Dual Drivers for Greater Energy Efficiency

Winery Engineering Association Conference

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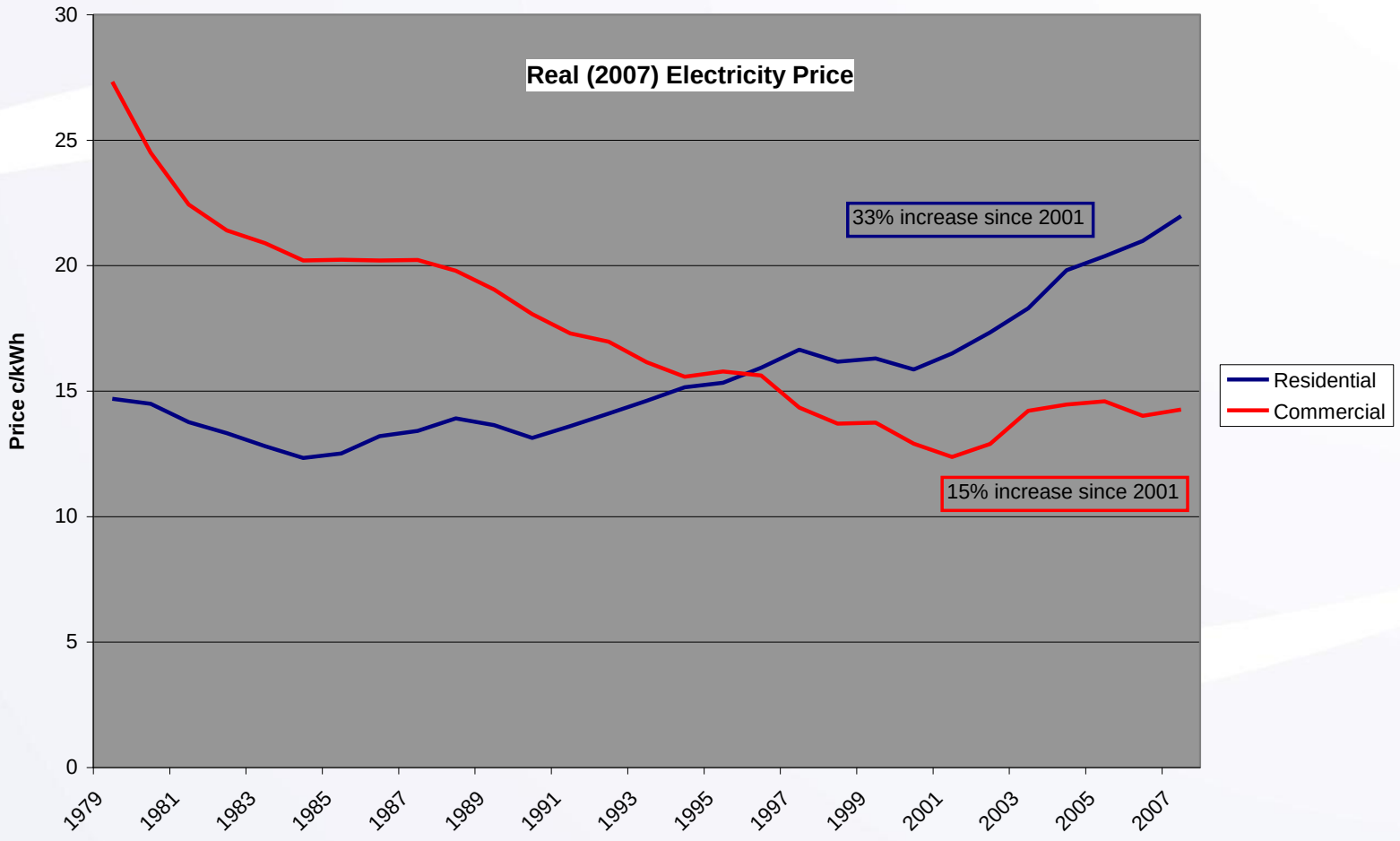
Outline

