



Unleash the Power of Flexibility with Shapeshifter: A Universal Flex Trading Protocol

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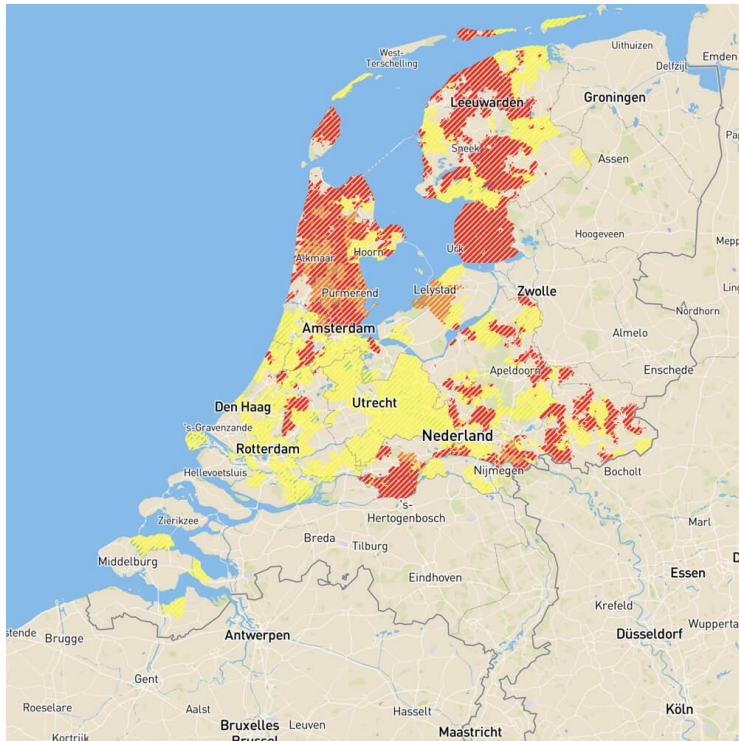
Tom Wetjens
Shapeshifter TSC member (EDSN)



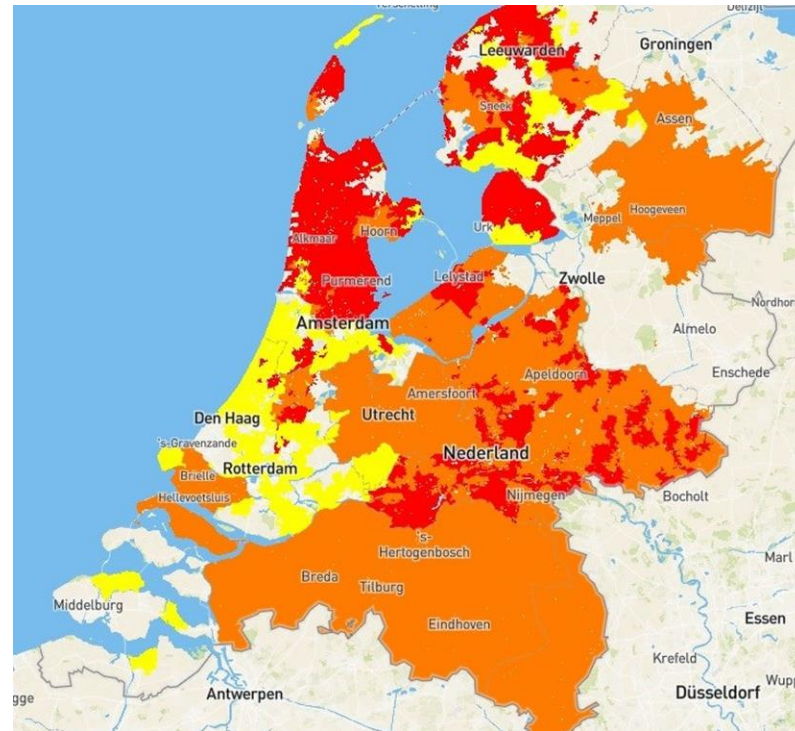
Outline

- What problem are we trying to solve?
- What is Shapeshifter and how does it work?
- How to use it?

