

From Industry 4.0 to Energy 4.0: Future Business Models and Legal Relations & Bird & Bird

Digitalisierung in der Energiewirtschaft
XX. Jahrestagung Institut für Berg- und Energierecht

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Overview

1. Introduction
2. Industry 4.0
3. Energy 4.0 & Business Models & Legal Relations
4. Conclusion



1. Introduction

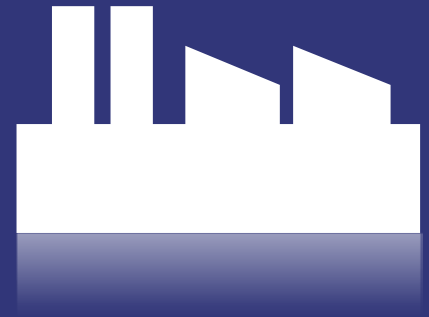
"Of the many diverse and fascinating challenges we face today, the most intense and important is how to understand and shape the new technology revolution, which entails nothing less than a transformation of humankind. We are at the beginning of a revolution that is fundamentally changing the way we live, work, and relate to one another. In its scale, scope and complexity, what I consider to be the fourth industrial revolution is unlike anything humankind has experienced before."

Klaus Schwab, founder and executive chairman of the World Economic Forum, *The Fourth Industrial Revolution*, 2016

1. Introduction

From Industry 4.0 to Energy 4.0

- Industry in general has recognised that we are at the beginning of a revolution that is fundamentally changing the way we live, work, and relate to one another
- Energy has been key to all industrial revolution so far
- The energy industry may not have fully realised how much the current industrial revolution will be transforming the energy industry
 - At a time, when the energy industry is struggling with the Energiewende
 - At a time, when other industries are already in the process of realising what potential and what risk are associated with Industry 4.0



