Towards Triple-A policies: More renewables at lower cost

Draft results from the IEE RE-SHAPING project

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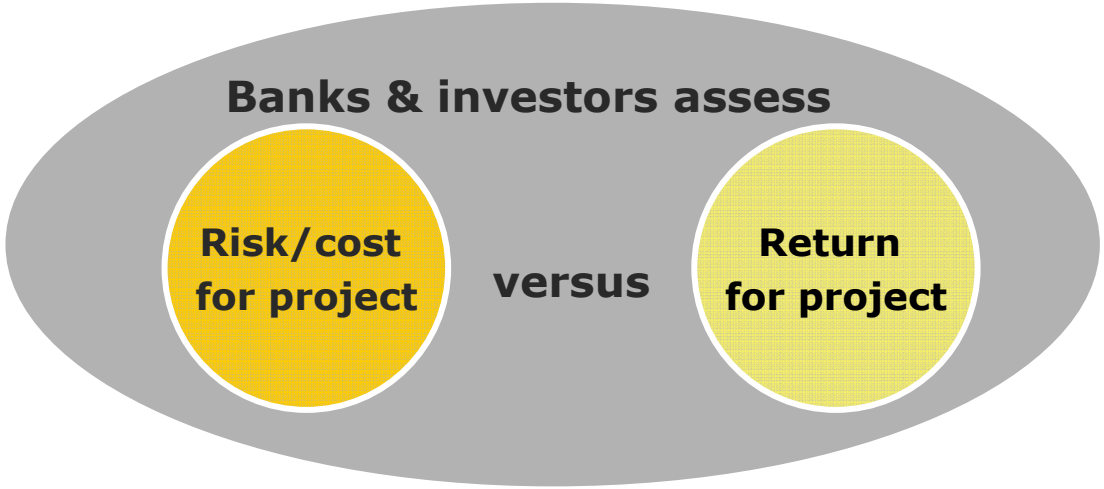
Why something needs to happen …

- Investments in RE need to double
  - Growth is too slow in many Member States
- Financial crisis reduces growth and drives up cost
  - Lenders review risks more critically
  - Worse financing conditions
  - Less projects bankable – especially affecting independent power producers & technologies/countries perceived more risky
- Institutional investors have large sums to spent at moderate rate of return, but risk-averse
- RE policy cost increase viewed more critically
  - High differences observed between countries' policy cost per MWh

… towards Triple-A RE policies



High risk = not bankable

RE policies key for project risk/cost

Traditional rating of creditworthiness:

"Greece angry with Moody's rating cut"

