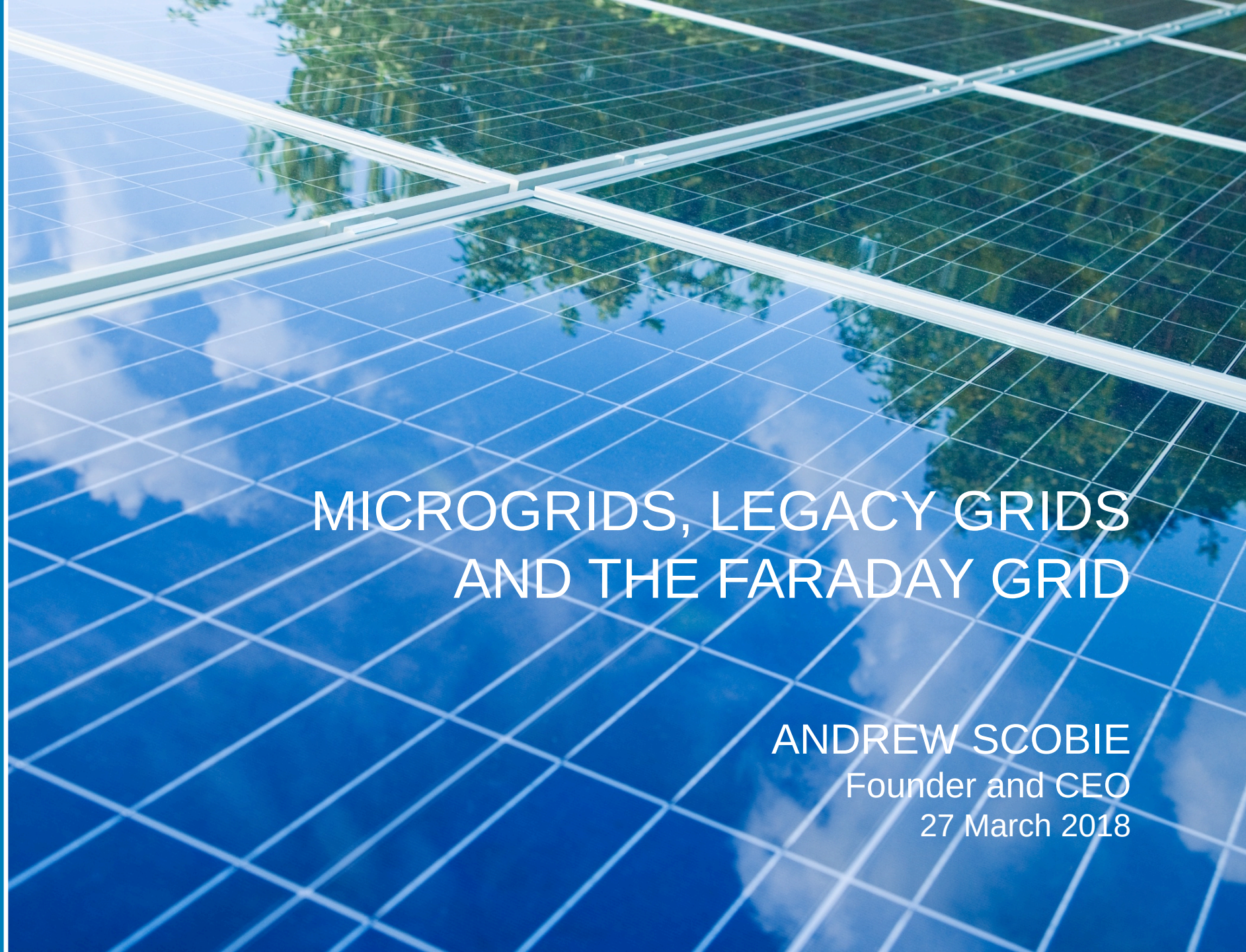
THE FARADAY GRID



# MICROGRIDS, LEGACY GRIDS AND THE FARADAY GRID

*Our electricity system reset, rebalanced…reimagined.*

ANDREW SCOBIE
Founder and CEO
27 March 2018

# The Traditional Value Proposition[1]

EFFICIENCY - Lower energy intensity and distribution system loss

RELIABILITY - Near 100 percent uptime for critical loads

SECURITY - Enable cyber security and physical security

QUALITY - Stable power to meet exacting consumer energy requirements

SUSTAINABILITY - Expand generation to renewables and cleaner fuel sources

1. Dohn, R. L. (2011). The business case for microgrids. *White Paper Siemens.*

# The Economics of Microgrids are Improving

The value proposition that microgrids offer has increased substantially with the growth of Distributed Energy Resources (DER) as the driving force.

