Minutes of the IEEE PSES TSTC teleconference held Wednesday, July 27, 2016 at 11:00 AM EST, for one hour.

1. Attendance/Introductions

Members present: Don Gies (Nokia Bell Labs), Joe Randolph (Randolph Telecom), Anne Venetta-Richard (Nokia), Tom Smith (TJS Technical Services Inc), Jim Wiese (Adtran), Paul Ng (GE Energy), Dan Roman (Colgate-Palmolive), Svetlana Ulemek (Burndy)

Members absent: Al Martin (retired), Peter Lim (Alpha Technology), Philip Havens (Littelfuse), Gary Schrempp (Dell), Mick Maytum (MJMaytum), Ernie Gallo (Ericsson – Telcordia)

Interested parties (not present)
Tim Ardley (Adtran), Doug Parker (Adtran), Peter Tarver (Enphase Energy), Steve Zugay (Cree)

2. Meeting arrangements

Note that the bridge number has changed.

New Bridge No.:
(Toll Free-USA): +1 866 606 3804
(Toll Free -UK): 0800 026 0282
(Direct Dial USA) +1 404 891 5272
(Direct Dial - London) +44 20 7660 2135

Participant Passcode: 589 138 2663

3. Previous meeting minutes

The minutes of the June meeting were reviewed and approved.

4. Power Supply Standards Affecting Telecom - Paul Ng

Paul gave a presentations on Low Voltage DC Power Interfaces <1000 V and on the IEC Technical Committee TC22 scope and power supply standards. The presentations are attached.

Paul's presentations were well received, and we thank him for sharing this information with us.

5. New business

Ernie Gallo-Ericsson Telcordia has joined the TSTC.

Jim Wiese has joined the ANSI/US Technical Advisory Group for IEC TC108.

Don Gies has joined ATIS – STEP.

6. Additional agenda items

a. AC Power Over Coaxial Cabling –

Jim Wiese had asked how the standards IEC 60950-1 and IEC 62368-1, -3 handle AC power via utility coaxial cable

Don – Several members of TC108 working groups have proposed it be added to IEC 62368-3, but the response from TC108 was that it was not in the scope of IEC 62368-3 (The standard only covers DC powering over ICT cabling, and serves a general practice standard for other industries to refer to).

AC power over coaxial cabling is handled by the base standard IEC 62368-1.

ES3 to ES1 separation still required.

Coaxial connector may need to be evaluated using standard because few coaxial connectors are certified.

US and Canadian Electrical Codes have requirements for AC power over coaxial cabling.

Jim- What about the rules for coaxial cable connections?

Don- Use hazard-based analysis to separate/isolate incoming AC power.

Applying rules for coaxial cable system would be “prescriptive”.

7. Old Business

None

Next meeting

Proposed Wednesday, 28 September 2016.
Note: No meeting in August 2016

Respectfully submitted
Don Gies, Chairman

Low Voltage DC Power Interfaces

< 1000Vdc
e.g. 380Vdc

Scope

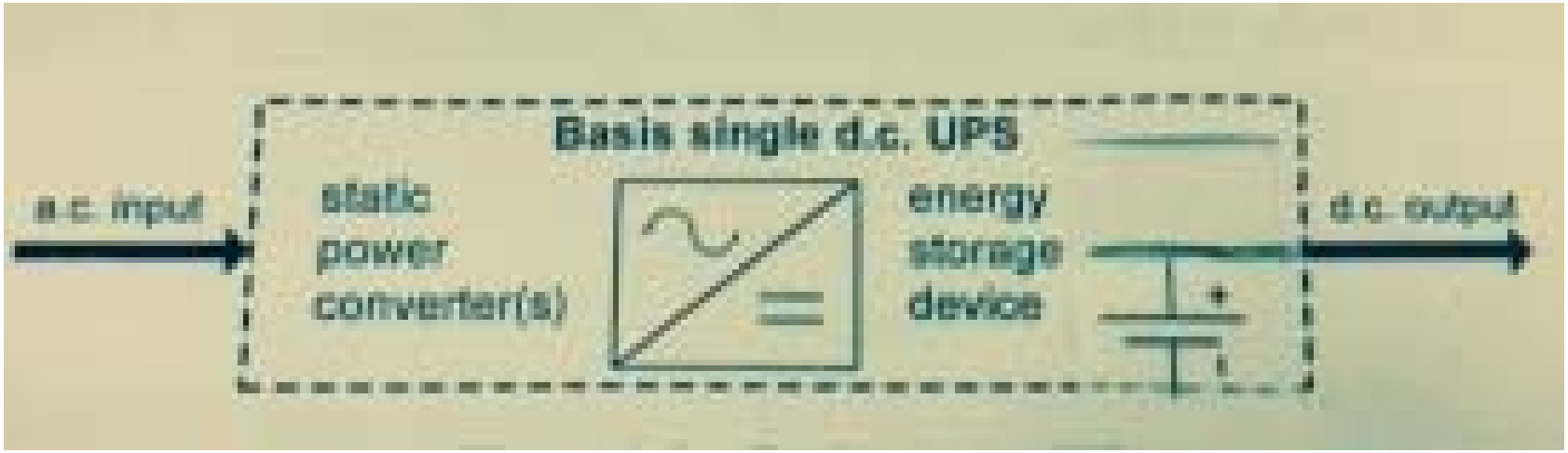
- IEC Strategy to tie all the ECO DC technologies together
- IEC committees TC22, SC22E, SC22H
- High level only – for contribution, sign up with US TAG
- Go over safety considerations

