Experience in Renewable Energy Policy

Renewable Energy Training Programme

23-25 April 2014, Bangkok

Important messages from Yesterday

Yesterday we heard (Dr. Xiaodong Wang) that the essential prerequisites for success were

- Adequate tariffs and a standardised PPA
- Mandatory grid access
- Incremental cost-pass-through

We also heard that

- Policy comes before finance and tariff design

Yesterday's best question from the floor

- Why should a developing country set technology specific targets, rather than let the market decide what technologies are least cost?

Additional messages this morning

- Objectives should define policy
- One cannot define meaningful policy objectives in the absence of knowledge of the costs

Objectives

Valid objectives of public policy:

- GHG emissions reduction at least cost
- Encourage use of (cost-effective) renewable energy in remote areas to alleviate rural poverty (where grid extension is prohibitively expensive)
- Need to avoid the local environmental damage costs of coal

Objectives that need careful scrutiny

- RE to improve energy security
- RE to leverage industrial development

Poor objective

- We have a renewable energy resource, so it should be exploited

(+Objectives that we don’t like to talk about in public!)

Energy security?

In most countries, energy security only comes up as a potential benefit when trying to justify an expensive RE technology.

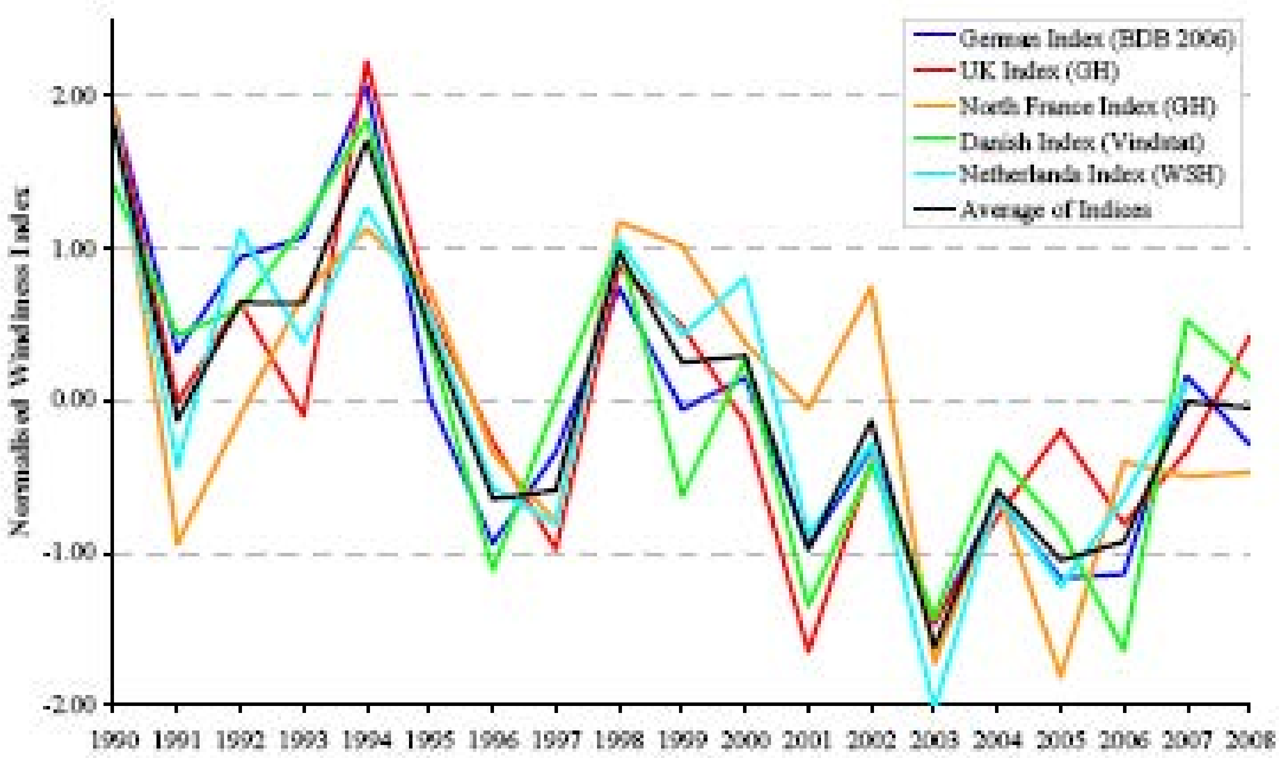
Other hedges against supply disruptions and price volatility of fossil fuel imports

- Increase physical storage (only in US, strategic oil reserve, or Germany, natural gas storage is energy security a valid *a priori* argument for RE to avoid the costs of storage for energy security)
- Futures hedging

Many countries indeed have inadequate physical storage of oil, but you should correct that in any event, regardless of any decision to CSP.

Recommended website:
http://www.risk.net/energy-risk/feature/2323248/the-10-biggest-energy-risk-management-disasters-of-the-past-20-years: tells the story of the Ceylon Petroleum Company's $1billion loss in 2008/2009 playing the futures market!

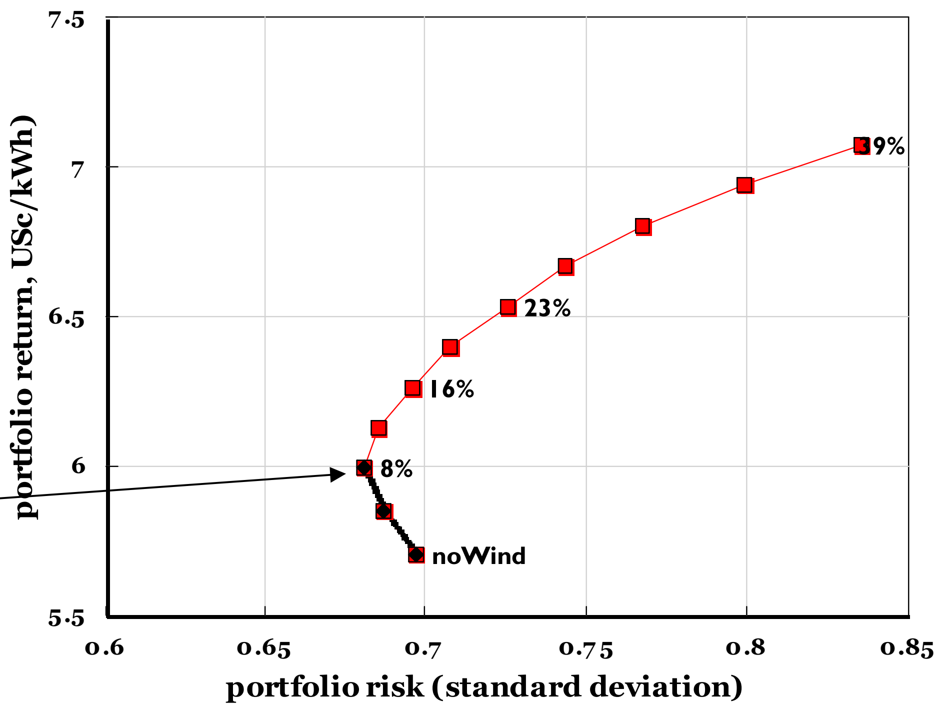
Wind as a risk-free resource?



Geothermal and CSP have lower resource variability.

Risk v Return: Financial portfolio theory

- Wind is to other technologies in a generation portfolio as treasuries are in a financial portfolio (an optimal financial portfolio always includes some treasuries)!
- Chart shows trade-off between risk and return for **Cap Verde**, where generation is diesel + wind – classic illustration of risk.v.return: Minimum risk at 8% wind
- However, wind remains an expensive hedge against fossil fuel volatility for most developing countries.
- But this is at least a rational justification for a target!



CSP is a very expensive hedge against physical supply disruption or price spikes (as during 1991 Gulf War)

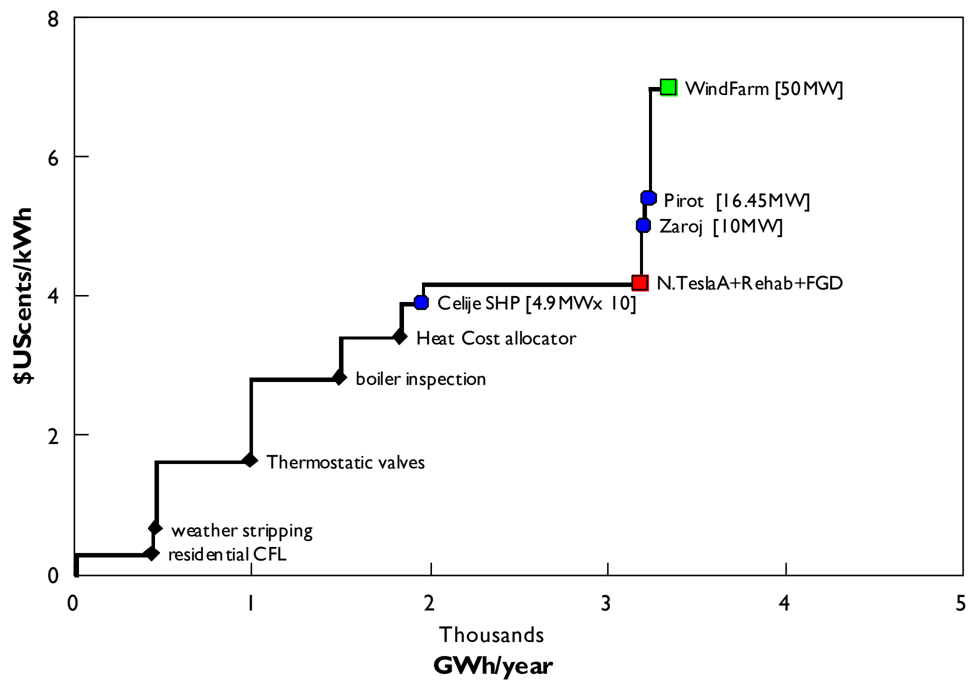
Oil

Coal

Conclusion on energy security benefits: one has yet to see a convincing quantitative argument!

Guidance for Economic Analysis?

- At project appraisal, Guidelines for Economic analysis require a comparison of the proposed project with mutually exclusive alternatives.



