



ON TRACK - Refuelling infrastructure for fuel cell vehicles in Europe

LeadIng.



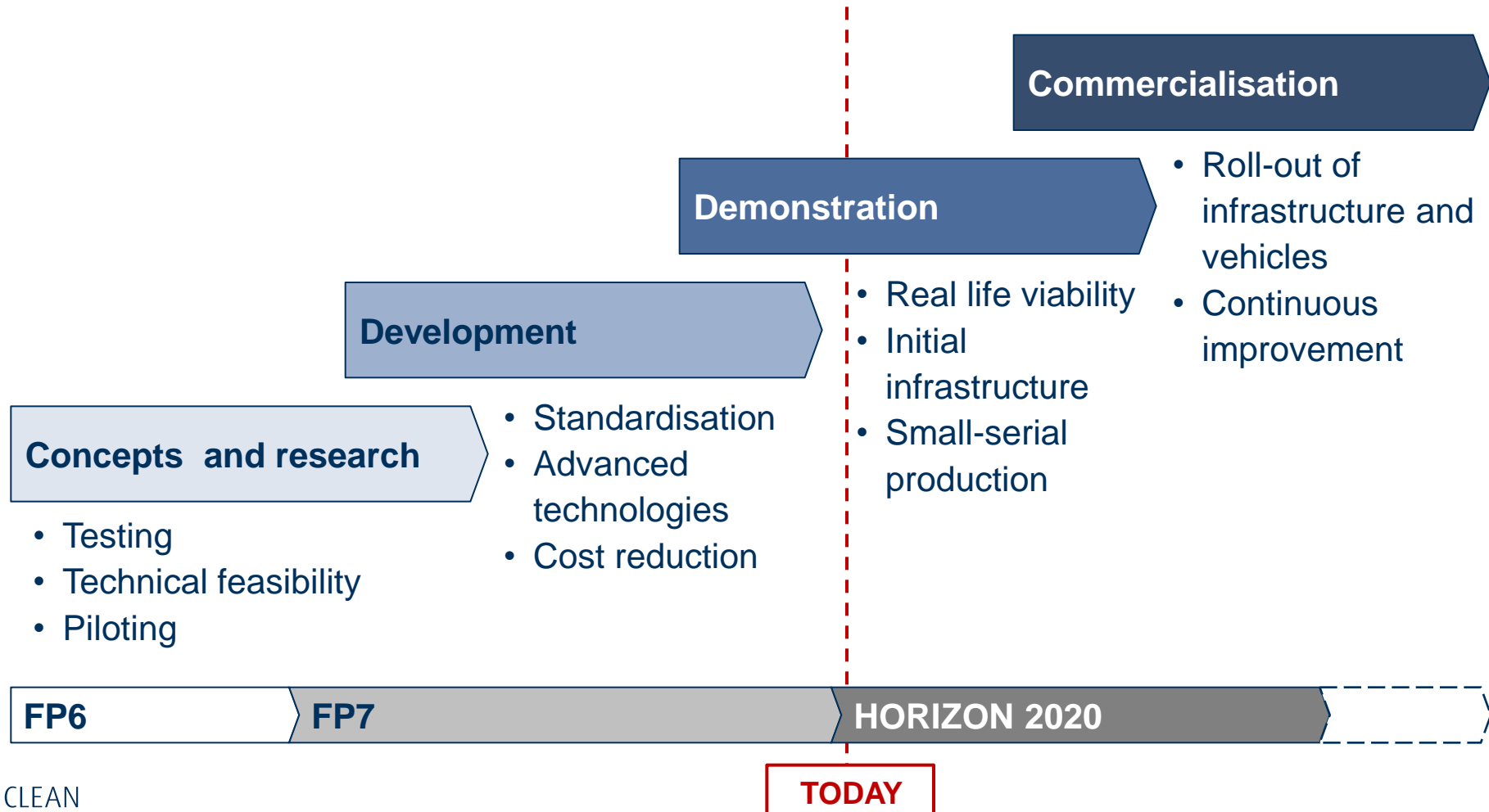
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Dr. Andreas Opfermann
FCH JU Stakeholder Forum 2014
Brussels, 12th November 2014







