Upside Energy pays people to **NOT** use energy.

We’re building a cloud service that aggregates energy stored in millions of existing devices – uninterruptible power supplies, batteries attached to solar PV arrays, electric vehicles, domestic heating systems – and uses it to sell balancing services to the grid. The service requires no hardware upgrades or regulatory approval.

**We deliver value to all energy supply participants**

- Flexible balancing services
- Competitive pricing
- Low marginal cost

- Increased product value
- Enhanced usage data

- Service revenue streams
- Enhanced usage data
- Maintenance sales leads

- Attractive financial returns
- Remote battery monitoring
- Environmental credentials

- Grid operators
- Distribution Network Operators
- Energy Suppliers

- Manufacturers
- Value Add Resellers (VARs)
- Installers

- Battery Owners

**Our team**

- **Dr Graham Oakes.** Founder / CEO. Systems engineer and project governance expert with 30 years experience.

- **Mike Mathias.** Partnership Director. 30 years experience of successfully growing technology companies.

- **Lesley Allan.** Operations Director. 20 years in programme management in technology and creative sectors.

- **Devrim Celal.** CFO. 19 years of experience with blue chip consultancy and finance background.

- **Neil Hughes.** Advisor. Former Head of Technology at National Grid.

- Matt Fisher, Matt Potts, Andy Molineux (co-founders) and three further software engineers.

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£580k of grant funding from:

**Partnerships for advanced IP with:**

- Innovate UK
- Department of Energy & Climate Change
- University of Oxford
- University of Reading
- University of Manchester
- Queen Mary University of London
- Heriot Watt University

We are currently defining service provision with the National Grid

28/09/2015
Energy Regulators Say EPA's Climate Rule Poses Grid Challenges
Federal Energy Regulatory Commission Expresses Cost, Reliability Concerns

WASHINGTON—President Barack Obama's proposed rule to curb carbon emissions from the nation's power plants could raise costs and affect reliability in the U.S. electricity system, federal regulators told Congress.

But the commissioners of the Federal Energy Regulatory Commission, the government agency charged with overseeing the electric grid and other parts of the nation's energy infrastructure, also said at a House hearing that the government has a responsibility to reduce emissions.

FT View
The growing absurdity of German energy policy
Berlin increasingly needs dirty coal to make up for scrapping nuclear

At a time of mounting concern about climate change, governments are under pressure to introduce renewable sources of energy in order to cut greenhouse gas

National Grid warns of lower winter power capacity

Finance firms in Japan
Solar shambles
Japan has failed to learn from Germany's renewable-energy mess

EIGHTY miles north-west of Fukushima's hulking nuclear corpse, Yauemon Sato, a small businessman, has charged into the solar-power business. Mr Sato has rented land, hired a workforce and lined up ¥60m ($6.8m) in capital from local investors and banks. His company says it can produce electricity for about 700 households. But the local power utility is refusing to buy more than a quarter of it.

Japan set one of the world's highest tariffs for renewable energy in 2012, as part of a bid to live without atomic power following the Fukushima disaster. Electricity companies were ordered to pay ¥12 a kilowatt-hour (kWh) to producers such as Mr Sato. Thea price for solar

2010: £600m
Source: National Grid
2010: £600m
2020: £950m
Source: National Grid
2010: £600m
2020: £950m
Source: National Grid
USA
2010: $1.5b
2020: $2.5b
Source: Navigant Research

Global
$50b in 2025
Source: Transparency Market Research

2010: £600m
2020: £950m
Source: National Grid
Uninterruptible power supplies

6GWh

Computers, cellphone towers, traffic lights etc
Uninterruptible power supplies

6GWh

Computers, cellphone towers, traffic lights etc
We save

600 tonnes

of CO₂ p.a. per MW of capacity
Uninterruptible power supplies

6GWh

Computers, cellphone towers, traffic lights etc

SIEMENS
Domestic solar PV arrays
Domestic solar PV arrays

SHARP

0.5GWh
Data analytics

Demand management algorithms (Open Innovation)

Battery fleet management (Patent applied for)

Battery communications (Open Standards)

Upside Cloud

SIEMENS

SHARP

Cloud
Demand management algorithms (Open Innovation)

Battery fleet management (Patent applied for)

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VIRTUAL ENERGY STORE

Data analytics
VIRTUAL ENERGY STORE

Demand management algorithms
(Open Innovation)

Battery fleet management
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Battery communications
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Data analytics

nationalgrid

npower

SOUTHERN CALIFORNIA EDISON

PG&E

VIRTUAL ENERGY STORE

UPS\^DE

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SOUTHERN CALIFORNIA
EDISON

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UPSIDE

SIEMENS

UPSIDE

SHARP

UPSIDE

An EDISON INTERNATIONAL Company

UPSIDE
We are creating a **virtual energy store**

**Scalable, Secure and Resilient**

Cloud architecture designed to scale to millions of devices.

