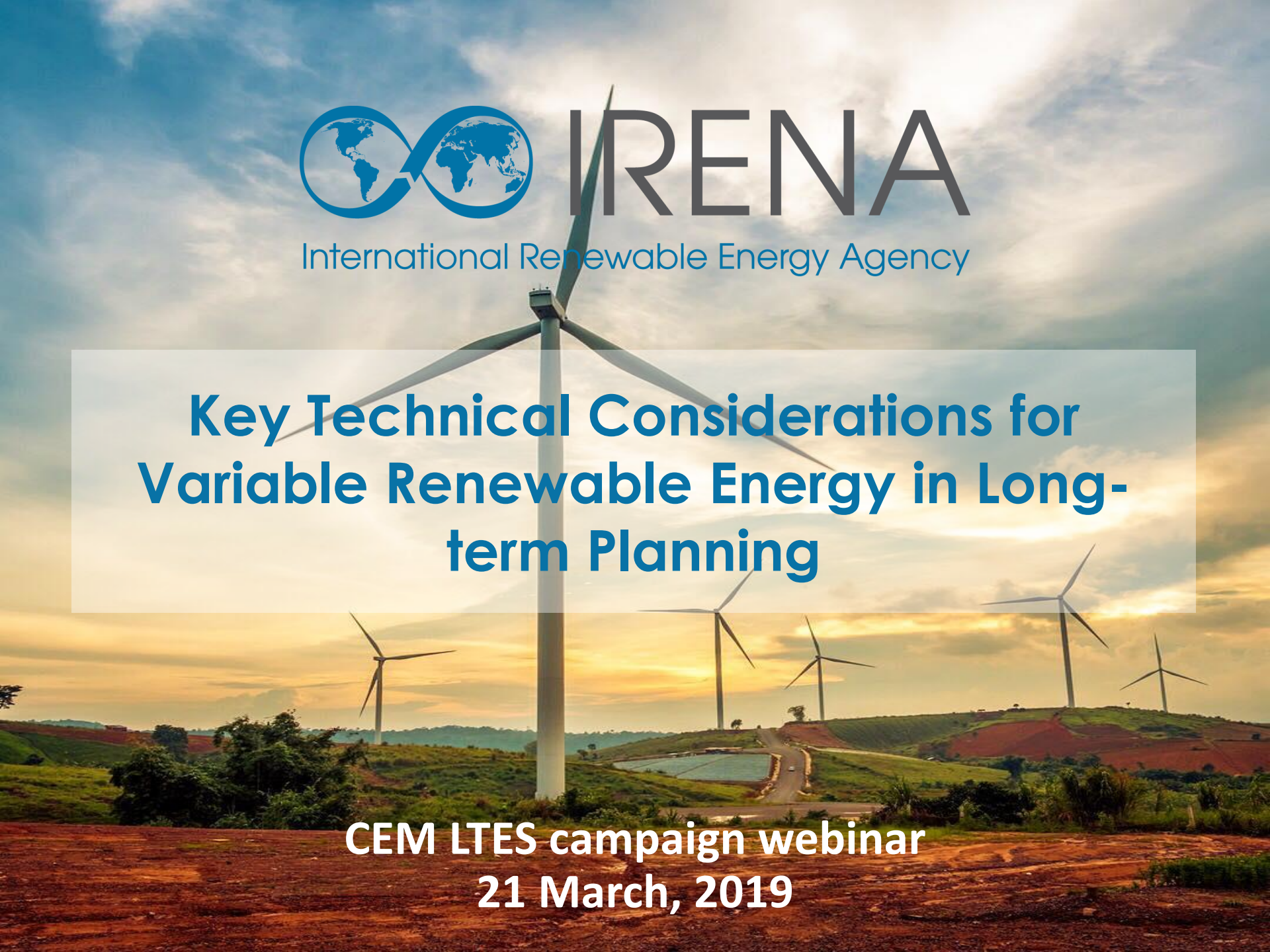

IRENA

International Renewable Energy Agency

Key Technical Considerations for Variable Renewable Energy in Long-term Planning

CEM LTES campaign webinar
21 March, 2019

How scenarios are used and developed

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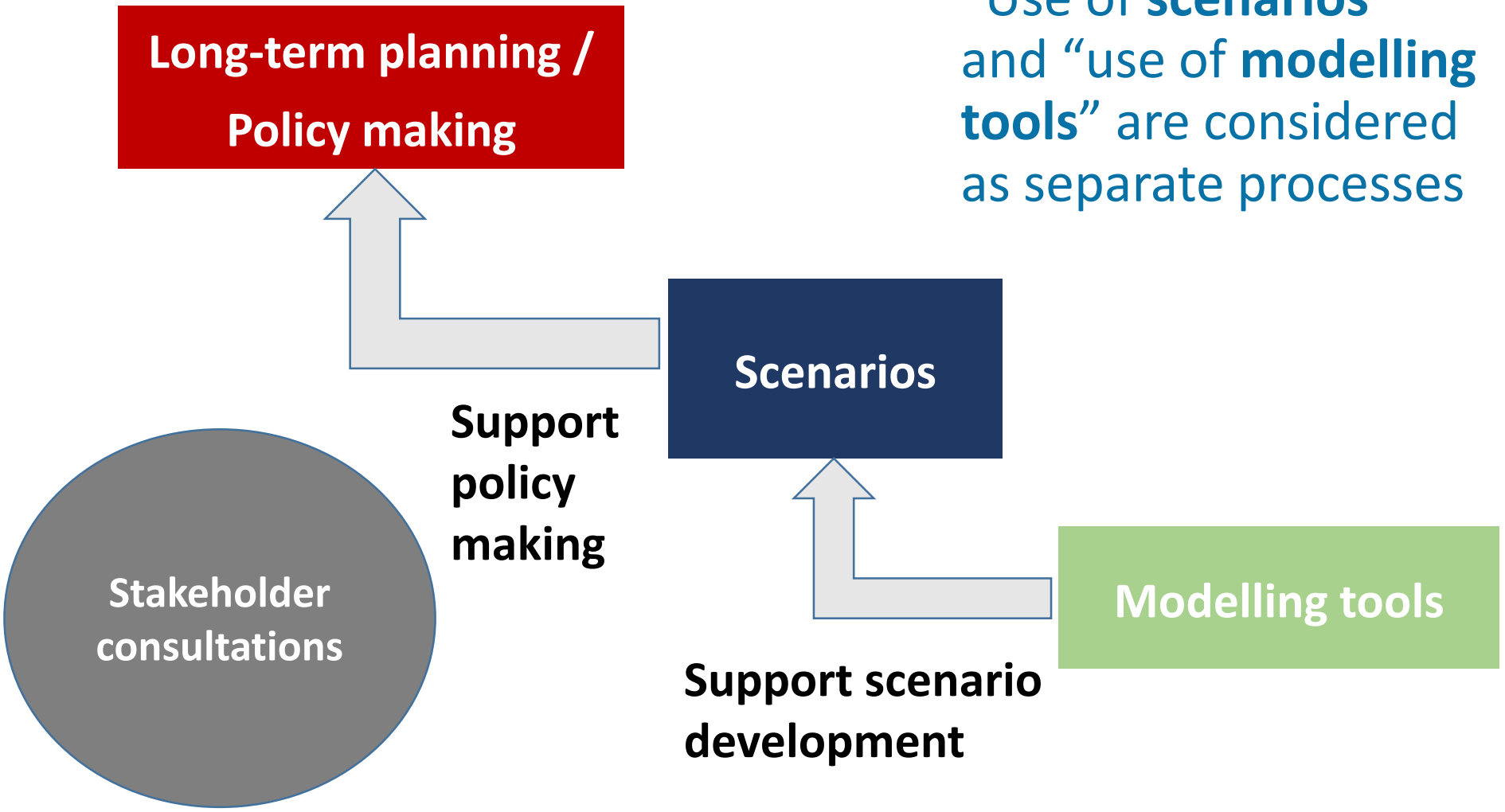
International Renewable Energy Agency

"Use of **scenarios**" and "use of **modelling tools**" are considered as separate processes



Long-term planning with VRE

Long-term generation expansion models

- Primarily focused on economic assessment of options
- System-wide optimization
- Reduced representation of operational aspects
- Does not necessarily answer “reliability” questions

Government

“Deploying variable renewables (VRE) is beneficial.”

“Our country should adopt ambitious long-term VRE targets.”

