

## ECOTRICITY: AN OPTIMAL INVESTMENT DECISION FOR ELECTRIC HIGHWAY EXPANSION<sup>1</sup>

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As part of its ambitious plan of building an “electric highway,” Ecotricity Group Ltd. (Ecotricity), a prominent supplier of electricity, built a network of free rapid-charging stations along major highways. The stations were on both sides of the roads at charging points owned by the company.<sup>2</sup> As of July 2016, the company had 300 rapid chargers throughout the United Kingdom.<sup>3</sup> Ecotricity wanted to expand this network, so needed a strategy for installing new chargers in different segments of the road network in the United Kingdom.<sup>4</sup> To meet the challenges for further growth, how should the company address the demand for chargers in different segments of the network?<sup>5</sup> Could Ecotricity succeed in the long term with an optimal investment decision for electric highway expansion?

### ECOTRICITY

Ecotricity was founded by Dale Vince in 1995 as a social enterprise to fight climate change through electricity. Vince grew up in Norfolk, England, and lived as a “new-age traveller” in the 1990s in an ex-military vehicle powered by a small windmill.<sup>6</sup> He started Ecotricity in 1995 as a means of getting a fair price for wind power. From its first windmill, established at Lynch Knoll in 1996, not far from the M5 highway, Ecotricity had grown by February 2016 to a customer base of 176,607 homes, with installed capacity of 70.7 megawatts. The company’s annual revenue in fiscal year (FY) 2014–15 was £109.8 million.<sup>7</sup>

The company had received many awards, such as the Eurostar Ashden Award for Sustainable Travel (2014) and the P.E.A. (People. Environment. Achievement.) Travel Award for Ecotricity’s electric highway.<sup>8</sup> In 2004, Vince was named by Queen Elizabeth II as an Officer of the Most Excellent Order of the British Empire (OBE) for “services to the environment and electricity industry.”<sup>9</sup>

In 2010, Ecotricity ventured into green gas—fuel made from renewable resources—making Ecotricity a full-fledged energy company. The company’s mission was to make “green electricity . . . from the wind, the sun and the sea, and green gas . . . from organic material and, soon, grass.”<sup>10</sup> Ecotricity generated electricity using 86.5 per cent renewable sources (FY 2013–14) when the national average was just 16.7 per cent. In 2014, it introduced 100 per cent green electricity.<sup>11</sup>

The company used what it called “ecobonds” to raise capital: investment strategies that allowed customers and the wider public to participate in the financial benefits of Ecotricity’s efforts.<sup>12</sup> In the third issue of ecobonds, released in December 2015, Ecotricity raised £18.5 million in capital for six new renewable energy projects to power 10,000 homes each year.<sup>13</sup> The bond offered investors 5.5 per cent interest per annum and an additional 0.5 per cent to Ecotricity customers.<sup>14</sup> Ecotricity also used its customers’ energy bills to fund new sources of green energy. The company referred to this process of reinvesting profits into renewable energy projects (instead of issuing dividends) as “turning ‘Bills into Mills’”—a reference to converting energy bills into energy-producing windmills).<sup>15</sup>

Ecotricity’s mission was to “change the way electricity is made and used in Britain” with “three principal attractions: the greenest energy, the best customer service, and an ethical pricing policy”—an effort that earned the company praise and loyalty.<sup>16</sup> In a survey conducted by Which? Switch, an energy supplier switching service, Ecotricity was rated as the best energy company with a score of 84 per cent and the lowest number of complaints (0.84 per 1,000 customers), trouncing all the major players in the energy market, who received an average of 16.31 complaints per 1,000 customers.<sup>17</sup> Molly Scott Gato (an Ecotricity customer) proudly reported, “You do feel better when you know that it is not polluting the environment every time you are using an electrical appliance.”<sup>18</sup>

## GREEN BRITAIN: DALE VINCE’S VISION FOR 2030

Vince had a vision of a “Green Britain” by 2030. He maintained that, “Britain can be self-powered using renewable energy . . . and basically [can be] a country powered fully by renewable energy.”<sup>19</sup> According to Vince, his initiatives were not motivated merely by climate change but also by the wish to create jobs, transport, and energy supply in a sustainable manner, and to move away from conventional resources such as coal plants.<sup>20</sup>

Vince believed that “half of the vehicles on the road in Britain will be electric. Every new car sale by [2030] will be electric. [Britain] will be saving £8 billion a year in avoiding burning petrol and diesel, and our health system will be better off by £1.25 billion due to cleaner air and breathing-related health problems.” These estimates were based on a modelling study Ecotricity commissioned from Cambridge Econometrics.<sup>21</sup> If Vince’s vision was realized, there would be a significant increase in the number of electric vehicles (EVs) and in the demand for battery charging. A rapid expansion in the charging-point infrastructure was needed to meet this projected growth of EVs.