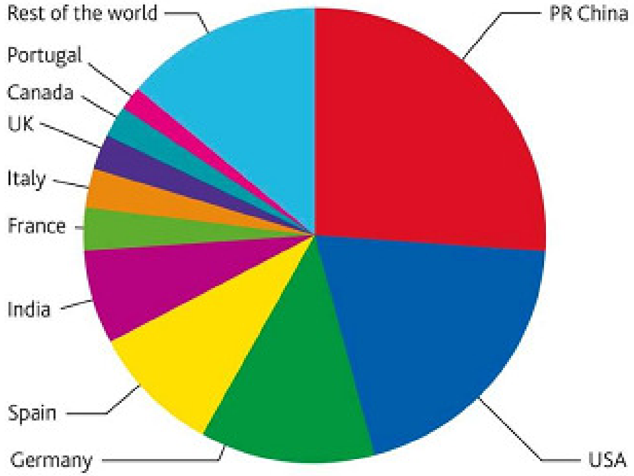
- Usually one hides with the argument that other low hanging fruit (energy efficiency, other options for reducing GHG emissions, including rehab of fossil projects) are complements, not substitutes (i.e. one would also do these things anyway).

- But when setting the framework for a national RE policy analysis, a broader perspective is indeed needed (again: do least cost things first!)

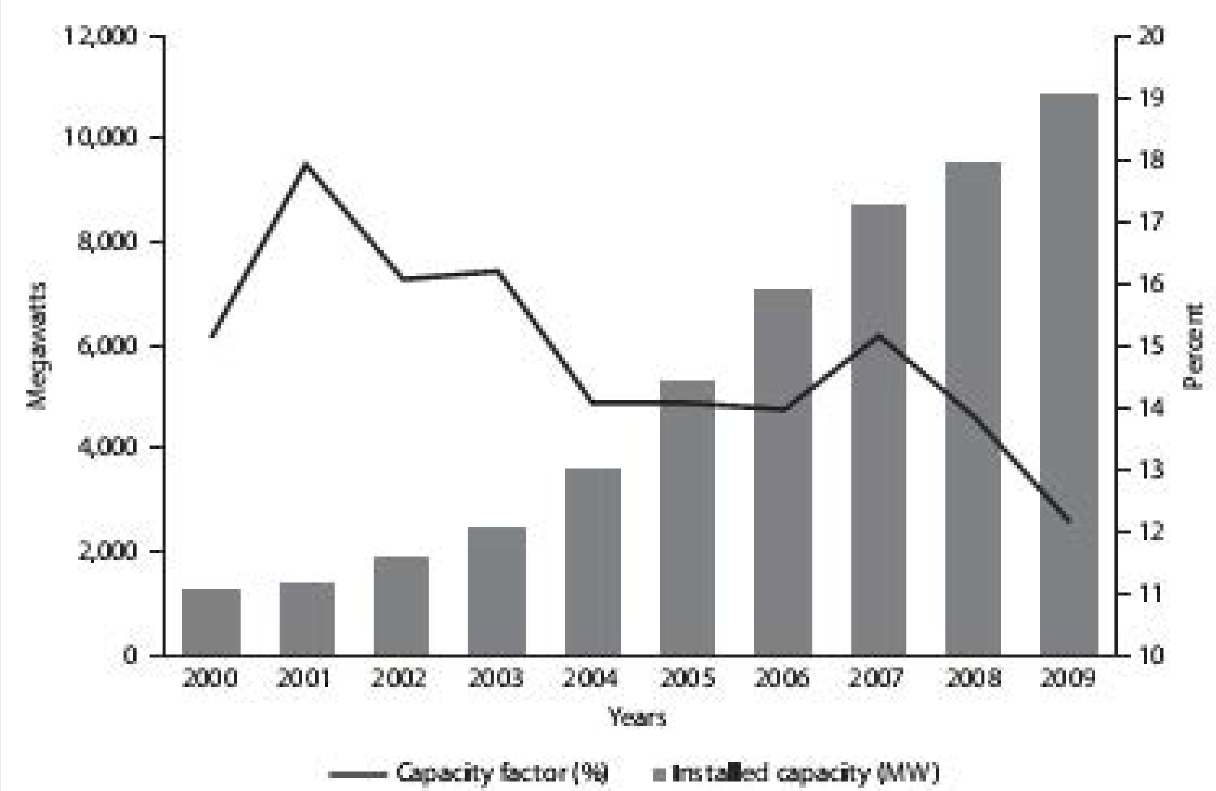
Renewable energy policy

- RE policy is about the trade-offs between the announced objectives and the ability to deliver them
- Countries that clearly articulate and quantify these trade-offs (***and*** meet Dr. Wang's three conditions for detailed design) will succeed (e.g. Sri Lanka and Vietnam for small hydro)
- Countries that rely on political and aspirational goals (6,000 MW by 2020, 15% by 2015 etc.) in the hope that the incremental costs will sort themselves out later (perhaps buried somewhere in utility books) will fail (Indonesia).
- Many countries have impressive MW but few kWh (yardstick for measuring success)

India: wind MW v. Capacity factors



Country	MW	% SHARE
PR China	62,364	26.2
USA	46,919	19.7
Germany	29,060	12.2
Spain	21,674	9.1
India	16,084	6.8
France**	6,800	2.9
Italy	6,737	2.8
UK	6,540	2.7
Canada	5,265	2.2
Portugal	4,083	1.7
Rest of the world	32,143	13.5
Total TOP 10	205,526	86.5
World Total	**237,669**	**100.0**

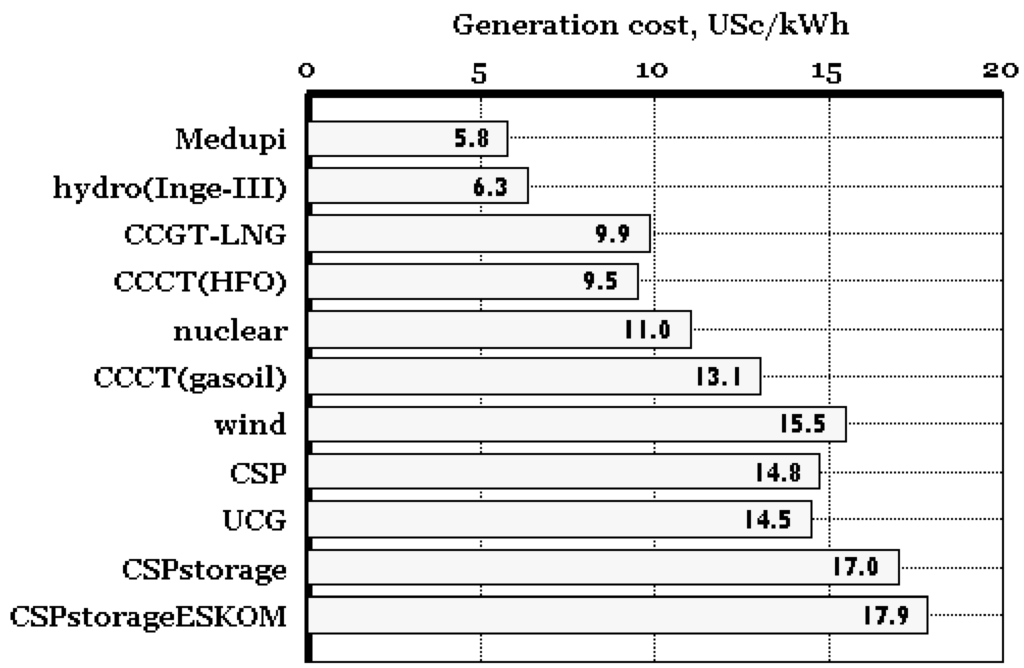


Fundamental question of RE policy: who pays

- Most (though not all) renewable energy involves incremental costs.
- These can be expressed as the cost of avoided carbon (i.e. that value of avoided CO_2 that brings the economic rate of return to the hurdle rate).
- In South Africa, when the World Bank financed the highly controversial 4,800 MW Medupi coal project, this question was dramatically highlighted

Costs of avoided carbon, South Africa

	production cost [USc/kWh]	carbon shadow price $/tonCO$_2$
Medupi Coal	**5.8**	**0**
Hydro(Inge-III)	6.3	7
CCCT-LNG	9.9	156
CCGT-HFO	9.5	105
Nuclear	11.0	67
CCCT(gasoil)	13.1	275
UCG	14.5	223
CSP, 25%LF	14.8	115
Wind	15.5	124
CSPstorage, 40%LF	17.0	143
CSPstorageESKOM	17.9	155



How much finance is needed?

Finance requirements (project scaled in size to deliver the same energy output as Medupi)

	total financial cost	incremental carbon finance requirement
	$USbillion	$USbillion
CCGT-LNG	5.5	-9.3
CCCT(gasoil)	5.5	-9.3
CCCT(HFO)	6.4	-8.5
hydro(Inge-III)	10.1	-4.7
UCG	13.0	-1.9
Medupi	**14.8**	
Nuclear	34.4	19.6
Wind	35.4	20.5
CSP	40.2	25.4
CSPstorage	46.3	31.5
CSPstorageESKOM	48.7	33.9

How much carbon finance was actually available (that financed CSP and wind)?
<$500million

The two big stakeholder consultation questions!

1. Why should developing country governments and/or their consumers pay 50-150$/ton CO_2 when the world carbon markets currently value CO_2 at 5$/ton (or at their peak $30-40/ton)?

2. Even if one could agree that the World Bank should finance RE that has avoided carbon cost of $50/ton CO_2, is there enough concessional finance to buy down the incremental costs? CTF is even better than free money, but rarely available to cover more than 20% of the necessary finance requirement.

The other hidden question: discount rate

- The choice of discount rate is a fundamental question for any economic and policy analysis of RE.
- Almost every utility company in the developing world uses 10-12% as the (real) discount rate for capacity expansion planning. Ever since the WASP model was provided by IAEA, and engineers went to Argonne National Lab for a training program, the same value has been used. Almost every World Bank energy project appraisal also uses 10-12%.
- But where does this number come from? On what basis is this justified?
- RE advocates argue for lower discount rates, because lower discount rates favour capital intensive renewable energy projects.
- The Stern Report, which elaborated the economic impacts of climate change - used a discount rate of 1.4% in the calculations of damage costs of GHG emissions.

Discount rate

- Economic theory says that in the context of development finance the rate should be the opportunity cost of capital to the Government. But why should that be almost the same everywhere, and be the same today as it was 20 years ago?
- Economists have written hundreds of books and papers on the subject, and the literature has become even greater in connexion with climate change strategy
- Social welfare definition : social rate of time preference+change in marginal utility of consumption over time (=marginal utility of income x consumption growth rate).
- Ethicists argue that the social rate of time preference should be zero: the well being of future generations should count as much as current generation. (Stern Report used 0.001, leading to an overall discount rate of 1.4%).