Energy planning officials

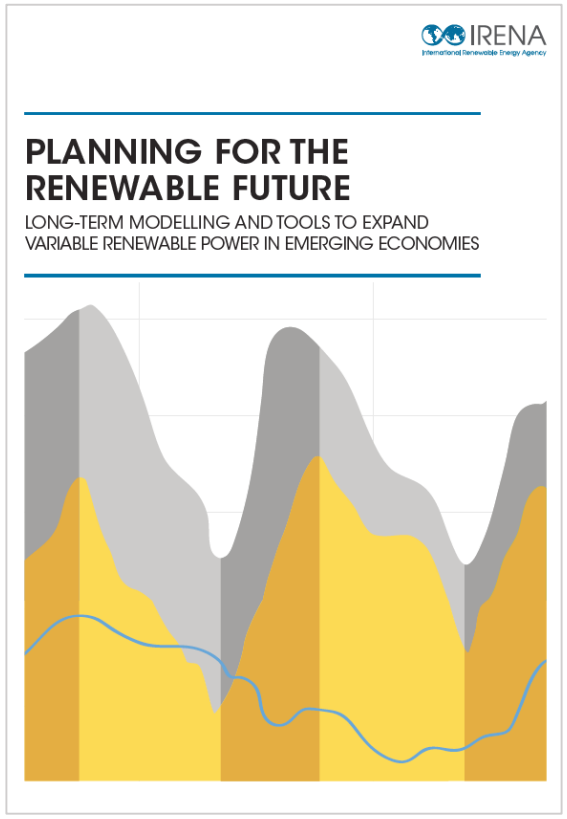
System operators

“VRE’s short-term variability endangers power system reliability”

“There is an upper limit of X% VRE”

