

# DC Congress DC = DeCent

Nieuwegein, June 15<sup>th</sup> 2018

## Roadmap DC

Issued April 2018 by Berenschot  
on behalf of TKI Urban Energy and RVO

Results and next steps?



## Questions for roadmap

1. Outlining an action perspective.
2. Potential: international and NL, 2035 and 2050.
3. Broader vision: users, knowledge institutes, grid operators, manufacturers, construction.
4. Roadmap: innovations and opportunities?

Including: DC for and in buildings, dwellings, districts, business parks, greenhouses, public lighting, distribution of electricity.

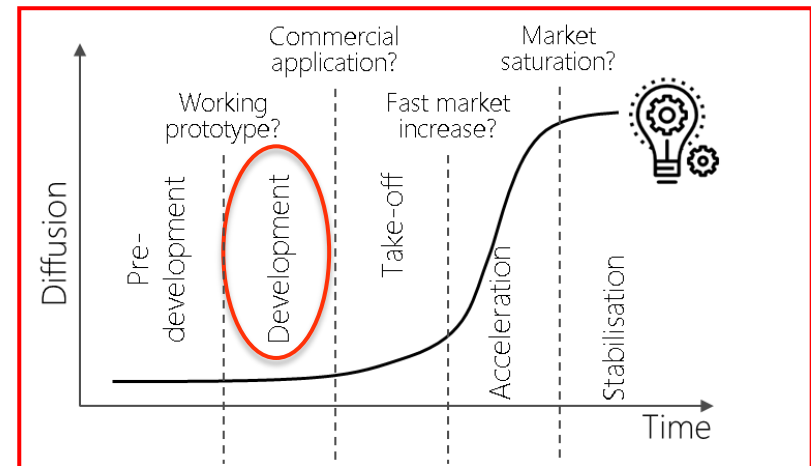
Not including: transmission of electricity.

## Uncertainties & variety of interests

1. Benefits DC yes, but relative to fact that former AC investments are today's assets.
2. DC 'islands' in AC world are possible, but standards still based on AC.
3. How to measure, verify and settle supplied DC electricity (trading)?

4. Small market place.

How will DC develop,  
increasing its market share ?



# Certainties

1. Opportunities from power electronics: price & efficiency, sizes.  
Long term (high) loads are still a challenge.
2. Standards are on their way (NEN 1010).
3. RD and pilots (with and without subsidies) and group of “front runners” in NL.
4. Increasing number of home appliances on DC.
5. Owners of greenhouses: business cases expected to be positive in the near future.

## Outline of roadmap with 19 stakeholders

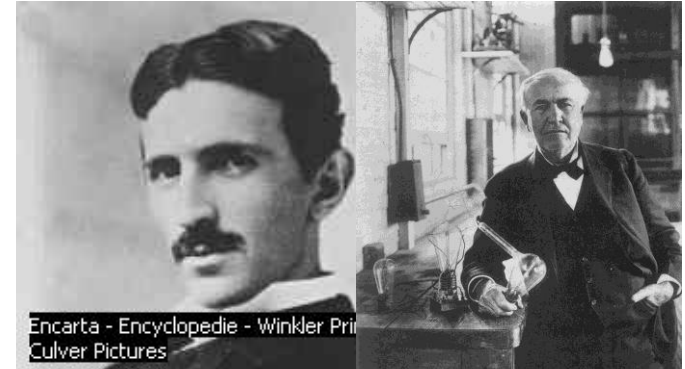
- (potential) users
- grid operators
- manufacturers (large companies & SMEs)
- construction & technical service
- knowledge institutes
- others

Broad support for roadmap, but opinions and visions may differ.

No AC 'or' DC, but challenging fields of DC applications in AC world.

