Using data to fuel Energy Transition

Jephraim Manansala

Chief Data Scientist, Energy Policy Team

Institute for Climate and Sustainable Cities

INSTITUTE FOR CLIMATE AND SUSTAINABLE CITIES

“Data is the new oil.”

Both assets possess an immense value once processed and refined

Source: C. Humby, 2006; The Economist, 2017

Source: OECD/ IEA, 2017; PWC, 2022

2022

Microsoft aramco Alphabet amazon

Article • Oil & Gas

Saudi Aramco hastens digital technology innovation

By Dominic Ellis

March 22, 2021 • 3 mins

Acceleration of digital investment follows sharp fall in net income to $49 billion in 2020...

Source: Energy Digital, 2021

Data is NOT the new oil... it is so much more!

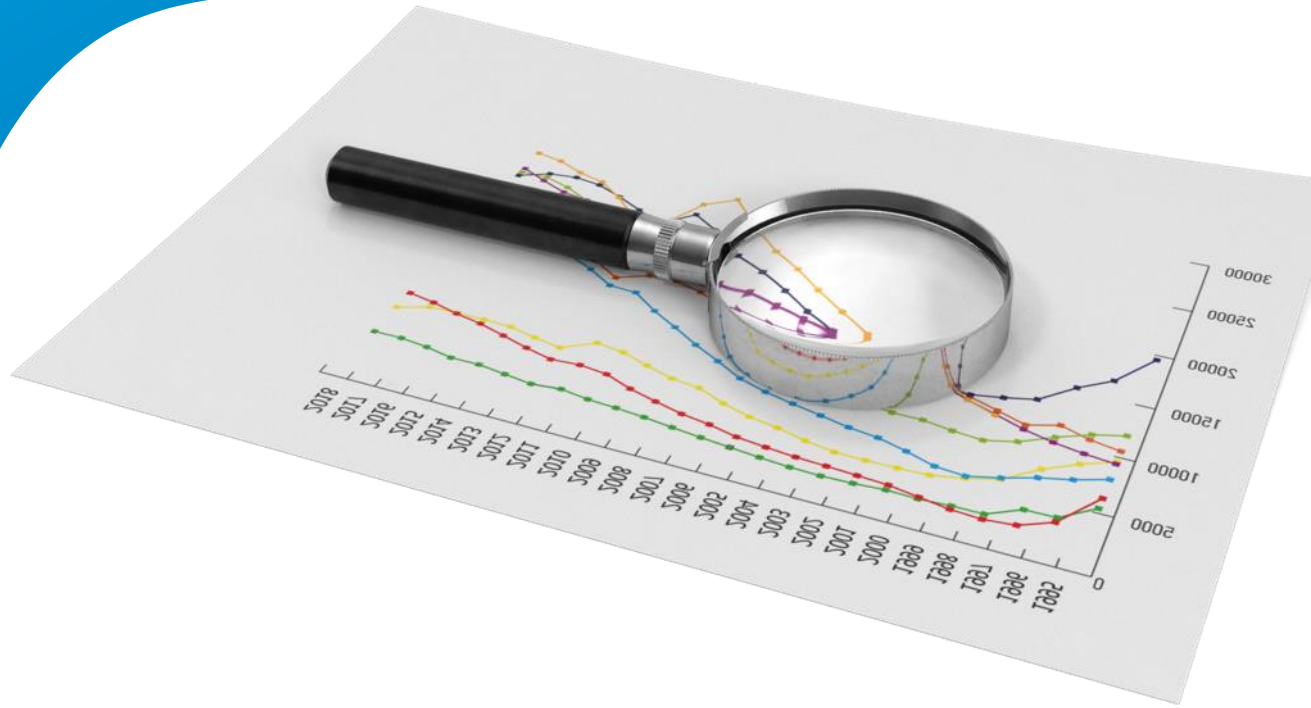
Data is **abundant, reusable,** and **more valuable in the right hands**