## ELECTRIC VEHICLES AND CHARGING POINTS

In 2014, Ecotricity launched its electric highway, a network of battery-charging points, initially accessed for free by registered users. Customers registered on Ecotricity’s website to receive a swipe card that they could use at the free charging points on the network. Simon Crowfoot, the managing director of the electric highway project, described the self-regulating nature of the electric highway:

Ecotricity’s electric highway is an open nationwide network, currently free to join, free to use and powered by renewable energy. We encourage our registered customers to behave respectfully to other users and to abide by our terms and conditions of use. We also publish and distribute a “good etiquette guide” to encourage users to behave fairly. It is in the interests of all drivers to respect this code as we all transition to lower emissions travel.<sup>22</sup>

On average, the electric highway network delivered 5 million miles (8 million kilometres) of emission-free clean electricity for EV customers.<sup>23</sup> Rapid chargers (Type A) were installed by the company in diverse locations, such as in public parking lots at IKEA Coventry, Birmingham Airport, and the Welcome Break station on the M3.<sup>24</sup> The company had also already begun to expand its highway network by installing charging points along highways (A-roads) and in airports and ports, subject to the available power supply capacity.<sup>25</sup> Still, there were insufficient charging points. John Chivers, an Ecotricity charging-point user, pointed to the shortage of rapid chargers and recommended that Ecotricity impose charging-time restrictions, such as 40–50 minutes.<sup>26</sup>

## Electric Vehicle Chargers

There were three broad classifications of EV charging devices, categorized by how long it took to fully recharge the batteries. Slow chargers took 6–8 hours; fast chargers, 3–4 hours for a complete recharge; and rapid chargers typically took 30 minutes for an 80 per cent recharge.<sup>27</sup> The time for charging also depended on the vehicle being charged. The research project My Electric Avenue, which monitored EV usage and charging behaviours, found that 75 per cent of EVs were charged only once a day and that 65 per cent were charged to a full battery.<sup>28</sup>

Each rapid and fast charger could have multiple connectors, allowing more than one car to simultaneously charge. Among the 10,356 connectors available in February 2016, rapid-charging points offered by the various service providers accounted for 1,904 connectors in 866 devices across 651 locations. Ecotricity wanted to grow its highway network by installing more of these rapid chargers.<sup>29</sup>

Zap-Map was a widely used tool for locating charging points in a network. It was designed as a guide on several aspects of ownership for EV buyers. For example, Zap-Map recommended a driving range of 80–100 miles (130–160 kilometres) per day for EV cars, making these vehicles particularly suitable for short commutes.<sup>30</sup> The mileage that could be obtained also depended on the EV model, road congestion, road conditions, and climate. Open Charge Map and PlugShare were two crowd-sourced initiatives that also provided information about charging-point locations. The U.K. user base for these initiatives was growing.

The government's Electric Vehicle Homecharge Scheme provided EV purchasers with a subsidy of 75 per cent of the total capital cost of installing a home chargepoint, up to a maximum of £500 including taxes.<sup>31</sup> The typical cost of a home slow charger was about £1,000 per unit. There were various models available on the market, such as WallPod: EV HomeCharge by Rolec Services Ltd., Chargemaster plc's Homecharge, Pod Point's 3 kilowatt (kW) and 7 kW models, and the GE WattStation, taken over by Chargemaster.<sup>32</sup>

Depending on the EV model, a user could buy a suitable connector or adaptor that would allow an EV to be charged at various charging points. Some private owners registered their home- or office-based chargers with charging-point information providers such as PlugShare or Zap-Map to allow others to use their charging points. Unlike public chargers (Type A), access to private charging points (Type B) was limited by the adaptor points, the availability of parking and waiting space, the distance from the motorway, and the owner's willingness to share access.

Often, a utility company such as Ecotricity, or an EV manufacturer such as Tesla, sponsored and installed rapid AC/DC charging points in customer residences that had appropriate access and parking space. The company made these charging points available to other customers as a method of expanding their network, which could be an advantageous situation for owners because they could charge their EVs in 30 minutes

instead of 6–8 hours, as required with slow chargers (see Exhibit 1 for a comparison of various EV charging products and their features and costs.).

Britain had two classes of public charging systems: national and regional. Based on analyses conducted by Zap-Map, the distribution of chargers in U.K. regions was as follows: London (19.4 per cent), South East (15.4 per cent), Scotland (15.2 per cent), South West (9.2 per cent), and all other regions (40.8 per cent).<sup>33</sup> The highways that Ecotricity wanted to address were the M4, M5, and M40, in South East and South West regions.

In February 2016, the total number of charging points provided by all suppliers was 10,356 connectors, available through 5,679 devices, spread across 3,882 public locations in the United Kingdom. This survey excluded charging points at home and work.<sup>34</sup> In March 2015, the number of public charging points in the United Kingdom had been 7,208 points across 2,926 locations; thus, in just under a year, the number of connections had increased 44 per cent and the number of locations had increased 33 per cent.

### Volume and Growth Projections of Electric Vehicles

According to Vince, based on a study conducted by his company, it would be cheaper to run an electric vehicle than a petrol vehicle in 2030, and running an EV would result in savings of about £1,000 a year.

