



What power electronics topologies are needed to achieve the Session 1 vision?

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# Applications, Drivers and Topologies

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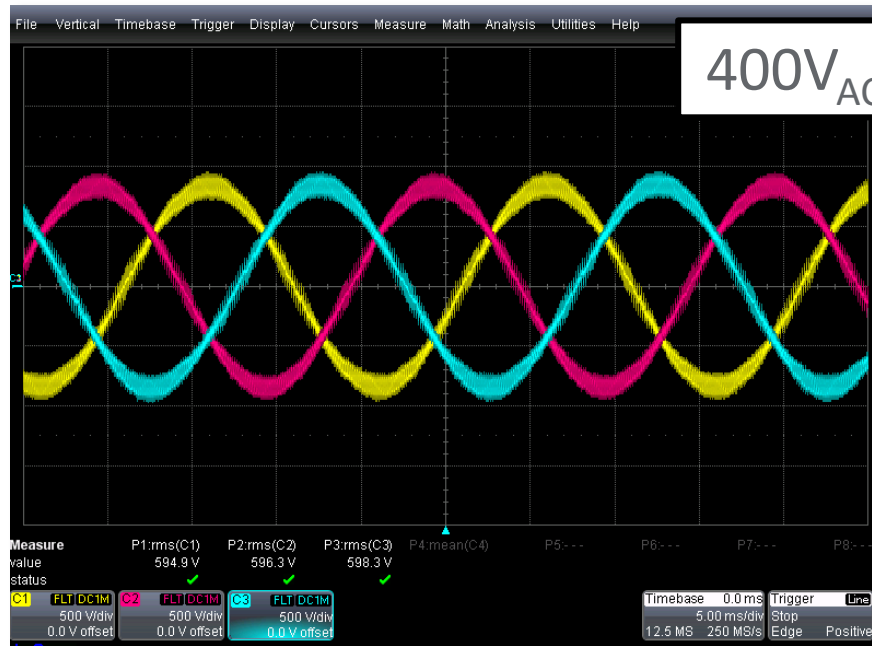
- Integration of renewables, energy storage, electric transportation
- Minimizing system cost and maximizing system efficiency
- Medium voltage architectures
  - AC architectures with SST
  - MVDC - Solar, Ship-board Power enabled by SST
- Topologies with high-frequency switching
  - Wide-bandgap devices
  - SST topologies with soft-switching
- Topologies with low-frequency switching
  - Traditional multi-level topologies
  - Modular Multi-level Converter
  - Multipulse converter



# SiC-Enabled Simple 2L Architecture

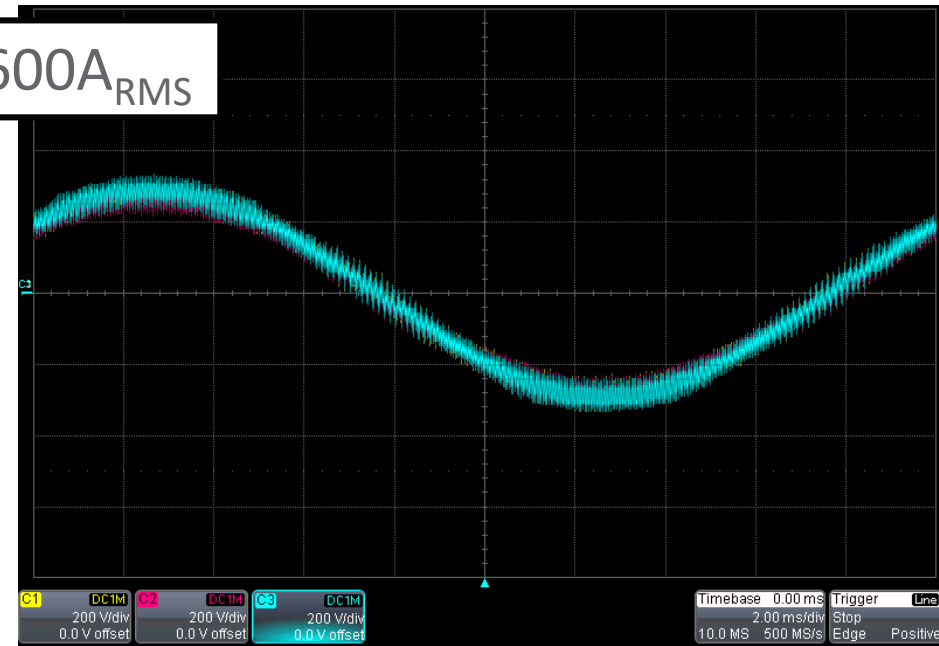
SiC Power Block delivers clean waveforms @ 99% efficiency

