

Blockchain and Smart Contracts in the Energy Industry: A European Perspective & Bird & Bird

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A low-angle, upward-looking photograph of three modern skyscrapers with glass facades. The buildings are arranged in a slightly curved line, receding into the distance. The sky is a vibrant blue with scattered white clouds. A bright sun is positioned at the top center, creating a prominent sunburst effect with rays extending across the sky. The overall composition is dynamic and emphasizes the height and scale of the architecture.

I. Introduction

I. Introduction

Blockchain & Energy Digitalization

- Blockchain part of broader energy digitalization challenge
- Modern technology meets existing energy law landscape not originally designed to address specific challenges and opportunities of digital world
- Digital, internet driven industries historically did not heat homes or produce the power to run the computers
- Tech & Comms legal framework not geared towards very long term investments in industrial assets, with different security of supply concepts

I. Introduction

Blockchain & Energy Digitalization

- Emerging digitalization is relevant not only in the renewables industry, but also in oil & gas sector:
 - Smart oil fields
 - Smart gas meters
 - Big data & analytics
 - Robotics & drones
 - Internet of Things
 - Blockchain

I. Introduction

Blockchain & Energy Digitalization

- Energy digitalization means combining two previously separate, strongly regulated worlds with different rules
- Challenge: Ensuring that legal system work in such a way that secure, inexpensive, efficient and consumer and environmentally friendly energy will be available also in tomorrow's digital world



II. Blockchain and Smart Contracts in a Nutshell

II. Blockchain and Smart Contracts in a Nutshell

Blockchain & Nutshell

- Blockchain is a distributed, decentralized ledger
 - Enables peer-to-peer transfers of value
 - No need for an intermediary
 - For details, see [Satoshi Nakamoto](#)
- Seen as the main technical innovation of Bitcoin and other cryptocurrencies
 - But not limited to cryptocurrencies

II. Blockchain and Smart Contracts in a Nutshell

The image displays two overlapping screenshots. The background is a screenshot of the Bird & Bird website. The top navigation bar includes the company logo, a search bar, and menu items: CLIENT SOLUTIONS, WHERE WE WORK, EXPERTISE, OUR LAWYERS, NEWS & EVENTS, CAREERS, ABOUT, and CONTACT. Below this, a secondary navigation bar lists WHERE WE WORK, WEBINARS, ABOUT US, and EXPERTISE. The main content area features a video player with a portrait of a man. A yellow arrow points to his mouth. Below the video, the title 'Blockchain - An overview & the legal issues' is visible, followed by a short description: 'Bird & Bird partner Jonny Emmanuel talks about blockchain: what is it, how does it work and what are some of the legal issues, based on his experience advising clients in this space.'

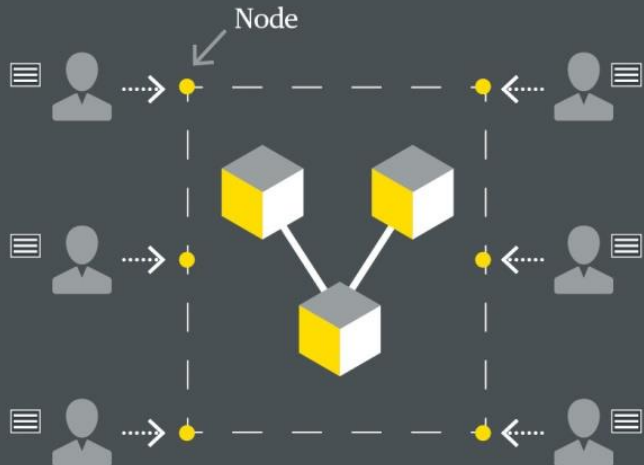
The foreground is a screenshot of a YouTube channel page for Bird & Bird. The top navigation bar includes the YouTube logo, a search bar, and icons for camera, grid, chat, and a 'SIGN' button. The main content area shows a video player with the title 'Energie- & Versorgungswirtschaft' and a 'PLAY ALL' button. Below the video player, there are five related video thumbnails with their titles and durations:

- 1 Updates on Energy 4.0 - smart meter, blockchain & further digital transformation (8:19) Bird & Bird Deutschland
- 2 Update Energie 4.0: Smart Meter, Blockchain & weitere digitale Transformation (8:16) Bird & Bird Deutschland
- 3 Energie 4.0 - die digitalisierte Zukunft der Energieversorgung (9:46) Bird & Bird Deutschland
- 4 Elektromobilität - Kernthemen aus regulierungs-, haftungs- und (12:43) Bird & Bird Deutschland
- 5 Energie 4.0 - Die Digitalisierung der Energiewirtschaft - Neueste Themen, neueste (8:29) Bird & Bird Deutschland

II. Blockchain and Smart Contracts in a Nutshell

Nodes

1

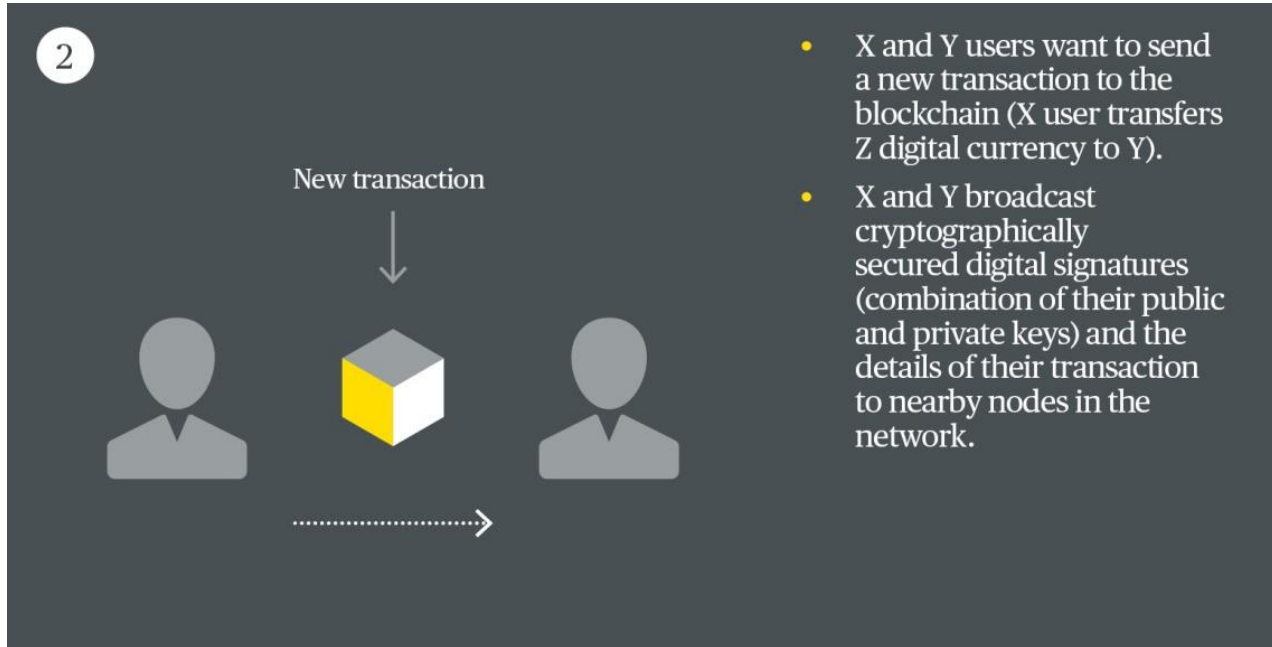


The diagram illustrates a blockchain network. It features a central cluster of three yellow and white 3D blocks connected by lines. This cluster is surrounded by a network of nodes, represented by small yellow circles. Dashed lines connect these nodes in a mesh pattern. On the left and right sides of the network, there are icons of people (users) with arrows pointing towards the nodes, indicating interaction. A label 'Node' with an arrow points to one of the nodes in the network.

- Blockchain software installed and running by user on a machine is called a node.
- Each node stores a copy of the database (list of transactions).
- Nodes used to set up accounts (used by users to participate in the blockchain: create and send new transactions).
- Private keys (a secret number generated for an account) are used to operate accounts.
- Public keys (a public number generated for an account) identify each account on the blockchain.

