



# Wallbox-Inspektion

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Jan Körber

8. May 2025

[www.wallbox-inspektion.de](http://www.wallbox-inspektion.de)

[www.ise.fraunhofer.de](http://www.ise.fraunhofer.de)

# Agenda

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Targets Wallbox-Inspektion

How to test Charging Infrastructure?

Wallbox-Inspektion Test Guideline

Results

Conclusion & Outlook





20 übermittelte Antworten

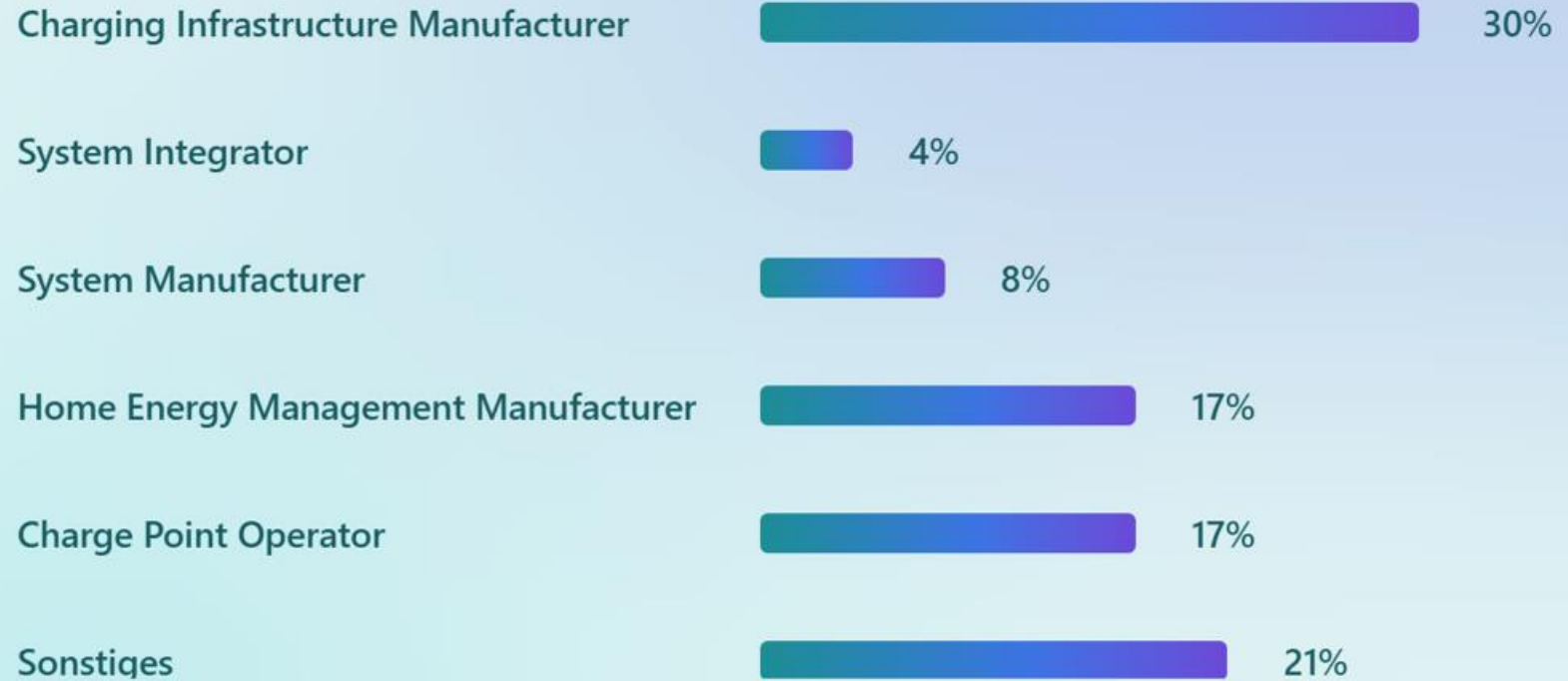
## Why do you work with Charging Infrastructure?

Scannen Sie den QR  
oder verwenden Sie  
den Link, um  
teilzunehmen



<https://forms.office.com/e/AkxKkeDEKF>

Link kopieren





20 übermittelte Antworten

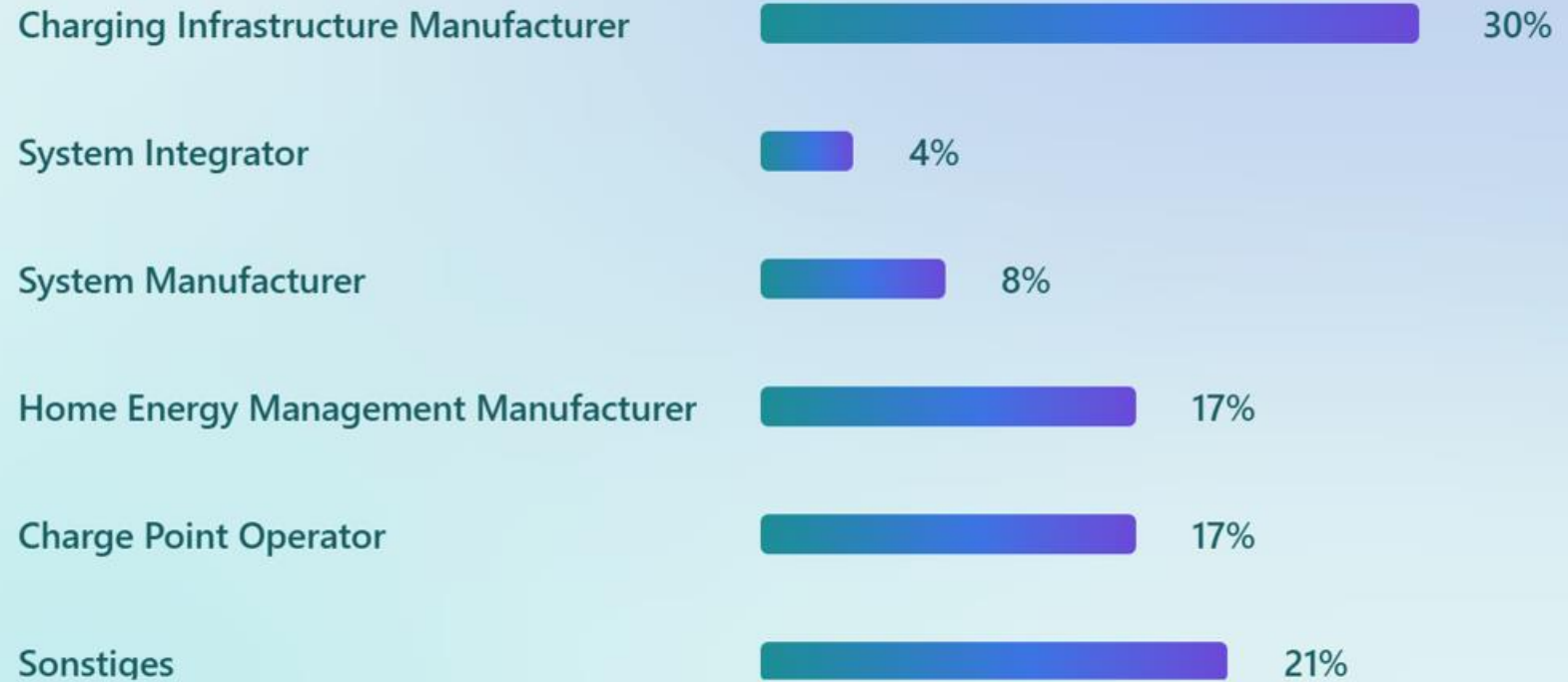
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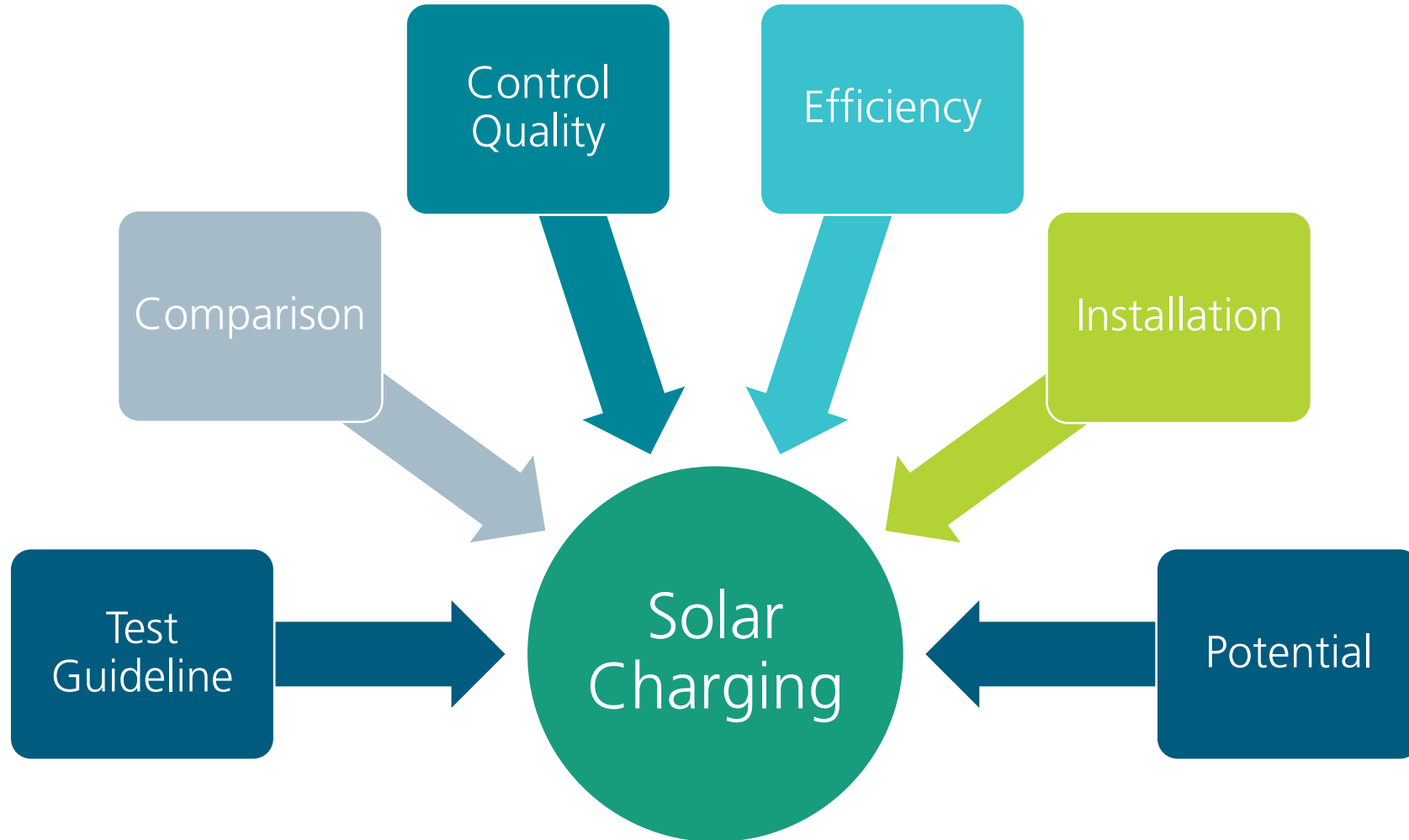
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Link kopieren



