



**E-CONTROL**

## **Power Quality and the Need for Grid Codes E-Control Experience**

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PSCC Liege, 26. August 2005

# Highlights

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- Austrian Grid Code & UCTE Operation Handbook
- Reliability, Power Quality & Quality Regulation
- CEER & ERGEG activities

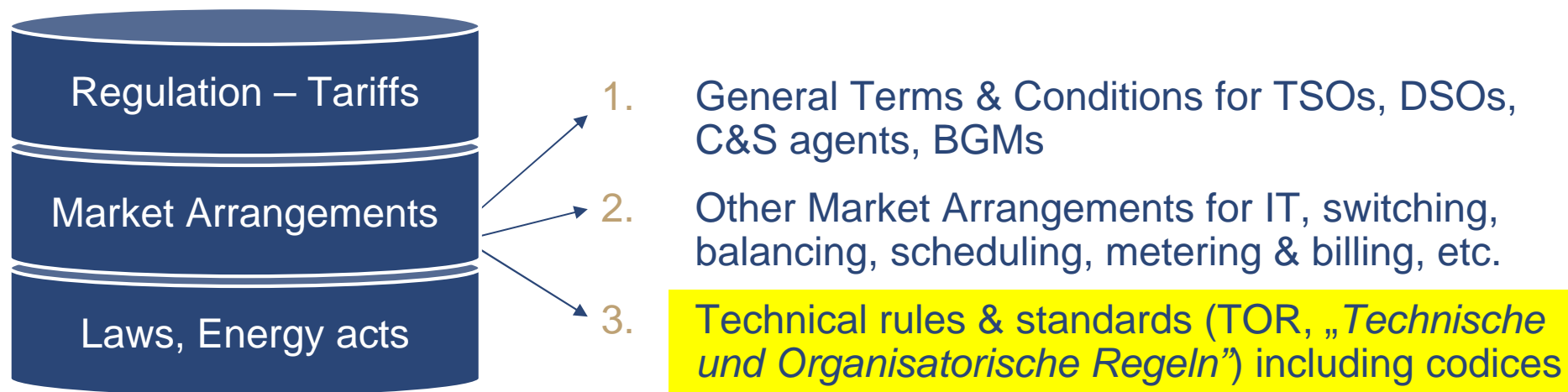
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# Austrian Technical Rules & Codices

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Part A. Introduction, Glossary & References

