AWS re:Invent

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Centrica: Balancing the grid with innovative technology

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AWS is empowering the digital utility



Decarbonization



Decentralization



Digitization

Industry solution categories

AWS Cloud services

AWS-enabled customer and partner solutions

BUSINESS TRANSFORMATION

IT TRANSFORMATION	OT TRANSFORMATION	ASSET AND WORK OPTIMIZATION	ENERGY TRANSITION	CUSTOMER ENGAGEMENT

DATA INSIGHTS

Core services	DATABASE	EDGE	ANALYSIS	AI/ML	VOICE AND CHAT Alexa, Amazon Lex, Amazon Connect
Foundation technology	STORAGE	ELASTIC COMPUTE	NETWORK	SECURITY	
Data capture, ingest, and integration	STREAMING, QUEUING & MESSAGING	IOT EDGE, CORE ANALYTICS	DATA CATALOGING AND ETL	EDGE COMPUTE AND STORAGE	

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Our customers and partners

The power and utilities industry encompasses the production, transmission, distribution, retailing, and management of electricity, gas, and water serving the earth population of 7.7 billion

Utilities including OEMs



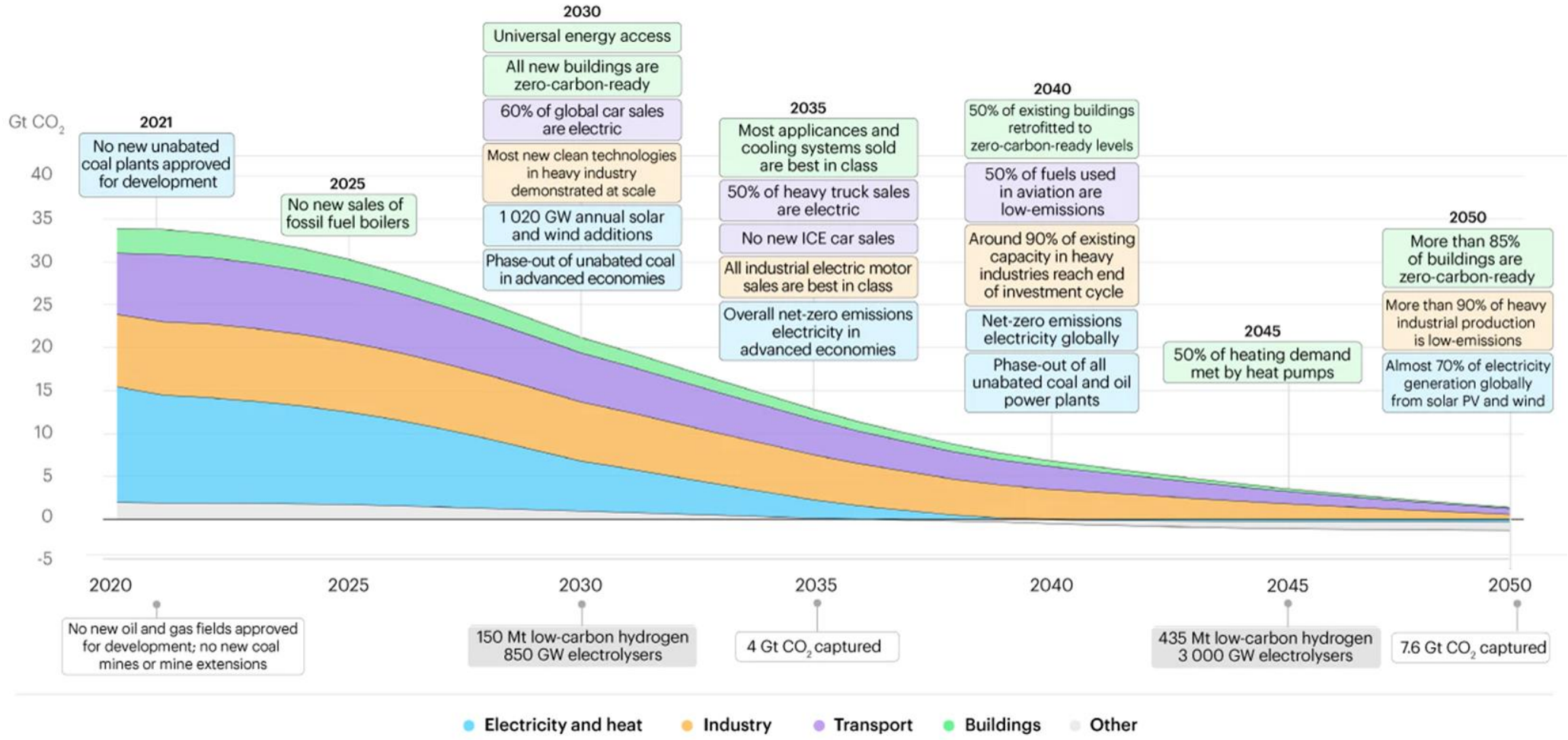
ISVs and GSI/SIs



. . . and many more

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IEA energy transition roadmap



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AWS P&U energy transition use cases



Distributed Energy Resource Management System (DERMS)

Virtual power plants

Renewable energy forecasting

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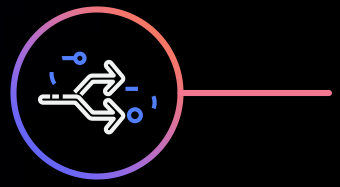
Agenda



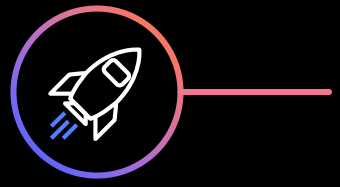
Introduction to Centrica



A shift to planet and people



Helping others make the shift



Technology as an enabler in the green transition

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Who is Centrica?

AN INTERNATIONAL ENERGY SERVICES AND SOLUTIONS COMPANY

centrica

Our strategy is driven by our purpose to help our customers live sustainably, simply, and affordably

As the pace of change continues to accelerate, we will respond by focusing colleagues and technology on helping businesses and households use energy more efficiently and sustainably

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Centrica’s sustainability journey

History of Centrica

1816
Preston becomes the first town in the UK to have gas streetlights. Until the 20th century, gas was primarily used for streetlights.

1817
GLCC designs the world’s first gas meter, which is installed at the gasworks of the Royal Mint.

1858
The world’s first domestic water heater is designed.

1870
