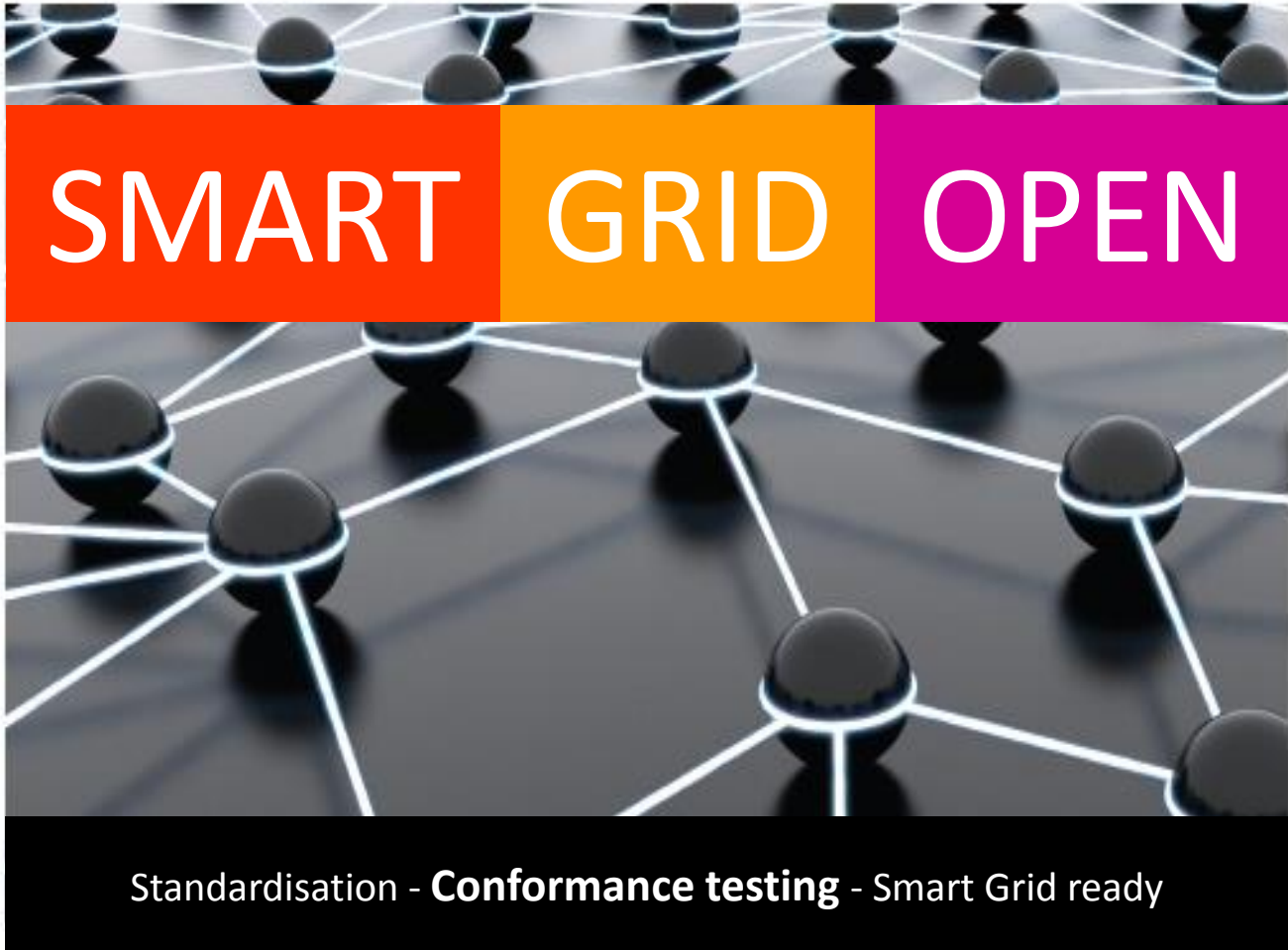


# Smart Grid Open

## Projekt intro og resultater

*Claus Amtrup Andersen*  
*caa@eurisco.dk*



SMART

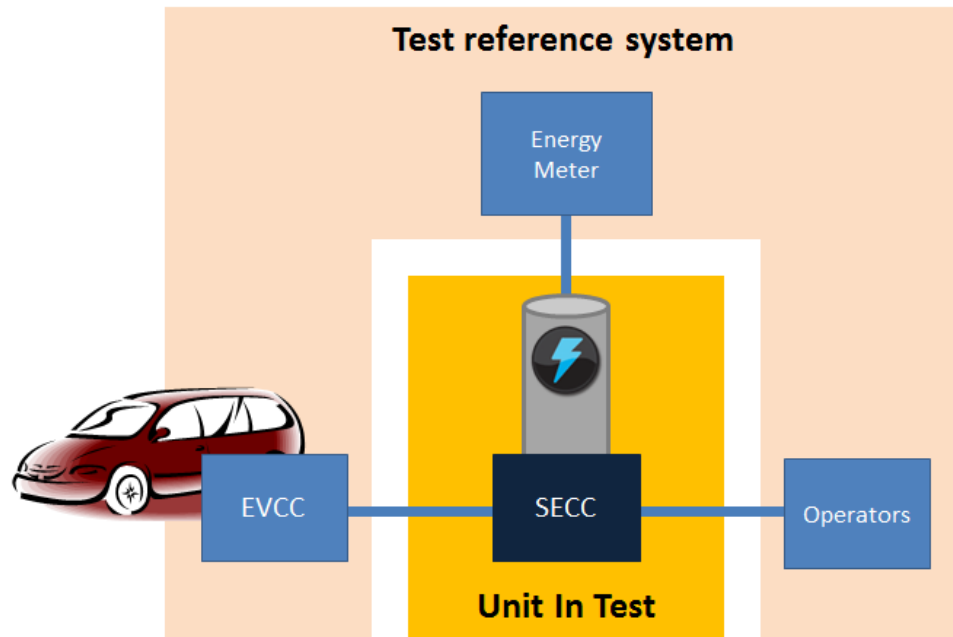
GRID

OPEN

Standardisation - **Conformance testing** - Smart Grid ready

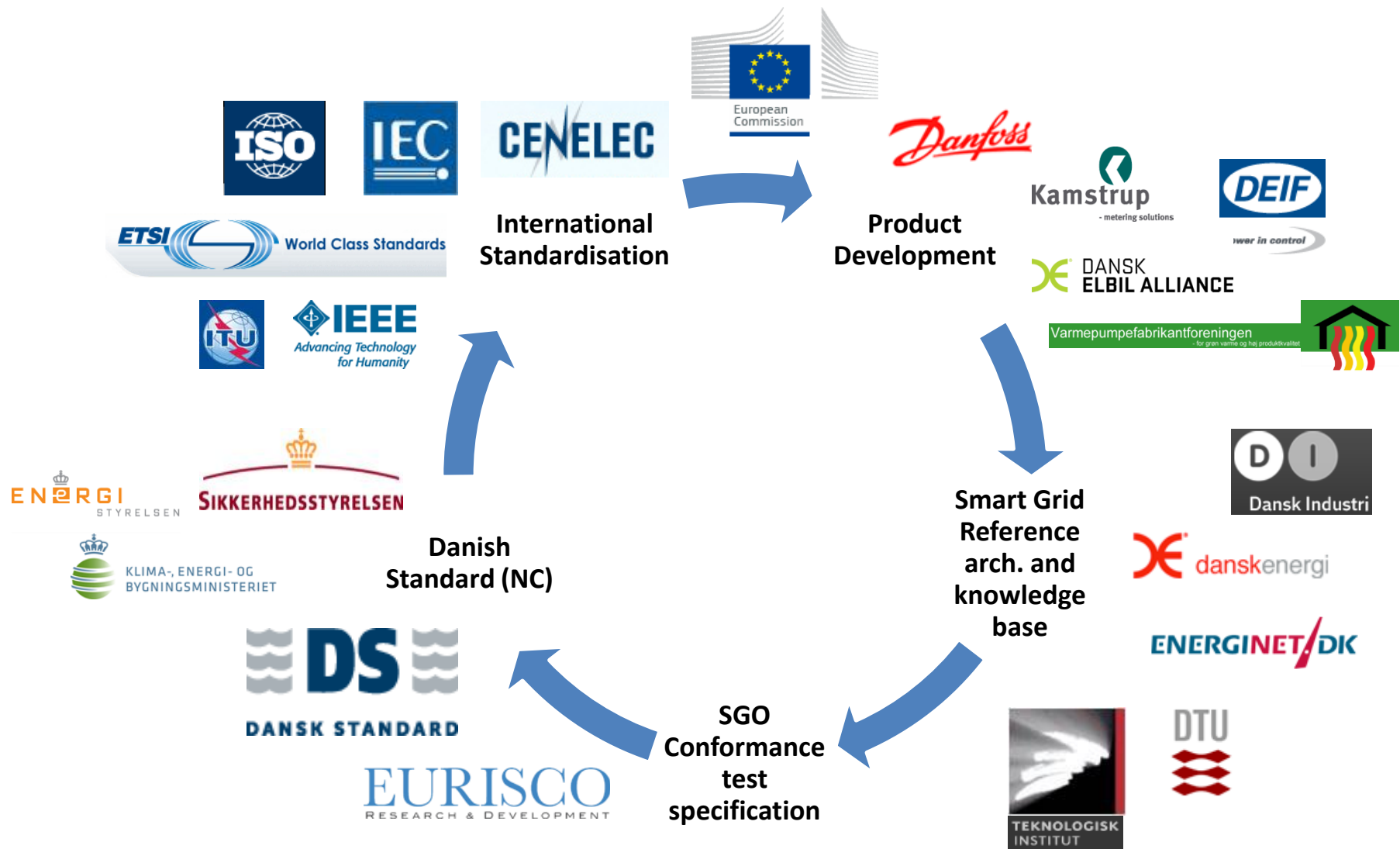
The “Smart Grid Open” project will secure the realization of guidelines, methods and testing protocols enabling conformance testing of communication interfaces for Smart Grid Ready products and services.

