IRENA

FlexTool

TRAINING FOR MENA

OPENING SESSION: Projects and initiatives in the MENA Region

IRENA
International Renewable Energy Agency

Power System Flexibility according to IRENA
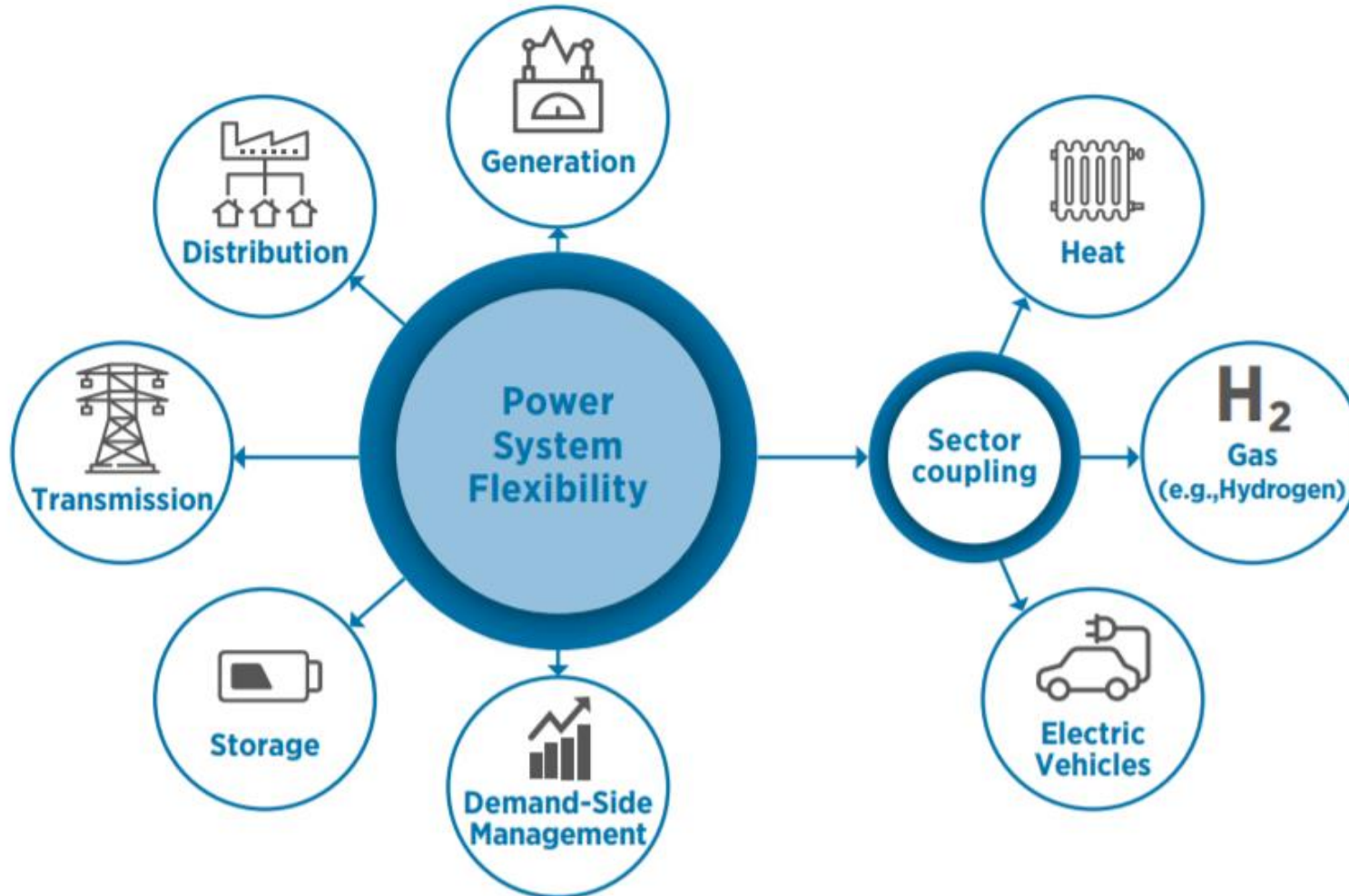
Flexibility according to IRENA (2018):

"*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*"

