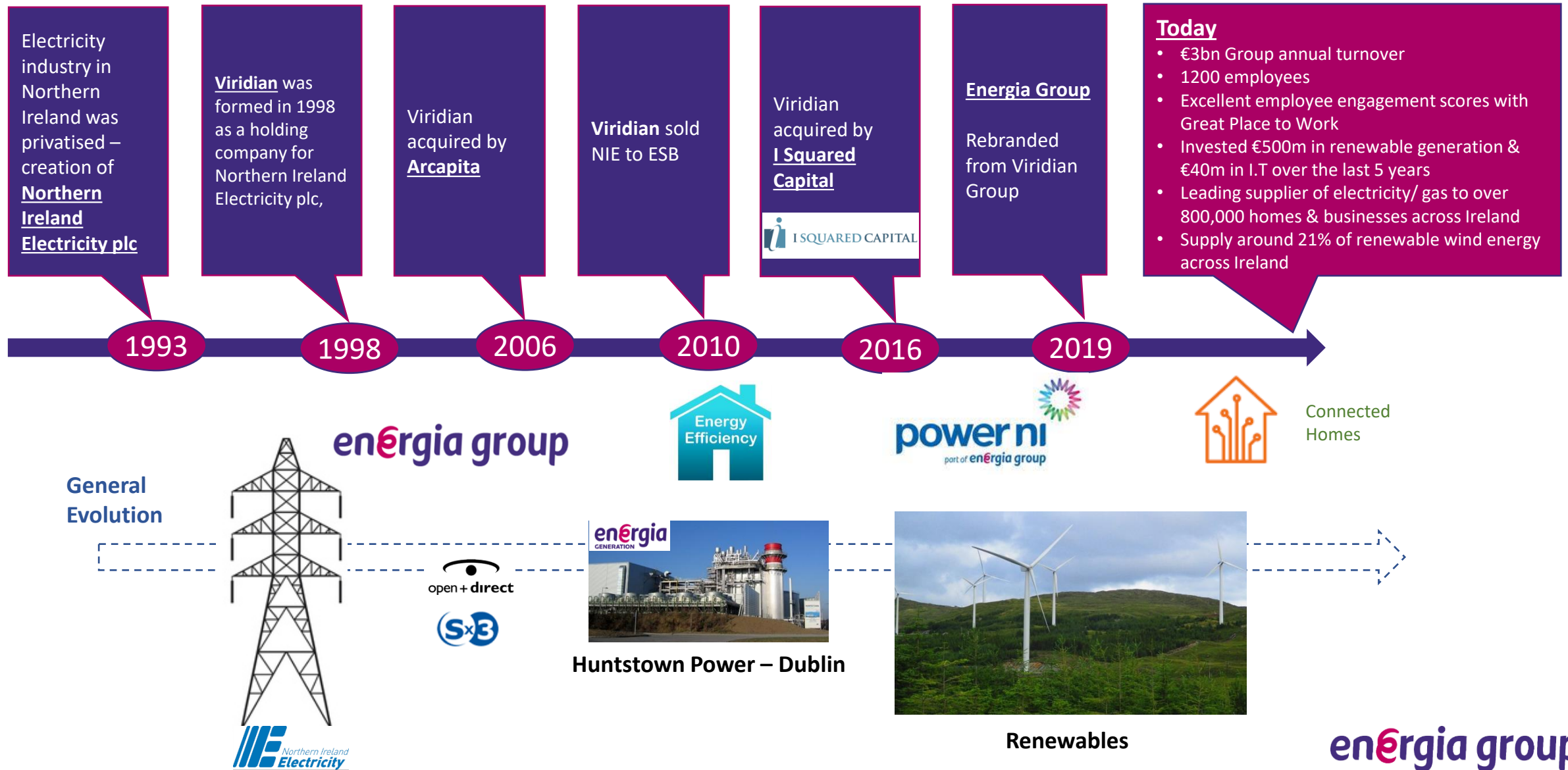QUEEN'S UNIVERSITY BELFAST | FACULTY OF ENGINEERING AND PHYSICAL SCIENCES

MSc Data Analytics
Analytathon – March 2024

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About Energia Group

Electricity industry in Northern Ireland was privatised – creation of **Northern Ireland Electricity plc**

