South Africa's electricity system: regime resistance, crisis, and strategy of incumbency

MB Ting (Blanche)
Science Policy Research Unit (SPRU)
University of Sussex
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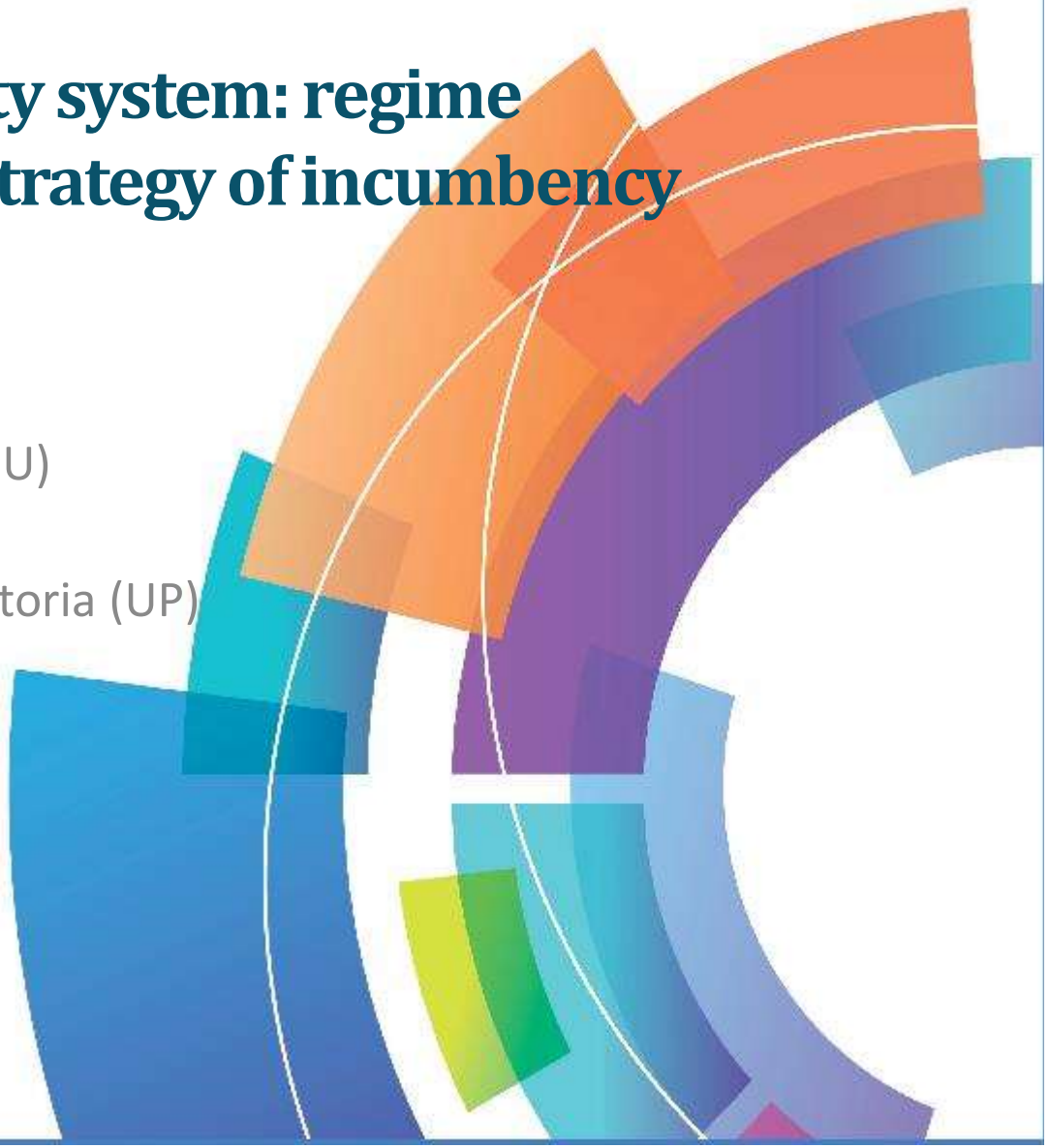

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Outline

- Introduction
- Innovation and discontinuity
- Socio-technical revolutions

- Socio-technical transitions
- Selection environment
- Regimes and lock in

- Empirical case study
- Way forward

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Innovation and discontinuity

- This study attempts to understand how innovation can take place in **path dependent systems** (e.g. innovation-new technologies).
- It is often the case that **in science and technology studies**, more emphasis is place on new and innovative technologies. However, considering the response by incumbents is equally as significant, and could potentially provide strategies that enable **accelerated change**.
- Studies of innovation have shown that the introduction of **technical change** is not random but **path dependent** and **interdependent** with other innovations clustered in systems, which are in turn interconnected in revolutions (Perez, 2009).

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Long term socio-technical change

- Technical change is often associated with **co-evolutionary changes** in products, services, whole industries, social, cultural (systems change). **Complexes of systems**, part of the socio-material fabric of our economies, institutions, cultural frameworks, social interactions and everyday practices.

- The Techno-economic Paradigm framework (TEP) (Perez, 1983), approximates that various waves of socio-technical systems last around **40-60 year cycles.** (alignments in the directionality of multiple socio-technical systems).