The first prepayment gas meter is designed.

1956
Queen Elizabeth II opens Britain’s first nuclear power plant in Cumberland.

1957
The Clean Air Act is introduced, which boosts the use of gas fires for heating.

1986
The gas industry is privatized, and British Gas PLC is formed.

First shares traded in December. The Office of Gas Supply (OFGAS) was at the center of the framework of regulations established under the Gas Act 1986, which created British Gas PLC.

2000
Centrica acquires Direct Energy, marking a major step in international expansion.

2009
Centrica acquires 20% of British Energy’s nuclear fleet of power stations from EDF.

Centrica acquires Venture Production PLC to become a leading operator of mature and orphaned gas assets in the UK continental shelf.

2013
Centrica signs long-term American LNG export contract with Cheniere.

2014
Centrica acquires Bord Gais Energy.

Direct Energy teams up with Nest.

2015
Centrica announces new strategy focused on being a customer-facing business, powered by technology and innovation.

2016
Centrica acquires NEAS energy and ENER-G Cogen International Limited.

Centrica signs 5-year LNG deal with JERA.

2018
November 2018: Carers UK partnership announced.

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Our purpose: People and planet



By 2030, we want to

- Create an engaged and inclusive team that reflects the full diversity of the communities we serve
- Recruit 3,500 apprentices and provide career development opportunities for underrepresented groups
- Inspire colleagues to give 100,000 hours to build inclusive communities

By 2045–2050, we want to

- Help our customers be net-zero carbon (by 2050)
- Be a net-zero carbon business (by 2045)

Doing business responsibly: Underpinned by strong foundations to ensure we act fairly and ethically – from customer service to human rights

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Our sustainability plan

Net-zero plan at a glance

Helping our customers live sustainably, simply, and affordably

Be a net-zero business by 2045

40% carbon reduction by 2034

Build a zero emissions UK fleet by 2025

As we increasingly switch to electric vehicles (EVs)

Reduce property emissions

In the UK by 50% by 2030 with efficient and low-carbon solutions, alongside flexible working

Grow our low carbon asset portfolio

With up to 800 MW of solar and battery by 2025

Move away from fossil fuels

By exiting oil and gas exploration and production, while exploring hydrogen storage as well as carbon and storage

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Help our customers be net zero by 2050

