

OPTRES: OPTIMAL PROMOTION STRATEGIES FOR INCREASING THE SHARE OF RES-E

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- 1. Introduction**
- 2. Survey on policy strategies**
- 3. Objectives of promotion strategies**
- 4. A comparison of the success**
- 5. Success criteria for Feed-in tariffs**
- 6. Success criteria for TGC-based quotas**
- 7. The issue of competition**
- 8. Conclusions**

CORE MOTIVATION:

**Policy targets for an
INCREASE of RES-E!**

**(e.g. RES-E directive of the EC to
increase the share of RES-E from 12%
to 22% until 2010)**

What is the problem?

~~Which instrument fits best?~~



MAJOR PROBLEM:

**Correct design of
policy**

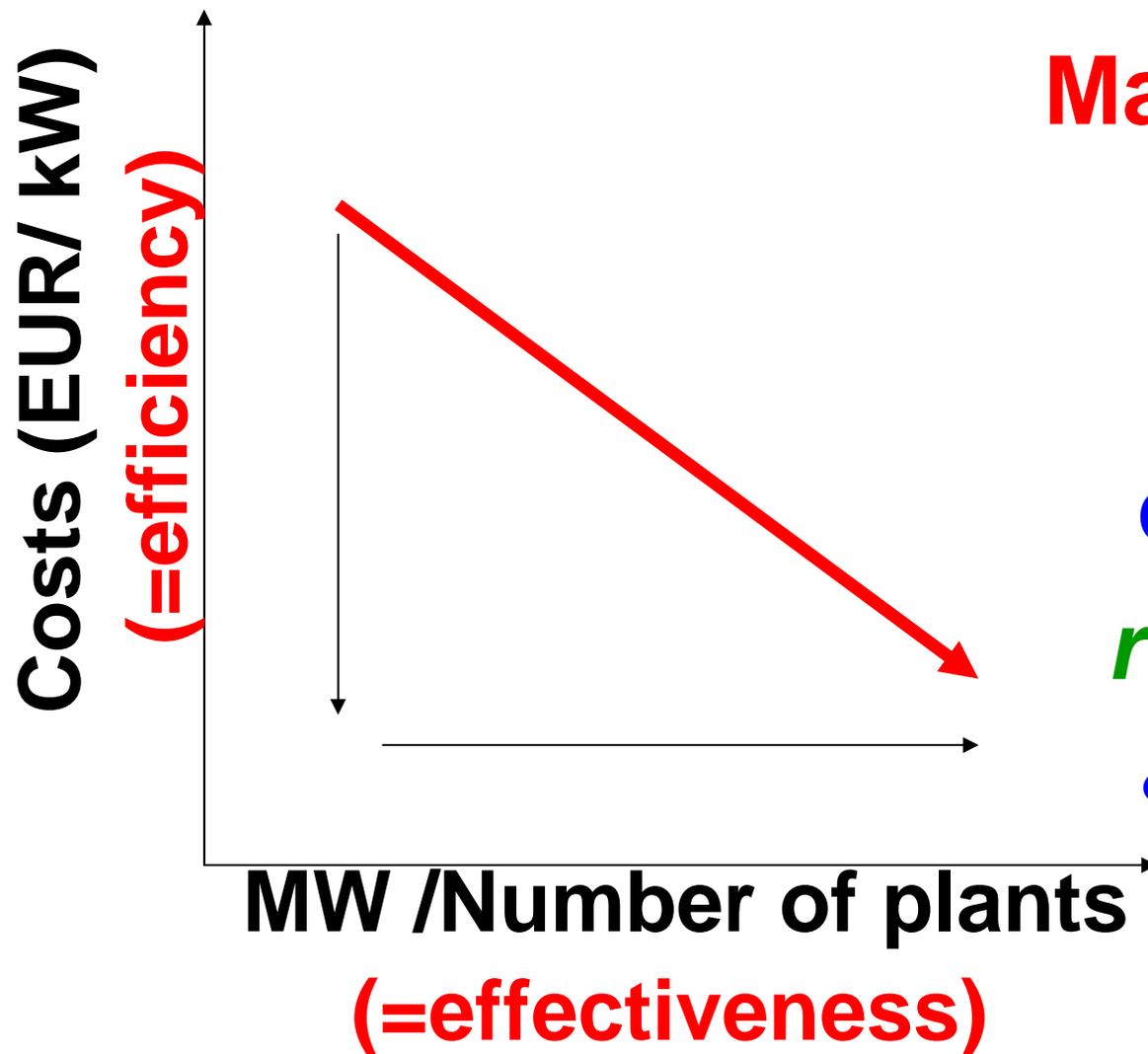
- with respect to:
 - renewable targets
 - Financial incentives
 - Credibility for investors
 - Transfer costs!

2. SURVEY ON

POLICY STRATEGIES

		REGULATORY	VOLUNTARY
Capacity-driven strategies	Generation-based	<ul style="list-style-type: none"> • RPS • Quota-based TGCs 	<ul style="list-style-type: none"> • National generation targets
	Investment focused	<ul style="list-style-type: none"> • Bidding/Tendering 	<ul style="list-style-type: none"> • National installation or capacity targets
Price-driven strategies	Generation-based	<ul style="list-style-type: none"> • feed-in tariffs, • rate based incentives • Net metering 	<ul style="list-style-type: none"> • Green Power Marketing <ul style="list-style-type: none"> • Green tariffs • Solar stock exchange
	Investment focused	<ul style="list-style-type: none"> • Rebates • Soft loans • Tax incentives 	<ul style="list-style-type: none"> • Contracting • Shareholder progr. • Contribution <ul style="list-style-type: none"> • Bidding
Other		–	<ul style="list-style-type: none"> • NGO-marketing • Selling green buildings <ul style="list-style-type: none"> • Retailer progr. • Financing • Public building prog.

