

The logo for Elaadnl, featuring the text 'Elaadnl' in a blue sans-serif font with a yellow lightning bolt graphic below the 'd'.

Elaadnl

The word 'TESTING' in a large, white, outlined, sans-serif font, positioned at the top of the image. A yellow lightning bolt graphic is located above the 'I'.A large white text overlay on a green-tinted background of a server room. The text reads 'The Elaad Testlab' in a bold, sans-serif font.

# The Elaad Testlab

A portrait of Thijs van Wijk, a man with short brown hair and a light beard, wearing a light blue button-down shirt. He is smiling and looking towards the camera. The portrait is set within a white rounded rectangle.

Thijs van Wijk  
Manager Elaad Testlab



A smaller version of the Elaadnl logo, enclosed within a white circular thought bubble that has a small white dot below it, suggesting an idea or goal.

- Knowledge & innovation centre
- Non profit foundation
- Cooperation of grid operators



Our goal:

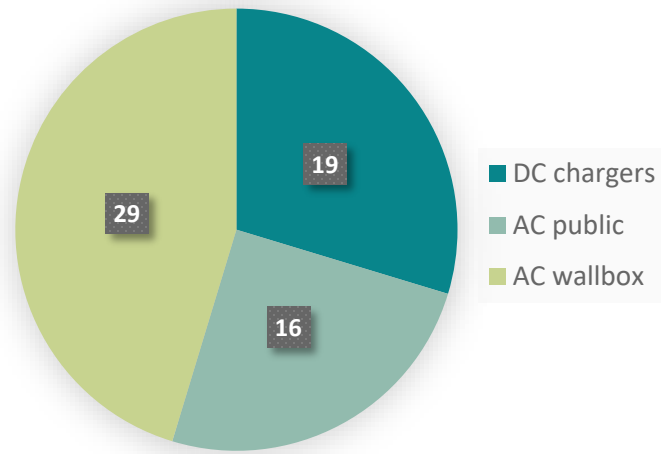
Integrating electric transportation in the electricity grid

# The Elaad Testlab

- Research Test Lab to improve grid integration of EV charging
- Pre-certification and pre -normative testing
- Helping OEMs to improve grid integration
- Learn to adept standards and the grid
- Open & free
- Suitable for all kinds of electric vehicles including busses and trucks
- Different types of public and home AC chargers and DC chargers
- Highly accurate measurement equipment
- Automated test and analysis
- 360 kW bidirectional test system from Keysight



Charging stations





The logo for Elaadnl, featuring the company name in a blue sans-serif font with a yellow lightning bolt graphic underneath. It is contained within a white circular speech bubble in the top right corner of the image.

