

Industrial policy for recycling: The case of the renewable energy sector in South Africa

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TOWARDS A JUST TRANSITION - THE ROLE OF INDUSTRIAL POLICY

Introduction

- A low-carbon, just transition of the electricity sector is necessary for SA to meet its Paris Agreement commitments.
- By one estimate, this requires 70 GW of renewables by 2030, and almost 240 GW by 2050 (McCall et al., 2019).
- But this could have significant social and environmental impacts resulting from increased extraction, production and ultimate disposal of solar panels and wind turbines.
- The circular economy approach incorporates these considerations into a framework that is more sustainable.
- We investigated the applicability of this concept to renewables in South Africa, with a focus on recycling of solar PV and wind energy technologies.

The Circular Economy

An economic system that replaces the 'end-of-life' concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes. It operates at the micro, meso, and macro level, with the aim to accomplish sustainable development, thus simultaneously creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations.



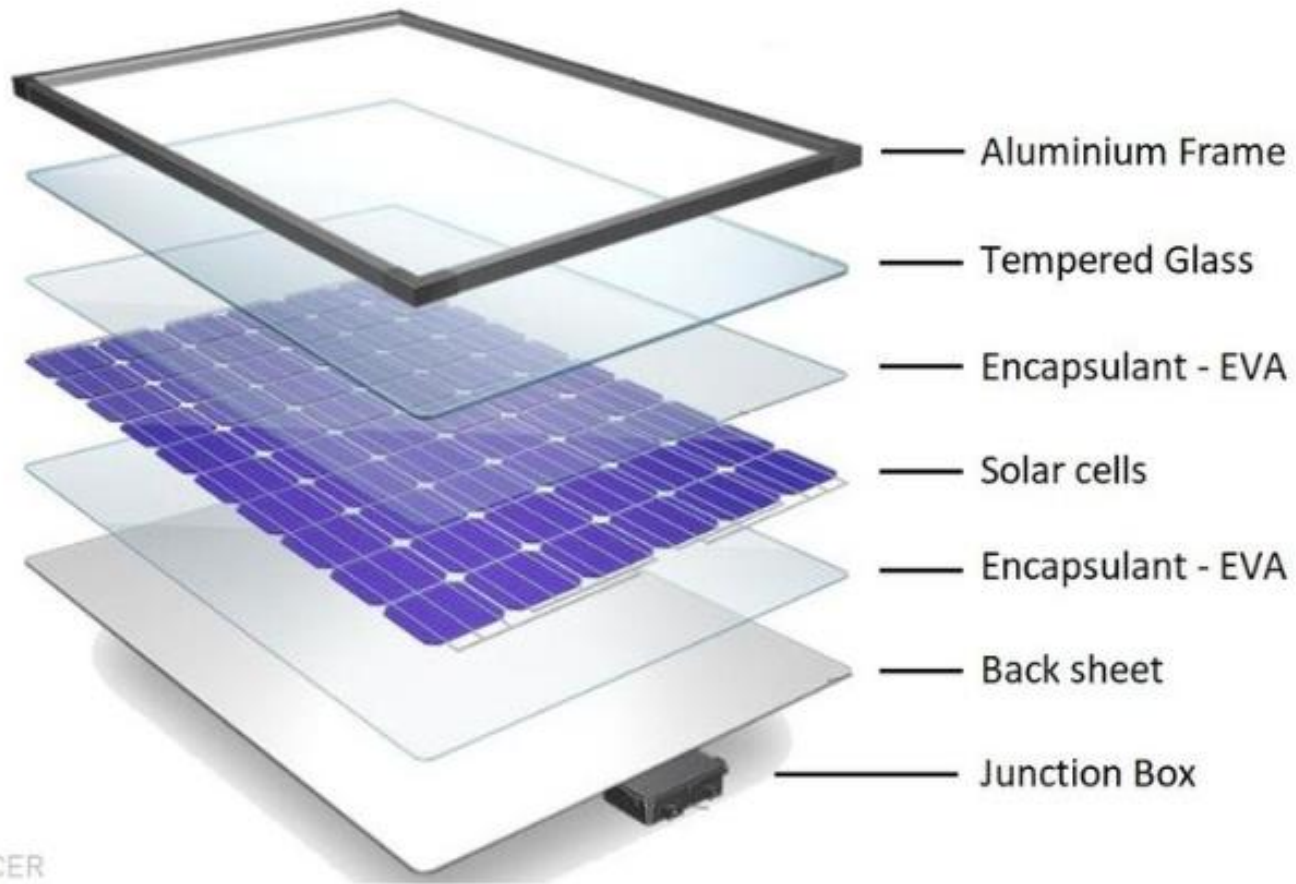
The Circular Economy: Benefits

| Environmental | Economic | Social |
|---|--|--|
| <ul style="list-style-type: none">· Reduced virgin material extraction and energy input· Virgin inputs are largely renewable from productive ecosystems· Reduced wastes and emissions, and therefore fewer environmental impacts from pollution· To the extent possible, wastes are nutrients that can be used by nature | <ul style="list-style-type: none">· Reduced raw material and energy costs· Protection against cost fluctuations of raw materials· The value in resources is used many times, not only once· The use of costly, scarce resources is minimised· Reduced costs that arise from environmental legislation, emissions control, taxes and insurance· Green market potential (attracts customers and investment)· Reduced waste management costs· New markets are found for the value in resources | <ul style="list-style-type: none">· New employment opportunities created through new uses of the same resources· Potential for increased cooperation and participation across the economy· Reduced injustices linked to extraction and waste pollution, e.g. the impacts of mining on livelihoods and on water, air and soil quality |

A Circular Economy Approach to Wind and Solar

- The renewables industry still needs rapid and substantial growth!
- However, this will have an environmental impact. Globally, by 2050,
 - the low-carbon transition in the electricity sector could increase total mineral requirements by between 200 - 900% (Watari et al., 2019); and
 - produce 60 - 78 million tonnes of solar PV waste alone (IRENA and IEA-PVPS, 2016, 34).

