

NEW YEAR'S EVENT – SWISS FEDERAL OFFICE OF ENERGY, BERNE, JANUARY 5TH 2017

Don't Panic - The ABB Galaxy

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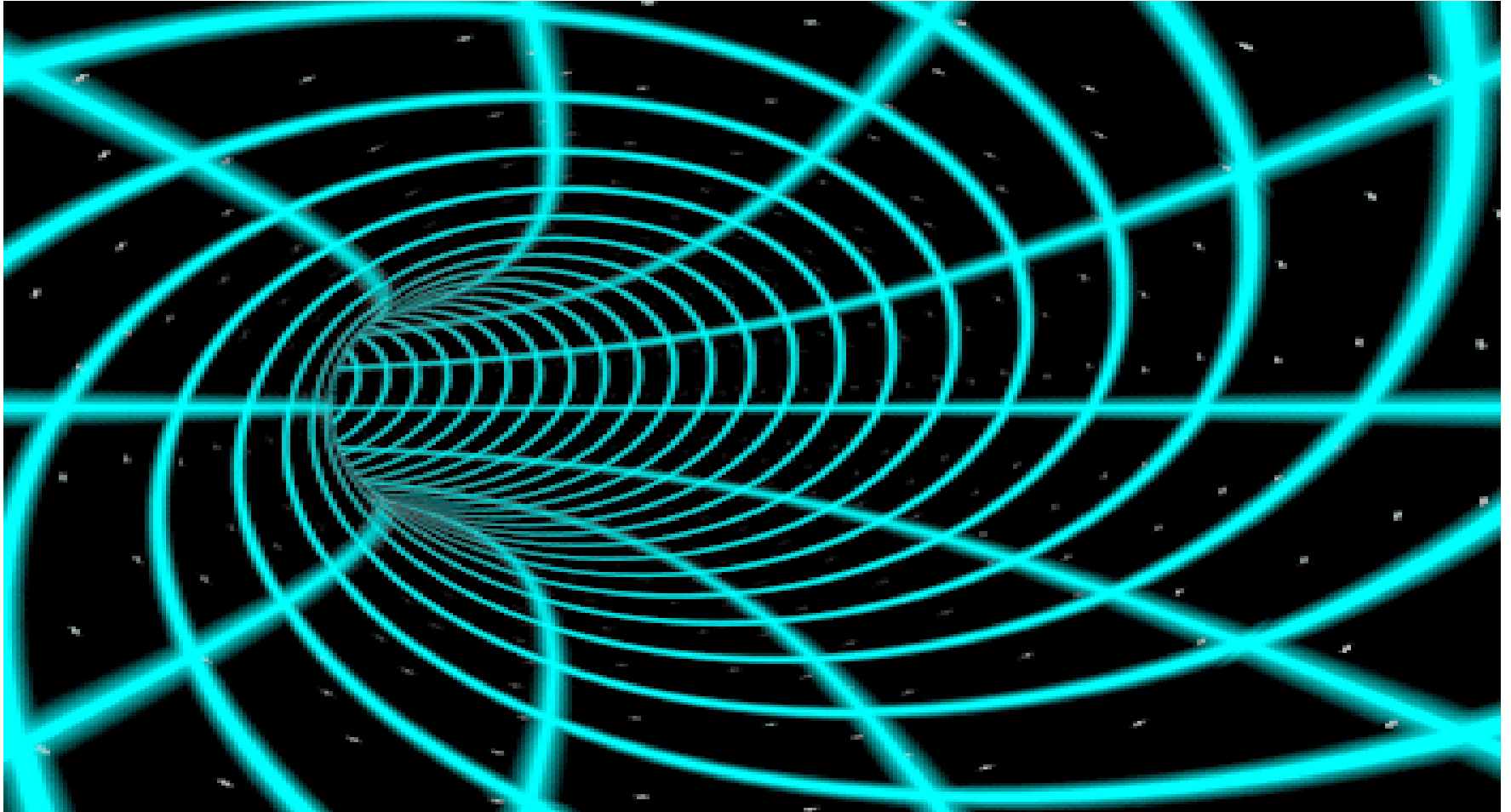
Important notices

This presentation includes several time warps and thus contains forward- and backward-looking information and statements including statements concerning your businesses in the future and in the past. These statements are based on current expectations, estimates and projections about the factors that may affect your future performance, including global economic conditions, and the economic conditions of the regions and industries that are major markets for you.

