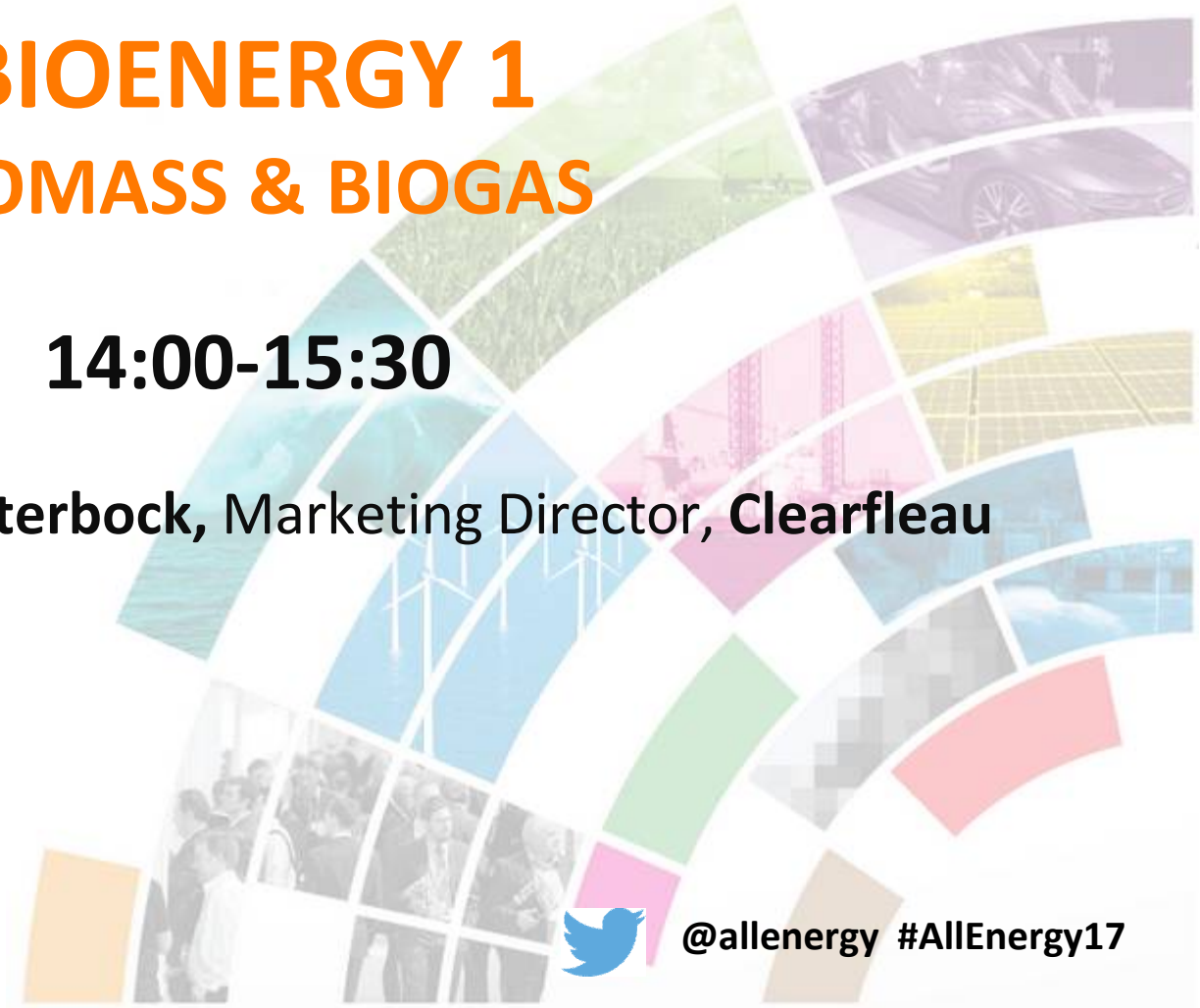
ALL-ENERGY®
EXHIBITION AND CONFERENCE 2017
10-11 MAY, SEC GLASGOW

BIOENERGY 1

BIOMASS & BIOGAS

14:00-15:30

Chair: Richard Gueterbock, Marketing Director, **Clearfleau**



@allenergy #AllEnergy17

Clearfleau™

Energise Liquid Wastes
Optimise Liquid Assets

Developing the Circular Economy - Bio-energy on Industrial sites

Glasgow 10th May 2017

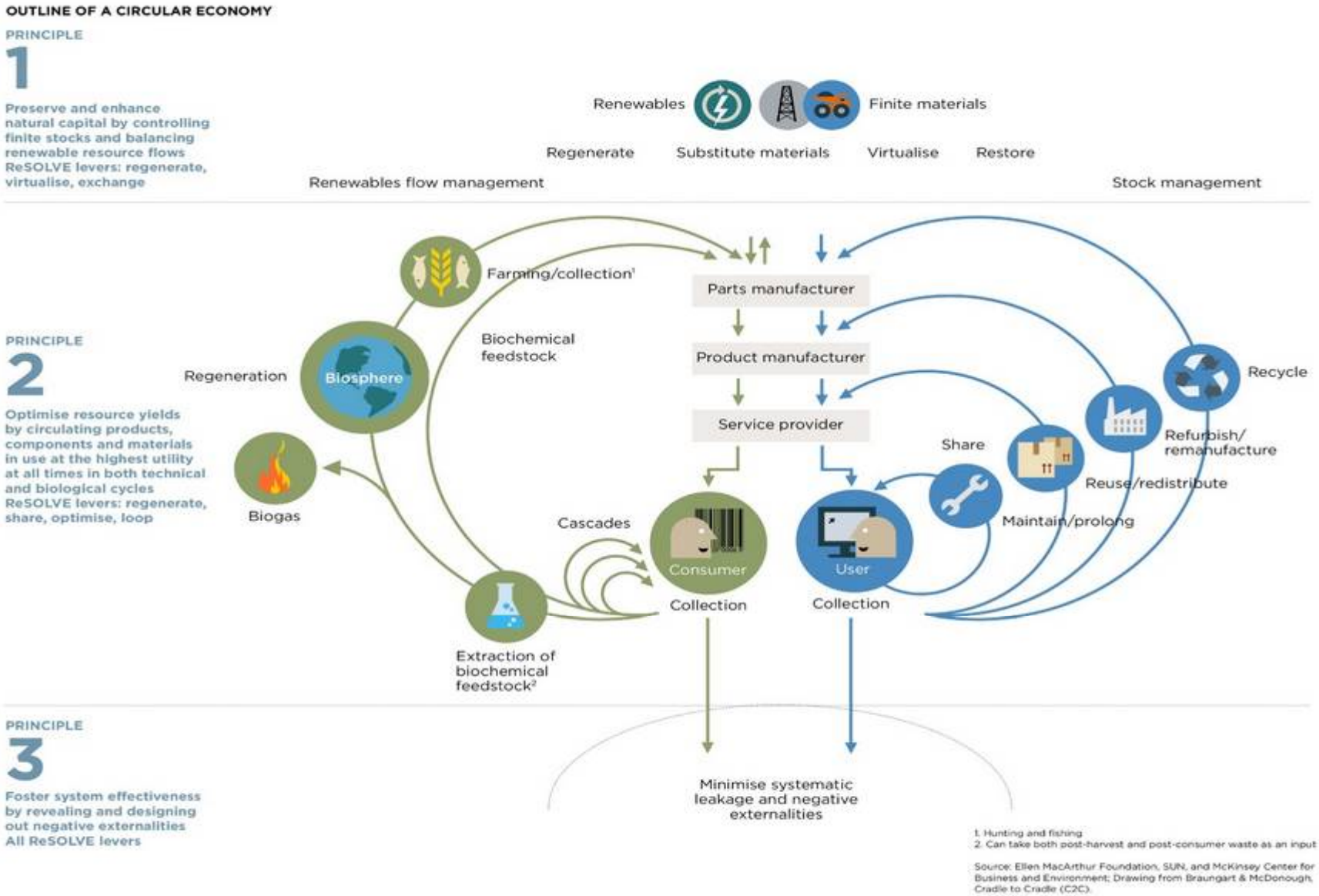
THE CIRCULAR ECONOMY

Regenerative, circular economy based on life-cycle efficiency, re-use and recycling of products / materials:

- improving resource productivity
- cutting waste and emissions
- addressing resource scarcity
- limiting environmental impacts
- re-engineering manufacturing
- generating on-site bio-energy

After 2015 Paris COP21 Climate Change Convention, food and beverage multi-nationals made commitments to change their practices and signed this statement: *"We want the facilities where we make our products to be powered by renewable energy, with nothing going to waste, as corporate leaders, we have been working hard toward these ends, but we can and must do more."*

OUTLINE OF A CIRCULAR ECONOMY



Bio-energy: making a start

Adding Value to Bio-residues:

- Improved resource use
- De-centralised energy
- Lower disposal costs
- Greater site efficiency

On-site Benefits:

- **Bio-Energy** - replace fossil fuels
- **Clean Water** - re-use or discharge
- **Resources** - re-use of residues
- **Bio-solids** - nutrients for crops
- **Emissions** - carbon reduction

BIO-ENERGY - EVOLVING MARKETPLACE

British AD Market - 3 Core Sectors:

Municipal: landfill diversion

Farm: slurry and residues

Industrial: bio-degradable residues

Drivers for Food & Beverage Sites:

- Diversion from landfill
- Escalating energy costs
- Treatment capacity limits
- Effluent discharge consents
- Replacing old treatment plants

