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A SUNBURNT COUNTRY

HARNESSING AUSTRALIA'S MOST ABUNDANT RESOURCE

Alexander Laurie, Stuart Mounter, Renato Villano

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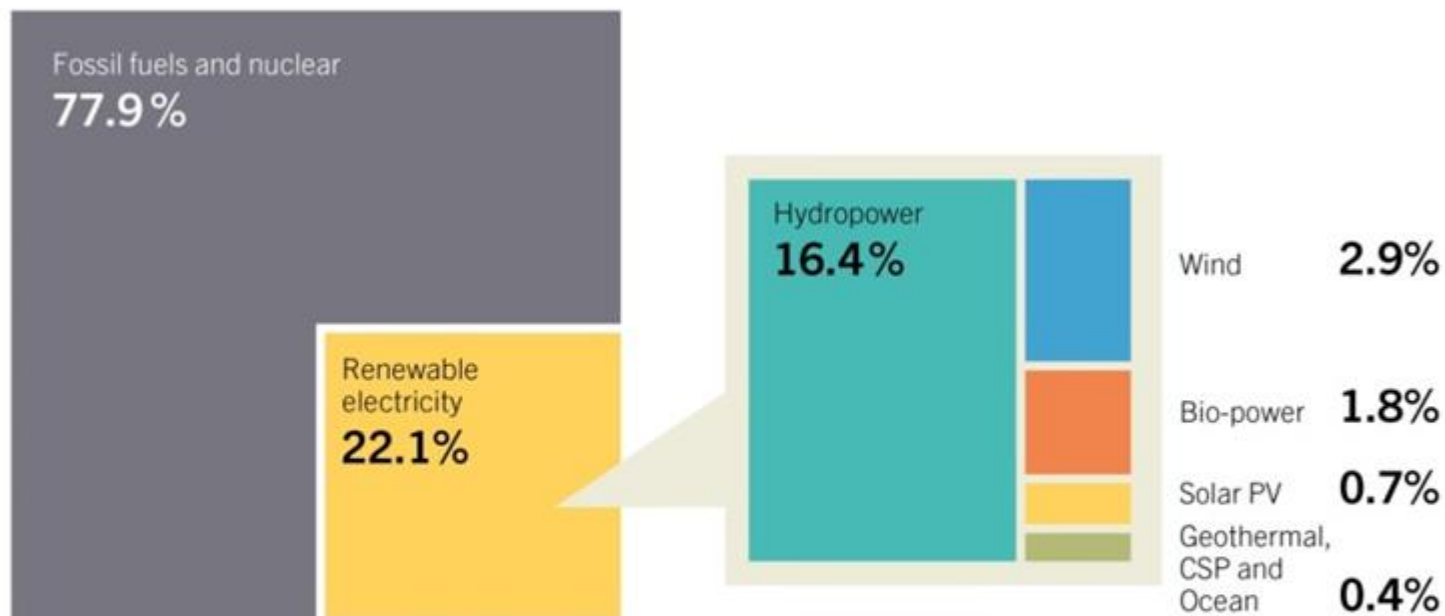


Research questions and objectives

To determine the financial viability of large-scale solar projects for Australian landowners using solar lease agreements

1. Critical assessment of the presence of large-scale solar in Australia, with reference to global trends
2. Evaluation of the potential value of a large-scale system to representative agricultural enterprises using a hypothetical solar project

