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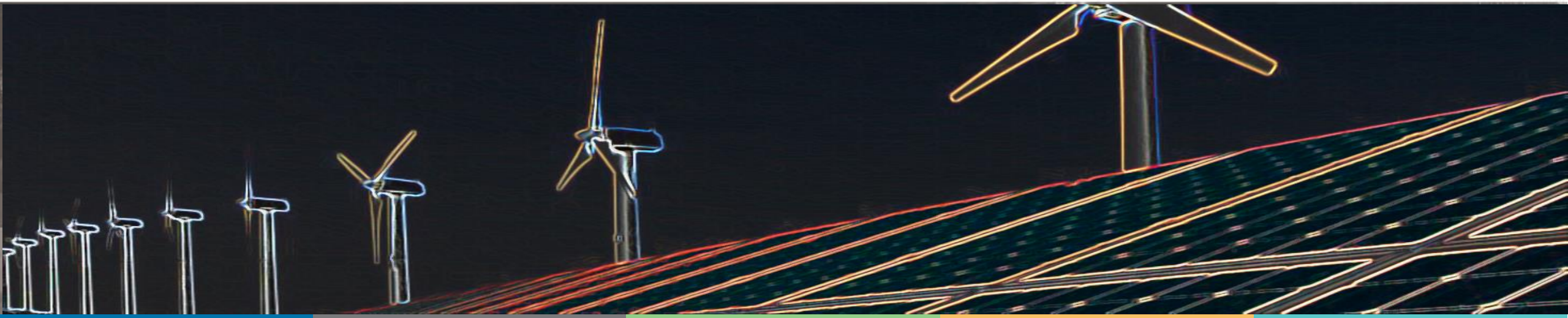
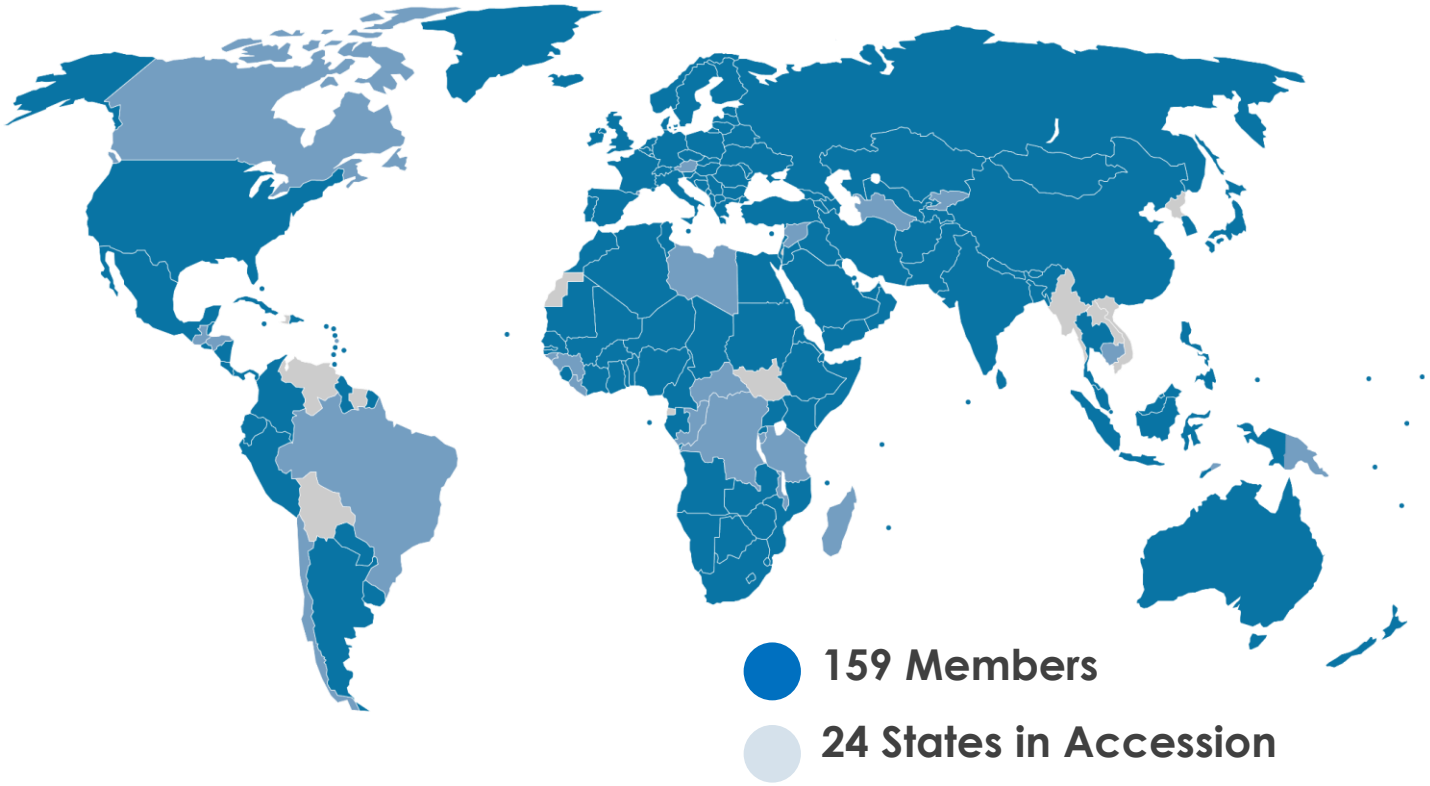


Managing patents in the renewable energy sector: insights and future innovation needs

Intellectual Property, Managing Green Technologies and CCMT Conference
October 10, 2018
Milan, Italia

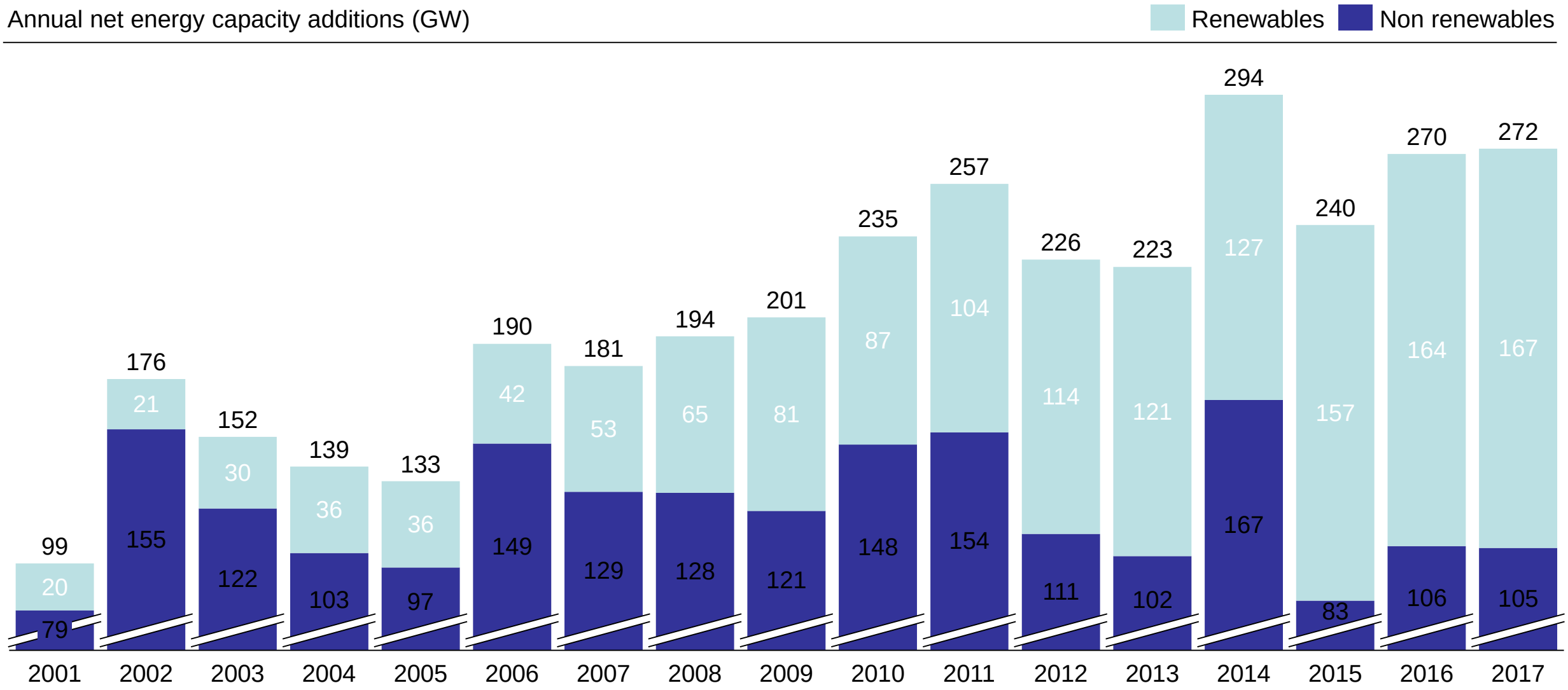
About IRENA

- Inter-governmental agency established in 2011
- Headquarters in Abu Dhabi, UAE
- IRENA Innovation and Technology Centre – Bonn, Germany
- Permanent Observer to the United Nations – New York