Patented fleet management algorithm designed to scale.

Software and infrastructure set up to support security requirements for ‘critical national infrastructure’, driven by ongoing DECC reviews.

Designing for distributed deployment across multiple high-availability data centres. Our target is zero loss of service even in face of complete data centre outage.

<table>
<thead>
<tr>
<th>UPSiDE ENERGY CUSTOMERS</th>
<th>UPSiDE CLOUD SERVICE</th>
<th>UPSiDE CAPACITY CUSTOMER (equipment owners)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UPSiDE</td>
<td>UPSiDE UPS</td>
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<tr>
<td></td>
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<td>UPSiDE PV</td>
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<tr>
<td></td>
<td></td>
<td>UPSiDE EV</td>
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<td>UPSiDE Heat Pumps</td>
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**Virtual Energy Store**

**Demand Management – Grid Monitoring and Prediction, Portfolio Management**

Algorithms predict grid state over next 1-24 hours and hence position our storage for maximum impact. Portfolio management algorithms allocate capacity to revenue streams so as to optimise economic and environmental returns. IP developed through unique open innovation model can be slotted into this layer as required. This also allows easy internationalisation – we slot in local algorithms as required.

**Device Fleet Management**

Upside’s fleet management algorithm (patent applied for) manages device fleets based on statistical properties. This allows extreme scalability (stateless architecture) while ensuring that load is distributed evenly across the devices, thus minimising impact on battery life.

**Device Communications**

Use open standards to maximise reach to different device types and manufacturers.
To deliver benefits to all stakeholders

Open Innovation Community

Develop advanced algorithms

Battery
Manufacturer and Reseller

Sells devices and services

Battery Owner

Offers device capacity

Upside Platform

Delivers Balancing Services

Energy Suppliers

Grid and Network Operators

Pays for Service

Upside Operating Company

<table>
<thead>
<tr>
<th></th>
<th>Upside gives...</th>
<th>Upside receives...</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Grid Operator, Energy suppliers</strong></td>
<td>Low cost, highly responsive and highly flexible balancing services</td>
<td>Balancing Services revenue £100k/MW p.a.</td>
</tr>
<tr>
<td><strong>Device Owner</strong></td>
<td>Revenue from existing devices</td>
<td>Energy storage capacity to integrate into the virtual energy store</td>
</tr>
<tr>
<td></td>
<td>Remote battery health monitoring</td>
<td></td>
</tr>
<tr>
<td><strong>Device Manufacturer and Reseller</strong></td>
<td>Increased sales &amp; service revenue Device monitoring data</td>
<td>Sales channel to get to device owners</td>
</tr>
<tr>
<td><strong>Research Community</strong></td>
<td>Device data to drive research projects Licence revenue from algorithms</td>
<td>Improved algorithms to optimise our device portfolio management</td>
</tr>
</tbody>
</table>
1) All owners get valuable monitoring data

- A unified and distributed view of the status of all their devices
- Battery health monitoring

“Remote monitoring is gaining popularity among end users”
Frost & Sullivan

2) Economic benefits can also be substantial

- 10,000 medium sized UPSs (3KVA)
- Geographically distributed base stations
- Annual revenue: £2.25million

*Domestic Storage PV Array*

- Domestic solar PV 2.5KW load
- Social landlord
- Revenue: £250 per unit
  3yrs paid in advance

*These benefits are delivered with no upfront costs for installation – we generate payback for the battery owner from day 1.*
Eliminating 5,000,000 tonnes of CO$_2$ p.a. by 2025
We focus on large numbers of small sites

- Demand response market is developing fast with a number of active players, both in Europe and the US.
- However, most players compete for STOR and target large commercial and industrial sites. Their processes are capital intensive & labour driven.
- Upside’s cloud-based service, partnering with equipment manufacturers, is scalable and requires relatively lower CAPEX. That’s how we can address the larger volume-driven market.
- We are a software-development specialist. We’ve developed a software-only solution: we can retrofit without hardware upgrade or site visit.
- Our service operates behind-the-meter and hence avoids need for heavyweight regulatory approvals. Thus we can move rapidly.
- The only other major player focusing on the same target audience is Nest, a recent Google acquisition for $3.2bn. However, Nest focuses on energy efficiency, not demand response.
- Nest is a large competitor, however our partnerships with manufacturers such as Sharp and Siemens give us strong competitive positioning. We help existing manufacturers protect and grow their markets, while Nest will try to take market share from them.
We differentiate ourselves through:

**Scalability**
- Unique algorithms (UK patent applied for. PCT application in preparation) manage battery life while scaling to millions of devices. Cloud service has been architected from the ground up to deliver this scalability.
- Large installed base of storage available to us. e.g. 6GWh of batteries in existing UK UPS.

