4TH GRID SIMULATOR WORKSHOP, DENVER (CO) 25-26.04.2017

# ABB Grid Simulator

## Mapping the future

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# Agenda

Introduction

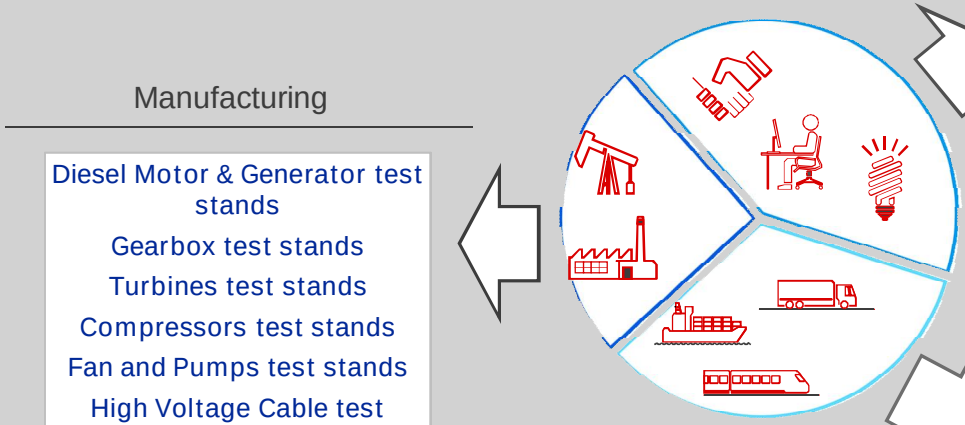
Grid Simulator Features

- State of the Art
- Future Direction

# ABB Teststands applications Introduction

# Multimegawatt teststand applications

## Our expertise



### Manufacturing

- Diesel Motor & Generator test stands
- Gearbox test stands
- Turbines test stands
- Compressors test stands
- Fan and Pumps test stands
- High Voltage Cable test stands