2. Industry 4.0

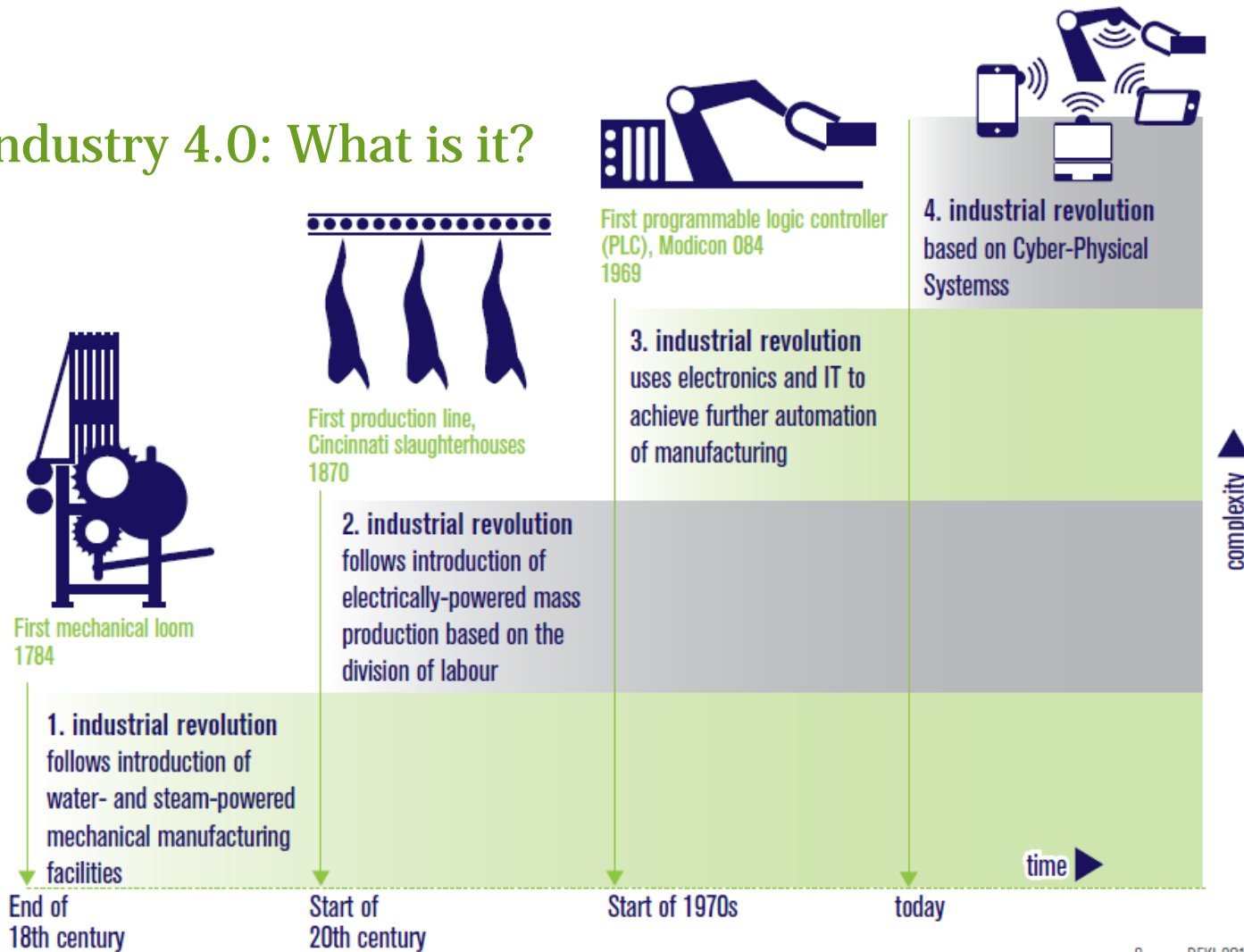
2. Industry 4.0

Industry 4.0: What is it?

- Buzzword (but not a US invention)
- Term first used in 2011 at the Hannover Fair
 - 2012 to 2013 Working Group on Industry 4.0
 - Chaired by Siegfried Dais (Robert Bosch GmbH) and Henning Kagermann (acatech)
 - Final Report of Working Group presented 8 April 2013 at the Hannover Fair "Recommendations for implementing the strategic initiative INDUSTRIE 4.0"
- Used for the next industrial revolution currently taking place
- 2016 Davos Economic Forum: Fourth Industrial Revolution

2. Industry 4.0

Industry 4.0: What is it?



Source: Final report of the Industrie 4.0 Working Group, page 13

Source: DFKI 2011

2. Industry 4.0

Industry 4.0 Components

- No clear definition for Industry 4.0
- Industry 4.0 components (based on literature review)

Search Term (Group)	Number of Publications in Which Search Term (Group) Occured
Cyber-Physical Systems, Cyber-Physikalische Systeme, CPS	46
Internet of Things, Internet der Dinge	36
Smart Factory, intelligente Fabrik	24
Internet of Services, Internet der Dienste	19
Smart Product, intelligentes Produkt	10
M2M, Machine-to-Machine	8
Big Data	7
Cloud	5

Source: [Hermann/Pentek/Otto, Desing Principles for Industrie 4.0 Scenarios](#), page 8

2. Industry 4.0

Cyber-Physical Systems

- Definition
 - System composed of physical entities and controlled or monitored by computer-based algorithms
 - Units that bridge the cyberworld of computing and communications with the physical and biological worlds
 - Sensor-based communication-enabled autonomous system
- Examples
 - Medical devices: pacemakers, insulin pumps
 - Critical infrastructure: supervision and control of power plants, oil and gas distribution networks, refineries
 - Automobiles: anti-lock braking system, electronic stability control, fuel injection, emission control

2. Industry 4.0

Industry 4.0 Design Principles

	Cyber-Physical Systems	Internet of Things	Internet of Services	Smart Factory
Interoperability	X	X	X	X
Virtualization	X	-	-	X
Decentralization	X	-	-	X
Real-Time Capability	-	-	-	X
Service Orientation	-	-	X	-
Modularity	-	-	X	-

Source: [Hermann/Pentek/Otto, Desing Principles for Industrie 4.0 Scenarios](#), page 11



3. Energy 4.0 & Business Models & Legal Relations

3. Energy 4.0

What is Energy 4.0?