Two Technologies

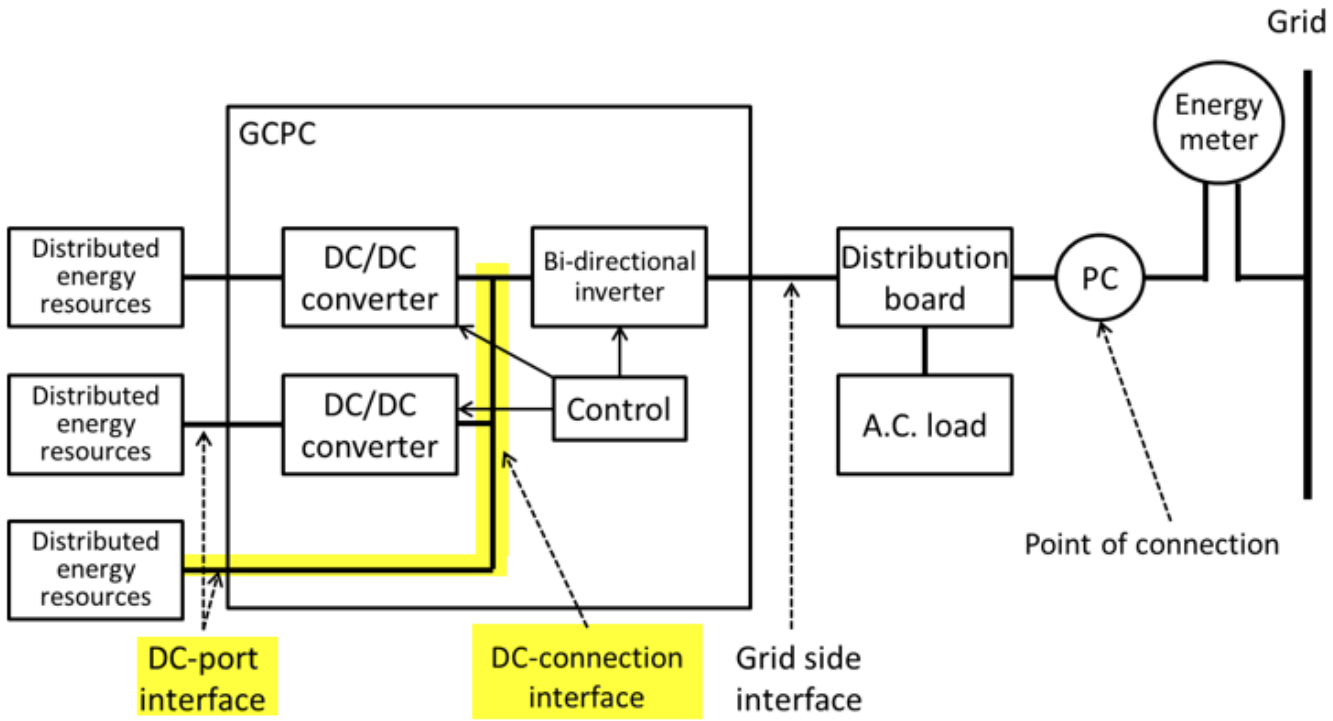
- DC UPS
- Bi-Directional Grid Connected Inverters

