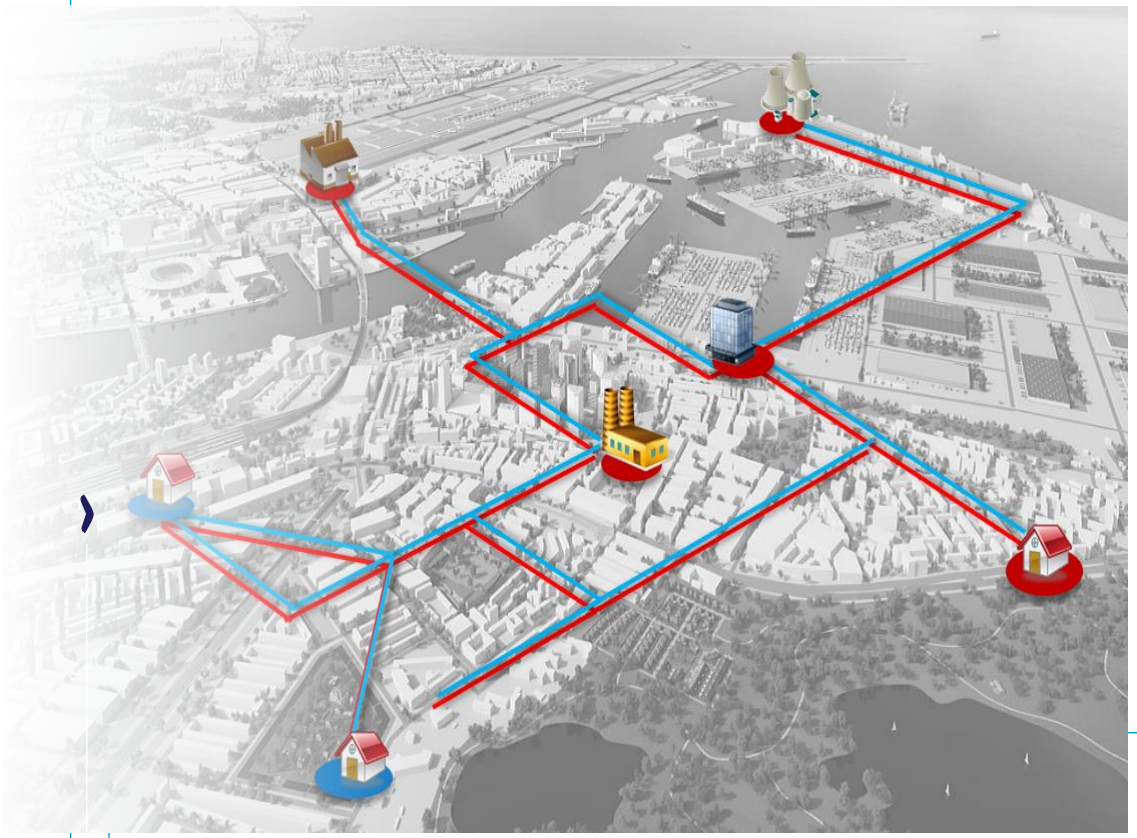
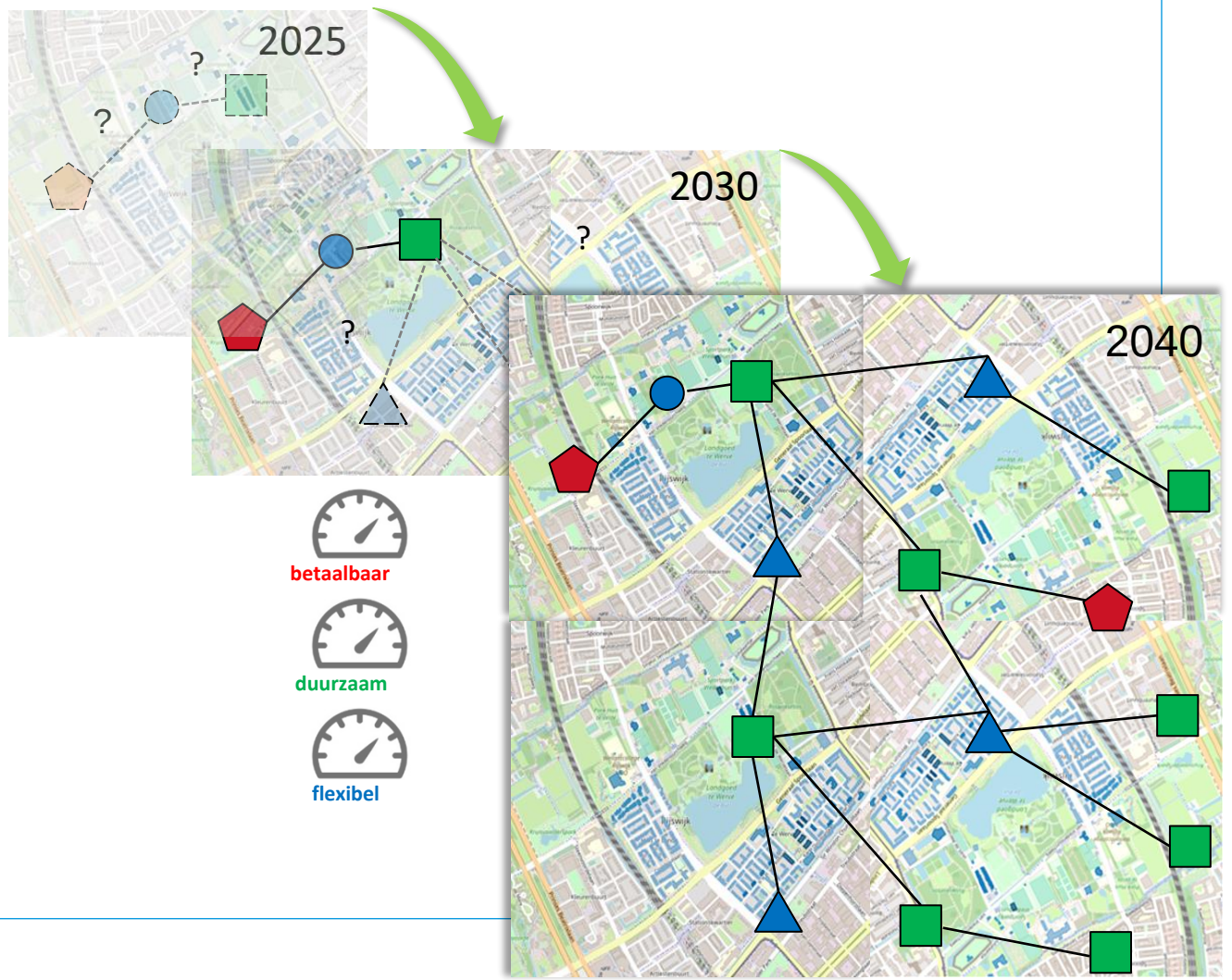
Dit project is mede gefinancierd door TKI-Energie uit de Toeslag voor Topconsortia voor Kennis en Innovatie (TKI's) van het ministerie van Economische Zaken en Klimaat.