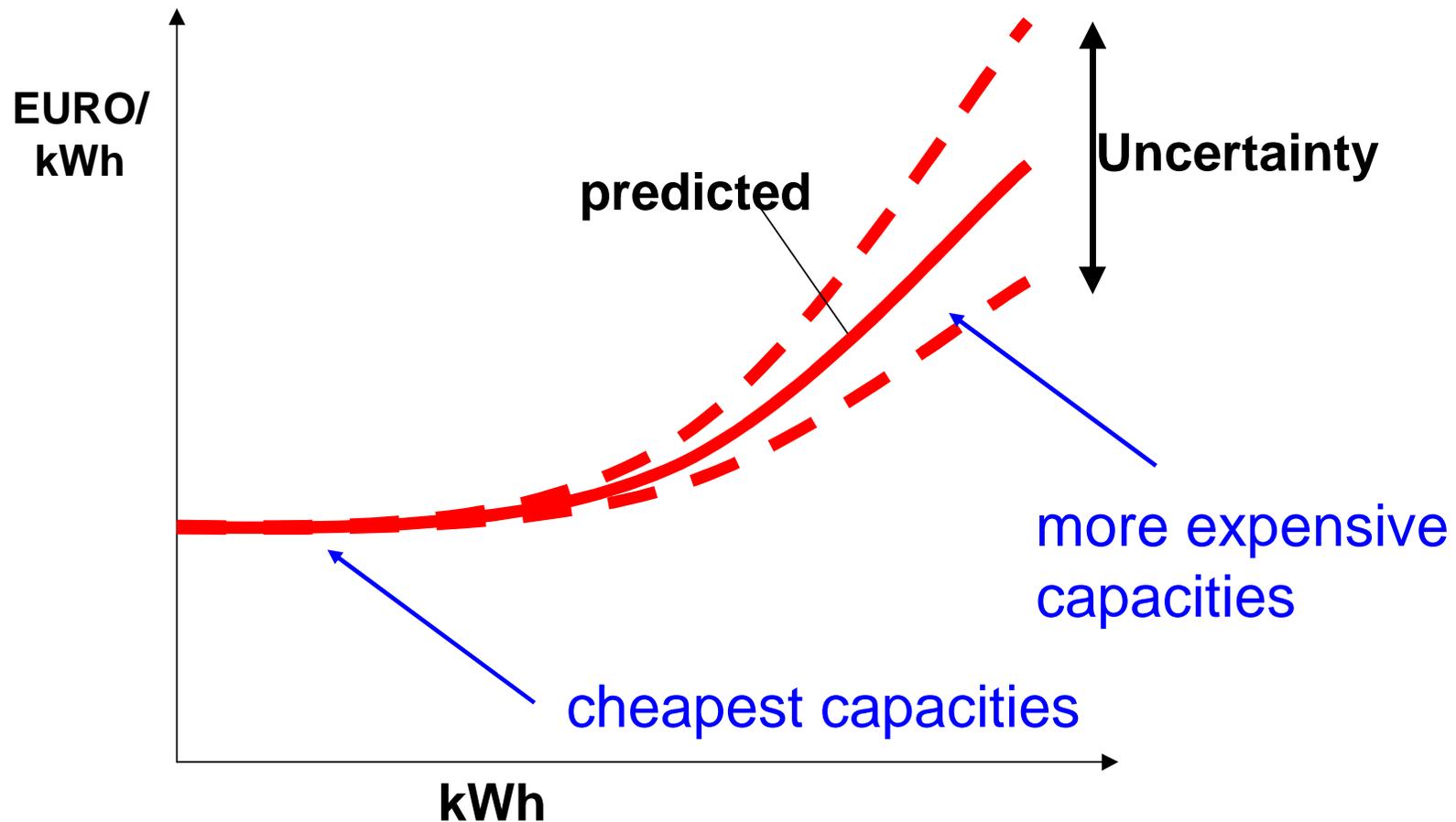
TO SUCCESSFUL STRATEGIES



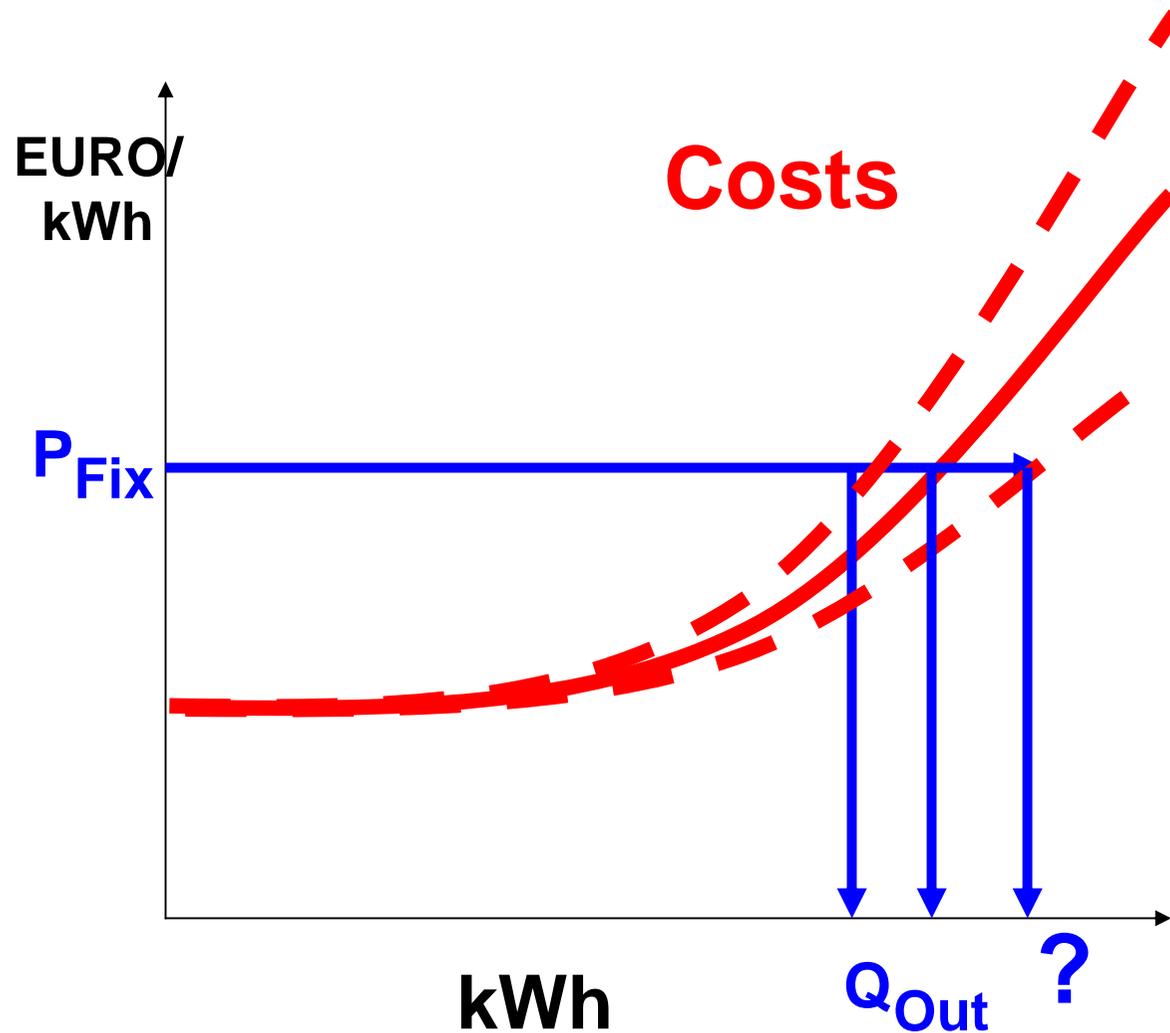
Major objectives:

- increase the amount of electricity from *renewables* and
- reduce costs!