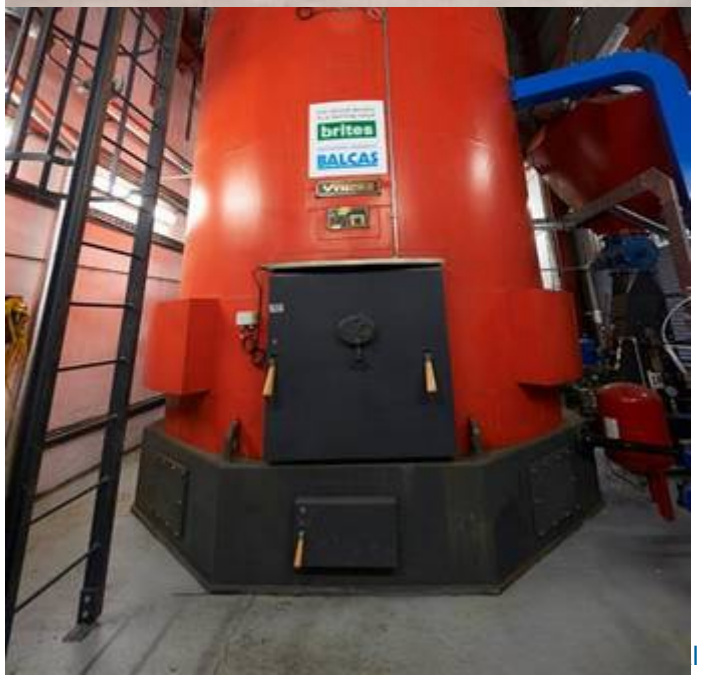
BUT - UK lags behind European neighbours like Sweden

Industrial Solutions

- Biogas / bio-methane
- Biomass heat supply
- Fuel cells / hydrogen

De-centralised Supply

- Base load / cost control
- Energy security for site
- Replacing fossil fuels
- Improved residue use
- Site decarbonisation



On-site Bio-energy on Distillery, Food and Biofuel Sites

If Sweden can – You can!

- about <u>how</u> we become an climate leader

All Energy Glasgow 10th of May 2017

Speaker:

Bengt- Erik Löfgren

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Let me briefly introduce Sweden….

- We have a population of about 10.0 million….
- About 85% of the population live in urban areas…
- GDP per capita* is about $46 702 (OECD $40 084)
- We have no oil, gas, or coal resources of our own…….
- ..but we are at the forefront of environmental thinking….

* source: OECD (**2016**)

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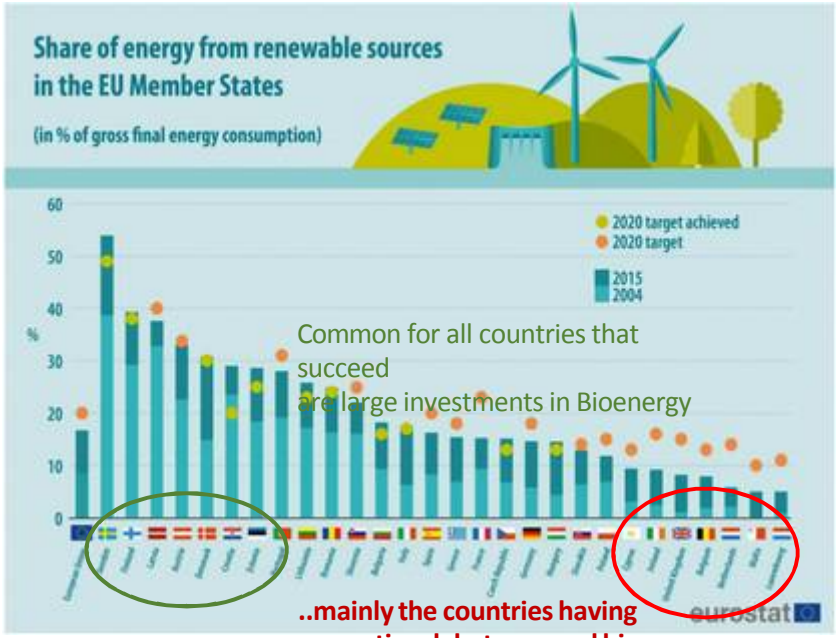
Swedish Pellet Association

ÄFAB

I want to brag a little….

- We are simply the best!



