ENERGY

V2G initiatives, experiments and implementation path in The Netherlands

The Solar and electrical mobility revolution conference

Petra de Boer

30 March 2015

 DNV GL © 2014

Solving the energy trilemma

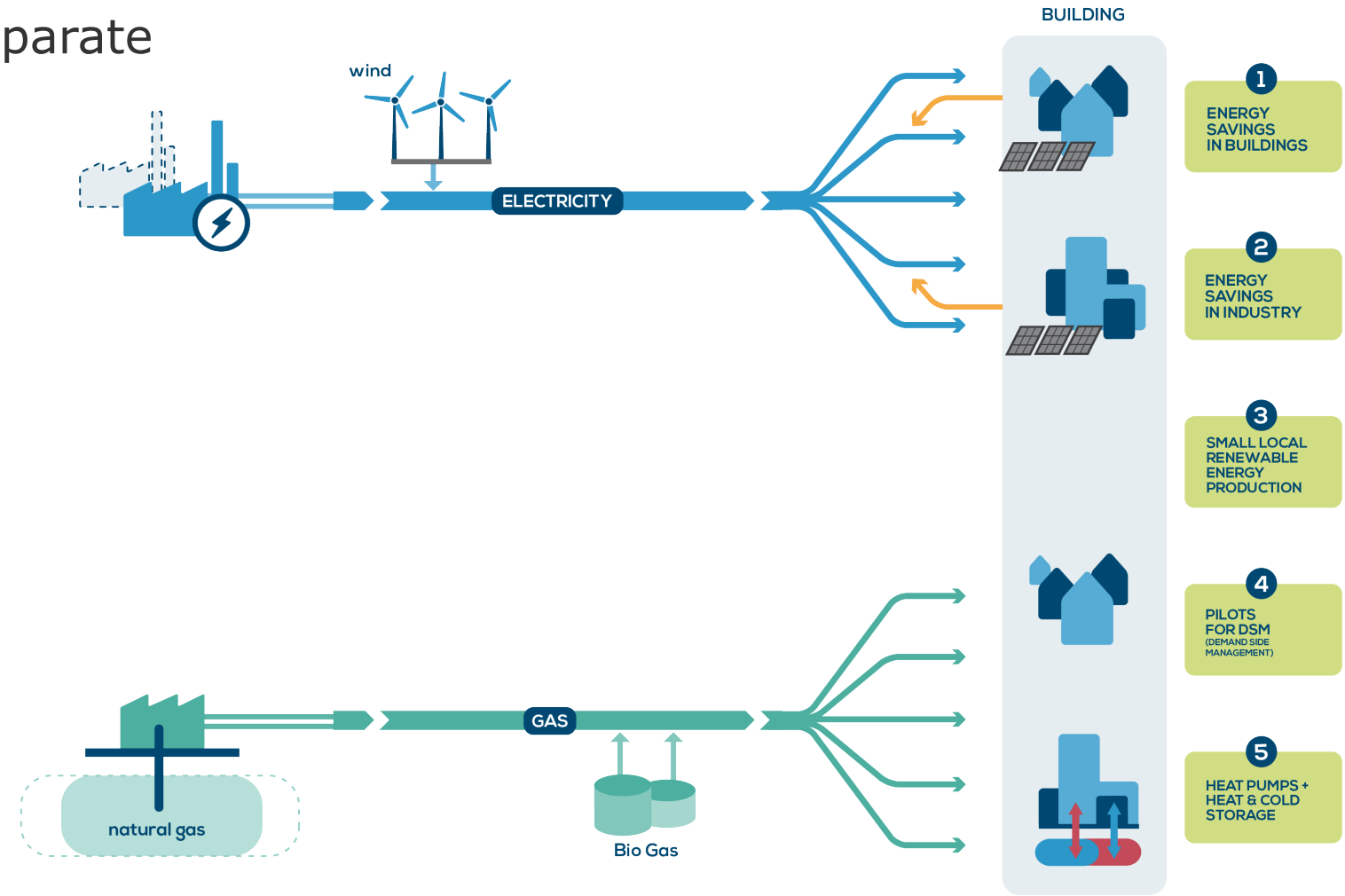
Why do we need to change our energy system?

- Growing share of wind and solar → large variations in power output → big investments in energy infrastructure
- Alternatively: new business models, change “end-users” into consumers and prosumers, from commodity to services
- Challenge: Public not really interested in their energy footprint – yet
- Lack of incentives to efficiently use local energy systems
- An example from Liander in Arnhem: extra investment in the grid would cost €5.900 per household