Viridian was formed in 1998 as a holding company for Northern Ireland Electricity plc,

Viridian acquired by **Arcapita**

Viridian sold NIE to ESB

Viridian acquired by **I Squared Capital**

I SQUARED CAPITAL

Energia Group

Rebranded from Viridian Group

Today
- €3bn Group annual turnover
- 1200 employees
- Excellent employee engagement scores with Great Place to Work
- Invested €500m in renewable generation & €40m in I.T over the last 5 years
- Leading supplier of electricity/ gas to over 800,000 homes & businesses across Ireland
- Supply around 21% of renewable wind energy across Ireland

1993 — **1998** — **2006** — **2010** — **2016** — **2019**

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Energy Efficiency

power ni
part of energia group

Connected Homes

General Evolution

open + direct

S×3

energia GENERATION

Huntstown Power – Dublin

Renewables

Northern Ireland Electricity

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Branding Strategy

| Customer Solutions | Renewables | Flexible Generation |

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Modern customer-centric utility focusing on renewable technology.

€1bn Investment in island of Ireland

€3bn Investment in 'Positive Energy'

Driving the transition to a net zero carbon future and helping Ireland meet its climate action targets.

993 Employees

Flexible Generation

The operation of and purchase of electricity from conventional generation assets currently comprising:

747MW Capacity at Huntstown

c.11% of all-island peak electricity demand

Customer Solutions

Intelligent energy solutions for our energy supply businesses operating in the ROI and Northern Ireland:
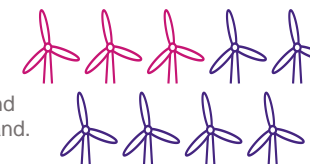
832,500

2019 Electricity Sales

3.5TWh

4.6TWh
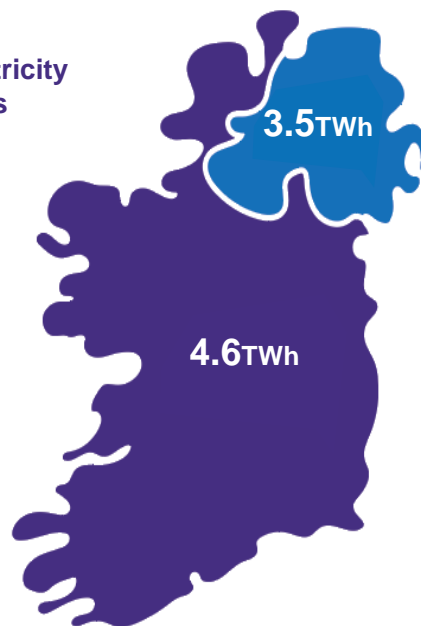
Renewables

A renewable energy business comprising:

309MW

Wholly owned onshore wind farms on the island of Ireland.

1,281mw

PPAs with third party renewable generators and the Group's own wind farms throughout Ireland.

Bioenergy Plant

Currently commissioning the **largest** Anaerobic Digestion Facility in Ireland

Green Hydrogen

First green hydrogen project in construction on the island of Ireland

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Decentralisation

Decarbonisation

EVs

On-site generation · Batteries

I&C equipment

Biogas

Democratisation

Bundling

BLOCK CHAIN

Digitalisation

Balancing services · Energy trading

Capacity market · Peak price management

Constraint management · Energy efficiency

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The Energia Analyathon Challenge:
Similar Trading Days Identifier

To develop a methodology to assess and score the similarity of wind generation, energy demand and net energy demand profiles for any energy trading day (23:00 prior day → 22:59 subsequent day), which can be used by Energia's Trading Team to identify similar days in the past.

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Context:

Electricity on the island of Ireland is sold by generators, and bought by suppliers, in a single market venue, called the Irish Single Electricity Market. Most transactions are done on a 'Day Ahead' basis in an auction at 11:00 each morning – meaning that bids to sell and buy are agreed in that auction for electricity that will be delivered in tomorrow's Trading Day.

A 'Trading Day' runs from 23:00 night before to 22:59 on the trading day itself. Prices are agreed per each 30 minute period.