- Not (yet) an official buzzword of German politics
- Digitisation of the energy sector: The next big thing
- Why?
 - Physical energy world is changing at an unprecedented speed
 - Intermittent renewables
 - Nuclear phase-out
 - Other phase-outs? Lignite, hard coal, oil, gas?
 - New transmission and distribution grids
 - Storage
 - Commercial energy world is changing at an unprecedented speed
 - Unbundling, trading, many new players, new products, etc.
 - Vastly increased and increasing collection and flow of data

3. Energy 4.0

Key Elements of Energy 4.0

- Cyber-physical systems: System composed of physical entities and controlled or monitored by computer-based algorithms
- The energy industry is becoming one big and highly complex cyber-physical system
- Consequence: The energy industry is likely to be seriously affected by all Industry 4.0 developments, with Energy 4.0 in turn materially influencing Industry 4.0

3. Energy 4.0

Energy 4.0 - It is already happening!

- Which current energy developments have nothing or little to do with sensor-based communication-enabled autonomous systems?
 - Generation?
 - Transmission and distribution?
 - Trading?
 - Retail?
 - Consumption?

3. Energy 4.0

It is already happening!

- Which hot Tech & Comms subject has nothing or little to do with energy?
 - Cloud computing?
 - Big data?
 - IT and data security?
 - Smart everything?
 - Internet of things?
 - Outsourcing?
 - Standardisation?
 - Data protection?

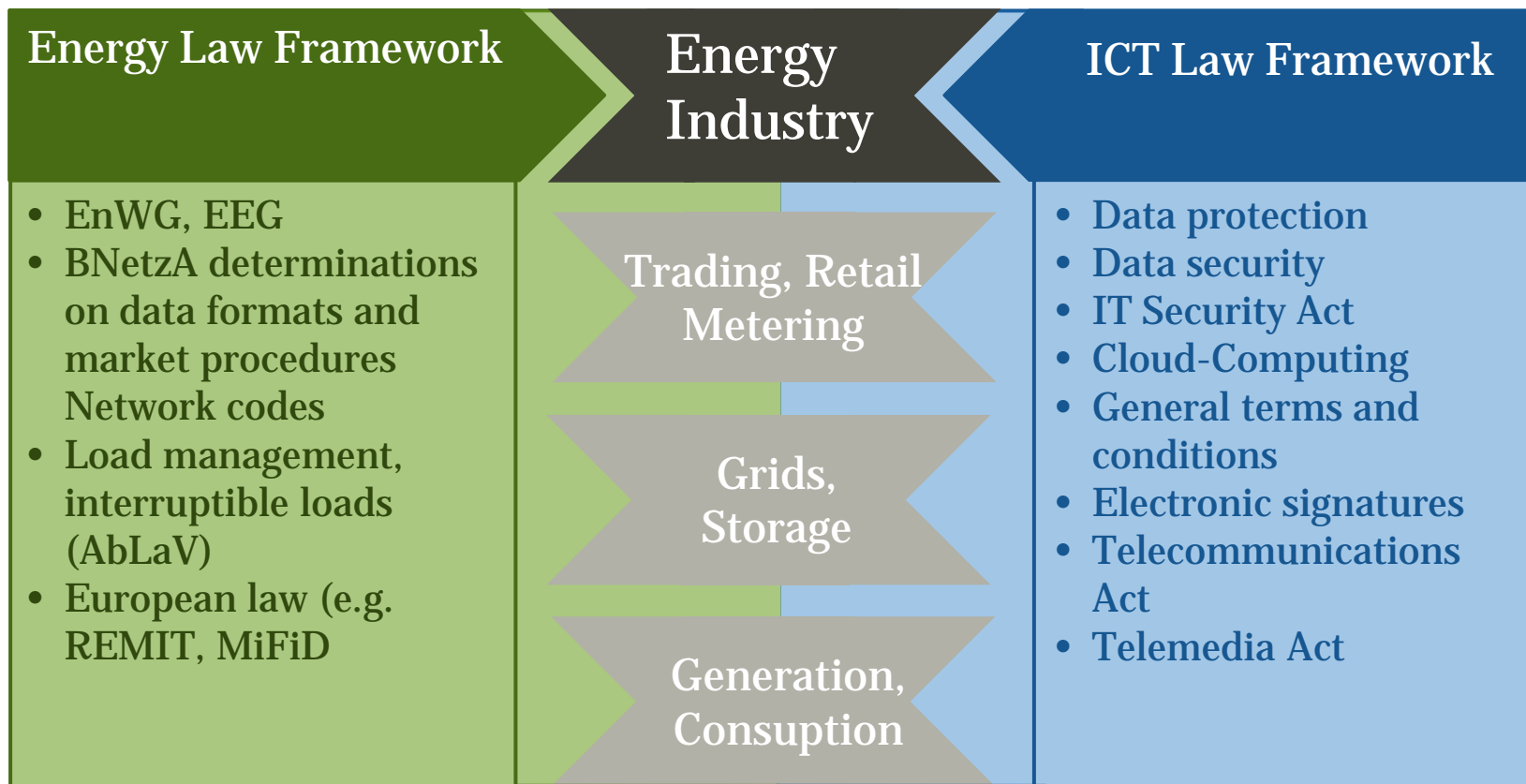
3. Energy 4.0 & Business Models & Legal Relations

