

Launch of IEA's Reports on Electricity Security

12 April 2021

International Energy Agenc



Secure Energy Transitions in the Power Sector

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Paris, 12 April 2021

The power sector landscape is changing dramatically





Traditional system

Centralised / dispatchable High inertia and stability Central planning One way flows of energy and communication Closed networks, few devices

New system

Decentralised / variable generation Low system inertia from rotating machines Multiple actors / competitive markets Two way flows of energy and communication Open networks and many devices Changing climate patterns

Under this circumstances is necessary to understand what changes are needed to keep security of supply





Different types of supply interruptions, form duration and depth to long lasting interruptions.

Recent outages affirm the critical role of electricity





Besides failure of physical elements of the grid, lack of investment and proper market frameworks, and increasing extreme weather events can create significant supply interruptions

Why electricity is a special sector, and why we need reliability standards



- Lack of consumer's real time responsiveness may require rationing of energy to alleviate supply shortages- but how much is acceptable?
- Policy makers have the task to provide answer to this question setting reliability standards
- Alas there are no perfect ones, since individual metrics can only track specific aspects, e.g. :
 - Average frequency (e.g. LOLE)- but how many consumers are affected?
 - Average energy not served (e.g. EENS)- rationing 1 consumer during 24 hrs is the same as rationing 24 consumers during an hour?

Reliability metric	Dimension	Probability
Reserve margin	Available capacity margin (% of peak demand)	None
Expected Energy Not Served (EENS)	ENS* magnitude (MWh)	Average value
Loss of Load Expectation (LOLE)	ENS frequency (hr/year or days/year)	Average value
p95 (95th percentile)	ENS frequency (hr/year)	Tail risk, 1/20 years event
Loss of Load probability (LOLP) for a specified ENS volume	ENS frequency (hr/year)	Probability of a specified ENS level

Multiple reliability indicators should be considered, accounting for both average and extreme risks, in order to ensure a proper level security of supply according to society's preferences

Large shares of VRE will change the way power system will behave





Reduced costs will make variable renewables the fastest growing source of electricity in the coming years. Variability and uncertainty will require updates in market frameworks and new ways to operate the system

Large amounts of dispatchable capacity, used to balance the system, is being retired in advanced economies



sources, like nuclear and hydro, lag behind

Coal and gas-fired plants will need to provide more flexibility



Coal and gas-fired plants will run less often at baseload, particularly in SDS, but will be needed to meet peak demand and to provide system flexibility

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Flexibility will increasingly be provided by non-thermal sources





■ Hydro ■ Gas ■ Coal ■ Oil ■ Nuclear ■ Other ■ Interconnections ■ Batteries ■ Demand response

Thermal power plants continue to provide the bulk of flexibility needs, along with interconnections, but use of batteries and demand-side response is rising fast

Markets and investment frameworks need to remunerate all system services needed for electricity security



Power systems need to reward and incentivise flexibility and capacity contributions of assets and technologies. Australia, Ireland and Chile are examples of countries adapting their markets to achieve this.

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Measuring Reliability will require new methods





Stochastic methods provide a much more detailed picture of the risks for power systems accounting for weatherdependent factors affecting both demand and supply - and the contribution of different types of resources to adequacy under different scenarios

For systems relying on gas for adequacy, deliverability will be increasingly relevant



Average gas demand is expected to decrease in Northwest Europe between today and 2030, but will provide a greater share of peak demand and flexibility needs.

Technical aspects of gas infrastructure will become essential to assess security of supply- and more coordination will be needed





Technical parameters such as delivery rates and flexibility provided by the gas sector will be very important for the power sector in Europe in the coming years - planners, regulators and system operators need to get "gas savvy"

Cross-border integration brings economic and security benefits





The generation of clean energy – such as wind, solar PV and hydro – and the prevailing demand profile all vary by region. Interconnection with neighbouring regions allows systems to take advantage of complementarity, increase security and bring down overall system costs.





The IEA's participation in this event was made possible through the Clean Energy Transitions in Emerging Economies programme has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 952363.