CARBON FLEX DURBAN - FINDINGS

Accelerating grid decarbonisation with 24/7 Carbon Free Energy metrics

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ENERGYUNLOCKED

Quantenergy™

bulb / Foundation

About Carbon Flex Durban

24/7 Carbon-free Energy (CFE) means that every kilowatt-hour of electricity consumption is met with carbon-free electricity sources, every hour of every day, everywhere -- UN

Energy Unlocked, eThekwini, and KwaZulu-Natal with support from Bulb Foundation and Joe Slovo Foundation are building evidence of the value of 24/7 CFE for Durban. The evidence supports the design and implementation of a pilot to help answer the following questions:

- How can 24/7 CFE approaches support 20% Eskom independence for eThekwini municipality by 2025?
- What do we learn to inform national policy? Ie: carbon impact, need for data training / readiness, skills, financing mechanisms, changes to energy regulation?
- What other stakeholder roles are there to drive this? What are the calls to action for them?

Following a workshop with national, province, municipal and private sector participants in July 2022, research and modelling was undertaken to explore the above.

Durban – Project Summary

Problem:

- How to solve load shedding and decarbonisation goals at the same time?

The project:

- Assess the benefits of the 24/7 CFE approach and its potential in supporting the above to inform pilot design and implementation

What we did:

- Quantified the carbon impact benefit at hourly level of the deployment of key energy decarbonisation technologies for Durban
- Support design of a 24/7 CFE pilot to support achieving this impact
- Engaged with stakeholders to explore Durban's current and planned energy transition activities and to share findings from the analysis to inform 24/7 CFE pilot design

Outcome:

- Increase likelihood and pace of implementation of new electrification and flexibility solutions in Durban and South Africa to assist rapid grid decarbonisation

Assessment Method (Google tool modified for city level)

Inputs

Supply

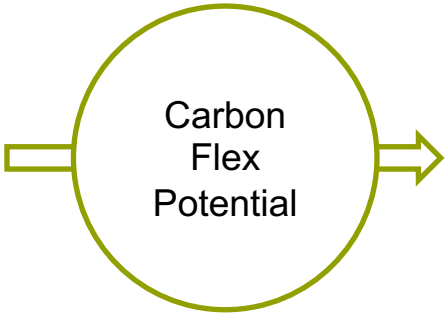
- Half hourly grid mix % 'carbon free' – IEA 2022
- Adding renewable energy generation to 2030 (SA IRP)
- Local generation 2022 - 2030 (Arup Durban report – wind, solar, biogas plant, other)

Demand

- Half hourly demand
- *Measures that could be taken across buildings and transport*

Sources:

- Public data, reports
- *Stakeholder data*



Outputs: 2 Assessments

City footprint reduction

- Adding renewable generation
- *Adding flexible / low carbon technologies*

Impact on grid decarbonisation

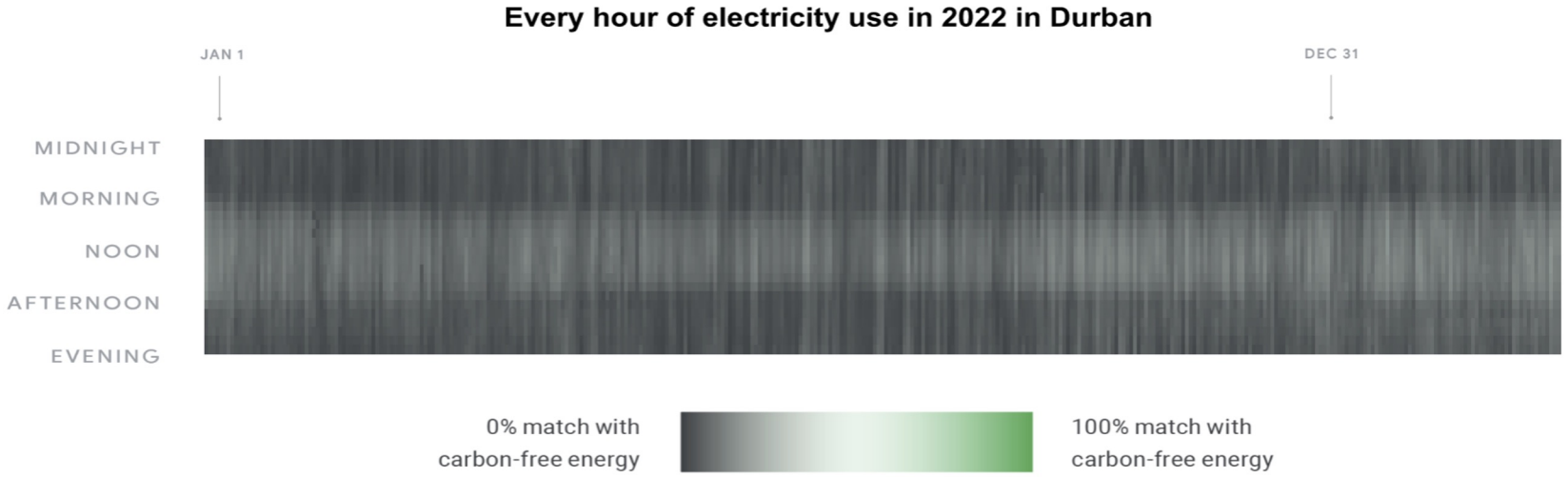
- Adding low carbon technologies
- *Adding flexible / low carbon technologies*