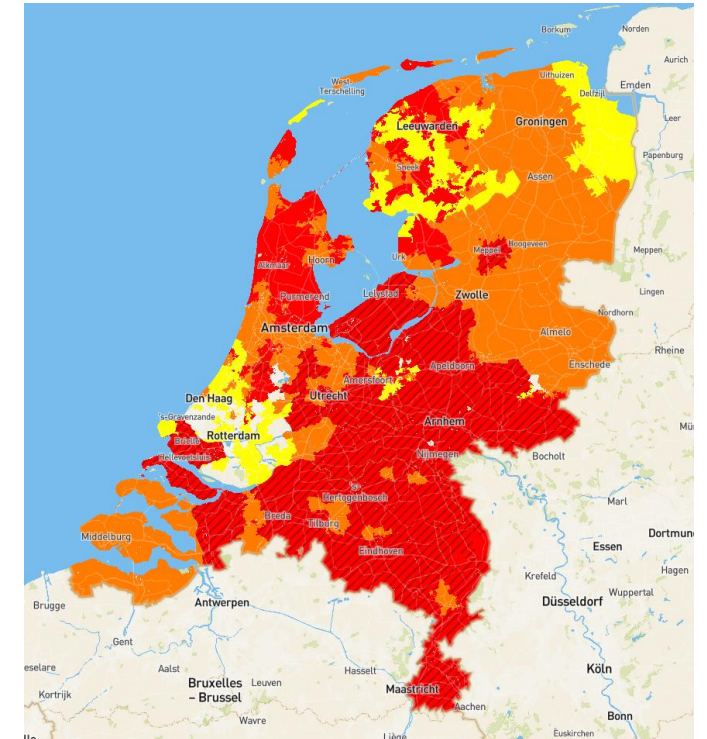
The Dutch grid is at its limits



2022



2023



2024

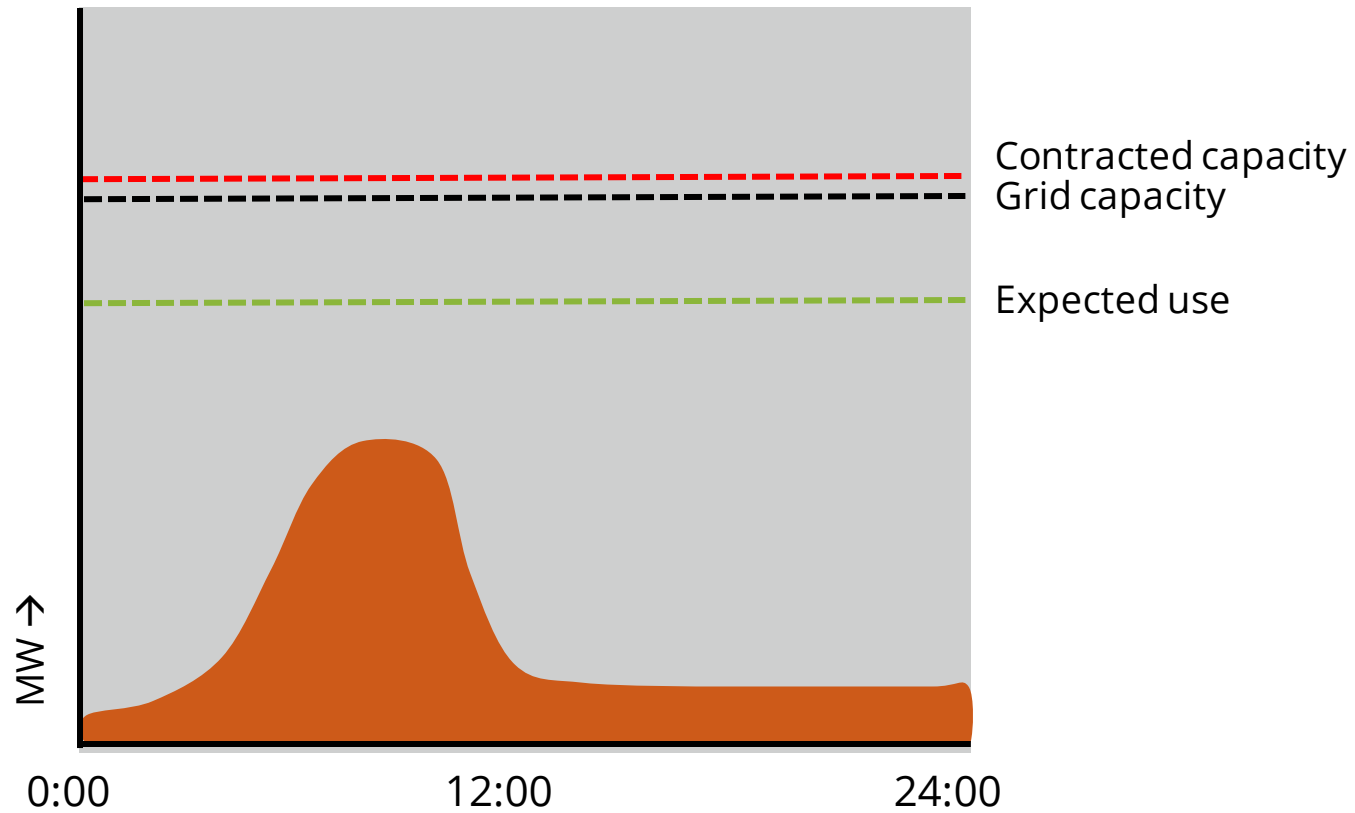


Trends in the Energy Transition

- ✓ Centralized to decentralized production
- ✓ Increasing electrification
- ✓ Increasing simultaneity

