



Limits of Energy Balance Analysis for Energy Efficiency Indicators

“From Macro to Micro Energy Indicators”

Data and Methodology Training Session

How and why to get the big picture right

IEA

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Introduction

- NZ's methodology
- What are we trying to do?
- What we know we don't know
- Methodological limits - Can indices adequately explain comfort, activity, structure or productivity?
- Energy services way of thinking
- Where to from here

NZ methodology – a Suite of Indicators

- Compare energy use change in PJ
- Compare energy intensity indicators
- Isolate change components by
- Integrate with micro indicators.

Energy Efficiency

Politicians want it...

Experts argue about it...

Stakeholders doubt it ...

Ordinary folk just don't get it at all...

Our key challenges are about defining and communicating what we analyse

What is Energy Efficiency?

Energy Intensity is not Energy Efficiency

- but intensity indicators are used to define EE

Physical output indicators ignore wealth effects

- but may be the best indicator for sectoral EE given reasonable sectoral homogeneity

Macroeconomic EE is very difficult:

- modern economies are very heterogeneous
- output/benefit definition and measurement is very difficult

Its like trying to measure God!

No one can see EE, but its everywhere

Everyone has their own sense of what EE is,

- but most people can't explain exactly what it is

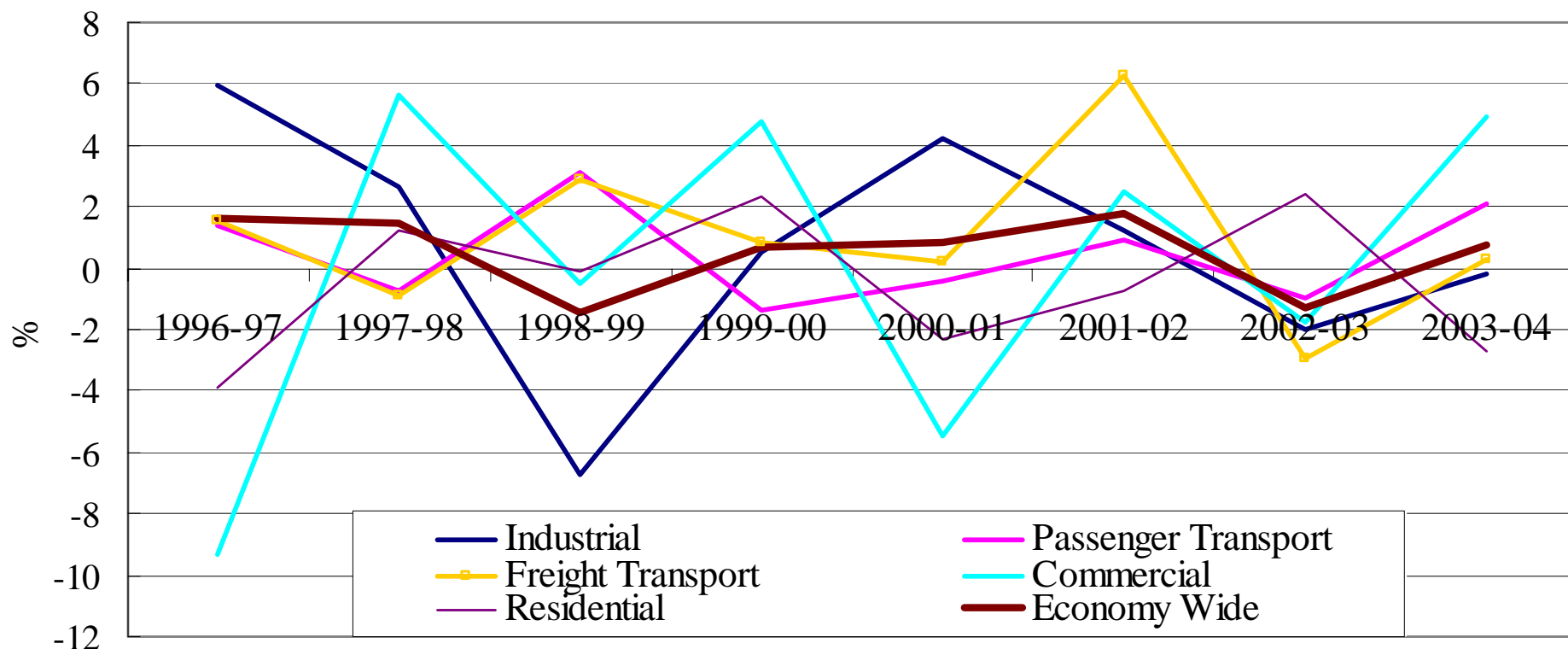
Plenty of agnostics and athiests

Many claim to have 'seen' it or what it does

- but who can measure it?

