Net Metering for Malaysia:

International experiences and policy options

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IET – International Energy Transition

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Solar PV Workshop (Net Energy Metering, Self-Consumption and Large Scale)

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IET – International Energy Transition

Dr. David Jacobs

- Founder and director of IET
- 10+ years experience in renewable energy policies
- 50+ publications on energy and climate
- PhD in renewable energy policies (feed-in tariffs)
- Lecturer on energy and climate issues at FU Berlin
- 2010: Researcher at UNITEN (Brain Gain Malaysia)

- Focus on sustainable energy policy and market design
- Consulting and presentations in 30+ countries around the world
- Clients: IRENA, UNEP, BMWi, IEA RETD, World Bank, OSCE, Ka-Care, etc.

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- Foster dialogue on emerging policy issues and innovation across the globe.

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Developments in PV policies:

Increasing incentives for “prosumerism”

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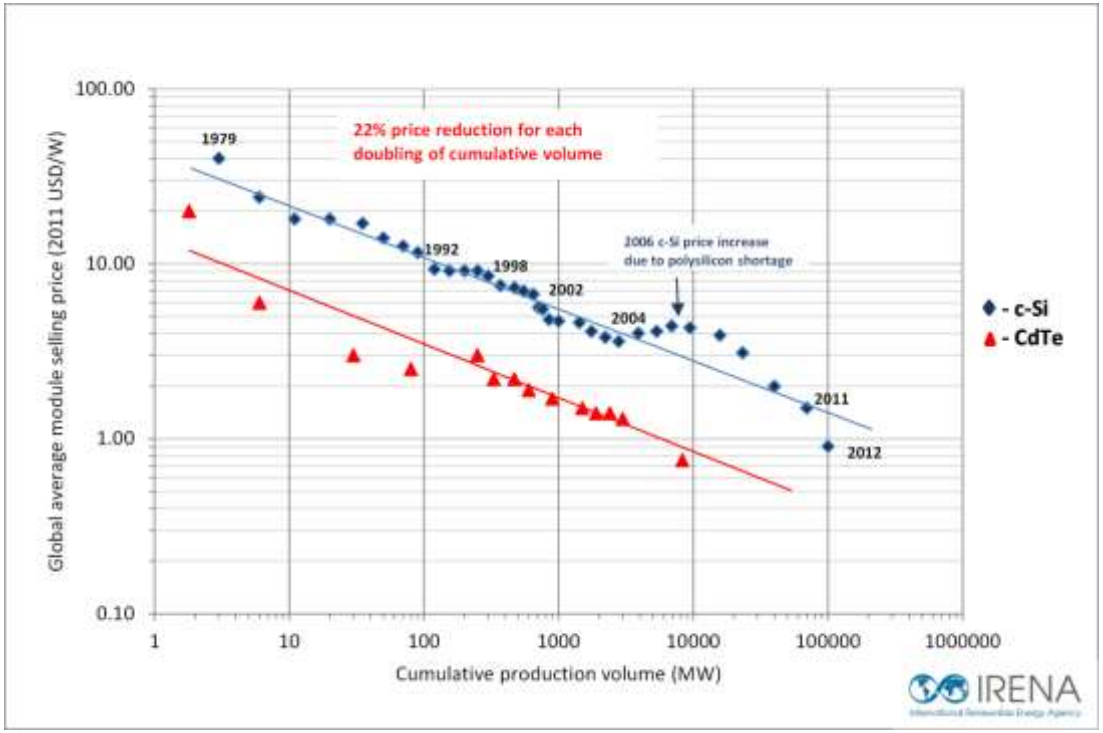
Cost development of PV

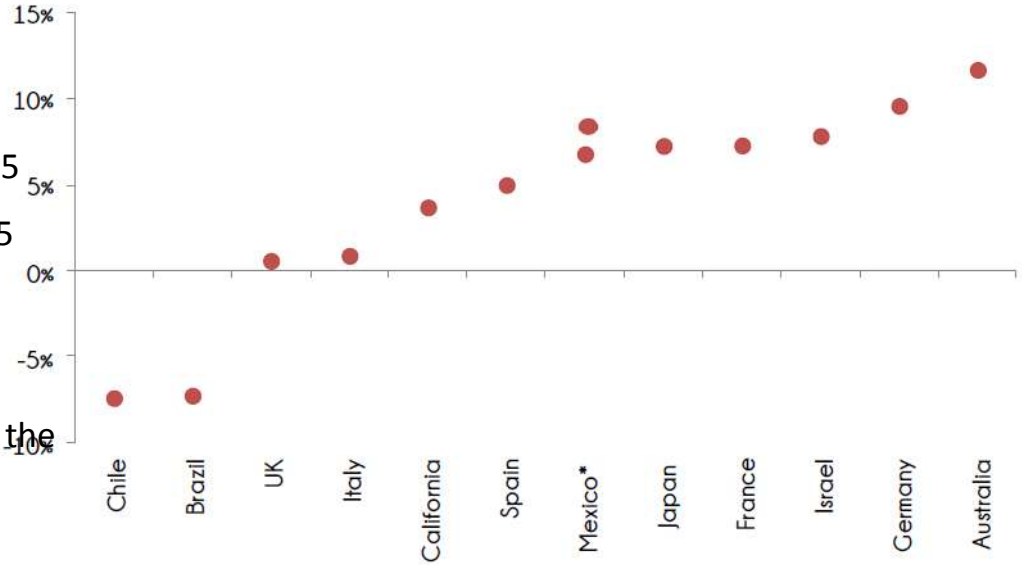
- 22% price decrease for each doubling of cumulative installed capacity
- 80% cost reduction in the past 5 years
- Further cost decreases can be expected:
  - 1.8-4 €cent/kWh in 2050 (7sen-16sen per kWh)



Development of electricity prices

- Increasing wholesale and retail prices in many parts of the world, due to:
  - Reduced energy subsidies for fossil fuels
    - Subsidies in OECD countries: USD 55 to 90 billion annually between 2005 and 2011.
    - Global subsidies: US$ 550 billion in 2013 alone – more than four times the subsidies that were spent for renewables
  - Market liberalisation – « true costs »
  - Support programs for renewables

