**Fault Tolerance:** is ability of a system to maintain proper operation in the event of failures or faults in one or more of its components.

**Detection of faults**: Due to the high number of components, the detection of a fault can be complicated in principle. However, the availability of powerful microprocessors made it possible to develop very intelligent methods for fault detection. Some examples of these advanced methods are techniques based on frequency analysis [4], [5], the use of neural networks (NNs) to search for some specific patterns [6], and the study of the time behavior in voltages and currents at the load [7]–[9].

* Some methods include additional hardware to keep operating.
* Topology can be changed.
* the cascaded inverter uses its modularity advantageously to introduce the idea of **redundancy of cells** instead of using redundancy of components.

**Fault Diagnosis:** Two maindiagnosis solutions

1. Switch Measurements: No extra hardware needed. Measurements came from sensors. It is possible to determine open or short circuit.
2. Output Waveform Analysis: solutions based on the measurements of output phase voltages or currents.

**Solutions for NPC:**

A diagram of a circuit

Description automatically generated

* Solution I: The fault tolerant capacity is achieved due to the redundancy of voltage vectors present in NPC converters. due to the redundancy of these voltage vectors, the converter is still able to continue working. Nevertheless, the switches have to withstand the total dc-link voltage.

A diagram of a sextant

Description automatically generated

Vector Diagram when Sa4 fails.

* Solution II:
* Solution III:
* Solution IV:
* Solution V:

A table of numbers and text

Description automatically generated with medium confidence