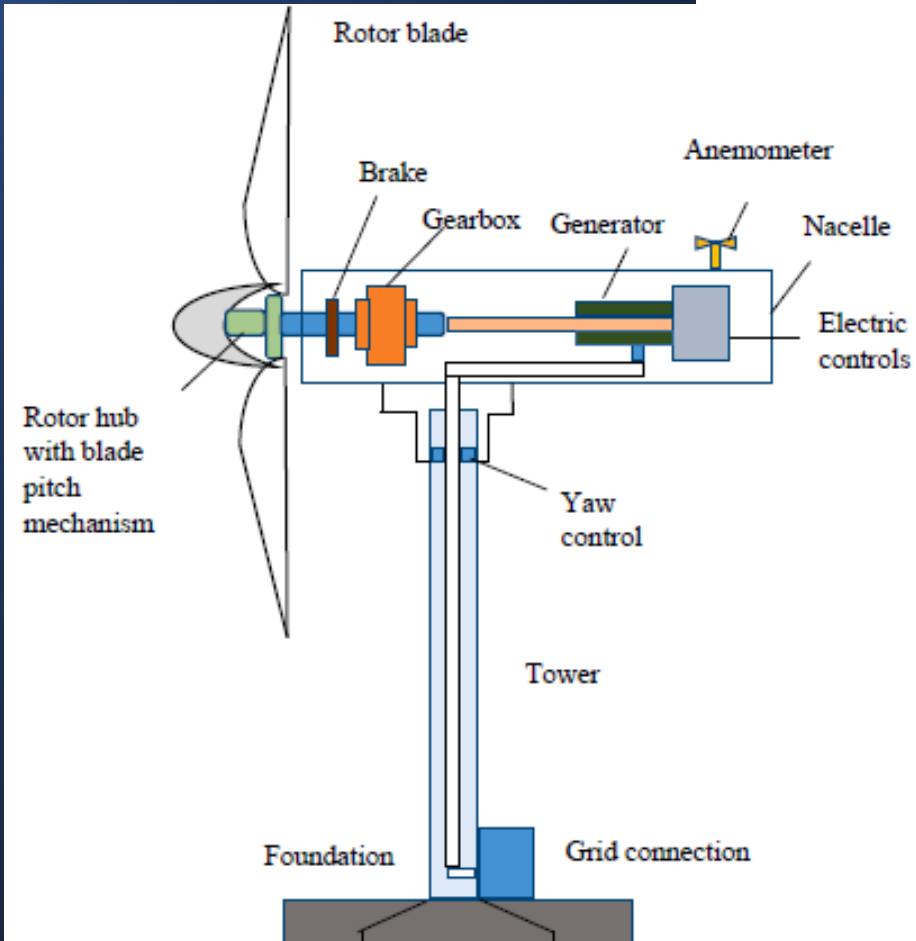
Solar



Recyclability:

- Glass and aluminium frame >80% of the weight and easy to recycle
- Delamination to access silicon, silver, lead, difficult but possible
- Inhibited by costs and lack of PV waste, but this is changing rapidly!

Wind



Recyclability:

- 80-90% of a wind turbine can be recycled
- Concrete, steel, and select metals easily separated and recycled
- Recycling of composite materials and magnets a challenge or unfeasible

Relationship between recycling and production



- Recycling only effective if it displaces virgin material use
- Cannot recycle on a national scale if no production exists to feed into

Source: ClimateChange.ie

Production in South Africa

- Limited component manufacturing in SA
- Wind
 - Three local tower producers established since 2013 (one shut-down)
 - Rotor blade plant closed down in 2012
- Solar
 - Two local module manufacturers (small market share)
 - >75% of mounting structures locally produced, but these are lowest value
- Majority of components still imported (especially higher value components)

Policy recommendations: Localisation

BARRIERS

Market uncertainty

Eskom's lack of RE capacity

Failed local content requirements

Lack of tech transfer

Inadequate industry protection



RECOMMENDATIONS

Improved local content requirements

RE unit at Eskom

Import tariffs

Incentives for local manufacturing and procurement

Financing mechanisms

Mechanisms for tech transfers and skills development

State-owned manufacturing capacity

Policy recommendations: Recycling



Structural changes



Value chain adjustments



Regulatory changes



Market regulation



Innovation of product design and processes

Conclusion

- Wind and solar PV energy systems can be recycled = potential for circularity in SA RE sector
- RE component recycling dependent on existing manufacturing capacity
- Strong industrial policy needed to develop SA's wind and solar manufacturing sectors and incorporate circularity considerations
- Result is ↑ industrial capacity, economic diversification, job creation, ↓ negative environmental impact

Thank you



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