CLEAN
TECHNOLOGY
BY LINDE

FCH JU stakeholders in Europe create a strong foundation

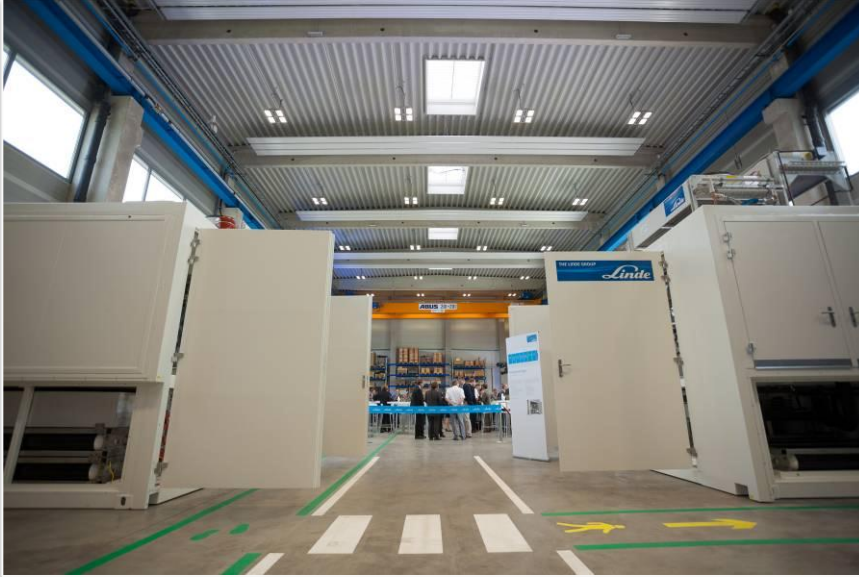
Development phases of FCEV & HRS



Levers for the rollout of the infrastructure are addressed

	Task	Status	
 Codes & Standards	<ul style="list-style-type: none"> Standardised fuelling interfaces Safety of H2 refuelling 	<ul style="list-style-type: none"> SAE J 2799 in place SAE J 2601 in place 	<input checked="" type="checkbox"/>
 Sustainability	<ul style="list-style-type: none"> Range of scalable, renewable H2 production pathways 	<ul style="list-style-type: none"> Certification of production from biogenic sources Grid-scale Power-to-Gas facility under construction 	<input checked="" type="checkbox"/>
 Metering	<ul style="list-style-type: none"> Reliable measurement for accurate billing of customers 	<ul style="list-style-type: none"> Adjusted metering device currently under factory testing 	<input checked="" type="checkbox"/>
 Footprint	<ul style="list-style-type: none"> Minimal land use for technology 	<ul style="list-style-type: none"> Land use reduced from 40 ft containers to 14 ft Underground storage demonstrated at different sites 	<input checked="" type="checkbox"/>
 Availability	<ul style="list-style-type: none"> Provide reliable refuelling infrastructure for customers 	<ul style="list-style-type: none"> Refuelling stations availability beyond 95% demonstrated 	<input checked="" type="checkbox"/>
 CAPEX	<ul style="list-style-type: none"> Reduction of hardware & installation cost 	<ul style="list-style-type: none"> High level of standardization as basis for scaling effect Opening of small-serial production facility 	<input checked="" type="checkbox"/>

