

# Brintinfrastrukturen i Danmark

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13. September, 2017



nel •  
Number one by nature

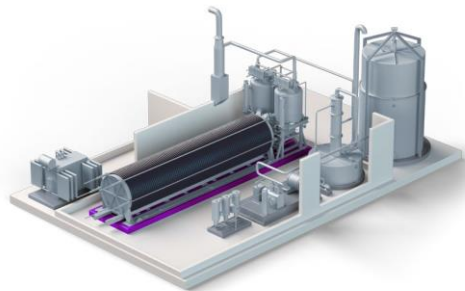
- World's largest pure-play hydrogen company with a market cap of more than \$250 million.
- 200 employees in Denmark, Norway and USA with world-class experience and skills.
- Offering hydrogen technology and solutions for industrial, energy and transport applications.
- More than 3500 hydrogen solutions delivered in 80 countries world wide since 1927.
- World #1 on hydrogen electrolyzers and hydrogen fueling – unrivalled performance and track-record.



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**ALKALINE ELECTROLYSERS**

Dates back to 1927



**PROTON**  
ON SITE

**PEM ELECTROLYSERS**

Acquired in 2017



**H<sub>2</sub> Logic**  
Hydrogen Fuel Cell Motive Power Solutions

**HYDROGEN FUELING**

Acquired in 2015



# PEM and Alkaline Electrolysers – small to large scale

- Global leader in large-scale hydrogen production plants – highest uptime, lowest conversion cost, robust and reliable.
- Proven and mature hydrogen production equipment since 1927 – delivered more than 3500 solutions in 80 countries.
- Scalable production capacity for industrial, energy and transport applications – from small scale to large scale solutions.



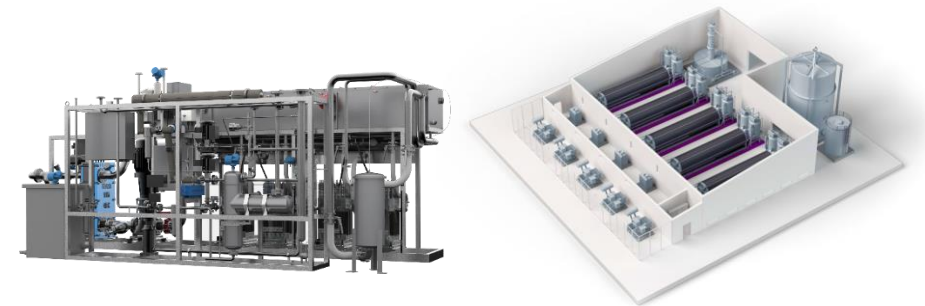
Small scale generators

Up to 12kg/day



Medium scale turn-key modules

Up to 600kg/day

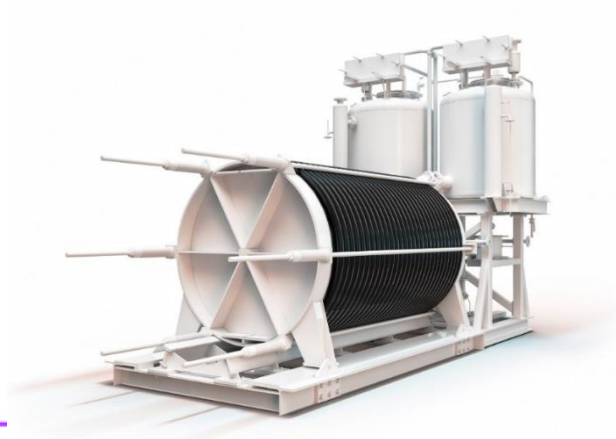
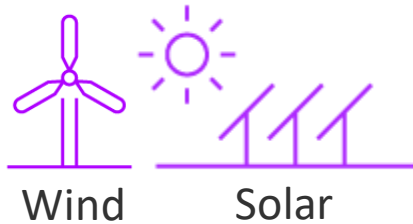


Large scale plant solutions

Up to any capacity size

# Nel Hydrogen: Zero emission – Zero compromise

- Nel Hydrogen provides solutions for renewable production and fast fueling of hydrogen with long driving range.
- Enables zero emission transport based on renewable energy with the same convenience and performance as gasoline.



**Electrolysers**  
Hydrogen production



**H2Station®**  
Hydrogen fueling

**Fuel Cell Bus**  
<10 min. fueling 400+km range  
20-40 kg per fill



**Fuel Cell Car**  
<5 min. fueling 500+km range  
4-7 kg per fill

# H2Station<sup>®</sup> hydrogen fueling solution

Turn-key standardized hydrogen fuelling station with dispensers for cars, busses, trucks and forklifts.

200kg per day at 70MPa or up to 600kg/day for 35MPa – all fast fuelling in accordance with SAE J2601.

Flexible configuration of hydrogen storage and fuelling capacity – very compact total footprint.

Can connect to various hydrogen supply sources e.g. onsite production or trucked-in delivery.