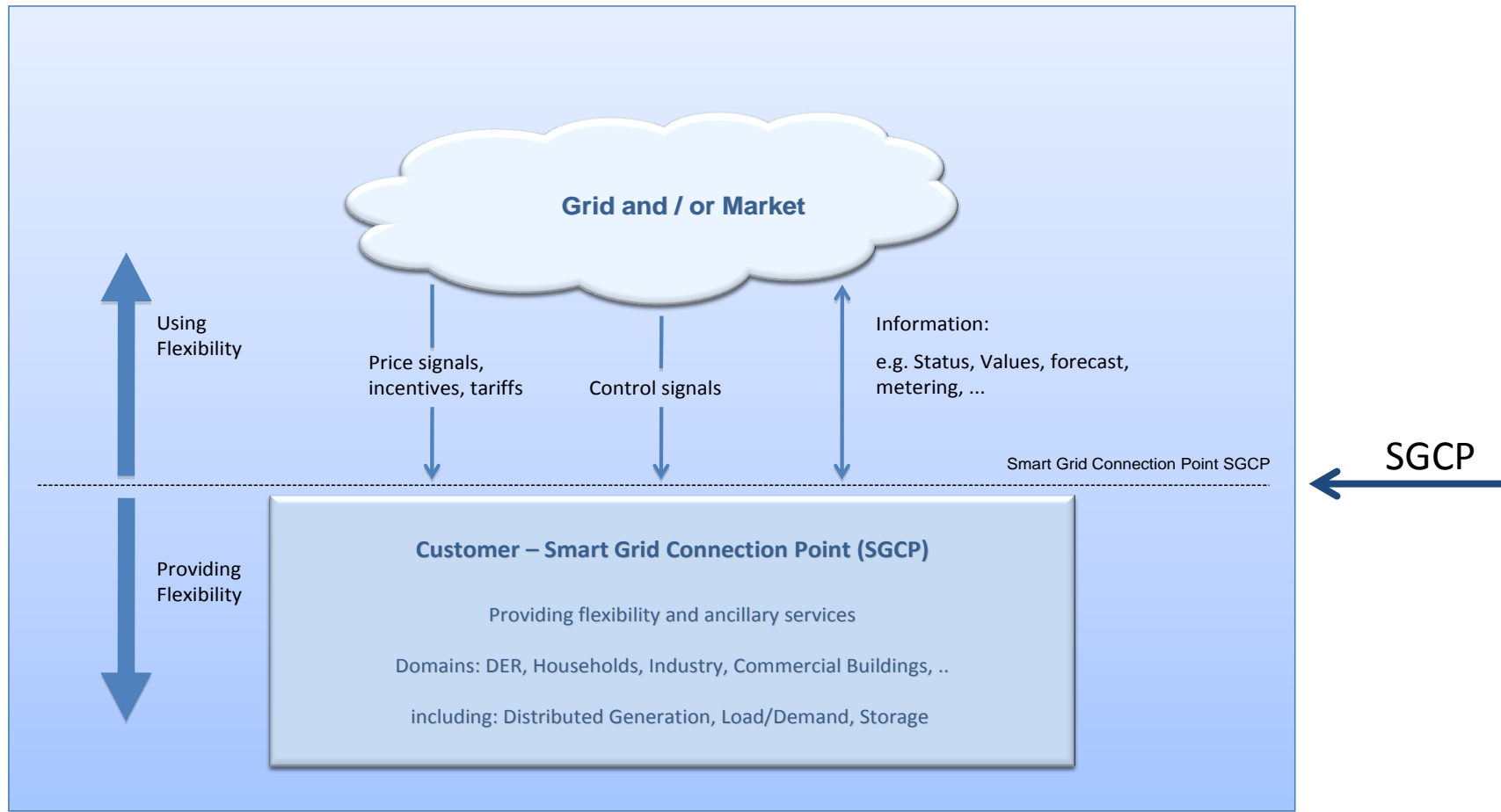
Reference testing systems, incl. documentation, will be designed and implemented. Smart Grid stakeholders, product manufactures and system integrators will be involved in investigations and subsequent dissemination activities.



