



From Measurement to Insights

Power Quality in the Netherlands. Today and Tomorrow.

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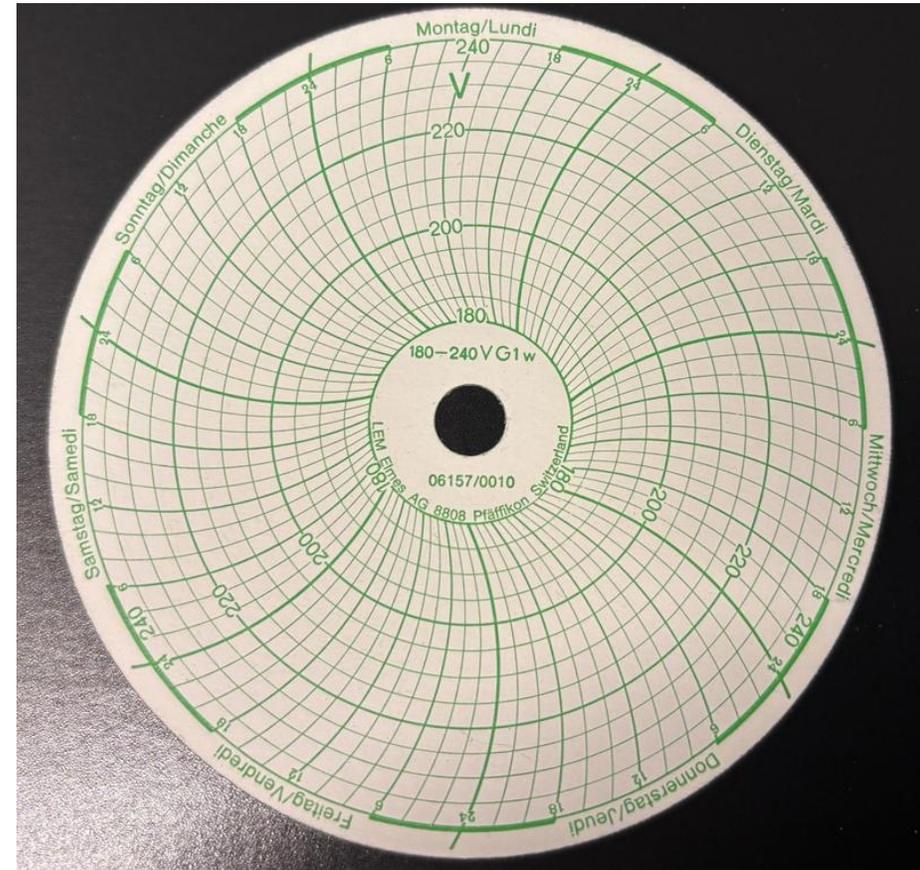
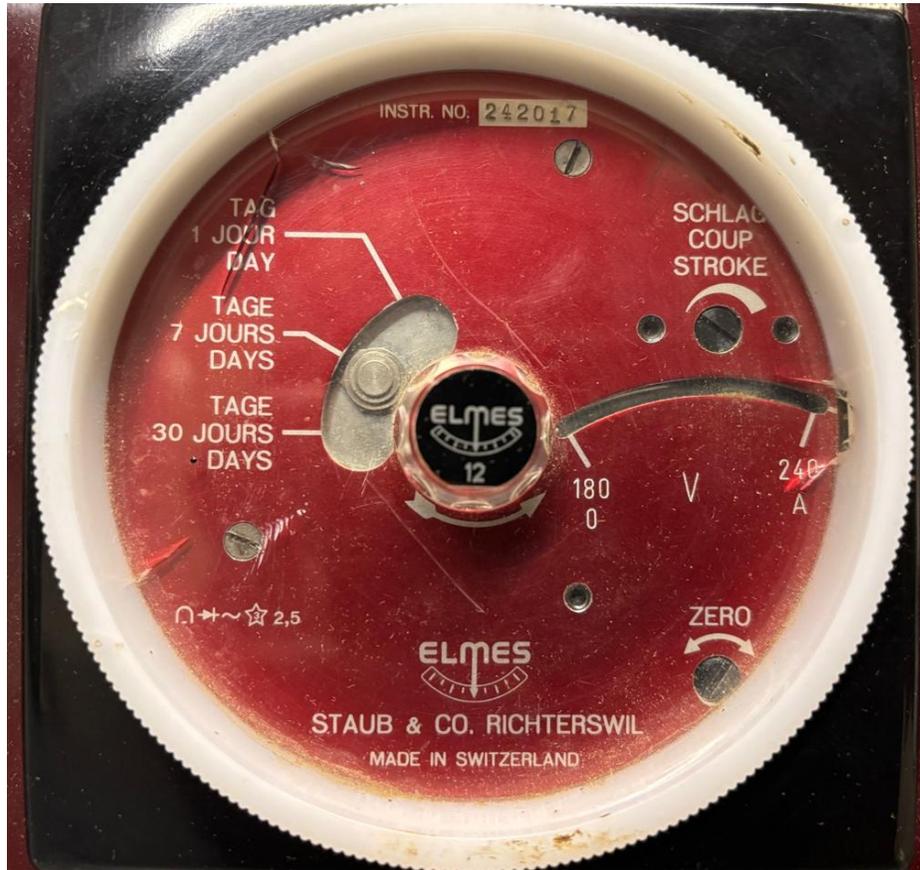
Next level Power Quality Monitoring



