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Gaurav Angira

Director, Energy & Resources Consulting

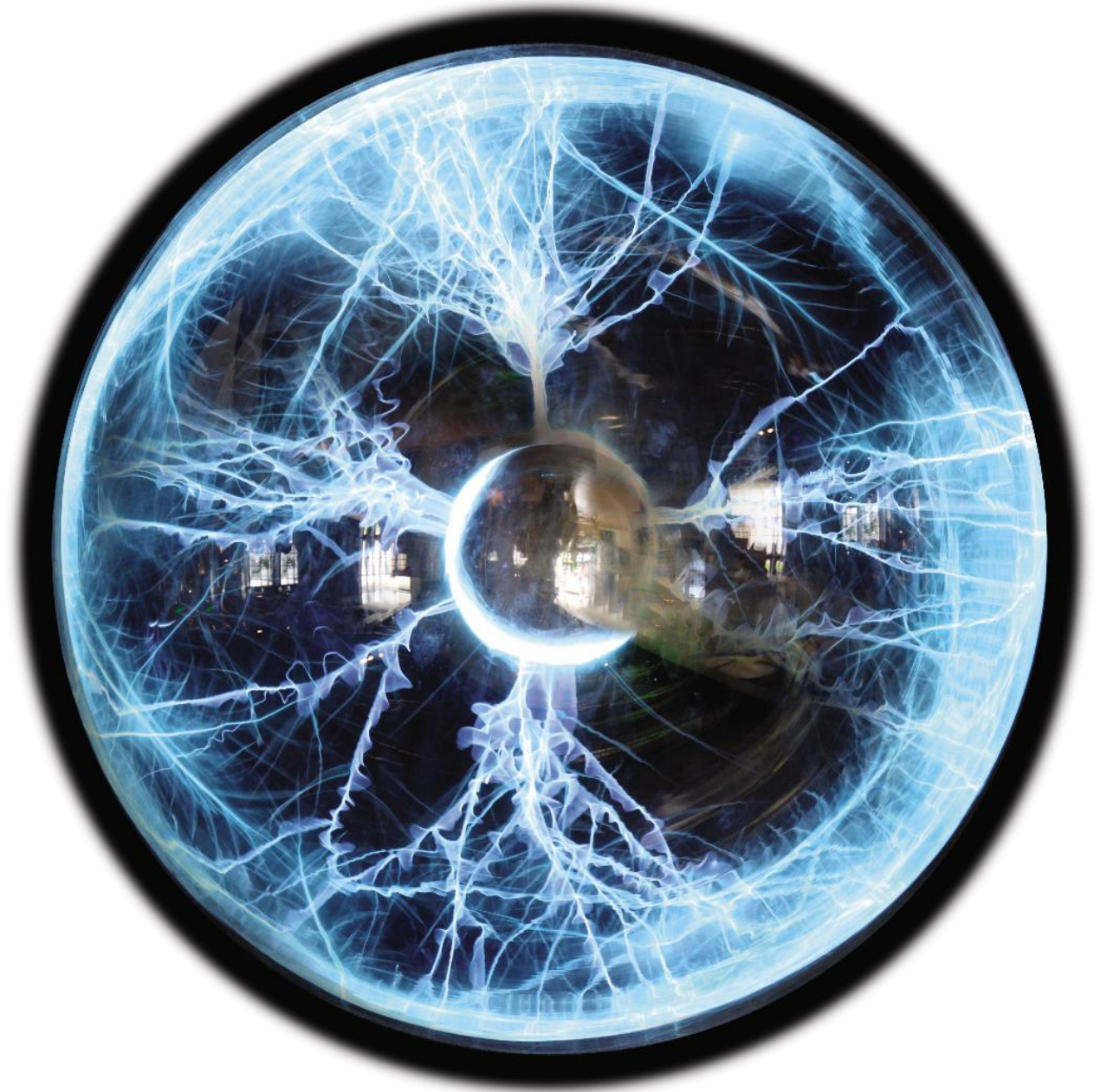
Deloitte Touche Tohmatsu India LLP

+91 97170 03165

gangira@deloitte.com

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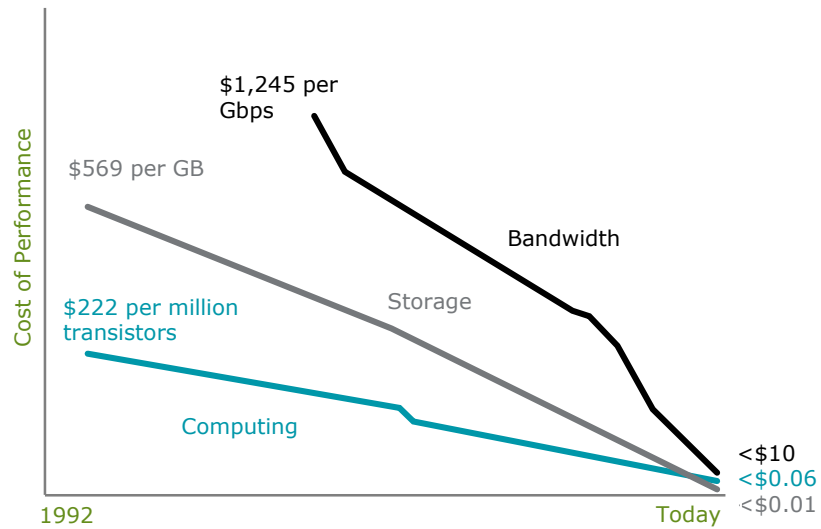
Emerging technology trends shaping power sector



Technological evolution spurs the rise of digital technologies – and ushers in disruption

These trends have ushered a 'Digital Era' ...

Costs in bandwidth, storage, and computing are declining at a rapid pace.....



1 See what we couldn't

- IIOT** – Connected assets and people, Track and Trace
- Drones** – Aerial imaging of vast, hard-to-reach, confined places

2 Analytics driven decision making

- Big Data Analytics**
- Predictive analytics**
- Artificial Intelligence / Machine Learning**

3 Automation is on rise

- Robotics**
- RPA**
- Blockchain**

4 Machines understand humans

- Real time information**
- Easy access and easy to use**

5 Interconnected systems

What it means to be 'Digital' for an enterprise ?