### Universities and Research Institutes

- Various Applications
- Grid simulator

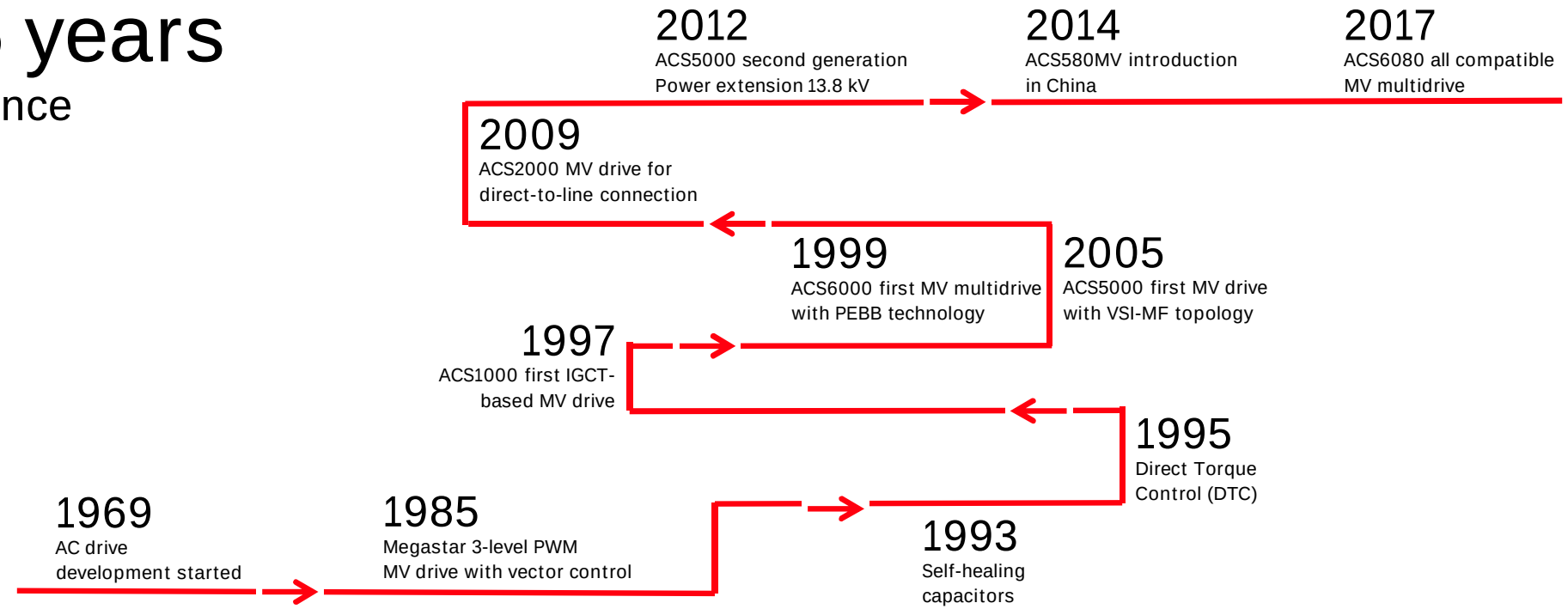
### Automotive and Aviation

- Aircraft wind tunnels
- Formula1wind tunnels
- Propulsion test stands
- Aircraft tires tests
- Train crash tests
- Chassis Dyno

# Medium Voltage Drives

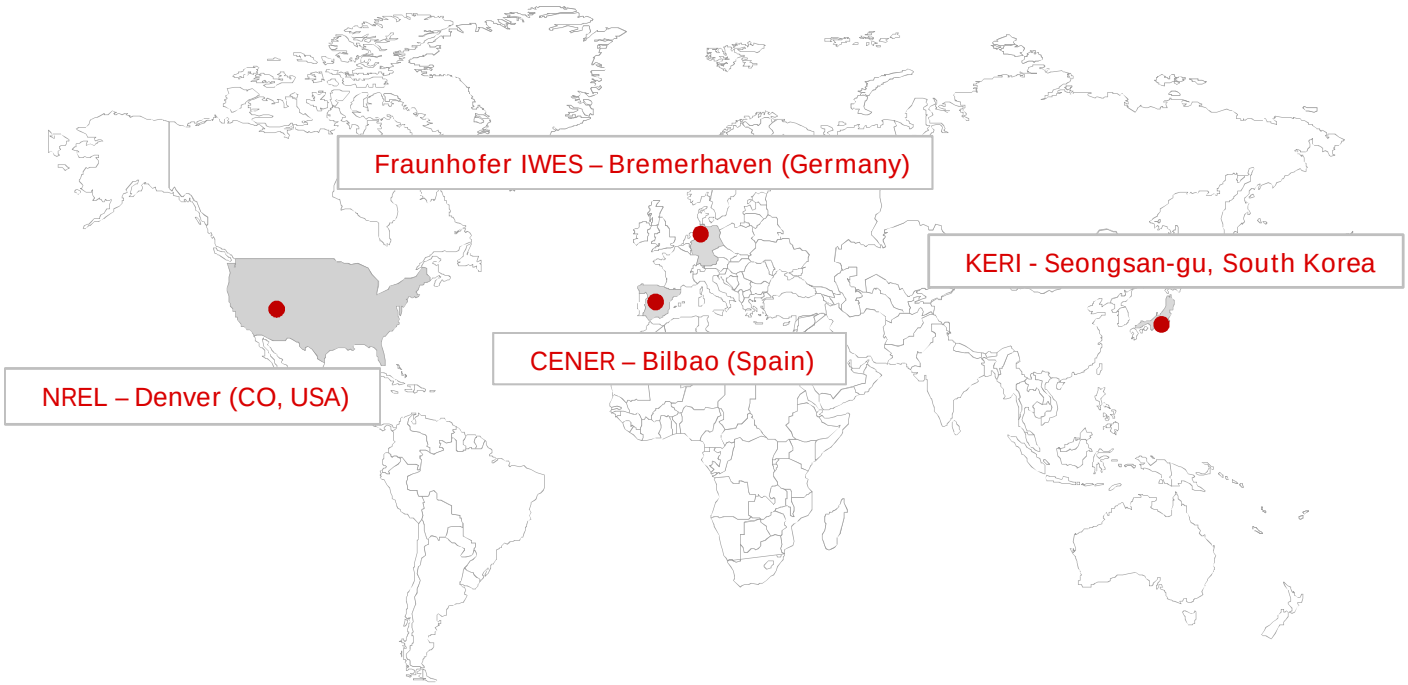
## Technology – the cornerstone of success