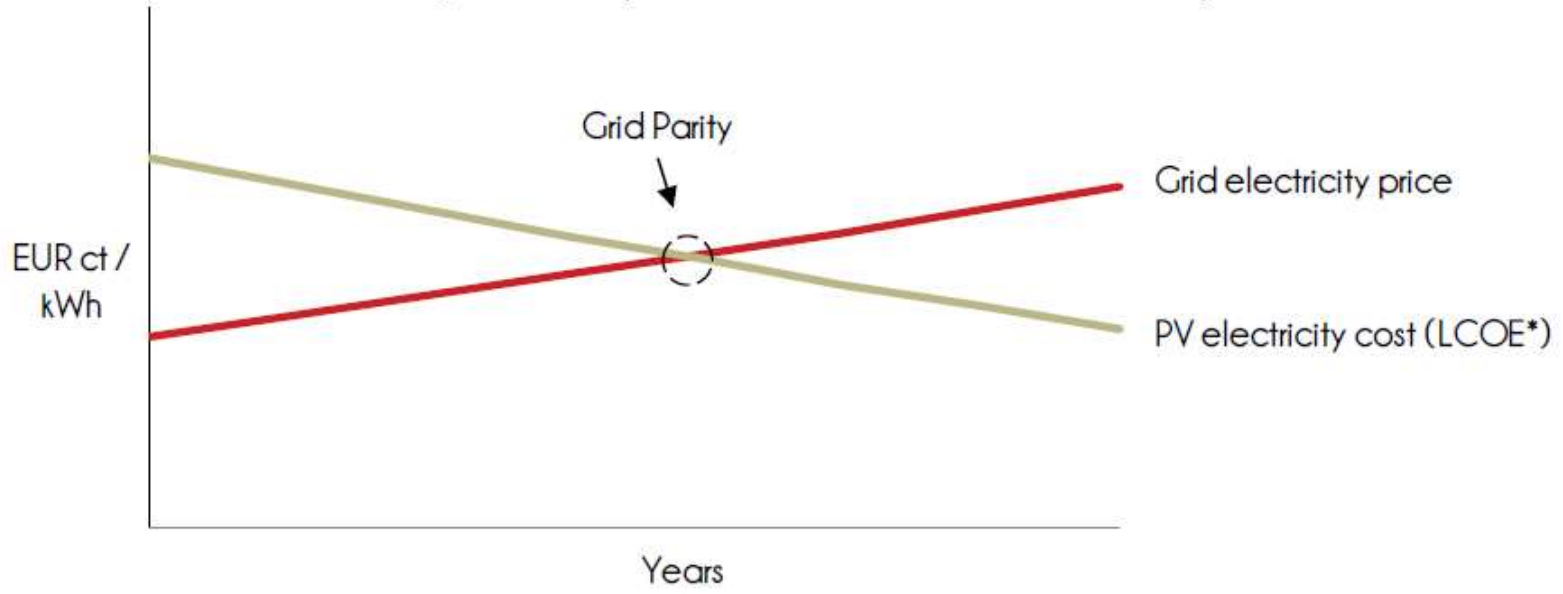
Figure 2: Evolution of retail electricity prices for residential consumers from 2009 to 2014