Next Green Car Ltd., a website that educated EV buyers, reported that as of January 2016, about 48,000 and plug-in cars and 2,900 plug-in vans were registered in the United Kingdom, across 38 models plus individual variants.<sup>35</sup> In 2015, the monthly average rate of EV registration as a percentage of registered vehicles grew by 1–1.7 per cent—a monthly average of 2,309 new registrations (see Exhibit 2).

The estimated vehicle traffic in 2040 was expected to grow by 29–60 per cent, depending on the scenario.<sup>36</sup> Ecotricity estimated the number of EVs in the United Kingdom in 2030 would be 5 million.<sup>37</sup> One per cent of current highway traffic was EVs.<sup>38</sup> Ecotricity's expansions strategy could assume that the traffic flow in 2030 would be all electric and five times the current EV traffic in each highway segment.

### COMPETITORS

Companies such as Chargemaster, Charge Your Car Limited, and Tesla, Inc. were some of Ecotricity's key competitors in providing charging-point services. But Ecotricity's business model was unique. In an interview, Vince explained:

We have been able to spread parts of our message; some of the things we have done have been adopted by other energy companies. Fundamentally, we are a different “beast.” We exist for a mission. The money we make, we put back into our mission. Other energy companies exist for the shareholders, and that is the fundamental reason why nobody has gone down this path.<sup>39</sup>

Although no competitor had a similar business model, several new players offered charging-point networks across the United Kingdom. The open charging systems were a blend of moderate-, quick-, and fast-charging points. Source London, ChargePlace Scotland, Plugged-in Midlands (PiM), and ecar Northern Ireland were some of the large regional systems.<sup>40</sup> Among national charging-network providers, the main players were Charge Your Car, Ecotricity, Pod Point, and Chargemaster's POLAR. Tesla's supercharger system was an innovative and quick-charging method for Tesla customers. These charging systems were installed in places such as hotels and restaurants, and were referred to as “destination charging.”<sup>41</sup>

In 2014, Ecotricity alleged that Tesla abused certain non-exposure agreements in its joint network development.<sup>42</sup> Tesla countersued, claiming that Ecotricity was trying to build an imposing business model that stopped Tesla from expanding its supercharger system. Tesla, which continued developing superchargers for its Model S, affirmed that the dispute with Ecotricity was over. Tesla spokesman Ricardo Reyes declared that, “Ecotricity and Tesla [had] reached an out-of-court settlement, the terms of which were confidential.”<sup>43</sup>

Choosing how many chargers to install in different regions of the United Kingdom was an important consideration for Ecotricity’s success in expanding its electric highway service. One of Ecotricity’s competitors, Chargemaster, was the administrator of PiM’s charging-point system, which had been run by Cenex since the plan was set in 2010.<sup>44</sup> Each of the 870 PiM charging points were to be added to Chargemaster’s POLAR charging system, discoverable by means of a smartphone application. Chargemaster planned to add another 100 units to this system. In 2015, David Martell, chief executive officer of Chargemaster, stated, “We will be investing in many new charge points and back-end server technologies. We will also be working closely with existing stakeholders to make the Midlands a showcase that facilitates and promotes the ownership and operation of EVs.”<sup>45</sup>

The Ecotricity highway was concentrated on key motorway routes, targeting service stations such as Roadchef’s Motorway Service Areas and Moto Hospitality Ltd.’s service areas. EV owners used websites to identify these charging stations and plan where they would charge their cars on their route. Ecotricity particularly wanted to expand their charging network along the M4, M5, and M40 routes. Within segments 01, 02, 23, 45, and 56, these motorways offered a total of 14 charging points (see Exhibit 3).

Due to its proximity to London, highway segment 56 (on the M40) had a higher annual average traffic flow than the southwest region (see Exhibit 3).<sup>46</sup> Combining forecasted growth in traffic, which, depending on the scenario, ranged from 29–60 per cent, and Vince’s optimistic prediction that all vehicles sold in 2030 would be EVs, Ecotricity needed to consider expanding its highway network to accommodate five times the current EV traffic, which would lead to a significant demand for publicly accessible EV charging.

Ecotricity was already establishing its presence at each of the 28 Roadchef service areas.<sup>47</sup> There were 13 potential new locations for installing public chargers in highway segments 01, 02, 23, 45, and 56 (see Exhibit 3). Since the number of service stations for public chargers (Type A) would be limited, an expansion strategy could include installing private chargers (Type B) at the homes of Ecotricity customers who lived in proximity to highways (see Exhibit 4). However, because limited parking space would restrict the number of charging points that could be established at private locations, and limited waiting areas would restrict the number of customers who could wait while the charger was busy, Ecotricity needed to be judicious in choosing the proportion of new public and private chargers in each highway segment to meet charging demand.

## EXPANSION PLAN

Ecotricity grew from about 85,000 customers at the end of 2013 to 150,000 by the end of 2014. According to Vince, Ecotricity did “not spend a lot of money on advertising or sponsorship.”<sup>48</sup> Instead, Ecotricity used word-of-mouth marketing and had a refer-a-friend scheme that offered its customers a £50 voucher for recommending a new Ecotricity customer.

