ENERGY EFFICIENCY

Saving Electricity in a Hurry

Energy Efficiency: Policy Components, Principles and Instruments

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Shortfalls vary according to constraints, severity, and duration

Energy Constrained Systems – lack of MWh

- Poor rainfall – Brazil, Norway, New Zealand (2001), East Africa (2006)
- Poor operations planning & reservoir management – Tanzania, Brazil
- Conflicting uses for the water: Lake Victoria, Bonneville Power Authority
- No money to buy fuel (Ethiopia)
- Curtailment in fuel supply (e.g. Chile, importing gas from Argentina)

Capacity Constrained Systems – lack of peaking MW

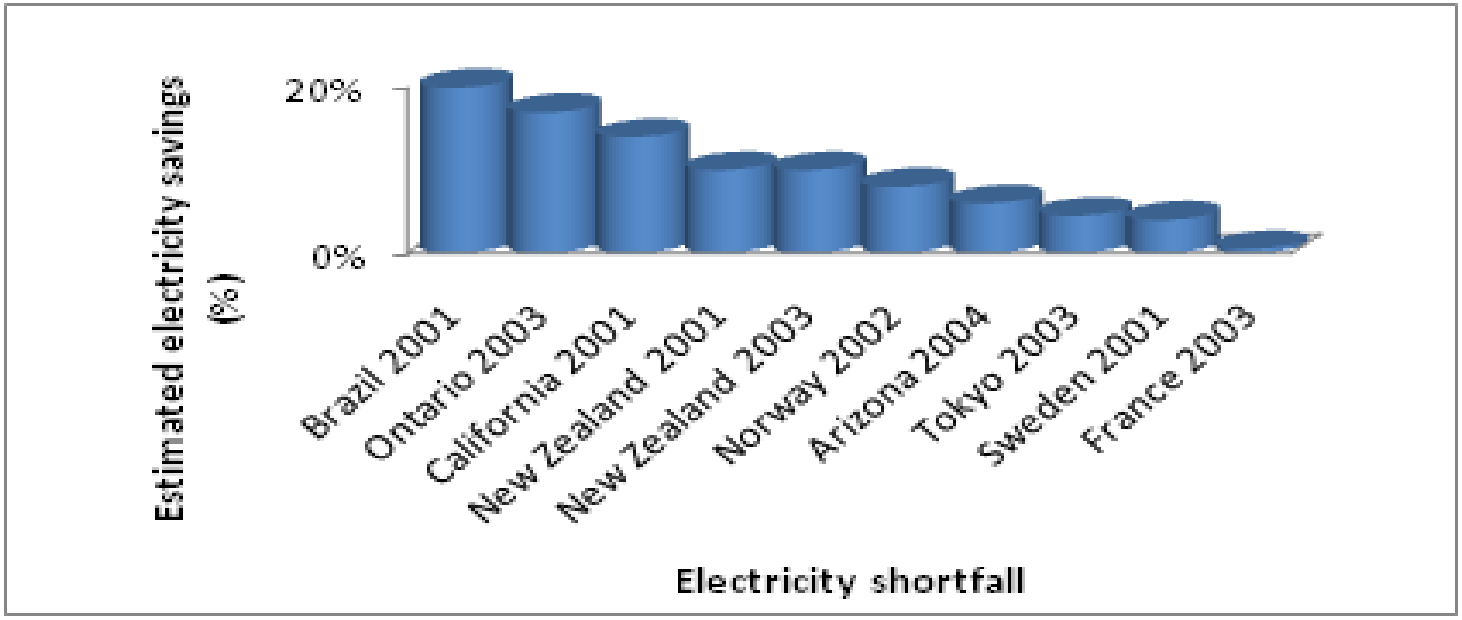
- Insufficient generation capacity to meet peak load (Kenya)
- Low reserve margins or susceptibility to generation outages (SA)
- Very high prices due to market manipulation or lost interconnection (California, Juneau AK)
- Unsustainable peak demand growth & low load factors (MENA countries)

