THE POTENTIAL IMPACT OF EFFICIENCY MEASURES AND DISTRIBUTED GENERATION ON MUNICIPAL ELECTRICITY REVENUE

AMEU Convention

15 October 2012

SEA

eed
Church Development Service
An Association of the Protestant Churches in Germany

LEADING THE ELECTRICITY DISTRIBUTION INDUSTRY
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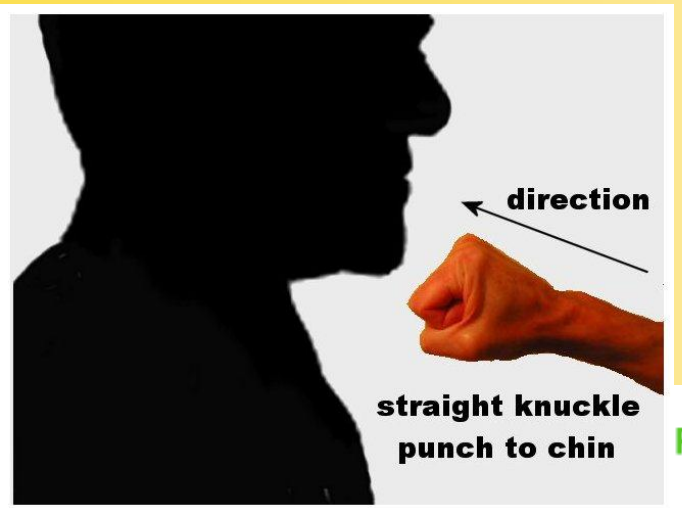
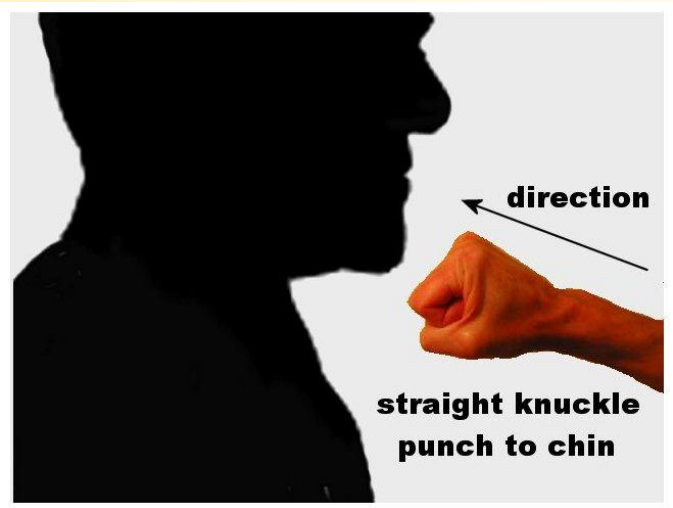
Introduction of SEA

- NGO, Non Profit Company
- Engineers, environmental scientists
- City partnerships and support around sustainable energy strategies and implementation for the last 12 years