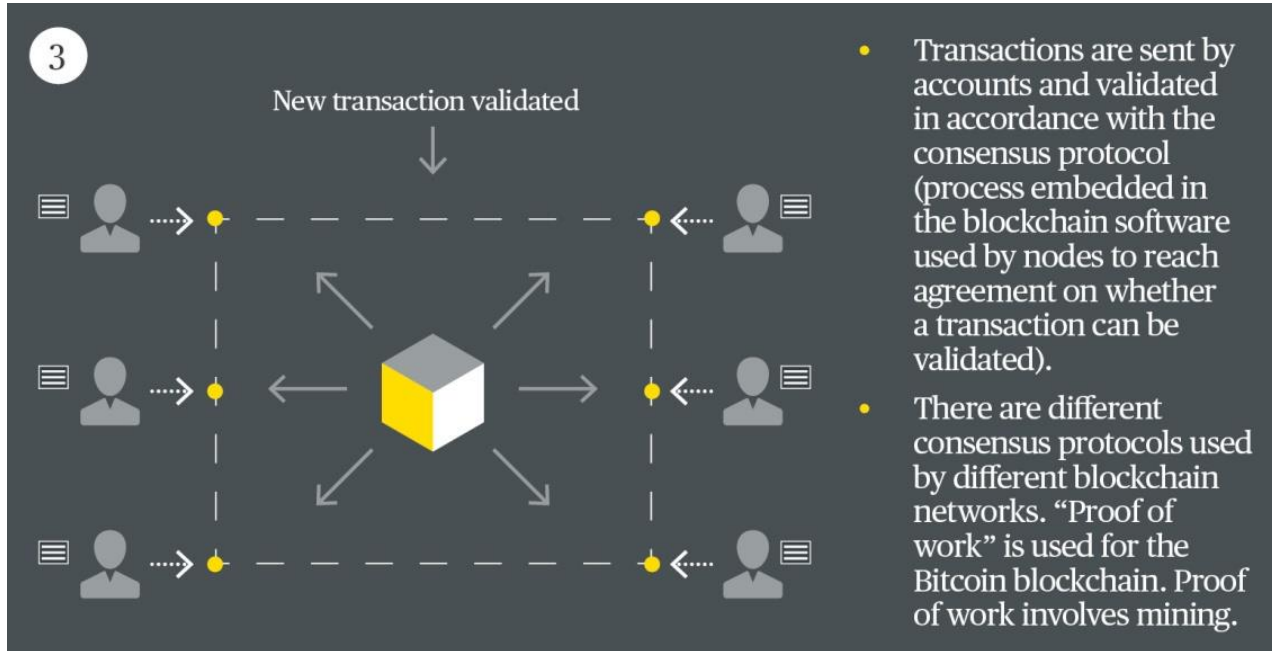
II. Blockchain and Smart Contracts in a Nutshell

New Transaction



II. Blockchain and Smart Contracts in a Nutshell


Validation



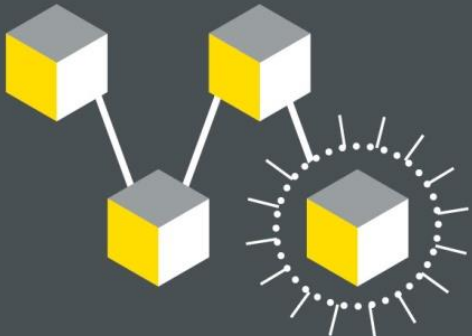
II. Blockchain and Smart Contracts in a Nutshell

Blockchain Record

4 Each participant database updated with new transaction.



- Once a transaction is validated it is recorded on the blockchain.
- Assuming nodes follow the proof of work consensus protocol:
 - Nearby nodes invest compute power to solve a mathematical puzzle required to produce the next block within which the proposed transaction is recorded (this is mining)
 - When the first node solves the mathematical puzzle they win a fee and the pending transaction is recorded in a new block of data
 - That new block is double checked by other members of the network until a majority agrees it is correct and then its added to the blockchain and becomes part of the database



II. Blockchain and Smart Contracts in a Nutshell

Types of Blockchain

Public Blockchain

- Open: anyone can participate
- Decentralized
- Special consensus mechanisms, e.g. proof of work / proof of stake
- Needs substantial amount of (computational) power, slower

Private Blockchain

- **Consortium Blockchains:** pre-selected, trusted nodes control the consensus process
- **Fully private Blockchains:** write permissions in the hand of centralized organization
- Less resource-intensive, faster

II. Blockchain and Smart Contracts in a Nutshell

Smart Contracts

- Promises in digital form, performed by the parties within protocols
- E.g. vending machine – or far more complex
- Ethereum combines Blockchain and Smart Contracts
 - Platform with Turing-complete programming language
 - Suitable for any transaction that can be defined mathematically



A photograph of several wind turbines in a mountainous landscape during sunset. The sky is a warm orange and yellow, and the mountains in the background are silhouetted against the light. The turbines are in the foreground, with their blades extending across the frame. The overall mood is serene and clean energy.