Microgrid enabling technology (MET) market to reach $112 billion by 2026 driven by desire to aggregate DERs.[2]

The relative case for microgrids has been strengthened due to the poor performance of network scale grids:

- Spiralling end user costs for electricity
- Unpredictability and control of electricity of cost
- Lack of security and increased threat to cyber attack
- Network reliability has declined, resilience threatened by:
  - ✧ Extreme weather, earthquakes, wildfires
- Provision of undesirable fossil fuel electricity

Microgrids are seen as a portal for defecting from the traditional power grid.

> *The 3,200 U.S. utilities are facing what former NRG Energy Inc. CEO David Crane labels a **"mortal threat"** to the industry*[3]

2. Navigant Research (2018) *Microgrid Enabling Technologies Market Overview*
3. Utilitydive.com - *https://www.utilitydive.com/news/microgrids-are-mortal-threat-to-electric-utilities-monopoly/183369/*

# Microgrids and Legacy Grid: Threat or Opportunity?

The threat (and opportunity) to microgrid growth is the indisputable need to sustain the legacy grid.

The Chair of PG&E says microgrids should have *"to pay through some sort of charge"* [4]

The UK Regulator Ofgem is reviewing charging arrangements so that network companies can equitably recover costs.[5]

Sustaining a profitable and efficient grid network is beneficial to society and to microgrid developers and operators.

- ✓ Economic value of microgrids are maximised through interoperability and gains from trade.
- ✓ Microgrids need to be imagined as nodes in a wider system

4. RenewableEnergyWorld.com - *http://www.renewableenergyworld.com/news/2013/10/big-corporations-embracing-microgrids-a-threat-for-utilities.html*
5. Ofgem(2017) *Targeted Charging Review*

# The great challenge is to integrate microgrids efficiently using a common protocol

- Historically microgrids had been constructed with a single stakeholder in mind (military, universities, industrials)
  - with the rise of DERs and community microgrids the focus must change
- Efforts across the United States are focussed on microgrid services tariff structures to encourage the development and use of resilient microgrids [6]
- However the interoperability of distributed microgrids and utility grids remains illusive and costly. Current initiatives include:
  - ComEd's pioneering Bronzeville (Illinois) microgrid integration project cost >$25m for what is essentially a study of microgrid integration [7]
  - New York's *Reforming the Energy Vision* is handing out $50m in prize money for microgrid feasibility and design studies [6]

Microgrid integration question has barely been asked let alone answered
GTM Research says:

> [As for the larger issues of how to share infrastructure, energy and real-world responsibility between microgrids and utilities], "We haven't seen a lot of these questions being asked before…" [6]
>
> gtmresearch

6. GTM Resarch (2018) - https://www.greentechmedia.com/articles/read/illinois-decision-opens-the-path-to-shared-utility-customer-microgrids
7. ComEd (2018) - https://www.businesswire.com/news/home/20180228006367/en/ComEd-Approved-Build-Microgrid-Clusters-Nation

