Advantages of Big Data and Applications in Power Systems

3th Nov 2017

Manchester Conference Centre

For MEEPS Conference

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PRA ARUP

Overview

1. Industry Challenges
2. Opportunities of Big Data
3. Implementation of Big Data
4. Cyber Security
5. Vision
6. Question and Discussion

Industry Challenges

Big Data is touching every Industry.

- Better data management system for massive amounts of data
- Bring the cloud to the data when the data can't be moved
- Applications propel big data adoption
- Faster hardware

Source: Oracle "Big Data Perditions 2017"

Industry Challenges within Power Systems

- Traditional Business with the lagging of big data adoption in other business sectors
- The massive amount of data from the diversified sources within Distributed Networks including Smart Meters
- The Transition of DNO to DSO to improve customer services

Why do we need data analytics in power systems?

General Objectives

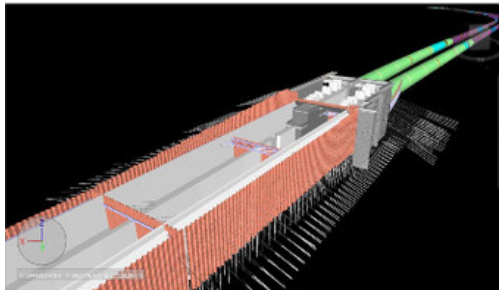
Increase Revenue / Profit	Decrease Costs	"Soft" Objectives

- More Accurate Demand Forecast
- Better Electric Loss Calculations
- State Estimation / Self-healing Network
- Active Network Management
- Better Stakeholder Engagement

Opportunities

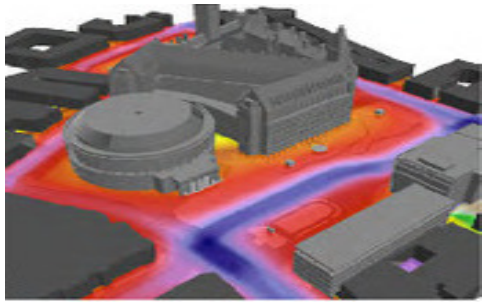
Visualisation:

The representation of data in a meaningful way



Digital Twin:

A digital replica of physical assets, processes and systems



Machine learning:

A method of data analysis that automates analytical model building.

Source: Arup

Data Processing Methods

Descriptive statistics:

To describe the basic features of the data in a study

Data integration:

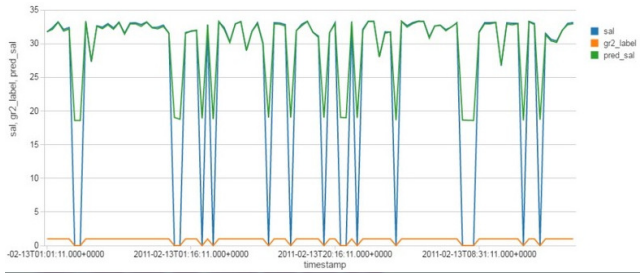
The combination of technical and business processes used to combine data from disparate sources into meaningful and valuable information

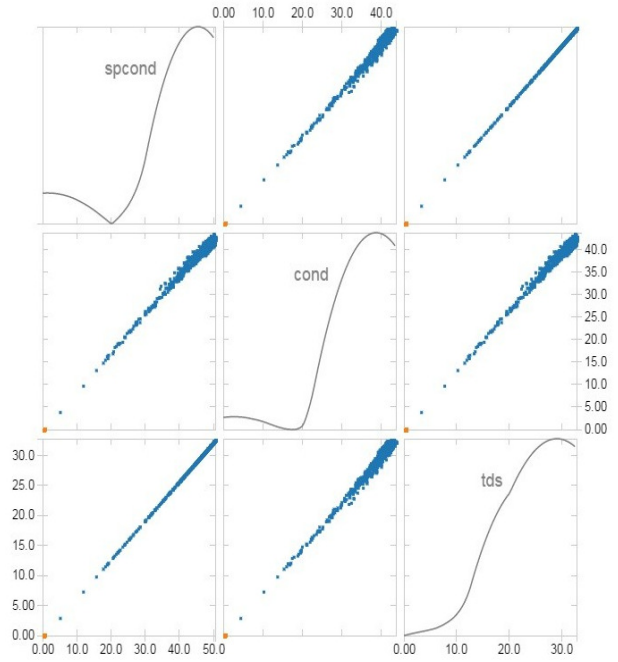
Data transformation:

The modification of every point in a data set by a mathematical function.