TKI GROW – Openbare Eindrapportage

Dynamisch **GRO**eimodel voor
productie, distributie, levering en organisatie
van duurzame **W**armte
in de gebouwde omgeving
aan de hand van casus Rijswijk





What is GROW about?

- Optimize planning and conceptual design of a heat network for lowest costs
- Countering different chicken-egg dilemmas for collective heat

1. demand/supply

development of demand and supply are interdependent…prior to investing in sources and infra early guarantees for contracted demand or needed… but price of heat depends on number of consumers!

2. warmtekavels

choice of ‘warmtekavels’ is made prior to a conditional offering for the residents … but the offering depends strongly on choice and dimensions etc. of such warmtekavel.

3. “real life” events

during realisation of a heat network, all kind of ‘real life events’ occur that need a change of plans. How to deal with that in a flexible way ?

Fase 1: Beleid
- TVW 2.0
- Warmtekavels

Fase 2: Keuze warmtebedrijf
- Intentieovereenkomst

Fase 3: Definitiefase
- Businesscase
- Voorwaardelijk aanbod

Fase 4: Voorbereidingsfase
- Aansluit- en leverovereenkomsten
- Investeringsvoorstel

Fase 5: Investeringsbesluit
- Investeringsbesluit
- Wijkuitvoeringsplan

Fase 6: Realisatie
- Warmtenet

Exploitation
- Zero-emissie warmtenet in 2050

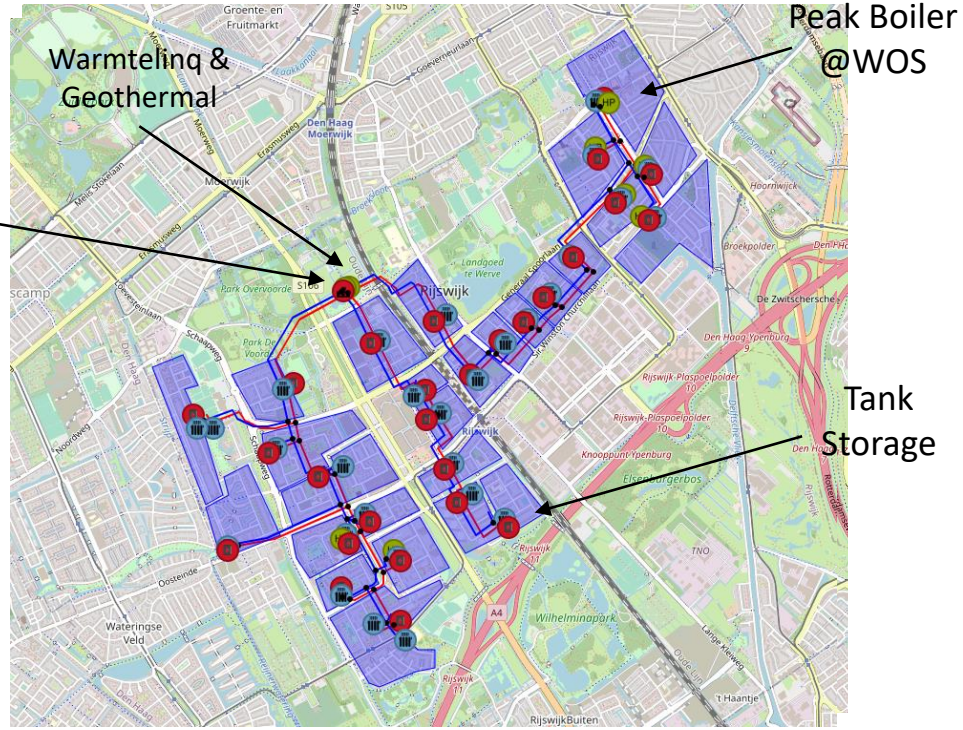
Optimized conceptual heat network design for lowest LCOE

RESULT

- Conceptual design heat network optimized for lowest Levelized Cost of Energy (LCOE) for residents/consumers
- In a cost+ model this translates to lowest heat ta

Solution	LCOE
Heat District Network	~ 21 €/GJ
Individual HP	~ 33 €/GJ

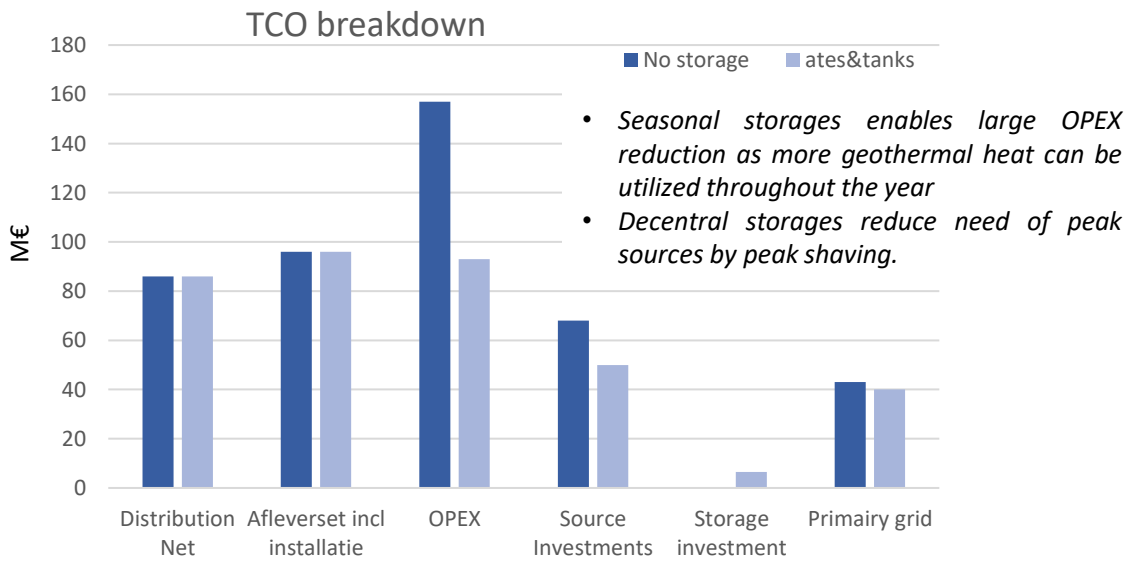
These are costs and not heat tariffs! And there may be some additional costs not in scope of Toolkit