Part B. Grid Code

Part C. Distribution Code

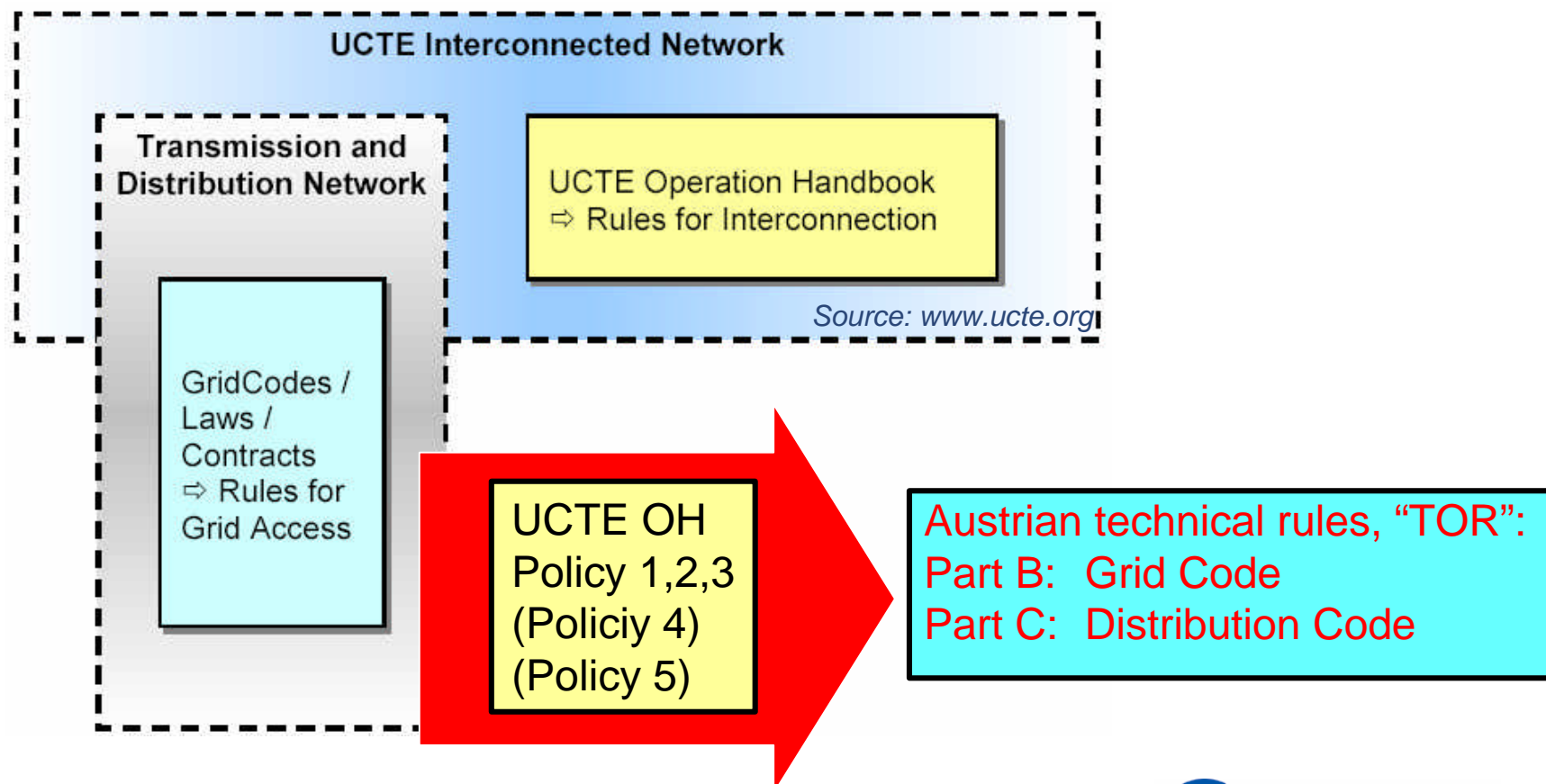
Part D. Special Technical Rules for EMC

Part E. Prevention and Remedy of Disturbances

Part F: Metering Code

# Austrian Codices & UCTE Operation Handbook

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## Austrian Codices & UCTE OH - Details

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- Congestion Management related issues (Policy 4): calculation of capacity, scheduling, congestion management, etc.
  - More detailed and exact definition of the (N-1) security criteria in terms of grid elements, contingency analysis framework and time to return to normal operational state
  - Common standards for scheduling and accounting (in the future, needed in the next release of Policy 2)
  - Emergency operation – restoration plans, training (in the future, needed in the Policy 5)
  - ...
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- Moreover -> initiative on the „Security and Reliability Guidelines“ cf. Article 8 of the Reg. (EC) 1228/2003