A combination of solutions is needed

» **Main flexibility sources**

  » **Generation**

    » Hydro, gas

  » **Grid**

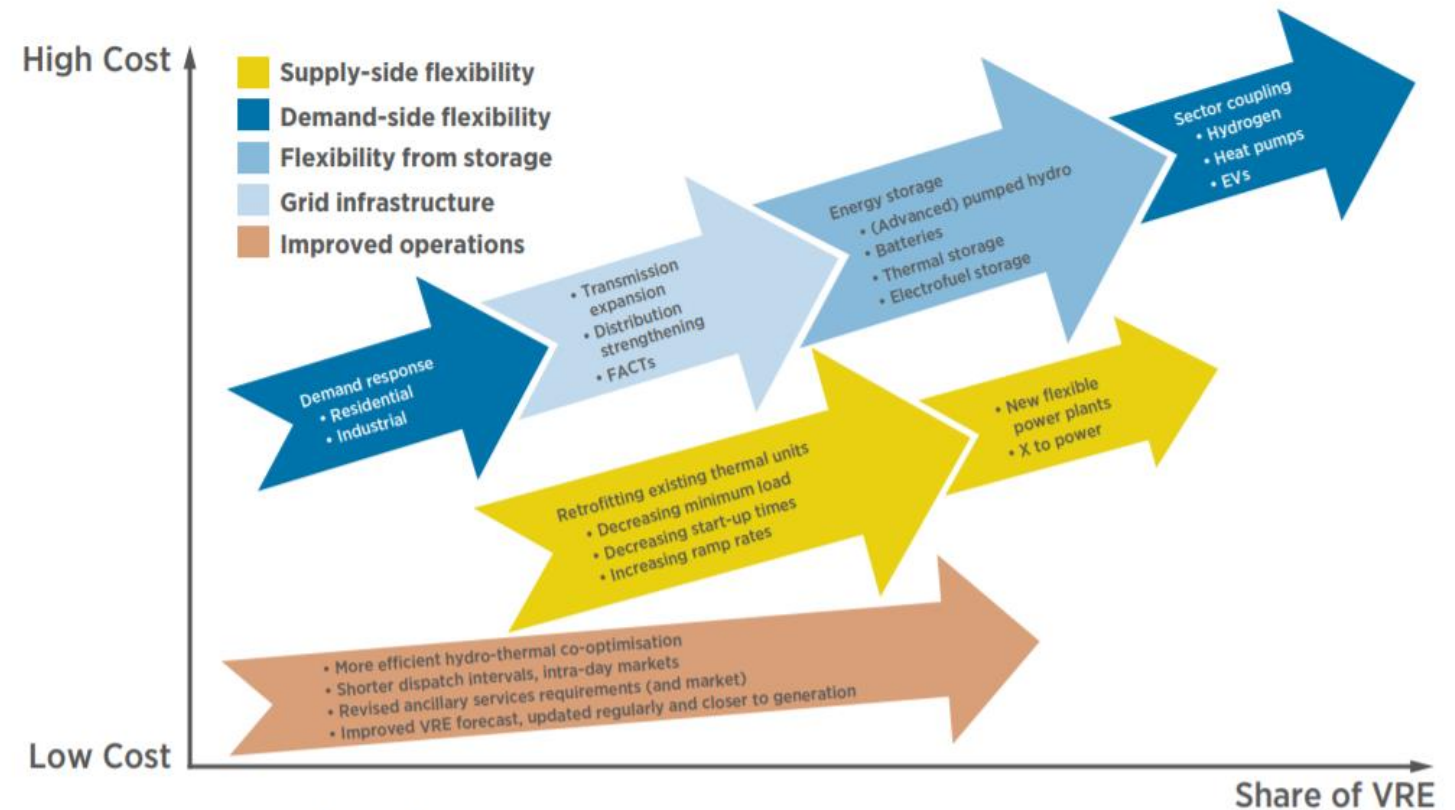   » Variable rating lines, T&D enhancement