# Power flow device advancements can facilitate interoperability

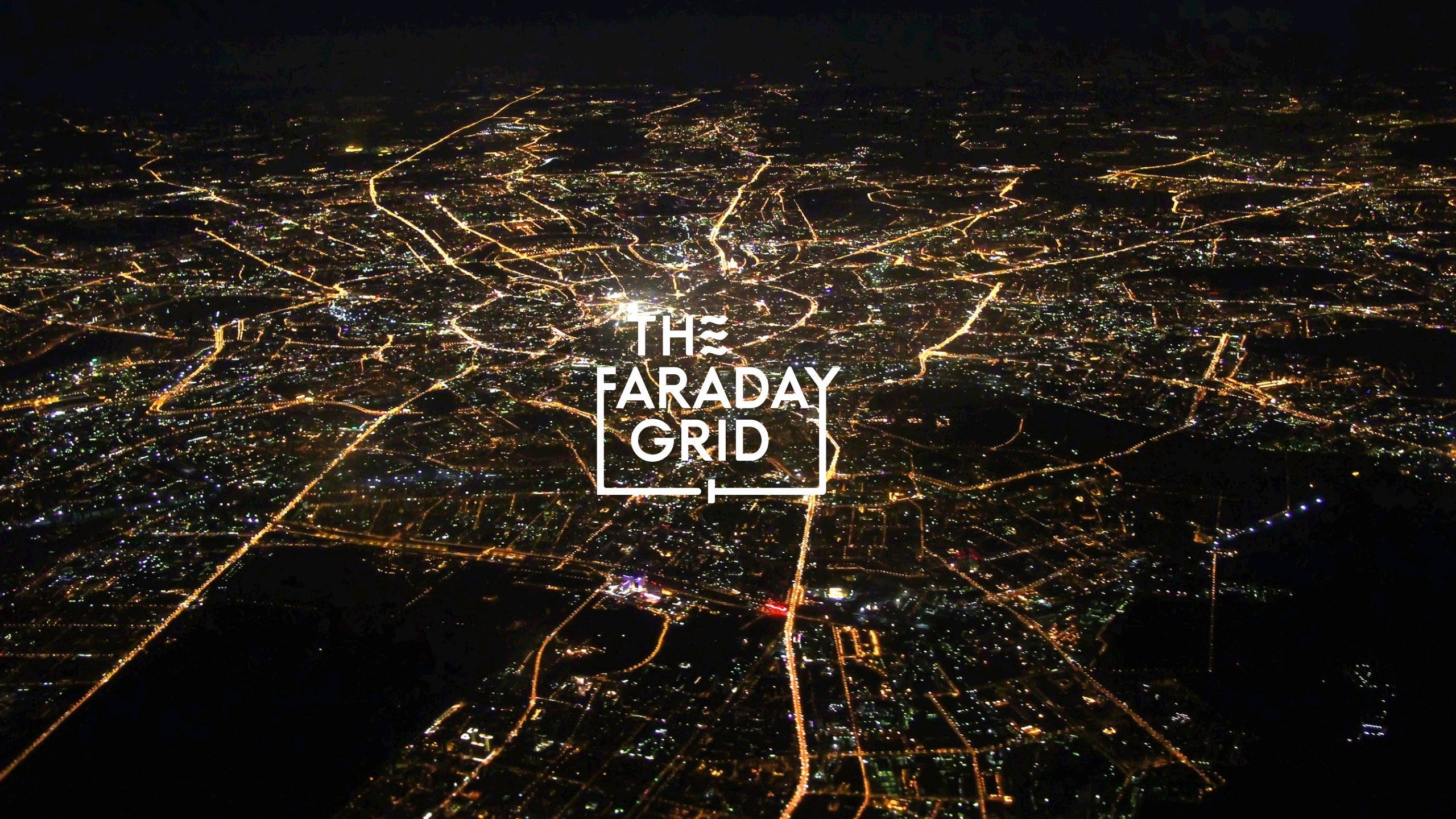
*Visual Output of a Faraday Exchanger device on 12 Dec 2017*

# Potential impact of an integrated and interoperable network of microgrids in New York State

High-fidelity modelling and simulation to illustrate impact on the New York state energy grid [8]

- Power quality enhancement worth $750 per household over the next five years
  - $12.4 billion per annum (value of removing all power quality problems in New York)
- Renewable Energy Hosting Capacity increased by 30% - 9.27 TWh [9]
- Removing 3million tons [10] of CO2 (583,000 cars off the road every year)
- Reduced network losses of 517.3 GWh → around 30% New York Coal generation

8. Input Data from U.S. Energy Information Administration (2018)
9. Assumes hosting capacity ~23%.
10. Based on Marginal Emission Factor of 0.316 kg CO2eq/kWh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