Discount rate

Example: Morocco concentrated solar power (CSP)

		Stern report	Govt. opportunity Cost	ONE
Discount rate		1.4%	5%	10%
LCOE, CCGT	USc/kWh	10.5	10.7	11.3
LCOE CSP	USc/kWh	12.7	16.9	24.5
ERR	[ ]	-0.07%	-0.07%	-0.07%
ERR+local	[ ]	0.18%	0.18%	0.18%
ERR+local+GHG@30$/t	[ ]	1.72%	1.72%	1.72%
Switching value, GHG	[$/ton]	28	106	247

Why 5% as opportunity cost of capital? The last Eurobond and US Bond Issue ($750 million) had nominal coupon rates of 5.5-6%. So with 2% inflation, real rate is ~4%. An additional issuance for the $2billion needed to finance a 360MW CSP might need a higher rate, so to be conservative we use 5%.

Issues in the experience of the past decade: the economics perspective

1. Disagreement as to what constitutes renewable energy: include or exclude large hydro? Include large hydro and many Asian countries are already doing much better than the EU and US

2. Most countries continue to set targets for RE as aspirational goals, not on the basis of economic analysis and an understanding of the incremental costs of RE

3. The key to a successful RE policy is the transparent and credible recovery of incremental costs

4. Where buyers of renewable energy are in financial distress, they will oppose RE, notwithstanding promises that tariff adjustments or subsidies from government will (eventually) compensate them

5. Growing awareness of the importance of economic efficiency as a criterion for selecting policy instruments.

Experience of the past decade

6. No agreement about what works best: many policy reversals – though as shown at the end of this presentation, there are a few clear lessons and emerging trends.

7. The *Law of Unintended Consequences* operates everywhere: RE policy is plagued by careless thinking

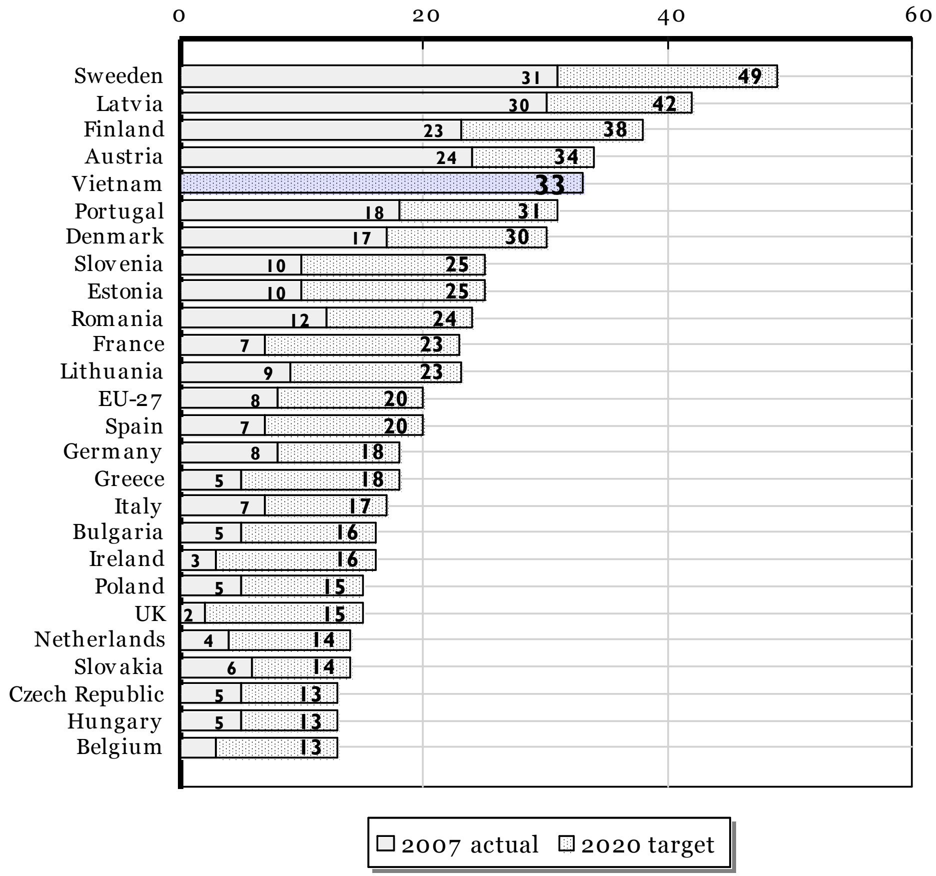
8. Detailed design matters: many potentially good policies are compromised by bad design.

9. Much poor advice comes from well-intentioned bilateral donors and IFIs

10. Only where Government itself is fully committed to renewable energy can policies be successful: in the absence of a politically powerful champion for RE, inter-ministerial disputes will block progress and prevent agreement on the way forward

1. What constitutes RE? Large hydropower

- If one includes hydropower, some Asian countries have a greater RE share in generation than most EU countries.

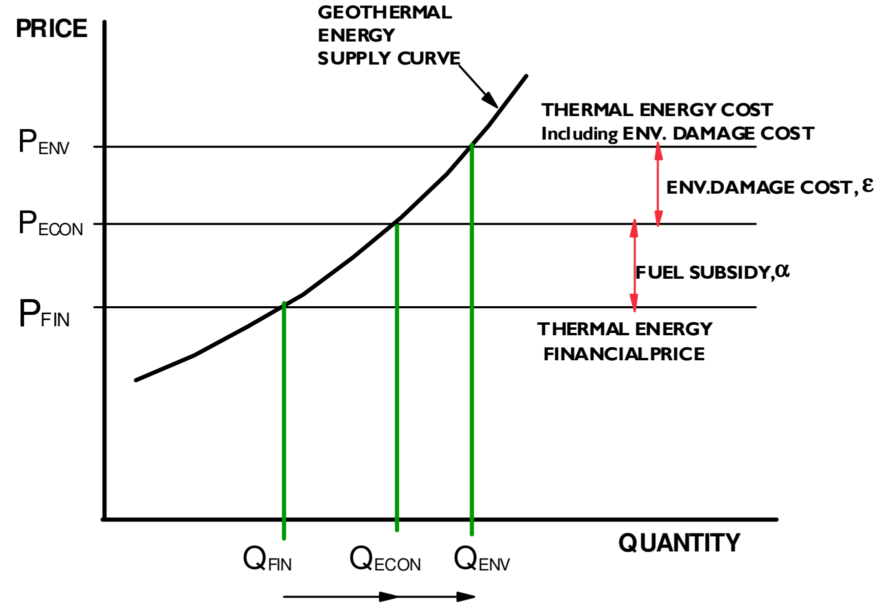


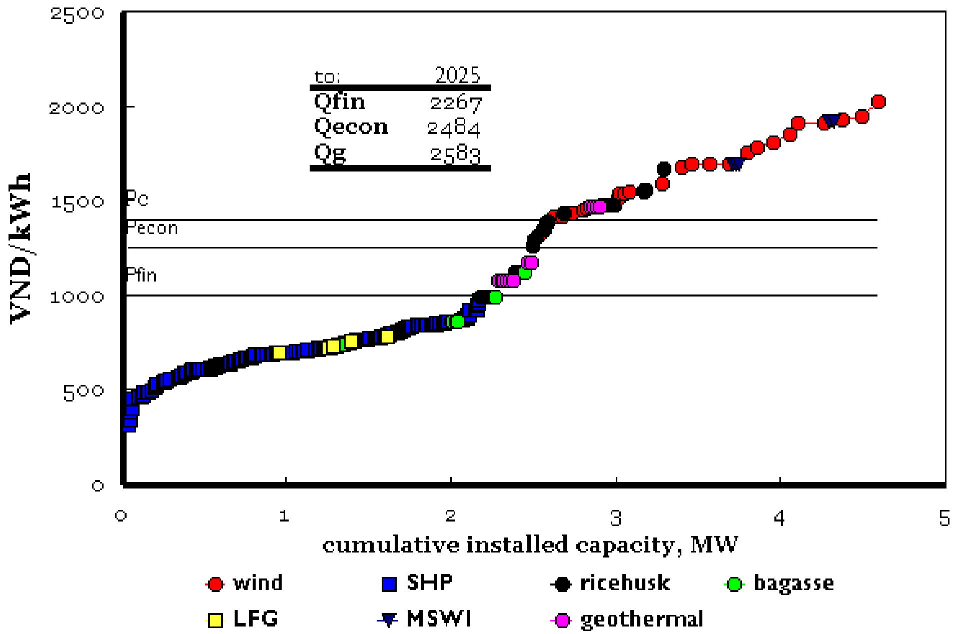
2. Aspirational goals

- Most countries continue to set targets for RE as aspirational goals, not on the basis of economic analysis and an understanding of the incremental costs of RE – 10% by 2015, 6000MW by 2020, etc. etc.

- There is only one rational way to decide what should be the target – which is where the renewable energy supply curve intersects the avoided social cost of thermal energy!

2. Aspirational goals v. rational targets





Rational economics says set the price at *Pecon,* let the market decide what technologies to use.

Objections!

Critics (and socialists) will say: some developers will make “windfall profits”. Need to

Economists will say: that is good. Let developers capture the producer surplus (but don’t give them an income tax exemption) – best way to build up a flourishing private sector willing to invest in RE.

The obsession to want to avoid “windfall profits” leads to other absurd results: let’s have a low feed-in tariff for good site, a high feed-in tariff for bad sites! Germany can afford this (as a matter of equity to spread the burden of absorbing wind power among its provinces), but for a developing country?!!

3. Transparent and credible recovery of incremental costs

- *Good example: Malaysia:* Feed-in tariff introduced together with a renewable energy Fund, funded by a consumer levy (small electricity consumer exempt). [1]

- *Not so good example: Vietnam*: In 2009 the Renewable Energy Master Plan (and the Ministry of Industry and Trade MoIT) proposed the establishment of a Renewable Energy fund to cover the incremental costs of feed-in tariffs based on the avoided social costs. The Prime Minister's office said no.

Design question – do *all* consumers pay

- In Malaysia, small consumers are exempt from levy
- In Germany, large industries are exempt from levy

Lesson: distributional impacts are important

[1] To finance the initial FIT payments, the government advanced RM189 million (US$60.4 million) to the RE fund. The amount is to be paid back. Subsequently, the fund will rely on income from the additional 1% tariff on monthly electricity rates (only applicable to consumers of 300kWh and above).