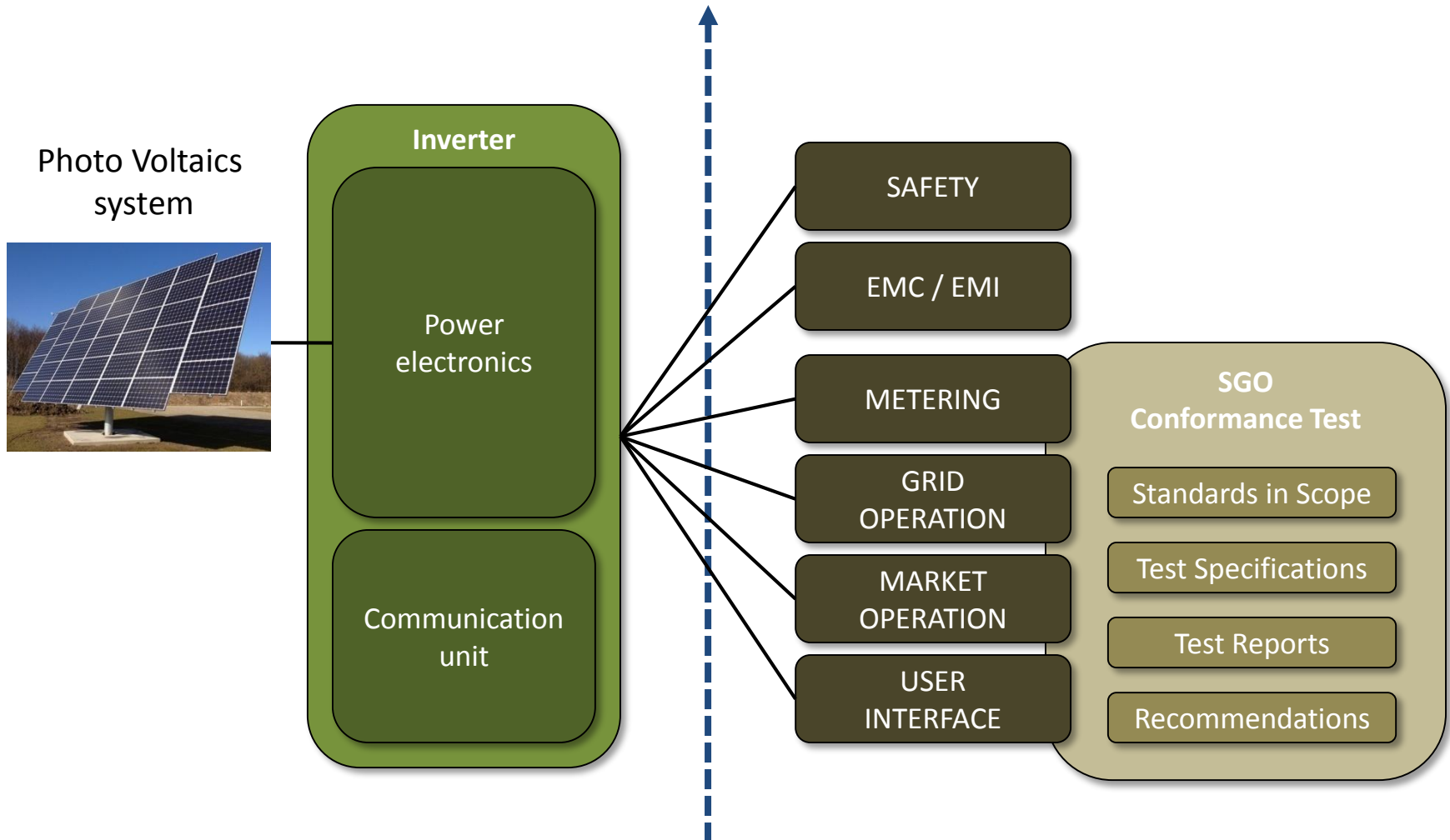
**NOTE:**

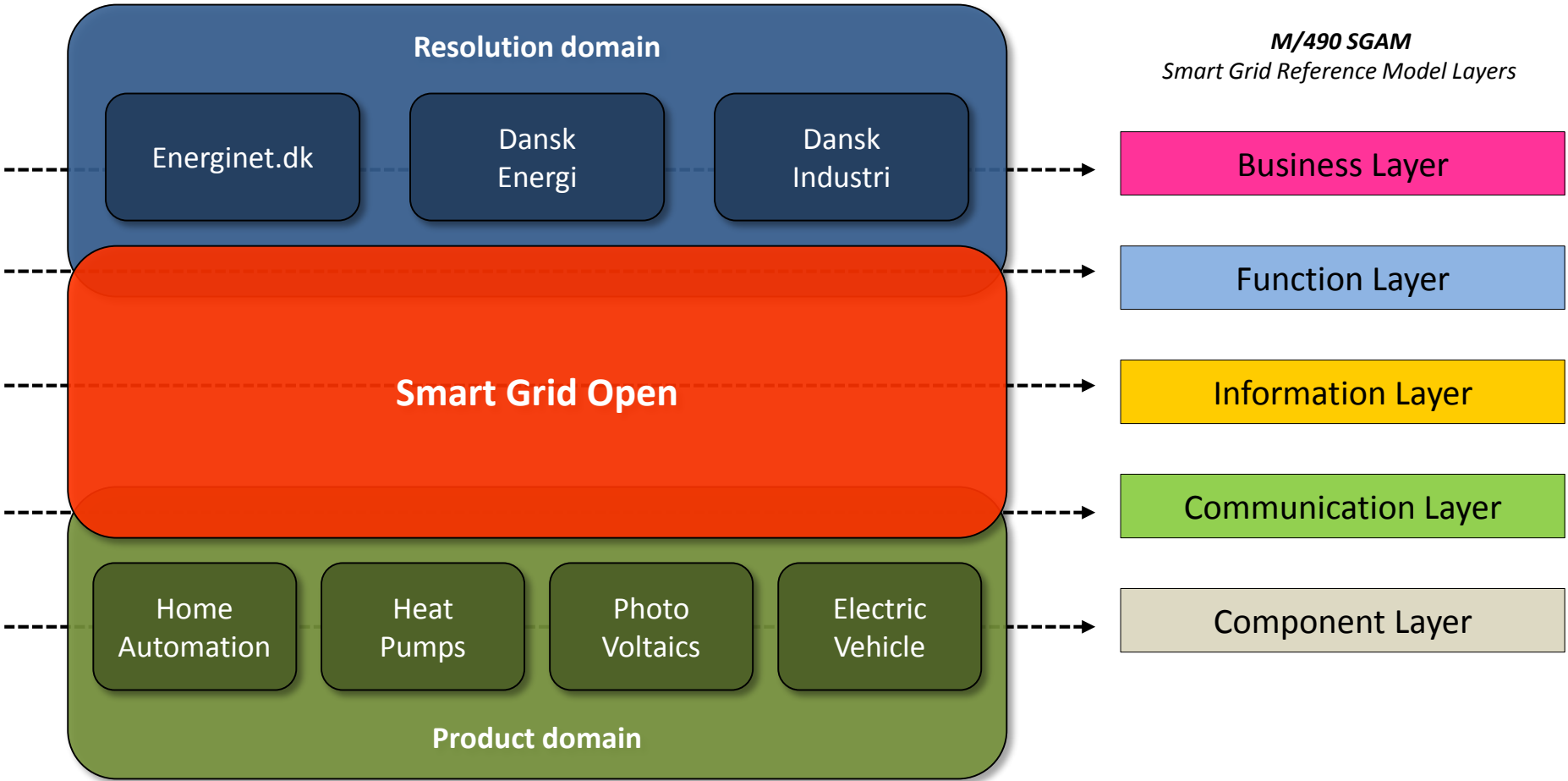
Regarding ‘Smart Grid’ data communication, international standards are needed, but **a standard is not an implementation guideline**, which means that conformance test based on well-defined reference systems and test procedures has to be established and supported.