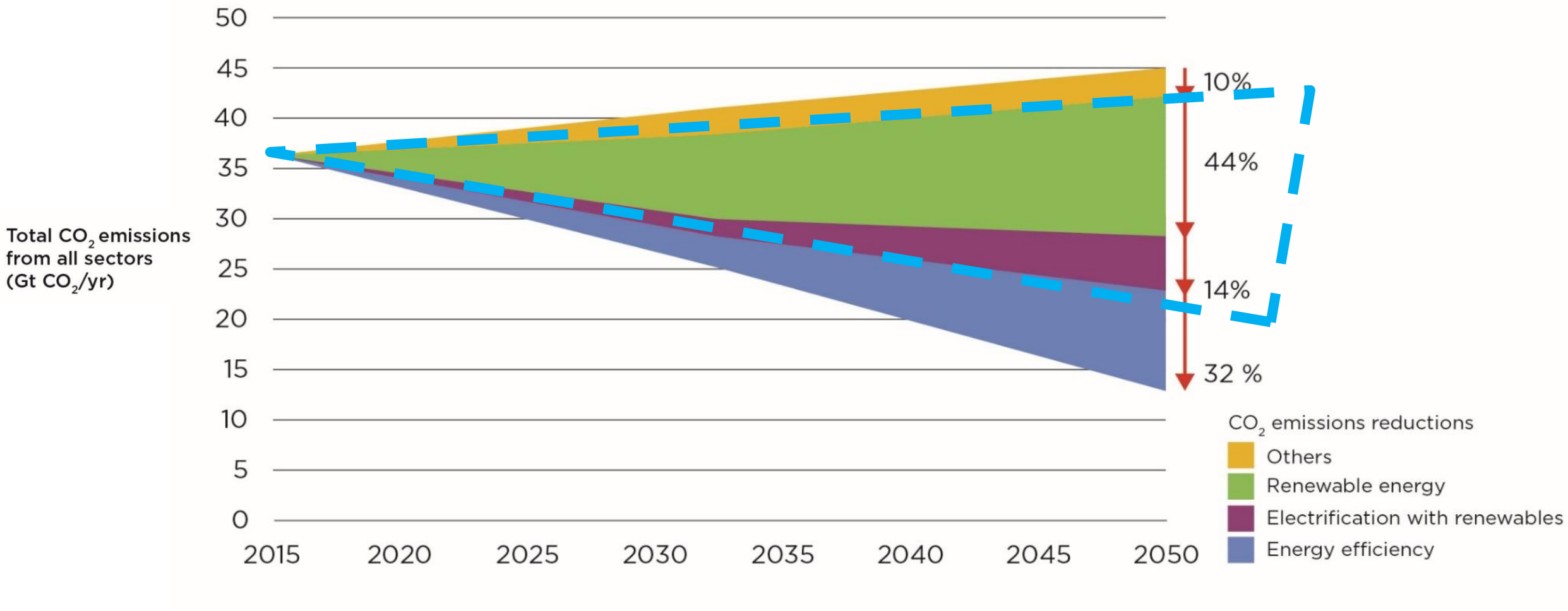


Mandate: Assist countries to accelerate renewable energy deployment

About half of the new electricity capacity worldwide is based on renewable energy.

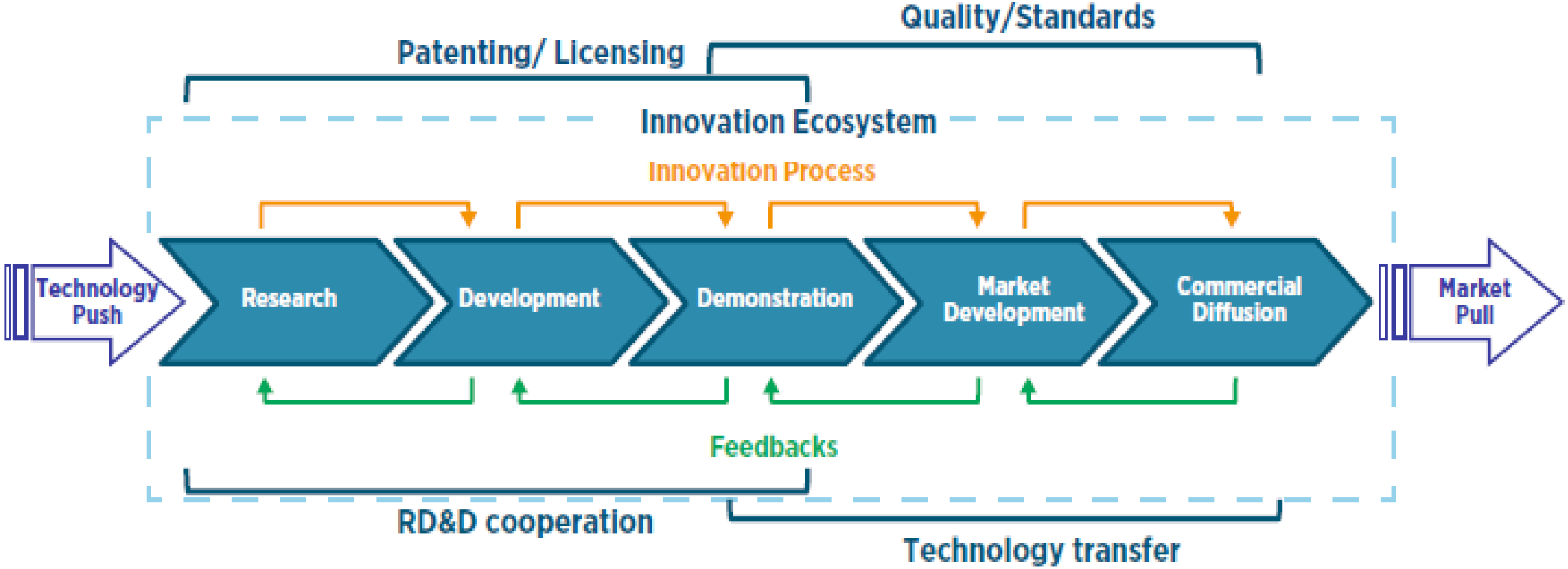


Renewables are crucial for decarbonisation the energy sector



Renewables would account for half of total emission reductions in 2050

IPRs are is one of the instruments to promote innovation in the technology life cycle



Source: IRENA (2015) Renewable Energy Technology Innovation Policy: A process development guide