Energy 4.0 Business Models?

- Missing basis for business models
 - Technical: "It's never going to work"
 - Regulatory: "Our regulatory framework does not allow this"
 - Commercial: "It's impossible to make money with this"
- Lack of vision
 - Google: "Stupid idea to think that you can make money with a free internet search engine"
 - Amazon: "I have a great local bookstore – don't need an internet one"
 - Twitter: "You cannot say anything meaningful with 140 characters"
 - Apple: "I already have a great mobile phone"

3. Energy 4.0 & Business Models & Legal Relations

Energy 4.0 Business Models: Convergence



3. Energy 4.0 & Business Models & Legal Relations

Energy 4.0 Business Models

- Huge investments needs (> EUR 1 trillion in energy sector)
- New, smarter technology everywhere
 - Generation, transmission, distribution, storage, consumption, trading, retail, services
- Information and communication technology (ICT) sector experience with quickly changing, disruptive technology
- All Energy 4.0 business models involve substantial ICT element
 - Can and should build upon ICT technical, commercial and legal experience
 - Must be open to questioning conventional energy wisdom
- Challenge for energy companies: ICT as inspiration and/or driver, not subordinate service provider

3. Energy 4.0

Today's Conference covers Key Energy 4.0 Subjects

- Data and consumer protection: Dr. Kay Diedrich
- Digitisation of the Energy Turnaround Act: Karsten Bourwieg and Dr. Cornelia Kermel
- Development perspectives for distribution grids: Frank Zeeb
- Protection of critical infrastructure: Prof. Dr. Thorsten Holz and Rainer Stock
- Smart energy: Prof. Dr.-Ing. Wirtsch.-Ing. Thorsten Schneiders

3. Energy 4.0

Today's Conference covers Key Energy 4.0 Subjects – But there's more!