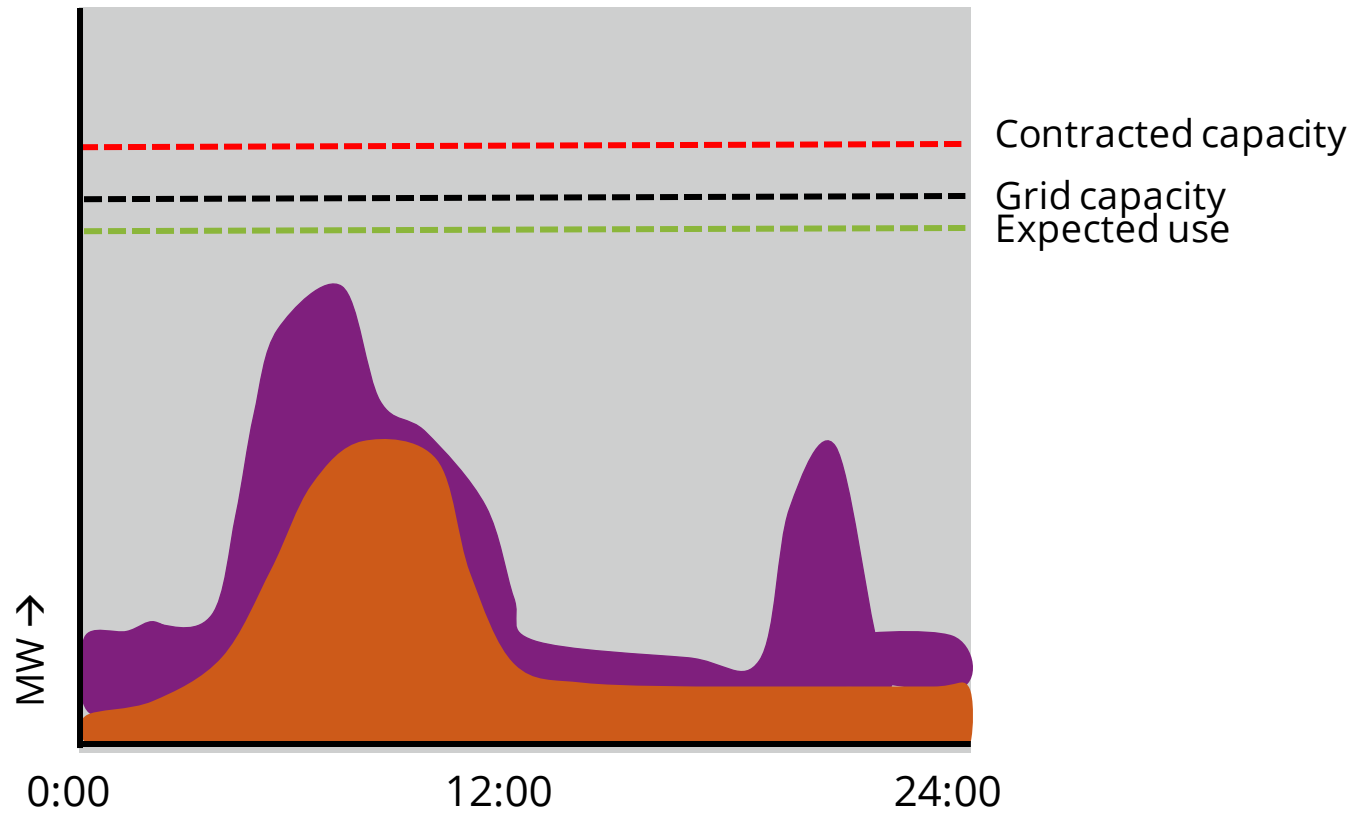
Flex optimizes grid utilization

Daily grid load



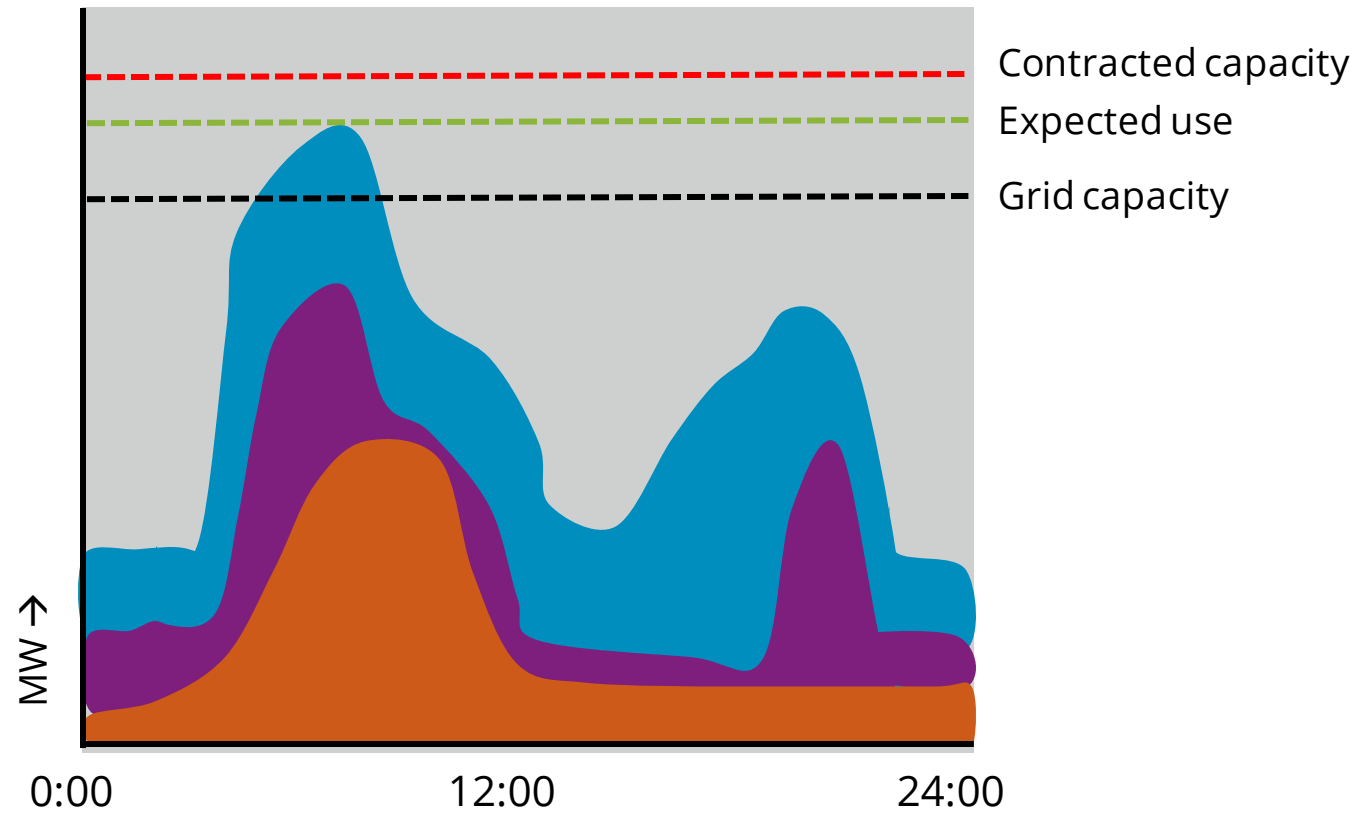
Flex optimizes grid utilization

Daily grid load



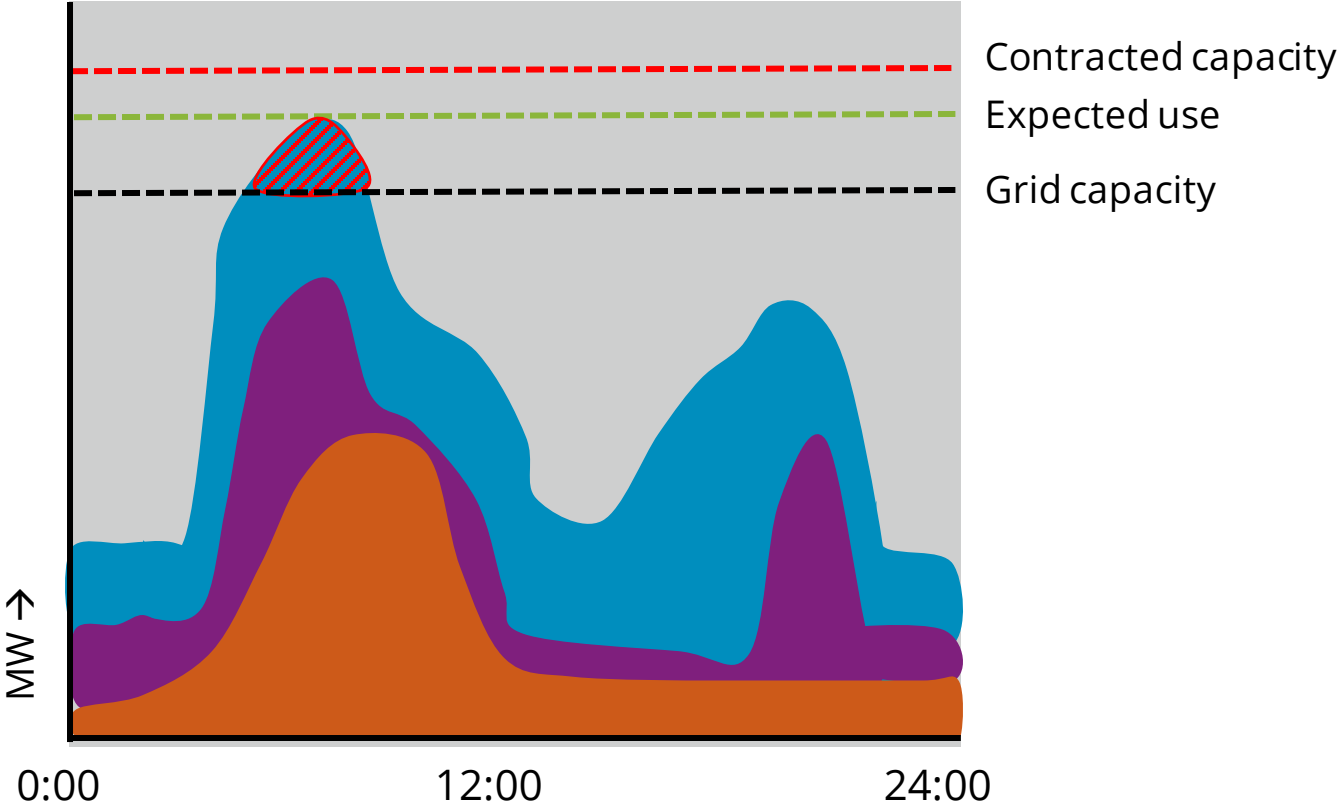
Flex optimizes grid utilization

Daily grid load

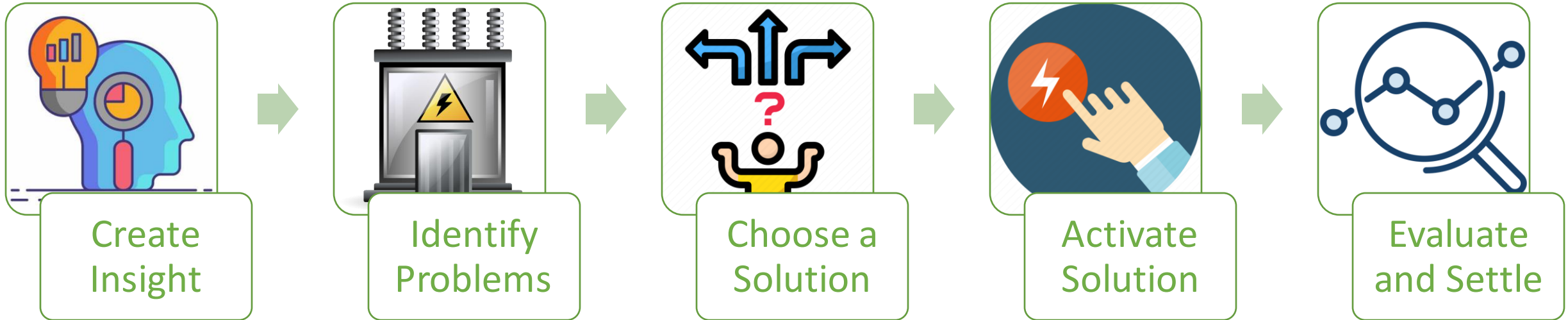


Flex optimizes grid utilization

Daily grid load



Congestion management