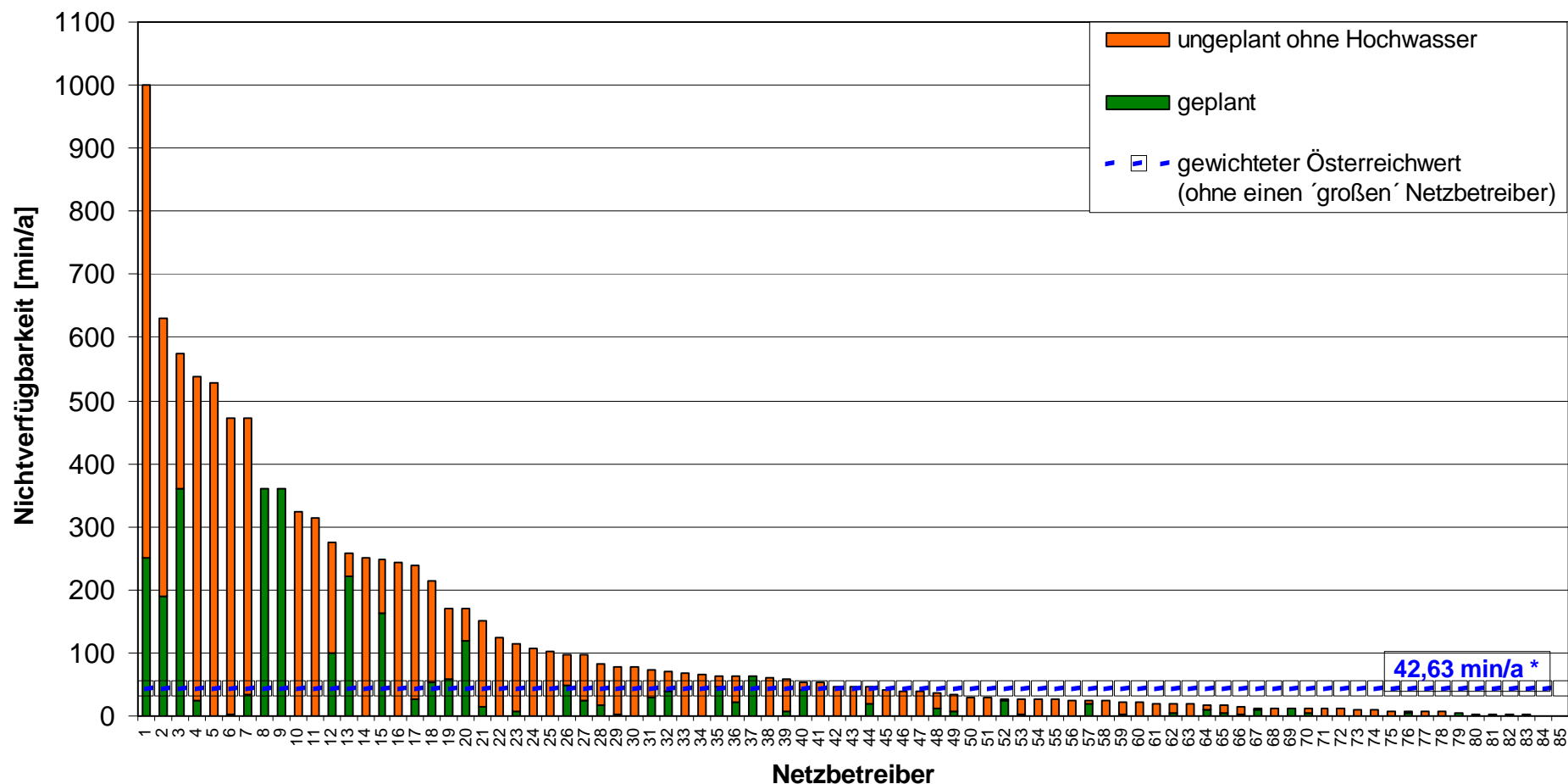
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# Reliability – Statistics 2002 (www.e-control.at)

## 2002 SAIDI - System Average Interruption Duration Index geplante und ungeplante (ohne Hochwasser) Versorgungsunterbrechungen > 1 kV bis 36 kV (Bezug: Leistung)