Double Whammies and Death Spirals

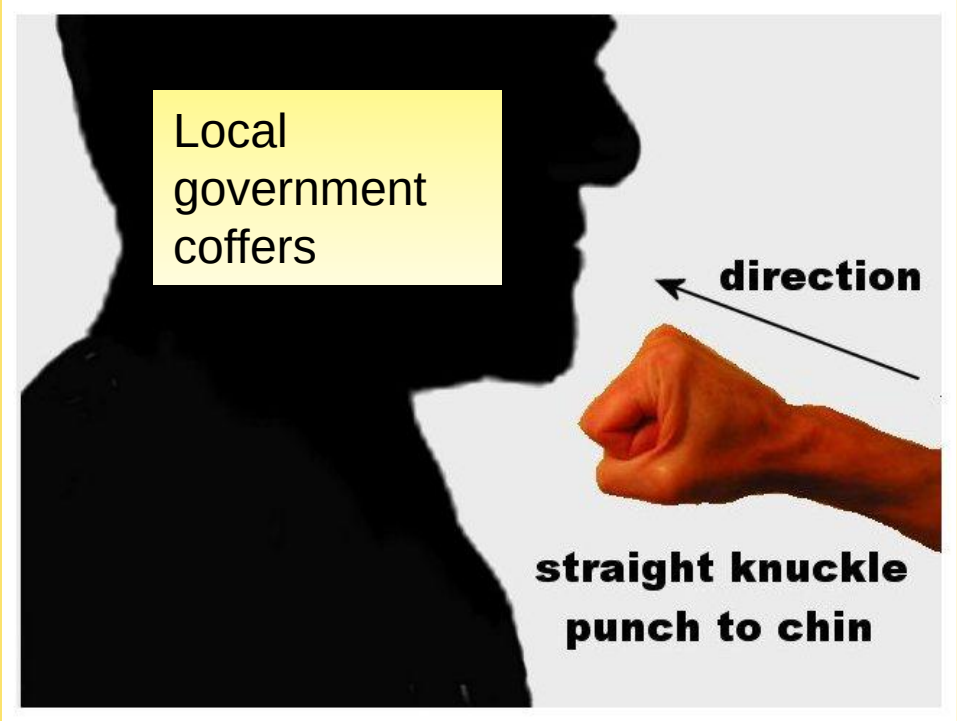




RAL

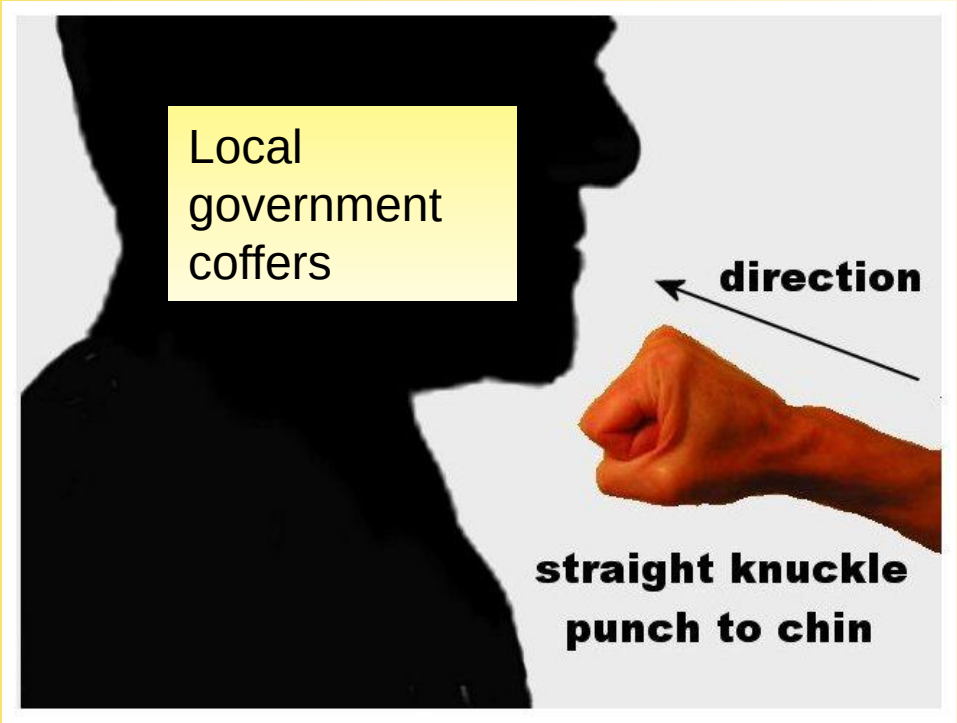
First Whammy:

What happens when its cheaper for high end users to generate their own electricity and implement efficiency measures?



Second Whammy:

What happens when at the same time there is increased demand for electricity from the poor?



Death Spiral:

When cross subsidising reaches levels where the high end users jump ship, and the business model becomes unsustainable

Issue overview

Essentially a focus on sustainable city finances

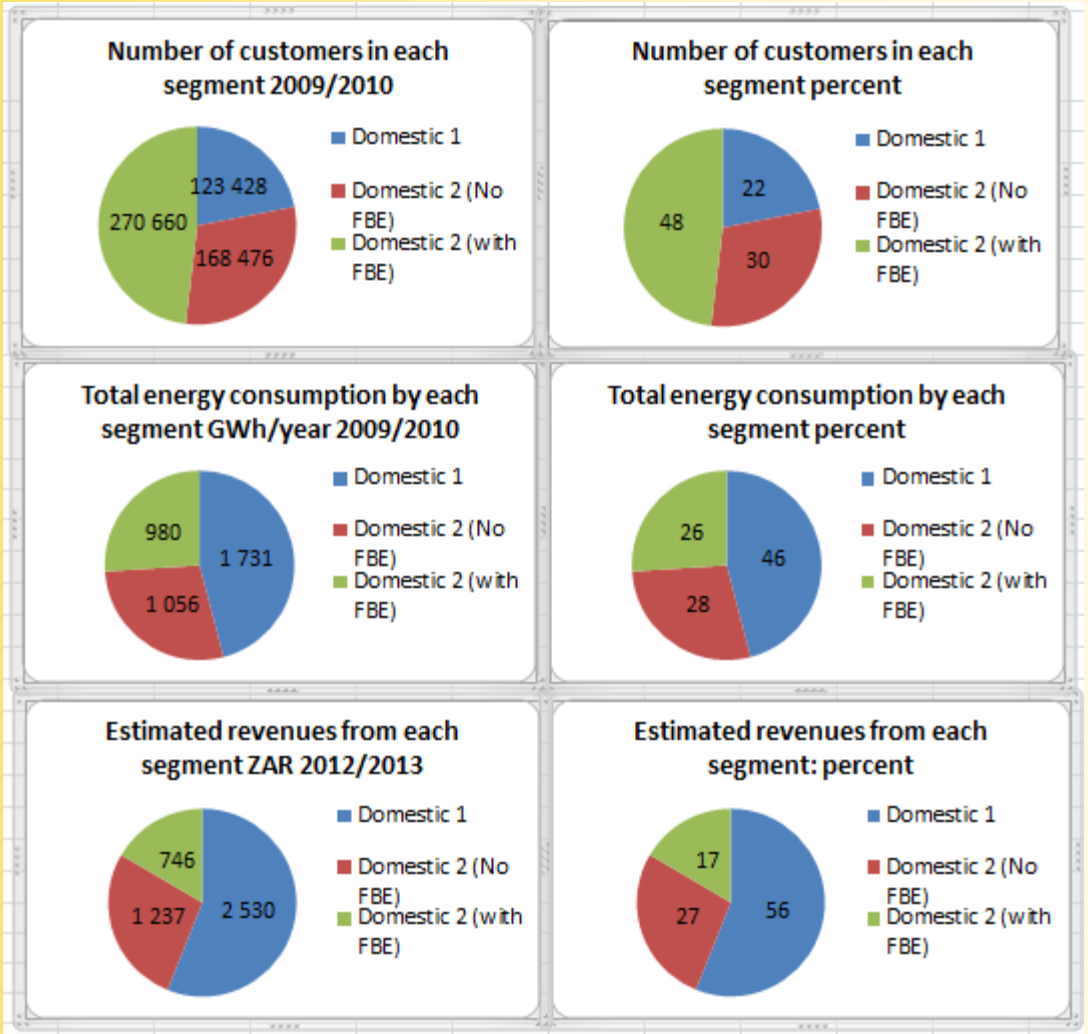
- City heavily dependent on electricity income to make books balance
- Typically 10% of electricity revenue fed into City coffers

