

Regulators: unblocking the Blockchain in the energy sector

*Brussels
Jun 5, 2018*



A portion of companies that are using or planning to use Blockchain

1%

of CIOs indicated ***any kind of blockchain adoption*** within their organisations

8%

of CIOs ***in the short-term planning*** or looking at active experimentation with blockchain

8% of the companies planning to use Blockchain, out of which:

23%

Responded ***blockchain requires most new skills*** to implement the new technology

18%

Responded that ***blockchain skills are the most difficult to find***



Agenda

1

The Revolution: from Consumer to Prosumer

2

The new distributed model raises issues

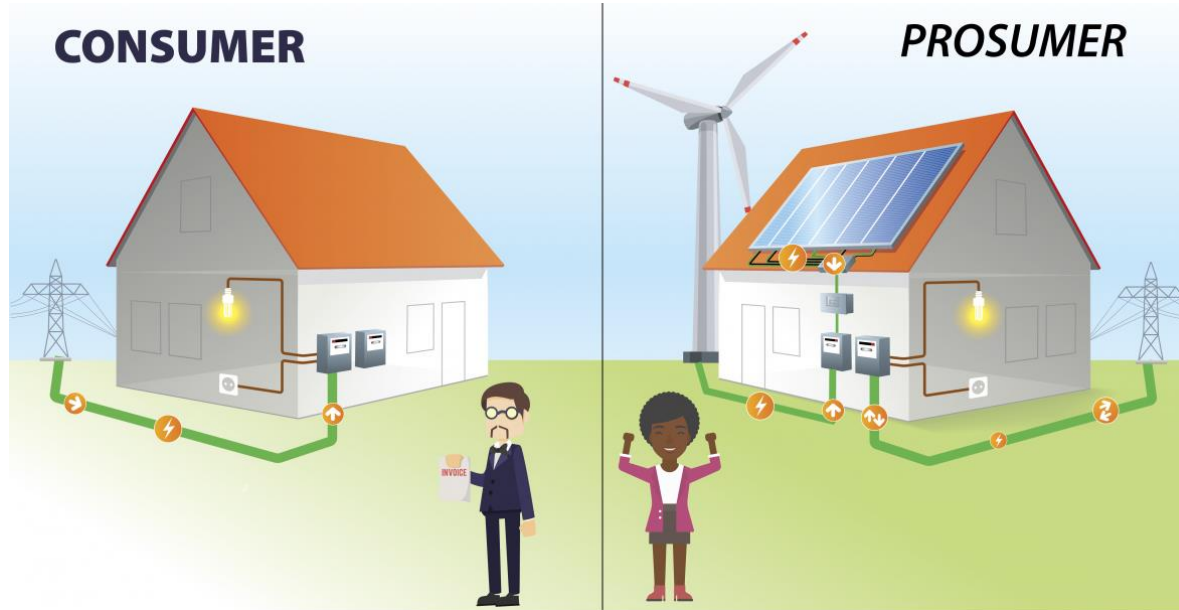
3

Blockchain is a key enabler of this change in model

4

Recommendations

Connected technologies and renewables turn Consumers into Prosumers



*The world of energy is changing very quickly from a top down to a distributed model introducing the **new concept of the Prosumer***



PV market growth (cost drop & PV market growth by 50% in 2016 alone)



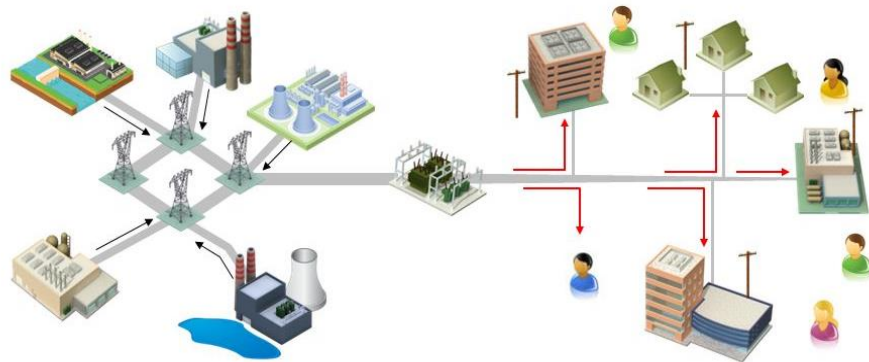
Electricity storage (pumped storage, lithium batteries, DSR, EV's)