 DNV GL © 2014

How our energy supply is organised

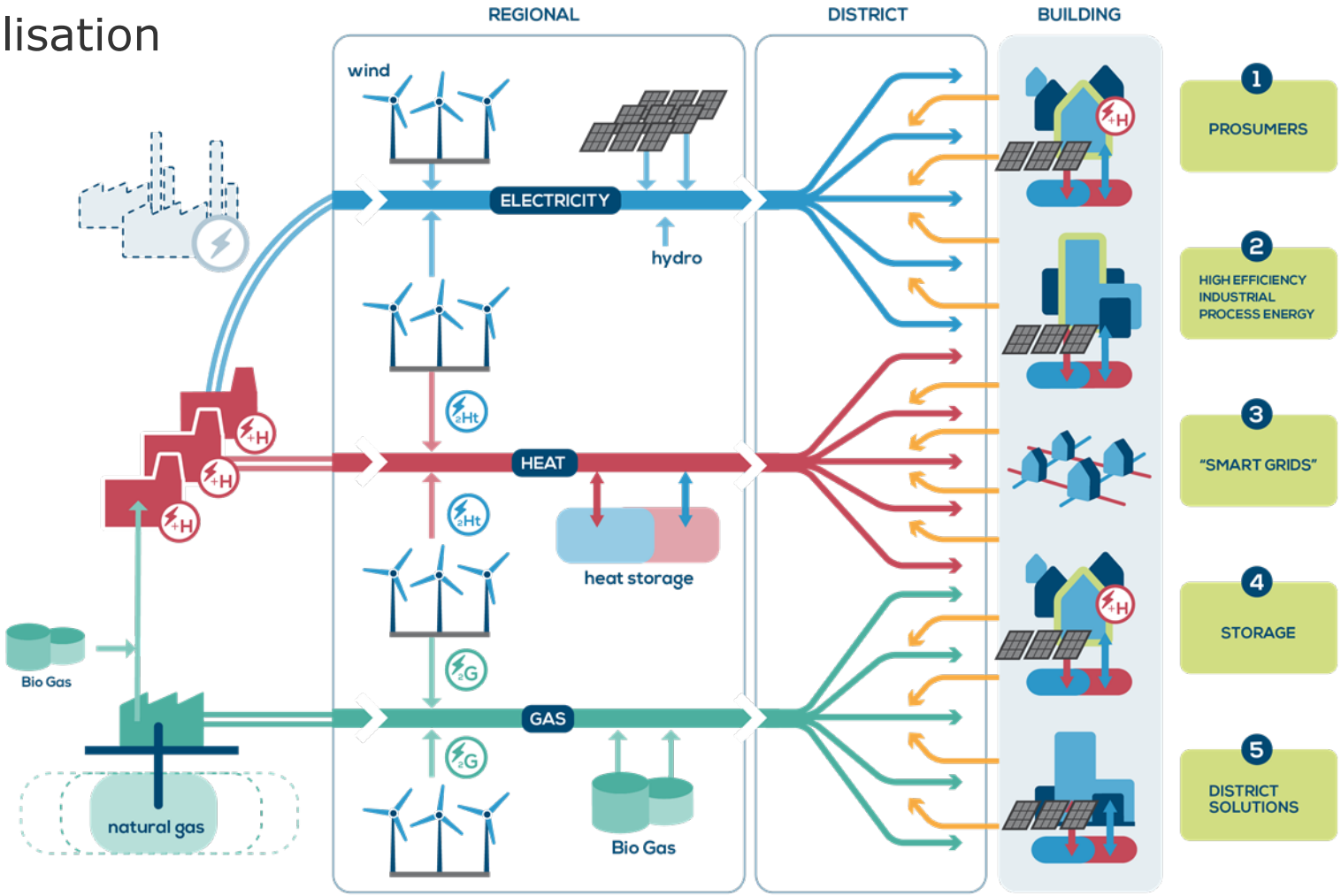
- **Today**: centralised & separate



Source: Top Sector Energy

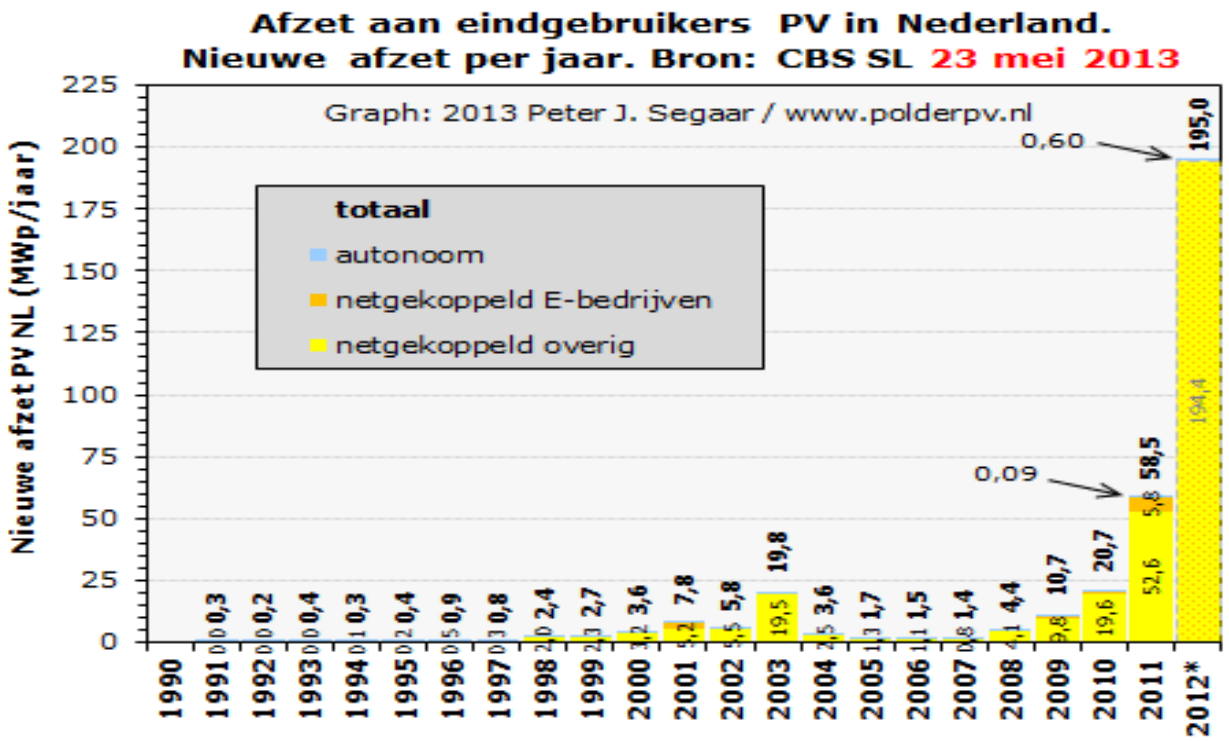
How energy supply will be organised

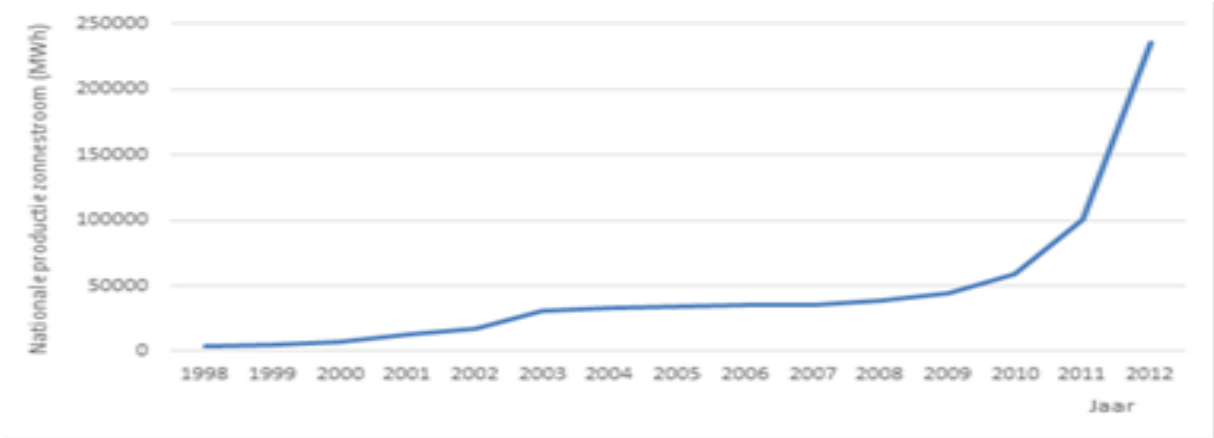
- **In future**: towards glocalisation



Source: Top Sector Energy

Solar market in The Netherlands

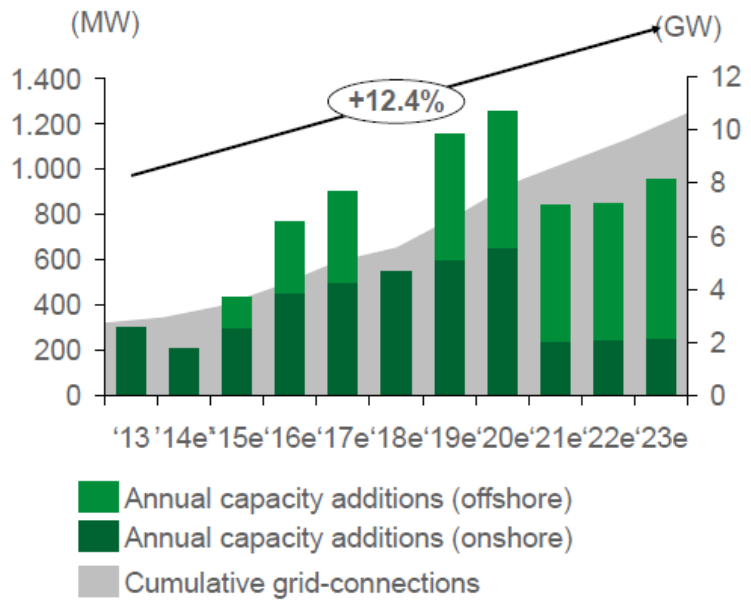


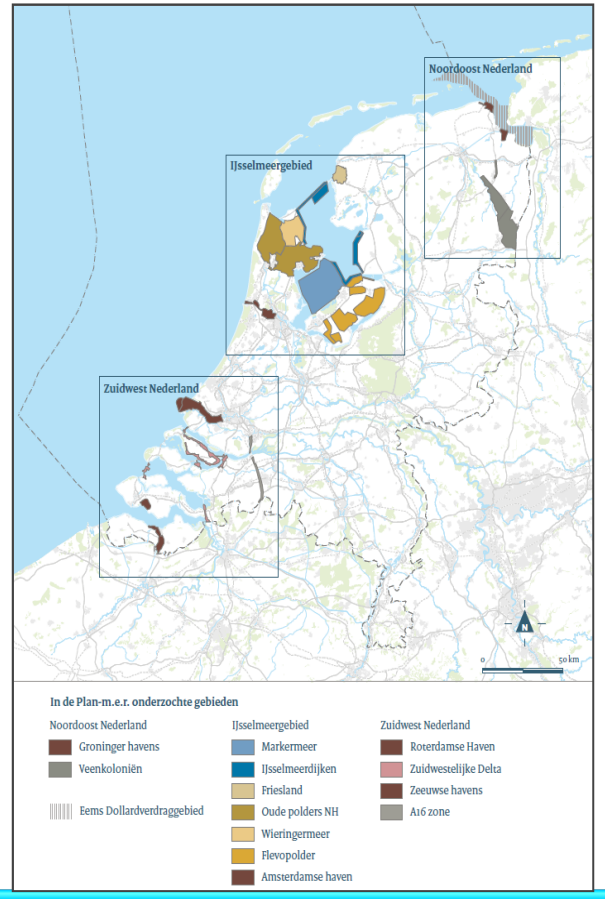


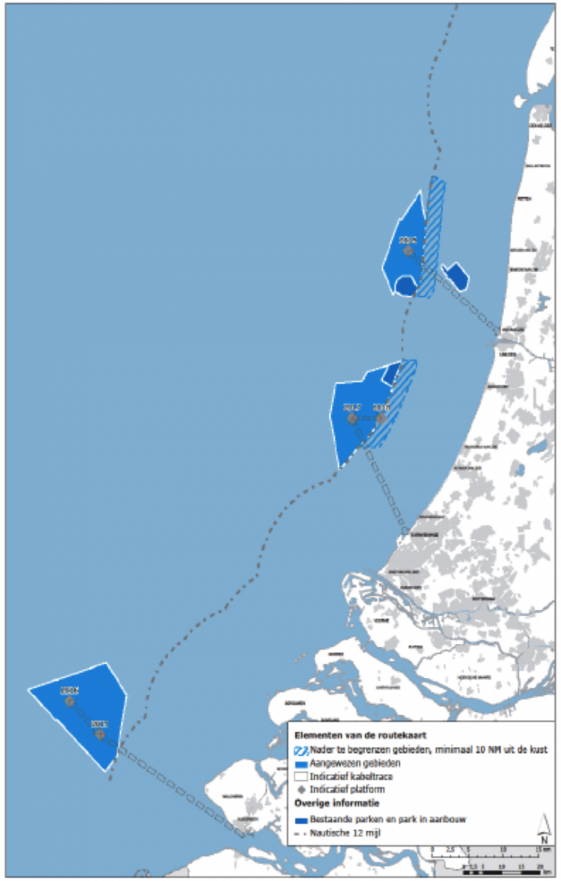
Ambition for the Netherlands is 4 GW solar in 2020