II. Applications in the Energy Industry

III. Applications in the Energy Industry

Blockchain & Physics

- Blockchain moves/stores data, not power
- Energy is physical, requires generation/production, storage, transformation, transportation and delivery
- "Energy supply is not a computer game, but the real world"
- Someone needs to make sure that the energy physically gets to where it is supposed to go, really, reliably, lawfully, always

III. Applications in the Energy Industry

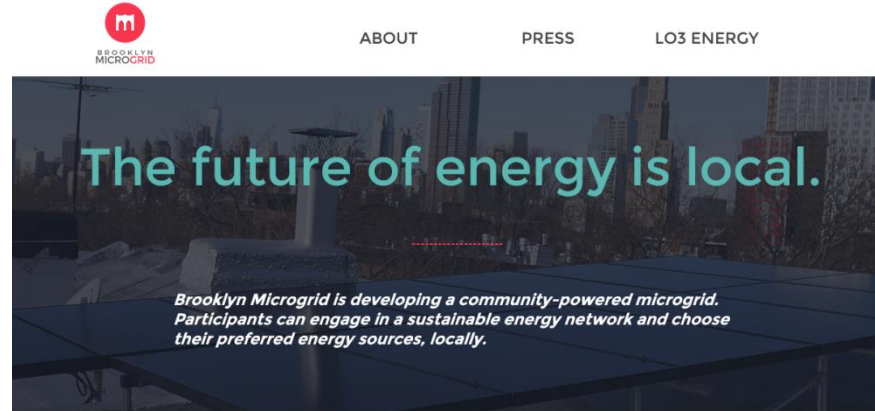
Blockchain & Physics

- On the other hand:
 - Renewables have led to vast increase in number of decentralised, intermittent producers, with ever increasing need to balance supply and demand, ever increasing data requirements to match supply and demand
 - Data ever increasingly relevant to supply power, really, reliably, lawfully, always
- Need to understand interdependence to understand and resolve legal issues

III. Applications in the Energy Industry

Brooklyn Microgrid

- Owners of PV systems sell their power in the neighbourhood using Ethereum Blockchain
- Communal energy network, with utility provider still maintaining and balancing the electrical grid, the actual energy is generated, stored, and traded locally by members of the community
- Similar projects in Europe: OneUp (Netherlands), Conjoule (Germany)



Source: <https://www.brooklyn.energy/>

III. Applications in the Energy Industry

Enerchain

- True P2P wholesale electricity and gas trading based on Blockchain with major European companies participating
- Potential to bypass trading platforms and brokers on the wholesale electricity market

The enerchain Project

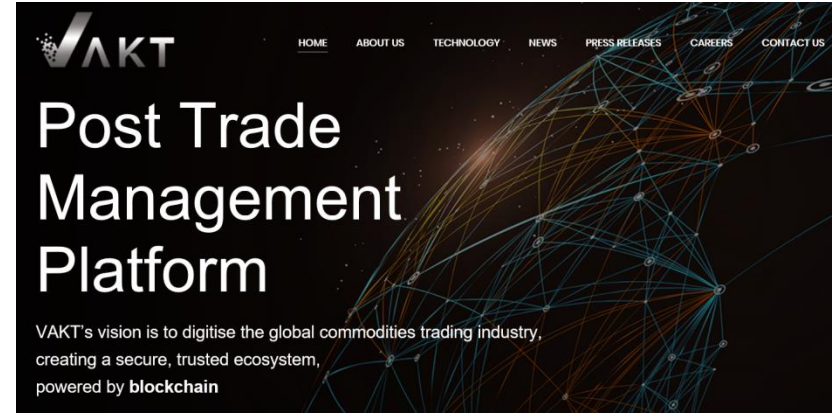


Source: <https://enerchain.ponton.de/>

III. Applications in the Energy Industry

Applications in Oil & Gas Trading

- Vakt: Blockchain platform facilitates trade in crude oil and other commodities by digitizing and centralizing post-trade processes
- BTL Interbit platform speeds up reconciliation processes in gas trading



source: <https://www.vakt.com/>



THE BUSINESS BLOCKCHAIN

Bringing chain connecting solutions to industry with Interbit's next generation blockchain

source: <http://btl.co/>

The background of the slide is the flag of the European Union, featuring a blue field with twelve five-pointed gold stars arranged in a circle. The flag is slightly blurred and has a subtle texture.