Estimated Renewable Energy Share of Global Electricity Production, End-2013

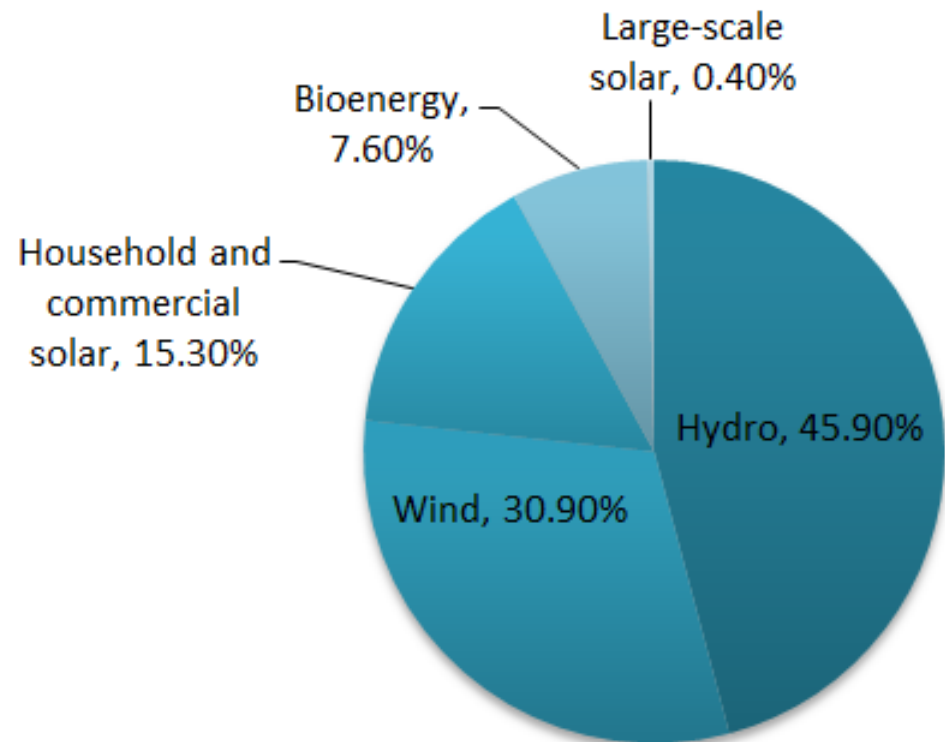
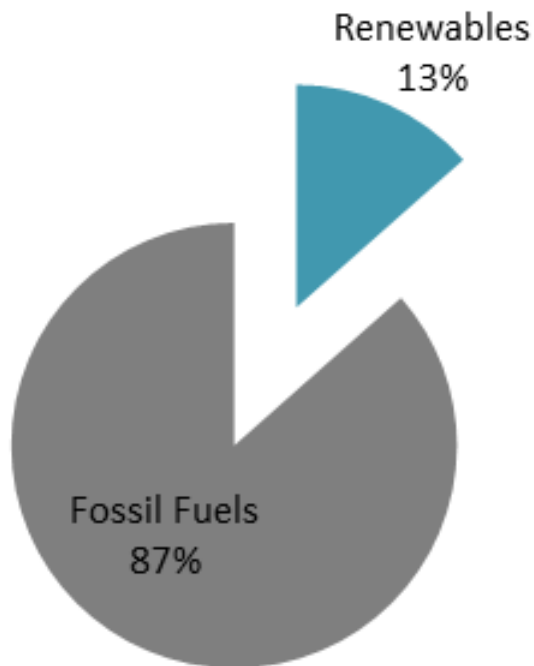


Based on renewable generating capacity in operation end-2013.
Data do not add up due to rounding.

REN21. 2014. *Renewables 2014 Global Status Report* (Paris: REN21 Secretariat).