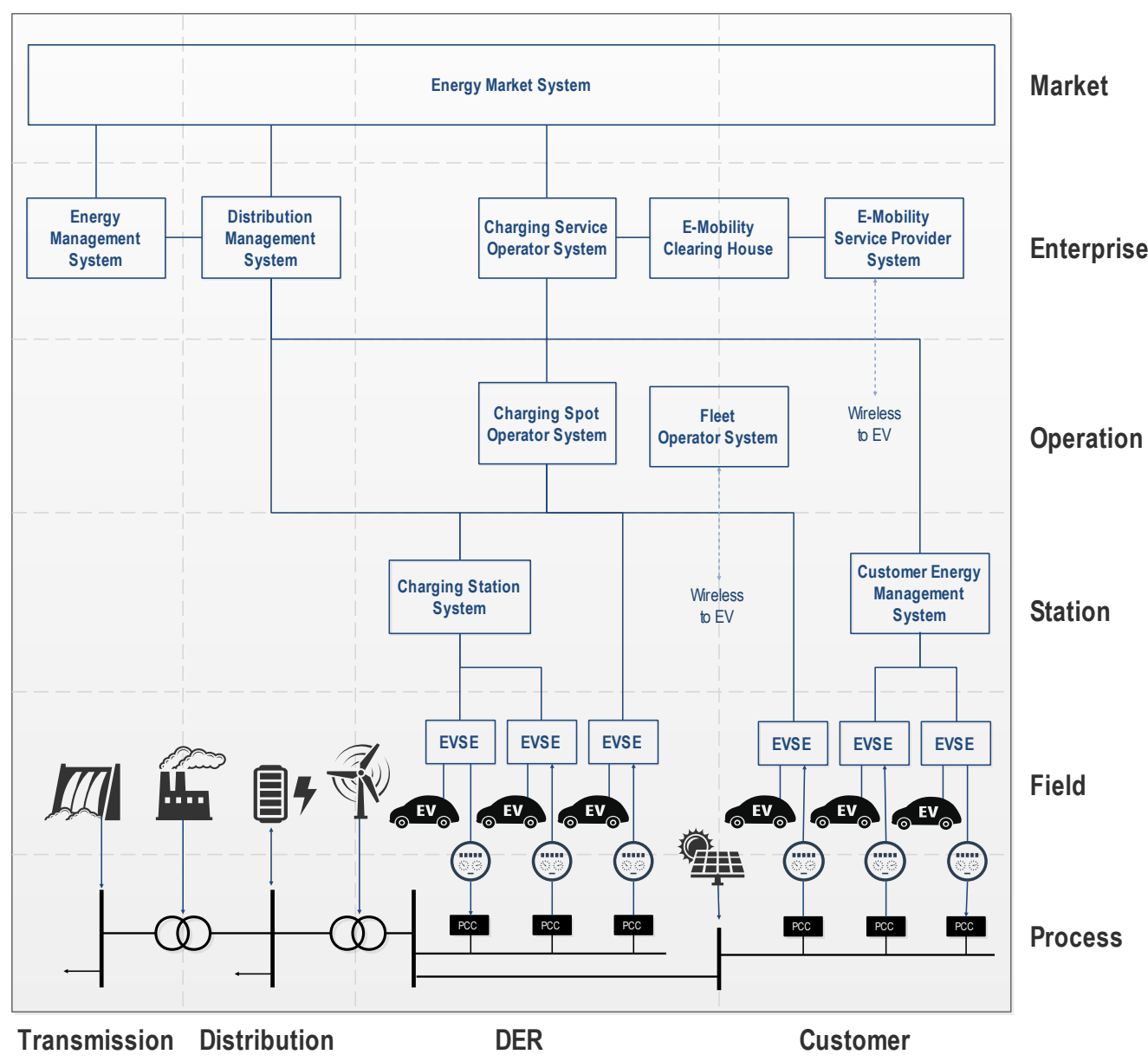


## 'Smart Grid Conncetion Point' i relation til SGO



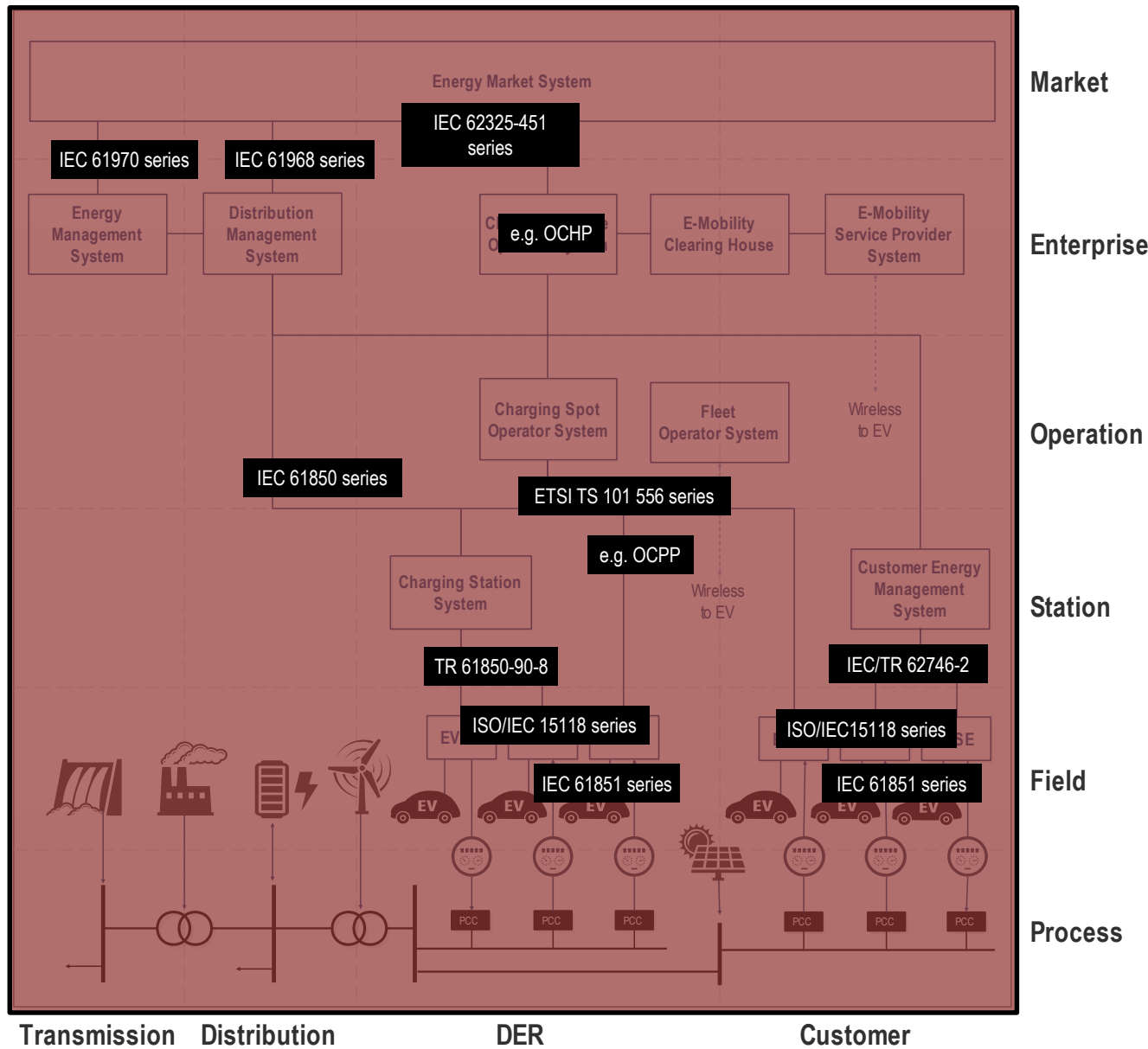


## SGAM COMPONENT LAYER

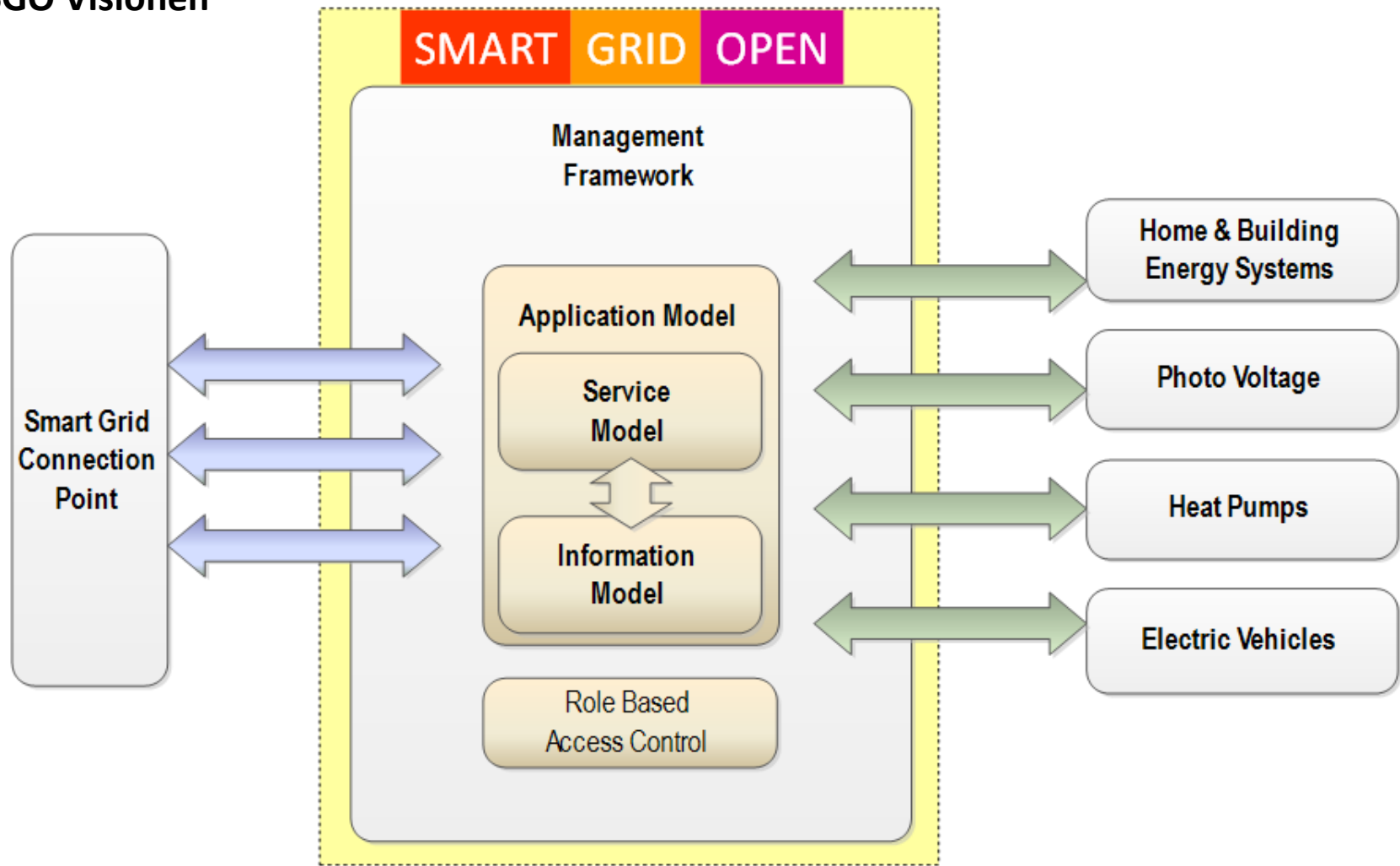


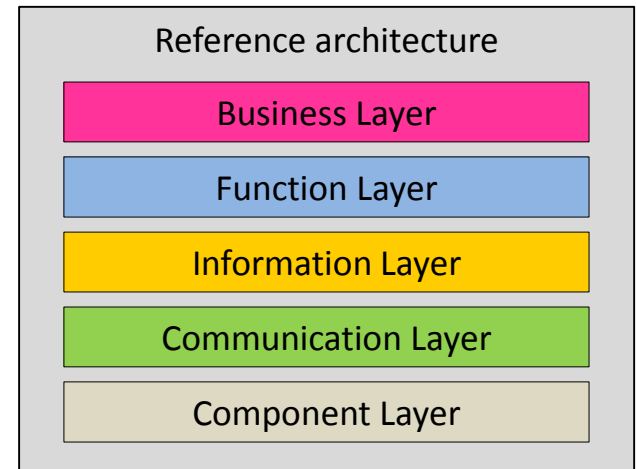
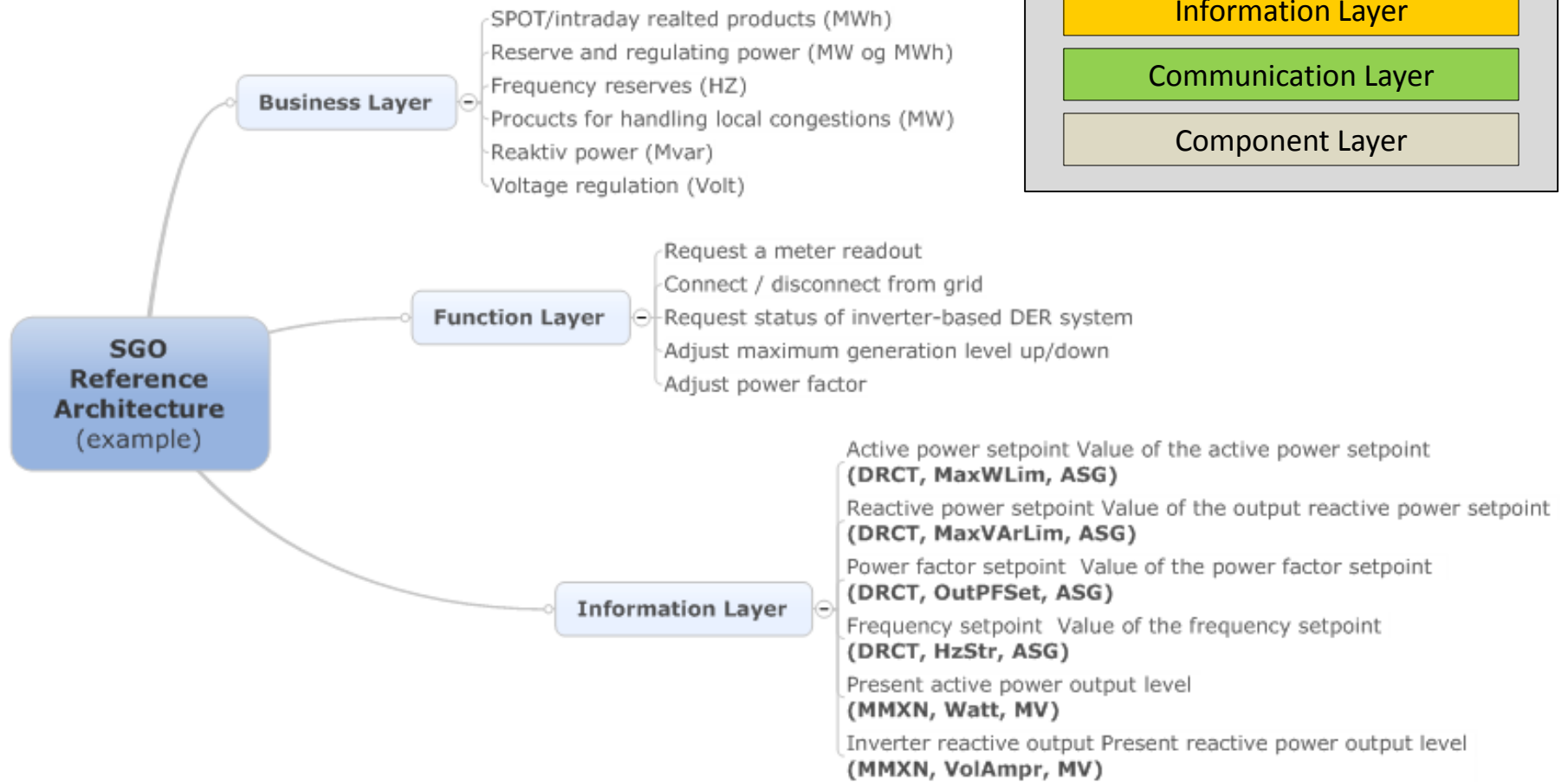


## SGAM INFORMATION LAYER



## SGO Visionen





GRØN: Need to have

Gul: Nice to have (evt. sub-functions)

RØD: Not needed

BLÅ: Needed but with no data communication

**Delresultat fra workshop med  
Danfoss, Energinet.dk, DTU,  
DTI og EURISCO vedr. PV**

Function INV1: connect / disconnect from grid (grid maintenance UC)

Function INV2: adjust maximum generation level up/down (MUC2-5, SUC-3)

Function INV3: adjust power factor (SUC1-2)

Function INV4: request active power (charge or discharge storage) (MUC2-3)