INPUTS

- Districts that are listed for collective heating
- Possible routing options primary grid
- Possible sources and storage options

- Applicable to both greenfield and brownfield cases
- constraints (order of districts/ sources etc.) can be applied
- Interesting to also include insulation scenarios!



Optimized planning of connected neighbourhoods, sources, grid and storage

RESULT

- “Roll-out” of connected neigbourhoods and all assets against lowest financial risk =>
- Evaluation of different source strategies and source mixes
- Easily re-calibrate during heating transition

INPUTS

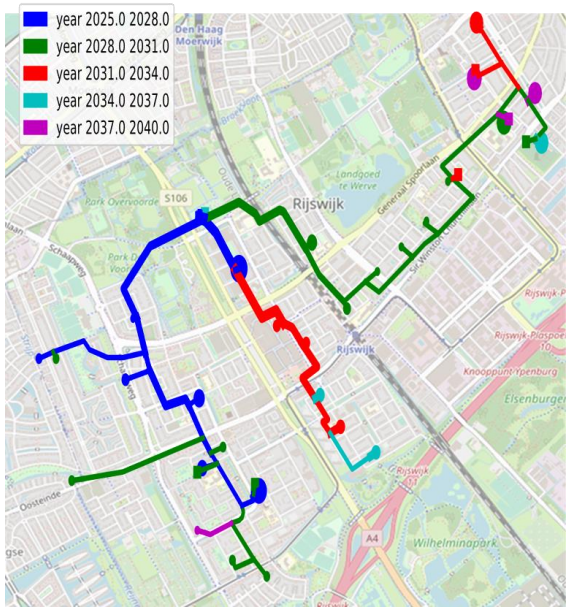
Littel Information is needed upfront, allowing to build upon current TVW’s. Info is needed about

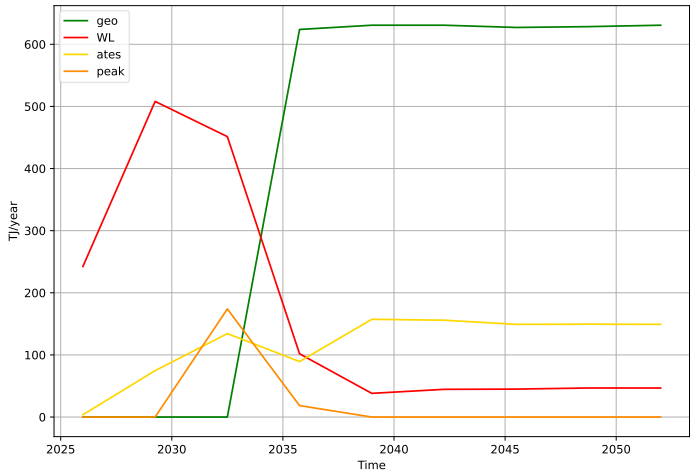
- desired order of sources/districts,
- max. investments (deployment speed) per year

