

ENERGY

# How certified T&D components help to improve power network performance

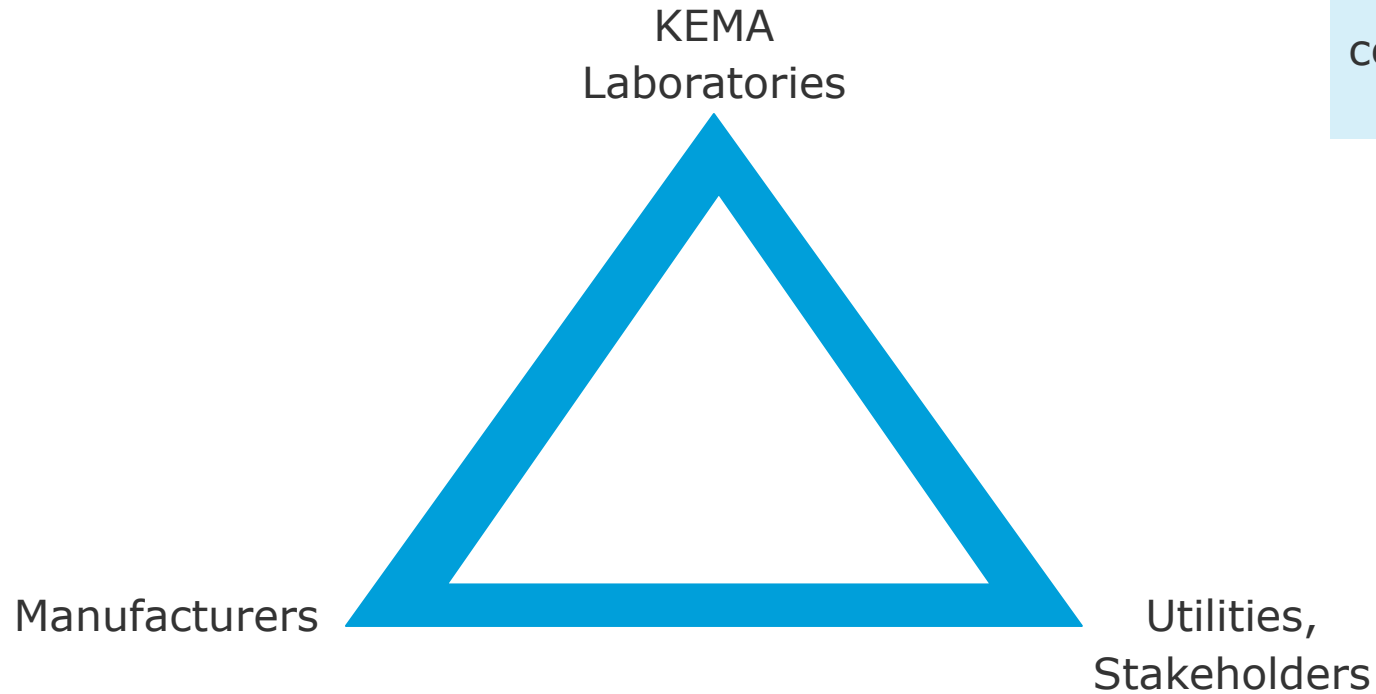
## Applicable for HVAC and HVDC projects

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# Trilemma on Quality for HVAC and HVDC projects



Independent testing and certification is a must for high quality projects

# Quality in HVAC projects versus HVDC projects

## HVAC

- Utility designs the system
- Utility specifies and tenders components
  - Many vendors
  - True global market
- Utility builds and tests system

## HVDC

- Utility defines performance criteria for a connection
- Contractor, HVDC manufacturer
  - Just a few vendors
- Closed vendor market
- Utility receives the connection with performance guarantee.