"No country in Europe has been so successful in renewables as Sweden"

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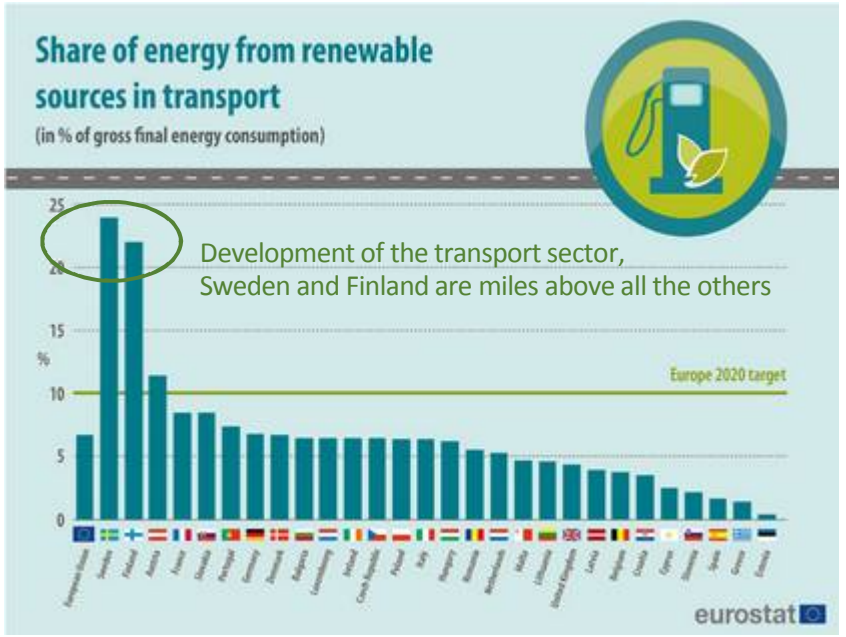
Swedish Pellet Association

ÄFAB

I want to brag a little….

- We already drive green!



"No country in Europe has been so successful in renewables as Sweden"

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How did this become a reality?

- We need to look back in 1990

- Higher oil prices have hardly hit our economy
- Timing with an “wake-up time era” in environmental questions
- Politicians in agreement that something has to be done
- Increased price of fossil energy will benefit local economy
- Safe and local energy source

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My first Conclusion

Brave politicians & wise consumers

Lack of understanding is our greatest enemy

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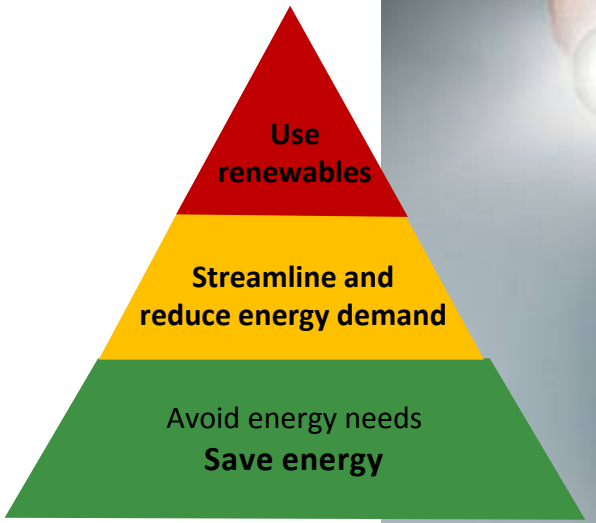
Our roadmap is simple and easy to understand

Replace fossil energy
with renewables
55,000 employees

Cut the losses – save energy
13,000 employees

Maximum
RECYCLING
18,600 employees

Always focus upon *sustainable resources* that are not "running out"



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It's not at my main topic today but…

Responsible forestry is increasing the growth…

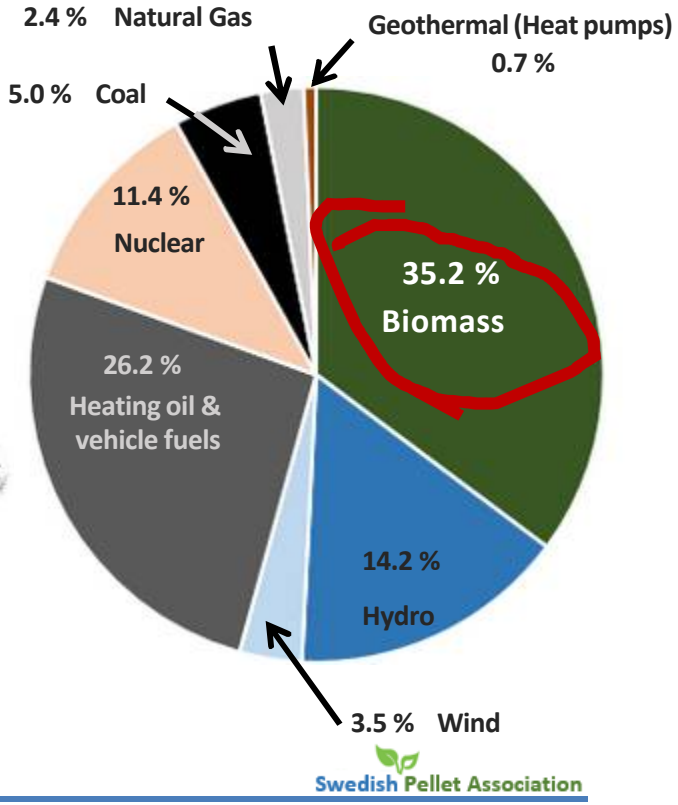
- Caring with thinning and harvesting at the right time increases the profitability of forest owners
- Byproducts provide extra income as biofuels
- A well-managed forest is growing faster and binds more carbon dioxide as an old forest
- As long as the harvesting of biomass is lower than the growth of the forest is bioenergy almost carbon neutral