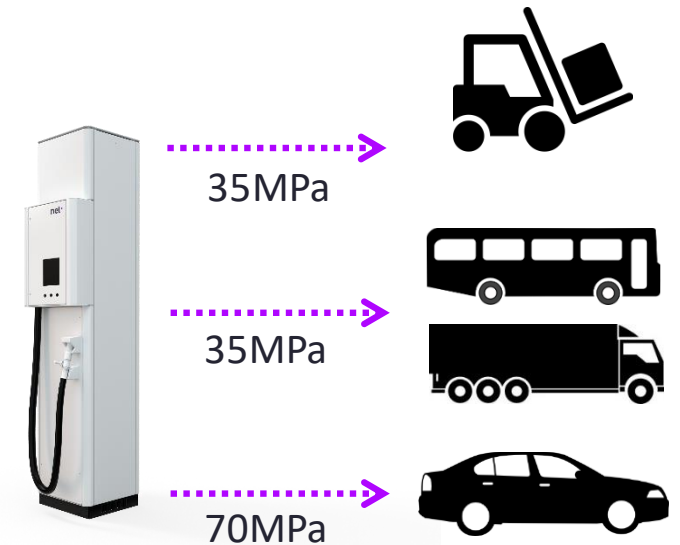
Supply Cabinet



Supply & Fueling Storage



Station Module



Dispensers

# New H2Station<sup>®</sup> manufacturing facility in Denmark



H2Station<sup>®</sup> manufactured  
at world's largest factory

300 H2Station<sup>®</sup> per year – sufficient for  
fueling 200.000 new FCEVs annually.  
€9 million initial investment.



# H2Station<sup>®</sup> – 70MPa Joint-Ventures and network sales

Nel Hydrogen has delivered more than 30% of 70MPa hydrogen fueling stations in Europe since 2011 and is now entering CA. In Denmark and Norway and Iceland entire countrywide networks are deployed in collaboration with oil and gas companies.