Does anyone recognize this typical device?

Next level Power Quality Monitoring

It's an analogue PQ-measuring box from the 80's / 90's



Unfortunately, this one doesn't meet the present and future requirements anymore.



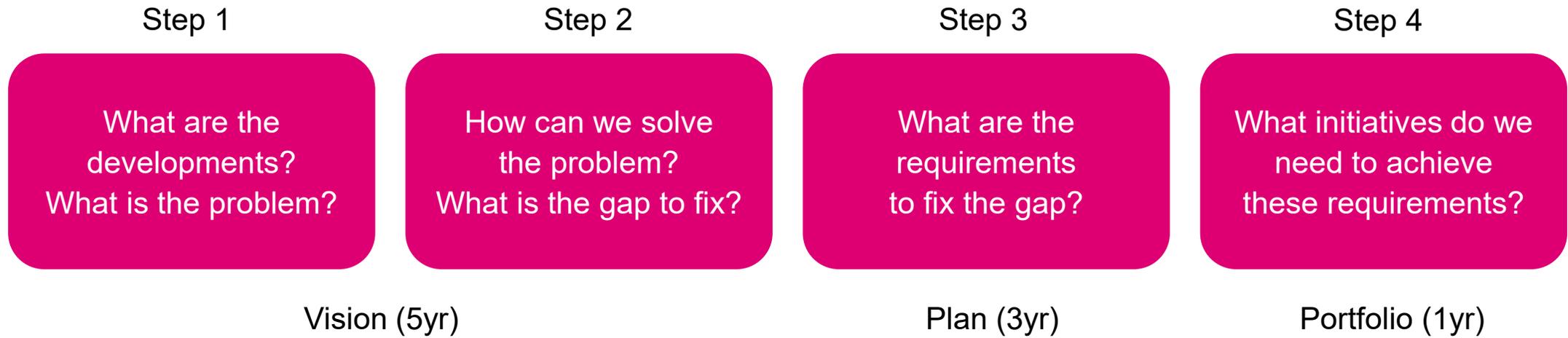
Hypothesis

“Good insights are key
to meet the present and future challenges
of the energy transition”

Without proper insights, DSO's:
don't know what's happening
don't know how to react
Won't be able to act proactively

This presentation will discuss a structured approach to gain the required insights

The structured approach (theoretical)



Let's go to the practical side of the theory....



Energy Transition leads to:

- an increase in maximum voltage in grids
- faster changing current flows in grids
- more questions from customers who need help
- more customer complaints about grid performance
- unexpected problems due to new technologies.

Practice (Step 2)

How can we solve the problem? What is the gap to fix?



Problem	Solution / gap
Increase of the maximum voltage	<ul style="list-style-type: none">• Better view of phenomenon around Un+10%• Increase # of sensors (MV & LV)
Faster changing current flows	<ul style="list-style-type: none">• Introduce shorter measurement intervals (e.g. 1 minute)
More questions from customers for help	<ul style="list-style-type: none">• Improve information for customers• Improve advise on immunity
More customer complaints	<ul style="list-style-type: none">• Improve diagnostics• Develop limits on emission
Problems caused by new technologies	<ul style="list-style-type: none">• Improve understanding of new technologies• Develop limits (technical codes)



Example (Step 2)

Problem: increase of the maximum voltage
Solution / gap: better view of phenomenon around $U_n+10\%$



Restspanning U (%)	Duur t (ms)			
	$10 \leq t \leq 200$	$200 < t \leq 500$	$500 < t \leq 1000$	$1000 < t \leq 5000$
$90 > u \geq 80$	Categorie A			Categorie C
$80 > u \geq 70$				
$70 > u \geq 40$				
$40 > u \geq 5$	Categorie B1	Categorie B2		
$5 > u$				

