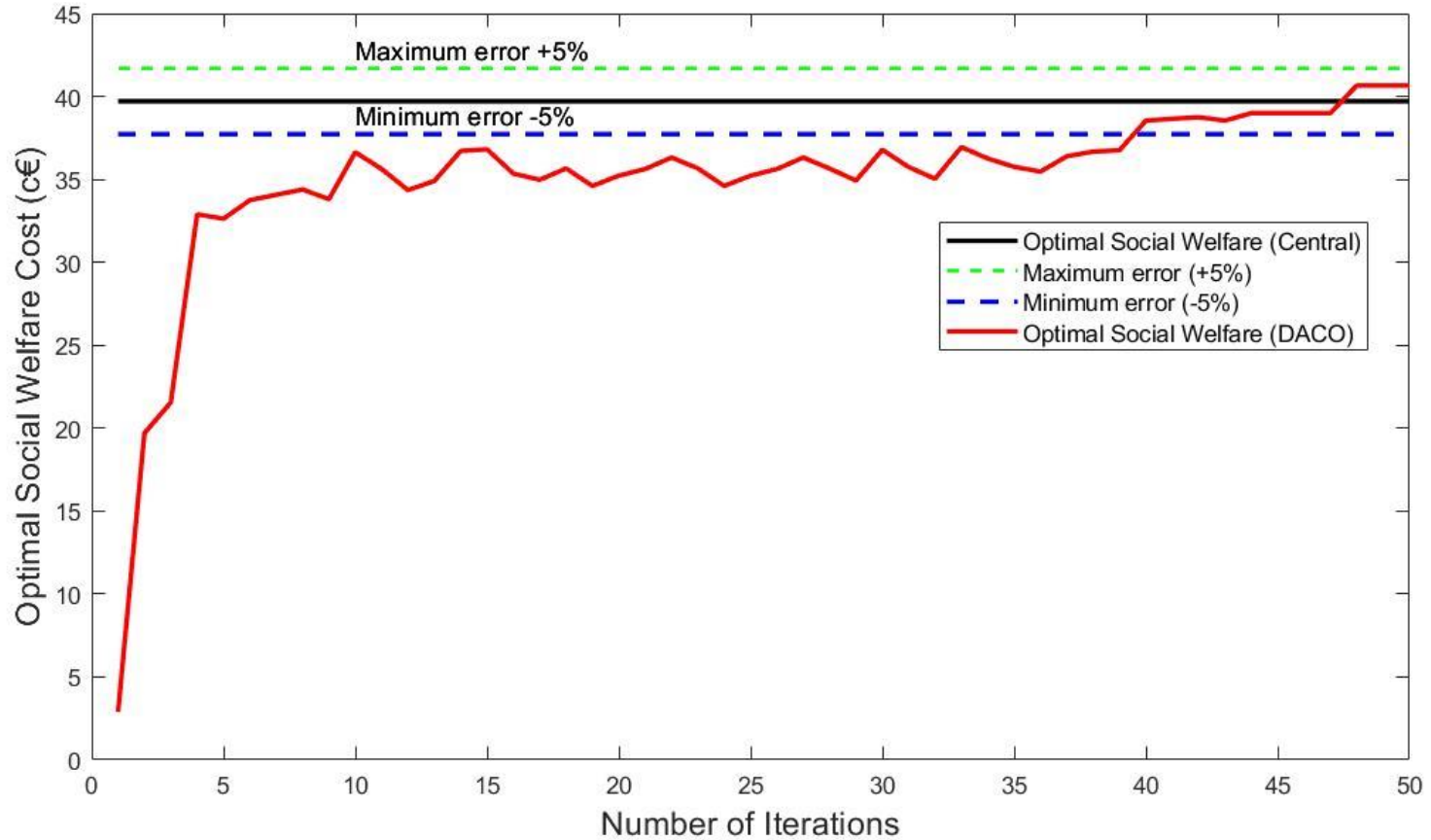
Market objective is to **maximize** the **social welfare** of all **participants...**



Decentralized ACO (DACO)

- Less complex compared to conventional methods, scalable & is a parallel process and not sequential.
- Able to optimize for multiple time periods & different market products (single & continuous)

Case Study: *Social welfare comparison (Central vs DACO)*



Thank you!