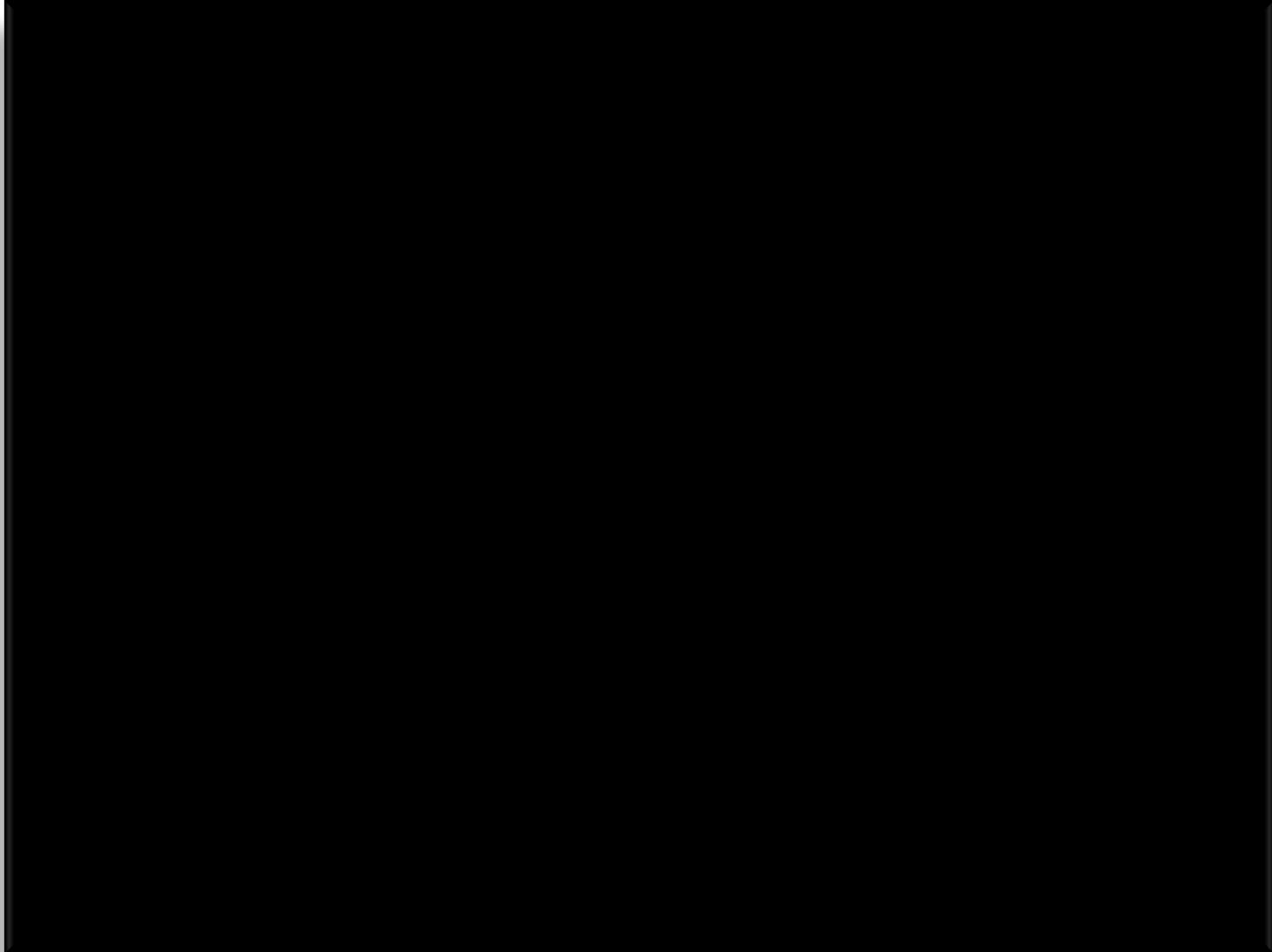
Opening of first small-serial production of hydrogen refuelling stations



