



CEER, ECRB and EURELECTRIC Joint workshop

Experiences with VQM in Denmark

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 **DANISH
ENERGY ASSOCIATION**

Agenda



- Key figures from Denmark
- The Danish regulation on Quality of Supply
- The Danish VQM programme
- *What the Danish customers say ...*

Key figures from Denmark



	Total
Total power consumption (in 2011)	32,000 GWh <i>(Approx. 5,580,000 inhabitants)</i>
Number of customers (in 2012)	3,250,000 customers <i>1 customer = 1 metering device 900,000 AMR-meters installed</i>
Number of DNOs (in 2012)	73 companies
Network (in 2011)	LV: 95,000 km (95 % is cable) MV: 63,000 km (95 % is cable) HV: 8,800 km (38 % is cable) EHV/Trans: 6,200 km (20 % is cable)
SAIFI (in 2010)	0.44 interruptions per customer <i>(outages ≥ 1 min.)</i>
SAIDI (in 2010)	20.2 min. per customer <i>ASAI = 99.996 % of the year</i>

The Danish regulation on Quality of Supply



1. The "average-served" customer

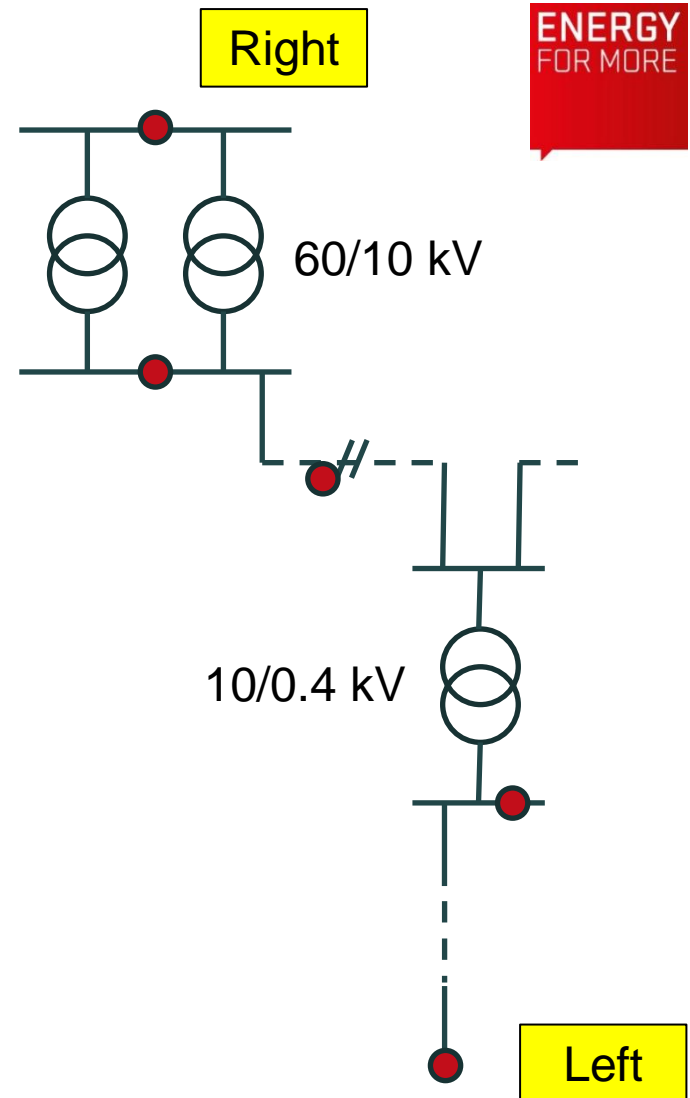
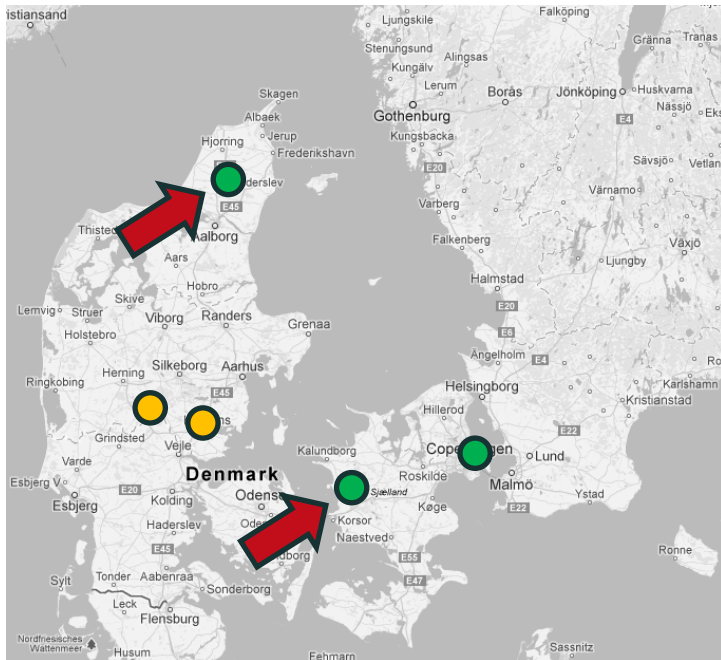
- Sum of number of interruptions (SAIFI, weighted)
- Sum of duration of interruptions (SAIDI, weighted)