Three Phase Output Currents



Fsw = 8kHz → low switching ripple

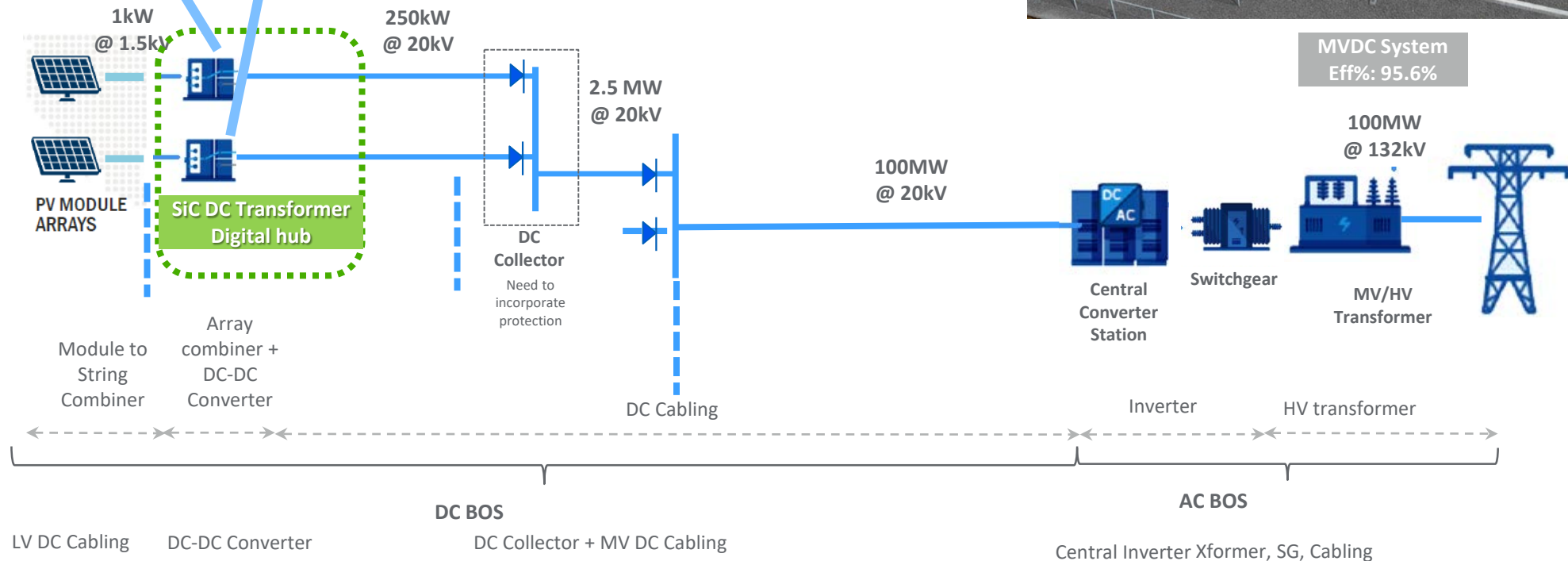
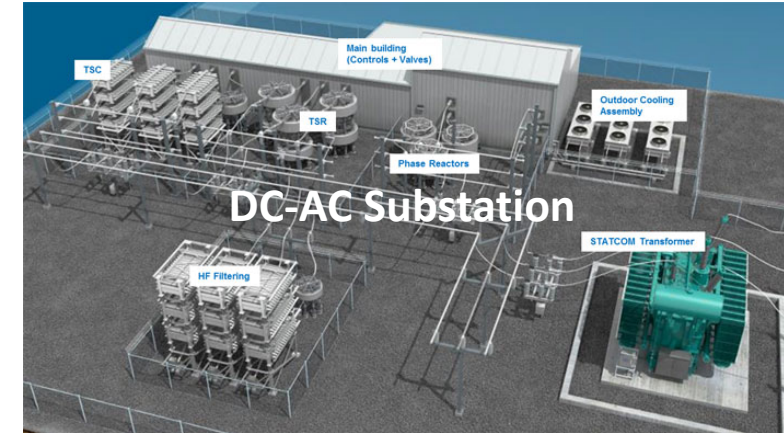
Perfect Sharing Simplifies Scaling