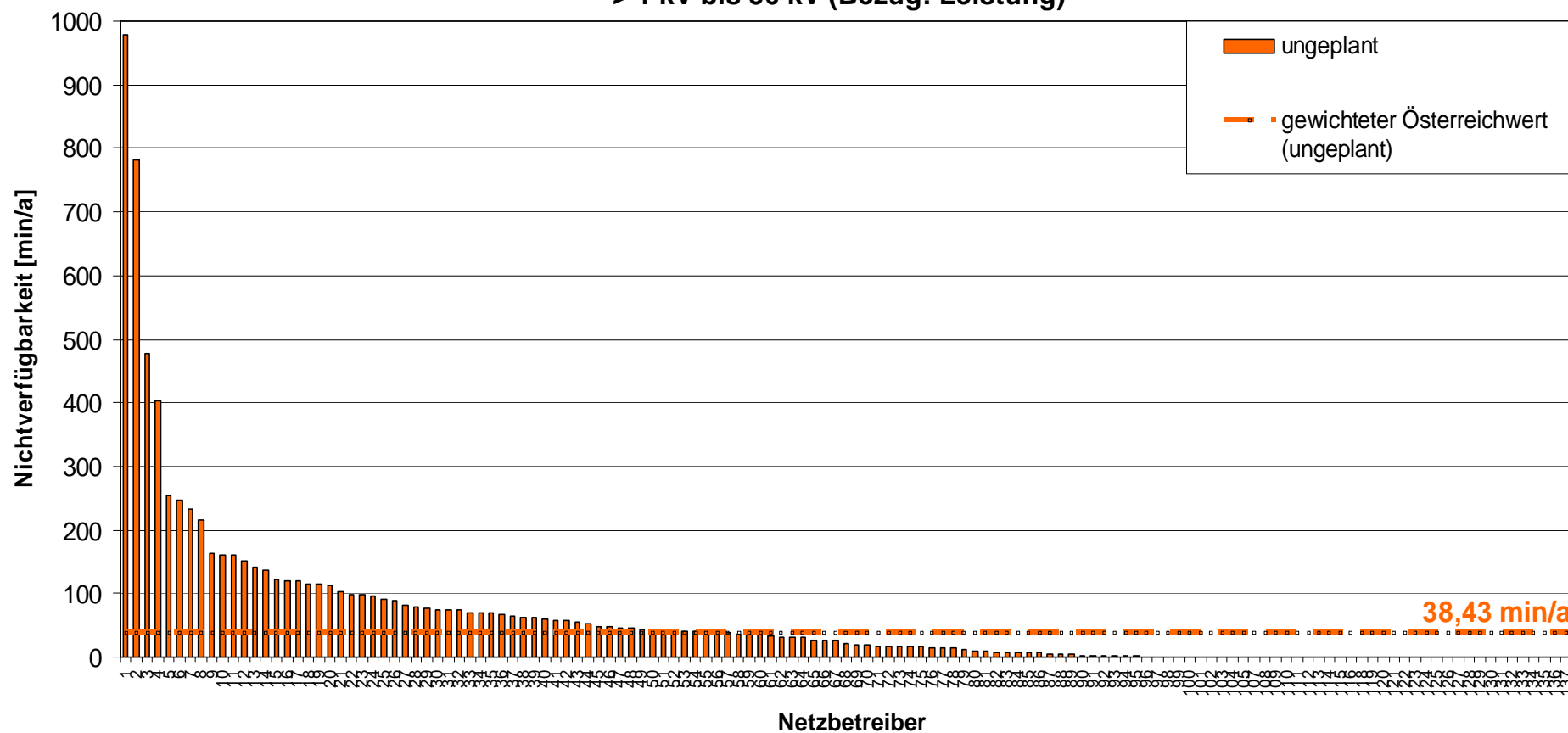


# Reliability – Statistics 2003 (www.e-control.at)



## 2003 SAIDI - System Average Interruption Duration Index

ungeplante Versorgungsunterbrechungen  
> 1 kV bis 36 kV (Bezug: Leistung)