Key metrics:
CFE Score baseline 2022
2030 CFE Score (predicted)
tCO2e avoided

Orange highlighted text indicates potential improvements to the modelling

2022 Durban 24/7 CFE Score

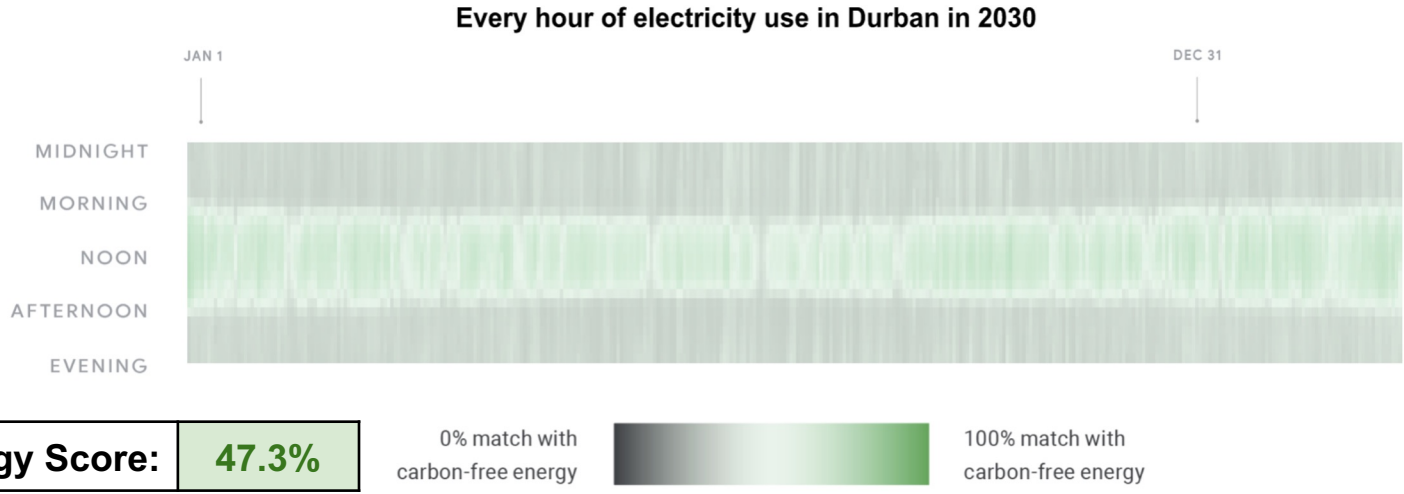
Insights:
- Largely coal-based grid provides little option for carbon free energy anytime
- Local renewable generation still very small proportion of total electricity consumed
- Hydro not currently included



