

## IRENA FlexTool

# Assessing power system flexibility to integrate a higher share of renewables

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- Power Sector Transformation Strategies team, IRENA

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**TUESDAY, 26 MAY 2020 • 16:00AM – 16:30AM CET**

## TechTips

- **Share it with others or listen to it again**
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## TechTips

- **Ask the Question**

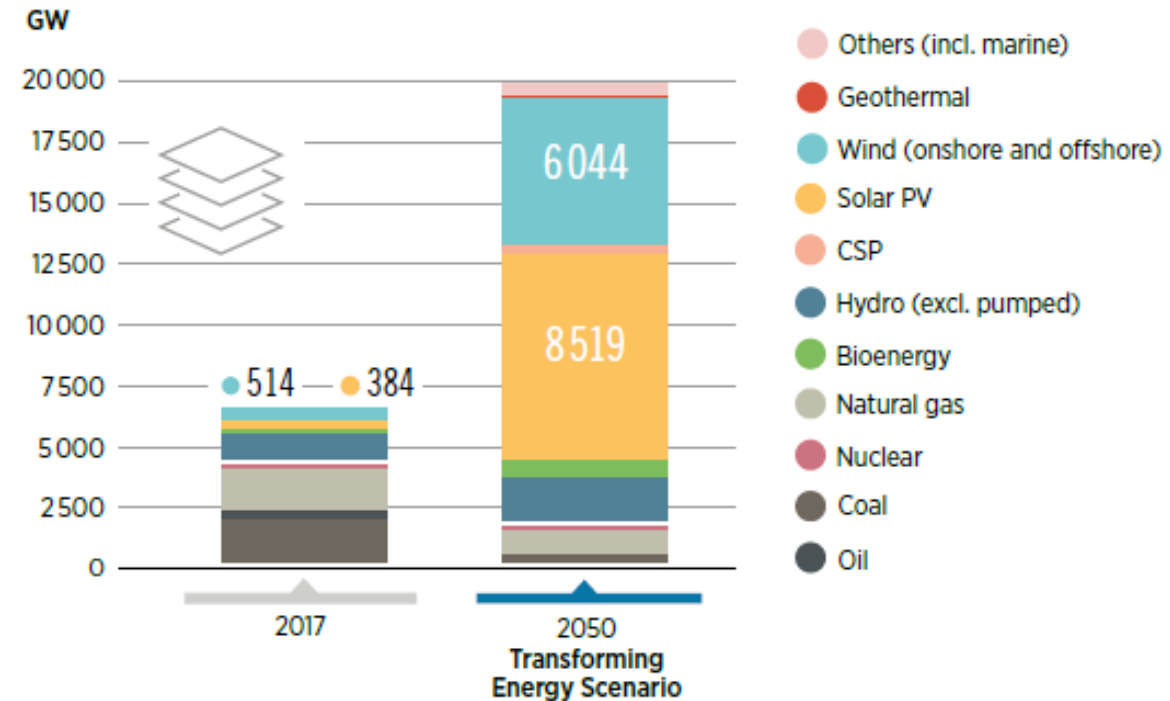
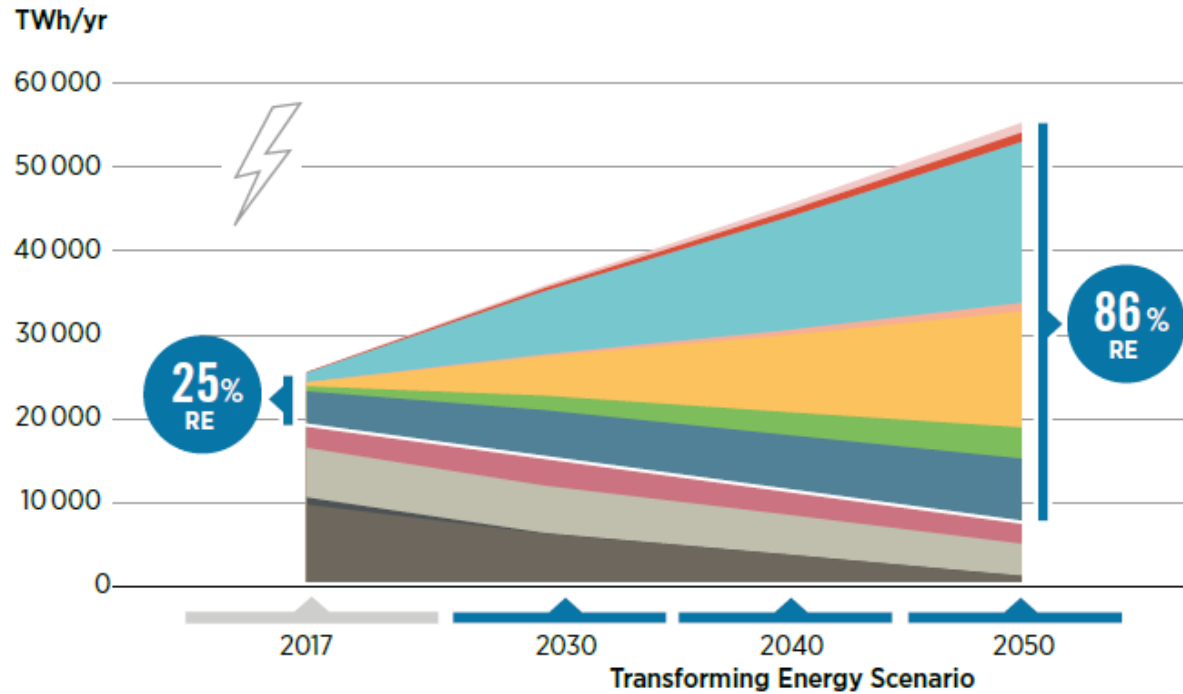
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# Solar PV and wind will lead the way in the power sector