Explore INSPIRE and get engaged in the work of patents and standards

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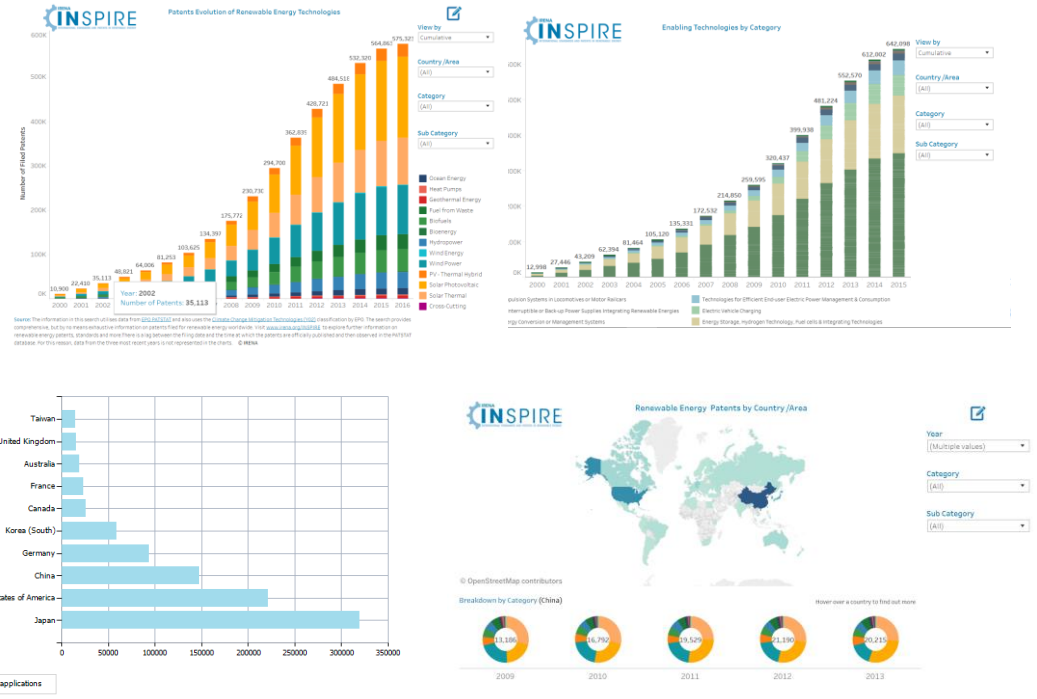
Free online platform International Standards and Patents in Renewable Energies(INSPIRE)

Access INSPIRE at: hiip://inspire.irena.org

Find here a video on how to use INSPIRE



Using PATSTAT database

1.7 million patents in RE

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INTERNATIONAL STANDARDS AND PATENTS IN RENEWABLE ENERGY

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Interested in RE patents?

Learn about the patent application process and browse IRENA's reports on patent developments

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Learn about RE standards

Information on standards development and project application

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Networking and more

Get in contact with developers and find reports on the topics

Read More

News and Events

Extending the Frontier of PV Reliability IRENA at the World Future Energy

Quality Infrastructure: Develop, Control, Cost and Benefit

Poll question 1

From 2006 to 2016, the quantity of renewable energy patents:

a) **Increased by 50%**

b) **Doubled**

c) **Tripled**

d) **Quadrupled**

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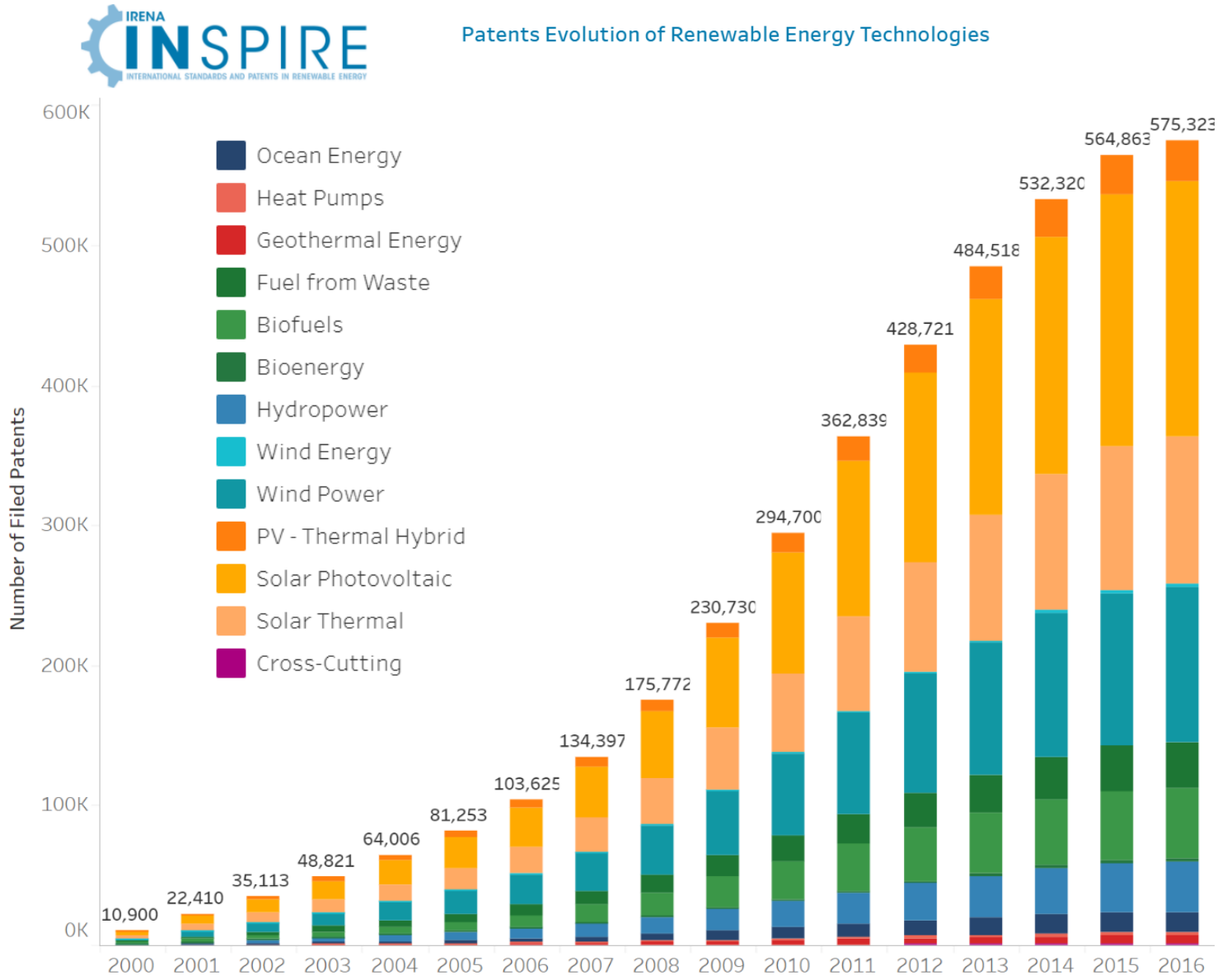
Patent Development in Renewables

- All the renewable energy technologies have **at least tripled** the quantity of patents in comparison to 2006
- Close to **600 000** patents in RE today
- Solar, Wind and Bioenergy accounts for **90%** of the patents in renewable Energy
- Solar is the leading technology with **55%** of patents in 2016



Source: inspire.irena.org

Poll question 2

In the upcoming years what technology you consider could file more patents?