A **digital enterprise** continuously redefines what it offers, how it delivers, and how it operates to drive **competitive differentiation**, maximize **profitability**, and minimize enterprise **risk**



Adoption of Exponential Technologies

Embracing new technologies such as mobile, cognitive, or internet of things



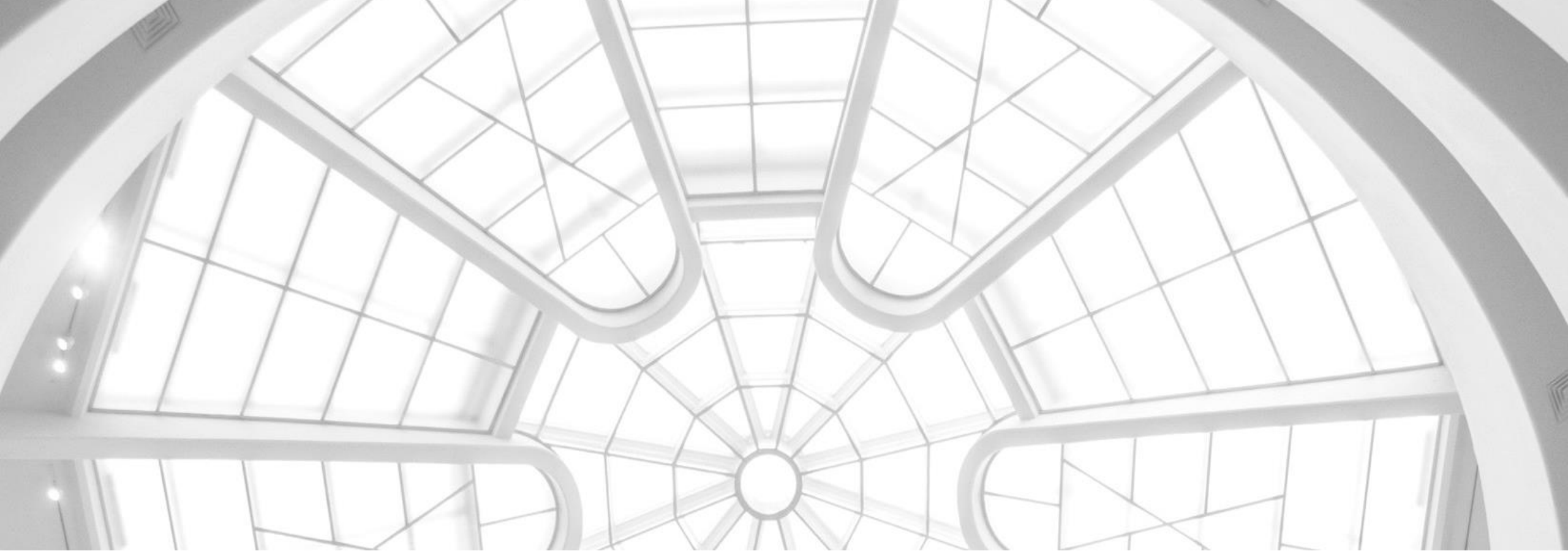
Digital Mindset

Incorporating a digital mindset into the DNA of the organization



Continuous Feedback Loop

Processes in place to encourage experimentation and innovation



**The world is getting
faster...Are You?**

The Deceptive Nature of Exponential Growth

30 linear steps



About 30 meters...

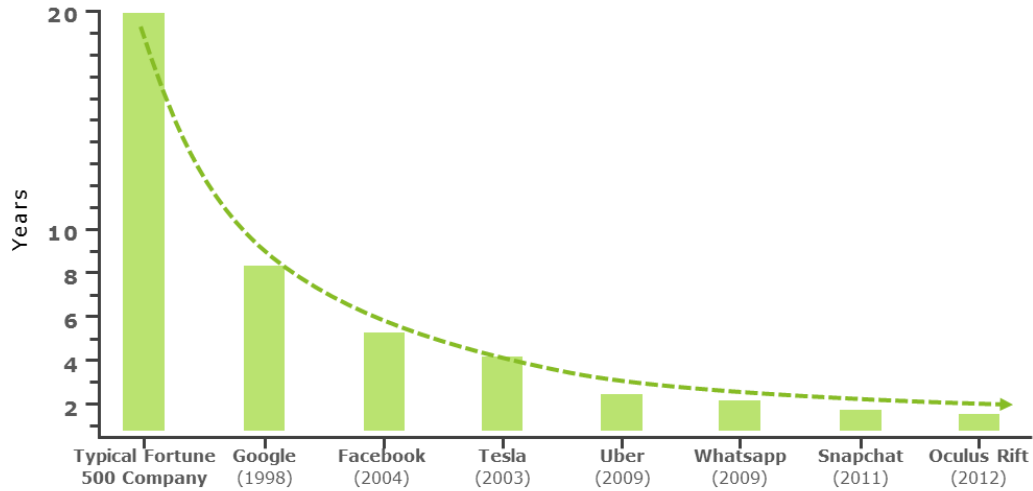
30 exponential steps
(i.e., $1 + 2 + 4 + 8 + 16 + 32 \dots$)



... 27 times around the earth

As reflected in

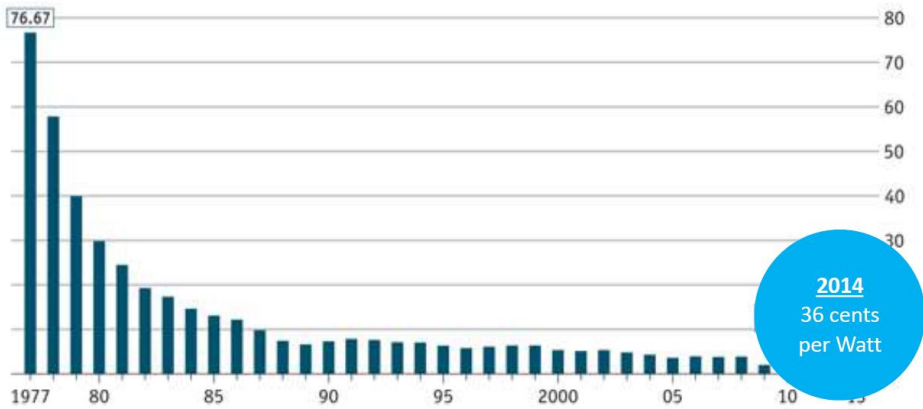
Time to a Billion Dollar Valuation



Source: Salim Ismail, *Exponential Organizations* Company & Founding Year

The Swanson effect

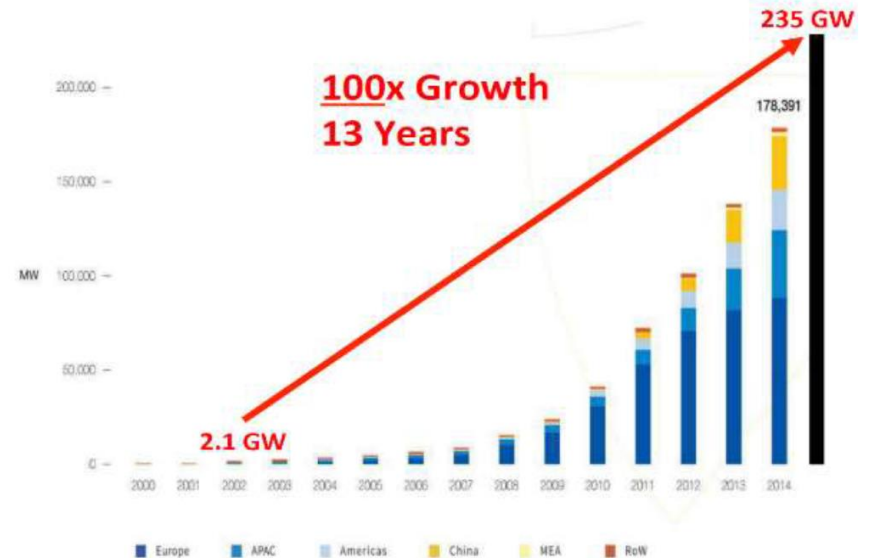
Price of crystalline silicon photovoltaic cells, \$ per watt



Source: Bloomberg New Energy Finance



Source: airbnb




Digital is creating waves of disruption

Businesses are experiencing forces of change...



