



# Task 14 Report: Best practices for provision of frequency related services from PV systems

Summary and Key Messages

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# Frequency related services from PV systems

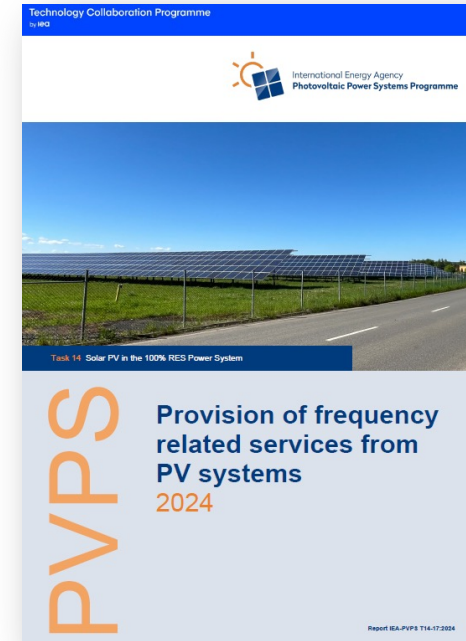


## Motivation – Global Energy transition

- Strong increase of DER power plants connected to the distribution and transmission systems esp. during last 10 years in a lot of countries
- Loss of system services from bulk power plants (coal, oil, gas, nuclear) with rotating generators
- Time periods of DER dominated power systems are increasing

## Actions needed

- New grid connected DER plants (PV etc.) must be able to take over system services
- Frequency Support are a central part of the services to be provided by DER in inverter dominated power systems



# Frequency related services from PV systems



## Contents

- Report overview and purpose
- Basics and overview of Frequency control services
- Frequency related Grid code Requirements for PV Systems
- Overview of Best Practices and field experiences from
  - Austria, Germany, Italy and Japan
- Recommendations

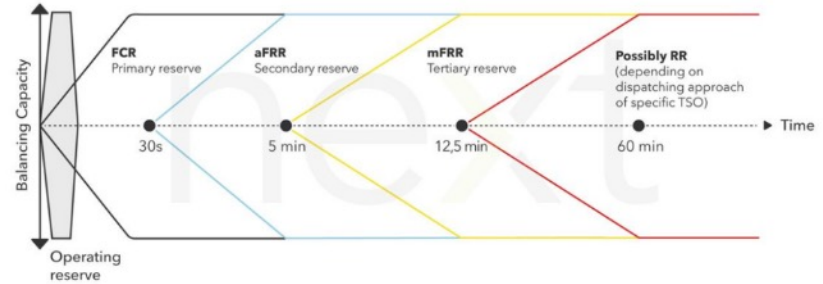
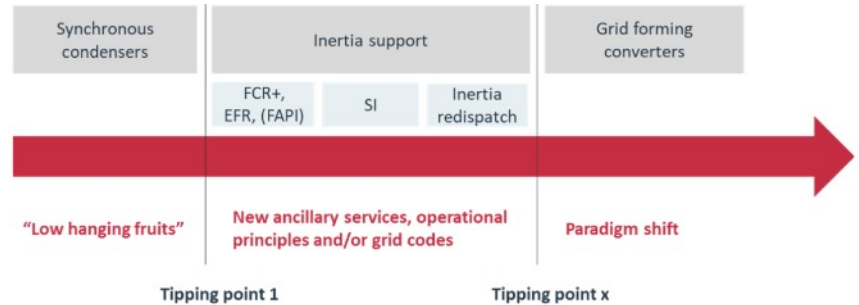


Fig. 4: Overview of different frequency control services in the European Union and its typical time intervals  
Source: [Balancing Services: Definition, Background & why we need it \(next-kraftwerke.com\)](https://www.next-kraftwerke.com/en/balancing-services-definition-background-why-we-need-it)



# Frequency related services from PV systems



## Key messages

- PV Systems already today have the technical capabilities to provide various frequency related grid services:
  - **Reduction** of active power generation in case of **overfrequency** (LFSSM-O)
  - If operated in curtailed mode or in combination with BESS, they are also requested to **increase** their active power output in case of **underfrequency** events (LFSSM-U).
- Transition from *grid-following* to *grid-forming operation* will enable PV systems to provide the **full set of frequency services**, analogue to services today provided by rotating generators
- **Technical, regulatory and market frameworks** need to be in place **to utilize these capabilities**
- Upcoming revisions of international grid-codes will already include associated requirements (e.g. European NC RfG)