

Farm energy productivity: “the last mile”

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**Growing
the best**



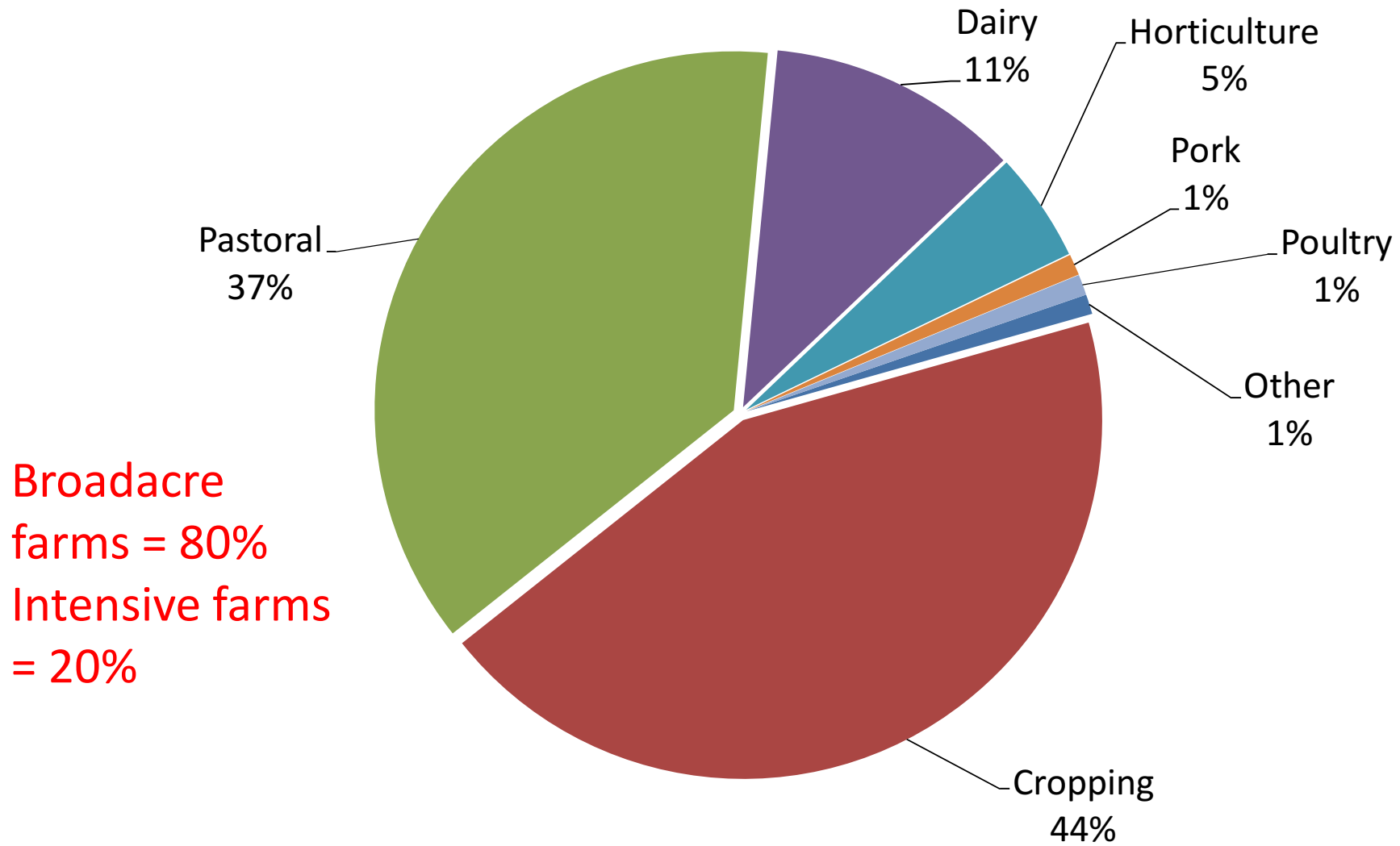
Summary

- Some background on energy in agriculture
- The NSW Farmers energy innovation program and opportunities on farm
- Strategic issues surrounding farm energy productivity and regional energy security