...enabled by

-  Artificial Intelligence
-  Digital Reality
-  Internet of Things
-  Exoskeleton
-  3D Printing
-  Drone
-  Blockchain

So the question stands...

Will you Disrupt or be Disrupted?







Artificial intelligence (AI)

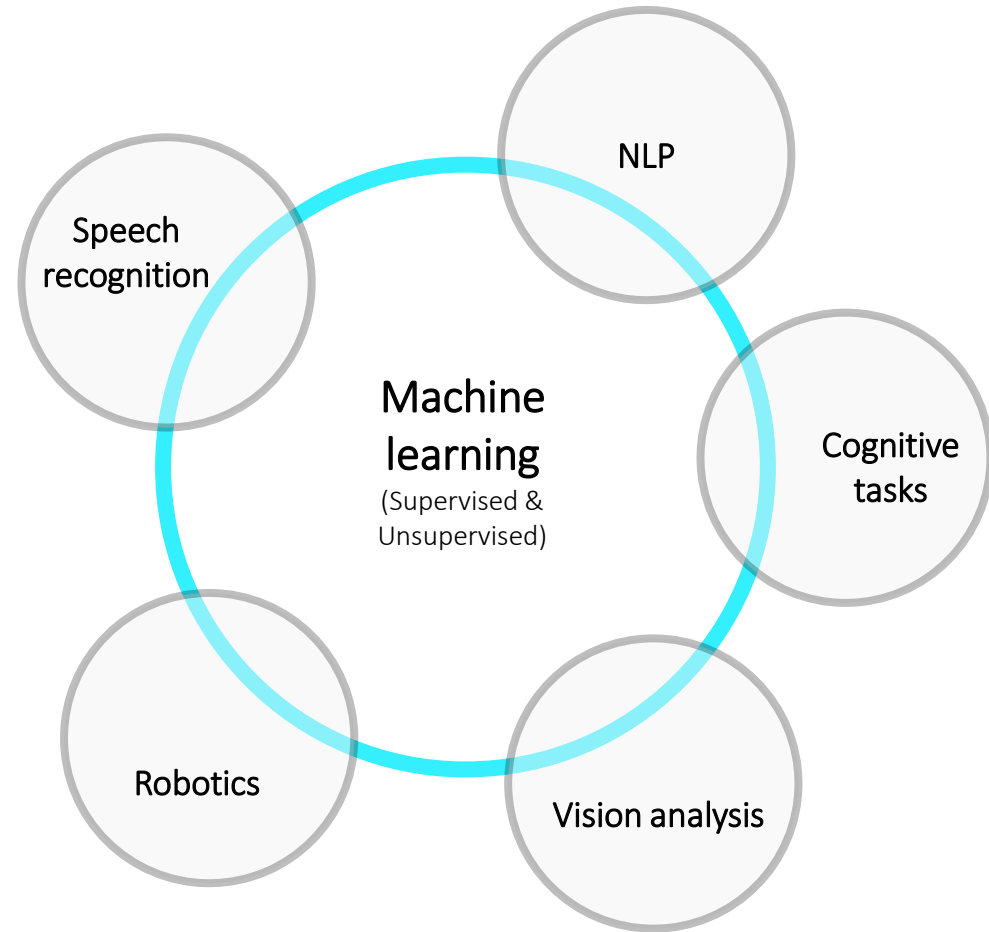


What is AI?

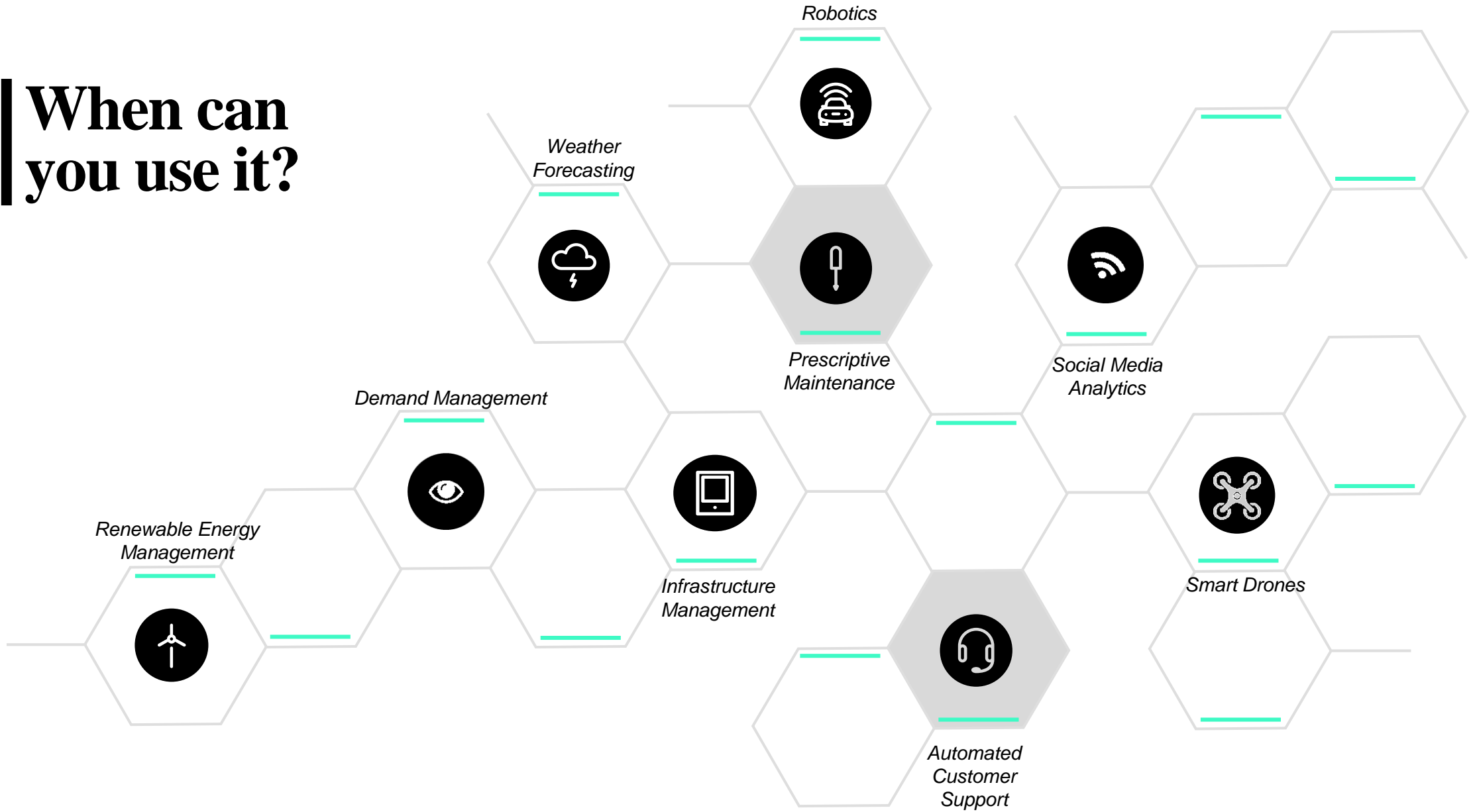
AI is a technology that makes the machines think and emulate human capabilities