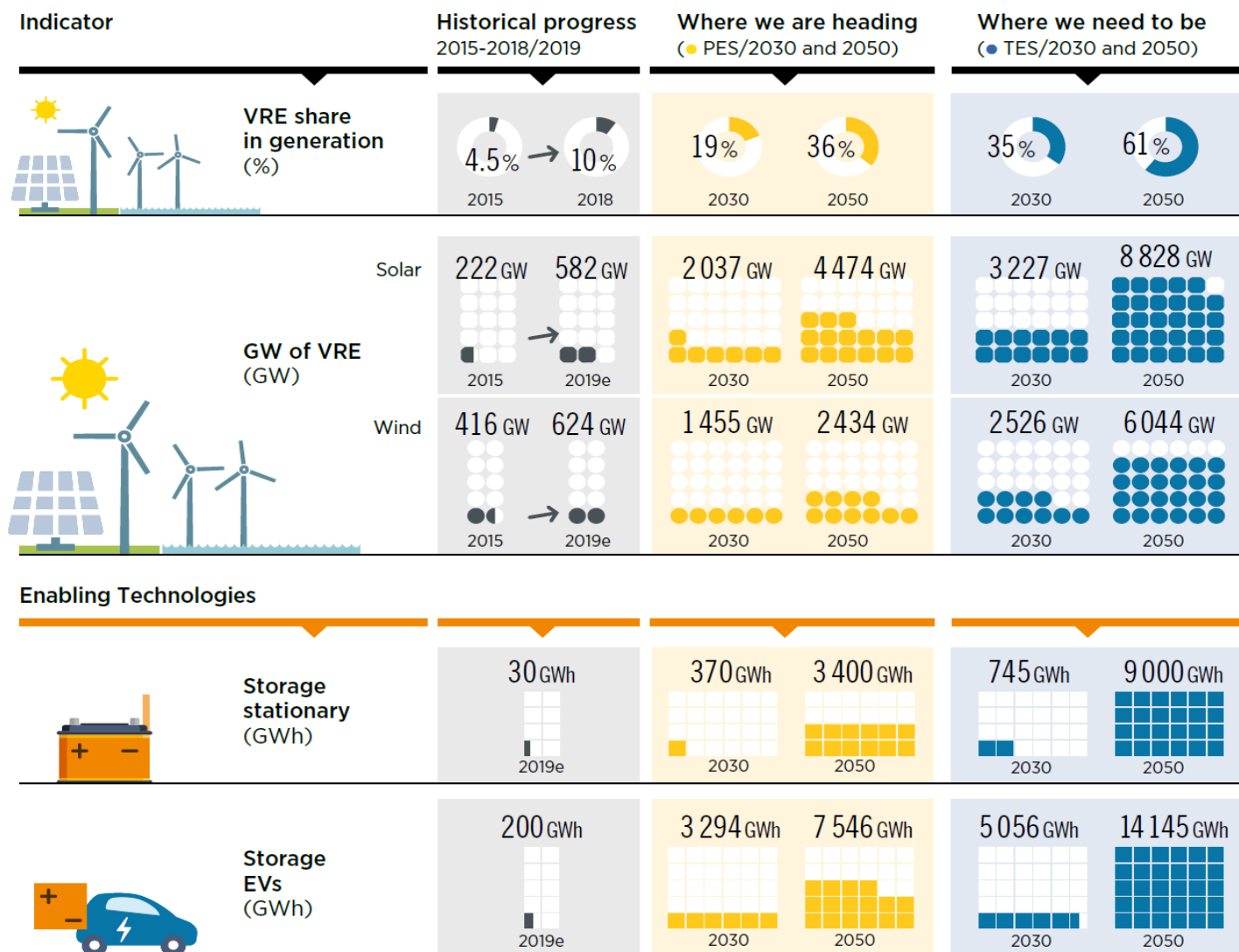


- **Wind power would be a major electricity generation source**, supplying more than one-third of total electricity demand. **Solar PV power would follow**, supplying 25% of total electricity demand.
- Power system capacity would need to grow to **20 000 GW by 2050**, with over **70% of it coming from solar PV and wind**.