a) **Biomass**

b) **Electric Vehicles**

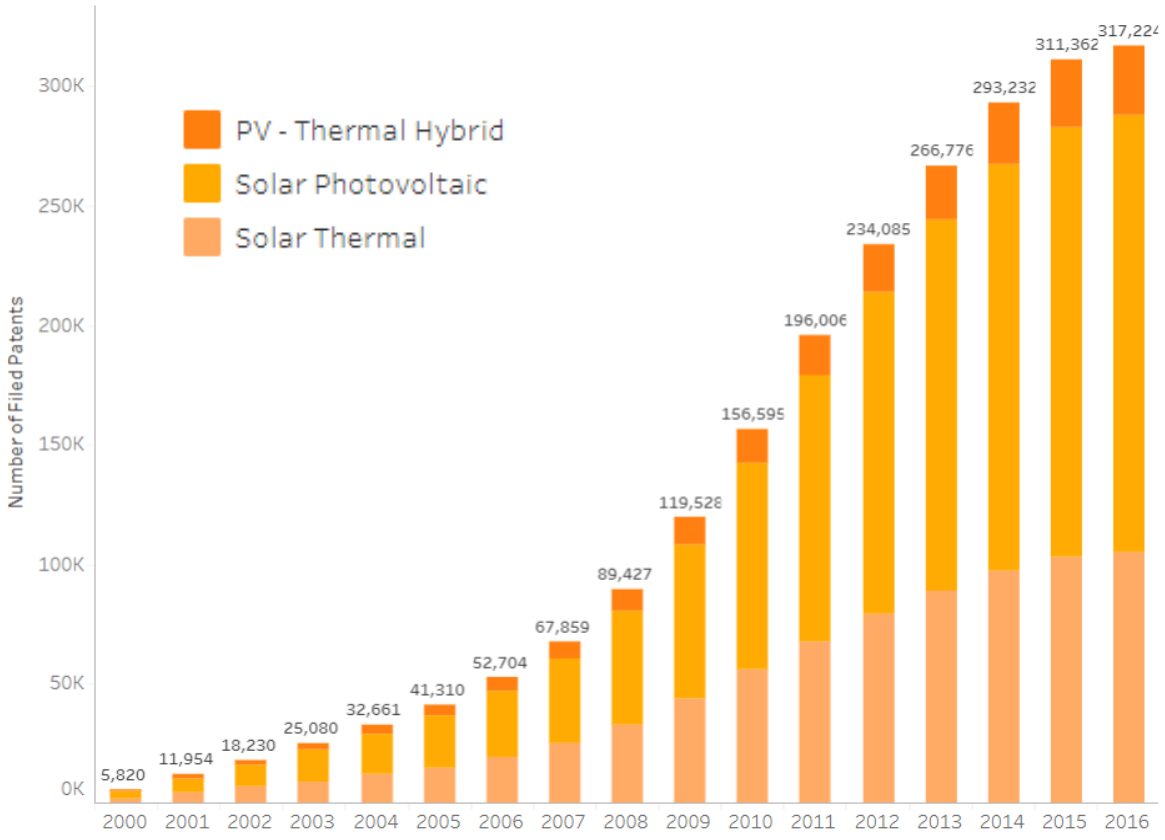
c) **Solar**

d) **Ocean**

e) **Battery Storage**

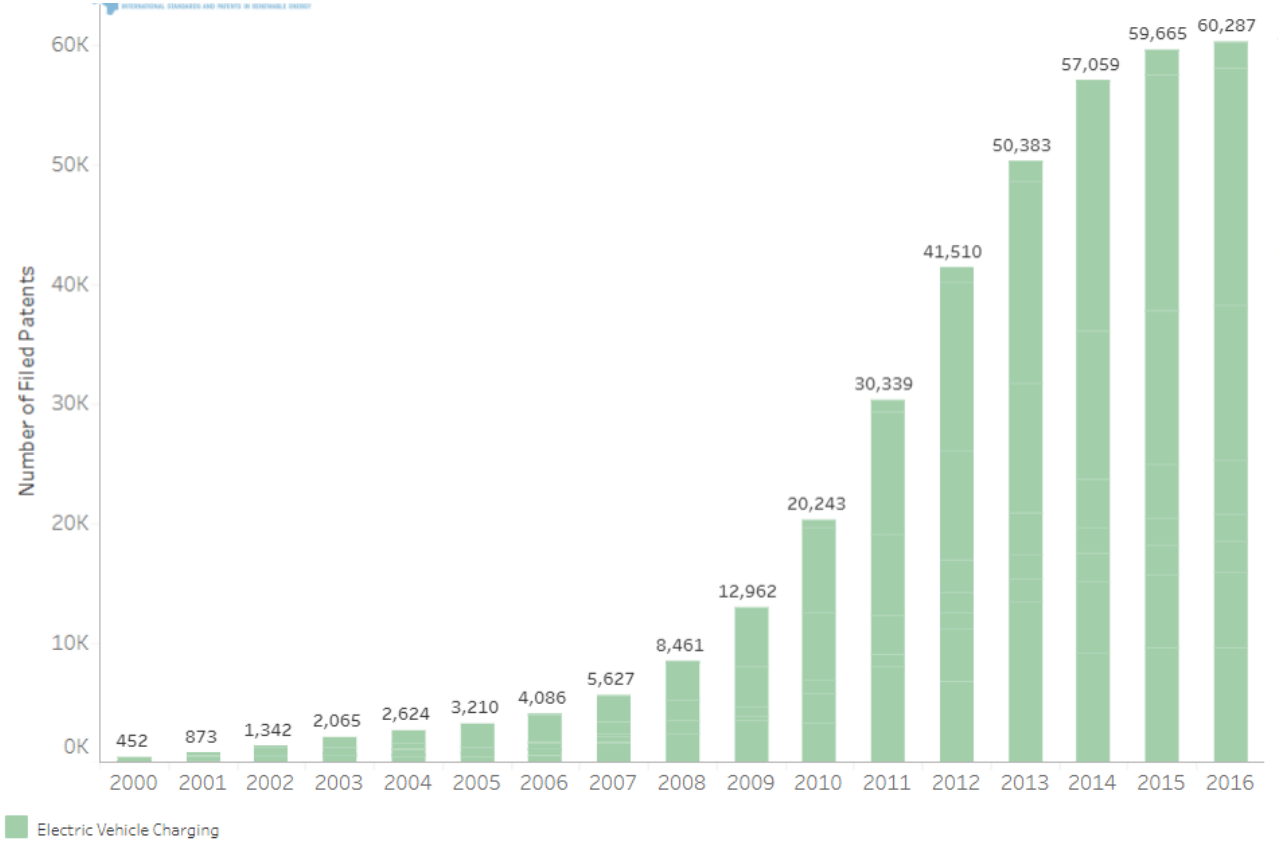
Innovation is now moving to enabling technologies

Patents in Renewable Energy



✓ Solar : **6 fold growth**

Patents in Enabling Technologies



✓ EV Charging : **16 fold growth**

Innovative developments - Innovation areas at the moment

Wind

Wind power (Y02B 10/30)

Wind energy (Y02E 10/70)

Wind turbines with rotation axis in wind direction (Y02E 10/72)

Blades or rotors (Y02E 10/721)

Components or gearbox (Y02E 10/722)

Control of turbines (Y02E 10/723)

Generator or configuration (Y02E 10/725)

Nacelles (Y02E 10/726)

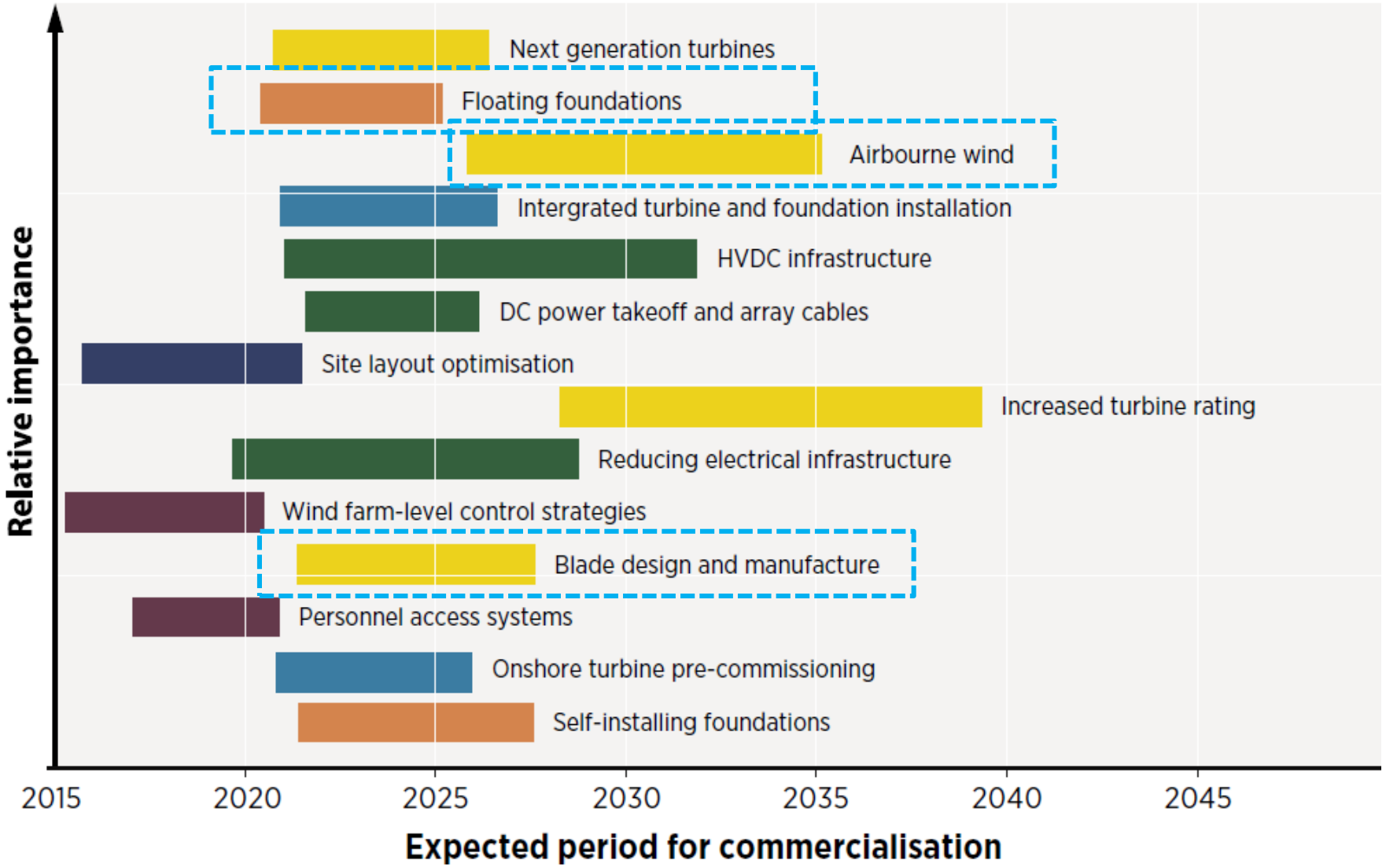
Offshore towers (Y02E 10/727)