28% reduction in carbon intensity by 2030



Roll out energy efficiency and energy management solutions

With products like Mixergy, Panoramic Power, and energy efficient boilers while planning for

- >2.5M Hive heating customers by 2025
- 6M more smart meters in homes by 2030



Deliver low carbon technologies

Such as solar and combined heat and power units (CHPs) alongside our ambition for

- 100,000 EV charge points per year by 2025
- 20,000 heat pumps installed each year by 2025
- Grow a substantial position in the UK battery optimization market by 2025



Supply cleaner energy

From renewable assets, biomethane, and hydrogen while aiming to

- Remain the UK's biggest retailer of zero carbon electricity
- >25% of our residential customers in Ireland on a green tariff by 2025
- Up to €100M invested in renewable assets annually by 2025

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Our sustainability plan

Net-zero plan at a glance

Helping our customers live sustainably, simply, and affordably

Work toward a just transition for everyone

For customers
By championing a fair and affordable transition

For colleagues
As we grow a greener and more inclusive team

For communities
By backing sustainable initiatives

For suppliers
Via collaboration for a low-carbon supply chain

Underpinned by . . .



Strong brands

Like British Gas, Bord Gáis Energy, Centrica Business Solutions, and Centrica Storage Limited



Expert colleagues

Across our 20,000 strong workforce, including 9,000 engineers and a commitment to recruit 3,500 green apprentices by 2030, with the ambition for 50% to be female



Robust management

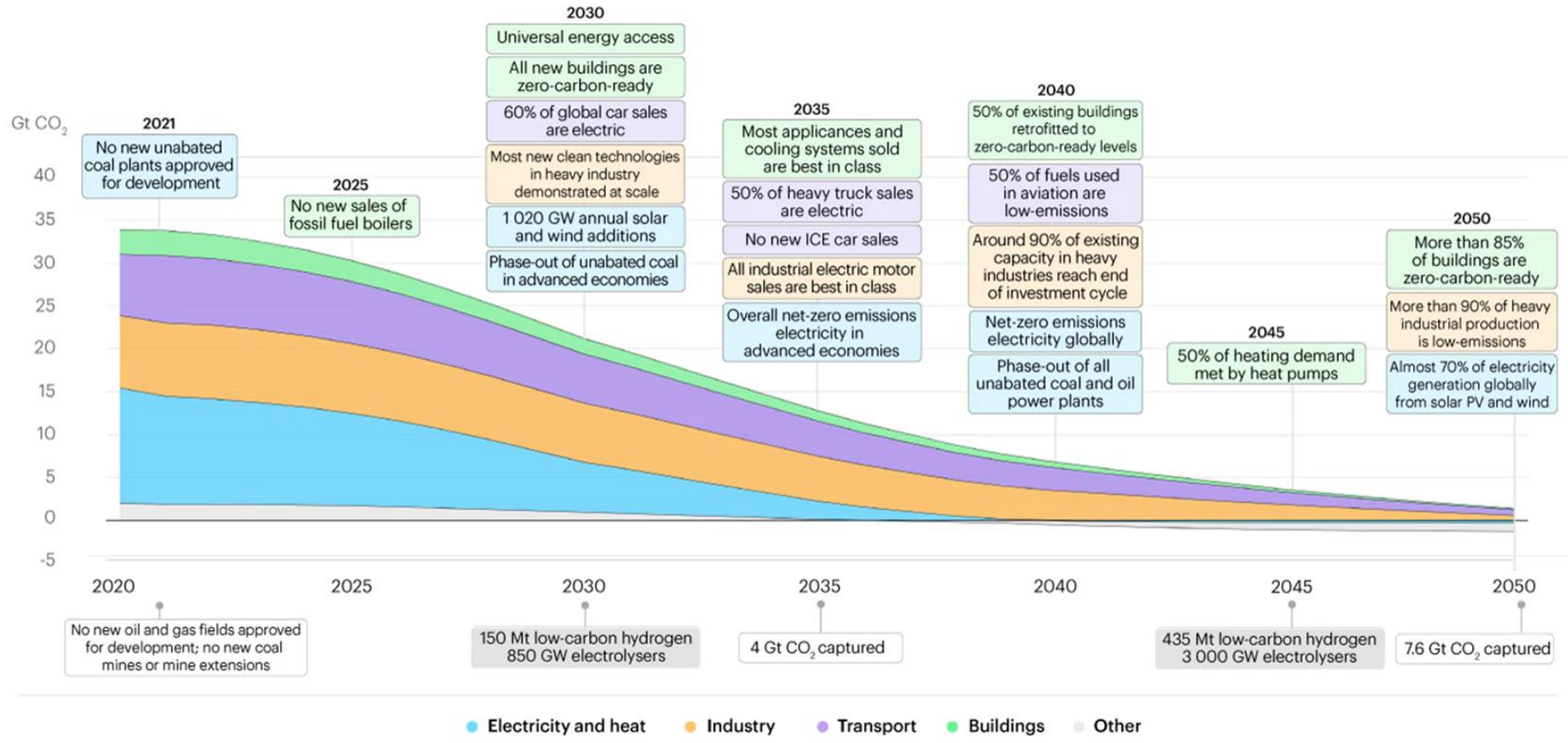
Over governance, reporting, and policy engagement