# The need for power system flexibility

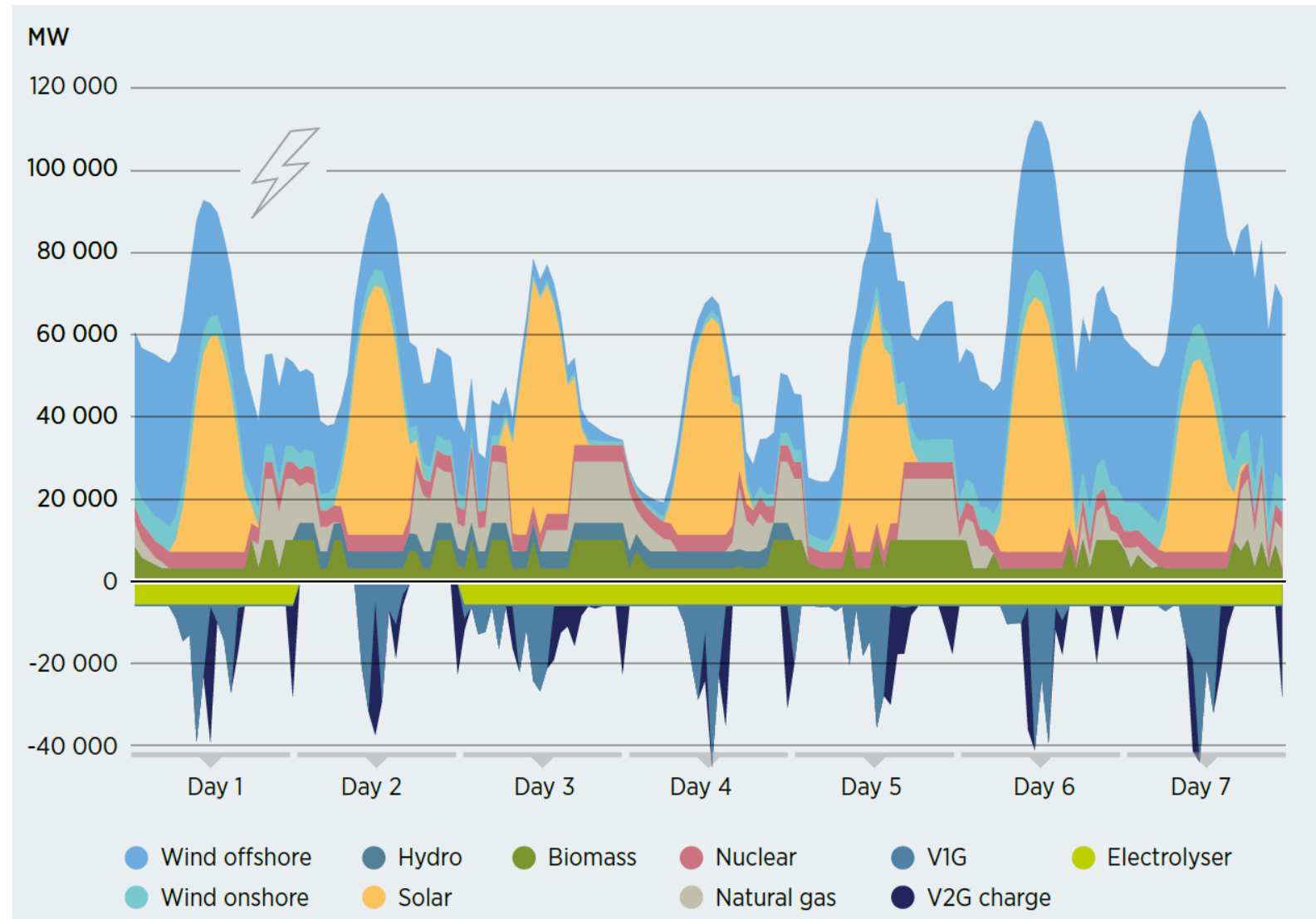
- **Flexibility in power systems is a key enabler for the integration of high shares of variable renewable electricity** – the backbone of the electricity system of the future.
- **Power systems must achieve maximum flexibility**, based on current and ongoing innovations in enabling technologies, business models, market design and system operation.
- On a technology level, **both long-term and short-term storage will be important for adding flexibility**