4. Buyers in financial distress

- Where buyers of renewable energy are in financial distress, they will oppose RE, notwithstanding promises that tariff adjustments or subsidies from government will (eventually) compensate them

- *Sri Lanka*: Ceylon Electricity Board has been in perpetual financial distress, and has long opposed the incremental costs of RE.

- *Indonesia*: Massive subsidies from MoF are required to cover the revenue requirements of PLN.

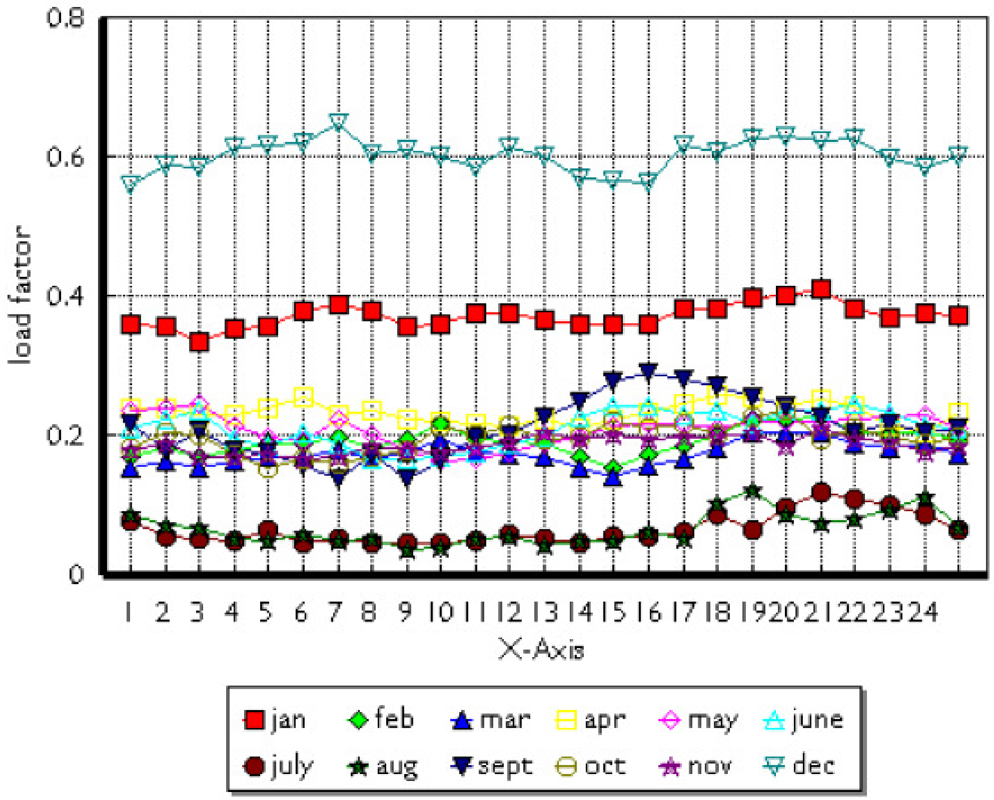
- *Vietnam*: EVN opposed the introduction of the avoided cost tariff for qualified RE projects in 2009.

4. Buyers in financial distress: wind power in Vietnam

- seasonal variations much greater in Asia (monsoonal climates) than in Europe

e.g. Vietnam
Monthly variation 0.08 to 0.6

Europe
Monthly variation 0.2 to 0.4



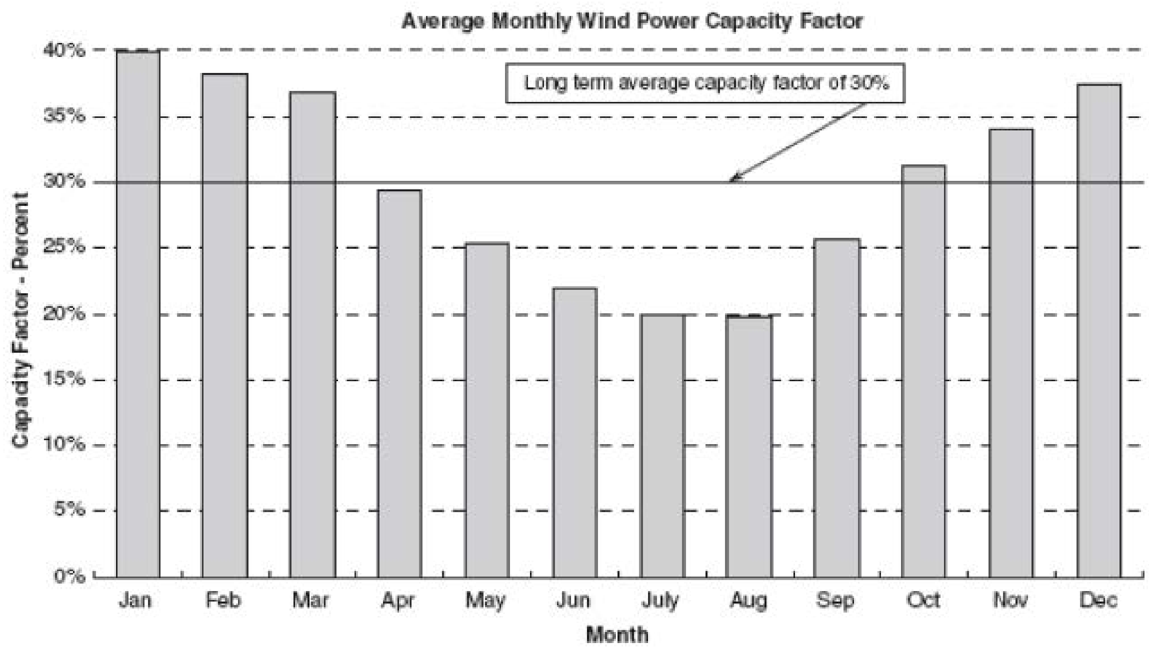
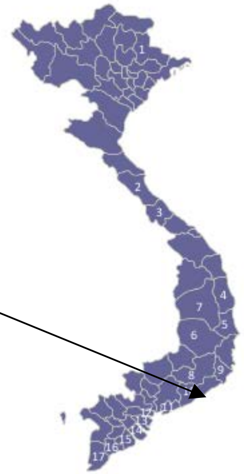


Fig. 3. Monthly wind power availability (averaged over 34 years of wind speed data).

4. Buyers in financial distress: Transmission

- Most of the best wind power sites are in 2 provinces
- Wind farm PPAs will be with the CPC – the distribution company in Vietnam with weakest cash flows.
- In theory, RE purchases are a pass-through in the tariff methodology
- In practice, PPAs require cash payments within 30 days, and most of the cash will be needed during a few months: 1500 MW accounts for 30% of the total distribution margin
- The financial managers of CPC are unconvinced that the tariff methodology will work in practice, and will oppose a wind tariff increase that would make likely many large wind farms.



Nr	Province	Number of projects	Installed capacity (MW)	Status				
				IR	IP	TD	UC	IO
1	Lang Son	1	200	1				
2	Quang Binh	3	NA	3				
3	Quang Tri	1	30	1				
4	Binh Dinh	3	251	1		2		
5	Phu Yen	1	45	1				
6	Dak Lak	2	NA	2				
7	Gia Lai	1	40.5		1			
8	Lam Dong	2	330		2			
9	Ninh Thuan	16	1,105.5	9	6	1		
10	Binh Thuan	20	1,541	17		1	1	1
11	Ba Ria-Vung Tau	2	112	1	1			
12	Tien Giang	2	150	1	1			
13	Ben Tre	2	280	2				
14	Tra Vinh	2	123	2				
15	Soc Trang	6	690	6				
16	Bac Lieu	1	99				1	
17	Ca Mau	2	300	2				
	Total	67	5,297	49	11	4	2	1

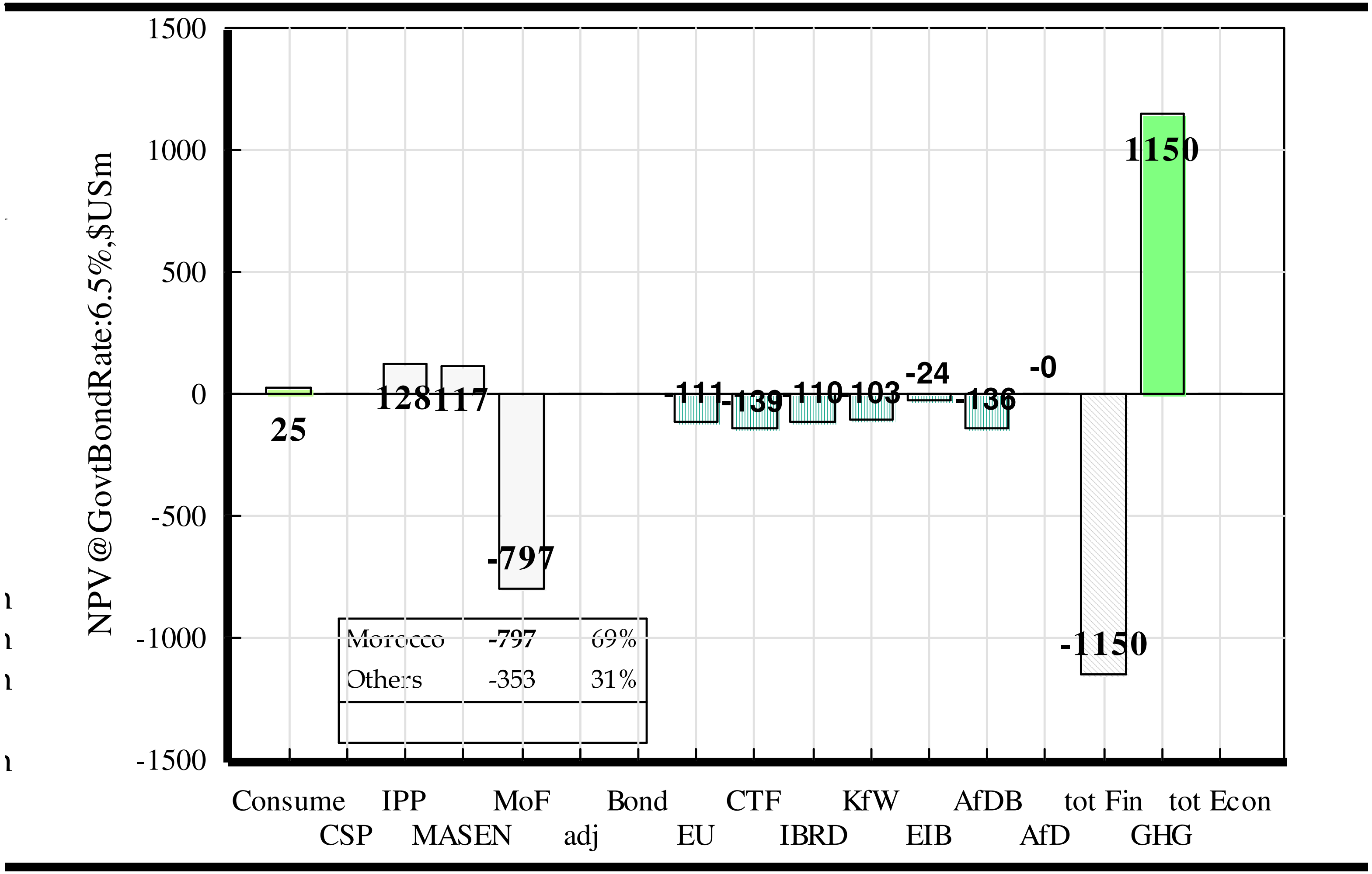
Status: IR = Investment Report[1]; IP = Investment Project; TD= Technical Design; C=Under Construction; IO= In Operation