Wind market in The Netherlands

Figure 64. Market outlook for the Netherlands, 2013 to 2023e



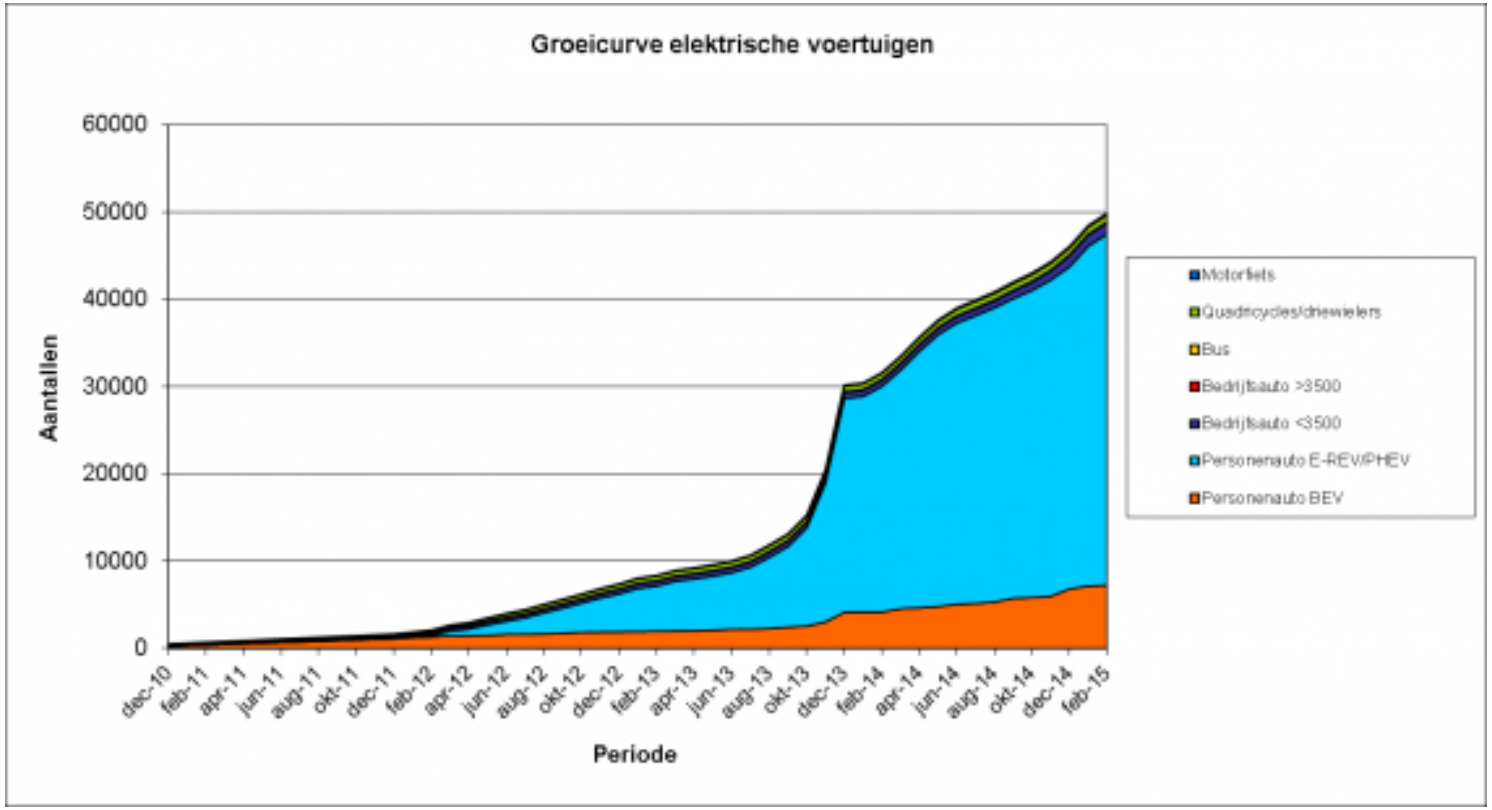




Ambition for the Netherlands is 6 GW wind onshore in 2020 and 4,5 GW offshore in 2023

DNV GL © 2014

Electric vehicles in The Netherlands



Source: RDW

Current situation

2015: 50.000

Ambition for the Netherlands is 200.000 EVs in 2020 and 1.000.000 in 2025

Private and confidential

EV is a game changer that starts to become serious business

Eneco develops new app in response to increase in sustainable electricity

Henk charges his Tesla when electricity price is low

Rotterdam, 05 March 2015

GM vs. TESLA

DE SLAG OM DE ELEKTRISCHE TOEKOMST

ALLE AUTO-FABRIKANTEN LIJKEN ER INMIDDELS VAN DOORDRONGEN DAT DE TOEKOMST – TENMINSTE DEELS – ELEKTRISCH ZAL ZIJN.

inmiddels van doordrongen dat de toekomst – tenminste deels – elektrisch zal zijn. Beleggers is het ook niet ontgaan: Tesla, dat zich volledig op elektrische auto's richt, behoort tot de beurslievelingen van dit decennium. Het aandeel is sinds de beursgang in 2010 vertienvoudigd.