Source: Creara 2015

Simplistic grid parity

Figure 4: Simplistic Illustration of PV Grid Parity

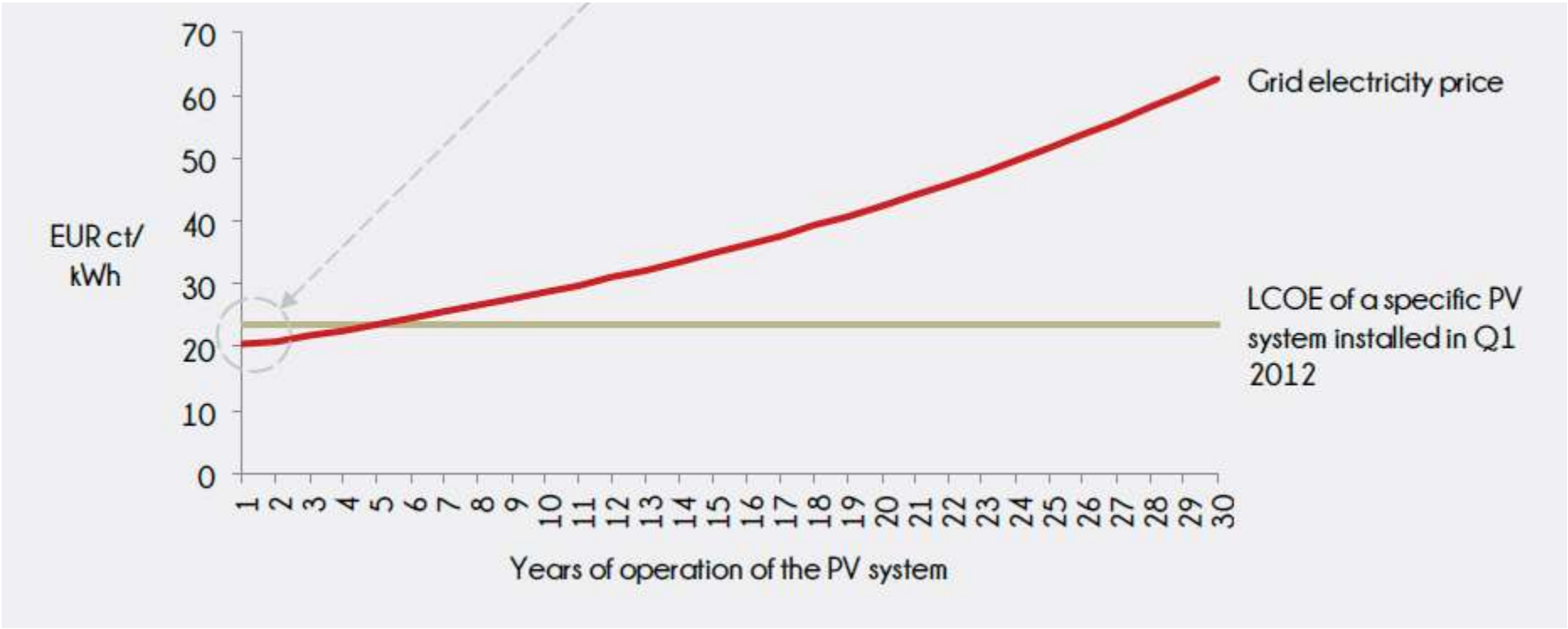


Note: * Levelized Cost Of Electricity
Source: Eclareon Analysis

Source: Eclareon 2013

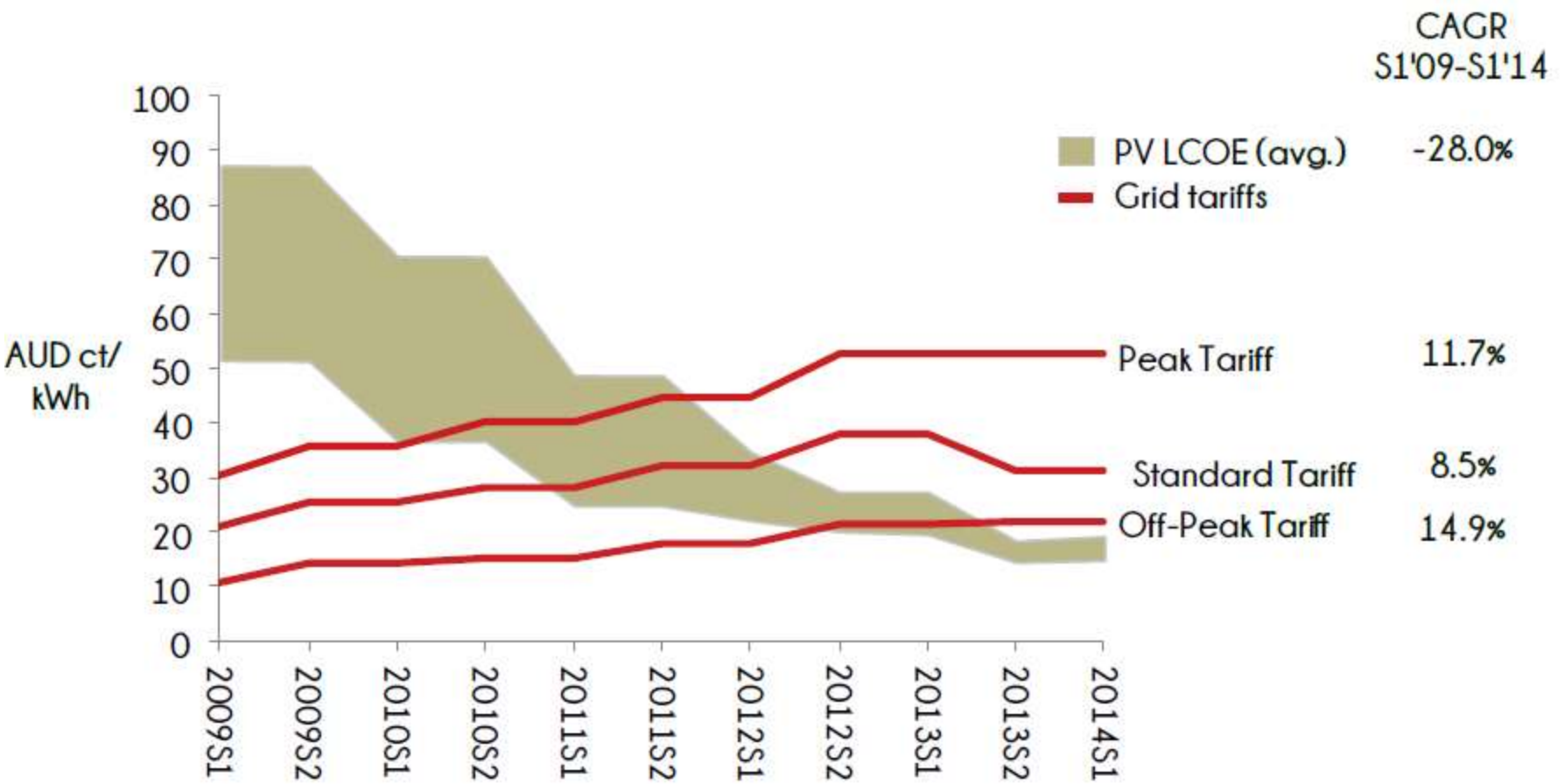
Simplistic grid parity – PV lifetime

- Net Metering: a bet for rising retail prices



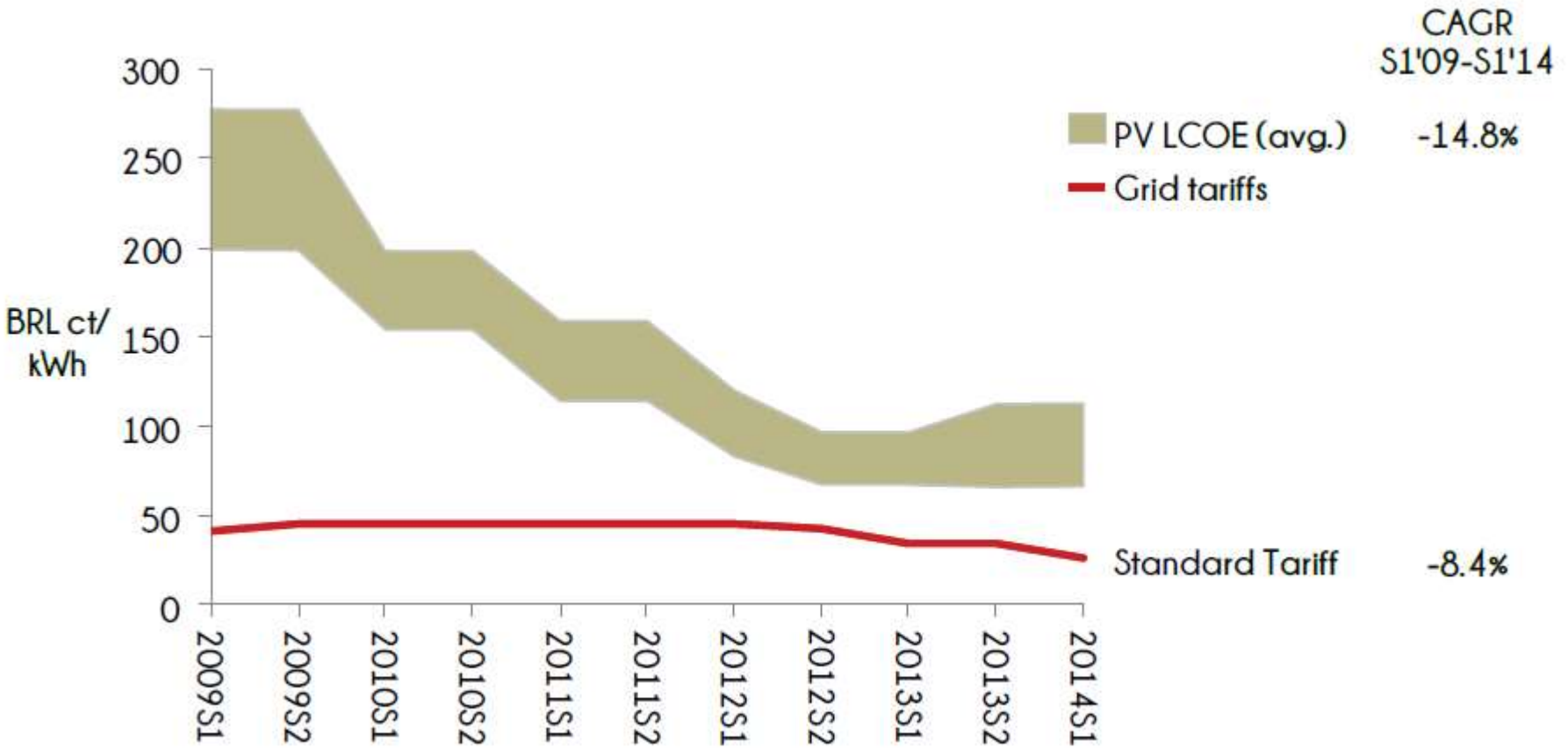
Source: Creara 2015

Grid parity in Sydney, Australia (residential)



Source: Creara 2015

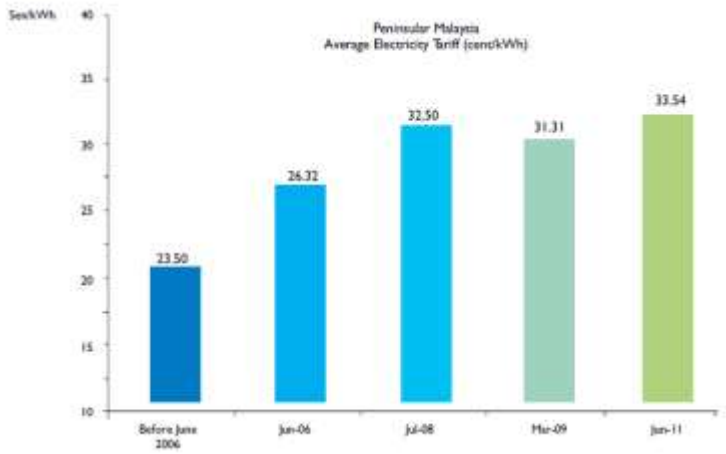
“Grid parity” in Sao Paulo, Brazil (residential)



Source: Creara 2015

Electricity prices in Malaysia

- Electricity prices in Malaysia have increased considerably in the past years
- Solar PV tariffs have been reduced
- Grid parity for certain consumer groups is approaching – residential sector with high consumptions