With more free manufacturers upcoming HVDC changes to HVAC



# Power System Performance and Failures

# Key performance targets of utilities



**KEMA** Laboratories

## Financial performance

- Return on investment to stakeholders
- Transparency on investor decisions

## Regulatory and legal conformity

- Avoid fines

## Public image

- Customer satisfaction and community relations
- Corporate social responsibility
- Environment and safety

# Risk mitigation through equipment certification

## Equipment certification

- Ensures performance criteria are met
- Ensures highest level of service reliability
- Minimizes liability issues

## Best practice in certification

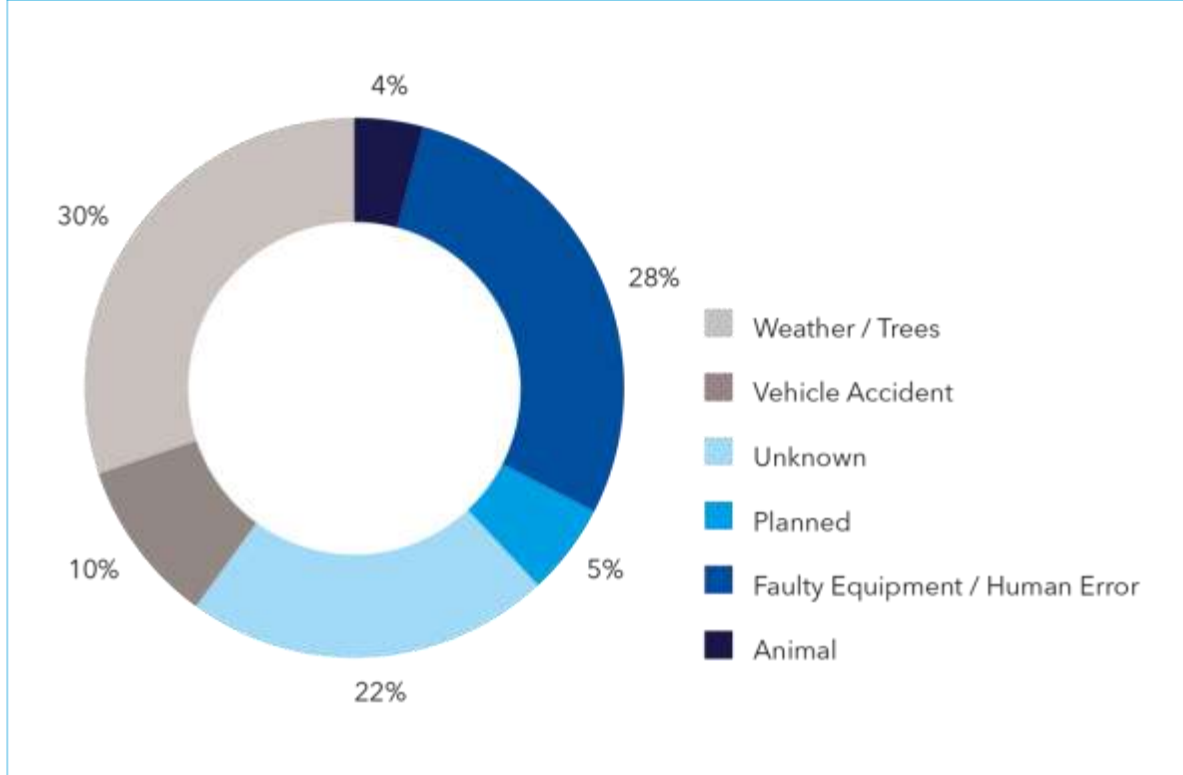
- Independent laboratory
- Outside the country of OEM