Dually Constrained Systems – lack of MWh and peaking MW

- Energy constrained systems with over-depleted reservoirs (Tanzania)
- Insufficient generation capacity to meeting intermediate load (India, Pakistan)

Source: World Bank 2009

Benefits of an electricity shortfall strategy



- Minimizes economic and social impacts
- Mobilizes support from stakeholders and civil society
- Increase awareness of the need for energy efficiency

Step-wise approach to developing a shortfall mitigation strategy

- 1. Identify possible shortfall scenarios
  - Cause
  - Severity
  - Duration
- 2. Understand patterns of customer electricity use
- 3. Evaluate potential energy savings measures
  - Costs, benefits, social impacts
- 4. Put in place standby arrangements
  - Identify lead agency
  - Authority for rationing and other measures

1. Identify possible shortfall scenarios and project their anticipated cause and duration

Timing

Duration:
1 hour – years

Advance warning:
none – years

Causation

Supply shortages

- Drought
- Interconnection or fuel interruption
- Unplanned outages or imbalances

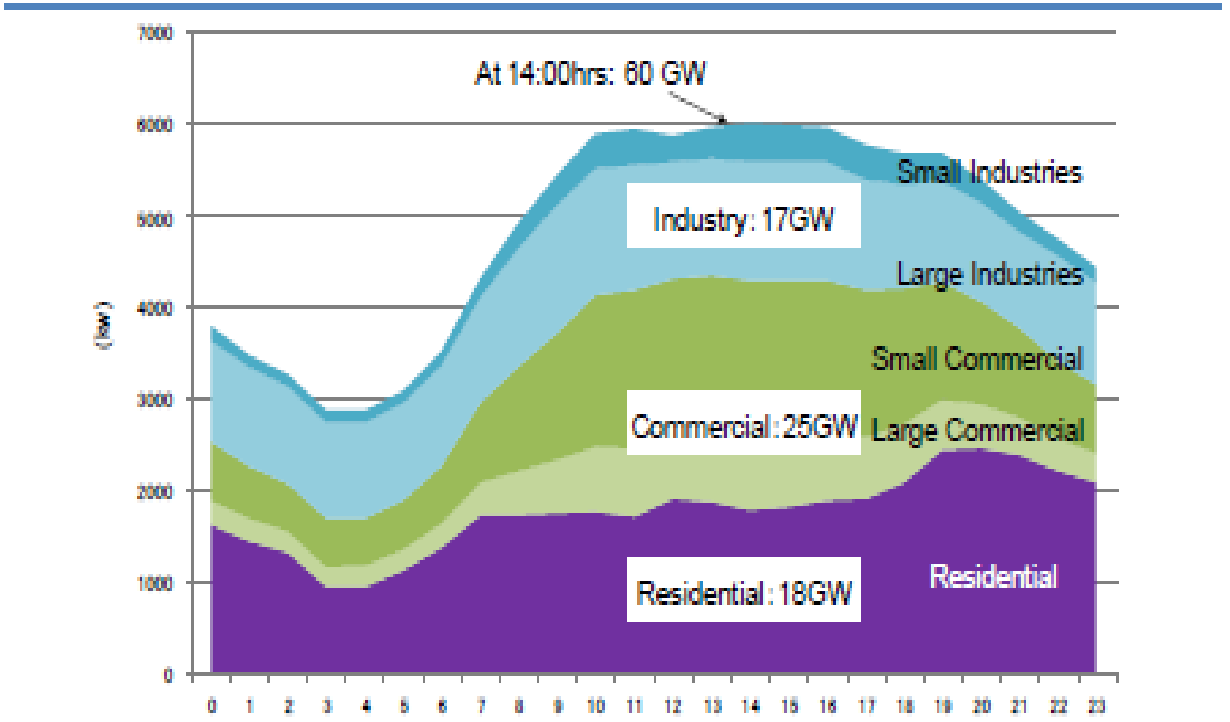
Excess Demand

- Heat wave
- Cold wave
- Unexpected demand

Recent electricity shortfalls

Country/state	Year	Cause	Constraint
Alaska	2008	Avalanche cut transmission line	Capacity
Bangladesh	2005	Demand growth, insufficient investment	Capacity
Chile	2007/08	Drought, gas shortfall, plant breakdowns	Energy/capacity
China	2007	Drought	Energy
Ethiopia	2009/10	Demand growth, insufficient investment	Capacity
Japan	2011	Earthquake/tsunami causes plant failure	Capacity
New Zealand	2008	Drought	Energy
Pakistan	2007	Demand growth, insufficient investment	Capacity
South Africa	2008	Demand growth, insufficient investment	Capacity