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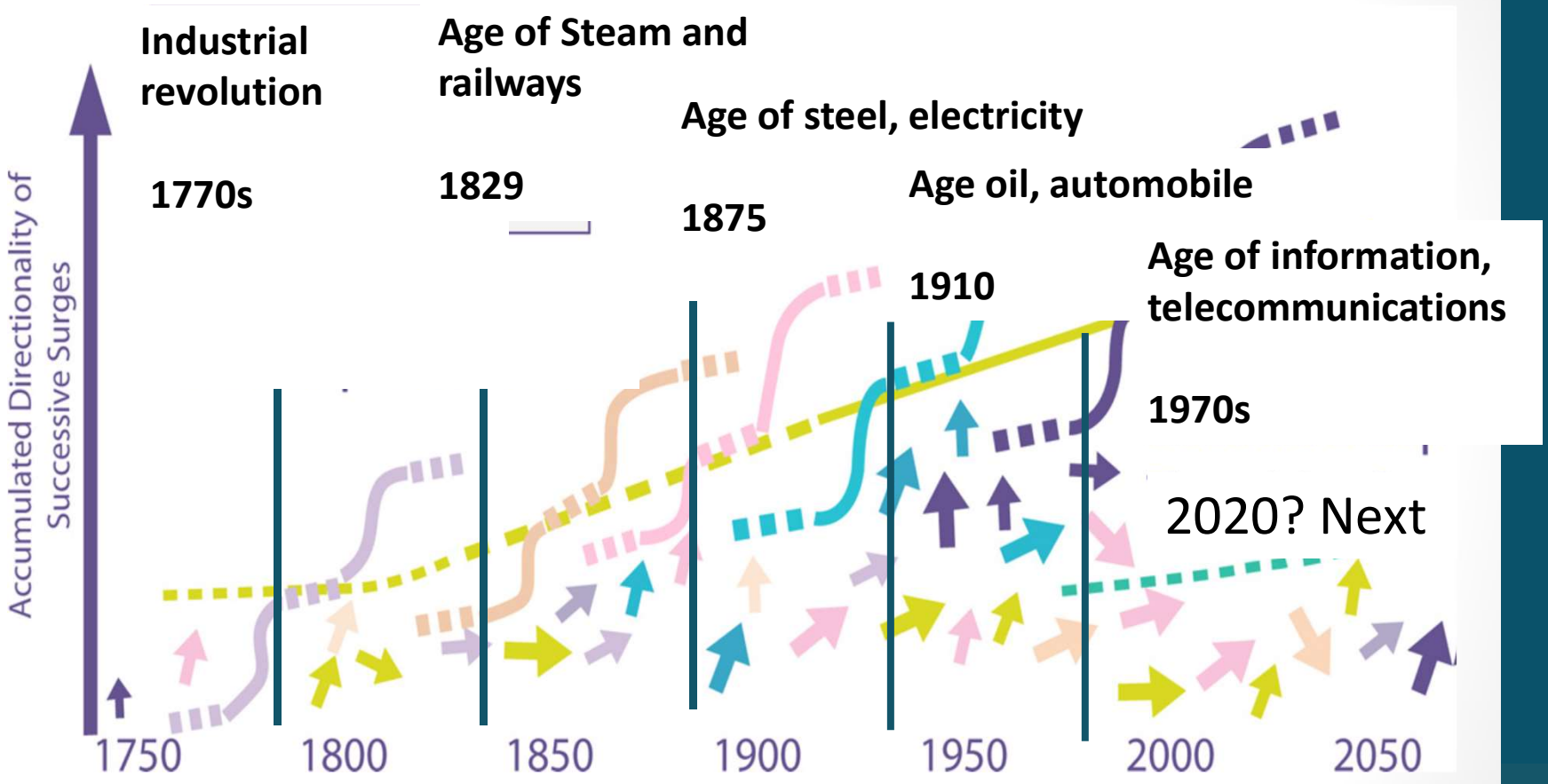
Socio-technical revolutions



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Schot and Kanger (2018), Perez (2002, 2009)

Socio-technical revolutions

- **Next?-** green-tech revolution (sustainability issues)
  - E.g. ICT and green tech (decentralisation, resource efficiency, smart grids, new forms of ownership).

- Main message-(macro trend)- we are in the midst of a revolution- e.g. socio-technical change-between old and new "rules"
- E.g **old rules-**reliance on fossil fuels, mass production, mass consumption, mechanisation, central energy production.
- **new rules-** small scale production, collective and shared consumption, decentralised energy production.
  - distributional consequences of the past-ecological and social costs (deepening social inequality)
  - New relationship between state, market and civil society
  - Social costs-increasingly becoming front and centre

Technological choices is not neutral

- socio-economic development has led to massive increases in wealth and welfare, including a decrease in absolute poverty, high GDP, an safety net etc
- increase in life expectancy, a decrease in infant mortality, access to high-quality food, clean water, cheap energy, mobility and communication services, sustained technological dynamism
- However, alongside these are environmental degradation, and widening inequality (technology and innovation can also contribute to inequality-access, benefits, and uneven distribution to risks).