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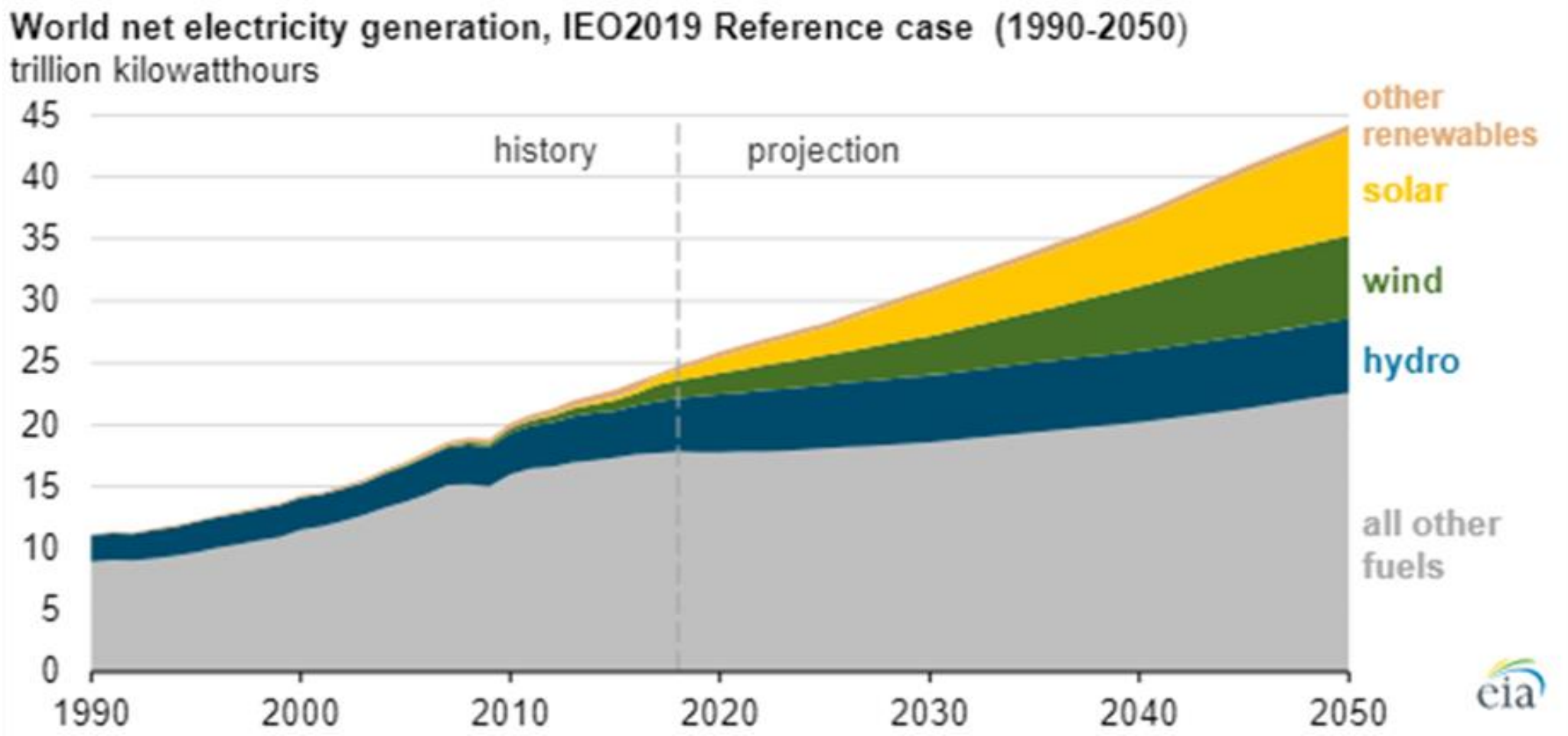
The growing momentum toward net zero