Issue overview

– However, steep electricity price increases are making technologies like rooftop photo voltaics and solar water heaters financially attractive to high end users

Issue overview

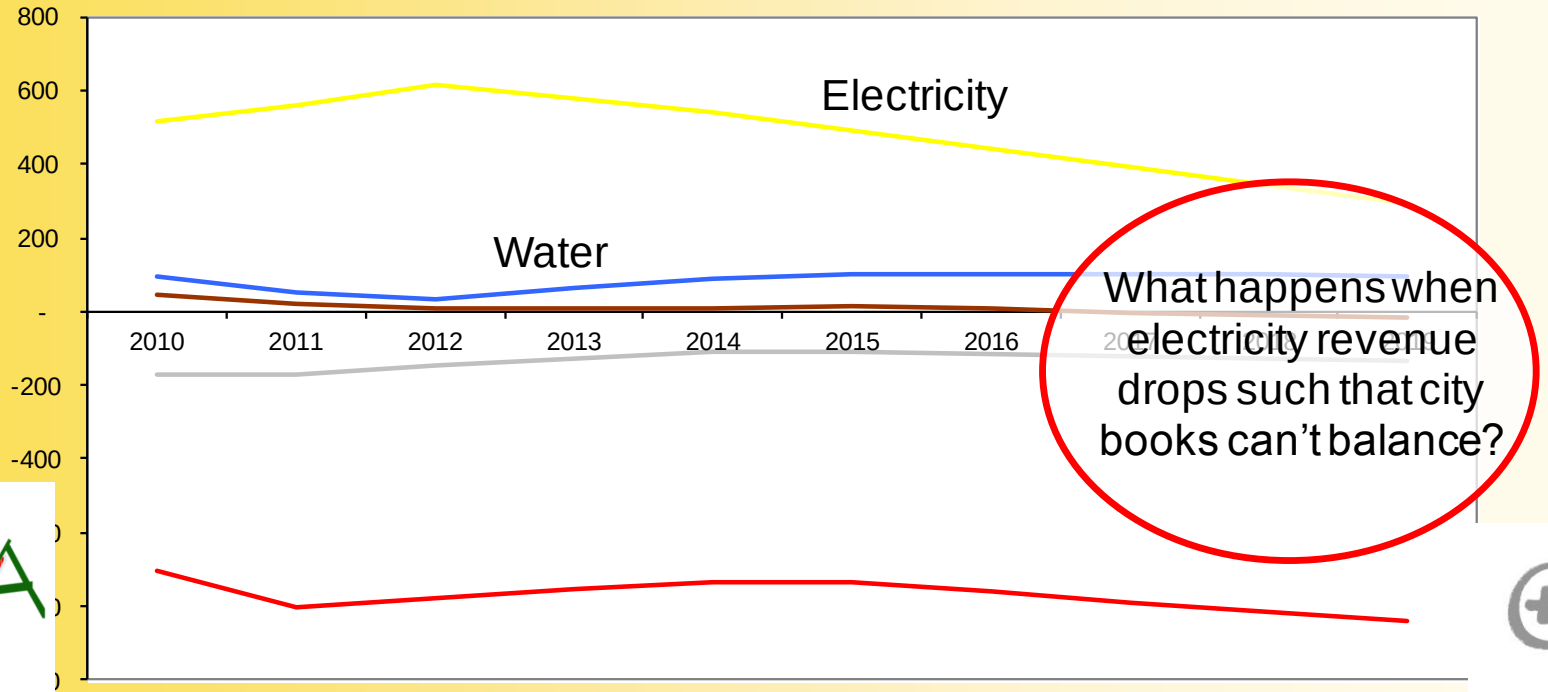
– City dependence on IBT 4 clients



Issue overview

Municipalities depend on these high end users for income. What will the impact of them becoming more efficient and installing pv be on local government in the next 10 years?

