



GCCN
GIPPSLAND
CLIMATE CHANGE
NETWORK



LOW CARBON GROWTH PLAN FOR GIPPSLAND:

Phase 1, Screening of All Measures

APPENDICES

August 2013



Report prepared for:
The Gippsland Climate Change Network

Report Authors:
Jack Brown, Energy Efficient Strategies
Lloyd Harrington, Energy Efficient Strategies

Additional Input from:
Robert Foster, Energy Efficient Strategies

Please note -

There are two components to the Phase 1, Selected Measures Report:
Final Report, October 2013
Appendices (this document), August 2013

Disclaimer:

The views, conclusions and recommendations expressed in this report are those of Energy Efficient Strategies. Where outside sources have been sought (stated in the acknowledgements), this has been noted in the text and the express permission gained before the information has been included.

While the authors have taken every care to accurately report and analyse a range of data in this report, the authors are not responsible for the source data, nor any use of misuse of any data or information provided in this report, nor any loss arising from the use of this data.

Acknowledgements:

This report and the analysis was prepared by Jack Brown and Lloyd Harrington of Energy Efficient Strategies.

The authors would like to specifically thank a number of individuals for their input into the report:

- Tia Navanteri, GCCN EO
- Scott Ferraro, ClimateWorks
- Judy Bush, Northern Alliance for Greenhouse Action
- Sam Smith, Future Proofing Geelong
- Glenn Marriott, Ag-Challenge Consulting

The authors would also like to thank the GCCN Steering Committee for their assistance and guidance throughout the project. In particular, thanks is given for the comments received on the draft of the report, these proved very valuable in the creation of this final report.

Funding for this project has been provided through Regional Development Australia Gippsland Committee, from the members of the Gippsland Local Government Network, and from the GCCN. The bank – MECU may also provide support for Phase 2 of this project.

Table of Contents

Appendix A: Excluded Measures Table	5
Appendix B: Excluded Sector 1 Measures – Manufacturing, Mining and Freight.....	9
Eco Driving	9
Freight Operational Efficiency Improvement.....	11
Large Articulated Truck Efficiency Improvements.....	13
Mining Energy Efficiency.....	15
Food and Beverage Manufacturing Energy Efficiency	17
Onsite Electricity Generation from Biomass/Biogas.....	19
Other Industry Energy Efficiency	21
Onsite Heat Generation from Biomass/Biogas	23
Other Industry Cogeneration.....	25
Gas Processing Improvements.....	27
Chemicals Process Improvements	29
Appendix C: Excluded Sector 2 Measures – Commercial and Services	31
Car and Light Commercial Vehicle Efficiency	31
Hybrid Cars.....	33
New Builds to 6 Stars	35
Electric Vehicles	37
Commercial Cogeneration	39
Bus and Rigid Truck Efficiency Improvement	41
Appendix D: Excluded Sector 3 Measures – Households.....	43
Choosing More Efficient New Vehicles	43
Shift Some Commuter Car Travel to Rail.....	45
Hybrid Cars.....	46
Residential New Builds to 7 Stars.....	48
Electric Cars	50
Solar PV.....	52
Appendix E: Excluded Sector 4 Measures – On The Land	54
On Farm Electricity Generation from Organic Waste	54
Improved Pasture and Grassland Management to Reduce Livestock Emissions	57
Improved Pasture and Grassland Management to Improve Soil Carbon	59

Anti-methanogenic Treatments.....	62
Improved Forest Management.....	64
Restoration of Less Productive Pasture and Grassland	66
Appendix F: Aspects of Matrix Creation and Measure Selection	68
Implementation Body/Stakeholders	68
Research	68
Appendix G: Measure Types and Discussion	70
Sector 1 Measures – Manufacturing, Mining and Freight	70
Sector 2 Measures – Commercial and Services.....	71
Sector 3 Measures – Households	72
Sector 4 Measures – On The Land	73
Measure Types Discussion	74
Behaviour Change	74
Freight Efficiency	74
Energy Efficiency	74
Distributed Energy	74
Vehicle Efficiency and Hybrids/Electric.....	75
New Builds.....	75
Soil Carbon, Forestry Practices and Livestock	75

Appendix A: Excluded Measures Table

The following table includes all measures that did not make it past the indicator and scoring process, even considering additional stakeholder input. Please note, it is not that these measures individually don't have merit, rather that due to the limited available project resources and the identification of challenging implementation hurdles, they were excluded from the final list of priority measures.

Sector	Measure	Cost A\$/tCO ₂ e	Reduction Potential -ktCO ₂ e	Term	Measure Type	Implementation Body/ Stakeholders	Regional Responsibility	Funding Possibilities	Key Constraint	Status	Recommended GCCN Role	Practicality Level	Score (/10)
1	Freight operational efficiency improvement	-341	19.1	Short	Freight efficiency	Trucking companies, Industry groups	Possible through coordination, education program?	Possibly a range – Automotive Transformation Scheme key	Proving savings achievable	N/A	N/A	Green	7
2	Hybrid cars (commercial)	-284	4.5	Long	Hybrids/ electric	SMEs, Vehicle sales companies, Government bodies?, Driving bodies?	Maybe possible for fleet vehicles, difficult to see implementation at a large scale	None indentified	Capital, most cost effective technology for rural?	N/A	N/A	Orange	7
1	Food and beverage manufacturing energy efficiency	-102	28.9	Medium	Energy efficiency	Food and bev manufacturers, Industry groups	Possible through coordination and awareness program	Possibly a range – AusInd Clean Tech Food and Foundries key	Capital investment, market pressures	N/A	N/A	Green	7
1	Other industry energy efficiency	-44	74.2	Medium	Energy efficiency	Industry – many actors	Possible through coordination	Unknown – possibly dependent on action undertaken	Large number mixed measures	N/A	N/A	Green	7
1	Other industry cogeneration	-8.1	25.0	Long	Distributed energy	Industry, Energy distributors?, Government bodies?	Maybe possible, very site dependant	Unknown – possibly Innovation Grants or AusInd Clean Tech Program	Capital investment, legislative constraints	N/A	N/A	Orange	7
1	Gas processing energy efficiency	-5	94.5	Medium	Energy efficiency	ExxonMobil, Government bodies	Possible through discussions	Unknown – possibly Innovation Grants or AusInd Clean Tech Program	Cost effectiveness for operator	N/A	N/A	Green	7
2	Commercial cogeneration	2	32.6	Long	Distributed energy	SMEs, Building owners, Government bodies?	Maybe possible, very site dependant	Unknown – possibly Innovation Grants or AusInd Clean Tech Program, EUAs	Capital investment, export rules	N/A	N/A	Orange	7

Sector	Measure	Cost A\$/tCO ₂ e	Reduction Potential -ktCO ₂ e	Term	Measure Type	Implementation Body/ Stakeholders	Regional Responsibility	Funding Possibilities	Key Constraint	Status	Recommended GCCN Role	Practicality Level	Score (/10)
2	Bus and rigid truck efficiency improvement	126	2.0	Long	Vehicle efficiency	Bus and trucking companies, Vehicle owners, Vehicle sales and manufacturers	Maybe possible for fleet vehicles, difficult to see implementation at a large scale	Possibly a range – Automotive Transformation Scheme key	Cost per tonne of abatement	N/A	N/A	Orange	7
4	Anti-methanogenic treatments	7	65.6	Medium	Livestock	Farmers, Farming bodies, DPI, Ag businesses and consultants, Vets, Dairy industry bodies, MLA	Maybe possible through encouragement program	Possibly a range – Carbon Farming Initiative key	Funding and identification of co-benefits	N/A	N/A	Orange	7
1	Large articulated truck efficiency improvements	-334	9.1	Long	Freight efficiency	Vehicle manufacturers, Trucking companies	Difficult – key groups outside Gippsland	Possibly a range – Automotive Transformation Scheme key	Requires design and manufacturing changes	N/A	N/A	Orange	6
3	Shift some commuter car travel to rail	-315	3.0	Short	Behaviour change	VLine, Individuals, State government, Rail and car user groups	Maybe possible through improved services and infrastructure	None identified	Requires behaviour change	N/A	N/A	Orange	6
3	Hybrid cars	-284	4.5	Long	Hybrids/ electric	Individuals, Vehicle sales companies, Driving bodies?	Difficult to see implementation at a large scale	None identified	Cost effectiveness	N/A	N/A	Orange	6
1	Onsite electricity generation from biomass/biogas	-52	73.6	Long	Distributed energy	Industry, Energy distributors?, Government bodies?	Maybe possible, very site dependant	Unknown – possibly Innovation Grants or AusInd Clean Tech Program	Capital cost, technology, regulations	N/A	N/A	Orange	6
1	Onsite heat generation from biomass/biogas	-40	66.9	Long	Distributed energy	Industry, Energy distributors?, Government bodies?	Maybe possible, very site dependant	Unknown – possibly Innovation Grants or AusInd Clean Tech Program	Capital cost, technology, regulations	N/A	N/A	Orange	6
2	Electric vehicles (commercial)	-23	3.2	Long	Hybrids/ electric	SMEs, Vehicle sales and manufacturers, Government bodies?	Maybe possible for fleet vehicles, difficult to see implementation at a large scale	None identified	Technology availability and cost effectiveness	N/A	N/A	Orange	6
3	Electric cars (residential)	-23	3.2	Long	Hybrid/ electric	Individuals, Vehicle sales and manufacturers, Government bodies?	Difficult to see implementation at a large scale	None identified	Technology availability and cost effectiveness	N/A	N/A	Orange	6

Sector	Measure	Cost A\$/tCO ₂ e	Reduction Potential -ktCO ₂ e	Term	Measure Type	Implementation Body/ Stakeholders	Regional Responsibility	Funding Possibilities	Key Constraint	Status	Recommended GCCN Role	Practicality Level	Score (/10)
3	Solar PV	70	23.9	Medium	Distributed energy	Householders, Solar sales and manufacturers, Energy distributors and retailers, Government bodies	Possible through encouragement program	Feed in tariffs only?	User cost effectiveness, feed in tariff rules	N/A	N/A	Orange	6
4	Restoration of less productive pasture and grassland	82	18.0	Long	Soil carbon	Farmers, Farming bodies, Ag businesses and consultants, Fertilizer and seed companies, DEPI, Government bodies?, Landcare	Maybe possible through encouragement program	Possibly a range – Carbon Farming Initiative key	Funding and site identification	N/A	N/A	Orange	6
2	Car and light commercial vehicle efficiency improvement	-398	20.3	Long	Vehicle efficiency	Vehicle sales and manufacturers, SMEs, Driving bodies?	Maybe possible for fleet vehicles, difficult to see implementation at a large scale	Unknown – possibly Automotive Transformation Scheme?	Requires design and manufacturing changes	N/A	N/A	Orange	5
3	Choosing more efficient new vehicles	-398	20.3	Long	Vehicle efficiency	Individuals, Vehicle sales and manufacturers, Driving bodies	Difficult to see implementation at a large scale	None identified	Requires design and manufacturing changes	N/A	N/A	Orange	5
1	Mining energy efficiency	-234	30.3	Long	Energy efficiency	Mining companies, Equipment manufacturers	Maybe possible, dependant on site	Unknown – possibly Innovation Grants or AusInd Clean Tech Program	Stakeholder reluctance to invest	N/A	N/A	Orange	5
3	Residential new builds to 7 stars	-76	34.6	Long	New builds	Building authorities, Building owners, Developers, Builders, Government bodies	Mandatory program = very difficult, Voluntary program = maybe possible	None identified	Requires State regulatory changes	N/A	N/A	Orange	5
2	New builds to 6 stars (commercial NABERS)	-34	41.5	Long	New builds	Building authorities, Building owners, Developers, Builders, Government bodies	Mandatory program = very difficult, Voluntary program = maybe possible	None identified	Voluntary scheme, or new regulation	N/A	N/A	Orange	5

Sector	Measure	Cost A\$/tCO ₂ e	Reduction Potential -ktCO ₂ e	Term	Measure Type	Implementation Body/ Stakeholders	Regional Responsibility	Funding Possibilities	Key Constraint	Status	Recommended GCCN Role	Practicality Level	Score (/10)
4	Improved pasture and grassland management to reduce livestock emissions	5	15.5	Short	Livestock	Farmers, Farming bodies, DPI, Ag businesses and consultants	Maybe possible through encouragement program	Possibly a range – Carbon Farming Initiative key	Funding and identification of co-benefits	N/A	N/A	Orange	5
4	Improved pasture and grassland management to improve soil carbon	6	52.7	Medium	Soil carbon	Farmers, Farming bodies, DPI, Ag businesses and consultants	Maybe possible through encouragement program	Possibly a range – Carbon Farming Initiative key	Funding and identification of co-benefits	N/A	N/A	Orange	5
4	Improved forest management	53	43.2	Short	Forest management	Farmers, Land owners, DEPI, DPCD, Landcare Groups, CMAs, State Government, Government bodies?, Vic Forests	Maybe possible through targeted program	Possibly a range – Landcare Grants or Carbon Farming Initiative	Funding and responsibility identification	N/A	N/A	Orange	4
4	On farm electricity generation from organic waste	-52	17.5	Long	Distributed energy	Farmers, Farming bodies, DPI, Ag businesses and consultants?	Maybe possible, very site dependant though	Unknown – possibly Innovation Grants or AusInd Clean Tech Program	Capital cost, technology, regulations	N/A	N/A	Orange	4
1	Eco driving	-501	6.3	Short	Behaviour change	Many and spread	Maybe possible, through increased awareness	None identified	Requires behaviour change	N/A	N/A	Red	3
1	Chemicals process improvements	147	5.6	Long	Energy efficiency	Unsure of applicable stakeholders	Unsure given lack of stakeholders	Unknown – possibly Innovation Grants or AusInd Clean Tech Program	Cost per tonne of abatement	N/A	N/A	Red	2

Appendix B: Excluded Sector 1 Measures – Manufacturing, Mining and Freight

Eco Driving

Implementation of eco-driving principles to reduce fuel consumption and associated greenhouse gas emissions in large articulated trucks. Drivers are typically trained through a combination of theoretical and practical lessons to prepare and drive their vehicles to reduce fuel consumption. Eco-driving may also have co-benefit of enhancing safe driving practices.