THIS CREATES A UNIQUE CHALLENGE



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A rapid increase in renewables online



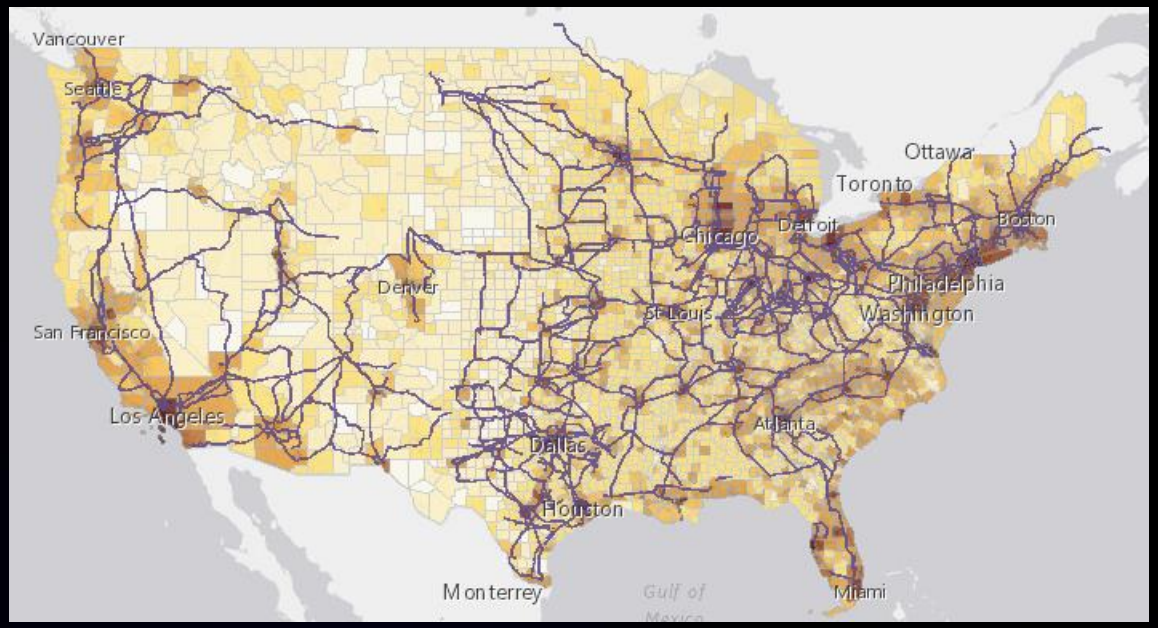
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Generation and consumption across the US

SOLAR AND WIND GENERATION PLANTS



POPULATION DENSITY AND THE CURRENT GRID



https://www.eia.gov/state/maps.php

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Enabling a more sustainable grid

From centralized assets



To decentralized assets

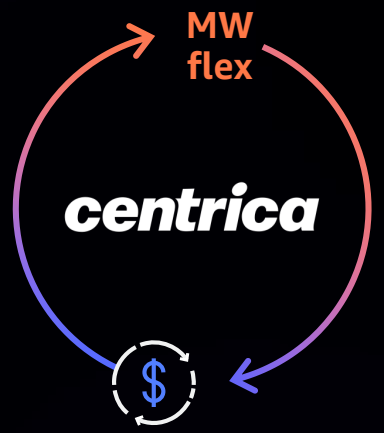


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Building and operating a virtual power plant