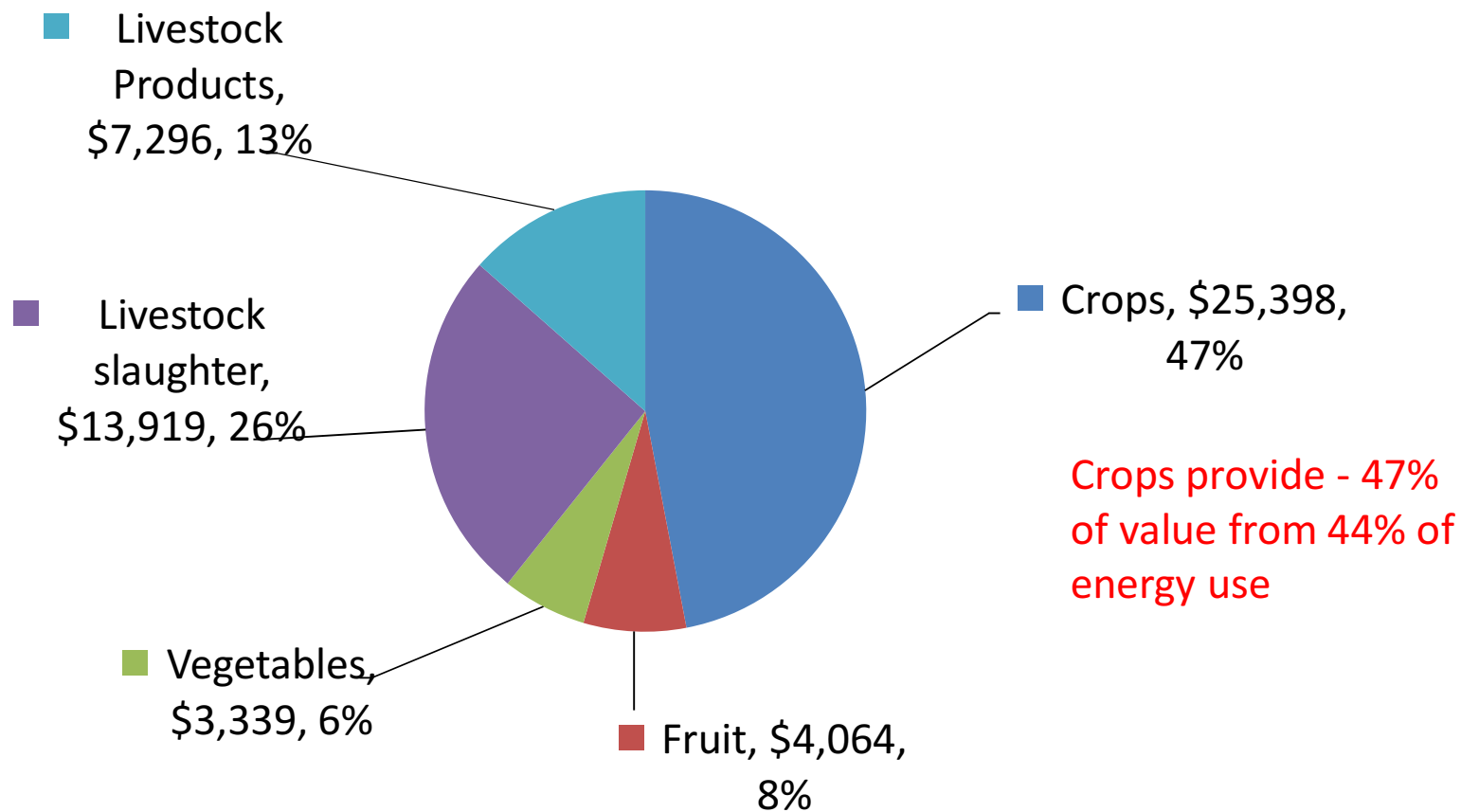
Agricultural energy use

- Very limited data available for Australia
- NSW farms consume an estimated 24 petajoules energy per annum
- Est cost \$900 million per annum
- “Last mile” factor - Farms typically at ends of distribution networks
- Higher prices (60% since 2007) and lower reliability and quality than other sectors.

