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## *Promoting the deployment of Wave Energy Conversion Technologies in South Africa*



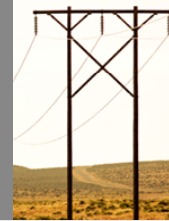
*Energy Innovation For Life*

**Thembakazi Mali**

Senior Manager : Clean Energy Solutions

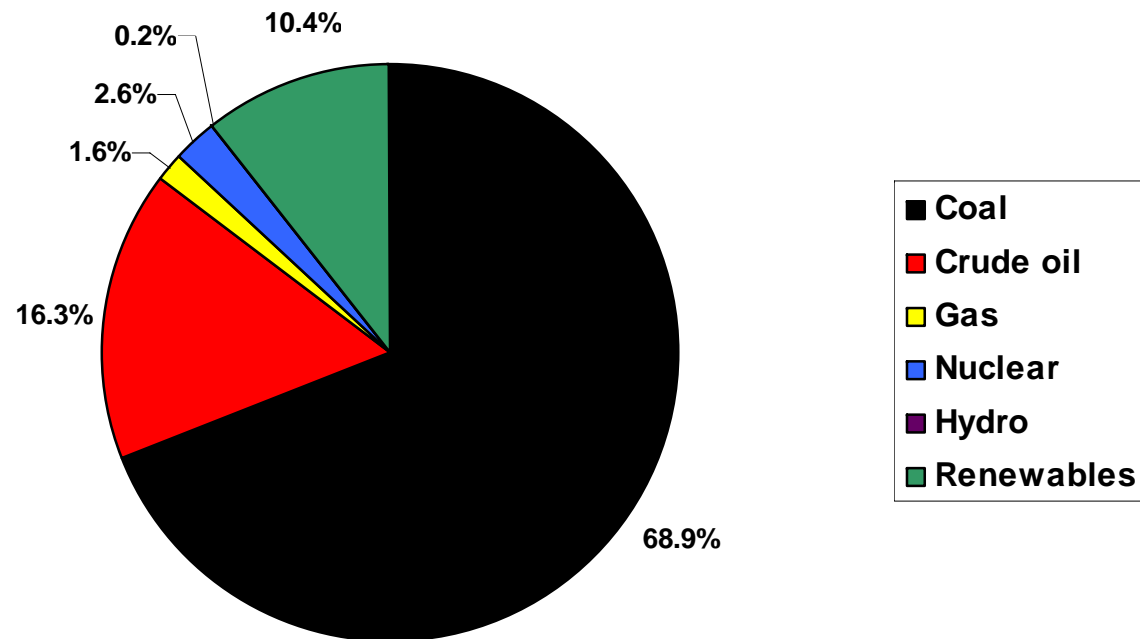
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# Total Energy Supply

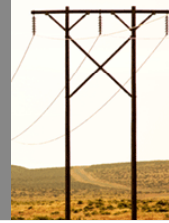


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## Total primary energy supply



# A case for Renewables



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SA among highest emitters of [carbon dioxide](#) in the world

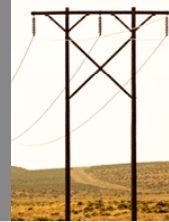
More than 75% of primary energy requirement from fossil fuels

SA ranked 12<sup>th</sup> in the world in terms of top emitters

 Urgent need:

- Reduce fossil fuel dependency
- Reduce carbon footprint
- Diversify our energy mix and supply