2. The "worst-served" customer

- Sum of number of interruptions per customer (weighted)
 - Sum of duration per customer (weighted)
-
- Penalties are "one-year"-penalties (reduction in the company's income cap)
 - The Danish benchmarking includes only interruptions lasting ≥ 1 min.
 - **There is no (national) registration of voltage quality incidents (dips etc.)**
 - Grid disturbances > 100 kV are monitored for the ENTSO-E Nordic statistic

The Danish VQM programme

- The programme was started in 2008
- 5 representative sites have been measured – more sites will come ...

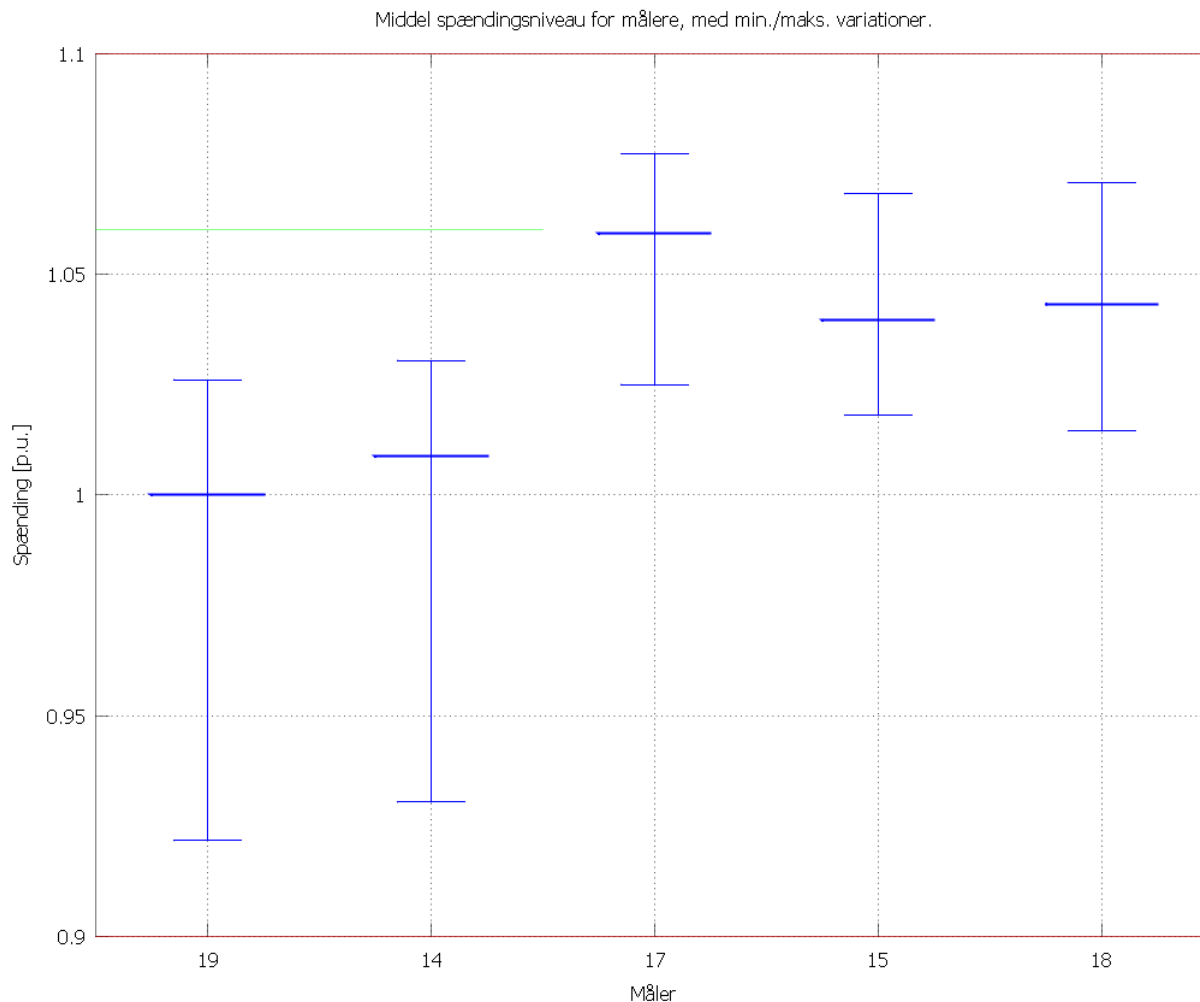


All measurements are according to EN 61000-4-30 for a 1-year period at each site

The Danish VQM programme – some results



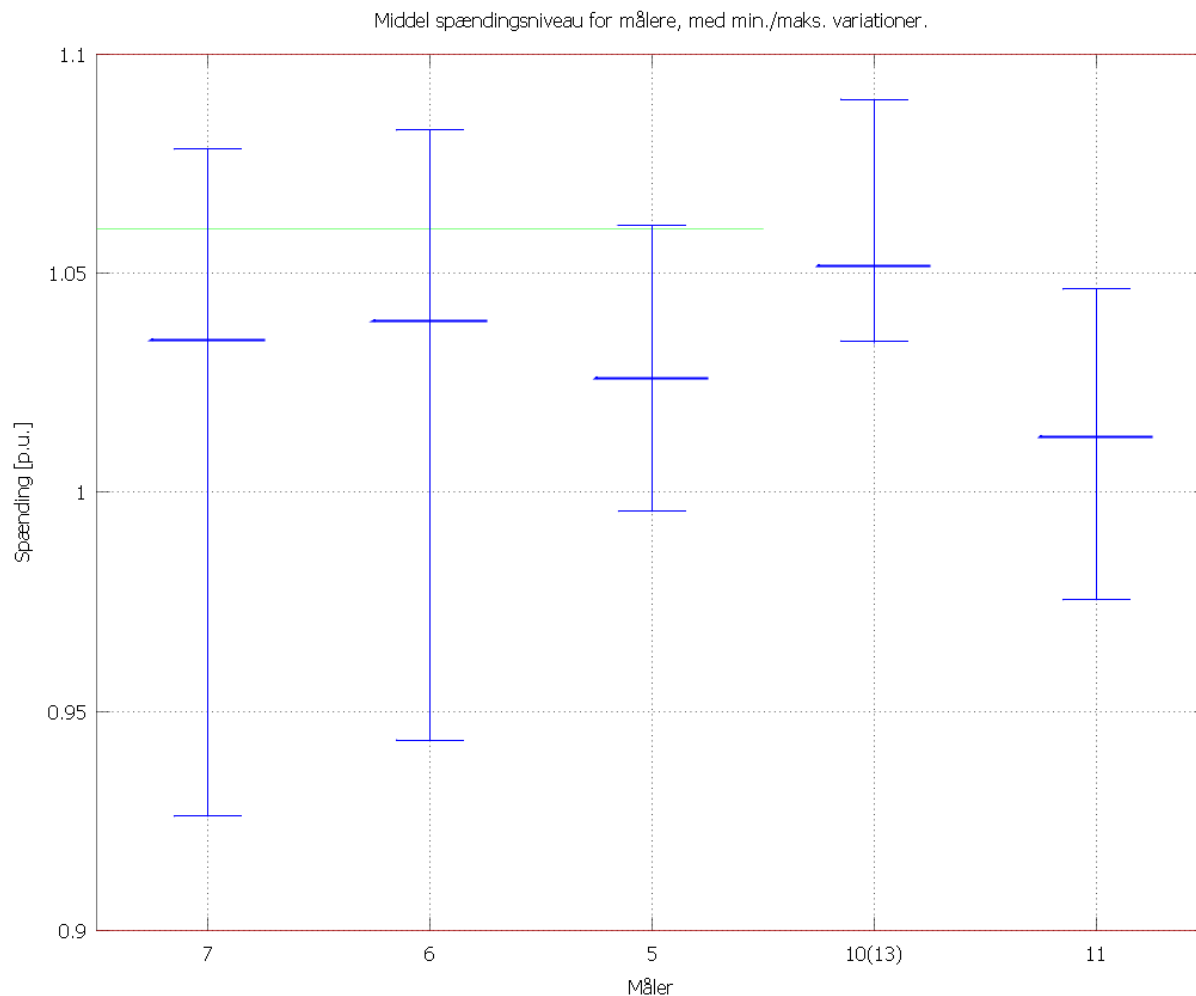
- Suburban area
(Northern part of
Jutland)