Cost (A\$/tCO₂e): -501

Emissions Reduction Potential (-ktCO₂e): 6.3

Assumptions:

- 20% abatement penetration rate
- 10% fuel savings at an upfront cost of approx. \$180 in training per driver

Measure Type: Behaviour Change

Timeframe: Short

Implementation Body/Stakeholders: Driving Organisations (ie RACV), Fleet Organisations, Government Bodies, Corporations, Individuals, SMEs

Regional Responsibility Level: Maybe possible through increased awareness, ad campaign?

Additional stakeholder input - *A driver education program could provide a quick win.*

Existence of Other Information: Limited information available:

European website containing eco driving information -
<http://www.ecodrive.org/>

News article concerning changes in driving technology -
<http://www.abc.net.au/news/2013-06-19/bmw-green-lights/4764206>

Practical Implementation Considerations: Requires behaviour change. How do you get people/organisations to take part in this measure? A voluntary response? Mandatory? It is nice in theory, but probably very hard in practice.

Funding Opportunities: No funding opportunities were identified for Eco Driving.

Comments:

- **General** – High negative cost, low abatement potential
- **Pros** – Many drivers, high car ownership in Gippsland, large use of freight in the region, high negative cost
- **Cons** – Behaviour change is extremely difficult to implement, many actors, many barriers, difficult to structure a workable response
- **Conclusion** – Measure incredibly hard to implement

ClimateWorks Road Map Notes: N/A

Key Constraint: Behaviour based

Practicality Level: Red

Draft Score of Measure: 3/10

Freight Operational Efficiency Improvement

Experience shows that improving operational efficiencies through the use of route optimisation or 'intelligent transport' systems can reduce fuel consumption by at least 10% and may also achieve more efficient use of labour and a reduction in the number of vehicles required.

Cost (A\$/tCO₂e): -341

Emissions Reduction Potential (-ktCO₂e): 19.1

Assumptions:

- 10% savings achievable across 50% of fleet
- Upfront cost of approx. \$10,000 per vehicle

Measure Type: Freight Efficiency

Timeframe: Short

Implementation Body/Stakeholders: Corporations, Trucking bodies, Government bodies, SMEs, Industry groups

Regional Responsibility Level: Possible through coordination – would require cooperation from all user groups? Existing programs?

Additional stakeholder input - *Could roll up into a broader industry energy efficiency opportunities through CSI (Monash). Education campaign to inform decision at time of replacement?*

Existence of Other Information: Some information concerning this measure – studies showing this in action and savings would be essential:

World Bank information - <http://dev-worldbank.digi-interactive.co.uk/its-applications/demand-responsive-transport/route-optimisation.html>

Australian Federal Government website on truck buying - <http://australia.gov.au/service/truck-buyers-guide>

Practical Implementation Considerations: General thought is that route optimisation 'should' happen already if margins are being considered and there is adequate knowledge. Possible there will be an impact on jobs if lower number of drivers are needed? May need buy in from both delivering and destination parties if there is to be workable integration.

Funding Opportunities: Unsure on funding opportunities, assistance would be required unless savings can be easily demonstrated.

Automotive Transformation Scheme (ATS) - <http://www.ausindustry.gov.au/programs/manufacturing/ats/Pages/default.aspx>

Innovation Grants - <http://www.nrm.gov.au/funding/agriculture/innovation/index.html>

Clean Technology Investment Program - <http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInvestment/Pages/default.aspx>

Clean Technology Innovation Program -

<http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInnovation/Pages/default.aspx>

Grow your Business - <http://www.business.vic.gov.au/grants-and-assistance/grow-your-business>

Grow your Business – Business Development Plan -

<http://www.business.vic.gov.au/grants-and-assistance/grow-your-business-business-development-plan>

Comments:

- **General** – High negative cost, reasonable abatement potential
- **Pros** – Many drivers, large use of freight in Gippsland, important sector to consider, short timeframe
- **Cons** – Large number of actors, barriers, upfront cost needs to be countered by demonstrated savings examples, not a large amount of detail on how this measure actually works
- **Conclusion** – Measure should be considered

ClimateWorks Road Map Notes: Low lock in risk; Relatively simple to implement

Key Constraint: Proving savings achievable

Practicality Level: Green

Draft Score of Measure: 7/10

Large Articulated Truck Efficiency Improvements

Improved efficiency of new vehicle purchases of large articulated trucks. Efficiency improvements including rolling resistance reduction, aerodynamic improvements and conventional internal combustion engine improvements.

Cost (A\$/tCO₂e): -334

Emissions Reduction Potential (-ktCO₂e): 9.1

Assumptions:

- Opportunity only allocated to vehicles in production year; no retrofits or early retirement
- 20 year average life of vehicles
- 2,400 new vehicles purchased between 2010 and 2020
- Incremental upfront cost in 2020 of between \$2,125 and \$10,825 to achieve savings between 3% and 11% as compared to typical fuel consumption

Measure Type: Freight Efficiency

Timeframe: Long

Implementation Body/Stakeholders: Corporations, Truck manufacturers, Industry groups, SMEs, Trucking companies

Regional Responsibility Level: Measure is difficult to deal with as key groups are probably outside of Gippsland. Are there truck manufacturers in the region??

Existence of Other Information: Some information concerning the measure:

The Energy Efficiency Exchange, Federal and State Government website - <http://eex.gov.au/resource/potential-energy-efficiency-opportunities-in-the-australian-road-and-rail-sectors/improved-vehicle-aerodynamics/>

Australian Federal Government website on truck buying - <http://australia.gov.au/service/truck-buyers-guide>

Practical Implementation Considerations: Not a large number of vehicles needed to make this measure work(?), although the measure is implemented at retirement and purchase. Surely, these changes to truck construction are already either in action or coming?? Are there retrofit options? – noted the measure doesn't consider these.

Funding Opportunities: Unknown whether there is funding for truck efficiency upgrades.

Automotive Transformation Scheme (ATS) - <http://www.ausindustry.gov.au/programs/manufacturing/ats/Pages/default.aspx>

Clean Technology Investment Program - <http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInvestment/Pages/default.aspx>

Clean Technology Innovation Program -

<http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInnovation/Pages/default.aspx>

Comments:

- **General** – High negative cost, low abatement potential
- **Pros** – Many drivers, large use of freight in Gippsland, important sector to consider
- **Cons** – Large number of actors, barriers, upfront cost needs to be countered by demonstrated savings examples, long timeframe, may be a response that occurs naturally over time
- **Conclusions** – Measure valuable but better options

ClimateWorks Road Map Notes: Low lock in risk; Relatively simple to implement

Key Constraint: Requires design and manufacturing changes

Practicality Level: Orange

Draft Score of Measure: 6/10

Mining Energy Efficiency

For brown coal mining, includes operational and equipment improvements in dredger/shovel and conveyer.

For other types of mining, includes operational improvements (reduce idle time of shovels/trucks, improved fuel monitoring and maintenance, etc), improved control and planning (control of transport equipment, truck dispatch optimisation, etc), and equipment improvements (truck light weight dump bodies, improved weighing system, shovel light weight dippers, autonomous drilling, replacement of light vehicles with hybrid cars).

Cost (A\$/tCO₂e): -234

Emissions Reduction Potential (-ktCO₂e): 30.3

Assumptions:

Brown coal mining

- Average of 2% electricity savings achievable across all mines
- Upfront cost of \$700 per MWh of energy saved in one year, average lifespan of 15 years

Other mining

- Average of 5% energy savings
- Operations and controls: Progress to a 100% penetration rate in 2020 from a BAU penetration rate of 50%. Upfront cost of \$100 per MWh of energy saved in one year, average lifespan of 10 years
- Equipment improvement: Progress to a 66% penetration rate in 2020. Upfront cost of \$535 per MWh of energy saved in one year, average lifespan of 20 years

Measure Type: Energy Efficiency

Timeframe: Long

Implementation Body/Stakeholders: Mining companies, Mining equipment manufacturers, Energy generators, Industry groups

Regional Responsibility Level: Maybe possible, dependent on site. Difficult to see how the GCCN can have a large input into this measure – generators are multinational companies...other mining could be locally owned and more option to suggestions?

Existence of Other Information: Some information on this measure:

The Energy Efficiency Exchange, Federal and State Government website - <http://eex.gov.au/industry-sectors/mining/>

News article concerning coal industry - <http://www.abc.net.au/news/2013-06-17/ministers-warn-against-winding-down-coal-industry-despite-dire-/4760414>

Practical Implementation Considerations: Large sunk costs in equipment make change difficult, it is assumed that brown coal generators are trying to squeeze as many dollars as possible out of operations, and are running on bare margins. Other mining types could be more open to suggestions concerning this measure.

Funding Opportunities: Unknown whether there is funding for truck efficiency upgrades.

Innovation Grants -

<http://www.nrm.gov.au/funding/agriculture/innovation/index.html>

Clean Technology Investment Program -

<http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInvestment/Pages/default.aspx>

Clean Technology Innovation Program -

<http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInnovation/Pages/default.aspx>

Comments:

- **General** – High negative cost, reasonable abatement potential
- **Pros** – Mining is an important sector for Gippsland
- **Cons** – Brown coal miners could be running on thin margins meaning paying money for efficiency measures would be difficult to encourage. For other miners with a reasonable project lifespan, this could be a good measure
- **Conclusion** – Measure may need closer assessment to understand other actors involved in Gippsland region, but generally it is expected there will be stakeholder reluctance to invest

ClimateWorks Road Map Notes: Medium lock in risk; Relatively simple to implement

Key Constraint: Stakeholder reluctance to invest

Practicality Level: Orange

Draft Score of Measure: 5/10

Food and Beverage Manufacturing Energy Efficiency

Major opportunities include improved control systems (automated or manual); reduction of duplicated or oversized equipment; boilers and steam distribution systems; waste heat recovery (eg used for pre-heating or other sites); building utilities.

Cost (A\$/tCO₂e): -102

Emissions Reduction Potential (-ktCO₂e): 28.9

Assumptions:

- Energy savings of 13% overall are achievable by 2020
- Upfront cost of \$150 per MWh saved in one year, average lifespan of 10 years

Measure Type: Energy Efficiency

Timeframe: Medium

Implementation Body/Stakeholders: Food and beverage manufacturers, Industry groups, SMEs, Corporations

Regional Responsibility Level: Possibly through a coordination and a targeted awareness program after identifying actors?

Existence of Other Information: Limited information concerning this measure:

Food and Beverage Industry Energy Efficiency, Australian Government website:

<http://www.ret.gov.au/energy/efficiency/eo/industry-sector/manufacturing/food-bev/Pages/FoodBev.aspx>

Practical Implementation Considerations: Costs to change equipment (large sunk costs in the industry), future investment uncertainty (cost pressures), lack of understanding of how and where to change things – both will impact on the ability of companies to do this. Probably many actors, successfully implementing the measure would require some coordination to get full value

Funding Opportunities: Some possible funding avenues were identified:

Clean Technology Food and Foundries Investment Program:

<http://www.ausindustry.gov.au/programs/CleanTechnology/CTFFIP/Pages/default.aspx>

Energy Efficiency Information Grants -

<http://GRANTS.MYREGION.GOV.AU/grant/energy-efficiency-information-grants-eeig>

Innovation Grants -

<http://www.nrm.gov.au/funding/agriculture/innovation/index.html>

Clean Technology Investment Program -

<http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInvestment/Pages/default.aspx>

Clean Technology Innovation Program -

<http://www.usindustry.gov.au/programs/CleanTechnology/CleanTechnologyInnovation/Pages/default.aspx>

Comments:

- **General** - Reasonable negative cost, reasonable abatement potential
- **Pros** – Energy efficiency is ‘easy’ to achieve, the food and beverage industry is an important sector for Gippsland
- **Cons** - Unknown number of actors, barriers, upfront cost needs to be countered by demonstrated savings examples, may be a response that occurs naturally over time?
- **Conclusion** - Measure valuable and worth further investigation

ClimateWorks Road Map Notes: Medium lock in risk; Relatively simple to implement

Key Constraint: Capital investment, market pressures

Practicality Level: Green

Draft Score of Measure: 7/10

Onsite Electricity Generation from Biomass/Biogas

Utilisation of onsite or local waste resources to generate electricity that displaces grid electricity consumption.