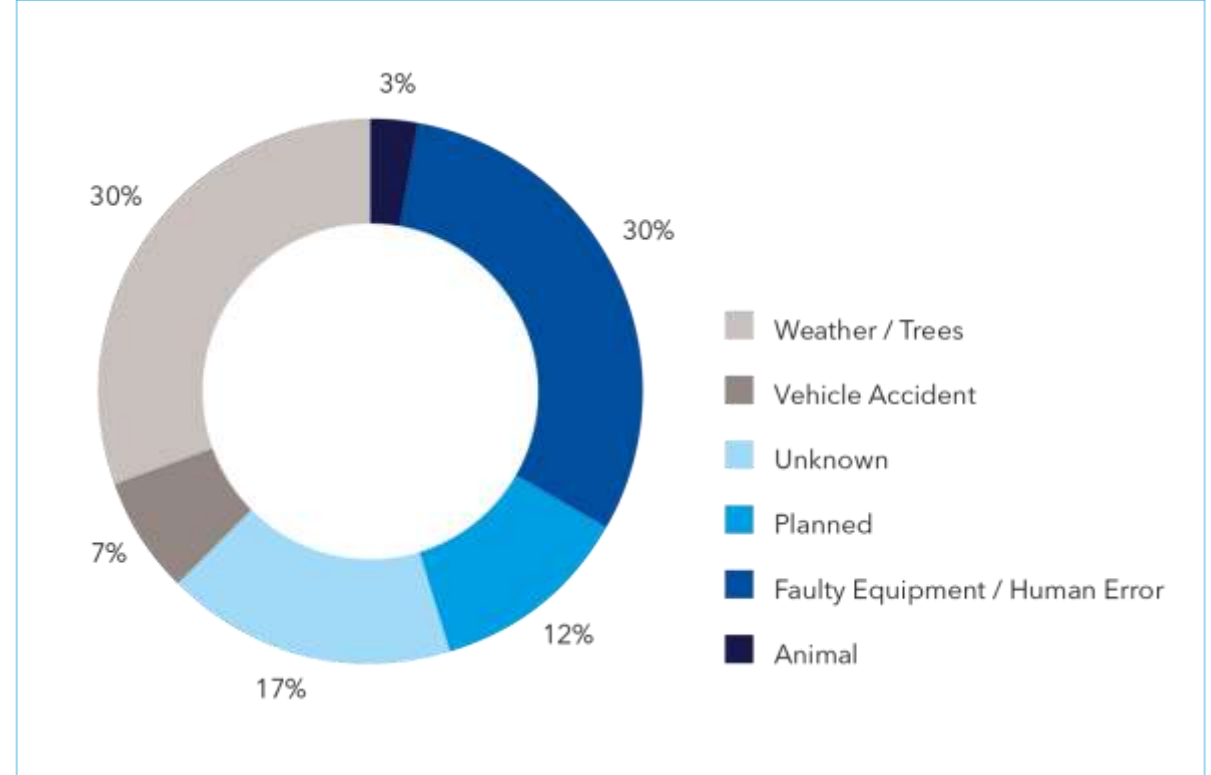
# Equipment causes blackouts

Most avoidable outages are equipment related

USA 2014 (Eaton Corp.) n = 3614