GENERAL MOTORS: DE CHEVROLET BOLT

Traditionele automakers komen ieder in hun eigen tempo met hybride of volledig elektrische modellen. Tot nog toe is bij de volledig op elektrici-

tot op de helft genaderd is: de marktkapitalisatie van Tesla is 25 miljard dollar, GM is 52 miljard waard. Tesla voert maar twee modellen, waarvan er één pas in 2016 geleverd kan worden. De andere, de Tesla Model S, kost in Nederland in goedkoopste uitvoering 71.900 euro.

DNV GL © 2014

Fastned en benzinepomphouders betwisten nu elkaars aanwezigheid langs snelweg

- 18 februari 2015, **AMSTERDAM (Energeia)** - Benzinepomphouders blijven strijden tegen de aanwezigheid van snellaadstation-bouwer Fastned langs snelwegen. Fastned op zijn beurt protesteert tegen de komst van laadpalen van benzinepomphouders op verzorgingsplaatsen waar ook Fastned actief is. Benzinepomphouders trokken deze week aan het kortste eind in een rechtszaak die was aangespannen tegen de komst van een snellaadstation langs de A59 in Noord-Brabant.

 DNV GL © 2014

Large volumes of Renewable Energy Sources require more flexibility …

- Fast controllable power generation, including curtailment of e.g. wind power
- Large(r) interconnection capacity, and cross-border trading
- Energy storage, small-scale and large-scale systems (and services)
- Smart local energy, i.e. integration of DG, demand response, and active participation of end-users

V2G is one of the options to get more flexibility in the system

 DNV GL © 2014

TKI Switch 2 Smart Grids

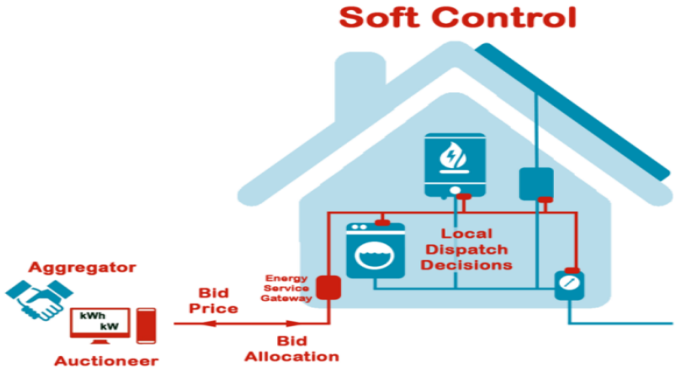
- Top sector policy of the Dutch government
  - Concentration of RD&D funding in nine top sectors, Energy being one of these nine, and Smart Grids being one of the seven themes within this top sector
  - Demand and supply of knowledge to be better connected, i.e. stronger role for private sector
  - Improving cooperation between companies, universities and government

- Innovation Program Smart Grids has been formulated
  - 32 projects have been awarded: 17 in 2012, and 10 in 2013, and 5 in 2014 (+ 1 pending)
  - Total budget about €41 million with ca. 50% share from companies
  - Several cross-TKI initiatives, e.g. Green Deal Smart Energy Cities, and System Integration

 DNV GL © 2014

Smart grids – trends and challenges

- Integration of distributed generation, often RES
- Self supporting communities
- Combining E-infra and ICT
- Cyber security thread



- Local energy management

- Many (new) stakeholders, with different interests, and innovative business models
- Including a lot of (Dutch) SMEs

Being connected, the new world of energy

Super computers that fit in the palm of your hand

Real-time streaming information

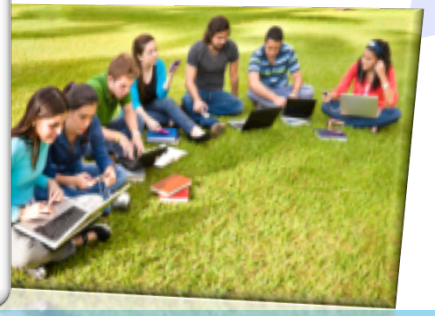
Access to 'the cloud'

