WEBINAR

"Procurement's role in delivering sustainable energy"

14th Nov 2023, 10am

Simon Frost

David Nash

Andy Joynson

Shirley Robertson

James Flanagan

NOVALUX

ADJ Consulting
Net Zero Factories

Scottish & Southern Electricity Networks

FROST
PROCUREMENT ADVENTURER

PROCUREMENT HEADS

Simon Frost

FROST
PROCUREMENT ADVENTURER

Procurement Expert

Andy Joynson

ADJ Consulting
Net Zero Factories

Energy Expert

David Nash

NOVALUX

Head of New Business Dev.

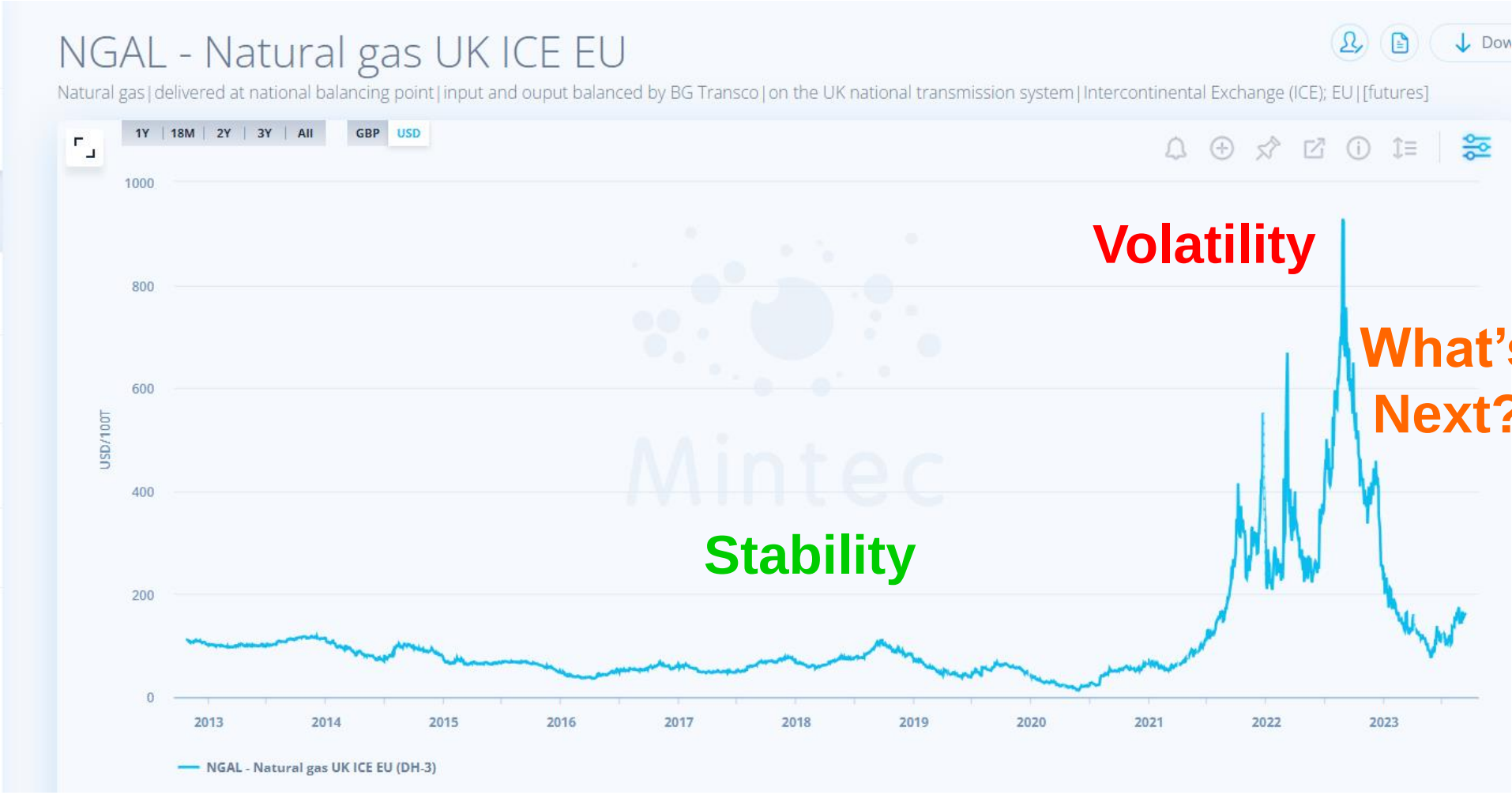
Shirley Robertson
James Flanagan

Scottish & Southern Electricity Networks

Head of Strategic Planning & Sustainability

Director of Procurement & Commercial

Sustainable Energy has become much more viable/interesting…




Why?

"How skilled & knowledgeable are you regarding sustainable energy?"

5/5 – Very Skilled and Knowledgeable

4/5 – Above Average

3/5 – Average

2/5 – Below Average

1/5 – Low (I'm a rookie)

The value we're aiming to give you during this session is:

1. Share tangible ideas for what Procurement can do to deliver Sustainable Energy

2. Open Dialogue

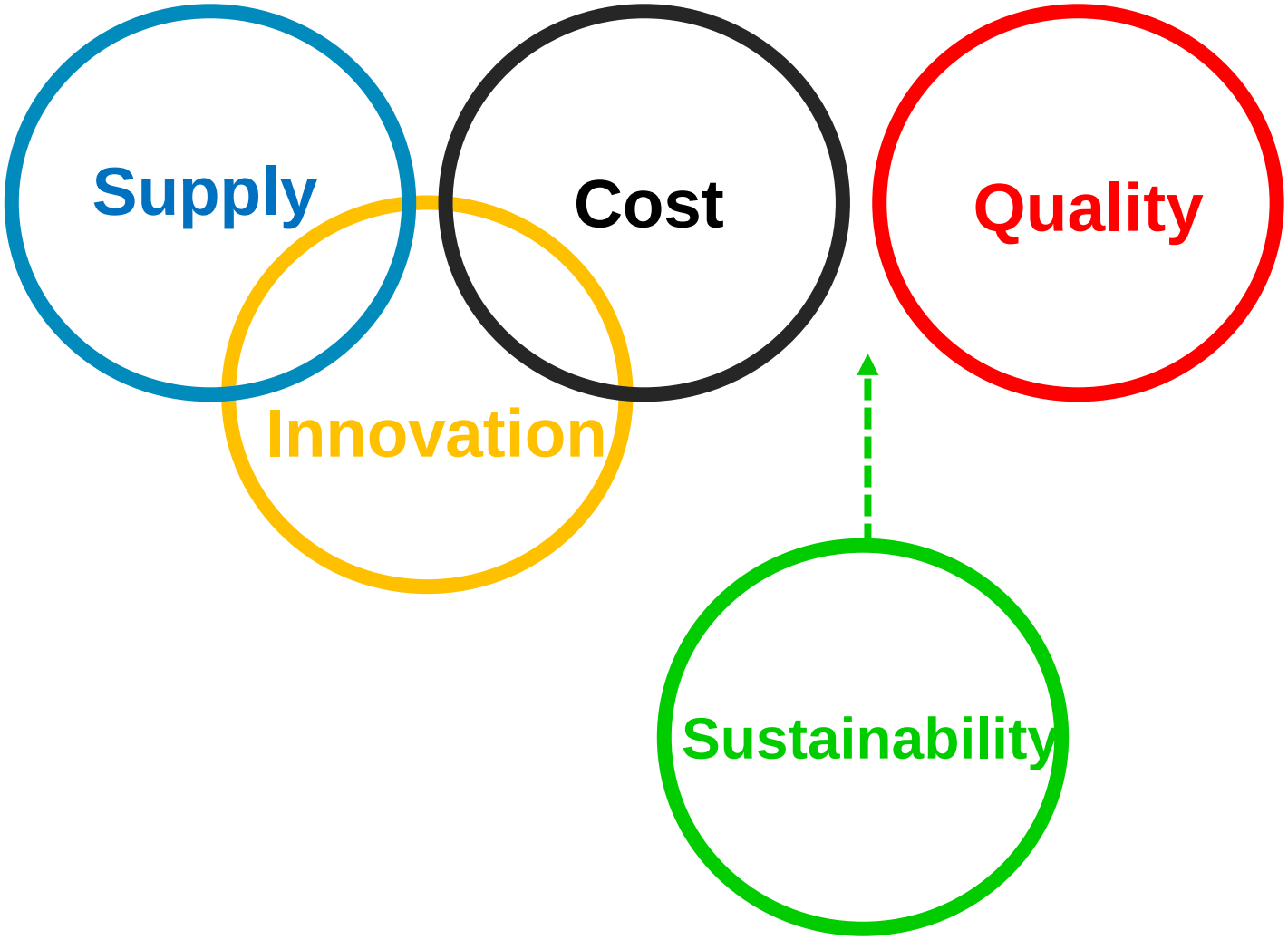
3. Network Community

4. Get you started, if you're not already

1. Procurement’s role (Simon)
2. Sustainable energy reference points (Simon)
3. Using less energy (Andy)
4. Sustainable energy sources (David)
5. Networks & Suppliers (Shirley, James)
6. Wrap Up (Simon)

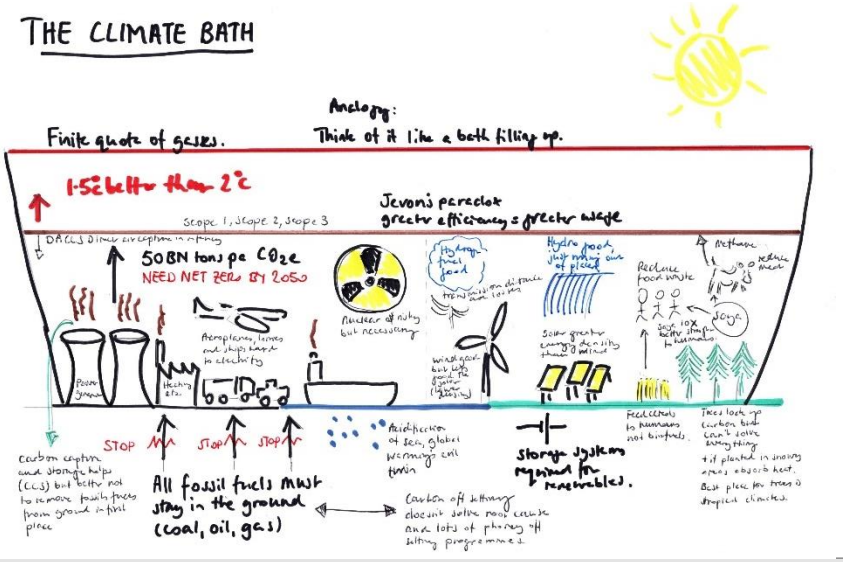
1
Procurement's role

Simon


Supply
Cost
Quality
Innovation
Sustainability

Building up Knowledge

- Books
- Websites
- Network
- Webinars
- Tradeshows
- Database/Crib Sheet
- Concepts



Building up Skills

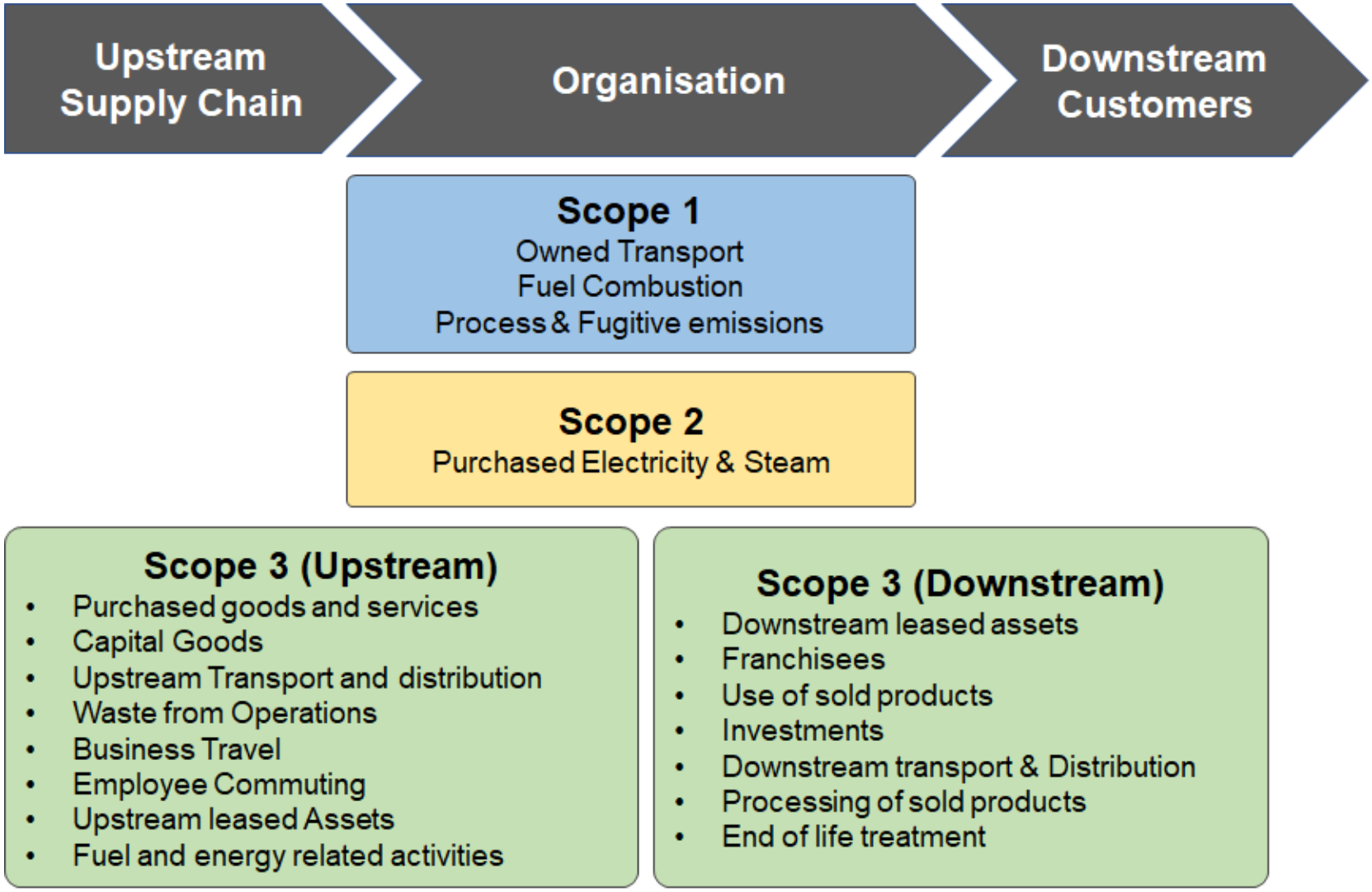
How to…

- Focus on the right areas
- Influence your business & suppliers
- Create a sustainable energy business case
- Measure & monitor impact
- Buy solar or a PPA

>> To deliver a positive result

- Reflect where you fit into the eco-system
- Influencing your business and your suppliers
- Finding your speciality and angle