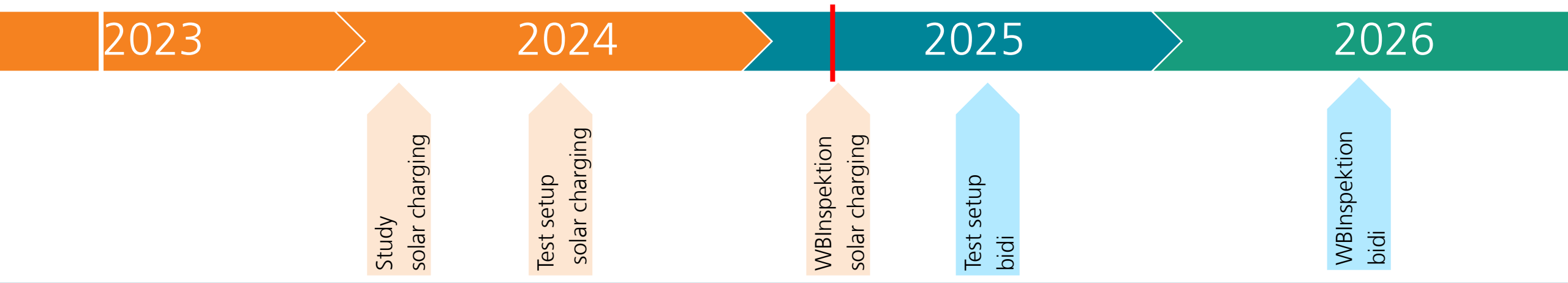
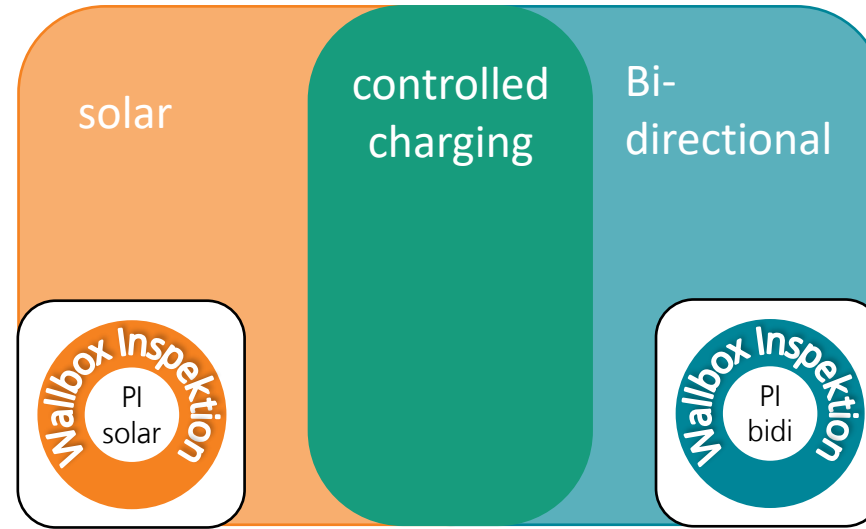
# Wallbox-Inspektion