Data acquisition:

The collation of data





Source: Arup

Typical Tools

Source: www.informationweek.com/big-data/big-data-analytics/16-top-big-data-analytics-platforms

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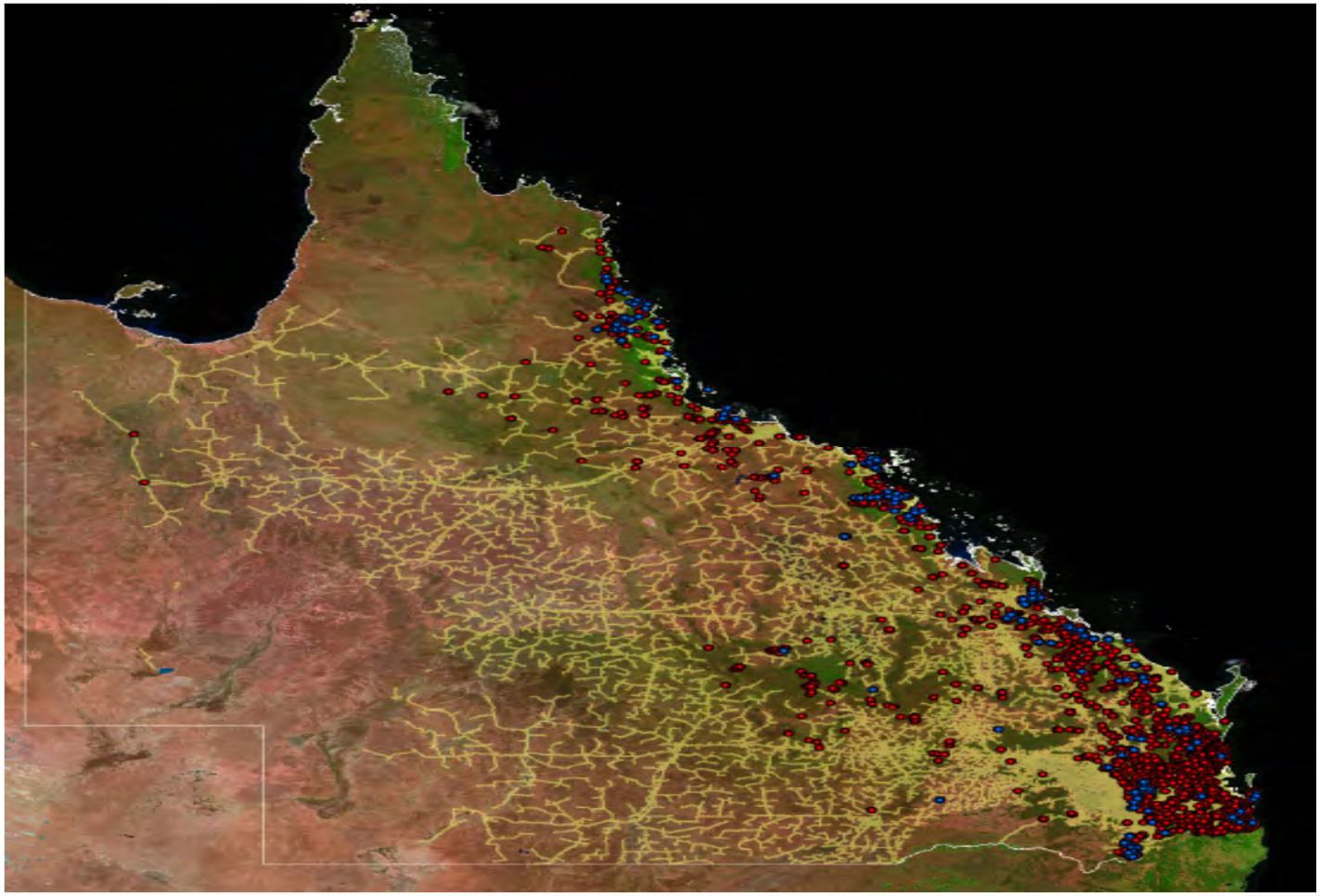
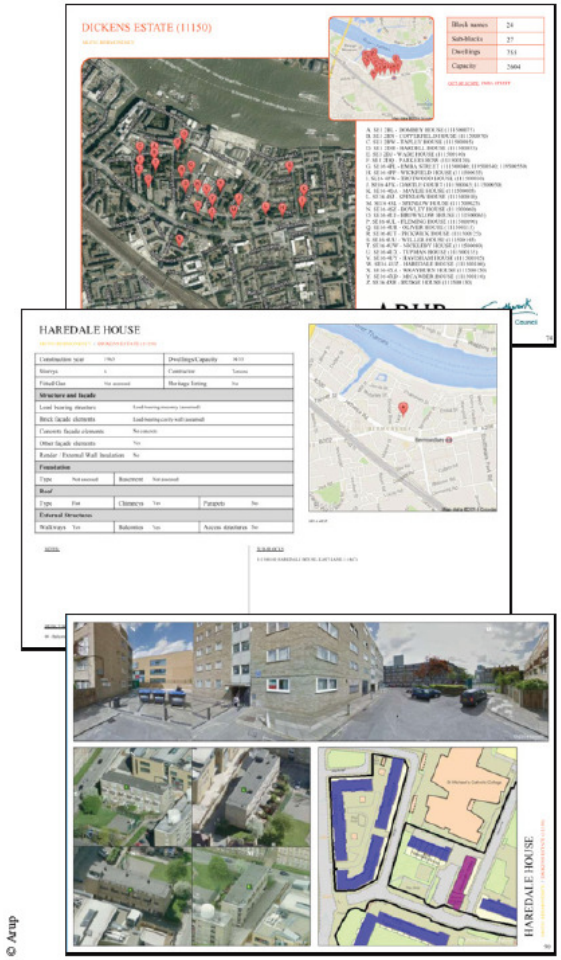
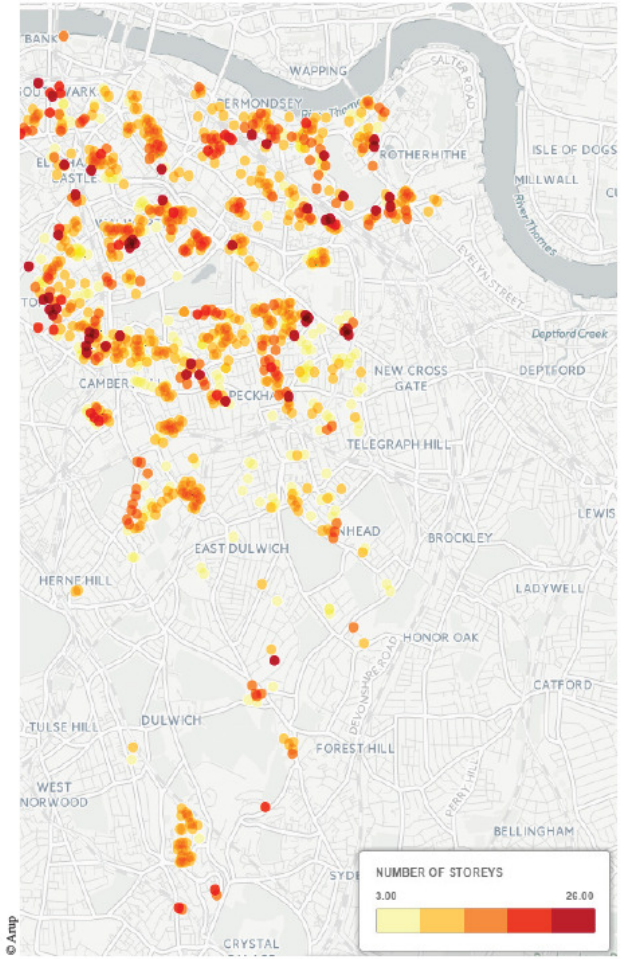
Industry Cases