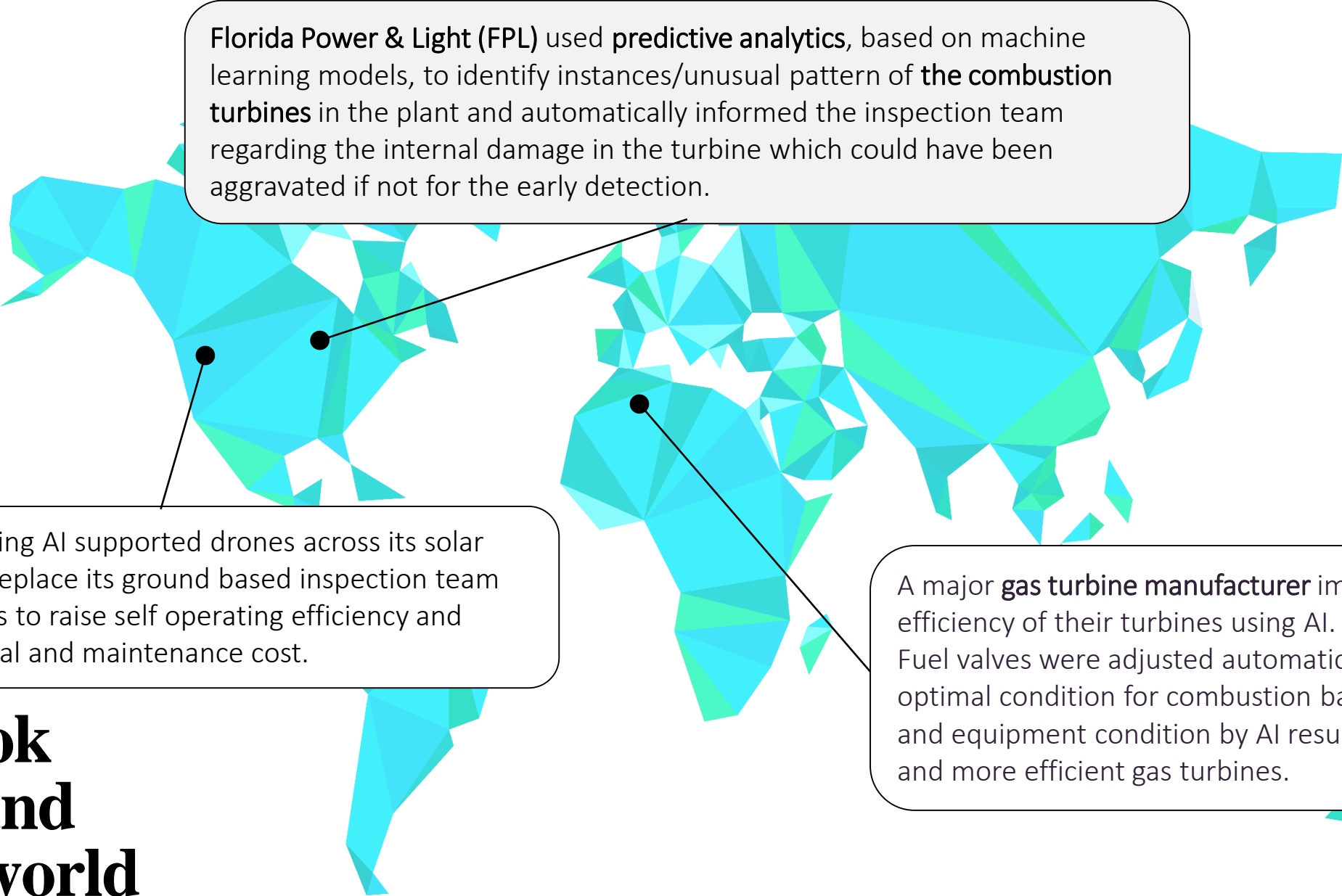
Advantage of Artificial Intelligence

-  Improved Decision Model
-  Continuous Improvement
-  Expert pattern recognition capabilities
-  Improved accuracy



When can you use it?





Florida Power & Light (FPL) used **predictive analytics**, based on machine learning models, to identify instances/unusual pattern of **the combustion turbines** in the plant and automatically informed the inspection team regarding the internal damage in the turbine which could have been aggravated if not for the early detection.

Duke energy is using AI supported drones across its solar power plants to replace its ground based inspection team with aerial drones to raise self operating efficiency and reduce operational and maintenance cost.

A major **gas turbine manufacturer** improved turbine efficiency of their turbines using AI. Fuel valves were adjusted automatically to create the optimal condition for combustion based on weather and equipment condition by AI resulting in improved and more efficient gas turbines.