## Motivation & Targets

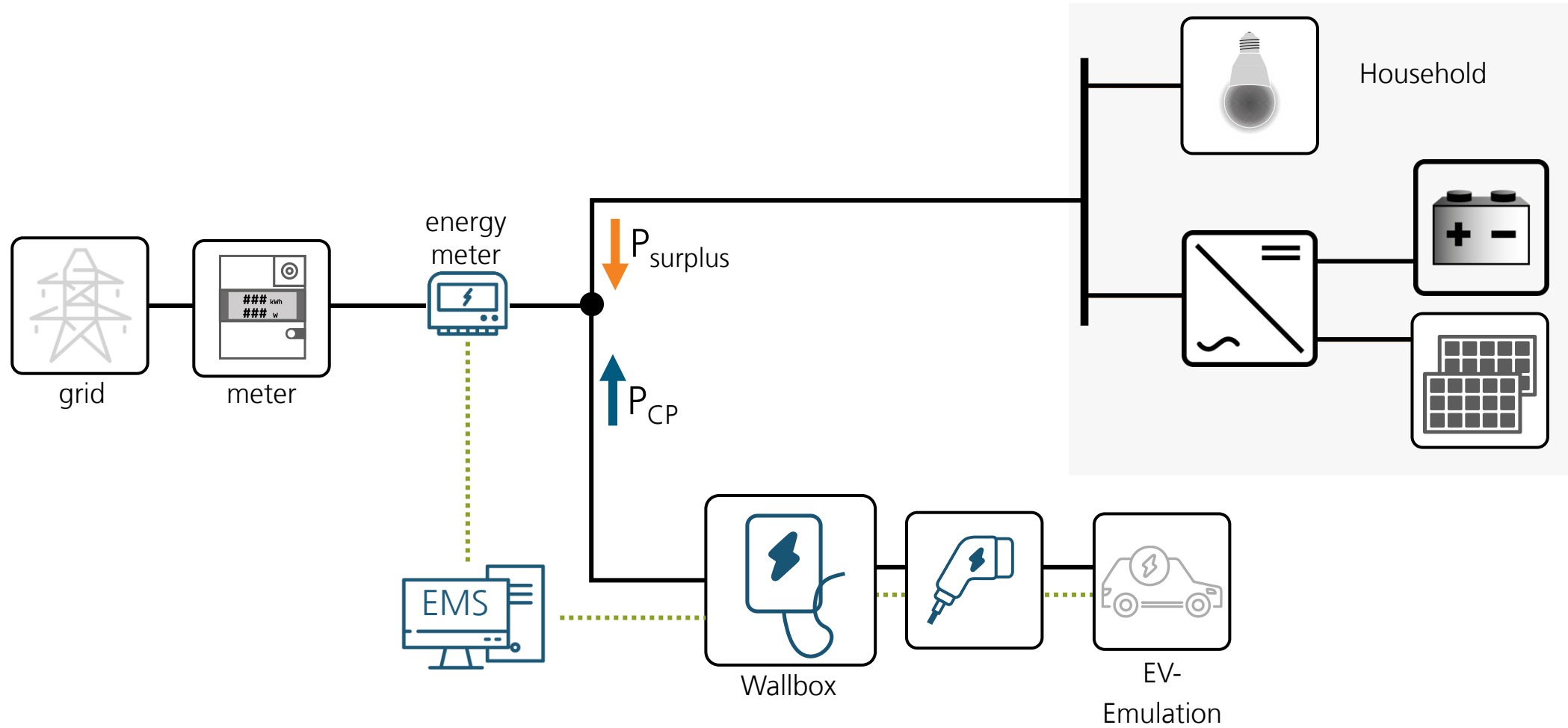


# Wallbox-Inspektion

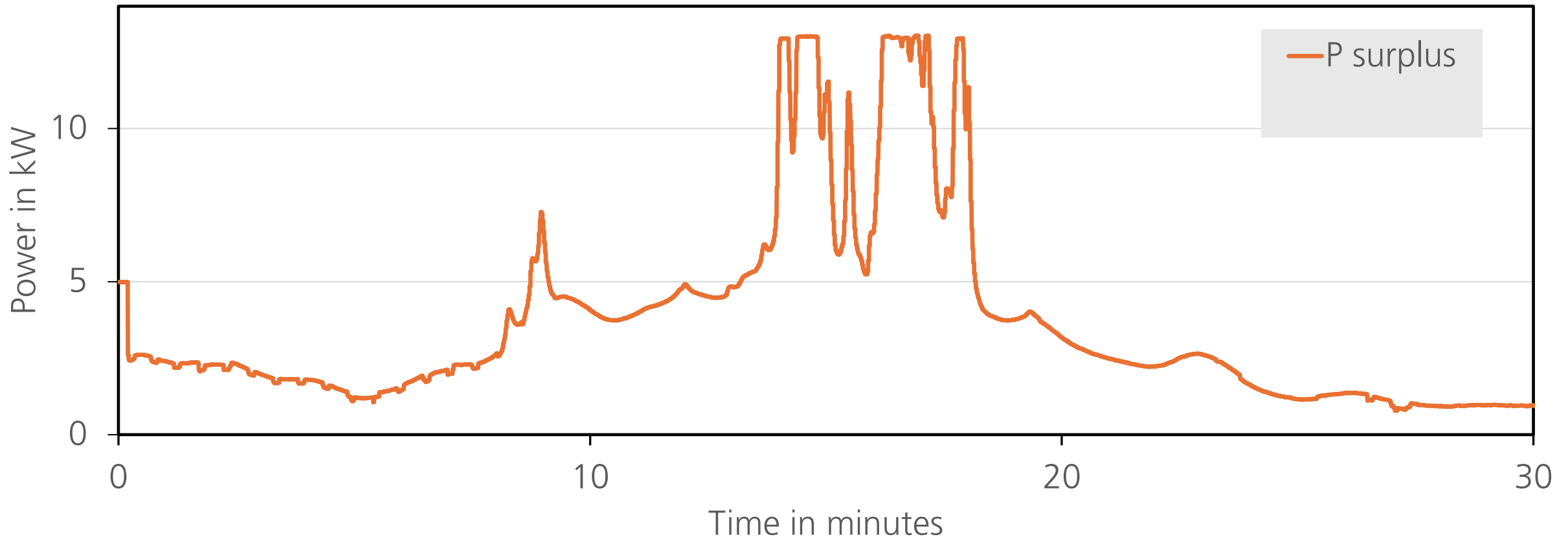
## Timeline



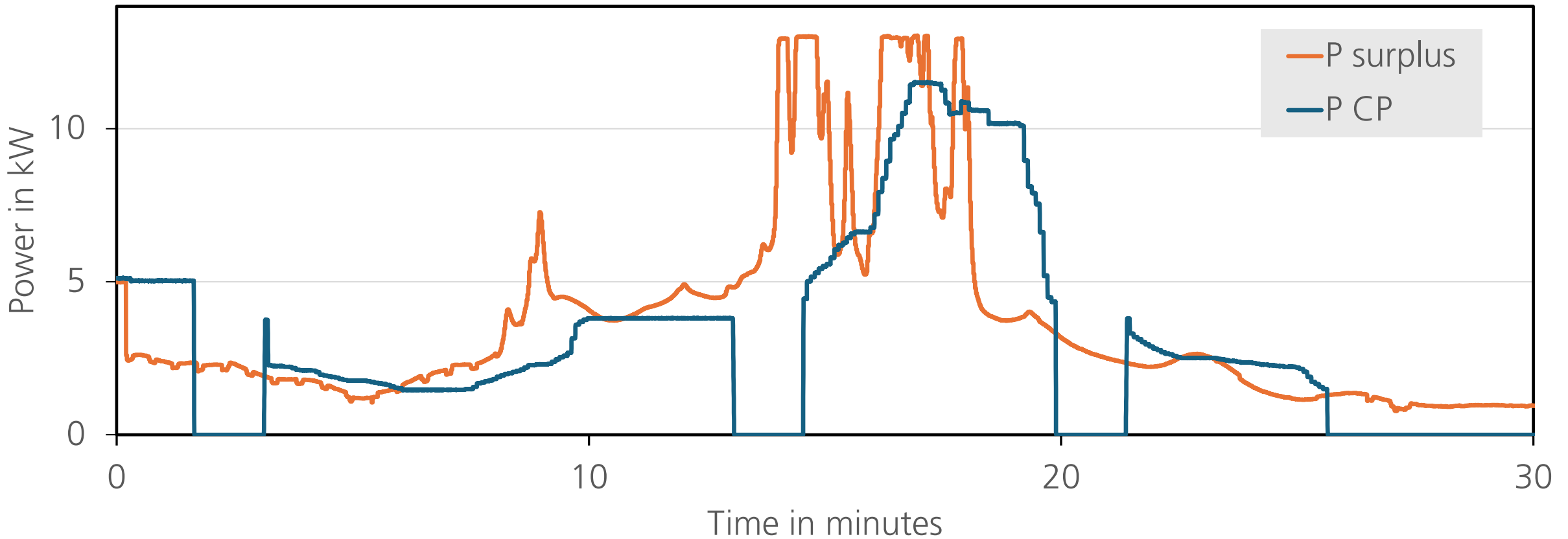
# System under Test



# Surplus of PV-Generation



# is consumed by the EV





11 übermittelte Antworten

## What is important for testing Charging Infrastructure

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teilzunehmen



<https://forms.office.com/e/iRs8zx6Fbq>

Link kopieren

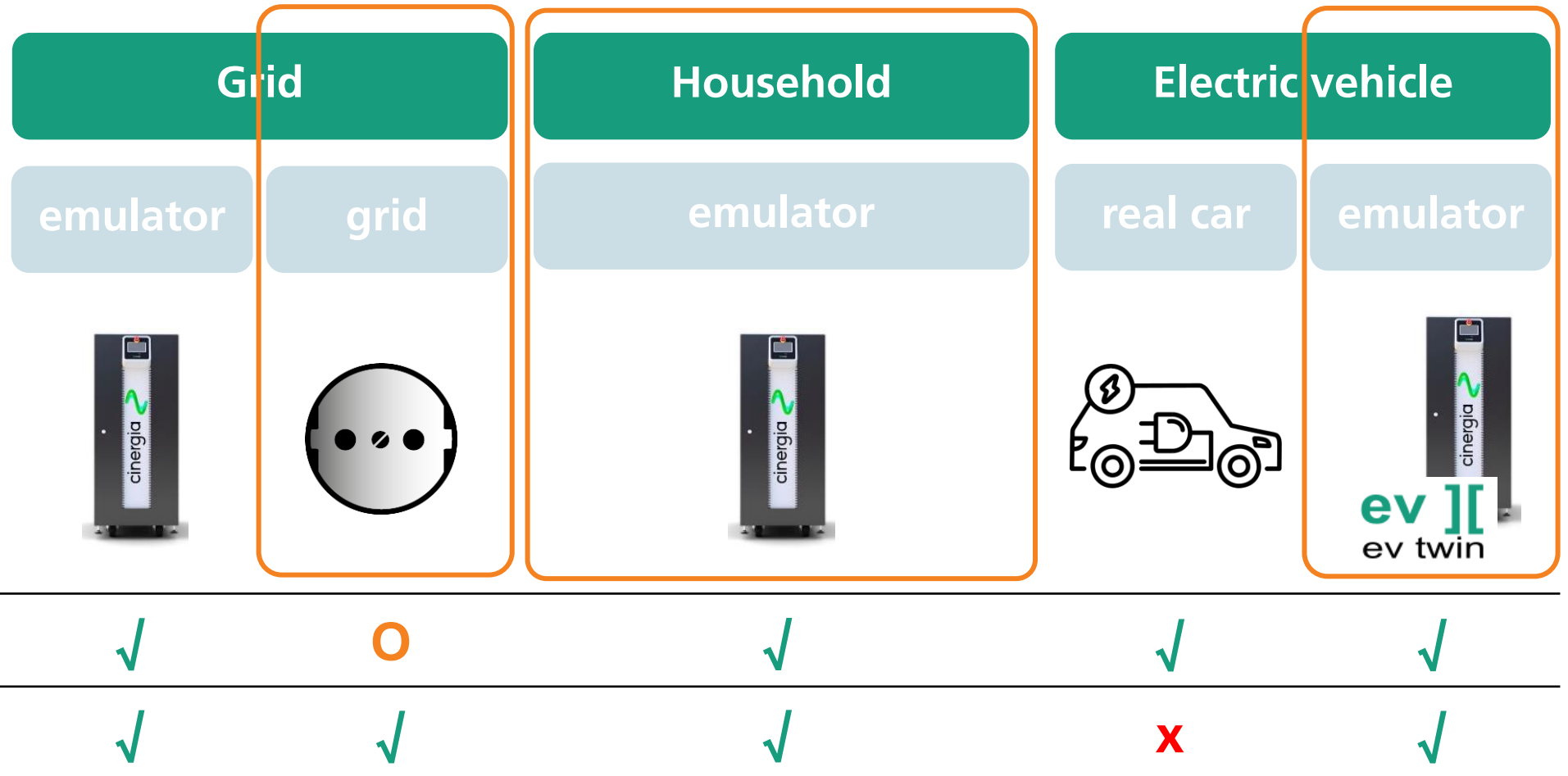
use cases synthetic **Kompatibilität**  
Requirements kennen **Powerflow monitoring**  
conventional **Möglichst realitätsnah** **real-world**  
Preference Scope **Gleiche Testbedingungen**  
**Systemborder** **Realistic tests** **Quality of each parts**  
**Reproduzierbarkeit**