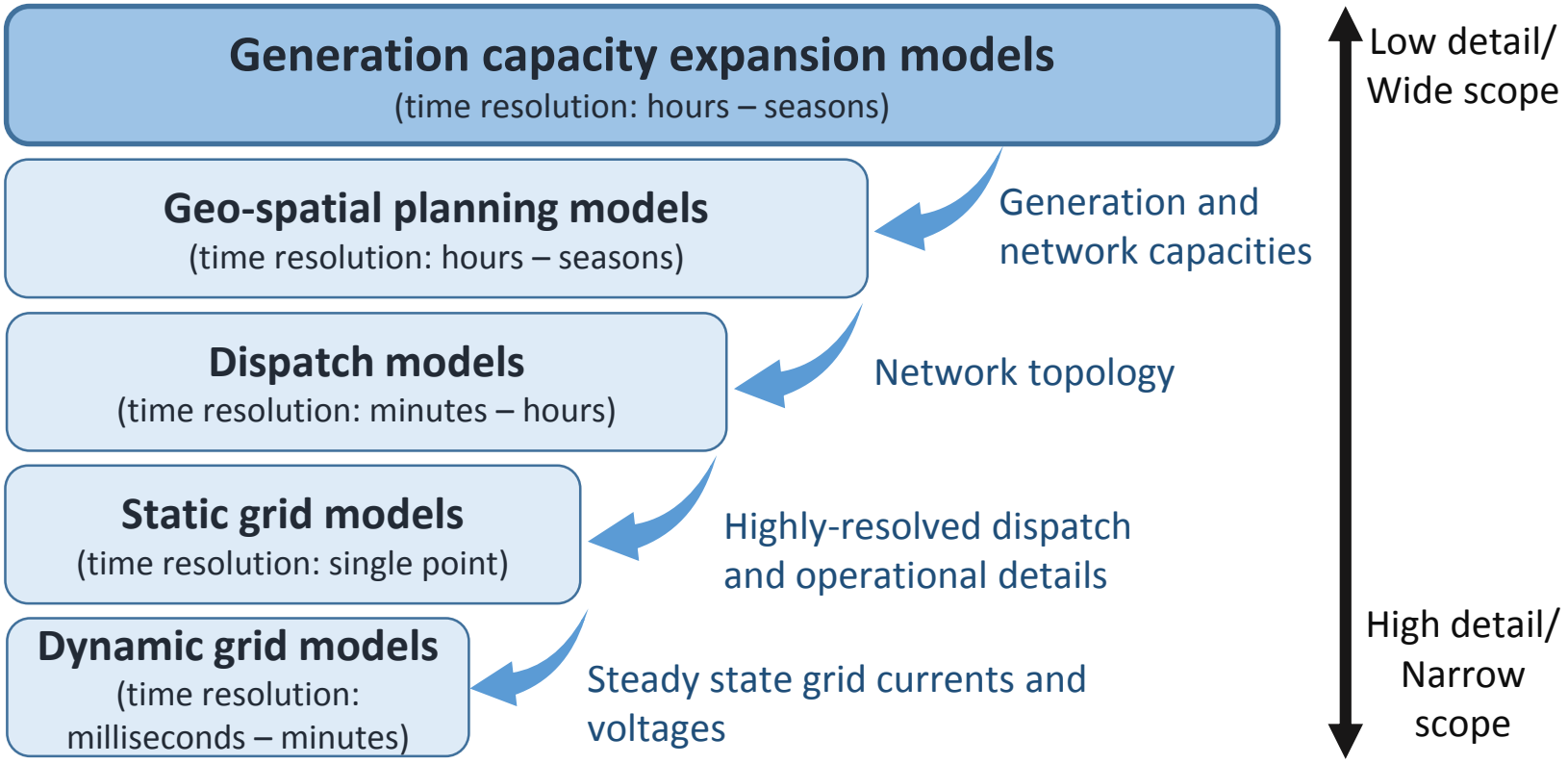
Background material

Addressing Variable Renewables In Long-term planning (AVRIL) project



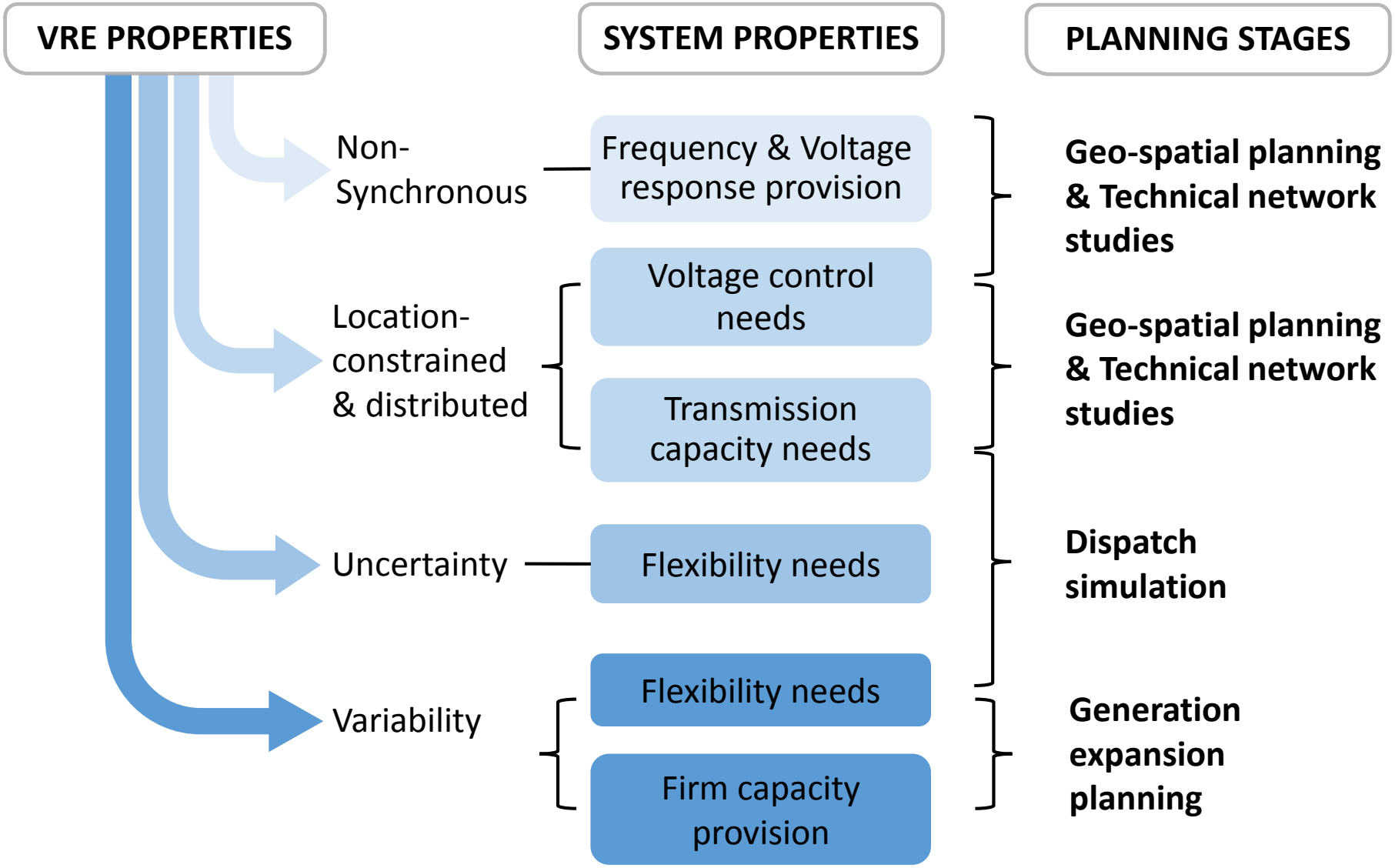
Application of planning tools

… without VRE



Source: IRENA (2017), Planning for the Renewable Future: Long-term modelling and tools to expand variable renewable power in emerging economies

Key features of VRE generation



Source: IRENA (2017), Planning for the Renewable Future: Long-term modelling and tools to expand variable renewable power in emerging economies