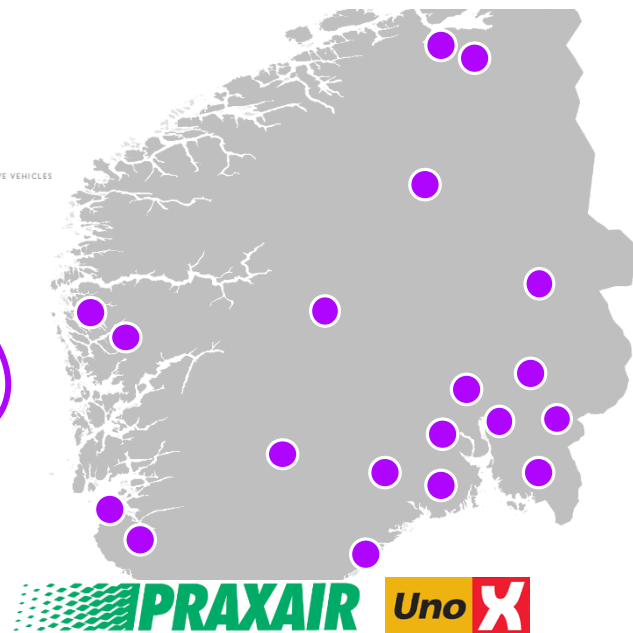
## DENMARK 2011-2016

10 H2Station<sup>®</sup> and  
Hydrogen production



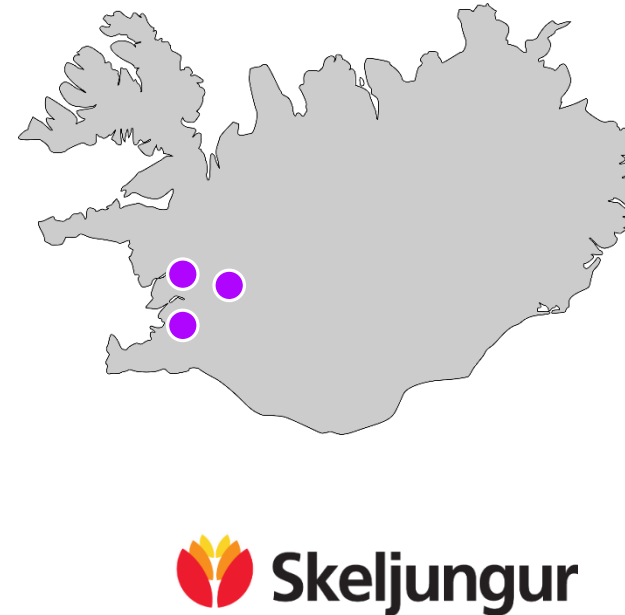
## NORWAY 2016-2020

Up to 20 H2Station<sup>®</sup> and  
Hydrogen production



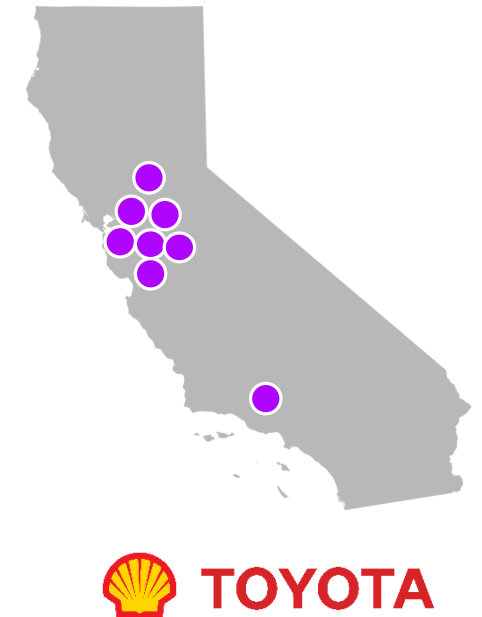
## ICELAND 2017-2020

3 H2Station<sup>®</sup> and  
Hydrogen production



## CALIFORNIA 2017-2018

Multiple H2Station<sup>®</sup> in San  
Francisco and Los Angeles



# Denmark FCEV fleet status & outlook

Total 68 FCEVs in Denmark allocated on more than 10 cities across the country.

Target of at least 500 FCEVs in Denmark by 2018 – requires annual sales growth.






Hyundai ix35: 60 units

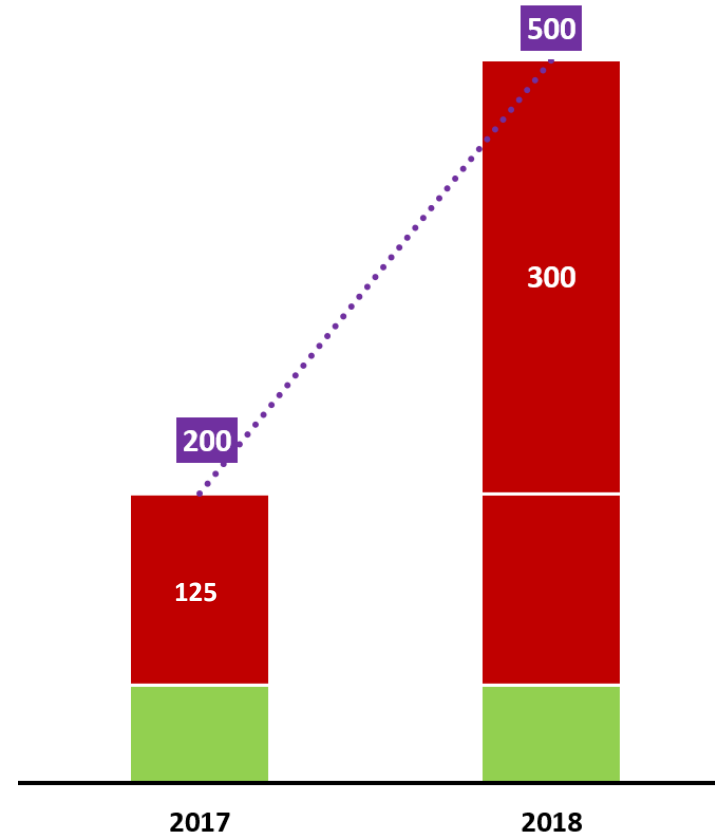


Toyota Mirai: 12 units



Honda Clarity: 3 units

-  Present fleet
-  Required annual sales
-  Target fleet (end of year)