Cost (A\$/tCO₂e): -52

Emissions Reduction Potential (-ktCO₂e): 73.6

Assumptions:

- Overall 685 kt (dry) of waste available in the region each year (excluding wood waste from sawmills which is assumed to be used in centralised power generation), with an overall energy content of 3.1 TWh (average energy content of 4,550 kWh/t dry)
- Approx. 5% of the total waste is used to generate electricity
- 30% average efficiency for conversion to electricity
- Upfront costs of \$6,000/kW, average lifespan of 20 years
- Fixed operation and maintenance costs \$54,000/MW/year and variable \$50/MWh

Measure Type: Distributed Energy

Timeframe: Long

Implementation Body/Stakeholders: Industry, Industry bodies, DRET, CEC?, CSIRO?, Corporations, Government bodies, Energy distributors?

Regional Responsibility Level: Possibly be able to encourage small scale off grid generation of this type dependent on the region etc – site dependent

Existence of Other Information: Limited information:

Clean Energy Council website -

http://www.cleanenergycouncil.org.au/dms/cec/policy/Bioenergy_Industry_2010-1-/Bioenergy_Industry_2010%5B1%5D.pdf

Practical Implementation Considerations: Funding and/or cost effectiveness for this kind of measure? Small scale requires large input of cash and a regular supply of fuel, larger scale requires similar - both have issues with coordination etc. Dependent on site and industry type that want to use this measure. It is assumed that it would be difficult to achieve the full amount of abatement with this measure.

Funding Opportunities: Unknown funding avenues, possibly:

Innovation Grants -

<http://www.nrm.gov.au/funding/agriculture/innovation/index.html>

Clean Technology Investment Program -

<http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInvestment/Pages/default.aspx>

Clean Technology Innovation Program -

<http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInnovation/Pages/default.aspx>

Grow your Business - <http://www.business.vic.gov.au/grants-and-assistance/grow-your-business>

Grow your Business – Business Development Plan - <http://www.business.vic.gov.au/grants-and-assistance/grow-your-business-business-development-plan>

Comments:

- General - Reasonable negative cost, reasonable abatement potential
- Pros – Lower generation emissions are key to abating carbon emissions, using ‘waste’ as industrial process ‘food’, energy generation security
- Cons – ‘Easy to say, hard to do’, this measure has merit in a theoretical sense but would probably be hard to achieve at scale
- Conclusion - Measure possible to do in bits but hard to achieve at scale – measure valuable but better options

ClimateWorks Road Map Notes: High risk of lock in; Difficult to implement

Key Constraint: Cost effectiveness, fuel supply, export regulations

Practicality Level: Orange

Draft Score of Measure: 6/10

Other Industry Energy Efficiency

Improve energy efficiency through improving control systems (automated or manual); reducing duplicated or oversized equipment, improving energy efficiency of boilers and steam distribution systems; waste heat recovery; improving building utilities. The greatest benefits are usually achieved when energy use is considered as a whole system.

Cost (A\$/tCO₂e): -44

Emissions Reduction Potential (-ktCO₂e): 74.2

Assumptions:

- Energy savings of 13% are achievable by 2020
- Upfront costs of \$140 per MWh saved in one year, average lifespan of 10 years

Measure Type: Energy Efficiency

Timeframe: Medium

Implementation Body/Stakeholders: Industry bodies, SMEs, Corporations, Government bodies, Industry – many actors

Regional Responsibility Level: Should be able to identify Gippsland actors and contact them through some kind of coordination system

Existence of Other Information: Some information:

International Energy Agency website, programs -

<http://www.iea.org/policiesandmeasures/energyefficiency/?country=Australia>

International Energy Agency website, programs -

<http://www.iea.org/policiesandmeasures/pams/australia/name,22660,en.php>

Energy Efficiency Opportunities, Australian Government website -

<http://energyefficiencyopportunities.gov.au/>

Practical Implementation Considerations: Why haven't some of these measures been implemented already? – this must mean there are significant barriers in place. Possibly cost, understanding, facilitation etc.

Funding Opportunities: Unknown funding avenues, possibly:

Energy Efficiency Information Grants -

<http://GRANTS.MYREGION.GOV.AU/grant/energy-efficiency-information-grants-eeig>

Innovation Grants -

<http://www.nrm.gov.au/funding/agriculture/innovation/index.html>

Clean Technology Investment Program -

<http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInvestment/Pages/default.aspx>

Clean Technology Innovation Program -

<http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInnovation/Pages/default.aspx>

Grow your Business - <http://www.business.vic.gov.au/grants-and-assistance/grow-your-business>

Grow your Business – Business Development Plan - <http://www.business.vic.gov.au/grants-and-assistance/grow-your-business-business-development-plan>

Comments:

- **General** - Reasonable negative cost, reasonable abatement potential
- **Pros** – Energy efficient is ‘easy’ to achieve, very important sector for Gippsland, relatively simply identifiable actors(?)
- **Cons** – Barriers, why haven’t these measures been implemented already?, difficult to identify all actors, upfront cost needs to be countered by demonstrated savings examples, may be a response that occurs naturally over time?
- **Conclusion** - Measure has merit, although unsure if measure will make cut

ClimateWorks Road Map Notes: Medium risk of lock in; Relatively simple to implement

Key Constraint: Large number of mixed measures

Practicality Level: Green

Draft Score of Measure: 7/10

Onsite Heat Generation from Biomass/Biogas

Utilisation of onsite or local waste resources to generate electricity that displaces direct fuel use.

Cost (A\$/tCO₂e): -40

Emissions Reduction Potential (-ktCO₂e): 66.9

Assumptions:

- Overall 685 kt (dry) of waste available in the region each year (excluding wood waste from sawmills which is assumed to be used in centralised power generation), with an overall energy content of 3.1 TWh (average energy content of 4,550 kWh/t dry)
- Bioenergy to replace use of gas/coal/oil
- Approx. 5% of total waste is used to replace direct fuel consumption
- Upfront costs of \$1000/kW, average lifespan of 15 years
- Operational and maintenance costs of \$6/MWh

Measure Type: Distributed Energy

Timeframe: Long

Implementation Body/Stakeholders: Industry, Industry bodies, DRET, CEC?, CSIRO?, Corporations, Government bodies, Energy distributors?

Regional Responsibility Level: Possibly be able to encourage small scale off grid generation of this type dependent on the region and site

Existence of Other Information: Limited information on the measure:

Clean Energy Council website -

http://www.cleanenergycouncil.org.au/dms/cec/policy/Bioenergy_Industry_2010-1-/Bioenergy_Industry_2010%5B1%5D.pdf

Practical Implementation Considerations: Funding and/or cost effectiveness for this kind of measure? Small scale requires large input of cash and a regular supply of fuel, larger scale requires similar - both have issues with coordination etc. Dependent on site and industry type that want to use this measure. It is assumed it would be difficult to achieve the full amount of abatement with this measure

Funding Opportunities: Unknown funding avenues, possibly:

Innovation Grants -

<http://www.nrm.gov.au/funding/agriculture/innovation/index.html>

Clean Technology Investment Program -

<http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInvestment/Pages/default.aspx>

Clean Technology Innovation Program -

<http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInnovation/Pages/default.aspx>

Grow your Business - <http://www.business.vic.gov.au/grants-and-assistance/grow-your-business>

Grow your Business – Business Development Plan -
<http://www.business.vic.gov.au/grants-and-assistance/grow-your-business-business-development-plan>

Comments:

- **General** - Reasonable negative cost, reasonable abatement potential
- **Pros** – Lower generation emissions are key to abating carbon emissions, using ‘waste’ as industrial process ‘food’, energy generation security
- **Cons** – ‘Easy to say, hard to do’, this measure has merit in a theoretical sense but would probably be incredibly hard to achieve at scale
- **Conclusion** - Measure possible to do in bits but hard to achieve at scale – measure valuable but better options

ClimateWorks Road Map Notes: High risk of lock in; Difficult to implement

Key Constraint: Cost effectiveness, fuel supply, export regulations

Practicality Level: Orange

Draft Score of Measure: 6/10

Other Industry Cogeneration

Generation of electricity and thermal energy in a single integrated system.

Cost (A\$/tCO₂e): -8.1

Emissions Reduction Potential (-ktCO₂e): 25.0

Assumptions:

- Cogeneration systems generate 5% of electricity usage by 2020
- Upfront costs of approx. \$800 per MWh generated in one year (depending on sector), average lifespan of 20 years

Measure Type: Distributed Energy

Timeframe: Long

Implementation Body/Stakeholders: Industry, Industry bodies, DRET, CEC?, CSIRO?, Corporations, Government bodies, Energy distributors?

Regional Responsibility Level: Possibly be able to encourage small scale off grid generation of this type dependent on the region and site etc

Existence of Other Information: Some information regarding this measure:

Clean Energy Council website -

<http://www.cleanenergycouncil.org.au/technologies/cogeneration.html>

ClimateWorks report on cogeneration -

http://www.climateworksaustralia.org/sites/default/files/documents/publications/climateworks_unlocking_barriers_to_cogeneration_report_sept2011.pdf

Practical Implementation Considerations: Funding and/or cost effectiveness for this kind of measure? Small scale requires large input of cash and a regular supply of fuel, larger scale requires similar - both have issues with coordination etc. Dependent on site and industry type that want to use this measure. It is assumed it would be difficult to achieve the full amount of abatement with this measure.

Additional stakeholder input – *There are also legislative constraints (ASH in Heyfield could not use native timber waste for cogeneration).*

Funding Opportunities: Unknown funding avenues, possibly:

Innovation Grants -

<http://www.nrm.gov.au/funding/agriculture/innovation/index.html>

Clean Technology Investment Program -

<http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInvestment/Pages/default.aspx>

Clean Technology Innovation Program -

<http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInnovation/Pages/default.aspx>

Grow your Business - <http://www.business.vic.gov.au/grants-and-assistance/grow-your-business>

Grow your Business – Business Development Plan -
<http://www.business.vic.gov.au/grants-and-assistance/grow-your-business-business-development-plan>

Comments:

- General - Reasonable negative cost, reasonable abatement potential
- Pros – Lower generation emissions are key to abating carbon emissions, energy generation security
- Cons – ‘Easy to say, hard to do’, this measure has merit in a theoretical sense but may be hard to achieve at scale
- Conclusions - Measure possible to do in bits but hard to achieve at scale – measure valuable but better options

ClimateWorks Road Map Notes: Medium risk of lock in; Relatively simple to implement

Key Constraint: Capital investment, legislative constraints

Practicality Level: Orange

Draft Score of Measure: 7/10

Gas Processing Improvements

Decrease the amount of gas used for gas processing through operational improvements and equipment upgrade.

Cost (A\$/tCO₂e): -5

Emissions Reduction Potential (-ktCO₂e): 94.5

Assumptions:

- 5% energy savings by 2020
- Upfront costs of \$140 per MWh saved in one year, average lifespan of 10 years

Measure Type: Energy Efficiency

Timeframe: Medium

Implementation Body/Stakeholders: ExxonMobil, Industry bodies, Government bodies, Unions, Maintenance corporations

Regional Responsibility Level: Depending on the relationship that exists with ExxonMobil(?), this could be a measure that can get off the ground

Existence of Other Information: Limited information:

ExxonMobil website - http://www.exxonmobil.com.au/Australia-English/PA/about_what_gipps_lfd.aspx

Practical Implementation Considerations: Why haven't measures been implemented already? Big companies involved, lot of money etc, doubtful that funding is an issue. Possibly understanding is the issue?, although that is doubtful as well

Funding Opportunities: Unknown funding avenues, possibly:

Innovation Grants -

<http://www.nrm.gov.au/funding/agriculture/innovation/index.html>

Clean Technology Investment Program -

<http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInvestment/Pages/default.aspx>

Clean Technology Innovation Program -

<http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInnovation/Pages/default.aspx>

Comments:

- General - Low negative cost, reasonable abatement potential
- Pros – Energy efficiency is 'easy' to achieve, very important sector for Gippsland, simple to identify actors(?)
- Cons – Barriers, why haven't these measures been implemented already?, upfront cost needs to be countered by demonstrated savings examples, may be a response that occurs naturally over time?, lifetime of sector?
- Conclusion - Measure should be considered

ClimateWorks Road Map Notes: Low risk of lock in; Relatively simple to implement

Key Constraint: Proving cost effectiveness for operator

Practicality Level: Green

Draft Score of Measure: 7/10

Chemicals Process Improvements

Includes improvement of chemical techniques, and the introduction of energy saving measures in motor systems, such as adjustable speed drives, more energy efficient motors, and mechanical system optimisation.

Cost (A\$/tCO₂e): 147

Emissions Reduction Potential (-ktCO₂e): 5.6

Assumptions:

Motor systems

- Approx. 17% savings in indirect energy compared to standard systems
- 70% penetration rate in 2020 compared to 30% in BAU
- Upfront costs of \$575 per MWh saved in one year, average lifespan of 14 years
- *Chemical processes*
- Process intensification and catalyst optimisation achieves 5% energy savings
- Upfront costs of \$350 per MWh saved in one year, average lifespan of 40 years

Measure Type: Energy Efficiency

Timeframe: Long

Implementation Body/Stakeholders: Struggle to understand why this measure is included in *The Plan*. Longford gas plant is picked up under another measure, pulp and paper under another measure - can't think of other big chemical processing plants in the region.

Additional stakeholder input - PACIA is doing some work around this.