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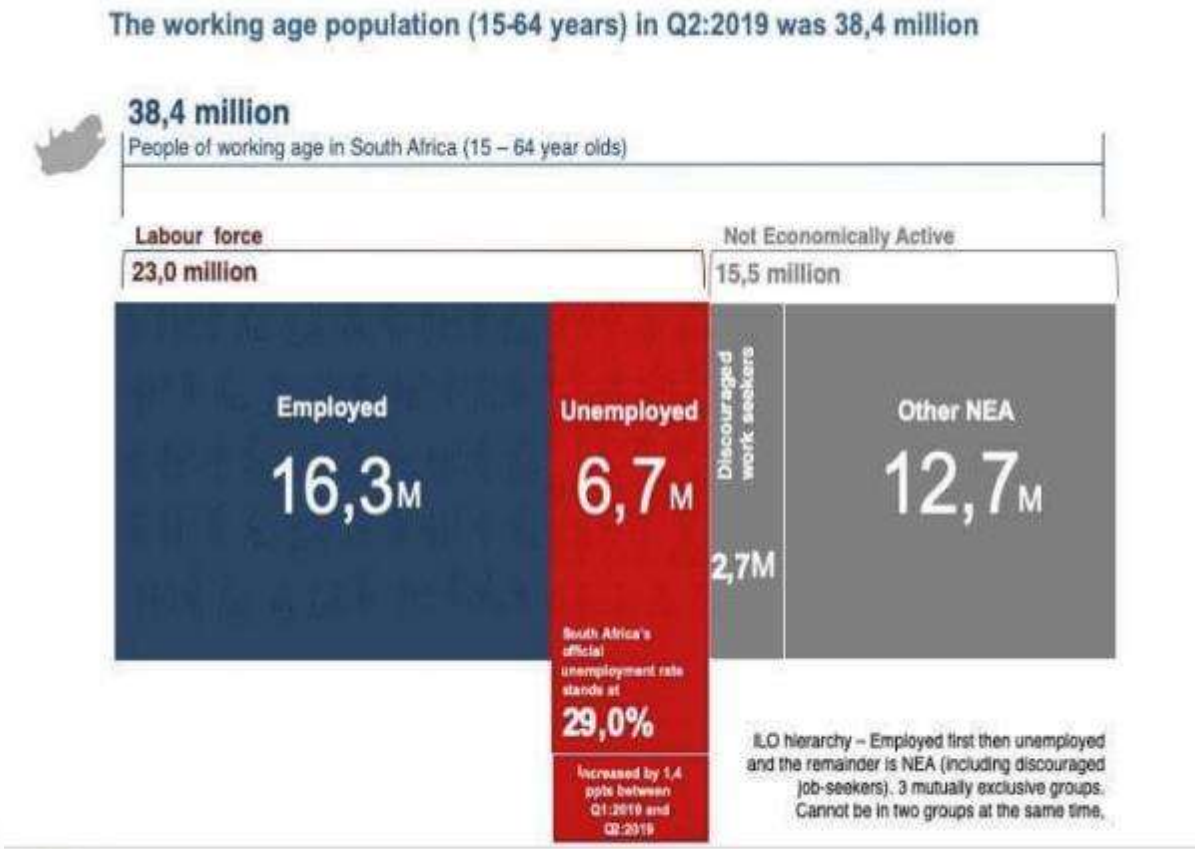
Technology and socio-economic context

Widening inequality is fuelling waves of civil unrest

More emphasis on justice, distribution (who benefits?), access (who participates?) value of consumer choices

Sustainable energy transformations-new order

- Age of populism, protectionism, and post-truth politics, the social-institutional environment is in unprecedented turbulence.
- citizens no longer trust that their interests are being represented by the established political elites. disenfranchised, frustrated with establishment
- Post truth politics- debate appeals to emotions-ideological impulses-rather than rational choices
- We cannot remove technological choices from the socio-economic context



South Africa

Unemployment rate 29%

High inequality

Job creation is key

Socio-technical transitions

- Technological choices are not neutral, nor autonomous, technologies are often **'selected' from the society** on which it is embedded.

- Technology uptake within society is a result of interactions between social groups that includes choices, perceptions, networks or strategies.

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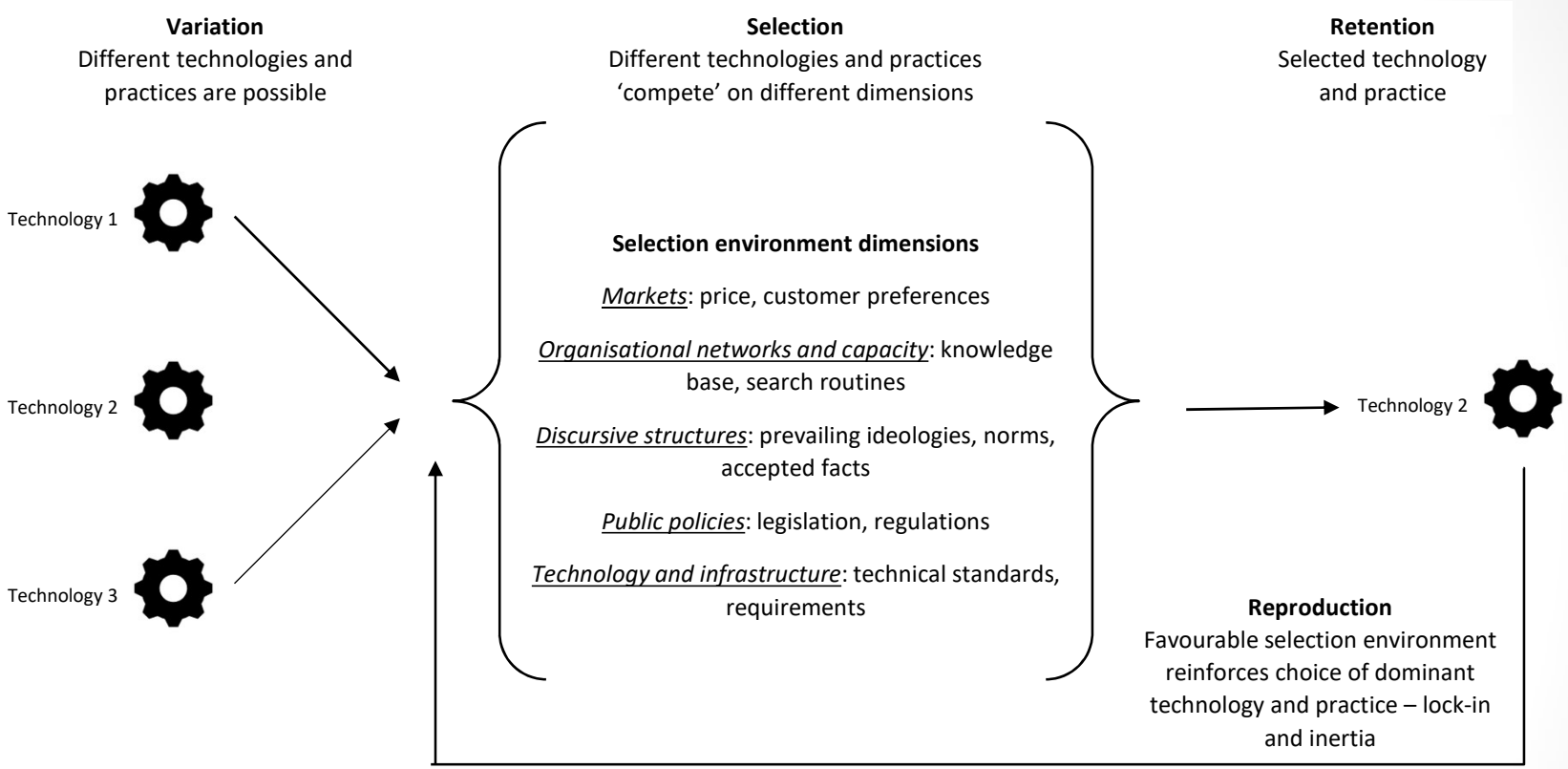