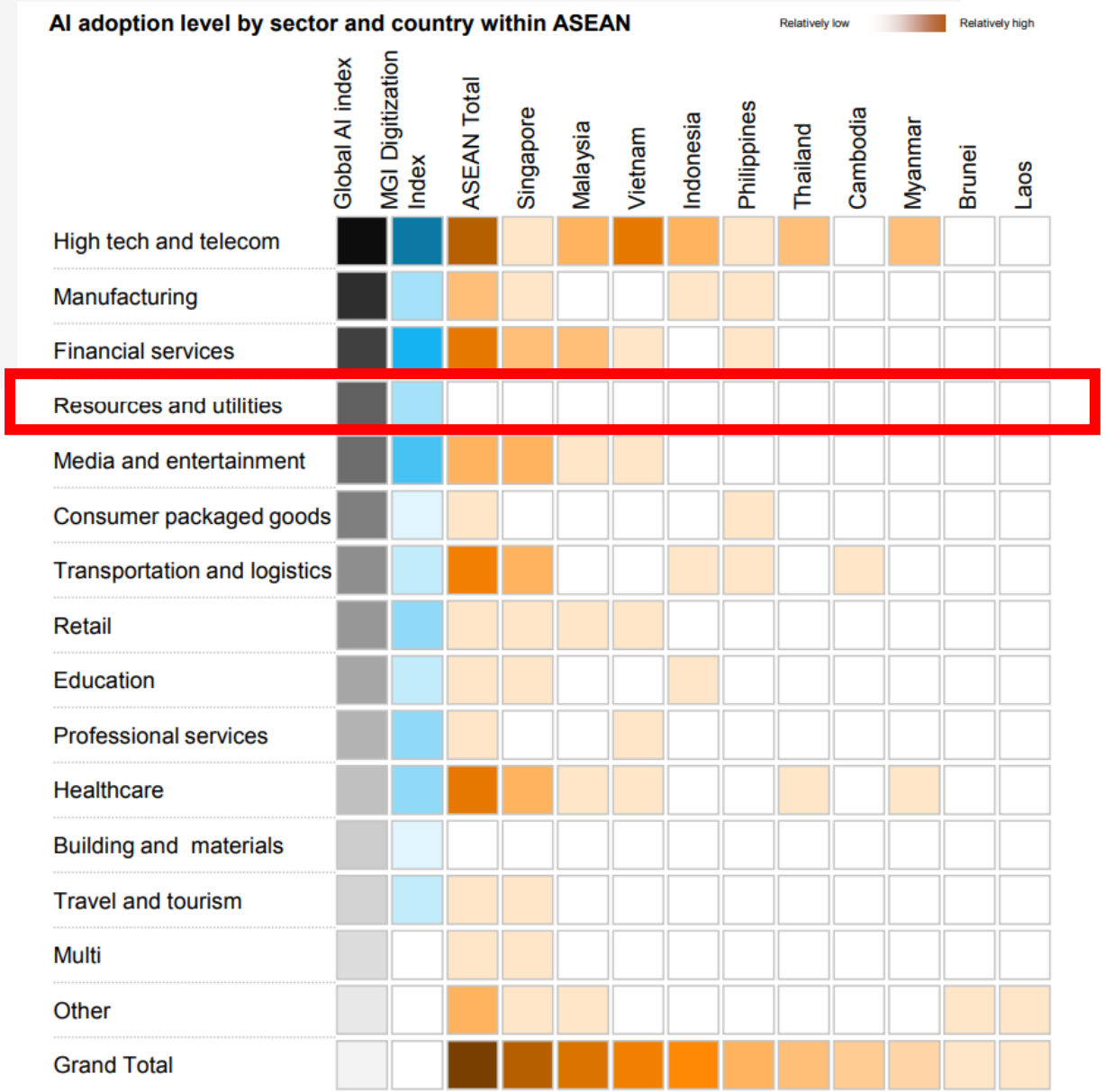
1. Data is abundant in resource

Source: IBM, 2017

2. Data is reusable and replicable

3. Data's value is in the eye of the beholder



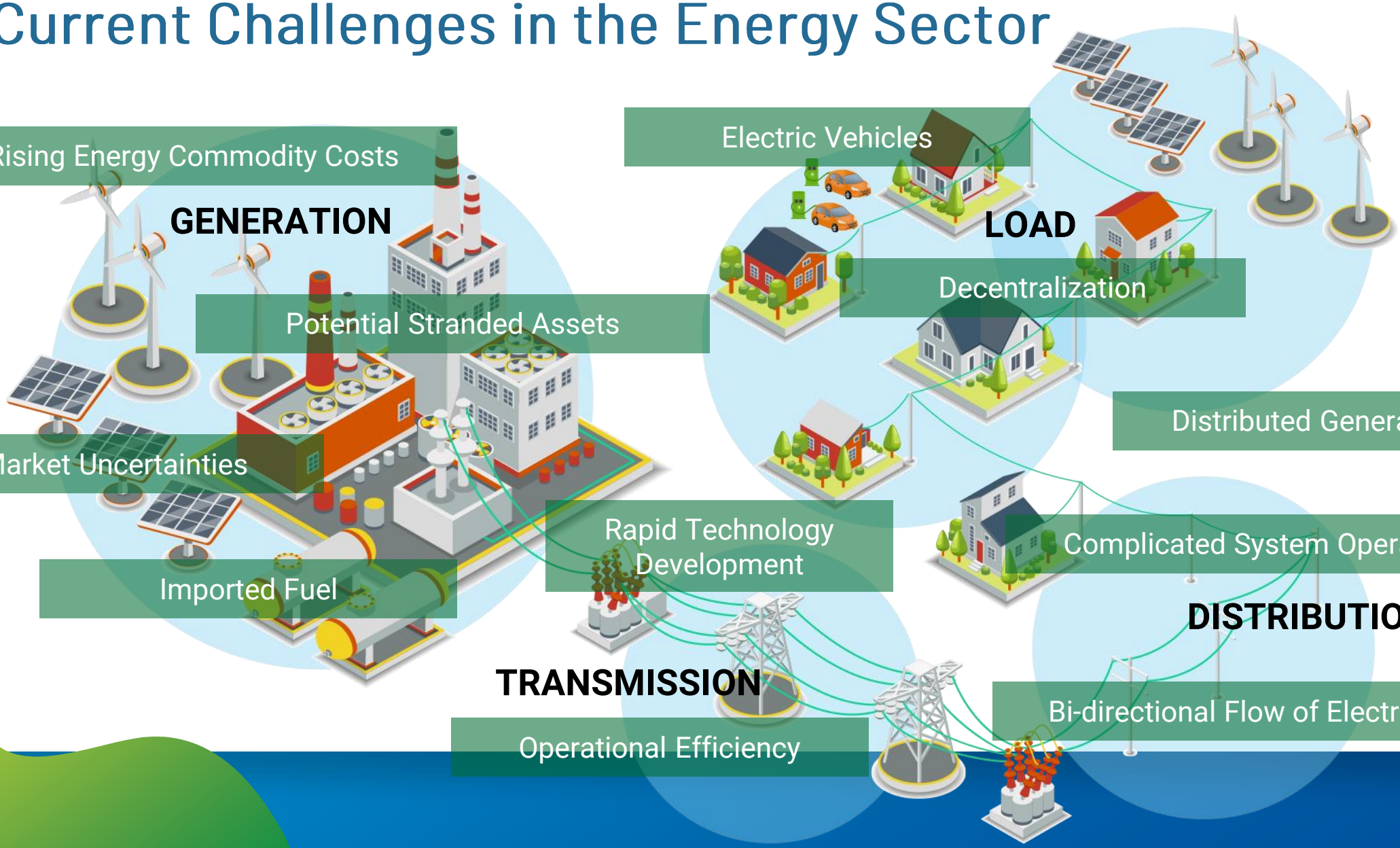


SOURCE: McKinsey Global Institute AI adoption and use survey; Digital Europe; Pushing the frontier; McKinsey Global Institute, June 2016; Digital America: A late of the haves and the have-mores, McKinsey Global Institute, December 2015, McKinsey Global Institute analysis, Sources for ASEAN index: press search of examples of AI development or adoption achieved or planned – indicative rather than exhaustive

Despite the increasing value of data, **Energy and utilities are lagging** in terms of adoption of more advanced data technologies.

Source: McKinsey & Company, 2017

Current Challenges in the Energy Sector



"Data and digitalization is key towards achieving net zero for the energy sector."

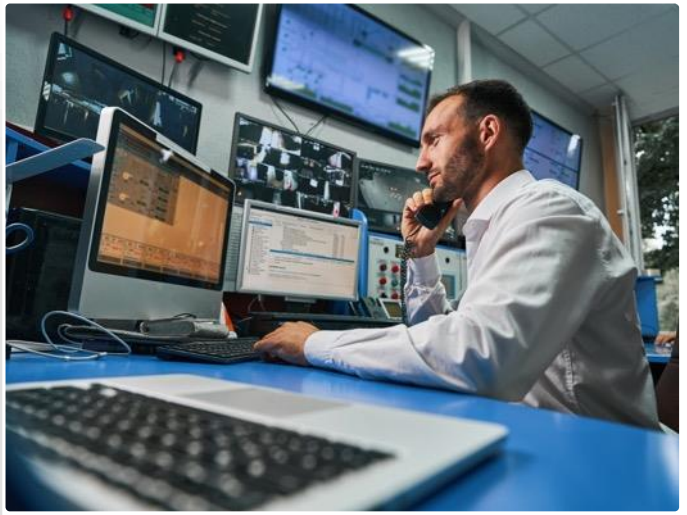
It allows us to extract the insights required to direct the energy transition.

Source: Ashurst, 2021

How can data solve these issues?