Wordcloud **Alle Antworten**

< 1 von 1 >

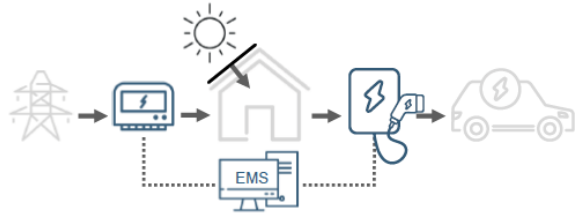
# Targets

## for Wallbox Testing



## Prüfrichtlinie

Unidirektionales und Solares Laden  
Version 0.7



Gefördert durch:



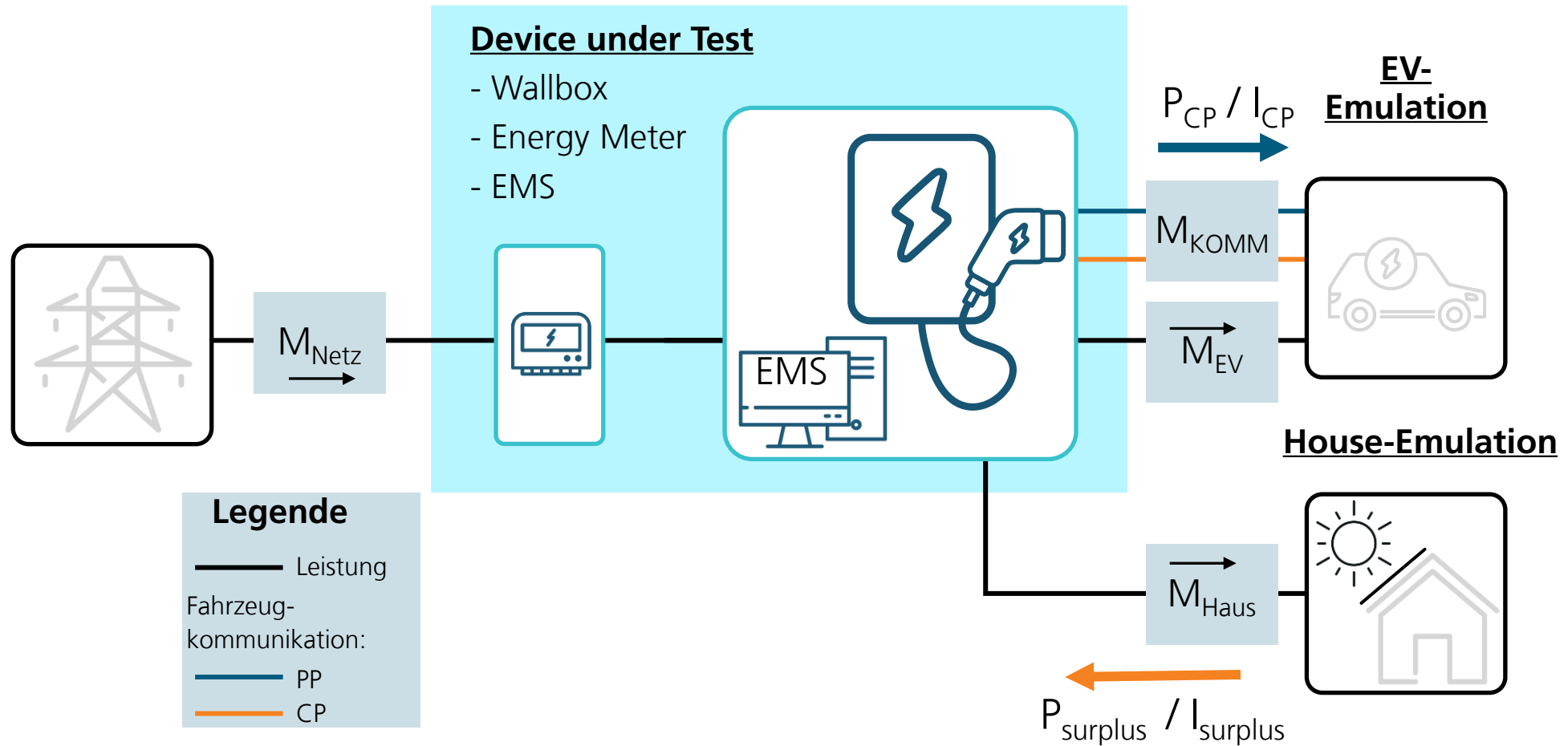
Bundesministerium  
für Wirtschaft  
und Klimaschutz