Lessons: (1) RE integration is not just a technical problem, but also a cashflow management problem.
(2) promote tariff reform and sound utility finance. Potential for large scale renewable energy will never be realised in its absence

5. Incremental costs, and who pays for them, is the main question

- Government (i.e. all taxpayers)
- Electricity consumers (through an explicit levy on consumer bills – as in Malaysia, Germany, or hidden in general rate increases).
- Grants – but very limited!
- Exports of renewable energy (e.g in the case of North Africa solar, exports to the EU – but little progress thus far)
- Global consumers through purchases of CERs under CDM and similar carbon markets – but prices have collapsed.
- International financial institutions through concessionary finance – Clean Technology Fund (almost free money, 0.25% service charge, 40 years, 10 year grace) – but available only in limited amounts.

5. Incremental costs, and who pays for them, is the main question



6. No agreement about what works best: many policy changes

- Sri Lanka: started with avoided cost tariff, then changed to feed-in tariff
- China (wind): started with competitive tendering, then changed to feed-in tariff
- Brazil and South Africa: started with FIT, changed to auctions
- Indonesia (geothermal) : started with competitive tenders (2003), then introduced FIT in 2012 (which failed!), now considering return to competitive tenders

Lesson: what matters most is not what support mechanism, but how well designed are the details, and is the recovery of incremental costs transparent?

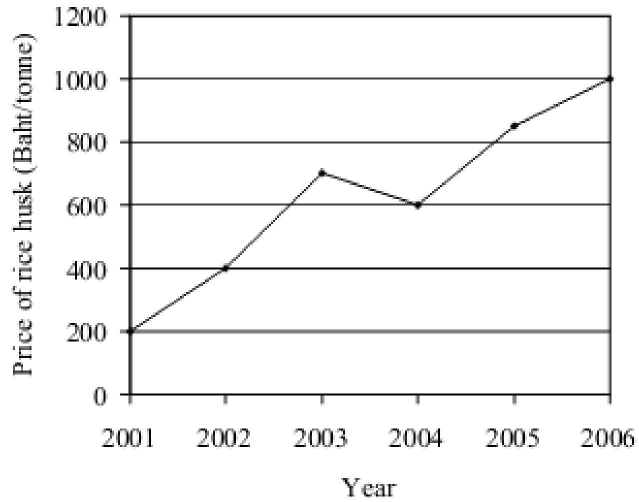
The reason for the success of RE in Germany is *not* (as most argue) that FIT is the best mechanism, but because the recovery of incremental costs through a consumer levy had widespread political and public support.

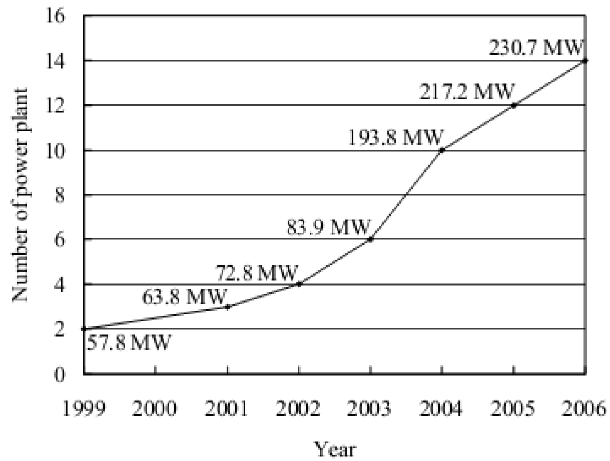
7. The *Law of Unintended Consequences*

- There is a general presumption that grid-connected biomass (e.g. rice husk) is desirable
- In Vietnam developers complain about lack of a suitable feed-in tariff
- But would grid connected biomass reduce GHG emissions?
- Biomass is presently used as process heat (ceramics, brick-making, rice mills) where it displaces oil
- At the margin, grid connected biomass displaces the most expensive thermal generation – which in Vietnam is gas CCGT
- GHG emissions from gas are lower than GHG emissions from oil!

Thailand experience

- Prior to the incentives offered for biomass projects, rice husk prices in Thailand were in the range of 3-4$/ton. But husk prices increased steadily from 2001 onwards, reaching $25/ton by 2006.
- This corresponded with the growth in the number of projects (from 2 to 14), and as capacity increased from 58 MW to 230 MW
- By 2010, rice husk prices were in the range of 1,000 –1,800 Bhat/ton ($33-59 $/ton)





7. The Law of Unintended Consequences

- Rational RE policy would emphasise incentives to reduce field burning, not use biomass for electricity generation
- If you bid up rice husk prices, one dis-incentivises the use of biomass as a fuel in rural industries where it displaces oil.

Lesson: promote critical thinking, not follow stale prescriptions (FITs for everything)

The market place brings its own solution: Vietnamese biomass is being pelletised and exported to Korea where it displaces oil: better outcome for global GHG than generating electricity in Vietnam.

8. Detailed design matters: potentially good policies are compromised by bad design

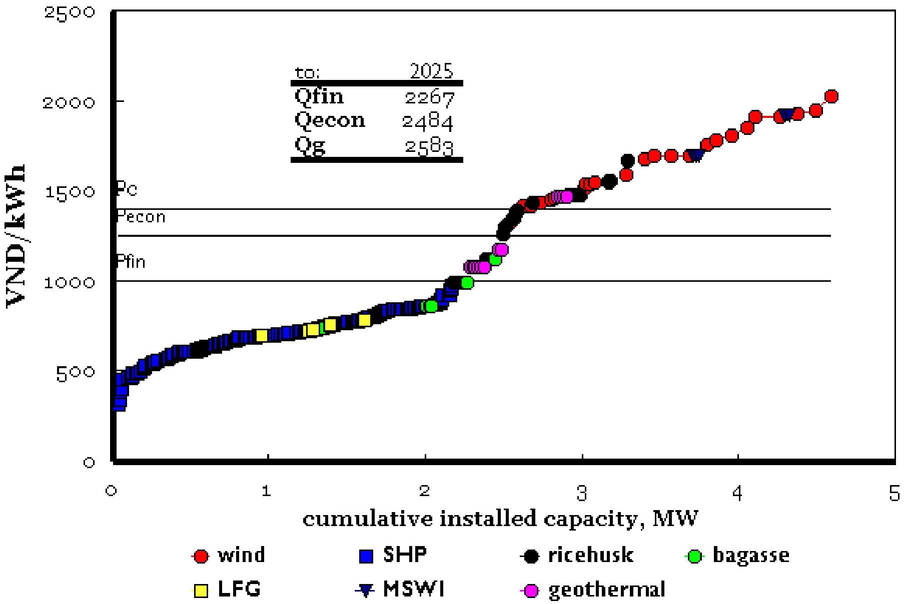
Indonesia geothermal law requires competitive tendering for geothermal work areas, and devolution to the provinces: good intentions!

Results:

- Lack of technical capacity of provincial tender committees results in bad pre-qualification screening
- Very small bid bonds do not discourage speculators
- $10million performance bond requirement not enforced
- Many winning bidders with unrealistic bid prices, projects cannot be financed
- Capable potential bidders discouraged

Lesson: deviations from best international practice are costly

9. Much poor advice comes from well-intentioned bilateral donors and IFIs



- Why promote wind power in places where the wind regime is at best mediocre?
- Why argue for tariffs that are differentiated by resource quality (on the German model, with low tariffs for good sites, high tariffs for poor sites)?
- Why promote grid-connected renewable energy in the presence of extensive subsidies fossil fuel prices? Subsidising renewable energy to offset the distortion of other subsidies is rarely efficient.
- Some recent progress: Vietnam is moving to price coal to EVN at market prices. Indonesia has recently set PLN's coal price to international levels.

Lesson: promote good economic analysis, not RE simply because a resource exists.

10. Champions and inter-ministerial dispute

Only where Government itself is fully committed to renewable energy can policies be successful: in the absence of a politically powerful champion for RE, inter-ministerial disputes will block progress.

In Morocco, the King decided Morocco should become a leader in CSP: first CSP project now under construction

In Indonesia, RE policy on geothermal is caught up in a three way dispute between

- Ministry of Energy and Mineral Resources, who wants to promote geothermal
- Ministry of State owned enterprises, who want Pertamina to be profitable (providing equity for its geothermal subsidiary for drilling is low priority, since returns are much lower than on oil drilling)
- Ministry of Finance, who wants to reduce the subsidy to PLN, not increase it!