<http://www.pacia.org.au/reports/8StepGuide>

Regional Responsibility Level: ??

Existence of Other Information: ??

Practical Implementation Considerations: Struggle to understand why this measure is included in *The Plan*. The extremely high cost per tonne of abatement and the very low amount of abatement available probably makes the measure untenable.

Funding Opportunities: Unknown funding avenues, possibly:

Innovation Grants -

<http://www.nrm.gov.au/funding/agriculture/innovation/index.html>

Clean Technology Investment Program -

<http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInvestment/Pages/default.aspx>

Clean Technology Innovation Program -

<http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInnovation/Pages/default.aspx>

Comments:

- General - Extremely expensive cost, very low abatement potential
- Comment - It would appear that this measure has been included in *The Plan* to cover off on a future brown coal to fertilizer/dry export product market
- Conclusion - Considering this is not a well known or populated space in Gippsland, it is assumed this measure can be safely ignored

ClimateWorks Road Map Notes: Low risk of lock in; More challenging to implement

Key Constraint: Cost per tonne of abatement

Practicality Level: Red

Draft Score of Measure: 2/10

Appendix C: Excluded Sector 2 Measures – Commercial and Services

Car and Light Commercial Vehicle Efficiency

Improved efficiency of new cars and light commercial vehicles purchased. Efficiency improvements include: Variable valve control, engine friction reduction, low rolling resistance tyres, tyre pressure control system, weight reduction, electrification (steering, pumps), optimised gearbox ratio, improved aerodynamic efficiency, stop-start system with regenerative braking, air conditioning modification, direct pressure injection strong weight reduction, optimised transmission.

Cost (A\$/tCO₂e): -398

Emissions Reduction Potential (-ktCO₂e): 20.3

Assumptions:

- Opportunity only allocated to vehicles in production year; no retrofits or early retirement
- 20 year average life of vehicles
- *For petrol:*
- Fuel economy of 9.6 litres per 100 km in 2020 before efficiency improvements. Fuel economy range from 8.3 to 5.9 litres per 100 km after efficiency improvements
- Incremental upfront costs range from \$450 to \$3,785 per vehicle depending on level of fuel efficiency achieved
- For diesel:
- Fuel economy of 9.2 litres per 100 km in 2020 before efficiency improvements. Fuel economy range from 8.1 to 6.0 litres per 100 km after efficiency improvements
- Incremental upfront cost in 2020 ranges from \$2,180 to \$4,020 per vehicle depending on the level of fuel efficiency achieved

Measure Type: Vehicle Efficiency

Timeframe: Long

Implementation Body/Stakeholders: SMEs, Individuals, Councils, Government bodies, Industry bodies, Vehicle sales and manufacturers, Driving bodies?

Regional Responsibility Level: Possibly would be able to work for fleet vehicles, difficult to see how this would get off the ground on a larger scale – possibly through an ad campaign?

Additional stakeholder input - *This might be related to vehicle emissions standards – therefore a Federal issue.*

Existence of Other Information: Some information related to this measure:

Living Greener, Federal Government website -

<http://www.livinggreener.gov.au/travel/motor-transport/buy-fuel-efficient-car>

Green Vehicle Guide, Australian Government website -
<http://www.environment.gov.au/settlements/transport/fuelguide/>
<http://australia.gov.au/service/green-vehicle-guide>

Truck Buyers Guide, Australian Government website -
<http://australia.gov.au/service/truck-buyers-guide>

Practical Implementation Considerations: The assumptions state that this is only for replacement vehicles which means any program to implement this measure has a long lifetime – difficult to do. There are many design and manufacturing changes required to vehicles to make this measure achieve full abatement potential – unlikely these would all occur

Funding Opportunities: Unknown funding avenues, possibly:

Automotive Transformation Scheme (ATS) -
<http://www.usindustry.gov.au/programs/manufacturing/ats/Pages/default.aspx>
[X](#)

LPG Vehicle Scheme - <http://www.usindustry.gov.au/programs/energy-fuels/lpgvs/Pages/default.aspx>

Comments:

- **General** - High negative cost, reasonable abatement potential
- **Pros** – Many drivers, large use of cars in Gippsland
- **Cons** – Large number of actors, barriers, may be a response that occurs naturally over time?, many drivers – how would this be enforced/encouraged/implemented/driven from a Gippsland level??. very long timeframe considering the assumptions
- **Conclusion** - Measure deemed too difficult to consider in this plan

ClimateWorks Road Map Notes: Medium risk of lock in; More challenging to implement

Key Constraint: Requires design and manufacturing changes

Practicality Level: Orange

Draft Score of Measure: 5/10

Hybrid Cars

More fuel efficient diesel and petrol hybrid cars (full and plug-in hybrids) supplant less fuel efficient cars over the medium to long term.

Cost (A\$/tCO₂e): -284

Emissions Reduction Potential (-ktCO₂e): 4.5

Assumptions:

- Average penetration rate in 2020 is 9%
- The incremental cost from existing technology ranges from \$4,800 to \$9,000 per vehicle

Measure Type: Hybrids/Electric

Timeframe: Long

Implementation Body/Stakeholders: SMEs, Individuals, Councils, Government bodies, Industry bodies, Vehicle sales companies, Driving bodies?

Regional Responsibility Level: Possibly would be able to work for fleet vehicles, difficult to see how this would get off the ground on a larger scale – possibly through an ad campaign?

Additional stakeholder input – *Education campaign to inform decision at time of replacement.*

Existence of Other Information: Some information related to this measure:

Living Greener, Federal Government website -

<http://www.livinggreener.gov.au/travel/motor-transport/buy-fuel-efficient-car>

Green Vehicle Guide, Australian Government website -

<http://www.environment.gov.au/settlements/transport/fuelguide/>

<http://australia.gov.au/service/green-vehicle-guide>

Practical Implementation Considerations: Hybrids are an established technology available in the Australian vehicle market, they probably have a price premium compared to other vehicles of the same size and possibly don't stack up payback, fuel efficiency and emissions wise compared to efficient diesels?? For shorter/city driving this may be different. There is also the question of where the charge electricity is sourced from (plug hybrids) – for emissions reasons

Funding Opportunities: Unknown funding avenues.

Comments:

- General - High negative cost, low abatement potential
- Pros – Many drivers, large use of cars in Gippsland, may be possible at a fleet level
- Cons – Large number of actors, barriers, may be a response that occurs naturally over time?, many drivers – how would this be enforced/encouraged/implemented/driven from a Gippsland level??. cost constraints
- Conclusion - Measure deemed too difficult to consider in this plan

ClimateWorks Road Map Notes: Medium risk of lock in; Difficult to implement

Key Constraint: Cost effective for rural areas?, capital requirements

Practicality Level: Orange

Draft Score of Measure: 7/10

New Builds to 6 Stars

New builds achieve an average 6 star equivalent in the NABERS rating system (office buildings are taken as a reference as they correspond to the average energy consumption per m² in the building fleet).

Cost (A\$/tCO₂e): -34

Emissions Reduction Potential (-ktCO₂e): 41.5

Assumptions:

- Energy savings estimated to be 41% across all subsectors
- Incremental upfront cost of \$90/m²

Measure Type: New Builds

Timeframe: Long

Implementation Body/Stakeholders: HIA, Building authorities, State Government, Councils, Corporations, SMEs, Government bodies, Building owners, Developers, Builders

Regional Responsibility Level: Very difficult to see how this measure can get off the ground in Gippsland. As the building regulations are State based legislation, it is extremely doubtful that they would be changed or implemented due to the GCCN project. A voluntary program is currently in place and it may be possible to further encourage this, but that wouldn't achieve the abatement potential

Existence of Other Information: ?????

HIA website information -

<http://hia.com.au/hia/channel/Builder/region/National/classification/Building%20and%20Planning%20Services/Energy%20and%20Water%20Efficiency.aspx>

http://hia.com.au/media/~/_media/Files/MediaMicrosite/Policy%20Releases/Energy%20Efficiency%20in%20Residential%20Buildings.ashx

Master Builders report -

<http://www.masterbuilders.com.au/TemporaryDownloads/C6F22710-A3BD-42CA-A9C8-B793295B58F8-CIE%20Energy%20Efficiency%20Report.pdf>

Victorian Building Commission website -

<http://www.buildingcommission.com.au/www/html/7-home-page.asp>

Green Building Council website - <http://www.gbca.org.au/project-directory.asp>

Australian Building Codes Board website - <http://www.abcb.gov.au/>

Practical Implementation Considerations: There is a great deal of political inertia within building regulations. There are some large and powerful vested interests that would need to be talked around to agreeing with the idea of new builds requiring 6 stars

Funding Opportunities: No funding avenues identified.

Comments:

- General – Negative cost, reasonable abatement potential
- Pros – Many buildings, construction an important sector
- Cons – Large number of actors, barriers, may be a response that occurs naturally over time?, many drivers – how would this be enforced/encouraged/implemented/driven from a Gippsland level??. cost constraints
- Measure deemed too difficult to consider in this plan

ClimateWorks Road Map Notes: High risk of lock in; More challenging to implement

Key Constraint: Voluntary scheme, new regulation

Practicality Level: Orange

Draft Score of Measure: 5/10

Electric Vehicles

By 2020, electric vehicles replace 3% of all new vehicle purchases in the Gippsland region.

Cost (A\$/tCO₂e): -23

Emissions Reduction Potential (-ktCO₂e): 3.2

Assumptions:

- Fuel savings of 35% per electric vehicle
- Incremental upfront cost of \$5,835 per vehicle (plus infrastructure costs of \$500 per vehicle), average lifespan of 20 years

Measure Type: Hybrids/electric

Timeframe: Long

Implementation Body/Stakeholders: SMEs, Individuals, Councils, Government bodies, Industry bodies, Vehicle sales and manufacturers, Driving bodies?

Regional Responsibility Level: Possibly would be able to work for fleet vehicles, difficult to see how this would get off the ground on a larger scale – possibly ad campaign?

Existence of Other Information: Limited information concerning this measure:

Living Greener, Australian Government website -

<http://www.livinggreener.gov.au/travel/motor-transport/buy-fuel-efficient-car>

Australian Government Vehicle and Fuel Guides -

<http://www.environment.gov.au/settlements/transport/fuelguide/>

<http://australia.gov.au/service/green-vehicle-guide>

Practical Implementation Considerations: EVs are a technology that is slowly being established in the Australian vehicle market, they have a price premium compared to other vehicles of the same size and possibly don't stack up payback wise compared to efficient diesels and maybe some hybrids(?) The biggest concern with an area as large as Gippsland, is the amount of charging infrastructure. Shorter/city driving may be ok. There is also the question of where the charge electricity is sourced from – for emissions reasons. Definitely a measure for the future, but probably outside the ability of this project

Funding Opportunities: Unknown funding avenues, possibly:

Automotive Transformation Scheme (ATS) -

<http://www.usindustry.gov.au/programs/manufacturing/ats/Pages/default.aspx>

Comments:

- General - Low negative cost, low abatement potential
- Pros – Many drivers, large use of cars in Gippsland, may be possible at a fleet level
- Cons – Large number of actors, barriers, may be a response that occurs naturally over time?, many drivers – how would this be enforced/encouraged/implemented/driven from a Gippsland level??. cost constraints
- Conclusion - Measure deemed too difficult to consider in this plan

ClimateWorks Road Map Notes: N/A

Key Constraint: Technology availability and cost effectiveness

Practicality Level: Orange

Draft Score of Measure: 6/10

Commercial Cogeneration

Generation of electricity and thermal energy in a single, integrated system.

Cost (A\$/tCO₂e): 2

Emissions Reduction Potential (-ktCO₂e): 32.6

Assumptions:

- 10MW capacity installed across the region by 2020
- Upfront cost of \$3000/kW, average lifespan of 20 years
- 25% capacity factor

Measure Type: Distributed Energy

Timeframe: Long

Implementation Body/Stakeholders: Corporations, SMEs, Building owners, Councils, Government bodies, Energy distributors?, Energy retailers?

Regional Responsibility Level: Possibly be able to encourage small scale off grid generation of this type dependent on the region and site etc

Existence of Other Information: Some information concerning this measure:

Clean Energy Council website -

<http://www.cleanenergycouncil.org.au/technologies/cogeneration.html>

ClimateWorks report -

http://www.climateworksaustralia.org/sites/default/files/documents/publications/climateworks_unlocking_barriers_to_cogeneration_report_sept2011.pdf

Practical Implementation Considerations: Funding and/or cost effectiveness for this kind of measure? Export rules? Small scale requires large input of cash and a good business case, larger scale requires similar - both have issues with coordination etc. Dependent on site and building/business type that want to use this measure. It is assumed it would be difficult to achieve the full amount of abatement with this measure

Funding Opportunities: Possibly funding avenues:

Innovation Grants -

<http://www.nrm.gov.au/funding/agriculture/innovation/index.html>

Clean Technology Investment Program -

<http://www.usindustry.gov.au/programs/CleanTechnology/CleanTechnologyInvestment/Pages/default.aspx>

Clean Technology Innovation Program -

<http://www.usindustry.gov.au/programs/CleanTechnology/CleanTechnologyInnovation/Pages/default.aspx>

Grow your Business - <http://www.business.vic.gov.au/grants-and-assistance/grow-your-business>

Grow your Business – Business Development Plan -

<http://www.business.vic.gov.au/grants-and-assistance/grow-your-business-business-development-plan>

Comments:

- **General** - Positive cost, reasonable abatement potential
- **Pros** – Lower generation emissions are key to abating carbon emissions, energy generation security, integrated measure
- **Cons** – Positive cost, 'easy to say, hard to do', this measure has merit in a theoretical sense but would probably be incredibly hard to achieve at scale
- **Conclusion** - measure possible to do in part but hard to achieve at scale – measure valuable but better options

ClimateWorks Road Map Notes: Medium risk of lock in; Relatively simple to implement

Key Constraint: Capital investment, export rules

Practicality Level: Orange

Draft Score of Measure: 7/10

Bus and Rigid Truck Efficiency Improvement

Improved efficiency of new buses and trucks purchased. Efficiency improvements include rolling resistance reduction, aerodynamics improvements and conventional internal combustion engine improvements.