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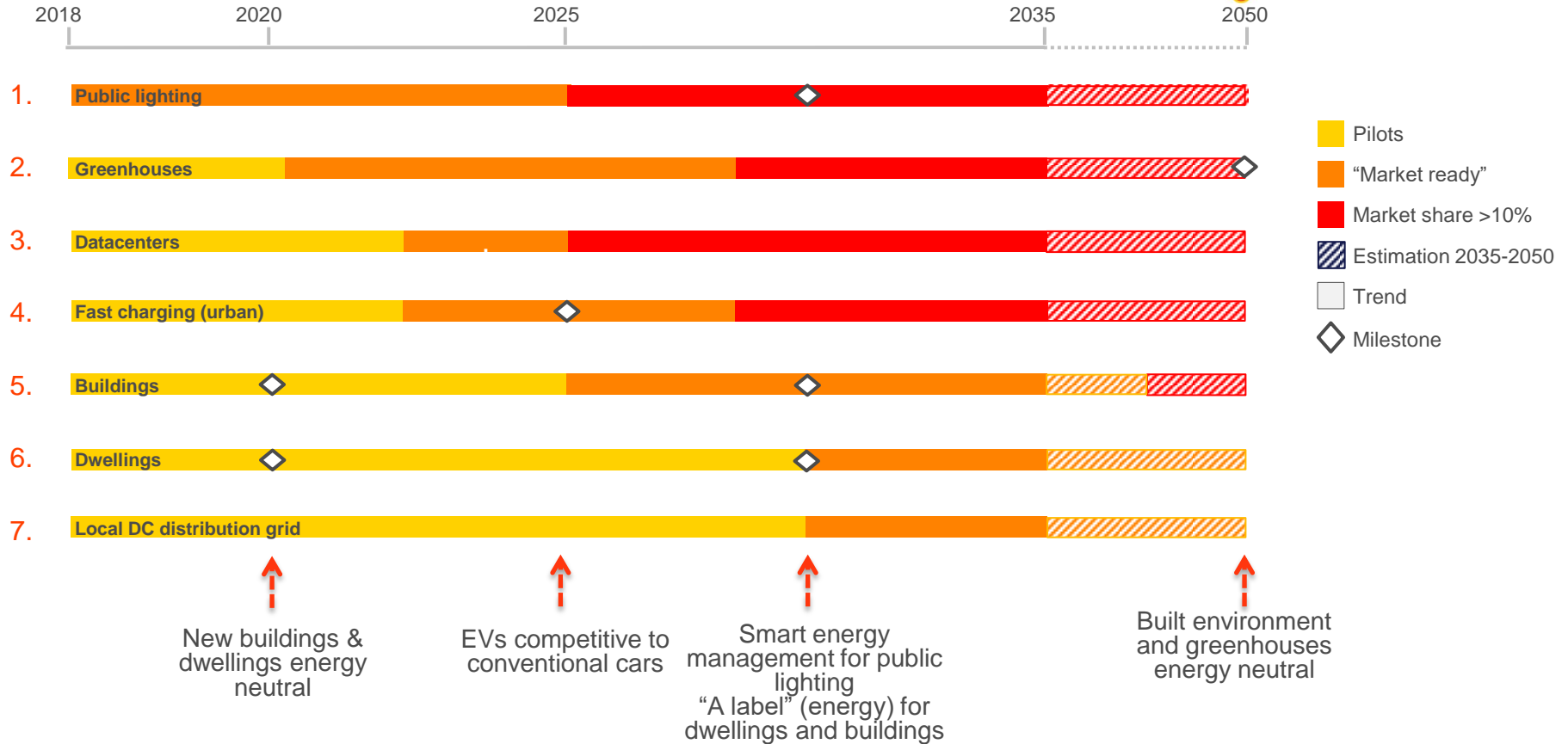
Tesla versus Edison  
Tesla and Edison

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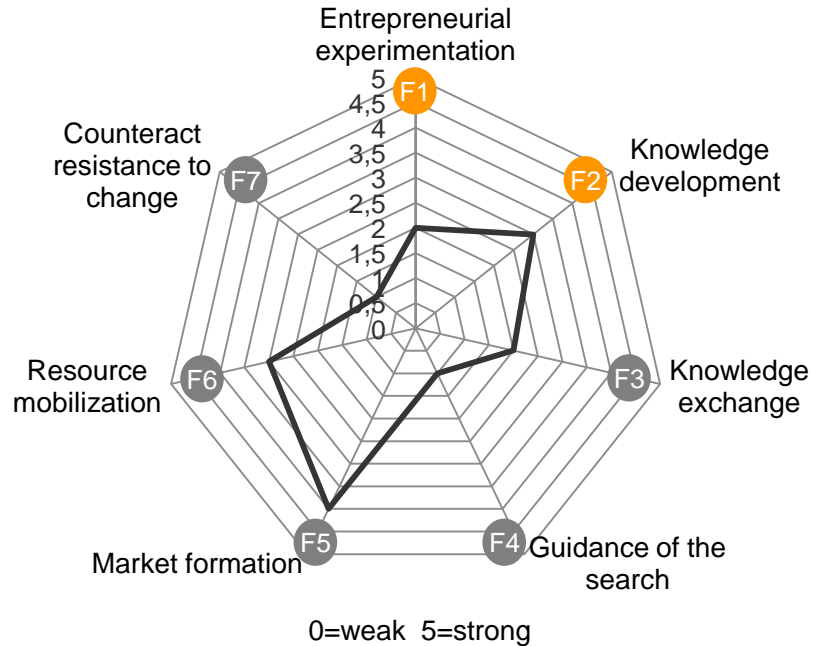
## Fields of application and their drivers