Inconsistent Results

Fig 5 : New Zealand energy efficiency performance by sector, 1997 to 2004



Its like trying to weigh frogs!

Easy to understand at a Micro level – engineering definitions work well – can't define Macro level?

(micro; can dissect a frog – macro; can't weigh it)

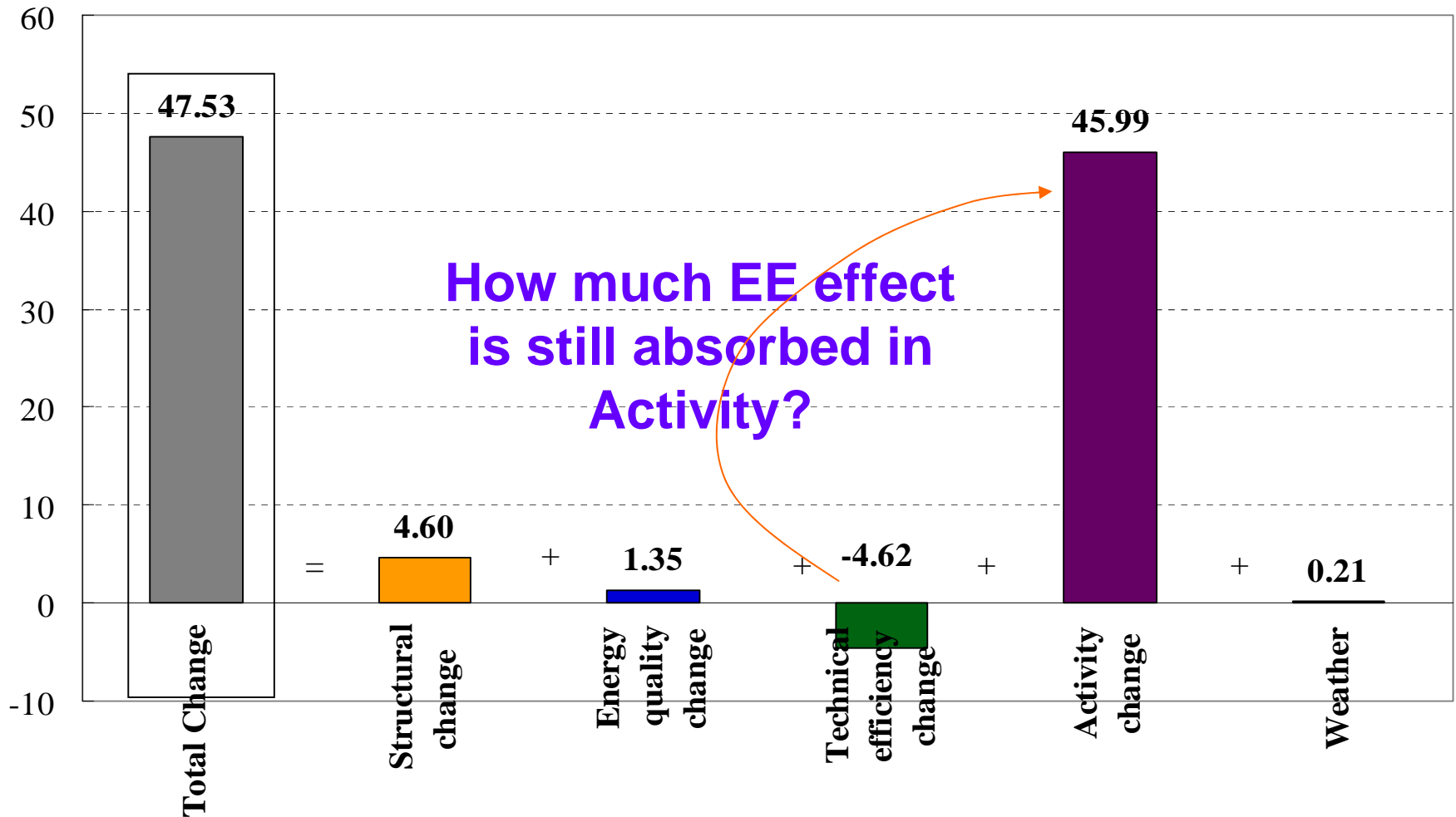
Energy data problematic, but measures of outputs or benefits worse – measures for comfort? mobility?