Source: Energy Efficiency & Renewable energy (Washington, US)

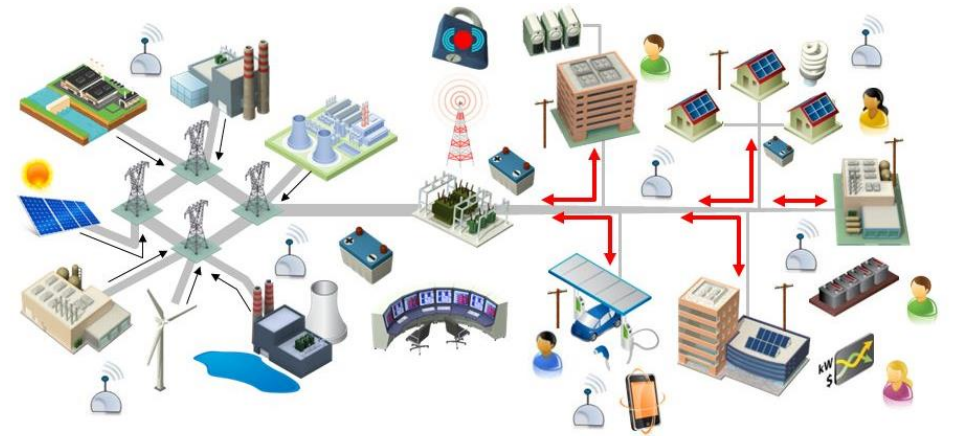
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Prosumers turn the Power System from a Top-down to a Distributed model

Today's Power System



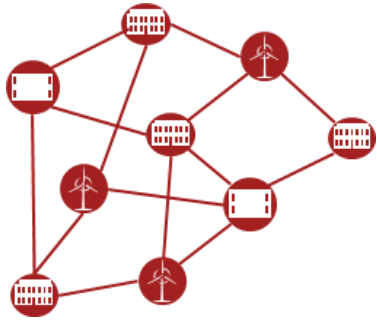
Tomorrow's Power System



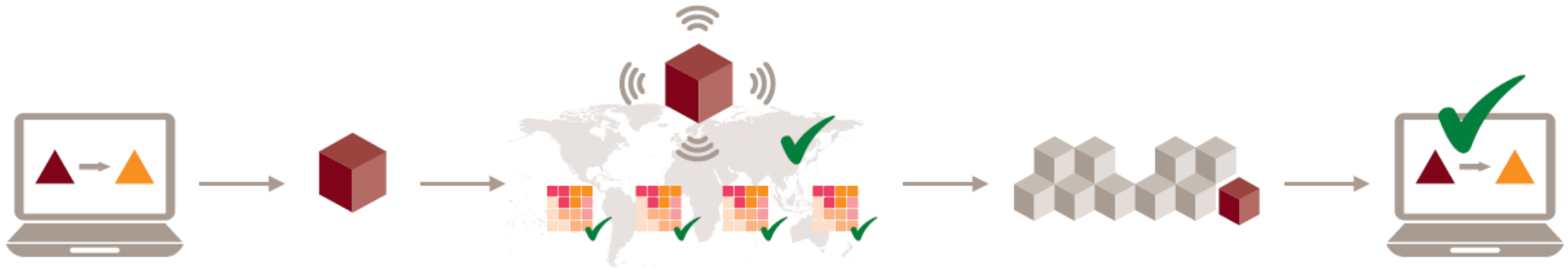
The emerging distributed model creates many additional challenges

- ***Bi-directionality*** of electricity flow and transactions & Smart-Metering
- ***Balancing***: increased volatility of the grid
- ***Explosion*** in number of players & data volume (multiple sources of production)
- ***Impact of EV*** on the system (consumption but also buffer/storage)
- Emerging ***smart cities*** applications
- ***Legacy issues*** for established players (IT, billing systems, meters)
- ***Cyber security*** (interconnected grid) & data privacy (GDPR)
- Significant ***update of regulations*** and consumer protection required

Blockchain is be a key enabler of this revolution...