DC UPS (IEC62040-5-X)

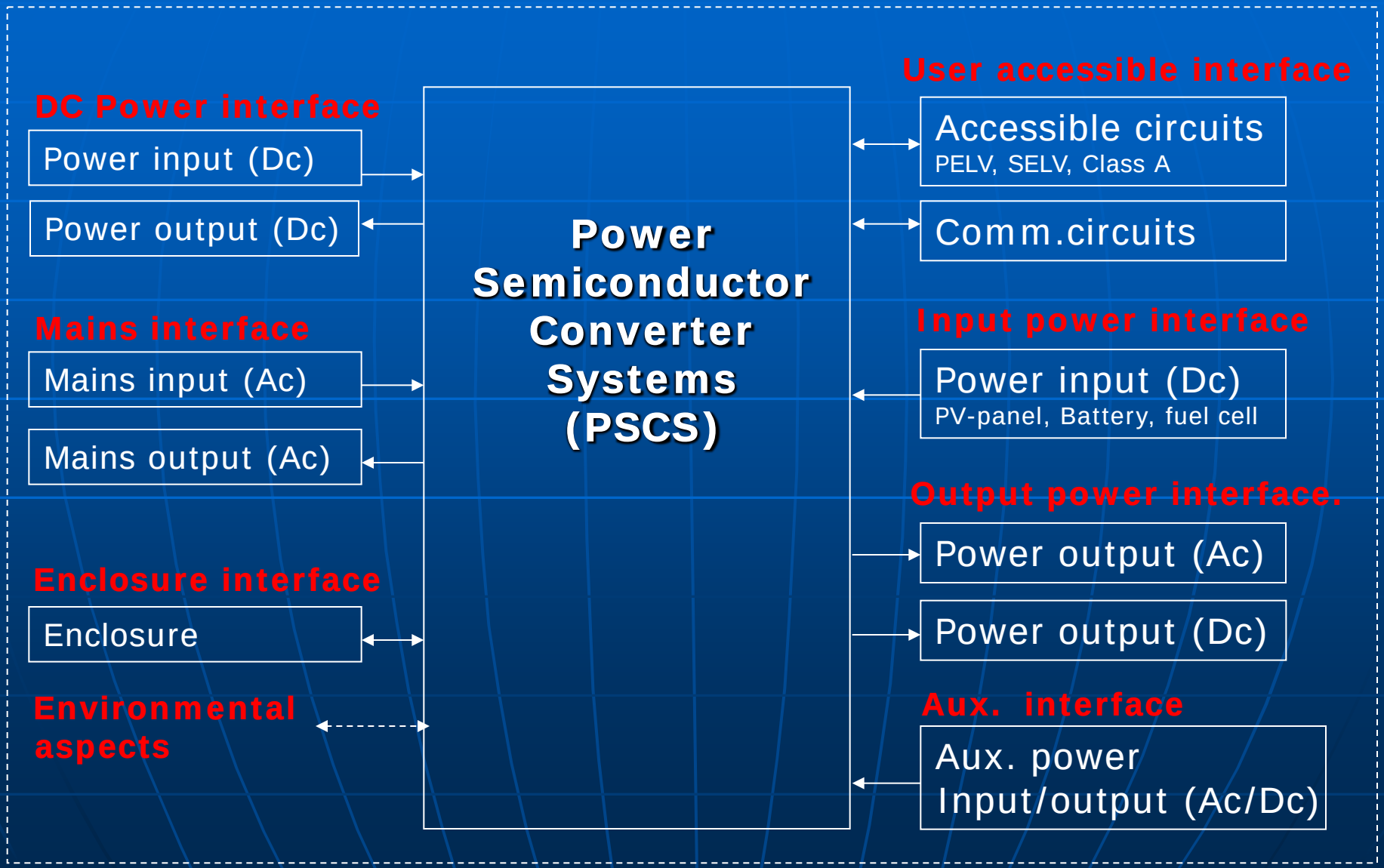
- Converts AC(single or three phase) to DC (i.e. 380Vdc nominal)
- Contains an energy storage component



Bi-directional Grid Converter - IEC62909-X -



Important safety aspects



Important safety aspects

Important product safety standards to consider:

TC22 Power electronic systems and equipment

- IEC61800-5-1: Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy.
- IEC62040-1: Uninterruptible power systems (UPS) - Part 1: General and Safety requirements.
- IEC62103: Electronic equipment for use in power installations
- IEC61204-7: Low-voltage power supplies, dc output - Part 7: Safety requirements.
- IEC62310-1: Static transfer switch systems – Part 1 safety

Important safety aspects

Important product safety standards to consider:

TC82 Solar photovoltaic energy systems:

- CD/IEC62109-1: Safety of power converters for use in photovoltaic power systems – part 1:general requirements.
- CD/IEC62109-2: Safety of power converters for use in photovoltaic power systems - Part 2: Particular requirements for inverters.

TC88 Wind turbines:

- IEC 61400-1: Wind turbines - Part 1: Design requirements.
- IEC 61400-2: Wind turbines - Part 2: Design requirements for small wind turbines.

Important safety aspects

Important product safety standards to consider:

TC105 Fuel cell technologies:

- IEC 62282-2: Fuel cell technologies - Part 2: Fuel cell modules
- IEC 62282-3-1: Fuel cell technologies - Part 3-1: Stationary fuel cell power systems – Safety
- IEC 62282-5-1: Fuel cell technologies - Part 5-1: Portable fuel cell power systems – Safety
- IEC 62282-6-1: Micro fuel cell power systems – part 6-1 - Safety

Important safety aspects

Important product safety standards to consider:

TC66 Safety of measuring, control and laboratory equipment:

- IEC61010: Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements.

TC108 Safety of electronic equipment within the field of audio/video information technology and communication tech.

- IEC60950: Information technology equipment - Safety - Part 1: General requirements.

TC44 Safety of machinery – Electro technical aspects:

- IEC60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements

Important safety aspects

Other important safety standards to consider:

TC64 Electrical installations and protection against electric shock.

- IEC60364-X Electrical installations of buildings

Important safety aspects

Important horizontal safety standards to consider:

• IEC60664-1	Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests.
• IEC60664-3	Insulation coordination for equipment within low-voltage systems – Part 4: Consideration of high-frequency voltage
• IEC60664-4	Insulation coordination for equipment within low-voltage systems – Part 4: Consideration of high-frequency voltage stress
• IEC60529	Degrees of protection provided by enclosures (IP Code)
• IEC61201	Touch voltage threshold values for protection against electric shock
• IEC61140	Protection against electric shock – Common aspects for installation and equipment
• IEC60990	Methods of measurement of touch current and protective conductor current
• IEC61032	Protection of persons and equipment by enclosure – Probes for verification

Important safety aspects

Important horizontal standards to consider:

- IEC60721-X-X Classification of environmental conditions
- IEC60068-2-X Environmental testing – Part 2: testing

Important safety aspects

Important documents to consider:

- IEC guide 104 — The preparation of safety publication and the use of basic safety publications and group safety publications.

  Annex A: Safety aspects relating to electrical equipment.
  Annex B: Horizontal safety functions at present assigned.
  Annex C: Group safety function at present assigned.

Important safety aspects

Insulation coordination:

- **Circuit designation.**
  - Class A,B,C and ELV / PELV / SELV. (IEC61201, IEC60364-1)
  - System networks (TN, IT etc.) (IEC60364-1)

- **Non-mains input/output.** (CD2 IEC62109-1, IEC62040-1-1)
  - Limited short circuit capability. O.V. catagory,
  - Multiple supply,
  - Short circuit.
  - Battery considerations

Important safety aspects

Insulation co-ordination:

- **Environmental conditions**
  - WET location (IEC61201, 64/1462/NP, IEC61010-1)
  - Temperature, humidity, Dust, vibration (IEC60723-3-3)
  - Enclosure protection, (IEC61010-1)
    - (Light) Industry-household,
    - (non) professional.