Procurement can influence all Scope 1, 2 and 3 emissions:



There are two main groups of levers:

Supply Side Levers

Install & utilise more

Demand Side Levers

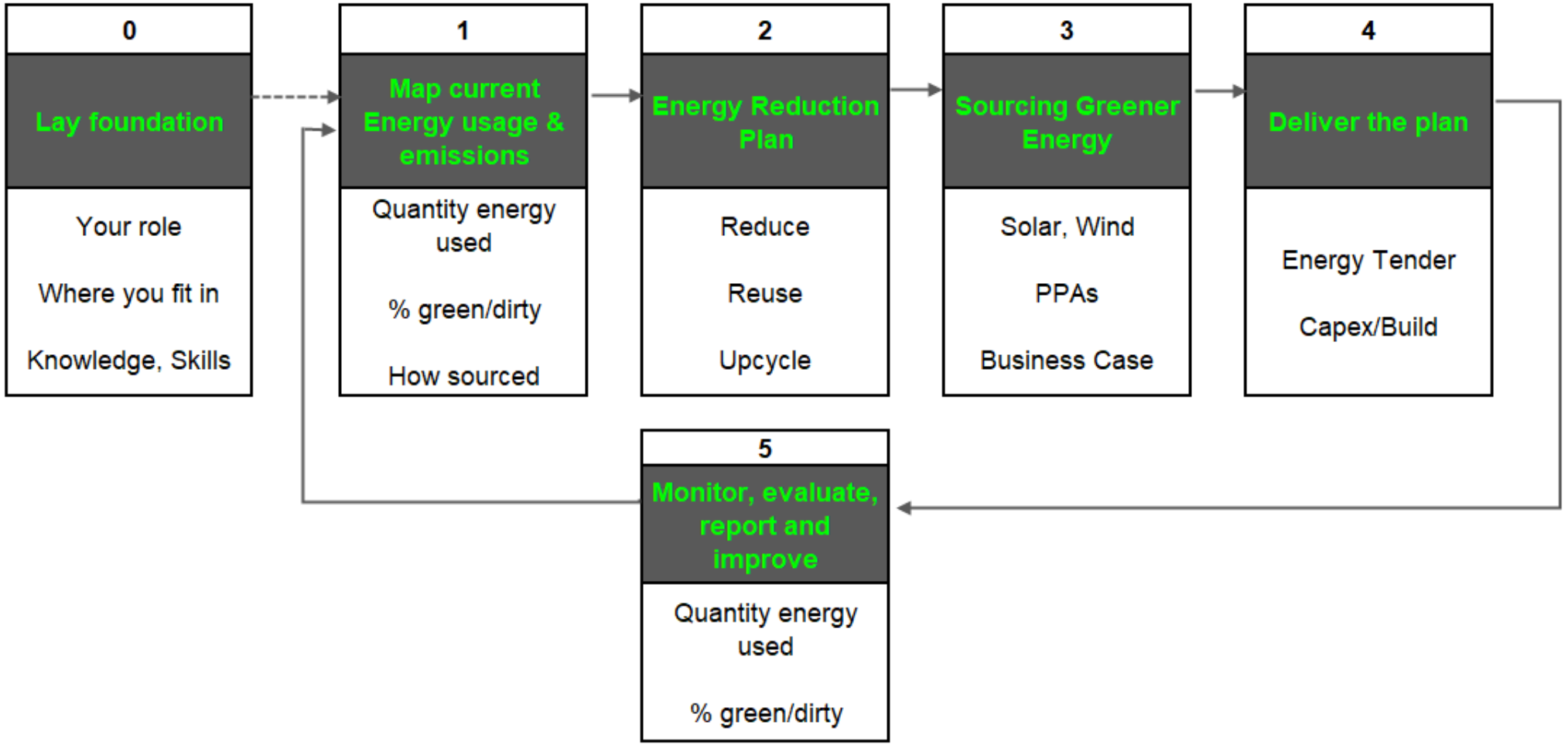
Reduce, Reuse, Upcycle

It helps to understand where we can influence:

Benefit (De-carbonising)					
High	Grid Green Energy (ie green tarriff)	*The easy option*			(Nuclear Fusion) (Nuclear Fission)
Medium	Solar (Installed) Energy Storage Systems	*Actually increasing installed green energy*	Wind (PPA) Solar (PPA)	Wind (installed) Electro-fuels	Hydrodams
Below Average		Biomass Energy from waste Biofuel		Hydrogen	
Lower		Coal > Gas			Geo thermal
	Easier	**Average**	**Hard**	**Very Hard**	**All but Impossible**

Ability to influence

Create a framework for your business and/or your suppliers:



We can work with our suppliers in different ways:

- Collaborative Learning
- Collaborative Training
- Collaborative Buying
- Commercial Structures
- Industry Strategy

- Supplier Weighting
- Supplier KPIs
- Incentives

- Mandate

2
Reference Points

Simon

"How much electricity does the world use per year?"

A – 54,000 TWh

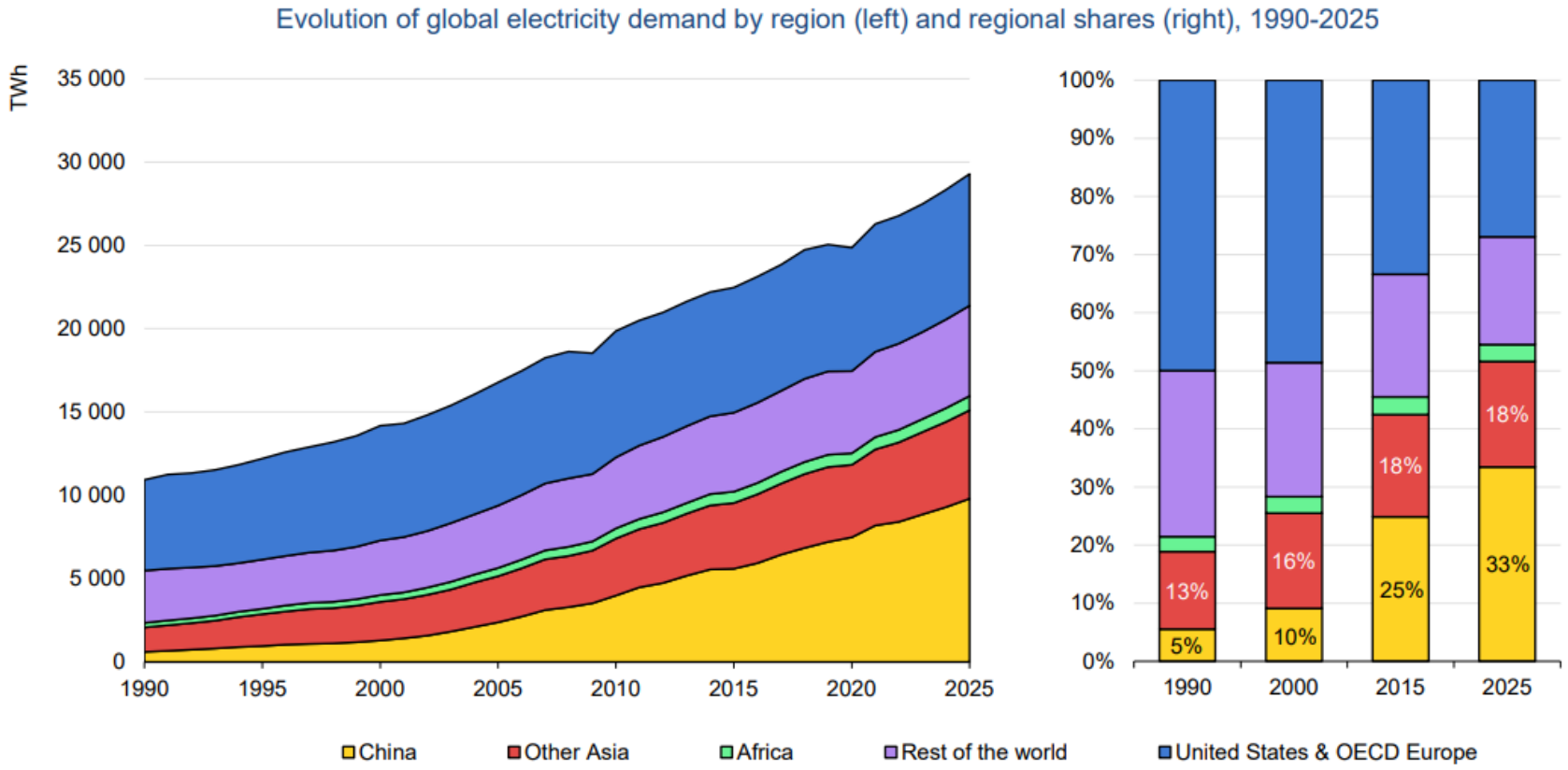
B – 27,000 TWh

C – 13,000,000 MWh

D – 9,000,000 MWh

E – 600,000 MWh

2023 Global electricity consumption is ~27,000 TWh. Demand continues to increase – by 2025, Asia will account for half of the world's electricity consumption and one-third of global electricity will be consumed by China

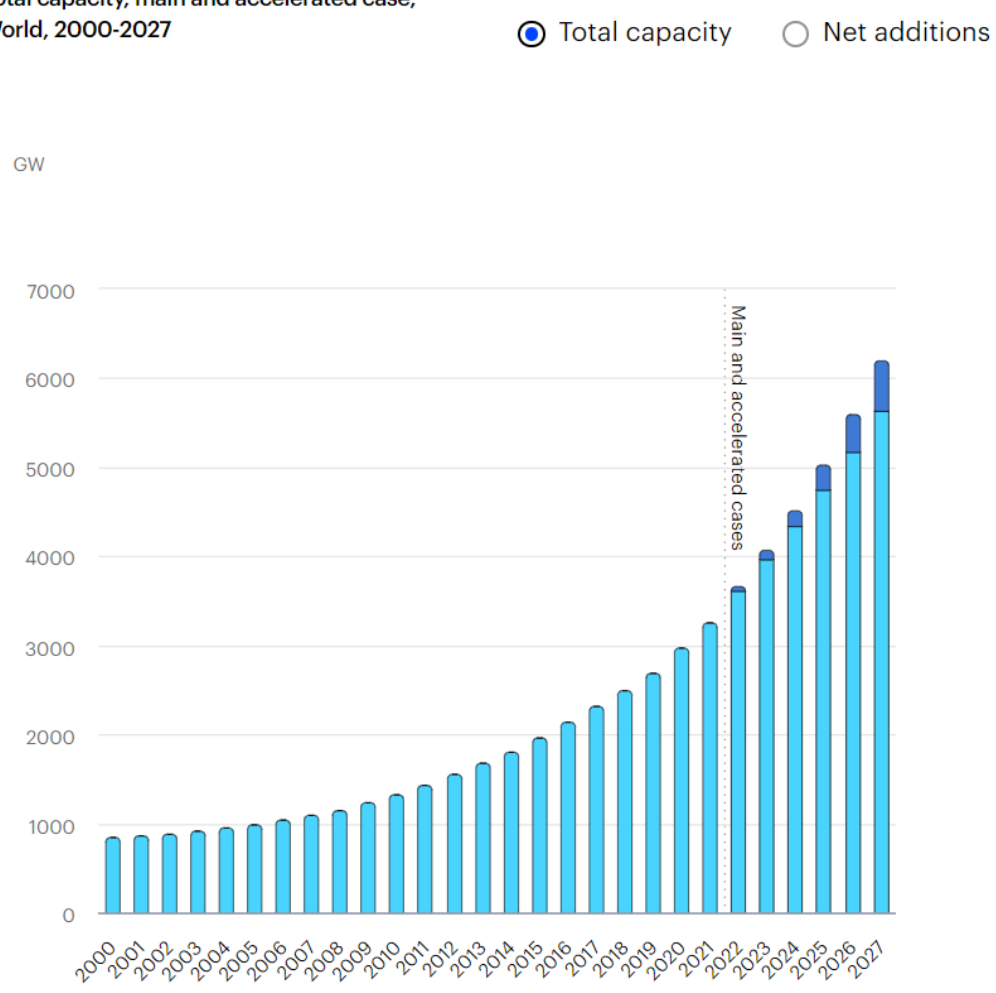


IEA. CC BY 4.0.

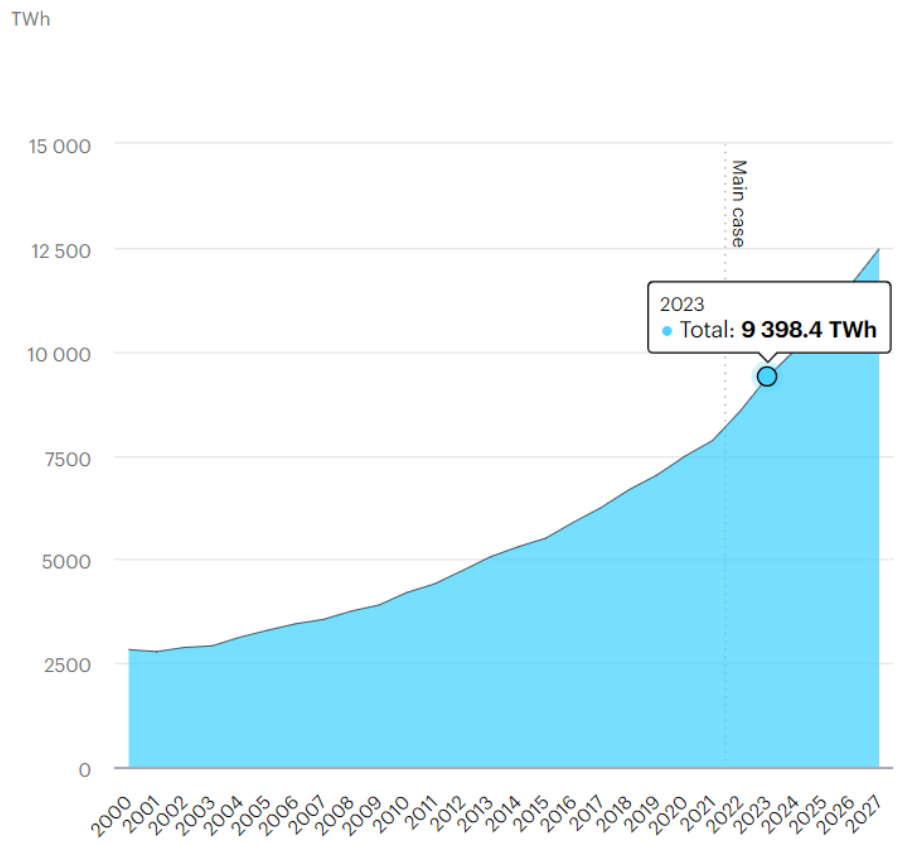
Courtesy of IEA.org

Renewables account for ~1/3 of all electricity production with supply ramping up quickly:

Total capacity, main and accelerated case, World, 2000-2027

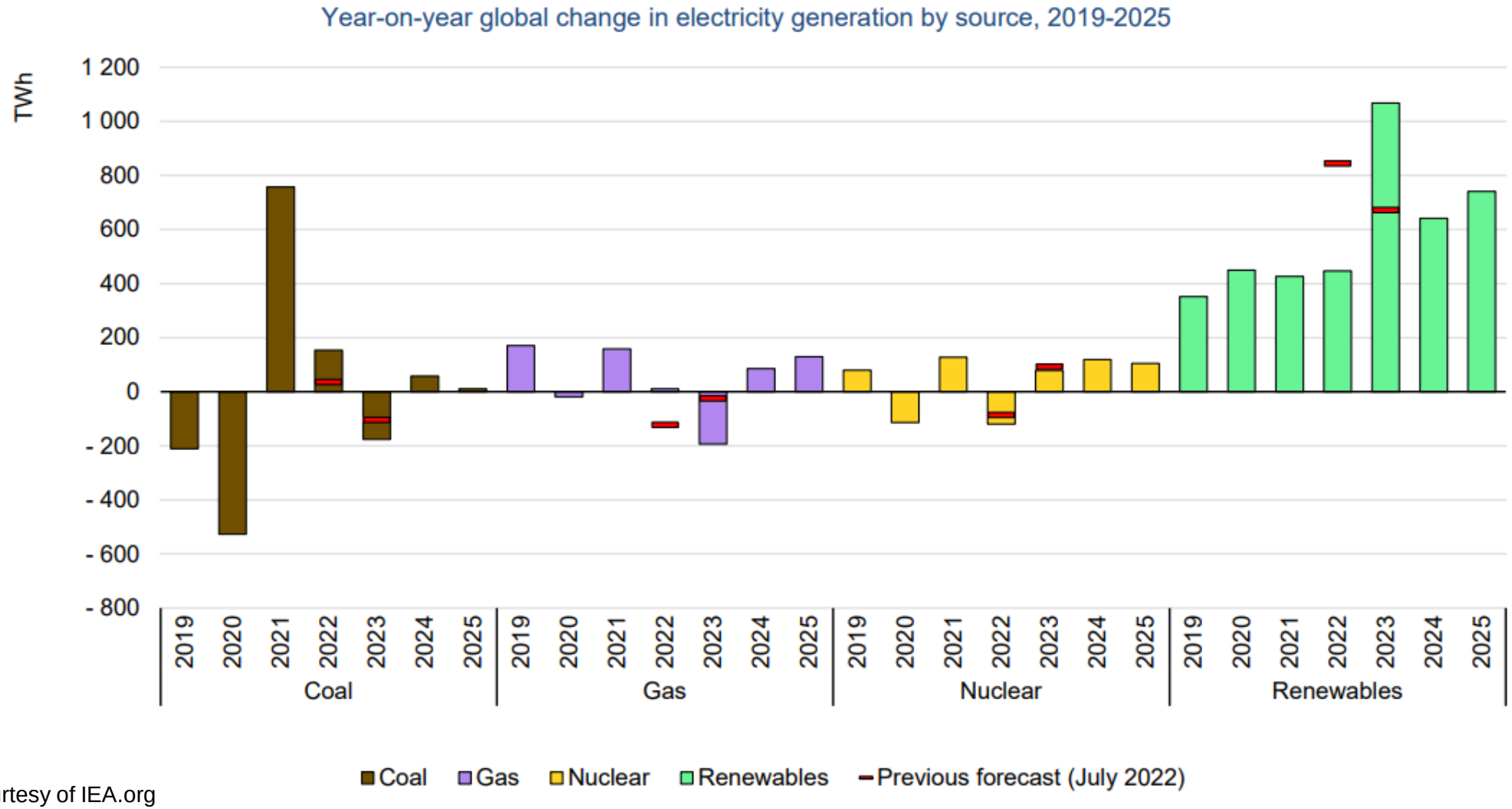


Total generation, main case, World, 2000-2027



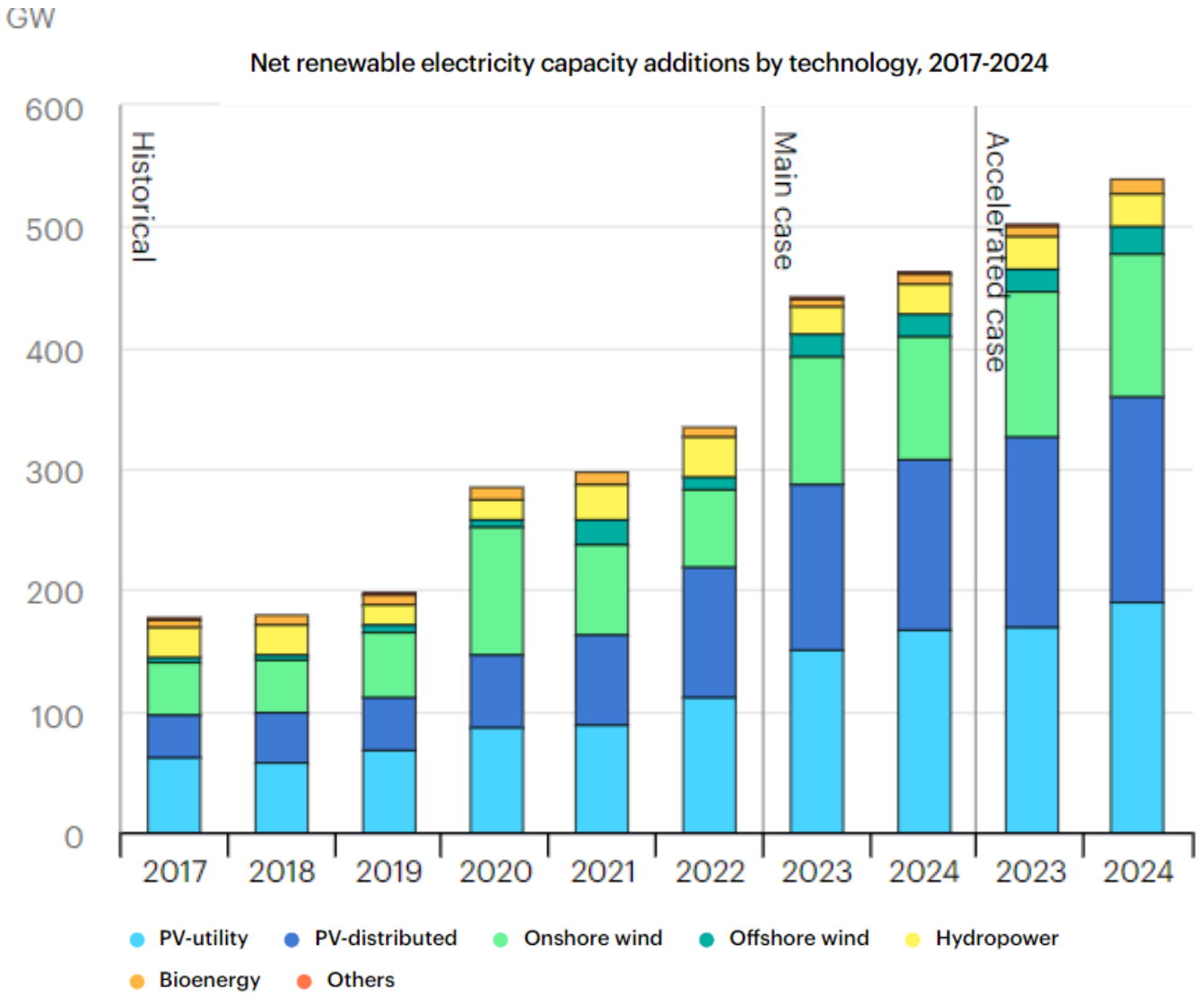
Courtesy of IEA.org

A comparison of sustainable energy sources shows that renewables is dampening fossil fuel generation:



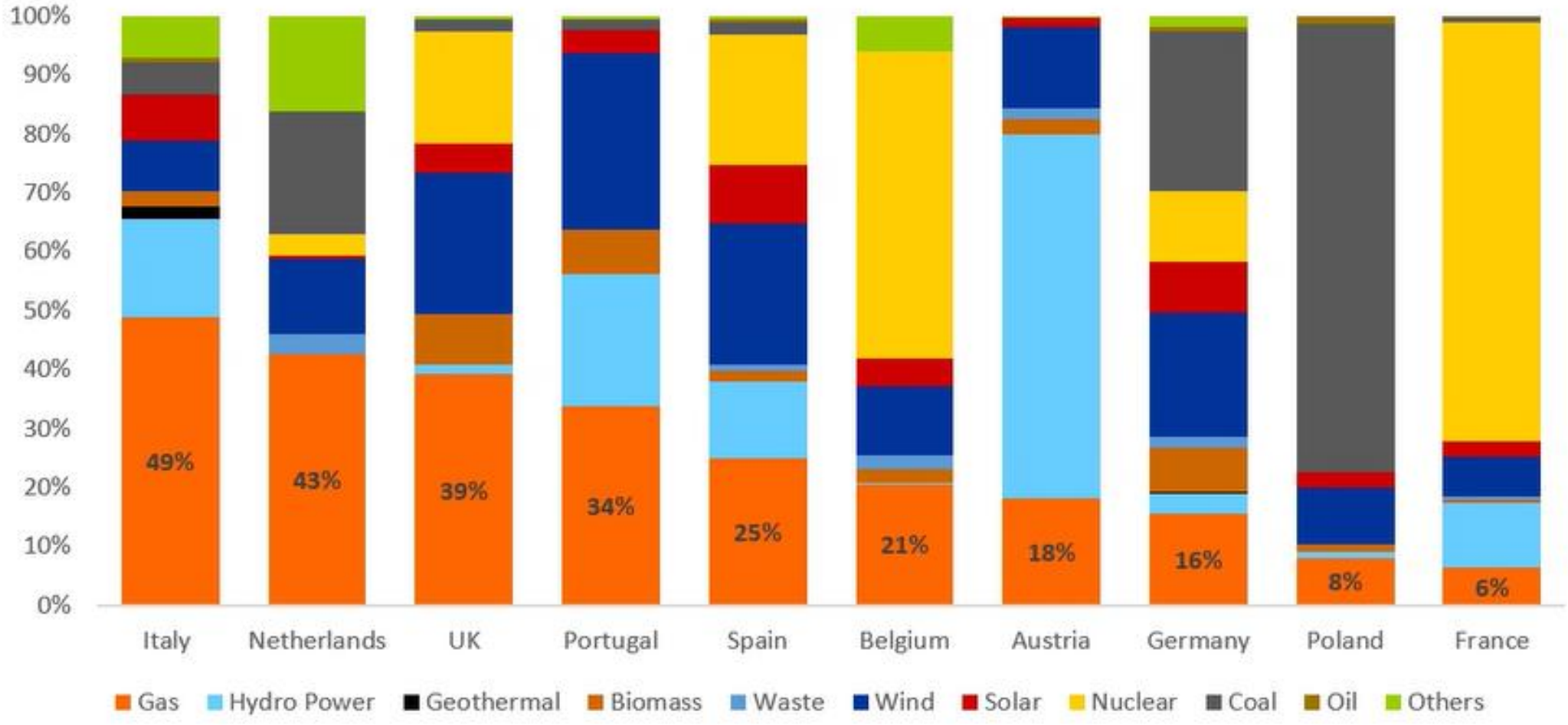
Courtesy of IEA.org

Solar is the big growth area:



Courtesy of IEA.org

The overall energy mix varies considerably by country:



I keep a crib sheet to help me calibrate scale:

Electricity Consumption	Quantity pa
Total World	**27,000 TWh** 27,000,000,000 MWh
Europe	**3,500 TWh** 3,500,000,000 MWh
London	**38TWh** 38,000,000 MWh
1 X large heavy industry factory	**200,000 MWh** 200,000,000kWh …varies considerably by factory
1 X mid-sized food factory	**15,000 MWh** 15,000,000kWh …varies considerably by factory
1 X 4 bed house	**4 MWh** 4,000 kWh
1 X boiling a kettle	0.09kWh

7,700 power stations

Sufficient except summer to winter& day to night imbalance

Electricity Generation	Quantity pa
Coal fired power station size - 500MW	**3.5 TWh** 3,500,000 MWh
Nuclear power station size 1 reactor, 1,000MW	**7TWh** 7,000,000 MWh
3 Gorges Dam 22,500MW	**95TWh** 95,000,000 MWh
Big wind turbine 8-12 MW, offshore (on shore 2-3MW)	**0.02 MWh** 20,000MWh
World's biggest solar farm Bhadla, India 6kha, 2,245MW	**0.73 TWh** 733,000 MWh
10 X solar panels 4kW	**4.5MWh** 4,500kWh

1 TWh = 1,000 GWh = 1,000,000 MWh = 1,000,000,000 kWh
1 GWh = 1,000 MWh = 1,000,000 kWh
1 MWh = 1,000 kWh

3
Using less energy

The Demand Side

Andy

was:

- Ops/Supply Director across range of food & bev businesses
- latterly, ‘chief blender’ (Europe Ops Dir) @ innocent drinks

now:

- Consultant - industrial energy systems
- Business Dev Dir. – Caldera Heat Batteries (Zero Carbon Heat)

My experiences ….

operations – wide range of food & bev businesses

innocent drinks

carbon neutral factory design & operation

taking the energy design principles into industry

Which is most important to you?

A – Sourcing more sustainable energy

B – Predictable energy pricing

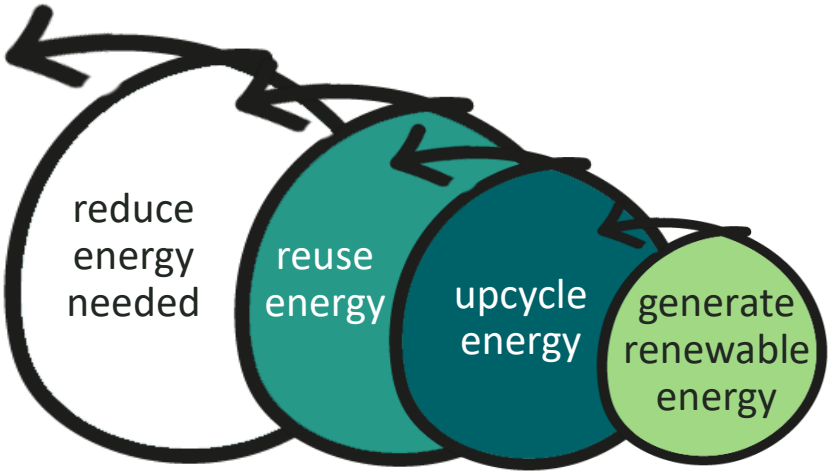
C – Using less energy

In this section, we're going to cover:

- a few principles to keep in mind
- innocent - the blender & ambitions for it
- principles of the blender energy design
- how do the learnings apply
- a UK food business example

A few principles

- The best energy your business will ever procure is the energy it never uses!
- The next best energy the business will buy is the energy it re-uses!



…and lessons learnt

Cheap energy means we treat it as a 'one way' resource. We consume, then release to waste.

All energy tends toward heat

- Heat, often called 'low grade energy', is a resource that we should value highly, conserve & re-use or sell

The technology for sustainable energy solutions for industry is pretty much all there

- Don't wait
- The cost-effective application of technology is key
- Many engineers understand how to move forward. And many don't.