# Denmark HRS network status

## The world's first country wide network in daily operation

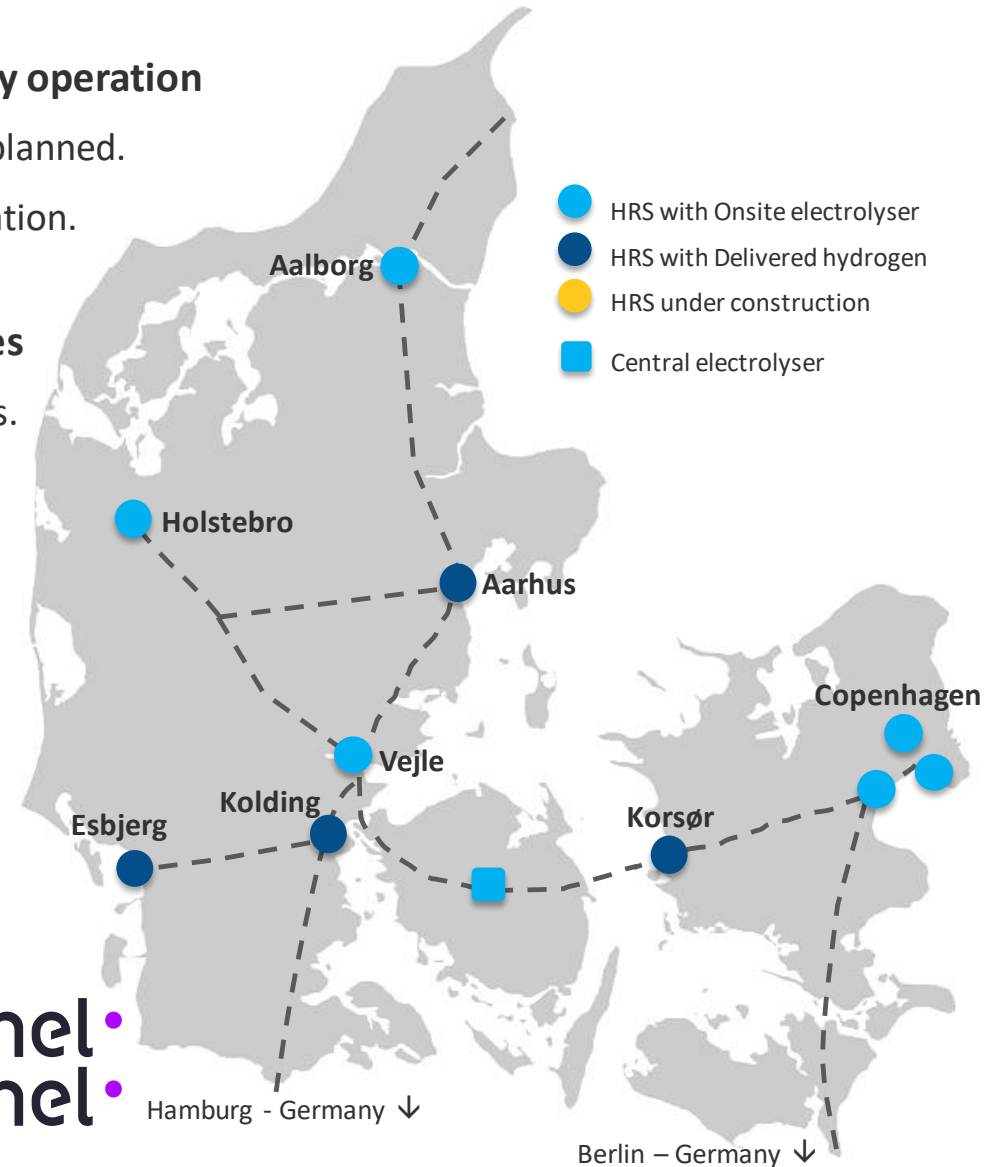
- 10 stations in operation – additional stations planned.
- 50% of population within 15 km of nearest station.

## Collaboration with leading oil & gas companies

- Joint venture investments in operation entities.
- H2 Logic equipment including O&M services.

## 100% green hydrogen supply in Denmark

- 6 stations – onsite electrolysis production.
- 4 stations – central electrolyser.
- Denmark 42% wind power share in 2014
- Target of 100% renewable power by 2035.