Introducing Shapeshifter

Shapeshifter implements the [Universal Smart Energy Framework](#) for flexibility forecasting, offering, ordering, and settlement processes

USEF was founded in 2014 with the common goal of developing a smart energy system that benefits all participants



USEF has been put into practice by Dutch DSO's. And in other European countries USEF has also been used and/or implemented as a reference



Update on framework in January 2020 based on learning experiences from implementations and in collaboration with DSO's and aggregators.

USEF Flex Trading Protocol (UFTP) is a subset of USEF and specifically aimed at flexible trading between the Aggregator and DSO or TSO.

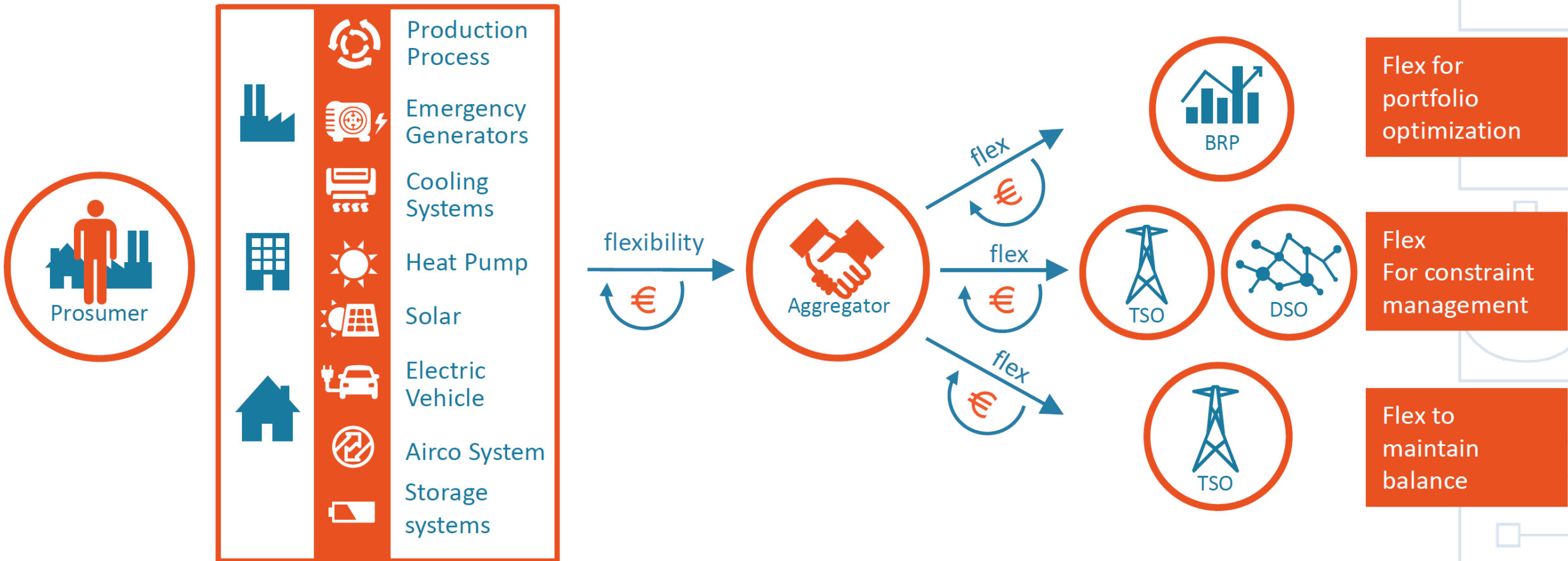


In 2021 UFTP is part of the Linux Foundation Energy Flexibility Suite as Shapeshifter.