Advanced hydrogen refuelling technology for the commercialisation of FCEVs



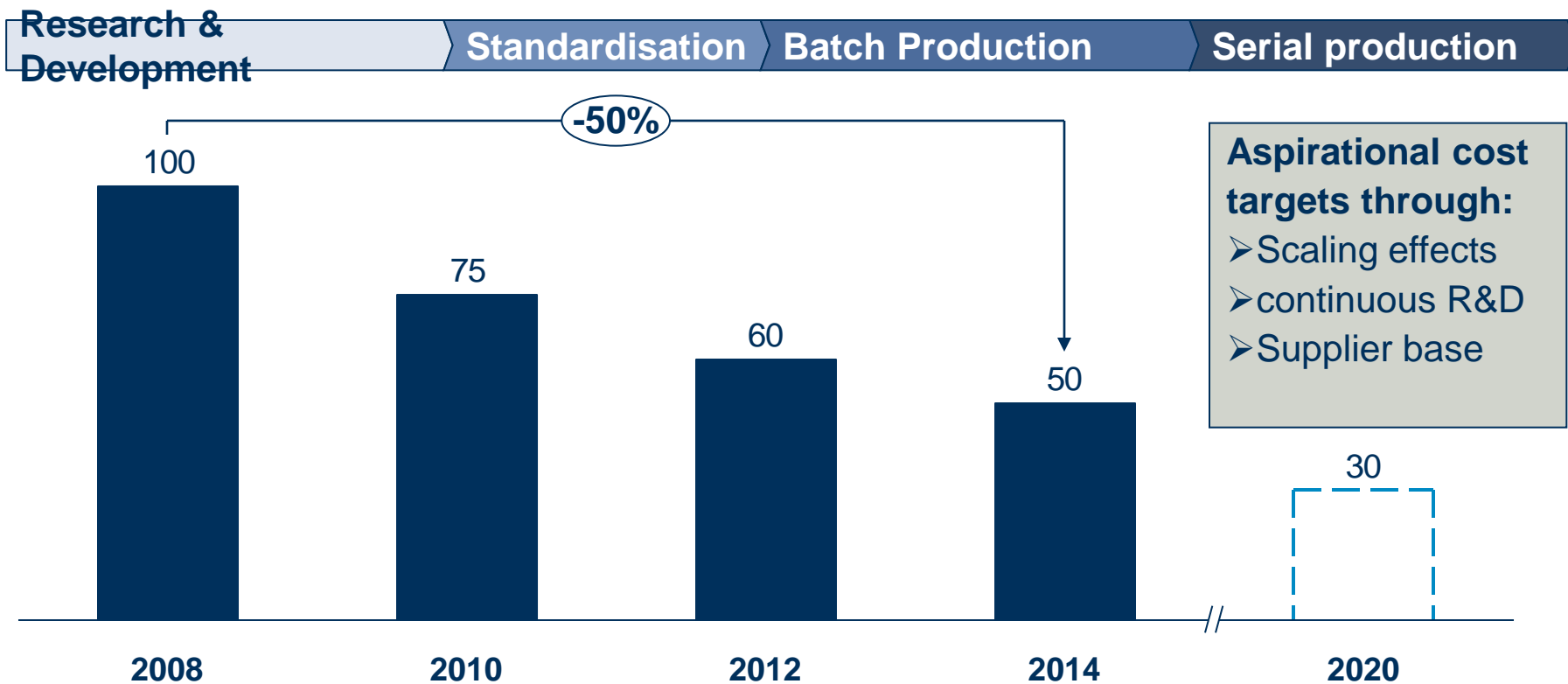
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On-going R&D efforts for hydrogen infrastructure solutions