    » Smart Grids

  » **Storage**

    » Pumped Hydro

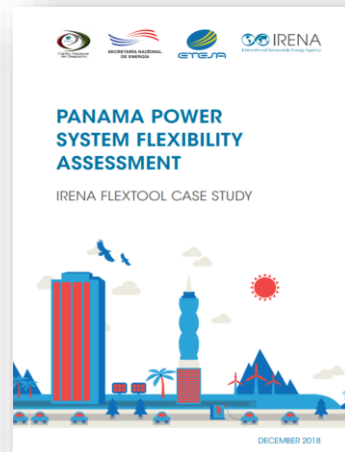   » Batteries

    » V2G

  » **Demand Response**
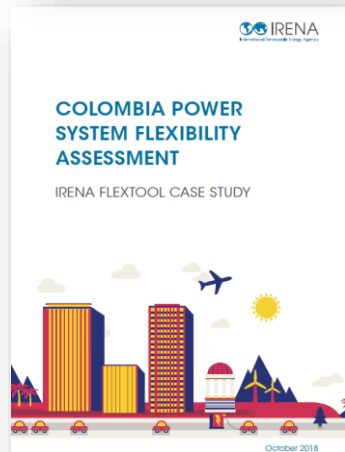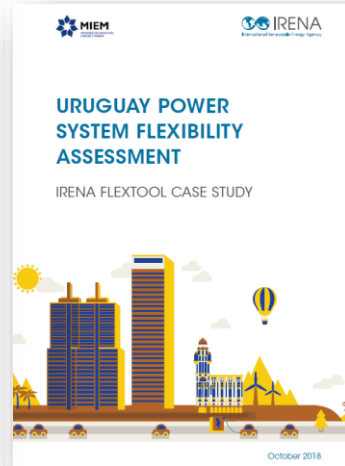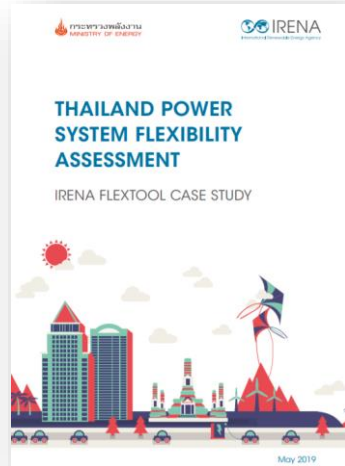
    » Conventional: DSM, aggregation

    » Sector coupling: Heat pumps, boilers, H2

  » **Market/Institutional**

    » Unlock flexibility/remove barriers

    » Regulation needs to support flexibility

Source: based on Denholm et al., 2010

IRENA FlexTool: Present and Future

IRENA
FlexTool

THAILAND POWER SYSTEM FLEXIBILITY ASSESSMENT
IRENA FLEXTOOL CASE STUDY
May 2019

URUGUAY POWER SYSTEM FLEXIBILITY ASSESSMENT
IRENA FLEXTOOL CASE STUDY
October 2018

COLOMBIA POWER SYSTEM FLEXIBILITY ASSESSMENT
IRENA FLEXTOOL CASE STUDY
October 2018

PANAMA POWER SYSTEM FLEXIBILITY ASSESSMENT
IRENA FLEXTOOL CASE STUDY
DECEMBER 2018

POWER SYSTEM FLEXIBILITY FOR THE ENERGY TRANSITION
PART 1: OVERVIEW FOR POLICY MAKERS

POWER SYSTEM FLEXIBILITY FOR THE ENERGY TRANSITION
PART II: IRENA FLEXTOOL METHODOLOGY

Present and Future Work

1. *Assessing Regional Integration*

   a) Central America (Panama, first country)

   b) ASEAN (Thailand, first country)
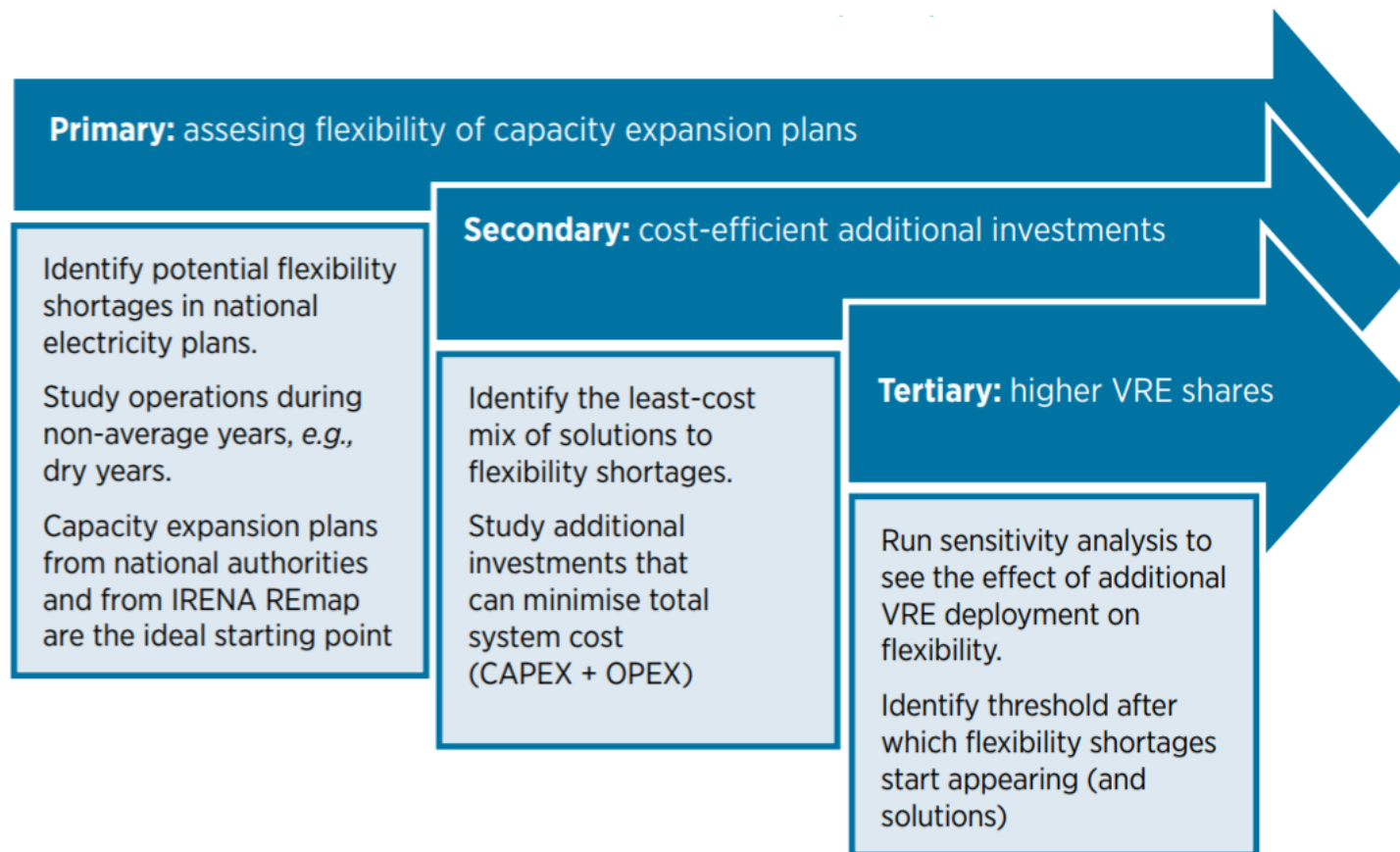
2. *FlexTool Training*