ENERGY POLICY

FORECASTING AND PLANNING



SYSTEM OPERATIONS

Impacts of Data on Energy Policy

VRE cost savings

Recurring Outages of Baseloads and its costs

Automatic fuel pass-through

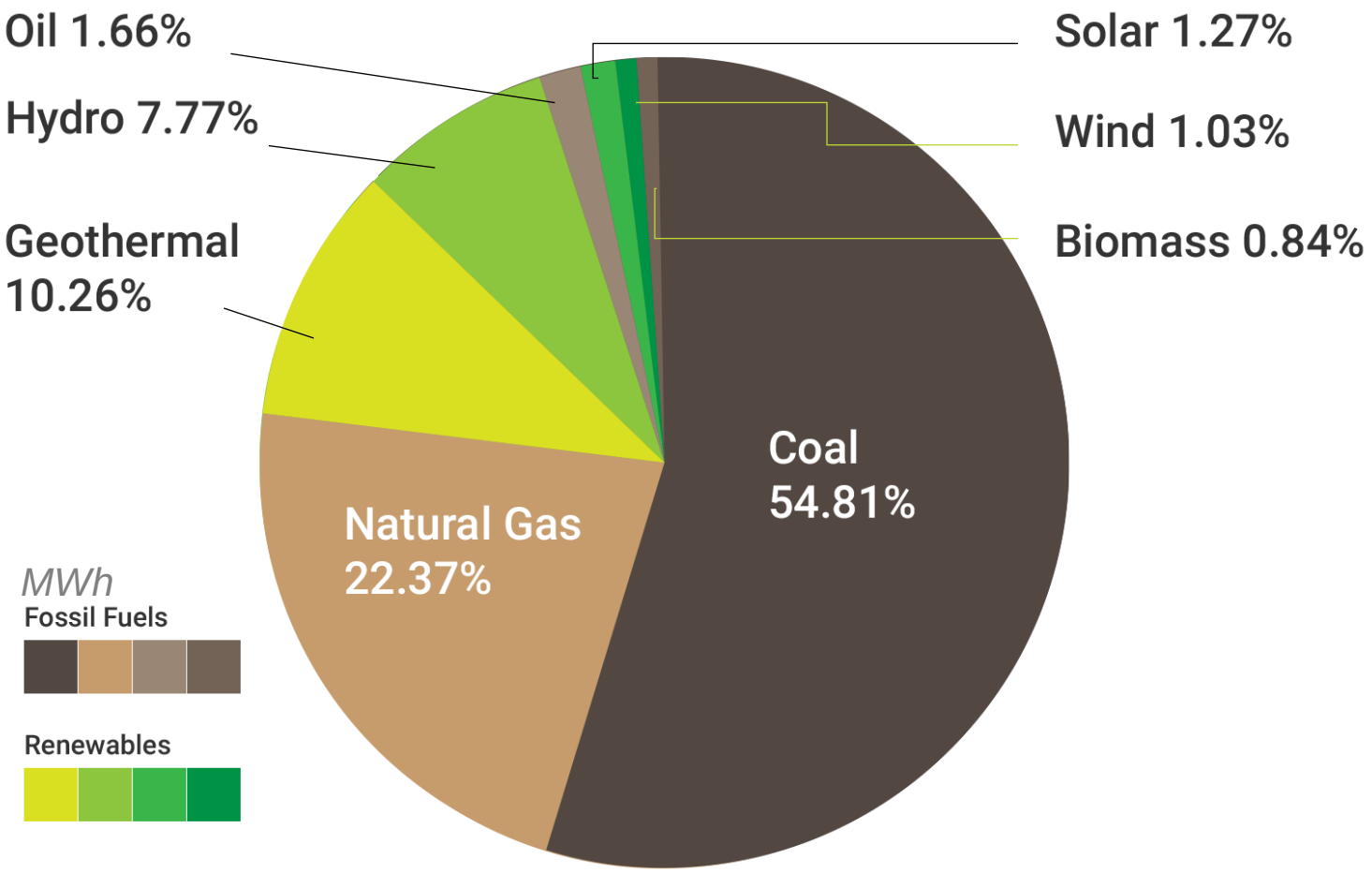
Source: CASE PH, 2021

- Partnership between CASE for Southeast Asia and Department of Energy (DOE)

- Study that utilizes the WESM Data to assess existing coal and variable renewable energy plants

Source: CASE PH, 2021

Philippine Energy Mix in 2019



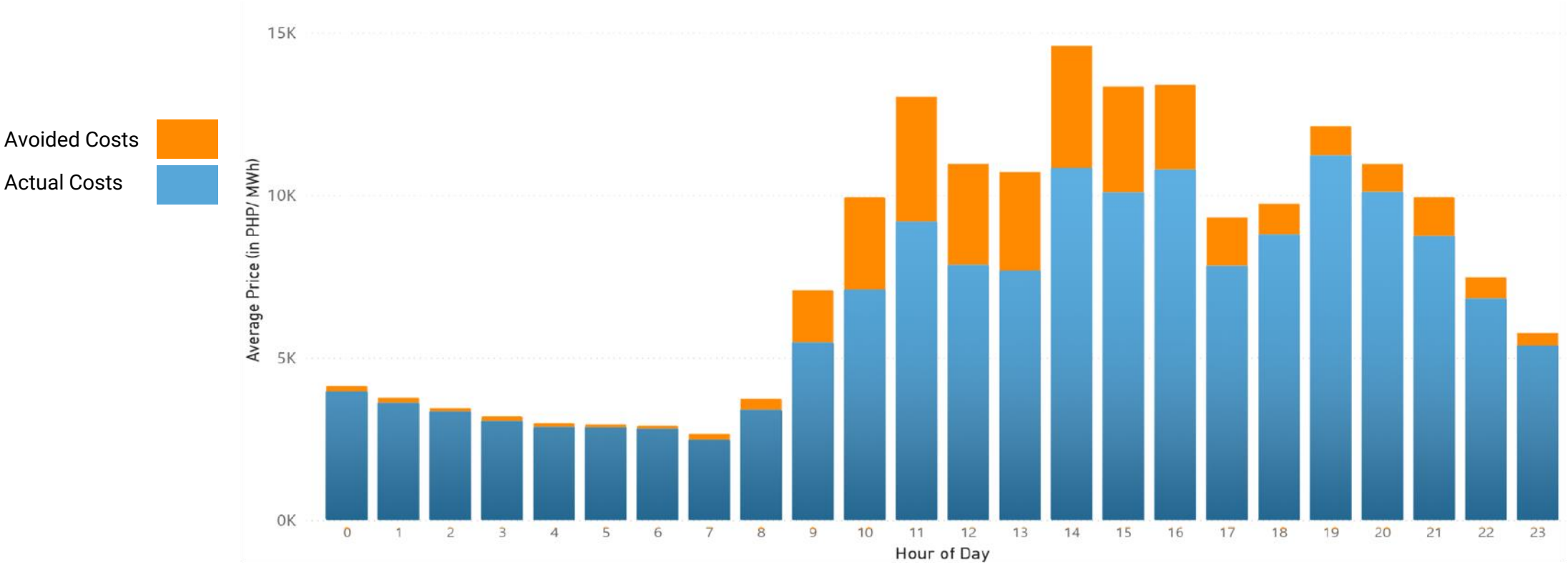
Fossil fuels account for around **75% of the energy mix.**

Meanwhile, VRE only account for less than **3% of the energy mix**.