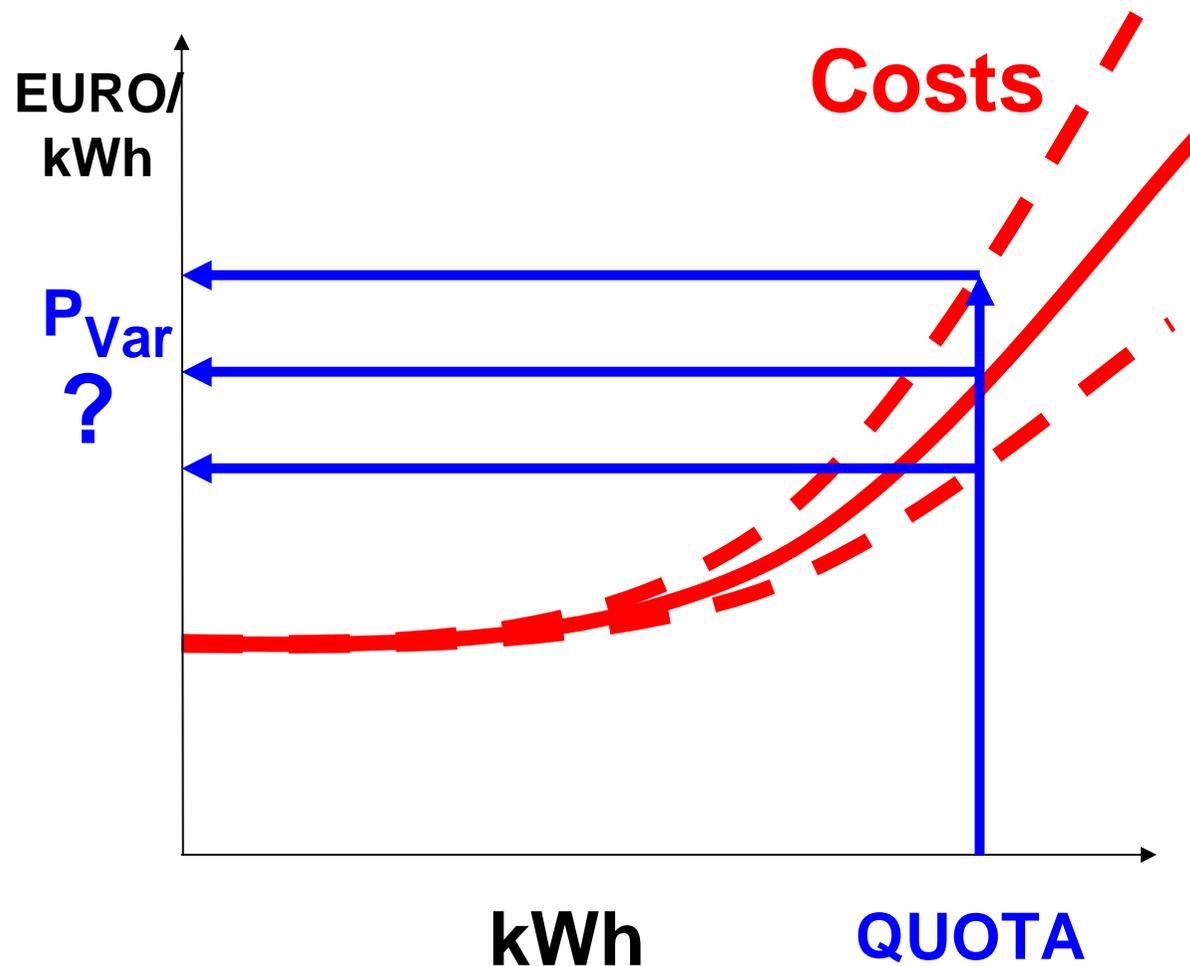
RESOURCE CURVES



WORK



HOW QUOTA-BASED TRADABLE GREEN CERTIFICATES WORK



***Quota-based TGC systems as well as
Feed-in tariff systems create an***

artificial market

and cause

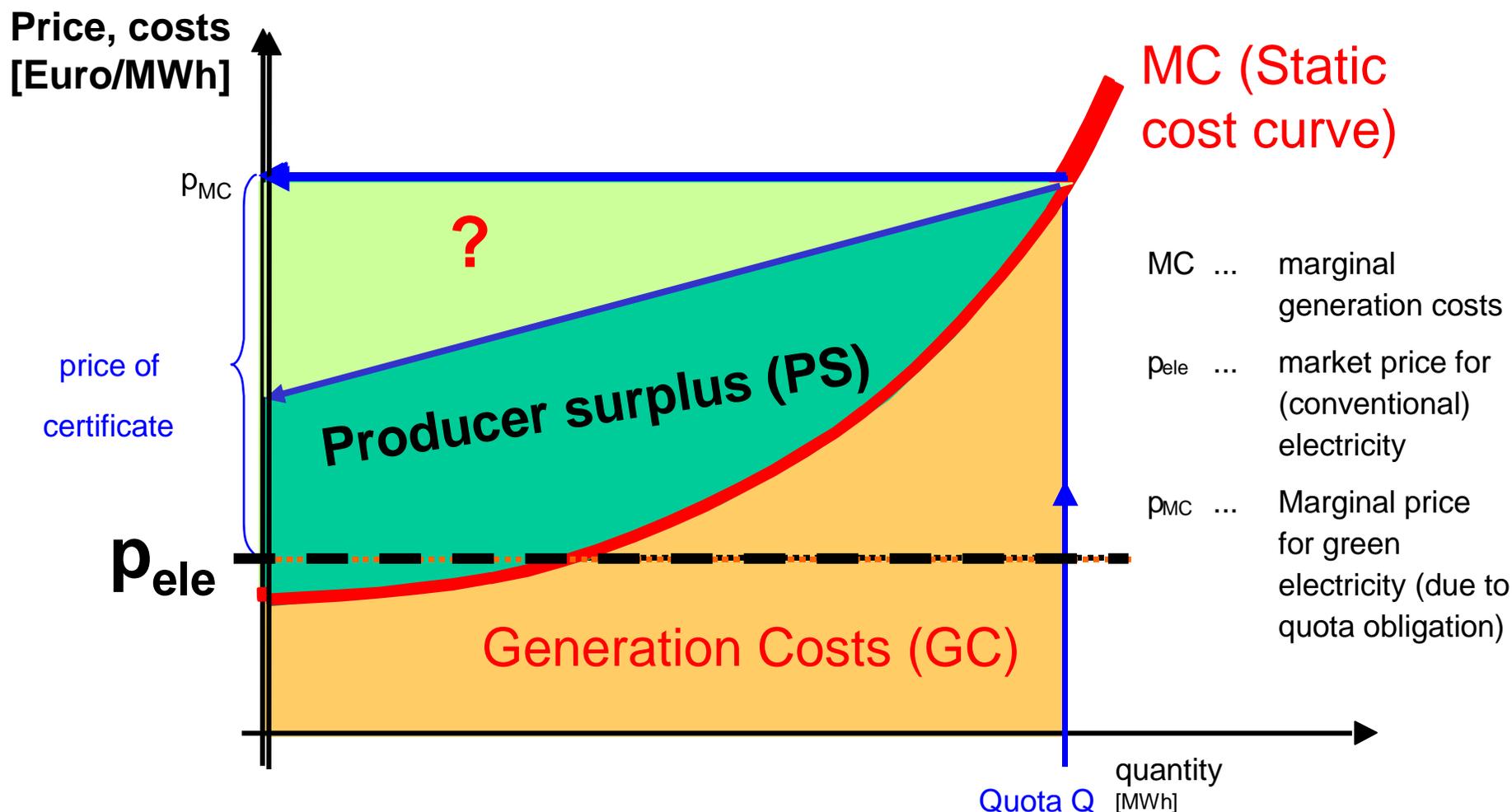
transfer costs (additional costs)

*Why is it important to
minimize these additional costs?*

***These additional costs have finally to be
paid by the final customers***

**(regardless which promotion scheme is
chosen)**

Minimise additional costs for consumers = **Producer Surplus + **Generation costs** - **Revenues** electricity market**



The lower the costs are which have finally to be paid by final customers

the higher will be public acceptance

the larger will be the amount of additional electricity generated from RES.

Green-X - Deriving optimal promotion strategies for increasing the share of RES-E in a dynamic European electricity market

Energy policy instruments - Electricity

Select: Germany

Germany

Feed in tariff | Tendering system | Tradable Green Certificate

Feed in tariff

Fixed tariff

Premium tariff

Valid for plants not older than: 15

Guaranteed tariff for: 20 year(s)

Flat rate

Value: €/MWh

Stepped rate

Maximum value: 85,26 €/MWh Full

Minimum value: 61,74 €/MWh Full

Green-X - Deriving optimal promotion strategies for increasing the share of RES-E in a dynamic European electricity market

Results - Country specific - Cross-section

Select: European Union 15

General Results

Total Electricity Consumption

Share of total electricity consumption

Total Electricity Generation

Share of total electricity consumption

Electricity Generation

Total Electricity Generation of which from renewable energy sources (RES)

Share of total electricity generation

Share of total electricity consumption

of which from electricity plants (ELE)

Share of total electricity generation

Share of total electricity consumption

of which from combined heat and power plants (CHP)

51,591,61 GWh

Share of total electricity generation: 1,68 %

Share of total electricity consumption: 1,67 %

Generation Costs

Total Generation Costs due to renewable energy sources (RES)

24,336,06 MMill. Euro per year

of which due to electricity plants (ELE)

26,741,35 MMill. Euro per year

Share of total generation costs: 83,51 %

of which due to combined heat and power plants (CHP)

