IRENA
International Renewable Energy Agency

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INTERNATIONAL RENEWABLE ENERGY AGENCY
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Note of the Director-General

Adapting electricity market design to high shares of Variable Renewable Energy

1. The world is undergoing an accelerated energy transition, one driven by environmental, technological, social, economic, and policy factors. The ways in which electricity is produced, transported, and consumed are essential to this transformation, which will bring about profound changes over the next several years. These changes include the progressive decarbonisation of the energy mix; the decentralisation of generation capacity and the growing availability and reduced costs of distributed energy resources; increases in regional inter-connection and market integration; and consumer empowerment, enabled by information and communication technologies.

2. With decreasing costs and improving technologies, renewable energy deployment in the power sector has grown at a tremendous pace over the past decade. Globally, solar capacity has increased seven-fold between 2010 and 2016, and wind deployment has more than doubled. Since 2012, more renewables capacity has been added in the power sector compared to fossil fuels and nuclear combined.

3. Sustaining the growth momentum for renewables will require additional efforts to ensure smooth integration into the power system. Depending on local circumstances, high shares of variable renewable energy can raise some challenges for traditional power systems. The challenges are further compounded by the fact that significant proportion of renewable capacity is distributed across the customer end of the distribution network, on rooftops and in the backyards of homes and businesses.

4. Rethinking the design and operation of power markets is required to effectively and efficiently handle the substantial increase in variable renewables, together with the rise in distributed generation infrastructure. One of the key features of a future power sector is enhanced flexibility. This can be achieved through a variety of measures, including those focusing on the supply side, demand side, transmission and distribution networks, storage, system operation and management, and electricity market design.

5. Electricity markets have been traditionally tailored to a context in which grid-connected, large-scale, flexible power plants supplied electricity in response to a relatively easy to forecast, passive demand. Until recently, electricity demand has been assumed to be highly inelastic and mainly dependent on temperature and expected economic activity. To enable higher shares of variable and distributed renewable energy deployment, regulations governing the electricity markets need to adapt to a fast-changing scenario in a timely manner.

6. Policy makers, regulators and power system operators around the world – whether operating under vertically integrated systems or within liberalised power markets – are taking, or considering, measures to adjust to completely new conditions. This must be done in ways that promise adequate,

reliable and safe electricity services at reasonable prices while sharing system costs and benefits among all stakeholders in a fair and equitable manner.

7. To support decision making on key features of an enabling electricity market design, IRENA has developed the study *Adapting electricity market design to high shares of Variable Renewable Energy*. This report identifies key regulatory and policy measures needed to adapt the power sector to growing shares of variable and decentralised renewable electricity, from wholesale markets and system operations to distribution networks and end users. Based on case studies, the recommendations are based on sound regulatory principles and reflect the complex inter-relationships of activities and stakeholders across the power sector.

8. The plenary discussion at Council will provide an important platform for Member States to share their national experiences and benefit from a cross-regional exchange of perspectives and lessons learnt on adapting electricity market design. This is an appropriate moment for a discussion on the topic given the growing debate within many countries on effective and efficient mechanisms to integrate rapidly rising shares of variable renewable energy.

Questions

- What policy and regulatory measures are being taken or considered to support effective and efficient integration of variable renewable energy in the power sector?
- What measures are being taken to improve the flexibility of the power system and to adapt market design to high shares of variable renewable energy solutions?
- How can IRENA support Member States in their efforts to develop a power system that is compatible with high shares of distributed and renewable energy?