The Danish VQM programme – some results



- Rural area
(Western part of
Sealand)



Customer complaints – the handling proces



- A customer calls the DNO with "a VQ-problem"
- 1. The DNO (its call-center and/or network engineers) gives guidance to the customer to eliminate the customers own installation as the "source of error"
- 2. If the "source of error" is in the customer's own installation => **Case is closed!**
- 3. If the problem is still not solved: DNO will send operational staff e.g.:
 - checking the PCC (e.g. cable connections, fuses in the cable cabinet)
 - doing VQ-measurements if still no failure is found
- 4. If VQ-measurements shows a VQ-problem, actions are made (e.g. tripping transformer, reinforcing the network etc.)

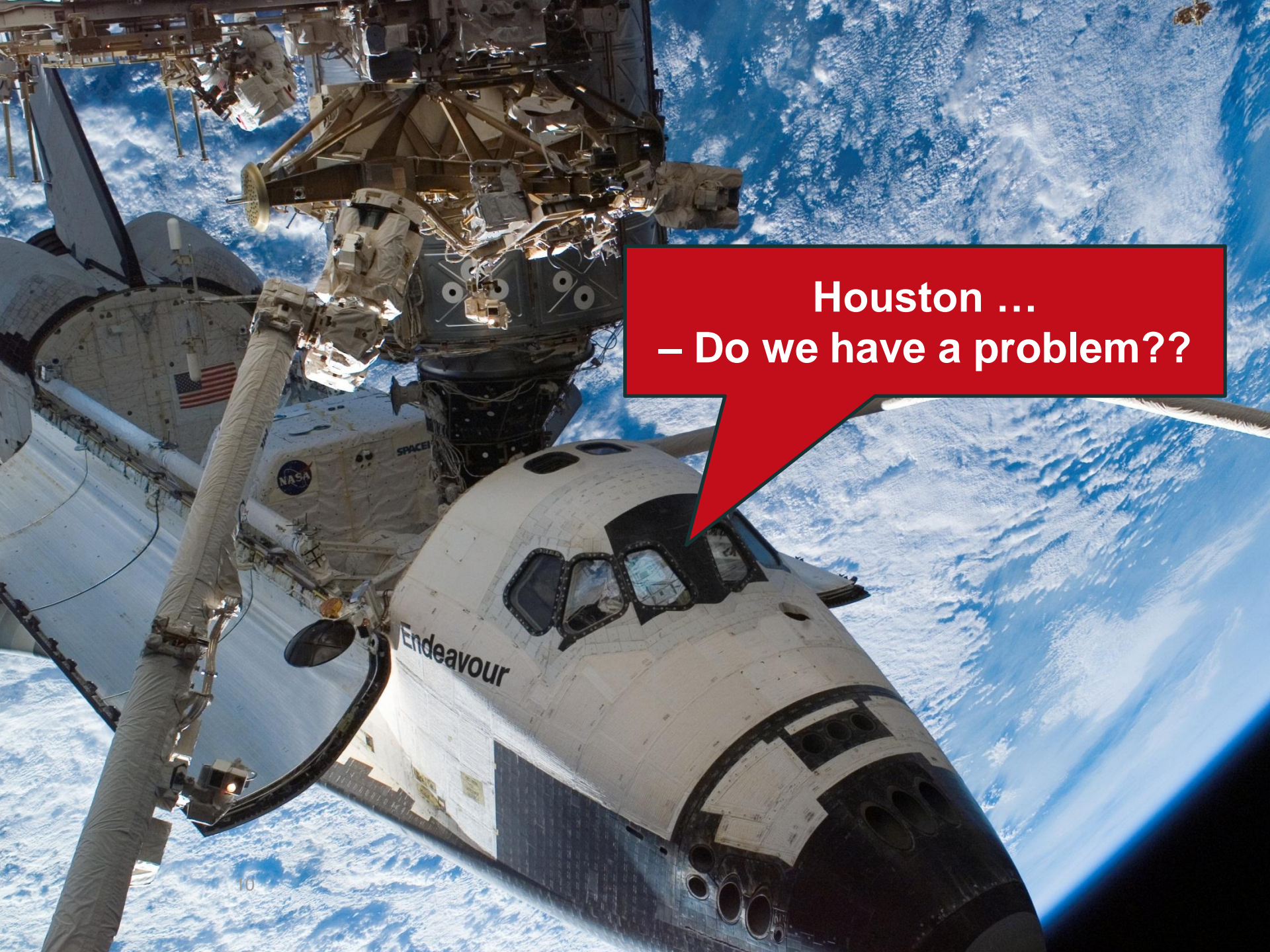
Customer complaints in Denmark (in 2010)



	Company A	Company B	Company C	Total in DK
Number of customers	1,000,000	375,000	175,000	3,250,000
Network (% is cable)	LV: 90 % MV: 100 %	LV: 96 % MV: 95 %	LV: 92 % MV: 93 %	LV: 95 % MV: 95 %
Number PQ-related complaints	46 0.05 ‰	200 0.5 ‰	110 0.6 ‰	≈ 750 ≈ 0.25 ‰
Number of <i>justified</i> PQ-related complaints*	29 0.03 ‰	n/a	35 0.2 ‰	≈ < 200 ≈ 0.06 ‰

* = a PQ-measurement for one week is carried out according to EN 61000-4-30 and is followed up by action from the DNO (e.g. tripping transformer, reinforcing the network etc.)

**The Danish solution:
Approx. 95 % of the
distribution network is cable!**



**Houston ...
– Do we have a problem??**

The Danish customers say ...



- A meeting was held in April 2011 with representatives from:
 - The National regulator
 - The Industry
 - The Energy companies and Danish Energy Association
- A survey was sent to 200 companies in May/June 2012 (CTO'es)
- The survey was made as a "joint venture" between:
 - The Danish Energy Regulatory Authority (the National regulator)
 - The Confederation of Danish Industry (the Industry companies)
 - The Danish Energy Association (the Energy companies)

The Industry said ...