- Background to the dual drivers
- Description of 2 NZ wine industry projects
  - Product GHG footprinting
  - Winery energy efficiency

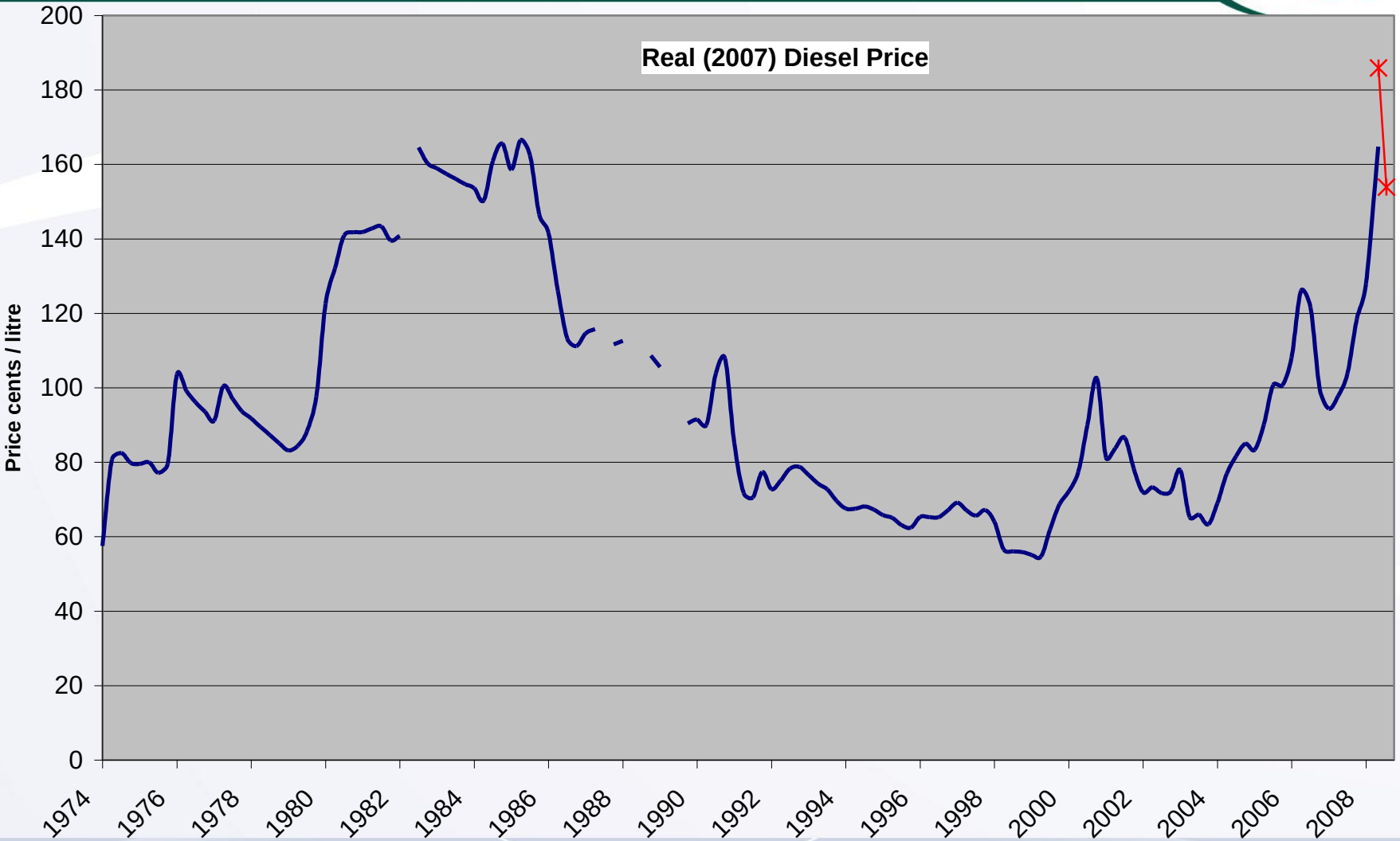
Background

- Renewed focus for improved energy efficiency is being driven by:
  - Increasing energy prices
  - Market demands for greater sustainability, this is reflected in the current “carbon” footprinting projects

Electricity Prices



Diesel Prices



Why choose Anchor Butter that's shipped frozen

when you can choose Country Life?

