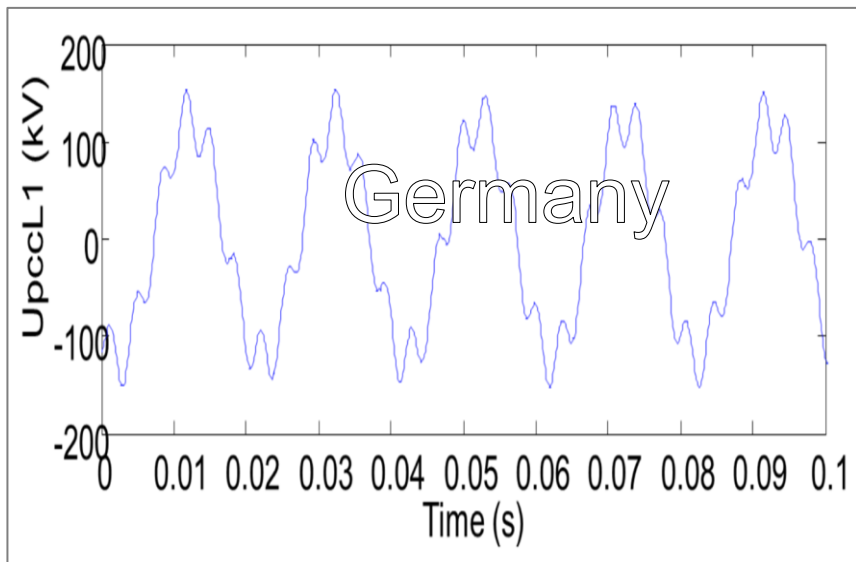
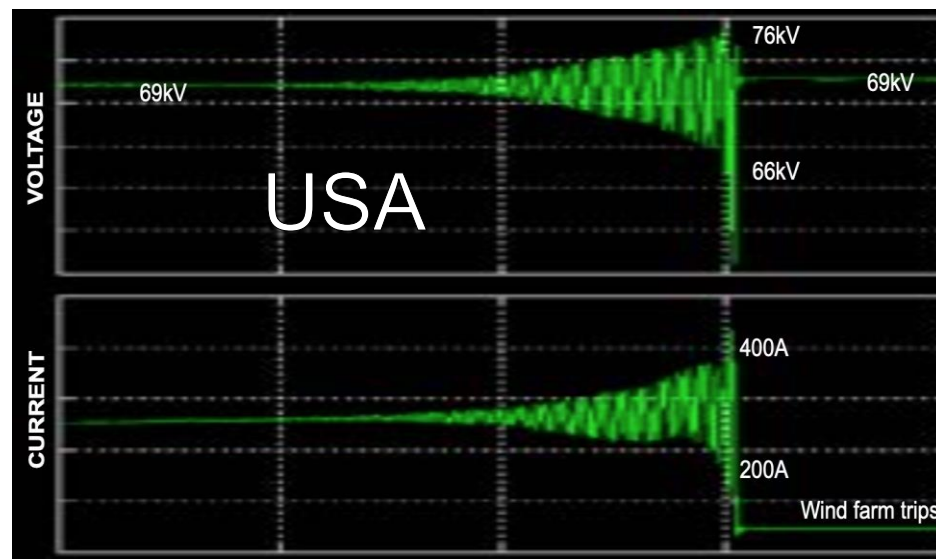
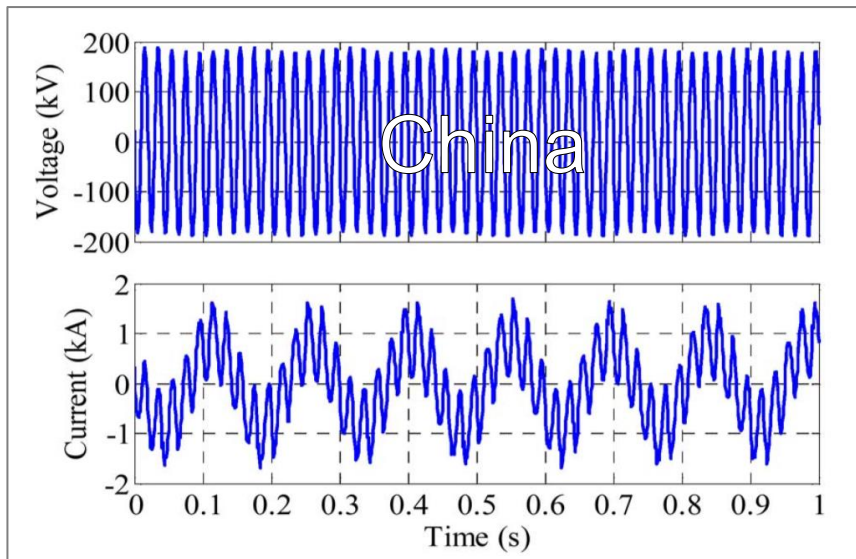