# Renewable Energy Sources



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Biomass



Solar



Wind

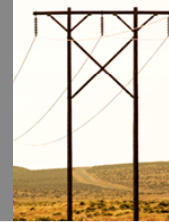


Ocean

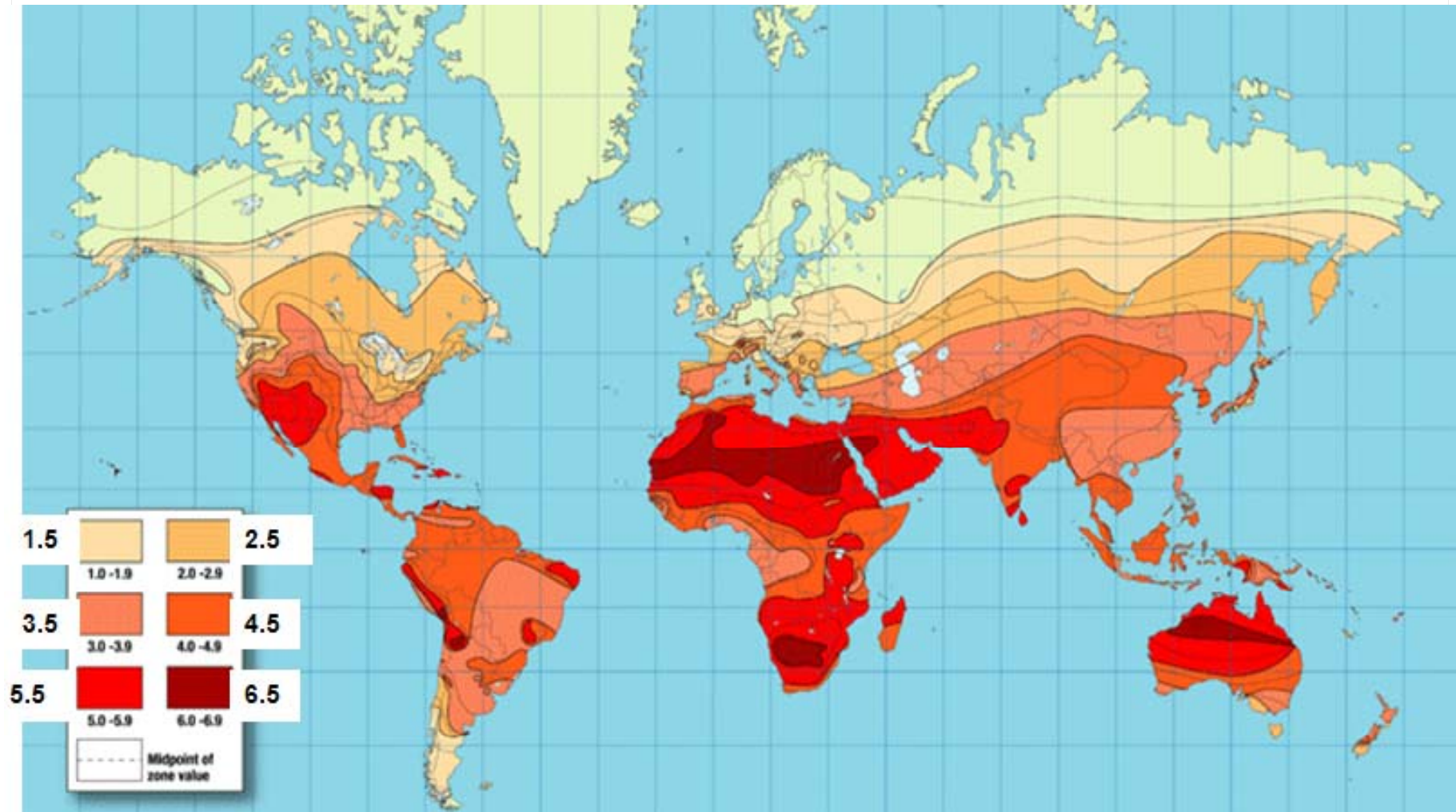


- Natural resources
- Naturally replenished

# Solar Resource, World

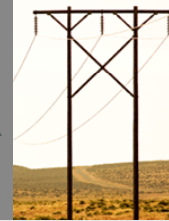