Triple-A rating

=Very creditworthy: Low default risk

=Lenders eager to lend, investors eager to invest

=Low risk premiums → Low interest rates → Low cost for debt

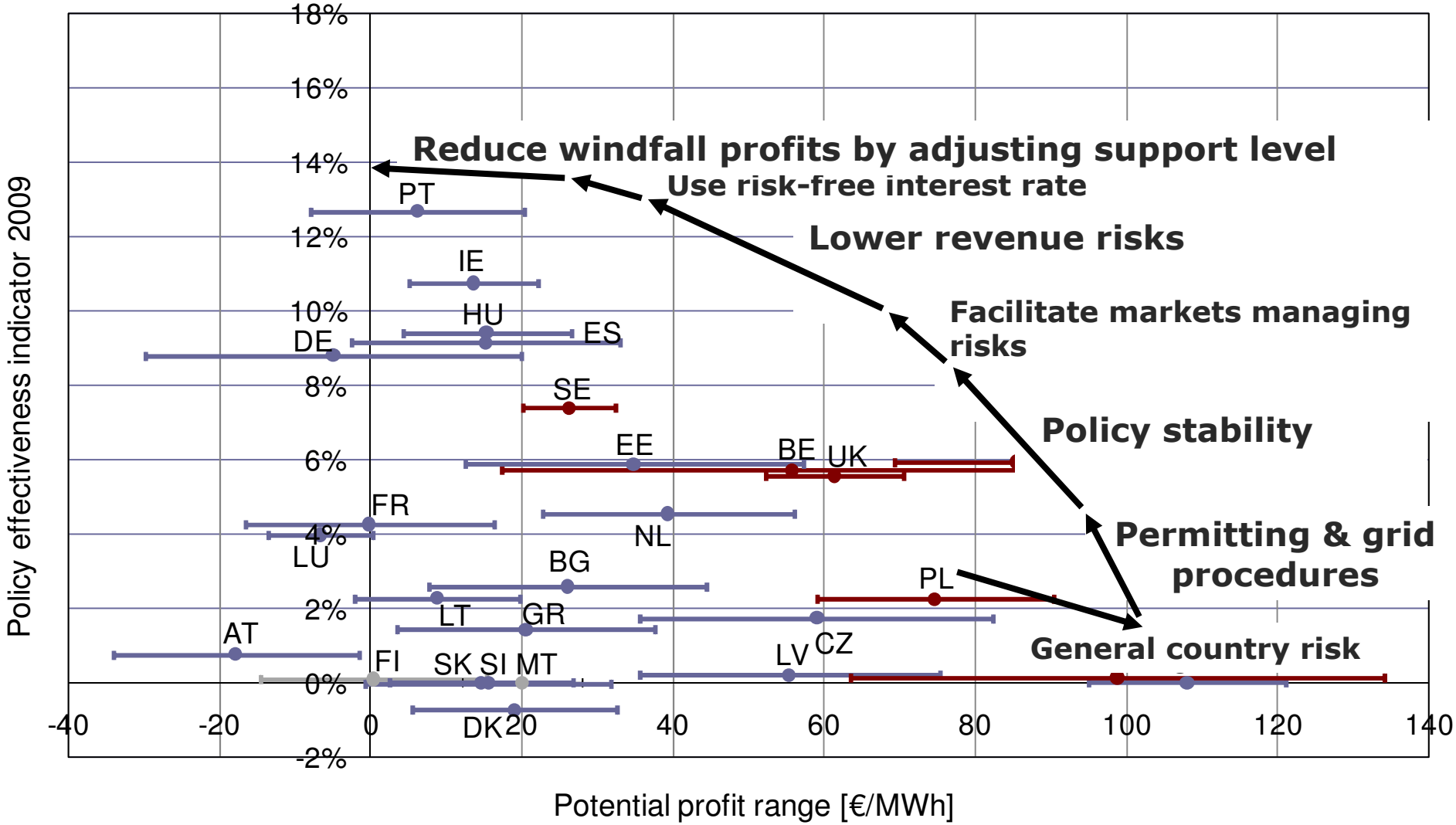
'Rating' of RE policy framework:

Implicitly done by developers, investors & lenders

<u>Countries with triple-A RE policies will experience more RE growth at lower cost</u>

- EU overall by €8bn annually in 2020
- This study: 20 policy options that can each reduce levelized cost by 2-20+%