Most factories are designed by separate teams – Construction, MEP (Mech, Elec, Plumb), and Process

- This leads to sub-optimal outcomes
- Put the Process & MEP together to optimise energy use.

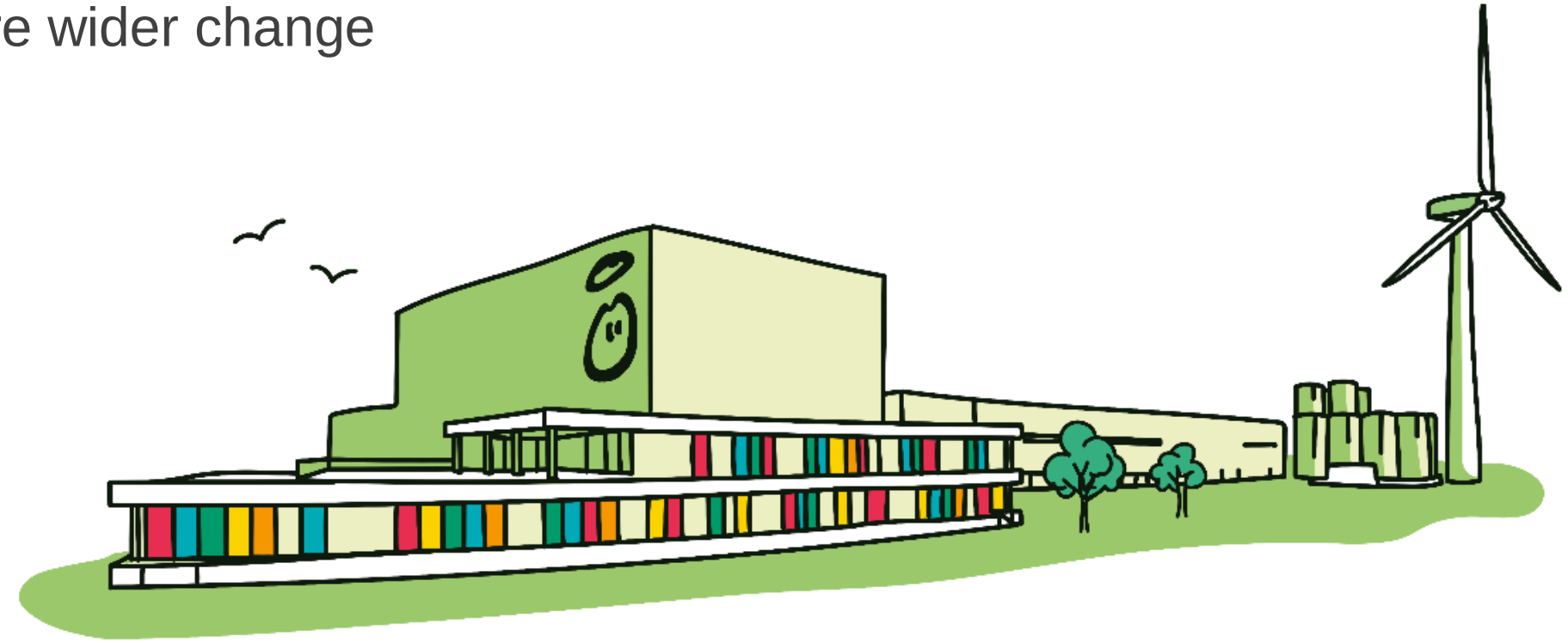
Start with the end in mind

- Plan for all electrification and design from there
- Work back to what you can do now ready for when low-cost electrical power is available

‘the blender’ – innocent drinks’ own juice and smoothie factory

Give the planet a seat on the design team of the earth’s favourite little healthy drinks factory

inspire wider change



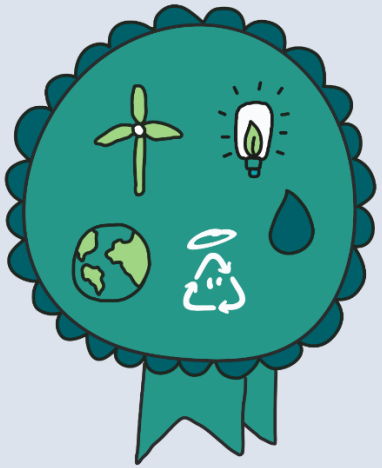
the earth's favourite little healthy drinks factory

factory for people

a great place to work that looks after its people and gives back to the community

planet friendly

cutting out carbon and minimising water usage and waste



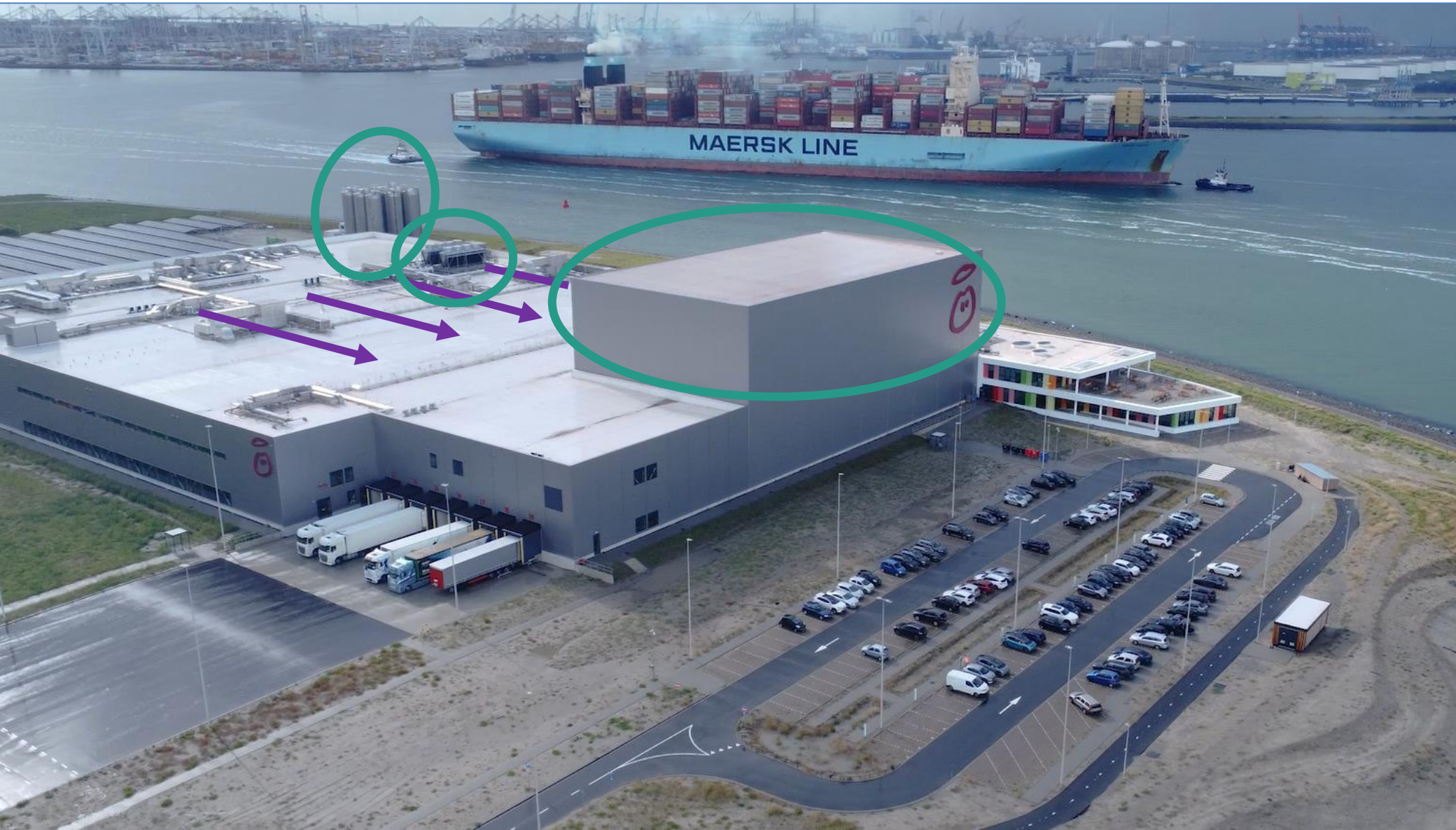
better business

sharing what worked and what didn't to inspire the next generation of factories

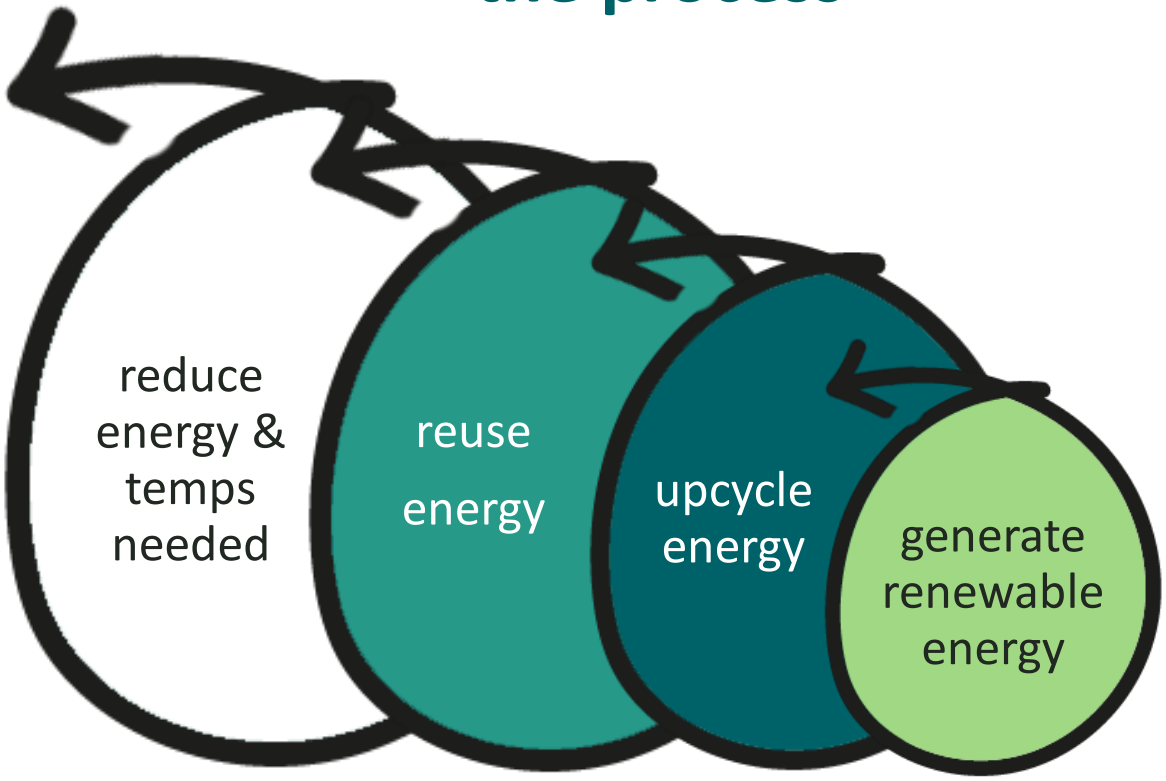
Fully electric, operationally carbon neutral design

PROCUREMENTHEADS

Production flow. Heat energy flow.



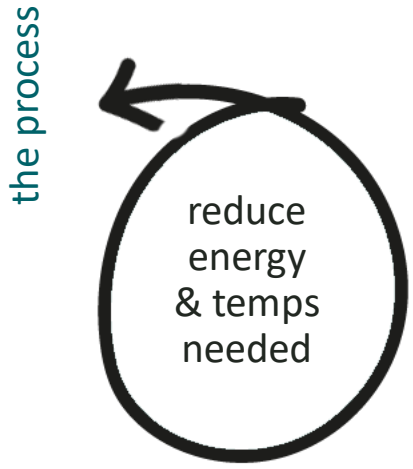
the process

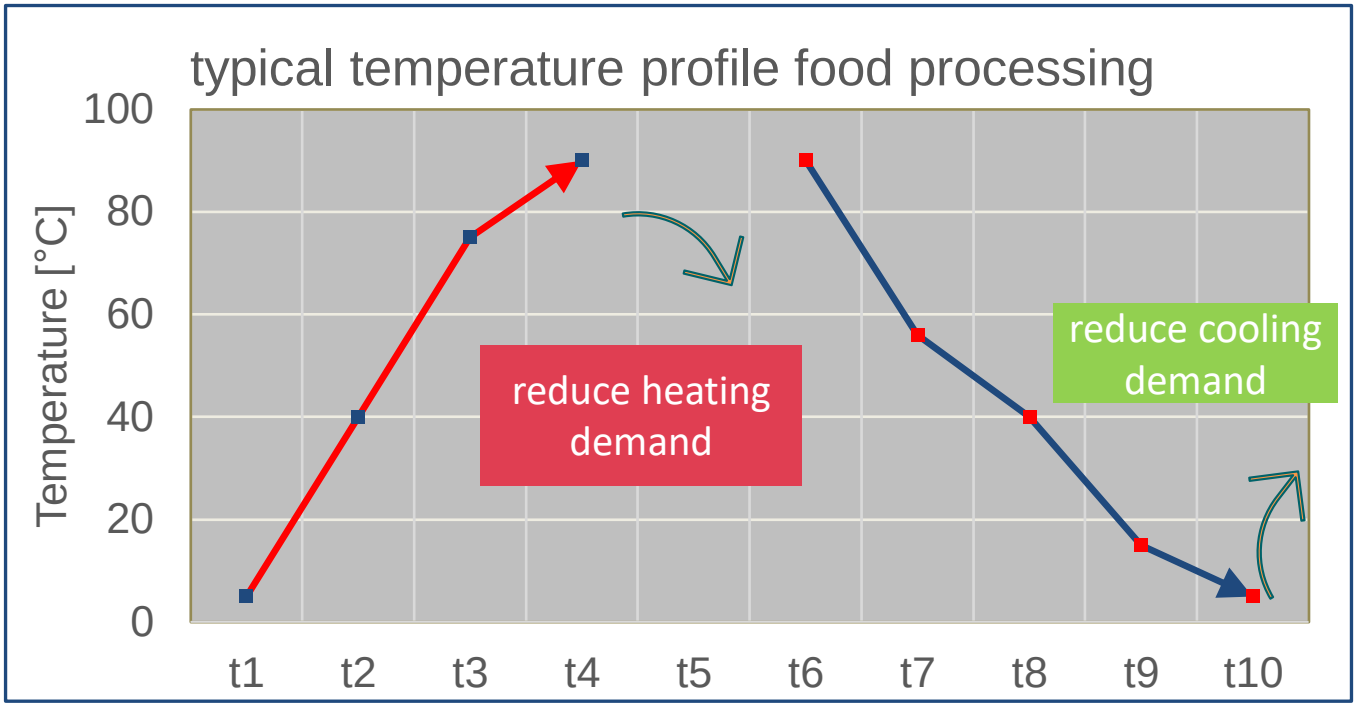


=> 100% electric & carbon neutral

Stage 1 – reduce the energy **and** temperatures needed

- Steam for **ONLY** what is really required. Avoid a steam network to feed lower temp services
- Decrease temperature - level for pasteurisation - 90°C > 85°C
- Melt frozen juices with hot water instead of steam
- Multi temperature heat circuits (65°C where possible, 90°C for pasteurising & CIP)
- Maximise chill temperature (+1°C reduces energy required by 3%).
  - Run the warehouse 1°C warmer