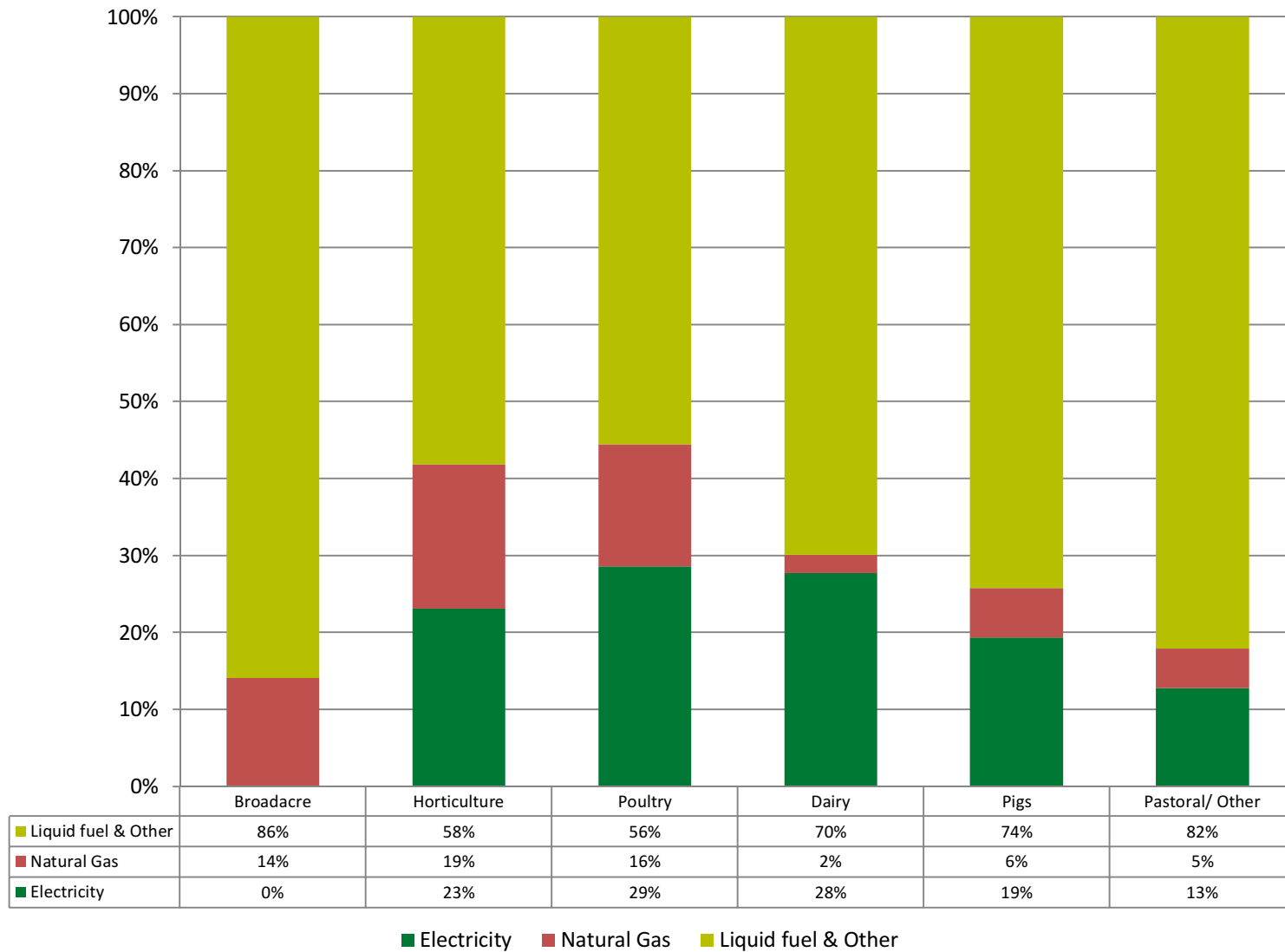
Energy use by type of farm (%)



Value of Australian Agricultural Commodities 2011-12 (\$ millions)



Energy use by source



Broadacre farms: Pastoral and cropping

- Around 36,000 SMEs, 95% of the 38,000 commercial farms in NSW
- Energy second or third highest expense, typically exceeding 6% of the cost of production
- Diesel for vehicles and irrigation pumping generally the biggest cost