There are numerous risks and uncertainties, many of which are beyond your and my control, that could cause your actual results to differ materially from the information and statements made in this presentation and which could affect your and my ability to achieve any or all of your stated targets. The important factors that could cause such differences include, among others:

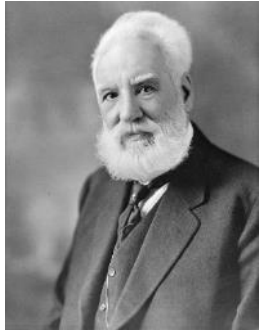
- Your readiness to embark with me on this time journey

Time Warp – We are in 1877



Alexander Graham Bell will not recognize his “baby”

Here's how the phone system has developed since ...

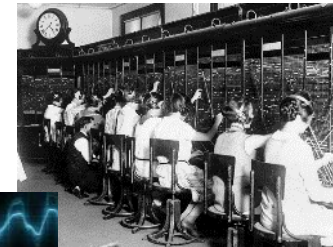
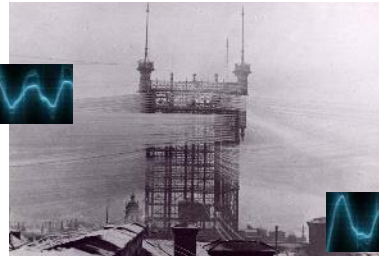


Device

Network

Operation

Past

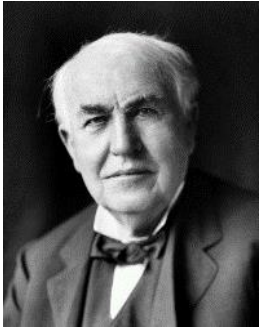


Present



Thomas Edison will feel “at home” with modern grids

Here’s how the power system has developed since ...



Generation

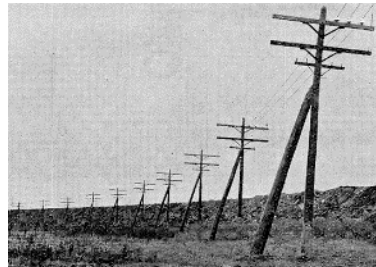
Past



Present



Power grids



Consumption



.. predictions have proven to be difficult....

"I believe in the horse. The automobile is only a temporary appearance."

1904 Emperor Wilhelm II (The last German Emperor)

"There is not the slightest indication that nuclear energy will ever be available."

1932 Albert Einstein (Physicist, Nobel laureate)

"Television has no future. It's just a strawfire."