**> 45 years**
experience



# Grid simulator installed bases

## Global network



# Performance and Reliability

## High scalability in a standard design

### ACS6000

From MINI to MAXI

- ~5 MVA, <5 meters long, delivered as one unit
- >30 MVA, >30 meters long, delivered in up to 10 transport unit

Arc resitant design (IAC … )

Special Layouts

One scalable design – fits for all powers

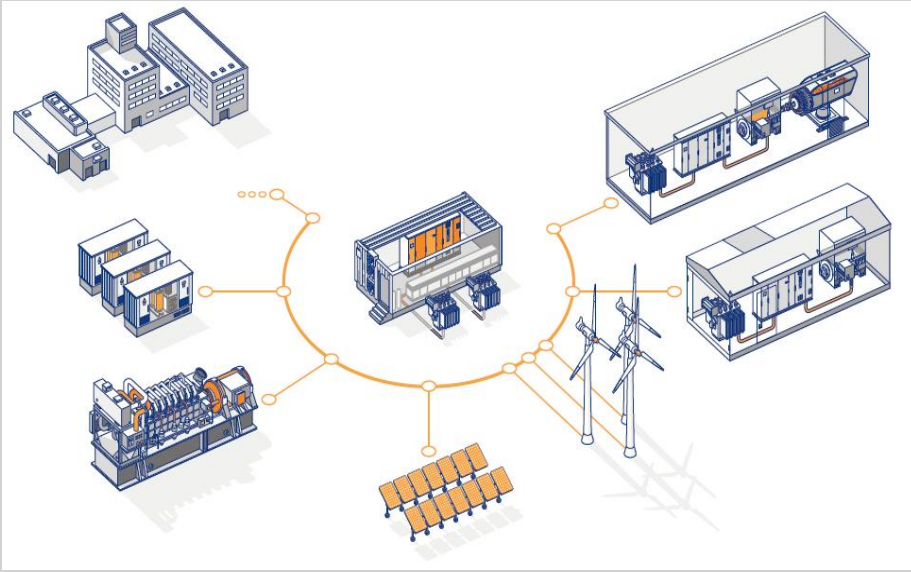

# ABB Grid Simulator
# State of the art

# A general overview

## ABB Grid simulator

### Features

- Based on MVD active power electronic
  - Converter, input / output transformers, RC snubber (opt)
- ABB ACS6000 high performance drive
- Arc resistant design
- Any kind of grid code can be simulated and repeated
- 1,2 and 3ph voltage unbalances can be simulated
- Purpose is to test devices to be compliant to grid codes
  - Wind or Tidal Turbines
  - Converter systems
  - PV inverters
  - BESS