To increase community involvement, Shapeshifter will be present at the LFE Summit in June 2023



Flexibility value chain

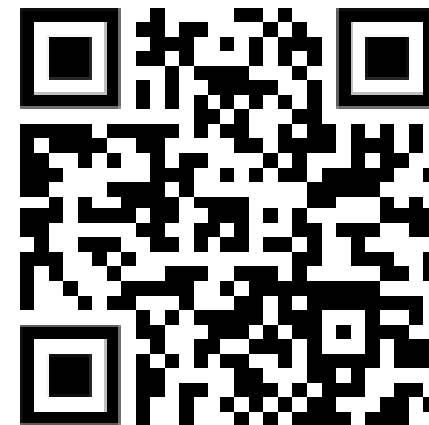


Typical Shapeshifter flex applications



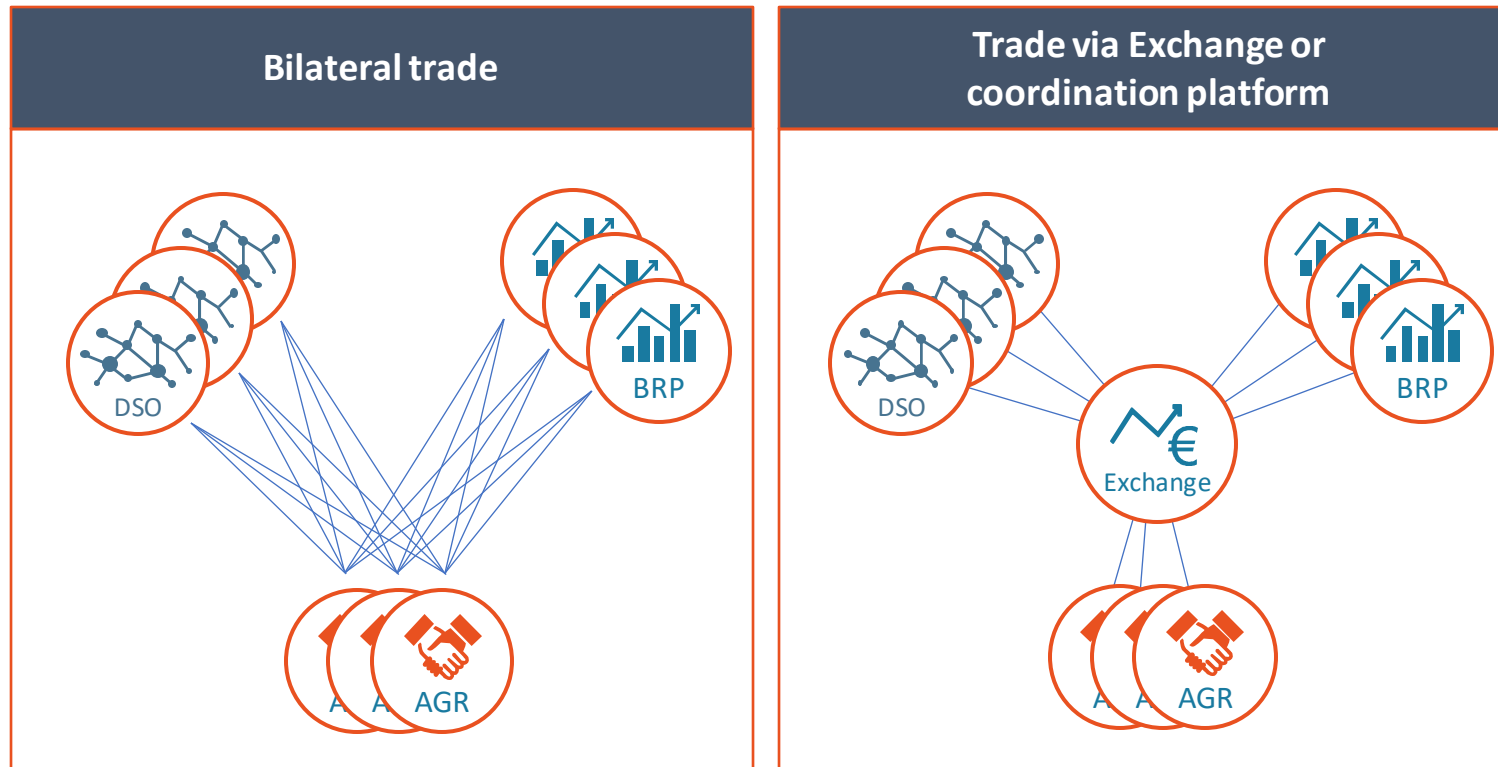
The Shapeshifter project

- Specification + XML schemas
 - Technical Steering Committee
 - Java library (Alliander, GOPACS, SP)
 - Python library (Enexis)
-
- Apache 2.0 license
 - OpenSSF best practices (change control, reporting, quality, security)
 - LF Energy



[Shapeshifter \(github.com\)](https://github.com/Shapeshifter)