Nissan Motor GB Ltd. was partnering with Ecotricity to promote the use of EVs. Jim Wright, Nissan’s managing director, said:



At Nissan, we believe that all electric driving offers a number of benefits to UK motorists and should be made accessible to all. That is why we have partnered with Ecotricity to call on the new government to give electric vehicles the prominence they now deserve and introduce official signage for charging points across the UK.<sup>49</sup>

Vince, in turn, acknowledged Nissan:

Both the cars and the infrastructure are in place to support the electric car revolution in Britain—there are electric highway pumps at almost every motorway service, while companies like Nissan are developing top-quality electric cars. It's time to introduce charging point road signs in Britain—they'll provide the necessary direction for the thousands of electric car drivers in Britain as well as increase public awareness that the infrastructure is ready for them to make the move to an electric car.<sup>50</sup>

For expansion, Vince targeted strategic A-roads, especially in areas not already covered by the motorway network; for example, in Wales (the A55) and in the southwest (the A30), leading down to the most southern point in Britain, Land's End in Cornwall. A longer-term plan included also expanding the network to the most northern point of Britain, John O'Groats in Scotland.<sup>51</sup> Vince added:

In February [2015], we delivered one million zero emission miles [1.6 million kilometres] to Electric Highway members. The first million miles took nearly two years, so that's quite a step change. Before [2015] ends, we expect to be delivering two million miles [3.2 million kilometres] a month—that's a great reflection of the progress EVs are making in Britain.<sup>52</sup>

In 2016, Ecotricity announced a £70 million renegotiating bargain from Aviva Investors for Ecotricity's efficient power utility portfolio.<sup>53</sup> Vince said that, "the deal would provide enough money to increase Ecotricity's total generation to 100 [megawatts] within 18 months."<sup>54</sup> To increase their customer base by harnessing their customer service reputation, Ecotricity announced a 7 per cent drop in the price of its green gas, effective April 1, 2016.<sup>55</sup>

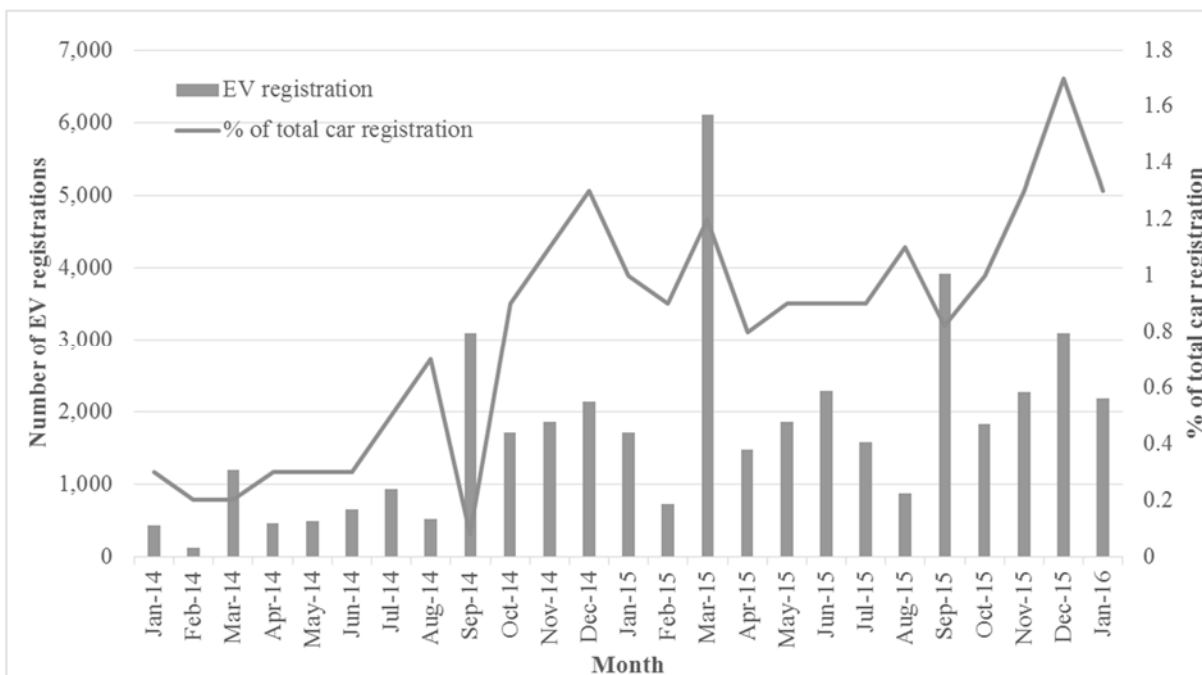
Given its priority of establishing a U.K.-wide electric highway, Ecotricity wanted to grow the number of charging points in the M4, M5, and M40 regions by judiciously choosing between owning public charging points (Type A) in, for example, service stations on motorways, and sponsoring private charging points (Type B) with existing household customers. Type A chargers were more expensive than Type B, but Type A chargers could charge more cars per hour (see Exhibit 1). Ecotricity's expansion priority was to optimally distribute these two chargers in the region to meet estimated charging demand. With the investment for expansion of the charging infrastructure in the region, what proportion of Types A and B chargers should Ecotricity use to optimally expand its highway network?