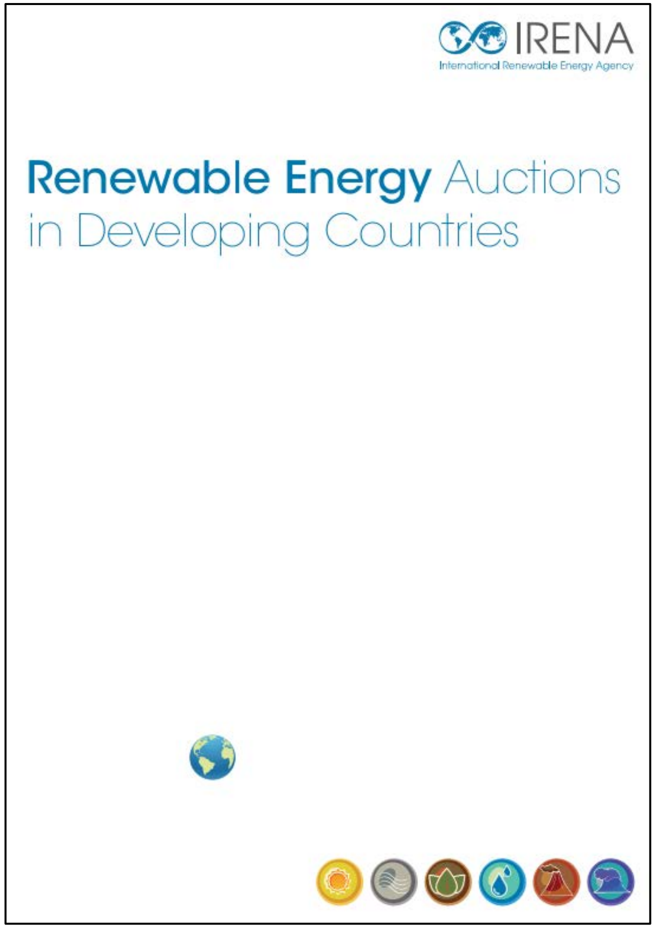
Lesson (for the World Bank): act as honest broker, facilitate dialogue, promote stakeholder consultation (ideally together with other IFIs!).

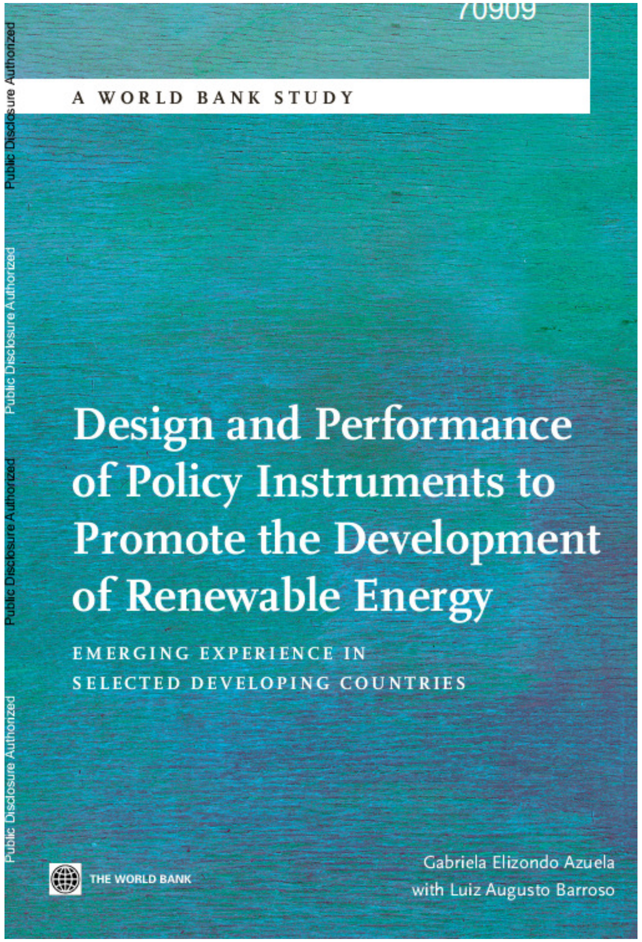
Policy Instruments

Renewable Energy Training Programme

23-25 April 2014, Bangkok

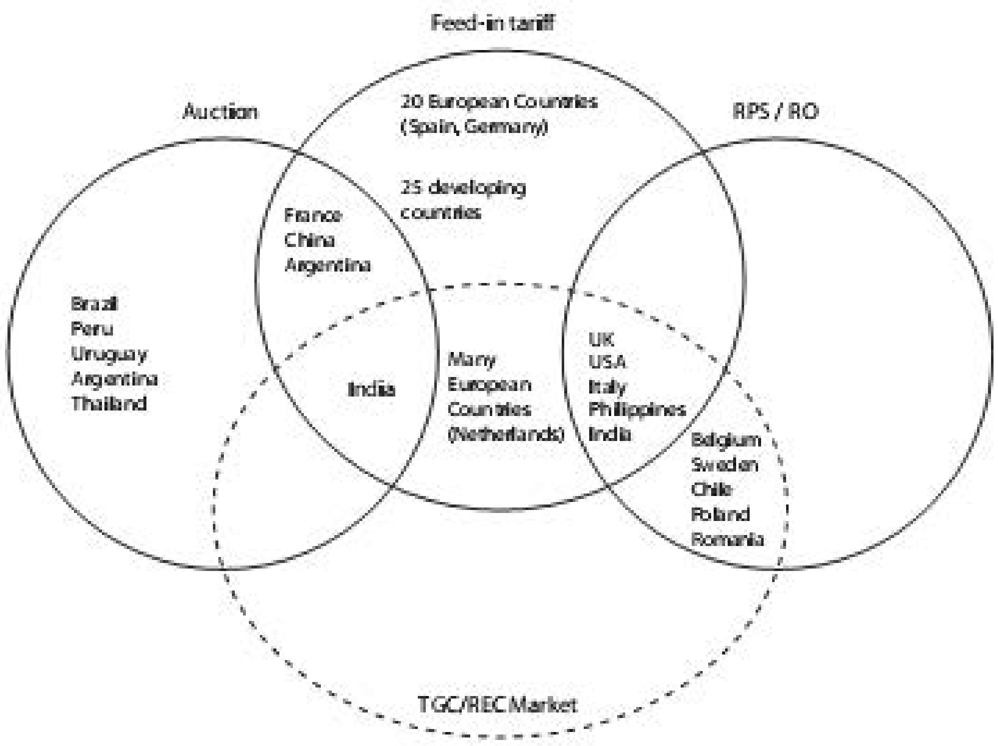
Recommended reading!





Feed-in tariffs: Advantages

- The most popular support mechanism, widely advocated as a way to reach targets.
- Set the tariff high enough, and MW targets easily reached (but set the tariff too low, and no project will be built)
- Bankers prefer FIT over quotas and TGC because of certainty of revenue (but other competitive tendering/auctions also provide certainty of tariff streams

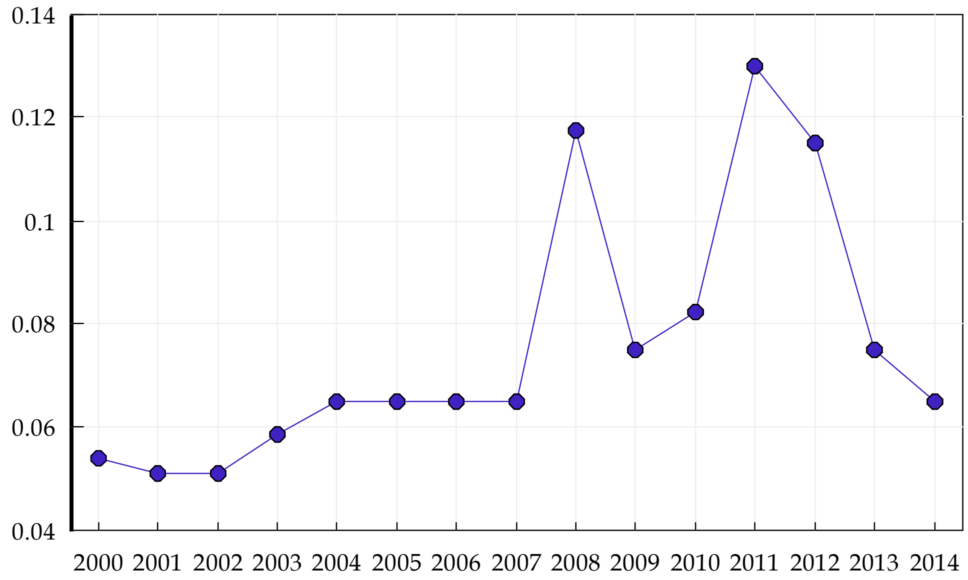


Feed-in tariffs: Disadvantages

- Set the tariff too low, and no projects.
- But care is required before declaring feed-in tariff failure because no projects. Vietnam wind feed-in tariff is 7.8 USc/kWh. Indeed no projects at this level.
- But is the Government so badly informed? In fact no, tariff was based on avoided cost of coal plus 1 USc/kWh subsidy to be provided from the Vietnam Environmental Protection fund.
- So no (uneconomic) wind projects is a *good* outcome! Vietnamese has excellent lower cost RE resources, notably small hydro, and the wind resource is modest – 25-30% load factors for most projects – compared to 42% for wind projects in Egypt, 40% in Morocco, 40%+ in Texas.

Feed-in tariffs based on production costs+fair return

- Need many assumptions. But can Government ever know more about market conditions, technology, site conditions, achievable efficiencies – than developers?
- How can Government assess what is a fair rate of return?
- How can one know how projects will be financed?
- All renewable energy resource project are subject to site specific risks – geology for small hydro, wind resources (small changes in location may have dramatic impacts), supply problems for biomass. Only developers are in a position to assess these risks, and financial returns will always require risk premiums for private investors. A fixed feed-in tariff (based on some declaration that x% FIRR is "fair" implies all projects have the same risk, which is clearly not true).



Other advantages?

Are feed-in tariffs less likely to offer opportunities for corruption than tenders?

If a feed-in tariff is generous, the supply of developers will exceed the supply of sites and projects. Then how do you allocate developers to sites:

- All come? (breaks the bank)
- First-come, first-served? (not efficient)
- Administrative discretion? (surely even greater potential for corruption than tenders)

Tax incentives

In place almost everywhere

- Reduced corporate tax rates
- Tax holidays
- Accelerated depreciation
- Investment tax credits
- Production tax credits (as in the USA)(the most transparent mechanism)

All are transfer payments - moving money from one domestic pocket to another:

- Does nothing to incentivise efficiency (in the early days of the Indian wind program, accelerated depreciation rules resulted in large numbers of dummy projects!)
- Need very careful detailed analysis before concluding there is real benefit
- For example, do not give a VAT/customs duty exemption on construction costs for a RE project if that project is likely to benefit from concessional finance.

Direct government subsidy schemes

Details are everything. There are more badly designed schemes than good ones!