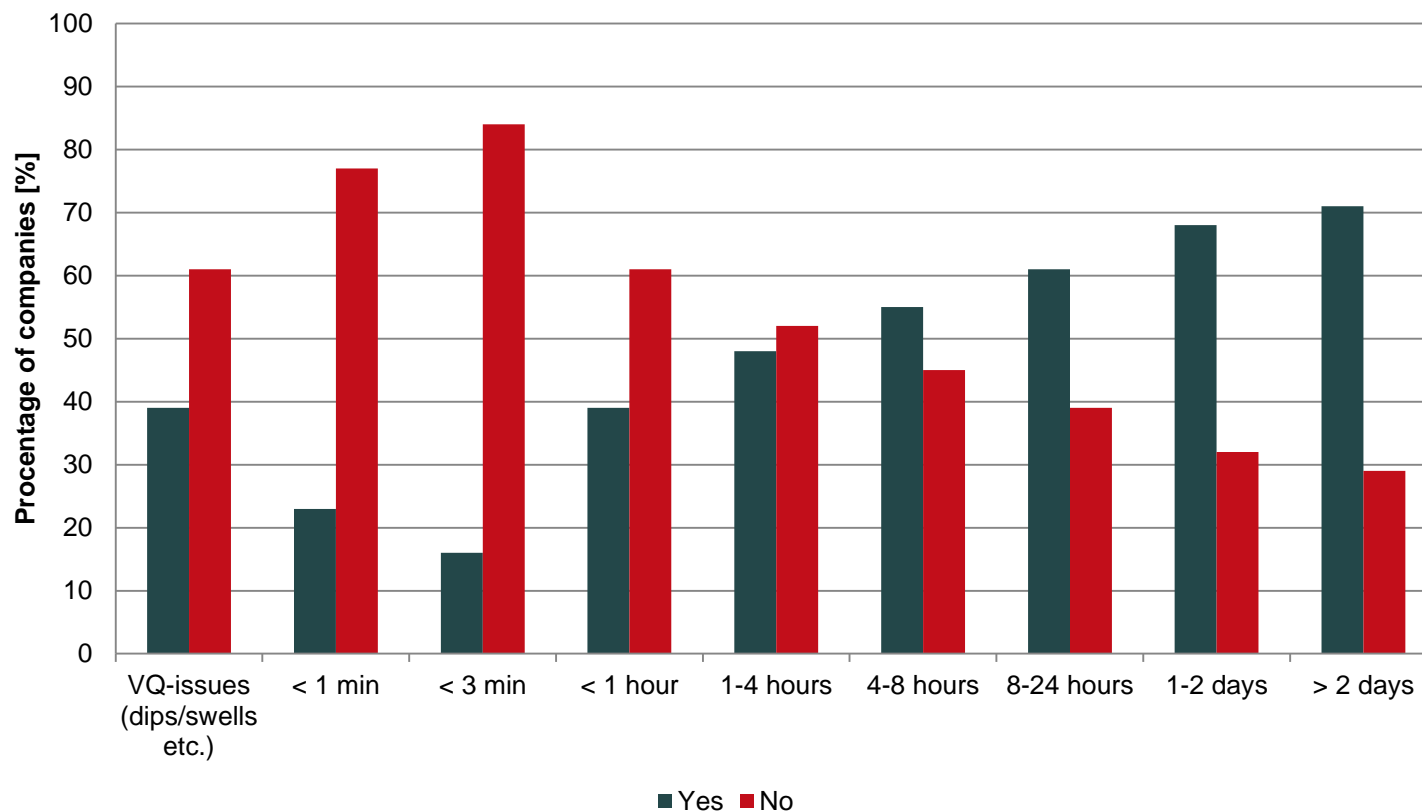


- (Only!) 32 companies replied
 - Approx. 1.5 % of the total power consumption in Denmark in 2011
- *How do you see the Quality of Supply in Denmark?*
 - 80 % (Extremely high/High), 10 % (Average), 10 % (No comments)
- *How many times within the last year have you experienced VQ-incidents causing problems for your industrial production processes?*
 - 56 % (none), 25 % (1-2 times), 6 % (3-4 times), 13 % (5-7 times)
 - *The reasons for the problems were not part of the survey*

The Industry said ...



Willingness to pay (local solutions)



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**The Danish solution:
Approx. 95 % of the
distribution network is cable!**



**Houston ...
– Do we have a problem??**



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**Thank you for
your attention!**