Farm energy innovation program

- Funded by Federal Department of industry
- Working with farmers across all sectors
- Key themes:
 - Energy planning
 - Energy purchasing
 - Efficient farm vehicles
 - Energy in irrigation
 - Energy in intensive facilities
 - Renewable energy

Energy productivity goals

- Efficiencies in activities with high energy use (eg tractors, irrigation pumping, intensive facilities)
- Direct savings plus dividends from increased energy security
- Empowering farmers and their advisors to measure and manage energy as a variable cost
- Improved understanding of energy priorities in the farm context

Energy Planning

- Identify major energy demands
- Perform farm energy audit
- Create farm energy plan



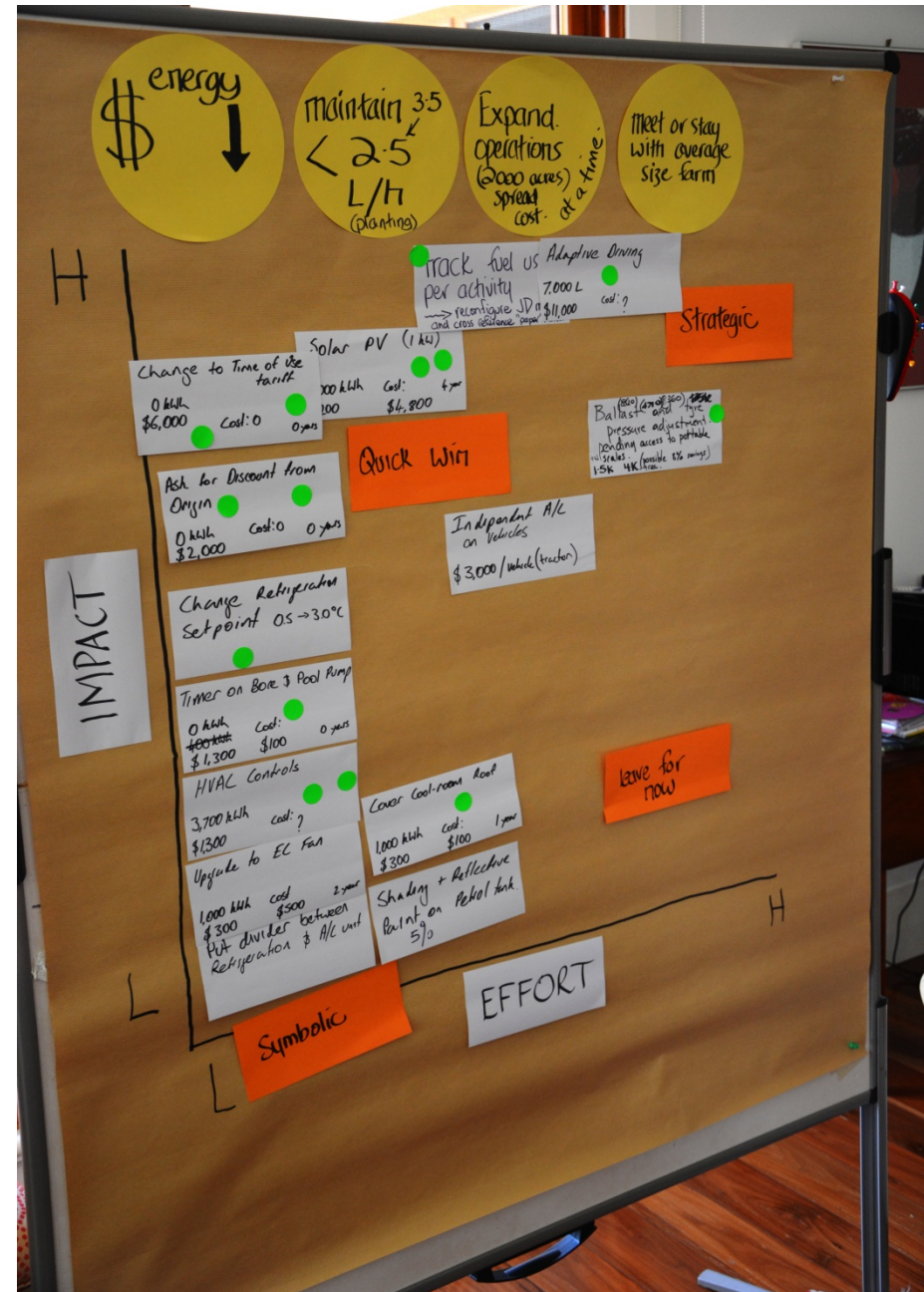
Action plan

Plan action & accountabilities to implement or investigate

Opportunities	Next activity	Who/with	by when... (savings)
<p>Solar PV (1 kW)</p> <p>3,000 kWh Cost: \$1,200 4-year</p> <p>Cost: \$4,800</p>	<p>sarah to find candidate installers.</p> <p>- find 3 quotes (by end of week)</p> <p>- check quotes</p>	<p>- yellowdot</p> <p>- Butcher & Moree</p> <p>Examples Phil or Gerry</p>	<p>June</p>
<p>Adaptive Driving</p> <p>7,000 L Cost: \$11,000</p> <p>Independent A/C on Vehicles</p> <p>\$3,000/vehicle (tractor)</p> <p>track fuel use per activity</p> <p>→ reconfigure JD metrics and cross reference "paper" monitor</p>	<p>- Find recommendations for:</p> <ul style="list-style-type: none"> - optimum setup - fuel use key performance indicators <p>- Investigate if there are sellers of this technology for agriculture</p> <p>- Draft prototype operator's fuel use template</p> <p>- print out word version and add to cabs</p> <p>- explain process to operators</p> <p>- Aggregate data for benchmarking.</p>	<p>- John Deere (chesterfield)</p> <p>Andrew</p> <p>Gerry (send on + current version)</p> <p>John</p>	<p>May</p> <p>May</p>