Advanced Vector Control (AVC)

Cumbernauld
22 June 2022

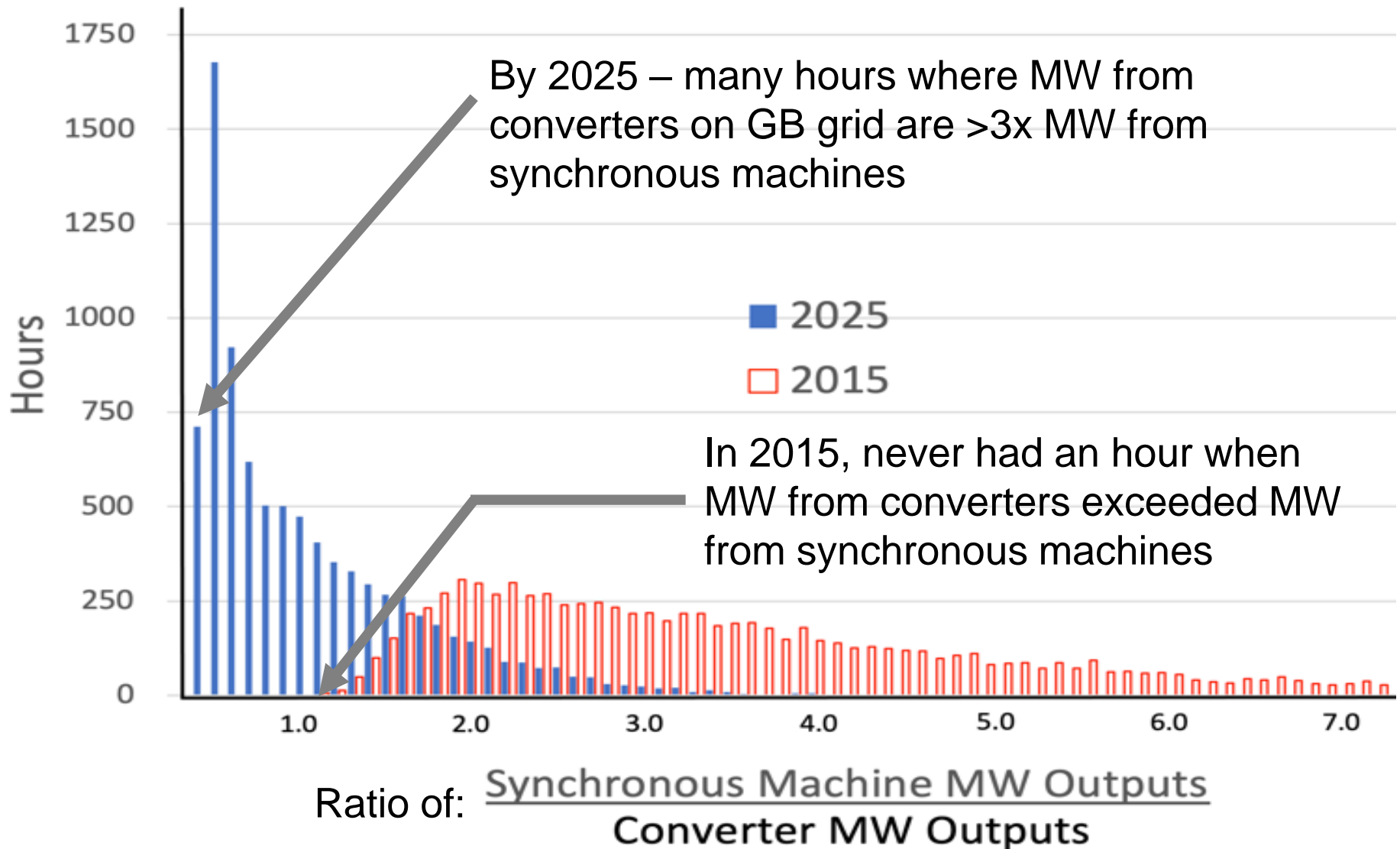
The Problem