Annual financial surplus/shortfall per service



Need identification

- To develop a tool to accurately calculate potential revenue loss from RE and EE implementation by municipal electricity end users

Tool design

Necessary to include

- varying time of day and seasonal bulk purchase tariffs in calculations
- realistic data for PV and SWH benefits over 24 hr period and over summer and winter
- realistic technology uptake data

Note – also models residential lighting and cooking efficiency, industry, local government and commercial efficiency

Tool development

- Method
  - 6 Largest intake points for Cape Town (over 50% of annual electricity supply) ½ hourly load data over a full year. Just completed eThekwini too
  - Megaflex tariff
  - Focus on residential sector RE and EE interventions
  - Projections on real life data – SWH and PV market analysis, examples of commercial buildings, streetlights, industry

Interventions modelled

Solar PV (residential)		
No system	100,000	over 10 yrs
kWp/system	2	kWp
Commercial buildings		
No buildings	1,000	over 10 yrs
Av demand/bldg	550	kW
Savings per bldg (pk)	50	kW
Residential water heating*		
No. SWHs	350,000	over 10 yrs
Demand / cyl	3	kW
Residential LED downlighters		
No lights	300,000	over 10 yrs
Savings per light	40	Watts
Residential eff showerhead, geyser blanket		
No installations	300,000	over 10 yrs
Savings per install	3%	
Industrial load reduction		
No customers	1,000	over 10 yrs
Av demand/cust (pk)	600	kW
Savings per cust.	5%	kW

* - residential eff water heaters equipped with timers to avoid peak load periods (i.e. megaflex peak)

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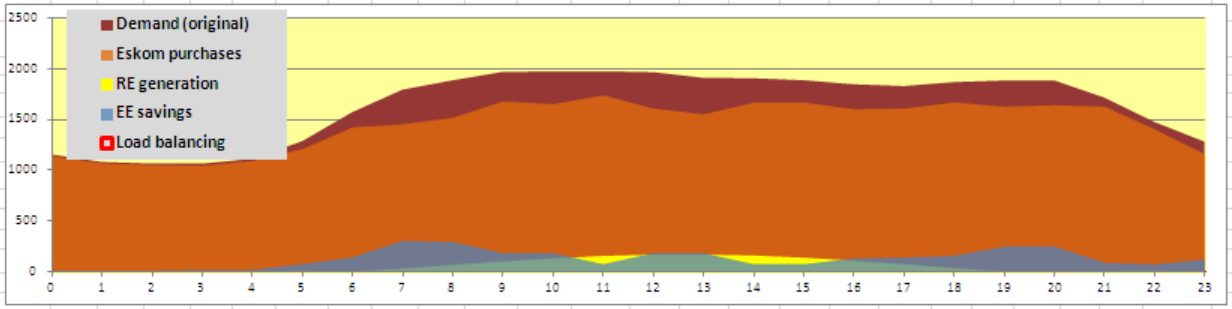
City load profile analysis (Cape Town) 24Aug2012 (10yr projection) - Microsoft Excel

City electricity load profile (MW) and revenue impact analysis

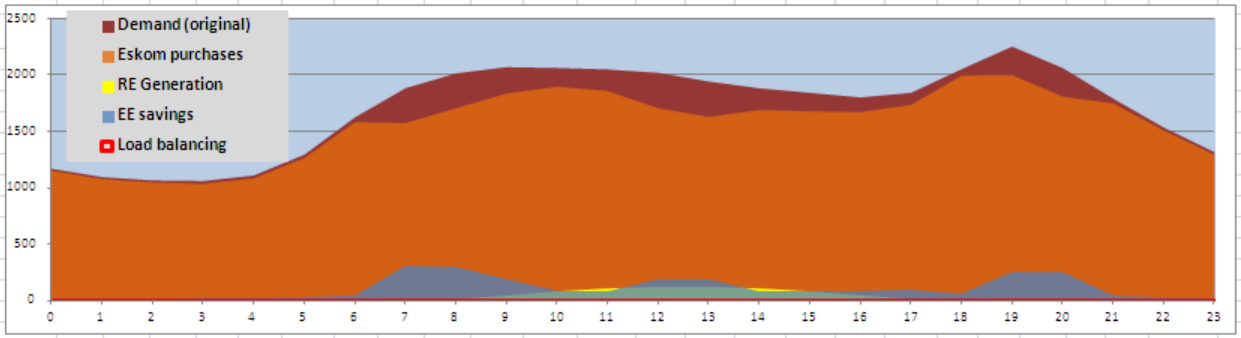
10 yr projection

Summer:



Megaflex preiods: off pk | off pk | off pk | off pk | off pk | off pk | std | peak | peak | peak | std | std | std | std | std | std | std | peak | peak | std | std | off pk | off pk

Winter:



Revenue Impact

	daily (wkday)	daily (wkend)	monthly	Annual
Savings (loss) from interventions - low demand (summer):	-R 11,164,686	-R 14,479,592	-R 371,084,131	-R 4,453,009,571
Savings (loss) from interventions - low demand (winter):	-R 5,310,567	-R 8,645,208	-R 193,208,828	-R 2,318,505,937
Savings (loss) from interventions - hi demand (winter)*:	-R 377,297	-R 8,851,099	-R 91,977,228	-R 1,103,726,737
Savings (loss) from interventions - average over year:				-R 7,875,242,246
City elec revenue:				R 42,918,090,761
Impact on revenue:				-18.3%

