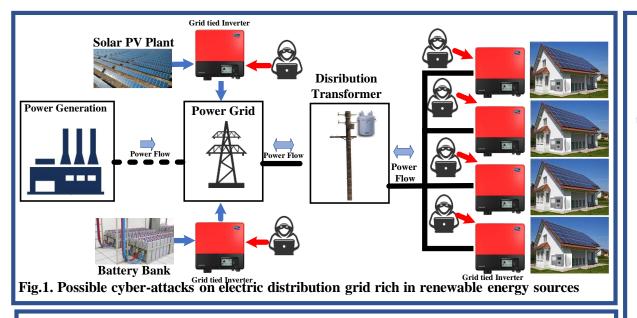
## Enhancing Cyber Security of Grid Connected Renewables via Digital Watermarking Technology



## **Problem:**

In 2015 the first known successful cyber attack, the on a power grid in Ukraine leaving 225000 customers without power for 6 hours. As distributed energy resources penetration increase, the vulnerability threats increase. By 2025, it projected that more than 50 billion Internet of Things (IoT) devices will be connected.

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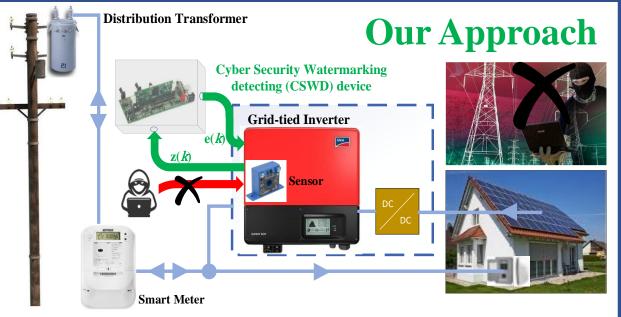


Fig.2. Our solution to enhance cyber security of grid connected renewables via digital watermarking technology

## **Solution:**

We propose a new defense mechanism against cyber attacks in grid-tied Photovoltaic (PV) systems connected at the distribution level. The core of such a defense mechanism dynamic watermarking approach is to detect malicious manipulation of voltage/current sensor measurements feeding inverter control. The defense mechanism is capable of detecting several kinds of cyber attacks in less than 16ms. Consequently, our approach makes the inverter and its auxiliary devices more resistant to cyber attacks . In addition, our approach does not require a complex communication network with other components of the power grid.