A look around the world



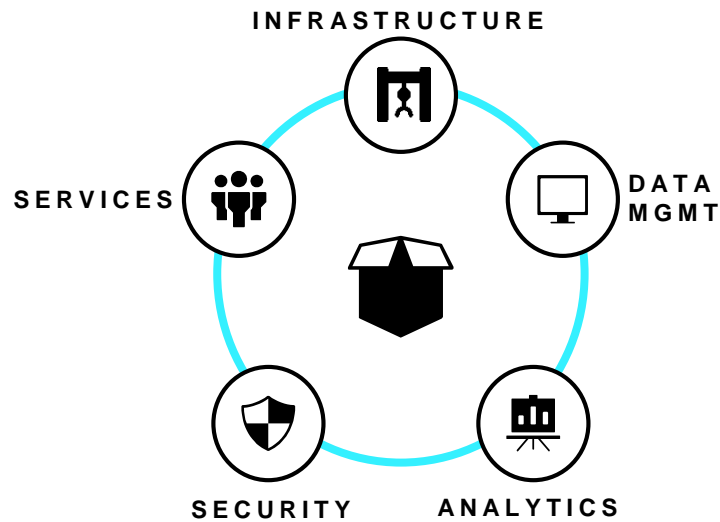
IoT

▾

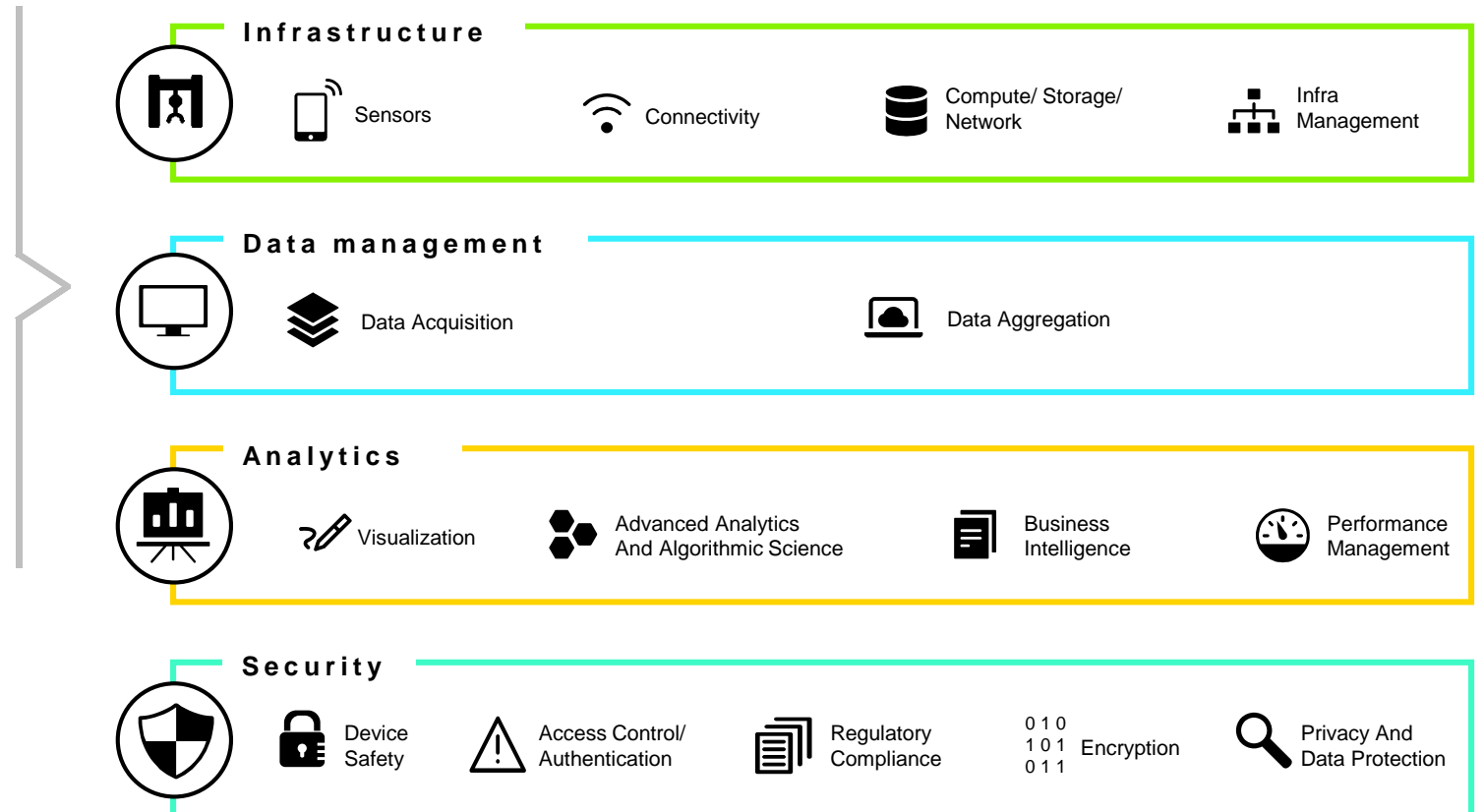
IoT is more than just sensorization

A high impact IoT system combines analytics, software, infrastructure, security, and professional services into a solution to accelerate the ROI timeline

Scalable architecture



Solutions



When can you use it?



Optimization

Use indoor and outdoor sensors as necessary to track inventory

- ↓ Inventory
- ↓ Stock outs
- ↑ Service levels
- ↑ Operational efficiency
- ↑ Forecast accuracy



Planning

Prevent downtime spent searching for lost tooling,

- ↓ Tooling costs
- ↑ Simulating DER forecasts
- ↓ Unplanned downtime
- ↑ OEE (optimized shared tooling)
- ↑ ROA



Quality analytics

Monitor your quality holding area and track

- ↑ First Pass Yield (FPY)
- ↓ Quality incidents
- ↓ Rework
- ↓ Scrap
- ↓ Warranty costs



Synchronization

Optimize operations and labor efficiency based on where needs are

- ↓ Labor costs
- ↑ Operational efficiency
- ↓ Past due workload
- ↑ OEE
- ↑ Throughput / OTD



Visibility

Provide enhanced visibility and order tracking to your customers.

- ↑ Central control centre
- ↑ Forecast Accuracy
- ↑ Supplier Performance
- ↑ Remote project monitoring
- ↓ Inventory