   a) Cuba (November 2019)

   b) Latin America (19 May 2020)

   c) ASEAN (2 June 2020)

   d) **MENA (today)**

Objectives of the flexibility assessments

IRENA FlexTool

The **IRENA FlexTool** performs both **capacity expansion** and **economic dispatch** of a power system with a focus on power system flexibility

Objectives of the FlexTool studies

1. Analyze **power system flexibility** using a base year (e.g., 2017)

2. Analyze **power system flexibility in the future** using **REmap projections** and national expansion plans

3. Analyze the **value of regional integration**

4. Study if there could be **cost-efficient additional investments in more VRE or flexibility solutions** (e.g., sector coupling)

Primary: assesing flexibility of capacity expansion plans

Identify potential flexibility shortages in national electricity plans.

Study operations during non-average years, *e.g.,* dry years.

Capacity expansion plans from national authorities and from IRENA REmap are the ideal starting point

Secondary: cost-efficient additional investments

Identify the least-cost mix of solutions to flexibility shortages.

Study additional investments that can minimise total system cost (CAPEX + OPEX)

Tertiary: higher VRE shares

Run sensitivity analysis to see the effect of additional VRE deployment on flexibility.

Identify threshold after which flexibility shortages start appearing (and solutions)

Power sector planning in Arab countries: Country practices and improvement priorities

Flexibility:	Algeria Current?	Algeria Priority?	Bahrain Current?	Bahrain Priority?	Egypt Current?	Egypt Priority?	Iraq Current?	Iraq Priority?	Jordan Current?	Jordan Priority?	Lebanon* Current?	Lebanon* Priority?	Libya Current?	Libya Priority?	Morocco* Current?	Morocco* Priority?
1. Validating that your long-term capacity mix meets short-term flexibility requirements (e.g. ramping), and assessing flexibility costs (e.g. cycling costs, efficiency losses, etc.)	Y	1			Y	1		1.5		1.5		1	Y	1	Y	N
2. For more advanced flexibility analysis at higher VRE penetration levels, hourly representation	Y	1			Y	1		1.5		1.5		0.5	Y	1	Y	N
3. Assessing the contribution of storage and demand response to flexibility		0.5				1		1	Y	1	Y	1	Y	1	Y	N

Flexibility:	Oman* Current?	Oman* Priority?	Palestine Current?	Palestine Priority?	Qatar Current?	Qatar Priority?	Saudi Arabia Current?	Saudi Arabia Priority?	Somalia Current?	Somalia Priority?	Sudan* Current?	Sudan* Priority?	Yemen+ Current?	Yemen+ Priority?	# of countries Current?	# of countries Priority?
1. Validating that your long-term capacity mix meets short-term flexibility requirements (e.g. ramping), and assessing flexibility costs (e.g. cycling costs, efficiency losses, etc.)	Y	N	Y	1		1	Y	1		1				1	7	12
2. For more advanced flexibility analysis at higher VRE penetration levels, hourly representation		N		0.5	Y	1	Y	1		1				1	6	11
3. Assessing the contribution of storage and demand response to flexibility		1		N		0.5	Y	0.5		0.5				1	5	9

» Results obtained from the AVRIL workshop that took place in Amman in April 2019

» **12 out of 15 countries** in the region have as priority to validate the long-term capacity mix in terms of flexibility

» IRENA FlexTool is a very suitable tool for this type of analysis

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International Renewable Energy Agency

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