Source: Arup

Industry Cases





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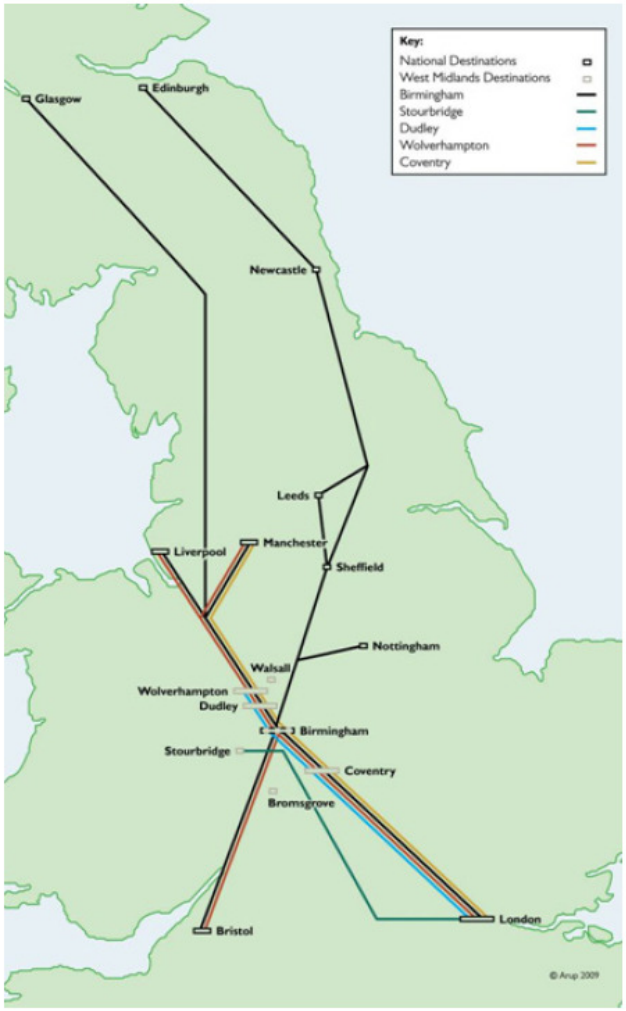