<p>Upgrade to EC Fan</p> <p>1,000 kWh Cost: \$300 2-year</p> <p>Cost: \$500</p>	<p>Call Bob brother (HVAC supplier)</p>	<p>Sarah</p>	
<p>Char... ..</p> <p>Ask for Discount from</p> <p>0 kWh Origin Cost: \$6,000</p> <p>0 kWh Cost: \$2,000 0-year</p>	<p>Recieve offer from retailer</p>	<p>Sarah</p> <p>Andrew</p>	<p>April/July</p>

Priority matrix

Select first 3-5 based on Impact on business plans and effort required



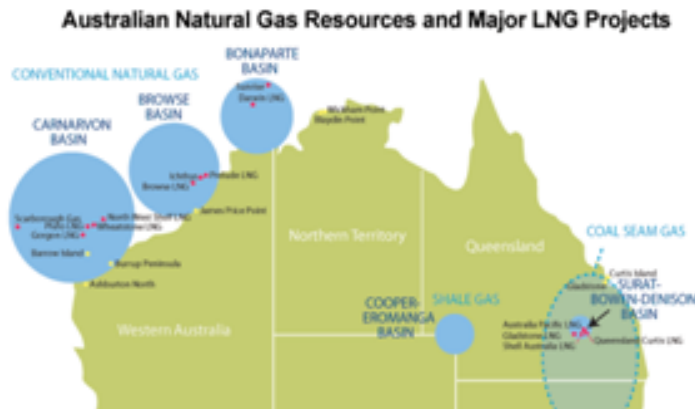
Adding energy planning to the farmers skill set



Energy Purchasing



Electricity



Natural Gas



Liquid fuels (diesel, petrol)

Efficient Farm Vehicles

- Focus tractors and harvesters – Diesel
 - Adaptive driving
 - Ballasting
 - Tyre inflation
 - Wheel slip
 - Tractor purchasing



Key fuel saving measures

- | | |
|-------------------------------|-------------|
| • Buying the right tractor | 8% savings |
| • Correct vehicle setup | 8% savings |
| • Efficient vehicle operation | 15% savings |
| • Maintenance | 7% savings |
| • Record keeping and planning | 5% savings |

Possible ~36% savings in fuel use

Energy in Irrigation

- Pump and irrigation sizing
- Diesel vs electric pumping
- Solar pumping
- Irrigation network setup
- Variable speed drives
- Sensors and smart controls



Energy in Farm Facilities

- Building shell/envelope
- Heating, ventilation and cooling
- Lighting
- Refrigeration/cool room storage
- Hot water
- Power quality
- Motors, pumps and drives

