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PANEL DISCUSSION

5 March 2020

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DC in the home

P2030.10.1 Working Group

Standard for Electricity Access

Standard for Electricity Access Requirements with Safety Extra Low Voltage (SELV) DC for Tier ll and Tier lll of Energy Sector Management Assistance Program (ESMAP) Multi-tier Framework for Household Electricity Supply

- **Distribution Standard**
- **Simple**
- **Easy to adopt**
- **Safe, even for first time users of electricity**
- **Sustainable**
- **Scalable**

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Objective and Scope

- **Spans power delivery from 50W to 800W**
- **Standard should not limit source and storage capacity**
- **Should be scalable so that a small system at the outset can be scaled later**
- **Should follow a similar approach as AC to the extent possible**
- **Addresses concerns regarding sustainability, maintenance and repair, availability of spares by default**

Multi-tier Matrix for Measuring Access to Household Electricity Supply

ATTRIBUTES			TIER 0	TIER 1	TIER 2	TIER 3	TIER 4	TIER 5
	1. Peak Capacity	Power capacity ratings[28] (in W or daily Wh)		Min 3 W	Min 50 W	Min 200 W	Min 800 W	Min 2 kW
				Min 12 Wh	Min 200 Wh	Min 1.0 kWh	Min 3.4 kWh	Min 8.2 kWh
		OR Services		Lighting of 1,000 lmhr/ day	Electrical lighting, air circulation, television, and phone charging are possible			
	2. Availability (Duration)	Hours per day		Min 4 hrs	Min 4 hrs	Min 8 hrs	Min 16 hrs	Min 23 hrs
		Hours per evening		Min 1 hr	Min 2 hrs	Min 3 hrs	Min 4 hrs	Min 4 hrs
	3. Reliability						Max 14 disruptions per week	Max 3 disruptions per week of total duration <2 hrs
	4. Quality						Voltage problems do not affect the use of desired appliances	
	5. Afford-ability					Cost of a standard consumption package of 365 kWh/year < 5% of household income		
	6. Legality						Bill is paid to the utility, pre-paid card seller, or authorized representative	
	7. Health & Safety						Absence of past accidents and perception of high risk in the future	

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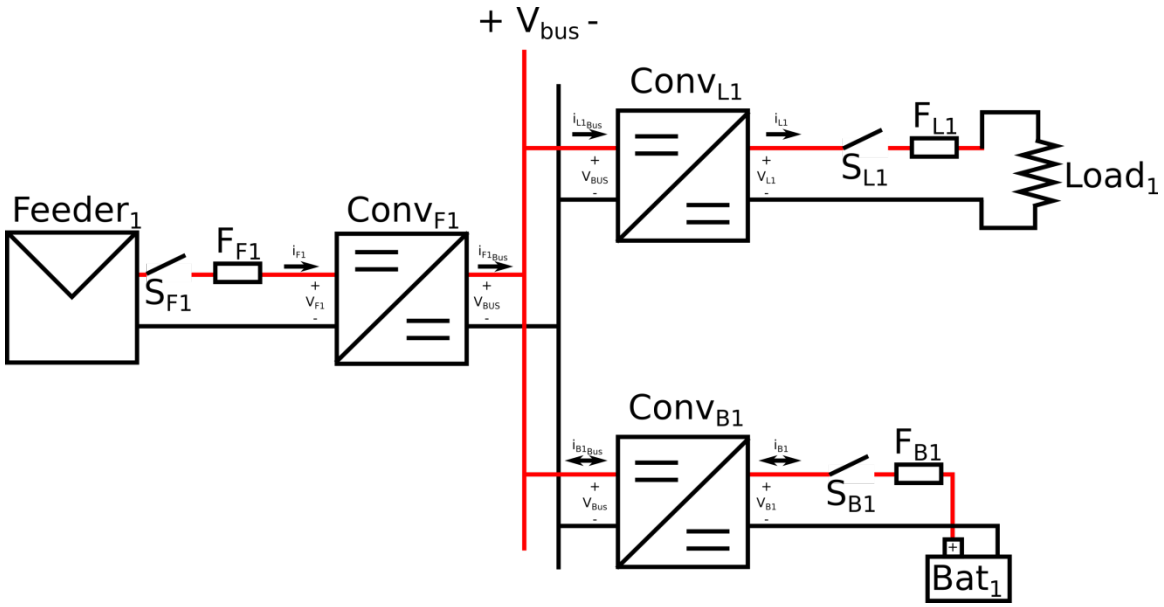
Architecture

- **Defines a distribution bus**
- **Sources, storage and loads are connected to this bus**
- **Allows use of DC-DC converters to enable connection to common bus**
- **Protection devices are also represented**



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Salient Provisions

Voltage

- **48V Nominal**
  - **Voltage Range 36-52V (Harmonised with ISO 21780 and P2030.10)**
  - **52-58V - Temporary Over Voltage Condition**

Current

- **Current per circuit 5A (so that arc can extinguish)**
- **Multiple circuits can be used in a distribution (like AC)**

Polarity to be observed

Overcurrent protection only for sources and batteries. Load side not typically required

Earthing - No requirement for earthing conductor. Both positive and negative shall be isolated from earth

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Projected Benefits

- **Access to Finance**
- **Easy Electrification, Electricity for all**
- **Scalable**
- **Inherently safe in most environments**
- **Sustainable**
    - **Repair and Reuse**
- **Custom business models, generate local entrepreneurship**
- **Leverage products from large-scale markets like batteries from automotive, wires from AC eco-system, etc…**

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Going Beyond

DC appliances inherently energy efficient than their AC counterparts

- **LED Lights**
- **BLDC Fans**
- **Induction cooktops**
- **Refrigerator**
- **Chillers**
- **….**

But in order to perform well, management is needed - source, load and storage. For best utilisation, some kind of an autonomous demand response would be needed or user-orchestrated demand response

Local computing capability that can payback itself

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Energy Efficiency and Demand Response

P2030.10.2

- **IoT extension of P2030.10.1**
- **Energy efficiency**
- **Demand Response**
- **Creation of a nano-grid (??)**

Uses three computing elements

- **Small, low-cost local computer**
- **Consumer's mobile phone**
- **Cloud**

THANK YOU

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