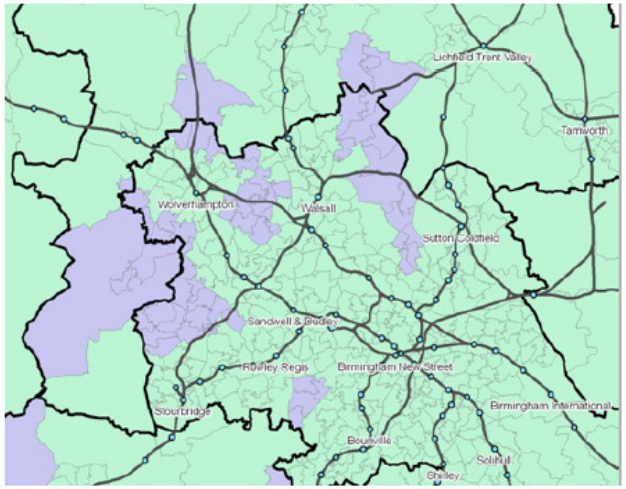

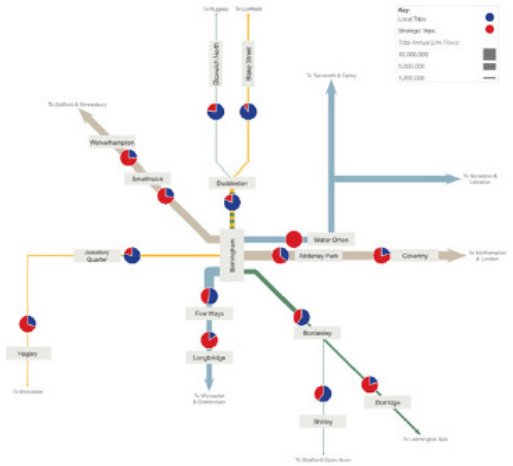

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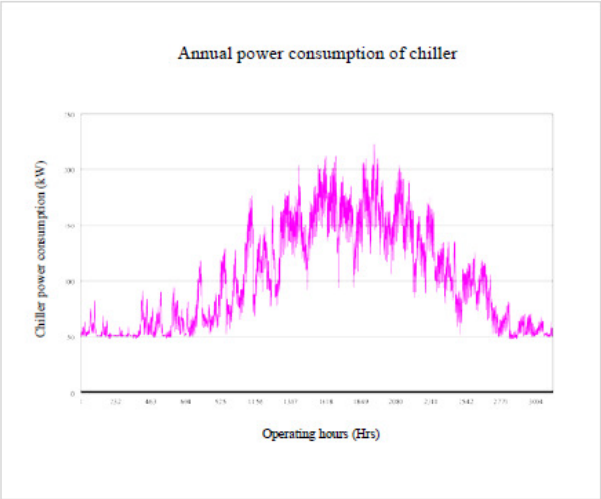