hr	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Nett MW purchas frm Eskom	1144	1071	1054	1046	1094	1210	1422	1453	1518	1677	1651	1737	1608	1552	1665	1667	1601	1607	1669	1626	1639	1626	1402	1160
Nett MW purchas frm Eskom	1150	1076	1046	1034	1083	1262	1580	1573	1704	1834	1895	1857	1705	1627	1689	1676	1669	1733	###	1997	1807	##	1506	1292
Original Demand MW (sum)	1162	1088	1071	1071	1119	1293	1579	1800	1891	1975	1979	1980	1972	1917	1912	1893	1853	1835	1874	1890	1892	1722	1481	1288
Original Demand MW (wint)	1167	1093	1063	1059	1108	1292	1623	1881	2013	2068	2061	2048	2017	1940	1880	1840	1800	1840	###	###	2060	##	1533	1315
RE generation	0	0	0	0	0	0.0	9.4	39.0	74.8	108.4	138.3	161.6	174.7	174.9	165.6	144.4	115.6	80.5	42.4	10.5	0	0	0	0
Yes/No	0	0	0	0	0	0.0	0.0	0.0	10.6	44.7	81.9	110.0	123.4	124.0	110.0	82.8	46.6	11.6	0.0	0.0	0	0	0	0
1	0	0	0	0	0	0.0	9.4	39.0	74.8	108.4	138.3	161.6	174.7	174.9	165.6	144.4	115.6	80.5	42.4	10.5	0	0	0	0
1	0	0	0	0	0	0.0	0.0	0.0	10.6	44.7	81.9	110.0	123.4	124.0	110.0	82.8	46.6	11.6	0.0	0.0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Input parameters

Solar PV		
No sys	100,000	
kWp/sys	2	kW
PV c/kWh lost	423.7	c/kWh
PV daily charge	0	R/day
Landfill gas		
Installed MW	5	MW
Av Generation cos	80	c/kWh
Streetlights		
No lights	300,000	
Savings per light	40	watts
Traffic lights		
No lights on	100,000	
Av demand/light	75	watts
Savings per light	60	watts
Commercial buildings		
No buildings	1,000	
Av demand/bldg	550	kW
Savings per bldg	50	kW
Residential water heating		
No SWHs	350,000	
Demand / cyl	3	kW
Residential cooking to gas		
No hhs to gas	100,000	
kW avoided per hh	2	kW
Residential LED downlighters		
No lights	300,000	
Savings per light	40	watts
Residential showrhd, geyser blk		
No installations	300,000	
Savings per install	3%	
Industrial load reduction		
No customers	1,000	
Av demand/cust (p	600	kW
Savings per custo	5%	kW
Load balancing		
Daily energy gen	750	MWh
Daily energy use	965	MWh

Sheet tabs: ...mm weekend | Load profiles | RE generation | EE interventions | Load Balancing | Data | Datal

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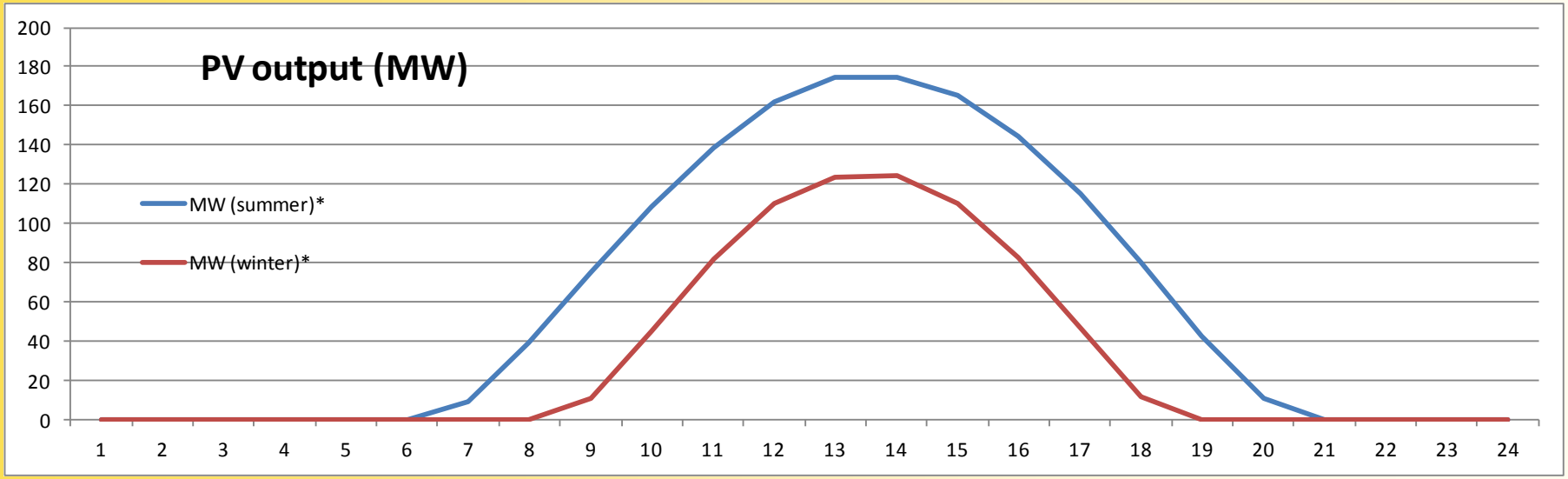
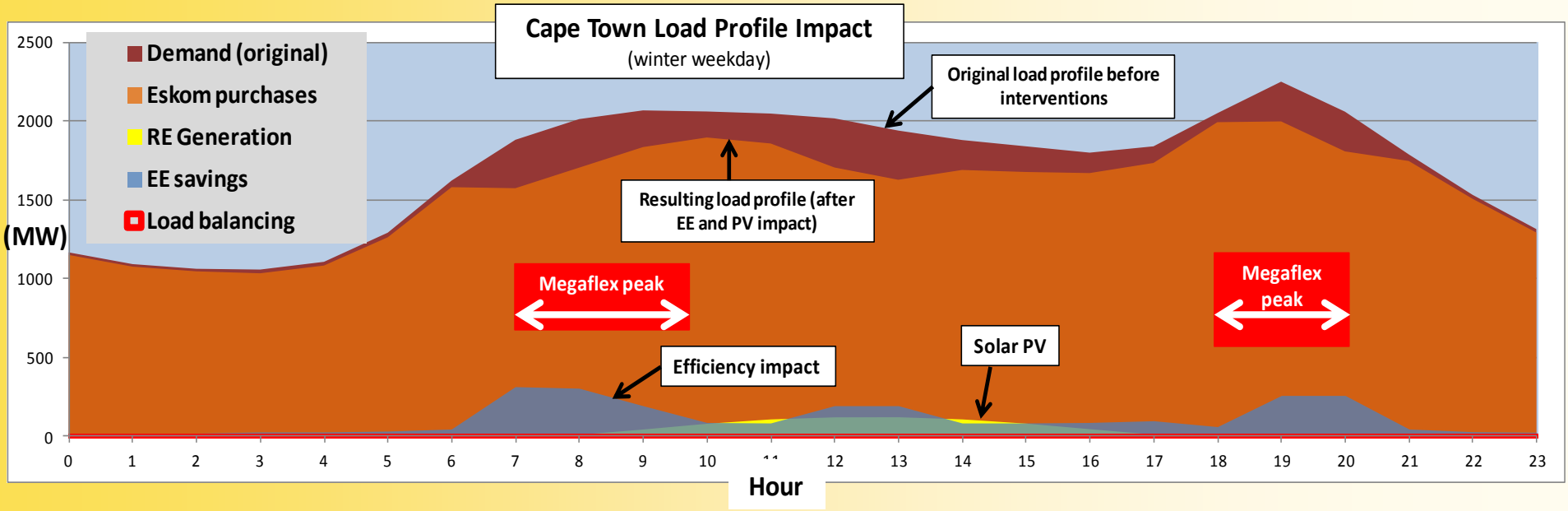
PV impact profile



