

 EURO  
MAINTENANCE

ROTTERDAM AHoy  
17 - 19 APRIL **2023**

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Power Quality specialist

**VeriteQ**

Den Haag NL

Tracing and eliminating the source of  
PQ (Power Quality) faults

VeriteQ

[www.Euromaintenance.net](http://www.Euromaintenance.net)

# PQ (Power Quality) faults

## Content

- PQ Reference list / knowledge of **VeriteQ**
- Harmonic and interharmonic faults;
- How can we detect these faults?;
- Implications of harmonics in the users installation;
- Three cases of Power Quality faults.



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# VeriteQ

## Experience of PQ analysis



Stedin  
Net dips

RWE Generation  
Geertruidenberg  
Eemshaven  
Renewables



Tractie, PQ storing  
in SIL 4 beveiliging



Gemiva Zorg



Rijnstate  
Ziekenhuis



DUSART PHARMA  
DEDICATED TO SERVICE



Rijkswaterstaat  
Lichteiland Goeree



IVA Groep BV



VeriteQ

# Who causes PQ faults?

Public grid ?

or

User/ factory ?

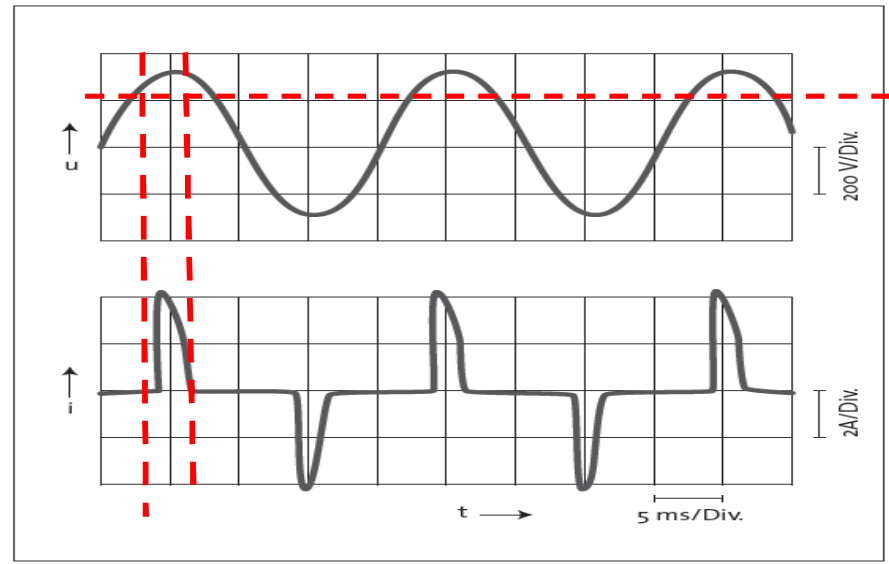
Southern company USA	98% by user
Scottish power UK /USA	95% by user
Stedin The Netherlands	98% by user