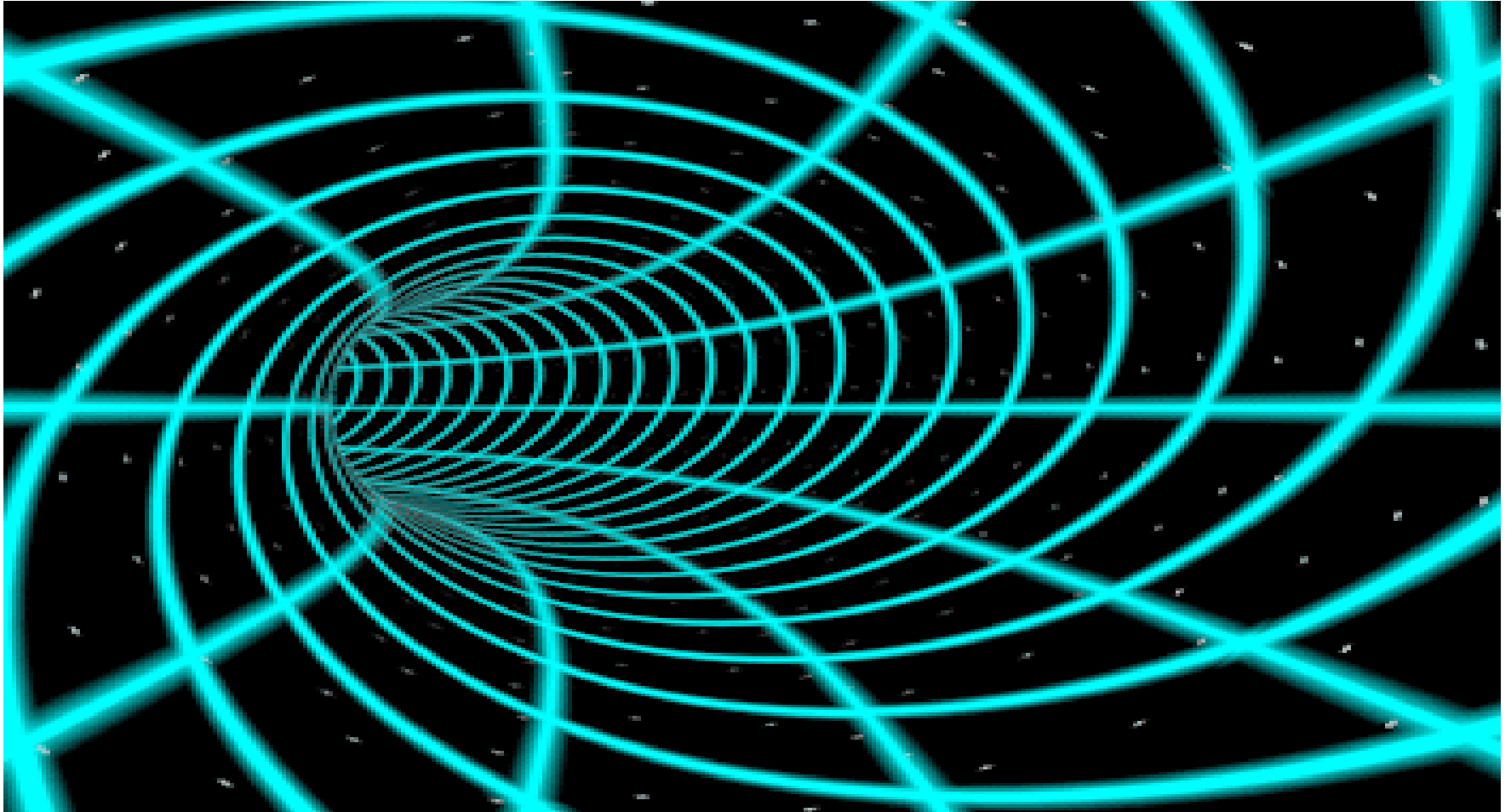
1941 Mary Sommerville (Head of BBC-Radio education program)

...but sometimes exceptional individuals get it right

"Why, sir, there is every probability that you will soon be able to tax it"

1850 Michael Faraday's purported reply to William Gladstone, (minister of finance), when asked of the practical value of electricity.

Time Warp – Welcome to 2042 – New Year's Event – BFE



A revolution in many markets...

Disrupt or be disrupted

World's largest taxi company owns no taxis



