

Goals, trends and strategies for low-carbon power & heat

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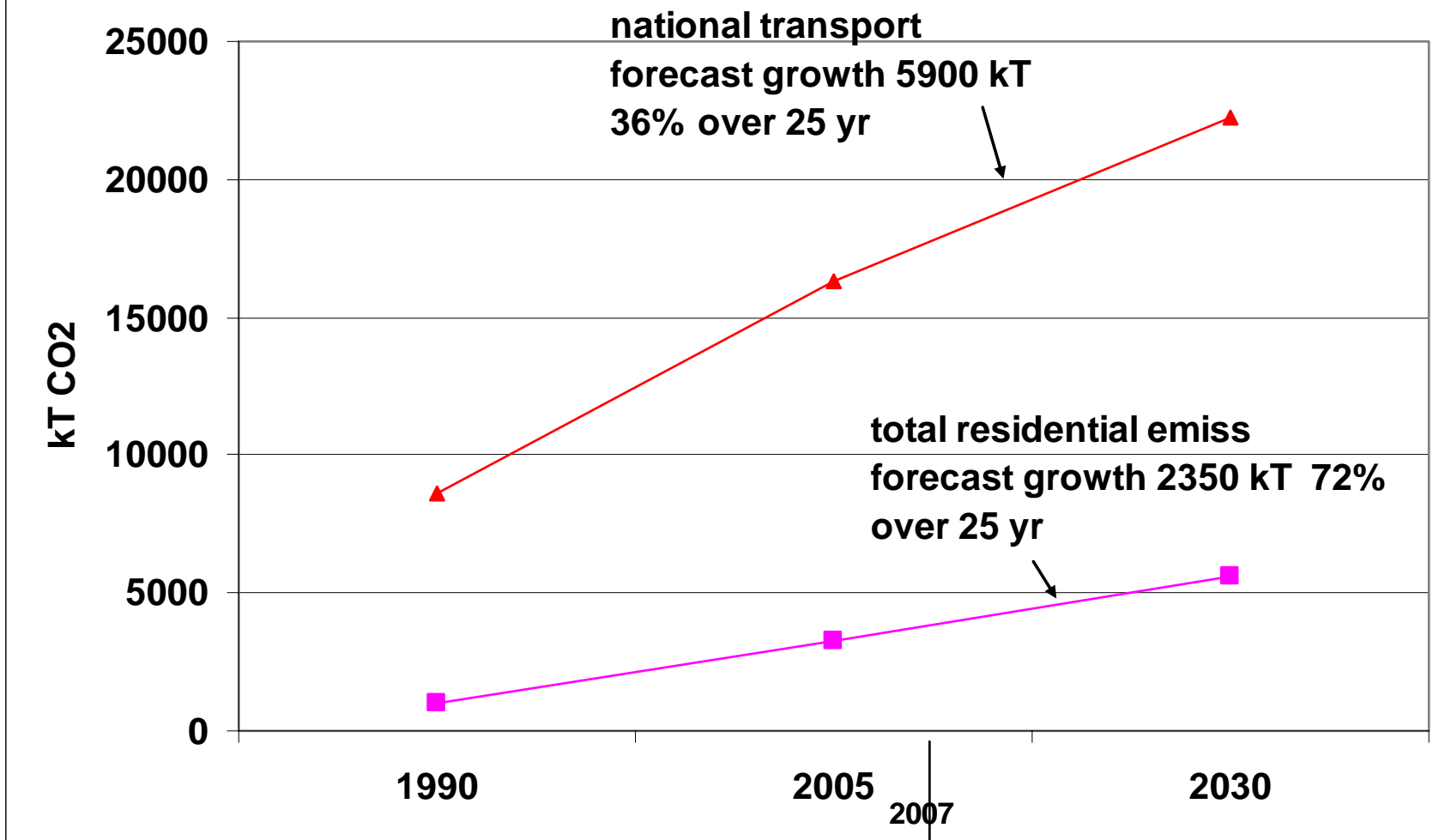
Goals relevant to power and heat, inferred:

- **Reverse present trend of increasing electricity-related GHG emissions**
- **Introduce cost of carbon “either now or over transition period”**
- **Remove “undue” barriers to distributed generation and energy efficiency**
- **Promote innovation and join international networks in e.g. geothermal, marine energy, biofuels and CCS**
- **Make electricity affordable to low-income consumers**