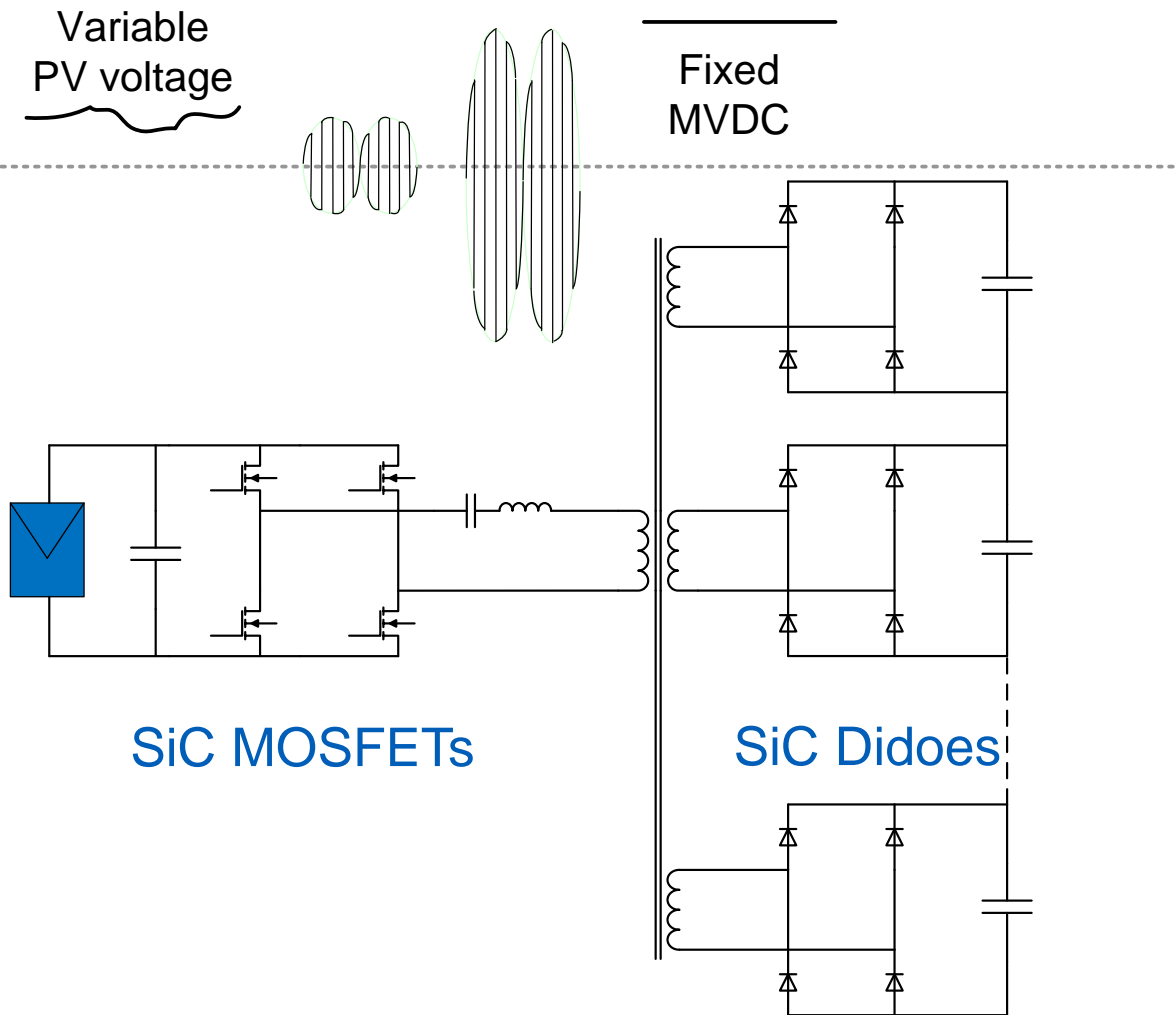
Overlaid currents of 3 modules in parallel

Industry first SiC Power Block for MW-scale applications

# MVDC Solar Farm



# DC transformer technology – SiC and Resonant Switching



- DC-DC conversion with pulsating AC links
- Soft-switched 200 kHz internal link
  - Series resonant circuit operated at resonance during nominal conditions – zero switching loss
  - Magnetizing inductance/ current selected to facilitate zero voltage switching
  - High frequency switching enabled by SiC
  - Maximum power point tracking using variable frequency control

SiC and High Frequency Transformer technologies enable DC-transformer