Function INV5: pricing signal for charge/discharge action

Volt-var management modes

Volt-var mode VV11: available vars support mode with no impact on watts

Volt-var mode VV12: maximum var support mode based on **W<sub>max</sub>** (SUC1)

Volt-var mode VV13: static power converter mode based on settings (SUC1-2)

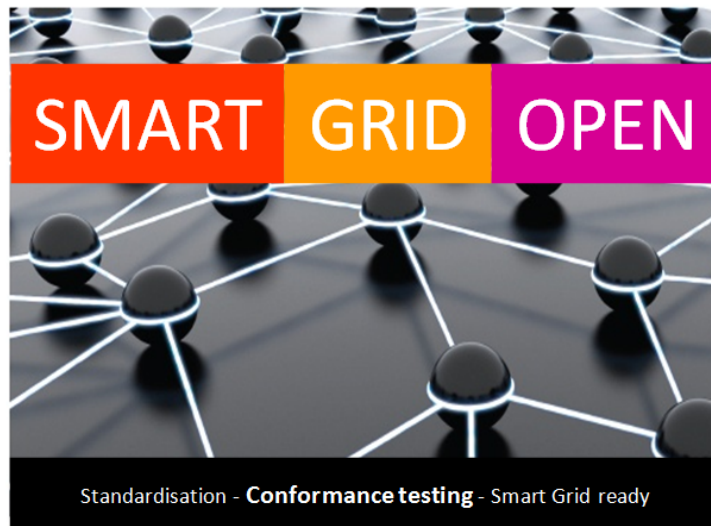
Volt-var mode VV14: passive mode with no var support

Frequency-watt management modes

Frequency-watt mode FW21: high frequency reduces active power (UC?)

Frequency-watt mode FW22: constraining generating/charging by frequency (MUC1)

## SGO Reference Architecture



Deliverable D1-1

Version 1-0 2013-12-18

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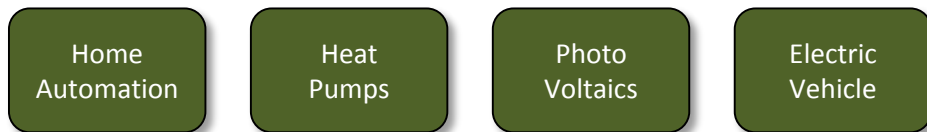


