

Overview of IEC standards activities on LVDC for electricity access

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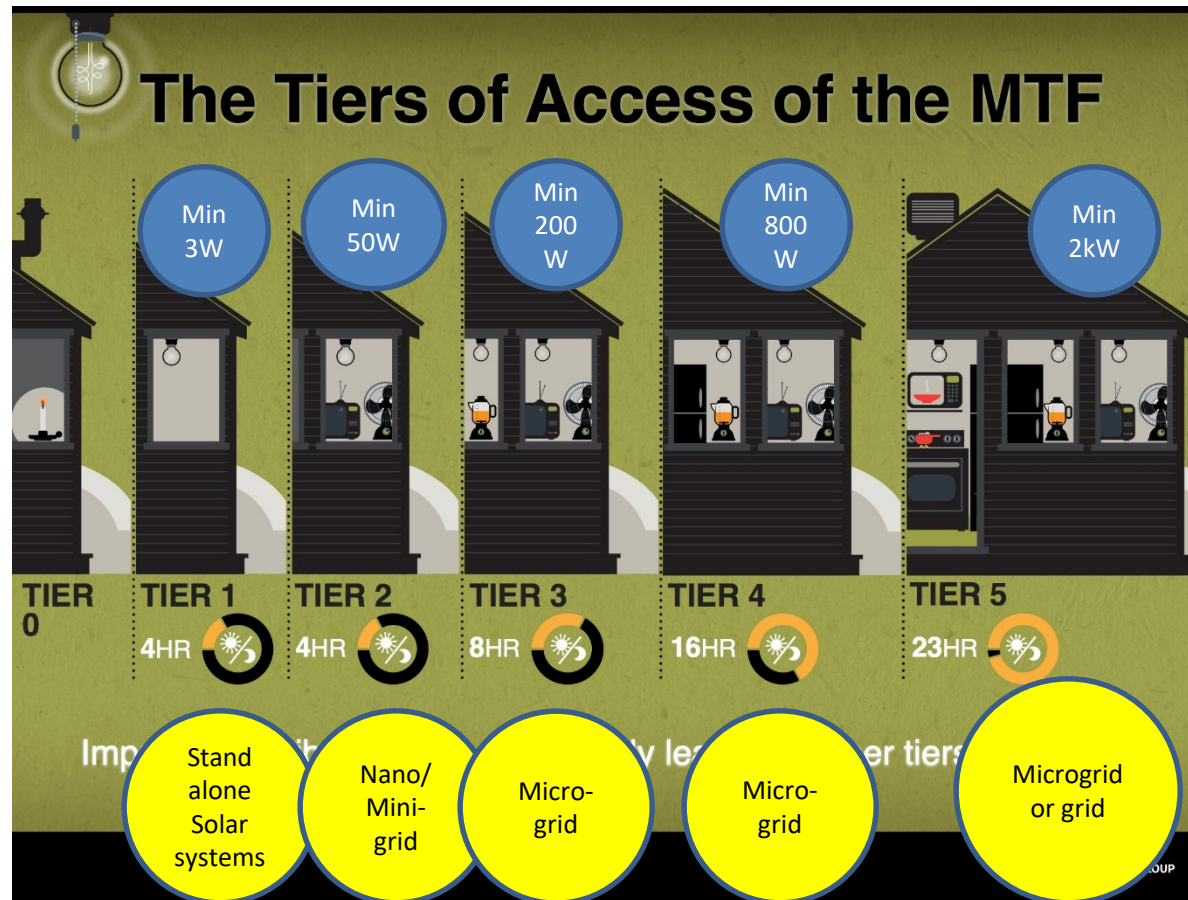
Overview

- Introduction to electricity access
- How can DC infrastructure help?
- Challenges with LVDC for electricity access
- Standards for LVDC
- Overview of IEC work relevant to LVDC

What is electricity access?

- Electricity is a key driver for better economy, improved education and healthcare, and reduced poverty
- But... over 1.2. billion people are without access to electricity

What is electricity access?



World Bank five classes multi-tiers electricity access definition

<http://www.worldbank.org/en/topic/energy/publication/energy-access-redefined>

How can DC infrastructure help?