4,694,72 MMill. Euro per year

Share of total generation costs: 16,49 %

Total Costs for Society

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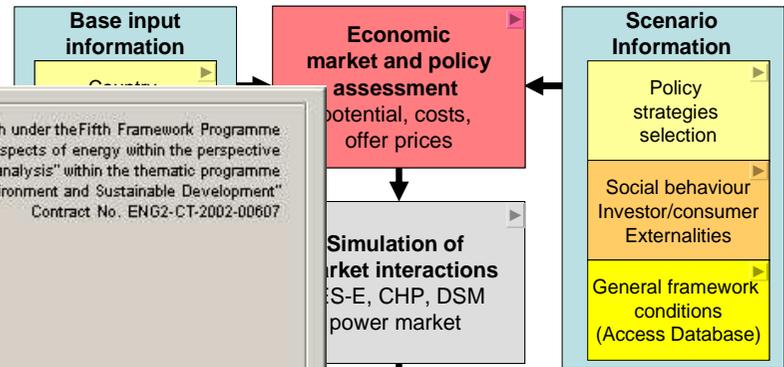
Green-X

Deriving optimal promotion strategies for increasing the share of RES-E in a dynamic European electricity market

Platform Win2000 SP3
Win XP SP1
Version 4.4.3

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Vienna University of Technology

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the share of RES-E in a dynamic European electricity market

2020

Denmark

Share of Electricity Generation	Electricity Generation new plants	Share of Electricity Generation new plants	Installed capacity	Share of Installed capacity	New installed Capacity
%	GWh	%	MW	%	MW
100,00	38,67	100,00	3.522,69	100,00	10,47
100,00	38,67	100,00	3.522,69	100,00	10,47
15,46	11,34	29,33	265,95	7,55	1,75
1,54	0,96	23,23	33,97	0,96	1,36
15,61	15,97	41,30	271,88	7,72	2,76
0,00	0,00	0,00	0,00	0,00	0,00
0,30	0,00	0,00	9,67	0,27	0,00
0,30	0,00	0,00	9,67	0,27	0,00
0,00	0,00	0,00	0,00	0,00	0,00
1,17	6,95	17,98	18,65	0,53	1,28
0,74	0,00	0,00	14,94	0,42	0,00
0,91	0,01	0,00	1,26	0,04	0,00
0,01	0,00	0,00	1,28	0,04	0,00
0,00	0,00	0,00	0,00	0,00	0,00
0,00	0,00	0,00	0,00	0,00	0,00
0,00	0,00	0,00	0,00	0,00	0,00
0,00	0,00	0,00	0,00	0,00	0,00
7,388,44	81,37	20,68	53,49	1,55	7,39
8,923,19	98,27	1,215,45	3.143,11	3,765,11	106,88
1,261,93	13,90	137,28	350,00	401,95	40,00

... to simulate various policy strategies for the promotion of RES-E in a dynamic framework on a national or international level (*considering DS-effects*)

(Current: EU-25, end 2006: EU28, future: EU 39???)

1999

2001

2003

2005

2007

ELGREEN

theoretical modeling

GREEN-X

TRACK:
GREEN-NET

OPTRES

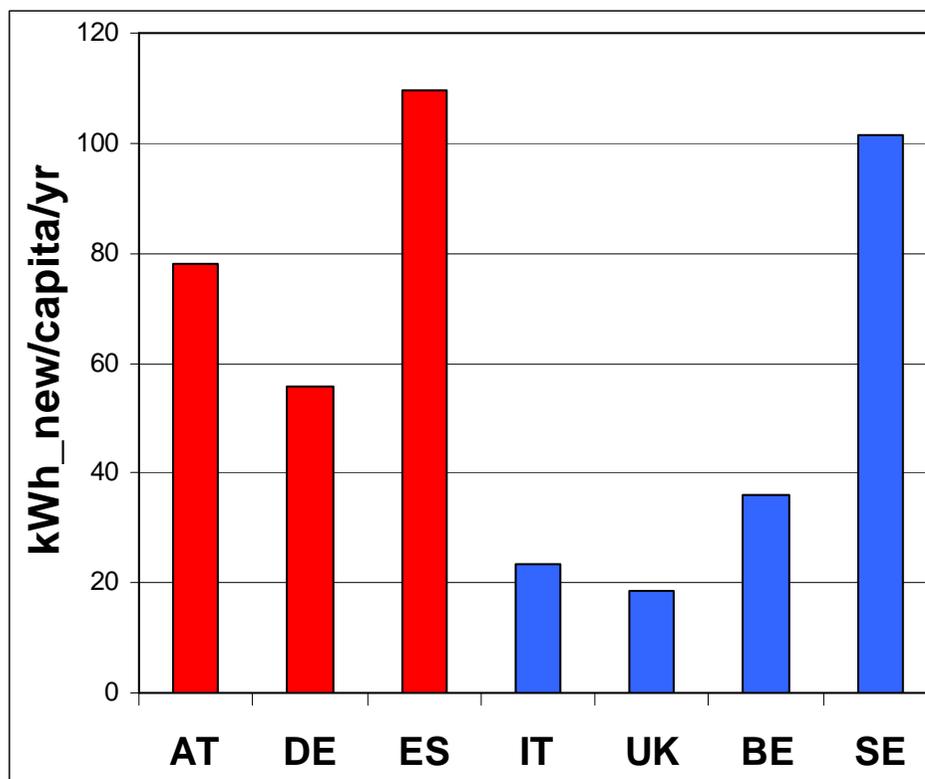
PROG-RES

FUTURE

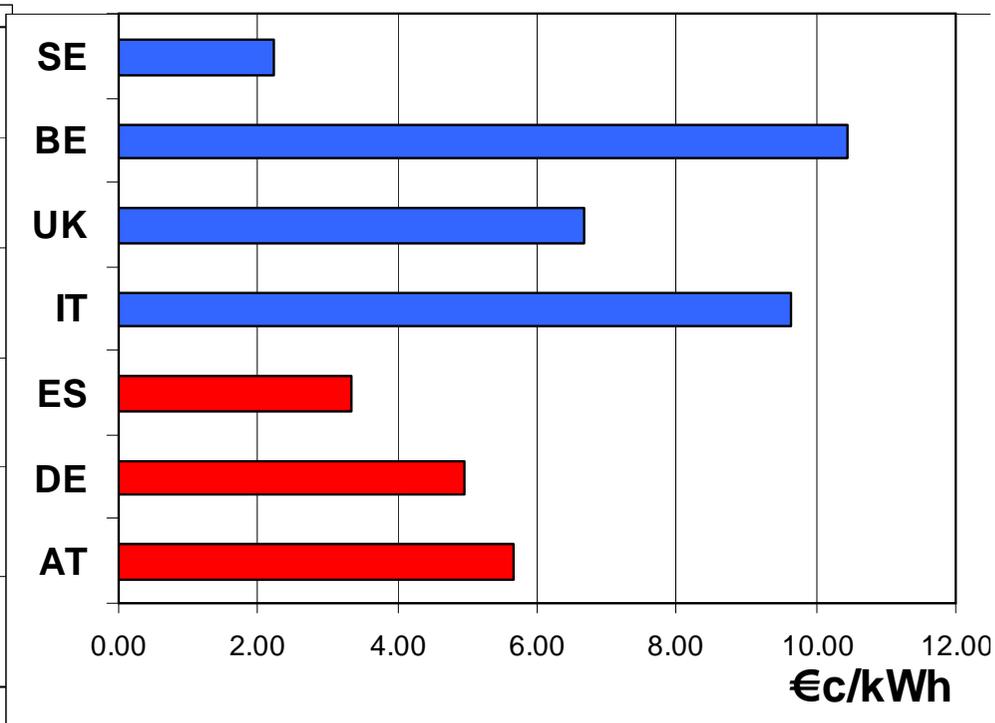
empirical application

COMPARISON OF STRATEGIES

Effectiveness:

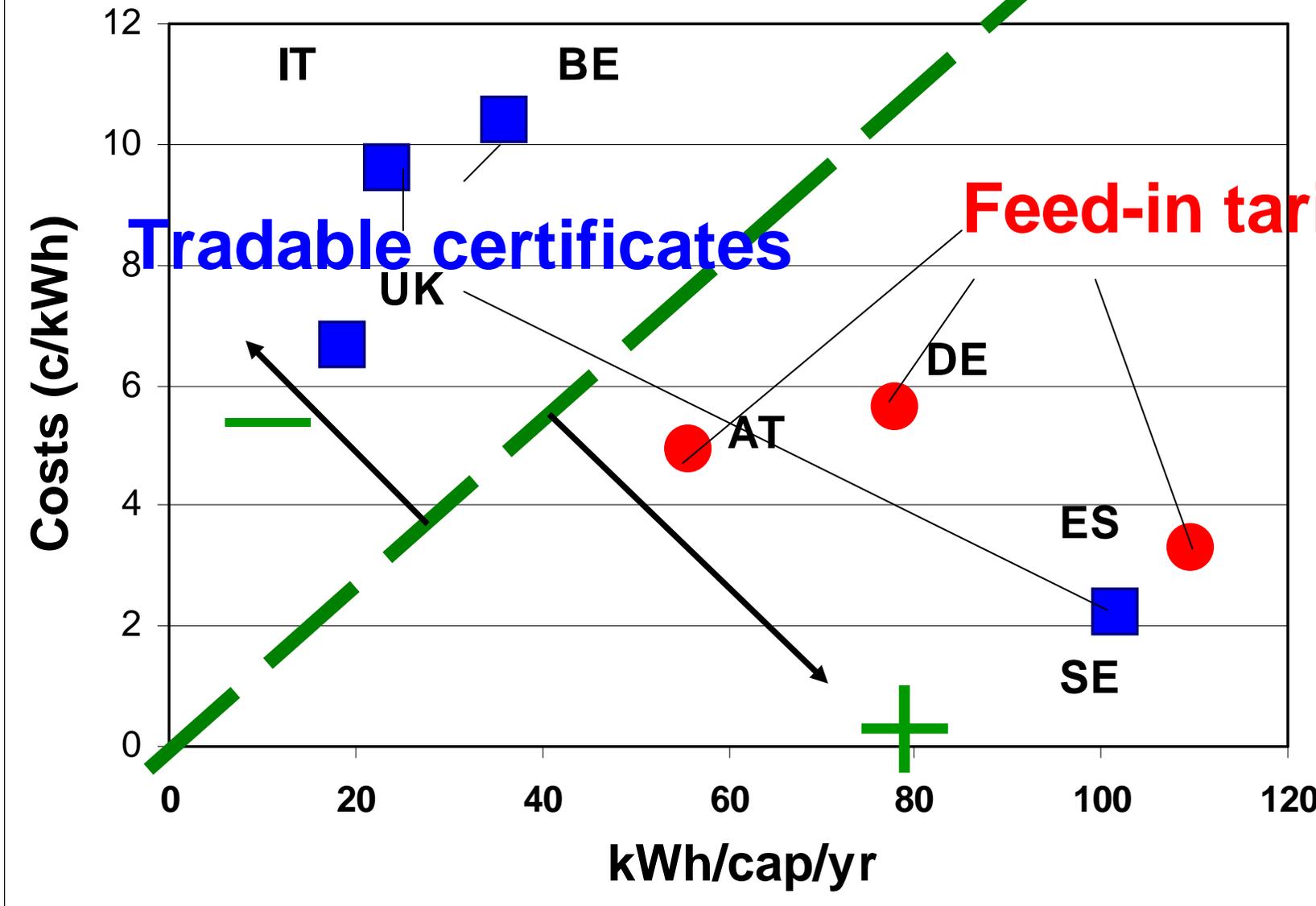


Costs:



(2000-2004)