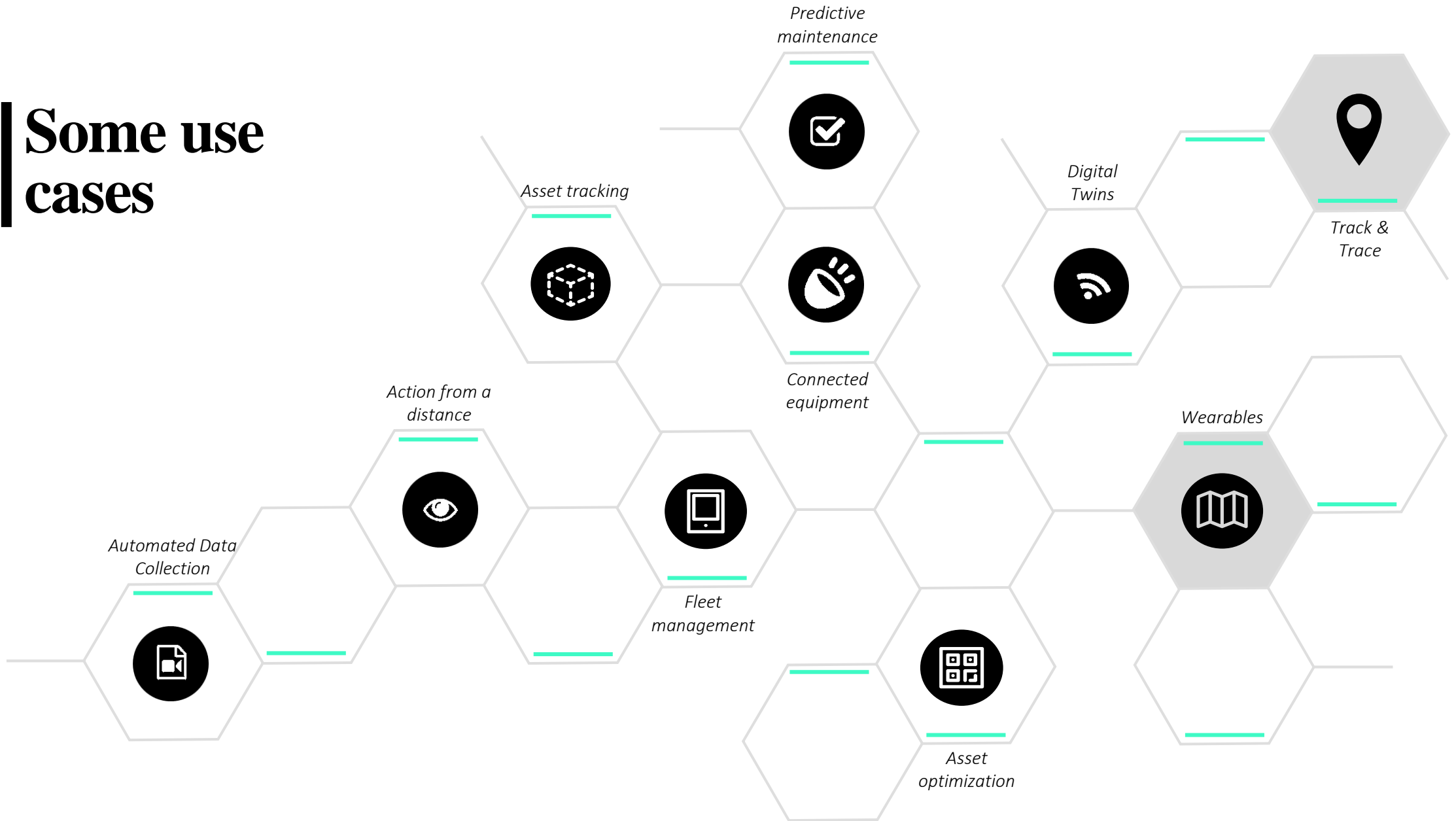


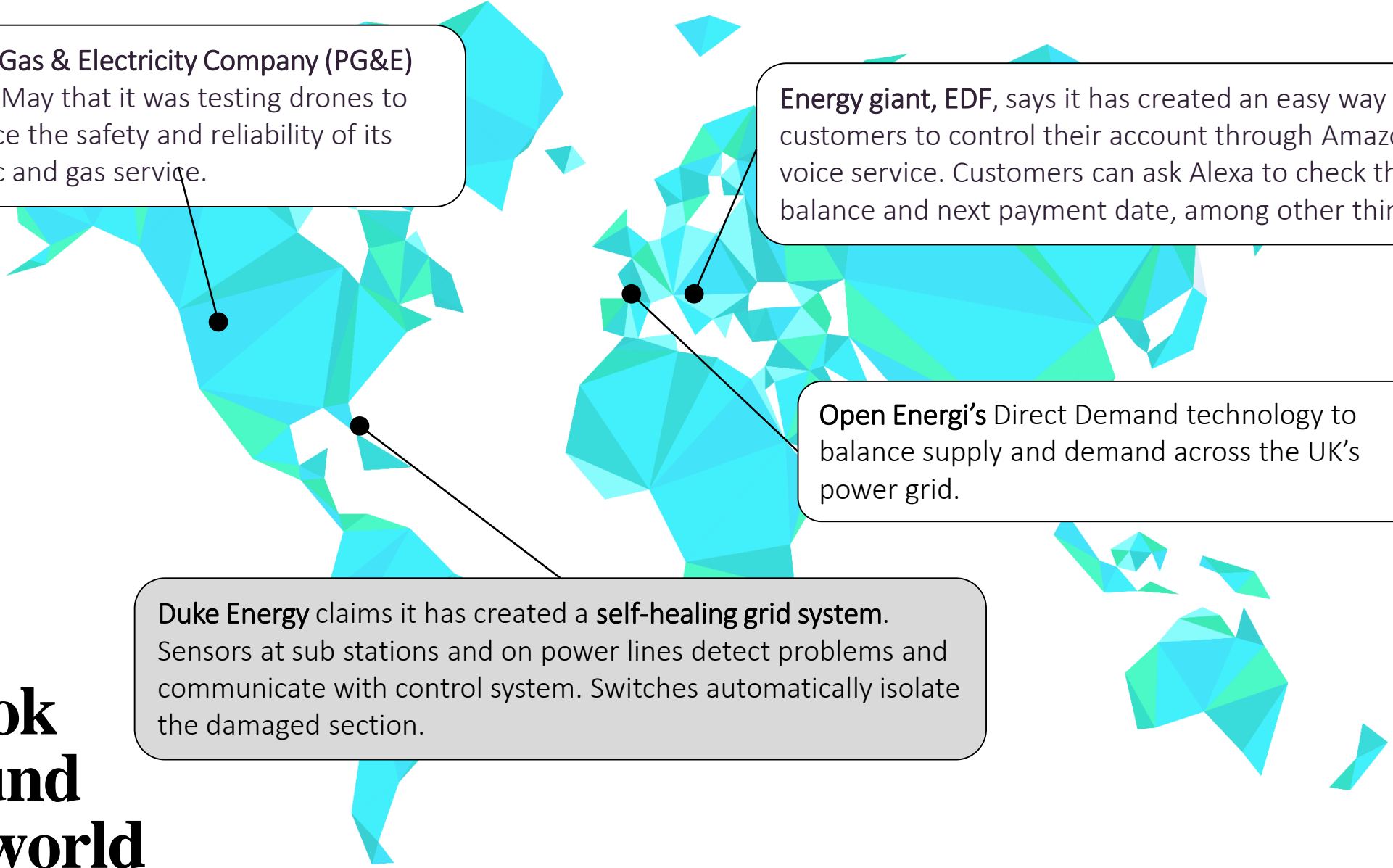
Resource tracking

Track employee location, performance, and safety near restricted areas

- ↓ Labor costs
- ↓ Employee distress
- ↑ Service levels
- ↑ Efficiency and productivity
- ↑ Emergency response

Some use cases





Pacific Gas & Electricity Company (PG&E) said in May that it was testing drones to enhance the safety and reliability of its electric and gas service.

Energy giant, EDF, says it has created an easy way for customers to control their account through Amazon's Alexa voice service. Customers can ask Alexa to check their account balance and next payment date, among other things.

Open Energi's Direct Demand technology to balance supply and demand across the UK's power grid.