Canada 2014 (Eaton Corp.) n = 257



# Statistics on Failure Rate during Type Testing



## Around **25%** of test-objects initially fail to pass type-tests



Line trap



Transformer winding



Disconnecter



Switchgear panel



Broken bushing

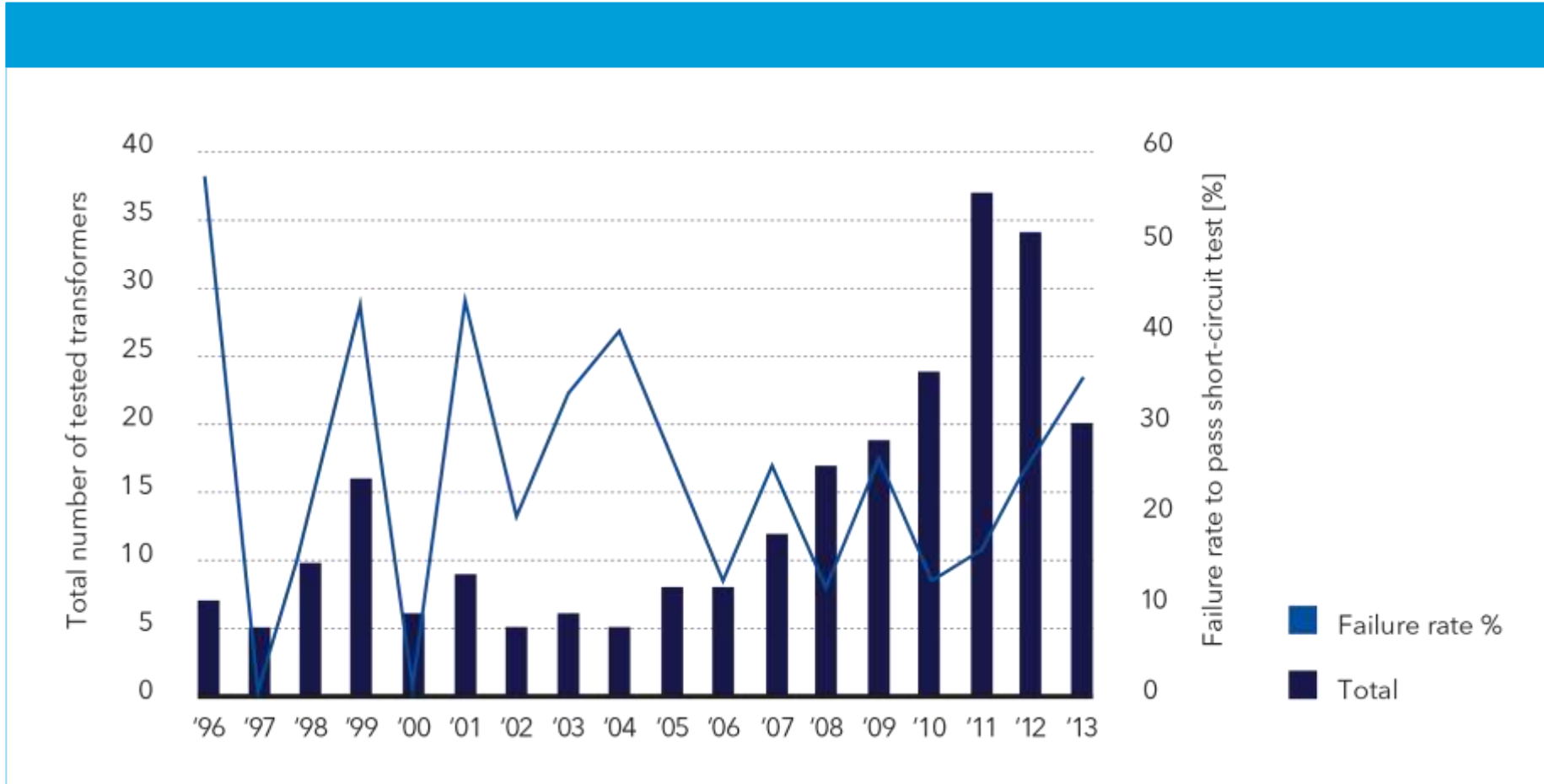


Distribution transformer