Long-term investment implications

	Generation	Networks
Adequacy	**Firm capacity**	**Transmission capacity**
Security of operation	**Flexibility**	**Voltage control capability**
	Stability (frequency response and voltage response)	

Most relevant

High relevance

System-specific

Near-term relevance

Source: IRENA (2017), Planning for the Renewable Future

Long-term energy planning with VRE

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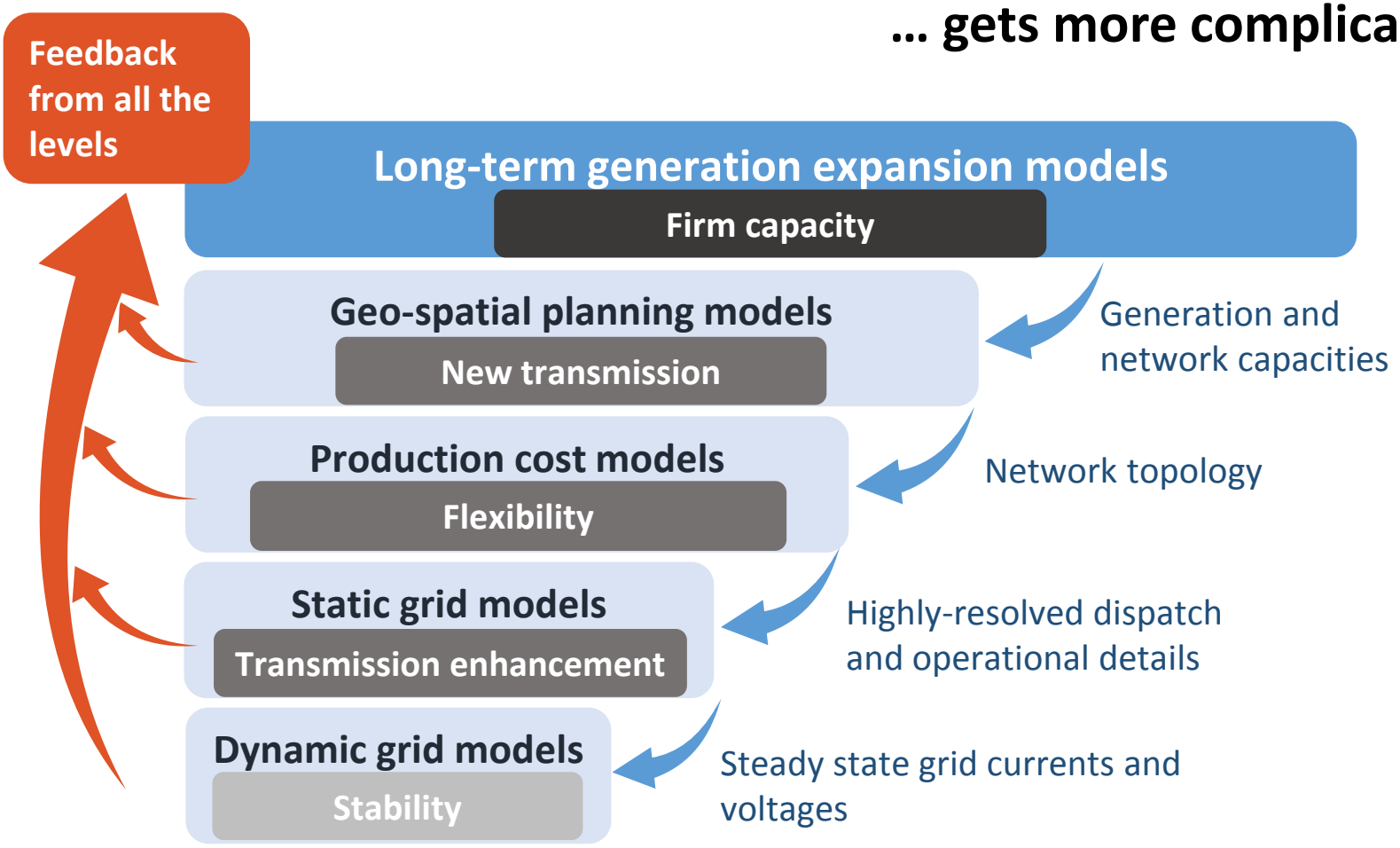
… gets more complicated



Low High

Relevance of VRE impact in long-term planning

Conclusion

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It is important to do it right from the beginning!

How?

- Coordinated planning across planning bodies
- Improve long-term energy planning modeling methodologies by incorporating key VRE features

One of the best practice is using multiple models for validations. IRENA developed a tool for validating flexibility of planned capacity expansion plans.

Thank you

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