**EXHIBIT 1: ELECTRIC VEHICLE CHARGING PRODUCTS AND THEIR FEATURES**

Product #	Product type	Phase/supply to car	kW (nominal power)	Number of sockets, connectors	Typical charge time (Hrs)	Tethered or socket	Price
1	Wallbox	Single-phase 16A	3.6	1	8	Tethered	From £1,500
2	Wallbox	Single-phase 30A	7	1	4	Socket	From £1,600
3	Single-phase commercial	Single-phase 16A	3.6	1	8	Socket	From £3,500
4	Single-phase commercial	Single-phase 30A	7	2	4	Tethered	From £2,500
5	Three-phase commercial	Three-phase 30A	22	2	2	Socket	From £7,500
6	Three-phase commercial	Three-phase 30A	22	2	2	Socket	From £6,800
7	Three-phase commercial	Three-phase 63A	43	2	1	Socket	From £10,000
8	Quick Charger	QC, CHAdeMo DC 3 Phase	50	1	0.5	Tethered	From £28,000
9	Quick Charger	QC, CHAdeMo AC/DC 3 Phase	50	2	0.5	Tethered	From £35,000

Note: kW = kilowatts; Hrs = hours. For this case, product 7 will be considered for private chargers (Type B) and product 9 for public chargers (Type A) to expand the Ecotricity highway network. "Typical charge time" is the average number of charging hours per typical electric vehicle to obtain 100 per cent battery charge. £ = GBP = British pound sterling; US\$1 = £0.74 and £1 = US\$1.35 on January 10, 2018.

Source: "Electric Vehicle Charging Overview and Pricing," British Gas, accessed January 10, 2016, [www.britishgas.co.uk/content/dam/bgbusiness/documents/ElectricVehicleChargingPointPriceList.pdf](http://www.britishgas.co.uk/content/dam/bgbusiness/documents/ElectricVehicleChargingPointPriceList.pdf).

**EXHIBIT 2: NEW ELECTRIC VEHICLE REGISTRATIONS, JANUARY 2014–JANUARY 2016**

Source: "Electric Car Market Statistics," Next Green Car, accessed January 15, 2016, [www.nextgreencar.com/electric-cars/statistics](http://www.nextgreencar.com/electric-cars/statistics).

**EXHIBIT 3: TRAFFIC FLOW DATA ON THE SEGMENTS OF HIGHWAY NETWORK FOR ECOTRICITY'S CHARGER CAPACITY EXPANSION**

Highway segment	Highway	Count point ID*	AADF**	Existing charging points	Potential locations for new chargers
01	M5	46,018	58,048	4	3
02	M4	18,498	52,594	2	2
23	M4	56,011	62,726	2	4
45	M40	73,854	61,202	3	2
56	M40	56,030	76,030	3	2

Note: \* "Count point ID" refers to a specific location on the highway where the traffic flow is counted. The ID is used as a reference code for downloading traffic data from the Department of Transport website. \*\* AADF refers to the annual average daily traffic flow of cars and taxis only for 2014. Other vehicles have been excluded for simplicity.

Sources: "Traffic Counts: Individual Count Point Data and Downloads," Department for Transport, United Kingdom, accessed February 15, 2016, [www.dft.gov.uk/traffic-counts/cp.php](http://www.dft.gov.uk/traffic-counts/cp.php); Department for Transport, "Road Traffic Forecasts 2015 (London, UK: Government of the United Kingdom, March 2015), accessed February 22, 2016, [www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/411471/road-traffic-forecasts-2015.pdf](http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/411471/road-traffic-forecasts-2015.pdf); "Our Electric Highway," Ecotricity, accessed February 15, 2016, [www.ecotricity.co.uk/for-the-road/our-electric-highway](http://www.ecotricity.co.uk/for-the-road/our-electric-highway).



**EXHIBIT 4: MOTORWAY AREAS FOR SPONSORING HOME-CHARGING POINTS (TYPE B)**

<b>Zone</b>	<b>Local and unitary authority districts</b>	<b>Number of houses*</b>	<b>Ecotricity customers</b>
01 (M5)	Stroud and South Gloucestershire	127,000	845
02 (M4)	Swindon	68,000	453
23 (M4)	West Berkshire	52,000	345
45 (M40)	Aylesbury Vale	55,000	366
56 (M40)	Chiltern and Wycombe	94,000	626

Note: \* Number of houses obtained using small area estimates from the 2011 census, Office of National Statistics.

Assumptions:

1. One per cent, on average, of Ecotricity customers will be willing to install a charging point and will have a suitable location
2. Each charging is done to 100 per cent battery capacity.
3. On average, electric vehicles are charged 80 per cent of the time at their homes and 20 per cent of the time on the highway network.
4. One per cent of vehicles on the highway are electric vehicles.
5. Any electric vehicle user on a road stretch who requires charging will stop at the nearest charging point within the network.

Source: Ministry of Housing, Communities & Local Government, "Statistical Data Set: Live Tables on Household Projections," Government of the United Kingdom, accessed February 15, 2016, [www.gov.uk/government/statistical-data-sets/live-tables-on-household-projections#based-live-tables](http://www.gov.uk/government/statistical-data-sets/live-tables-on-household-projections#based-live-tables).