2. Understand patterns of electricity use – by sector and end-use



Source: ANRE/METI, 2011[6].

3. Evaluate energy and demand savings measures

a. Price signals

b. Information campaigns

c. Technology replacement

d. Rationing

e. Market mechanisms

a. Price signals

- Time-of-use (TOU) pricing, in which price varies according to a preset schedule, *e.g.* time of day, day of week and season.
- Real-time pricing (RTP), in which the end-user price is linked directly to hourly spot prices in a wholesale market.
- Critical-peak pricing (CPP), a hybrid of TOU and RTP in which a TOU rate is in effect all year except for a contracted number of peak days (exact dates unknown) during which electricity is charged at a higher price.

b. Information campaigns

- Analyse what consumer behaviour to change
- Identify the target group
- Choose effective communications channels
- Convey urgency while keeping an upbeat tone

2. New Zealand: Proven practice information campaigns (EECA)

- Energywise campaign – Patt Murray
- http://www.energywise.govt.nz/energyspot/episode-2/heat-loss-in-the-home
- Provides concrete advice
- Resonates in terms of things people care about (comfort, health)
- Really good website to find out more information www.energywise.govt.nz
- 'Normalises' energy-saving behaviour

Italy: No lift days

7 minutes of stairs a day can...

- **Decrease risk of heart attack by more than 60%**
- **Burn fat!**
- **Oh yeah...save energy**

results: decrease final energy consumption by 35%

UNITA' TECNICA EFFICIENZA ENERGETICA

Japanese energy saving innovation

Web site for households to check energy use

Household Power Saving Menu Agency of Natural Resources & Energy

Check the actions below and prepare measures of your household.

Suggested Menu for Household Power Saving Actions	Power Saving Effect: Reduction Rate	Power Saving Effect: Power Reduction	Check
A/C ① Set room temperature at 28℃.	10%	130W	☐
② Use "sudare" or "yoshizu" (Japanese shades made of rattan and reed) to decrease sun exposure. ※When setting the temperature by 2℃.	10%	120W	☐
③ Turn off A/C and use electric fan. ※Avoid Dry mode operation and frequent switching on/off as they increase power usage.	50%	600W	☐
Refrigerator ④ Change the refrigerator temperature setting from powerful to medium, minimise opening doors and limit amount of food kept inside.	2%	25W	☐
Lighting ⑤ Turn off lights during the day and reduce lighting in the evening.	5%	60W	☐
T V ⑥ Use energy savings mode, decrease brightness, and switch off when not in use. ※Change mode from "standard" to "energy saving" mode and reduce hours of watching by 1/3.	2%	25W	☐
Toilet heater /warm shower ⑦ Switch off seat-heating & hot-water functions.	Reduction by either one of the two: >1%	5W	☐
Rice cooker/jar ⑧ Cook rice for the day and store it in the refrigerator rather than keeping it warm in the rice cooker.	2%	25W	
Standby Power ⑨ Unplug unused appliances.	2%	25W	☐

Apply ④⑦⑧&⑩ measures even when you are away from home.