Before Anchor Butter reaches your table it's frozen and shipped over 11,000 miles from New Zealand.

Country Life, however, is made with milk from British farms and is proud to carry the Red Tractor logo for food standards. So why choose anything else?

There is increasing demand on land to produce food and fuel to protect the environment.

System for calculating carbon footprint flawed

Why is it flawed?

"If the international community fails to agree on a standard system of carbon accounting, we could see imported dairy products being marketed as having a smaller carbon footprint than the same product produced in the UK."

John Allen of Kite Consultancy

NZ Wine Response

- Conduct a GHG product footprinting project
  - Product rather than corporate footprint
  - Product footprinting has a much wider scope
    - Includes all inputs from extraction of the oil to bottle waste disposal
  - Corporate footprinting is the fuel and electricity that you own and control
  - All industries are struggling with data issues

NZ Wine Response

- Product GHG footprinting
  - Data issues, data issues, data issues
  - Need to include all the inputs outside of your control ..... obvious difficulties
  - There are enough difficulties including the electricity and fuel use in your own winery
    - Accounting records
    - Separation into varieties
- The end goal is carbon (energy) reduction

Energy Efficiency Project

MAF SFF & NZ Wine is running a Winery Energy Efficiency Project

- Stage 1
- Development of energy use benchmarks
- Conducted winery surveys (level 2 energy audit) with very detailed questions on all machinery size, performance and running times

Energy Efficiency

What they found was that:

- It is very hard to compare wineries at a ‘high level’ e.g. kWh/L wine due to the variation between wineries
- Tried to overcome by developing a ‘full winery equivalent’ – no longer recognisable as your winery

Benchmarking Tools

Stage 2

Two options:

1. Collect a detailed inventory of machinery (e.g. motor sizes) and estimating running time and performance
2. Model a wineries energy use
    - Works well as it is all about heating a cooling a liquid

BEST WINERY

Lawrence Berkeley National Laboratory

Fetzer Vineyards

California Energy Commission

Pacific Gas and Electric Company

BENCHMARKING AND ENERGY AND WATER SAVINGS TOOLS FOR THE WINE INDUSTRY

Christina Galitsky and Ernst Worrell
Lawrence Berkeley National Laboratory

BEST Winery

- BEST allows wineries to compare their performance against a common standard or optimal performance
- Applicable to a wide range of facilities by compensating for different production streams

BEST Winery

- While BEST does produce benchmarks e.g. MJ/case the key result is an index.
  - An index of 100 = doing as well as the BEST Winery
  - BEST is modelled on an indoor winery
  - From a performance tracking perspective this does not have a large impact

BEST Winery

- If outdoors and you score 200 you know why
- What is more important is how that score changes in subsequent years
- When implementing energy improvement practices/technologies you want to measure and track the change rather than worrying about your starting point

BEST Winery - Modifications

- Converted to SI units from imperial units
- Regional temperatures
- Ability to select electricity processes

BEST Winery

- One of the big positives is the limited data requirement
- It is important to measure change but you don’t want to send more time measuring than it takes to make the change

BEST Winery – Corker Winery

	Red
Grapes received over 12 month period (tonnes)	94
Juice received over 12 month period (litres)	67,544
Amount fermented over 12 month period (litres)	67,544
Wine undergoing malolactic fermentation over 12 month period (litres)	67,544
Wine undergoing malolactic fermentation over 12 month period (Cases)	7,505
Wine produced over 12 month period (litres)	64,595
Wine produced over 12 month period (Cases)	7,177
Barrel room storage capacity utilised on average over 12 month period (litres)	64,556
Amount of wine that is cold stabilised over 12 month period (litres)	64,595
Wine bottled over 12 month period (cases)	