aufgrund eines Beschlusses  
des Deutschen Bundestages

# Prüfrichtlinie Unidirektionales und Solares Laden

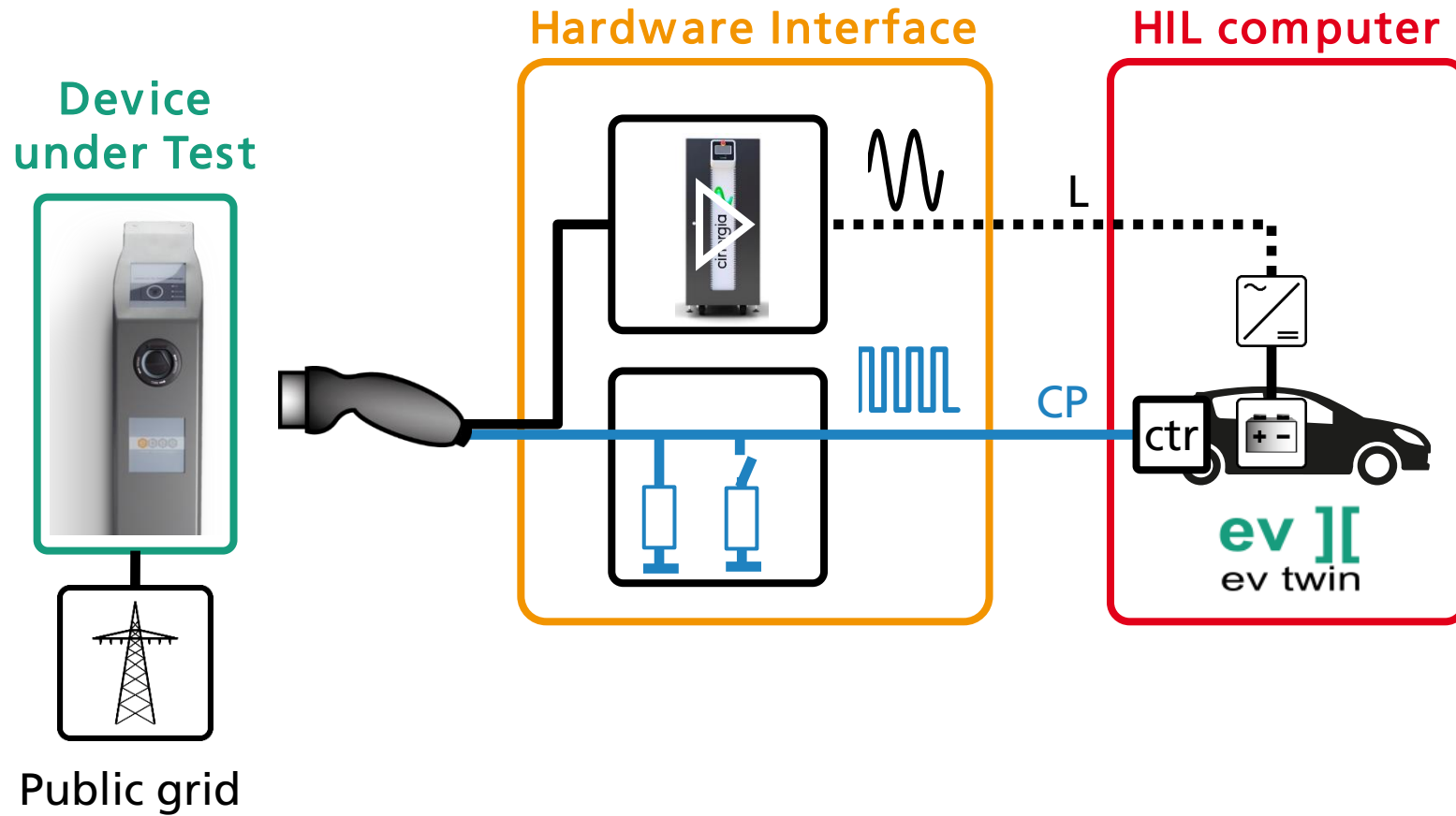
# Measurements

## Definitions of Currents around EV




# EV-Emulation – Power HIL

Digital Twin Electric Vehicle – AC Charging



# Digital Twin EV Charging

ev twin



**Emulation of  
EV charging behavior**

**Wallbox-  
Inspektion**

2023



HIL Marketplace > EV charging twin

**ev ]['** EV charging twin  
0.3.0  
Fraunhofer ISE

**Description:** The Toolbox 'EV Charging Twin' has been developed at Fraunhofer Institute for Solar Energy Systems ISE at the Digital Grid Lab (www.digital-grid-lab.de) in the department Smart Grids. Purpose of this work is to test interoperability and functionality of EV charging equipment. 'EV Smart Charging Twin' contains typhoon libraries and example to perform P-HIL tests of EV charging infrastructure. The libraries are perfectly designed for smooth tests in the Digital Grid Lab. But with suitable HIL-Connects from typhoon this toolbox is easily applicable. The toolbox also contains components for controlling power amplifiers of manufacturer cinergia and regatron.

**Note:** The Toolbox is specified with the HIL-Connect 'EV' for connecting EV supply infrastructure to HIL-Computers. Without this equipment, not full functionality can be achieved. But lot of things are possible.

**Main functionality** is to emulate the AC or DC charging behavior of electric vehicles. The core model is the component 'EV' defining the charging behavior of different brands of EV.