Intervention impact

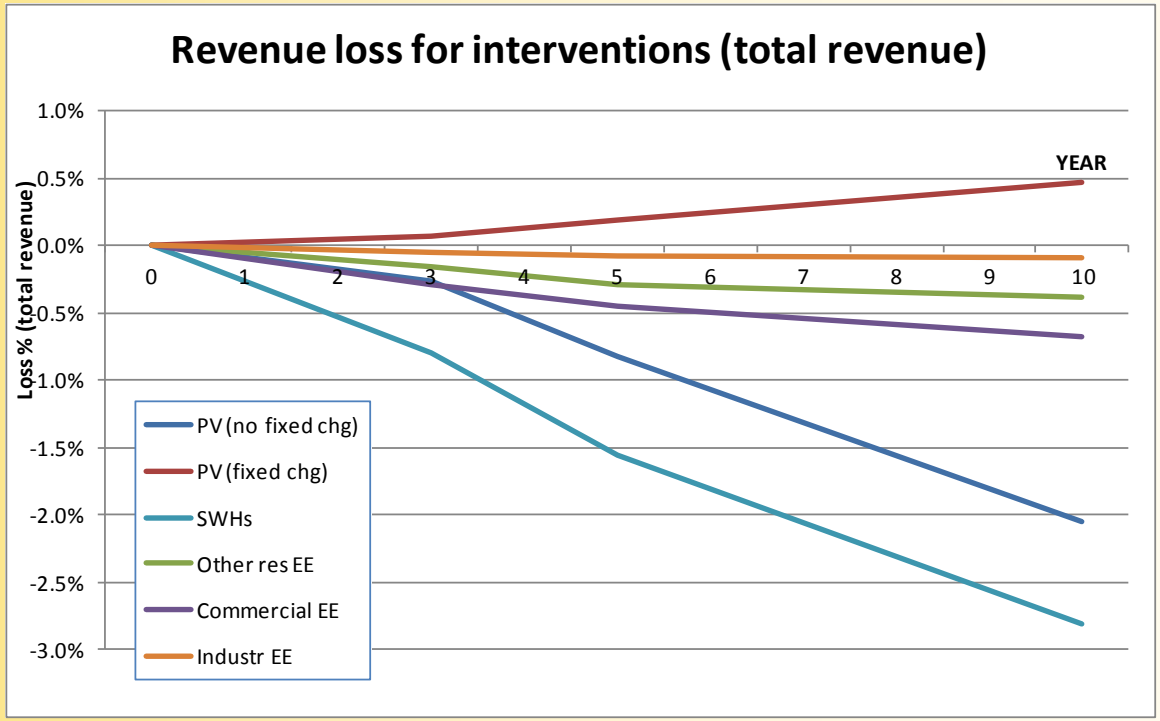
- SWH and PV largest impact
- Adopted by high end users most affected by price increases
- Extra revenue loss impact as a result of users being on inclining block tariff 4 (IBT 4)
- Revenue losses from this market is serious
- Commercial uptake of PV not modeled, but also expected to be significant