Takeback & rebound means that EE interventions give more service and minimal demand reduction

Should we account for under-heated homes? sub-optimal production?

Decomposition

Fig 3: Economy-Wide Energy Change Components, 2001-2004



Energy Services Required- Spaceheating NZ homes

All figures PJ.	2001	2017
Required end-use heat energy for 18C	43	
Supplied consumer heat energy	20	
Heat energy projected with growth to 1.82m homes and no change to housing stock energy (frozen efficiency)		57
Heat energy projected with all pre-1978 housing stock upgraded & new stock 50% of NZBC 2000 energy needs		45
Heat energy projected with all pre-1978 housing stock upgraded & new stock 50% of NZBC 2000 energy needs and 1 million heat pumps.		35

Takeback & Rebound

Takeback - potential savings applied to improved service resulting in reduced energy savings

Rebound – new consumption from savings

5 yr NZ insulation/health study; \$1200 insulation retrofit provides \$3300NPV. 70% of value is health/productivity improvements, 30% energy savings.

Benchmarks for takeback and rebound? Is this normal?

Relationship between takeback and sub-optimal service? – less developed counties, full takeback?

Energy Services

Table 3: Appliance proliferation in New Zealand households

Appliance	Total		% Change	Per 1000 people		Household	
	2001	2004		2001	2004	2001	2004
Oven	2,698,000	2,891,700	7%	709	731	1.88	1.93
Washing Machine	1,392,400	1,451,500	4%	366	367	0.97	0.97
Dryer	916,000	910,800	-1%	241	230	0.64	0.61
Refrigerator	2,306,800	2,402,700	4%	606	607	1.61	1.61
Dishwasher	564,600	657,600	16%	148	166	0.39	0.44
Television	1,410,000	1,466,600	4%	371	371	0.98	0.98
Computer	675,300	928,900	38%	178	235	0.47	0.62
Heater	4794400	5017800	5%	1260	1268	3.35	3.36

Communication

Most folk think EE gives a reduction in consumption
-it will 'save energy'

Few folk understand the concept of a
service/energy input ratio

Few agree what EE or EC actually are

Economists understand economic efficiency

Our Grandmothers understood the concept of
'wasting energy'

Q. How can our work be shaped and communicated
so that it is more meaningful to ordinary folk?

We're currently trying to;

- Improve measurement of primary energy transformation efficiency
- Review our definitions for sectors and sub-sectors (abstractions of perception and data classifications)
- Drive analysis of service improvement down to major end uses activities eg heaters in homes, hot water supply...
 - to see if a modelling approach based on technology diffusion trends can improve both the definition and measurement of 'activity' and 'structure'

Where to from here

What is energy efficiency? esp. at macro level.

Can we get consistent definitions of EE, EC, RE?

Is there a practical EE methodology for an imperfect world?

What indicators are effective for EE?

Who else is setting EE targets – how will you monitor progress? Should we set EE targets at all?

Data problems –how do we explain variability?

What role for technology diffusion indicators?

How do we better understand the virtues and vices of takeback and rebound?

How do we communicate EE effectively?

This group could...

Standardise definitions - link policy aspirations to quantification and communication for EE,EC,RE.

Define essential quality requirements for energy and service data gathering

Develop and define the state of the art in EE assessment methodologies and processes

Collate international benchmarks on; BAU EE, takeback/rebound

Enable international cooperation and peer review

A unique role for the IEA...

Include in the regular energy policy reviews on member nations a specific assessment of:

- EE, EC, RE Strategy
- Targets for EE, EC, RE
- Processes used to monitor progress
- Data quality used for monitoring

develop benchmarks of practice and performance from these

Improving energy choices

www.eeca.govt.nz