Elaadnl

Test/ certification development

# Available test setups

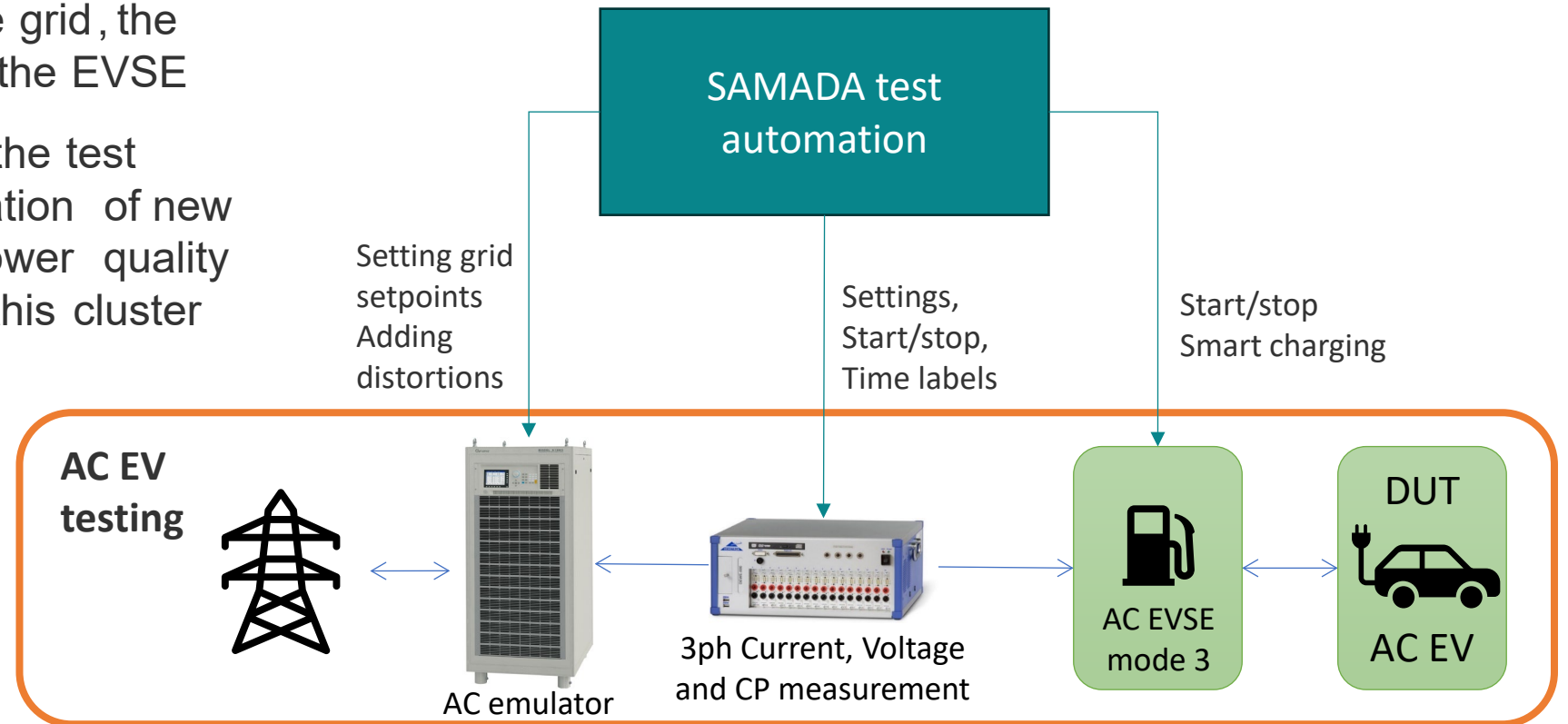
The Elaadnl logo is printed on the back of a dark-colored shirt worn by a person in the foreground. The logo consists of the company name in white with a white lightning bolt graphic below it.