Danish Hydrogen Fuel A/S

Copenhagen Hydrogen Network A/S



Hamburg - Germany ↓

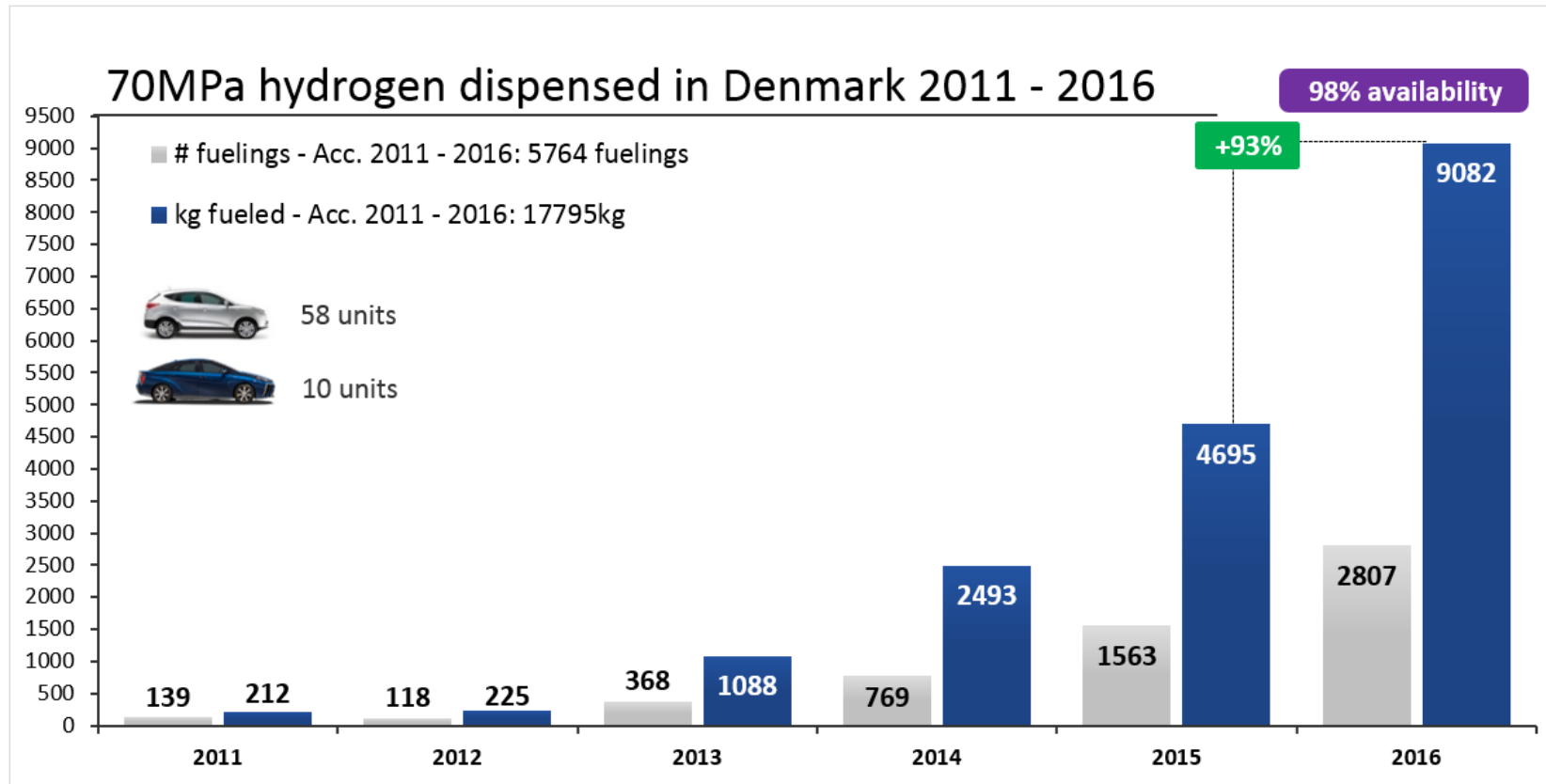
Berlin - Germany ↓

# Denmark HRS network operation

Total 17,795 kg dispensed / 5,764 fueling in entire network during 2011 – 2016.

All fuelings 70MPa SAE J2601 with -40°C pre-cooling and approved by car manufacturers.

Average network availability of 98% – all HRS's are publicly accessible 24/7.



# HRS Opening - Korsør

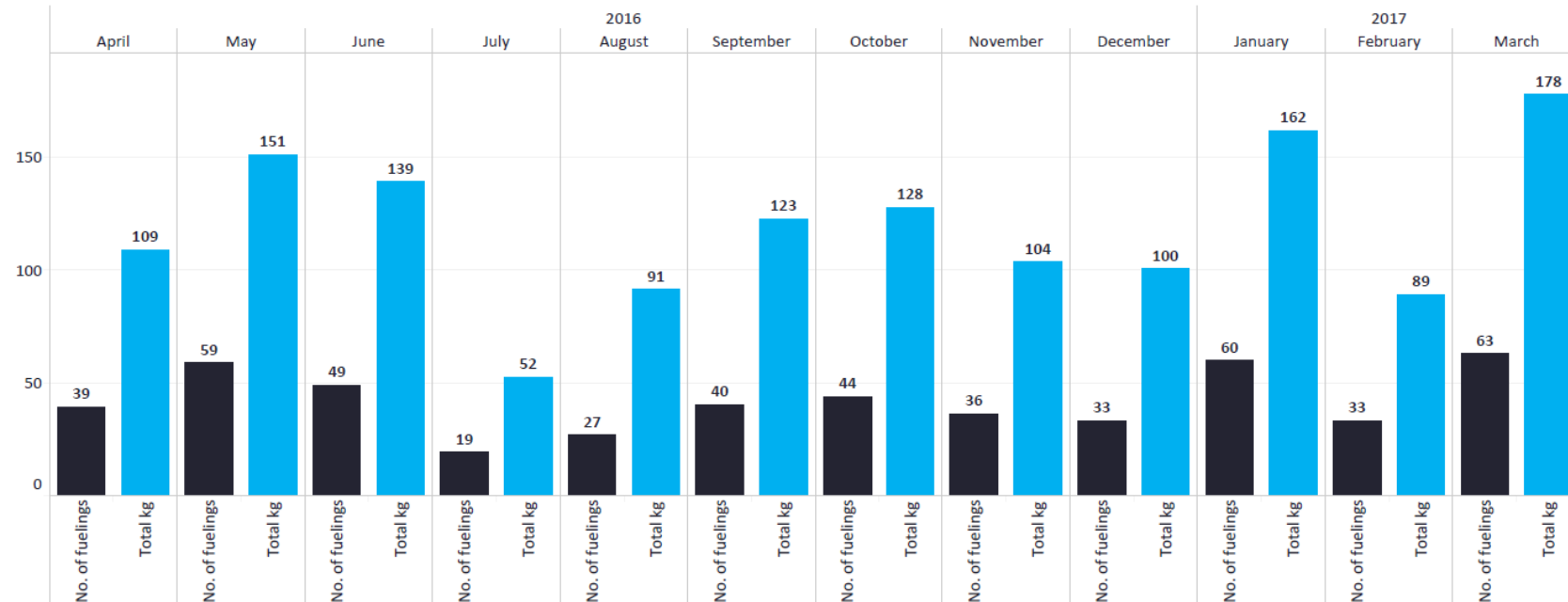
Official opening on 14.09.2015 – 3,5 months ahead of schedule.