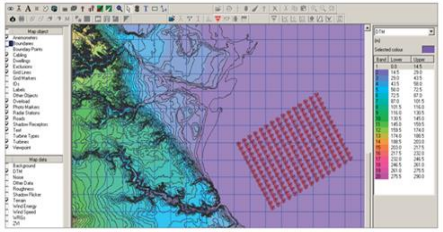
Onshore towers (Y02E 10/728)

Wind turbines with rotation axis perpendicular to the wind direction (Y02E 10/74)

Reference: BAT-Buoyant Airborne Turbine, Atsushi Shimizu, Sandia Natiional Laboratories,Offshorewind.biz

Patent information as an input to Innovation Outlooks





Wind farm design

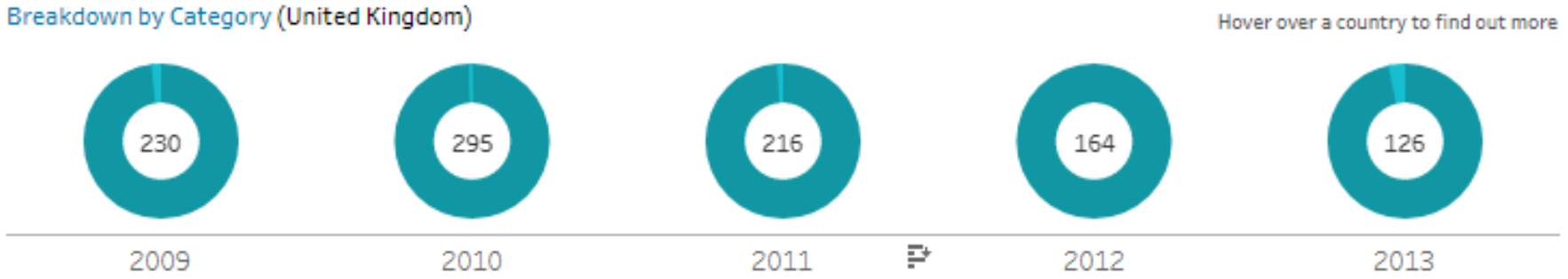
Turbines

Installation

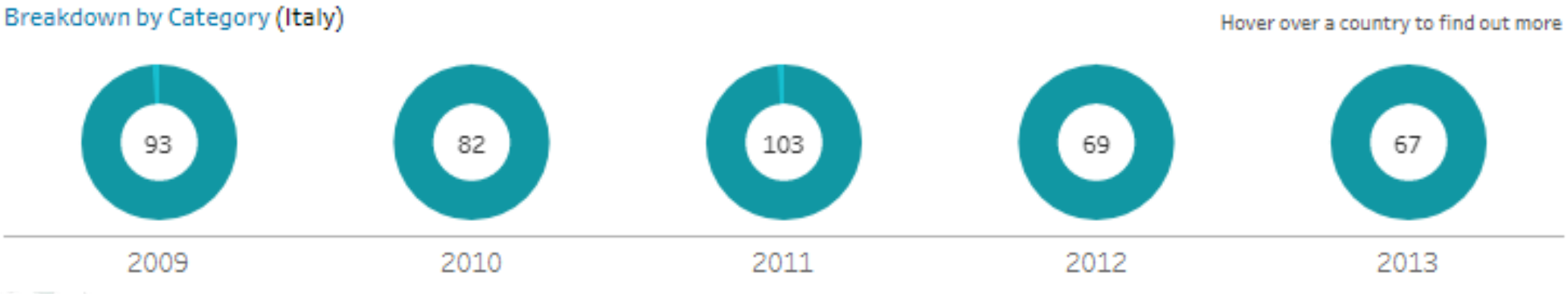
Electrical Interconnection

RE Patent progress in countries

United Kingdom



Italy



Poll question 3

Which technology may need stronger efforts in IPR and innovation as of today?