Source: CASE PH, 2021

VRE avoided market costs in its past years of operation

Renewable has **reduced the settlement price of electricity by 28%** during peak hours even with less than 3% share in energy mix



Source: CASE PH, 2021

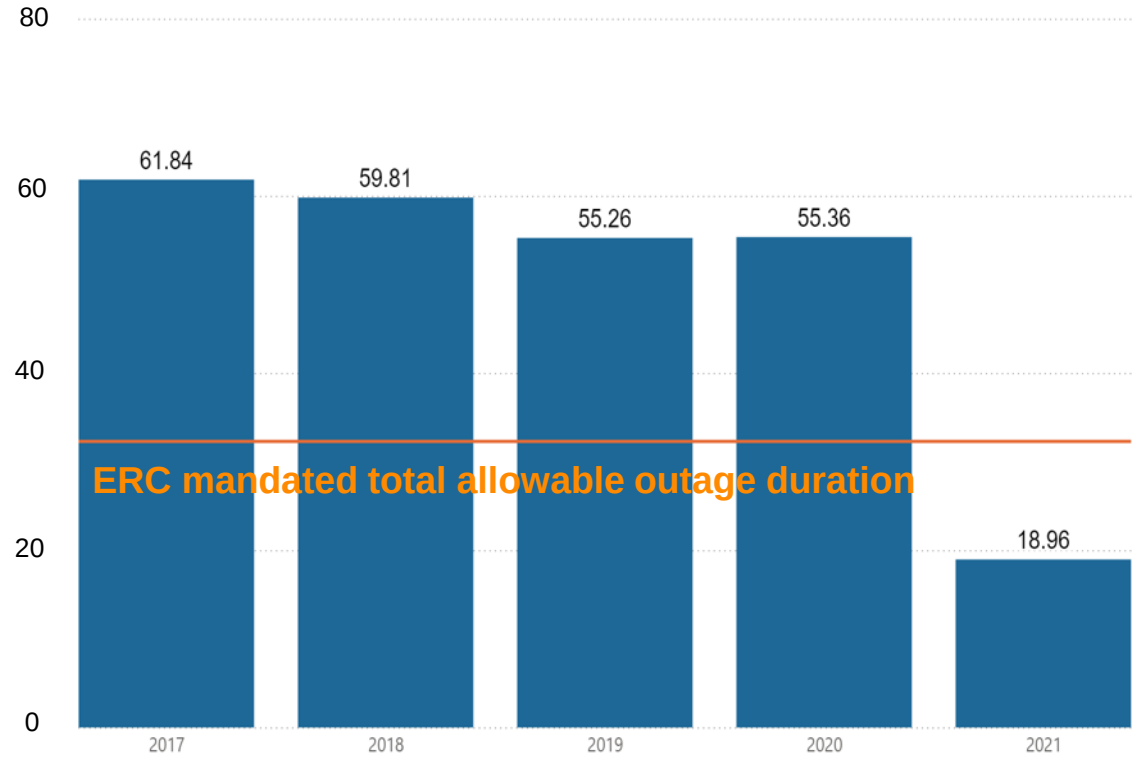
Recurring outages by coal plants

Frequent and recurring outages of plants **exceed their ERC-mandated limits**

Circulating Fluidized Bed

Average Outage Duration

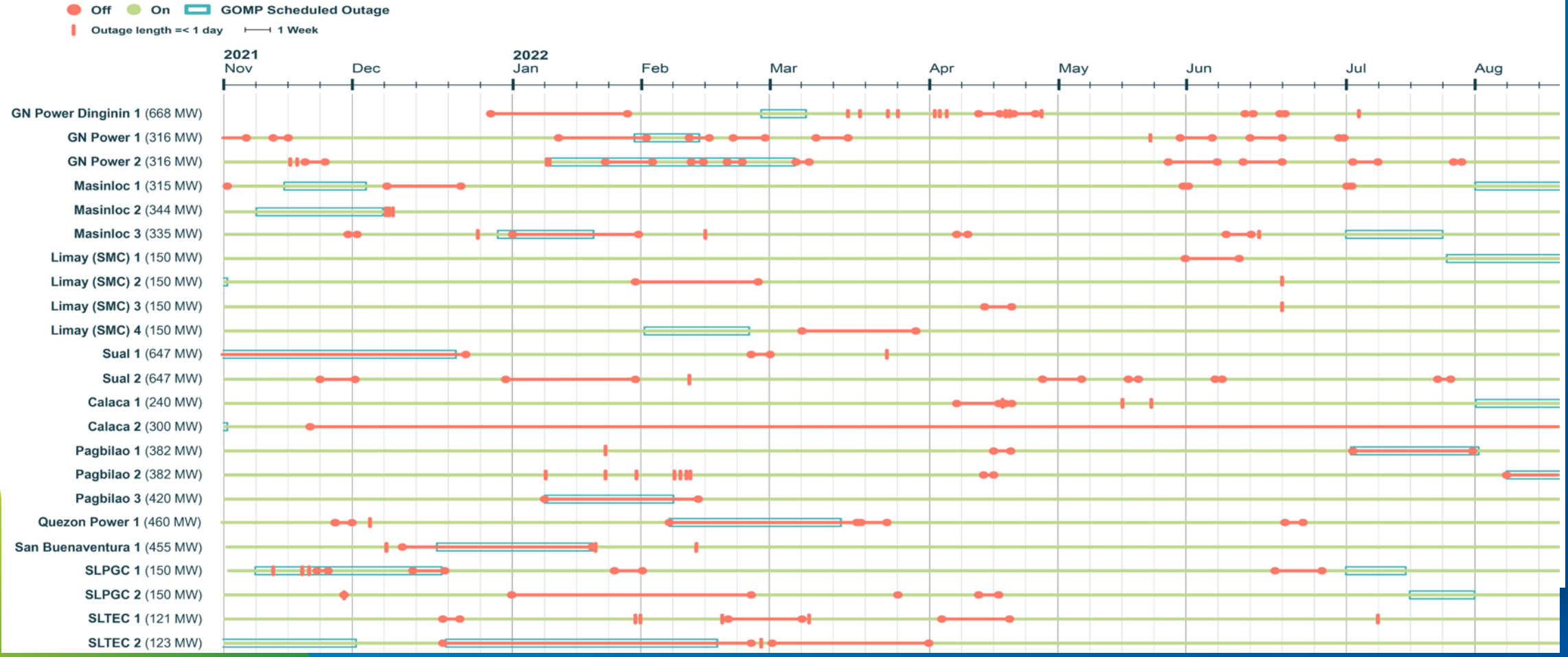
Days



Source: CASE PH, 2021

Recurring outages by coal plants

Frequent and recurring outages of plants are **not scheduled** based on the Grid Operations and Maintenance Program or GOMP.