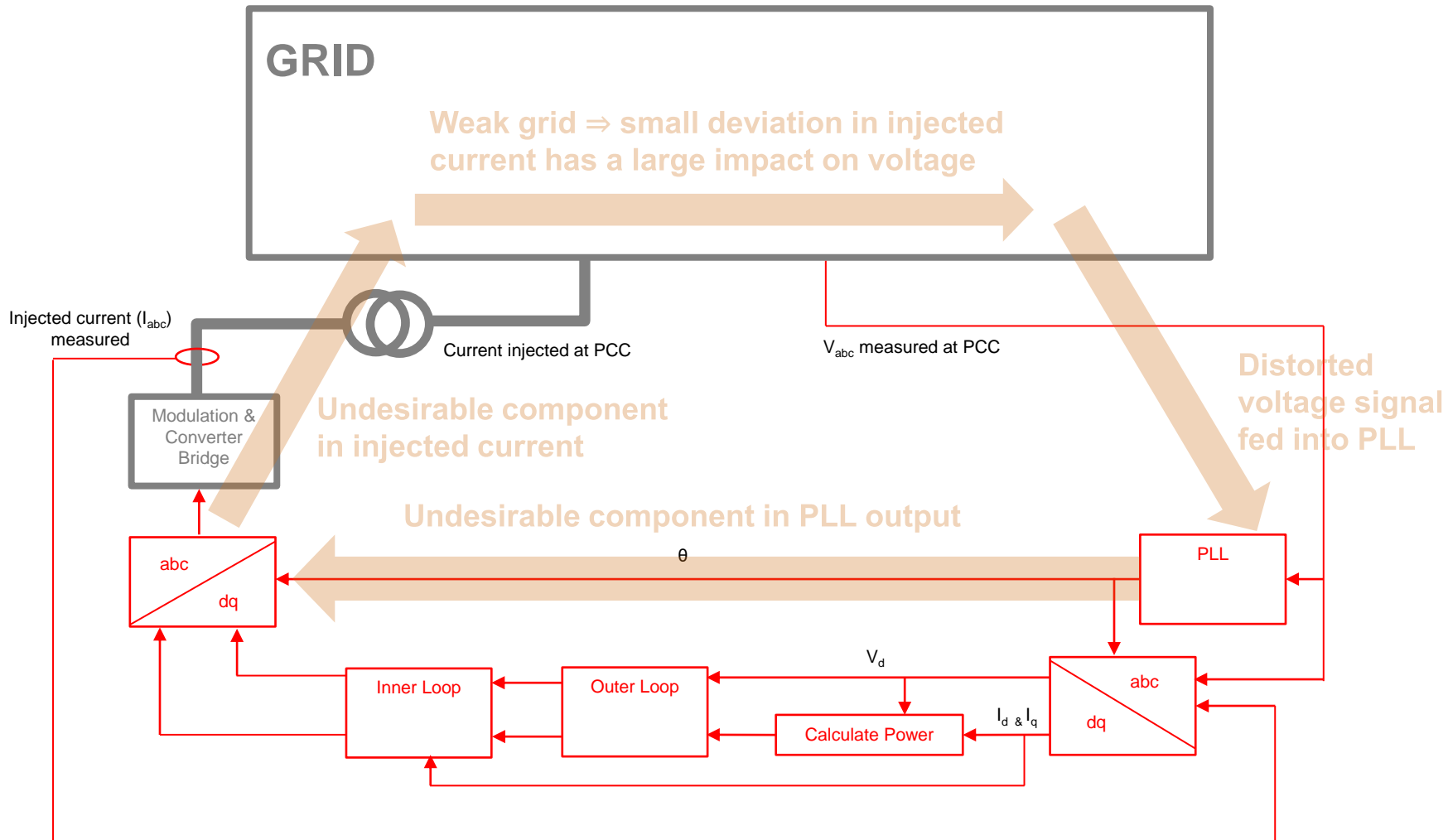
Lots of grid following converters
+ few nearby synchronizing machines
= Trouble !