- Digitisation of the energy turnaround is much broader than the "Digitisation of the Energy Turnaround Act"
- Plethora of additional subjects traditionally associated more with ICT than with energy, e.g.
 - Data ownership
 - Protection of intellectual property
 - Outsourcing
 - E-commerce
 - Liability for product and system failure



4. Conclusion

4. Conclusion

From Industry 4.0 to Energy 4.0

- Digitisation of the energy industry will be a key driver of future change
- The energy industry will have to look to the IT and telecommunications industry and other advanced industries for technical, commercial and legal experience
- Energy lawyers will need to better understand legal problems and solutions those other industries can offer
 - No need to reinvent the wheel
 - But have to make wheel work in a heavy duty, high speed scenario, with many quick turns, in often uncharted territory



5. Q & A

Vielen Dank & Bird & Bird

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twobirds.com



5. Back-up - About Bird & Bird -

5. About Bird & Bird - Dr. Matthias Lang -



'B&B has long been building up a hard-hitting energy team, and reinforced this with Dr. Matthias Lang. "Competitors praise him as "experienced, calm and knowledgeable"'

JUVE Handbook 2011/2012

"Leading legal practitioner"

International Who's Who of Energy Lawyers, 2015

Matthias combines regulatory know how, commercial thinking and cross-border energy expertise.

- Matthias is a partner in the International Energy & Utilities Sector Group at our Düsseldorf office.
- He advises German and international clients on energy, regulatory, state aid and environmental law as well public commercial law. He has additional expertise in corporate law and European law, as well as standardisation.
- Matthias advises on infrastructure projects involving conventional and renewable energy regulation, including planning and permit procedures for extra high voltage lines and other industrial installations. He has worked on transactions also in other regulated industries, including healthcare and water. His work includes representing clients before the Federal Network Agency and other authorities in diverse administrative proceedings, before national and European courts and in arbitration proceedings. With his team, he has also advised on the transposition of European law, such as REMIT or MiFiD.
- Matthias is a regular contributor to conventional and online legal publications. He writes the section on permits for conventional power plants and wind farms for the "Berlin Commentary on Energy Law". He writes on international company law in the "Beck Online Commentary on the Limited Liability Company Act". He has also published articles about renewable energy, disclosure and information obligations for sellers, on state aid to the coal sector and on the permitting regime for HVDC lines. Matthias also runs the [German Energy Blog](#) and frequently speaks at national and international seminars and conferences and teaches energy law in postgraduate courses at FU and TU Berlin.

5. About Bird & Bird

- Energy & Utilities Expertise -

Bird & Bird's involvement in the energy sector is broad-based. We have a genuine understanding of the key business technologies, processes and regulatory frameworks that underpin the sector

