Energy resilience and the water-energy nexus

Paul Simons, Deputy Executive Director, International Energy Agency
Asia Clean Energy Forum, Manila, 7 June 2017
Energy security and resilience in the face of climate change

- Energy security has been a core mission of the IEA since its founding in 1974.

- Resilience: the capacity of the energy system to cope with a hazardous event or trend, responding in ways that maintain its essential function and structure.

- Climate change affects all components of the energy system:
  - Primary energy supply
  - Energy transformation
  - Transportation, transmission, distribution
  - Energy demand
The choice of low-carbon technologies and fuels affects energy resilience

- Solar PV and wind can reduce water needs; CCS, concentrating solar power, nuclear, and biofuels can exacerbate water stress

- Hydropower is vulnerable to water shortages; but serves as energy storage

- Synergies between actions that meet both low-carbon and resilience objectives should be emphasised:
  - energy efficiency
  - distributed renewable generation
  - energy storage
Different low-carbon technologies have different water needs.

The shifts away from coal & natural gas in the power sector lowers withdrawals in the 450; but increased shares of nuclear, CCS & CSP increase consumption.

Global water requirements for the energy sector by scenario

Source: IEA World Energy Outlook, 2016
Future coal-fired power generation sites will consider water as a factor beyond coal transportation cost and electricity transmission cost to load centres alone.
Variable renewables **can enhance** energy resilience

**Benefits**

- **Diversification**
  - Balanced generation portfolio
  - Diversify fuel mix

- **Domestic supply**
  - Reduce import bills and lower fossil fuel price risks

- **Environment**
  - Greenhouse gas and local pollution reduction

**Risks**

- **Variable and uncertain**
  - Outputs depend on weather and climate

**System integration options**

- Grid
- Generation
- Storage
- Demand shaping

More clean, secure and resilient system
Conclusions

• In addition to the need to decarbonise, the energy sector must also build resilience to climate change and other risks

• Depending on the mix of technologies and fuels employed, the low carbon transition can build resilience in some ways, but create new risks in others
  - Solar PV and wind can reduce energy water needs; CCS, biofuels, CSP can increase water stress

• Integrated planning can help achieve multiple policy objectives – including decarbonisation, resilience-building, and smarter water use – while avoiding unintended negative outcomes

• Variable renewables can enhance energy system resilience, but successful integration of high shares requires improvements in system planning, operation and market design