

A decorative graphic on the left side of the slide, consisting of three overlapping circular frames. The top frame shows a smiling woman talking on a mobile phone. The middle frame shows two large industrial cooling towers at a power plant. The bottom frame shows two workers in blue uniforms and hard hats working on a large metal ring component. The background of the slide is white with a blue diagonal stripe on the left.

An estimation of price elasticity of demand for the residential electricity sector in South Africa

Delivered by: Dr Johannes Jordaan

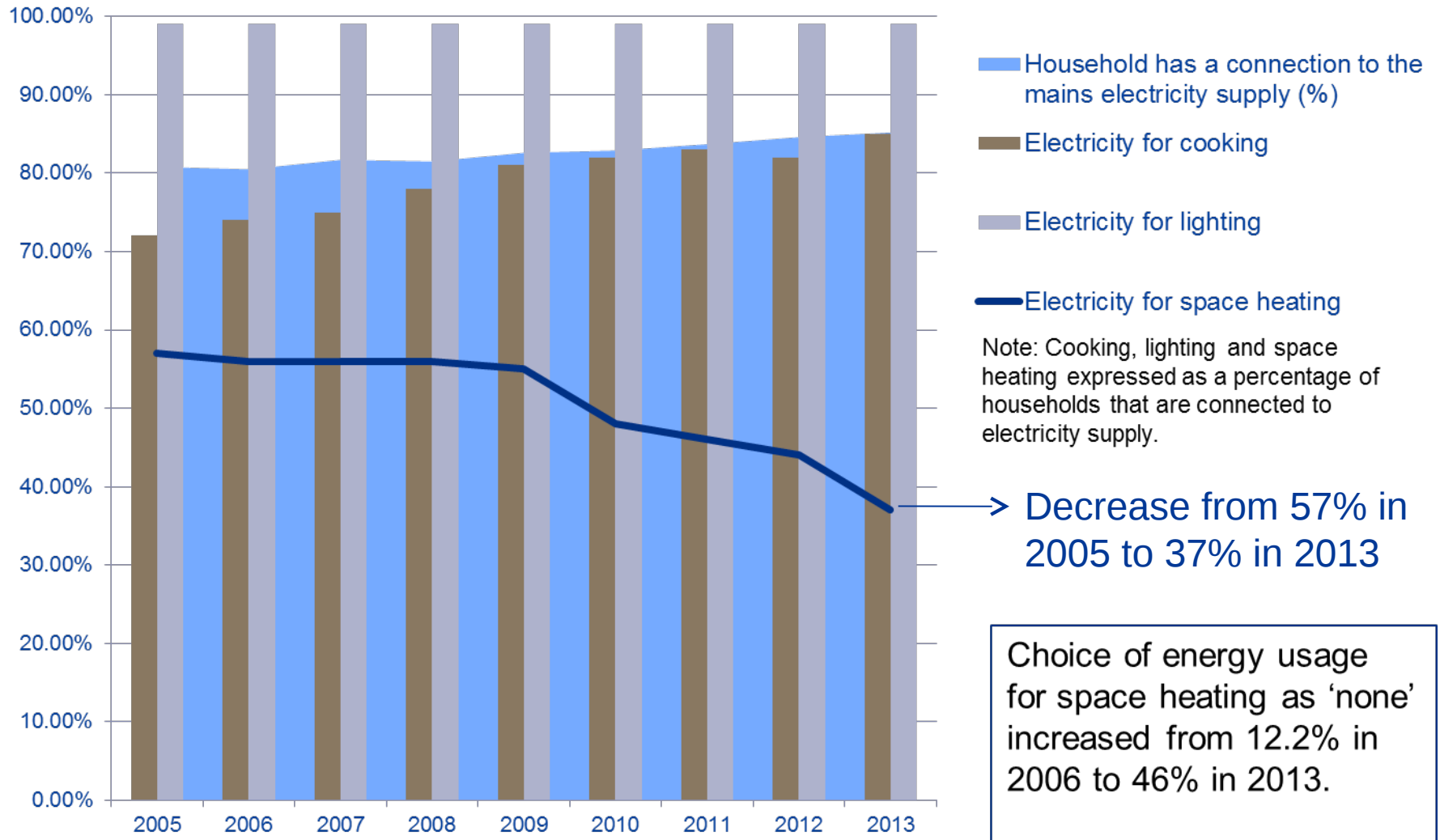
Date: 12 November 2014

Domestic Loads seminar

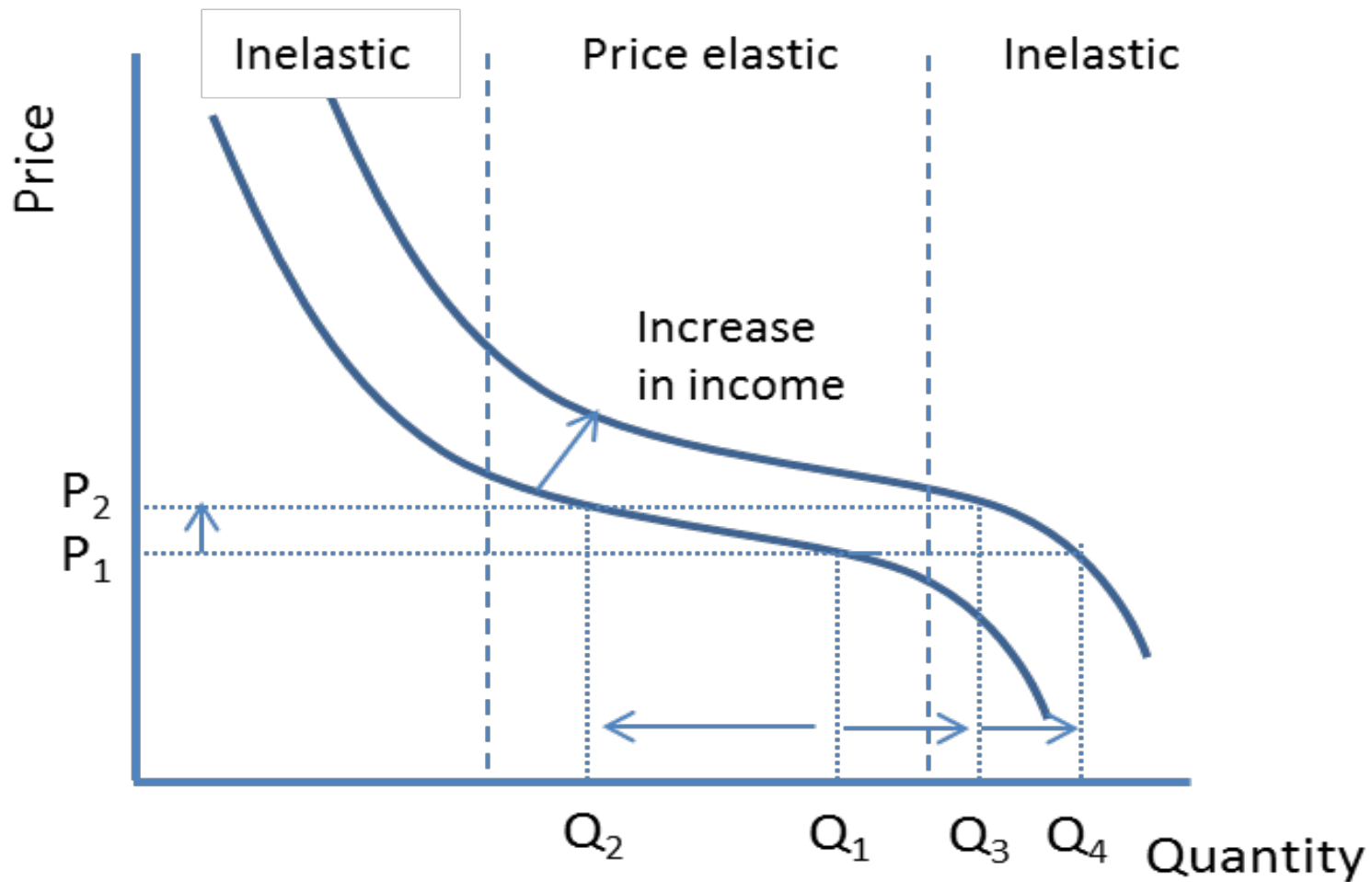
- Introduction;
- Household usage of electricity;
- A hypothetical demand curve for electricity;
- Relationship between income and electricity consumption;
- Price elasticity of demand;
- Electricity share per income decile;
- Estimated direct price elasticity of demand for SA household deciles;
- Concluding remarks.