# HRS Operation – Korsør (1 of 2)

Accumulated:	2,076 kg	723 fuelings	20 months
Average per month:	109 kg	38 fuelings	
Peak month:	178 kg	63 fuelings	

Fueling quantity past 12 months - Korsoer



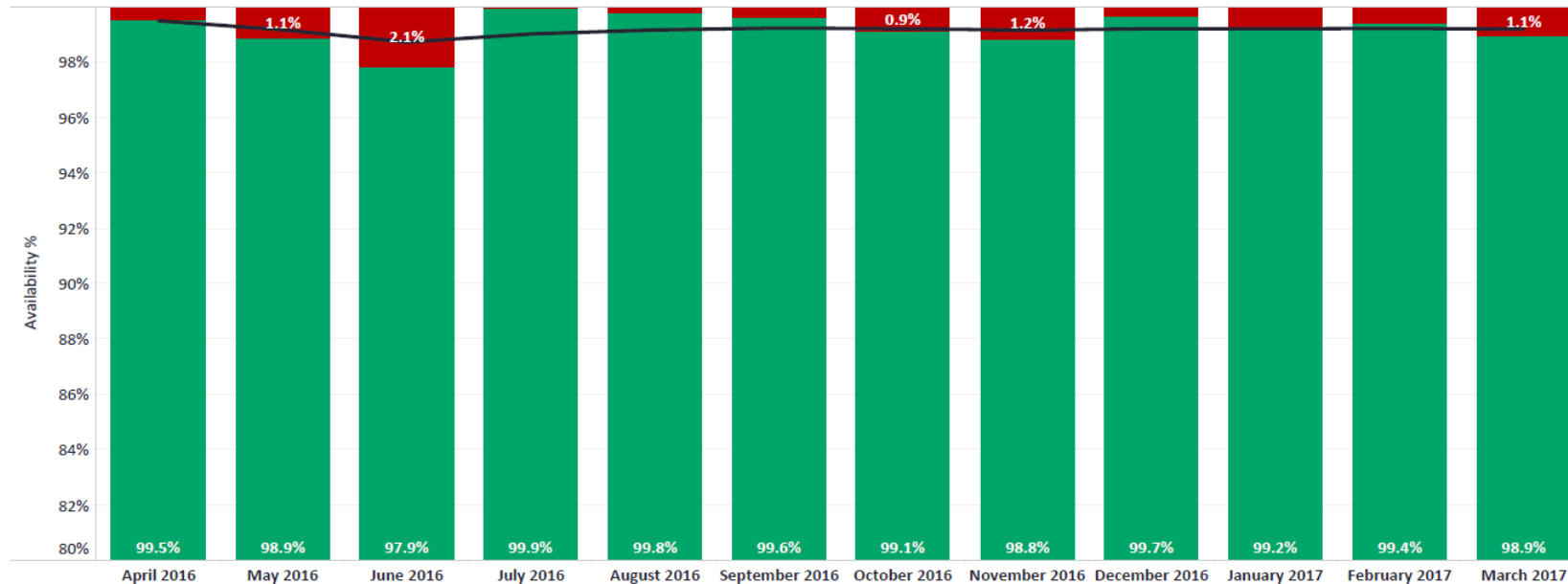
- **Accumulated:** 2,076 kg / 723 refuelings
- **Average per month:** 109 kg / 38 refuelings
- **Peak month :** 178 kg / 63 refuelings



# HRS Operation – Korsør (2 of 2)

Average availability total: 98.7% 19 months  
Average availability last year: 99.2%  
Average availability last quarter: 99.2%

Availability last year - Korsør



- **Average availability:** 98,7% – 19 months
- **Highest availability:** 99,9%
- **Lowest availability:** 92%
- **Availability definition:** 24 hours deducted all down-time including maintenance