EnergyFlexHouse  
TEKNOLOGISK INSTITUT

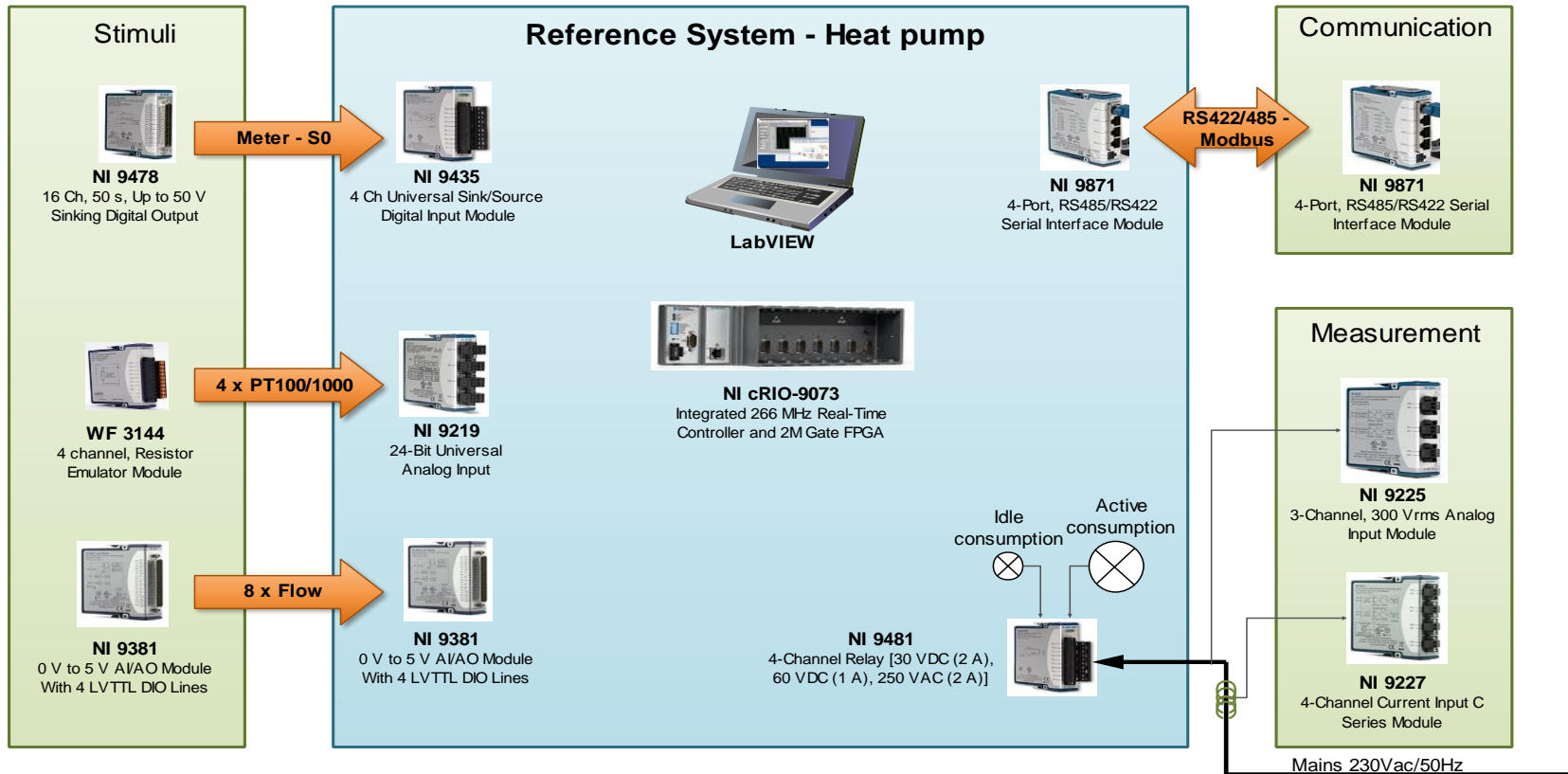
Energiforbruget i EnergyFlexHouse Family  
Følg familiens energiforbrug live – opdateres hvert 12. minut



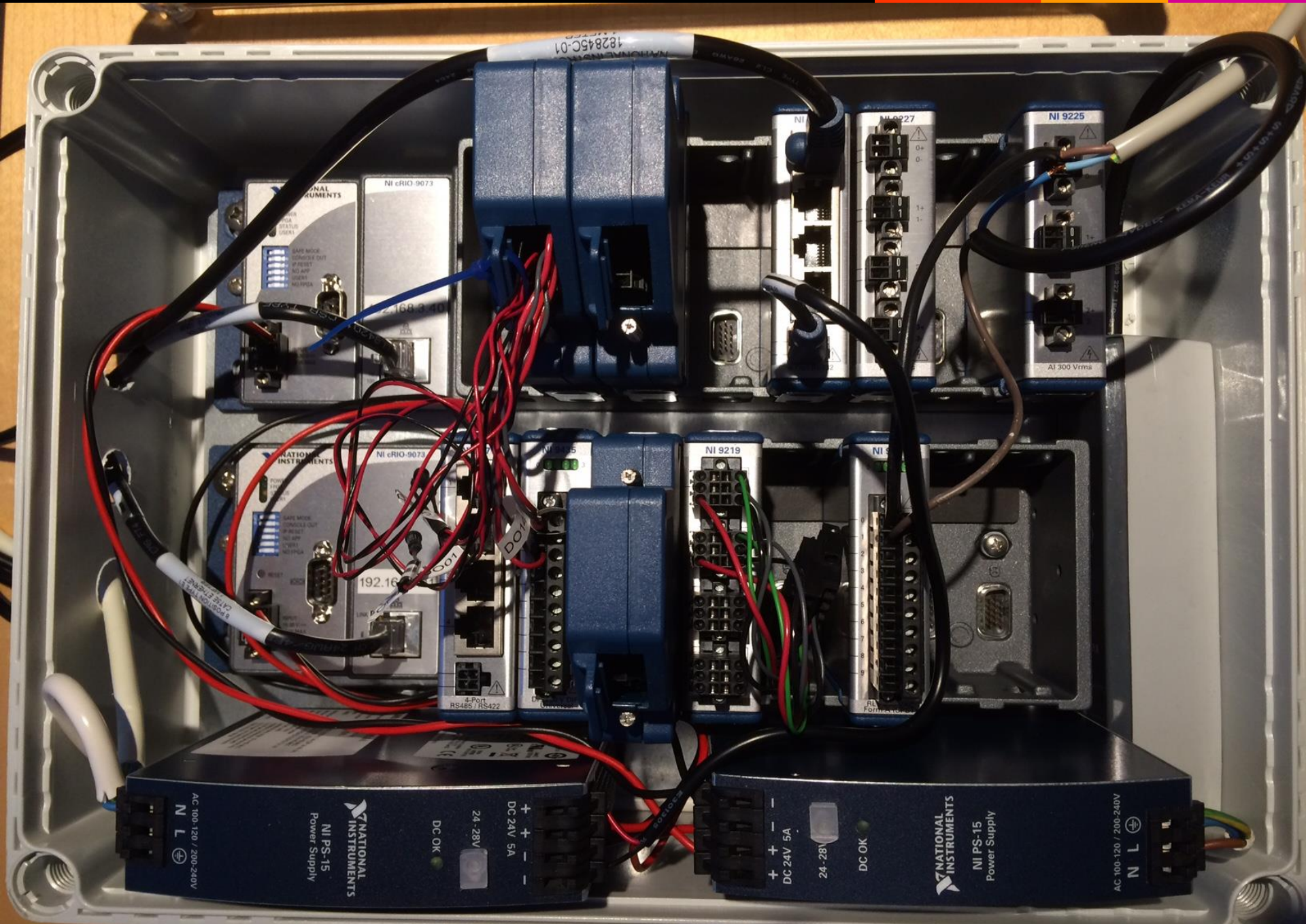
## SGO projektet har arbejdet med i alt 4 fagdomæner



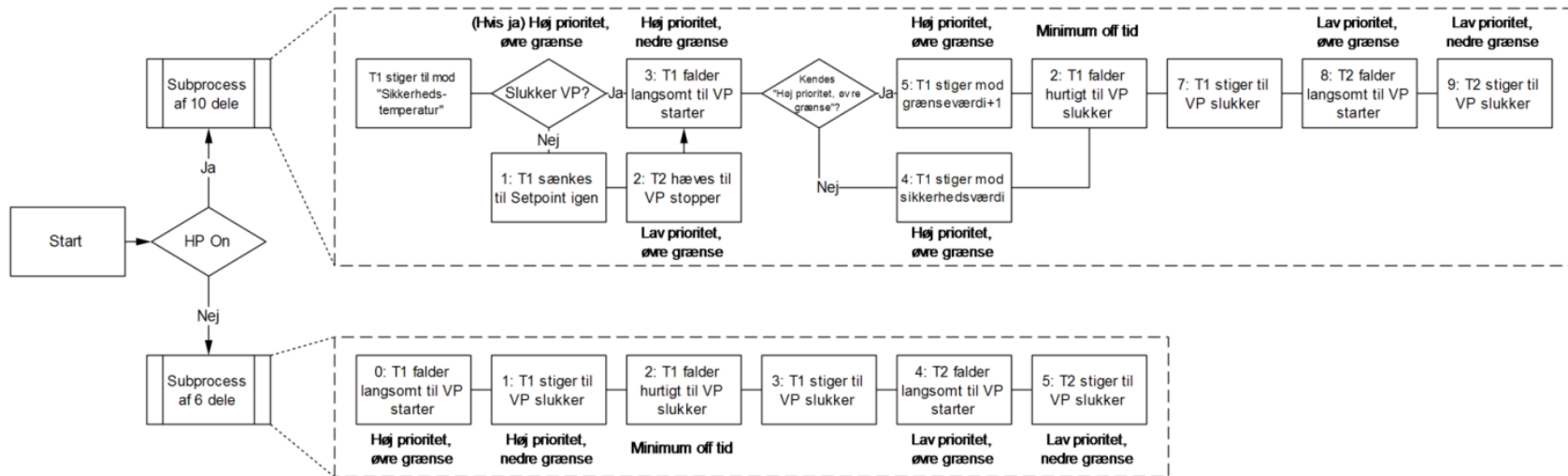
## Praktisk eksempel for test af varmepumper