- Consumer prices index (CPI) increased with 31% between 2008 and 2013;
- Electricity (as measured in CPI) increased with 124% between 2008 and 2013;
- As a result the proportion of expenditure households allocated to electricity (using the weight of electricity in the CPI calculation) increased from 1.68% in 2008 to 4.13% in 2013;
- Electricity is considered to be a necessity rather than a luxury good and as a result the demand for electricity is generally inelastic or insensitive to price changes (the elasticity is less than one);
- Data shows that 12.24 million, or 84.7% of households in SA use electricity for lighting purposes (StatsSA);
- An estimated 20.5% of households receive free basic electricity (FBE).

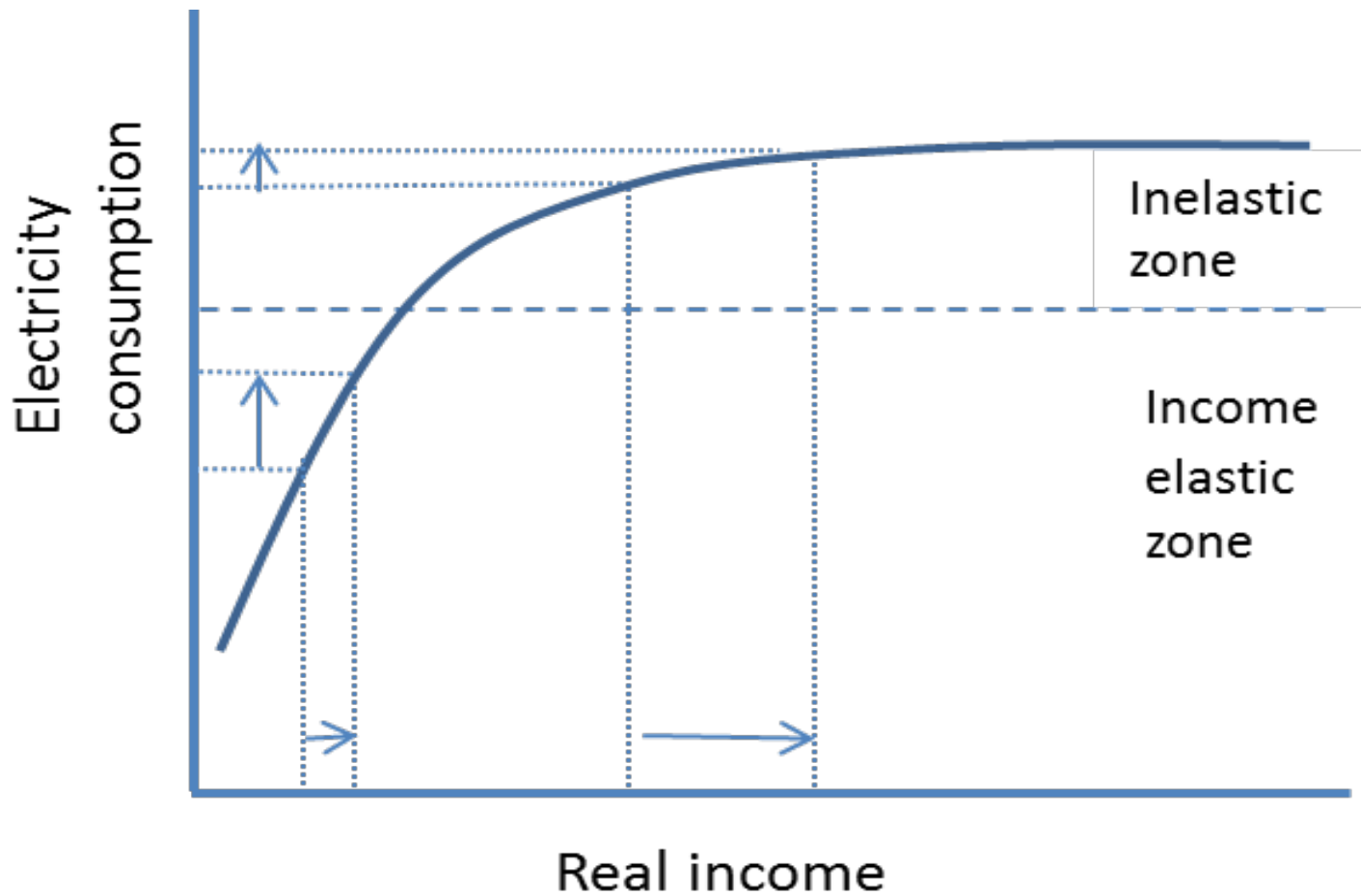
Households usage of electricity



A hypothetical demand curve for electricity



Relationship between income and electricity consumption



- $E_d = \frac{\Delta Q/Q}{\Delta P/P} \dots\dots(1)$
 - E_d is the price elasticity of demand,
 - Q is the quantity consumed (with Δ the change in consumption between two periods) and
 - P is the price or tariff (with Δ the change in price between two periods).
- $E_d = f(p^e, p^f, r, X_i) \dots\dots(2)$
 - E_d is the demand for electricity (consumed);
 - p^e is the price of electricity;
 - p^f is the price of substitute energy sources;
 - r is household income levels and
 - X_i is a vector of all other influencing factors including temperature (heating degree days), population, energy intensity of growth.