IV. Legal Issues of Blockchain-based Solutions in the European Union

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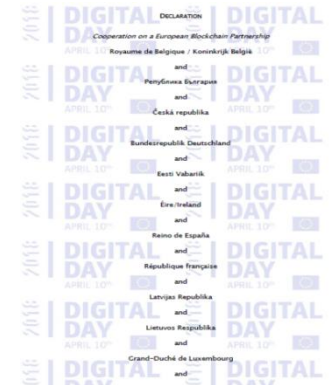
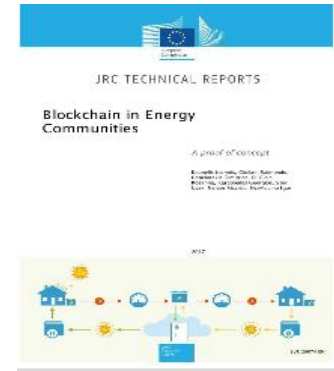
1. Energy Law: Basics of EU Energy Law & Policy

- Main goals: open, liberalized internal energy market, security of supply, energy efficiency & saving, promotion of renewable energy and interconnection of networks
- EU shares legislative competence with member states
- Range of regulations and directives regulate electricity and natural gas markets
- Latest legislative proposal: "Clean Energy for All Europeans" (Winter Package, EU Commission)

IV. Legal Issues of Blockchain-based Solutions in the European Union

1. Energy Law: Basics of EU Energy Law & Policy

- No specific laws on Blockchain/Smart Contracts
- October 2017: European Council asked Commission to look into Blockchain
- February 2018 Commission launches EU Blockchain Observatory and Forum
- 10 April 2018 Blockchain Partnership Declaration
 - Signed by 25 EU Member States
 - Shall support the delivery of cross-border digital public services, with the highest standards of security and privacy



IV. Legal Issues of Blockchain-based Solutions in the European Union

1. Energy Law: Current regulatory issues

- Prosumers likely to be considered "suppliers" → numerous obligations
 - Terms and conditions, billing, information on energy mix to be made available to consumers
 - Obligation to contribute to grid balancing / managing their own balancing group?
 - In some countries: suppliers' licenses and universal service obligations
- Supplier changes within max. three weeks vs. supplier changes within minutes in Blockchain-based electricity trading

IV. Legal Issues of Blockchain-based Solutions in the European Union

1. Energy Law: Current regulatory issues

- High regulatory burden for P2P electricity trading: EU energy law was not drafted with Blockchain & Smart Contracts in mind
- Blockchain-based P2P electricity transactions between prosumers only feasible if external service provider fulfils obligations on behalf of prosumers
 - Blockchain as a tool to avoid the need of an intermediary?

IV. Legal Issues of Blockchain-based Solutions in the European Union

1. Energy Law: Winter Package – a way forward?

- "Active customers": entitled to generate, store, consume and sell self-generated electricity in all organized markets **without being subject to disproportionately burdensome procedures** (Electricity Directive Recast)
- "Peer to peer trading": sale of renewable energy between market participants by means of a **contract with pre-determined conditions governing the automated execution and settlement of the transaction ...** directly between market participants (Renewable Energy Directive adopted in Dec 2018)

IV. Legal Issues of Blockchain-based Solutions in the European Union

1. Energy Law: Winter Package – a way forward?

- "Renewables self consumers": **right to sell their excess electricity through P2P trading arrangements** without being subject to discriminatory or disproportionate procedures, charges and unjustified regulatory barriers (Renewable Energy Directive)
- ➔ Winter Package tries to ease the burden for P2P electricity trading
- ➔ But: actual impact will depend on transposition in national law. Namely: Which procedures are disproportionate? Which regulatory barriers are unjustified?