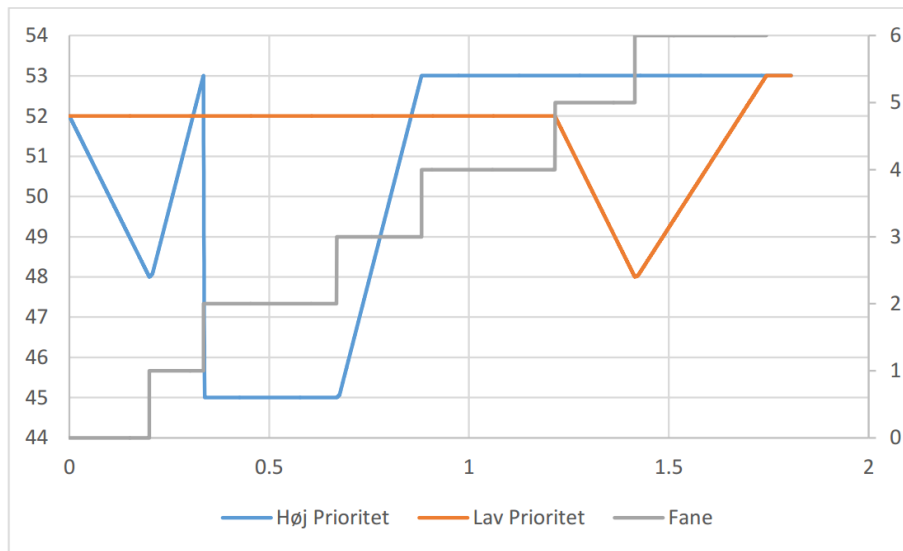








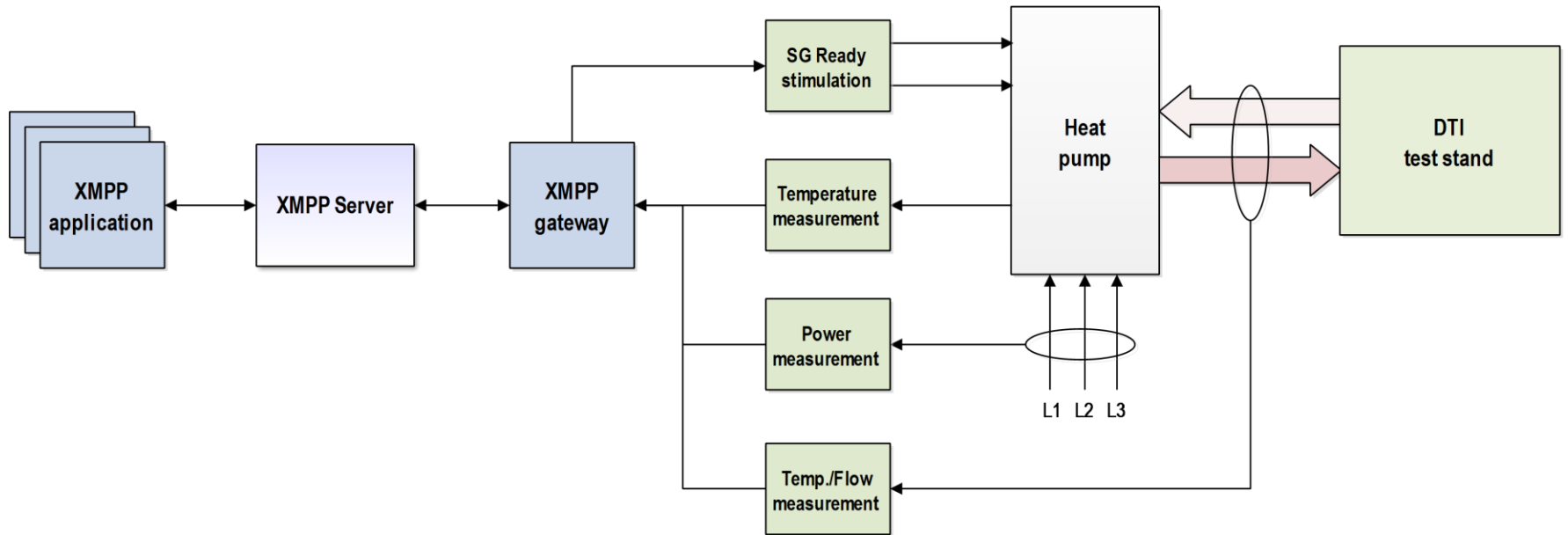
Figur 7: Flow Chart over SubVlen Tester.vi



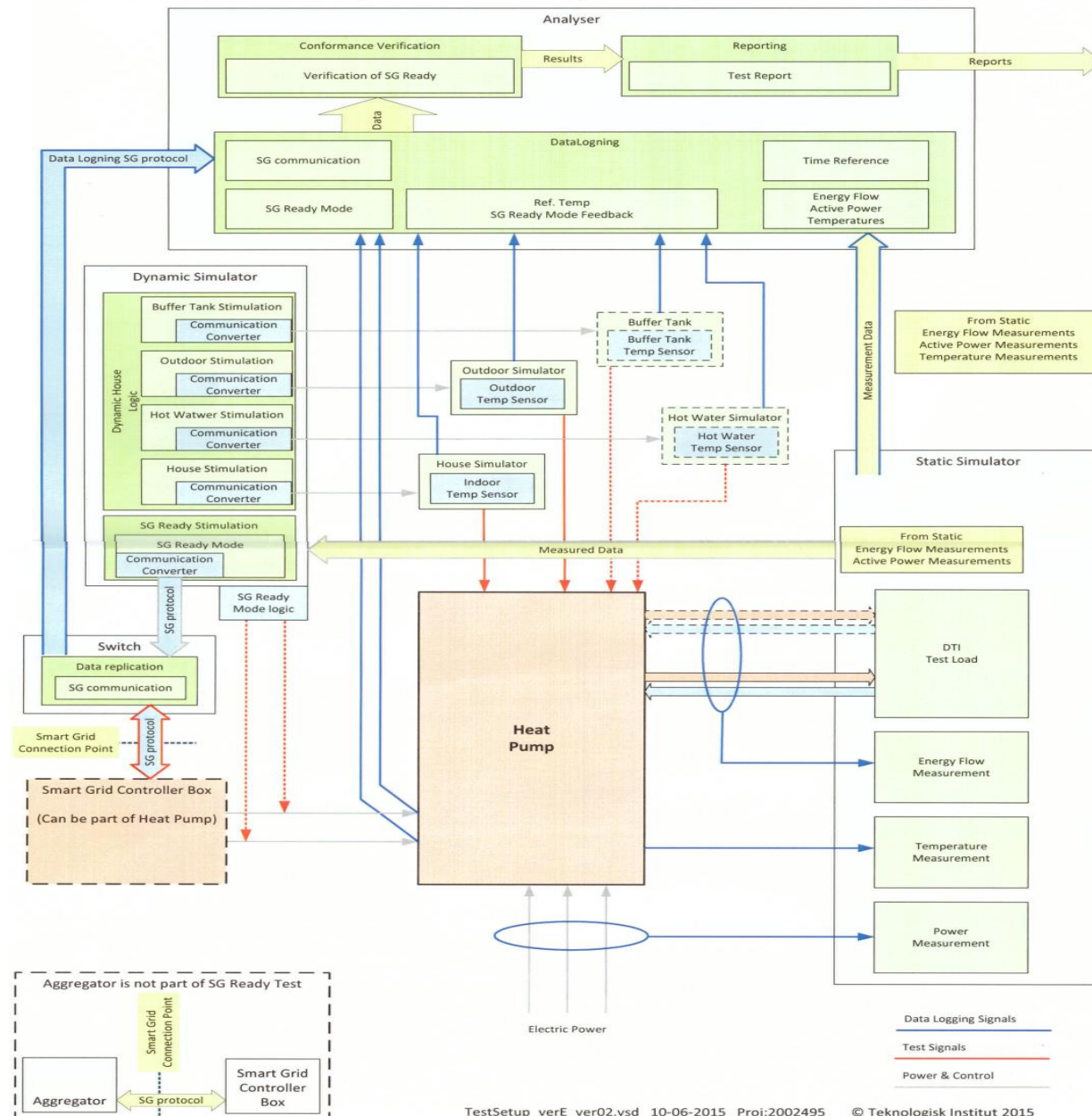
**Testopstilling for afprøvning (forståelse) af SG Ready specifikationen**