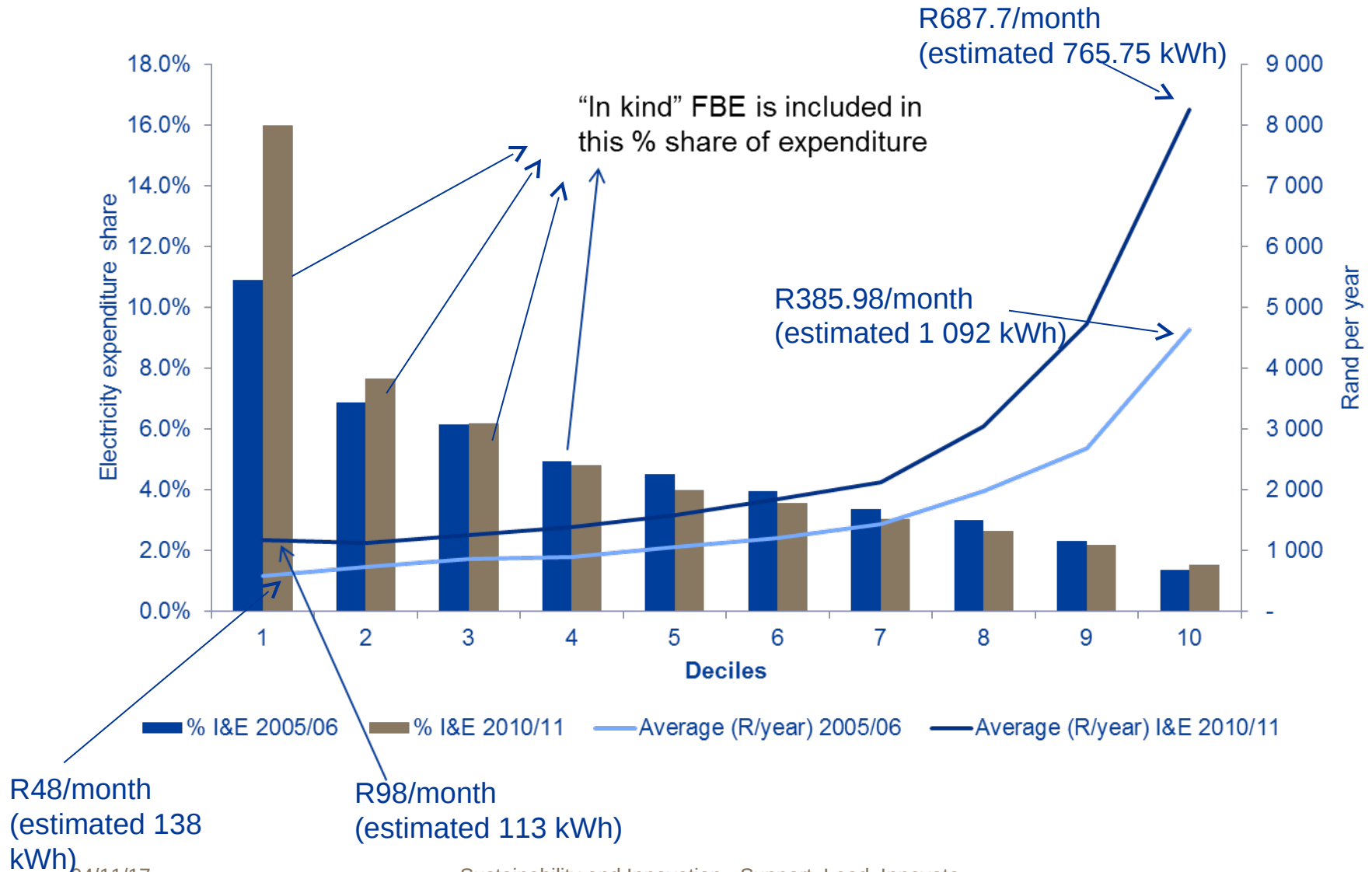
- When the price elasticity of demand for a good is perfect inelastic ($E_d = 0$), changes in the price do not affect the quantity demanded for the good and as a result raising prices (*ceteris paribus*) will cause total revenue to increase;
- When the price elasticity of demand for a good is relative inelastic ($-1 < E_d < 0$), the percentage change in quantity demanded is smaller than that in price; when the price is raised, the total revenue rises (and *vice versa*).
- When the price elasticity of demand for a good is relative elastic ($-\infty < E_d < -1$), the percentage change in quantity demanded is greater than that in price; when the price is raised, total revenue falls (and *vice versa*).