IV. Legal Issues of Blockchain-based Solutions in the European Union

2. Contract Law

- The attractive part: automatic performance and enforcement of legal obligations
 - *"no room to bring an action for breach when breach is impossible"* (Werbach & Cornell 2017)
- The difficult part: Things go wrong. Drafting a contract (and code) that takes into account all possible contingencies and states all their responses is not possible
- Coders will have to cooperate with lawyers to ensure legally sound design of the contract & reasonably bulletproof contract code

IV. Legal Issues of Blockchain-based Solutions in the European Union

3. Consumer Protection Law

- Extremely developed in the EU: unfair contract terms, information requirements, cooling-off periods, withdrawal rights in "distance contracts"
- Are prosumers traders or consumers?
 - Probably both, depending on their role
- Does all consumer protection law apply to smart consumer contracts?
 - Cooling-off periods in smart contracts don't make sense
 - Exception for "automatic vending machines" may apply to smart contracts: automated exchange of goods

IV. Legal Issues of Blockchain-based Solutions in the European Union

4. Data Protection Law

- EU General Data Protection Regulation (GDPR), in force since 2018
- Broad territorial scope: controllers/processors who process personal data of EU data subjects, related to offering goods/services in the EU
- "Personal data": any information relating to an identified or identifiable natural person
- Even pseudonymized information, e.g. IP addresses
- Blockchain: transactional data linked to a person & pseudonymized public key can be personal data

IV. Legal Issues of Blockchain-based Solutions in the European Union

4. Data Protection Law

- Rights of data subjects (examples):
 - Access personal data and information relating to data processing (Art. 15)
 - Enforcement in the Blockchain: Who is the data controller? Difficult without a platform operator (public Blockchain): Each node?
 - Right to rectification of inaccurate personal data (Art. 16) and right to erasure of personal data (Art. 17)
 - Blockchain is an immutable, append-only ledger...

IV. Legal Issues of Blockchain-based solutions in the European Union

4. Data Protection Law

- Solutions for GDPR compliance within a Blockchain
 - Interpretation: Does supplementary statement qualify as rectification of data?
 - Technical modifications:
 - storing personal transactional data off-chain, so it can be modified retroactively
 - Private Blockchains governed by rules on data processing and third parties validating transactions (rather than mining)
 - Zero-Knowledge-Proof: transactions that don't make any of the parties identifiable

IV. Legal Issues of Blockchain-based solutions in the European Union

4. Data Protection Law

- To what extent Blockchain is compatible with GDPR remains uncertain
- Draft Proposal for a new ePrivacy Regulation and proposal for recast of the Electricity Directive do not address the issue

IV. Legal Issues of Blockchain-based solutions in the European Union

5. Financial Markets Regulation

- Directive on Markets in Financial Instruments (MiFID II)
 - Authorization requirements for provision of investment services (i.e. trading of options, futures, swaps, forwards, other derivative contracts relating to commodities)
 - May be relevant for Blockchains enabling wholesale electricity trading
 - Do virtual currencies qualify as "financial instruments" under MiFID II?
 - Either way, the use of a virtual currency as a means of payment alone does not trigger obligations under MiFID II

IV. Legal Issues of Blockchain-based Solutions in the European Union

5. Financial Markets Regulation

- Regulation on Wholesale Energy Market Integrity (REMIT)
 - Prohibits insider trading and market obligations; extensive reporting obligations
 - Who is responsible for ensuring compliance in Blockchain based P2P trading systems?
 - Enerchain requires each participant to report trades in accordance with REMIT

V. Conclusions

A vintage-style compass with a silver-colored metal casing and a detailed compass rose is positioned in the lower right quadrant of the frame. The compass is set against a background of a map with a grid of latitude and longitude lines. The text "V. Conclusions" is overlaid in a white, serif font, centered horizontally and partially overlapping the compass. The entire image has a monochromatic blue tint.

V. Conclusions

- Very different forms of Blockchain & smart contract based applications in the energy industry
- Compatibility with EU (energy) law depends largely on their specific design: private Blockchains are easier to reconcile with legal framework, but lack features of Blockchain prototype
- EU "Winter Package" addresses issues related to Blockchain and smart contracts, but does not set up a comprehensive legal framework
- But: Blockchain and smart contracts play an increasing role in the energy industry – industry players, computer people and lawyers will need to make them work



V. Q & A

Thank you & Bird & Bird

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