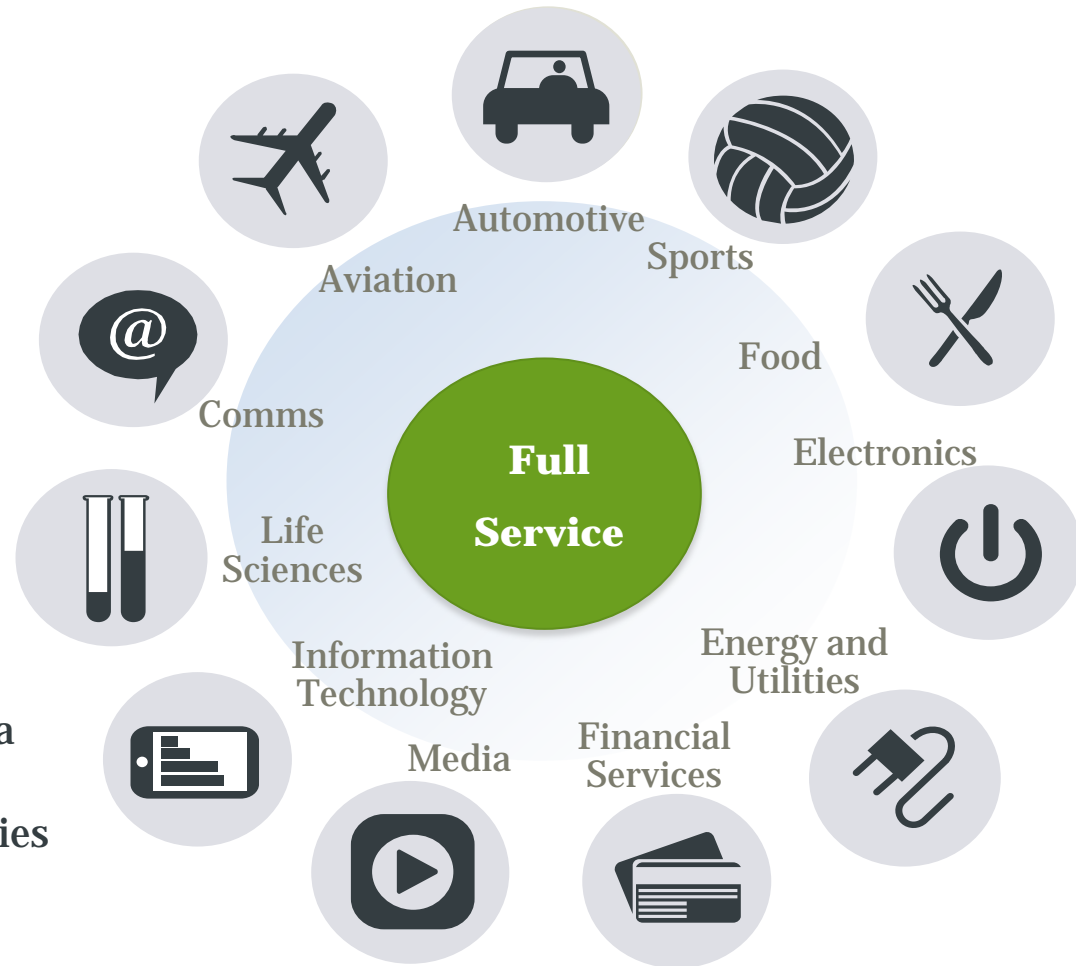
- The German Energy & Utilities sector group includes more than 30 experts (including 10 Partners) from all relevant legal fields
- We support our clients on national and international projects in both the growing Single European Market and other areas
- Furthermore, the sector group comprises experienced career changers from the energy industry. This composition ensures hands-on advice on the basis of tested knowledge of the energy sector



5. About Bird & Bird - Facts & Figures -

International

- One of the leading international law firms, established 1846 in London
- Deep industry knowledge
- Excellence in client service
- International reach
 - 27 locations worldwide, 18 countries
 - 4 German offices in Düsseldorf, Frankfurt, Munich and Frankfurt
 - Worldwide (excluding US/Canada) extensive advice in all fields of law with a focus on technology orientated and innovative business sectors and companies
 - More than 225 Partners and more than 1,100 lawyers



5. About Bird & Bird - International Network -

A world map with a blue silhouette, overlaid with a network of white lines and dots representing global connections. The dots are concentrated in Europe and Asia, with lines radiating outwards to other continents. A dark grey rectangular box is positioned on the left side of the map, containing a list of cities.

Abu Dhabi, Beijing,
Bratislava, Brussels,
Budapest, Copenhagen,
Dubai, Düsseldorf,
Frankfurt, The Hague,
Hamburg, Helsinki, Hong
Kong, London, Lyon,
Madrid, Milan, Munich,
Paris, Prague, Rome,
Shanghai, Sydney,
Singapore, Skanderborg,
Stockholm, Warsaw