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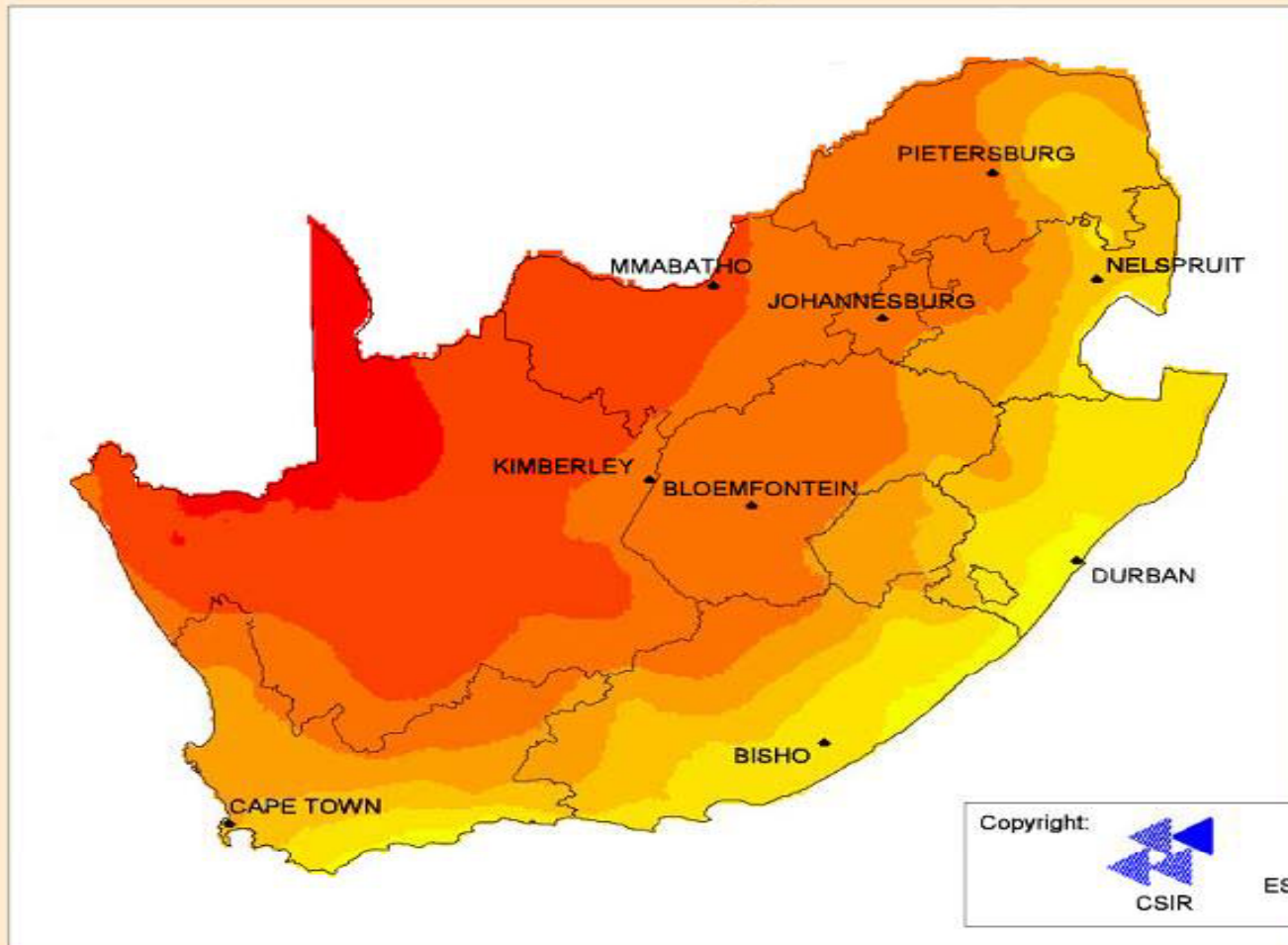


# Solar Resource, South Africa



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## South African Renewable Energy Resource Database - Annual Solar Radiation



Annual global (direct plus diffuse) solar radiation received on a level surface.