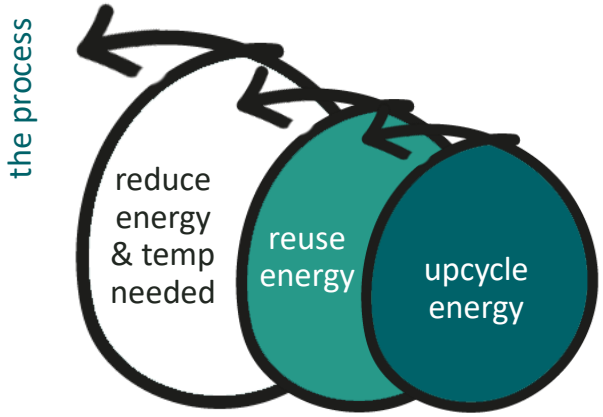


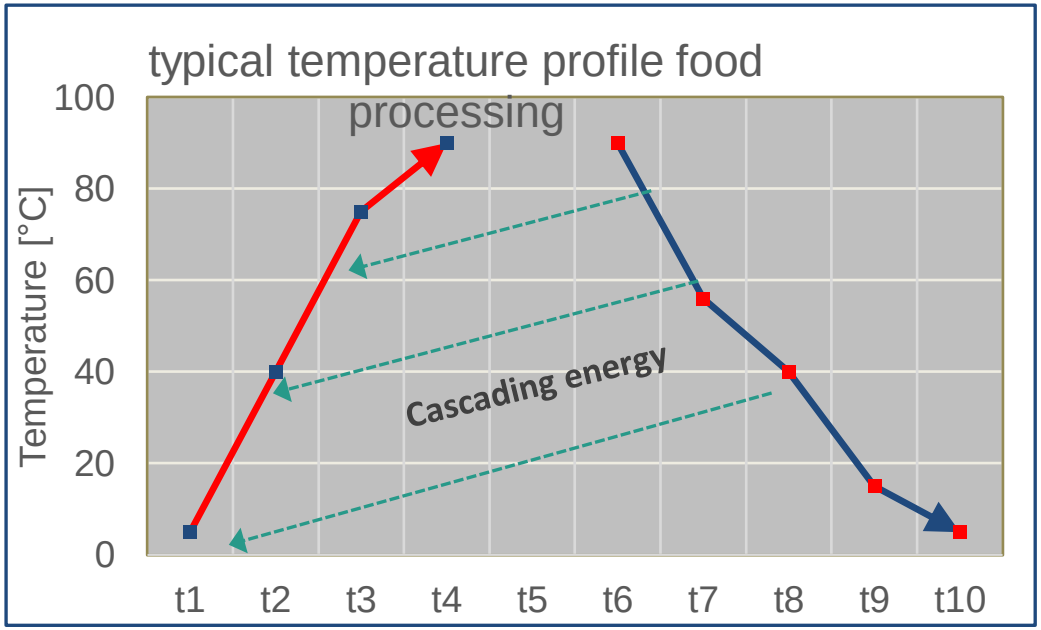


Stage 2 - Reuse as much energy as possible

Introduce more energy efficient pasteurisers with extended surfaces and low dTs

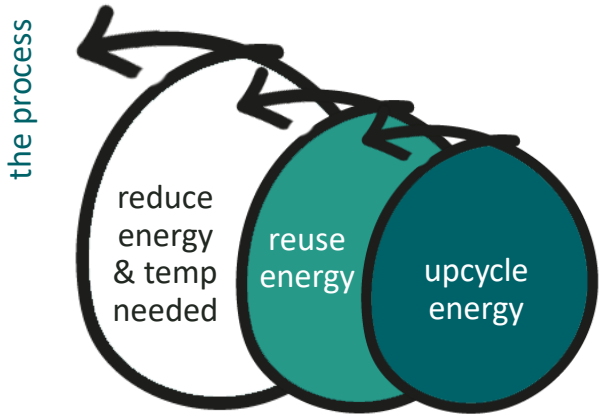
Pre heat CIP water with waste heat from air compressors

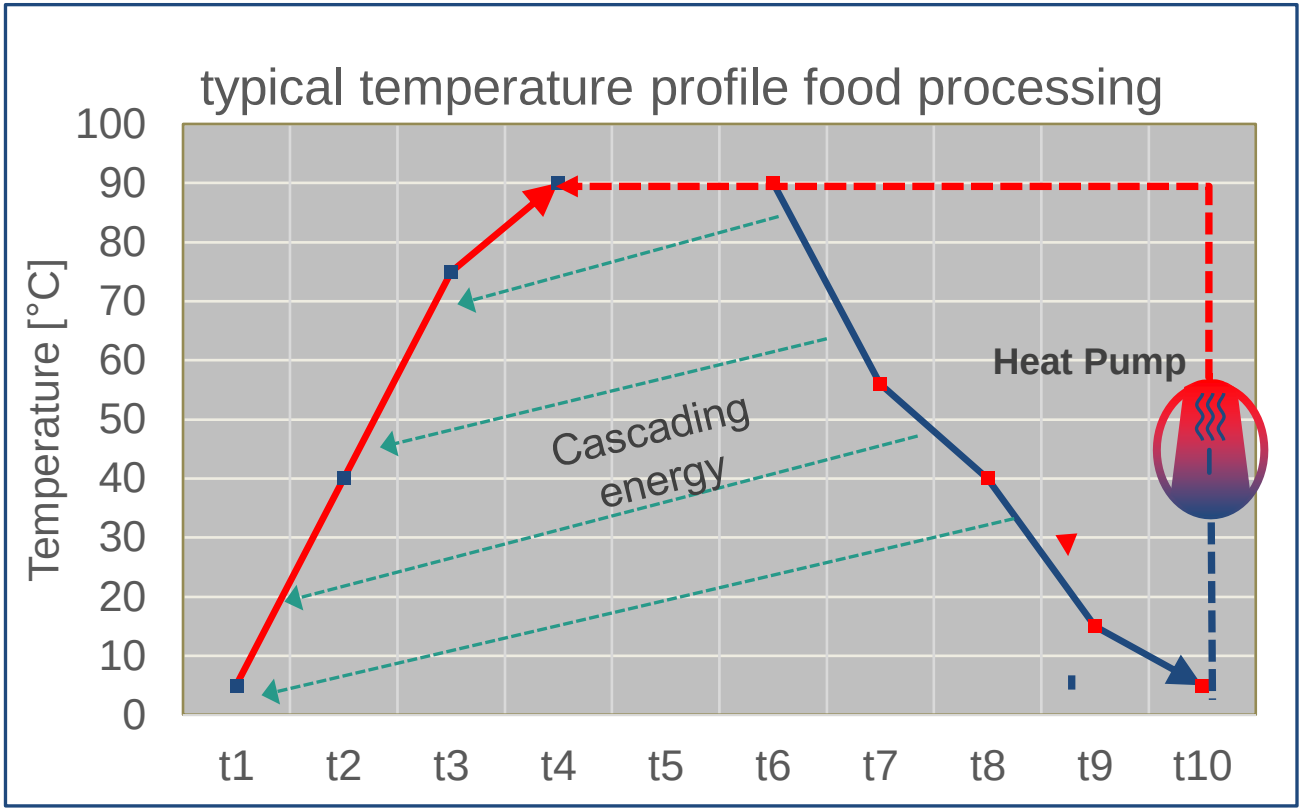




Where it's not possible to cascade, then upcycle:

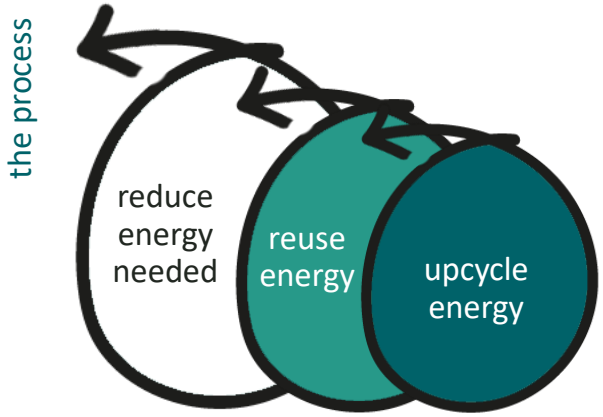
- Use heat pumps to upcycle waste heat from our HVAC & condenser plant
- Take 'waste' heat at c. 25-35°C and promote to 65°C and then again to 90°C
- Two 250k litre heat batteries to provide service water at useful temperatures for the site processes

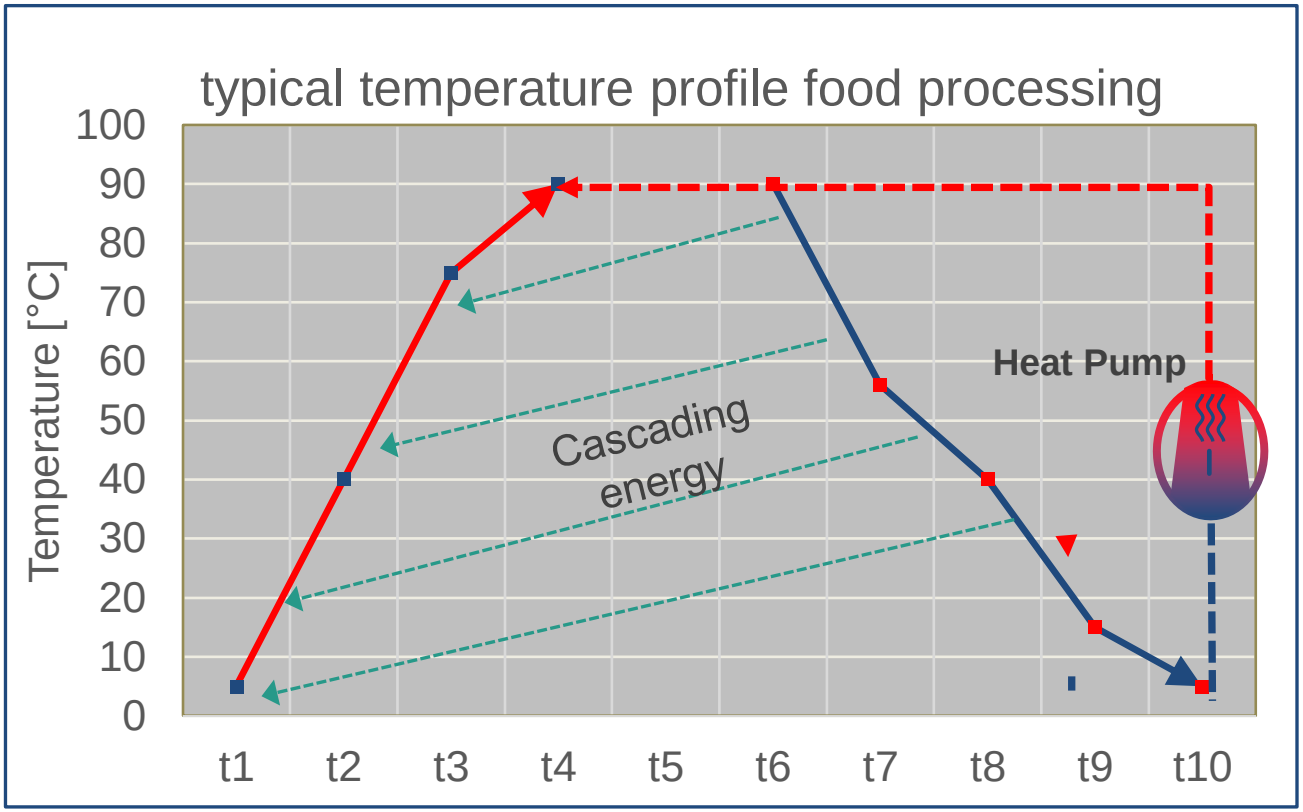




We could upcycle energy to within limits:

- We avoided making steam we didn't need
- But where we couldn't re-use heat for steam, we installed an e-boiler, scaled to meet those needs

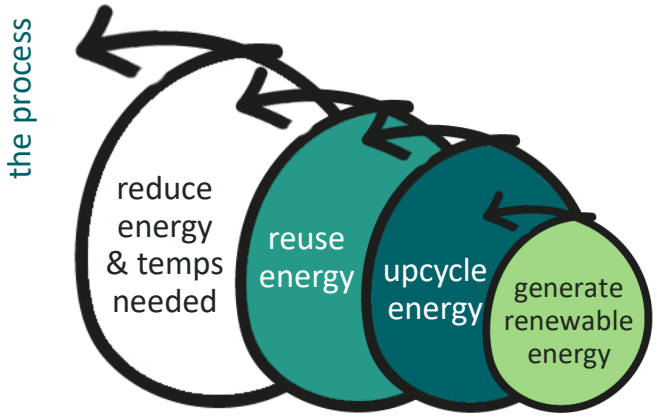




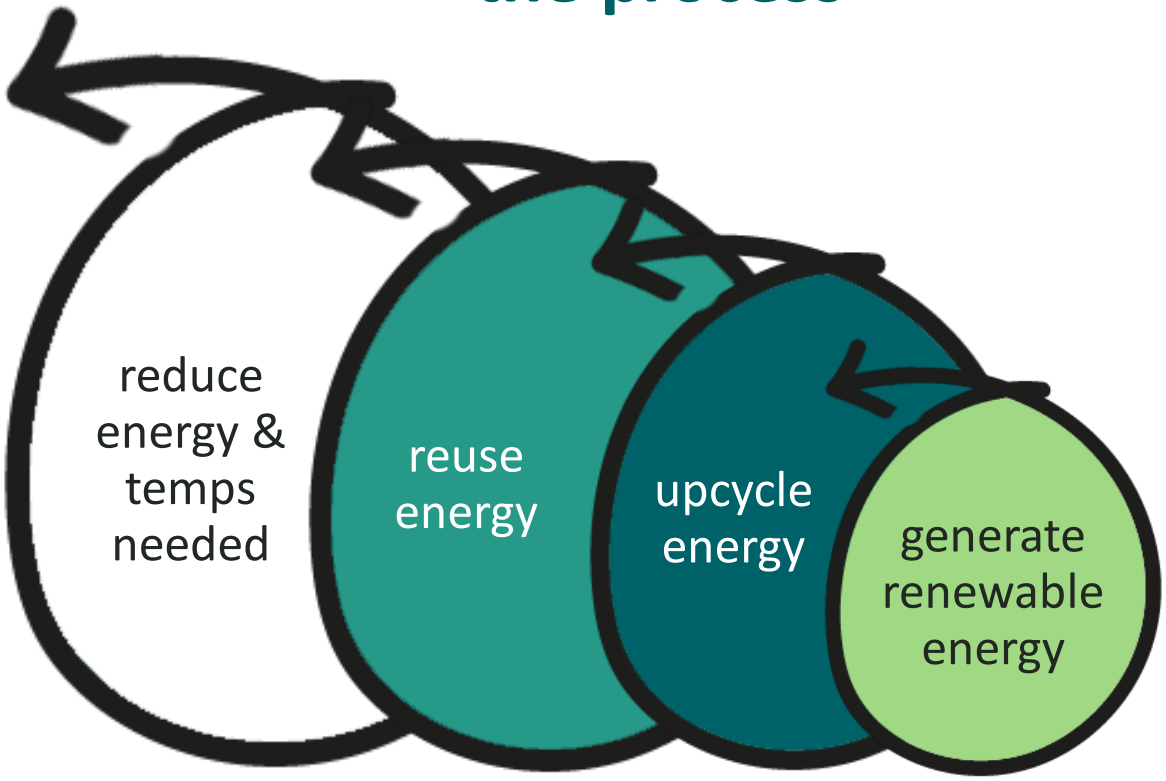
the blender - only ~55% of the energy of same size peer factories