**Available typhoon  
Marketplace**

IEC 61851-1  
ISO 15118-2

2025

**ISO15118-20  
bidirectional charging**

DC und AC

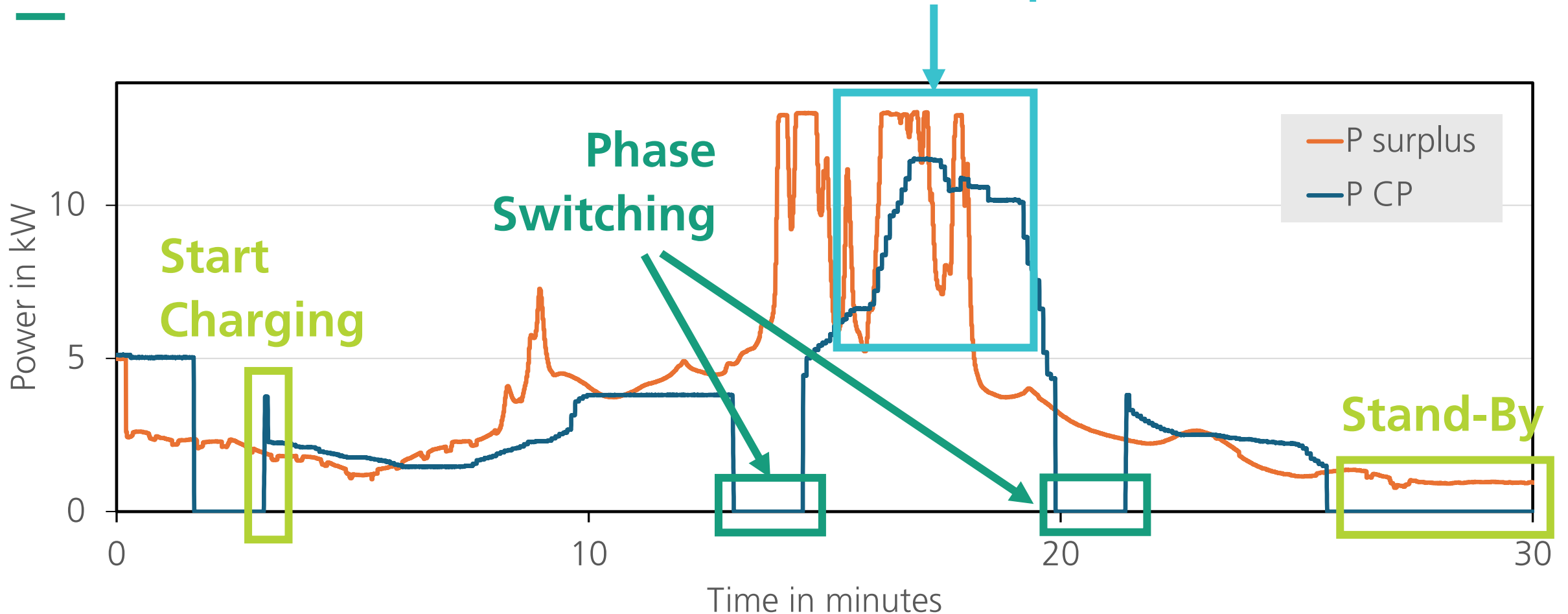
**Further EV models**

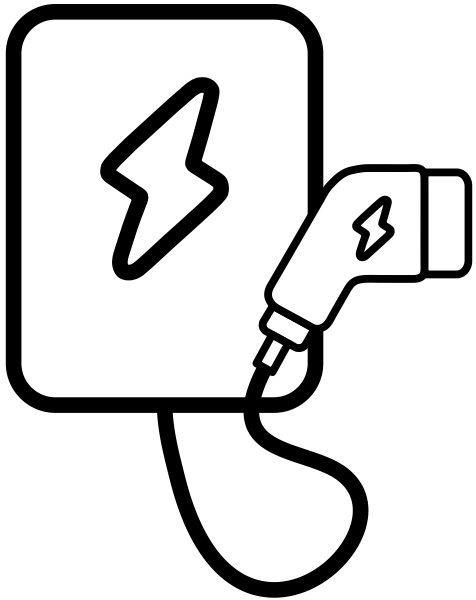
**??? Conformity Tests  
IEC 61851-23**

DC electric vehicle charging station

# Solar Charging Test

Detecting Relevant Sections





**Stand-By**

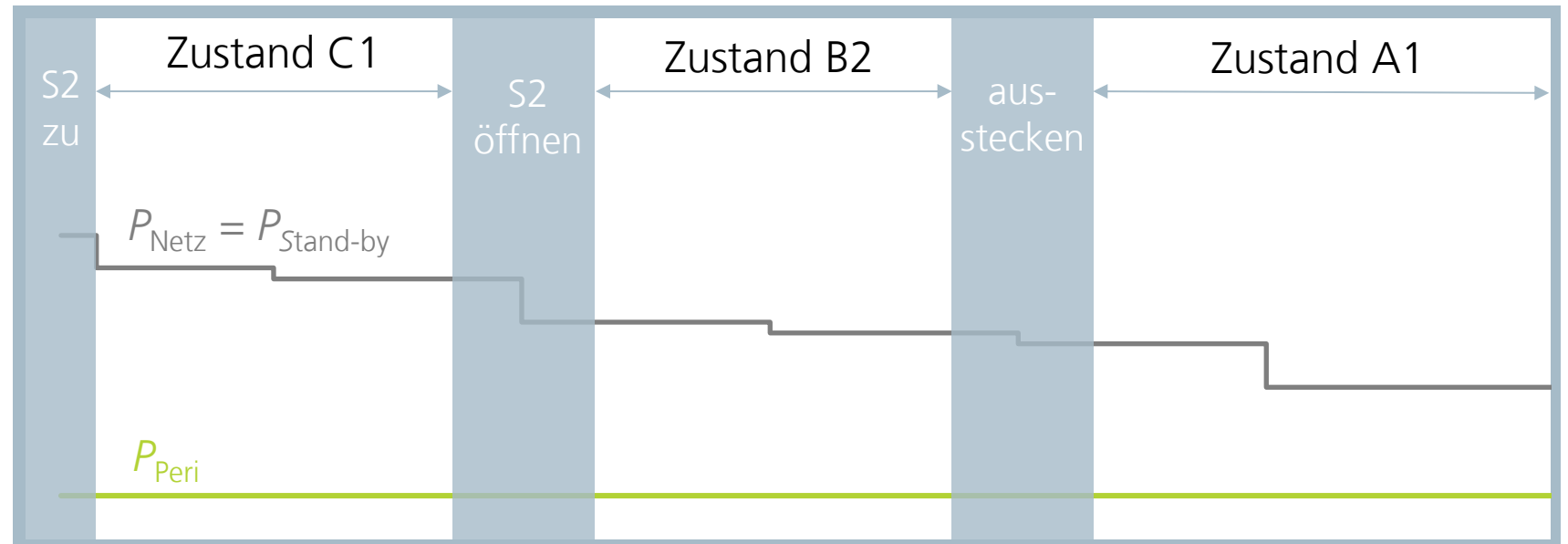
**Testdefinition and Results**

# Stand-By and periphery

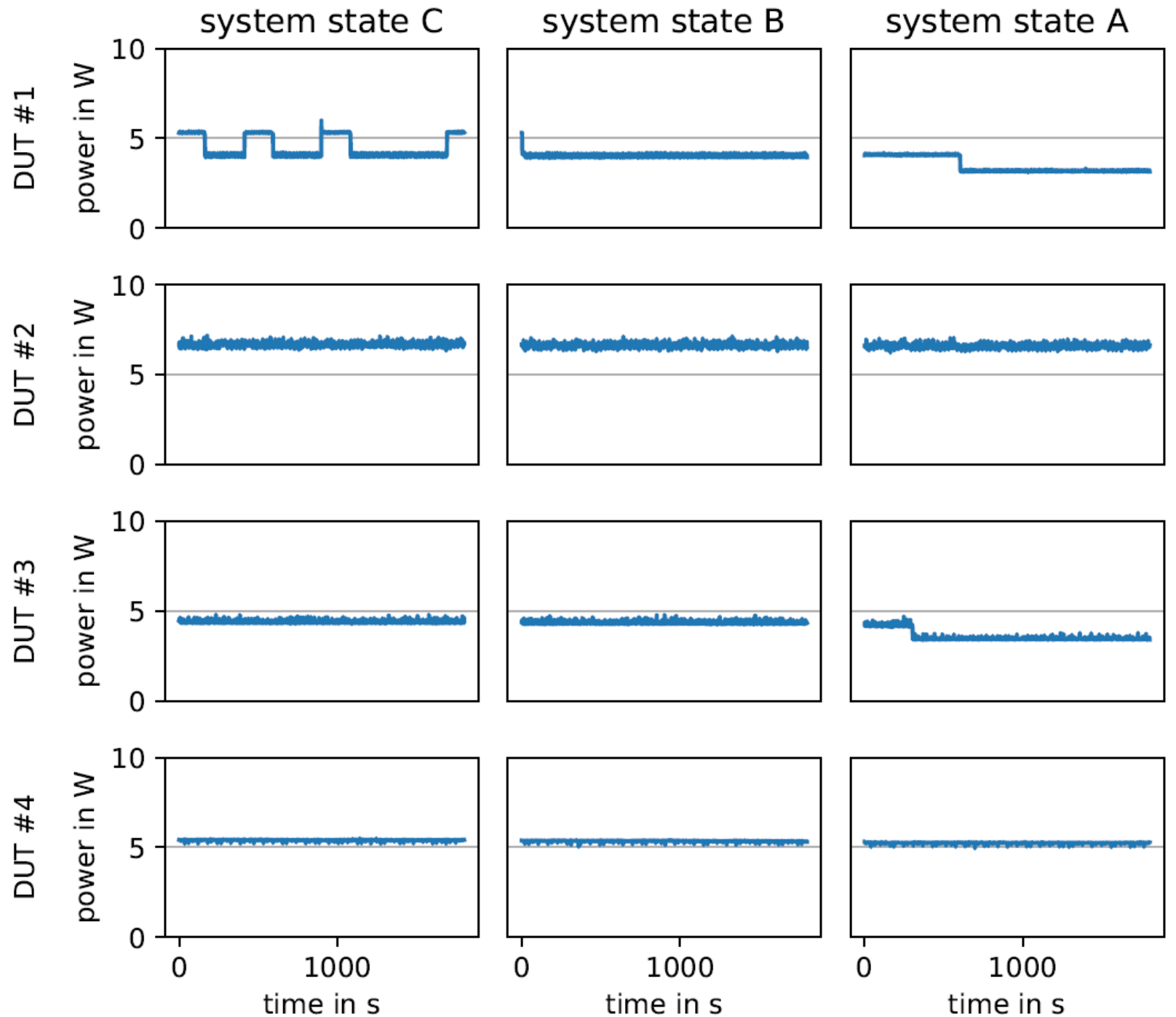
Follow the system states:  
C, B, A

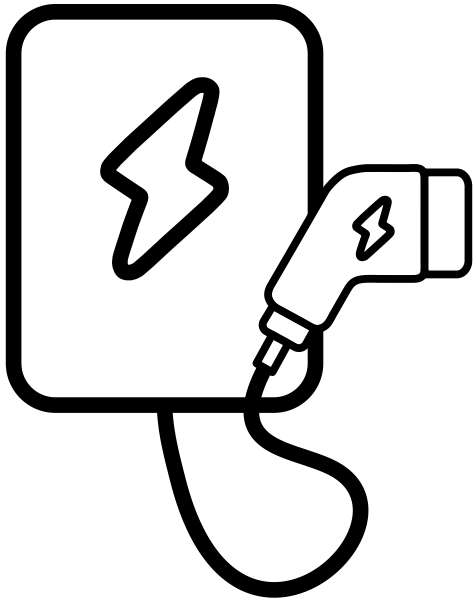
Check if deep Stand-By

Additional measurement  
of periphery consumers