Technology is selected in a multi-dimensional environment-technology is not neutral, but is dependent on social fitness/legitimacy, financial and technical requirements (Ting and Byrne, 2020)

Regimes and lock in

- Regimes can be defined as shared semi-coherent (i.e. relatively stable and aligned) sets of rules or routines directing the behaviour of actors on how to produce, regulate and use technologies part of a specific sociotechnical system.

- Once technologies are adopted in society, there is a process of '**retention' and 'reproduction' – or 'lock-in**' – that occurs through establishing regulations (e.g. government subsidies), legally binding contracts, market parameters such as scale and sunk investments, as well as sociological structures that include cognitive routines, and power and politics, making changes away from the retained technologies difficult.

Lock-in	Examples
Technological	Dominant design, standard technological architectures and components, compatibility
Shared mindsets, cognitive frames	Routines, preferences, blinding actors to development outside their focus, cognitive schemas
Industry	Industry standards
Regulatory institutions	Government policy, legal frameworks, departments

Empirical case study

- Eskom crisis-load shedding. Selection environment example of its deep embedding in society

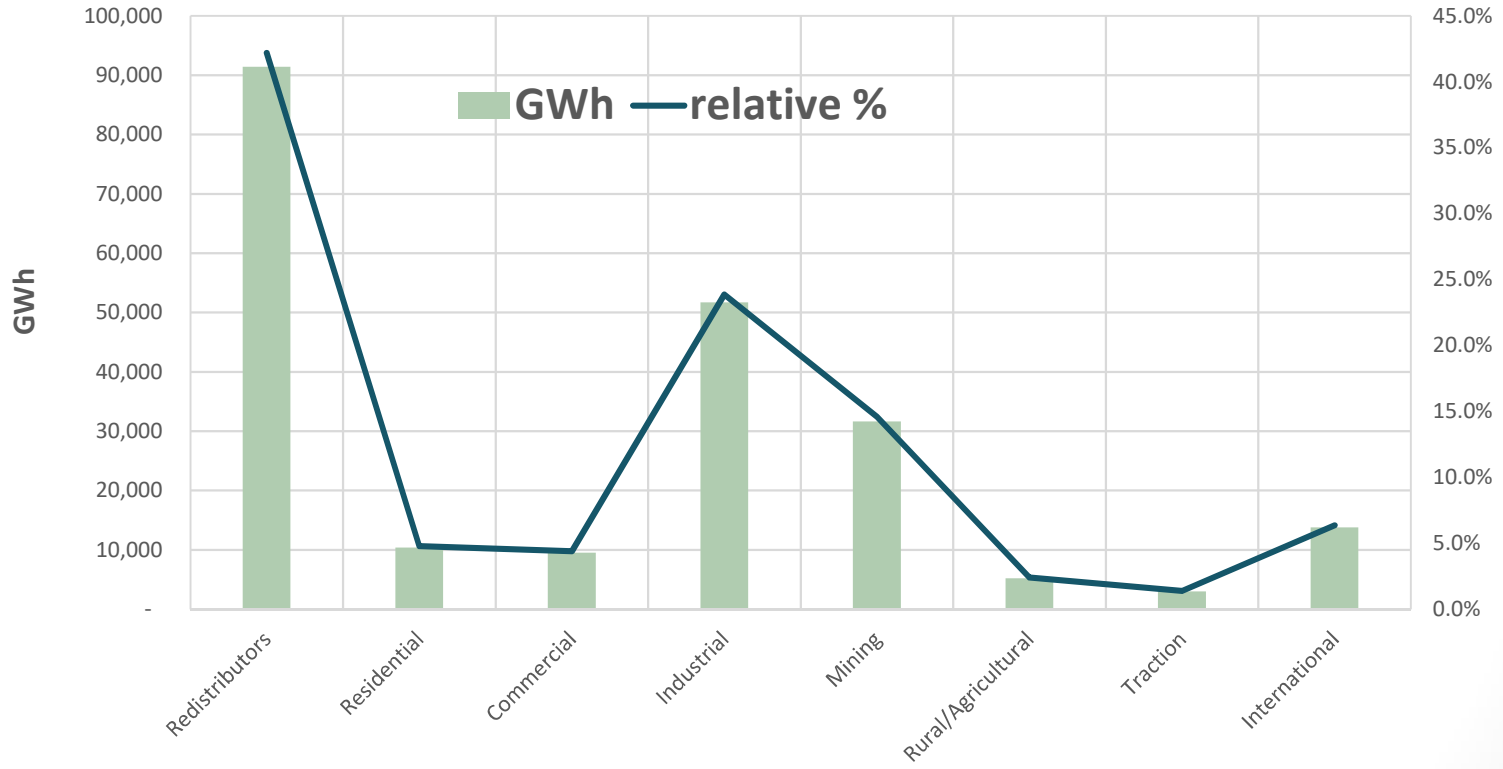
- Eskom established in 1923, as part of supporting the mineral energy complex (MEC).
- MEC is described as the relationship between mining, energy-intensive mineral processing, the coal-to-electricity sectors, and parts of the supportive transport and logistics infrastructure. The coal-fired electricity regime became a highly institutionalised.