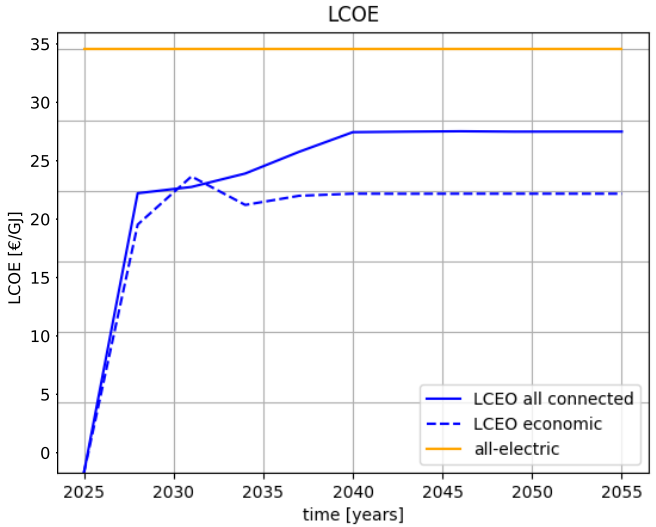
This info can be incorporated in the optimization

Demand cluster

Bronnen & ATES







WarmtelinQ acts as a ‘kickstarter’ for the network until the number of connected consumers is large enough to switch to local sustainable source such as geothermal heat.

Compared to only connecting “profitable” districts, connecting all districts results in higher LCOE (EUR/GJ), but still costs are lower than the reference scenario of all-electric (heat pumps). How to deal with the less profitable parts of a network given emerging market ordering?

Countering different chicken-egg dilemmas

- Large heat network takes too long to realize ! We want to start – we will “grow organically, stringing beads”

Larger scale networks can be realized when the roll-out consists of financially viable sub-parts towards an optimized end-picture.

“Stringing beads” does not start with an optimized end-picture in mind

- In practice, things always go different, too hard to organize

Recalibrate your design during the transition towards full implementation

- Larger grid plans pose too high financial risk-> “volloop” risk

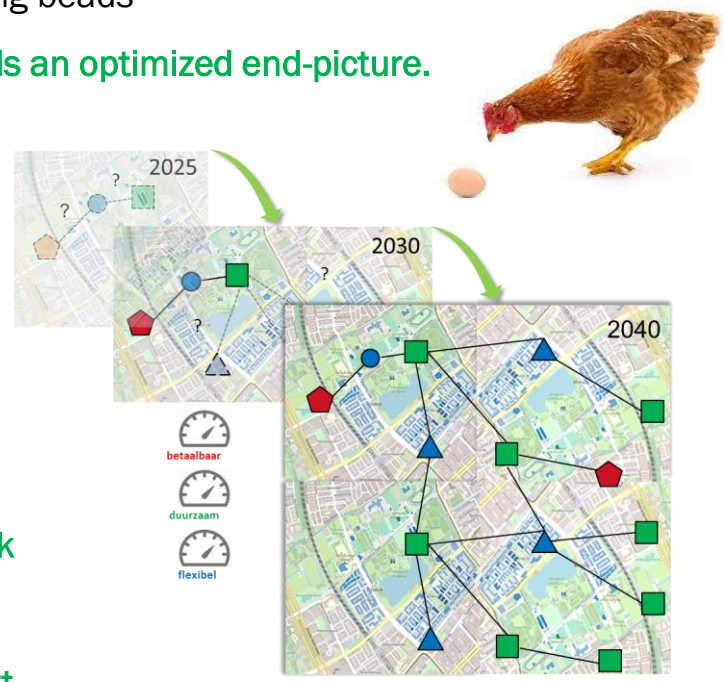
Roll-out optimization leads to balance between costs and revenues when the network “grows”

- Demand for and supply of heat = chicken-and-egg

Demand and supply development can be holistically optimized over time, countering the “volloop” risk

Organizing sufficient demand for a heat network remains a key societal-organizational challenge.

Lowest LCOE is key ingredient in an enticing offering to residents and helps to obtain societal support.



- Develop a workflow to that purpose, integrating the techno-economic and financial-organizational aspects?

GROW

- Demonstrate that workflow with a real-life case, showing how to overcome the drawbacks

Use case Rijswijk

Platform and Toolkit used for GROW

WARMINGUP | DESIGN TOOLKIT

https://www.youtube.com/watch?v=xrPCmpUxEAI