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# Test setup smart charging

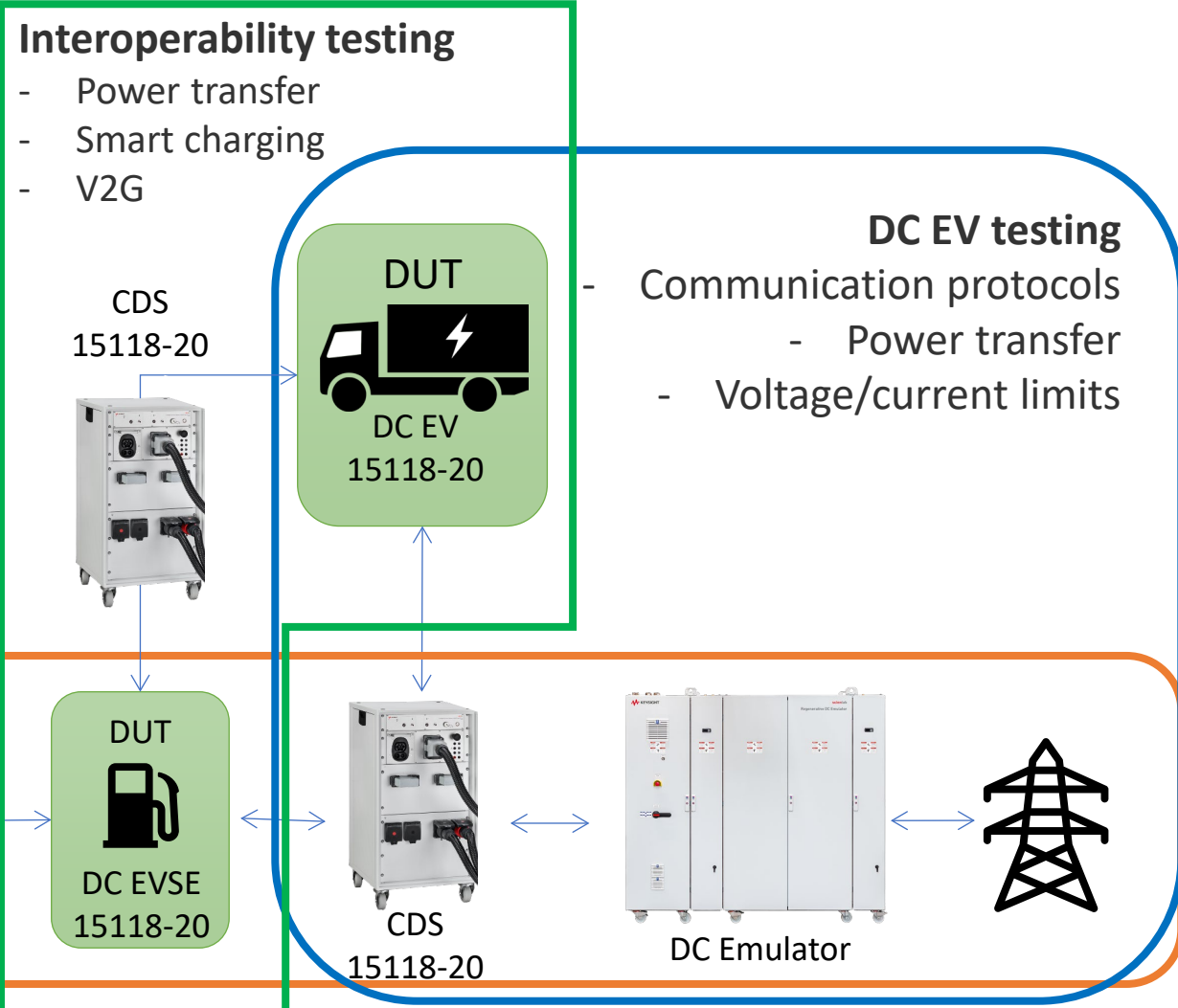


- Test in-house developed fully automated Power Quality and Smart charging scenarios
- Ability to control the grid, the measurements and the EVSE
- Useable for testing the test process and certification of new smart charging or power quality requirements from this cluster