Example of a poor scheme: *Vietnam Environmental Protection Fund Scheme (VEPF)*

- Developer gets a subsidy to cover the difference between the actual production cost and the offtake price. VEPF decides what equity return shall apply in the calculation of production cost.
- No incentives for developers to seek CDM/CER sales
- Not really bankable since the sources of revenue for the Fund are modest
- Allocation of funds is first-come, first served, the worst of all rationing schemes

Low cost Government loans

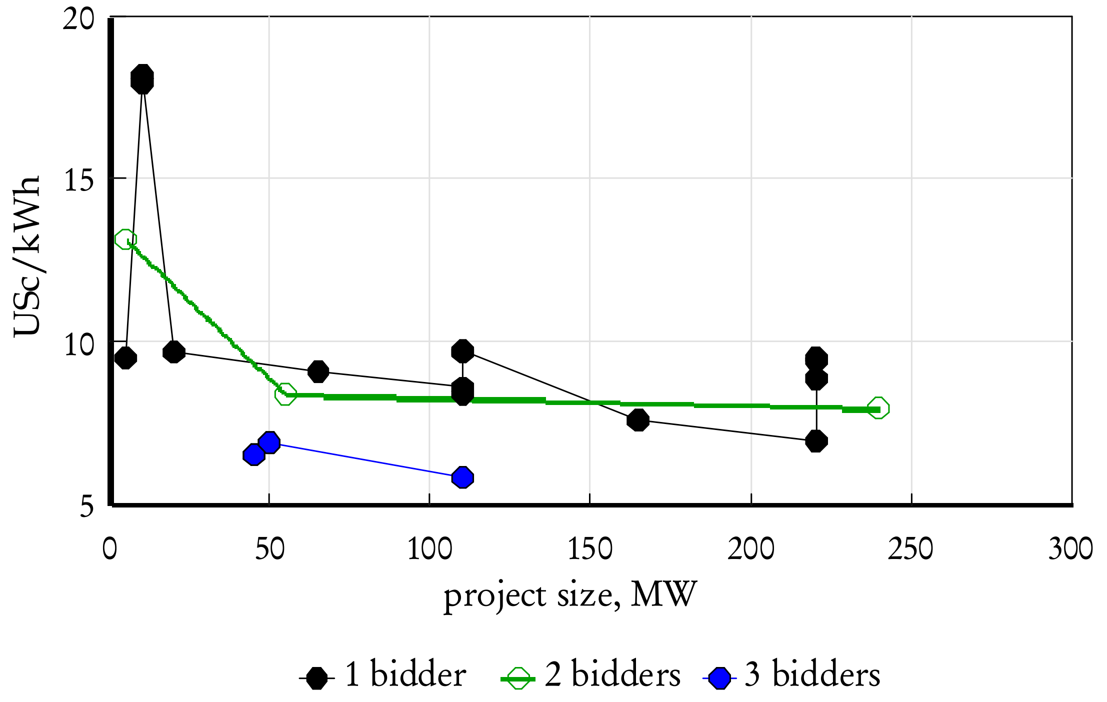
- Would low cost loans from State Development Banks not have the same impact as IFI concessionary finance?

- Brazil provided low cost loans to developers who where part of the early PROINFA FIT through the National Development Bank.

- But in most places, such Banks were established to promote rural and agricultural development, and finance social projects (e.g. SDBV in Vietnam) – with high social returns in reducing rural poverty. But funds are limited. And is it reasonable to reduce assistance to these sectors for sake of high cost RE projects ($50-100 $/ton CO_2), whose principal benefits accrue to the world community – a community that prices CO_2 for its own industries at $5-30/ton?

Competitive tendering: disadvantages

Indonesia geothermal experience: if not carefully designed, lowest cost bid may be unrealistic.



More bidders suggest more competition and lower prices. In reality projects bid at 6-8USc/kWh are stalled.

Competitive tendering: design principles

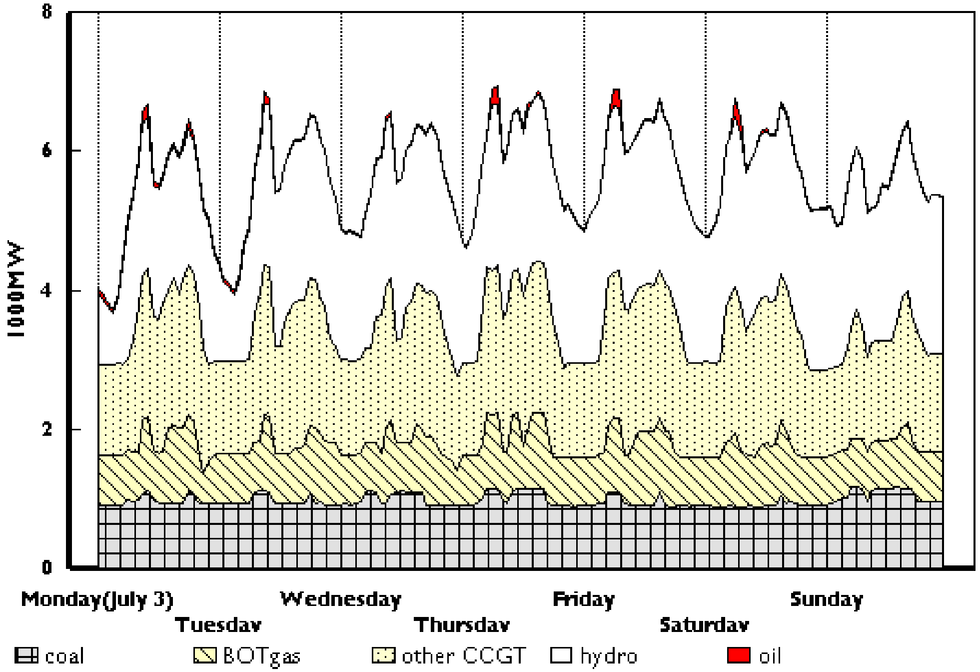
Rule of thumb: follow the general principles in the World Bank Procurement guidelines

- Rigorous pre-qualification screening
- Technically qualified tender committees
- Meaningful bid bonds (% of project size)

Plus

- Independently certified resource information (wind, geothermal) that meet internationally accepted resource measurement standards
- To the extent possible, environmental & land permits in hand

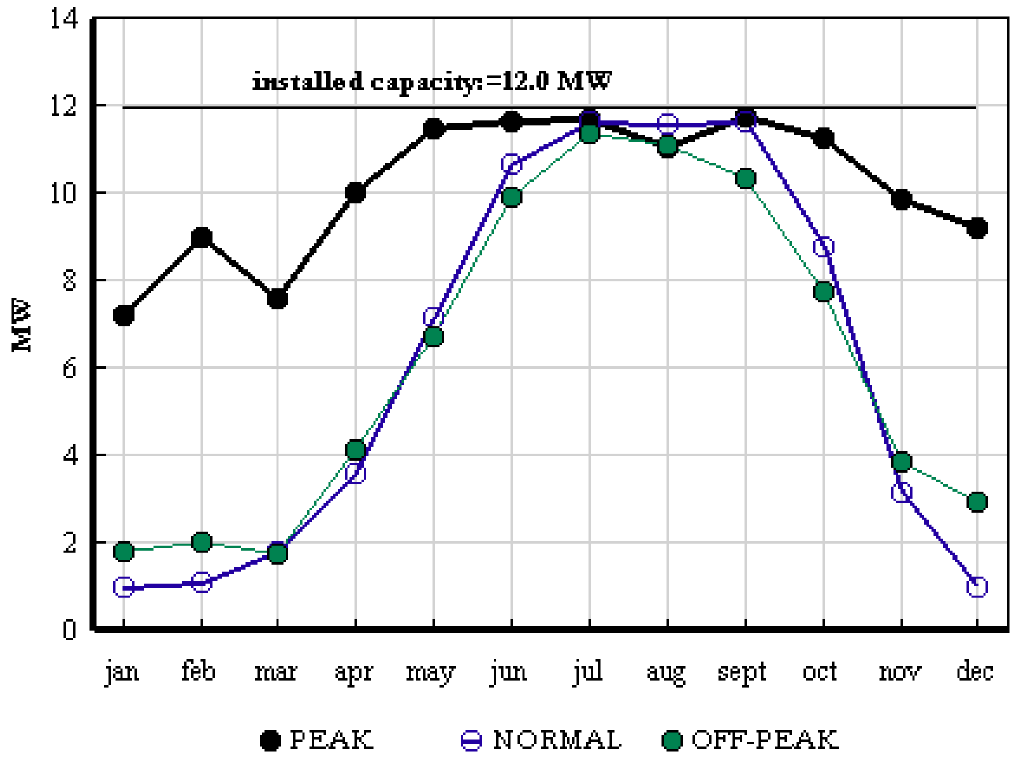
Avoided cost tariffs



- First introduced in the USA in PURPA law of 1978 (QF programme in California)
- First application in Sri Lanka, IBRD/GEF supported RE programme
- Basic idea: tariff=avoided cost of the buyer (in Vietnam, that is gas CCGT)
- Buyer should be indifferent to purchasing RE or purchasing thermal energy from the marginal thermal project (i.e. the one with the highest variable cost).
- Basic question: to what extent to RE projects have capacity value i.e. avoid the buyer's capacity costs.