Domestic Tariff (kWh)	Current Rates (sen/kWh)	New 2014 Rates (sen/kWh)
For the first 200 kWh (1-200 kWh) per month	21.8	21.8
For the next 100 kWh (201-300 kWh) per month	33.4	33.4
For the next 100 kWh (301-400 kWh) per month	40.0	51.6
For the next 100 kWh (401-500 kWh) per month	40.2	
For the next 100 kWh (501-600 kWh) per month	41.6	
For the next [illegible] kWh (601-700 kWh) per month	42.6	54.6
For the next 100 kWh (701-800 kWh) per month	43.7	
For the next 100 kWh (801-900 kWh) per month	45.3	
For the next kWh (901 kWh onwards) per month	45.4	57.1

http://savemoney.my/electricity-tariff-increased-by-15-in-malaysia-2014

Net Metering policies internationally:

Increasing interest

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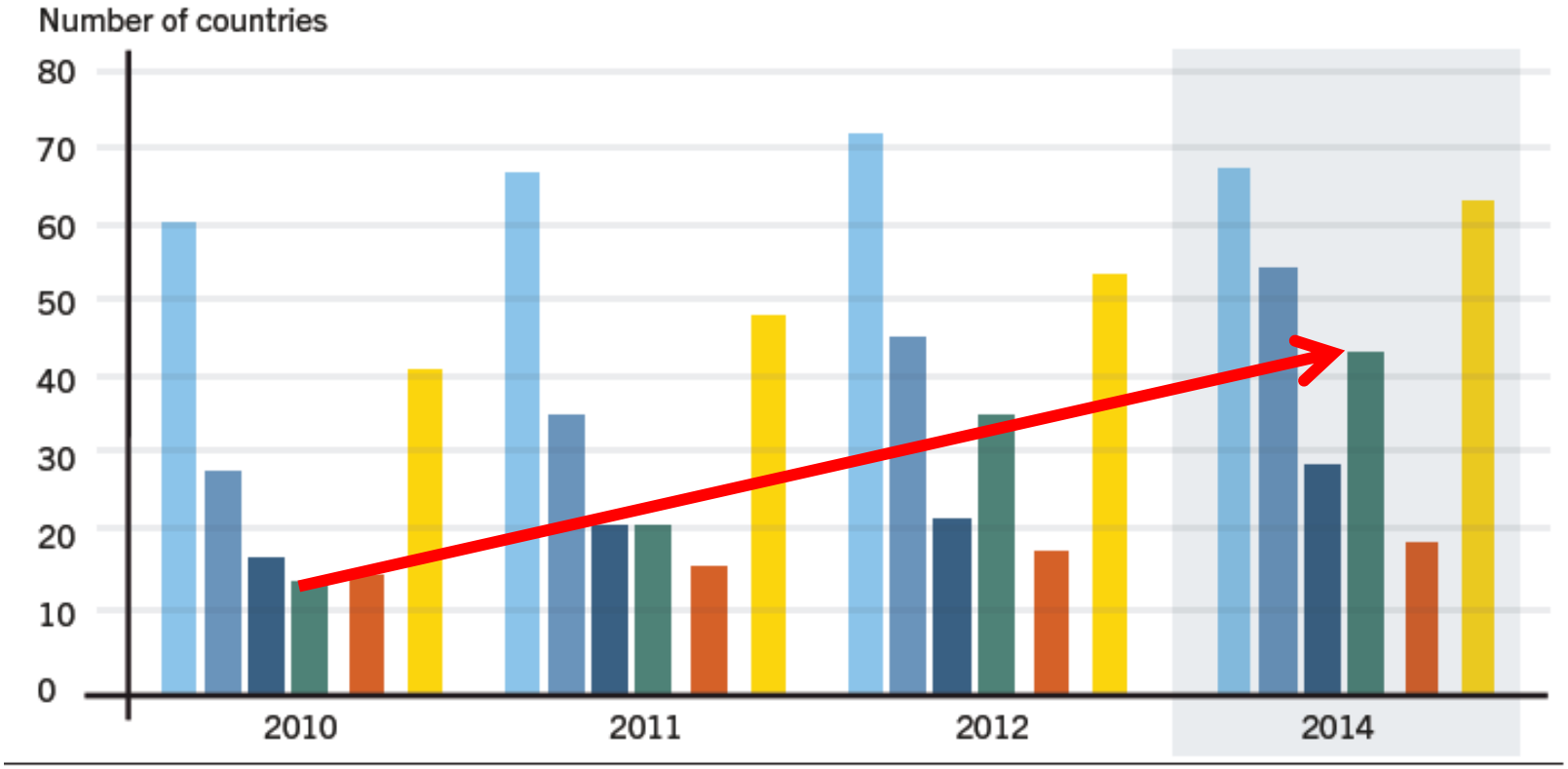
Number of countries with Net Metering

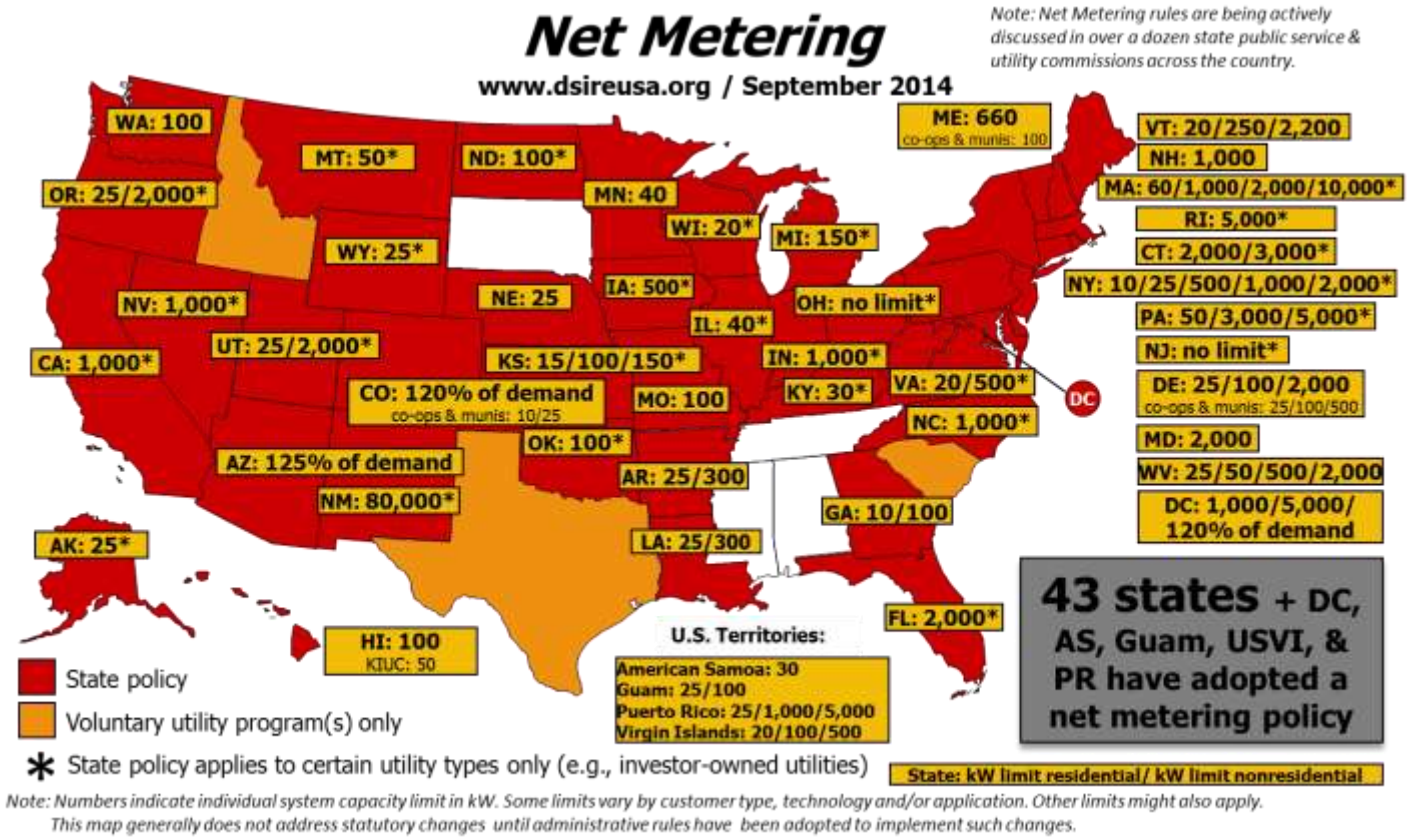
- Up from 13 countries in 2010 to 43 countries in 2014