BEST Winery – Corker Winery

Red	Sweet Whites	Dry whites	
		Tank fermented	Barrel fermented
94	0	609	7
67,544	0	455,260	4,784
67,544	0	434,967	4,784
67,544	0	0	0
7,505	0	0	0
64,595	0	422,954	4,593
7,177	0	46,995	510
64,556			4,593
64,595	0	422,954	4,593

BEST Winery – Corker Winery

Energy Usage Data	
Enter total amounts of each energy type for your 12 month period. Include all meters that supply energy used in wine production and related processes:	
Electricity consumption (kWh/year)	178,844
Natural gas consumption (MJ/year)	100,000
Annual LPG consumption (kg)	3,000
Annual diesel and fuel oil consumption - (L/year)	0

BEST Winery - Results

The AgriBusiness Group™

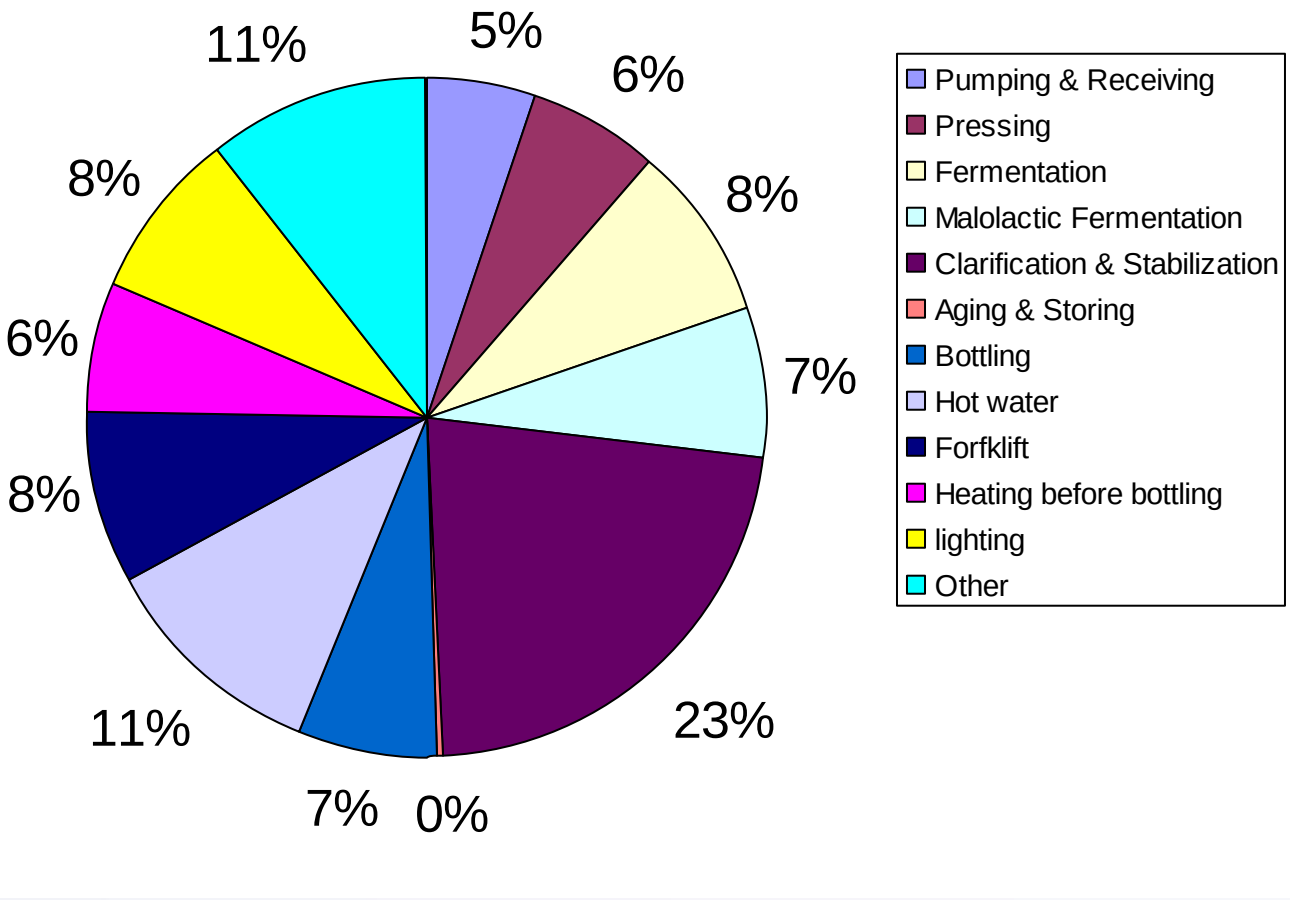
Energy Intensity Index (EII)	**148**
Water Intensity Index (WII)	**270**