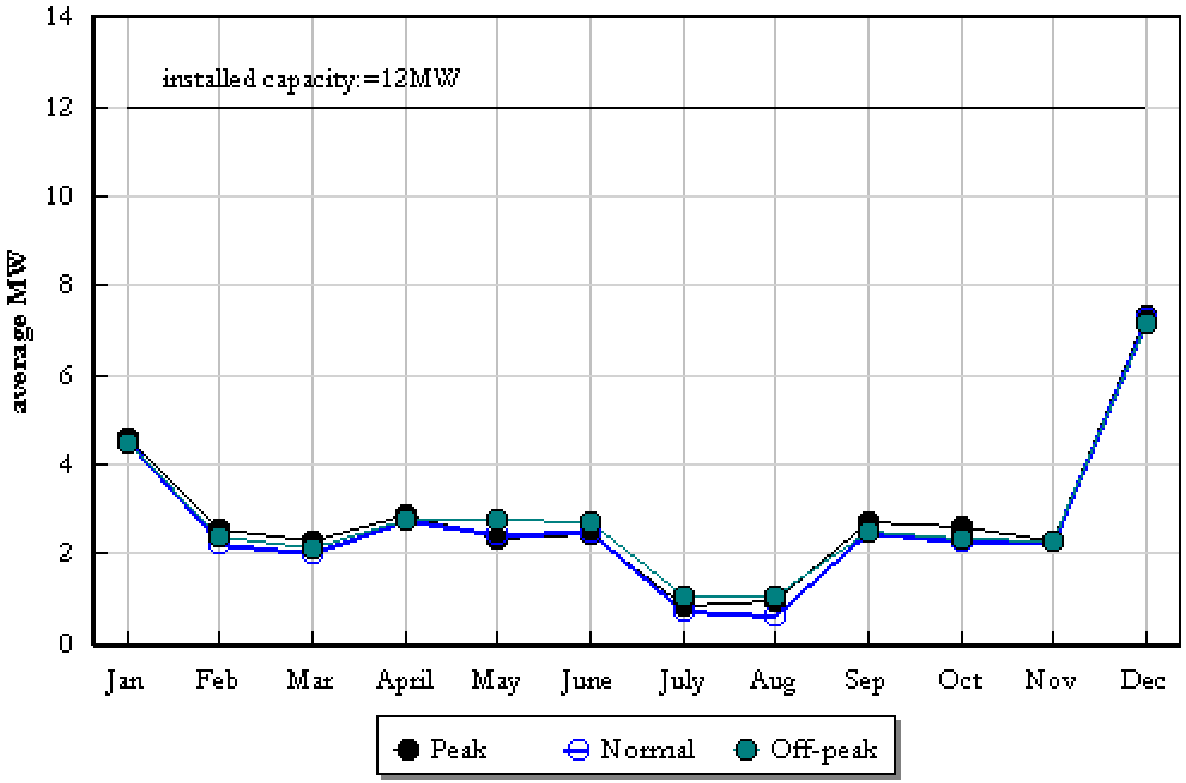
Capacity value: wind v. small (daily peaking) hydro

- Daily peaking SHP provide significant capacity value, even during the dry season – e.g., 12 MW Nam Mu project in northern Vietnam.
- Graph shows the average MW dispatched during each of the three tariff blocks (peak, normal, off-peak), by month, in a "daily peaking project" (small reservoir sufficient to store daily dry season inflows and then released during peak hours).
- Even during driest months (January-March), during peak hours the project delivers an average of 8MW.



Capacity value: wind v. small (daily peaking) hydro

- Same assessment for a 12MW wind farm!
- Even in the windiest month, only an average of 7MW.
- Note little variation of average output by hour of the day.
- Average annual load factor 22% (From 10-minute wind speed data on Ly Son Island)



Lessons for tariff design

- RE tariffs should be designed to send the right signals to the marketplace
- In Vietnam, the main issue was to *dis*courage pure-run-of-river projects, and *en*courage daily peaking projects

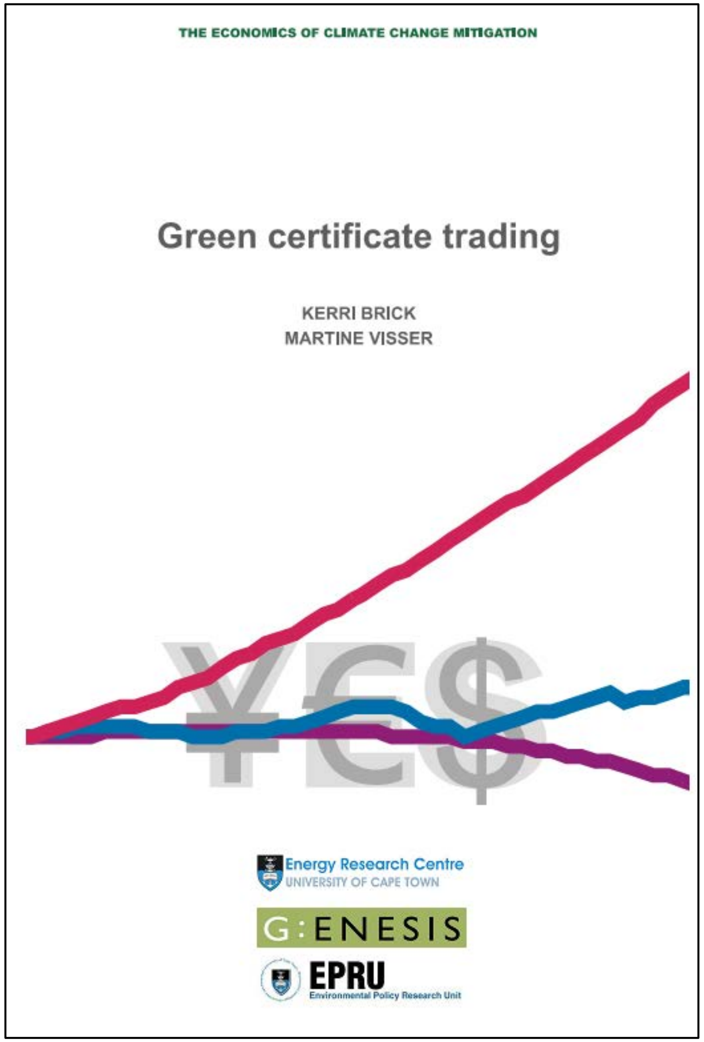
VND/kWh

	dry season (November-June)			wet season (July-October)			
	Peak hours	Normal hours	off-peak	Peak hours	Normal hours	off-peak	Surplus energy
	[1]	[2]	[3]	[4]	[5]	[6]	[7]
North	603	590	561	529	498	484	242
Centre	573	567	563	481	468	460	230
South	575	568	555	511	501	492	246
Capacity charge	1,772						

Quota and Tradable Green Certificates

- Quotas only work where there are significant penalties for non-compliance

- Penalties are meaningless where the power sector entities upon whom the obligation is imposed are state owned.



Renewable Energy Auctions

Pioneered in Latin America (Peru, Brazil)

Comparison of FIT(PROINFA) v auctions in Brazil: significant cost reductions

	PROINFA			Technology-specific auction ("reserve energy" auction) 2009		
	MW	GWh/year	US$/MWh	MW	GWh/year	US$/MWh
Wind	1,423	3,740	154	1,800	6,596	80
Small Hydro	1,191	6,260	96	—	—	—
Bioelectricity[a]	779	2,661	77	2,379	4,800	84
			Impact on costs			
Total capacity (MW)[b]		3,393			4,179	
Total energy (GWh/year)		12,661			11,397	
Average cost (US$/MWh)		109			80	
Total cost (million US$/year)[c]		1,381			911	
Net impact on tariffs (US$/MWh)[d]		3.8			1.6	

Many design questions: ceilings

- It may be supposed that in an auction (or competitive tender) subject to a ceiling price, winning bids will be very close to that ceiling price.
- The international experience is unclear. For example, in the renewable energy auctions in Peru, winning bids have been between 53% and 82% of the ceiling price, so not much impact of the ceiling.

		Winning bid	ceiling	Winning bid as % of ceiling
		$/MWh	$/MWh	%
Small hydro	2009	60.2	74	81%
Solar	2010	221	269	82%
Wind	2010	80.4	110	73%
Biomass	2010	63.5	120	53%

Many Design questions: ceilings

- On the other hand, the experience in South Africa suggests there may be a benefit to an *undisclosed* ceiling price.

- In the first auction round (for wind, solar PV 2011) the average contract prices were between 98% and 114% of the disclosed ceilings.

- In a second 2012 round the ceilings were undisclosed, and average prices were much lower (11.2 USc/kWh for wind, as opposed to 14 USc/kWh in the first round. Of course the question is on what basis were the ceilings derived!

- How much of the low cost RE capacity promised by the Latin American auctions will actually be built (and be profitable) is not yet clear.

Conclusions

Renewable Energy Training Programme

23-25 April 2014, Bangkok

Competitive bidding v. administrative allocation

- A consensus is emerging in favour of competitive bidding.
- Prices that are too low can be fixed by robust tendering processes (rigorous pre-qualification, meaningful bid bonds)
- Prices that are too high can be subjected to ceilings (though whether ceilings should be published or undisclosed depends on the type of auction)
- Transaction costs are a small a small fraction of the potential benefits of competition

Generous feed-in tariffs are increasingly under question

- Even in Germany, the pioneer of FITs, politicians and the public are now questioning the high cost.

- In 2012, [2] German residential customers paid 25 UScents/kWh for electricity, of which the surcharge for the feed-in tariff levy accounted for 3.59 UScents/kWh, or 13.9% of the average bill. This *surcharge* rose to 5.28 UScents/kWh in 2013 (excluding VAT)!

- The Ministry of Finance in Indonesia oppsed the 2012 geothermal feed-in tarif not because the tariff was too high, and would increase subsidy – but because if MoF has provided a sovereign guarantee and the guarantee is invoked, and the developer was not selected competitively, the official concerned may stand before court for corruptly squandering state funds.

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[2] Power-intensive industrial consumers and the railways benefitted from various degrees of exemption). See, e.g., See Karsten Neuhoff *et al*, *Distributional Effects of Energy Transition: Impacts of Renewable Electricity Support in Germany*. Economics of Energy & Environmental Policy, Vol 2,No.1, March 2013, p41-54.

PPAs

- Standardised, non-negotiable PPAs are slowly being introduced everywhere. In Asia, introduced for RE projects first in Sri Lanka, then in Vietnam, now in Indonesia. These have proven demonstrably superior to *ad hoc* negotiation between the IPP and the buyer – not necessarily because the negotiated price is any different, but because:

  - Buyers who are in financial distress don't like to take on PPAs that require cash payment within 30 days(!)
  - *Ad hoc* negotiations often drag on for years

Even in competitive tenders, where the biding sets the price, one should avoid post-tender negotiations on indexation and escalation formulae – these need all to be fixed at tender so the reliability of the cash flow forecasts is improved.

Renewable energy funds

Good idea in theory, problems in practice.

- The Vietnamese Environmental Protection Fund, as a vehicle for providing subsidy, was badly designed, had no credible source of funds.
- The Sri Lanka arrangements for the recovery of incremental costs of the new feed-in tariff were bungled because the calculations for its revenue were badly estimated, so the door to MoUs quickly closed.
- The Malaysian Fund seems well designed, credible, with a transparent source of funds in a levy on electricity sales: time will tell!

Summary

- Clear objectives first: objectives govern policy
- Then an evaluation of the tradeoffs between objectives and affordability
- Whatever the uncertainties, derive supply curve (+ resource mapping if need be)
- Then design the overall policy framework, who pays, options for buying down the costs through concessional finance, evaluate the impacts of different support tariffs on stakeholders
- No policy or tariff reform will be successful without stakeholder consultations
- Then apply international best practice – Dr Xiaodong Wang's list!
  - Tariff consistent with objectives
  - Standardised PPA
  - Mandatory off-take
  - Credible recovery of incremental costs