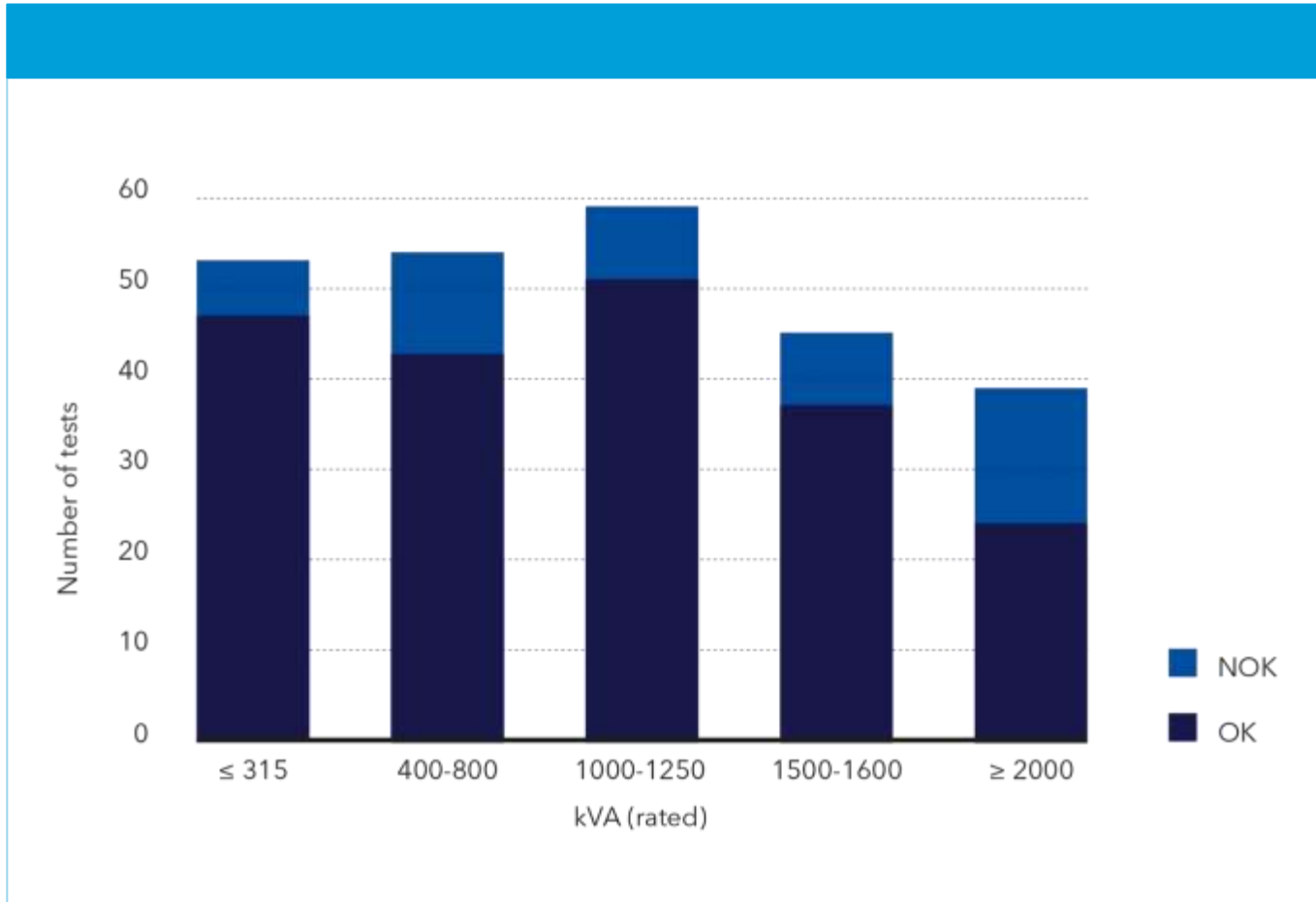


Oil spill

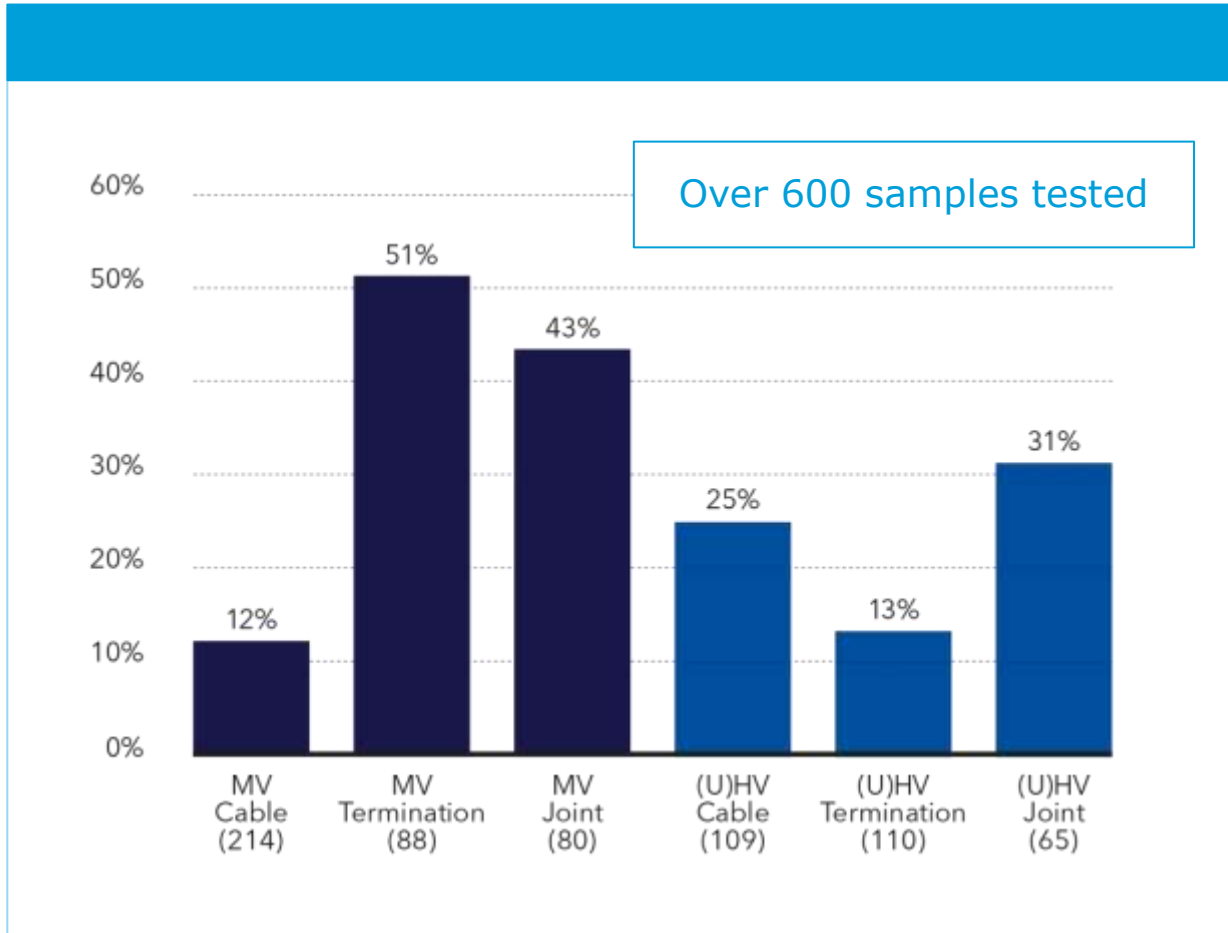
# Initial Failure Rate Large Power Transformer