Goals modified

- **[reduce not only electricity but also heat-related emissions]**
- **[pricing carbon must begin now, and increase progressively according to climate change urgency]**
- **[Remove barriers to investment in “local energy” (e.effic & renewables). Profits from electricity price hikes should be spent on local energy not roads or even power stations]**
- **[innovation needed also in clean wood burning, smart metering, automatic load shedding plug, peak-limiting tariff - join IEA taskforce 15!]**
- **[Affordability for low-income is about whole power price rise, not just fixed charges. Greenhouse-intensive industry should negotiate specific PREs rather than demand carbon pricing schemes that ignore true economic cost of emissions]**

past and forecasted CO2 emissions, kT CO2, 1990-2030



Source: calculated from E Outlook tables, MED GHG report 2004, Energy Data Files

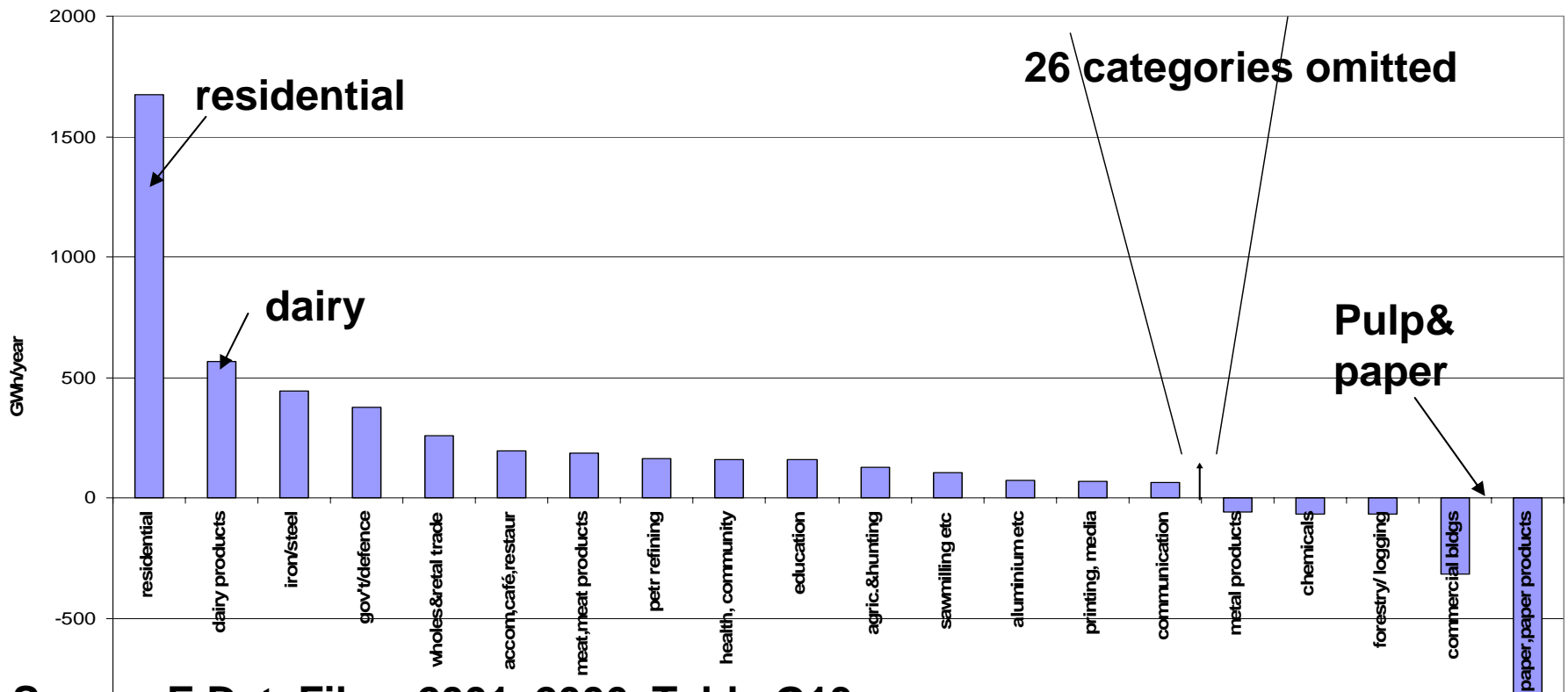
Residential emissions, a major concern

- **Is fastest growing in percentage terms (excluding international transport)**
- **Drivers of household energy growth:**
 - **More population (adds 10 PJ over 25 yrs)**
 - **Bigger houses (adds 5 PJ “)**
 - **Warmer houses (adds 8 PJ “) – CHRANZ Oct '06)**
- **Residential assets longer lasting than vehicles**
- **Most residential emissions comes from electricity – our estimate is very conservative as doesn't count fact that marginal emissions, space heat & light, come from coal and gas**
- **Transmission and most generation investment now driven mainly by peak demands – residential electricity growth driving that**