Branches and tops are an excellent fuel for heat and power

Our carbon tax has boost all kind of renewables…

- Taxes on fossil energy gives **cash flow in to the government** and stimulates the **development of all alternatives**
- **High total tax** on all fossil energy
  - Oil **€85 + €320 = €405** per m^3
  - Natural gas **€90 + €240 = €330** per 1000 kg
- Only carbon tax **is €115/ton CO_2**
  - 4 times higher than in any other country.
  - 25 times higher than the price of emissions in cap and trade.
- We have already tested the **carbon tax in full scale**.
  - Our economy has not collapsed
  - Jobs have not moved abroad.

Final Use of Energy 2015
53,6 % RENEWABLE



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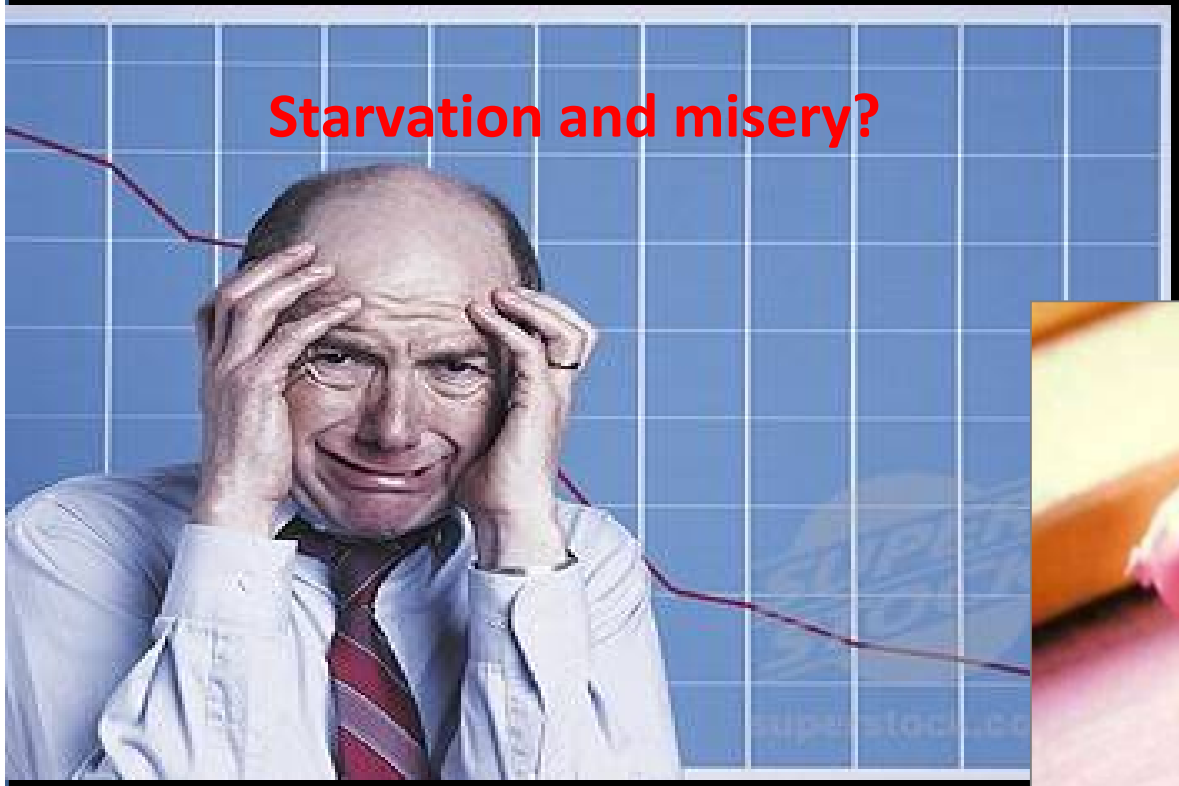
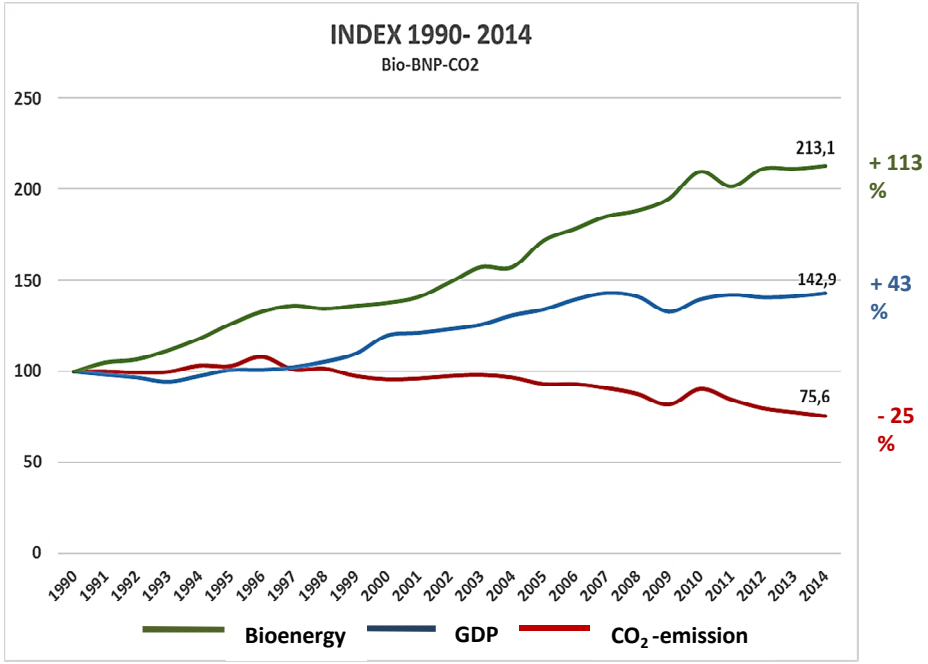
So what have we in Sweden been forced to sacrifice…