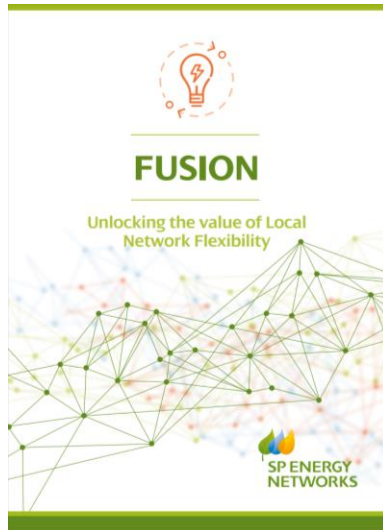
Flex trading options



Shapeshifter is designed and used for bilateral trade between DSO and AGR and for trade via a coordination platform

Implementations

Fusion



Shapeshifter is implemented in the UK for congestion management in a demonstration project

GOPACS



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Optimize your renewable energy production



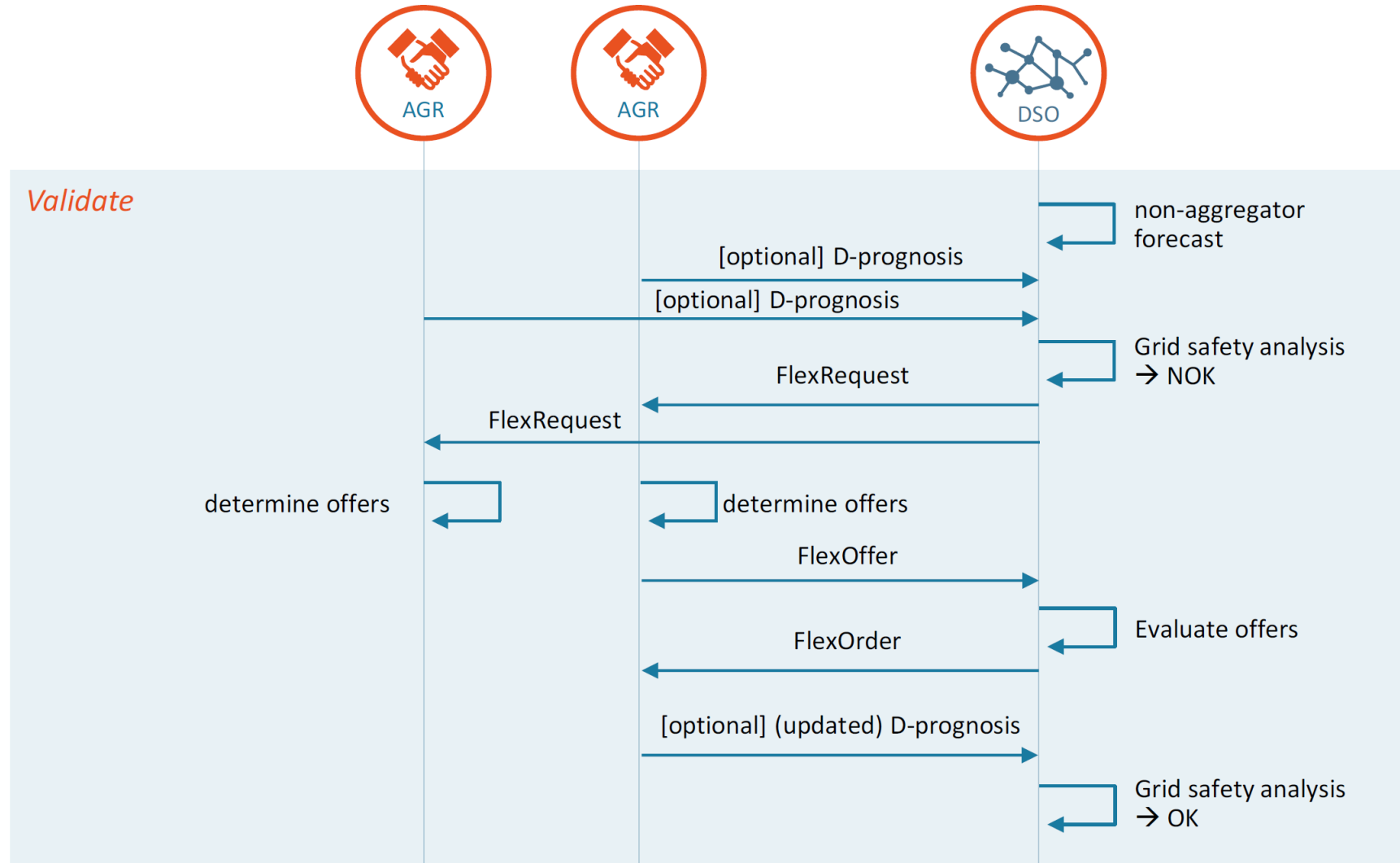
Shapeshifter is also used to activate capacity limit contracts at GOPACS in the Netherlands