# Stand-by





## Control Steps

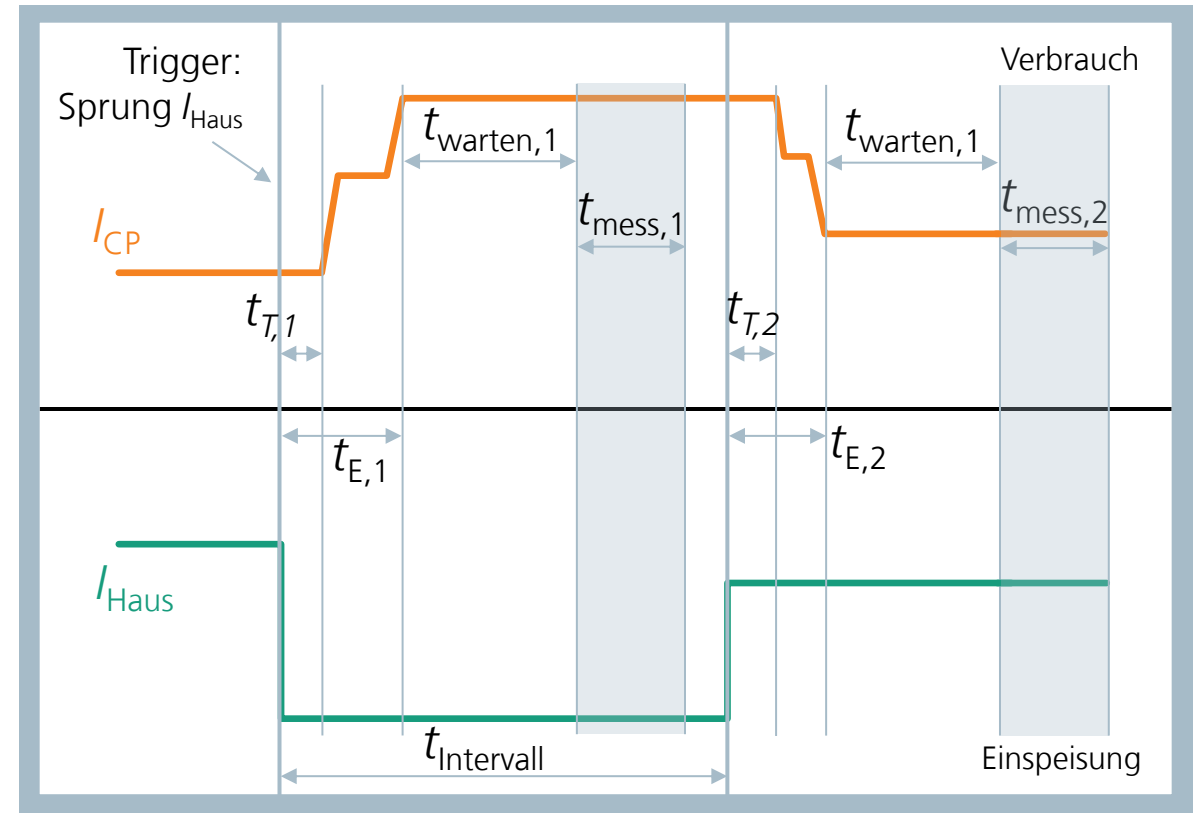
### Testdefinition and Results

# Control Steps

$t_T$  dead time

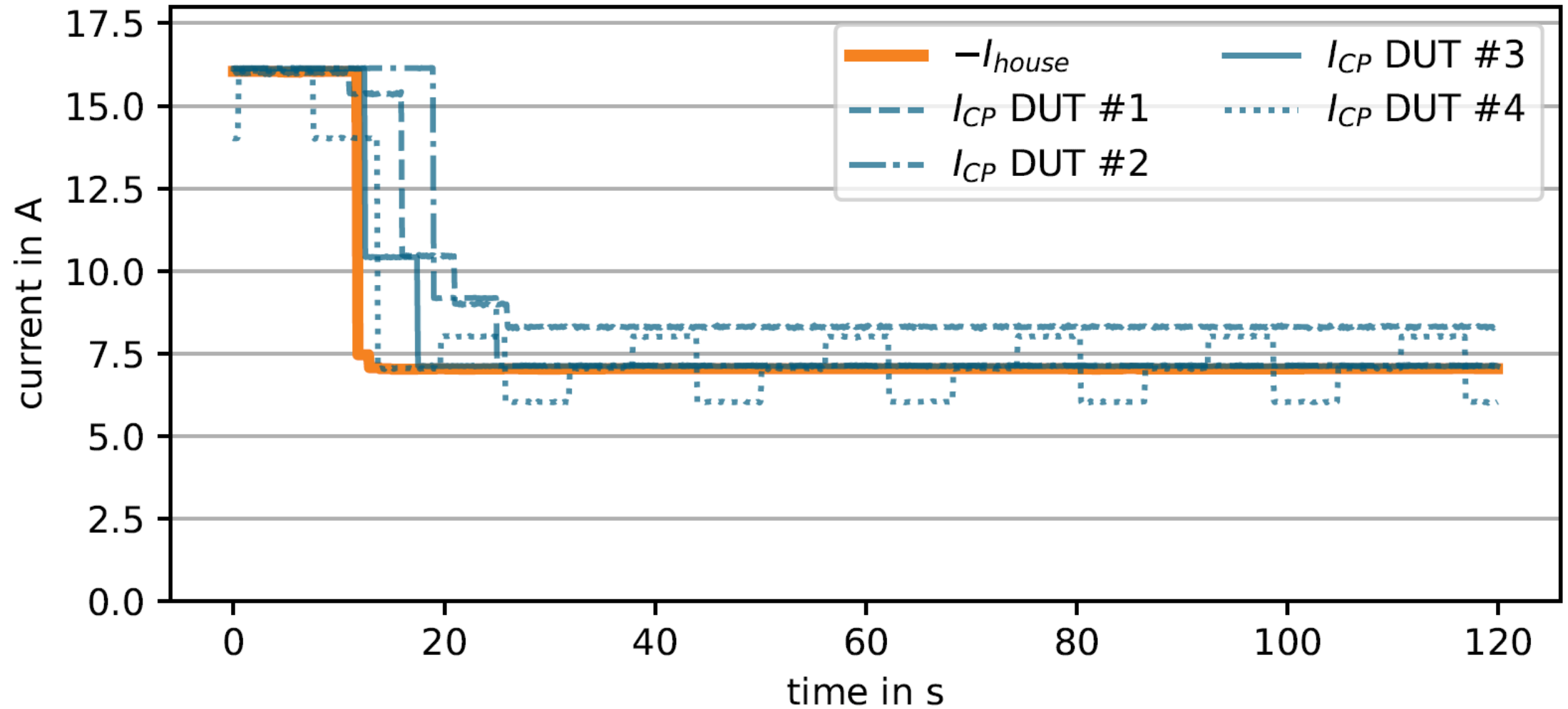
$t_s$  settling time

$\Delta I_{CP}$  deviation of current



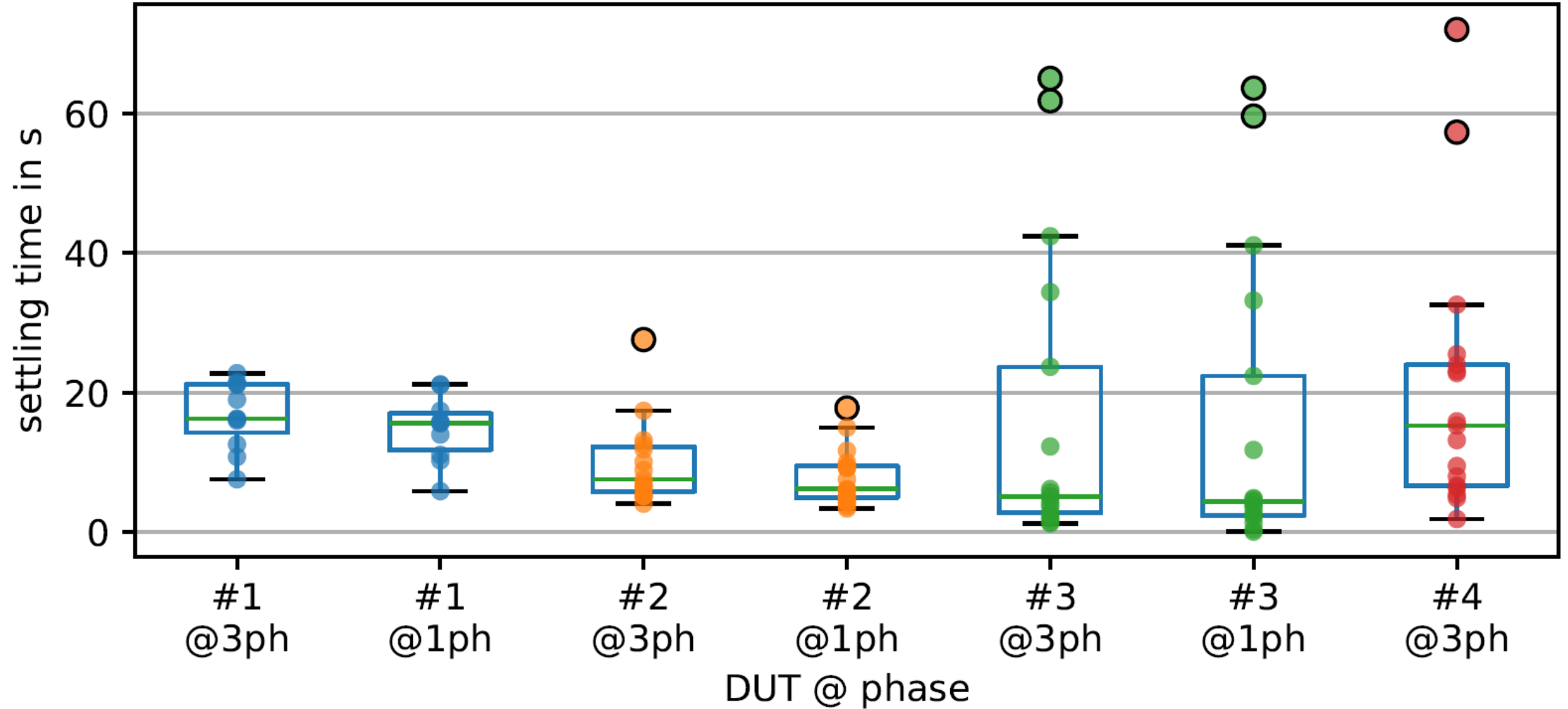
# Step 7A to 16A

## Comparison



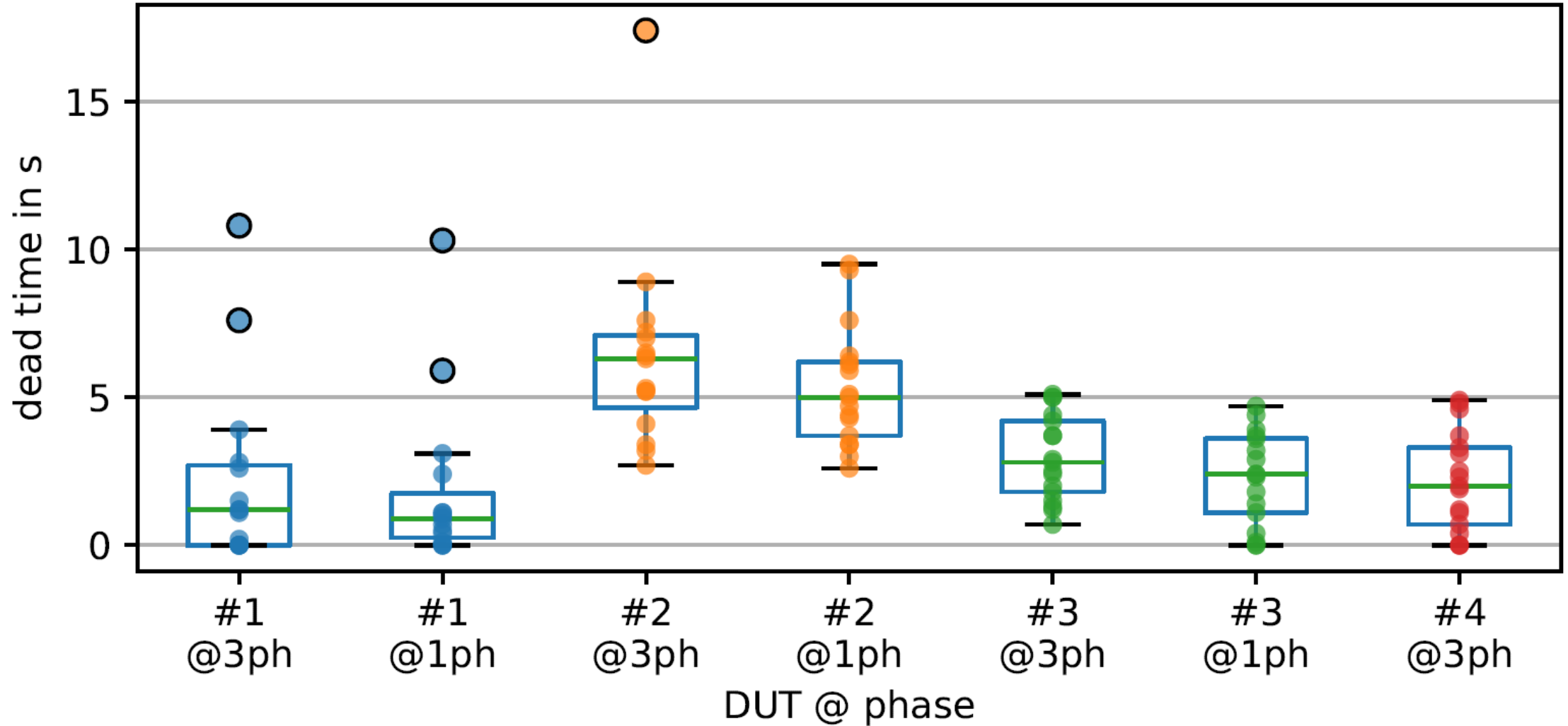
# Control Steps

## Settling Time

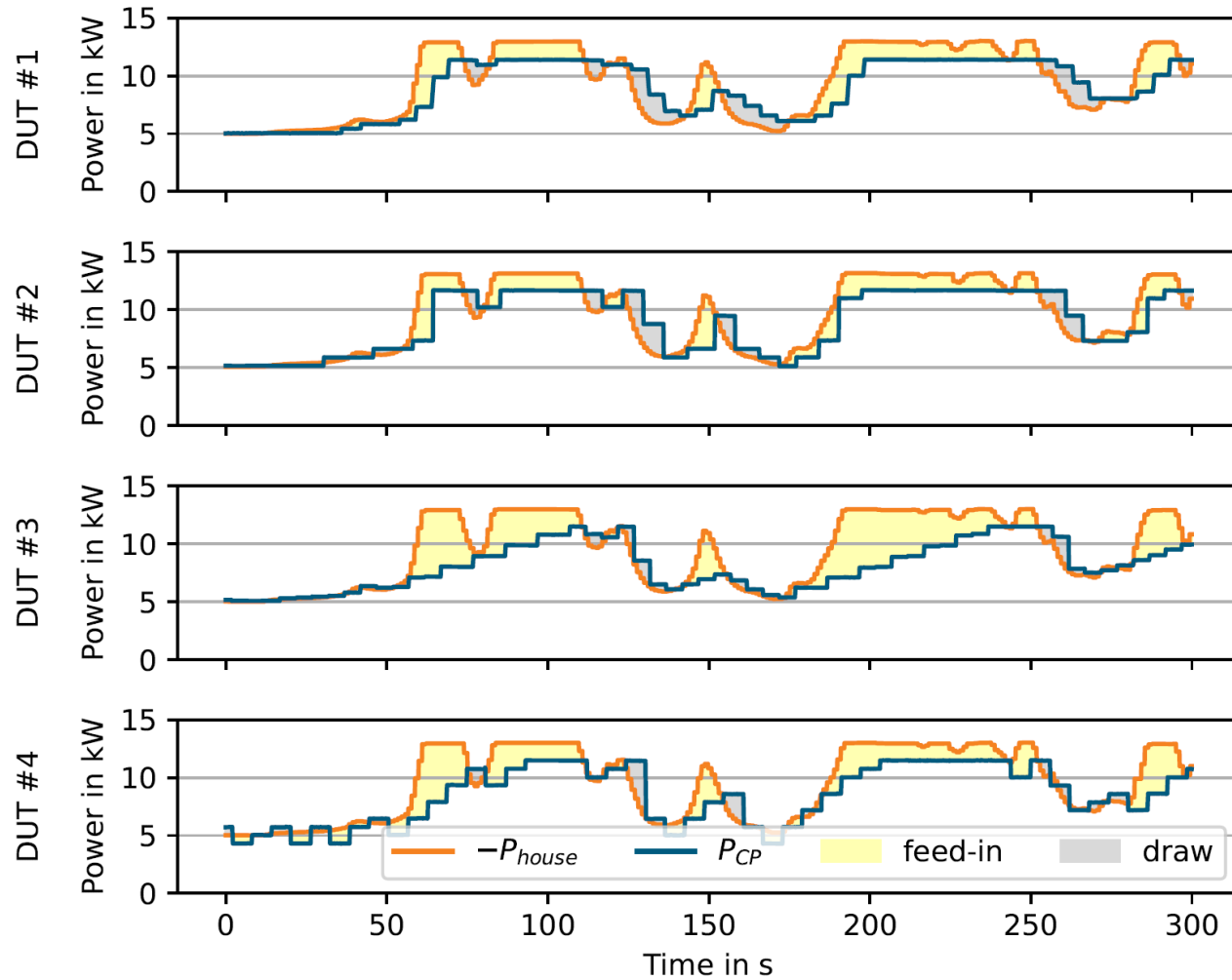


# Control Steps

## Dead Time



# Application Test



$E_{draw}$ [Wh]	$E_{feed-in}$ [Wh]	$E_{EV}$ [Wh]	$E_{house}$ [Wh]
50.1	94.7	740.5	789.0
49.8	81.1	752.0	798.1
17.6	135.0	673.3	787.0
37.8	116.1	704.2	790.6



## Conclusion and Outlook

# Conclusion

Stand-By & Control Steps are significant