Swedish GDP increased while CO_2 emissions went down

- High carbon pricing better than grants



The main reasons for breaking connection with economic growth and higher emissions are from our use of bioenergy.

About 85 000 sustainable jobs, manly in rural arias

Our experience can be implemented in all countries

If Sweden can- You can!

We Swedes surely can tell you what NOT to do……

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Conclusions

- All kinds of waste is a resource
- Always “Polluter Pays Principle” in the first room
- Knowledge and cooperation
- Long-term energy policy
- Communicate cross-disciplinary and cross-sector
- Need of ambassadors

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I would like to end up my presentation with a quote that feels just as relevant today - when we talk about renewable energy - as it was in back in 1969, when Neil Armstrong called Houston and said.....

It's only one small step for a man, but a giant leap for the mankind…

Thank you for listening!

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All Energy
Biomass and Biogas Session
10th May 2017

Biogas/biomass as part of the energy mix on a small distillery site

Uisdean Fraser

IEng GCGI MCIWM MEI MIPlantE MSOE

MD Synergie Environ Ltd

cutting cost, consumption and carbon

A bit about me…

- Managing Director/Owner at Synergie Environ Ltd
- Responsible for developing the first AD plant in the UK to operate on source-segregated bio-waste (2004/5)
- Currently act as Project Director and Technical lead on a large portfolio of AD and district heating projects
- Currently leading the development of a portfolio of over £30M of projects

A bit about Synergie Environ…

- Formed in 2009 – wholly owned by the two directors
- Experts in low carbon engineering project design, development and delivery - mostly work in the AD and District Heating sectors
- Work on behalf of developers to take projects from feasibility to commissioning

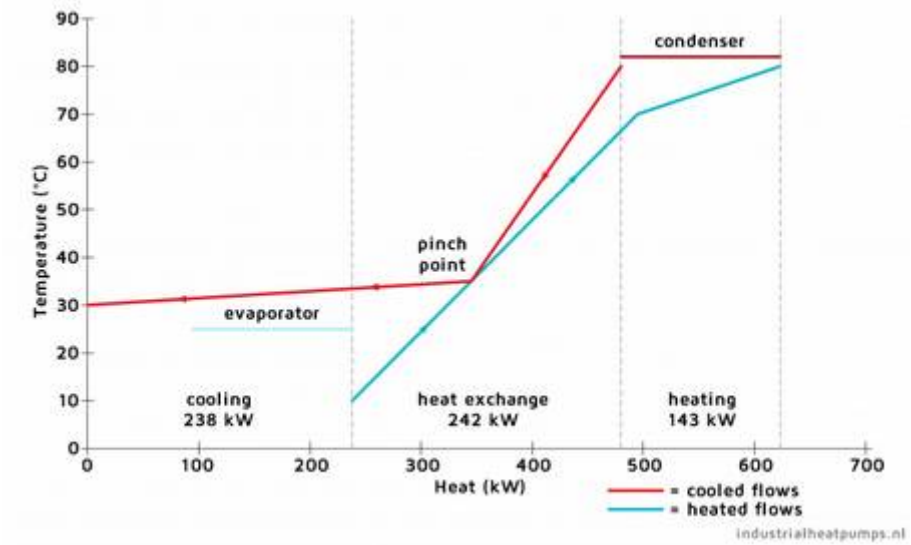
What am I here to talk about……

- *"Biogas/biomass as part of the energy mix on a small distillery site"*

- How to integrate
- How to maximise process efficiency/revenues

Considerations…

- Existing heating systems on site
- Process heating profile
- Any particular process “pinch points”