# A brief explanation of harmonics

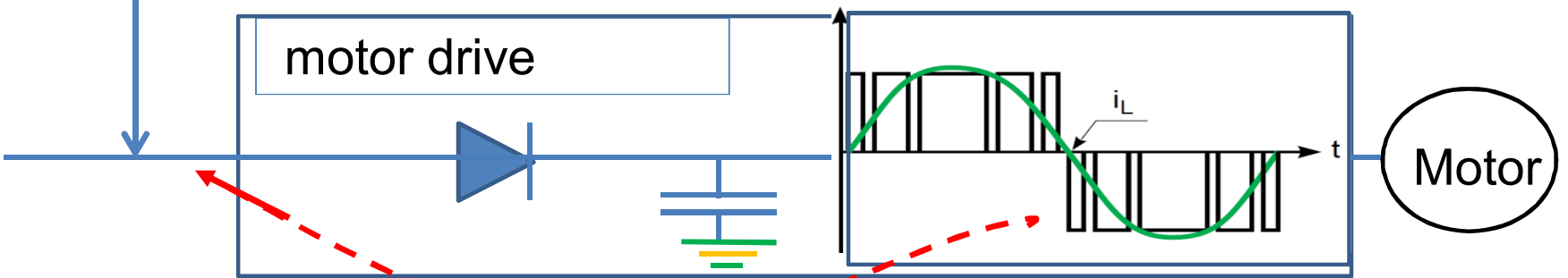
# Harmonics

Supply voltage  
**50 Hz Sinus**

Consumed current  
**is distorted**

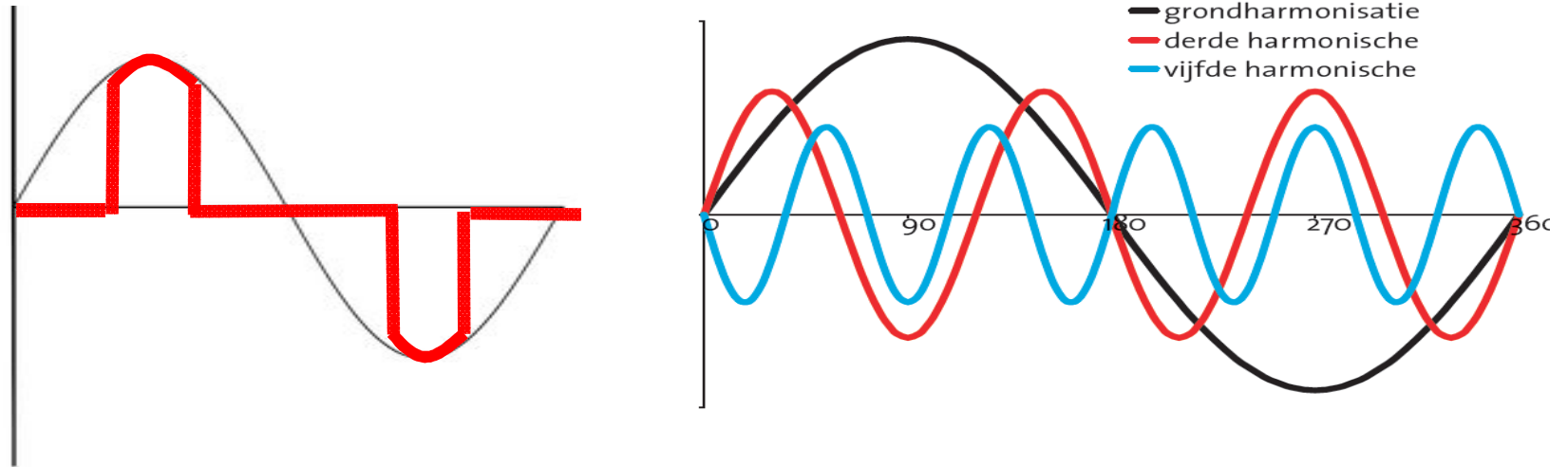


Open gate



Feed back motor speed (interharmonics)

