

<p>Karlheinz Schwarz SCC, Karlsruhe (Germany) schwarz@scc-online.de</p>	<p>15th Power Systems Computation Conference PSCC August 22-26, 2005 Liège, Belgium</p> <p>Invited session Substation Automation, IEC 61850</p> <p>IEC 61850 – Also Outside the Substation for the Whole Electrical Power System</p>
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Content	<h2 style="text-align: center;">Content</h2> <ul style="list-style-type: none"> ■ Need for seamless process information exchange ■ IEC TC 57 (Power System Control) ■ IEC TC 88 (Wind Turbines) ■ Summary <div style="background-color: yellow; padding: 10px; text-align: center;"> Slides available: www.nettedautomation.com/news </div>
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	<h3 style="text-align: center;">Need for seamless process information exchange</h3> <ul style="list-style-type: none"> ■ Islands of information ■ Too many solutions ■ Need: One Standard
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Needs for Information Exchange	<h3 style="text-align: center;">Vision of UCA ... 1995</h3>
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Needs for Information Exchange	<h3 style="text-align: center;">Status ... 2005</h3>
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Needs for Information Exchange	<h3 style="text-align: center;">Reality ... 2006+</h3>
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IEC Standardization

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- TC 57 working groups
- TC 88 working group

IEC Standardization

Working Groups of TC 57 / TC 88

- **TC 57 (Power System Control)**
 - **WG10: Power system IED communication and associated data models (IEC 61850)** [IED – intelligent electronic device]
 - **WG17: Communication systems for distributed energy resources (DER)**
 - **WG18: Hydroelectric power plants – Communication for monitoring and control**
 - **WG 19: Interoperability within TC 57 in the long term**
- **TC 88 (Wind Turbines)**
 - **PT 25: Communications for monitoring and control of wind power plants (IEC 61400-25-1 to -5)**
 - **PT 25: Communications for monitoring and control of wind power plants – Condition monitoring (IEC 61400-25-6)**

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IEC Standardization

Current standardization activities (1)

- **IEC 61850 – Communication networks and systems in substations** [all 14 parts are standard]
 - maintenance of 14 parts
 - power quality monitoring information models (LN and data)
 - extensions for statistical and historical statistical data
- **IEC 61400-25 – Communications for monitoring and control of wind power plants** [1st CDV]
 - information models (LN and data)
 - mapping of ACSI (communication services as defined in IEC 61850-7-2) to web services
 - condition monitoring for wind turbines (LN and data)

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IEC Standardization

Current standardization activities (2)

- **IEC 62344 – Hydroelectric power plants - communication for monitoring and control** [1st CD]
 - information models (LN and data)
- **IEC 62350 – Communications Systems for Distributed Energy Resources (DER)** [1st CD]
 - information models (LN and data)
- **OpenAMI** (new US/CA project to specify information models for Advanced Metering and Demand Response); see below for details; <http://www.openami.org>
 - information models (LN and data)
- **UCA-International Usersgroup:** supporting organization for IEC 61850 and OpenAMI; <http://www.ucausersgroup.org>

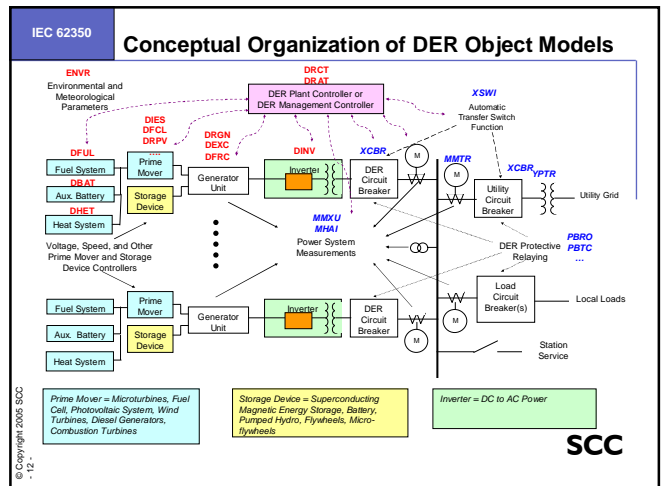
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IEC Standardization

Decentralized energy resources (DER)

- **IEC 62350 – Communication Systems for Distributed Energy Resources (DER)**
- **Start of project: Dec 2004**
- **1st committee draft**

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IEC 62350

Excerpt: Logical Node "DCIP" Reciprocating Engine

some 50 data


Configuration Settings			
DiesOwner	DOO	Owner and operator of device	O
DERLoc	GPS	GPS location of device	O
DiesFuel	ING	Type of fuel	O
DiesAvgCalFuel	ASG	Average calorie content of fuel	O
DiesMaxTurPres	ASG	Max turbine pressure	O
DiesMaxInletTemp	ASG	Max inlet temperature	O
DiesMaxOutTemp	ASG	Max outlet temperature	O
DiesMinSpeed	ASG	Min speed	O
DiesMaxSpeed	ASG	Max speed	O
DiesHeatRtCurves	CSD	Heat rate curves: From IEC 61850-7-3 Clause 7.9.4	O
DiesFuel	ING	Type of fuel used by diesel engine	O
Status Information			
DiesOnOff	SPS	Diesel is on or is off	M
DiesMode	INS	Operational or in test/off-line mode.	O
SpdDroop	SPS	Speed droop status: Disabled, enabled	O

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Wind power plants

- IEC 61400-25 – Communications for monitoring and control of wind power plants
- Start: 2001
- 1st committee draft for vote



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IEC 61400-25

Wind power plant specific logical nodes

1st CDV

- WTUR Wind turbine general information
- WMET Wind power plant meteorological information
- WAPC Wind power plant active power control information
- WRPC Wind power plant reactive power control information

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IEC 61400-25

Wind turbine specific logical nodes

1st CDV

- WTUR Wind turbine general information
- WROT Wind turbine rotor information
- WTRM Wind turbine transmission information
- WGEN Wind turbine generator information
- WCNV Wind turbine converter information
- WTRF Wind turbine transformer information
- WNAC Wind turbine nacelle information
- WYAW Wind turbine yawing information
- WTOW Wind turbine tower information
- WALM Wind turbine alarm information
- WSLG Wind turbine state log information
- WALG Wind turbine analogue log information
- WREP Wind turbine report information

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IEC 61400-25

Specific mappings of IEC 61850-7-x (61400-25-4)

- **ONE** mapping of information models and services defined in IEC 61850-8-1 to **MMS** (Manufacturing Message Specification, ISO 9506)
 - provides all C/S services
 - efficient and powerful (binary encoding; for machines!)
 - runs on TCP/IP and OSI Transport
- Definition and mapping to **web services** in IEC 61400-25-4:
 - provides all C/S services
 - inefficient (ASCII encoding; for human beings!?)
- Mapping to **IEC 60870-5-101** in IEC 61400-25-4:
 - provides a few basic master/slave services (read, event)
 - efficient serial communication for remote access

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Summary

Summary

- The standards IEC 61850, IEC 62350, IEC 62344, IEC 61400-25, ... define comprehensive **harmonized Information models**, appropriate **SCADA-Functions**, one **Configuration Language**, use **TCP/IP** and **web technology**
- **One standardized solution** for all application domains of the electric power delivery system
- Now is the time to apply IEC 61850 and its „companion“ standards **within** and **outside substations**
- **IEC 61850 and the extensions** under way are important contributions to **reducing the proliferation of solutions!!**
- For the electric power delivery system it is likely that we get a **unique standard for all applications for the next 20+ years**

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