- **Decentralised ledger of all transactions**
- **No need for a trusted third party as intermediary**
- **Efficient and secure documentation**



A provider and a customer agree a transaction

The transaction is combined with other transactions made during the same period to create a data block

The data block is stored in the decentralised global network in a tamper-proof manner and thus verified

The verified block is combined with all other blocks previously verified, thereby creating a (continuously growing) blockchain

The transaction is confirmed to both parties

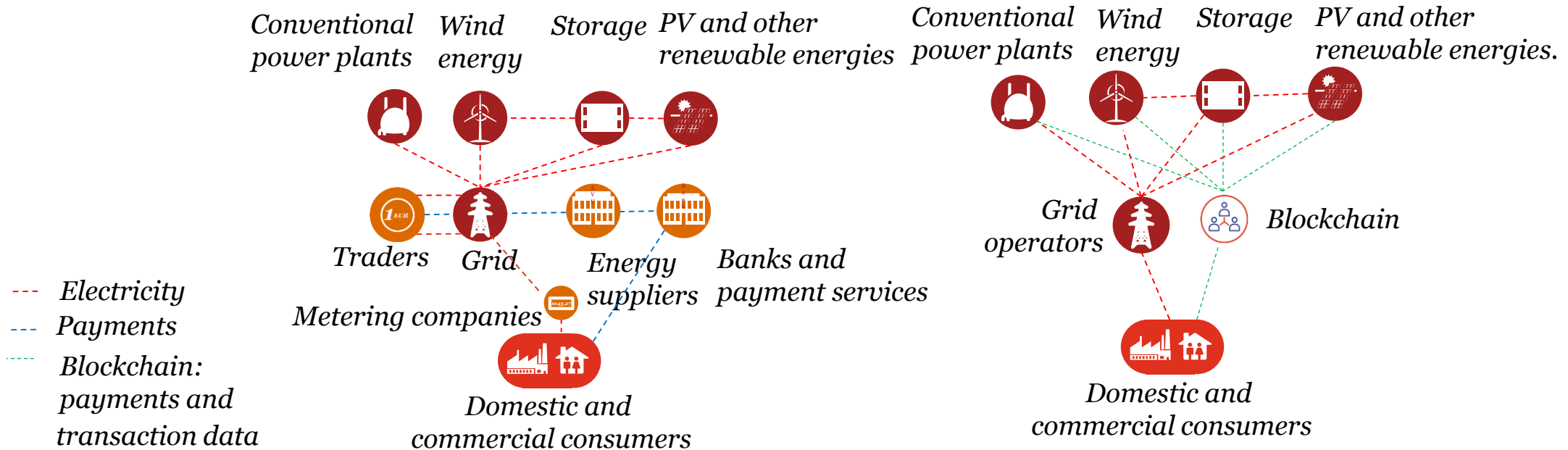
Source: PwC

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... and Blockchain will massively disrupt the energy world...

Today's value chain

The energy world with Blockchain








The distributed Blockchain model CAN make metering companies, energy traders and banks redundant.

Source: PwC

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... thus creating many opportunities for new entrants and startups

	B2C energy trading / Peer-to-peer systems 			Mobility 	Asset management 	Further applications in the energy sector 	Further applications 	
Europe	Enerchain	Ponton	TenneT			OneUp	Lykke	
		Vandebroen	sonnen			Stadtwerke Energie Verbund	Lisk	
	TWL	Conjoule	Alliander				Guardtime	
	AdptEve	freeel.io	Lumenaza*		Electron	Kleiner Racker	Parity	
	WienEnergie	BTL	StromDAO			GrünstromJeton	ChromaWay	
	Allgäu	Slock.it		Share&Charge		Stromhaltig.de	etherisc	
	Fortum	innogy		Demos		InnoEnergy	Ethereum	
	Wuppertal	ConsenSys	Vattenfall	Car eWallet		GridSingularity	IOTA**	
	Ecochain		Powerpeers*				MultiChain	
USA		Siemens	TransActive Grid	Powertree	Filament	Smart Solar	SolarChange	ChainOfThings
		LO3 Energy	Grid+	Arcade City		Volt Markets	ElectriCChain	Linq
						SolarCoin	Wattcoin Labs	NASDAQ
Rest of the world		Power Ledger	Vector	La'Zooz	ElectraSeed	M-PAYG	TEPCO	WanXiang
		LedgerAssets	Origin	KEPCO	Energy-Blockchain Lab	Marubeni	FinTech4Good	Bankymoon
	The Sun Exchange			Toyota				Vodacom

*Interesting peer-to-peer model, currently without the use of blockchain

** Not based on a Blockchain, but on a Distributed Ledger, which, by its own account, overcomes the Blockchain's inefficiency.