5. About Bird & Bird

- Energy Sector Focus -

Our clients

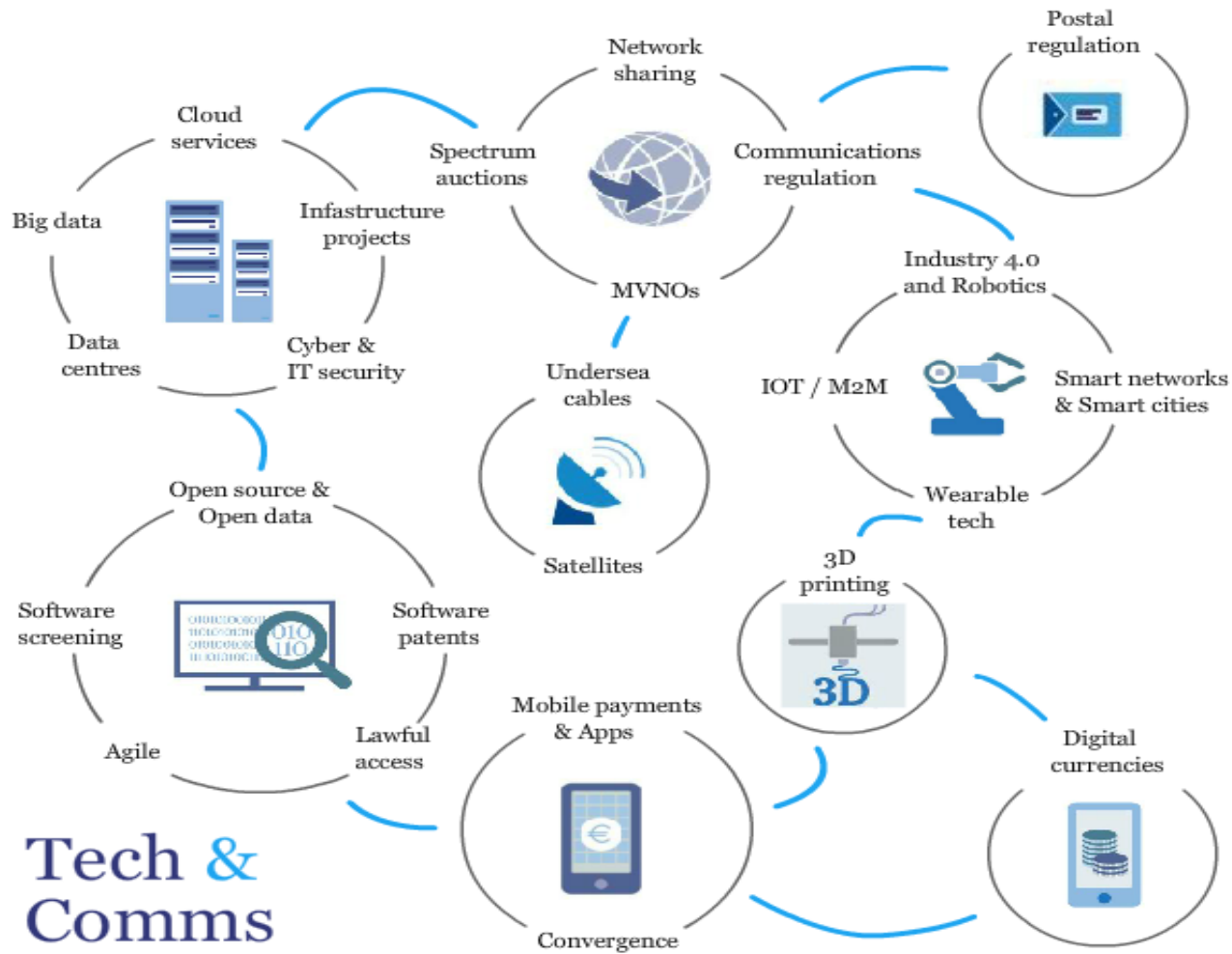
- Utilities
- Generators and storage operators
- Transport and distribution system operators
- Trading Houses
- Operators of renewable energy systems
- Wind farms, solar park , bio fuel producers
- Energy services providers
- Banks
- Private equity / infrastructure funds
- Project financiers
- Regional authorities
- Federal Republic, Länder, districts, municipalities
- Manufacturers and suppliers
- Project / process developers
- System integrators

Our areas of advice

- Renewable and conventional generation
- Grid expansion and grid access
- Grid fees / incentive regulation
- Smart Grid / Smart Metering
- Electric mobility
- Legislation and standardisation
- Energy storage, carbon capture & storage
- CO₂ certificates / emissions trading
- Green IT
- Oil & gas
- Privatisation/remunicipalisation
- Water supply
- Waste disposal
- Energy projects
- M&A in the energy sector