Integration with oil fired systems

- Capacity and age of existing system
- Condensate return or not
- Existing hot well and boiler make up water
- Control systems and integration

synergie environ
cutting cost, consumption & carbon

Integration with biomass systems

- Capacity and age of existing system
- Control and integration points
- Impact on existing RHI payments

Direct process integration

- Need a very good understanding of process heat demand profiles including:
  - How much heat…
  - When….
  - Where…

- Displacement of existing heat recovery – potential impact on overall process efficiency and therefore RHI payments
- Any process “pinch points” e.g. cooling water

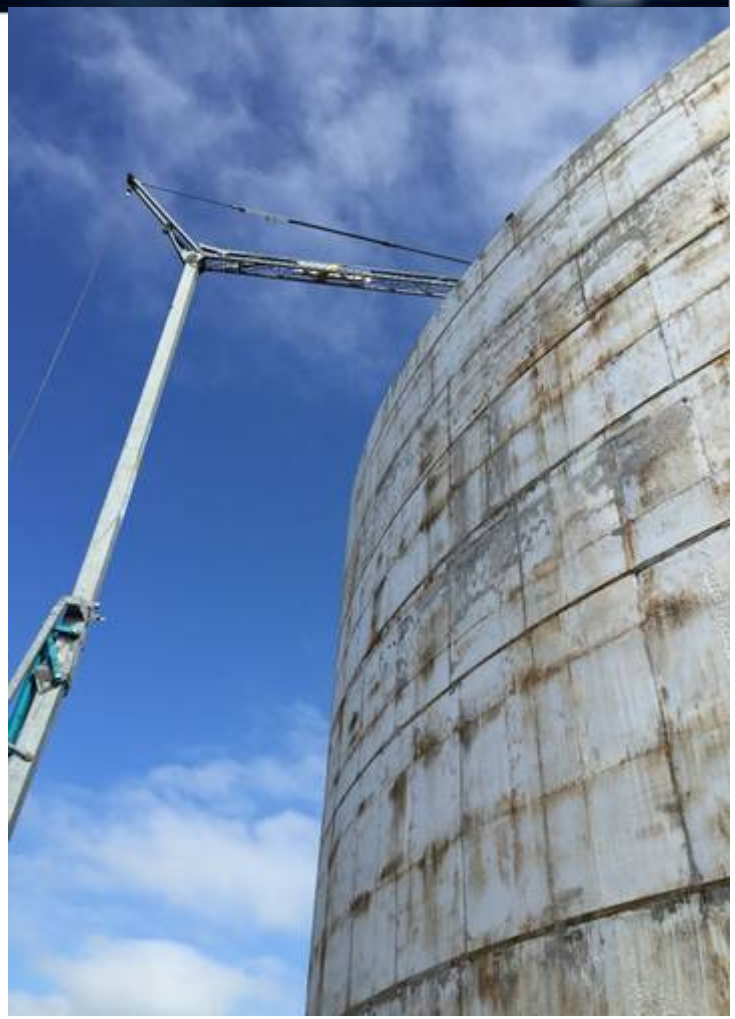
Potential solutions – direct integration

- Direct heat to process areas currently not heated by recovered heat

- Indirect use – e.g. absorption chiller to cool parts of the system
- Secondary use – e.g. building heating

Conclusions

- AD can form an important part of the energy mix for a distillery
- Integration is site dependant – no one size fits all solution
- Must be based on a good understanding of the site, existing energy mix & process



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cutting cost, consumption & carbon