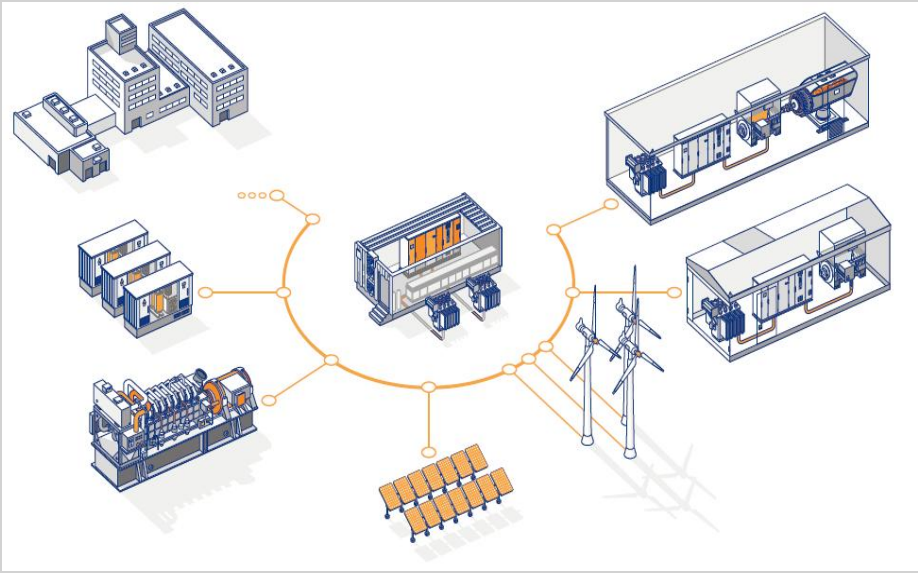


# State of the art

## ABB Grid Simulator

### Features

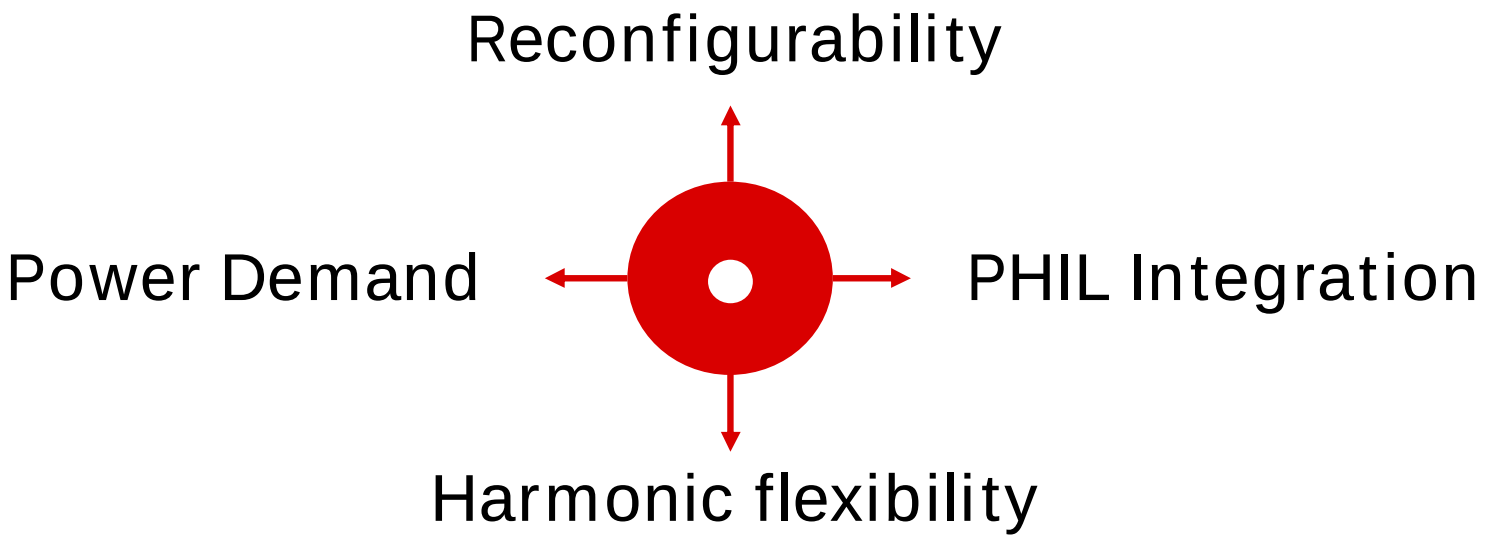
- Power: 20+ MVA
- Short Circuit power: up to 44 MVA
- Dynamic slew rates up to 20 p.u.
  - Voltage rate of changes down to 1msec
- Combined functionality grid simulator and dynamometer in one lineup
- Independet variation of phase angle, frequency and voltages
- Frequency range: 45-65 Hz
- Voltage distortion  below 1%
- Accurancy (freq and voltage) < 0.1%