# Harmonics and THD (Total Harmonic Distorsion)

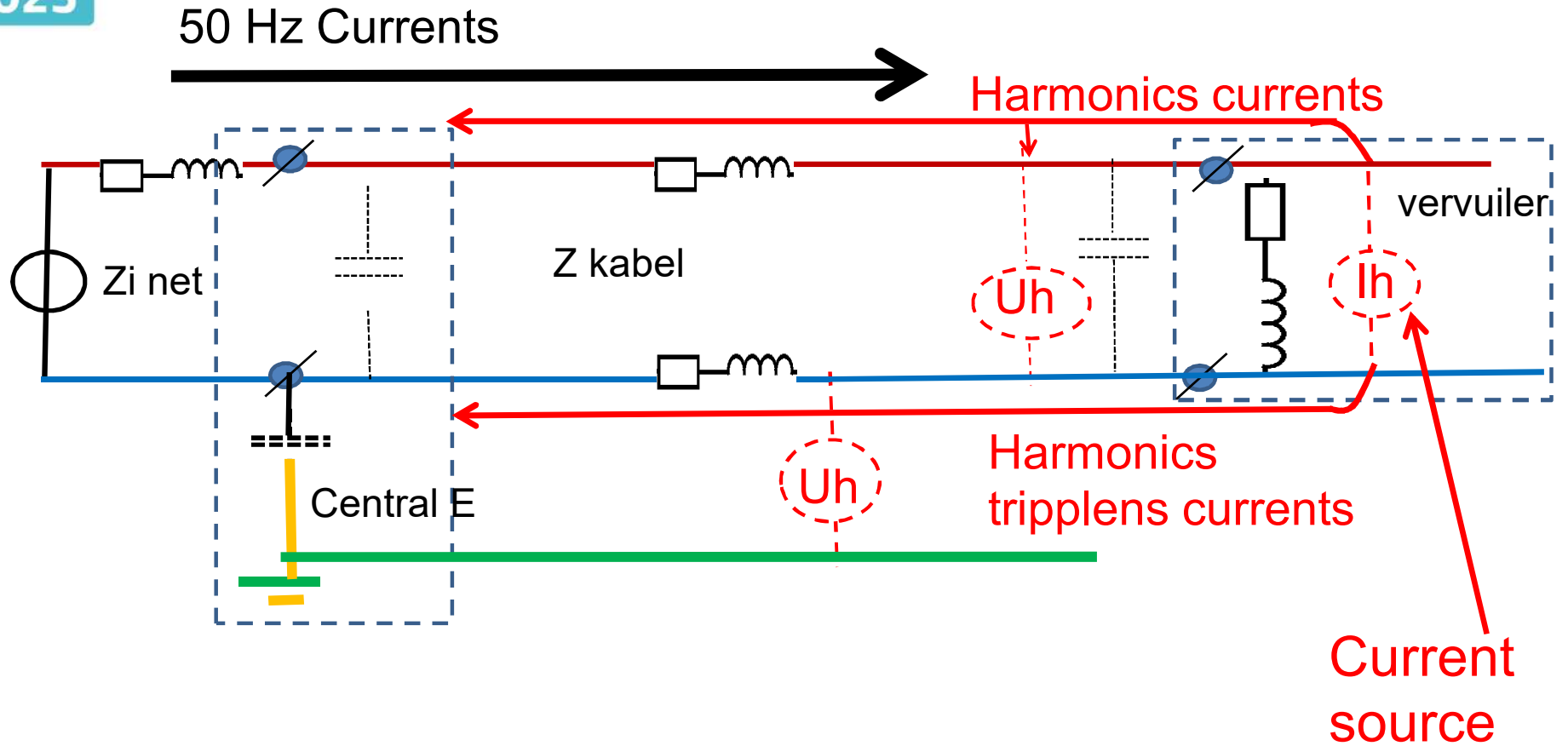


$$THD = \sqrt{\frac{(h2)^2 + (h3)^2 + (etc)^2}{(h1)^2}}$$

EN50160

- THD                      upto 40<sup>ste</sup>
- measurement        upto 50<sup>ste</sup>
- UK G5/5                upto 100<sup>ste</sup>