### Legend:

Provincial boundaries

Towns

#### Annual solar radiation

- 6000 - 6500 MJ/m<sup>2</sup>
- 6501 - 7000 MJ/m<sup>2</sup>
- 7001 - 7500 MJ/m<sup>2</sup>
- 7501 - 8000 MJ/m<sup>2</sup>
- 8001 - 8500 MJ/m<sup>2</sup>
- 8501 - 9000 MJ/m<sup>2</sup>
- 9001 - 9500 MJ/m<sup>2</sup>

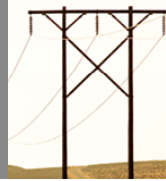


100 0 100 200 300 Kilometers

Copyright:

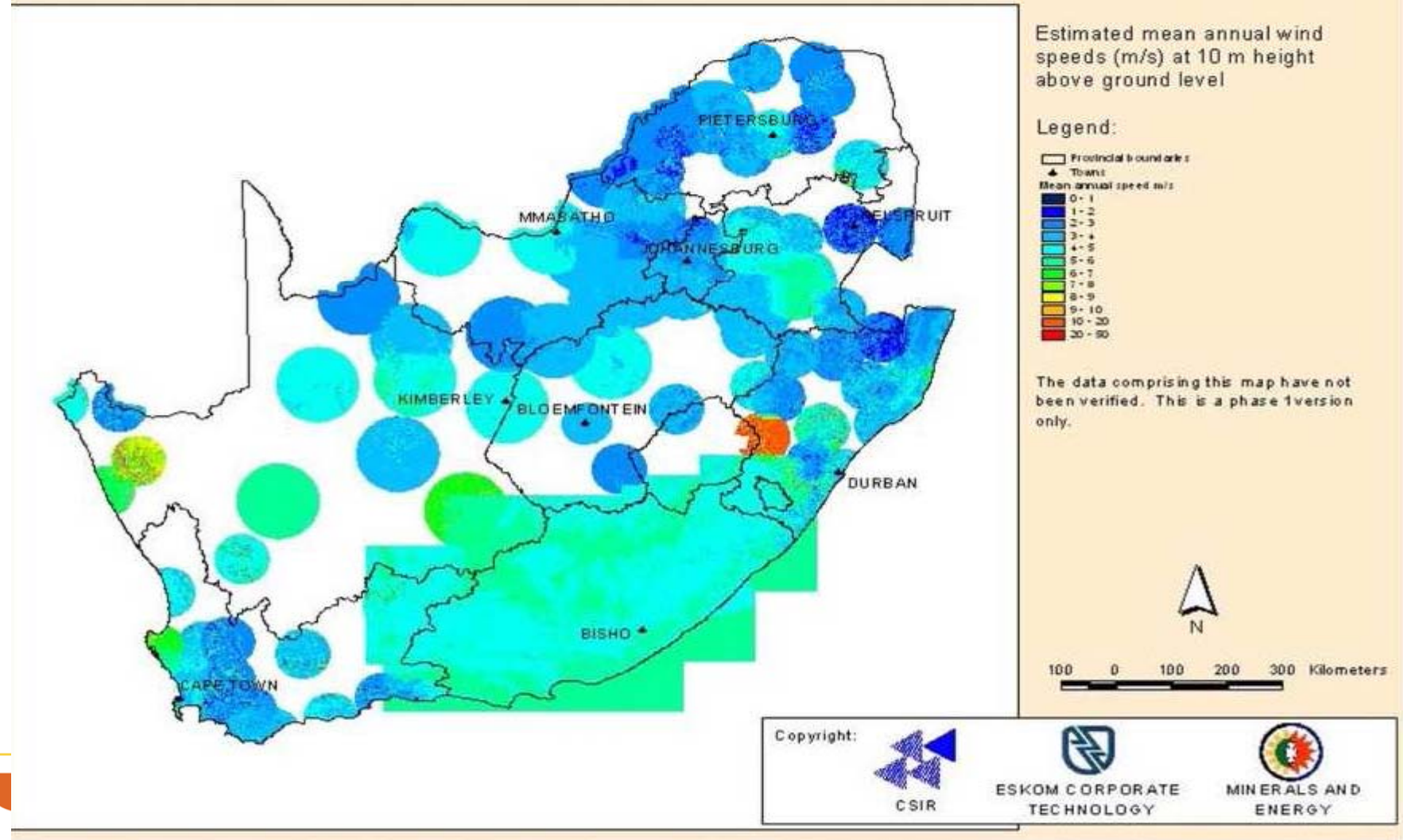


# Wind Resource, South Africa



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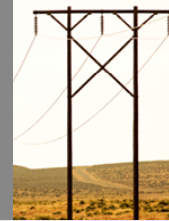
## South African Renewable Resource Database - Wind Resource



T1

T2

## SA's potential: Renewable biomass available



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### Residues:

Agricultural subtotal	12.3 Mt/a
Forest industry subtotal	5.0 Mt/a
Energy crops (10% of available land) <i>(Marrison and Larson, 1996)</i>	67 Mt/a
Invasive plant species	8.7 Mt
<b>Total, annual basis</b>	<b>93 Mt/a</b>