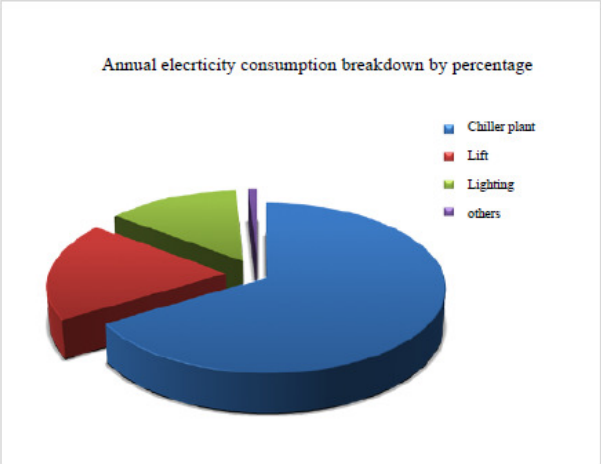

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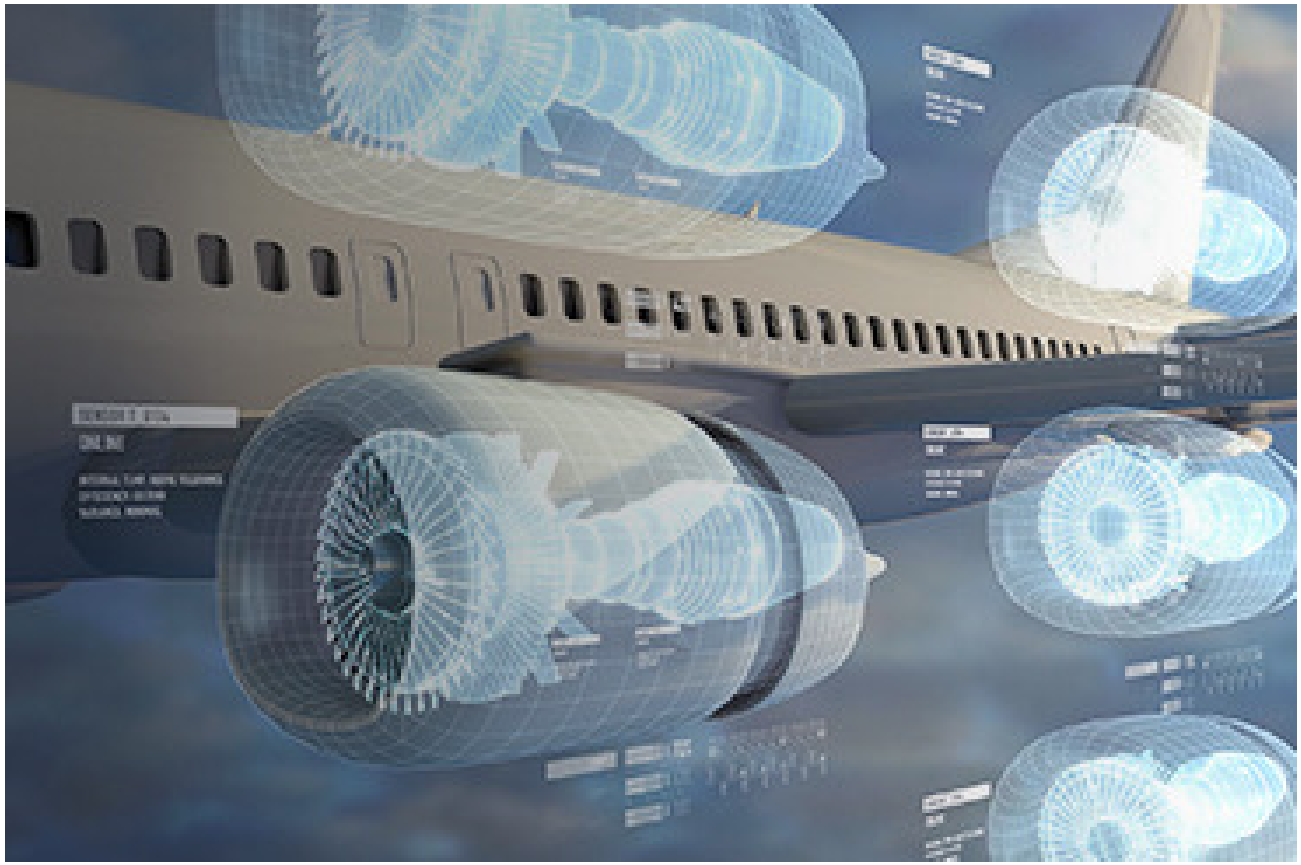
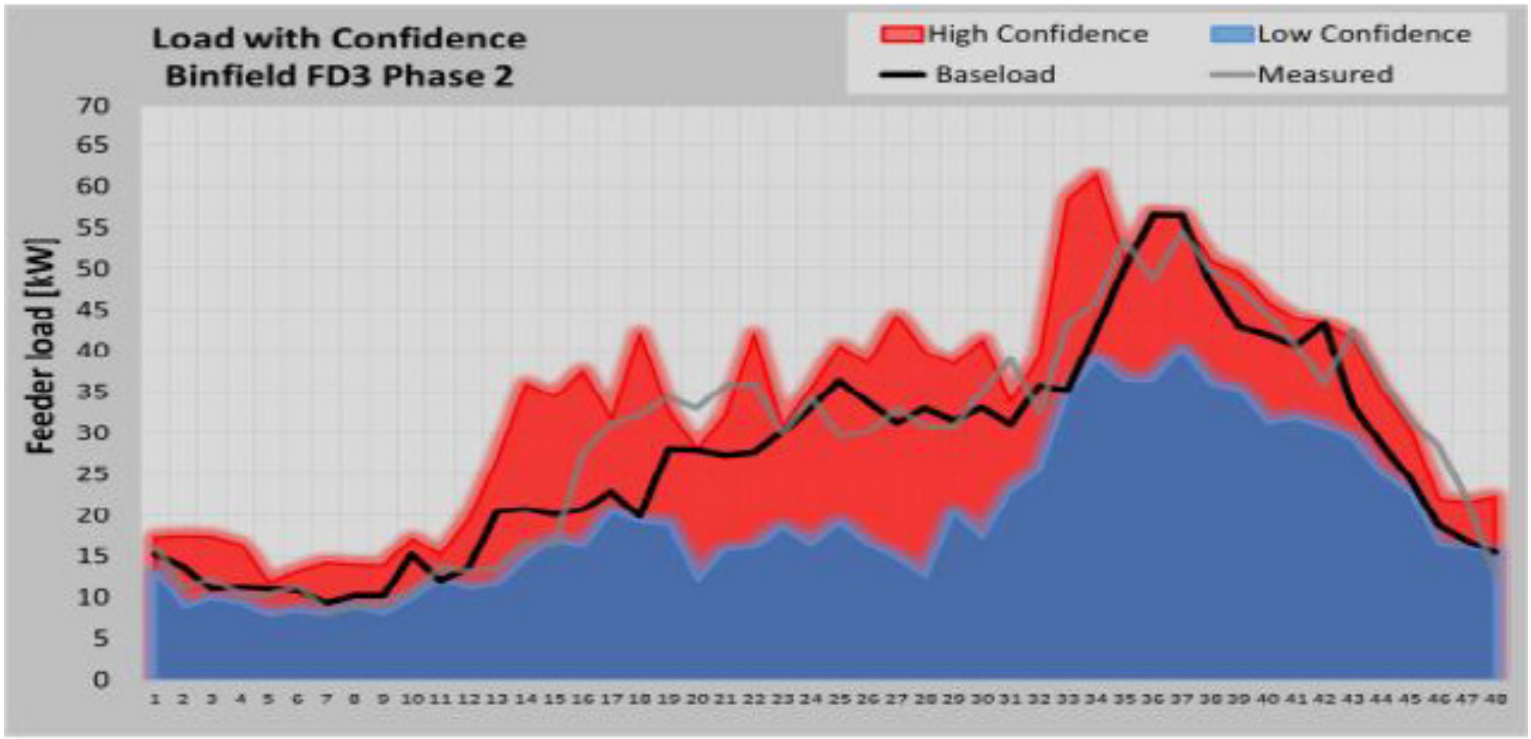