24/7 Carbon Free Energy Score:	9.1%

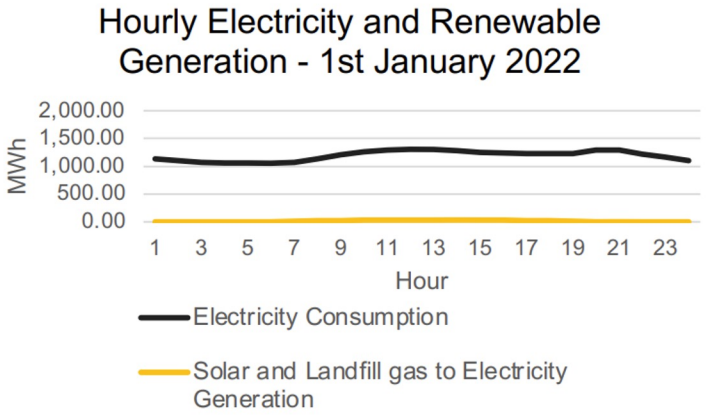
2030 Durban 24/7 CFE Score

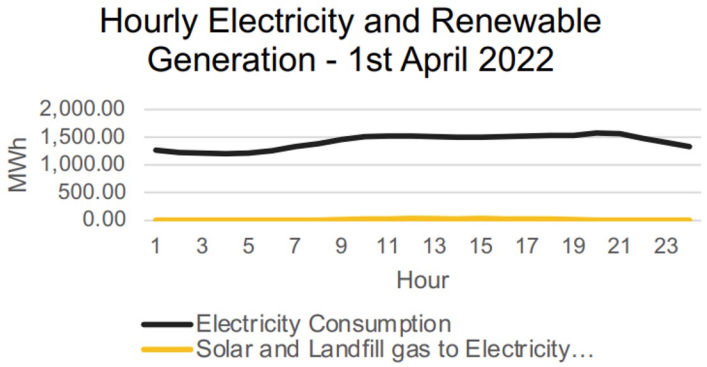
Insights:
- Still heavily reliant on coal-based grid,
- Potential for demand-side to shift to solar/wind may be maximised already because of load shedding though uptake of electrification + solar show the benefits of a portfolio approach
- This score may be optimistic because we didn't increase the electricity consumption – but historically very low demand growth is consistent with a low growth scenario to 2030
- 40% of this carbon free score is due to National grid decarbonization rather than Durban local generation