# Hourly electricity dispatch in 2050: no major flexibility issues

*One-week dispatch of the UK power systems showing how selected technologies balance demand and supply with large shares of solar and wind in 2050*

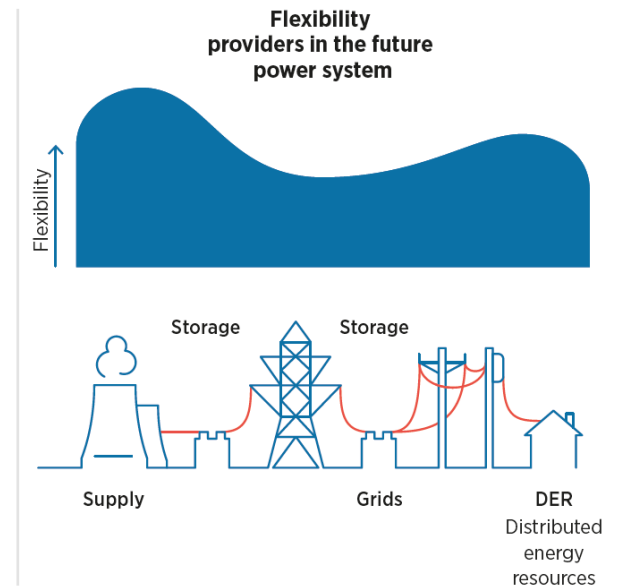
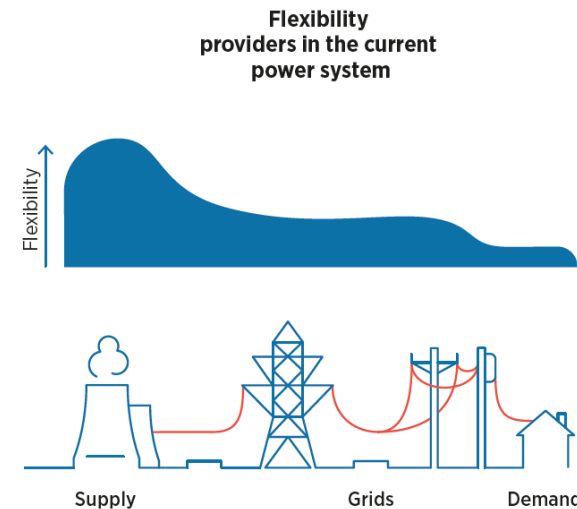
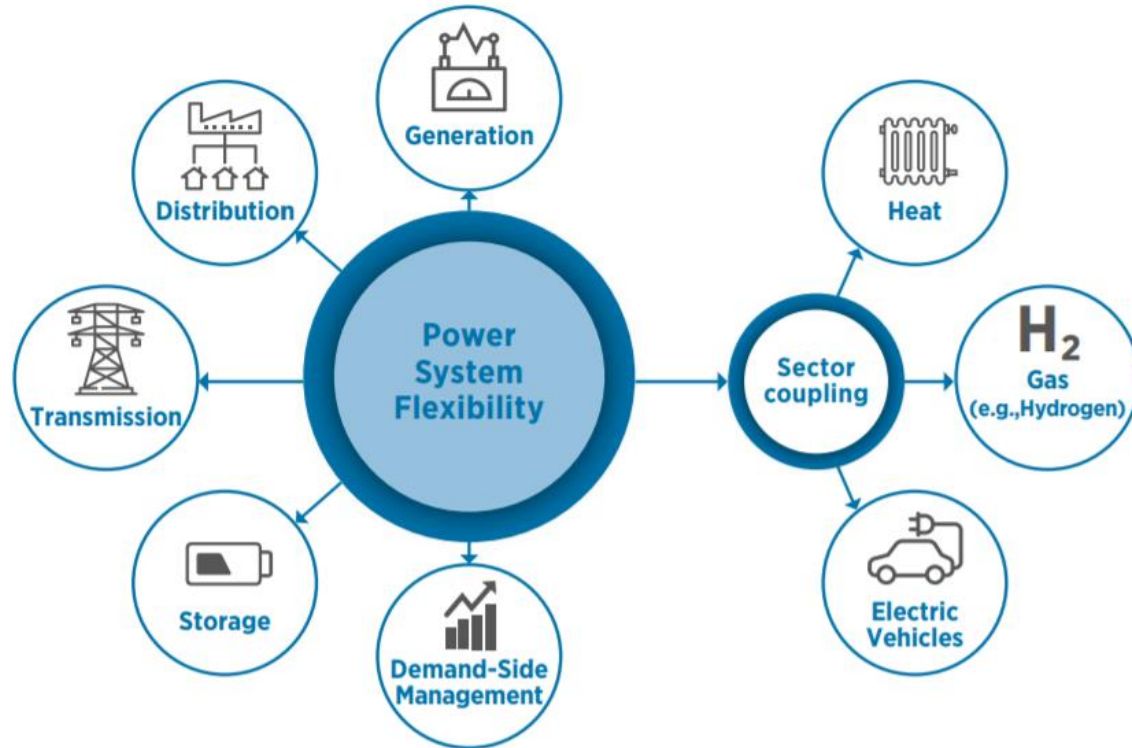
- There are **no macroscopic flexibility issues** that lead to significant unserved energy in the power system in any country or region, and curtailments of variable renewable wind and solar power are limited.