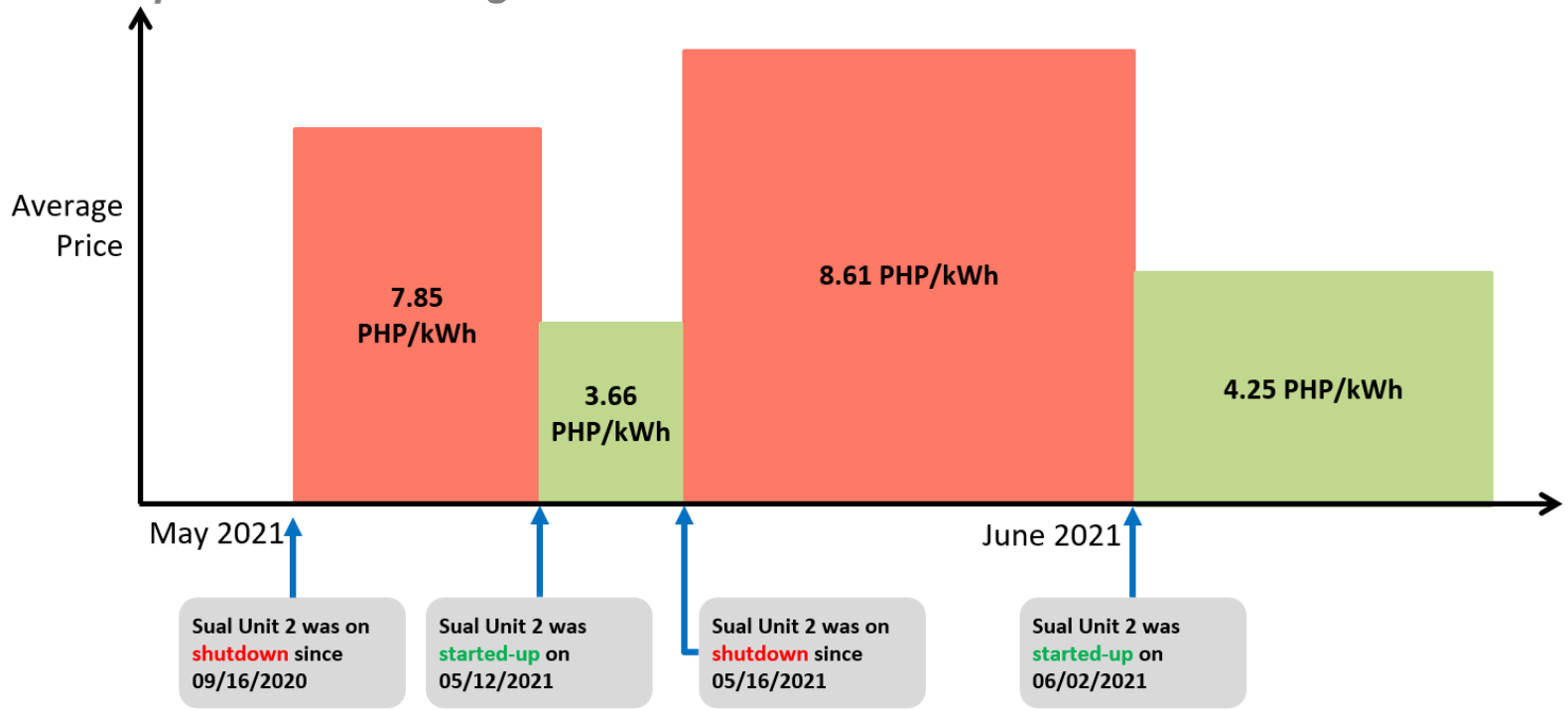


Source: CASE PH, 2021

Costs from recurring outages by coal plants

The average generating cost in the spot market **significantly increases whenever a coal plant is unavailable**

Sual Unit 2 Timeline of Operation vs. Price of Electricity in the Spot Market during Summer 2021

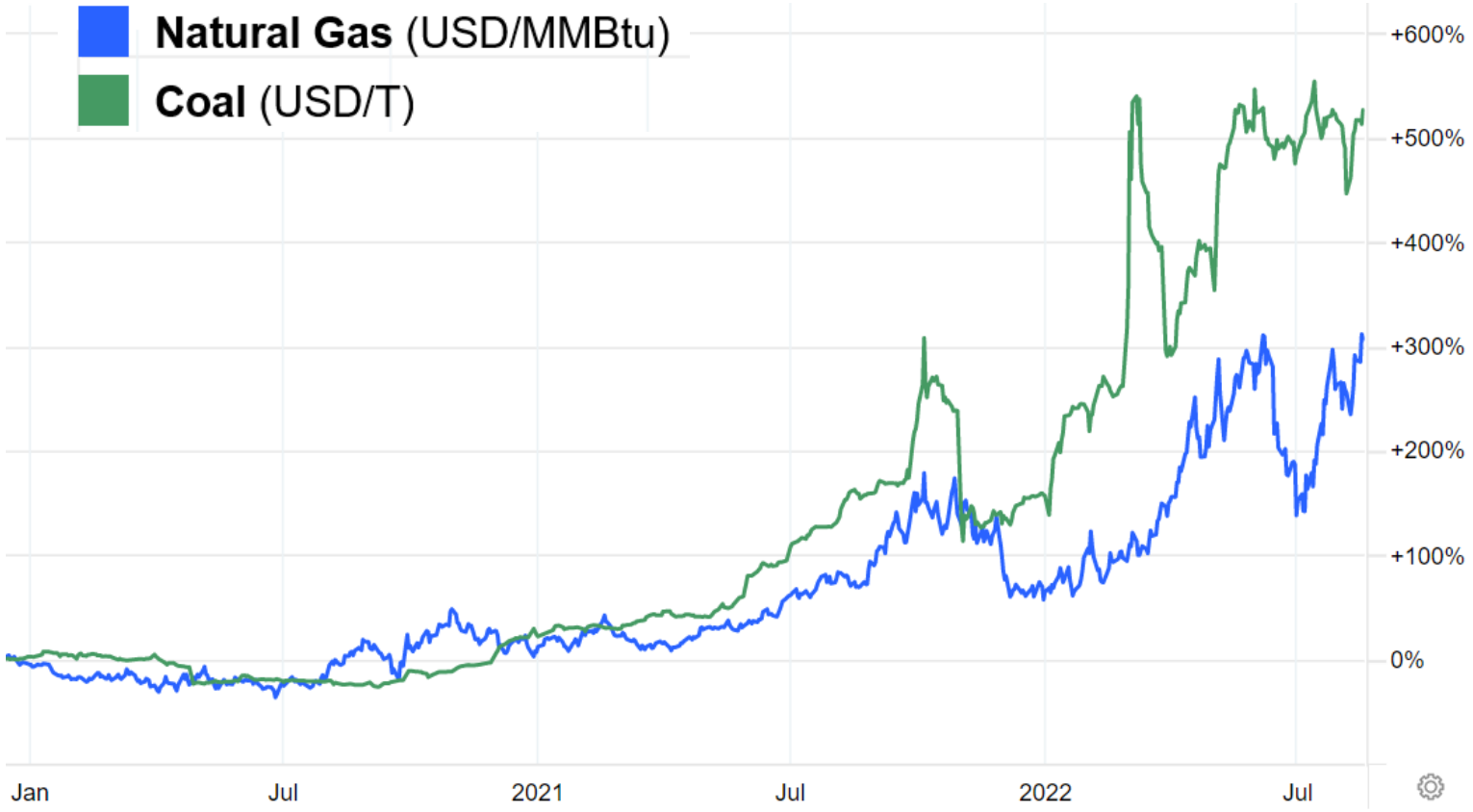


1 BILLION peso increase in system market costs in just **two days of outages**

(during the previous rotating blackouts in Luzon)