Field of application	Drivers
1. Public lighting	Municipalities committed to 50% savings in 2030
2. Greenhouses	Positive business case expected soon, more opportunities from LEDs
3. Datacenters	Need to save costs for energy and space
4. Fast charging (urban)	Space in urban environment for (fast) charging is challenge
5. DC grids in buildings	Advantages later with larger amounts of PV, EV & HPs
6. DC grids in dwellings	Id (5)
7. Local DC distribution grid	Uncertain, opportunities for business areas, combi with AC grid

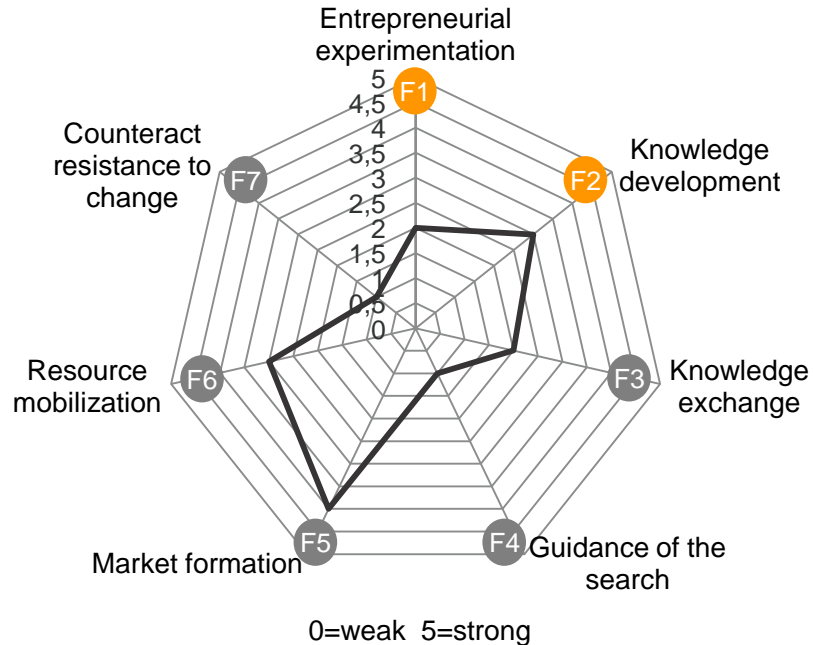




# Innovation system (Hekkert)



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... almost all functions need improvement

- F1 Entrepreneurial experimentation:** small number of SME's and industrial parties, limited scale & test facilities.
- F2 Knowledge development:** amount of knowledge OK, quality and availability (for practical education) inadequate.
- F3 Knowledge exchange:** limited exchange between R&D, industry & end users.
- F4 Guidance of the search:** no broader vision, lack of standards, no clear policy objectives.
- F5 Market formation:** limited introduction today, potential uncertain but expected to be large.
- F6 Resource mobilization:** no lack of RD&D funding; knowledge construction-engineering (potential) bottleneck.
- F7 Counteract resistance to change:** no resistance expected, but sense of urgency neither existing.

## Recommendations (interrelated)

1. Existing niches as 'stepping stone' for more.

“If one only loves what one knows .....” ⇒ improve quality of knowledge exchange, not only technology, also business models.

Larger pilot, public authorities as “first buyer”, for example with respect to public lighting.

2. Knowledge development: increase group of stakeholders, include end users and construction & engineering.
3. Uncertainties and risks: reduce them.

## Recommendations (interrelated)

4. Evaluate roadmap, define new stepping stones.  
Coming years.
  
5. Room for experiments in energy laws and regulation.  
“Net-, meet- en tarieven codes”, i.e. details with respect to grid specs, metering, settling, billing, tariffs.  
To be specified.
  
6. Practical education  
Power electronics: from universities and higher education to engineering, construction, service and maintenance.

## More information

[www.tki-urbanenergy.nl](http://www.tki-urbanenergy.nl)  
[info@tki-urbanenergy.nl](mailto:info@tki-urbanenergy.nl)

Catalogue TKI Urban Energy projects (pdf): <https://topsectorenergie.nl/urban-energy/publicaties>.

Projects app: search for “TKI Urban Energy” in App Store or Google Play Store or by  
<https://app.tki-urbanenergy.nl/projecten>.

Final reports per project via catalogue or app.

Yvonne Boerakker, [Yvonne@TKI-UrbanEnergy.nl](mailto:Yvonne@TKI-UrbanEnergy.nl), +31 (0)6 2507 7288

Olivier Ongkiehong, [Olivier.Ongkiehong@RVO.nl](mailto:Olivier.Ongkiehong@RVO.nl), +31 (0)6 2506 8965



**TKI URBAN ENERGY**  
Topsector Energie