- Country continues to rely on mining and the mineral sector, with mining contributing to around 7% of GDP, 15% FDI, 25% of exports and accounting for more than 1 million jobs

- Eskom has remained a **vertical monopoly responsible** for electricity generation (> 90%), transmission (95%) and distribution (> 50%) deriving most of its revenue from three primary customers: redistributors through municipalities, industry, and large mining companies.

- Together, these **three consumer-categories** account for approximately 80% of electricity consumption making them powerful sources of pressure to maintain the status quo

Electricity consumption (GWh) and relative %



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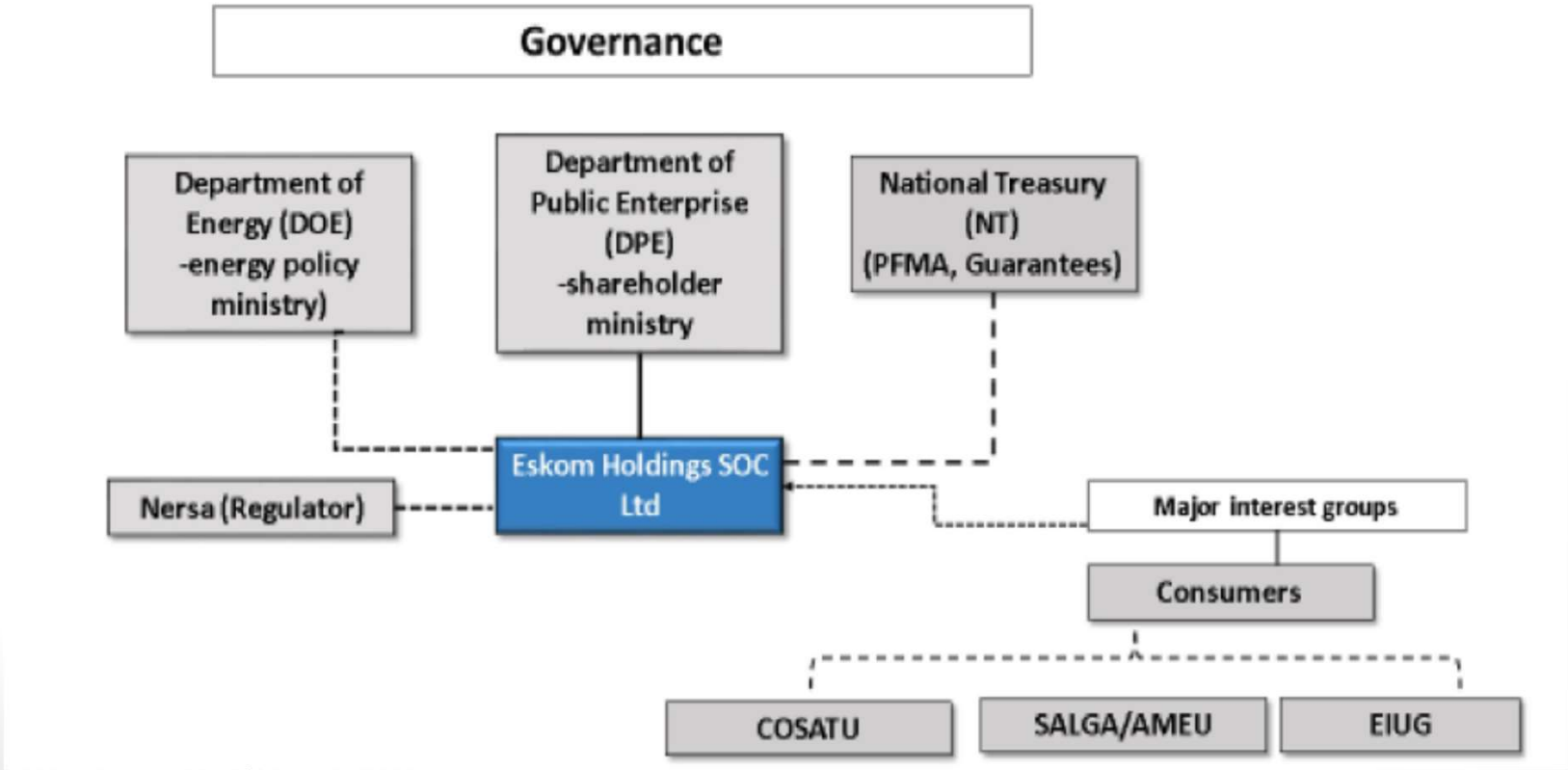
- South African government has a strong ideological stance