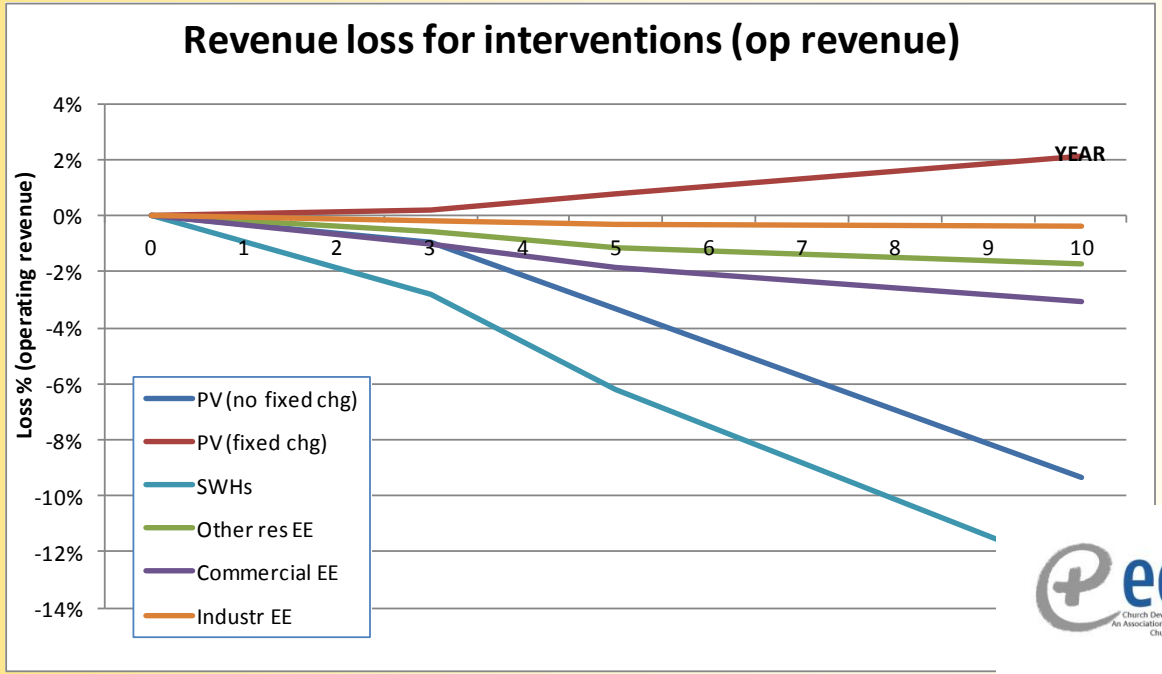
Load profile modelling results



- SWH impacts at megaflex peak – least impact on City revenue
- PV impacts- middle of the day – largest impact on City revenue