(Studies show UK is also vulnerable)

The Problem is Getting Worse



What's the Cause?



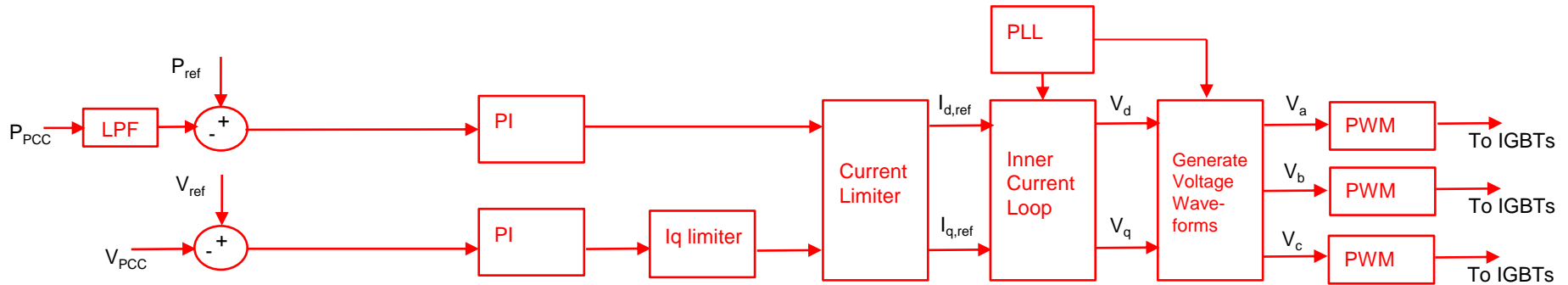
Unintended feedback loop. Gain = (PLL gain) * (power output of inverter) * (weakness of grid)
Gain around the loop $> 1 \Rightarrow$ Trouble !

Grid Forming

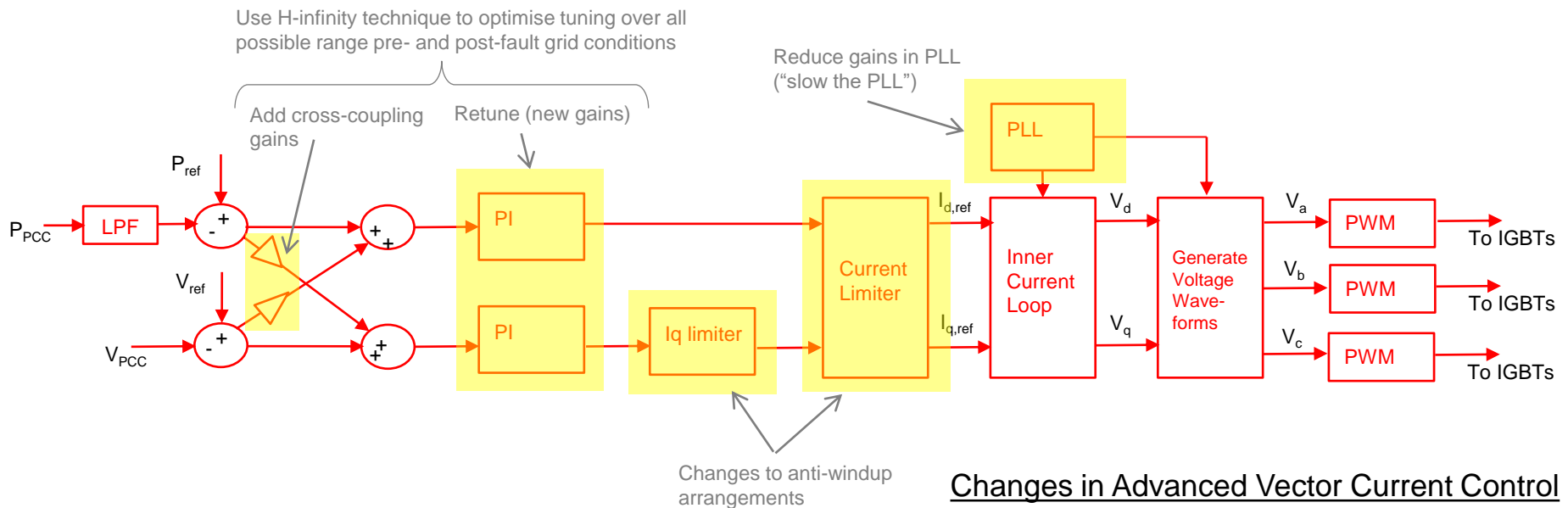
- Technically best solution. No PLL
- Best applied to new projects, especially batteries
- But many areas are already full of grid following converters
- Is there a way their performance can be improved with a software change?