Figur 9: Eksempel på testforløb. Vandrette akse er timer, højre akse er hvilken fane, Tester er på, venstre akse er temperatur

**Efter metodeudviklingen kom  
så den praktiske afprøvning  
på en række varmepumper**

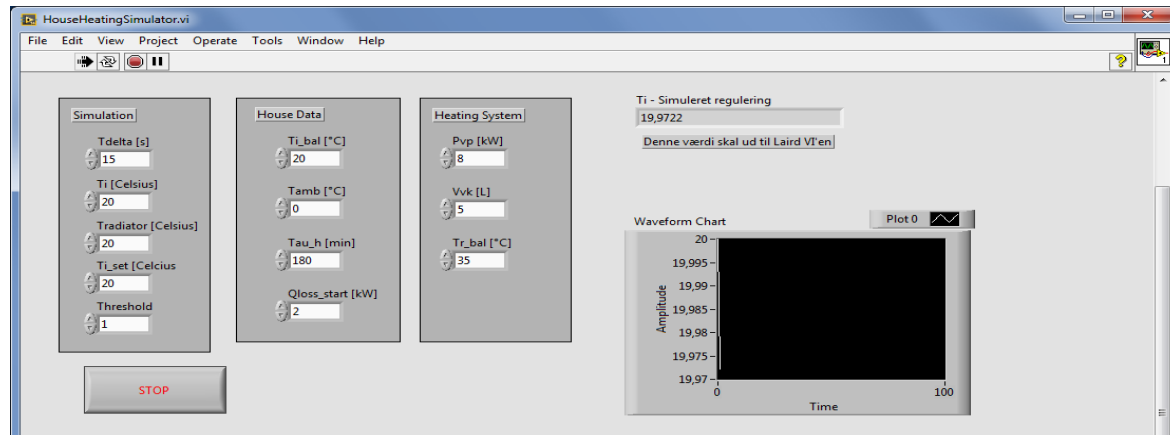
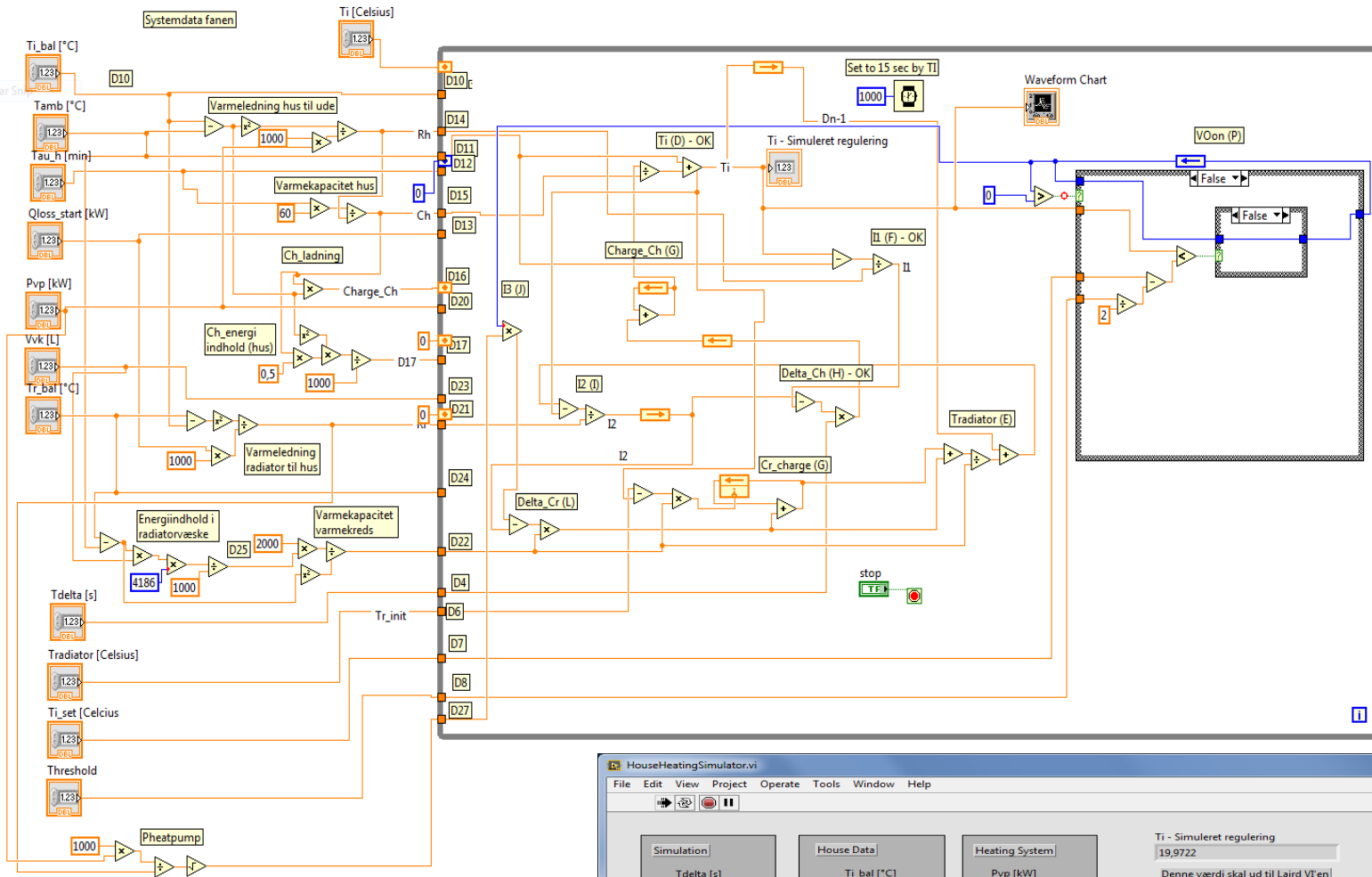


## Generic Test Setup for Smart Grid Ready Heat Pump Conformance Testing.



Se "Simulering af hus med varmepumpe 20150311.xlsx" af Kjeld for udregninger

Simulering fanen - Bogstav i () refererer til kolonnen i excelarket



- Testmetoder for 'Smart Grid' skal inkludere alle parter
- Der skal enten være en lovgivning (pisk) eller økonomi (gullerod) som drivmiddel
- Udvikling af testmetoder er ikke en 'papiropgave' – det kræver praktiske afprøvninger og dialog med branchegrupperne
- Der mangler ikke tekniske standarder, men der mangler internationale 'user groups' som kan sikre interoperabilitet mellem produkter og standarder
- SG Ready er 'det bedste tekniske kompromis' og et godt eksempel på udfordringerne omkring testmetoder
  - Ny grænseflade til varmepumpen (delt adgang)
  - Ikke international standard, men branchespecifikation
  - Envejs-kommunikation - ingen feedback (teknisk simpelt)
  - Ingen officiel testspecifikation



 **Spor B, Smart Grid & varmepumper - Mødelokale 17.1.2, Bygning 17****14.30 Intro til Smart Grid**

*Kjeld Nørregaard, seniorprojektleder, Teknologisk Institut*

**14.35 Smart Grid Open projekt intro og resultater**

*Claus Amtrup Andersen, direktør, Eurisco ApS*

**14.55 Smart Grid Ready Label – eksempel på Smart Grid Open- testmetode**

*Kjeld Nørregaard, seniorprojektleder, Teknologisk Institut*

**15.15 Pause****15.35 Varmepumper i et Smart Grid- system (HPCOM projekt)**

*Claus Amtrup Andersen, direktør, Eurisco ApS*

**15.55 Perspektiver for fremtiden**

*Claus Schøn Poulsen, centerchef, Teknologisk Institut*

**16.15 Smart Grid energilagring – spørgsmål og dialog****16.30 Afslutning**

# Spørgsmål?

*Claus Amtrup Andersen  
caa@eurisco.dk*