Largest accommodation provider owns no real estate



World's largest movie house owns no cinemas **NETFLIX**

But new ones emerged...

Largest grocery stores owns no supermarkets



Grocery2U

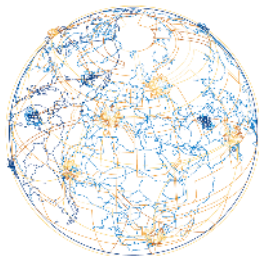
Largest healthcare company owns no hospitals



The energy $\langle r \rangle$evolution

Elements of the evolved grid

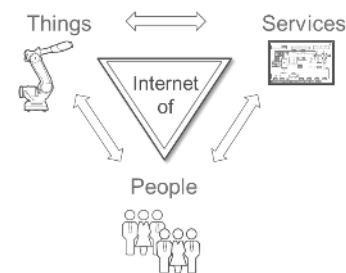
Grid interconnection



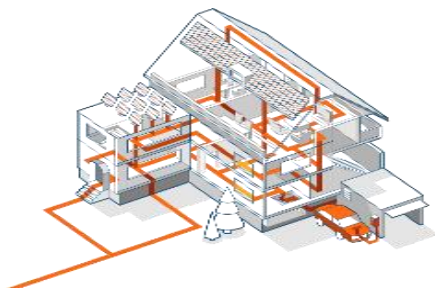
Power quality & demand mgmt.