## ENDNOTES

- <sup>1</sup> This case has been written on the basis of published sources only. Consequently, the interpretation and perspectives presented in this case are not necessarily those of Ecotricity Group Ltd. or any of its employees.
- <sup>2</sup> "Electric Car Charging Stations," Ecotricity, accessed January 8, 2017, [www.ecotricity.co.uk/for-the-road/our-electric-highway](http://www.ecotricity.co.uk/for-the-road/our-electric-highway).
- <sup>3</sup> David Pratt, "Ecotricity to Allow 30 Minute Charging after Consumer Backlash," Clean Energy News, July 11, 2016, accessed October 19, 2016, [www.cleanenergynews.co.uk/news/transport/ecotricity-to-allow-30-minute-charging-after-consumer-backlash](http://www.cleanenergynews.co.uk/news/transport/ecotricity-to-allow-30-minute-charging-after-consumer-backlash).
- <sup>4</sup> "For the Road," Ecotricity, accessed October 19, 2016, [www.ecotricity.co.uk/for-the-road](http://www.ecotricity.co.uk/for-the-road).
- <sup>5</sup> David Pratt, "Ecotricity Losing Money from Charging Network, Says Electric Highway MD," Clean Energy News, August 17, 2016, accessed October 23, 2016, [www.cleanenergynews.co.uk/news/transport/ecotricity-losing-money-from-charging-network-says-electric-highway-md](http://www.cleanenergynews.co.uk/news/transport/ecotricity-losing-money-from-charging-network-says-electric-highway-md).
- <sup>6</sup> "About Me," Zero Carbonista, accessed January 8, 2017, <http://zerocarbonista.com>.
- <sup>7</sup> £ = GBP = British pound sterling; all currency amounts in £ unless otherwise stated; US\$1 = £0.74 and £1 = US\$1.35 on January 10, 2018. "Ecotricity Group Ltd," Due Dil, accessed February 26, 2016, [www.duedil.com/company/03521776/ecotricity-group-ltd](http://www.duedil.com/company/03521776/ecotricity-group-ltd).
- <sup>8</sup> "About Ecotricity: Our Awards," Ecotricity, accessed February 26, 2016, [www.ecotricity.co.uk/about-ecotricity/our-eco-credentials/our-awards](http://www.ecotricity.co.uk/about-ecotricity/our-eco-credentials/our-awards).
- <sup>9</sup> Robert Mendick, "Eco Millionaire Dale Vince and His £750,000 Electric Sports Car—Part Funded by the Taxpayer," *Telegraph*, November 6, 2010, accessed November 17, 2016, [www.telegraph.co.uk/news/earth/greenertransport/8114607/Eco-millionaire-Dale-Vince-and-his-750000-electric-sports-car-part-funded-by-the-taxpayer.html](http://www.telegraph.co.uk/news/earth/greenertransport/8114607/Eco-millionaire-Dale-Vince-and-his-750000-electric-sports-car-part-funded-by-the-taxpayer.html).
- <sup>10</sup> "About Ecotricity: Our Green Energy," Ecotricity, accessed February 26, 2016, [www.ecotricity.co.uk/our-green-energy/our-green-electricity](http://www.ecotricity.co.uk/our-green-energy/our-green-electricity).
- <sup>11</sup> Ecotricity, *Nothing Happened, Everything Changed: Progress Report 2014*, accessed November 17, 2016, [www.ecotricity.co.uk/about-ecotricity/our-history/2014](http://www.ecotricity.co.uk/about-ecotricity/our-history/2014).
- <sup>12</sup> "Ecobonds," Ecotricity, accessed January 8, 2017, [www.ecotricity.co.uk/about/ecobonds](http://www.ecotricity.co.uk/about/ecobonds).
- <sup>13</sup> Ecotricity, "Ecobond Three Raises Almost £19 Million," press release, December 2, 2015, accessed February 26, 2016, [www.ecotricity.co.uk/news/news-archive/2015/ecobond-three-raises-almost-19-million](http://www.ecotricity.co.uk/news/news-archive/2015/ecobond-three-raises-almost-19-million).
- <sup>14</sup> Ibid.
- <sup>15</sup> "The World's First Green Electricity Company," Ecotricity, accessed November 17, 2016, [www.ecotricity.co.uk/about-ecotricity](http://www.ecotricity.co.uk/about-ecotricity).
- <sup>16</sup> Ecotricity, "Ecotricity #1 Energy Company in Which? Customer Survey," press release, January 22, 2015, accessed January 10, 2018, [www.ecotricity.co.uk/news/news-archive/2015/ecotricity-1-energy-company-in-which-customer-survey](http://www.ecotricity.co.uk/news/news-archive/2015/ecotricity-1-energy-company-in-which-customer-survey).