## HRS Opening - Aarhus



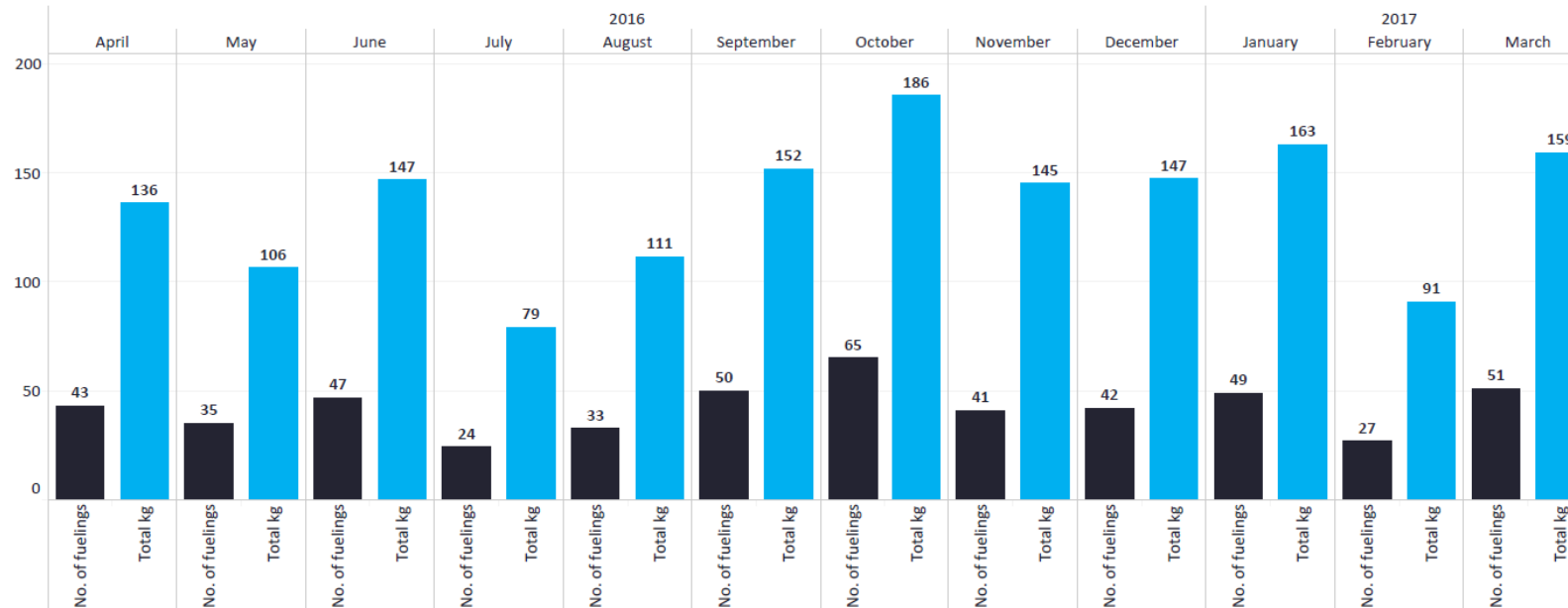
**HRS commenced operation on 10.12.2015 with public access (20 days ahead of DoW schedule).  
Formal opening was conducted on 21.01.2016 due to avoid overlap with Dec./holiday.  
Refueling station for Gasoline/Diesel and Car wash was opened next to HRS on 27.06.2016**



# HRS Operation – Aarhus

Accumulated: 1,991 kg 625 fuelings 17 months  
 Average per month: 124 kg 39 fuelings  
 Peak month: 186 kg 65 fuelings

Fueling quantity past 12 months - Aarhus V



- **Accumulated:** 1,991 kg / 625 refuelings
- **Average per month:** 124 kg / 39 refuelings
- **Peak month :** 186 kg / 65 refuelings

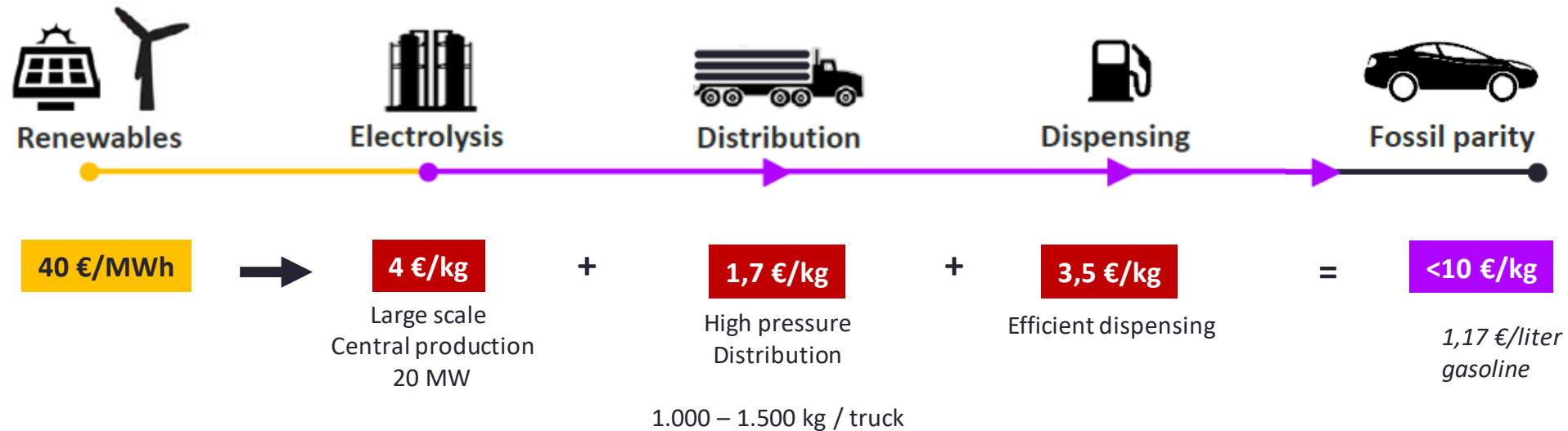


# H2 supply chain for full deployment – Fossil Parity

- Optimized hydrogen supply chain
- Cheap renewable electricity is converted to hydrogen
- Distributed by truck, and dispensed competitively

Fueling infrastructure can be provided as part of the supply contract.