EFFECTIVENESS VS COSTS

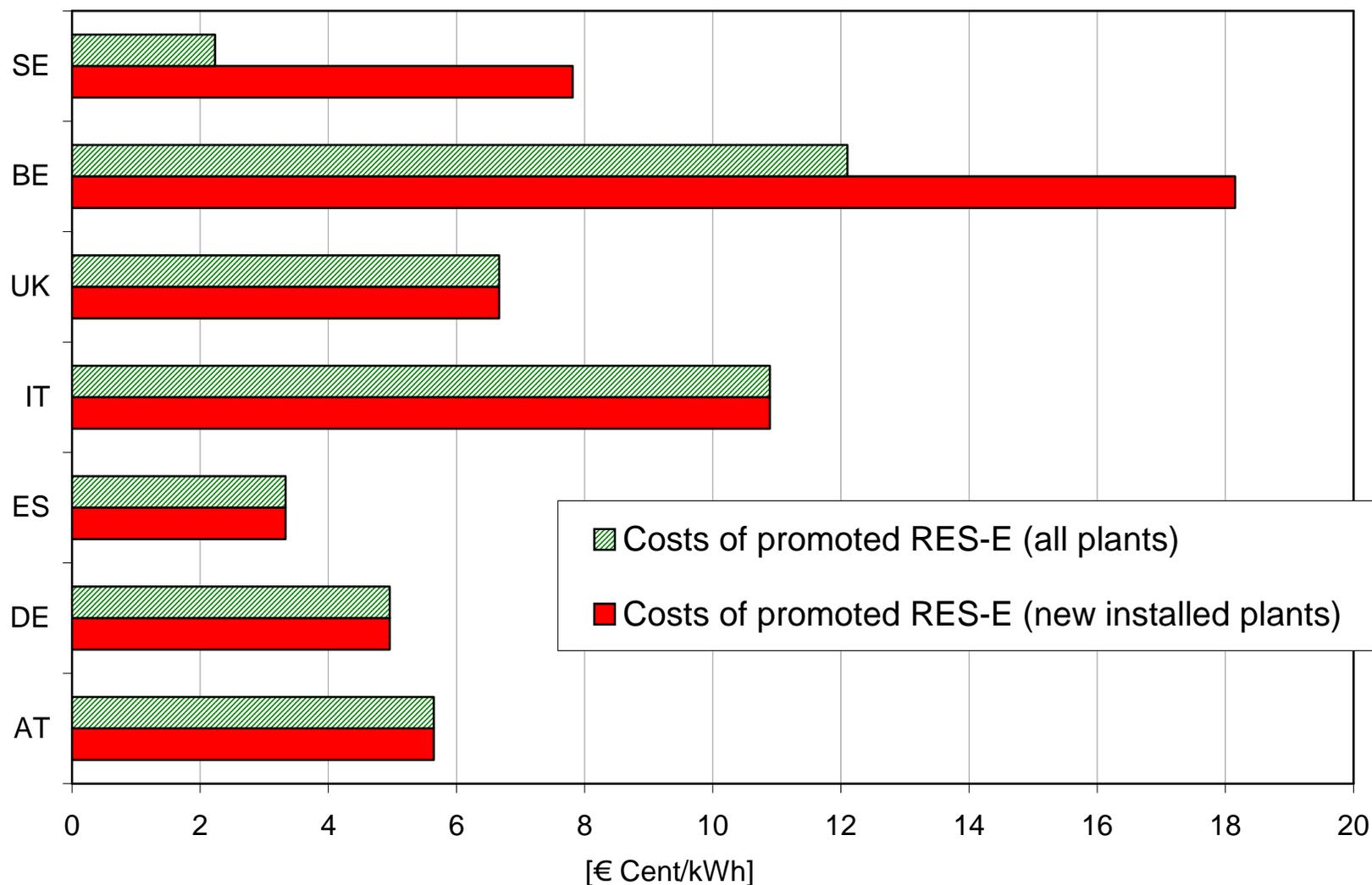


Tradable certificates

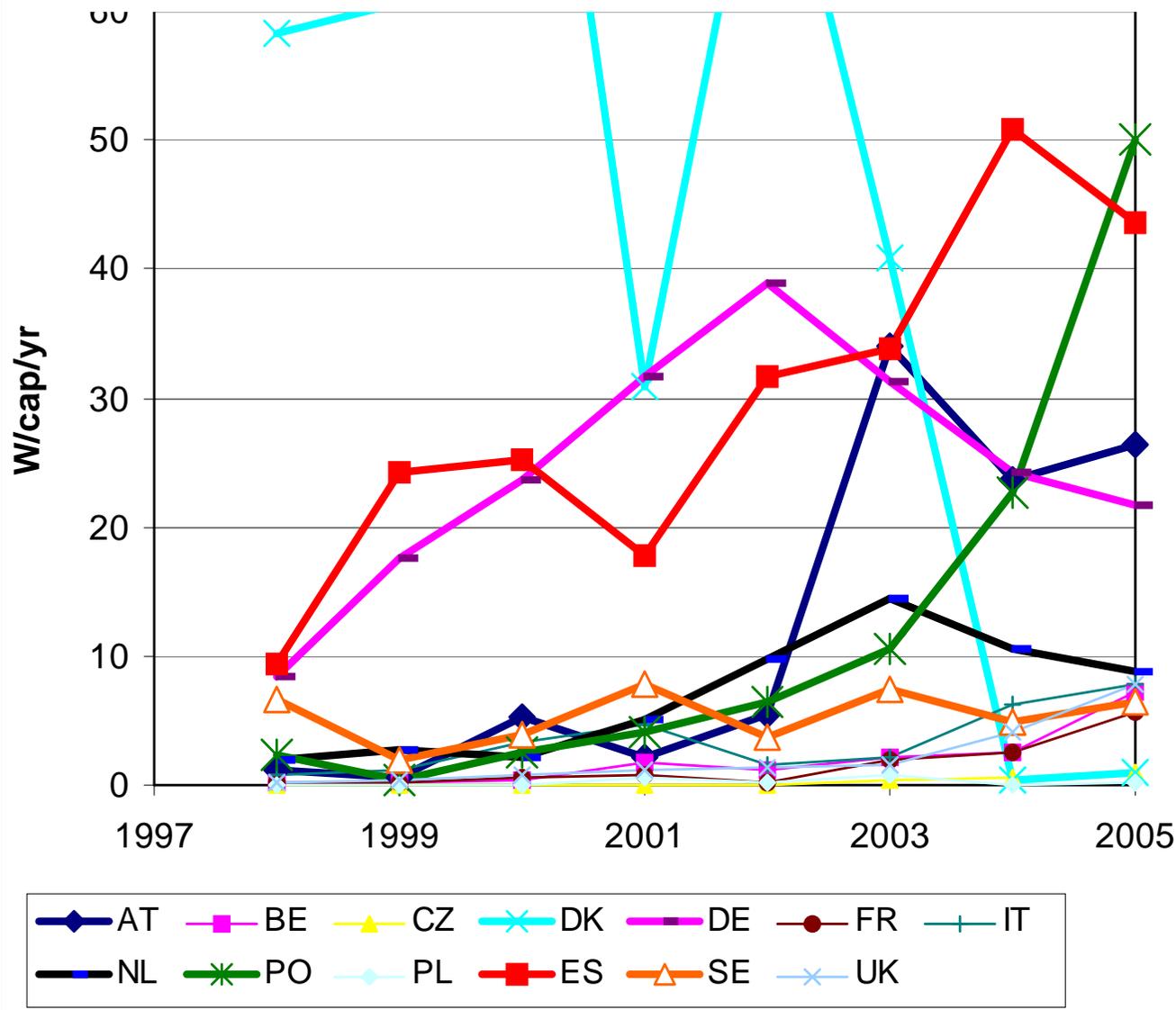
Feed-in tariffs

Costs of promoted kWh vs costs of new kWh

Costs of promoted RES-E versus costs of "new" RES-E

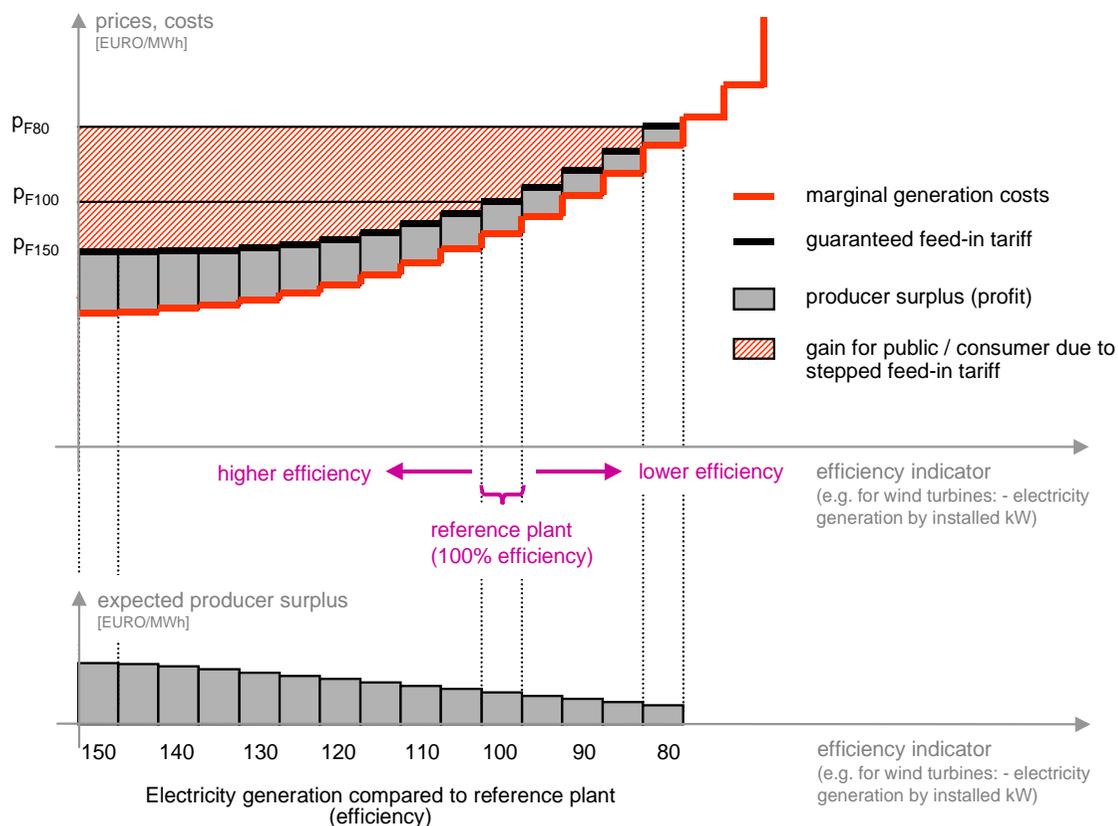