Each morning, Energia's Trading Team meet to discuss and agree their trading strategy the upcoming daily auction. The team use forecasts of energy demand and wind generation potential (from weather forecasts) in order to decide what prices (for each 30 minute period) they will bid to sell power into the market, and prices they will offer to buy power back out of the market.

To help with this, the Trading Team would like a quick and easy way to take the forecasts for tomorrow (electricity demand forecast, wind generation forecast, etc) and identify those days in the past that most closely match that pattern. This would allow them to see what trading strategies worked well on those past days (in terms of profitability) and what strategies didn't work.
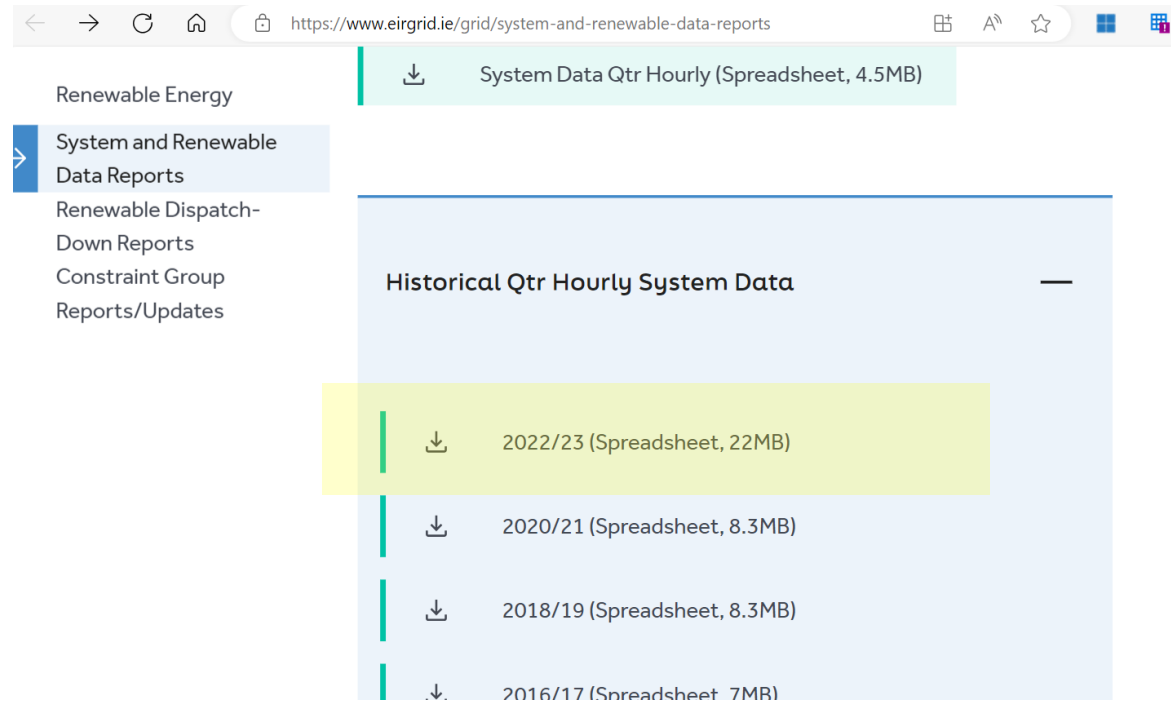
To do this, the Trading Team need you to:

- analyse the detailed data for 2022-23 that is available on the EirGrid website (see link on next slide)
- devise a measure of 'similarity' (i.e. what exactly does a "similar day" mean, how can it be measured, how many dimensions of similarity?) -- remembering that no two days will be exactly the same!
- ensure the method proposed is practical and tractable, returning a feasible number of "typical" profiles and a measure of exactly how similar each historic day identified is compared to the forecast from tomorrow.

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The data source:

EirGrid publishes data on total energy demand (ie from households, businesses, public sector) for every 15 minute period in each year. The same dataset also records the source of generation (e.g. conventional, renewables, imports/exports via interconnectors). This data is accessible at:
https://www.eirgrid.ie/grid/system-and-renewable-data-reports

Thank you and good luck!