- <sup>17</sup> "Best Energy Companies 2015," Which? Switch, February 2016, accessed January 10, 2018, <https://press.which.co.uk/wp-content/uploads/2015/01/Which-Energy-Satisfaction-Survey-2015.pdf>; Ecotricity, "Ecotricity Doubles in Size, 2 Million Britons Dump the Big Six," press release, January 12, 2015, accessed December 10, 2015, [www.ecotricity.co.uk/news/news-archive/2015/ecotricity-doubles-in-size-2-million-britons-dump-the-big-six](http://www.ecotricity.co.uk/news/news-archive/2015/ecotricity-doubles-in-size-2-million-britons-dump-the-big-six).
- <sup>18</sup> "Ecotricity, UK, Wind Power—Ashden Award Winner," YouTube video, 5:37, posted by Ashden, February 26, 2008, accessed February 20, 2016, <https://youtu.be/qmJ7mhZmg9w>.
- <sup>19</sup> Dale Vince, interview by Polly Toynbee, "Ecotricity's 2030 Vision for a Green Britain," YouTube video, 6:54, posted by Ecotricity, May 6, 2015, accessed January 10, 2016, <https://youtu.be/tcOBg8kV6Zc>.
- <sup>20</sup> Ibid.
- <sup>21</sup> "Our 2030 Vision," Ecotricity, accessed January 10, 2018, [www.ecotricity.co.uk/about-ecotricity/our-eco-credentials/our-2030-vision-for-a-green-britain](http://www.ecotricity.co.uk/about-ecotricity/our-eco-credentials/our-2030-vision-for-a-green-britain).
- <sup>22</sup> Nikki Gordon-Bloomfield, "As More Plug-in Cars Hit the Roads, Inconsiderate Use of Public Charging Stations Is on the Rise Too," Transport Evolved, February 3, 2015, accessed February 21, 2016, <https://transportevolved.com/2015/02/03/plug-cars-hit-roads-inconsiderate-use-public-charging-provision-rise>.
- <sup>23</sup> Ecotricity, *Nothing Happened, Everything Changed*, op. cit.
- <sup>24</sup> "General FAQs," Ecotricity, accessed November 17, 2016, [www.ecotricity.co.uk/for-the-road/faqs/general-faqs](http://www.ecotricity.co.uk/for-the-road/faqs/general-faqs).
- <sup>25</sup> ElectrAA (2015), "Ecotricity Update with Joe Patel July 2015," YouTube video, 6:22, posted by ElectrAA—Electric Automobile Association, August 17, 2015, accessed February 20, 2016, <https://youtu.be/OExT0Z9lpq0>.
- <sup>26</sup> "More Rapids Please, Vicar!," YouTube video, 2:27, posted by John Chivers, December 31, 2015, accessed January 10, 2016, <https://youtu.be/r--7sqPkoJk>.
- <sup>27</sup> "Charging at Home," Zap-Map, accessed February 17, 2016, [www.zap-map.com/charge-points/charging-home](http://www.zap-map.com/charge-points/charging-home).
- <sup>28</sup> Jill Fisher, Rupert Gammon, and Katherine N. Irvine, *My Electric Avenue (REV): SDRC 9.6: An Assessment of the Public Acceptance of Demand Side Response of EV Charging Using Esprit* (Chester, UK: EA Technology, 2015), accessed February 20, 2016, <http://myelectricavenue.info/sites/default/files/MEA%20SDRC%209%206%20Issue%202.pdf>.
- <sup>29</sup> "How Many Charging Points Are There in the UK, 2016," Zap-Map, accessed February 17, 2016, [www.zap-map.com/statistics](http://www.zap-map.com/statistics).
- <sup>30</sup> "Electric Buying Guide," Zap-Map, accessed February 14, 2016, [www.zap-map.com/electric-vehicles/ev-buying-guide](http://www.zap-map.com/electric-vehicles/ev-buying-guide).
- <sup>31</sup> "Electric Vehicle Homecharge Scheme: Guidance for Customers," Government of the United Kingdom, accessed January 10, 2018, [www.gov.uk/government/publications/electric-vehicle-homecharge-scheme-guidance-for-customers-version-21](http://www.gov.uk/government/publications/electric-vehicle-homecharge-scheme-guidance-for-customers-version-21).
- <sup>32</sup> "Charging at Home," Zap-Map, accessed February 17, 2016, [www.zap-map.com/charge-points/charging-home](http://www.zap-map.com/charge-points/charging-home).
- <sup>33</sup> "How Many Charging Points Are There in the UK, 2016," Zap-Map, accessed February 17, 2016, [www.zap-map.com/statistics](http://www.zap-map.com/statistics).
- <sup>34</sup> "Charging Points: EV Charging Explained," Zap-Map, accessed February 14, 2016, [www.zap-map.com/charge-points](http://www.zap-map.com/charge-points).