Active company/ utility Blockchain developer / Startup Project/Initiative Other company / organization

Enerchain: Peer to peer energy trading for Energy trading companies



30+ European energy trading companies develop a peer-to-peer trading system in the wholesale energy market using blockchain technology.

Key objectives

- Standardised transactions between various trading partners
- Lower transaction costs

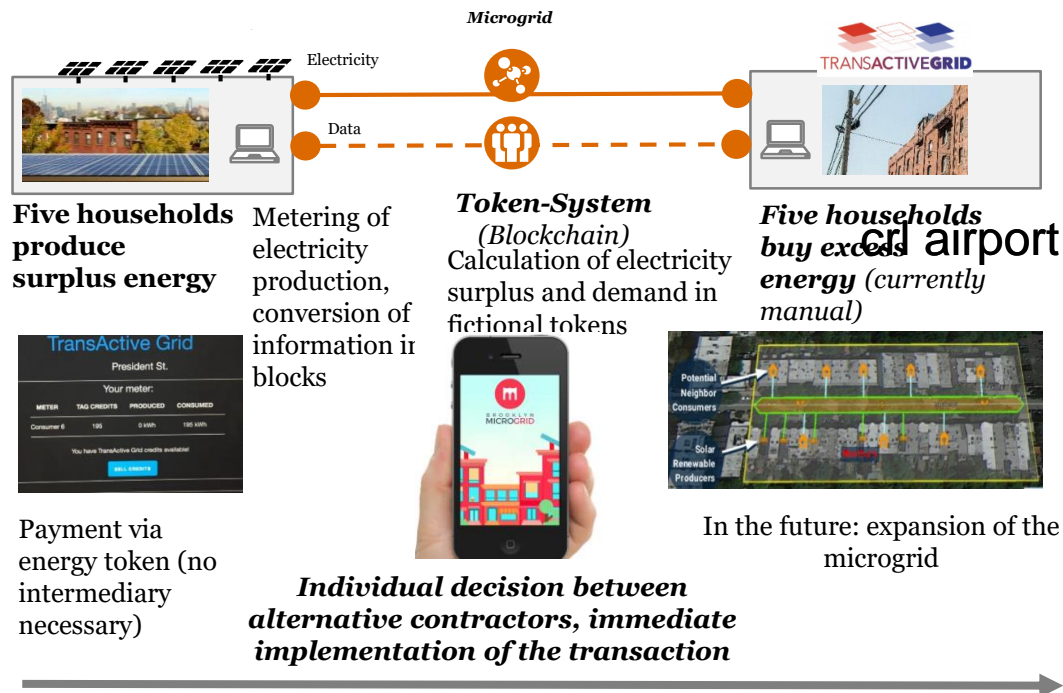
Status

- First trade in October 2017
- Further detailing and deployment in 2018

Source: PwC

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Brooklyn Microgrid: Peer to peer energy trading amongst Households



- **LO3 Energy and Siemens**
- **Ethereum Blockchain**
- **50 feeders and 300 households**
- **A BMG App** has been developed (it shows green electricity production/consumption and integrated electricity into the grid)
- **Regulatory hurdles** still exist

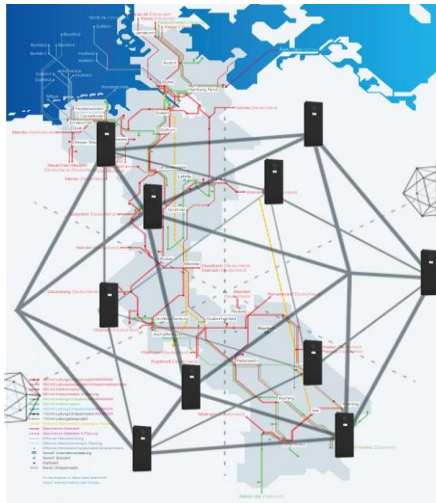
Source: PwC

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TenneT: Grid balancing

Increased **renewable electricity generation** and emergence of prosumers will make the electricity grid **more volatile**.