Open systems

Open data

New technologies, new business models, new careers

Social media, social trends



Mobile, and socially connected anytime

 DNV GL © 2014

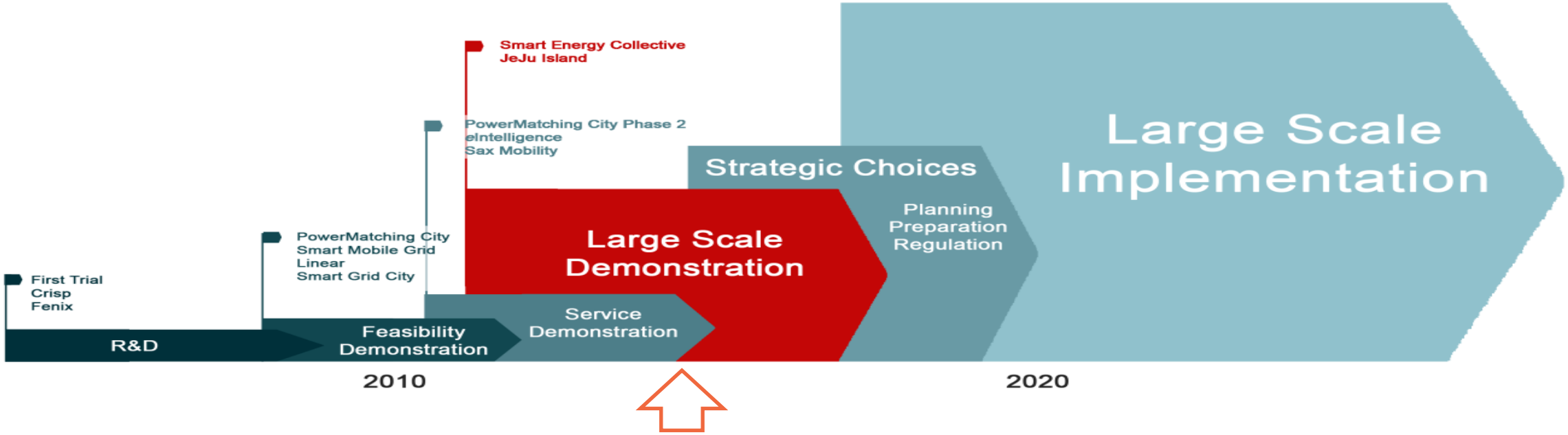
DNV·GL

Agenda of TKI S2SG – organizing SG community

- Being an innovation platform for SG throughout the 'innovation chain', i.e. from RD&D up to market application and implementation
- Actively stimulate cooperation between companies, academia and governments (match making), and create critical mass in selected topics
- Create 'eco system' at both local and international level

 DNV GL © 2014

Route to 2020, and beyond



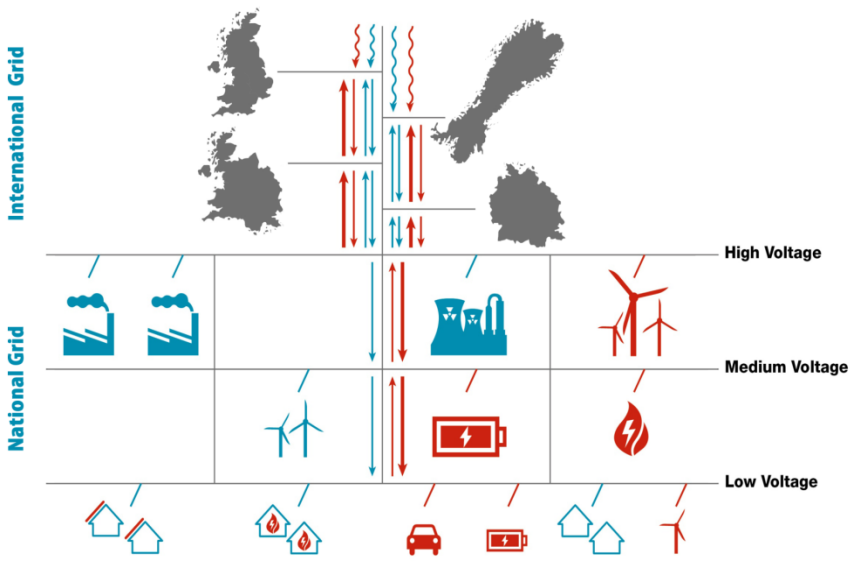
Green Deal
Smart Energy Cities

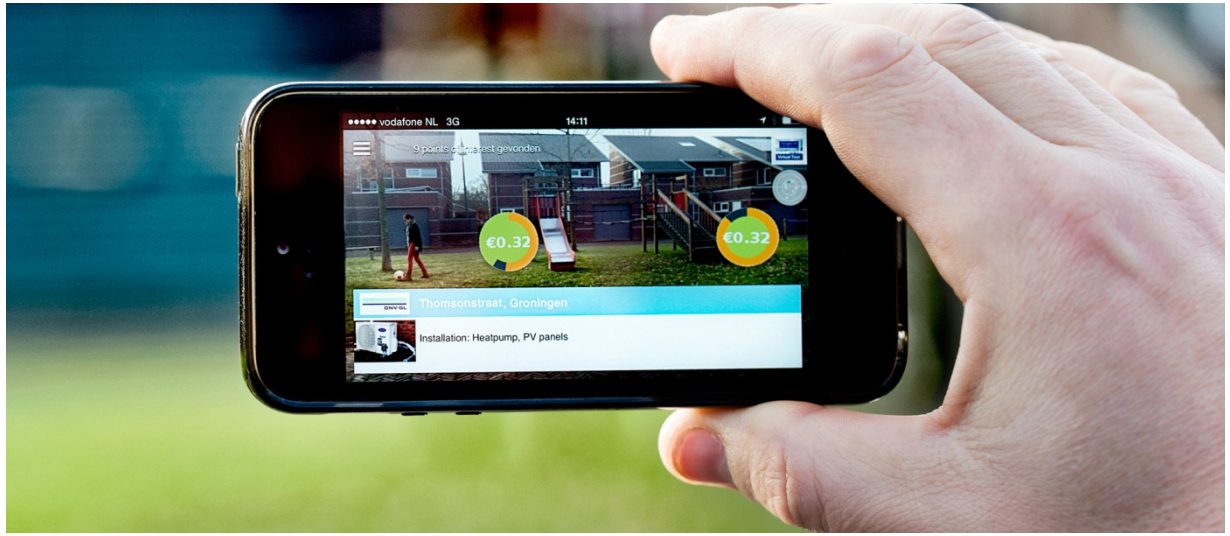
Smart Grid Evolution: Service Platform for

Universal Smart Energy Framework

V2G is not on this route yet, but has to step in

Smart grid pilots





Private and confidential

EV's involved in smart grid projects, some examples

Smart Charging:

- Power Matching City
- EVPV-Grid project
- Quick charging, power by the Sun
- SG Rendement voor Iedereen, smart charging

Reuse of EV batteries in smart grids:

- 2BCycled: Second life applications of EV batteries, on Pampus

V2G:

- Smart Grid Vehicle-to-Grid (V2X) Energy & Mobility, Amsterdam
- SG Rendement voor Iedereen, Robin Berg, Lomboxnet
- V2G boat Amsterdam

 DNV GL © 2014

Smart Grid Rendement voor Iedereen

- Development and testing of 8 smart grid services
- Test of these services in 2 pilots with 100 households each in Amersfoort and Utrecht
- One of the services was smart charging of electric vehicles to optimize local usage of solar energy, another service was V2G

Insight4all | Advice4all

Together4all | Profit4all

Flex4all | Solar4all

E-car4all | Storage4all

First public charging station connected to a solar system

Smart Solar Charging Utrecht

- 20 smart charging stations by General Electric, Schuuring, Stedin, Gemeente Utrecht

- In close cooperation with Last Mile Solutions, Upp Energy, NewSolar, EBU, UU en Netbeheer Nederland

 DNV GL © 2014

V2G in Utrecht

- Nissan Leaf
- In cooperation with Nissan Europe
- Opening in March 2015

 DNV GL © 2014

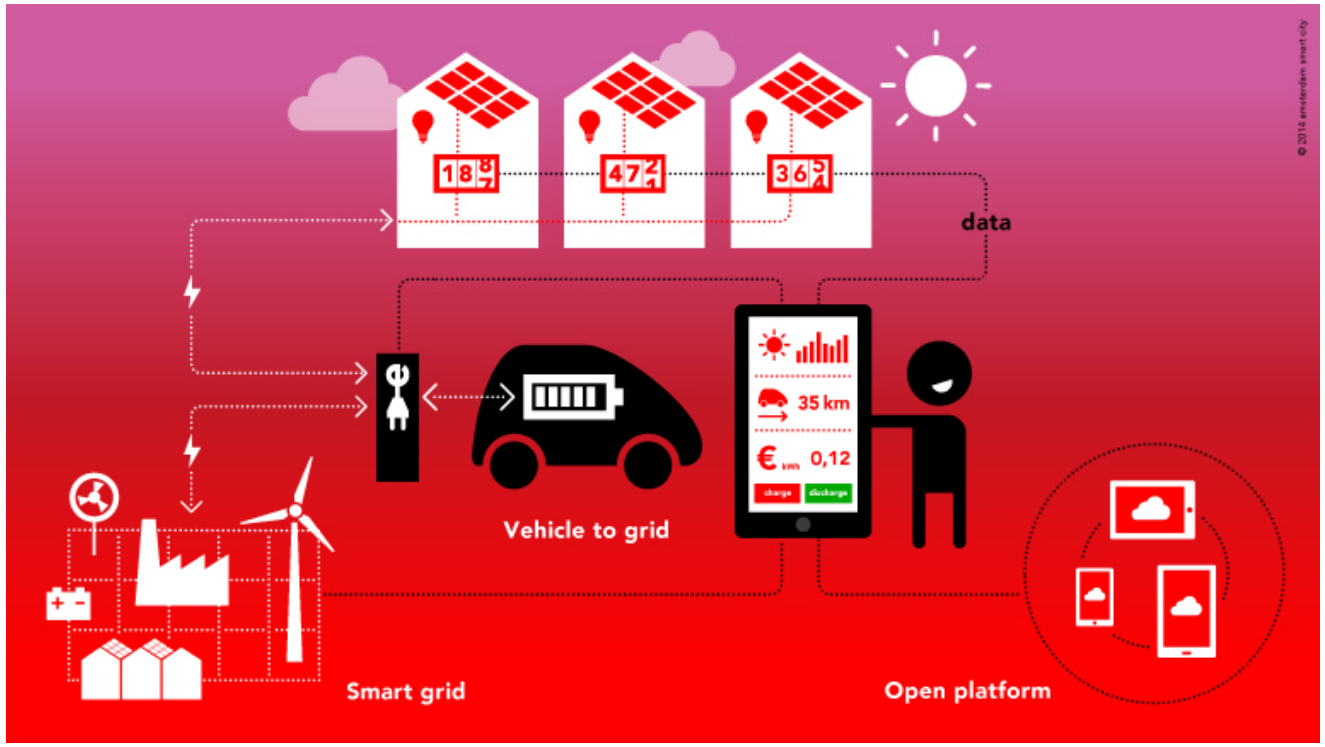
Smart Grid V2X Energy & Mobility (V2X)

- Cofely, Alliander, ABB, Mitsubishi Motor Corporation, Amsterdam Smart City, Hogeschool van Amsterdam en stadsdeel Nieuw-West