Source: REN 21 2014

Net Metering international

- Policy was first implemented in the US in early 1980s



Net metering programs world-wide

Europe	Americas	Americas	Asia	Middle East	Africa
Albania	Barbados	Costa Rica	Japan	Jordan	Tunesien
Belgium (regional)	Chile	Grenada	Philippines	Palestine	Cap Verde
Czech Republic	Guatemala	Jamaica	Singapore	Lebanon	South Africa
Denmark	Canada (regional)	St. Lucia	South Korea	Syria	Egypt
Greece	Mexico	Micronesia	Thailand		Lesotho
Italy	USA (43 States)	Honduras,	India		
Malta	Peru	Guatemala	Pakistan		
Switzerland	Dominican Republic		Sri Lanka		
Portugal	Panama				
Spain	Uruguay				
Cyprus	Brazil				
Latvia					
Ukraine					

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Source: REN21 2014

Self-consumption of electricity:

Is this really something new?

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Historic assessment of self-consumption non-utility generation

- Before electricity markets were monopolized, self-consumption and non-utility generation was mainstream (not the examption)!
  - In the US, the share of non-utility, cogeneration based power production had decreased from more than 50% in 1912 to 3.5% in 1978 (EEI 1981)
  - In Germany, non-utility power generation was exceeding utility-based power generation until the 1930s. Later, it decreased from 37.5% of the total installed capacity in 1950 to 16.4% in 1981 (Deutscher Bundestag 1988).
- Today, 10% of power production in Germany is self-consumed by the industrial sector.

Net Metering:

Important design features

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Design Options: Eligible technologies and sectors

Features	Design Options
Eligible Renewable/ Other Technologies:	**Photovoltaics** (but also Solar Thermal Electric, Landfill Gas, Wind, Biomass, Hydroelectric, Geothermal Electric, Municipal Solid Waste, Hydrokinetic, Anaerobic Digestion, Small Hydroelectric, Tidal Energy, Wave Energy, Ocean Thermal)
Applicable Sectors:	**Residential (limitation to certain system size?)** Commercial, Industrial, Schools, Local Government, State Government, Federal Government, Agricultural, Institutional

Source: Freeing the Grid 2014

Design Options: Program or system-size caps?

Features	Design Options
Program size caps	• Defined as a percentage of total peak demand (e.g. 5% of peak demand) • Defined as a capacity limit (e.g. 500 MW) • Unlimited
System size caps	• Limit on installed capacity per unit (e.g. 10 kW) • Limitation in relation to the average, annual electricity demand in a region/country (e.g. average electricity demand of 300 kWh/a; 1% of 300 kWh = maximum size of 3 kw) • Caps on the maximum allowable level of distribution level penetration on a per-circuit basis (e.g. 15% of decentralized generation). • No direct caps (indirectly via role-over provisions)

Design option: Roll-over provisions for excess electricity

Features	Design Options
Roll-over period	• Indefinite • Bi-annually • Yearly • Monthly • Hourly

- The electricity grid servers as a “storage unit”
- Electricity can be **banked** (surplus electricity is carried forward and used to offset consumption in the future)
- Depends on the billing system (frequency) and climate conditions
- Restrictive approaches: incentives to size plants according to onsite demand

Design option: Defining the value of excess electricity

Features	Design Options
The value of the roll over:	• retail price • wholesale price • combinations (A fixed feed-in tariff rate)

- Policymakers need to strike a balance between establishing **incentives for PV investment** and **stability** in the electricity system!

Net Metering for Malaysia:

Changing the rate structure?

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Fair cost distribution?

- Is net metering “fair” to residential customers that do not participate in the program? (“Death-spiral argument”)
- Pay a fair portion for the upkeep of the grid (net metering uses the grid as a storage unit)
- Fair cost distribution depends on electricity price structure (for the residential sector):
  - Volumetric charges (per kWh)
  - Fixed charges (per connection)
  - Maximum demand (kW)

Higher fixed charges: The way forward?

- High fixed charges (Alternatives: Minimum bill - irrespective of consumption)
  - Disincentive for Net Metering
  - Limited incentives for energy efficiency
  - Higher burden for low-income households
  - Incentive for grid defection (in the long-run)
- Additional charges that only apply to Net Metered costumers?
  - Per kW monthly charge (Arizona)
  - Per kW “standby” charge (Virginia)

Net Metering and self-consumption:

A balance of costs and benefits

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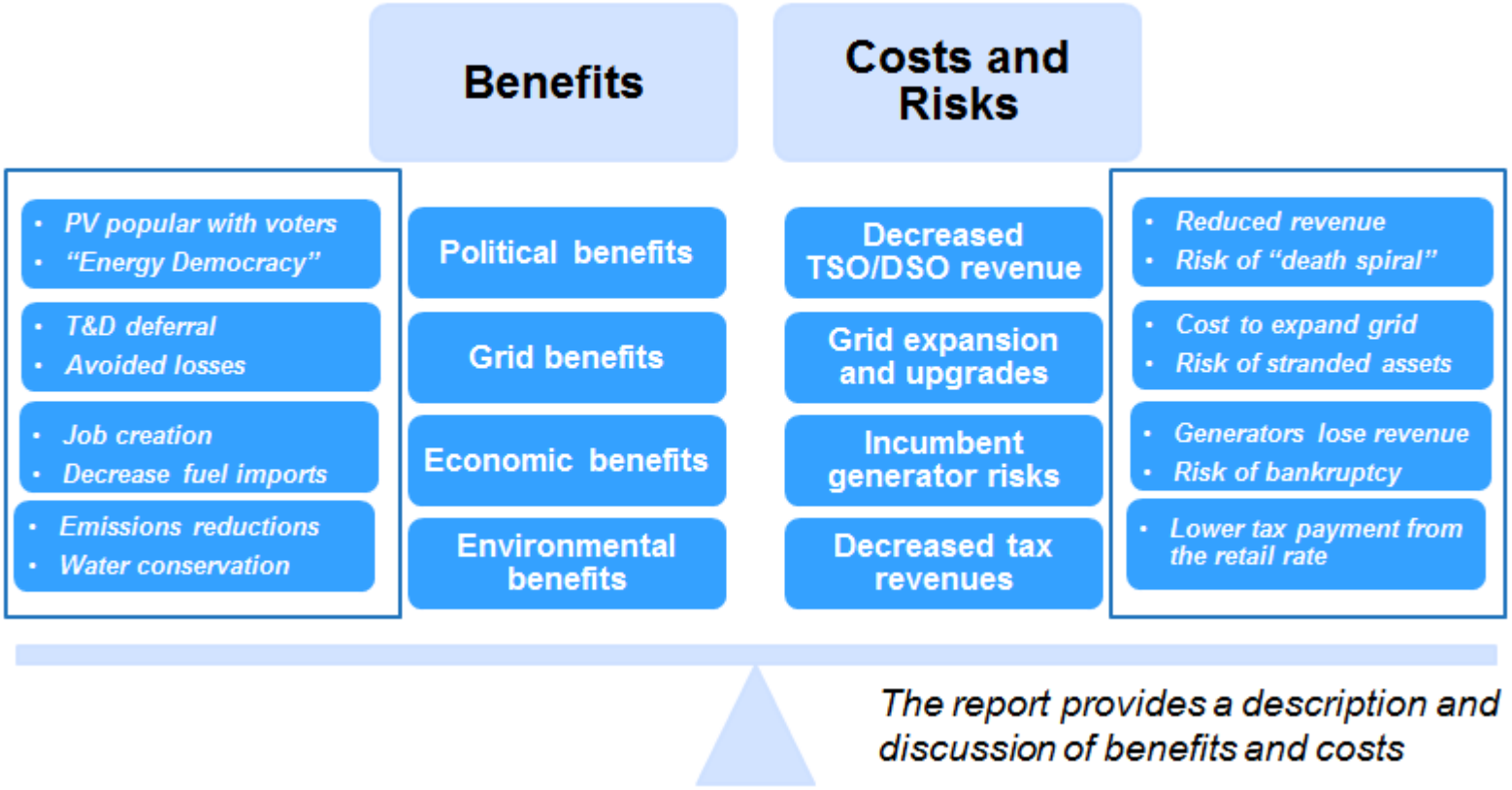
Opportunities and risks need to be clearly articulated and balanced – and stakeholder interests aligned



Source: IEA RETD 2014

Benefits and costs: Establishing a standard methodology for assessment

- Costs for the Net Metering costumer
  - installation costs, insurance costs, maintenance costs, and inverter replacement
- Costs for the system (and the utility)
  - Integration costs
  - Lost revenue for the utility
    - Due to a shrinking customer base
    - Competition between (old) utility business and self-generation

Source. IREC 2013, Couture 2014

Benefits and costs: Establishing a standard methodology for assessment

- Costs for the system (and the utility)
  - Billing and metering costs (administrative costs)
    - One-stop-shop agency
    - assume automization in the future
- Calculating reduce value of solar in high penetration scenarios

Source. IREC 2013, Couture 2014

Benefits and costs: Establishing a standard methodology for assessment

- Benefits for the electricity systems
  - Avoided energy benefits
    - the cost of the electricity that the utility did not need to produce – "marginal generation displaced" – peak generation, over 30 year lifetime of PV)
    - Peak shaving!
  - Avoided line and system losses
  - Secure generation capacity (despite intermittency – system-wide analysis necessary)
  - Distribution and transmission impact (avoided congestions in the grid)
  - Source: IREC 2013

Benefits and costs: Establishing a standard methodology for assessment

- Benefits for the electricity systems
  - Grid support - ancillary services (reactive power, voltage control, frequency response)
  - Financial services (fuel price hedge)
  - Financial services (reduced market prices during peak hours)
  - Security services: resilience and reliability
  - Environmental services (carbon and other emissions)
  - Calculating macro-economic benefits (job creation)
  - Fast deployment of solar PV (compared to other technologies)
  - Democratisation of energy system (not only “rich people”) – special programs for lower-income families?

Source. IREC 2013

Net Metering:

Recommendations for Malaysia

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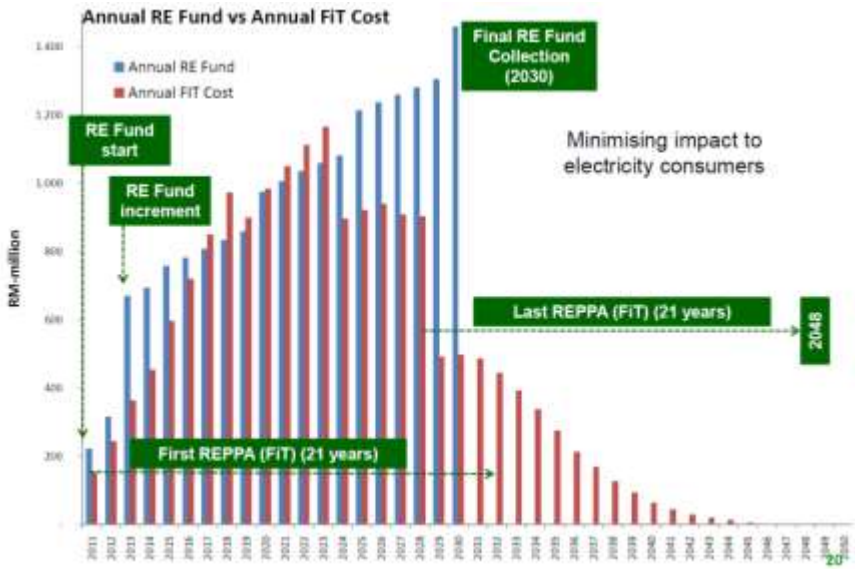
Benefits of Net Metering in Malaysia

- Limited budget for PV under FIT program - “budget-neutral” additional PV capacity
- Incentives to size PV systems according to onsite load (limited effects on distribution and transmission system)
- Pave the way for citizen-owned renewables – democratize the energy system



Investment (in)security in the case of net metering compared to FITs

- Changes in Net Metering regulations will effect new power plants AND existing power plants (no contractual arrangements)

- Changes in electricity pricing (moving from monopolised markets to liberalized markets in the coming 20 years?)

- Changes in electricity rate structure (customer classes)

Recommendation for Malaysia -
A stepwise approach towards "prosumerism"