Conventional energy sources will not be able to fully meet the **demand for electricity**

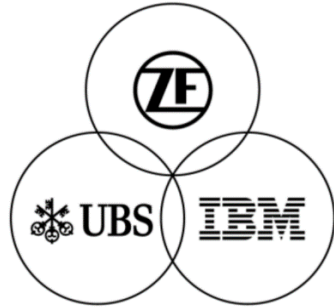


- TenneT is the first Transport System Operator (TSO) to use decentralised, connected storage capacity for grid stabilisation
- The flexible use of Sonnen's battery storage allows to **integrate 24 MW of flexibility** and to **re-dispatch them according to the availability of wind power**
- The digital process of **verifying and documenting the performance values of these distributed flexible energy** devices is delivered using Blockchain
- The pilot is build on open-source based Hyperledger Fabric and is scalable

Source: PwC

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ZF, UBS and IBM: EV Car eWallet



- ZF, UBS and IBM are developing an **open automotive transaction platform** based on IBM Blockchain technology
- **Car eWallet acts as a digital agent** that can independently perform tasks and approve payments without requiring users to take action themselves
- Use cases: **Autonomous settlement** of tolls and parking fees, as well as the "electricity refueling", in addition, agent can do additional tasks, such as trunk or open doors
- Two new partners since the IAA - **APCOA** (Parking Management Company) and **Charge-Point** (American provider of e-charging stations)

Source: PwC

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New technologies create new risks

1987

Black Monday

Not understanding
Programme trading

2008

Financial crisis

Not understanding sub-
prime market structure
and risks

2010

Flash Crash

Not understanding the
High Frequency Trading

- **Unacceptable to have the grid down (think of VISA last week): leads to material consequences and exposed national security.**
- **It is paramount that regulators understand the technology and risks it creates.**

Source: Media, PwC

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The regulators must eliminate the possibility of the grid going down

- Blockchains are ***designed to circumvent regulations*** (‘trust’ through decentralisation, not through a centralised authority).
- Energy sector transactions remain commercial in nature and ***all commercial transactions are and must be regulated.***
- The regulatory framework that shall emerge must combine three strategic dimensions: ***financial, data, energy.*** This is a unique level of complexity.
- ***Blockchains ARE hackable*** (e.g. Verge). By nature, they are decentralised and viral, it is hence impossible to deactivate the affected part of the network (no circuit-breakers).
- A cyber-attack (virtual) can have dramatic material consequences.

Source: PwC

PwC best perspective for Regulators of Blockchain use in Energy (1/2)

- It is critical that **regulators understand what blockchain is and what it is capable of today** to understand the risks (much riskier than people think).
- The first priority is **to get the right people and skills**. It will be expensive.
- Regulators must engage with the legacy players **AND the start-ups** to shape the market. Most of the expertise and innovations lie with the start-ups.
- Need for regulations regarding the **legal framework and licensing of Prosumers**, to clarify their status in the energy system and the legal obligations placed, beyond simple financial constraints (e.g., merit order, ring-fencing).

PwC best perspective for Regulators of Blockchain use in Energy (2/2)

- Moving to a ***multiple suppliers per customer*** environment: having a supplier and simultaneously an opportunity to participate in market places such as peer-to-peer or peer-to-local-market (e.g., only green energy or charitable giving).
- Regulations need to support ***dynamic pricing***, to support differentiation in the value of energy from and for different market players. But need to avoid ***price-gouging*** à la Enron.
- ***Deal with cybersecurity***: electric grid security and data privacy issues.
- Help market players through ***sand-boxes***: test, fail, repeat, succeed.

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Acknowledgements

The author gratefully acknowledges the following people for their comments and input in relation to this paper:

- Professor David Shipworth, UCL Energy Institute
- Georg Rute, Elering (Electric power transmission in Estonia)
- Jokūbas Viduto, WePower (Lithuanian Blockchain-based start-up)
- Marisol Angel Guzman-Montoya, Innovation Judge/Coach Latin Energy Forum, CEO ARVAKR ENERGY ORG
- My shadow (on Feb 14, 2018): Roberts Kairis, 5th grade of Babites School
- Catharina Geiselhart, PwC Germany, expert in Digital Energy and Blockchain in the energy sector
- Steve Mullins, PwC UK, Smart Energy Global leader
- Gunther Duetsch, PwC Germany, Director
- Baiba Apine, PwC Latvia, Director

Source: PwC

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