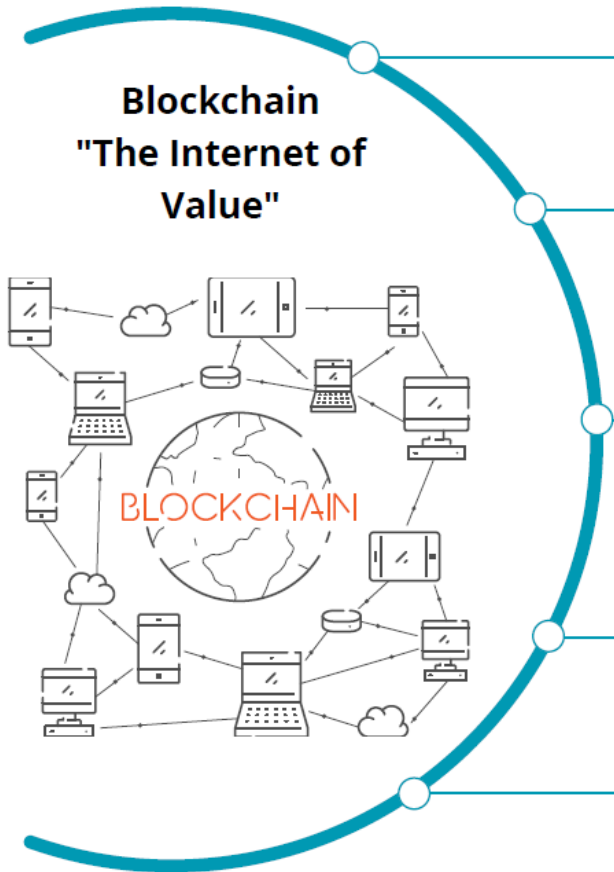
Duke Energy claims it has created a **self-healing grid system**. Sensors at sub stations and on power lines detect problems and communicate with control system. Switches automatically isolate the damaged section.

A look around the world

Blockchain



What is it?



Real time: Enables the near real time settlement of recorded transactions, removing friction, reducing risk but also limiting ability to charge back.



No Third Party or Intermediary: Uses cryptographic proof instead of trust, allowing any two parties to transact directly with each other without the need for a trusted third party.



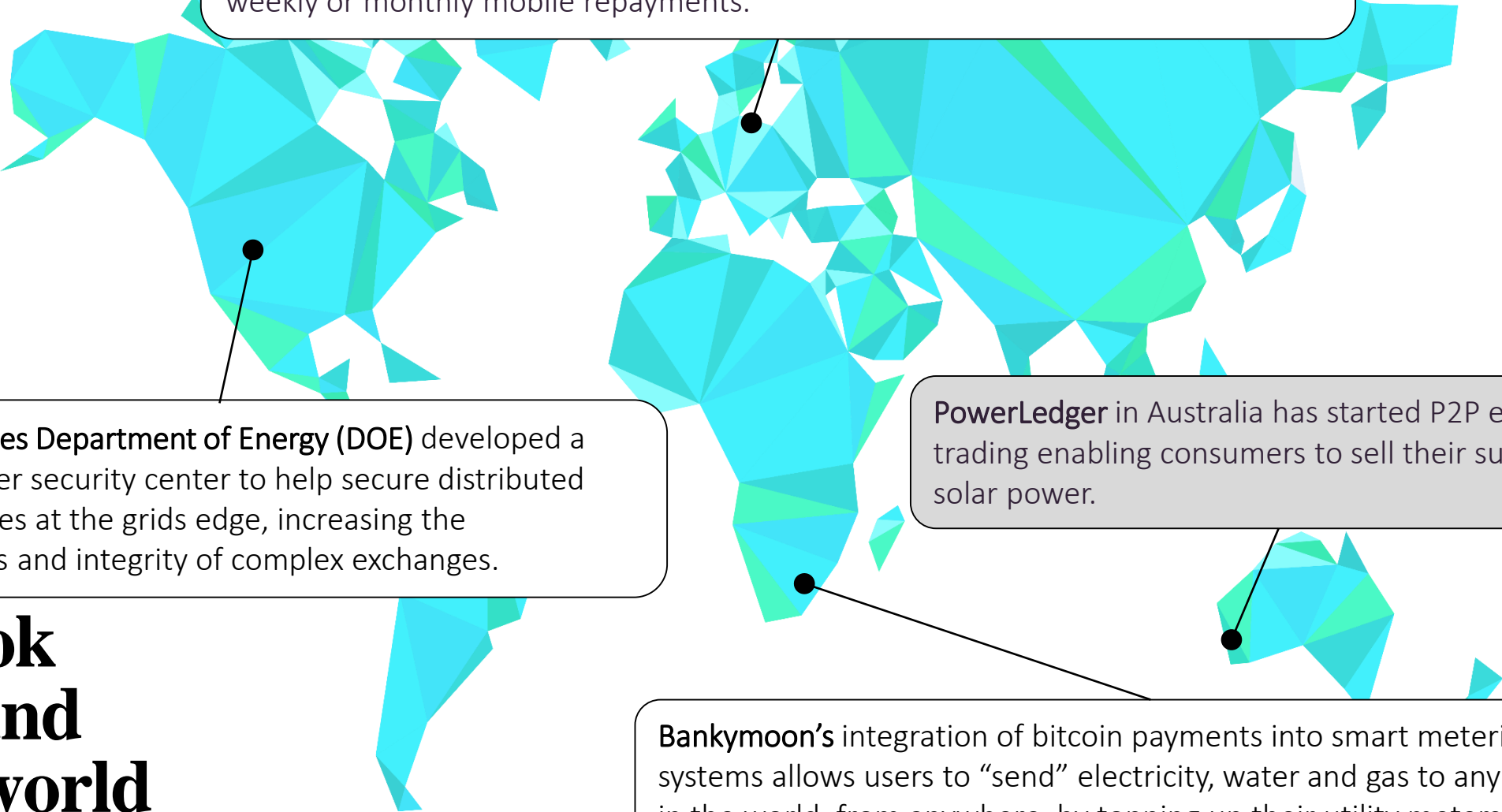
Shared and distributed ledger: Records a history of transactions through peer-to-peer distributed network. The blockchain preserves only the proof of the transaction existence.



Irreversibility: Contains certain and verifiable record of every single transaction ever made. This prevents double spending, fraud, abuse and manipulation of transactions



Censorship resistant: Crypto economics ensures that the blockchain continues pumping out new blocks and that blocks are not being reverted or altered.



M-PAYG is a provider solar energy systems for the developing world. Their systems allow off-grid low-income households and businesses to access solar energy through small-scale mobile repayments. To use the system you unlock it through weekly or monthly mobile repayments.

The United States Department of Energy (DOE) developed a Blockchain cyber security center to help secure distributed energy resources at the grids edge, increasing the trustworthiness and integrity of complex exchanges.

PowerLedger in Australia has started P2P energy trading enabling consumers to sell their surplus solar power.