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Lynd et al. 2003. Plant Biomass Conversion to Fuels and Commodity Chemicals in South

Africa: A Third Chapter? South African Journal of Science **99: 499 – 507.**



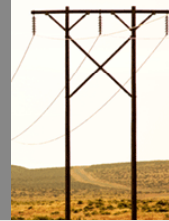
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**T1**      ThembakaziM, 17/07/2008

**T2**      ThembakaziM, 17/07/2008

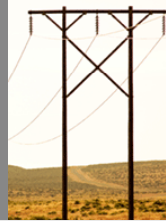
# Global Wave Resource



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# Strategic context



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## National Policy

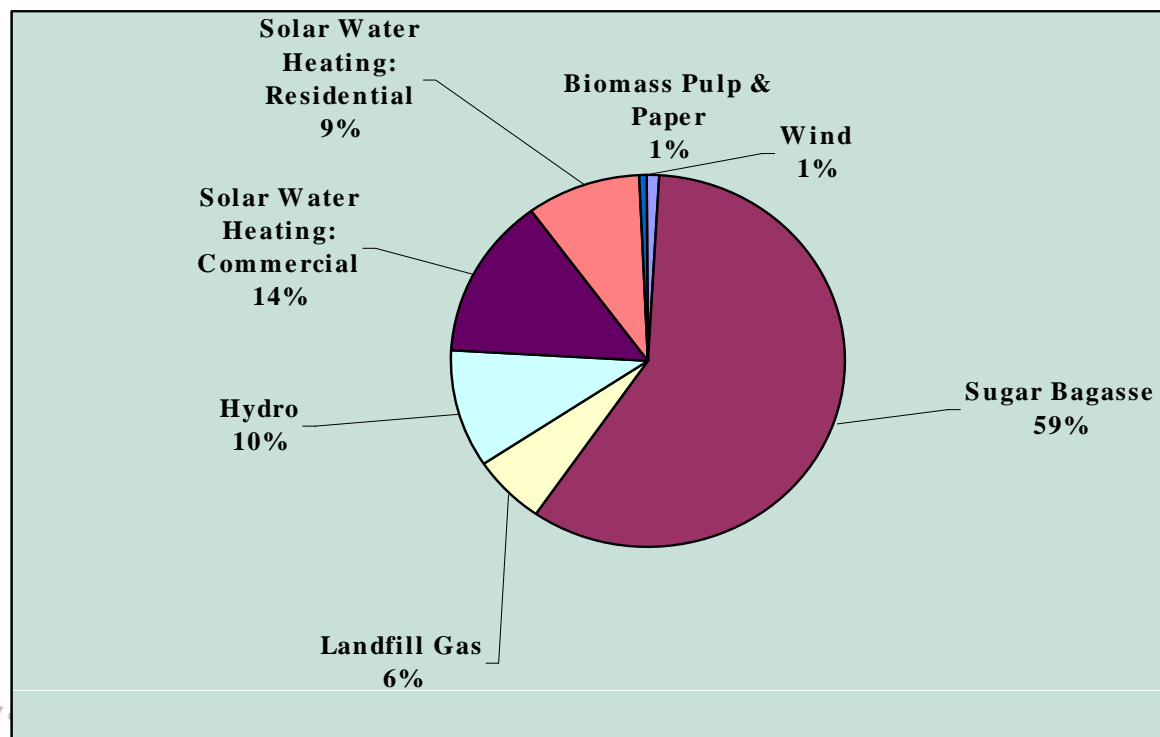
- National target – Renewable Energy Production of 10 000 GWh by 2013 (was confirmed to be economically viable with subsidies and carbon financing)
- Biofuels Industrial Strategy 2007 – 2% by 2012
- Energy Efficiency Strategy – Renewable sources should make 5% of total energy consumption by 2013