BEST Winery - Results

Summary Data	
Your Facility Energy and Water Use (input data):	
Electricity Consumption (kWh/year)	178,844
Fuel Consumption (MJ/year)	248,530
Total Energy Consumption (MJ/year)	892,368
Energy Intensity (MJ/case produced)	16.3

Technical Potential for Efficiency Improvement:		
Electricity (kWh saved/year)	66,818	37%
Fuel (MJ saved/year)	49,434	20%
Total Energy (MJ saved/year)	289,981	32%

BEST Winery - Results



BEST Winery - E. Reduction

- Processes
  - Refrigeration
  - Pumping
  - Compressed air
  - Lighting
  - Hot water

BEST Winery – E. Reduction

Share Refrigeration Use (of total electricity use):	**50%**	**1.64 kWh/case**

Measures	**Potential Application (%)**	**Typical Energy Savings**	
		% of Refrigeration Energy Use	**kWh/case annually**
System Changes			
Monitor performance	**100%**	3%	0.05
Monitor refrigerant charge	**100%**	10%	0.16
Monitor suction line filters	**100%**	3%	0.05
Monitor contaminants in refrigerant	**0%**	2%	0.03
Tank insulation	**25%**	19%	0.32
Nighttime air cooling	**100%**	12%	0.20
Reduced infiltration load from door closings	**25%**	15%	0.25
Building Shell - reflective roofing materials		3%	0.06

BEST Winery - E. Reduction

Night time air cooling – explanation note

Bringing in outside air brings in air at lower temperatures and provides savings due to reduced cooling electricity use ….. We estimate energy savings for this measure to be about 20%, applicable to warehouses (for aging and storing), offices and cold stabilization only, where outside air circulation is not already required. …

BEST Winery - Results

The AgriBusiness Group™

Energy Intensity Index (EII)	**148**
Water Intensity Index (WII)	**270**

BEST Winery - Results

Energy Intensity Index (EII)	**148**
EII (after implementation)	**129**
Water Intensity Index (WII)	**270**
WII (after implementation)	**263**

BEST Winery - Results

Technical Potential for Efficiency Improvement:		
Electricity (kWh saved/year)	66,818	37%
Fuel (MJ saved/year)	49,434	20%
Total Energy (MJ saved/year)	289,981	32%

BEST Winery - Results

Potential for Efficiency Improvement:		
Electricity (kWh savings/year)	24,532	14%
Fuel (MJ savings/year)	34,647	14%
Total Energy (MJ savings/year)	118,056	13%

BEST Winery - Results

Economics:	
Electricity Savings ($/year)	$ 2,404
Fuel Savings ($/year)	$ 651
Water Savings ($/year)	$ 33
Capital Costs ($/year)	$ 5,533
Simple Payback Period (years)	1.8

BEST Winery - Weaknesses

- Once beyond the benchmarking aspect there is an avalanche of overwhelming energy efficiency measures
  - Preparing a guide which will include a top ten energy efficiency opportunities
  - A Guide to Energy Efficiency Innovation in Australian Wineries
- Does not currently model outdoor vats

BEST Winery - Strengths

- Low level of data required
- Overcomes production differences
  - Volumes
  - Variety mix
  - Processes
  - Location

BEST Winery - Strengths

- Could overcome seasonal temperature differences
- Models energy use by process
- Has detailed energy efficiency measures
- Very little training is needed to use the benchmarking and tracking component

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