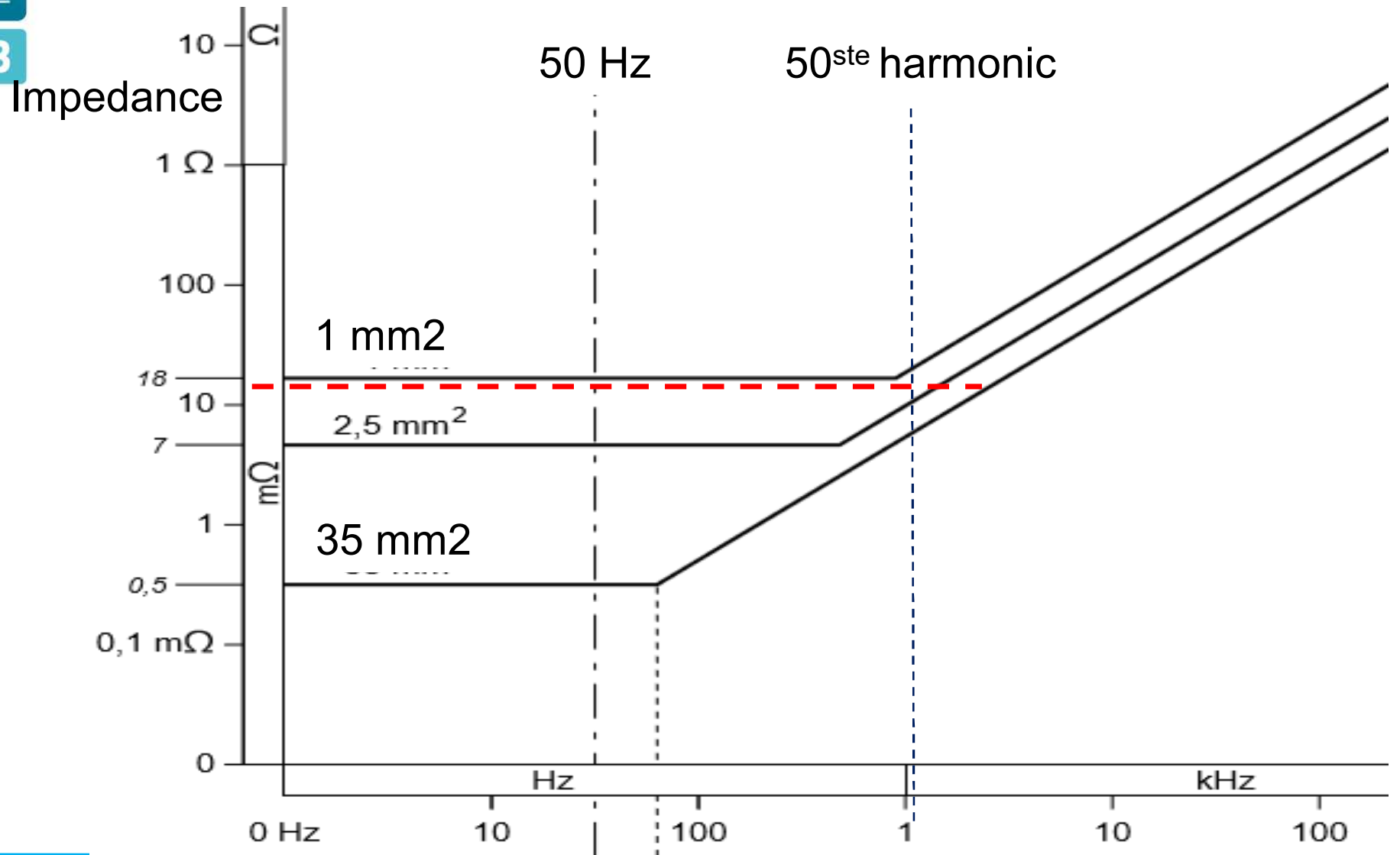
# Harmonics currents are the source



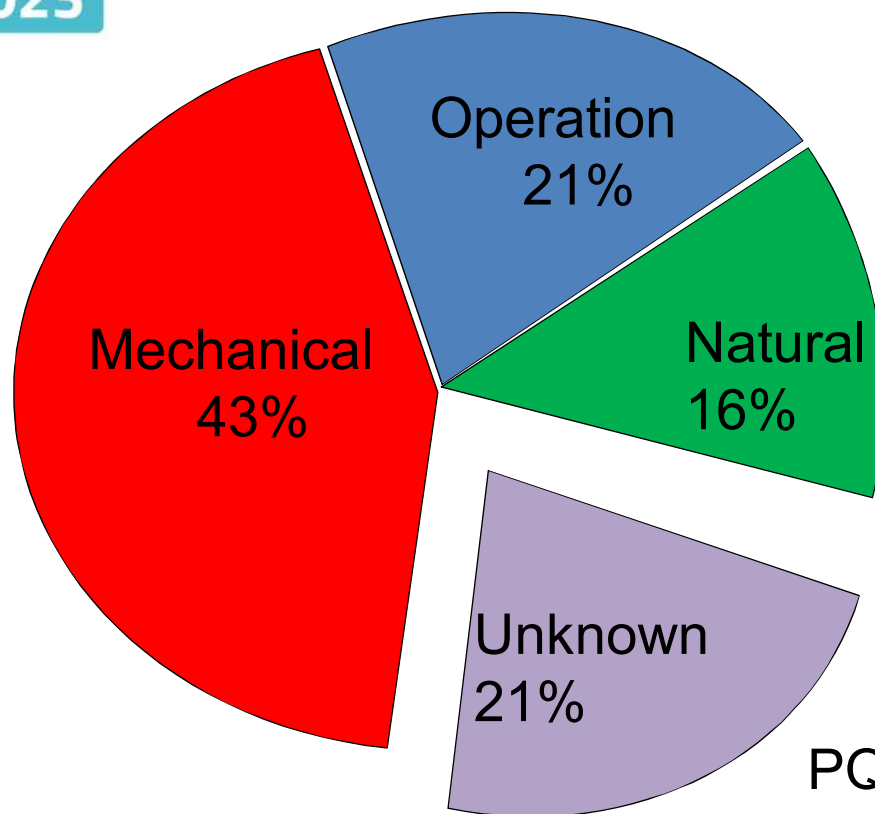


# Cable resistance v.s frequency

$$\sqrt{R^2 + j\omega L^2}$$



# “plant incidents”



PQ faults , hidden here ? !