Cost (A\$/tCO₂e): 126

Emissions Reduction Potential (-ktCO₂e): 2.0

Assumptions:

- Assume 20 year lifespan of vehicles
- Fuel economy of 28 litres per 100 km in 2020 before efficiency improvements. Fuel economy ranges from 27 to 25 litres per 100 km after efficiency improvements
- Incremental upfront cost ranges from \$1,200 to \$7,980 vehicle depending on the level of fuel efficiency achieved

Measure Type: Vehicle Efficiency

Timeframe: Long

Implementation Body/Stakeholders: SMEs, Individuals, Councils, Government bodies, Industry bodies, Vehicle sales and manufacturers, Driving bodies?, Bus and trucking companies

Regional Responsibility Level: Possibly would be able to work for fleet vehicles/bus and truck companies, difficult to see how this would get off the ground on a larger scale – possibly ad campaign or targeted action for certain companies?

Additional stakeholder input - *Could be more of an education campaign to raise awareness at time of replacement.*

Existence of Other Information:

Australian Government Truck Buying Guide -
<http://australia.gov.au/service/truck-buyers-guide>

The Energy Efficiency Exchange, Federal and State Government website -
<http://eex.gov.au/resource/potential-energy-efficiency-opportunities-in-the-australian-road-and-rail-sectors/improved-vehicle-aerodynamics/>

Practical Implementation Considerations: The assumptions state that this is only for replacement vehicles, which means any program to implement this measure has a long lifetime – difficult to do. There are many changes required to vehicles to make this measure achieve full abatement potential – unlikely these would all occur. High positive cost would be a key barrier as well

Funding Opportunities: Possibly funding avenues:

Automotive Transformation Scheme (ATS) -
<http://www.usindustry.gov.au/programs/manufacturing/ats/Pages/default.aspx>

Clean Technology Investment Program -
<http://www.usindustry.gov.au/programs/CleanTechnology/CleanTechnologyInvestment/Pages/default.aspx>

School Energy Efficiency Grants Program -
<http://www.education.vic.gov.au/about/programs/infrastructure/pages/energygrant.aspx>

Comments:

- **General** - High positive cost, low abatement potential
- **Pros** – Many drivers, large use of freight in Gippsland, important sector to consider
- **Cons** – Large number of actors, barriers, upfront cost needs to be countered by demonstrated savings examples, long timeframe, may be a response that occurs naturally over time, positive cost
- **Conclusion** - Measure valuable but better options

ClimateWorks Road Map Notes: Medium risk of lock in; More challenging to implement

Key Constraint: Cost per tonne of abatement

Practicality Level: Orange

Draft Score of Measure: 7/10

Appendix D: Excluded Sector 3 Measures – Households

Choosing More Efficient New Vehicles

Improved efficiency of new cars purchased.

Efficiency improvements include: Variable valve control, engine friction reduction, low rolling resistance tyres, tyre pressure control system, weight reduction, electrification (steering, pumps), optimised gearbox ratio, improved aerodynamic efficiency, stop-start system with regenerative braking, air conditioning modification, direct pressure injection strong weight reduction, optimised transmission.

Cost (A\$/tCO₂e): -398

Emissions Reduction Potential (-ktCO₂e): 20.3

Assumptions:

- Opportunities only allocated to vehicles in production year; no retrofits or early retirement
- 20 year average life of vehicles

For petrol cars:

- Fuel economy of 9.6 litres per 100 km in 2020 before efficiency improvements. Fuel economy ranges from 8.3 to 5.9 litres per 100 km after efficiency improvements
- Incremental upfront costs range from \$450 to \$3,785 per vehicle depending on the level of fuel efficiency achieved

For diesel cars:

- Fuel economy of 9.2 litres per 100 km in 2020 before efficiency improvements. Fuel economy ranges from 8.1 to 6.0 litres per 100 km after efficiency improvements
- Incremental upfront cost in 2020 ranges from \$2,180 to \$4,020 per vehicle depending on the level of fuel efficiency achieved

Measure Type: Vehicle Efficiency

Timeframe: Long

Implementation Body/Stakeholders: Individuals, Councils, Government bodies, Industry bodies, Vehicle sales and manufacturers, Driving bodies?

Regional Responsibility Level: Difficult to see how this would get off the ground on a large scale – possibly ad campaign?

Additional stakeholder input - *Education campaign to inform decision at time of replacement.*

Existence of Other Information: Some information for this measure:

Australian Government Fuel Guides -

<http://www.livinggreener.gov.au/travel/motor-transport/buy-fuel-efficient-car>

<http://www.environment.gov.au/settlements/transport/fuelguide/>

Australian Government Vehicle Buying Guides -
<http://australia.gov.au/service/truck-buyers-guide>
<http://australia.gov.au/service/green-vehicle-guide>

Practical Implementation Considerations: The assumptions state that this is only for replacement vehicles which means any program to implement this measure has a long lifetime – difficult to do. There are many changes required to vehicles to make this measure achieve full abatement potential – unlikely these would all occur

Funding Opportunities: Unknown funding avenues, possibly:

Automotive Transformation Scheme (ATS) -
<http://www.usindustry.gov.au/programs/manufacturing/ats/Pages/default.aspx>
X

LPG Vehicle Scheme - <http://www.usindustry.gov.au/programs/energy-fuels/lpgvs/Pages/default.aspx>

Comments:

- **General** - High negative cost, reasonable abatement potential
- **Pros** – Many drivers, large use of cars in Gippsland
- **Cons** – Large number of actors, barriers, may be a response that occurs naturally over time?, many drivers – how would this be enforced/encouraged/implemented/driven from a Gippsland level??. very long timeframe considering the assumptions
- **Conclusion** - Measure deemed too difficult to consider in this plan

ClimateWorks Road Map Notes: Medium risk of lock in; More challenging to implement

Key Constraint: Requires design and manufacturing changes

Practicality Level: Orange

Draft Score of Measure: 5/10

Shift Some Commuter Car Travel to Rail

Shift approx. 420 return commuter car trips and general car trips per day to train journeys by the provision of additional services on existing infrastructure.

Cost (A\$/tCO₂e): -315

Emissions Reduction Potential (-ktCO₂e): 3.0

Assumptions:

- Shifted journeys are on average 109 km return

Measure Type: Behaviour Change

Timeframe: Short

Implementation Body/Stakeholders: State Government, Vline, Councils?, Rail and car user groups, Consumers

Regional Responsibility Level: Possibly an ad campaign may help? There will be key barriers that need to be addressed that may be outside the region's control (ie freq of trains)

Existence of Other Information: No other information was found.

Practical Implementation Considerations: This could be a very difficult measure to implement, even in spite of the obvious positive side. Frequency of trains, infrastructure quality, consumer behaviour and requirement for travel to and from train destinations, reliance on personal transport modes (ie cars) – all will play a part. There has been some improvement on this through the regional rail upgrades to the Traralgon/Pakenham line – unsure how these improvements have impacted on this measure. Probably very difficult to achieve further improvement as a result of this GCCN project

Funding Opportunities: No funding avenues were identified

Comments:

- **General** - High negative cost, low abatement potential
- **Pros** – High car ownership in Gippsland so replacing trips is a good thing, high negative cost
- **Cons** – Behaviour change is a extremely difficult thing to implement, many actors, many barriers, limited ideas on how to structure a response
- **Conclusion** - Measure incredibly hard to implement

ClimateWorks Road Map Notes: N/A

Key Constraint: Requires behaviour change

Practicality Level: Orange

Draft Score of Measure: 6/10

Hybrid Cars

More fuel efficient diesel and petrol hybrid cars (full and plug-in hybrids) supplant less fuel efficient cars over the medium to long term.

Cost (A\$/tCO₂e): -284

Emissions Reduction Potential (-ktCO₂e): 4.5

Assumptions:

- Average penetration rate in 2020 is 9%
- The incremental cost from existing technology ranges from \$4,800 to \$9,000 per vehicle

Measure Type: Hybrids/Electric

Timeframe: Long

Implementation Body/Stakeholders: SMEs, Individuals, Councils, Government bodies, Industry bodies, Vehicle sales and manufacturers, Driving bodies?

Regional Responsibility Level: Difficult to see how this would get off the ground on a larger scale – possibly ad campaign?

Existence of Other Information: Some information for this measure:

Australian Government Fuel and Vehicle Guides:

<http://www.livinggreener.gov.au/travel/motor-transport/buy-fuel-efficient-car>

<http://www.environment.gov.au/settlements/transport/fuelguide/>

<http://australia.gov.au/service/green-vehicle-guide>

Practical Implementation Considerations: Hybrids are an established technology available in the Australian vehicle market, they probably have a price premium compared to other vehicles of the same size and possibly don't stack up payback, fuel efficiency and emissions wise compared to efficient diesels? For shorter/city driving this may be different. There is also the question of where the charge electricity is sourced from – for emissions reasons

Funding Opportunities: No funding avenues were identified

Comments:

- General - High negative cost, low abatement potential
- Pros – Many drivers, large use of cars in Gippsland, ease fuel costs for consumers
- Cons – Large number of actors, barriers, may be a response that occurs naturally over time?, many drivers – how would this be enforced/encouraged/implemented/driven from a Gippsland level??. cost constraints
- Conclusion - Measure deemed too difficult to consider in this plan

ClimateWorks Road Map Notes: Medium risk of lock in; Difficult to implement

Key Constraint: Cost effectiveness

Practicality Level: Orange

Draft Score of Measure: 6/10

Residential New Builds to 7 Stars

New houses are built to at least 7 stars in the NatHERS rating system from 2015 onwards, as compared to the baseline 6 stars.

Cost (A\$/tCO₂e): -76

Emissions Reduction Potential (-ktCO₂e): 34.6

Assumptions:

- Heating, ventilation and air conditioning (HVAC) energy consumption of households decreases from 49 kWh/m² to 25 kWh/m²
- Incremental upfront cost of \$24/m²
- 100% of new homes are built to higher standard from 2013 onwards

Measure Type: New Builds

Timeframe: Long

Implementation Body/Stakeholders: HIA, Building authorities, State Government, Councils, Government bodies, Building owners, Developers, Builders

Regional Responsibility Level: Very difficult to see how this measure can get off the ground in Gippsland. as the building regulations are State based legislation, it is extremely doubtful that they would be changed due to this project

Existence of Other Information: Information concerning this measure:

HIA website reports -

<http://hia.com.au/hia/channel/Builder/region/National/classification/Building%20and%20Planning%20Services/Energy%20and%20Water%20Efficiency.aspx>

http://hia.com.au/media/~/_media/Files/MediaMicrosite/Policy%20Releases/Energy%20Efficiency%20in%20Residential%20Buildings.ashx

Master Builders website report -

<http://www.masterbuilders.com.au/TemporaryDownloads/C6F22710-A3BD-42CA-A9C8-B793295B58F8-CIE%20Energy%20Efficiency%20Report.pdf>

Building Commission website -

<http://www.buildingcommission.com.au/www/html/7-home-page.asp>

Green Building Council website - <http://www.gbca.org.au/project-directory.asp>

Practical Implementation Considerations: There is a great deal of political inertia within building regulations. There are some large and powerful vested interests that would need to be talked around to agreeing with the idea of new builds requiring 7 stars

Funding Opportunities: No funding avenues identified

Comments:

- **General** - Negative cost, reasonable abatement potential
- **Pros** – Many buildings, construction an important sector

- **Cons** – Large number of actors, barriers, may be a response that occurs naturally over time?, many drivers – how would this be enforced/encouraged/implemented/driven from a Gippsland level?, cost constraints
- **General** - Measure deemed too difficult to consider in this plan

ClimateWorks Road Map Notes: High risk of lock in; Relatively simple to implement

Key Constraint: Requires State regulatory changes

Practicality Level: Orange

Draft Score of Measure: 5/10

Electric Cars

By 2020, electric vehicles replace 3% of all new vehicle purchases in the Gippsland region.

Cost (A\$/tCO₂e): -23

Emissions Reduction Potential (-ktCO₂e): 3.2

Assumptions:

- Fuel savings of 35% per electric vehicle
- Incremental upfront cost of \$5,835 per vehicle (plus infrastructure costs of \$500 per vehicle), average lifespan of 20 years

Measure Type: Hybrid/Electric

Timeframe: Long

Implementation Body/Stakeholders: Individuals, Councils, Government bodies, Vehicle sales and manufacturers, Driving bodies?