- Small scale off-grid installation is more feasible than grid extension for electricity access based on local resources
- PVs cost is declining and making significant changes in electricity access
- PVs generate DC and loads such as LED lighting requires DC supply
- “LVDC bridges the gaps between the solar photovoltaic (PV) generation and the consumption devices in the home”
- No synchronisation issue and easier to control
- Reduced conversion stages between sources and loads
- More connection with LVDC, higher tiers of energy access can be achieved



> 3.9 million solar home systems have been installed in Bangladesh



41million household in India to be electrified to meet 2019 universal electrification target

40GW solar power generation by 2022

LVDC for electricity access: opportunity and standards, LVDC International Conf. May 2018, Hangzhou, China

Challenges with LVDC

- LVDC is still considered as a highly disruptive technology
- LVDC needs to be safe and reliable, at least to the same extent as AC systems
- There is still a lack of standards, with no consensus on DC voltages, earthing for islanded microgrid arrangements, protection solutions, plugs, sockets, etc.

Standards for LVDC

- The standards will help to make LVDC technology safe for different applications
 - Inc. rural electrification, data centres, offices, last mile, etc.
- IEC has almost 30 TCs which may need to be modified to include DC
 - Allows the use of existing AC standards and knowledge relevant to DC
 - Requires systems level standards to cover all aspects relevant to DC products and systems

Standards for LVDC

- Nov'14
 - IEC Systems Evaluation Group (SEG4) established to evaluate LVDC applications, distribution & safety for developed and developing economies
- 2016
 - SEG4 concludes: “a very large number of publications, issued by over 30 IEC TCs, are concerned and will need updating” to include requirements for DC
- Feb'17
 - IEC Standardisation Management Board (SMB) established a new Systems Committee on LVDC & LVDC for Electricity Access.

Standards for LVDC

IEC LVDC Systems Committee

To provide technical foundation and guidance of LVDC systems in developed and developing countries

<http://www.iec.ch/lvdc/>

Coordination Advisory Group (CAG1)

- LVDC markets and use cases review for Standards
- Recommendations on industry needs for standardization
- Highlight areas for future cooperation with external stakeholders
- Promoting IEC LVDC work and Standards.

Coordination Advisory Group (CAG2)

- Responsible for internal coordination and implementation of the work carried out by different TCs and subcommittees.

Working Group1

- LVDC publications for electricity access



<https://ieccetech.org/issue/2016-08/Standardization-can-help-millions-access-electricity>

<https://www.esi-africa.com/electricity-access/>

Overview of IEC work relevant to LVDC

Existing IEC TCs effort relevant to DC

- IEC TC 82: Solar PV energy systems (develop standards and publications for PV systems including power converters and inverters & and recommendations for solar PV in rural decentralised electrification (IEC 62257 series))
- IEC TC 20: Electric cables, prepare standards for the design, testing for power cables and their accessories
- IEC TC 22: Power electronic systems and equipment, including DC converters
- IEC TC 8: Systems aspects for electrical energy supply
- IEC TC 64: Protection against electric shocks
- IEC TC 23: Electrical accessories: AC&DC operation
- IEC TC 32: Fuses

Overview of IEC work relevant to LVDC

Work in progress

- IEC TC 64:
 - PT 101, Application Guide: Residential electrical installation in direct current not intended to be connected to Public Distribution Network
 - IEC 60364-41 to introduce DC RCD
 - IEC 60364-42 to improve requirements for preventing the risk of fire
 - IEC 60364-43 to improve short circuit calculations
 - IEC 60364-5-54 on requirements to prevent corrosions
- IEC/TS63053 RCD for DC application
- IEC 60898-3 Circuit Breakers for DC application

Summary

- LVDC has the potential to accelerate electricity access by **providing a modular infrastructure** to scalably connect PV, storage, and loads
- There are many devices that work with DC, **but standards on interfacing DC supplies are missing**
- No standards are available for LVDC for electricity access yet.

But

- A number of IEC TCs deal with areas relevant to LVDC in their current scope, **and greater effort from different stakeholders is now required** to promote relevant solutions