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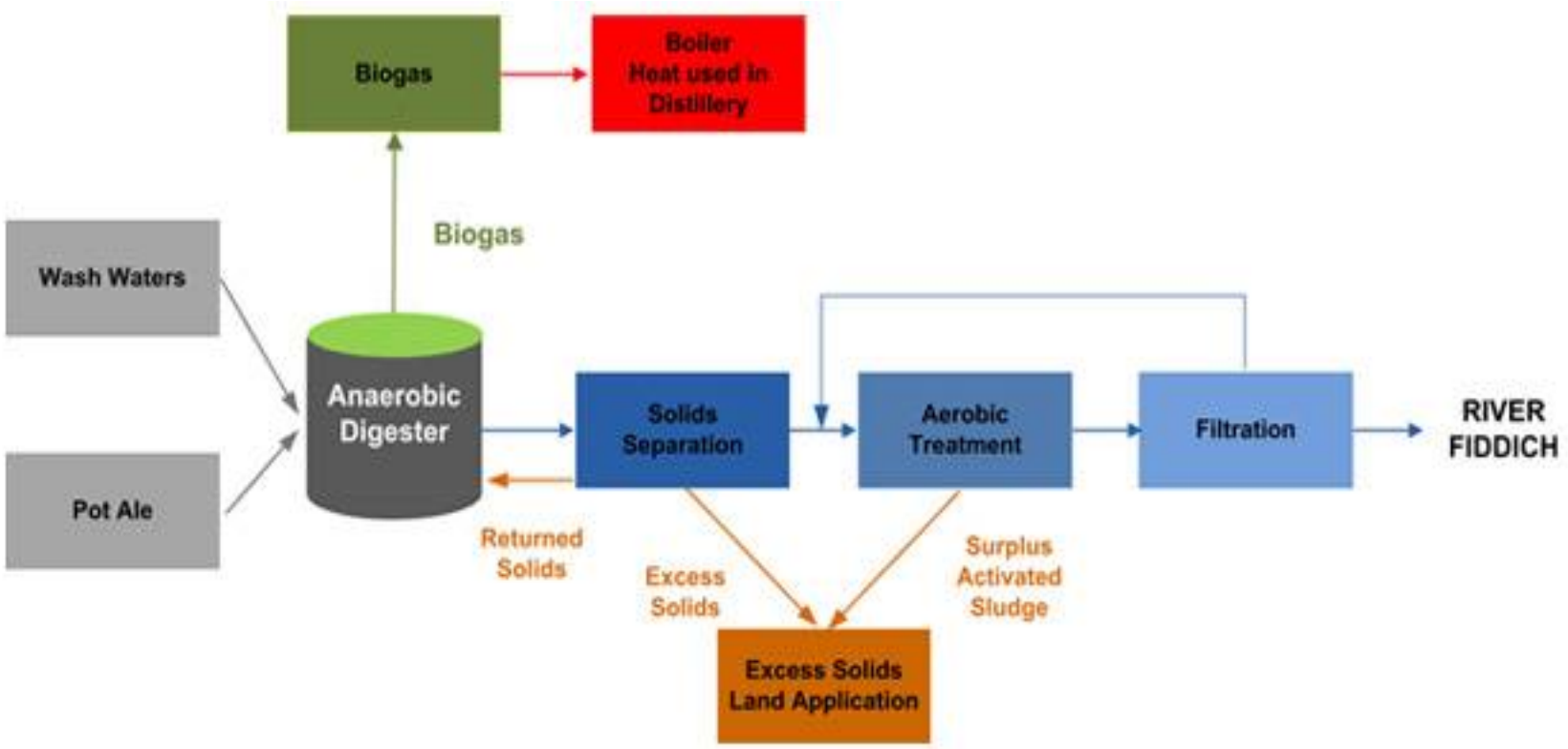
On-site Bio-energy on Distillery, Food and Biofuel Sites

Generating Energy from Effluents & Co-products

- More effective use of scarce natural resources
- Better use of manufacturing / process residues
- Meeting local energy demand / supply security
- Resource optimisation / industrial decarbonisation



Lake District Biogas Ltd

Clearfleau™

Gas to Grid Bio-energy Plant Treating Creamery Residues

Clearfleau™

ENVIRONMENTAL BENEFITS

Delivering Clean Energy and Enhancing Resource Use:

Replacing fossil fuels with biogas will enable smaller food businesses to embrace the circular economy and reduce environmental impact:

- **COD:** optimal biogas conversion
- **Water:** discharge to nearby river
- **Recycling:** energy from residues
- **Emissions:** cutting carbon footprint
- **Energy:** reduce fossil fuel demand
- **Nutrients:** bio-solids for farmland
- **Water:** clean water discharge/re-use

On-site Bio-energy Plant on Glendullan Distillery

- One of two plants built for Diageo in Speyside; now being replicated
- Treating co-products from malt distilleries for watercourse discharge

On-site AD Plant on New Lowland Craft Distillery

- Refurbishing run down industrial site in southern Scotland
- AD plant will supply 30% of heat, with zero off site disposal

Next Challenge – On-site Bio-energy for Smaller (SME) Sites

LDB - Larger Gas to Grid plants:

- Treating 1000 m^3/d of effluents
- Producing 1000 m^3/h of biogas
- Over 5MW thermal energy value
- Able to heat up to 4,000 homes
- Cost £10m - net revenue £2m/annum
- Target 20% ROI (savings / incentives)
- Funding - off balance sheet solution

Plants on Smaller Distilleries will:

- **Treat** ~ 100 m^3/d co-products
- **Achieve** >95% COD removal
- **Produce** 2000 m^3/d of biogas
- **Generate** 500 kWh (thermal)
- **Deliver** an ROI of circa 20%.

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DEVELOPING ON-SITE BIO-ENERGY

Robust Technology

- Demonstration sites
- Operational trials units
- Smaller on-site plants

Decentralised Supply

- CHP - on-site power
- Boiler - process heat
- Bio-methane - clean gas

Wider Policy Issues

- Preparing for Brexit
- Industrial Strategy
- Scottish Leadership

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Renewable Energy
From Liquid Residues

Thank You

For more information visit www.clearfleau.com,

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