Australian annual electricity generation 2014

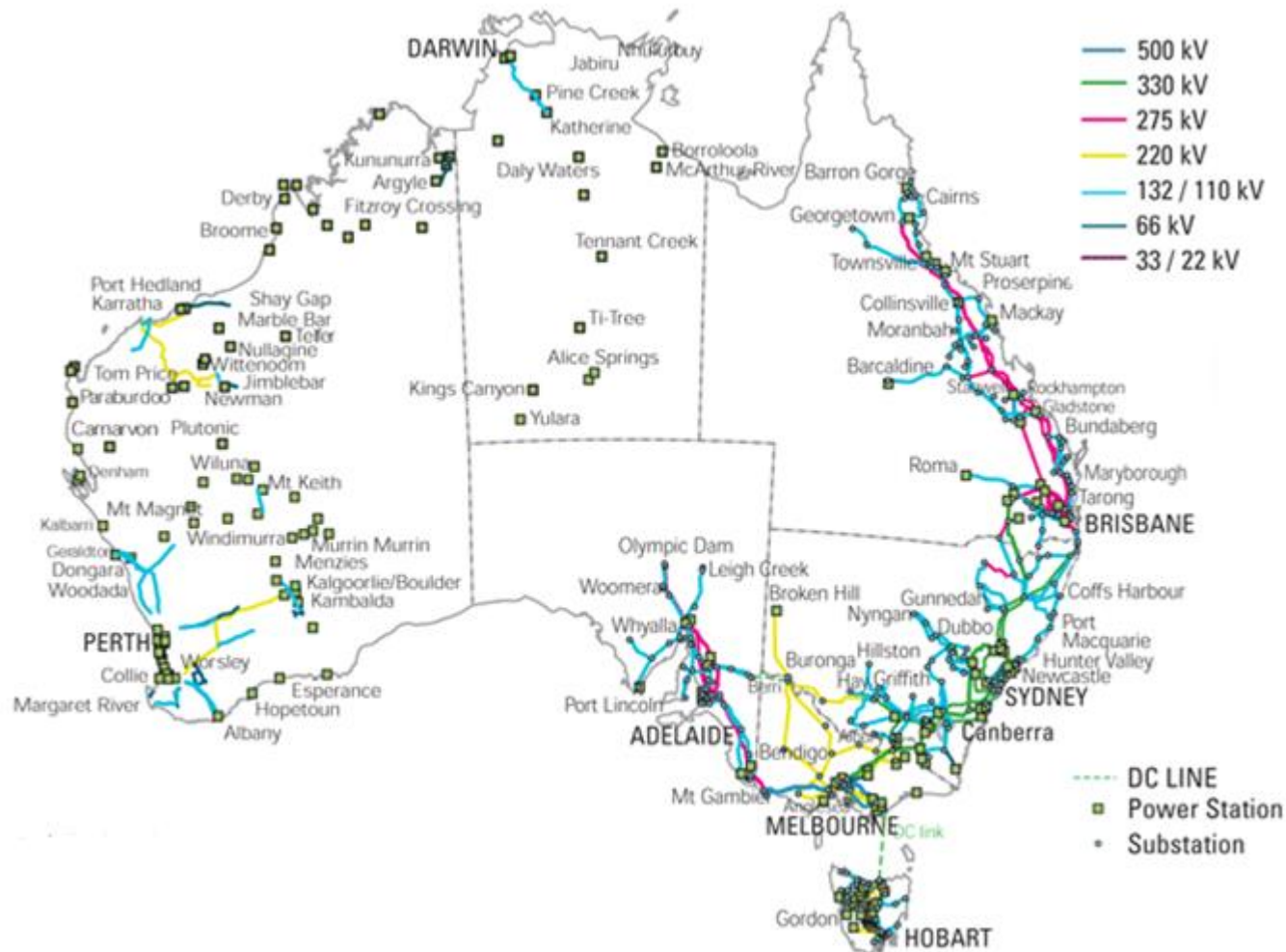
(Clean Energy Council, 2014)