We know DIPS

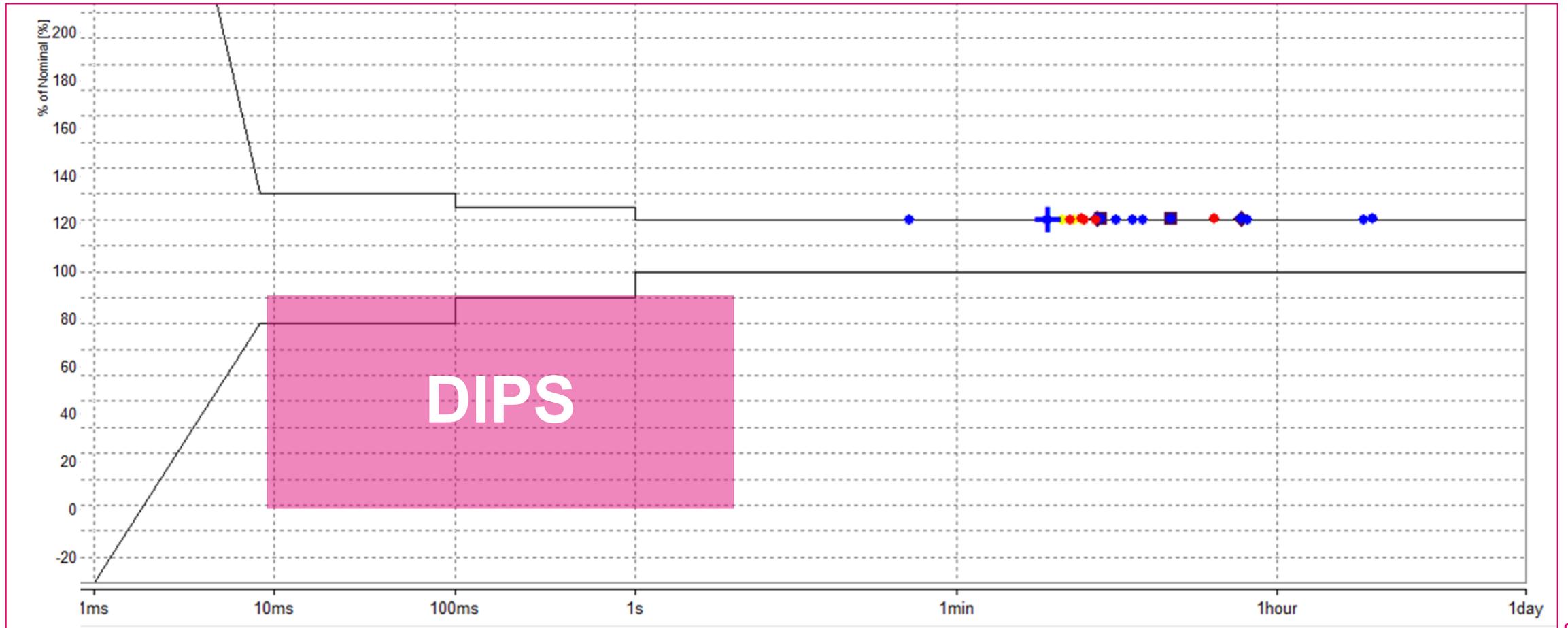
Example (Step 2)

Problem: increase of the maximum voltage

Solution / gap: better view of phenomenon around $U_n+10\%$



The Bigger Picture



More examples in the next presentations

Practice (Step 3)

What are the requirements (plan) to fix the gap?



Solution	Plan
<ul style="list-style-type: none">Increase # of sensors (MV & LV)	<ul style="list-style-type: none">Increase # of LV PQ-sensors (400)Increase # of MV PQ-sensors (200)Increase the use of LV - Smart Meters
<ul style="list-style-type: none">Better view of phenomenon around Un+10%Introduce shorter measurement intervals (e.g. 1 minute)	<ul style="list-style-type: none">Change software settingsIncrease data-storage
<ul style="list-style-type: none">Improve customer information regarding the situation	<ul style="list-style-type: none">Involve customers in the requirements for their needs (and deliver to their needs).
<ul style="list-style-type: none">Improve understanding of new technologiesImprove advise on immunity	<ul style="list-style-type: none">Check new technologies (E-Laad)
<ul style="list-style-type: none">Develop limits (technical codes)	<ul style="list-style-type: none">Develop new codes for asymmetry

Practice (Step 4)

What initiatives do we need to achieve these requirements?



Plan

- Increase # of sensors (MV & LV)
- Increase the use of LV - Smart Meters
- Change software settings
- Increase data-storage
- Improve effectiveness & actuality
- Check new technologies
- Develop new codes for asymmetry





VOTE #1

“System Operators will be able to organize good insights on their grids to meet the present and future challenges of the energy transition”

VOTE #2

The insights will not only be valuable for System Operators. They are also valuable for my contribution the energy transition. I'd like to connect!