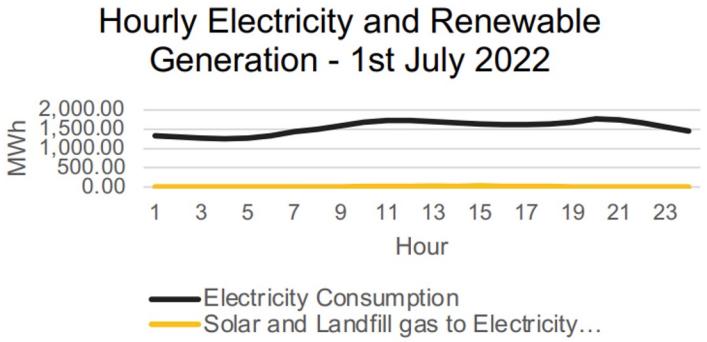


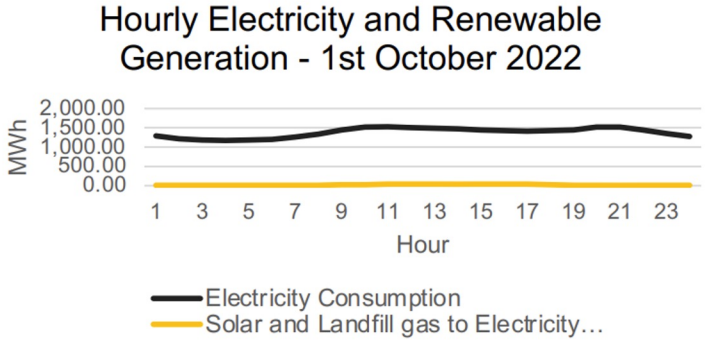
24/7 Carbon Free Energy Score:	47.3%

Daily view by season - 2022

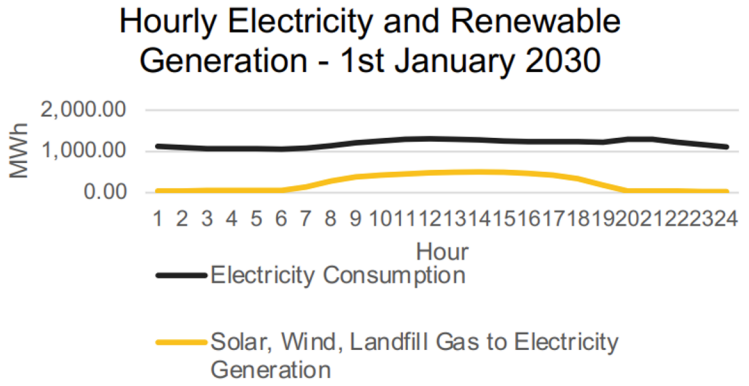


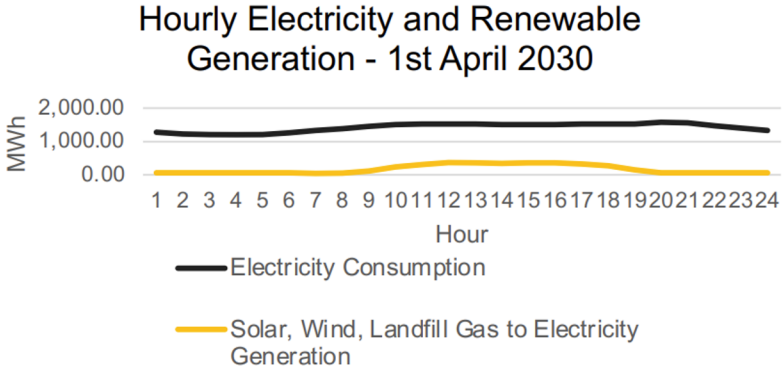


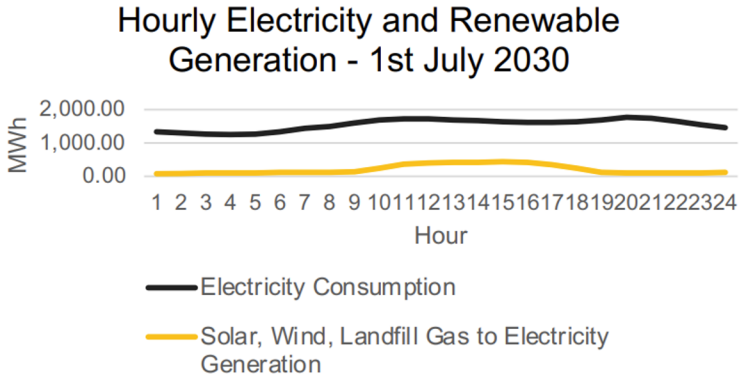


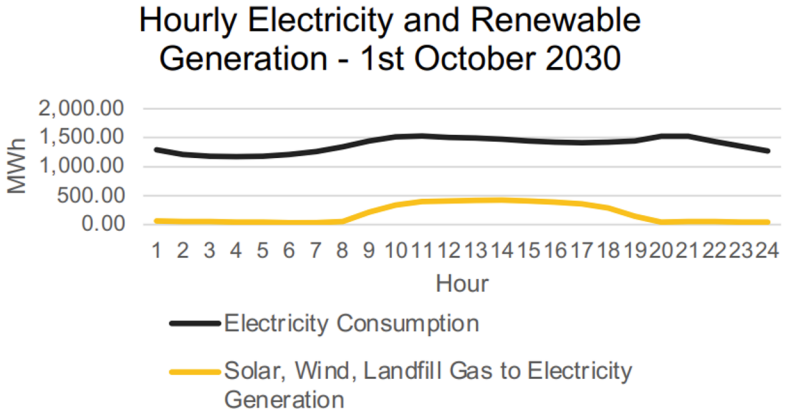


Daily view by season - 2030









Tonnes/ CO2 reduced 2022 – 2030

Year 2022
Annual avoided emissions from local renewable electricity is:

108,873 tCO2e

Year 2030
Annual avoided emissions from local renewable electricity is:

1,365,600 tCO2e

Discussion - Insights

What is the benefit of using 24/7 approach, measured as the volume of tCO2e avoided in Durban? Does it help with:
- Insights into how to support solar targets? Eskom independence targets?

Benefits from this approach (potentially):

(city)
- Measuring Eskom independence and carbon free are very aligned today
- However, most of the CFE benefits in 2030 are still due to Eskom grid decarbonisation
- Supports co-location of generation and demand for specific technology types
- Enables more granular planning of renewables – particularly the mix of supply side sources

(other stakeholders)
- 24/7 CFE metric could resonate with global private sector leadership
- (national) More accuracy in national decarbonisation policy based on transparency of impact in local areas
- Drives decision-making called ‘Emissionality’ ie: where to site more renewables to have the most impact
- Deciding how to best align flexibility potential with siting renewables in a portfolio approach can be supported by using the CFE metrics

Discussion – What Next?

Pilot project design to understand benefits to building or city such as:

- Improving city assessment – data strategies
- Developing financing and business models to support ‘solar + ‘ portfolios
- Attracting Foreign Direct Investment
- Attracting and contracting with Independent Power Producers

Pilot Value Stack

1 Accounting	2 Acting on Carbon	3 Attributing Value
Granular time and energy system or location-specific carbon intensity used in business case development and accounting. *Example:* *Feasibility study for the carbon flexing value of a new battery or building management system.*	Use carbon signals to trigger carbon operations of buildings and fleets and develop common evaluation protocols and standards. *Example:* *Google’s voluntary initiative to operate data centres to match to hourly carbon intensity and evaluate performance based on carbon.*	Local policies, programmes and procurement rules can incentivise the actions based on carbon. *Example:* *California’s Self Generation Incentive Programme that provides incentives for batteries responding to carbon signals.*