**Device Portfolio Characteristics**
- Domestic and small business demand delivers capacity when the grid most needs it
- Portfolio of many, small devices is inherently more flexible than demand response from few, large C&I sites
- Zero marginal cost (as we simply time-shift existing energy use), so compelling cost advantage c.f. generation

**Capacity Recruitment Model**
- We create significant benefits for manufacturers and resellers to sell our service (increased sales; on-going service revenues), giving us a large, existing channel with good links to target equipment owners
- We can recruit significant capacity (100MW+) from a small number of organisations with many small sites (mobile telcos, transport authorities, retail chains – currently talking to Telefonica, Transport for London, …)
- Currently working with manufacturers such as Siemens, Sharp and Riello UPS

**Ability to Stack Multiple Revenue Streams onto each Unit of Energy Storage**
- Multiple potential revenue streams from Grid Operators, Distribution Network Operators & Energy Suppliers
- Effective portfolio management of these streams makes storage economic, even at current battery prices
- Virtuous circle: the more batteries we recruit, the better our portfolio management becomes
- R&D partnerships with Universities of Manchester, Oxford, Heriot Watt, Queen Mary University London to extend our portfolio management through unique open innovation model
We are developing a portfolio of Intellectual Property

The ‘Intelligence in the Cloud’
We provide the ‘intelligence in the cloud’ that enables people to maximise their return on selling their demand-side flexibility to the grid. To do this, we operate three layers of algorithms:

1) **Grid Monitoring and Prediction.** We predict supply & demand on the grid, so we can position our fleet to exploit emerging opportunities.

2) **Demand Response Portfolio Management.** We shape our fleet’s response to flexibly deliver the highest value suite of services.

3) **Device Fleet Management.** We allocate the response to individual devices in a way that minimises impact on battery life.

One algorithm to rule them all
Our patent application (GB 1420198.2) covers layer 3. This layer mediates between the device fleet and algorithms in layers 1 and 2, meaning that algorithm developers in those layers cannot exploit their algorithms without using our IP.

This lets us build a highly leveraged model to extend the IP in our service: we open up layers 1 and 2 to open innovation.

We are developing further IP in layer 3 to reinforce this lock in. Seed funding will let us protect this IP and extend its coverage globally.

A unique open innovation model
We open up our data and platform to researchers to develop new algorithms in layers 1 & 2. In return, they give us first option to exclusively license the algorithms that emerge. This gives us a highly leveraged model to develop a growing portfolio of IP.

This model has proven highly attractive to universities such as Oxford, Manchester, Reading, Heriot Watt and Queen Mary University London.

“I don’t know anyone who’s doing this. It’s exciting.”
University of Reading
**Nesta – Prototype**
- Finalist in Dynamic Demand Challenge
- Won entry to EU Climate KIC

**Innovate UK – Small Scale Pilot**
- Awarded £470k of grant funding
- Build and pilot cloud service for range of devices (UPS, EV, PV), 300KW total load

**DECC – Advanced Algorithm Platform**
- Awarded £300k of grant funding
- Open innovation platform for algorithms

**National Grid – 2MW Pilot**
- Define service terms of commercial service in 2016
Our history

**Nesta** – Prototype
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Generating interest from many organisations

Utility Week
7 Aug 2015

Game changer
/Technology/Innovation

An Upside for everyone
A UK start-up wants to shake up the global demand response market by unleashing the potential of uninterruptible power supplies. Jane Gray reports.

“It’s attractive that you deliver payback from day 1, with no need for upfront investment.”
Datacentre manager, large financial services firm

“I see a lot of start-ups. This one makes sense.”
Senior Manager, Market Development & Innovation, Elexon

“You guys have found a way to make it work.”
Energy Innovation Centre

“It’s a nifty idea – it combines a way to help the whole country balance its load, with a scheme that actually pays money to subscribers.”
Green Datacentre News

Sites for small scale pilot

In discussion for large scale pilot