# Flexibility needs to be harnessed in all sectors of the energy system

## Flexibility according to IRENA (2018):

*“Flexibility is the capability of a power system to cope with the variability and uncertainty that VRE generation introduces into the system at different time scales, from very short to the long term, avoiding curtailment of VRE and reliably supplying all the demanded energy to customers”*



IRENA supports its member countries in planning for flexibility with:

1. An overview of flexibility for policy makers
2. A methodology to assess flexibility
3. The FlexTool to perform analytical work
4. Joint development of case studies in cooperation with member countries



## POWER SYSTEM FLEXIBILITY FOR THE ENERGY TRANSITION

PART 1:  
OVERVIEW FOR POLICY MAKERS



November 2018

Launched at the 16<sup>th</sup> IRENA Council (Abu Dhabi, November 2018):

- **Part 1: Overview for policy makers**
- **Part 2: Methodology report**

Case studies developed:

- **Colombia**
- **Uruguay**
- **Panama**
- **Thailand**

Ongoing regional analysis in:

- **Central America**
- **ASEAN**

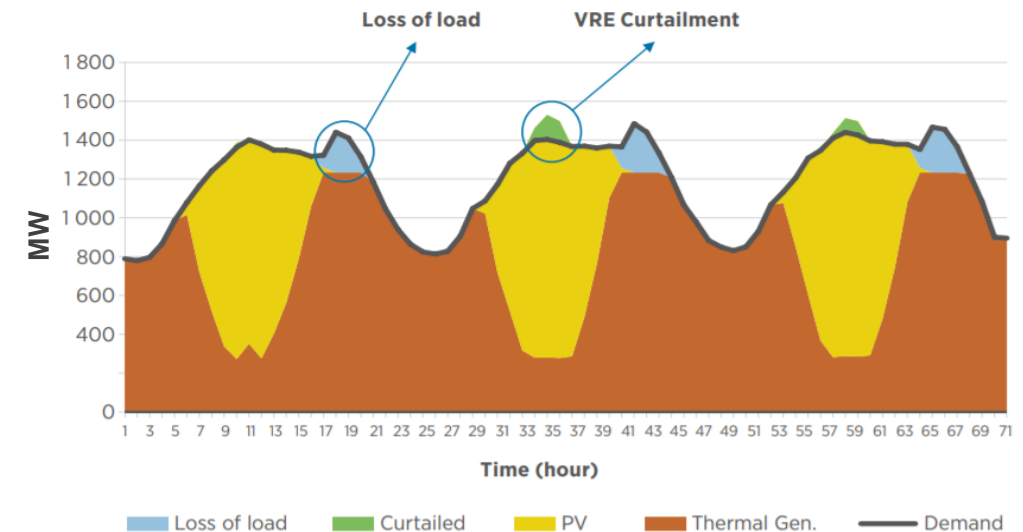




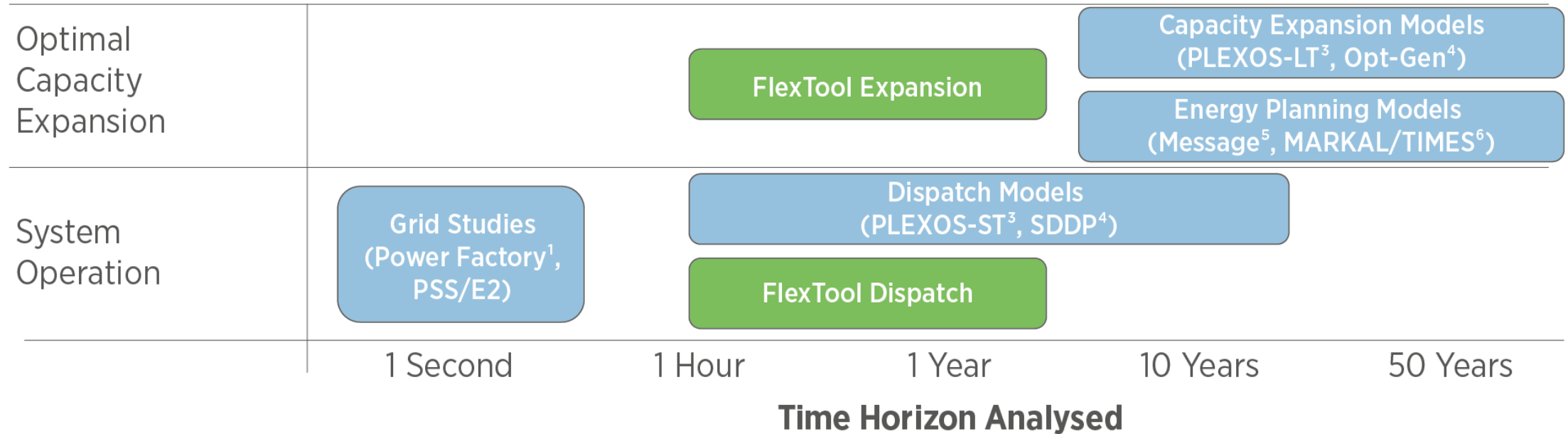
## IRENA FlexTool

- » Publicly and freely available optimization tool that performs capacity expansion and dispatch with a focus on power system flexibility
- » Developed by the VTT Technical Research Centre of Finland Ltd
- » **Version 2.0** released in April 2020 together with **training materials**

- » Flexibility issues identified by FlexTool:
  - » Non-supplied energy (loss of load)
  - » Reserve inadequacy
  - » Insufficient ramp
  - » VRE curtailment
  - » Spilled water from hydro reservoirs
  - » Transmission congestion



### FlexTool in the planning process



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<sup>4</sup> Copyright of PSR  
<sup>5</sup> Developed by the International Institute for Applied Systems Analysis (IIASA)  
<sup>6</sup> Developed by the Programme of Energy Technology Systems Analysis (ETSAP)

## » Engagement options

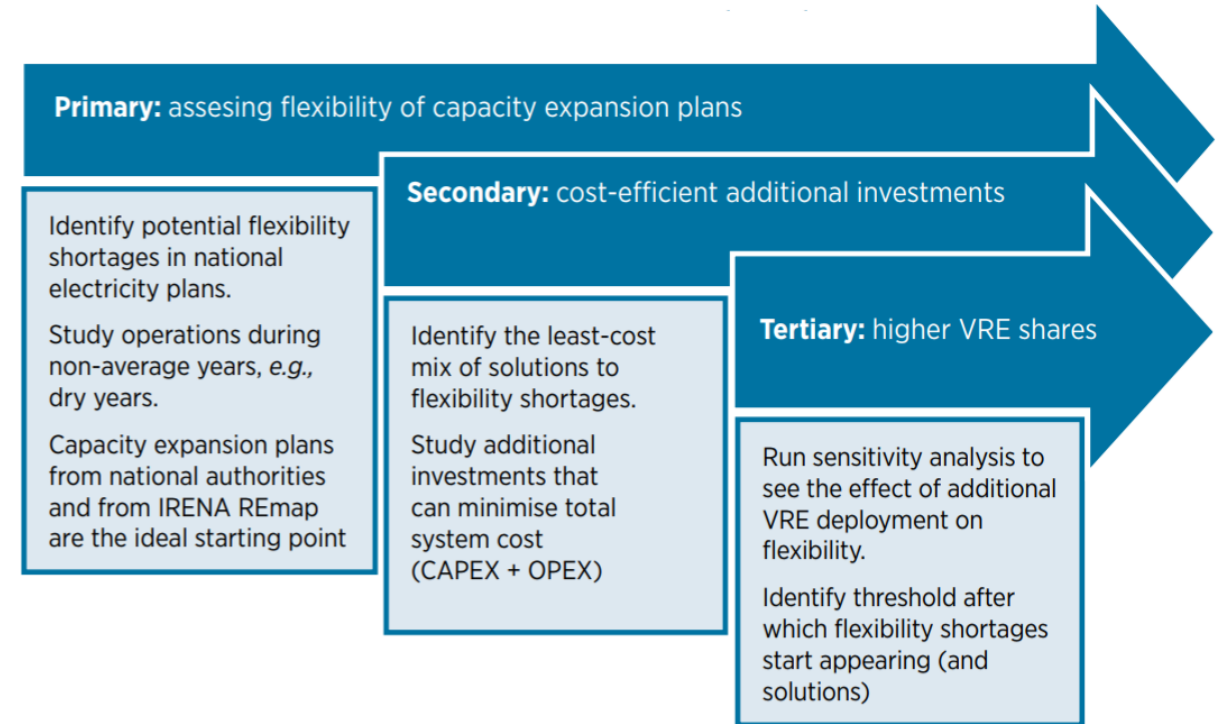
### » Option 1: Engagement with IRENA to develop a flexibility analysis