Both can be heavily impacted by user configuration (delays, LEDs off)

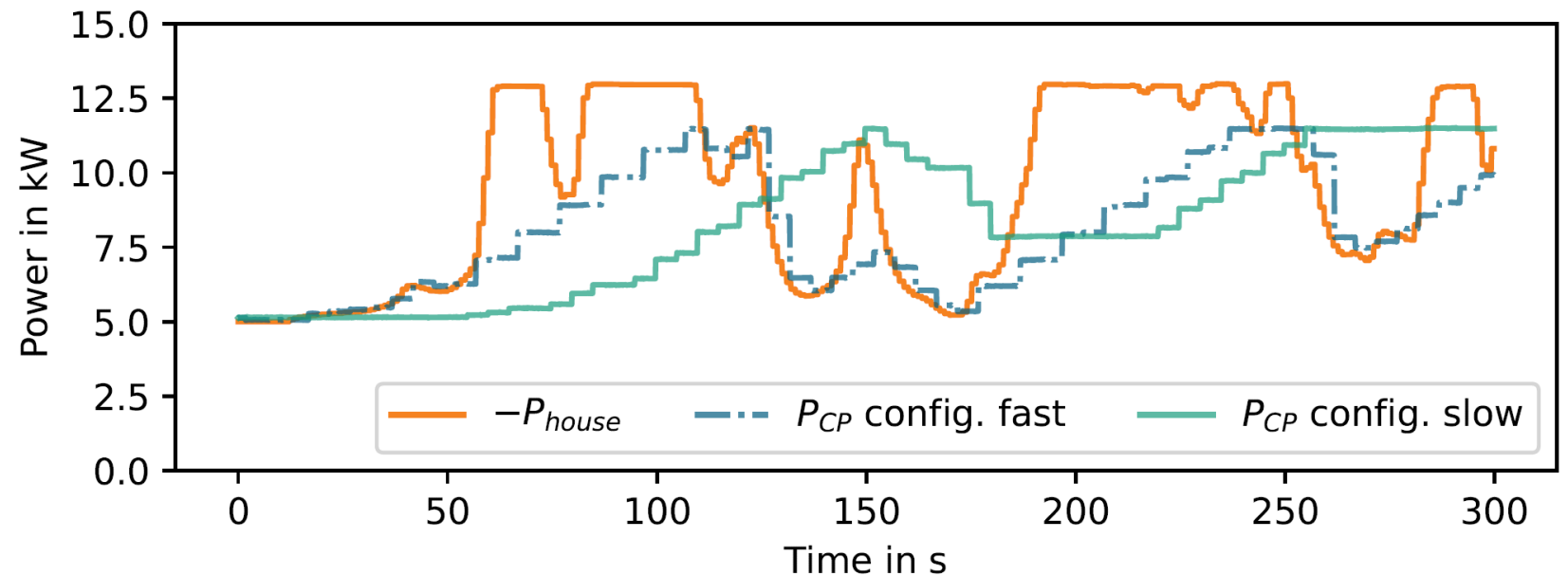
Control steps:

symmetric & asymmetric strategy

tradeoff SC vs. SS

depends on electricity prices

depends on dimensioning of PV





3 übermittelte Antworten

## What are your suggestions / wishes?

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teilzunehmen



<https://forms.office.com/e/sNT652he25>

 Link kopieren

**aufzunehmen** **Stabilität des** **Phasenumschaltung berücksichtigen**  
sind Zielgrößen

Wordcloud **Alle Antworten**

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[www.digital-grid-lab.com](http://www.digital-grid-lab.com)