WIND: INSTALLATIONS PER YEAR



5. SUCCESS CRITERIA FOR FIT's

1 Use a stepped FIT and calculate starting values carefully

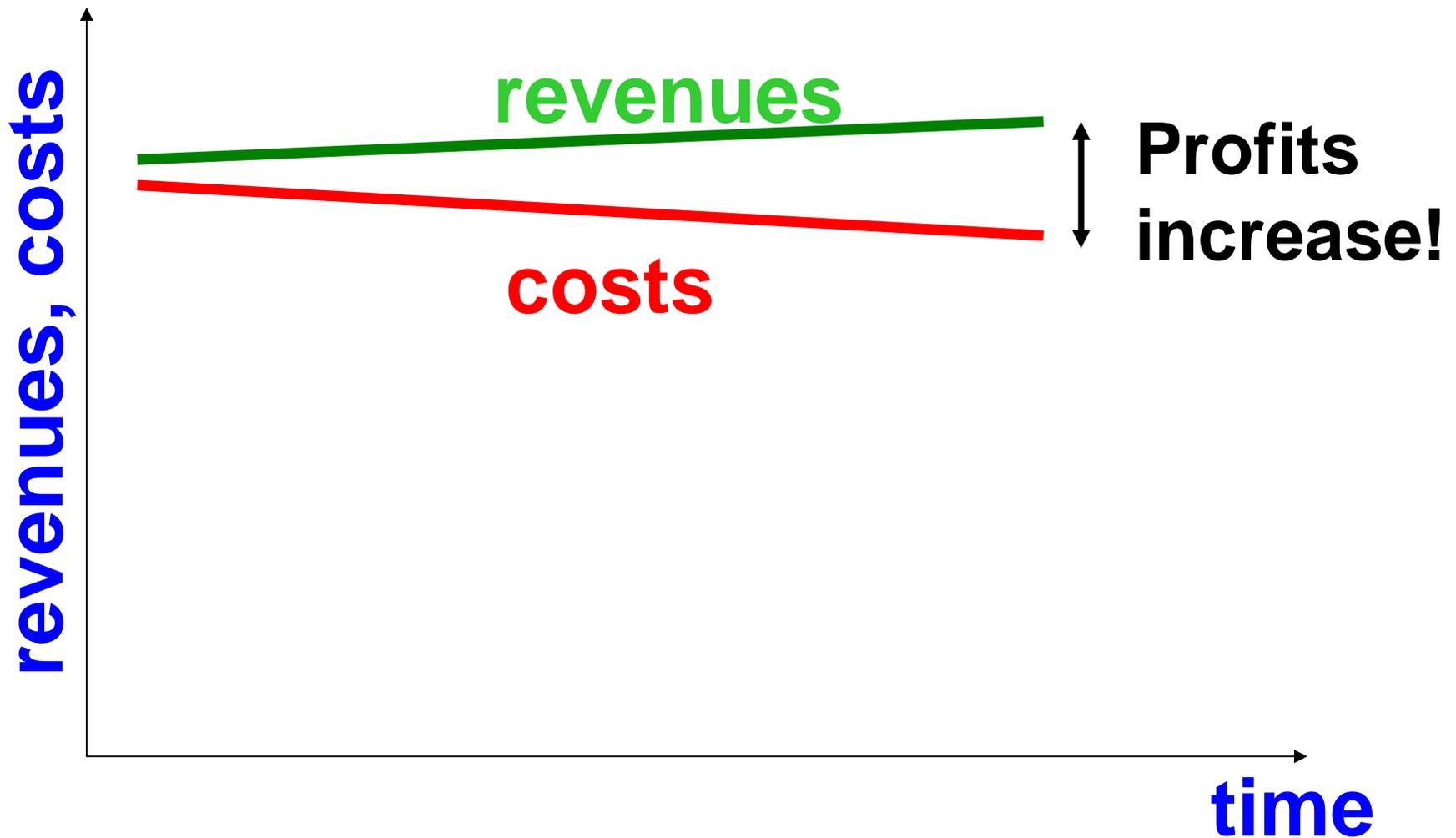


2 Decrease over time!

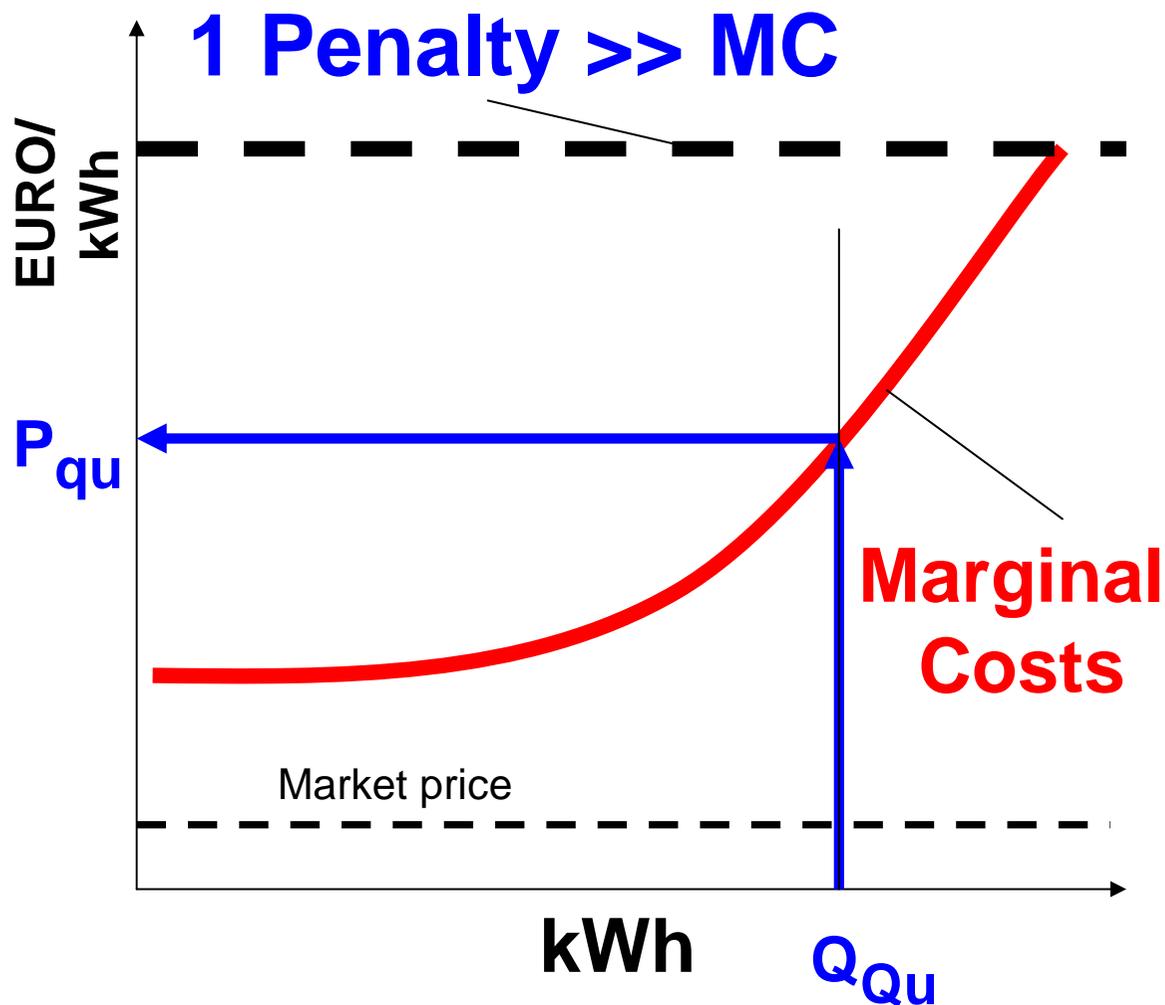
3 Realistic time frame

EMPIRICAL PROBLEM OF FITs:

The example of wind



6. SUCCESS CRITERIA FOR QUOTA-BASED TGC'S



2 Ensure long-term planning horizon!

3 Focus on new plants

1 Market is too small:

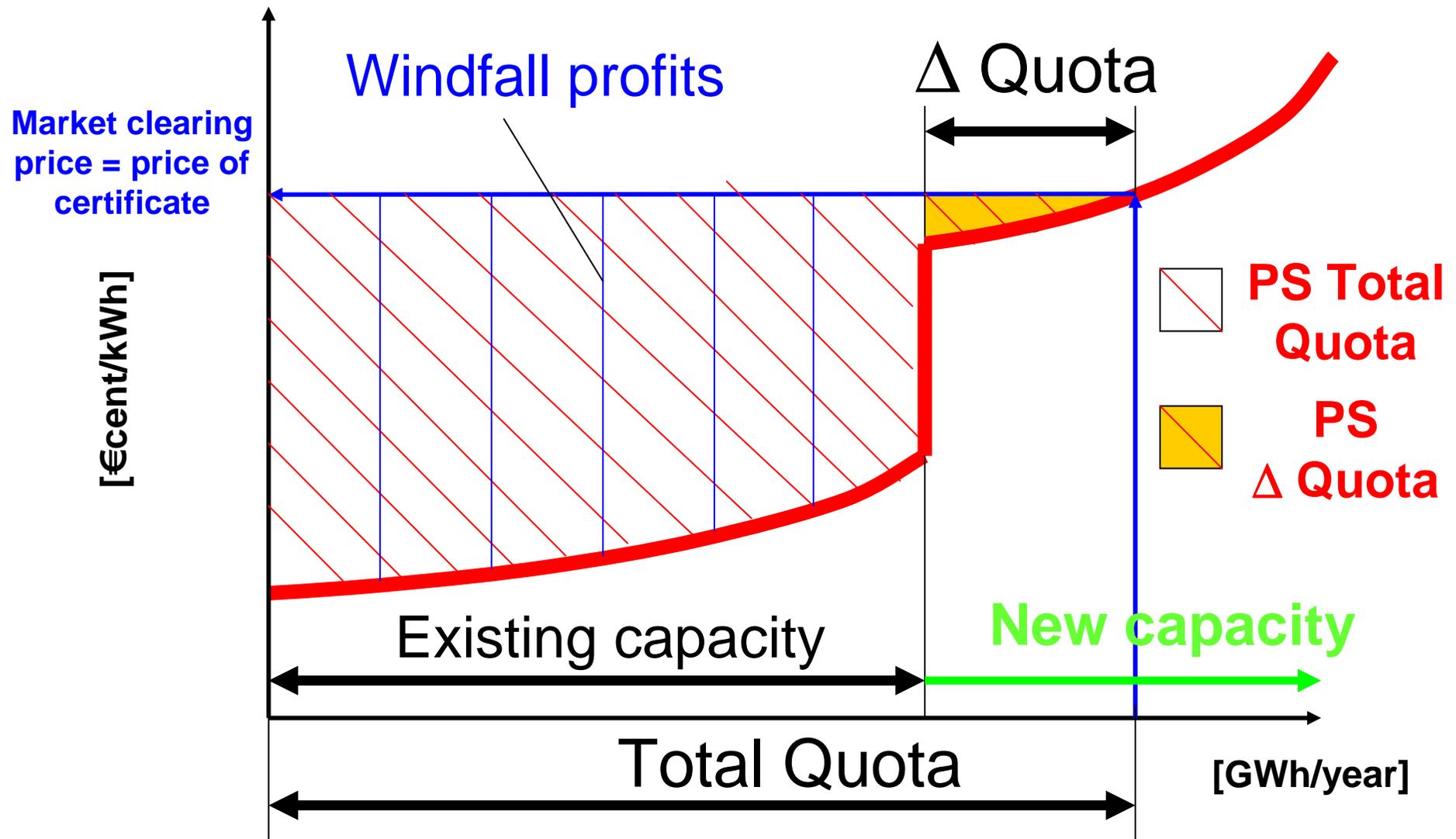
e.g. in a small country for one technology with very limited potential -> Non-Liquid because every single plant is known (e.g. Flanders (BE))

2 Windfall profits for existing capacities (e.g. Flanders (BE), Sweden)

3 Penalty is too low (e.g. UK)

4 Planning horizon too short (e.g. UK 2003, Italy)

QUOTA: EXISTING VS NEW CAPACITY



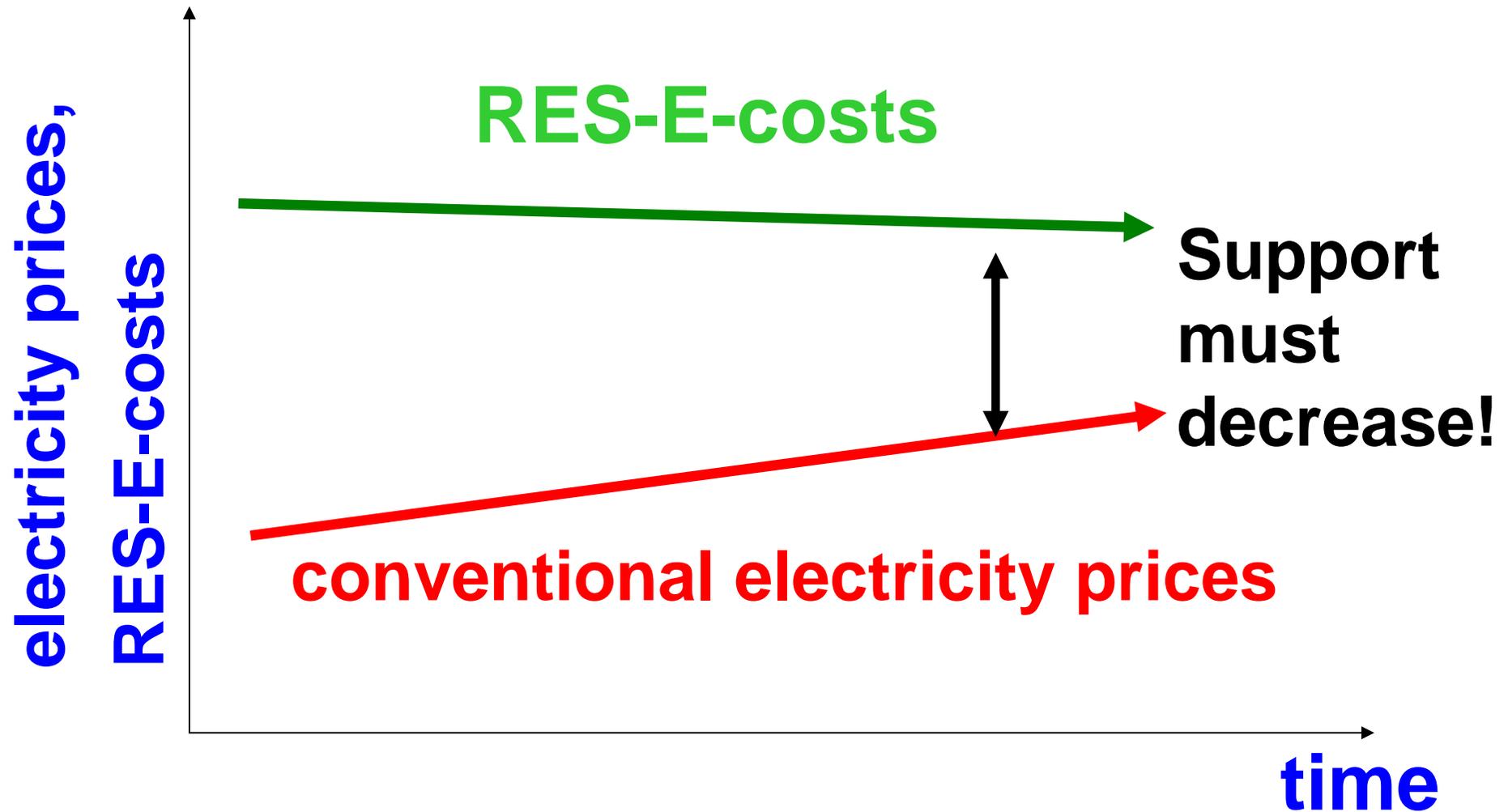
7. COMPETITION?

- **Competition among manufacturers exist**
- **Most important argument for TGCs: it is assumed that they foster competition between generators**
- **Objective of competition -> competitive prices**
- **competitive prices:**
 - Prices = marginal costs (of generation)**
- **Currently:**
 - certificate prices > average feed-in-tariffs**
- **No indicator for real competition in TGC markets!**
- **-> Utilities are in favour of TGC because they can make more money in TGC markets !**

- **Careful design of a strategies:**
by far the most important success criteria!
- **There should be a clear focus on NEW**

**IMPROVE THE CURRENT
SYSTEMS!**

and-go“ approaches



- **Instead of harmonisation: Stimulate/Foster competition between promotion schemes/between countries: Which system/where provides new RES-E capacities at lowest costs for society?**
- **Exchange of lessons learned: Improvement of strategy design must build on learning from each other: e.g. Feed-in-cooperation DE and ES -> Why not a similar “Club” of TGC – countries?**
- **Currently, a well-designed (dynamic) FIT system provides a certain deployment of RES-e fastest and at lowest costs for society**
- **However, for sustainable policy -> parallel focus on demand-side conservation of high priority!**

INTERESTED IN FURTHER INFORMATION?

- Download reports from:

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[www . green-x . at](http://www.green-x.at)

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