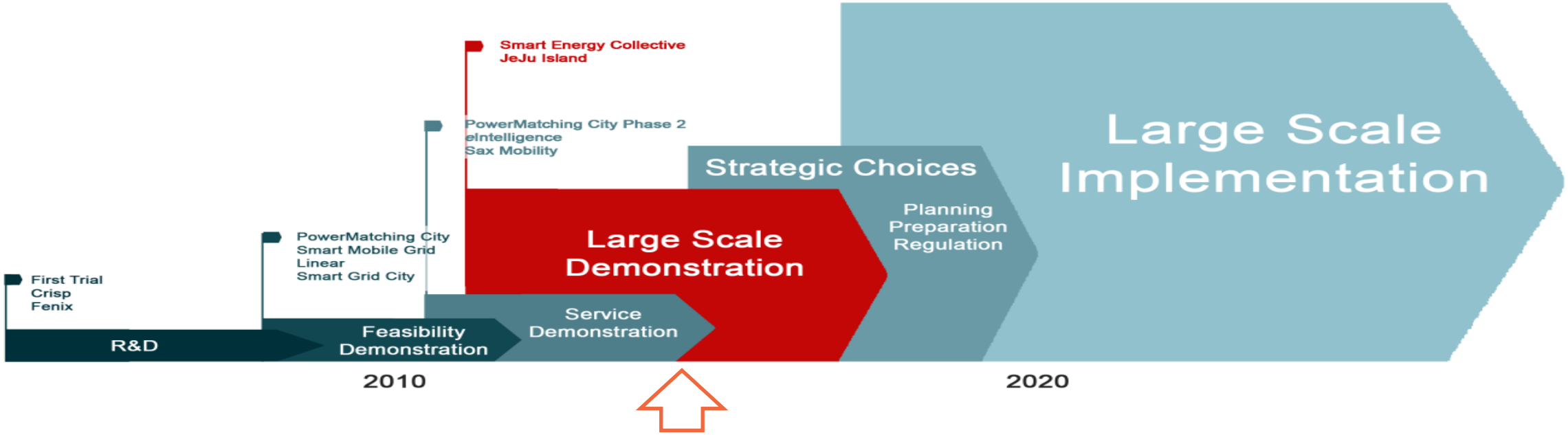
- Vehicle2Home 2014, Lochem

- Vehicle2Building 2015, Amsterdam

- Vehicle2Grid 2016, Amsterdam



Route to 2020, and beyond

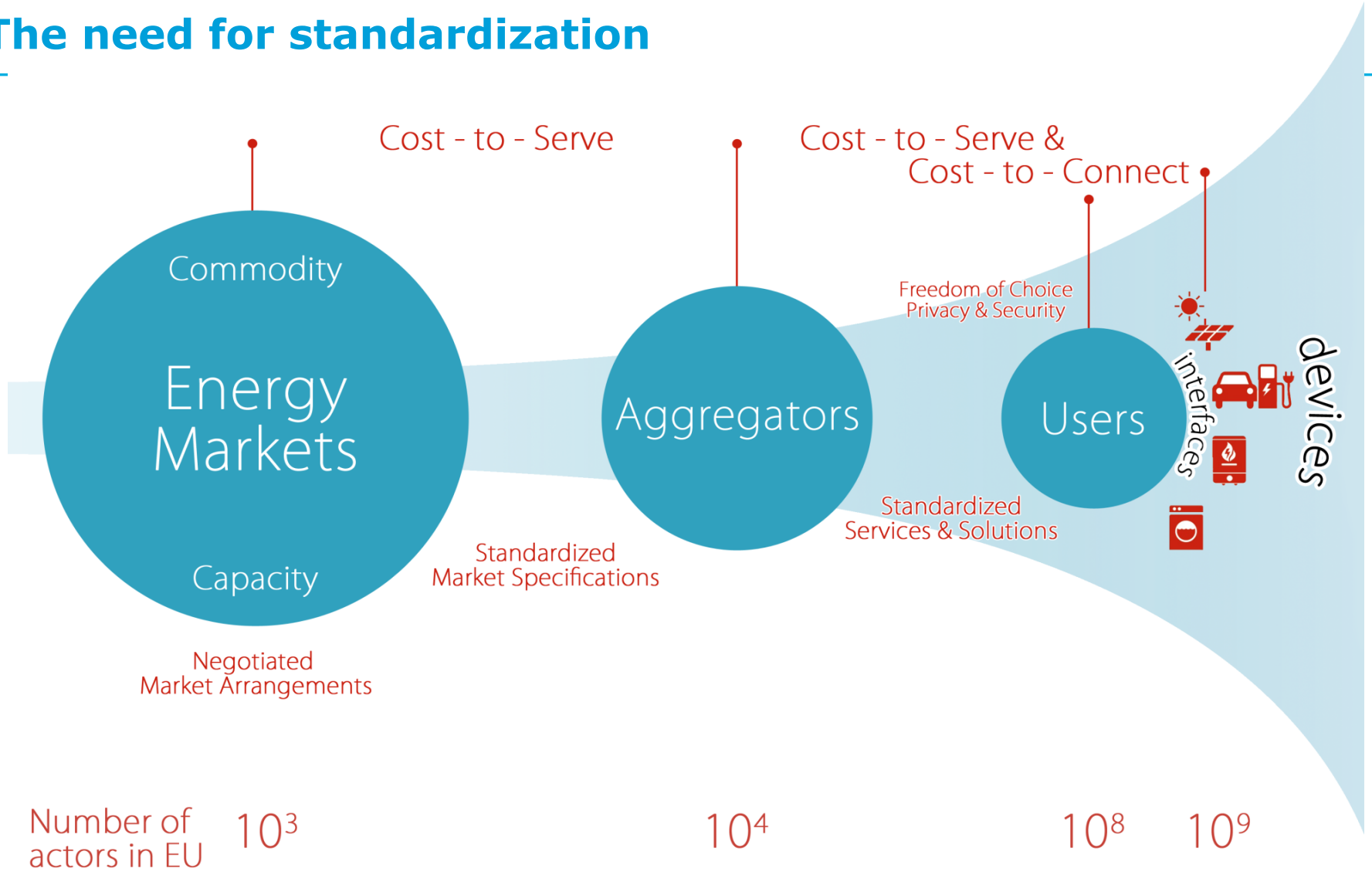


Green Deal
Smart Energy Cities

Smart Grid Evolution: Service Platform for Internet of Energy

Universal Smart Energy Framework

The need for standardization



Source: Universal Smart Energy Framework

The USEF Foundation

The Universal Smart Energy Framework (USEF®) enables you to seamlessly co-create a fully functional smart energy system and provides an open and consistent framework of specifications, designs and implementation guidelines.

The USEF foundation acts as the steward of the framework and has the ambition to establish it as the de-facto framework for smart energy products, services and solutions.

Thank you for your attention

Petra de Boer, Head of Section New Energy Technologies
Petra.deboer@dnvgl.com
+31 26 356 2552

www.dnvgl.com

SAFER, SMARTER, GREENER

 DNV GL © 2014