# Contribution to RE target

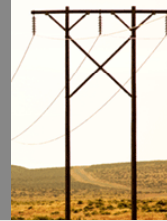


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## Macro-economic Analysis: 10 000 GWh least cost renewable energy contribution (excl biofuels, solar thermal power generation and wave)



# Renewable Energy Strategy

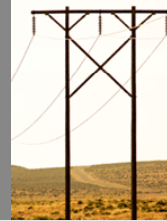


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Phase	Technologies
Phase 1. 1 <sup>st</sup> July 2004 – 30 <sup>th</sup> June 2007	Biogas Solar Water Heating Mini-hydro
Phase 2. 1 <sup>st</sup> July 2007 – 30 <sup>th</sup> June 2010	Small wind turbines PV Biogas Solar Water Heating
Phase 3. 1 <sup>st</sup> July 2010 – 30 <sup>th</sup> June 2013	Large Wind Turbines Concentrating Solar Power Wave Power Biofuels Mini-grids



# REFIT



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## Phase 1

Technology	R/KWh	c€/kWh	cEUR/kWh
Small hydro	0,94	7,4	6,5 to 8.5
Wind	1,25	9,8	8,2
Landfill Methane	0,9	7,0	9,5 to 14
CSP (Concentrated Solar Power)	2,1	16,5	

## Phase 2

CSP without storage, Biomass (solid), Biogas, PV systems (large ground or roof mounted), Concentrated PV and CSP central tower

***NO PPA!***

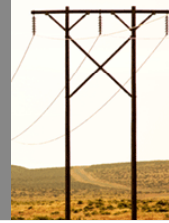
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**T3**      ThembakaziM, 17/07/2008

**T4**      ThembakaziM, 17/07/2008

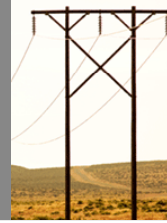
# Opportunities for wave energy development in SA



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- Abundant resource (30 – 50 kW/m)
- Energy security & strengthen weak coastal grid
- Strong research base dating back to the seventies
- Competent community of coastal engineers, naval architects and ship manufacturers

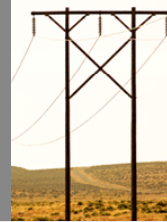
# Industry barriers



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- Immature, unproven technology
- Lack of collaboration between various role-players
- Low” cost of electricity in SA
- No financial incentives
- No clear guidelines for licensing and permit requirements
- Difficult to quantify environmental impacts

# Developments in southern Africa



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- Commercial
  - Pelamis (South Cape coast)
  - Finavera's Aquabouy (south west coast)
  - Oceanlinx (Namibia)
- Research
  - SWEC - a device at Stellenbosch University whose development was stopped because it was proved not to be competitive given our cheap coal power generation position.
  - Shore SWEC (modified SWEC) – possibility of prototype deployment at Grager Bay, Cape Town waterfront area
  - Small other converters
- South African Ocean Energy Network – promotion of sector
- OES ExCo – sharing knowledge, collaboration

Energy Research Institute - Energy





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# Thank You

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