*200kg/day per station, 10 year depreciation, <200km distribution:*





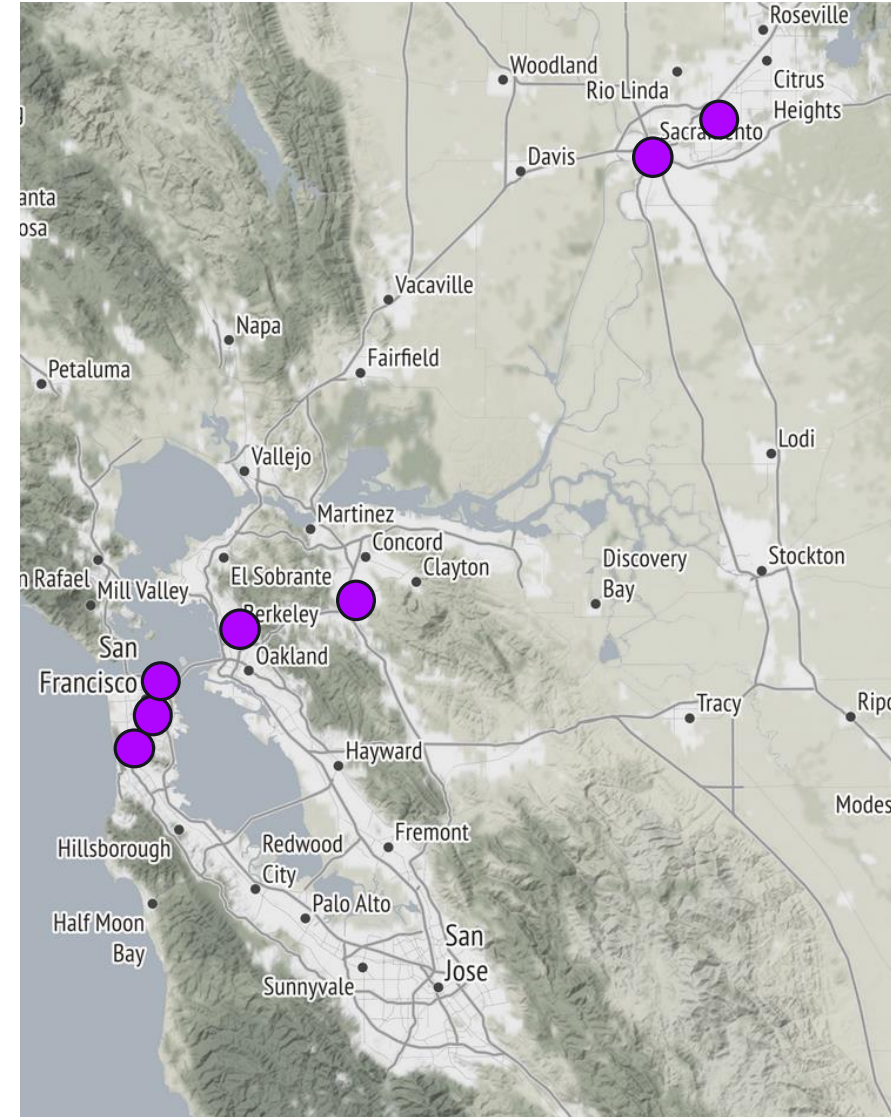
# H2Station<sup>®</sup> contract with Shell for San Francisco (2018)



Nel Hydrogen to deliver seven hydrogen stations for Shell in San Francisco

In collaboration with Toyota and supported by California Energy Commission

Stations to be build during 2018 and operated and maintained by Nel Hydrogen.



**TOYOTA**



# New generation H2Station<sup>®</sup> deployed

Footprint reduced to 1/3

Fueling capacity more than doubled (200-400 kg/day)

Back to back capacity: 18 fuelings in 3 hours

Product developed for serial production – fully certified for European and US markets



First installation in Kjørbo



- **Danish hydrogen fueling network in full operation with growing demand**
- **High availability of stations (>98%) demonstrated over 2 years operation**
- **Car roll out gaining traction in California -> strong demand for stations in CA**
- **Significant interest for heavy duty applications in Europe**
- **Next phase – implement fossil parity hydrogen supply for the transport sector**

End of presentation

**Thank you for  
your attention**

**Questions?**

[www.nelhydrogen.com](http://www.nelhydrogen.com)

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