- » Through relevant stakeholders such as the Ministry of Energy or TSOs
- » IRENA performs the analysis in collaboration with the counterpart nominated by the government

### » Option 2: Organisation of a (virtual) training on the IRENA FlexTool

- » The tool is user friendly and the basics can be learned in one day
- » Preferably done on a regional basis (e.g., South America)

## » Objectives of the flexibility studies:



- » IRENA launched in April 2020 a new version of the tool, FlexTool 2.0, with several enhancements that have been developed based on the feedback from experts

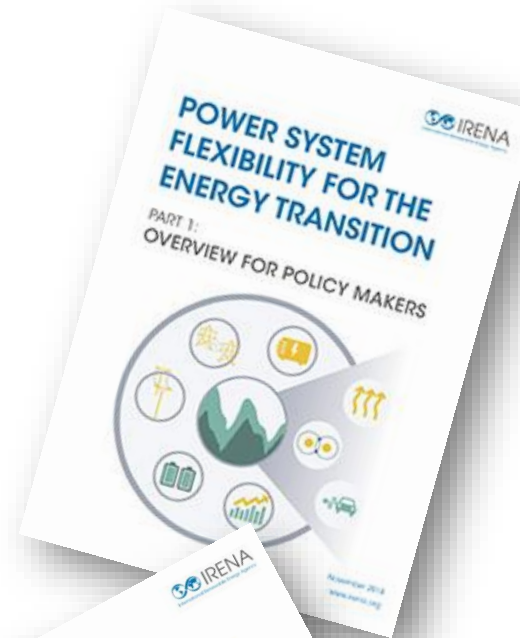
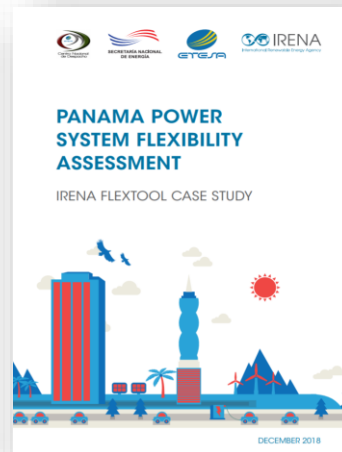
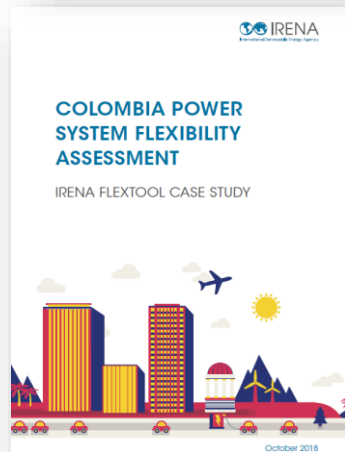
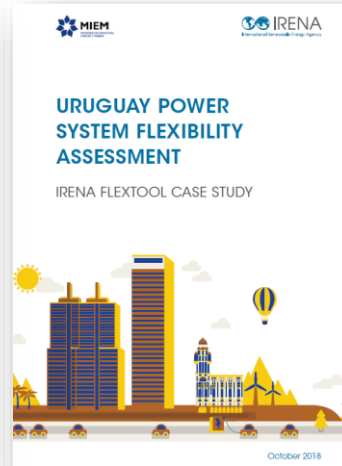
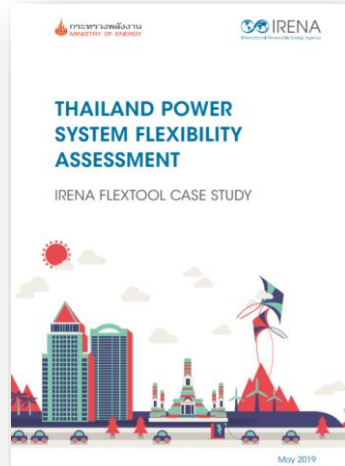
### **Technical enhancements**

1. Node groups to define properties for a country or region (e.g., reserves)
2. Units groups for investments
3. Minimum inertia constraint
4. Minimum time between shutdown and start-up constraint
5. Storage self-discharge constraint
6. Efficiency time series
7. Max and min generation, must-run constraints using time series
8. Detailed modelling of CHP units

### **GUI enhancements**

1. Possibility to specify the colors of each node and technology in the input data
2. Possibility to select a specific time period to show in the dispatch, in the results file
3. Results file contains more explanations of each of the parameters
4. New logo of the tool