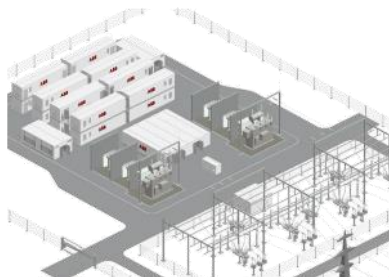
Digitalization



Residential roof top solar plus Micro- and Nano-grids



Energy storage

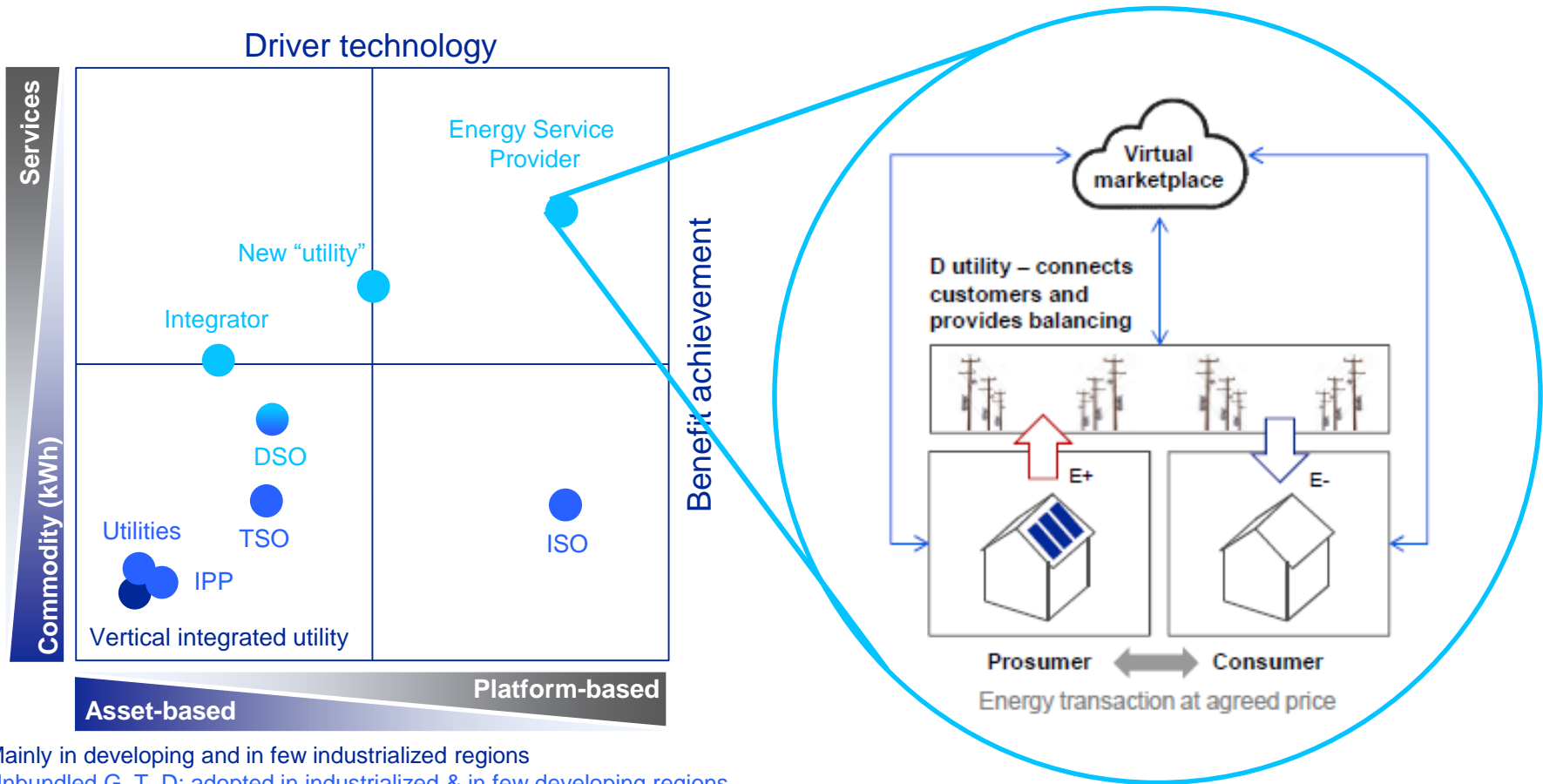


New business models



New business models emerged

Societal drivers and technological enablers



Mainly in developing and in few industrialized regions

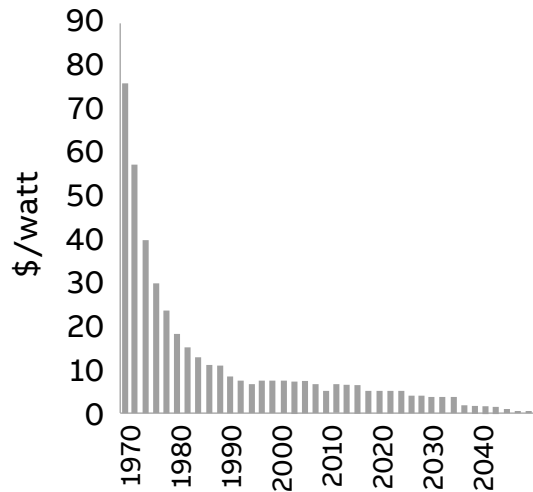
Unbundled G, T, D: adopted in industrialized & in few developing regions