Why not detected?

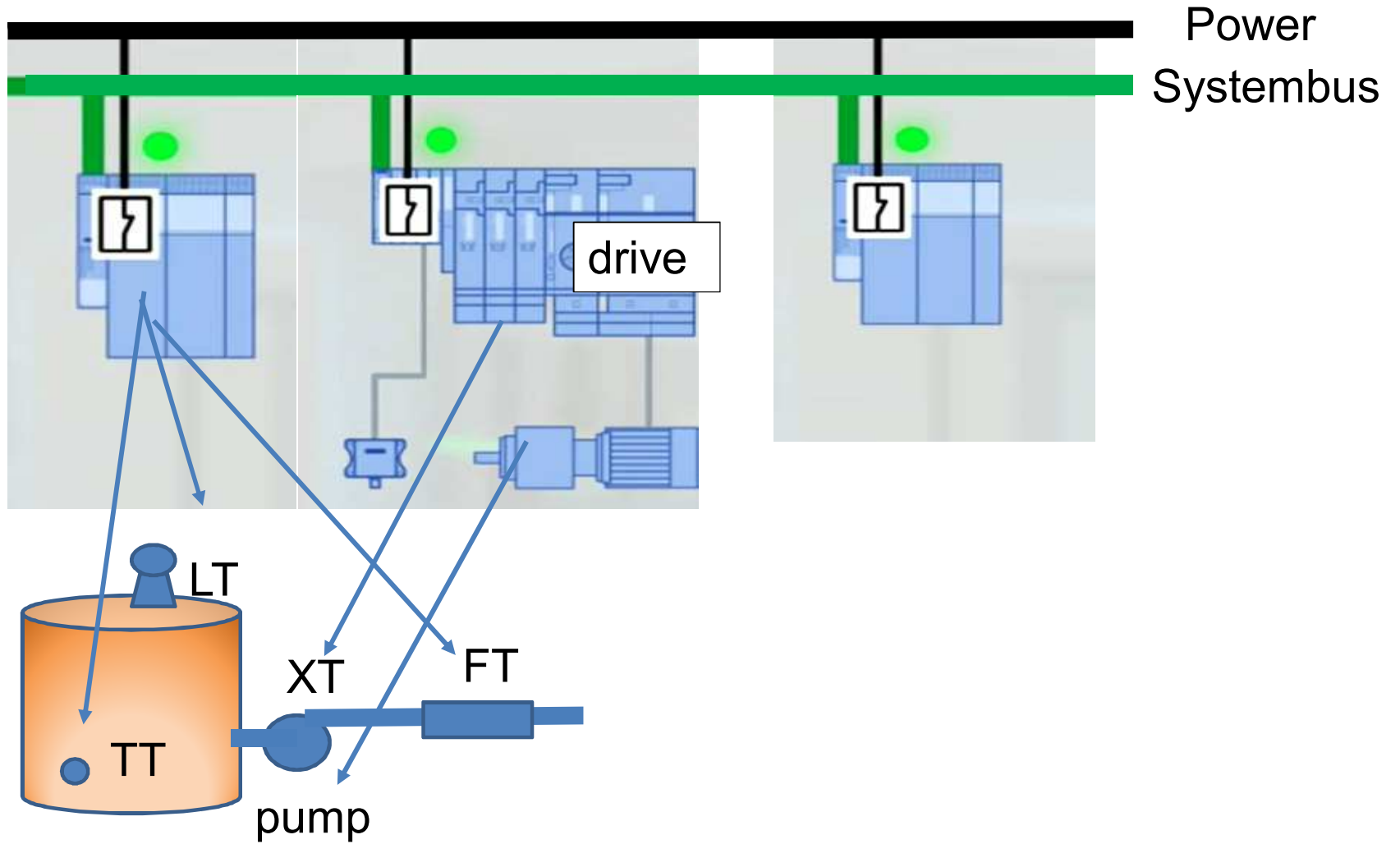
PQ faults can be intermittend < 100 msec !

Bron: Marsh & McLennan Protection Consultants

# To be expected

University Eindhoven:  
more PQ faults due to green energy.

# Power and control are integrating



# What you don't measure, you cannot manage



# Three Cases of PQ faults in the Netherlands