Source: CASE PH, 2021

Automatic Fuel Pass-Through in PPAs



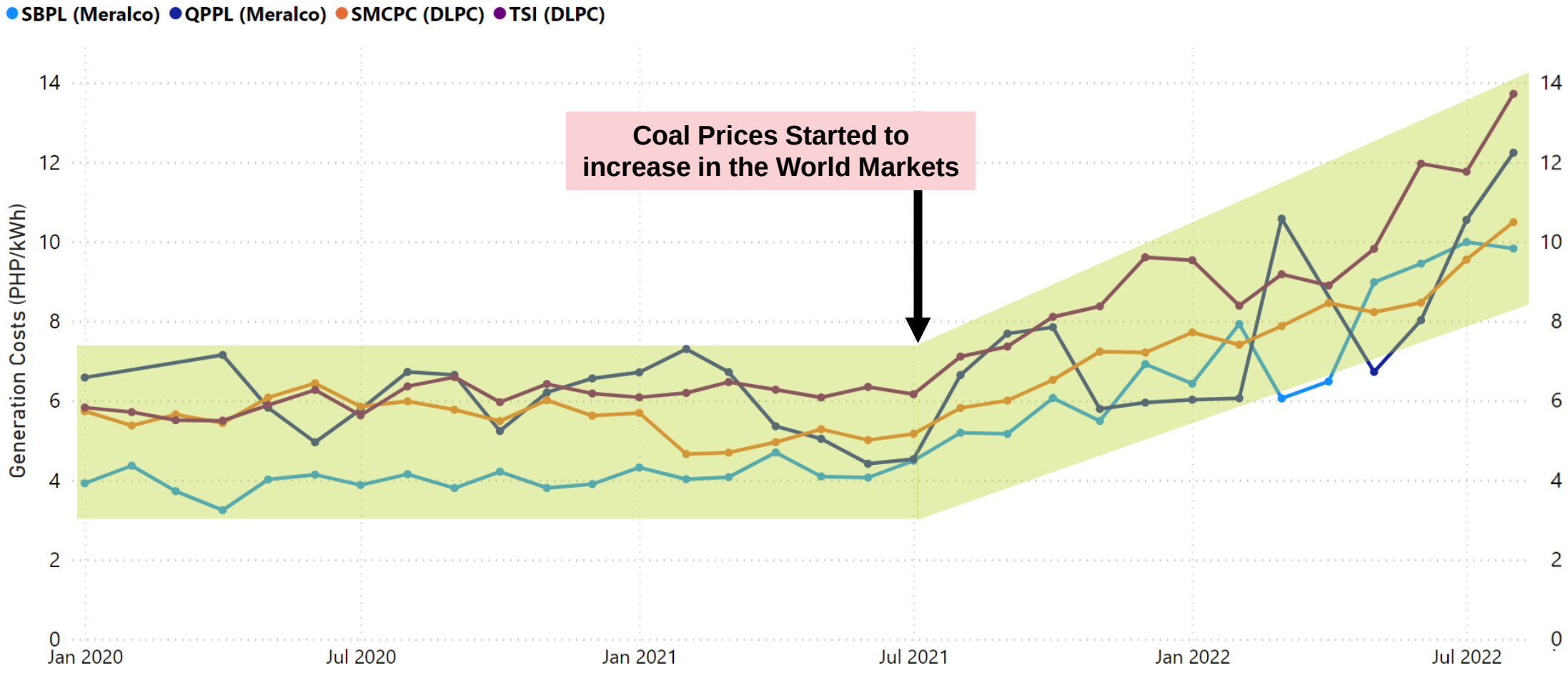
Automatic fuel pass through

It is the agreement between a power generator and a distribution utility to **sell electricity based on the current cost** of the benchmark fuel

Source: CASE PH, 2021; Trading Economics, 2022

Automatic Fuel Pass-Through in PPAs

Generation price breakdown shows the increase in prices of Coal that is **directly translated to the consumers**



Source: CASE PH, 2021; MERALCO, 2022; Davao Light, 2022

Impacts of Data on Forecasting and Planning

Asset management and maintenance

RE dispatch planning

Demand forecasting

Source: DNV GL, 2018

Asset management and maintenance

- Different assets will have different maintenance programs based on economic benefit.
- Data and digitization **supports the execution and optimization of maintenance workplans**

Corrective maintenance
ex: ‘run to failure’

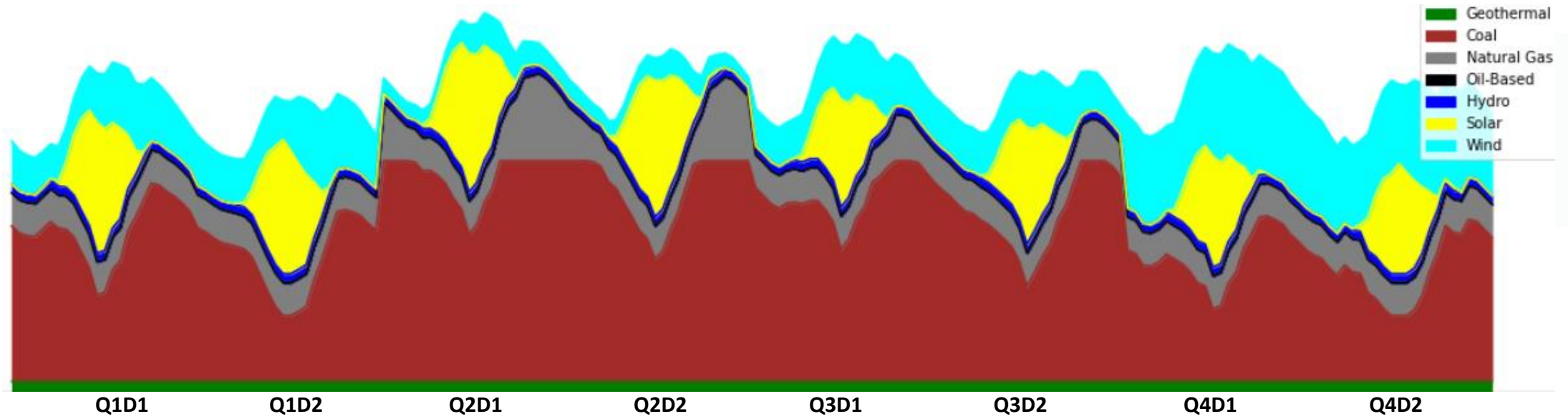
Preventive maintenance
ex: periodic maintenance

Predictive maintenance
ex: maintenance;
reliability-centered maintenance

Source: DNV GL, 2018

Renewable energy generation and dispatch planning

- Power generation from **wind and solar is highly dependent on the weather**.
- Generally, weather forecasts are used as the basis of forecasting of renewable energy
- Data and digitization can help integrate VRE by **enabling grids to better determine how much additional conventional energy** is further needed to match energy demand



Source: DNV GL, 2018

Demand forecasting

- Since the balance between the power supply and demand across all time periods is necessary, **demand forecasting is crucial**.
- Electricity demand is **highly influenced by the weather – particularly, cooling loads**.
- Data and digitization can **aid in bottom-up forecasting** which is necessary since loads are becoming more correlated due to the ongoing electrification of processes. Traditionally, a top-down approach is being done.