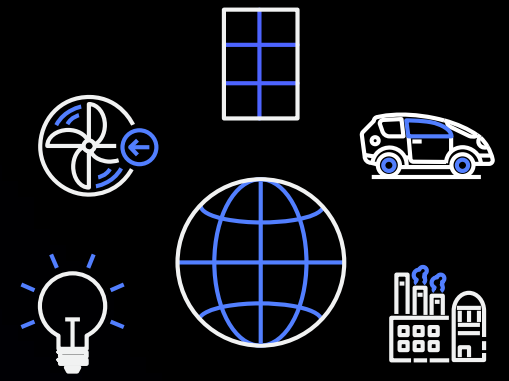
Value streams

- Ancillary market
- Capacity market
- Imbalance market
- Wholesale market



DERMS solution

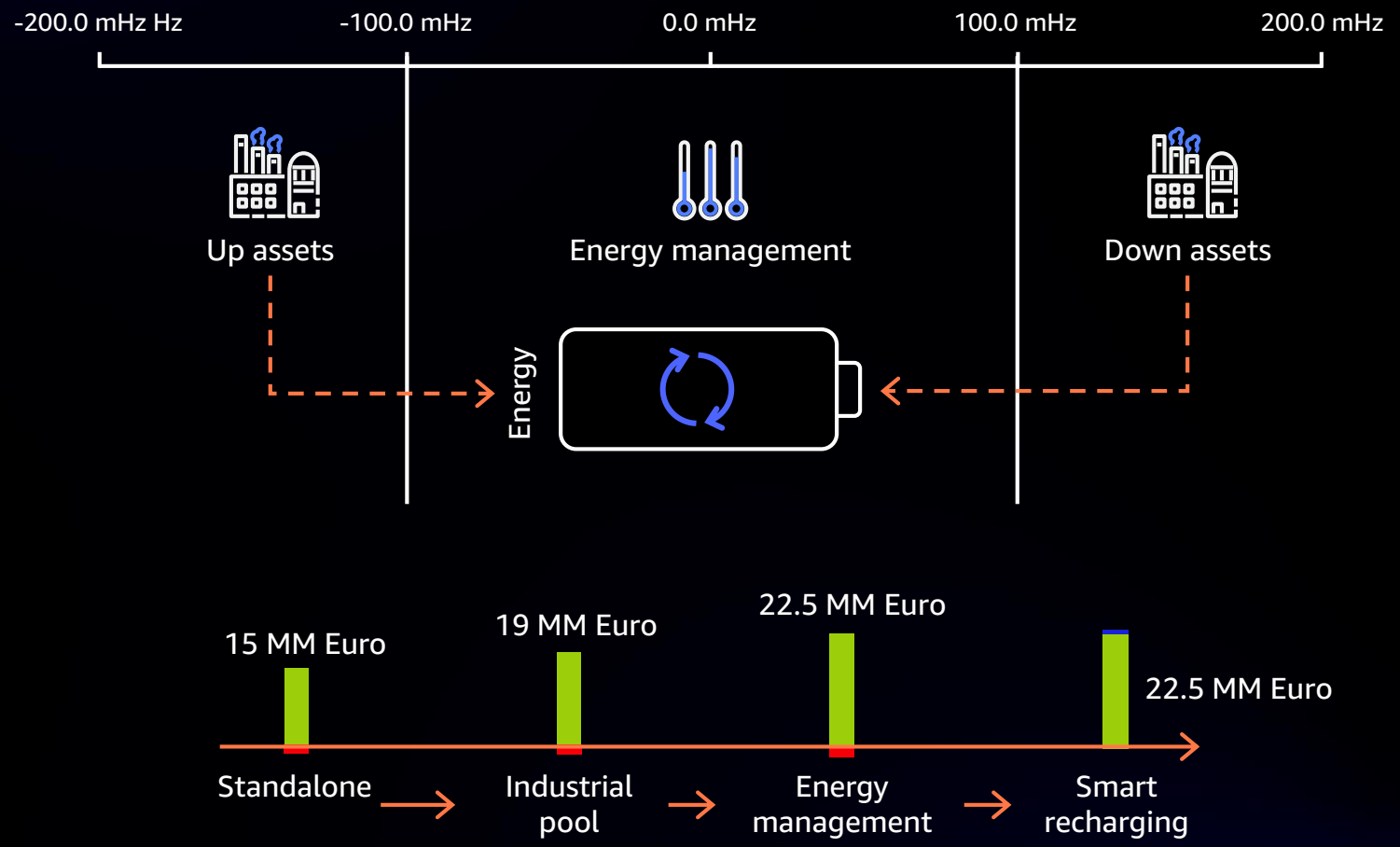
Distributed energy resources



Unlocking potential revenue

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Battery as cornerstone of project