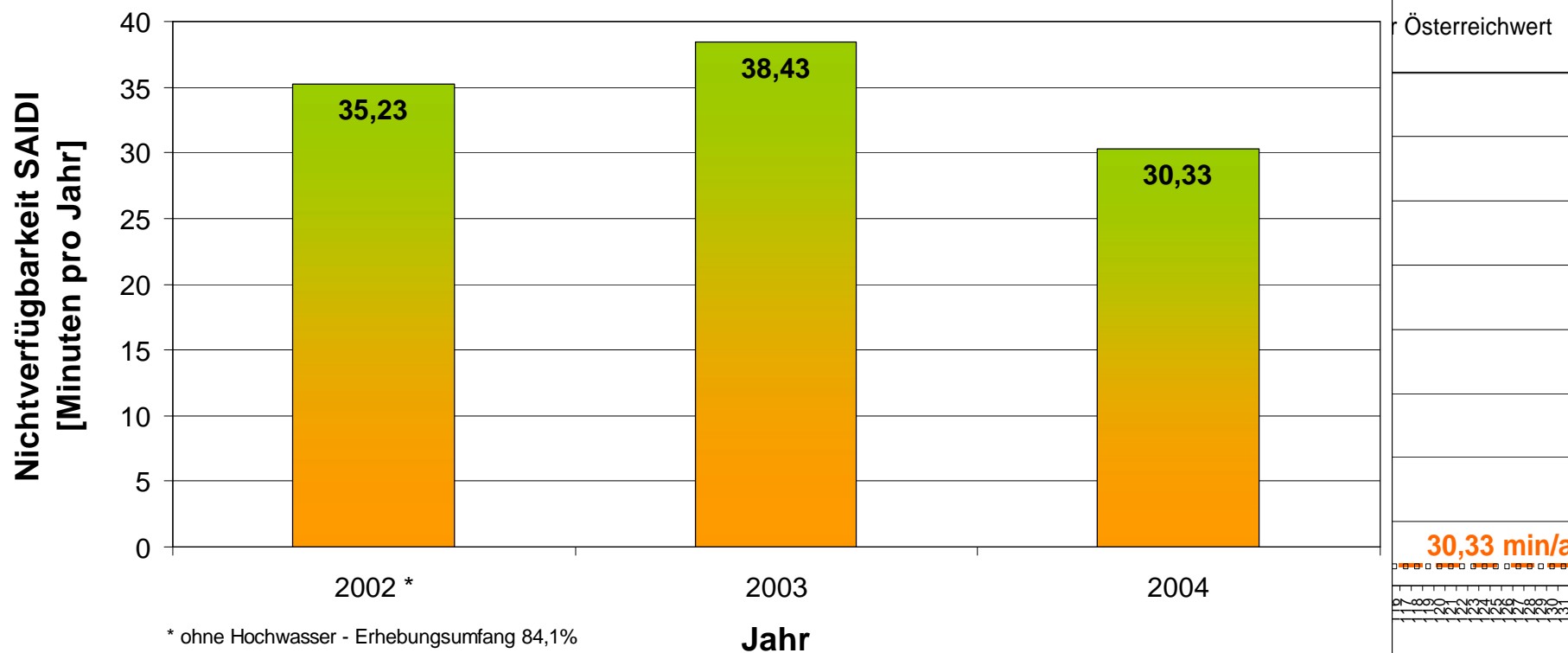


# Reliability – Statistics 2004 & Trends (www.e-control.at)

## Jährliche Nichtverfügbarkeit der Stromversorgung in Österreich



aufgrund von ungeplanten Versorgungsunterbrechungen im Mittelspannungsnetz  
(> 1 kV bis 36 kV; SAIDI - Bezug: Leistung)



# Power Quality - General

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- Definition of voltage standards by standardization bodies (agreement)
  - Definition of regulatory standards by regulatory authorities (consultation)
  - National and international benchmarking of PQ standards (harmonization)
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- Involving customers in the discussion
- Operational and planning standards
- Voltage quality monitoring and assessment

# PQ & Quality Regulation - Scope

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- PQ monitoring and assessment – initial considerations
  - ◆ Optimization of the metering points in terms of effort, resources, grid topology and customer structure
  - ◆ EN 50160 and beyond: voltage interruptions > 3 min.
  - ◆ Evaluation of grid parameters in dependence of voltage level and grid structure
  - ◆ Assessment of the equipment needed for completeness and coordination
- Quality Regulation
  - ◆ Reliability (input information – statistics)
  - ◆ Voltage quality (PQ) monitoring and assessment
  - ◆ Commercial quality

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- ◆ Quality Code

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# CEER Reports on QoS – PQ Regulation

TABLE 4.1 VOLTAGE QUALITY: COMPARISON OF PRESENT REGULATION						
	ITALY	NETHERLANDS	NORWAY	PORTUGAL	SPAIN	UNITED KINGDOM
Is voltage quality part of the regulation in your country?	YES	YES	NO	YES	YES	YES
Is voltage quality regulated on system level?	YES	YES	NO	YES	NO	YES
Is voltage quality regulated on individual level?	YES	YES	NO	YES	YES	YES
Is there a (financial) penalty when the standards are not met?	NO	NO	NO	NO	NO	YES
Does the voltage quality regulation apply uniformly in your country?	YES	YES	YES	YES	YES	YES
Is the voltage quality (also) regulated per region or zone?	NO	NO	NO	NO	NO	YES
Is the European standard EN 50160 imposed by regulation?	NO	YES	NO, Except for one level	YES	YES	NO
If yes, please indicate the voltage levels:		All levels	22 kV	Up to 45 kV	Up to 36 kV	
Is the voltage quality also regulated for voltage levels > 35 kV?	YES, partly	YES	NO	YES	YES	YES