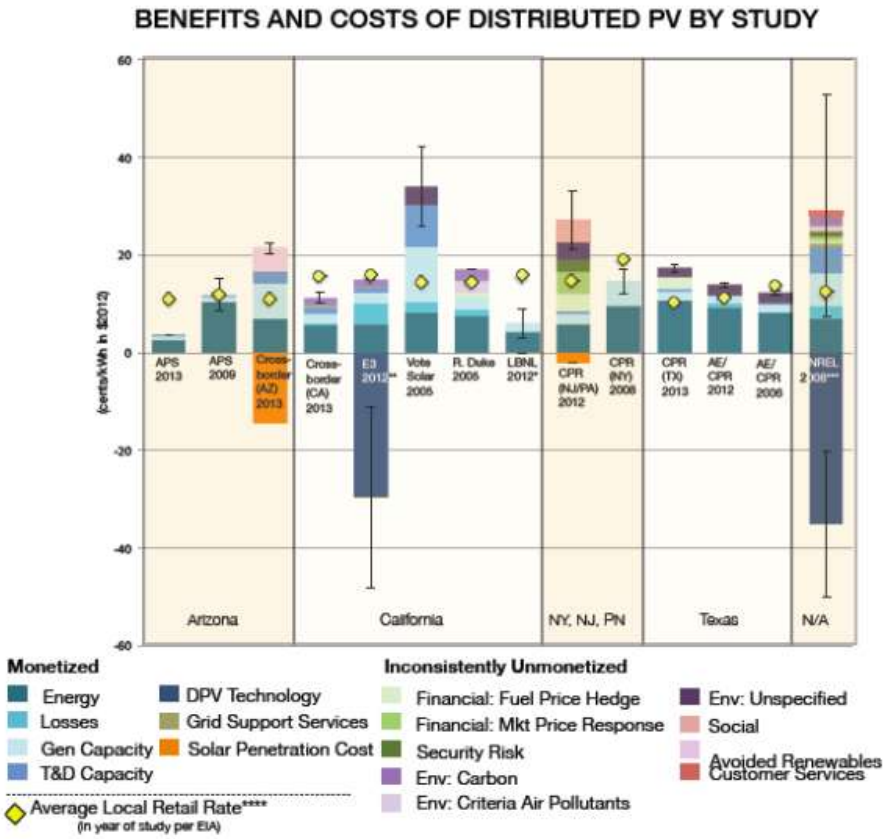
- **Step 1: Establish a simple and attractive Net Metering program in Malaysia**
  - Operate FIT and Net Metering in parallel
  - Design: Annual roll-over; excess electricity remunerated with retail price (simple net metering)
    - The number of interested households is limited
    - Impact on utility revenues and electricity system are minimal
    - Raise awareness amongst society concerning falling PV prices

Recommendation for Malaysia -
A stepwise approach towards "prosumerism"

- **Step 2: Establish a comprehensive framework for increasing shares of self-generation and prosumerism**
  - Re-regulation once the LCOE of solar PV is substantially lower than retail electricity prices (20% or more)
  - Adjustment of retail price structure; detailed and transparent cost/benefit analysis
    - The number of interested consumers will increase (residential and industrial sector)
    - Impact on utility revenues and electricity system will increase
    - In the long-term, the FIT program for distributed solar PV can be phased-out (focus on larger scale, free-standing systems).

Recommended analysis for Net Metering in Malaysia:

- An analysis of components of the electricity price in Malaysia (which costs are related to wholesale, grid usage, grid expansion, supply, etc.?).
- An analysis of existing cross-subsidies in the Malaysia electricity sector ("rich support poor") and the implications of Net Metering for cost-sharing.



Source: RMI 2013

- Development of a transparent standard methodology for analysing costs and benefits of Net Metering (distributed solar PV).

“Prosumerism” and grid defection:

The next revolution in electricity markets?

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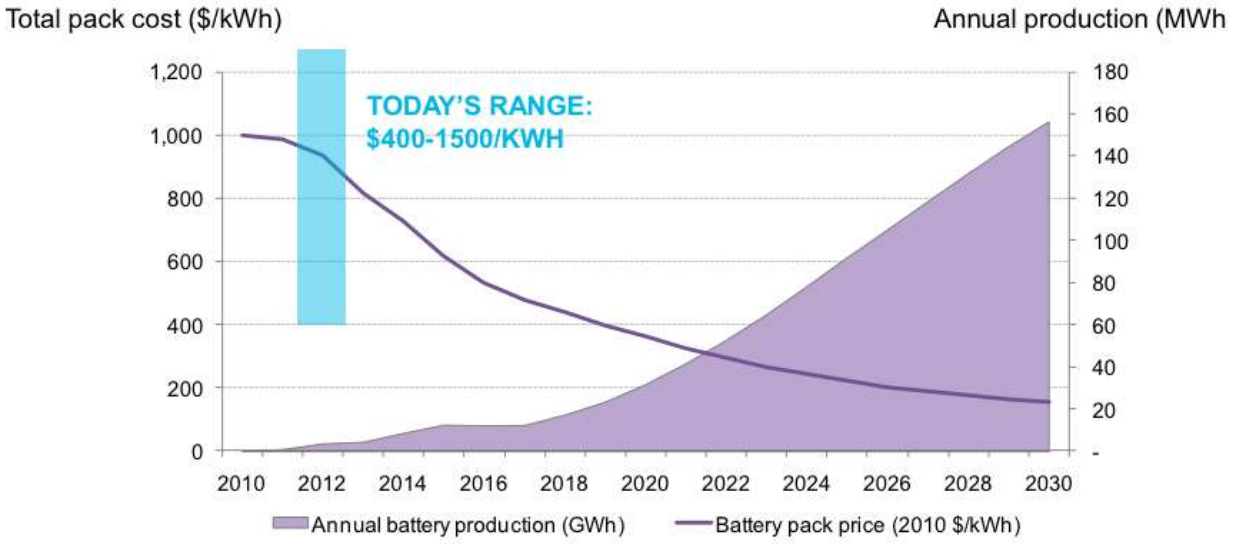
Grid defection

- In addition, cost for battery storage systems have dropped by 25% (in the first half of 2014)
- Further cost reductions can be expected

LI-ION BATTERY PACK COST AND PRODUCTION, 2010-30



Source: Bloomberg New Energy Finance

Bloomberg NEW ENERGY FINANCE

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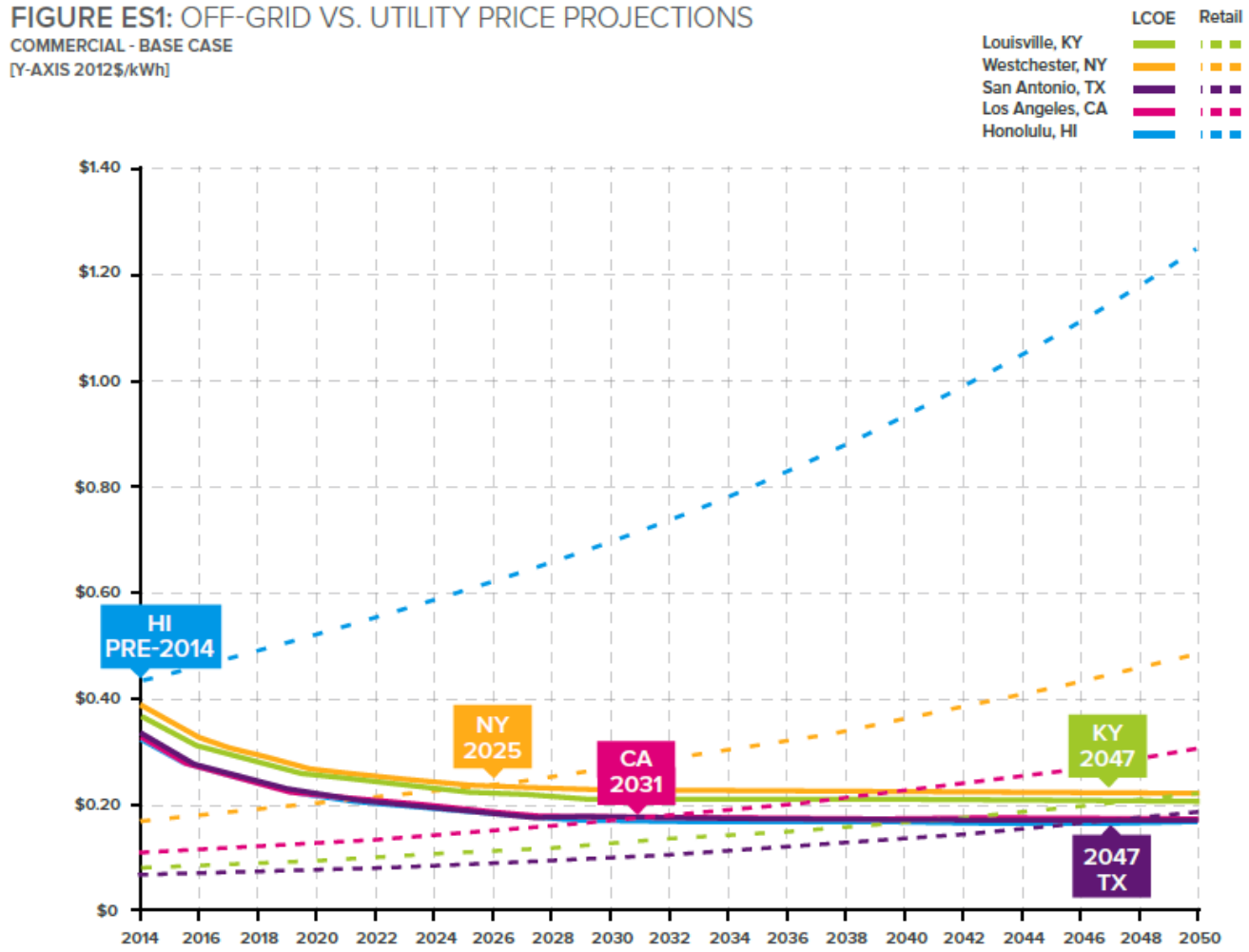
Grid defection: Not an imminent threat to utilities – but foresight required!