Grid operators



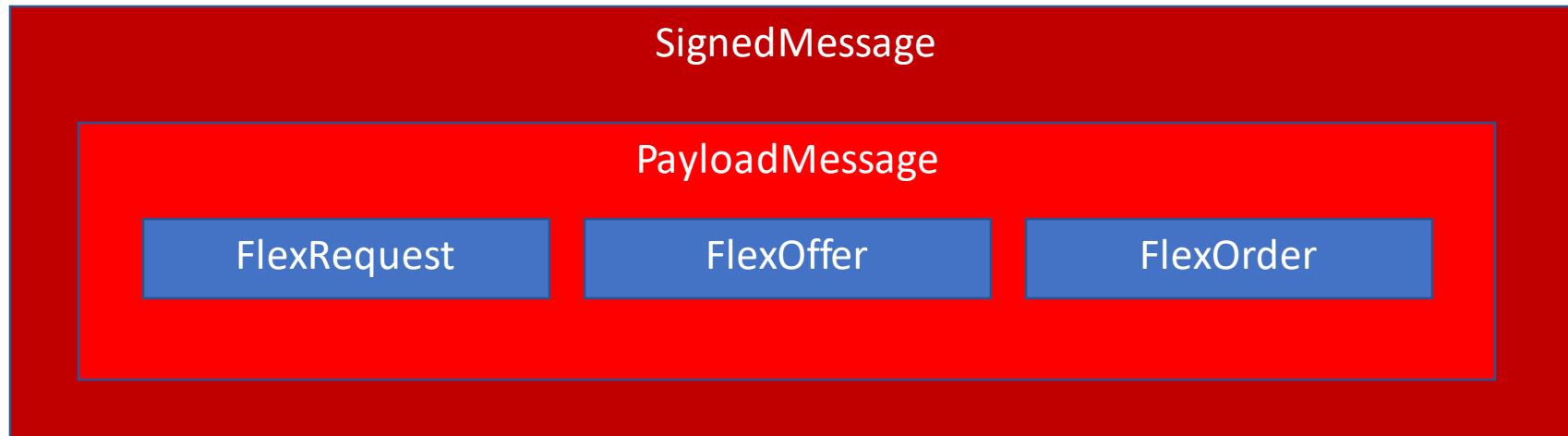
DSOs in The Netherlands are using Shapeshifter to facilitate trade with AGRs.

Example conversation



Message format

REST/XML API: messages are validated against XML schemas



NaCl cryptography ("salt", 2012)

Public-private key encryption (Ed25519) providing authentication and prevent tampering

```
POST /v3/shapeshifter/messages
```

```
<SignedMessage SenderDomain="dso.nl" SenderRole="DSO"  
Body="SwGOfSa4bZ9ghmuQmm71vTkg..." />
```


Example FlexRequest

```
<FlexRequest SenderDomain="dso.nl" RecipientDomain="agr.nl"
  TimeStamp="2021-10-29T06:54:26.861Z"
  ISP-Duration="PT15M"
  TimeZone="Europe/Amsterdam"
  Period="2021-10-30"
  ContractID="A-AA-A-12345"
  CongestionPoint="ean.265987182507322951">
  <ISP Disposition="Requested" MinPower="0" MaxPower="50000000" Start="48"
Duration="1"/>
  <ISP Disposition="Requested" MinPower="0" MaxPower="60000000" Start="49"
Duration="3"/>
</FlexRequest>
```

Meaning: "Please limit your power consumption to:

- 50 MW between 12:00 and 12:15 o'clock and
- 60 MW between 12:15 and 13:00 o'clock."

Example FlexOffer

```
<FlexOffer SenderDomain="agr.nl" RecipientDomain="dso.nl"  
  TimeStamp="2021-10-29T06:54:36.8868538Z"  
  MessageID="338ed243-5517-4400-962e-2b7b812c468c"  
  ConversationID="48cdc3d2-56c0-436c-8d5a-6f6cc3dc538d"  
  FlexRequestMessageID="d3ae4836-55b1-4084-b54e-34107b22648c"  
  ContractID="A-AA-A-12345" Currency="EUR">  
  <OfferOption OptionReference="ba40a5f8-849b-4fe6-958f-e628a1653558"  
    Price="20.00">  
    <ISP Power="50000000" Start="48"/>  
    <ISP Power="60000000" Start="49"/>  
    <ISP Power="60000000" Start="50"/>  
    <ISP Power="60000000" Start="51"/>  
  </OfferOption>  
</FlexOffer>
```

Some attributes omitted for clarity.

Example FlexOrder

```
<FlexOrder SenderDomain="dso.nl" RecipientDomain="agr.nl"  
  ConversationID="48cdc3d2-56c0-436c-8d5a-6f6cc3dc538d"  
  FlexOfferMessageID="338ed243-5517-4400-962e-2b7b812c468c"  
  ContractID="A-AA-A-12345" Price="20.00" Currency="EUR">  
  <ISP Power="50000000" Start="48" Duration="1"/>  
  <ISP Power="60000000" Start="49" Duration="3"/>  
</FlexOrder>
```

Some attributes omitted for clarity.

What's next

- Current challenges
- How you can contribute:
 - Report issues (bugs or feature requests)
 - Review or improve the specification
 - Contribute or review code in the Java or Python library
 - Create a new library for your programming language

Want to know more?

- Subscribe to the mailing list or join a TSC meeting at <https://lfenergy.org/projects/shapeshifter/>
- See [Shapeshifter \(github.com\)](https://github.com/shapeshifter/shapeshifter) or the Shapeshifter specification at <https://shapeshifter.github.io/shapeshifter-specification/>