# Initial Failure Rate Distribution Transformers



# Initial Failure Rate Cable and Accessories

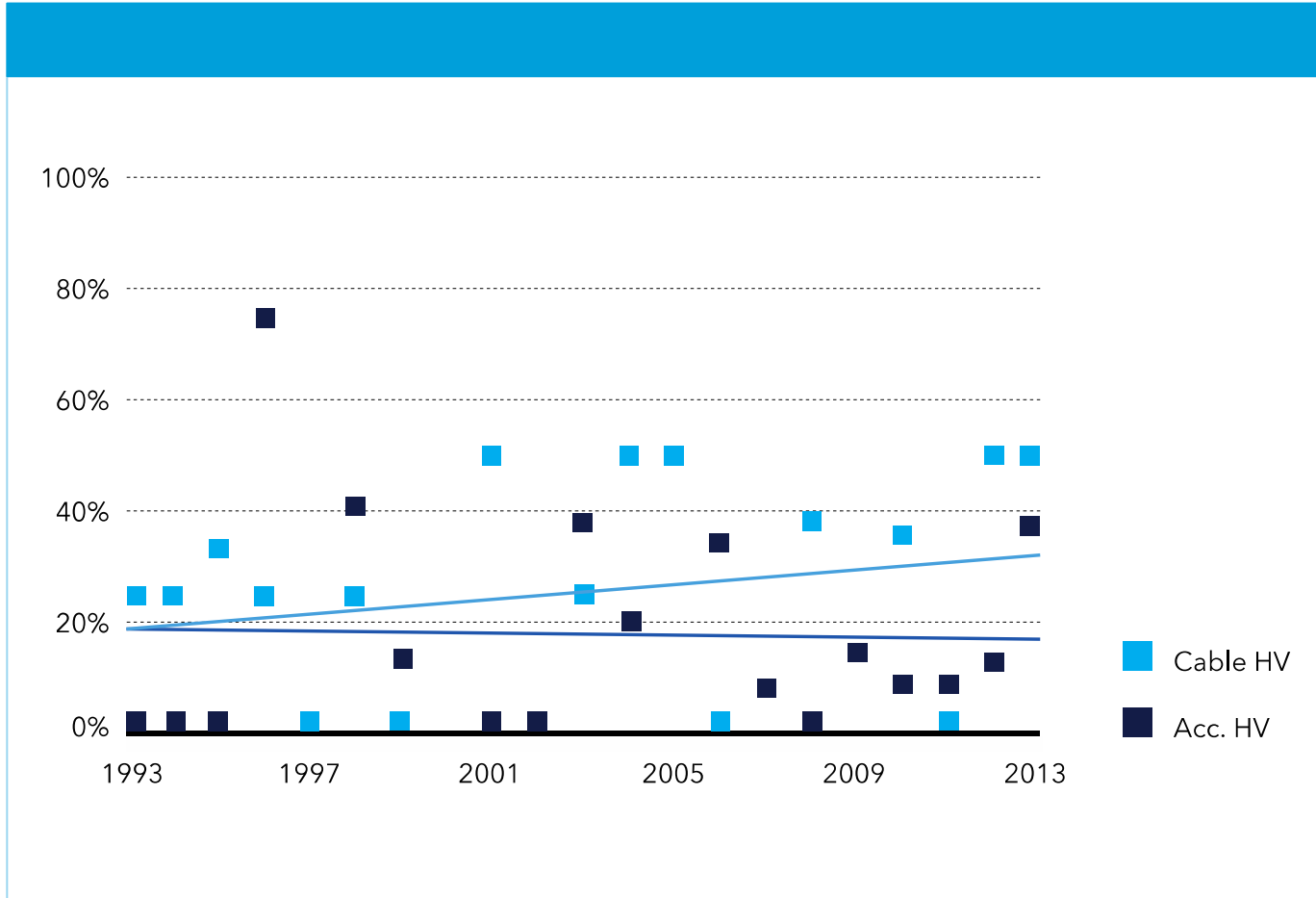




## Some Examples of Failures



# Failure Rate Trend High Voltage Cables



## Initial Failure Rate Circuit Breakers

- Statistics for medium and high voltage circuit breakers is not yet available in graphs.
- Initial failure rate is 25% and is stable over many years.



## Takeaways

- Initial failure rate of type testing is 25% for all T&D components.
- Failure rate stays stable over the year.
- Better materials, knowledge, modelling, production techniques are used to design components just below maximum stress levels due to:
  - Build more compact
  - Reduce usage of materials
  - Market competition and price pressure





# Accreditation and Certification?

# The three foundations of certification

## International standards



## Skilled personnel



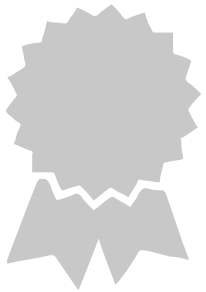
## Adequate test laboratories



# Certification – but what's in the name?

## Certification

Tests performed in independent laboratory by experienced test engineers.