Trends, electricity demand: compare 2000 with 2005

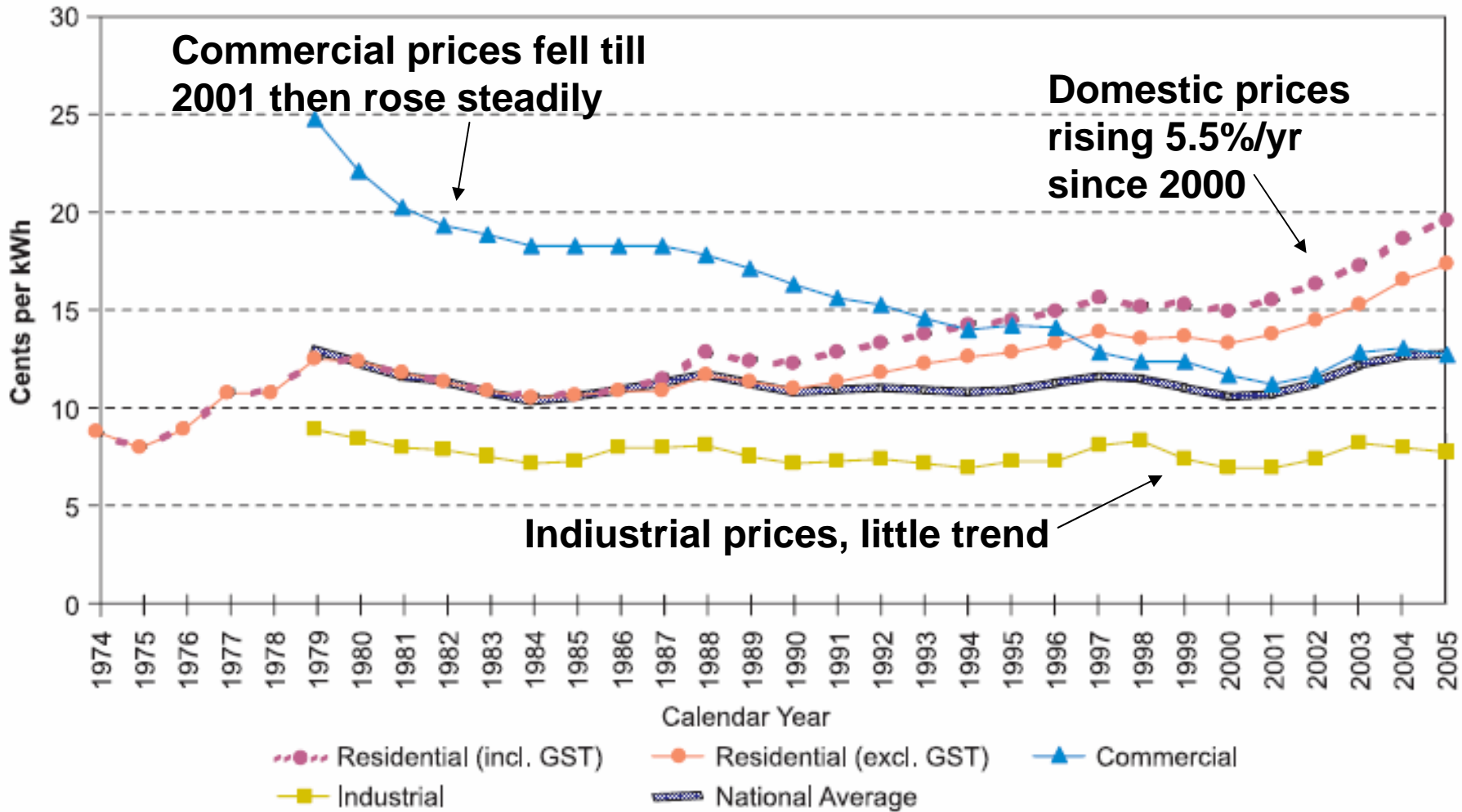
- Residential electricity demand grew 1676 GWh p.a. 15% incr
- Dairy products electricity demand grew 563 GWh p.a. 250% incr
- Pulp and paper electricity demand fell 824 GWh p.a. 32% decr
 - (shut-downs from power price rises; self-generation of electricity)