5. About Bird & Bird

- Tech & Comms Focus Groups -



5. About Bird & Bird - Energy Düsseldorf -

Energy and Utility Sector Expertise

- Düsseldorf team with deep sector knowledge
- Experience as lawyers and regulators
- Advice to national and international clients
- English language blog on German energy: www.germanenergyblog.de



5. About Bird & Bird - Tech & Comms Germany -



Tech & Comms Sector Expertise

- At the forefront of developments in the Tech & Comms sector for decades
- Unrivalled expertise in advising on matters ranging from smaller innovative projects to some of the largest, most complex and ground-breaking transactions and disputes
- Lawyers with a particular focus on Communications, Devices & Components, Digital Tech & eCommerce and Software & Services as well as several more specialist industries



5. About Bird & Bird - Energy Germany -



Energy and Utility Sector Expertise

- Further energy know how in Düsseldorf, Munich, Hamburg, und Frankfurt
- Multidisciplinary approach to allow comprehensive advice

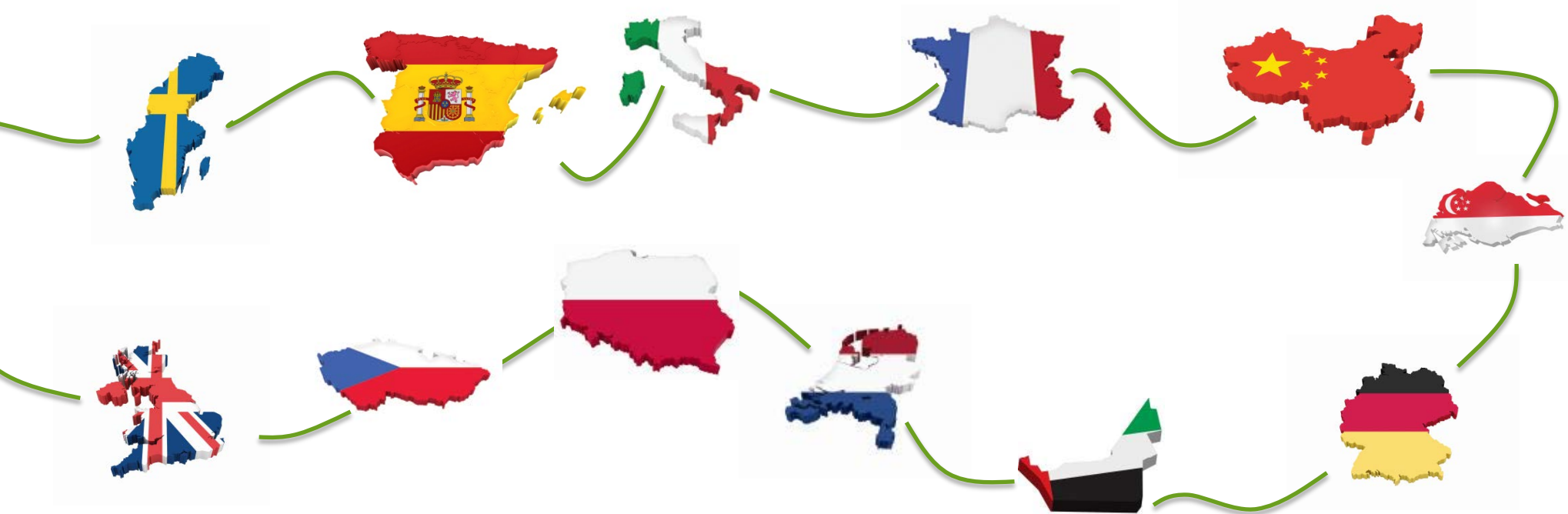


5. About Bird & Bird

- Energy Europe & Asia & Middle East -

Energy and Utility and ICT Sector Expertise

- Close cooperation with colleagues in other European and Asian offices
- Deep understanding of European Community law and procedure





*“Sources say:
‘This is a great firm – well
situated internationally, and
offering brilliant service’”*

Chambers Global 2011