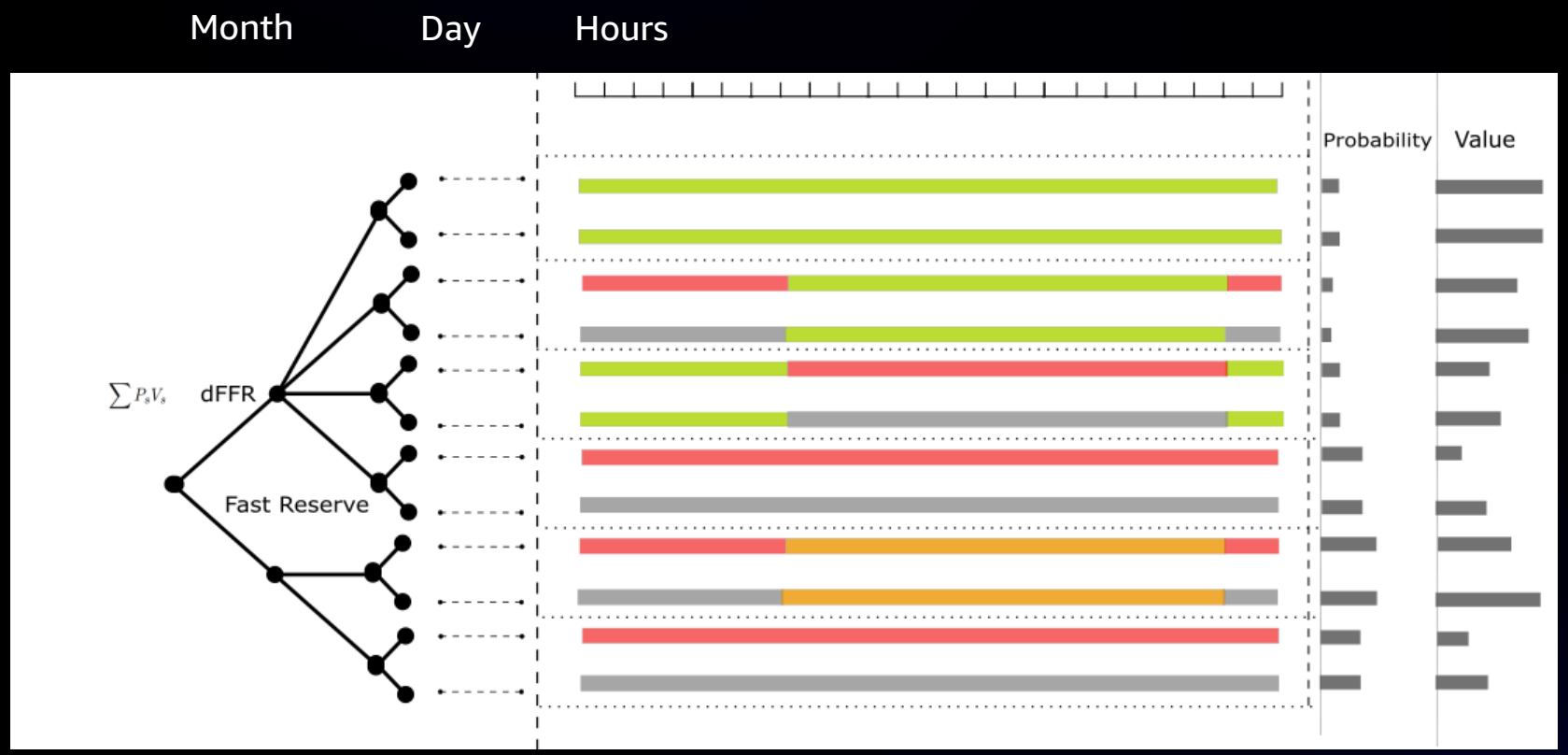
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Advanced multi-market trading strategies

Data-driven **optimized trading strategy** based on complex decision tree

Multi-market strategy is run on an hour-by-hour basis

Probability and value KPIs for each branch of the trading tree



Our **multi-market access** spans the following markets

- **Merchant play**
  - Spot market
  - Continuous intraday market
  - Imbalance market
  - Balancing mechanism
- **Ancillary services**
- **Local optimization**
  - Coincident peak
  - Demand charge management
  - Local incentives

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Maximizing battery operations