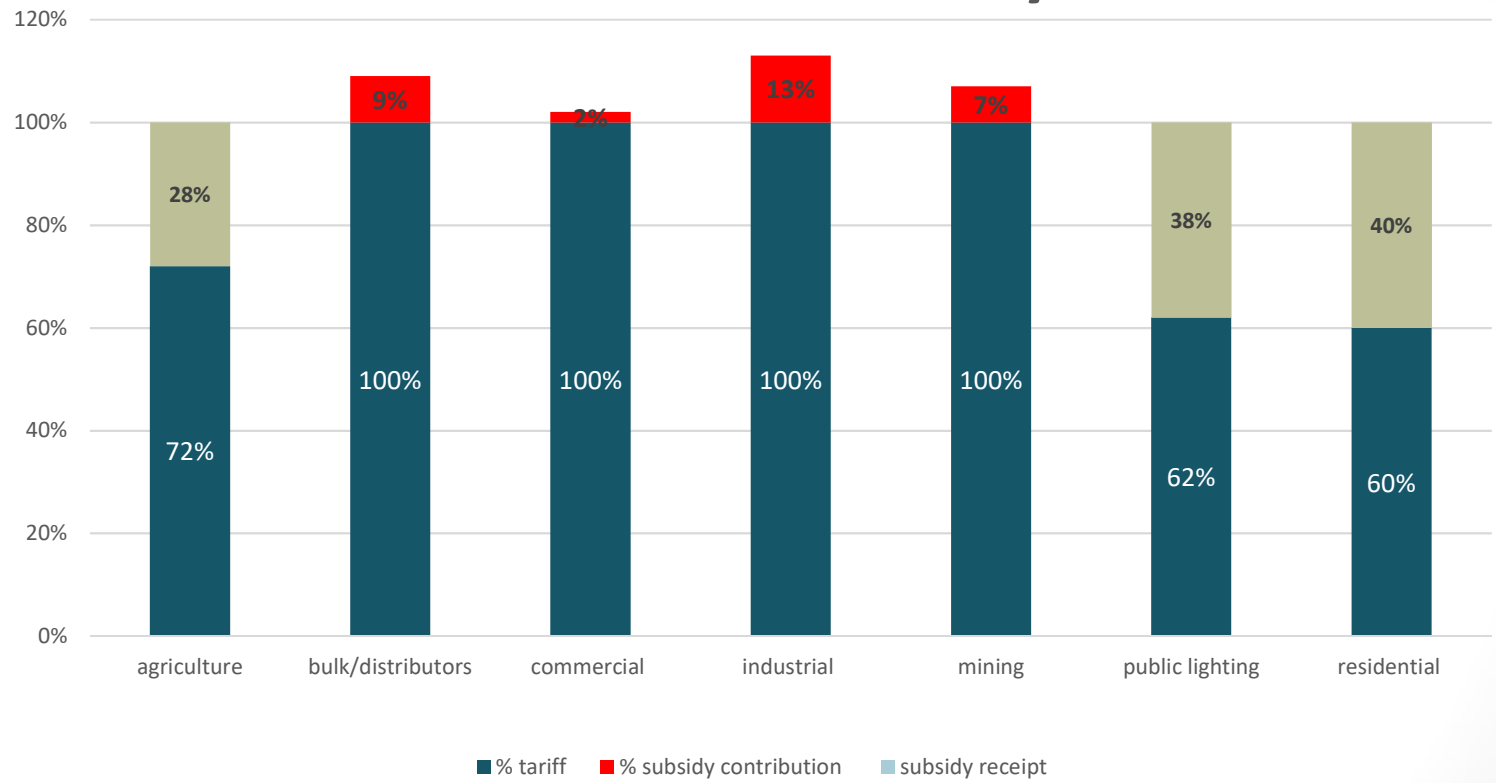
that the electricity system is an essential means of delivering on its socio-economic objectives.

- Eskom state owned utility- “quasi-government department”
  - Must provide affordable and accessible electricity (especially low income households)
  - Industrial policy (enable mining activities)

- Institutional environment-”multiple parents”-subject to intense lobbying, and precise accountability is unclear, and numerous directives



Tariff cross-subsidy



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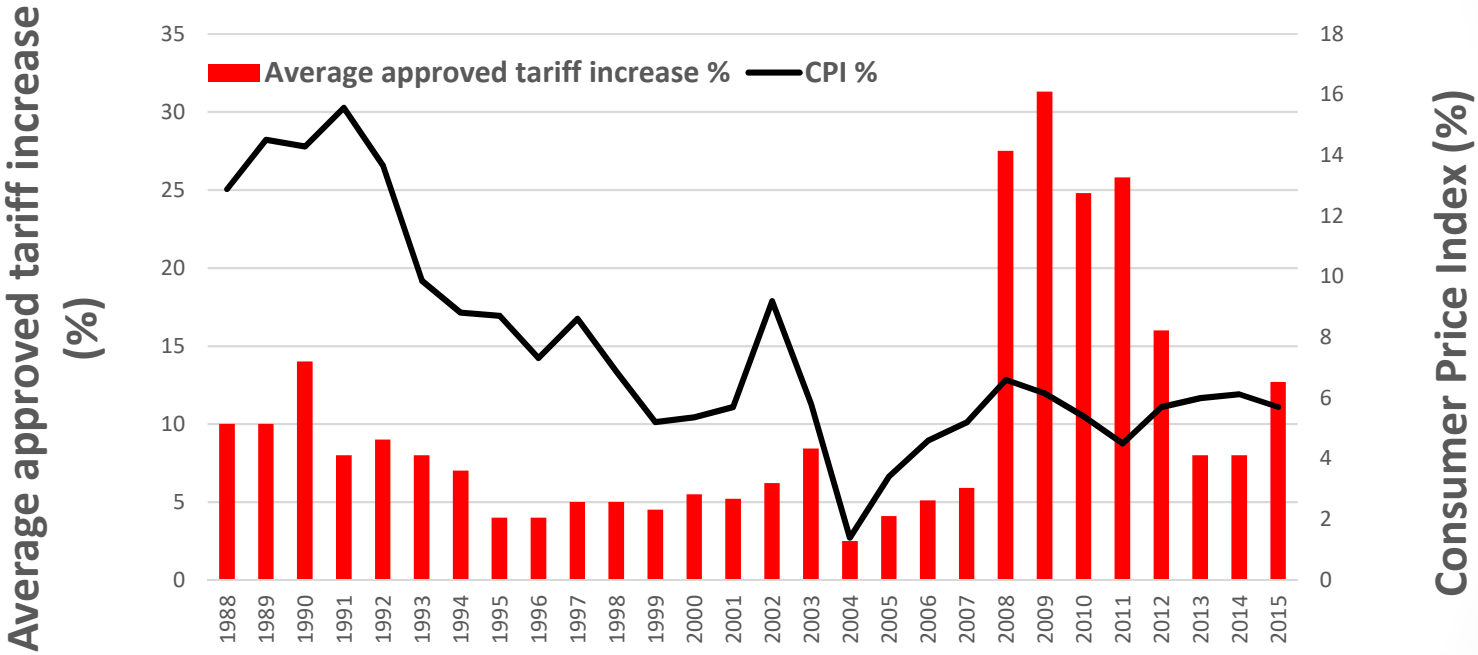
Per sector tariff subsidies-*Cost allocation based on MYPD3 2014/15 tariff decision*