Policy effectiveness (growth) versus policy cost efficiency - wind onshore 2009



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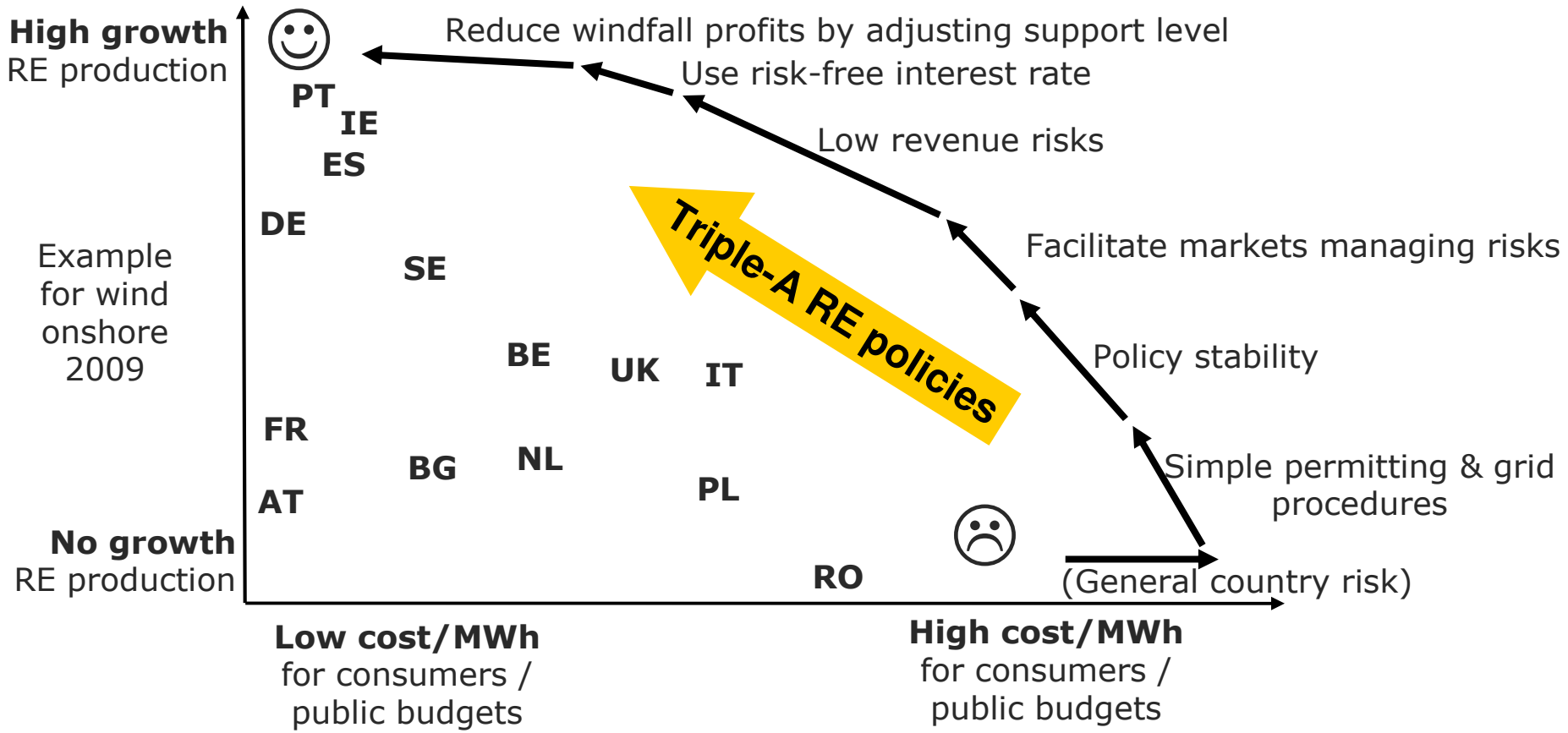
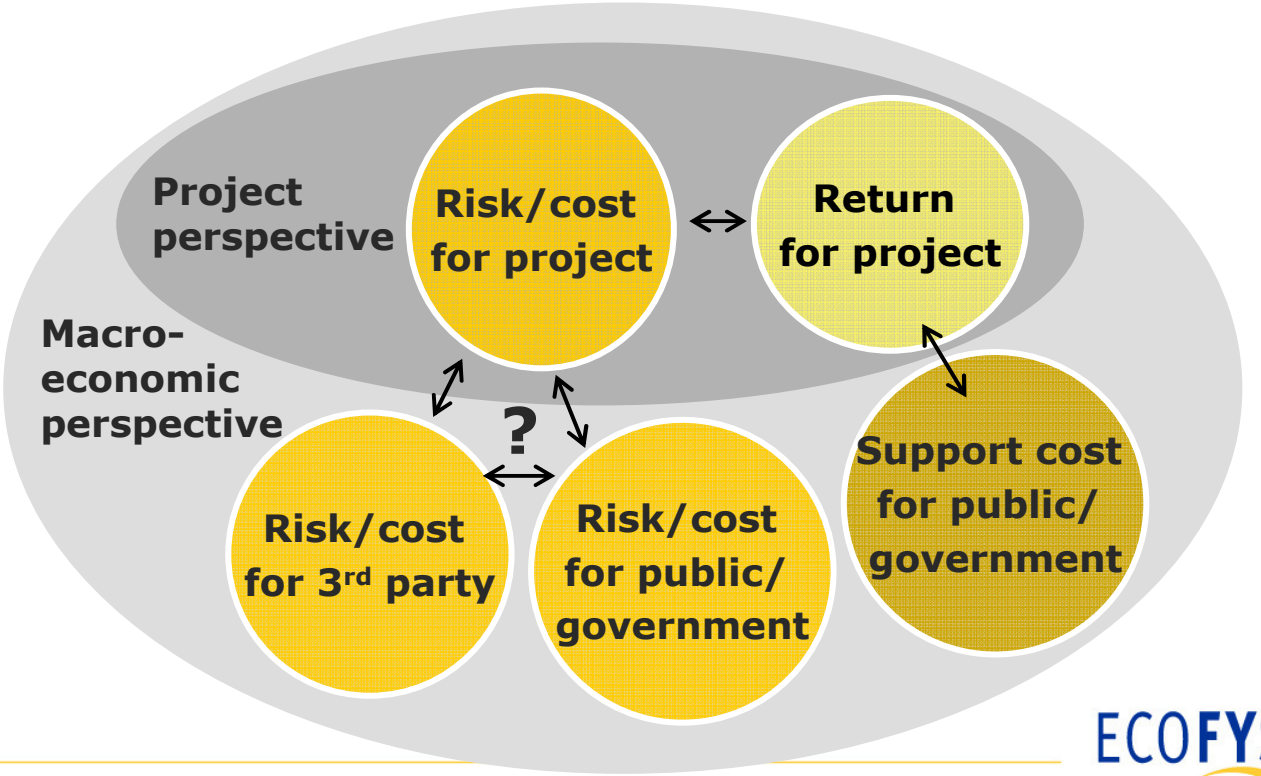
Triple-A policies help explain observed differences in policy effectiveness & efficiency