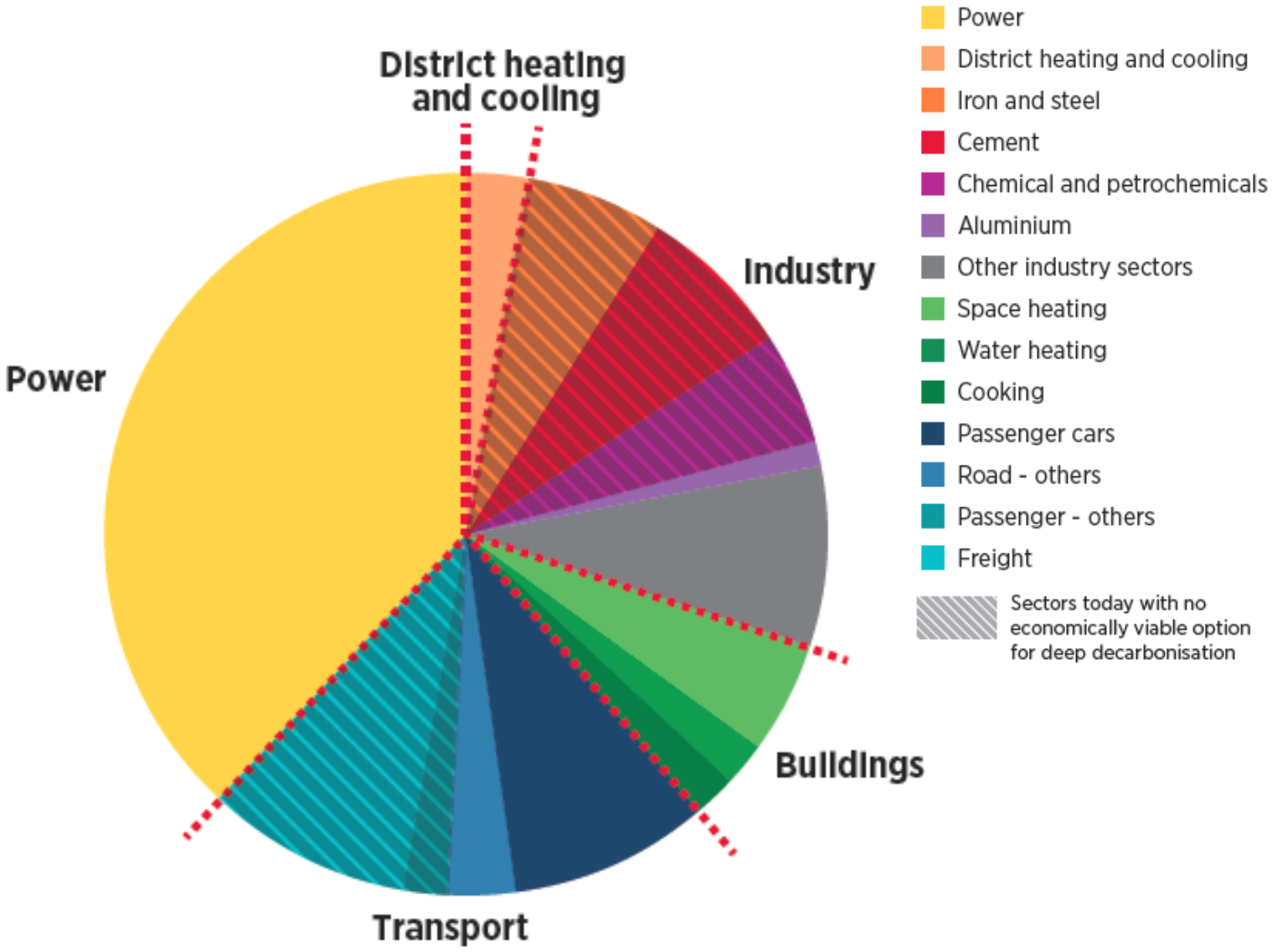
a) Smart Grids

b) Wind floating foundations

c) Electric Aircrafts

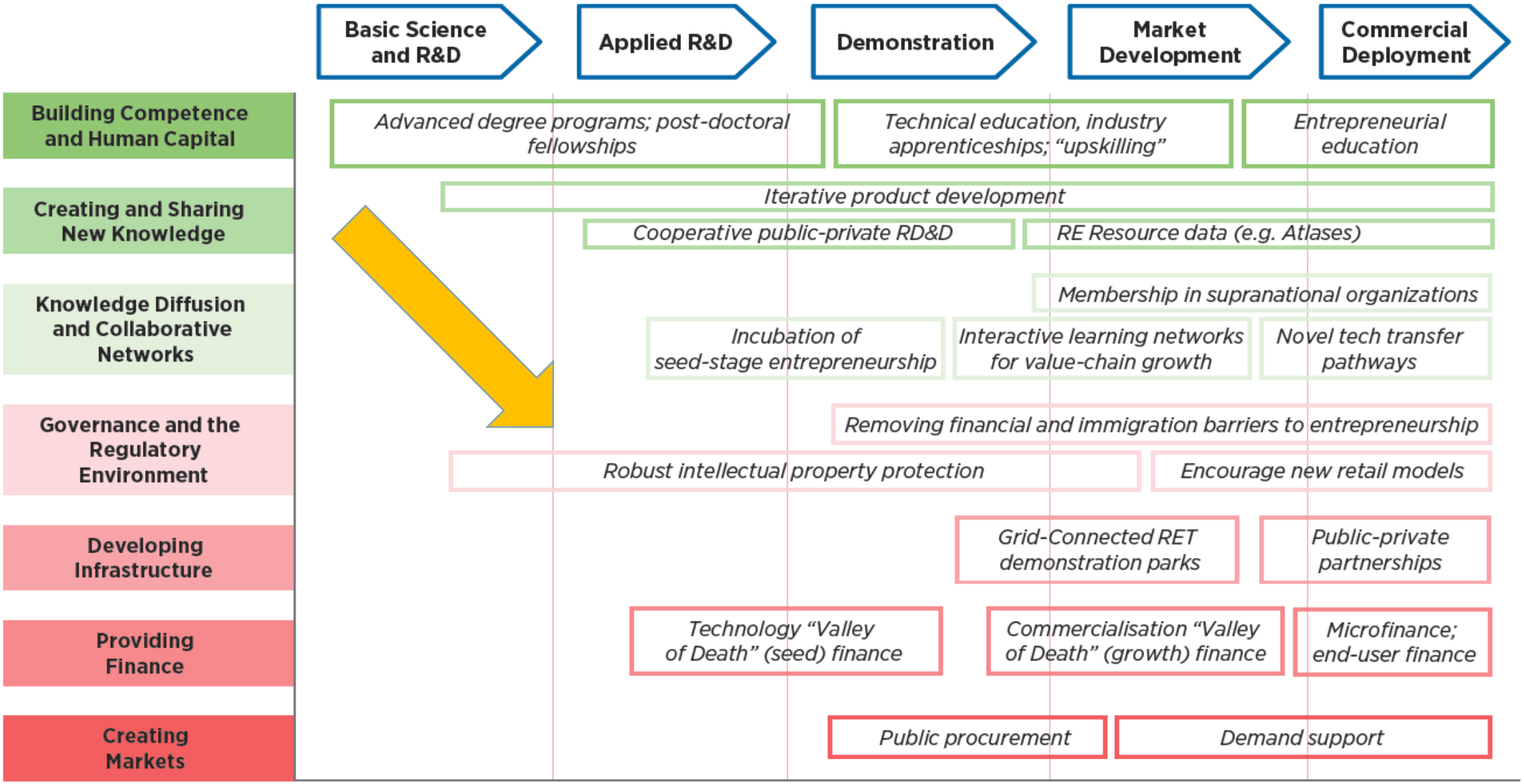
d) Solar Air Conditioners

Tracking innovation pace, still there is plenty of space for inventions



- **On track:** Solar PV, Onshore wind
- **Lagging behind but viable:** Solar CSP, Ultra high voltage DC
- **Not viable at current pace:** H2 vehicles, D&H cooling with renewables, CCS for natural gas and biomass, biomass for chemicals

IP as part of the innovation policy toolbox



Source: IRENA (2015) Renewable Energy Technology Innovation Policy: A process development guide

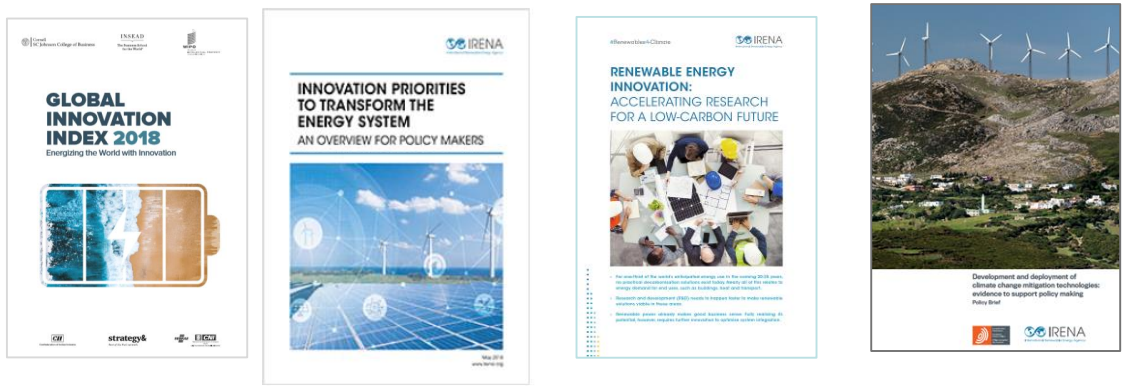
Overview: IRENA Innovation Work

Innovation Outlooks

Forthcoming :Electric Vehicles & Thermal Storage

IRENA Technology Briefs

Reports in innovation: energy transition, policy, IP, RD&D cooperation mechanisms



Innovation Landscape Report for the Power Sector Transformation

IRENA Innovation Week 2018

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International Renewable Energy Agency

Thank you for your attention!

Alessandra Salgado
IRENA Innovation and Technology Center
asalgado@irena.org
fboshell@irena.org

Back up

How to measure or track innovation?

R&D Investments, budget

R&D Initiatives

Start ups

Think tanks

Number of projects in the innovation pipeline

Intellectual Property: Patent Activities

Venture Capital

Information streams from patent data in IRENA

RET patent information can provide:

- Which countries and innovators are active
- Which countries are potential markets
- Trends of technology developments
- International research and co-operation as indicated by co-invention

Governments, through their patent offices, must be stewards of patent quality

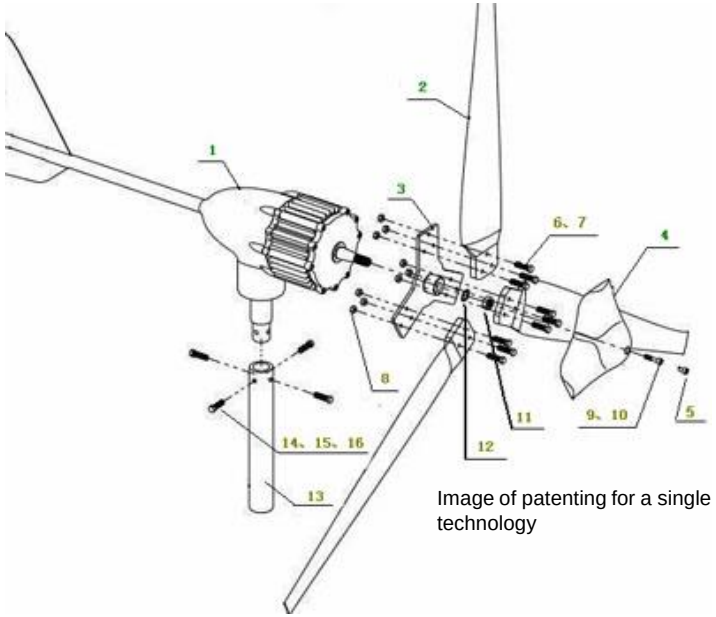

Image of patenting for a single technology

Benefits of cooperation in research, development & demonstration

For Technological Innovation

- Research, development and demonstration (RD&D) is one of the pillars of economic growth
- In developing countries RD&D significantly improves citizen's quality of life

For Increased Renewable Energy Deployment

- RD&D results in reduction of RE technology costs
- RD&D required to address issues concerning RE intermittency.