- **Protection against fire.**
  - Functional insulation

- **Protection against direct contact**
  - Clearance, creepage and solid insulation (O.V. cat., poll. Degree) (IEC60664-1)
  - Coating, potting and multilayer (IEC60664-3)
  - HF consideration above 30KHz(IEC60664-4)
  - Basic, suppl., double, and reinforced insulation. (IEC60664-X)
  - Clearance for high altitude, >2000m, (IEC60664-1)
  - Over Voltage transient protection. (IEC61643-X)
  - Temporary overvoltages (IEC60664-1)
  - Accessibility and IP classification (IEC60529, IEC61032)

Important safety aspects

Insulation coordination:

- **Protection in case of direct contact**
  - ELV/PELV/SELV/Class A, (IEC61201, IEC61140, IEC60364-1, 64/1503/CD)
    - Multiple circuits consideration
    - Normal and single fault condition
  - Limited voltage, current and energy consideration. (IEC61140)
  - Stored charge consideration. (IEC61140)

- **Protection against indirect contact**
  - Class I Protective bonding,
    - touch current (IEC61140, IEC60990, 64/1503/CD)
  - Class II (Reinforced /double insulation) (IEC61140)
  - Class III (PELV) (IEC61140)

- **Measures for extra protection**
  - RCD/RCDM, (IEC60755)
  - Restricted access.

Important safety aspects

Safety critical components.

- **Protective separation.** (IEC61140, IEC60950)
- **Insulation materials.**
- **X/Y capacitors.** (IEC60950, IEC60384-14, IEC60940)

Connectors, wires

- **Fix connected equipment.**
- **Plug connected equipment.**
- **Portable equipment**
- **Industrial connectors** (IEC60309, Nema ??)
- **Household connectors** (IEC60309, Nema ??)
- **Application specific connector**

Enclosure

- **Polymeric plastic / metallic enclosure**

Cooling systems:

- **Air or liquid cooling systems**
  - **Blocked filter.**
  - **Leakage of coolant.**

Important safety aspects

Test requirement

- **Type, routine and sample test consideration.**
- **Visual inspection**
- **Mechanical test**
  - Clearance and creepage distances (IEC60664-X)
  - PWB short circuit
  - Enclosure integrity (IEC60529, IEC61032)
  - Deformation test
  - Deflection test
  - Impact test
  - Etc.

Important safety aspects

Test requirement

- **Electrical test**
  - Impulse voltage (IEC60664-1, IEC60060-1)
  - ac/dc high voltage test (IEC60664-1, IEC61180-1)
  - Partial discharge test (IEC60664-1)
  - Protective impedance (IEC61201)
  - Touch current (IEC60990)
  - Short circuit test (Ph-Ph, PH-PE)
  - Break down of component.
  - Capacitor discharge (IEC61201)
  - Temperature rise (Incl. derating characteristic)
  - Protective bonding (IEC????)
  - Inrush current test
  - Backfeed power test (Dual supply from aux. sources)
  - Etc.

Important safety aspects

Test requirement

- **Abnormal operation test**
  - Loss of phase
  - Loss of Neutral conductor.
  - Inoperative blower
  - Clogged filter
  - Loss of coolant
  - Etc.

- **Material test**
  - High current ignition test
  - Glow wire (IEC60695-2-10/13)
  - Hot wire ignition
  - Flammability (IEC60707 / 60695-11-20)
  - Etc.

Important safety aspects

Test requirement

- **Environmental test**
  - Dry heat test (IEC60068-2-2)
  - Damp heat test (IEC60068-2-78)
  - Vibration test (IEC60068-2-6)
  - Hydrostatic presure
  - Transportation test (IEC60721-3-2) (Battery, coolant etc.)
  - Etc.

Scope of IEC62477 acc. to 22/113NP

This International standard relates to products that include power semiconductor converters (PSC), with a rated system voltage not exceeding 1000Vac or 1500Vdc.

The objectives of this standard are to:

- establish a common basis for safety requirements for products that contain power semiconductor converters.
- establish a common terminology for aspects relating to power semiconductor converter systems (PSCS).
- specify requirements intended to reduce risks of fire, electric shock, thermal and energy hazards and other safety issues, except functional safety, for the operator and layman who may come into contact with the equipment and, where specifically stated, for service and maintenance personnel.
- reduce such risks with respect to installed equipment, whether it consists of a system of interconnected units or independent units, subject to installing, operating and maintaining the equipment in the manner prescribed by the manufacturer.

This standard is intended to be used:

- for reference by product standards or,
- as minimum requirements for the safety aspects of PSCS in apparatus for which no product standard exists.
- Note: Considerations from TC22 PT5 are needed regarding potential exclusion of certain products.