Crisis-changes to the system



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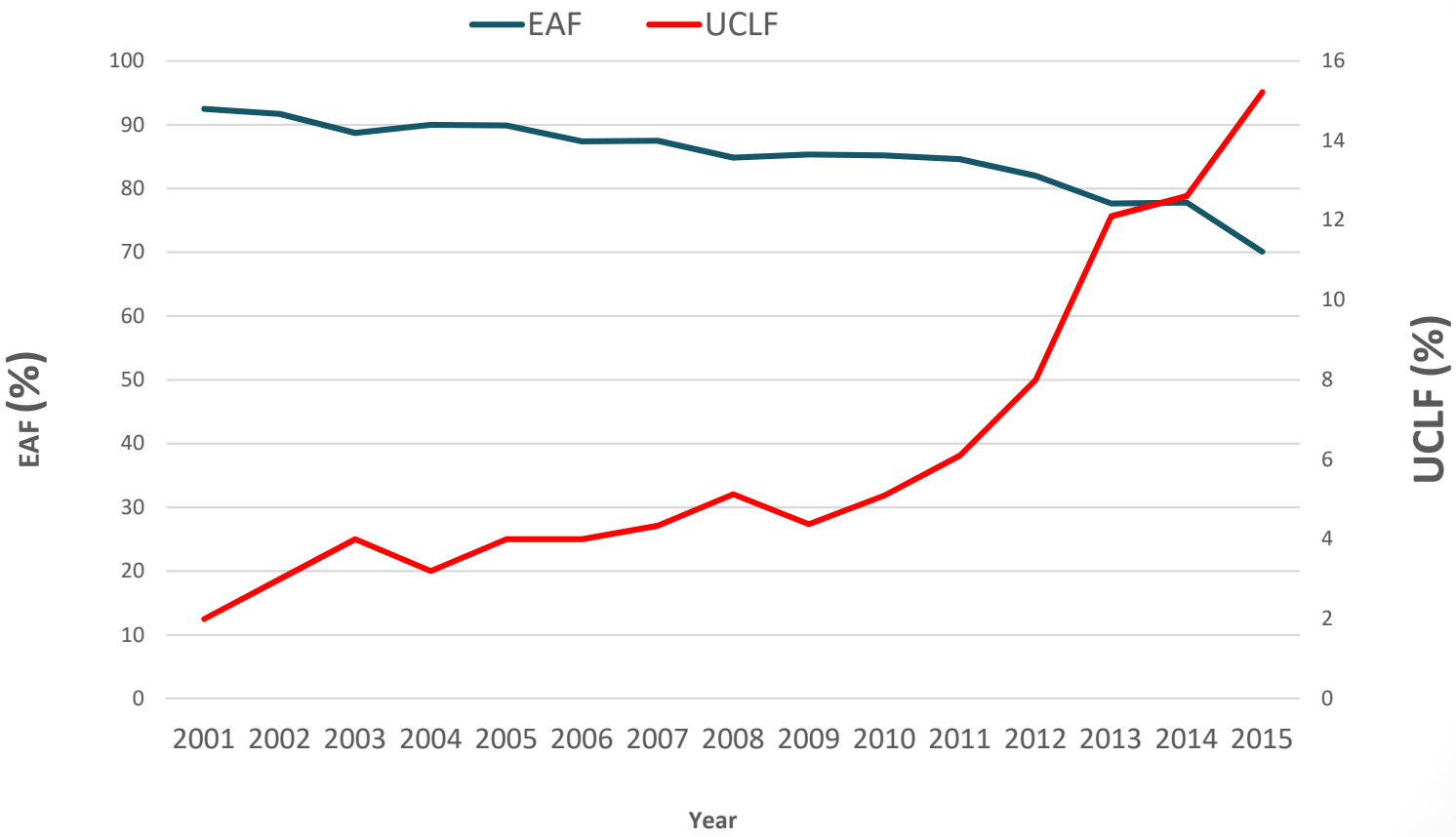