Regional Responsibility Level: Difficult to see how this would get off the ground on a larger scale – possibly ad campaign?

Existence of Other Information:

Australian Government Fuel and Vehicle Guides -

<http://www.livinggreener.gov.au/travel/motor-transport/buy-fuel-efficient-car>

<http://www.environment.gov.au/settlements/transport/fuelguide/>

<http://australia.gov.au/service/green-vehicle-guide>

Practical Implementation Considerations: EVs are a technology that is slowly being established in the Australian vehicle market, they have a price premium compared to other vehicles of the same size and possibly don't stack up payback wise compared to efficient diesels and maybe some hybrids? The biggest concern with an area as large as Gippsland, is the amount of charging infrastructure - shorter/city driving may be ok. There is also the question of where the charge electricity is sourced from – for emissions reasons. definitely a measure for the future, but probably outside the ability of this project

Funding Opportunities: Unknown funding avenues:

Automotive Transformation Scheme (ATS) -

<http://www.ausindustry.gov.au/programs/manufacturing/ats/Pages/default.asp>

[X](#)

Comments:

- **General** - Low negative cost, low abatement potential
- **Pros** – many drivers, large use of cars in Gippsland, large distances in Gippsland, recharge infrastructure?
- **Cons** – large number of actors, barriers, may be a response that occurs naturally over time?, many drivers – how would this be enforced/encouraged/implemented/driven from a Gippsland level??. cost constraints
- **Conclusion** - Measure deemed too difficult to consider in this plan

ClimateWorks Road Map Notes: N/A

Key Constraint: Technology availability and cost effectiveness

Practicality Level: Orange

Draft Score of Measure: 6/10

Solar PV

Installation of residential rooftop solar PV panels by 2020 to reduce demand for grid supplied electricity.

Cost (A\$/tCO₂e): 70

Emissions Reduction Potential (-ktCO₂e): 23.9

Assumptions:

- Penetration rate of 5% of households by 2020
- Typical installed capacity: 2.25 kW
- Upfront cost of \$3,000/kW, average lifespan of 25 years
- Fixed maintenance cost in 202: \$41/kW pa
- Variable maintenance cost in 2020: \$3.5/MWh pa

Measure Type: Distributed Energy

Timeframe: Medium

Implementation Body/Stakeholders: Individuals, Councils, Government bodies, Solar sales and manufacturers, Energy distribution and retailing bodies, State and Federal Government

Regional Responsibility Level: Possibly this could be encouraged at a Gippsland level, there are a lot of factors in play though.

Existence of Other Information: There will be ample information available concerning this measure, including:

The Australian PV Association - <http://www.apva.org.au/>

Practical Implementation Considerations: Solar PV is starting to become cost effective for householders, in spite of feed in tariffs being reduced – almost a natural progression happening. There is a strong political environment around this measure with many vested interests. Encouragement, not active project effort suggested

Funding Opportunities: No funding avenues identified, feed in tariffs noted

Comments:

- **General** - Positive cost, some abatement potential
- **Pros** – Lower generation emissions are key to abating carbon emissions, energy generation security, very visible abatement
- **Cons** – Positive cost, 'easy to say, hard to do', this measure may already be occurring at a natural rate as costs decrease, hard space to deal with due to the energy market and energy retailers
- **Conclusion** - Measure possible to do in bits but hard to achieve at scale – measure valuable but better options

ClimateWorks Road Map Notes: N/A

Key Constraint: User cost effectiveness, feed in tariff rules

Practicality Level: Orange

Draft Score of Measure: 6/10

Appendix E: Excluded Sector 4 Measures – On The Land

On Farm Electricity Generation from Organic Waste

Utilisation of onsite or local waste resources to generate electricity that displaces grid electricity consumption.

Cost (A\$/tCO₂e): -51

Emissions Reduction Potential (-ktCO₂e): 18.4

Assumptions:

- Overall 685 kt (dry) of waste available in the region each year (excluding wood waste from sawmills which is assumed to be used in centralised power generation), with an overall energy content of 0.512 TWh
- Approx. 5% of the total waste is used to generate electricity
- 30% average efficiency for conversion to electricity
- Upfront costs of \$6,000/kW, average lifespan of 20 years
- Fixed operation and maintenance costs \$54,000/MW/year and variable \$50/MWh

Measure Type: Distributed Energy

Timeframe: Long

Implementation Body/Stakeholders: Farmers, VFF, DRET, CEC?, CSIRO?, DPI, Federal and State Government, Ag businesses and consultants?

Regional Responsibility Level: Possibly be able to encourage small scale off grid generation of this type dependent on the region and site etc

Existence of Other Information: Some information available:

Clean Energy Council -

http://www.cleanenergycouncil.org.au/dms/cec/policy/Bioenergy_Industry_2010-1-Bioenergy_Industry_2010%5B1%5D.pdf

Ecogeneration Magazine article -

http://ecogeneration.com.au/news/can_australia_afford_to_waste_its_organic_waste/081439/

Practical Implementation Considerations: Funding and/or cost effectiveness for this kind of measure? Small scale requires large input of cash and a regular supply of fuel, larger scale requires similar - both have issues with coordination etc. Export regulations. Dependent on site and farm type that want to use this measure. It would be difficult to achieve the full amount of abatement with this measure

Funding Opportunities: Unknown funding avenues:

Innovation Grants -

<http://www.nrm.gov.au/funding/agriculture/innovation/index.html>

Clean Technology Investment Program -

<http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInvestment/Pages/default.aspx>

Clean Technology Innovation Program -

<http://www.ausindustry.gov.au/programs/CleanTechnology/CleanTechnologyInnovation/Pages/default.aspx>

Grow your Business - <http://www.business.vic.gov.au/grants-and-assistance/grow-your-business>

Grow your Business – Business Development Plan -

<http://www.business.vic.gov.au/grants-and-assistance/grow-your-business-business-development-plan>

Comments:

- **General** - Negative cost, reasonable abatement potential
- **Pros** – Lower generation emissions are key to abating carbon emissions, using ‘waste’ as industrial process ‘food’, energy generation security
- **Cons** – ‘easy to say, hard to do’, this measure has merit in a theoretical sense but would probably be incredibly hard to achieve at scale
- **Conclusion** - Measure possible to do in bits but hard to achieve at scale – measure valuable but better options

Additional Information:

General discussion with Glenn Marriott, from Ag-Challenge Consulting –

Not a lot of feedlot farming in Gippsland¹ – out of a group of 60 farms around the Lakes end of Gippsland, 10 had feedlots and perhaps 1 feedlot had cows on it 24 hours (ie enough waste to make a biodigester worthwhile)

Perhaps potential for a number of farms could get together to achieve this? Hard to do with cow waste - effluent is used as source of fertilizer, and if a biodigester is used, what do you do with the dry end product?

Additional stakeholder input from Tony Gardner, WGCMA –

I’m not sure what the end product after the biodigestation would actually contain, my fears is not much of value to the farmer and as such, there may be an increased need for inorganic fertiliser to be brought in from off farm.

I would think electricity generation from bio waste on farm is very unlikely given our pasture based systems, climate and a number of other factors. Bio waste will far more likely be used for nutrients and carbon reapplications to agriculture in my view.

ClimateWorks Road Map Notes: High risk of lock in; Difficult to implement

Key Constraint: Cost effectiveness, fuel supply, export regulations

Practicality Level: Orange

¹ Additional stakeholder input – *there is some; dry land, Upper Latrobe Catchment - eg west of Glengarry, east of Warragul.*

Draft Score of Measure: 6/10

Improved Pasture and Grassland Management to Reduce Livestock Emissions

Actions undertaken through 'improved pasture and grassland management to improve soil carbon' (below) also reduce livestock emissions via better feed quality and animal management.

Cost (A\$/tCO₂e): 5

Emissions Reduction Potential (-ktCO₂e): 15.5

Assumptions:

- 5% reduction in cattle enteric emissions
- 1.4 cattle/ha on improved pastures on 0.7 cattle/ha on natural grasslands brought under improved management

Measure Type: Livestock

Timeframe: Short

Implementation Body/Stakeholders: Farmers, Farming bodies, DPI, Federal and State Government, Ag businesses and consultants, Fertilizer and seed companies, VFF

Regional Responsibility Level: Difficult to see how this measure would be successfully implemented. Parts could be encouraged and implemented (perhaps), but with challenges

Existence of Other Information: Further information found on the measure:

International Panel on Climate Change website -

http://www.ipcc.ch/publications_and_data/ar4/wg3/en/ch8s8-4-1-1.html

http://www.ipcc.ch/publications_and_data/ar4/wg3/en/ch8s8-4-1-2.html

CSIRO website - <http://www.csiro.au/en/Outcomes/Environment/Australian-Landscapes/soil-carbon.aspx>

Australian Government websites -

http://www.daff.gov.au/climatechange/australias-farming-future/climate-change-and-productivity-research/soil_carbon

<http://www.climatechange.gov.au/reducing-carbon/carbon-farming-initiative>

Practical Implementation Considerations: There are many barriers to this measure – with strong discussion surrounding soil carbon and how to improve it². The definitions of improved pasture and grassland management needs to be clear, as do those surrounding better feed quality and animal management. How do adequately measure livestock emissions? Definition of natural grasslands? Who would pay for this measure? – are their additional outcomes that could occur?? Many actors.

Funding Opportunities: Possibly funding avenues:

Carbon Farming Initiative - <http://www.daff.gov.au/climatechange/cfi>

² Additional stakeholder input - *the inclusion of soil carbon in National sequestration targets is currently being considered.*

Regional Natural Resource Management Planning for Climate Change Fund - <http://www.environment.gov.au/cleanenergyfuture/regional-fund/index.html>

Carbon Farming Futures - <http://www.daff.gov.au/climatechange/carbonfarmingfutures>

CFI Tranche 3 - <http://www.climatechange.gov.au/reducing-carbon/consultations/carbon-farming-initiative/exposure-draft-regulations-carbon-farming-initiative—tranche-3>

Environmental Stewardship Fund - <http://www.nrm.gov.au/funding/previous/stewardship/index.html>

National Environmental Research Program - <http://www.nerpdecisions.edu.au/>

Comments:

- **General** - Positive cost, some abatement potential
- **Pros** – Agriculture a very important sector in Gippsland, funding from Federal programs?
- **Cons** – Enforcement of requirements?, ‘easy to say, hard to do’, large number of actors, barriers, may be a response that occurs naturally over time?, funding from Federal programs? ‘improved management’ is a nice coverall but what does it actually mean in a practical sense?, how do you practically measure livestock emissions?
- **Conclusion** - Parts of the measure should be considered?

Additional Information:

General discussion with Glenn Marriott, from Ag-Challenge Consulting –

The measure seems feasible - better quality feed can only be a good thing, and there is ample room for improvement in pasture management.

Better quality feed means short, green and leafy - dense energy ration. Hay is high fibre and therefore has higher methane content.

How do you measure the emissions? How do stocking rates impact on this? What do you gain from this – higher quality pastures, possibly equal more animals and therefore more content.

ClimateWorks Road Map Notes: Low risk of lock in; Difficult to implement

Key Constraint: Funding and identification of co-benefits

Practicality Level: Orange

Draft Score of Measure: 5/10

Improved Pasture and Grassland Management to Improve Soil Carbon

Optimise grazing intensity and timing for carbon sequestration and productivity; promote land productivity; fire management; species introduction (eg perennial grasses with higher productivity or greater sequestration through deeper roots).

Cost (A\$/tCO₂e): 6

Emissions Reduction Potential (-ktCO₂e): 52.7

Assumptions:

- Apply to approx. 545,000 ha of improved pastures land and 235,000 ha of natural grasslands
- Technical emissions reduction potential 0.3 tCO₂e/ha/yr sequestered in soil
- Penetration rate increases from BAU of 25% to 50% in 2020 for improved pastures and from BAU of 5% to 15% in 2020 for natural grasslands

Measure Type: Soil Carbon

Timeframe: Medium

Implementation Body/Stakeholders: Farmers, Farming bodies, DPI, Federal and State Government, Ag businesses and consultants, Fertilizer and seed companies, VFF, Dairy Australia, Gipps Dairy

Regional Responsibility Level: Difficult to see how this measure would be successfully implemented. Parts could be encouraged and implemented (perhaps), but with challenges

Existence of Other Information: Some information found on the measure:

International Panel on Climate Change website -

http://www.ipcc.ch/publications_and_data/ar4/wg3/en/ch8s8-4-1-1.html

CSIRO website - <http://www.csiro.au/en/Outcomes/Environment/Australian-Landscapes/soil-carbon.aspx>

Australian Government websites -

http://www.daff.gov.au/climatechange/australias-farming-future/climate-change-and-productivity-research/soil_carbon

<http://www.climatechange.gov.au/reducing-carbon/carbon-farming-initiative>

Practical Implementation Considerations: There are many barriers to this measure – with strong discussion surrounding soil carbon and how to improve it³. The definitions of improved pasture and grassland management needs to be clear, as do those surrounding land productivity, natural grasslands, and fire management. How is soil carbon sequestration and productivity

³ Additional stakeholder input - *the inclusion of soil carbon in National sequestration targets is currently being considered.*

adequately measured? Who would pay for this measure? – are their additional outcomes that could occur?? Many actors

Funding Opportunities: Possibly funding avenues:

Carbon Farming Initiative - <http://www.daff.gov.au/climatechange/cfi>

Regional Natural Resource Management Planning for Climate Change Fund - <http://www.environment.gov.au/cleanenergyfuture/regional-fund/index.html>

Carbon Farming Futures - <http://www.daff.gov.au/climatechange/carbonfarmingfutures>

CFI Tranche 3 - <http://www.climatechange.gov.au/reducing-carbon/consultations/carbon-farming-initiative/exposure-draft-regulations-carbon-farming-initiative—tranche-3>

Environmental Stewardship Fund - <http://www.nrm.gov.au/funding/previous/stewardship/index.html>

National Environmental Research Program - <http://www.nerpdecisions.edu.au/>

Comments:

- **General** - Positive cost, good abatement potential
- **Pros** – Agriculture a very important sector in Gippsland, funding from Federal programs?
- **Cons** – Enforcement of requirements?, ‘easy to say, hard to do’, large number of actors, barriers, may be a response that occurs naturally over time?, funding from Federal programs? ‘optimised management’ is a nice coverall but what does it actually mean in a practical sense?, large area to be improved, climatic issues impacting on grass selection?
- **Conclusion** - Parts of the measure should be considered?