Growth in GWh/year by category, 2000 -2005



Source E,DataFiles, 2001, 2006, Table G13a

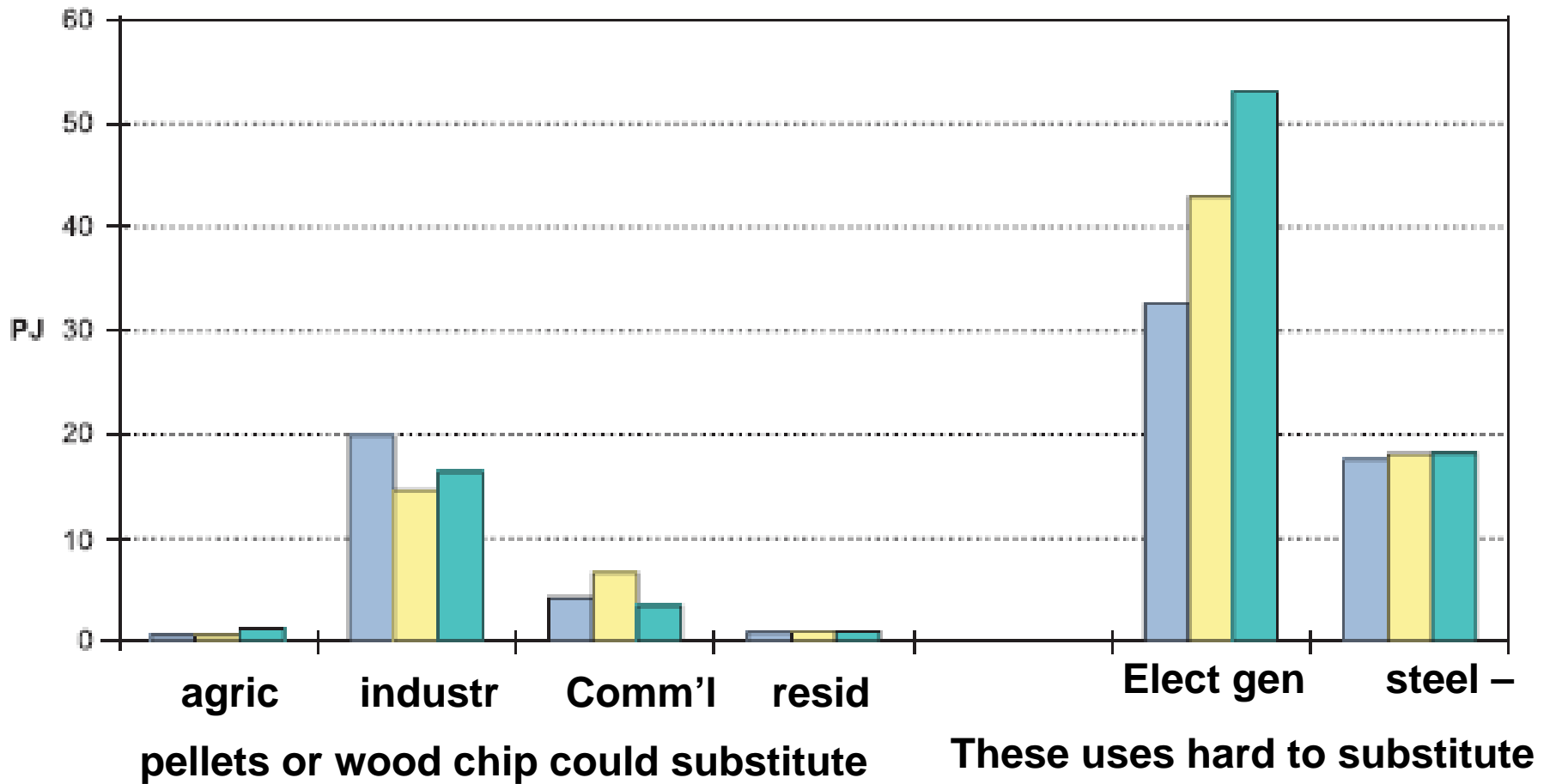
Chart I.2 Electricity Consumer Prices (Real 2005 Calendar Year Prices)