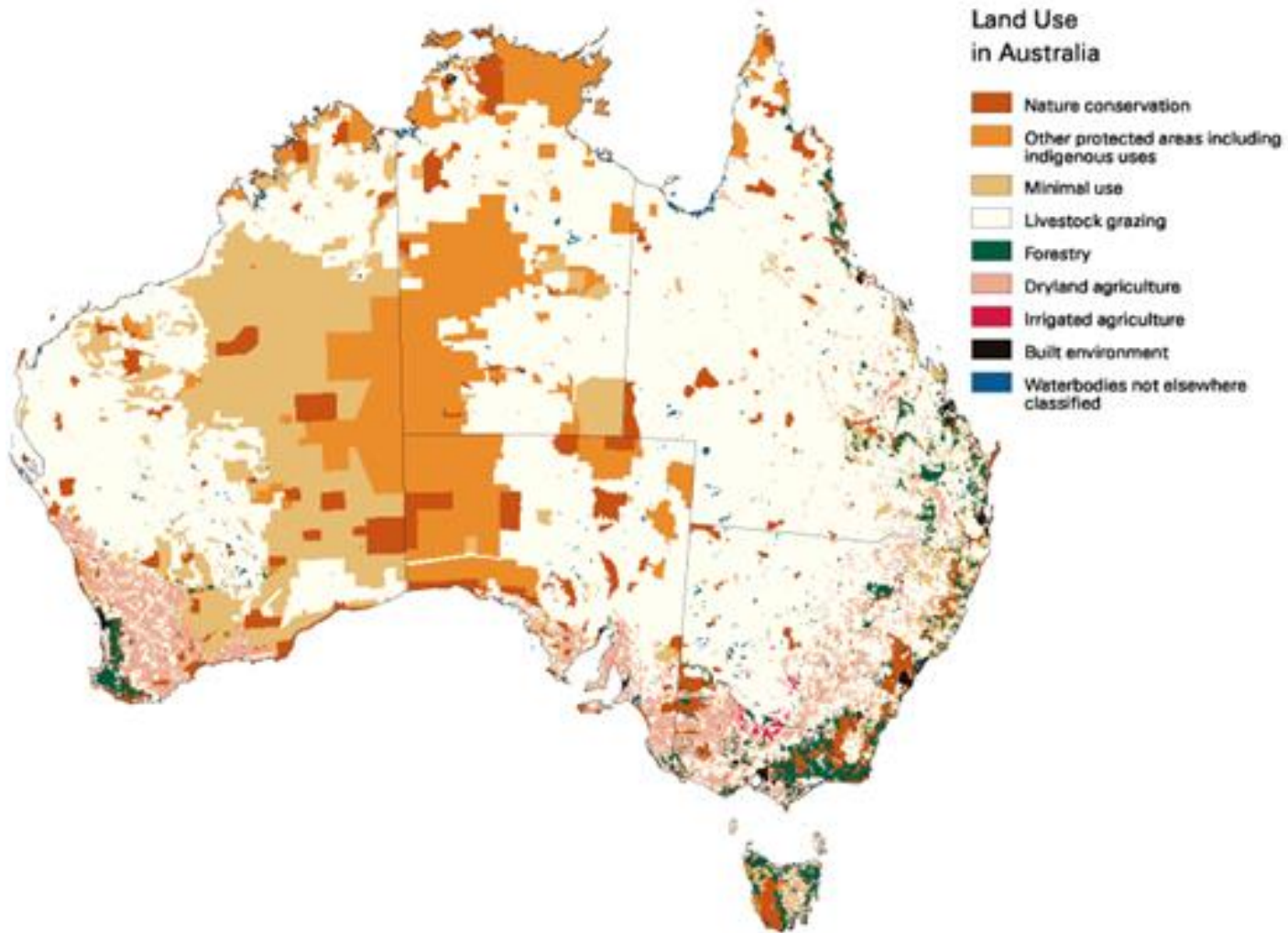
Growth expected for solar PV

- Australia is the sunniest nation in the world
- Investment into solar rapidly increasing as solar generation costs sharply decline, Renewable Energy Target locked in
- Multiple government support programs through ARENA & CEC targeted to large-scale funding rounds
- Large areas of land required, circa 2-3ha/MW (PV panels, Solar Choice)
- Location criteria to meet

Transmission lines and power stations



Australia's land uses



Australian Solar Farms

Technology	Owner	Location	Capacity (MW)	Status (2015)	Existing/previous land use ²
Solar PV	Solar Chocie	Bulli Creek, QLD	2,000	Planning	Cattle grazing
Solar PV	AGL	Nyngan, NSW	102	Commissioned (2015)	Cattle grazing and dryland cropping (mixed)
Solar PV	Fotowatio Renewable Ventures	Moree, NSW	56	Under construction	Cattle grazing and dryland cotton cropping
Solar PV	AGL	Broken Hill, NSW	53	Commissioned (2015)	Cattle grazing
Solar Thermal	CS Energy	Kogan Creek, QLD	44	Under construction	Native bushland (required clearing)
Solar Thermal	RATCH-Australia	Collinsville, QLD	30	Planning	Native bushland (requires clearing)
Solar PV	Fotowatio Renewable Ventures	Royalla, ACT	20	Commissioned (2014)	Cattle and sheep grazing
Solar PV	Synergy/GE	Greenough River, WA	10	Commissioned (2012)	Cattle and sheep grazing, irrigated cropping
Solar Thermal	Areva/Macquarie Generation	Liddell III, NSW	9.3	Commissioned (2012)	†
Solar PV	Belectric	Mildura, VIC	3.5	Commissioned (2014)	†
Solar PV	First Solar/University of Queensland	University of Queensland, QLD	3.275	Under construction	†
Solar PV	Silex (Solar Systems)	Mildura Stage 1, VIC	1.5	Commissioned (2013)	†