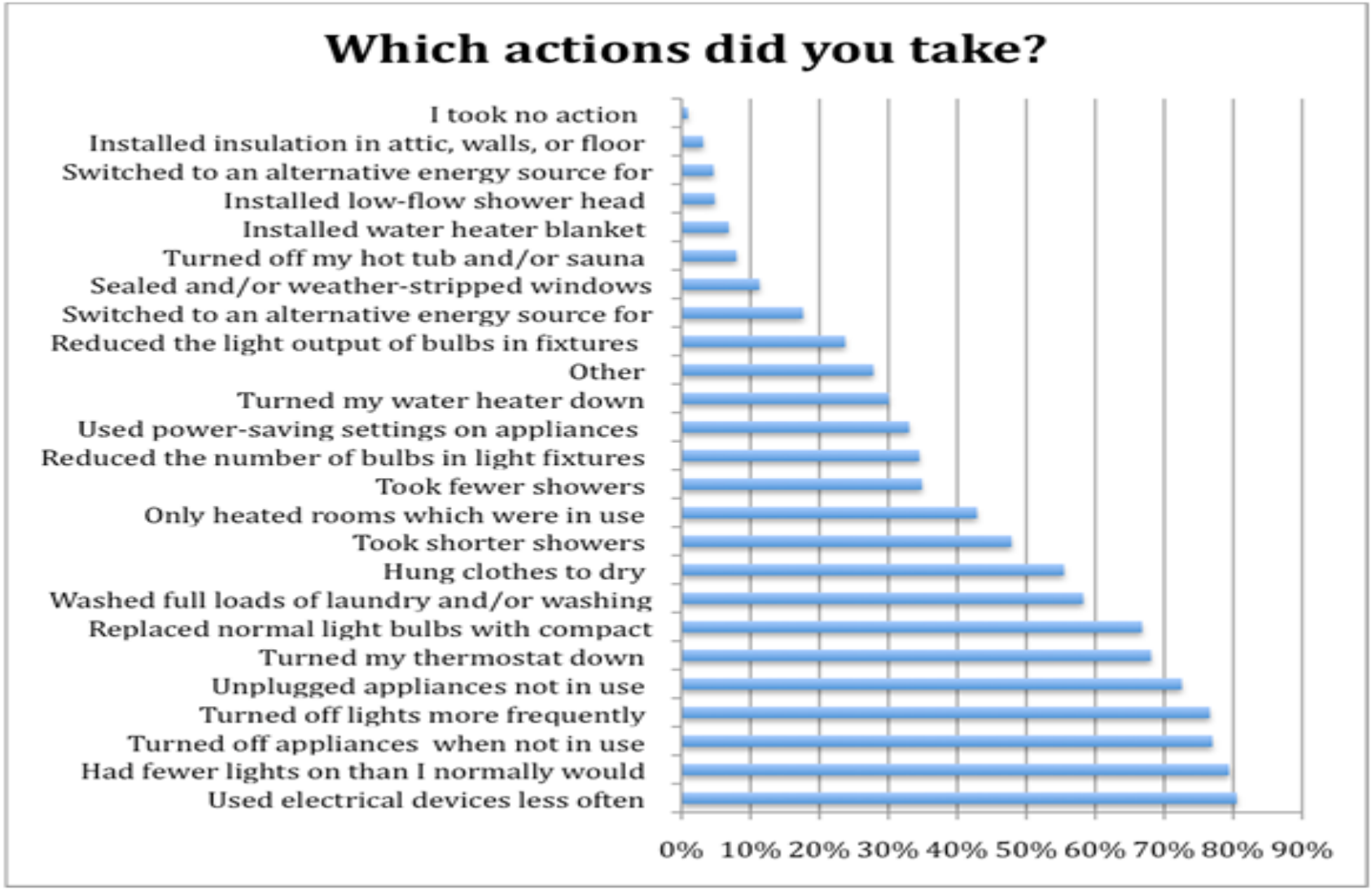
Save power by more than 15% (sum of power reductions) % W

! Beware of heat stroke. Save power with flexibility and comfort.

※Numbers listed for power saving effect are estimated as reduced power consumption and their % changes from the average daytime power consumption of about 1200W at 14:00 when family member(s) is(are) at home (ANRE estimation).