Additional Information:

General discussion with Glenn Marriott, from Ag-Challenge Consulting –

More grass/higher quality feed, correlates with higher quality cow emissions...ie grain has lower methane content than hay (would require investigation, not 100% sure about that). How does the carbon remain sequestered?

Certain things that can be done in terms of grazing that does reduce the root mass – ie the more it is grazed in hard times, the less the roots have a chance to grow (therefore let paddocks fallow?)

What is the definition of ‘natural grasslands’? There may be some natural grasslands remaining on roadsides, but that would be it. Different crop/grass types to change the amount of root stock in the soil?

Some comments from previous measure cover this as well.

ClimateWorks Road Map Notes: Low risk of lock in; Difficult to implement

Key Constraint: Funding and identification of co-benefits

Practicality Level: Orange

Draft Score of Measure: 5/10

Anti-methanogenic Treatments

Addition of dietary additives, injections, water medication, vaccines to reduce enteric emissions from cattle.

Cost (A\$/tCO₂e): 7

Emissions Reduction Potential (-ktCO₂e): 65.6

Assumptions:

- Technical emissions reduction potential – reduce livestock enteric emissions by 10% per head
- Penetration rate increases to 50% above BAU in 2020

Measure Type: Livestock

Timeframe: Medium

Implementation Body/Stakeholders: Farmers, Farming bodies, DPI, Federal and State Government, Ag businesses and consultants, Stock feed companies, Vets, Dairy Co-ops, VFF, MLA

Regional Responsibility Level: Difficult to see how this measure would be successfully implemented. Parts could be encouraged and implemented (perhaps), but with many challenges

Existence of Other Information: Information includes:

Australian Government website - <http://www.climatechange.gov.au/reducing-carbon/carbon-farming-initiative>

International Panel on Climate Change website - http://www.ipcc.ch/publications_and_data/ar4/wg3/en/ch8s8-4-1-2.html

CSIRO website - <http://www.publish.csiro.au/paper/EA07249.htm>

Australian Government report – Reducing Emissions from Livestock - http://www.google.com.au/url?sa=t&rct=j&q=&esrc=s&source=web&cd=6&ved=0CFMQFjAF&url=http%3A%2F%2Fwww.daff.gov.au%2F_data%2Fassets%2Fword_doc%2F0003%2F2118423%2Fccrp-outcomes.doc&ei=MOndUaWyGo7jkgW014CQBg&usq=AFQjCNH968BYq2PdlJw3Zor1dR-EMAmHiA&sig2=ulc4KC51dQYo8ABpJfmBUq&bvm=bv.48293060,d.dGI&cad=rja

Practical Implementation Considerations: This measure seems to be still in the theory stage. How do adequately measure livestock emissions? Who would pay for this measure? – are their additional outcomes that could occur? Many actors

Funding Opportunities: Funding avenues possibly include:

Carbon Farming Initiative - <http://www.daff.gov.au/climatechange/cfi>

Carbon Farming Futures - <http://www.daff.gov.au/climatechange/carbonfarmingfutures>

CFI Tranche 3 - <http://www.climatechange.gov.au/reducing-carbon/consultations/carbon-farming-initiative/exposure-draft-regulations-carbon-farming-initiative—tranche-3>

Environmental Stewardship Fund -

<http://www.nrm.gov.au/funding/previous/stewardship/index.html>

National Environmental Research Program - <http://www.nerpdecisions.edu.au/>

Comments:

- **General** - Positive cost, good abatement potential
- **Pros** – Agriculture a very important sector in Gippsland, funding from Federal programs? Dairy sector is also very important, Macalister Demonstration Farm
- **Cons** – Enforcement of requirements?, ‘easy to say, hard to do’, large number of actors, barriers, may be a response that occurs naturally over time?, funding from Federal programs?, how do you practically measure livestock emissions?
- **Conclusion** - Measure should be considered?

ClimateWorks Road Map Notes: Low risk of lock in; Difficult to implement

Key Constraint: Funding and identification of co-benefits

Practicality Level: Orange

Draft Score of Measure: 7/10

Improved Forest Management

Increase amount of woody growth in forests by:

- Removal of weeds such as blackberry that limit native woody vegetation growth
- Removal of feral animal species
- Insect/plant pest control to promote tree growth
- Fire control

Cost (A\$/tCO₂e): 53

Emissions Reduction Potential (-ktCO₂e): 43.2

Assumptions:

- 43,200 ha of forest brought under improved management by 2020
- Technical emissions reduction potential 1.0 tCO₂e/ha/yr

Measure Type: Forest Management

Timeframe: Short

Implementation Body/Stakeholders: CMAs, Farmers, Land owners, DPI, DPCD, State Government, Federal Government, Landcare groups, WGCM

Regional Responsibility Level: Possibly be able to encourage this measure to some extent, many challenges though

Existence of Other Information: Some information on the measure:

Australian Government websites - <http://www.climatechange.gov.au/reducing-carbon/carbon-farming-initiative/reforestation-tools>

http://daff.gov.au/data/assets/pdf_file/0012/1896888/Chris_Mitchell.pdf

<http://www.climatechange.gov.au/sites/climatechange/files/files/climate-change/nger/nga-factsheet5.pdf>

Victorian Government websites -

http://vro.dpi.vic.gov.au/dpi/vro/vrosite.nsf/pages/lwm_landcare_groups

<http://www.dpi.vic.gov.au/forestry/about-forestry/projects-and-initiatives/review-of-the-sustainable-forests-timber-act-2004/australian-forest-products-association-submission>

<http://www.dse.vic.gov.au/forests>

Landcare website -

<http://www.landcareonline.com.au/>

Practical Implementation Considerations: Who pays for this? Many actors? Seems to be a lot of different actions that need to be undertaken for full abatement potential to be reached. A lot of this measure will require ongoing work and will cost significant dollars to achieve – co-benefits with some of these? Insect control?? – seems far fetched. Fire control definition? – there is a policy of burn offs in much of the State forest in Victoria, how would that work into this measure? How do you evaluate success? Does this mean native forests only? – areas of plantation in the Gippsland region

Funding Opportunities: Possibly funding avenues:

Carbon Farming Initiative - <http://www.daff.gov.au/climatechange/cfi>

Caring for Our Country, Landcare - <http://www.nrm.gov.au/funding/index.html>

National Weeds and Productivity Research Program (?) -

http://www.daff.gov.au/natural-resources/invasive/national_weeds_productivity_research_program

Regional Natural Resource Management Planning for Climate Change Fund -

<http://www.environment.gov.au/cleanenergyfuture/regional-fund/index.html>

Environmental Stewardship Fund -

<http://www.nrm.gov.au/funding/previous/stewardship/index.html>

National Environmental Research Program - <http://www.nerpdecisions.edu.au/>

Regional Natural Resource Management Planning for Climate Change -

<http://www.environment.gov.au/cleanenergyfuture/regional-fund/index.html>

Victorian Landcare Grants - [http://www.depi.vic.gov.au/land-](http://www.depi.vic.gov.au/land-management/land/landcare/second-generation-landcare-grants-200506)

[management/land/landcare/second-generation-landcare-grants-200506](http://www.depi.vic.gov.au/land-management/land/landcare/second-generation-landcare-grants-200506)

Comments:

- **General** - Higher positive cost, good abatement potential
- **Pros** – Trees can only be a good thing when considering emissions abatement, Landcare groups already established, biodiversity corridors, fire control
- **Cons** – How much has already been done of this measure?, grass to the fenceline mentality, responsibility? - Council? farmer? CMA? State Government?, funding?, insect control practicalities??. evaluation of success?, what does 'improved management' mean in a practical sense? Fire control? – burning off is a key plank of forest management
- **Conclusion** - Measure should be considered but has issues

ClimateWorks Road Map Notes: Low risk of lock in; Relatively simple to implement

Key Constraint: Funding and responsibility identification

Practicality Level: Orange

Draft Score of Measure: 4/10

Restoration of Less Productive Pasture and Grassland

Restore less productive pastures to improve soil carbon sequestration. Reduce salinity, acidification and erosion by revegetation, applying lime, improving fertility via nutrient appliance. Apply organic substrates.

Cost (A\$/tCO₂e): 82

Emissions Reduction Potential (-ktCO₂e): 18.0

Assumptions:

- 20% of improved pasture and natural grassland is degraded (136,400 ha land in improved pastures and 58,000 ha of natural grassland)
- Technical emissions reduction potential 1.0 tCO₂e/ha/yr
- Penetration rate increases progressively from 5% in 2010, rising to 15% in 2020 for improved pastures
- Penetration rate increases progressively from 0% in 2010, rising to 8% in 2020 for natural grasslands

Measure Type: Soil Carbon

Timeframe: Long

Implementation Body/Stakeholders: Farmers, Farming bodies, DPI, Federal and State Government, Ag businesses and consultants, Fertilizer and seed companies, VFF

Regional Responsibility Level: Difficult to see how this measure would be successfully implemented. Parts could be encouraged and implemented (perhaps), but with challenges

Existence of Other Information: Information concerning the measure:

International Panel on Climate Change website -

http://www.ipcc.ch/publications_and_data/ar4/wg3/en/ch8s8-4-1-1.html

CSIRO website - <http://www.csiro.au/en/Outcomes/Environment/Australian-Landscapes/soil-carbon.aspx>

Australian Government websites -

http://www.daff.gov.au/climatechange/australias-farming-future/climate-change-and-productivity-research/soil_carbon

<http://www.climatechange.gov.au/reducing-carbon/carbon-farming-initiative>

Practical Implementation Considerations: There are many barriers to this measure – with strong discussion surrounding soil carbon and how to improve it. The definitions of improved pasture needs to be clear, as do those surrounding land productivity, natural grasslands, and fire management. How do adequately measure soil carbon sequestration and productivity? Who would pay for this measure? Many actors. It seems that parts of this measure are included in both soil health and environmental/revegetation plantings.

Funding Opportunities: Possible funding avenues:

Carbon Farming Initiative - <http://www.daff.gov.au/climatechange/cfi>

Regional Natural Resource Management Planning for Climate Change Fund - <http://www.environment.gov.au/cleanenergyfuture/regional-fund/index.html>

Carbon Farming Futures - <http://www.daff.gov.au/climatechange/carbonfarmingfutures>

CFI Tranche 3 - <http://www.climatechange.gov.au/reducing-carbon/consultations/carbon-farming-initiative/exposure-draft-regulations-carbon-farming-initiative—tranche-3>

Environmental Stewardship Fund - <http://www.nrm.gov.au/funding/previous/stewardship/index.html>

National Environmental Research Program - <http://www.nerpdecisions.edu.au/>

Comments:

- **General** - High positive cost, some abatement potential
- **Pros** – Agriculture a very important sector in Gippsland, funding from Federal programs?, integrated response
- **Cons** – Enforcement of requirements?, ‘easy to say, hard to do’, large number of actors, barriers, may be a response that occurs naturally over time?, funding from Federal programs? ‘improved management’ is a nice coverall but what does it actually mean in a practical sense?, who has responsibility?
- **Conclusion** - Parts of the measure should be considered?

Additional Information:

General discussion with Glenn Marriott, from Ag-Challenge Consulting –

Limited salinity in Baw Baw Shire – too much rainfall has leached it away. Some in the coastal areas, perhaps on the Bass flats for example.

Applying lime is not a fix all measure - aluminium toxicity is the only reason you would apply lime. The common, most grown pastures don't need a basic soil, and the natural soil in Gippsland is acidic – pH of 5 to 7.

Applying organic materials is good – but how do you do this at scale and how do you measure it? What does ‘20% of pasture is degraded’ mean??

ClimateWorks Road Map Notes: Low risk of lock in; Difficult to implement

Key Constraint: Funding and site identification

Practicality Level: Orange

Draft Score of Measure: 6/10

Appendix F: Aspects of Matrix Creation and Measure Selection

Implementation Body/Stakeholders

The entries in this part of the measure evaluation and the assessment matrix should not be taken as the defining authority for stakeholders involved in the implementation of a measure. The listing is intended to be broad in nature, and has allowed discussion and input from interested readers. It is almost certain that even after this process, stakeholders have been overlooked or missed from certain measures. All attempts were made to fill any holes in the selected measures prior to Phase 2 initiation.