## Witnessing

Test performed by a laboratory witnessed by other party.



## Paper evaluation

Test results from others are studied if it meets IEC. No direct involvement in tests and test evaluation.



## Self-approval

Manufacturer claims that product complies with the standard.



# Independency for various Certification schemes

Sort	Laboratory	Test Results	Evaluation
Certification	✓	✓	✓
Witnessing	✗	?	?
Paper evaluation	✗	✗	?
Self approval	✗	✗	✗

# KEMA Certificates and Reports



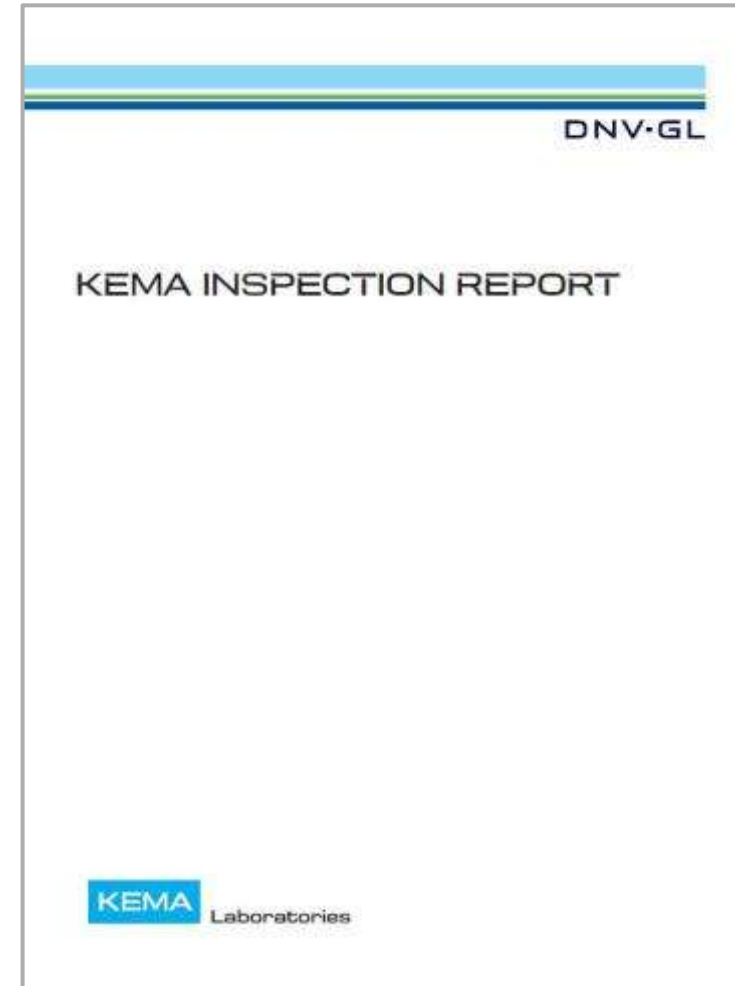
Gold; KEMA Type Test Certificate

Silver; KEMA Report of Performance

Grey; KEMA Test Report

# KEMA Inspection Report

- When witnessing tests in a non-KEMA Laboratory, the results are described in an Inspection report.
- The laboratory owner (manufacturer) is responsible for compliance to the standard.



# Summary and takeaways

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- ▶ Reliable power networks are essential for the economy of every country.  
Power system failures are not socially accepted anymore.

25% of the components initially fail a certification test.

- ▶ Improved knowledge, better materials and experience is used for making components cheaper.  
Quality performance has not improved.

- ▶ Utilities are keen to purchase components with proven quality and often write in tender documents  
“Component must be tested and certified by an independent laboratory, not in country of origin.”

- ▶ “Paper certification” looks like a quick and cheap way to obtain a certificate but for international trade this does not work.



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