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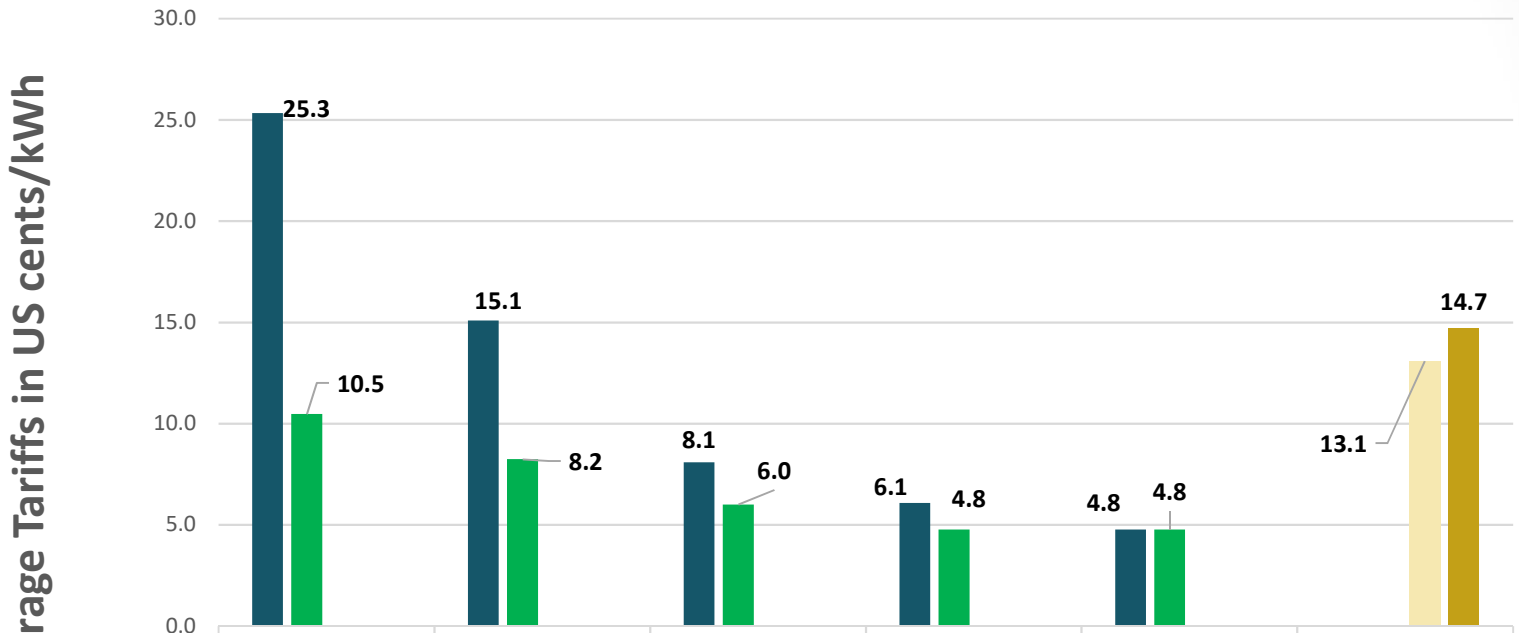
RE introduced



	Bid 1 (5 Nov 2012	Bid 2 (9 May 2013)	Bid 3 (4 Nov 2013)	Bid 4 (11 Dec 2014)	Bid 4.5 (2015)	
PV	25.3	15.1	8.1	6.1	4.8	
Wind	10.5	8.2	6.0	4.8	4.8	
Medupi						13.1
Kusile						14.7

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Evolving strategy of resistance

Resistance across multi dimensions in the selection environment

- **Market**-delay market reforms-Eskom, in 2015, used its monopoly status to block the signing of PPAs with RE I4P developers

- **Cognitive resistance-lock-in**' (as in cognitive rules guiding actor's behaviour) influences the discursive structure such that an incumbent typically **persuades decision makers to maintain the status quo.** Cognitive lock-in includes taken-for-granted beliefs, where an incumbent tends to search for **incremental solutions**, insensitive to new development outside their own focus.

- Delaying tactics and through **information asymmetry**, whereby others within the electricity system are prevented from scrutinising its data. **decreasing public transparency**

- There are claims that Eskom has become a **tool** for graft, in which procurement allocations are being redirected to benefit powerful elites. This demonstrates the significance of Eskom amongst its **organisational networks and prevailing discursive structures,** which may have reasons to maintain the state-owned utility's dominant position.

- **Organisation capacity and networks-** enlist powerful existing network-provoking opposition to renewables from the country's major trade unions

- **Public policies-** employ indecision and inaction

- exploiting both **information asymmetry** and the '**multiple parents' arrangement** of the governance institutions. Eskom can respond to decisions that do not suit its interests either **passively** or **more offensively** using powerful allies.

Voice of the Cape
@VOCfm

The Cape Town CBD is a sea of red this morning as hundreds of Cosatu members & supporters take to the streets to protest against job losses and the current Eskom crisis. Cosatu says it is against the privatization of Eskom. Demonstrators are marching to Parli.
📸Tauhierah Salie

12:06 · 19/02/2019 · Twitter for iPhone

@_cosatu

We call upon the President to consult widely with the trade union movement in the energy sector to find long lasting solutions to the crisis engulfing ESKOM, and avoid short-termism which may lead to more crisis says #NEHAWU #SONA2019 @ewnupdates @Fin24 @Eskom_SA @PresidencyZA

10:57 · 08/02/2019 · Twitter Web Client

Suggestions

- Market- clarity of monopoly model
- Organisational networks-(disruption in the old networks, inclusive participation of niche actors in policy debates)
- Discursive structures (interrogation, transparency is key, opening up debates with greater public scrutiny)
- Public policy (regulatory pressure, GHG).
- Technology and infrastructure (modular generation, flexible demand, and distributed energy networks).

Future?

Next revolution? Electricity trends

- Democratisation-diversity of actors (e.g. passive to engaged customers)
- Decentralisation (passive and deterministic to stochastic generation (e.g. distributed energy resources-small scale embedded generation)
- Digitalization- smart meters, automation, real-time data
- Very important- **consumer choices have value** (no longer passive consumers-e.g**. transactive energy**). Decisions at the level of the consumer

Conclusion

- Eskom load shedding requires understanding from a systems change perspective. Solutions cannot simply be narrowed into technological choices. There is a an energy systems challenge in the country.

- How are trade unions, labour issues associated with coal- addressed in a carbon conscious environment?
- What kinds of grid infrastructure do we need?
- How are we dealing with the next big challenge-municipalities?

- Social values becomes important-particularly in a setting where there is high inequality (access, affordability).

- Social costs can no longer be ignored-nor disassociated from technological choices

End

Thank you

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