Source: Second Benchmarking Report on Quality of Electricity Supply - CEER, September 2003



# CEER Reports on QoS – PQ Standards

1 - VOLTAGE QUALITY STANDARDS						
VOLTAGE QUALITY	ITALY	NETHERLANDS	NORWAY*	PORTUGAL*	SPAIN	UNITED KINGDOM
Frequency	EN 50160	EN 50160 with $f_c = \pm 1\%$ (99,5 % of the year)	Not regulated	EN 50160	EN 50160	$f_c = \pm 1\% f_n$
Voltage magnitude	EN 50160	EN 50160 with minor adjustments	22 kV; other levels: not regulated	$\leq 45$ kV: EN 50160; $> 45$ kV: $U_c = \pm 5\% U_n$	LV & MV: $U_c = \pm 7\% U_n$ $> MV$ : n.a.	LV (230V): $U_c = +10\% / -6\% U_n$ $> LV$ : $U_c = \pm 10\% U_n$
Fluctuations of voltage magnitude	EN 50160	EN 50160 with levels for 99,5% of the week	Not regulated	$U_c = \pm 5\%$	No explicit levels	No explicit levels
Voltage dips	Not yet regulated	EN 50160	Not regulated	$\leq 45$ kV: EN 50160; $> 45$ kV: n.a.	No explicit levels	No explicit levels
Temporary or transient overvoltages	Not yet regulated	EN 50160	Not regulated	Not regulated	No explicit levels	No explicit levels

Source: Second Benchmarking Report on Quality of Electricity Supply - CEER, September 2003

## CEER Reports on QoS – PQ Standards *(cont'd)*

VOLTAGE QUALITY	ITALY	NETHERLANDS	NORWAY*	PORTUGAL*	SPAIN	UNITED KINGDOM
Unbalance of three phase voltages	EN 50160	EN 50160 with levels for 99,5% of the week	Not regulated	≤45 kV: EN 50160; > 45 kV, indicative values: U <sub>L</sub> ≤2% (95% of the week, 10 min RMS)	No explicit levels	No explicit levels
Harmonic distortion of the voltage waveform	EN 50160	EN 50160 with levels for 99,5% of the week	Not regulated	≤45 kV: EN 50160; > 45 kV: indicative values	No explicit levels	THD < 5% at 275 and 400 kV, no explicit levels for lower voltages
Interharmonic voltages	Not regulated	Not regulated	Not regulated	Not regulated	No explicit levels	No explicit levels
Mains signalling voltage	EN 50160	EN 50160	Not regulated	Not regulated	No explicit levels	No explicit levels
DC components	Not regulated	Not regulated	Not regulated	Not regulated	No explicit levels	No explicit levels

Source: Second Benchmarking Report on Quality of Electricity Supply - CEER, September 2003





# CEER Report on Security of Supply

COUNTRY	NON DELIVERED ENERGY – CONCEPT, USAGE, VALUE		
Norway	Costs for non-delivered energy over 3 minutes (€= 8.4 NOK)		
	<b>In case of planned outages (notified)</b>		
	- Industrial	5,9	€/kWh
	- Trade and Service	8,7	€/kWh
	- Agricultural	1,9	€/kWh
	- Residential	0,9	€/kWh
	- Public sector	1,3	€/kWh
	- Wood and energy-intensive industries	1,4	€/kWh
	<b>In case of disturbances (non-notified)</b>		
	- Industrial	8,5	€/kWh
	- Trade and Service	12,7	€/kWh
	- Agricultural	1,3	€/kWh
	- Residential	1,0	€/kWh
	- Public sector	1,7	€/kWh
	- Wood and energy-intensive industries	1,7	€/kWh

NDE costs [€/kWh]

Quelle: CEER Report on Security of Electricity Supply 2004

# Thank you for your Attention !

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