# ABB Grid Simulator
# Future direction

# Mapping future directions

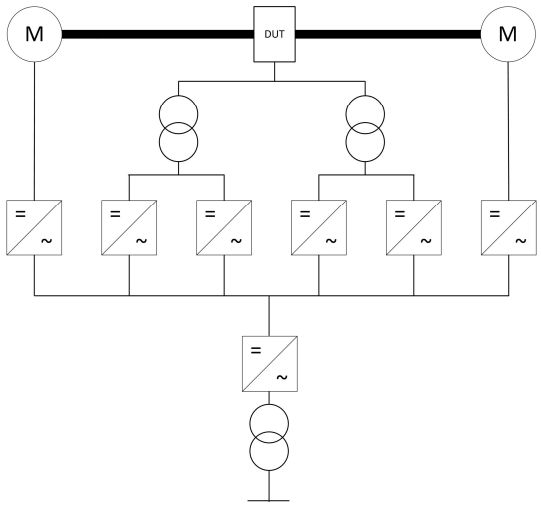
## ABB Grid simulator



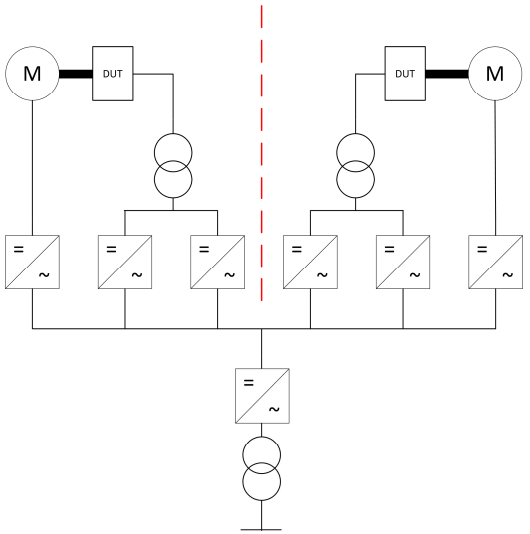
# Reconfigurability

## ABB Grid simulator and more

### Example 1



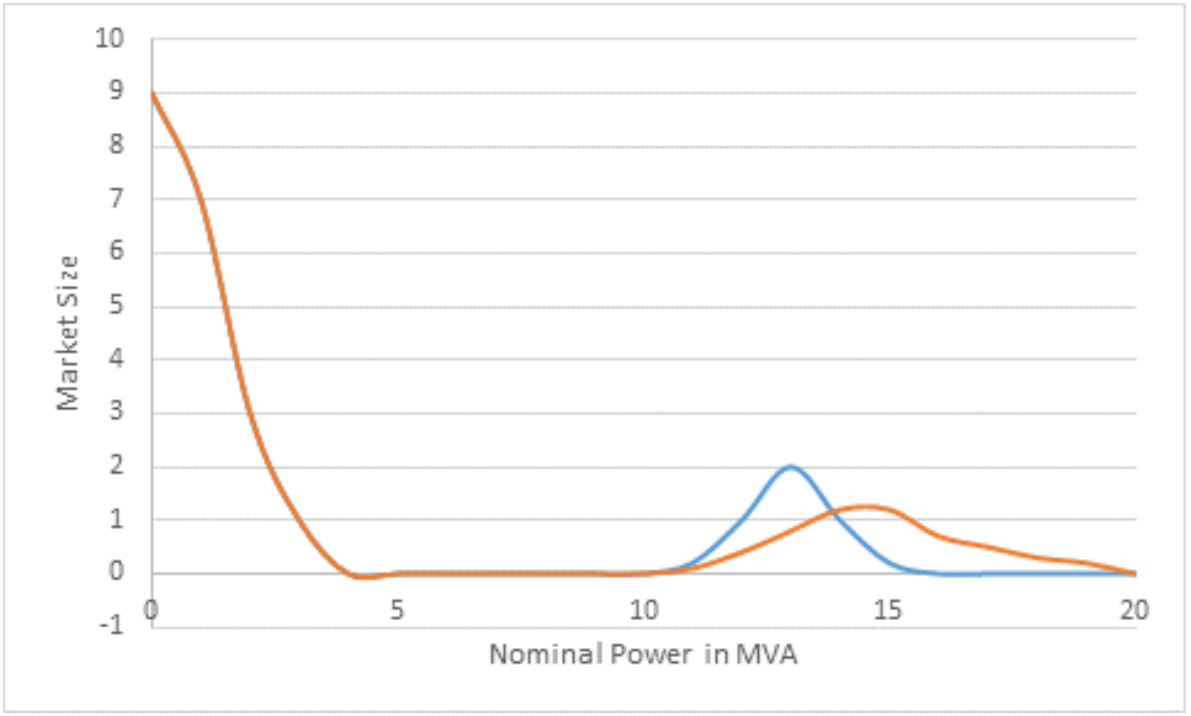

### Example 2




One possible configuration among others

# Power Demand

## ABB Grid simulator



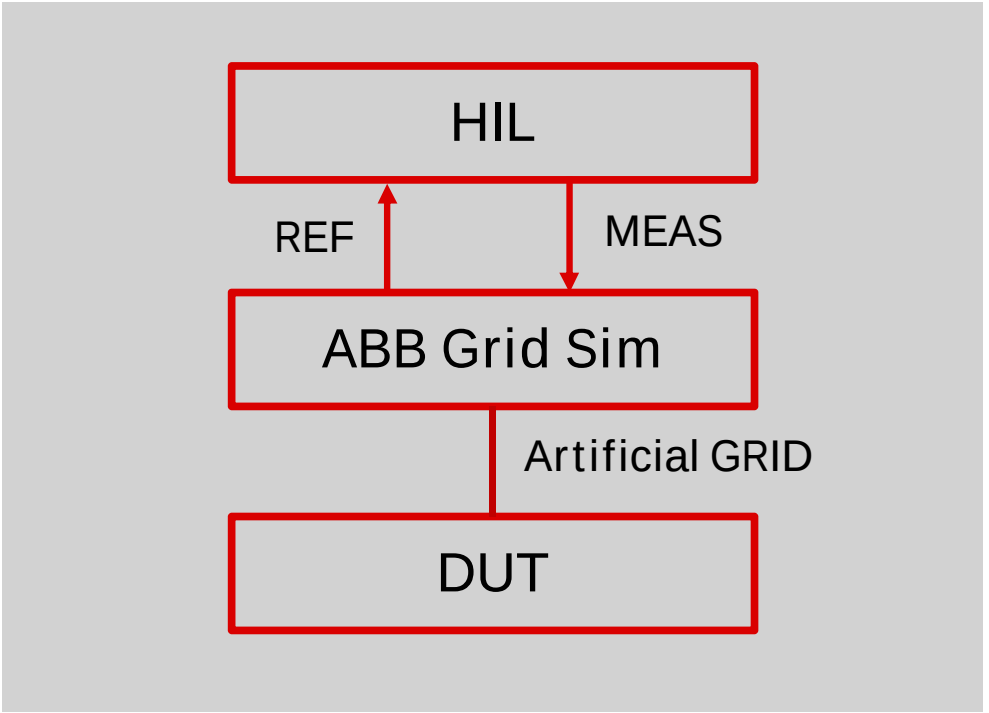

In which direction?

# PHIL Integration

## ABB Grid Simulator

### Features at a glance

- Reduce latencies
- Increase bandwidth
- Increase the amount of signals
  - V (DUT)
  - I (DUT)
  - Something else ?



# Harmonic Flexibility

## ABB Grid Simulator

### Future and Current Requirements

Steady state THD levels:

- THD(v) up to 50th
- THD(v) up to 100th

Filtering

Spectrum shaping to avoid critical frequencies

Injection of specific harmonics