Research

A great deal of research was undertaken in this review and evaluation of the *ClimateWorks Plan*, creation of this report and the resulting measures assessment matrix. The authors drew on personal experience, knowledge and expertise, gathered through a lifetime of living in Gippsland and studies focusing on sustainability, environmental science, climate change, environmental policy and energy efficiency. Other members of the Energy Efficient Strategies team also had input into the understanding of various measures.

Some guidance and comment was also provided by Scott Ferraro from ClimateWorks, Judy Bush from the Northern Alliance for Greenhouse Action, Sam Smith from Future Proofing Geelong, and Glenn Marriott from Ag-Challenge Consulting.

The following documents were closely examined in the research for this report:

- Low Carbon Growth Plan for Gippsland, 2011 – ClimateWorks;
- Low Carbon Growth Plan for Gippsland, Detailed Assumptions and Bibliography, 2011 – ClimateWorks;
- Gippsland Regional Plan, 2010;
- Gippsland Low Carbon Economy Transition Program – Project Plan, 2012.

The following documents were used or considered during the research for this report:

- Gippsland Transport Strategy, 2008;
- Latrobe City Council – Community Engagement Report, 2009;
- Future Proofing Geelong – Sustainability Covenant, 2011;
- Low Carbon Growth Plan for Australia – Full Report, 2010.

Numerous websites were used during the research for this report, with the key ones being:

- Australian Building Codes Board - <http://www.abcb.gov.au/>
- Australian Government Connection Point - <http://australia.gov.au/>
- AusIndustry - <http://www.ausindustry.gov.au/Pages/default.aspx>

- Building Commission Victoria - <http://www.buildingcommission.com.au/www/html/7-home-page.asp>
- BusinessVictoria - <http://www.business.vic.gov.au/>
- Caring for Our Country - <http://www.nrm.gov.au/>
- Clean Energy Council - <http://www.cleanenergycouncil.org.au/>
- ClimateWorks - <http://www.climateworks.com.au/>
- CSIRO - <http://www.csiro.au/>
- Dairy Australia - <http://www.dairyaustralia.com.au/>
- Department of Agriculture, Fisheries and Forestry - <http://www.daff.gov.au/>
- Department of Industry, Innovation, Climate Change, Science, Research, and Tertiary Education - <http://www.climatechange.gov.au/>
- Department of Resources, Energy and Tourism - <http://www.ret.gov.au/Pages/default.aspx>
- Department of Sustainability, Environment, Water, Population and Communities - <http://www.environment.gov.au/>
- Energy Efficiency Exchange - <http://eex.gov.au/>
- Energy Efficiency Opportunities - <http://energyefficiencyopportunities.gov.au/>
- EnergyRating – <http://www.energyrating.gov.au>
- Essential Services Commission - <http://www.esc.vic.gov.au/Home>
- Grantslink - <http://grants.myregion.gov.au/>
- Green Building Council Australia - <http://www.gbca.org.au/>
- Housing Industry Australia - <http://hia.com.au/>
- Insulation Council of Australia and New Zealand - <http://icanz.org.au/>
- International Panel on Climate Change - <http://www.ipcc.ch/>
- Landcare Australia - <http://www.landcareonline.com.au/>
- LivingGreener - <http://www.livinggreener.gov.au/>
- Low Carbon Australia - <http://www.lowcarbonaustralia.com.au/>
- Macalister Demonstration Farm - <http://www.macalisterdemonstrationfarm.com/>
- Municipal Association of Victoria - <http://www.mav.asn.au/Pages/default.aspx>
- Sustainability Victoria - <http://www.sustainability.vic.gov.au/www/html/1517-home-page.asp>
- Victorian Department of Environment and Primary Industries - <http://www.dse.vic.gov.au/>, <http://www.dpi.vic.gov.au/>, <http://www.depi.vic.gov.au/>

Appendix G: Measure Types and Discussion

Sector 1 Measures – Manufacturing, Mining and Freight

Gippsland's manufacturing, mining and freight sector employs just over one tenth of the regional workforce yet generate one third of the regional economic output. It illustrates the key role these sectors play in the economic wellbeing of the region. Much of this manufacturing is focused on the processing of meat, dairy and other food products produced on Gippsland's fertile agricultural land, and the manufacture of paper products from timber harvested in Gippsland's extensive forests. Mining (including oil and gas extraction) is the second smallest sector in terms of employment numbers, yet is the third largest sector in comparative regional output. Natural gas is extracted offshore from extensive reserves in the Bass Strait (where one fifth of Australia's crude oil is also extracted) and is then processed and distributed to Melbourne, NSW, South Australia, Tasmania and the ACT.

Gippsland can reduce emissions from Manufacturing, Mining and Freight by 573,500 tonnes per year by 2020. Capturing these emissions reductions would save businesses \$44.4 million each year across the regional economy through improved energy efficiency, reduced fuel use in freight, or through distributed energy solutions that improve the efficiency of how energy is used.

A range of websites can provide information and potential avenues for funding:

- Federal Energy Efficiency Opportunities Program; which provides information on potential responses - <http://energyefficiencyopportunities.gov.au/>
- Funding Application Support; helps businesses to strengthen their applications for third party funding opportunities related to resource efficiency - <http://www.sustainability.vic.gov.au/www/html/3605-funding-application-support.asp>
- Resource Assessment and Planning for Implementation; provides funding for eligible businesses to review their activities and to identify and implement resource efficiency improvements - <http://www.sustainability.vic.gov.au/www/html/3604-resource-assessment-and-planning-for-implementation.asp>
- Victorian Adaptation and Sustainability Partnership?? - <http://www.dse.vic.gov.au/conservation-and-environment/sustainability/victorian-adaptation-and-sustainability-partnership>
- Industry and Government Energy Efficiency Support Programs - <http://eex.gov.au/business-support/programs/>
- Steplight Grants (various) - <http://steplight.com.au/grants/>
- Low Carbon Australia (various) - <http://www.lowcarbonaustralia.com.au/>

Sector 2 Measures – Commercial and Services

Almost two thirds of Gippsland’s working population work in the commercial and services sector, the largest employing sectors are office based businesses, non retail food, health and education.

Many commercial and services businesses in Gippsland are SMEs, who typically lack the resources to identify and invest in energy efficiency retrofits or the most fuel efficient vehicles in class. The region’s buildings were constructed at a time before we had building efficiency standards, and many have not been substantially upgraded to improve energy efficiency since then. Work vehicles are often selected for reasons other than fuel efficiency, such as safety and a preference for vehicles with parts that are inexpensive and readily available. Gippsland’s dispersed population also means that opportunities are highly fragmented, and can therefore be harder to capture.

A range of websites can provide information and potential avenues for funding:

- Federal Energy Efficiency Opportunities Program; which provides information on potential responses - <http://energyefficiencyopportunities.gov.au/>
- Funding Application Support; helps businesses to strengthen their applications for third party funding opportunities related to resource efficiency - <http://www.sustainability.vic.gov.au/www/html/3605-funding-application-support.asp>
- Resource Assessment and Planning for Implementation; provides funding for eligible businesses to review their activities and to identify and implement resource efficiency improvements - <http://www.sustainability.vic.gov.au/www/html/3604-resource-assessment-and-planning-for-implementation.asp>
- Victorian Adaption and Sustainability Partnership?? - <http://www.dse.vic.gov.au/conservation-and-environment/sustainability/victorian-adaptation-and-sustainability-partnership>
- Industry and Government Energy Efficiency Support Programs - <http://eex.gov.au/business-support/programs/>
- Steplight Grants (various) - <http://steplight.com.au/grants/>
- Low Carbon Australia (various) - <http://www.lowcarbonaustralia.com.au/>

Sector 3 Measures – Households

By 2020 it is estimated that there will be 110,000 households in Gippsland, an increase of 16% over this decade. Most of this population growth is expected around the key regional centres of Warragul, Wonthaggi, Latrobe Valley, Sale, Bairnsdale, Leongatha and Cowes. This will also see 15,000 new homes built over this period to accommodate the growing population. Most Gippslanders live in separate houses, with just 9% of the population living in units, townhouses or apartments.

People in Gippsland also own more cars than average, and own their vehicles for longer, due to limited access to public transport across the region and the need therefore to keep more cars in the family to service the needs of everyone in the household.

Gippsland's households have the potential to reduce the energy used in their homes and the fuel used in their cars, which could reduce the region's greenhouse gas emissions by 177,600 million tonnes per year.

A range of websites can provide information and potential avenues for funding:

- Sustainability Victoria; an excellent source of information for householders - <http://www.sustainability.vic.gov.au/www/html/1517-home-page.asp>
- EnergyRating website; provides vast amount of information concerning appliances and equipment – www.energyrating.gov.au

Sector 4 Measures – On The Land

Land based activities are a key economic driver in Gippsland. Agriculture, Forestry and Fishing is the fourth largest sector in terms of regional output and the third largest in terms of employment, providing jobs for almost 10,000 Gippslanders. This also ensures it is a significant contributor to the region's greenhouse gas emissions, with land based activities contributing 1.3 million tonnes of emissions per year.

The region has over one million hectares of agricultural land, and extensively forested public land. Parts of Gippsland – particularly around the Macalister Irrigation District – are prime dairy land, producing 22% of Australia's milk. The region also produces excellent pasture for beef and lamb, and reliable water resources are attracting a growing horticulture industry. Despite some climate and soil variability across the region, Gippsland's fertile soils and water security are expected to see an intensification of agricultural activity in the future, and the region is positioning itself as the future food bowl for Victoria and Australia. Gippsland has also developed extensive local expertise in reducing emissions from land based activities, which have provided a valuable resource in the development of this Plan.

A range of websites can provide information and potential avenues for funding:

- Funding Application Support; helps businesses to strengthen their applications for third party funding opportunities related to resource efficiency - <http://www.sustainability.vic.gov.au/www/html/3605-funding-application-support.asp>
- Victorian Adaption and Sustainability Partnership?? - <http://www.dse.vic.gov.au/conservation-and-environment/sustainability/victorian-adaptation-and-sustainability-partnership>
- Industry and Government Energy Efficiency Support Programs - <http://eex.gov.au/business-support/programs/>
- Steplight Grants (various) - <http://steplight.com.au/grants/>

Measure Types Discussion

Broadly, each measure can be grouped into a different form of response. Some are sector dependent (ie Forest Management – On the Land sector), others are more general in nature (ie Energy Efficiency).

Behaviour Change

Sectors:

- Mining, Manufacturing and Freight;
- Households.

Behaviour change can be a particularly difficult response to implement as it requires a routine or action to be adjusted and a new habit created by end users. This can take time and a strong motivation for end users to be successful. It is also something that people can find difficult even if the change has positive results for them or their company. Behavioural changes are usually less desirable as they do not always persist.

Freight Efficiency

Sectors:

- Mining, Manufacturing and Freight.

A self explanatory response, freight efficiency allows more work from the same or lower amount of fuel consumption for a vehicle or a fleet of vehicles.

Energy Efficiency

Sectors:

- Mining, Manufacturing and Freight,
- Commercial and Services;
- Households;
- On the Land.

‘Getting more for the same or less’, is the key concept to describe energy efficiency. It underpins many forms of emissions abatement, and is the most important response that can be undertaken to reduce energy bills.

It is a response that is found through each of the four sectors. From downsizing equipment or installing ceiling insulation, to choosing more efficient appliances or replacing an old lighting technology with a new one.

Distributed Energy

Sectors:

- Mining, Manufacturing and Freight;
- Commercial and Services;
- Households;
- On the Land.

The dominant fuel types currently used to generate electricity are one of the core causes of emissions, with any move towards a decentralised generation capacity utilising lower emissions fuels generally having a positive impact.

Using waste as ‘food’ for industrial services like electricity or heat generation, can provide a solution to two or even three different issues confronted by business. Cogeneration using natural gas can generate heat and electricity, while producing lower emissions than conventional coal fired sources. In its purest form, electricity generated from solar PV cells provides an emissions free form of power.

Vehicle Efficiency and Hybrids/Electric

Sectors:

- Commercial and Services;
- Households.

Lowering the emissions from vehicles is another prime target for abatement. This may come through efficiency improvements (in many forms) to engines or through design changes, or due to vehicles being powered in a different manner - electricity only or through hybrid means.

New Builds

Sectors:

- Commercial and Services;
- Households.

Many building emissions could be ‘stopped at the source’ if initial design featured passive solar features that made the full use of orientation. An increased use of insulation at higher levels can also ease the requirement of space heating or cooling. A split incentive occurs when decisions are being made about building construction – the builder wishes to be paid for their services, and due to the requirement of speed, a lack of care or poor knowledge, the future occupant deals with decisions made in the building phase. Often these decisions don’t take the full cost of future services into account and impacts poorly on the occupants throughout the building lifetime. Many new houses are built to minimum specifications and future owners have no say in the energy attributes.

Soil Carbon, Forestry Practices and Livestock

Sectors:

- On the Land.

There are many avenues for emissions abatement when considering current forestry and farming practices. Increasing the sequestration of carbon in the soil is one key measure, as is the planting of trees and vegetation. Co-benefits include providing biodiversity security and increased pasture productivity. Combating the emissions from livestock is also a potential abatement measure that could allow large emissions reductions.