Source: DNV GL, 2018

Impacts of Data on System Operations

WESM Operations

Decentralization

Smart Demand Response

Source: DNV GL, 2018

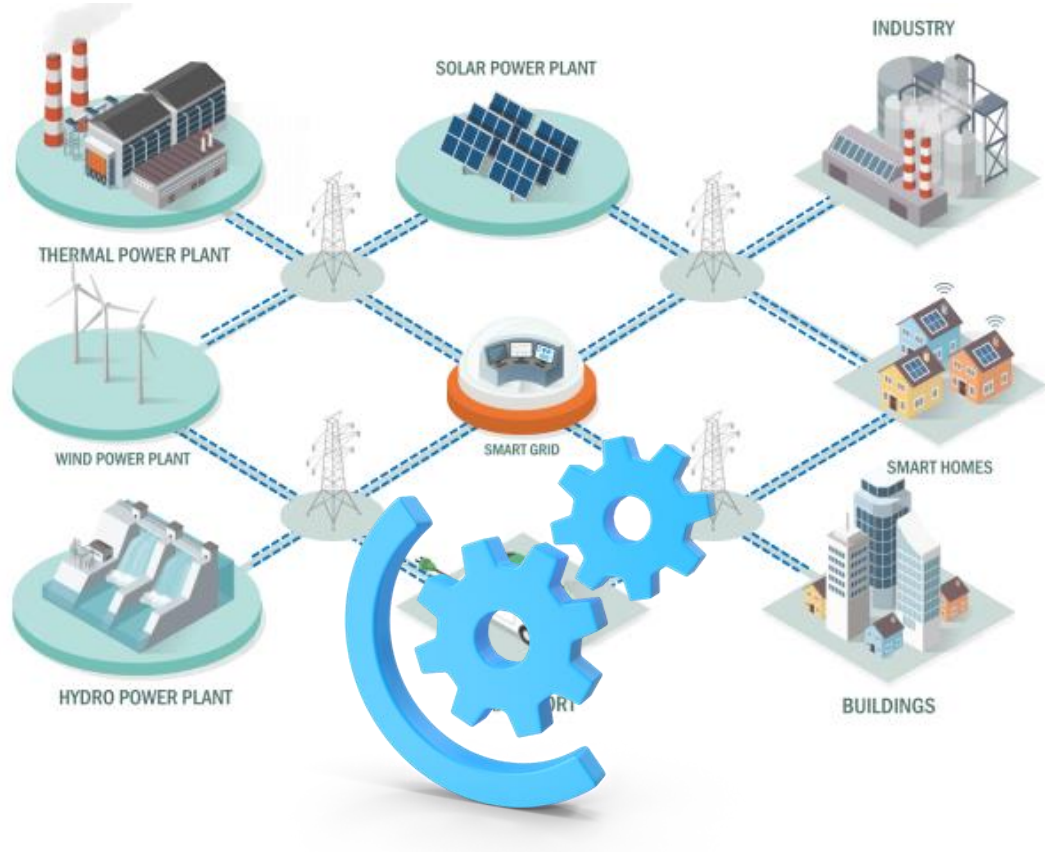
Wholesale Electricity Spot Market Operations

- WESM operations include **scheduling, pricing, dispatch, and settlement.**
- Data and digitization **gives traders, retailers and aggregators a better insight in their current and future market positions and risks**, leading to the development of tools that can swiftly act on these insights.

IEMOP
INDEPENDENT ELECTRICITY MARKET OPERATOR
PHILIPPINES

Source: DNV GL, 2018

Decentralization of System Operations



- **Wind and solar** are energy sources that are geographically distributed and vary with changing weather conditions.
- **Bidirectional flow of electricity is possible,** which complicates the grid operation.
- Data and digitization can help developments **towards more autonomous operational decision making**, to better adapt to the continuously changing circumstances.

Source: OECD/ IEA, 2017; DNV GL, 2018

Smart Demand Response

- Demand response is the most economically feasible solution to provide flexibility to **accommodate higher penetrations of renewable variable energy.**
- This is done by **adjusting consumption to meet the profile of the generation**.
- Data and digitization can **enable a higher degree of automation** that is required to drive smart demand response