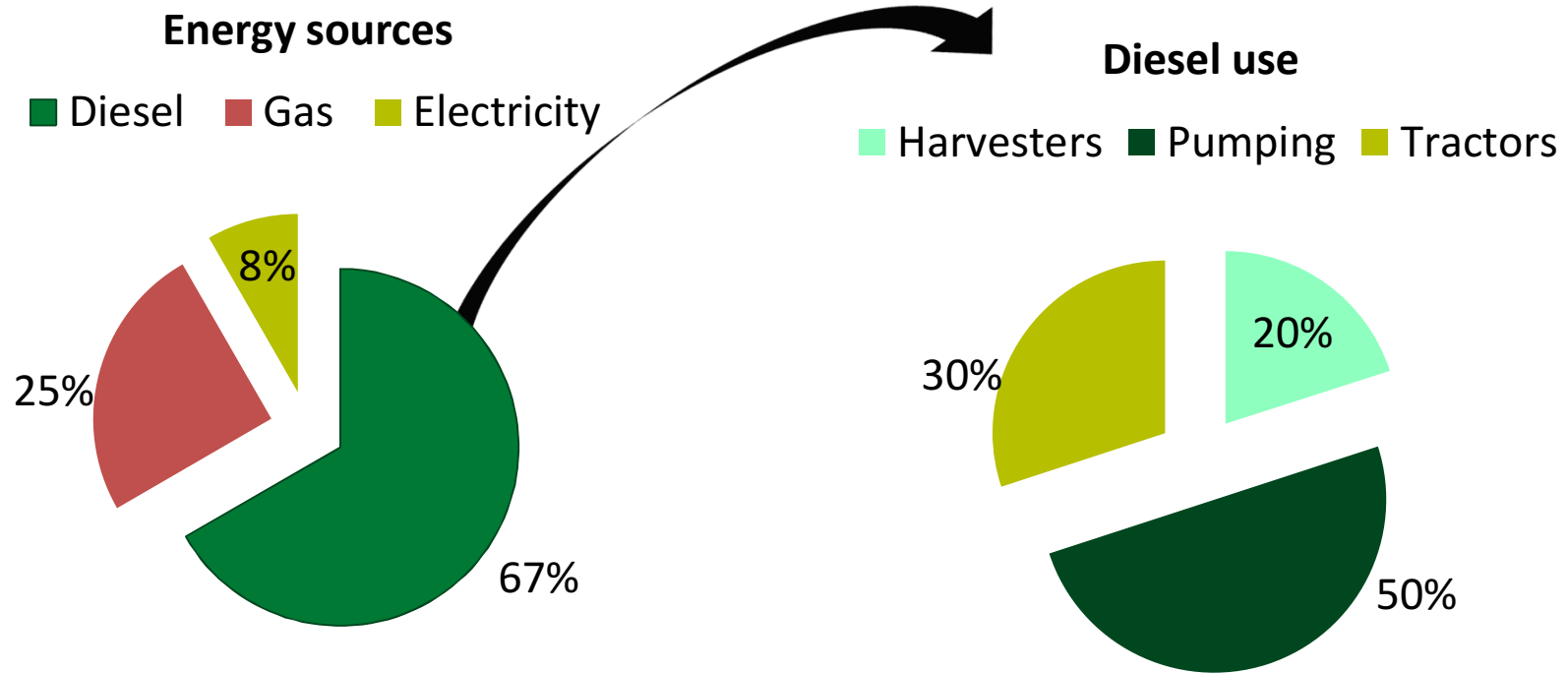


Renewable Energy

- Solar photovoltaic
 - Solar thermal
 - Enterprise scale wind
 - Ground coupled heat pumps
 - Waste to energy
 - Biogas
 - Biofuels
- Other new technologies...?



Illustrative irrigation farm



Case study – Broadacre dryland/irrigation

\$500k diesel, \$60k electricity

Buy Better

Changing Tariffs and Pricing with Origin/Country Energy

Requested NSW Farmers bulk buying discount: Savings \$8,000 p.a. (13%)

Use less

Improving the efficiency of tractors, mobile equipment and pumping:

Optimising tyre pressure and ballasting: Savings ~\$15,000 p.a. (3%)

Adaptive driving and fuel use monitoring: Savings ~\$10,000 p.a. (2%)

Low load pump and pumping control: Savings ~\$30,000 p.a. (5%)

Generate on farm

Electricity generation to offset purchases from the grid:

Solar PV system of 5 kW near house: Savings ~\$1,500 p.a. (3%)

Total savings: \$64,500

Regional opportunities

- New development increasing local demand
- Opportunities for innovation with multipliers for local communities
- Need for strategic planning and cross-sectoral collaboration
- D factor analysis the key – where is local generation and efficiency most beneficial to distributors and the national energy economy?