Centrica Technology brings >50% more value relative to standalone storage

- Trading algorithms: **>90%** of hindsight value
- Aggregation algorithms: **50%** more power available
- **30%** more cycles through warranty discussions
- **Negative energy cost** due to smart recharging
- Battery level aggregation supported as of summer 2019

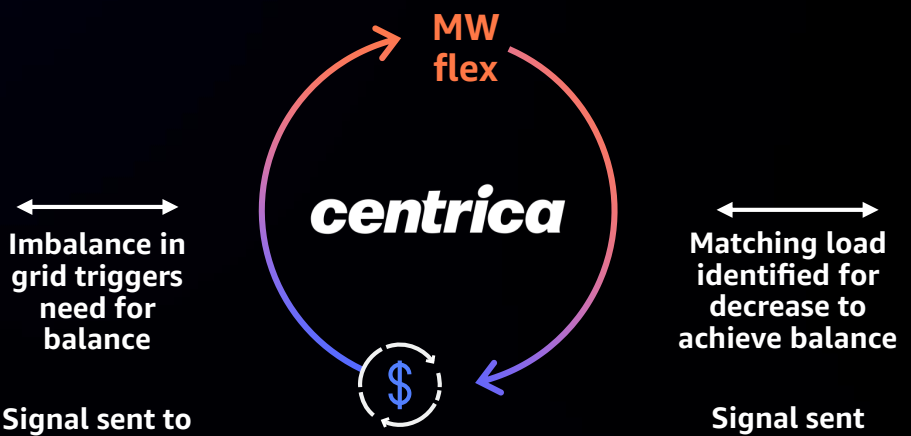


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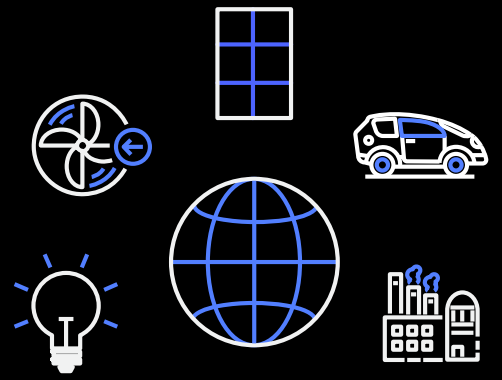
Centrica services powered by AWS

Value streams

- Ancillary market
- Capacity market
- Imbalance market
- Wholesale market



Distributed energy resources



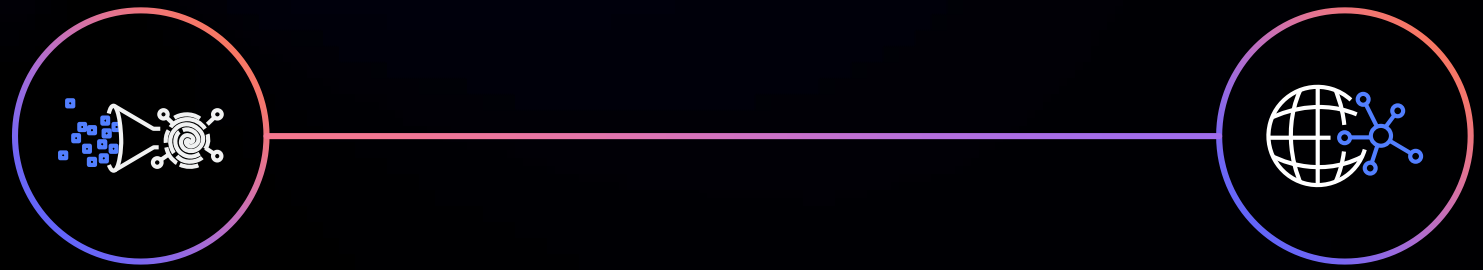
AWS services underpin AI, communication, and cloud computing

- Amazon Elastic Compute Cloud (Amazon EC2)
- Amazon Relational Database Service (Amazon RDS)
- Amazon Virtual Private Cloud (Amazon VPC)
- Amazon Route 53
- Amazon Simple Storage Service (Amazon S3)
- Amazon GuardDuty
- Amazon Simple Notification Service (Amazon SNS)
- Amazon ElastiCache
- Amazon CloudWatch

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A view of how the grid will continue to evolve



As more assets come online, more load goes into VPP

Automation has scale, and this enables transition from centralized power plants to distributed energy resources anywhere

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Thank you!



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