Unbundled D: emerging in industrialized regions

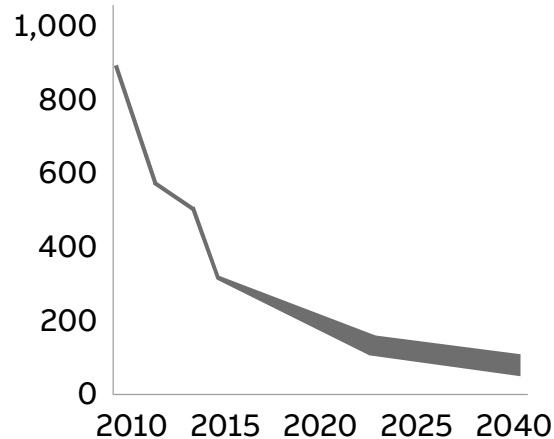
The energy <r>evolution

Disruptive developments drove key changes in our grids

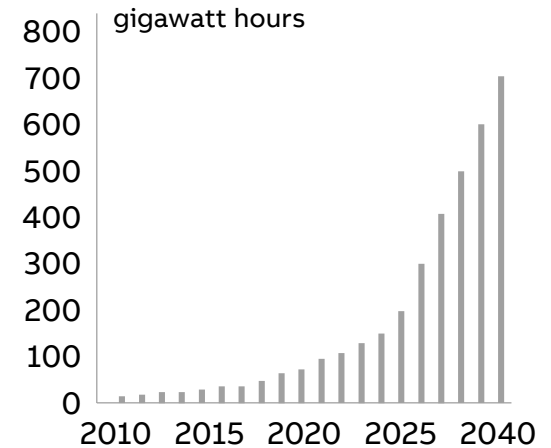
Price history of silicon PV cells



Cost for lithium-ion battery packs



Yearly demand for EV batt. power



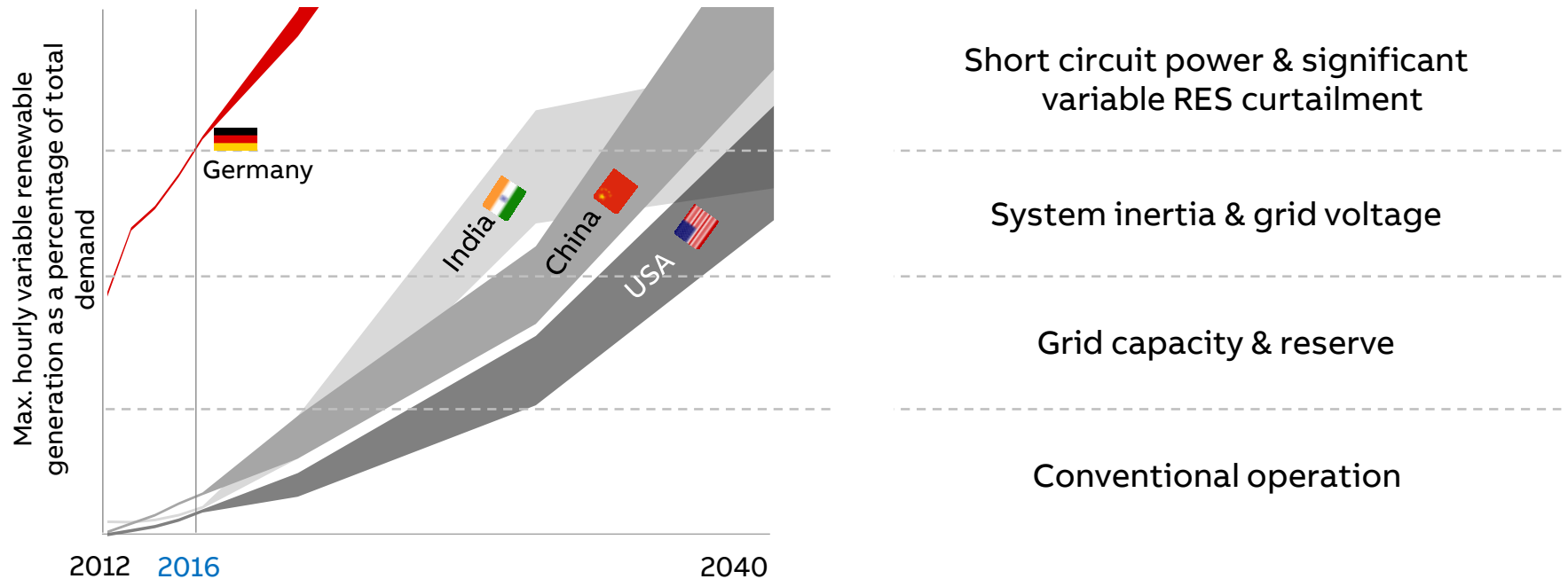
Batteries, photovoltaic, new business models... and nobody believed it...

- Dramatic cost reduction
- Scalability of technologies
- Consumer investment
- Marginal costs of electricity became zero

The energy revolution

An evolution in process but a revolution in impact

Technical challenges countries encountered

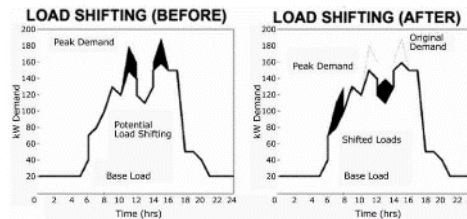


Grid investments and technologies were required to address challenges

Grid defectors and a global energy internet..

The evolved system accommodated them all!