- <sup>35</sup> "Electric Car Market Statistics," Next Green Car, accessed January 15, 2016, [www.nextgreencar.com/electric-cars/statistics](http://www.nextgreencar.com/electric-cars/statistics).
- <sup>36</sup> *Road Traffic Forecasts 2015*, (London, UK: Department for Transport, 2015), accessed February 22, 2016, [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/411471/road-traffic-forecasts-2015.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/411471/road-traffic-forecasts-2015.pdf).
- <sup>37</sup> "Our Electric Highway," Ecotricity, accessed February 15, 2016, [www.ecotricity.co.uk/for-the-road/our-electric-highway](http://www.ecotricity.co.uk/for-the-road/our-electric-highway).
- <sup>38</sup> "Electric Car Market Statistics," Next Green Car, accessed January 15, 2016, [www.nextgreencar.com/electric-cars/statistics](http://www.nextgreencar.com/electric-cars/statistics).
- <sup>39</sup> Dale Vince, interview by Polly Toynbee, "Ecotricity's 2030 Vision for a Green Britain," YouTube video, 6:54, posted by Ecotricity, May 6, 2015, accessed January 10, 2016, <https://youtu.be/tcOBg8kV6Zc>.
- <sup>40</sup> "EV Charging: Locate Charging Points Across the UK," Next Green Car, March 10, 2015, accessed January 24, 2016, [www.nextgreencar.com/electric-cars/charging-points](http://www.nextgreencar.com/electric-cars/charging-points).
- <sup>41</sup> Michael Graham Richard, "Tesla Built 858 New Public Charging Stations in the U.S. Over the Past 12 Months," Tree Hugger, November 30, 2015, accessed January 20, 2016, [www.treehugger.com/cars/tesla-built-858-new-charging-stations-us-over-past-12-months.html](http://www.treehugger.com/cars/tesla-built-858-new-charging-stations-us-over-past-12-months.html).
- <sup>42</sup> Danny King, "Tesla, Ecotricity Settle Supercharger Differences," Auto Blog, June 21, 2015, accessed January 24, 2016, [www.autoblog.com/2015/06/21/tesla-ecotricity-settle-supercharger-differences](http://www.autoblog.com/2015/06/21/tesla-ecotricity-settle-supercharger-differences).
- <sup>43</sup> Ibid.
- <sup>44</sup> Alex Grant, "Plugged-in Midlands Points Join Chargemaster Network," Fleet World Group, July 29, 2015, accessed January 24, 2016, <http://evfleetworld.co.uk/news/2015/Jul/Plugged-in-Midlands-points-join-Chargemaster-network/0438020931>; Cenex, "Cenex Chooses Chargemaster to Take Over Plugged-in Midlands Electric Vehicle Charging Network," press release, July 29, 2015, accessed January 8, 2017, [www.cenex.co.uk/press-releases/cenex-chooses-chargemaster-take-plugged-midlands-electric-vehicle-charging-network](http://www.cenex.co.uk/press-releases/cenex-chooses-chargemaster-take-plugged-midlands-electric-vehicle-charging-network).
- <sup>45</sup> Ibid.
- <sup>46</sup> "Traffic Counts: Individual Count Point Data and Downloads," Department for Transport, United Kingdom, accessed February 15, 2016, [www.dft.gov.uk/traffic-counts/cp.php](http://www.dft.gov.uk/traffic-counts/cp.php).
- <sup>47</sup> "Motorway Signs to Feature Energy Company Logo for First Time," Blue and Green Tomorrow, January 30, 2016, accessed February 21, 2016, <http://blueandgreentomorrow.com/2016/01/30/motorway-signs-to-feature-energy-company-logo-for-first-time>.
- <sup>48</sup> Ecotricity, *Nothing Happened, Everything Changed*, op. cit.
- <sup>49</sup> "Nissan and Ecotricity Petition for Charging Point Road Signs," Zap-Map, accessed February 21, 2016, [www.zap-map.com/nissan-and-ecotricity-petition-for-charging-point-road-signs](http://www.zap-map.com/nissan-and-ecotricity-petition-for-charging-point-road-signs).
- <sup>50</sup> Ibid.
- <sup>51</sup> Natalie Middleton, "Ecotricity to Expand Electric Highway Further," EV Fleet World, March 10, 2015, accessed February 21, 2016, <http://evfleetworld.co.uk/ecotricity-to-expand-electric-highway-further>.
- <sup>52</sup> Ibid.
- <sup>53</sup> Ecotricity, "Ecotricity Announces Funding Evolution with Aviva Investor Financing," press release, March 27, 2015, accessed January 8, 2018, [www.ecotricity.co.uk/news/news-archive/2015/ecotricity-announces-funding-evolution-with-aviva-investor-financing](http://www.ecotricity.co.uk/news/news-archive/2015/ecotricity-announces-funding-evolution-with-aviva-investor-financing); "Ecotricity to Accelerate Expansion with £70m Financing," Sustainable Review, March 27, 2015, accessed February 21, 2016, <http://sustainablereview.net/ecotricity-accelerate-expansion-70m-financing>.
- <sup>54</sup> Ibid.
- <sup>55</sup> Ecotricity, "Ecotricity Cuts Gas Bills by Market Leading 7%," press release, February 12, 2016, accessed February 15, 2016, [www.ecotricity.co.uk/news/news-archive/2016/ecotricity-cuts-gas-bills-by-market-leading-7](http://www.ecotricity.co.uk/news/news-archive/2016/ecotricity-cuts-gas-bills-by-market-leading-7).