Source: GE

Industry Cases

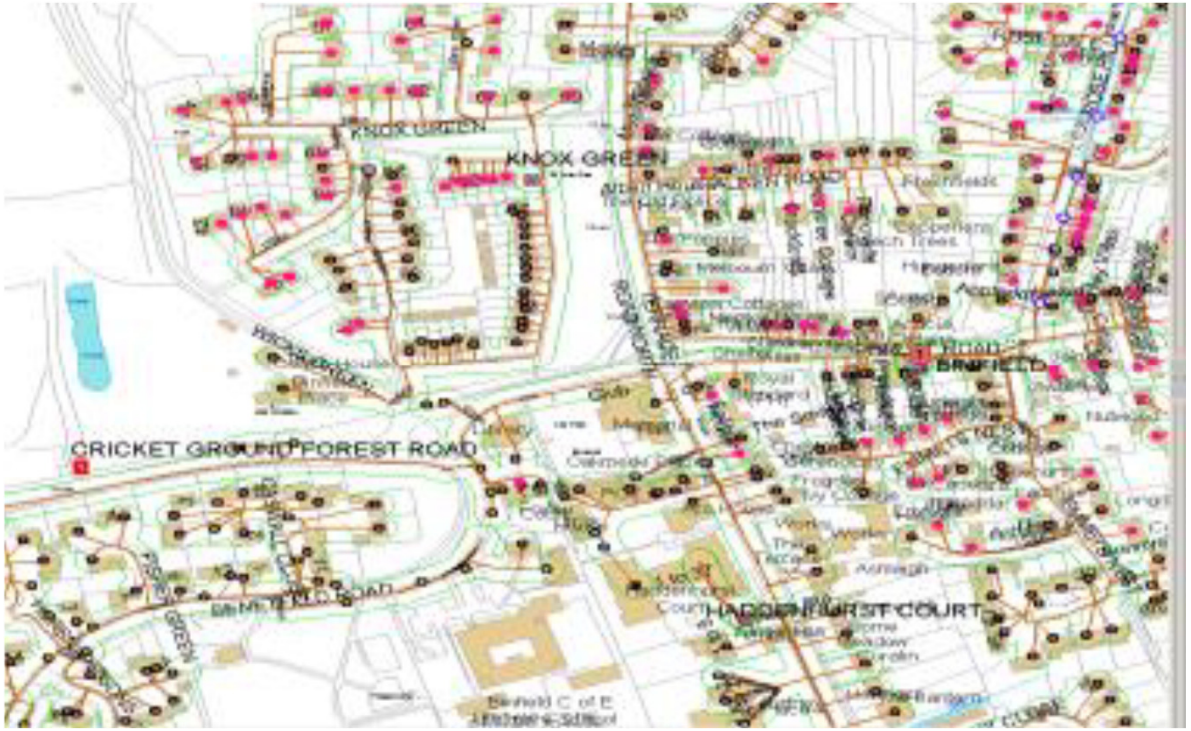
Source: Arup

Power System Cases



Source: SRDC 9.8 (c) Part 1 Learning Report from SSEN New Thames Valley Vision (NTVV)

Power System Cases



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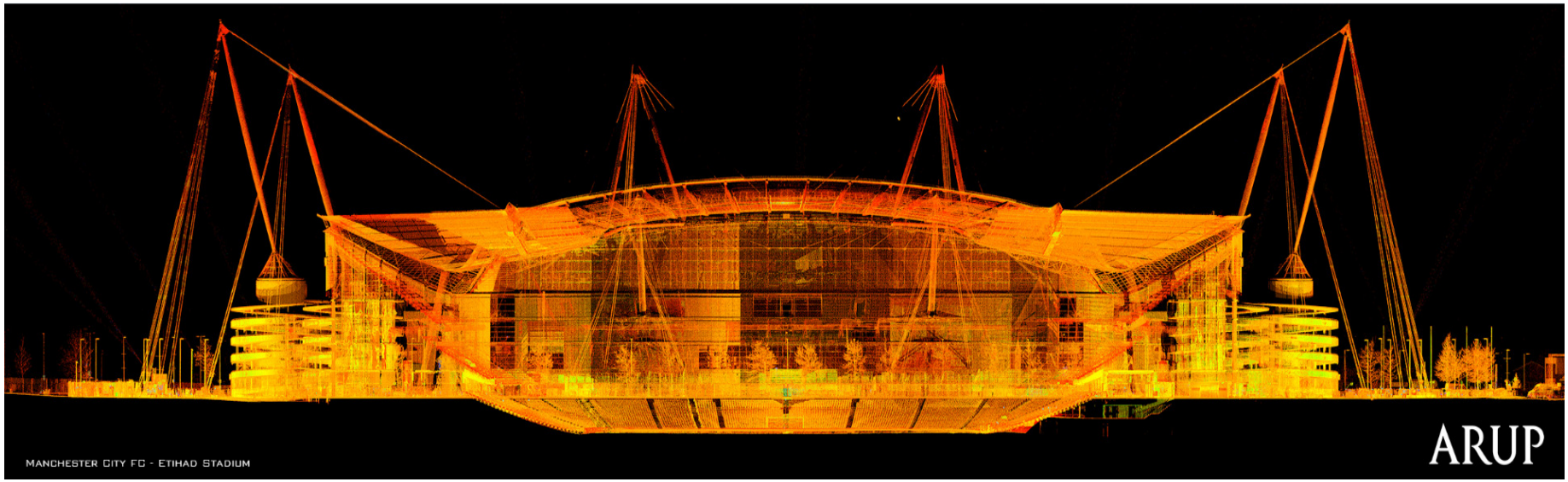
Cyber Security

- Data Protection: Linked to Human Being Behaviour and Regulatory Requirements (Such as European GDPR);
- The Structure of control or automation system within power systems to prevent unauthorised IT access from the hackers;
- USA cyber security practice and IEC 62443 “Industrial communication networks - Network and system security” ;
- The software update issues within Power Systems;
- Security issues for time synchronisation
- The potential security issues on Smart Meters.

Vision



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THANK YOU

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