Bankymoon's integration of bitcoin payments into smart metering systems allows users to "send" electricity, water and gas to anybody else in the world, from anywhere, by topping up their utility meters.

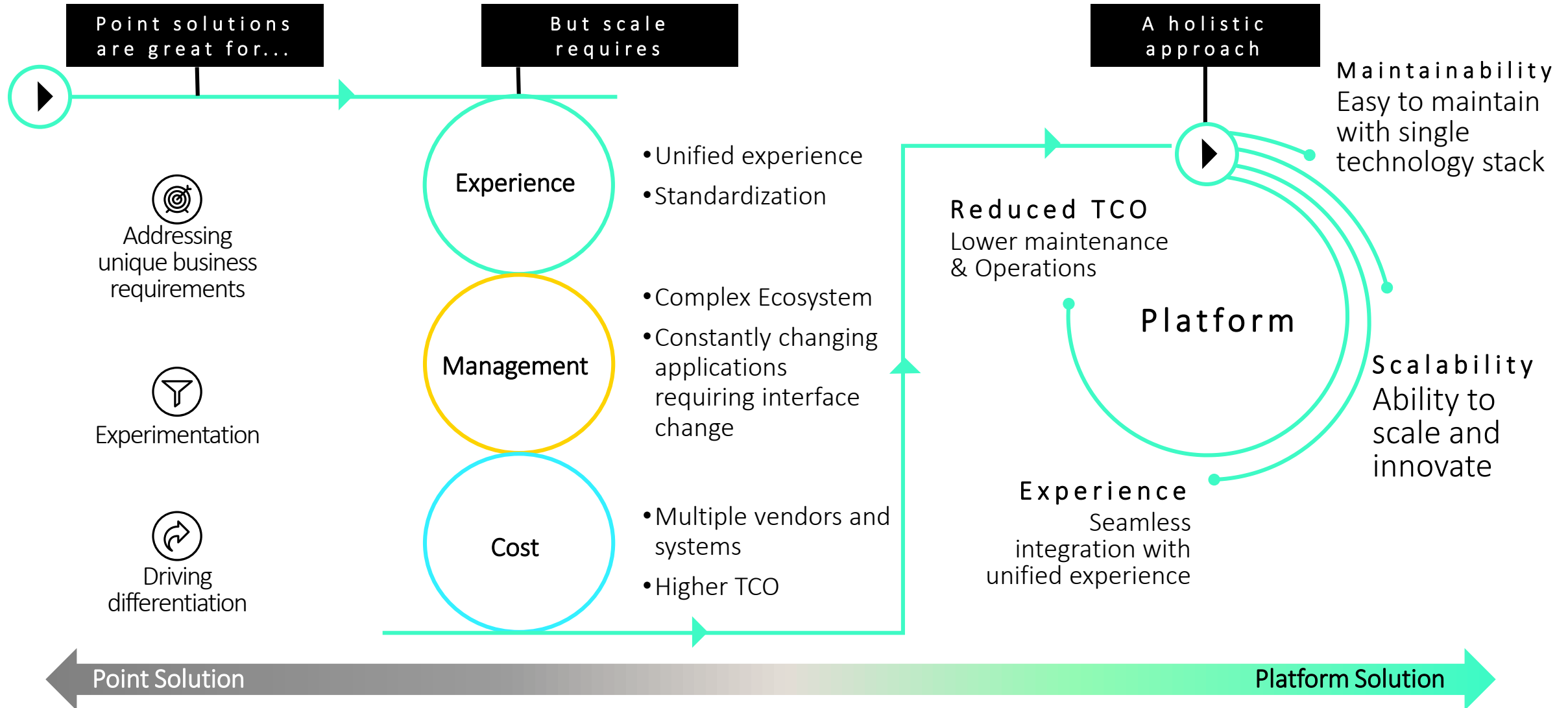
A look around the world



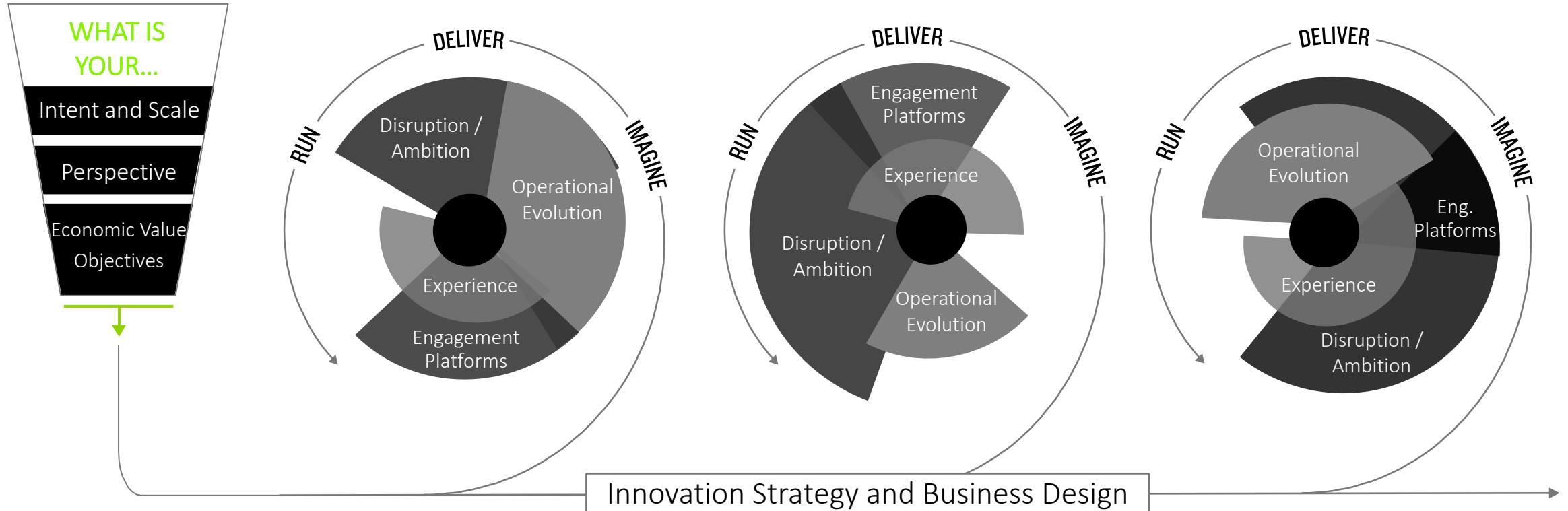
The digital way...

▾

Design for the future



Learning to think Digital



USER CENTRIC DESIGN

RAPID PROTOTYPING

ITERATIVE WORK

EXPERIMENTATION

Thinking Digital can help you

Re | IMAGINE
DESIGN
ENGAGE

Let's try it out!

Deloitte.



Gaurav Angira

Director, Energy & Resources Consulting

Deloitte Touche Tohmatsu India LLP

+91 97170 03165

gangira@deloitte.com

Thank you!