For Establishment of Cooperative Systems

- RD&D cooperation in RET reduces financial risks in contracts to unilateral RD&D by sharing it
- Cooperative RD&D facilitates that innovative technologies reach larger and global markets

Policy recommendations to support innovation in RE

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Recommended actions for policymakers and stakeholders	Examples and regional applications
Link R&D and innovation programmes to national macro objectives. Develop target-oriented support that include monitoring, reporting and verification of progress, and encompass the whole technology lifecycle from basic R&D up to commercialization.	**Republic of Korea** – National Strategy for Green Growth and the 577 Initiative: Economic growth via lead technology supplier in sectors with competitive advantage **Israel** – Fuel Choices Initiative: Energy security via alternative fuels to oil-based
Coordinate innovation across different sectors and governmental institutions. Determine the innovation needs across all sectors and energy services based on their annual growth rates, renewable energy shares and substitution costs. Systematically scan scientific progress and assess relevance for renewable energy deployment in the coming decades.	**United States** - Quadrennial Energy Review **Sweden** – VINNOVA **Chile** – InnovaChile
Invest in basic R&D, which has high risk and low interest from private sector	**Germany** – the German Research Foundation (DFG)
Support private sector innovation and entrepreneurship via small business programmers, promotion of start-ups. Focus R&D funding on technologies that are not yet market-ready, such as ocean energy and advanced liquid biofuels, and in sectors where RE penetration is especially low such as industry and freight transportation. As technologies become more mature, shift the support from supply side to demand side	**United States , Republic of Korea** and **Japan** - Small Business Innovation Research (SBIR) programmes **Israel** - Israel NewTech and Invest in Israel: business incubators
Establish knowledge management strategies that help researchers to bring their innovations into the market place, including training on business management and market assessment, technology transfer offices in universities, patenting and licensing, spin-offs	**United States , Germany, Republic of Korea, Japan** – Major technology universities have knowledge management and technology transfer offices to support their researchers in reaching commercialisation of their innovations
Develop stable incentive policies (FiT, PTC, Auctions), and long-term agreements that involve all partisan actors	**Germany** – cost reduction by learning by doing
Implement regulations to level the play field against non-renewable energy sources. Include standards for enabling technologies, such as HVDC lines, power electronics, smart grids, etc. as IT becomes more important in the power sector. Harmonize technology standards on international technology platforms, and promote quality assurance in development.	**United States** and **Republic of Korea** - Renewable Fuel Standard (RFS) and Renewable Portfolio Standard (RPS) programmes **IECRE** – Internationally harmonised standards and conformity assessment programme for renewable power generation technologies
Incorporate technology to market programmes	**United States** – ARPA-E **Germany** – ERP Innovation Programme **Switzerland –** CTI Start-up business coaching
Target oriented and coordinated international efforts	Mission Innovation and Breakthrough Energy Coalition

The increasing role of consumer

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The new consumer is also producing, storing, trading energy and managing own load