¹Not an exhaustive list of Australia's large-scale PV systems

²Land use identified in corresponding environmental impact statements

†Land use for projects smaller than 10MW varies significantly

Source: (Clean Energy Council, 2014)

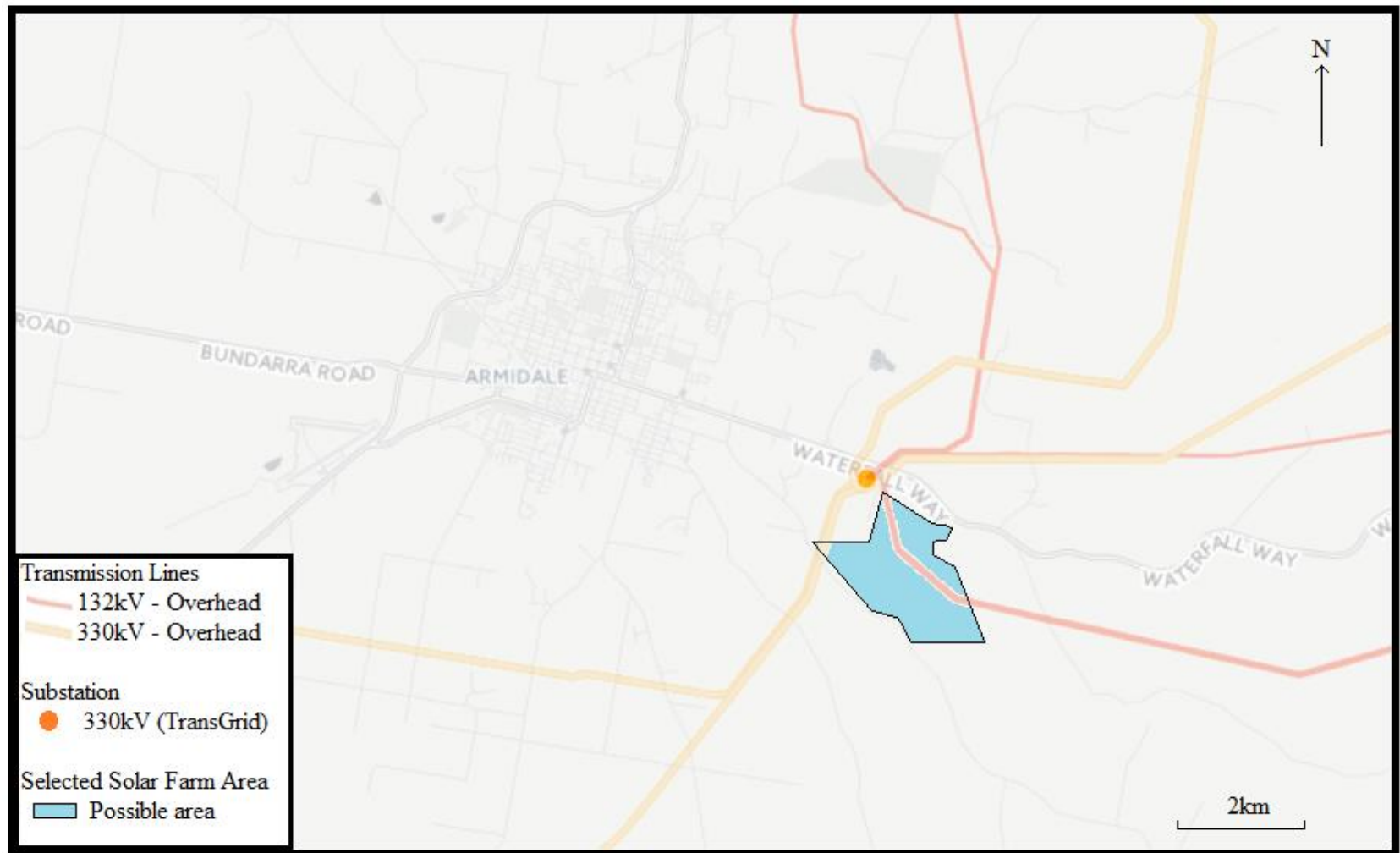
Solar lease agreements

- Useful to avoid the upfront capital cost
- Lease agreement dictated by value of land, PPA agreement
- 11% of German renewable energy capacity operating through lease agreements
- Lease agreement used to provide a secure long-term passive income source

Case study

- Representative 30MW project, 100ha
- Collaboration with *Solar Choice*
- Identified typical and optimal grazing enterprises
- Financial analysis; gross margin analysis and net present value calculation using benefit cost analysis

Site location



Data construction

- 20 year lease
- Two grazing enterprises & solar lease
- \$200/ha lease price used for solar lease
- Discount rates of 4, 7 and 10% used – 7% central rate (NSW Treasury guidelines)
- 100ha land area, data adjusted for 100ha
- All values are real values (net of inflation)
- NSW DPI data excludes fixed cost summary

Net present values

- NPV figures represent the value of each alternative in today's real dollar terms – useful for decision making. (Not inclusive of social benefits/costs)

	Net present value for the 20 year period (\$)		
Discount rate	Solar lease	Steers 240-420kg	Steers 240-460kg
4%	291,806.53	310,938.19	362,315.66
7%	231,880.28	247,083.02	287,910.68
10%	190,271.27	202,746.00	236,248.24

Accounting for fixed costs

	Additional Expenditure			
Enterprise	Base*	10%	20%	30%
Steers 240-420kg (\$)	64,475.52 (+\$0/ha)	70,923.07 (+\$64.47/ha)	77,370.62 (+\$128.95/ha)	83,818.18 (+\$193.43/ha)