Electricity revenue impacts



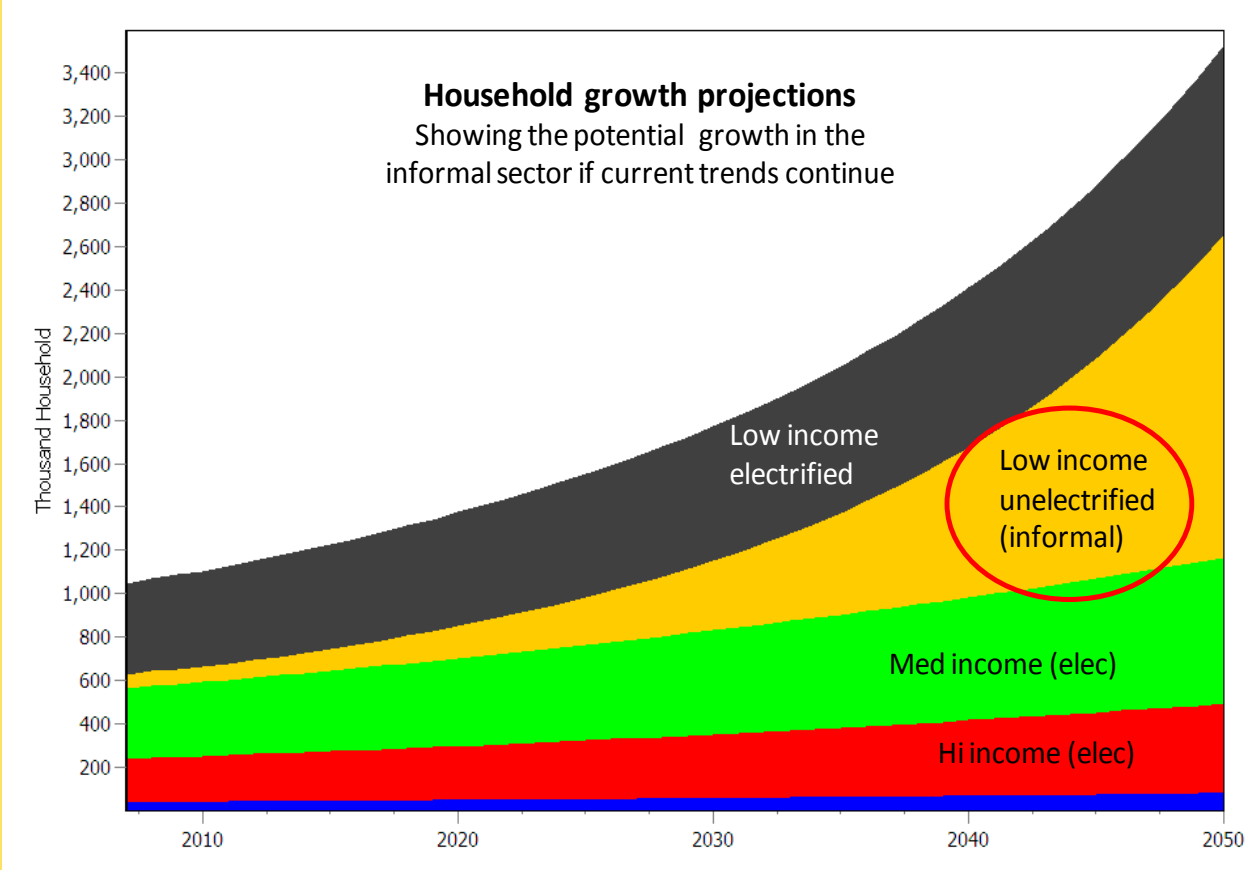


Findings

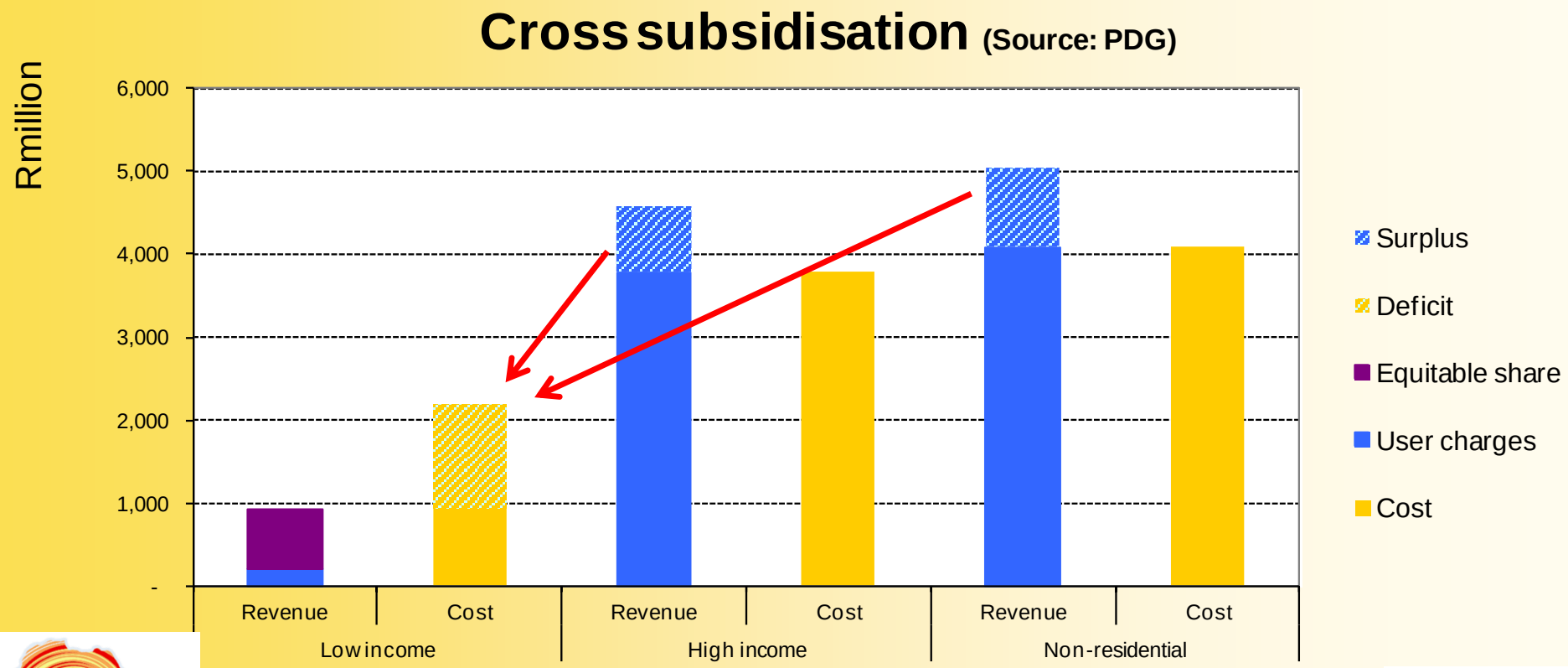
- Potentially a 22% operational revenue loss over 10 years – untenable
- Approaches need to be adopted to address this
  - Fixed charge for net metering – though may not avoid installation for ‘own use’
  - Decoupling energy and operational charges

Cross subsidising low income electrification

- Mounting political pressure to electrify informal settlements



Cross subsidising low income electrification



Double whammies and the death spiral

- Increased demand from informal settlements
- Increase of IBT high end tariffs to cross subsidise
- High end users implement more affordable alternatives
- City revenues decrease
- Vicious circle.....

Conclusions

- Rapidly increasing electricity prices coupled with decreasing PV and efficiency interventions creating potential untenable pressures
- Strategies must include
  - Not overburdening high end users
  - Fair net metering tariffs
  - Decoupling
- SWH – net economic benefit to country
- Small scale PV – net economic benefit not clear yet - large scale may be better

Main points

- Growing pressures on electricity revenue
- Evidence that increased uptake of PV and SWHs can have a major impact on city revenue
- High end users will drop off concurrently with increasing pressure for subsidised low income electricity delivery
- Plan needs to be put in place to address the situation

Thank You

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eThekwini – no IBT