Elon Musk

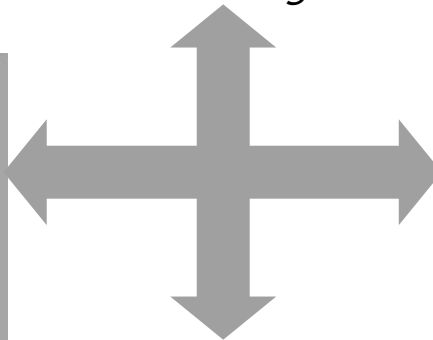


Demand management

State Grid – China



Grid defectors

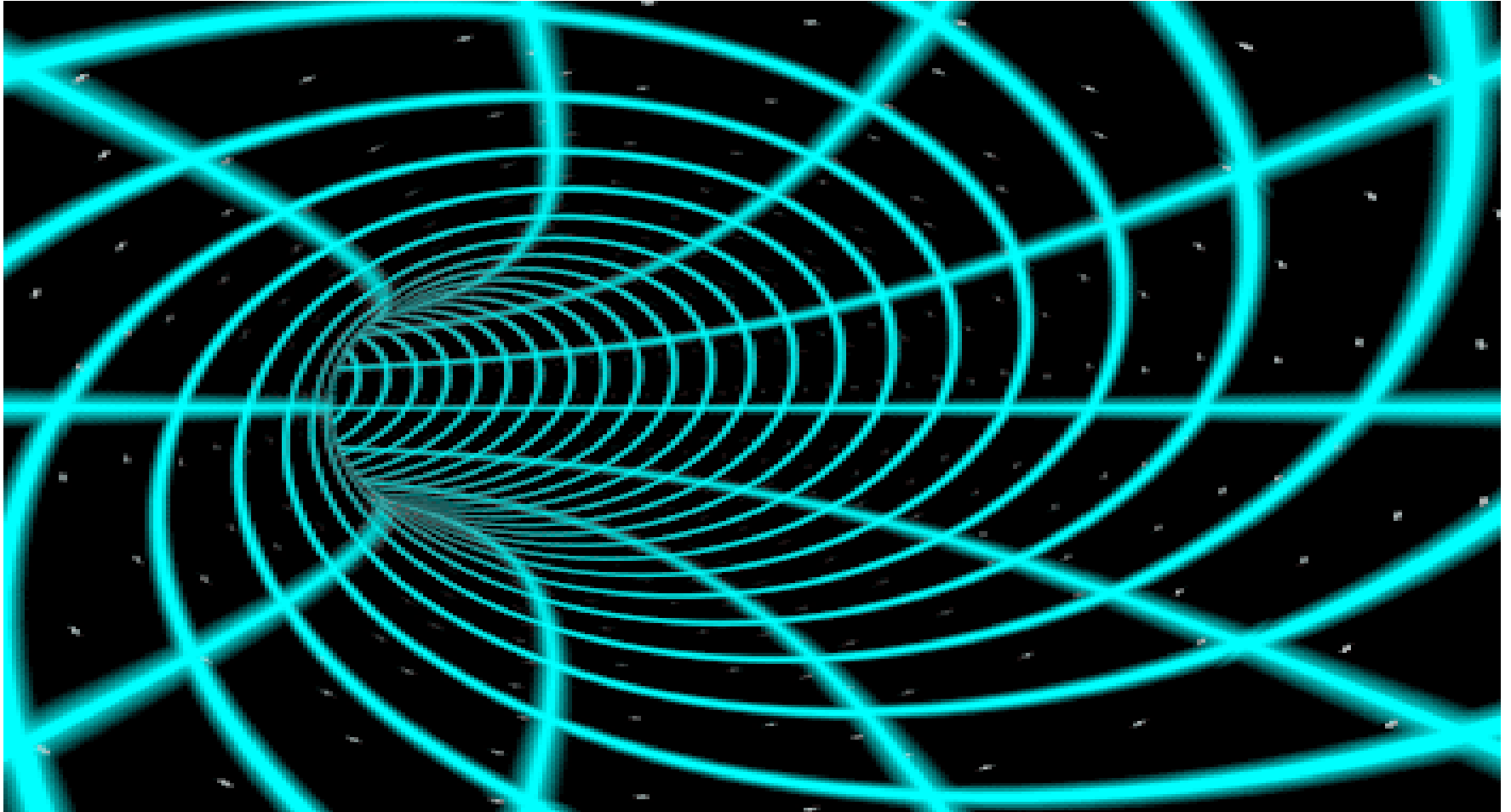


Bulk battery storage



Global energy internet

—
... hold on... back to 2017



The energy <r>evolution

.. The next 25 years....

Most of the technology is already here

Adoption by all market participants will be required

Very important role of the regulator

Don't Panic!

Lets write the future, together.