Steers 240-460kg (\$)	58,468.31 (+\$0/ha)	64,315.14 (+\$58.47/ha)	70,161.97 (+\$116.94/ha)	76,008.80 (+\$175.40/ha)

	Additional Benefit			
Solar Lease NPV Sum additions	Base	10%	20%	30%
NPV Sum*: Steers 240-420kg (\$)	231,880.28	306,626.89	381,385.10	456,143.30
NPV Sum*: Steers 240-460kg (\$)	231,880.28	299,670.49	367,460.69	435,239.29

Gross margin analysis

- 2012 NSW DPI data adjusted for inflation to obtain 2015 values

Gross margin per hectare* (\$/ha)				
Enterprise	2012	2013	2014	2015
Growing out steers 240-420kg in 12 months	196.69	202.02	207.52	213.13
Growing out steers 240-460kg in 12 months	229.19	235.41	241.80	248.33
Solar lease	-	-	-	200

	Enterprise	Income (\$)	Gross margin (\$/ha)
Normal Year	Steers, 240-420kg	85,768.77	213.11
Drought Year	Steers, 240-420kg	77,191.89	127.16
Normal Year	Steers, 240-460kg	83,301.29	248.33
Drought Year	Steers, 240-460kg	74,971.16	165.03
Normal Year	Solar Lease	20,000	200.00
Drought Year	Solar Lease	20,000	200.00

Discussion and conclusions

- Large-scale solar expected to grow more rapidly than alternate renewable technologies
- Case study analysis illustrates that large-scale solar can provide a secure, passive income source for relevant landowners using solar leasing
- Drought year implications and commodity price variability make a solar lease increasingly attractive

Further research

- Stochastic efficiency - risk
- Treatment of other enterprises
- Other location
- Different solar technology

Government policy implications

- Significant potential for value creation using a subsidy
- An annual subsidy of \$6,647 could generate 32% more value for the landowner
- Case analysis highlights reasons why landowners should be encouraged to seek solar leasing options
- Solar developers and policy makers may use this analysis to implement large-scale solar projects in the future