But we still required power:

- CO_2 neutral = incremental (new) RE capacity
  - Renewable energy through solar panels and 2 wind turbines
  - ~29GWh of generation - 3 GWh Solar & 26 GWh wind



the process

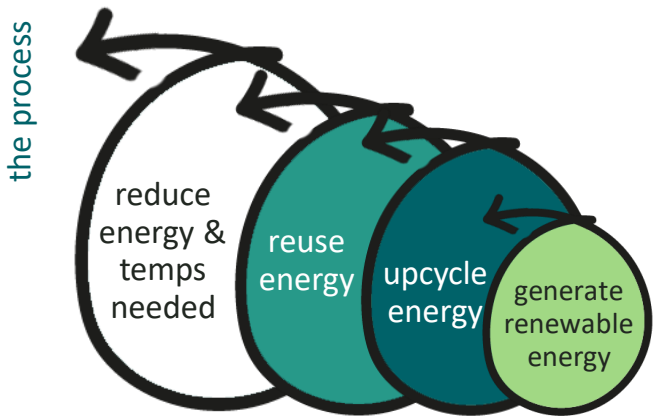


=> 100% electric & carbon neutral

PROCUREMENTHEADS

An existing factory

- 900T / wk of frozen food
- Process: freeze / temper / cook / freeze
- 9% efficient use of gas to cook the product
- c. **6MW** instantaneous, or 44GWh pa Gas
- Electrically powered refrigeration system rejecting heat to atmosphere



Apply the lessons

Reduce energy required:

- 50% improved existing cookers
- 74% better efficiency in 2 new additional cookers

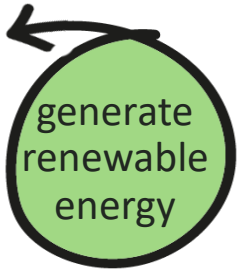
A 42% reduction => **3.4MW**

Re-use & Upcycle in 2 stages:

- 1st stage heat pump - 30°C up to 80°C
- 2nd stage heat pump - 80°C to Steam temps
  - Total heat of rejection 2.6MW + Compressor power of 1.1MW

Total useful energy available => **3.7MW**

A decarbonisation pathway IF we now source renewables on the supply side


generate
renewable
energy

4
Sustainable energy sources

Supply Side

David

Have you had a report produced to review the impact of solar PV and/or waste to energy on your business?

A - No, I am aware of these technologies but have not had the time to research /begin reaching out to suppliers

B - I am currently considering one or both of these technologies but have not yet reached out

C - Yes, I am in conversation with suppliers

D - Yes, I already have one or both of these technologies

Energy from waste
Biomass

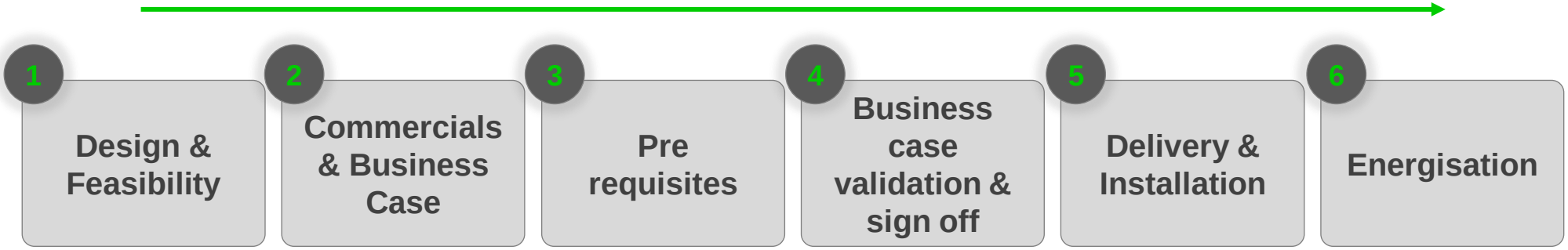
Solar

The way we should deploy these sustainable energies is:

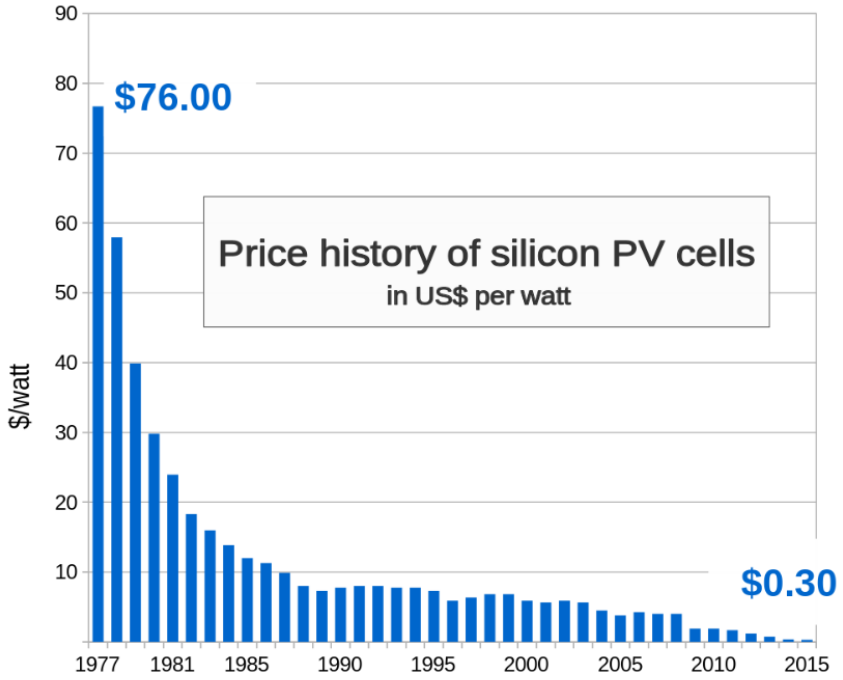
Biomass	Fuel from waste	Solar
• Good for processes with a significant heating requirement • Heavy user currently using gas or coal • Access to biomass as waste product or renewable source of energy (eg sawmills, packaging companies, farmers)	• Good for processes with a significant heating requirement • Heavy user currently using gas or coal • Has a waste product from a process with a calorific value (we can test it)	• Any business currently using grid electricity • Accessible roof space or land • Solar is currently the cheapest form of electricity available – can be deployed in most commercial situations

>> Today we'll major on solar

The process to source and install renewable energy is:



- **Technology** – continues to develop (eg storage systems)
- **PV Capacity** – ramped up (China piled in)
- **Installation** – growing fast +26% ‘22 vs 21! 4.5% total global electricity
- **PV Prices** - tumbled
- **Overall cost** – main part is now installation, not hardware



Source: Bloomberg New Energy Finance & pv.energytrend.com

Step 1 is about understanding the viability & potential benefit:

Action by Customer	Action by Novalux
• Confirm site location • Confirm PV area • Meter locations & MPAN supply #s • Half-hourly data	• Produce Desktop Design • Produce commercial forecasts • Produce consumption vs production report (energy produced vs PV utilised)

Here's an example of a business that has a relatively consistent consumption profile. The implication of their profile is great for solar which can provide a consistent base load:

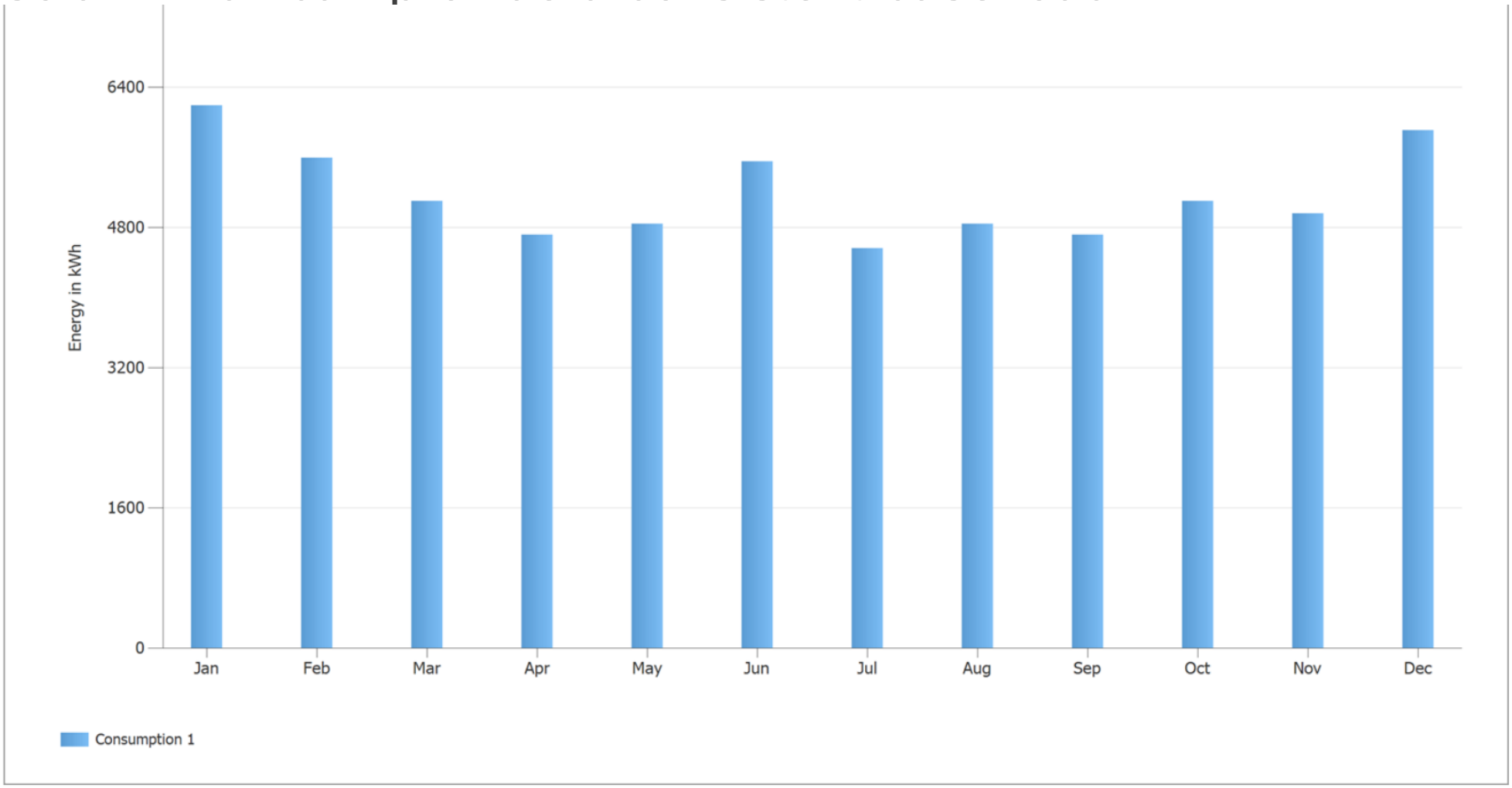


Figure: Consumption

Here's an example of a business that has a very season requirement, completely at odds with the solar curve – solar is less viable:

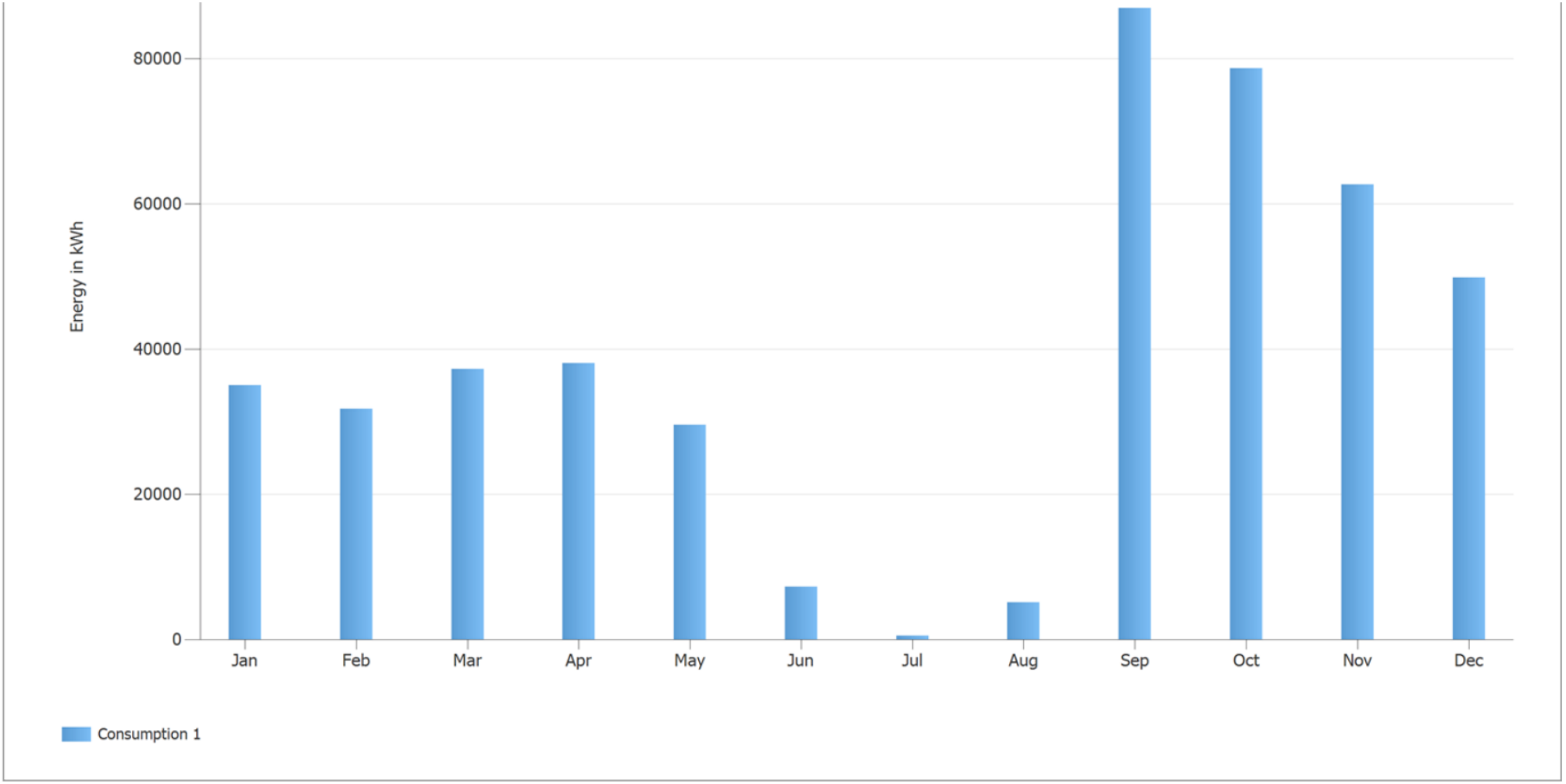
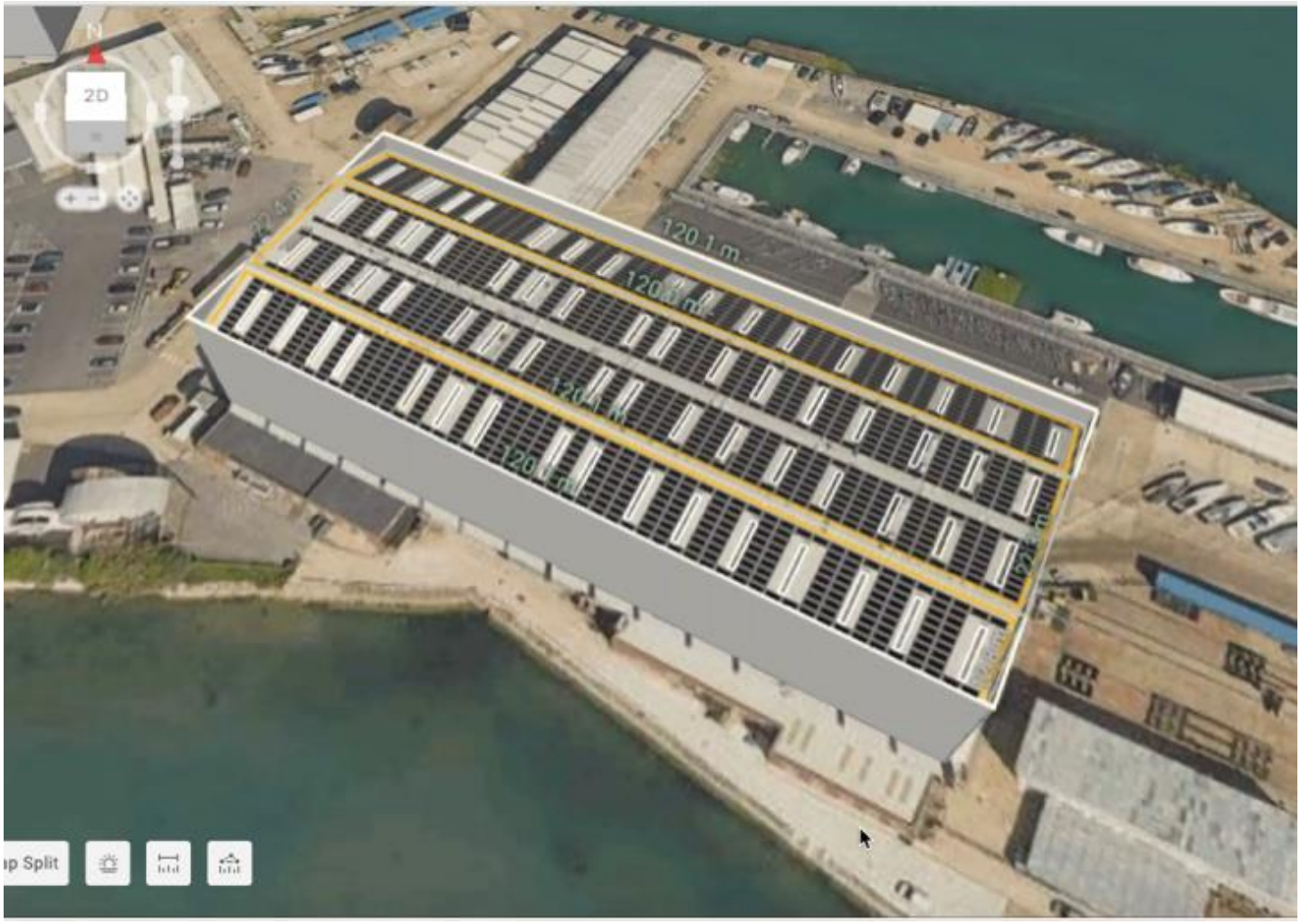


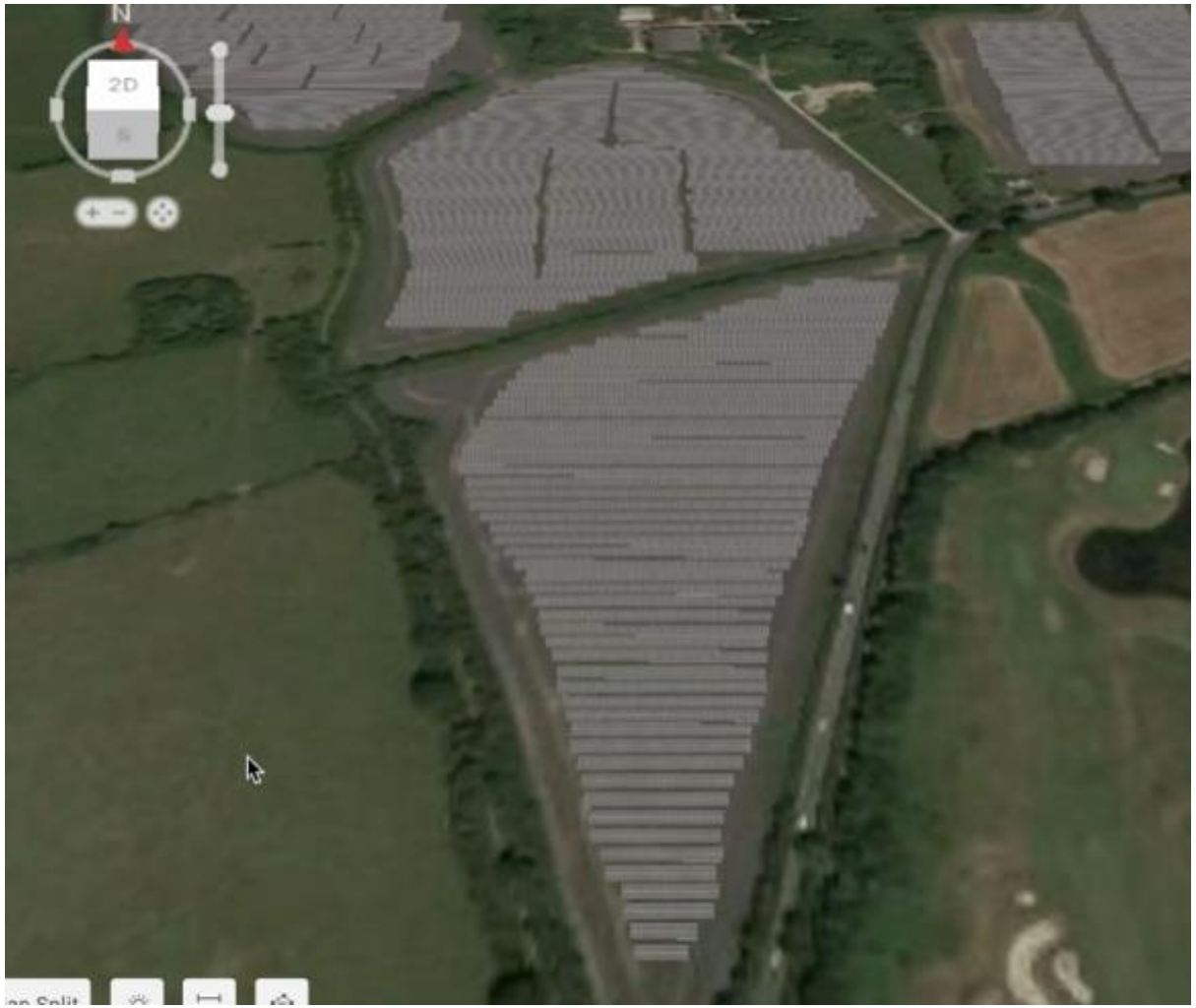
Figure: Consumption

There are a number of considerations that are required for roof mounted solar:



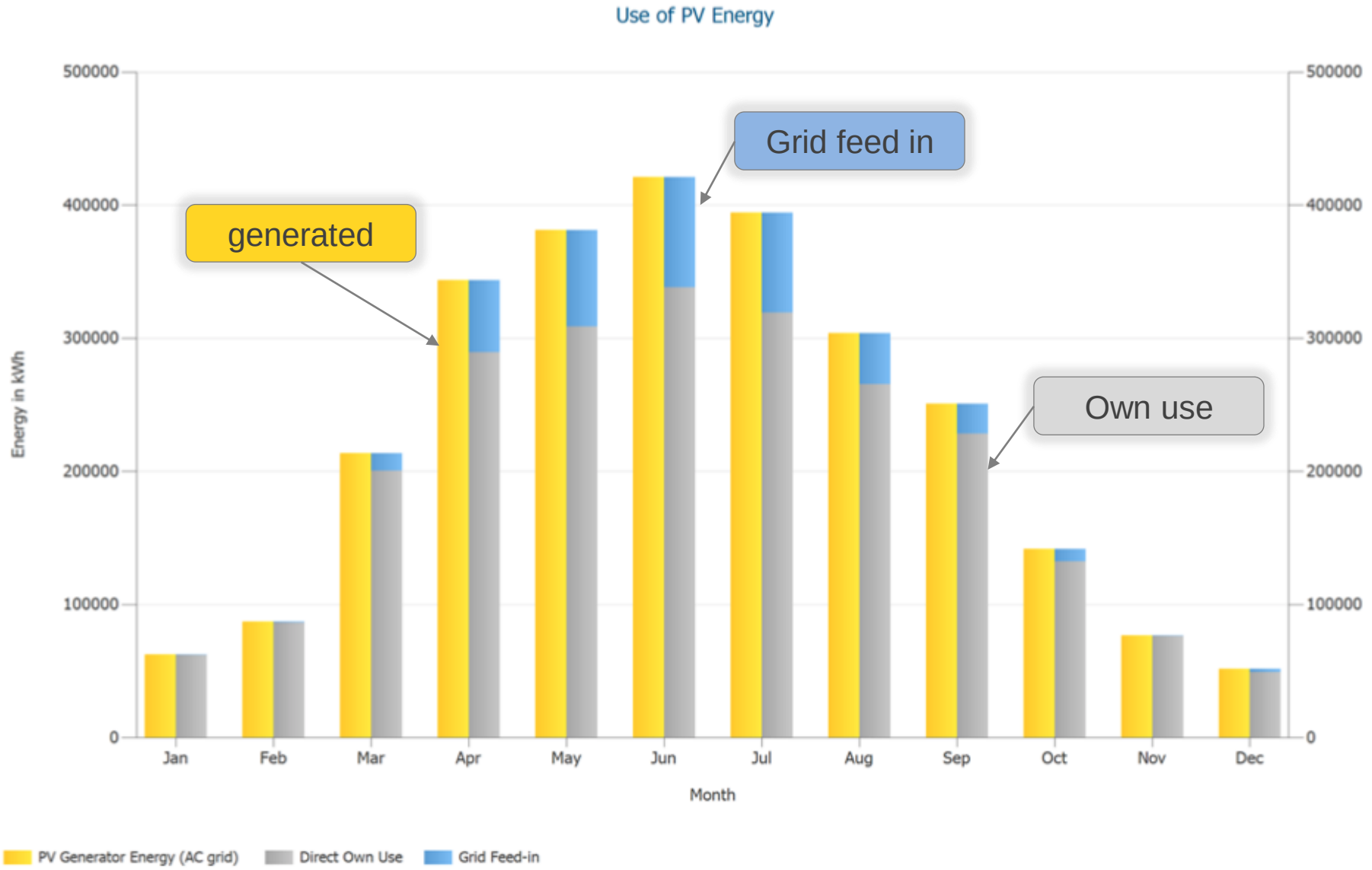
- Roof type
- Make-up (insulation)
- Structural integrity
- Skylights
- Parapets (shading)
- Reflection
- Wind/snow
- Roof mounting kit
- Ventilation

Equally, there are considerations for ground-based installations too:

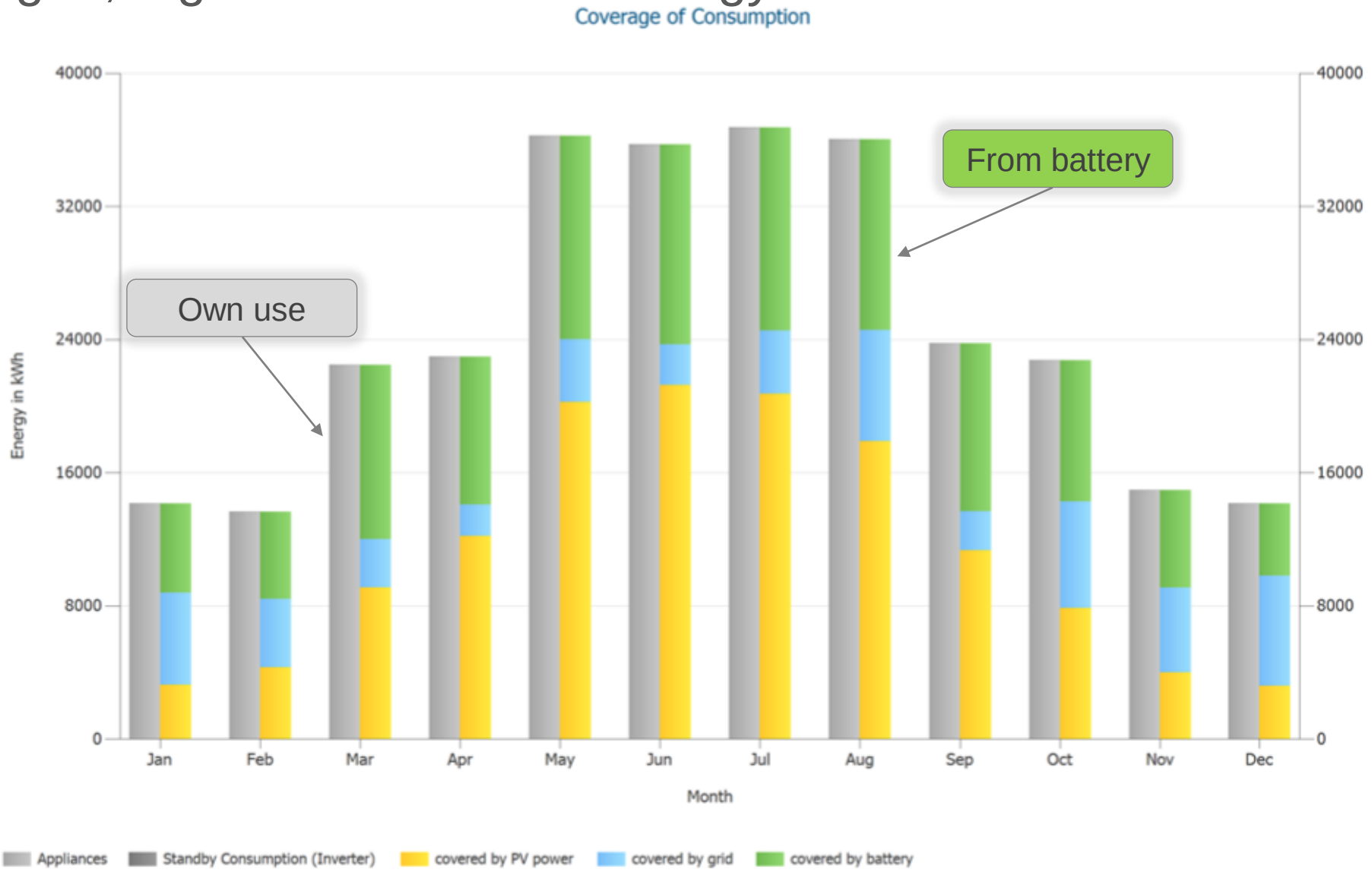


- Ground makeup
- Pull tests (drive in pile) – mounting required.
- Areas of beauty
- Felling of trees
- Flora & Fauna
- County/Parish Councils