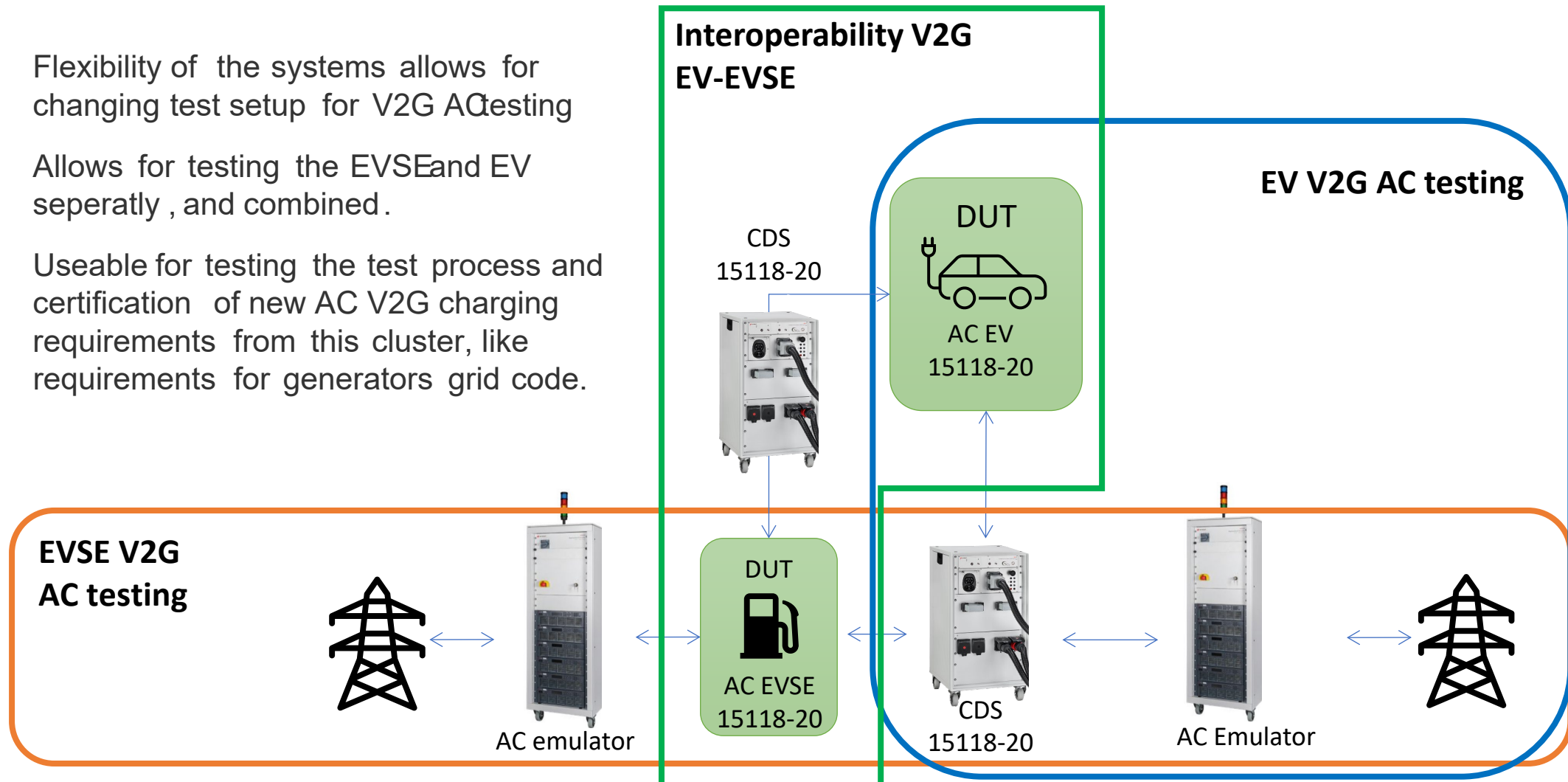
# Test setups DC V2G

- 360 kW Test setup. Grid, EV/EVSE communication and DC power all emulated and under full control
- Different test setups can be created for EV, EVSE and interoperability testing
- Useable for testing the test process and certification of new DC charging requirements from this cluster, like communication protocol support



# Test setups AC V2G

- Flexibility of the systems allows for changing test setup for V2G AC testing
- Allows for testing the EVSE and EV separately, and combined.
- Useable for testing the test process and certification of new AC V2G charging requirements from this cluster, like requirements for generators grid code.



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Experiences

# Testing Recommendations

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# Recommendations

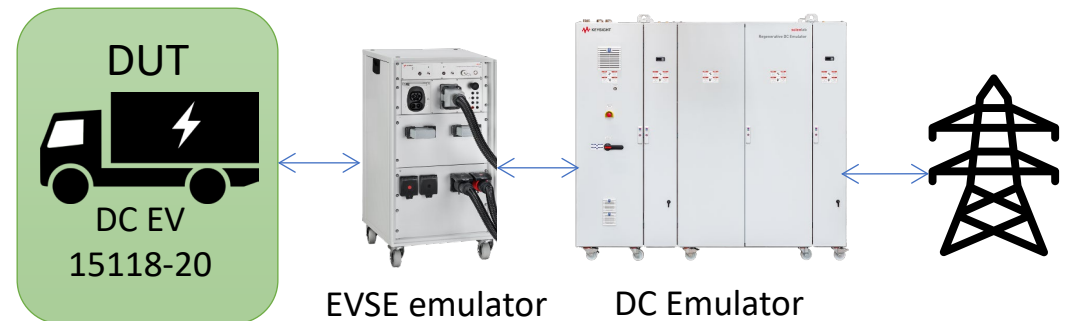


## Fast Recharging Power Curve testing

- Use EVSE + DC emulator for testing charging curve at controllable different maximum current and voltage levels (at least 400V and 800V, future 1250V for trucks)
- Max power for CCS is 400 kW. MCS goes up to 3.75 MW, but for trucks 1 MW considered enough
- Make sure the test setup is bidirectional ; able to discharge when vehicle supports V2G
  - ✓ Saves time, no need to empty battery by driving
  - ✓ Saves energy
- For unidirectional vehicles; use a roller bench
- Climate tests: only the vehicle in the climate chamber, not the DC charger. The charger itself will also be affected by temperature

## Choices

- Charging from ...till ... In % or kW? And gross or net capacity?
- Battery temperature: Preconditioning/ driving



# Recommendations



## Smart charging

- Just performing mode 3 or 15118-2 communication tests do not guarantee smart charging readiness
- Testing smart charging capabilities using scenarios
- The Elaad scenarios are based on years of experience and can freely be used
- Compliance to the IEC 61000-3 EMC emission standards should be tested on low, medium and maximum AC charging speed