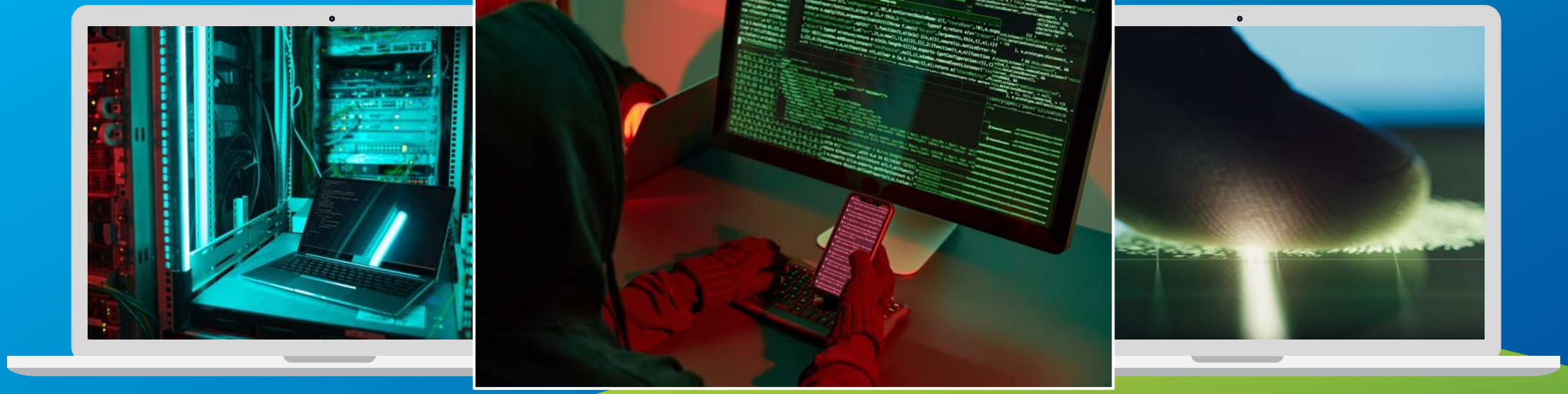
Source: DNV GL, 2018

Barriers to Data Adoption

Data Silos and availability

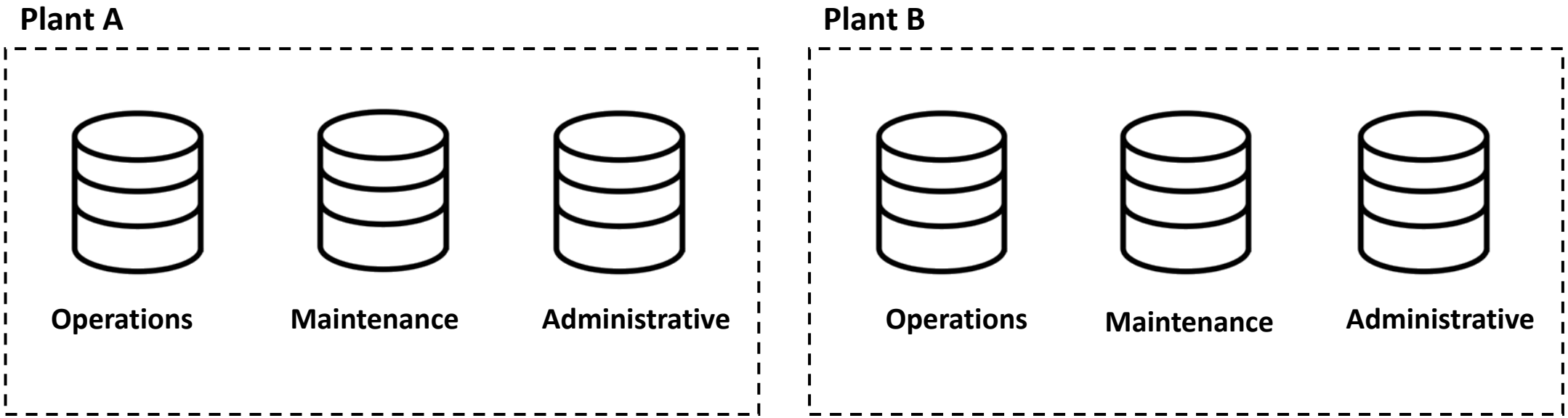
Cybersecurity

Data privacy and ownership



Data availability and Data silos

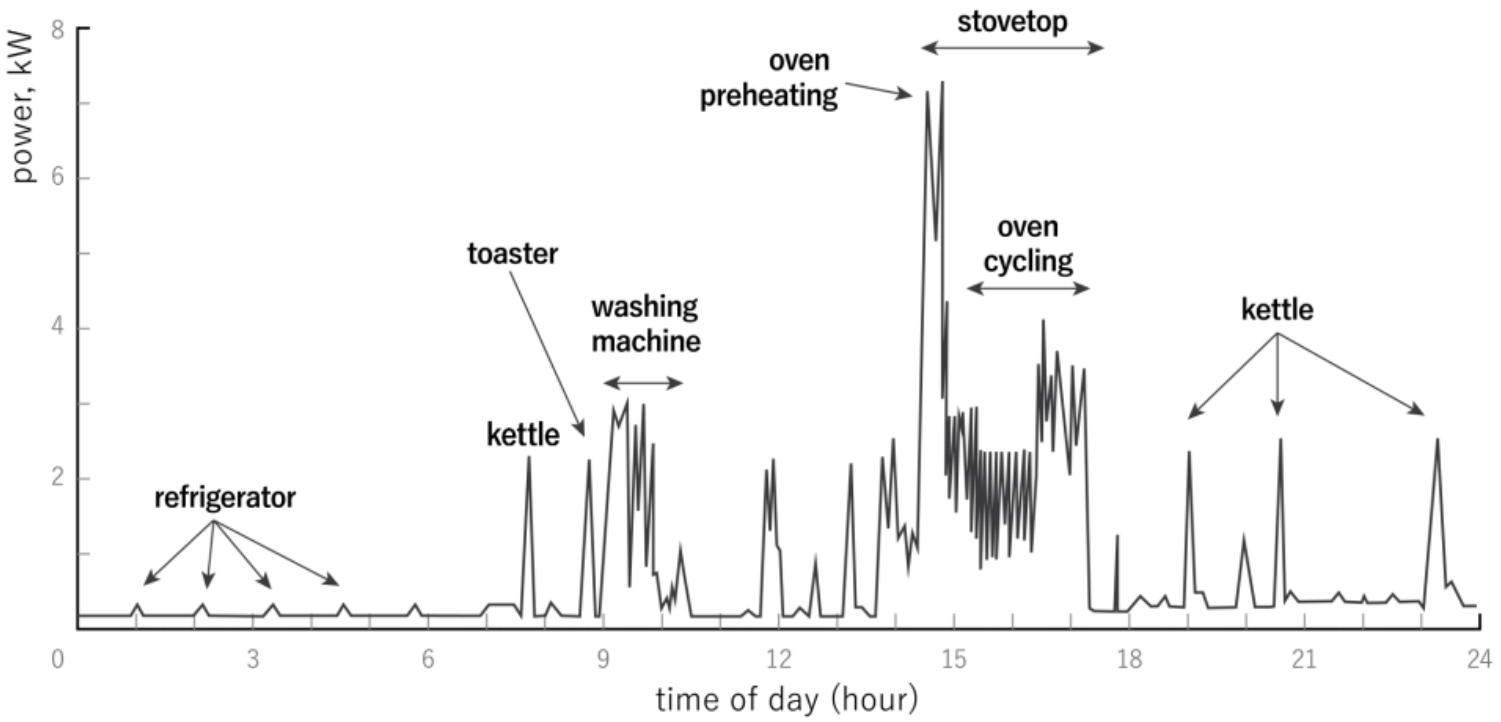
- A **data silo** consists of stored data that is not available to the ones that need the data.
- **Combining different datasets can create more value through synergies**.



Source: OECD/ IEA, 2017

Data Privacy and Ownership

Privacy and data ownership are becoming a major concern as more and more **detailed data are collected** from smart meters about household energy use.



Source: Newborough and Augood (1999), "Demand-side management opportunities for the UK domestic sector" (reproduced courtesy of the Institution of Engineering and Technology).

Source: OECD/ IEA, 2017

Cybersecurity

- Digitalization **can make energy systems more vulnerable to digital risks**, such as geomagnetic storms and cyber-attacks.

- Impacts can be minimized through:
  - Raised awareness, cyber hygiene, standard setting and staff training
  - Coordinated and proactive preparation by companies and governments
  - Design digital resilience in technologies and systems

Source: OECD/ IEA, 2017

Takeaways?

- Data and digitalization is **essential to accelerate the energy transition**, but alone will not lead to CO2 emission reduction.
- Data and digitalization is here to stay, we need to **embrace it to move forward**.

Data and digitalization fuel the energy transition.

Thank you!

jephraim@icsc.ngo

References:

[1] Data analytics in the electricity sector, DNV GL Group Technology & Research, 2018
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