Super Cool Biz Summer 2011 office fashion ideas

What a little behaviour change can do



c. Technology replacements

- deploying energy-efficient lighting, especially compact fluorescent lamps (CFLs) and light-emitting diodes (LED);
- replacing old equipment (ranging from refrigerators to traffic signals) with new, more-efficient technology;
- retrofitting and/or adjusting existing equipment to make it more efficient;
- installing load-control devices on selected appliances and equipment.

d. Rationing and market instruments

- Block load shedding
- Consumption rationing via quotas or entitlements
- Market-based rationing (quota and trade)
- Incentive/reward schemes (*e.g.* California's 20/20 rebate programme)

The cases

	Japan 2011	Juneau 2008	New Zealand 2008	South Africa 2008/09	Chile 2007/08
Energy savings	15% for most sectors	25% to 40%	3.6% to 6.7% for households	20%, primarily for industry	No demand growth
Duration	Since March 2011	6 weeks	June-July 2008	January 2008-2009	Several months
Electricity shortage management measures					
Price increases		**X**	**X** (industry)	**X**	**X**
Information campaigns	**X**	**X**	**X**	**X**	**X**
Technology replacement	**X**	**X (CFLs only)**	**X**	**X**	**X**
Rationing	**X**	**X**		**X**	**X**
Market mechanisms			**X**	**X**	

2011 Japan earthquake & tsunami

- 15-25 GW of TEPCO's total 70 GW capacity knocked out of service from the March 11 earthquake and tsunami
- 9 days of black-outs caused confusion and hardship
- Transport, hospitals, businesses hit hard
- Emergency Response entity (Electricity Supply Demand Emergency Response Headquarters) developed plans for the summer peak period
- Energy savings measures:
  - Multi-media awareness-building campaign
  - Mandatory rationing of 15% for industry
  - Super Coolbiz programme
  - Energy savings advice to small and medium enterprises
- Japanese community spirit and innovation in gear
- *Most consumers are ready to respond to a crisis. They just need some guidance to contribute.*

Key messages from the case studies

Case study	Key message
Japan	Most consumers are ready to respond to a crisis. They just need a little guidance in order to quickly contribute
Juneau, Alaska	Establishing a new, neutral entity (not government or industry) can help mobilize community response
New Zealand	Shortfall-prone countries should put in place pricing and other mechanisms to mitigate shortfalls
South Africa	Don’t rely on a single sector – need to mobilize all consumers
Chile	Plan ahead through collecting good data.

Recommendations for Governments and Regulators

- Evaluate whether your power sector is exposed to electricity shortfalls, and if so make contingency plans
- Designate responsibility for planning and implementing shortfall management strategies
- Make sure energy providers collect data on electricity usage patterns, to identify energy savings measures
- Consider the full range of energy savings measures in any electricity shortfall strategy
- Anticipate and resolves any regulatory or other barriers to your energy savings measures
- Clearly articulate a trigger point that defines when a shortfall is imminent, and when shortfall management should commence

Discussion topics

- Which of these demand side measures have been used in Ukraine?
- Which do you think would have the most impact on a shortfall?

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Questions?

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Juneau Alaska

- Small, isolated community
- Electricity shortfall by avalanche brought on a quick response
- *Juneau Unplugged* campaign reduced demand by 40%
- Fuel switching provided the most savings
- An NGO proved effective in mobilizing the community

JUNEAU UNPLUGGED
live more, use less

Evaluating rationing strategies

Rationing Strategies	Advantages	Disadvantages	Examples
Block load shedding	Easy to implement	Unpredictable, very inefficient, unpopular	Bangladesh California
Class-wide consumption quotas	Equitable Easy to explain and implement	Inefficient Requires "safety nets"	Brazil Japan
Market-based rationing (quota and trade)	Economically efficient Sustainable	More difficult to implement Requires strong leadership	Brazil
Incentive/reward schemes	Equitable Sustainable Encourages efficiency investment	More expensive in the short run	California
Rationing using price signals	Equitable Sustainable Reflects marginal costs Encourages investments	Bill impacts from higher rates Need to maintain a social safety net May induce load impact	Most OECD cour

Source: Heffner, et al 2009