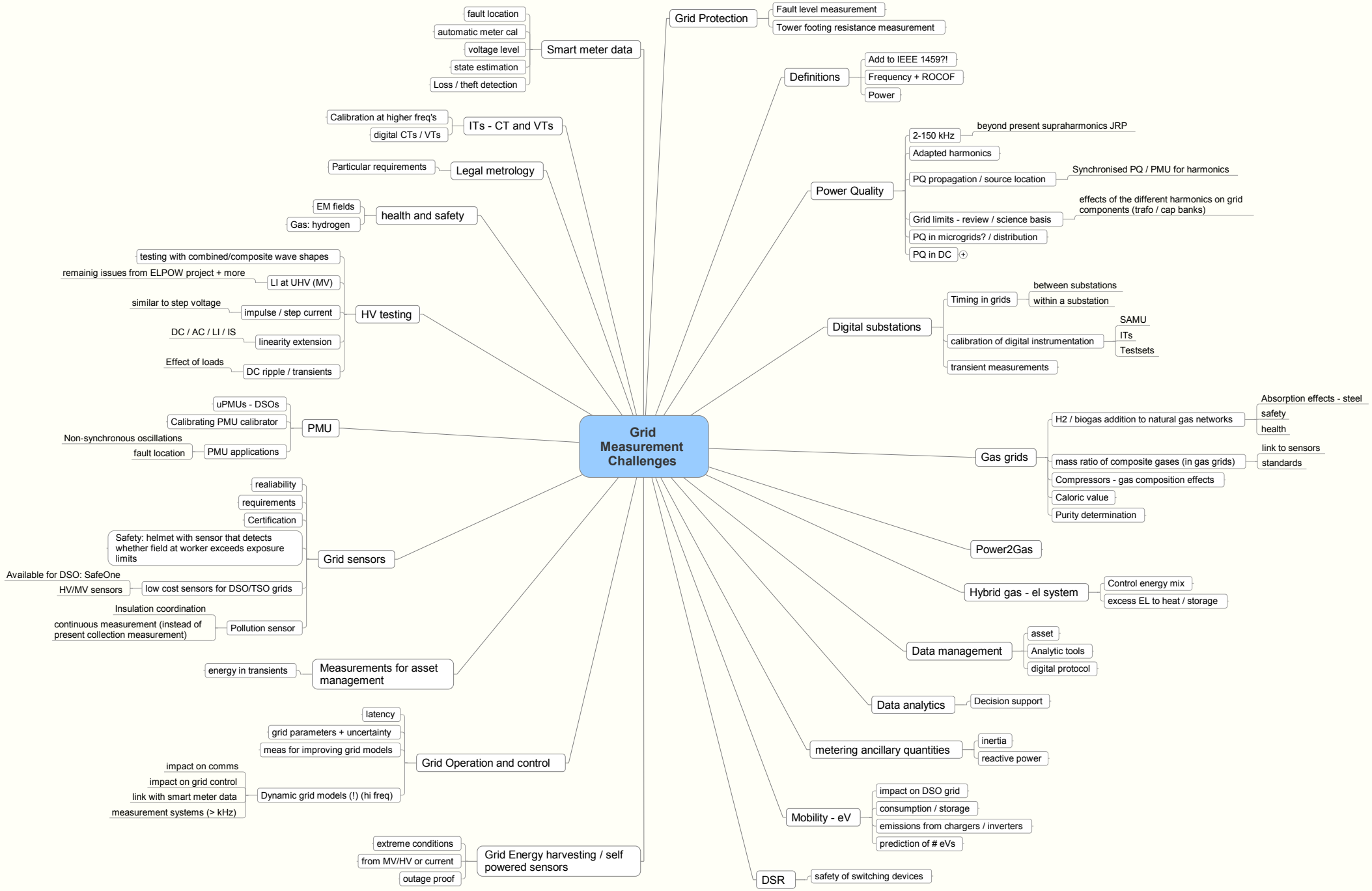
Grid Measurement Challenges
Smart meter data
fault location
automatic meter cal
voltage level
state estimation
Loss / theft detection
ITs - CT and VTs
Calibration at higher freq's
digital CTs / VTs
Legal metrology
Particular requirements
health and safety
EM fields
Gas: hydrogen
HV testing
testing with combined/composite wave shapes
remainig issues from ELPOW project + more
LI at UHV (MV)
similar to step voltage
impulse / step current
DC / AC / LI / IS
linearity extension
Effect of loads
DC ripple / transients
PMU
uPMUs - DSOs
Calibrating PMU calibrator
Non-synchronous oscillations
fault location
PMU applications
Grid sensors
realiability
requirements
Certification
Safety: helmet with sensor that detects whether field at worker exceeds exposure limits
Available for DSO: SafeOne
HV/MV sensors
low cost sensors for DSO/TSO grids
Insulation coordination
continuous measurement (instead of present collection measurement)
Pollution sensor
Measurements for asset management
energy in transients
Grid Operation and control
latency
grid parameters + uncertainty
meas for improving grid models
Dynamic grid models (!) (hi freq)
impact on comms
impact on grid control
link with smart meter data
measurement systems (> kHz)
Grid Energy harvesting / self powered sensors
extreme conditions
from MV/HV or current
outage proof
Grid Protection
Fault level measurement
Tower footing resistance measurement
Definitions
Add to IEEE 1459?!
Frequency + ROCOF
Power
Power Quality
2-150 kHz
beyond present supraharmonics JRP
Adapted harmonics
PQ propagation / source location
Synchronised PQ / PMU for harmonics
Grid limits - review / science basis
effects of the different harmonics on grid components (trafo / cap banks)
PQ in microgrids? / distribution
PQ in DC
Digital substations
Timing in grids
between substations
within a substation
calibration of digital instrumentation
SAMU
ITs
Testsets
transient measurements
Gas grids
H2 / biogas addition to natural gas networks
Absorption effects - steel
safety
health
mass ratio of composite gases (in gas grids)
link to sensors
standards
Compressors - gas composition effects
Caloric value
Purity determination
Power2Gas
Hybrid gas - el system
Control energy mix
excess EL to heat / storage
Data management
asset
Analytic tools
digital protocol
Data analytics
Decision support
metering ancillary quantities
inertia
reactive power
Mobility - eV
impact on DSO grid
consumption / storage
emissions from chargers / inverters
prediction of # eVs
DSR
safety of switching devices