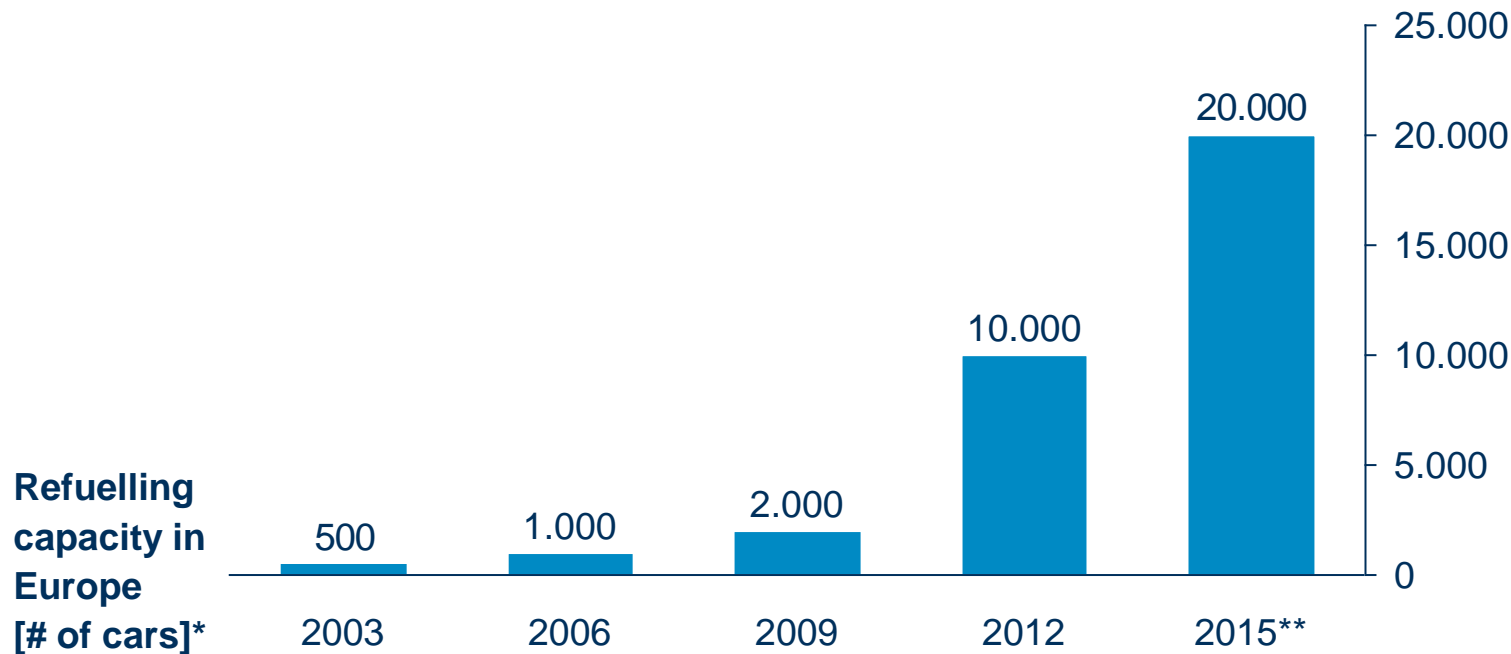
Example: cost reduction of 700 bar HRS*

■ Station cost [% of 2008 actual]



Upfront investment in infrastructure for the FCEV roll-out

Development of 700 bar HRS car servicing capacity in Europe



Vehicle roll-out [# of cars]	< 20	20-50	50 - 100	200 - 300	300 - 400

Strong commitment of OEMs and FCEV roll-out are crucial for success!

Support in place

- ✓ Clear CO2 reduction targets in transport...
- ✓ Support from government decision makers...
- ✓ Funding for R&D + Demonstration...
- ✓ Guiding legal framework ...

Closing the remaining gap

- ❑ ... limited incentives for roll-out of FCEV in EU (compared to US and Japan).
- ❑ ... aligned approach between EU and member states.
- ❑ ... specific levers for capital intensive infrastructure roll-out.
- ❑ ... enforceable target for infrastructure build-up.

It is our choice...



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Governments fail to deliver
strict CO2 targets.
Fossil fuels continue to
dominate transport sector.

November 2023

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Why the transition in the transport sector failed...



... and hydrogen
will remain the
fuel of the future.

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Reduced energy imports,
Emission of Europe's
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THEY DID IT

Success story hydrogen