Distributed generation

Behind the meter storage

Electric vehicles

Smart meters

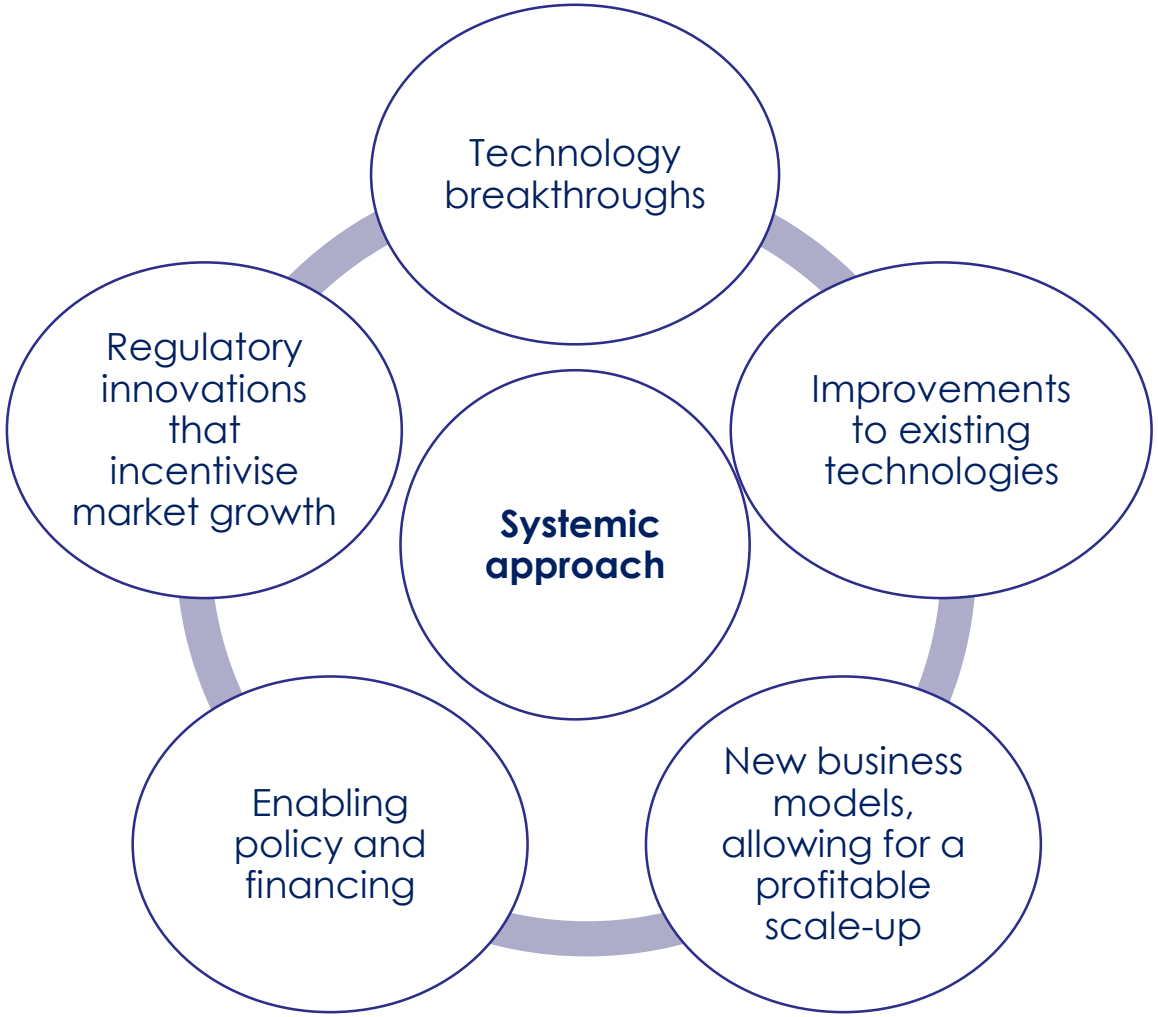
Digitalisation - Internet of things

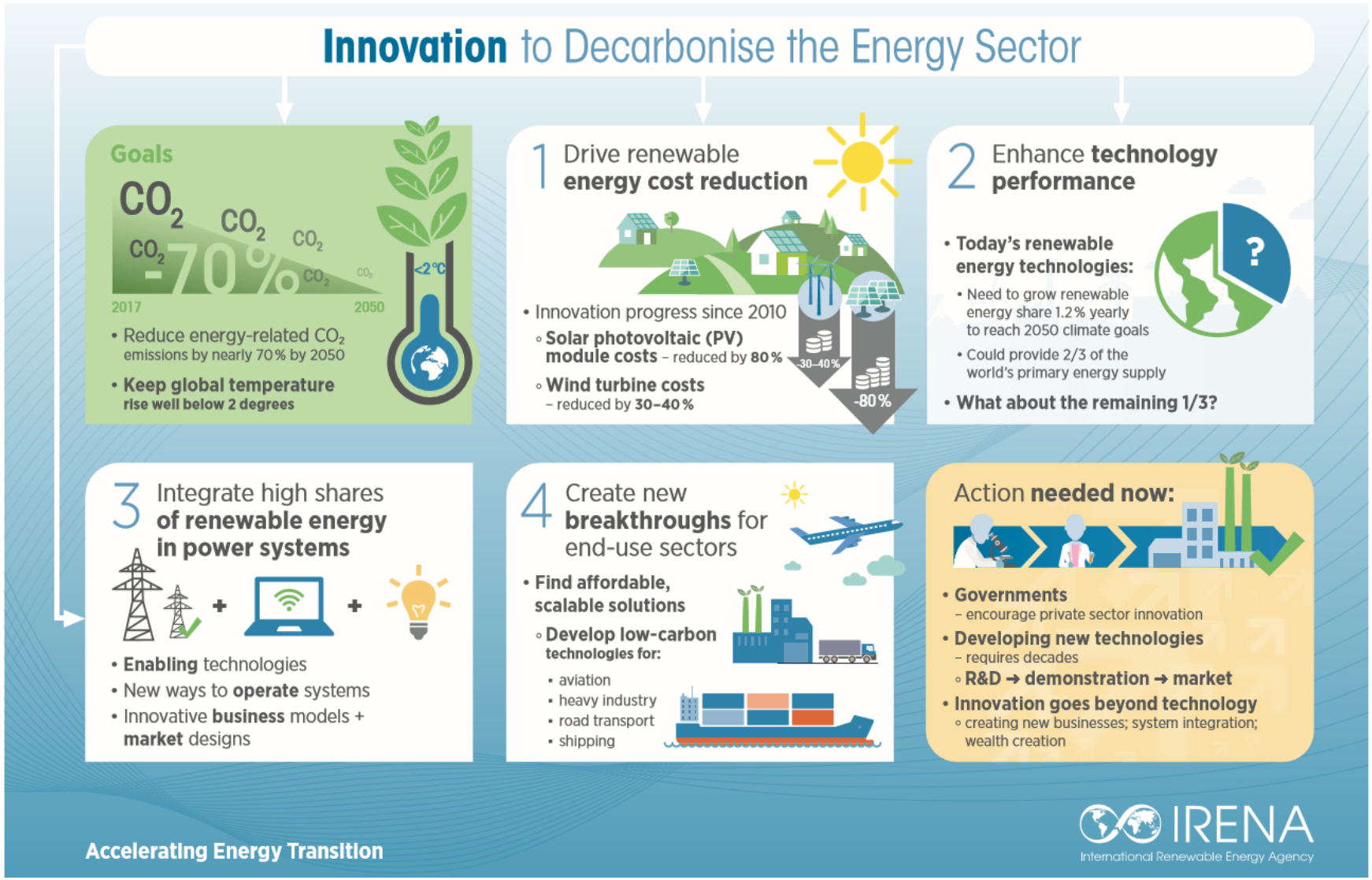
Artificial intelligence

IoT and Artificial Intelligence will support the consumer's participation in the energy market

What is Innovation for renewables?

All changes that help overcome barriers and result in an accelerated deployment of renewables




Innovation to Decarbonise the Energy Sector
Goals
CO_2
-70%
2017
2050
<2°C
• Reduce energy-related CO_2 emissions by nearly 70% by 2050
• Keep global temperature rise well below 2 degrees
1 Drive renewable energy cost reduction
• Innovation progress since 2010
◦ Solar photovoltaic (PV) module costs – reduced by 80%
◦ Wind turbine costs – reduced by 30–40%
-30–40%
-80%
2 Enhance technology performance
• Today's renewable energy technologies:
• Need to grow renewable energy share 1.2% yearly to reach 2050 climate goals
• Could provide 2/3 of the world's primary energy supply
?
• What about the remaining 1/3?
3 Integrate high shares of renewable energy in power systems
• Enabling technologies
• New ways to operate systems
• Innovative business models + market designs
4 Create new breakthroughs for end-use sectors
• Find affordable, scalable solutions
◦ Develop low-carbon technologies for:
▪ aviation
▪ heavy industry
▪ road transport
▪ shipping
Action needed now:
• Governments – encourage private sector innovation
• Developing new technologies – requires decades
◦ R&D → demonstration → market
• Innovation goes beyond technology
◦ creating new businesses; system integration; wealth creation
Accelerating Energy Transition
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Today's strong business case for renewable power

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Cost reduction in the period 2010 - 2017

73%
Solar PV

23%
Onshore Wind

Expected cost reduction in the period 2015 - 2025

54%
Solar PV

37%
CSP

15%
Offshore Wind

12%
Onshore Wind

- All renewable power options will compete with fossil fuels on price by 2020
- Wind and PV are abundant and available in most countries

Source: IRENA (2018), Renewable Power Generation Costs in 2017, International Renewable Energy Agency

Front runners in wind technology inventions

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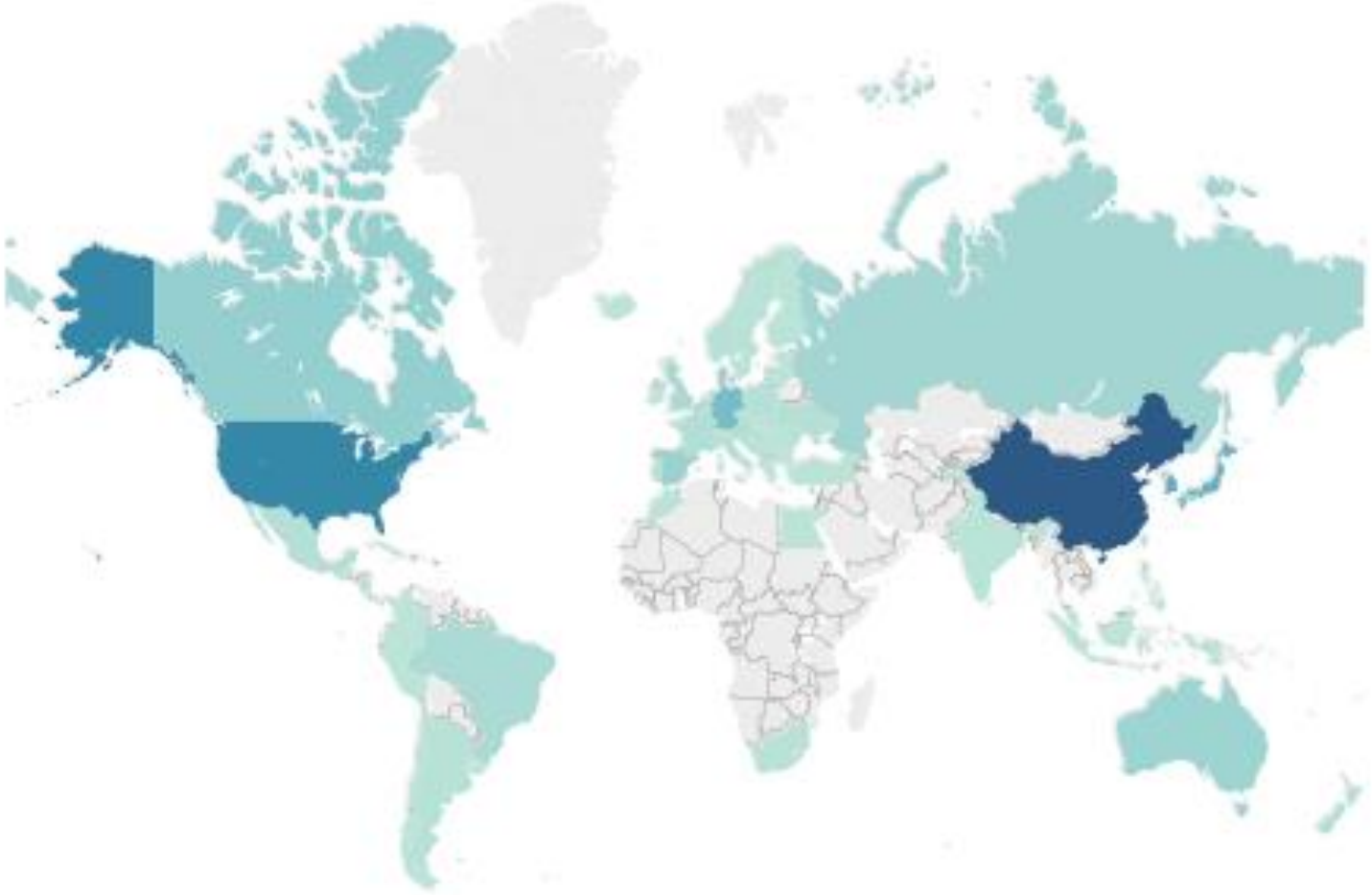
Global Overview on Patents

Find out how many **Wind Energy** patents were filed over time.



No lack of innovations – but what is relevant for the local context?

We need to map and understand the implications of these innovations for the power sector