Source: RMI 2013

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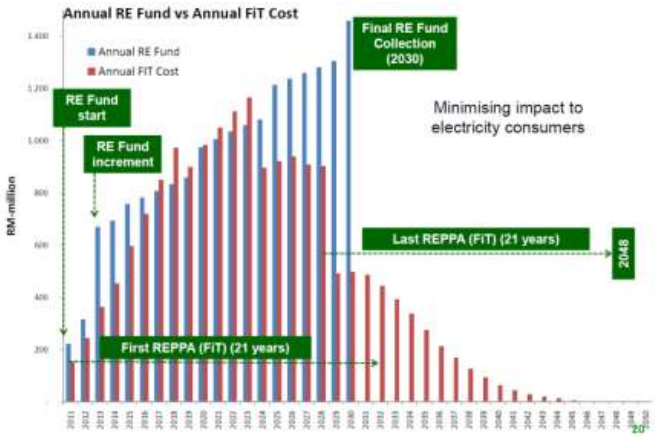
Summary

- Distributed solar PV (generation and consumption) is an important corner stone of the future electricity system. Don't pretend this is not the case! **Pro-active policy design is required.**
- Net Metering can deliver **budget-neutral** additional solar next to the FIT program.
- **Malaysian citizens** will demand for Net Metering – even if this is not in line with utility's BAU



Further reading

RESIDENTIAL PROSUMERS - DRIVERS AND POLICY OPTIONS (RE-PROSUMERS)

IEA-RETD
June 2014

Thank you very much for your attention!

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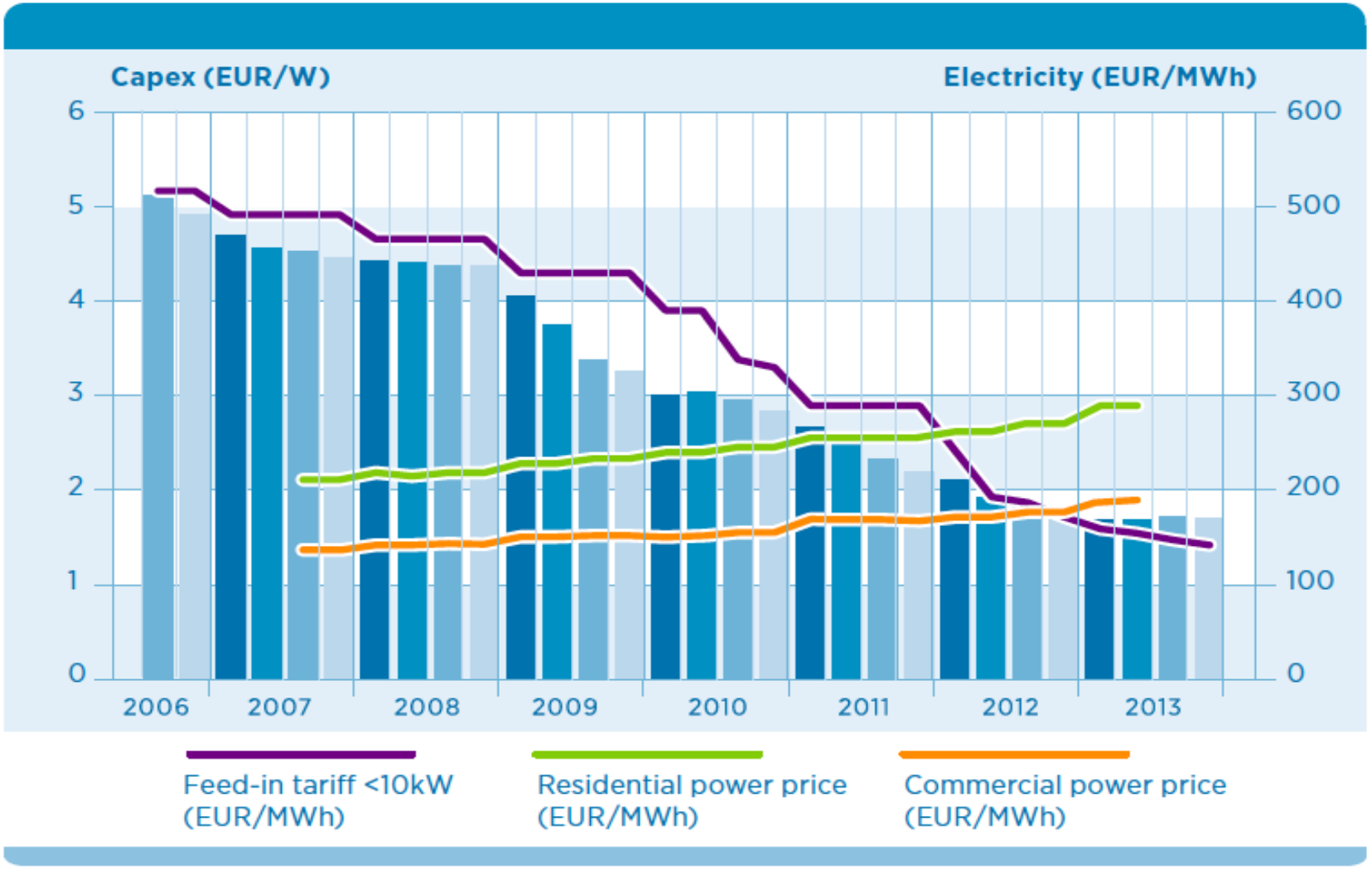
Back-up slides:

Cost-Benefits Analysis: Underlying assumptions

- What discount rate is used?
- What amount of electricity is considered (generation or excess)?
- Time horizon for study?
- Future utility load?
- Level of DG market penetration?
- Geographic boundaries?
- From whose perspective are benefits and costs measured?

Source. IREC 2013, Couture 2014

FITs and self-consumption in Germany



Source: Ferroukhi et al. 2014, http://www.irena.org/rethinking/Rethinking_FullReport_web_view.pdf