Price elasticity of demand: Literature review

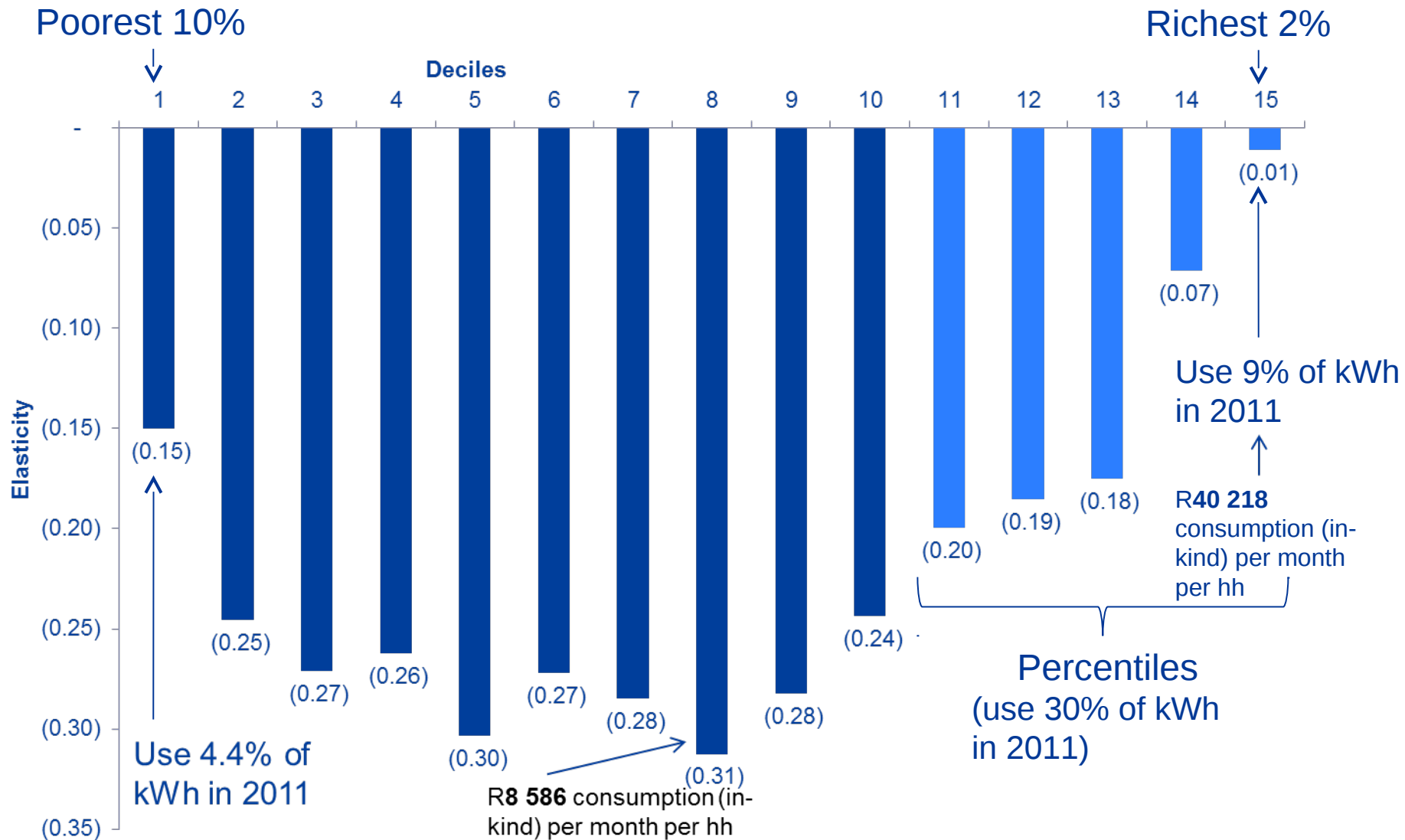
	Developed Countries						Developing Countries				
	US	US	Australia	Australia	Australia	Spain	West Indies	South Africa	India	China	Taiwan
Cold/winter	SR	LR							-0.32		
Mixed temperature	-0.13	-1.89		-0.26		-0.3			-0.65	-2.47	-0.2
	-0.9	-1.12									
	-0.82	-1.02									
	GMM	OLS		Winter	Summer						
Poorer	-0.49	-0.36	-0.48	-0.61	-0.25		-0.725	-0.9			
Lower middle income	-0.34	-0.24	-0.45	-0.53	-0.27		-0.852				
Upper middle income	-0.37	-0.27	-0.21	-0.19	-0.25		-0.788	-0.35			
High income	-0.29	-0.19	-0.21	-0.13	-0.18		-0.705				
Warm/summer									-0.16		

- The majority of the elasticities of electricity demand are relative inelastic;
- Elasticities are in general more negative for developing countries than developed countries, (although this varies depending on time-period; specific countries, estimation techniques used and income groups covered);
- Elasticities are more negative in winter than summer;
- It is more negative for poorer households than richer households;
- Elasticities are also more negative in the long-run than in the short-run (as consumers have more time to change their behaviour or utilise electricity efficient appliances in the long-run);
- Elasticities for residential consumers can also vary between different times of the day in countries with different time of use tariffs;
- Results from studies that also tested income elasticity, show typically a change in income results in a much higher impact than price elasticity (consumers tend to respond more to changes in their income levels than to change in the price level).

Electricity share per income decile (of those that use electricity)



Direct price elasticity of demand



- Take up of free basic electricity;
- Changes in patterns of household expenditure on electricity;
- Changes in electricity end-use patterns;
- Household debt levels;
- Dynamics of metropolitan electricity pricing revenue;
- Income elasticity of demand;
- Impact of aspects like electricity theft and 'culture of non-payment' vs financial stress.

Thank you