Of the total amount of solar energy generated, the aim is to maximise own usage and minimise grid feed in:



On site battery storage means that rather than exporting to the grid, a good chunk of the energy can be stored and used later:



The storage units are modular and relatively very easy to put in place:

When comparing proposals, ensure that key variables are similar:

25 year Financial Summary	
Elec Savings	£ 27,615,238
Export Income	£ 1,696,417
Total Benefit	£ 27,020,835
Cost per kWh (p)	3.56
System Payback	3.3 yrs

Financials	
Peak Output	3211.14
Annual Energy Production	2,728,274
Capital Cost ex-VAT	£2,290,819
Exported Elec Rate (p)	10.00
Elec Saving Rate (p)	26.50
Export Rate	14%
Exported Elec Earned	£38,196
Electricity Money Saved	£621,774
Total	£659,969
Annual Return	28.8%
IRR	33.2%

System Description	
System Size	3211.14
Orientation	East
Angle from Horizontal	15
kWh/kWp/yr	850
kgCO2/kWh	0.470

System Information	
System Size	3211.14
Annual Energy Production	2,728,274
Carbon Emission Savings	1,282,289
Active Area of PV (m2)	15,227

SAP Estimated Performance	
SAP Output	2,507,900
Orientation	East
Angle	15

Costs	
Total Excl VAT	£2,290,819.14
Price per kWp	£713
VAT	£458,163.83
Total Incl VAT	£2,748,982.97

Variables	
PV Reduction	0.5%
Export electricity price rise	5%
Electricity prices rise	5%

Key Variables

- Price per kWhr import
- Price per kWhr export
- % of export
- Price per kWh peak

A typical solar installation pays back in 3-4 years and is an excellent money saver:

Year	Export (£/year)	Money Saved (£/year)	Cumulative Benefit (£)
1	38,196	621,774	659,969
2	39,905	649,598	1,349,473
3	41,691	678,668	2,069,831
4	43,557	709,038	2,822,425
5	45,506	740,767	3,608,698
6	47,542	773,917	4,430,157
7	49,670	808,549	5,288,376
8	51,892	844,732	6,185,000
9	54,214	882,534	7,121,749
10	56,641	922,027	8,100,416
11	59,175	963,288	9,122,880
12	61,823	1,006,395	10,191,098
13	64,590	1,051,431	11,307,119
14	67,480	1,098,483	12,473,082
15	70,500	1,147,640	13,691,222
16	73,655	1,198,997	14,963,874
17	76,951	1,252,652	16,293,476
18	80,395	1,308,708	17,682,579
19	83,992	1,367,273	19,133,844
20	87,751	1,428,458	20,650,053
21	91,678	1,492,382	22,234,112
22	95,780	1,559,166	23,889,058
23	100,066	1,628,938	25,618,063
24	104,544	1,701,833	27,424,441
25	109,223	1,777,990	29,311,654
Total	**1,696,417**	**27,615,238**	**29,311,654**

25 Year Investment Summary:	
Capital Cost:	2,290,819
Profit:	27,020,835
Simple Payback:	3.3 yrs

The main pre-requisites are:

Pre-requisite	Time Period	Key Points
Grid Connection	3 months	• Grid will either accept the scheme, accept with limited export or reject the scheme
Planning	3-6 months	• Planning permission esp for larger sites • Glint & glare, ecology, ground assessment etc
Full Electrical Survey	1 week	• Full site survey by Novalux
Structural Survey	1 week	• Roofs capable to take weight of panels • Safety factor for wind and snow loads

Make sure to check the quote whether these things are included or excluded:

Costs

- Grid Applications
- Planning
- Scaffolding / Lifting
- O&M
- Health & Safety (Netting for skylights)
- Surveys
- Welfare Facilities
- Skip & Waste
- Access & Site Implications

Permissions

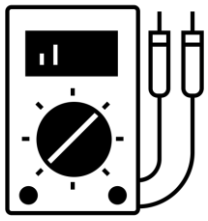
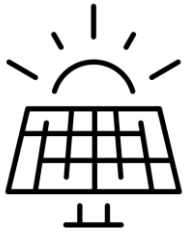
- Planning applications for each system (where required)
- Glint & Glare, Ecology & Ground Assessments (where required)
- Grid Connection Costs & Agreements with network operators

In our experience, some providers provide a minimum performance guarantee for their solar systems and in the event this isn't met, a financial payment to cover any shortfall.

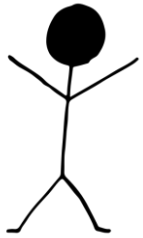
This type of guarantee is naturally given when suppliers have confidence in the PV units they are supplying

Solar Opex costs are typically cheap. As an example

	One off service	One off clean
3.2 MW	~ £4,500	~£12,500
1.1 MW	~ £2,200	~£6,500





There are typically 3 main ways to finance a solar installation:

Out-right purchase

- Typical Capex

PPA

- Power Purchase Agreement
- Fixed or variable tariff
- Only for large solar installations (>50GWh)
- Lengthy & hard to negotiate
- Hard to aggregate with other entities

Solar Lease

- Pay a fixed monthly “rent” or lease payment
- Calculated using the estimated production of the system, in exchange for right to use PV system
- Export only and consumption projects
- Consumption would be required to stay at an agreed level

Installation….

Energisation….

5
Networks & Suppliers

Shirley & James

An overview of our business:

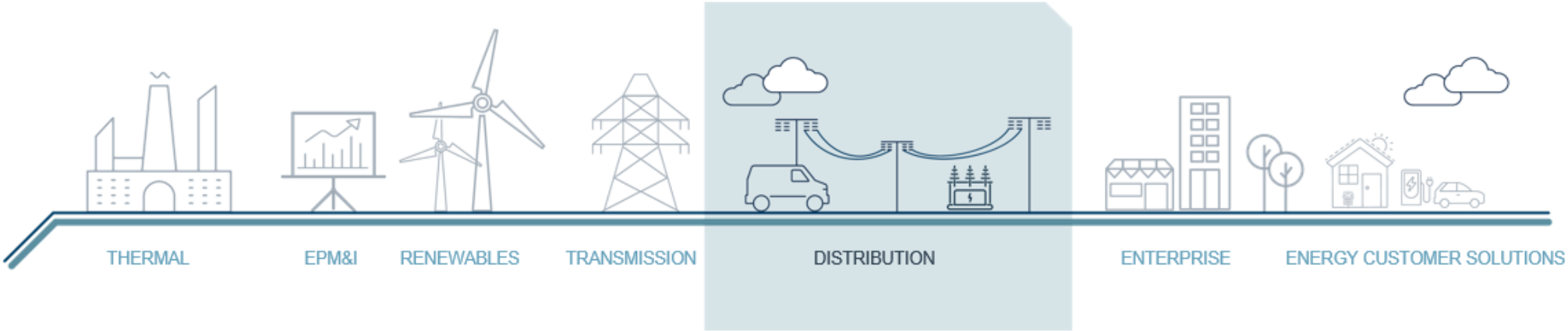
A LEADING ROLE IN A LEADING GROUP

sse | For a better world of energy

Scottish & Southern Electricity Networks

SHEPD
Scottish Hydro Electric Power Distribution Plc

SEPD
Southern Electric Power Distribution Plc



ABOUT SSEN

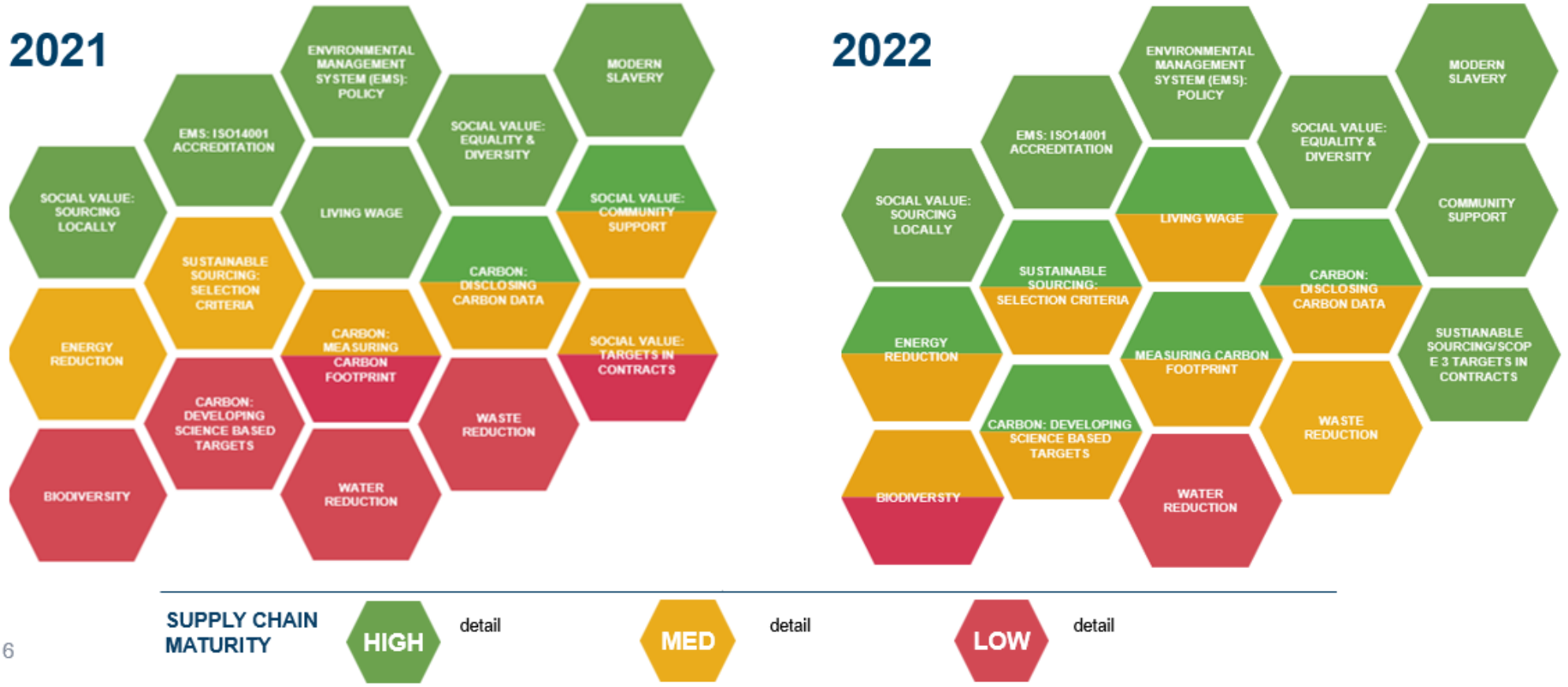
Our electricity distribution network delivers power to over 3.9 million homes and businesses across the diverse and unique geographies of the north of Scotland and central southern England.

We are Scottish and Southern Electricity Networks

- Over **3.9 million** homes and businesses served by our networks
- Over **4,000** employees across the country
- More than **876,000** customers on our Priority Services Register
- Over **127,000km** of overhead lines and underground cables
- **470km** subsea cables powering island communities
- **115,000** substations

We have 16 targets for our supply chain maturity assessment:

SUPPLY CHAIN MATURITY ASSESSMENT: 16 TARGETS



SUSTAINABLE SUPPLIER CODE

- ✓ Launched SSC in May 2023
- ✓ 2 x webinars and 2 x engagement days
- ✓ 31.5% of suppliers (by spend) signed up

Scottish & Southern Electricity Networks SUSTAINABILITY FIND OUT MORE ssen.co.uk/sustainability

STAKEHOLDER INFLUENCE IS THE SILVER BULLET

INTERNAL	EXTERNAL
✓ Investing in our People ✓ Successful Apprenticeship Program ✓ Employee volunteerism program ✓ Internal stakeholder awareness campaign on sustainable and responsible sourcing	8 DECENT WORK AND ECONOMIC GROWTH ✓ Community investment fund ✓ Sustainable procurement framework enforced across the value chain ✓ Inclusive community engagement and charitable partnerships
✓ Waste management ✓ Product design ✓ Green packaging ✓ Reduce, reuse, recycle employee engagement ✓ Water waste awareness campaigns	12 RESPONSIBLE CONSUMPTION AND PRODUCTION ✓ Water efficiency commitments (i.e. through ISO 14001 and LEED) ✓ Material consumption review (Wood, Copper, Aluminum, Steel)
✓ Science Based Targets ✓ Nature based Solutions & Strategies ✓ Investing in innovative engineering solutions	13 CLIMATE ACTION ✓ Regulator and policy stakeholders engagement ✓ Community engagement ✓ Green awards for suppliers ✓ Environmental Accountability & Stewardship

Network capacity needs continued expansion especially in key bottleneck areas:

6
Wrap Up

Simon

Key Messages

- #1 focus is to use less energy
- Installing solar is the easiest way to make a difference
- Storage is a key enabler for wind & solar
- Build up skills & knowledge together
- Create your own crib sheet
- Collaborate – influence – dictate?

Presenters, happy to share further expertise with you

Quarterly Webinars. Next one in Q1 2024

Varied group of presenters

Light-touch open network

“How to source sustainable energy” – White Paper

Simon Frost

FROST
PROCUREMENT ADVENTURER

Procurement Expert

www.procurementadventurer.com
frost@procurementadventurer.com

+44 (0) 7967372378

Andy Joynson

ADJ Consulting
Net Zero Factories

Energy Expert

andy.joynson@btinternet.com

+44 (0) 7770735018

David Nash

NOVALUX

Head of New Business Dev.

dnash@novaluxenergy.com
www.novaluxenergy.com

+44 (0) 7753269382

Shirley Robertson
James Flanagan

Scottish & Southern Electricity Networks

Head of Strategic Planning & Sustainability

Director of Procurement & Commercial

DistributionSustainabilityTeam@sse.com

Thank you

Questions