## Ongoing and future work

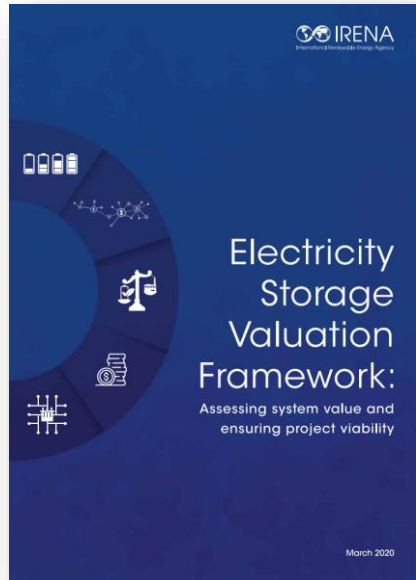
### 1. Analysing the value of regional integration

- a) Central America (Panama completed)
- b) ASEAN region (Thailand completed)

### 2. Capacity building

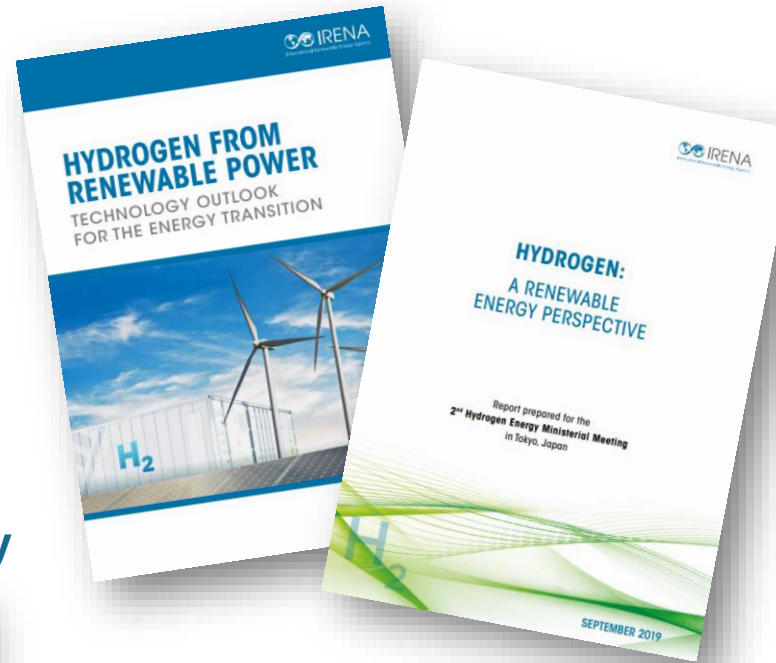
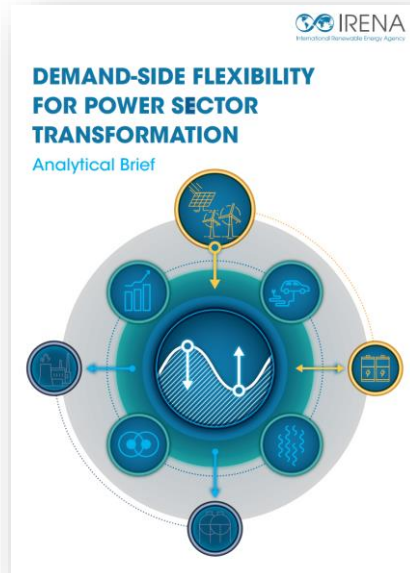
- a) Latin America (19 May 2020)
- b) ASEAN (2 June 2020)
- c) MENA (July 2020)
- d) [Cuba \(November 2019\)](#)

# Other relevant work from IRENA's PST team



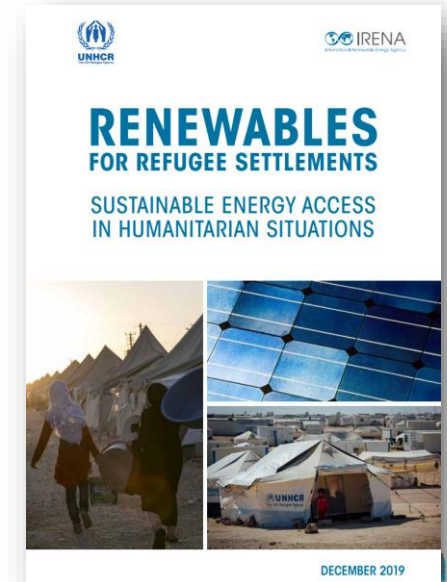
Electricity Storage

## Demand-side flexibility



Renewable Hydrogen

## Renewable Minigrids



## Questions & Answers

Please use the 'Questions' feature on the webinar panel

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☐ **THURSDAY, 4 June 2020 • 16:00 – 17:00 CET**

**Special edition “COVID 19 and renewables - impact on the energy system”**




To register: <https://attendee.gotowebinar.com/register/4704682019271652621>

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**“Renewable Power Generation Costs in 2019: Latest Trends and Drivers”**

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