Tamworth case study

- Strong local economy around agriculture, food and fibre processing and mining
 - New food processing factories
 - 180 new poultry sheds to supply
 - also, new coal mines

= increased demand for electricity
- How to supply it – from the grid or from renewables?
- Turning organic waste into a resource?
- Transgrid planning new substation & 66,000 volt line

The “Last mile” issue

- Ends of networks:
 - more expensive to supply
 - harder to service, monitor and manage
 - a source of hazard (heat = fire)

= higher charges, lower quality, reliability
- Applies to electricity, gas, diesel...



countryenergy

TAX INVOICE

please pay

\$3,989.36

by 21 August 2012

Origin Energy Electricity Limited
ABN 33 071 052 287

invoice no. 4
date issued 01/08/12
charges for this bill period 30/06/2012 to 31/07/2012

ENERGY

	Quantity	Units	Unit price c	TLF	DLF	Amount \$
Peak Energy	2104	kWh	7.7351	0.9578	1.0996	171.40
Shoulder Energy	5161	kWh	7.7351	0.9578	1.0996	420.45
Off Peak Energy	7032	kWh	4.9089	0.9578	1.0996	363.56
Total	14297					\$955.41

MARKET PARTICIPATION

Fee	Quantity	Units	Unit price c	DLF	Amount \$
End User Advocacy	14296	kWh	0.0012	1.0996	0.19
Ancillary Services	14296	kWh	0.0450	1.0996	7.07
NSW Energy Saving Scheme	14296	kWh	0.1230	1.0996	19.34
AEMO	14296	kWh	0.0382	1.0996	6.00
Large Renewable Energy Target	14296	kWh	0.4810	1.0996	75.61
Small Renewable Energy Scheme				6	150.60
Total					\$258.81

NETWORK (Tariff BL

				Amount \$
Peak Energy				420.67
Shoulder Energy	5161	kWh	19.9938	1,031.88
Off Peak Energy	7032	kWh	9.3473	657.30
Network Access Charge	31	days	626.2000	194.12
Total				\$2,303.97

**Network charge
64% of total bill!**

NMI 40011747766

monthly maximum demand at:

25/07/2012 1430 HRS

58.988856 kVa

Power Factor 0.646000

average cost (c/kWh):

25.37

**greenhouse gas emissions produced
by your electricity usage for this
period is: 15.15 ton CO₂**

Greenhouse gas emissions are up
2.02 tonnes from last year.

Visit www.climatechange.gov.au to
find out more on climate change and
greenhouse emissions.

Charges continued on next page. Please see over ▶

Keys to improving farm energy productivity

- Better agricultural energy data to enable benchmarking (by commodity; farm type, machinery)
- Targeted R&D funding to develop solutions (eg poultry waste to energy; irrigation energy efficiency)
- D-factor analysis to direct geographic approach to renewable incentives
- Explicit focus on regional needs and opportunities in national energy planning and policy

Closing thoughts...

- National model for electricity based on coal field generators and high voltage transmission.
- Is there a more cost effective, sustainable way to power regional Australia?
- Can we build on regional interest in off grid, and island grid supply models to solve last mile and network infrastructure funding problems?
- Can we remove barriers to distributors and retailers providing demand data to researchers and planners?

- Thank you
- Questions?

Waste to energy

- A complex team effort...
- Elements in feasibility analysis
 - Quantifying and mapping the waste resource
 - Transport logistics
 - Financing a processing plant
 - Locking in waste suppliers and energy clients
- Site factors and precinct models
- Planning the key

What's special about tractors?

- Lack of pertinent efficiency information
- Small market in Australia
- Huge investments -> efficiencies or inefficiencies can be locked in for decades
- Substitutions are not very viable
 - Can't move away from diesel either.
- Crucial aspects to reduce fuel use are
 - Optimising setup
 - Operators and behaviour