What is AVC?



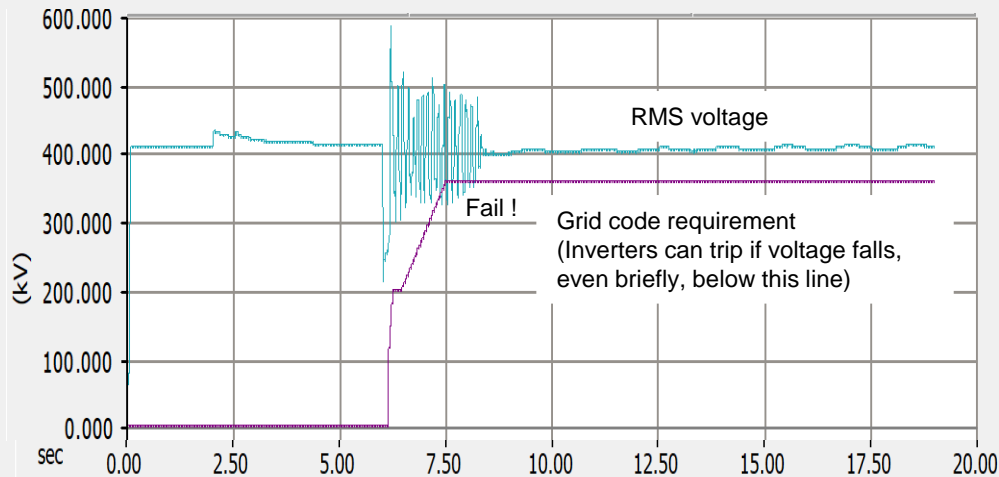
Conventional Vector Current Control



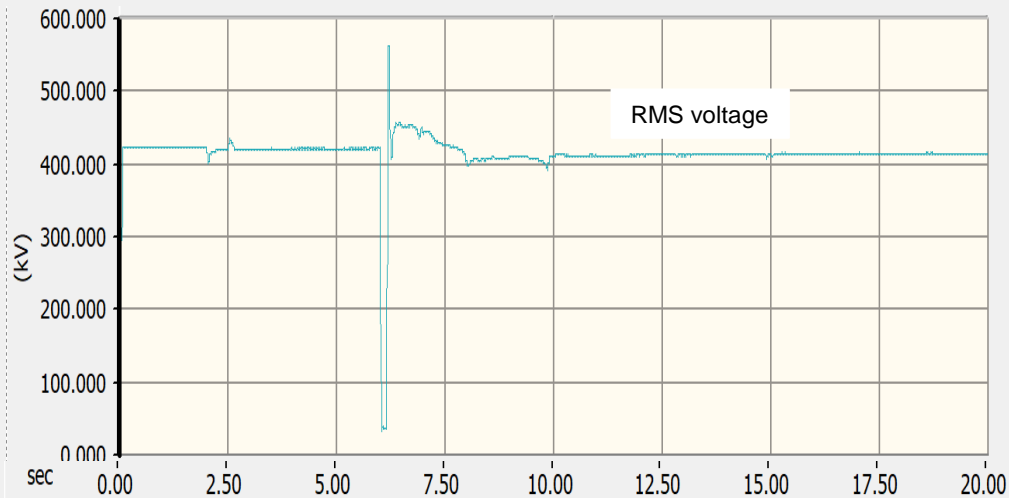
Changes in Advanced Vector Current Control

It Works

Conventional Control. Converter at 75%



AVC. Converter at 90%



- Comparison of AVC and conventional using generic converter models that differ only in control scheme.
- Converter models tested using a detailed model of the GB grid and a fault case that is credible under GB security standards.
- Conventional control fails at 75% loading, AVC still works at 90%.