Source E.DataFile Sept 2006

Coal consumption for industry, commercial ~20 PJ/yr

Calendar Years Comparison of Coal Consumption by Sector, 2003-2005



Source: E.DataFile Sept '06 chart C3

Investment trends today: mostly large-scale supply

Need investment, end-use efficiency and renewables

- **Investment in Transmission \$300m/yr, expected \$4 billion next decade**
- **Planned investment, generation 10-15 yr: Meridian \$2-3b, MRP \$1b, ...**
- **petroleum exploration: ? petroleum production? coal production?**
- **Energy efficiency: \$2 billion investment 2007-2030 expected to yield \$4 billion benefit [Source Brander, EECA to NGO forum 15 Feb]**
 - **Solar programme: \$15m government \$ over 5 yrs**
 - **More solar accomodated if 2 million “load-responsive plugs”: \$200m**
 - **Buildings use n% of NZ electricity; outlive most power stations. hence building codes critical for energy-efficient future**
- **Disinvestment in household wood burning:**
 - **Christchurch: remove 40,000 open fires and low-eff wood burners by 2012**
 - **Strong marketing of heat pumps plus stringent air quality standard makes this likely in other centres.**
- **Disinvestment in trees - must be reversed!**

NZES proposed actions, power and heat

- **Price on carbon – 7 options [I prefer polluter pays options]**
- **Regulation: facilitate DG [no action on smart meters!]**
- **Incentives/subsidies for DG, SWH, FIDA for wood industry [need strong incentives for investment in energy efficiency]**
- **RMA: streamline consents for wind, geothermal, nat policy guidance [need more flexible air quality regulation, ban smoke not wood burner]**
- **R&D: \$14.6m covers fossil and renewable energy sources [but mainly for large-scale technologies and incumbent research organisations:**
 - **\$0 for efficient smokeless wood burning in homes and industry**
 - **\$8m for tidal energy**
- **Affordability: small change in low fixed charge regime [it's overall price level that hurts: consumers must challenge market power of retailers]**

Analysis 1: what's going on; what should change?

- **Demand trends show big opportunities for residential electricity substitution, plus substitution of ~20 PJ coal by wood for heat.**
- **Trend to warmer bigger homes is stressing electricity capacity and CO2 emissions; removal of log burners exacerbates that.**
- **Electricity price levels are unregulated so all residential consumers are paying to expand electricity system.**
- **Investments and subsidies show strong supply-side bias.**
- **Profits from gentailers are yielding “unexpected” government surpluses: gov’t has conflict of interest in electricity regulation.
∴ need independent regulator!**

Analysis 2: what's going on; what should change?

- **Smart grid technology and tariffs allow customers to control power bills, distributors to reduce network losses. But this requires culture change, and reduces retailer super-profits**
- **Missing: holistic management of carbon stocks - using trees for carbon sequestration and future energy resource**
- **Missing: “local energy”: multiple benefits from energy investments close to consumers, recycle \$ in community**
- **Missing: benefits of matching energy quality to energy uses: solar and bioenergy for heat, electricity for essential uses.**

Proposed priorities

- **Priority for investment should be low-carbon end-use energy, to balance massive supply side investment.**
- **Energy efficiency: need strong focus on longest-lived assets (bldg codes, transmission and especially distribution networks)**
- **Renewables: local energy to have priority over remote (wind, marine), again to redress present imbalance**
- **R&D priorities should include**
 - **Smart meters/networks/tariffs for price-responsive demand, to balance supply from intermittent renewables, increase efficiency of distrib. networks**
 - **Industrial and comm'l wood burners - wood chip cheaper than pellets; clean efficient residential wood burning, cogeneration from woody biomass**
 - **Species trials for multiple use: nutrient control, biomass energy, high value products, sequestration of carbon in soils**

Proposed new principles

- **Carbon price level: should reflect urgency of climate change actions**
- **Carbon price structure: price should fall on those best able to reduce emissions (not best able to shift costs to other parties)
Recycle carbon charges to make actual changes in emissions**
- **Biosphere carbon management: massive tree planting to sequester carbon, and for future use to substitute for concrete and steel, and for bioenergy. But plant them WHERE??**
- **∴ Regional and local planning for multiple use forests: sequester carbon, create future energy resource, recreation. biodiversity even in urban areas (extend Karori sanctuary)**
- **Institutional: independent regulator for energy to mitigate government conflicts of interest**

Summary

- **GHG emissions are increasing especially in residential sector; major policy change needed to reverse trend**
- **Affordability to domestic consumers reducing; gov't conflict of interest in power sector profits**
- **Investments today mainly in large-scale energy projects; priority now to support local renewables, e. efficiency, price-responsive demand**
- **Deforestation trend must reverse: need trees for multiple use including carbon sequestration, water&soil conservation, energy, recreation, timber for low-carbon building, and (importantly) biodiversity**
- **Price on carbon should begin now, and be targeted to those best able to manage emissions (not avoid costs or shift them onto others)**