These indicators / graphs are available for all technologies and Member States within RE-Shaping

Who is best prepared to bear the risk? 1/2

1. Consider both project & macro-economic perspective
2. Recognize that different parties can bear the risk
3. Recognize that different parties have different options to mitigate risks at different cost and with different societal benefits ➔ macro-economic result will vary
4. Recognize that one policy does not fit all: Optimal allocation and treatment of risk will differ between countries and technologies.



Who is best prepared to bear the risk? 2/2

rather the
RE project

Macro-economically optimal allocation and treatment of risk depends on

1. Technology-specific risks and technology maturity
2. Country-specific technology deployment status*
3. Country-specific electricity market design and structure*
4. Project size and investor group
5. Influenced by dominating macro-economic paradigms

rather the
'public'

- **Construction risk**
- **Technology risk**
- **Operation risk**
- **Biomass price fluctuations** (cost risk)
- **Annual variability of wind/solar** (revenue risk)
- **Power revenue risk & balancing demand-driven RET** (FIP & quota system)
- **Power revenue risk & balancing supply-driven RET** (FIP & quota system)
- **Certificate revenue risks** (quota system)
- **Curtailment in case of grid congestion** (revenue risk)
- **(Offshore) electricity grid development**
- **Monetary policy risks** - interest rates, exchange rates, inflation
- **Permitting & grid access complex & intransparent**
- **Abrupt policy changes or budget/capacity caps**
- **Retro-active policy changes**

*RE-Shaping indicators available

Finding a new balance?

Government

- Meeting national objectives
  - Minimising societal cost

Market

- Meeting company objectives
- Maximising return on investment

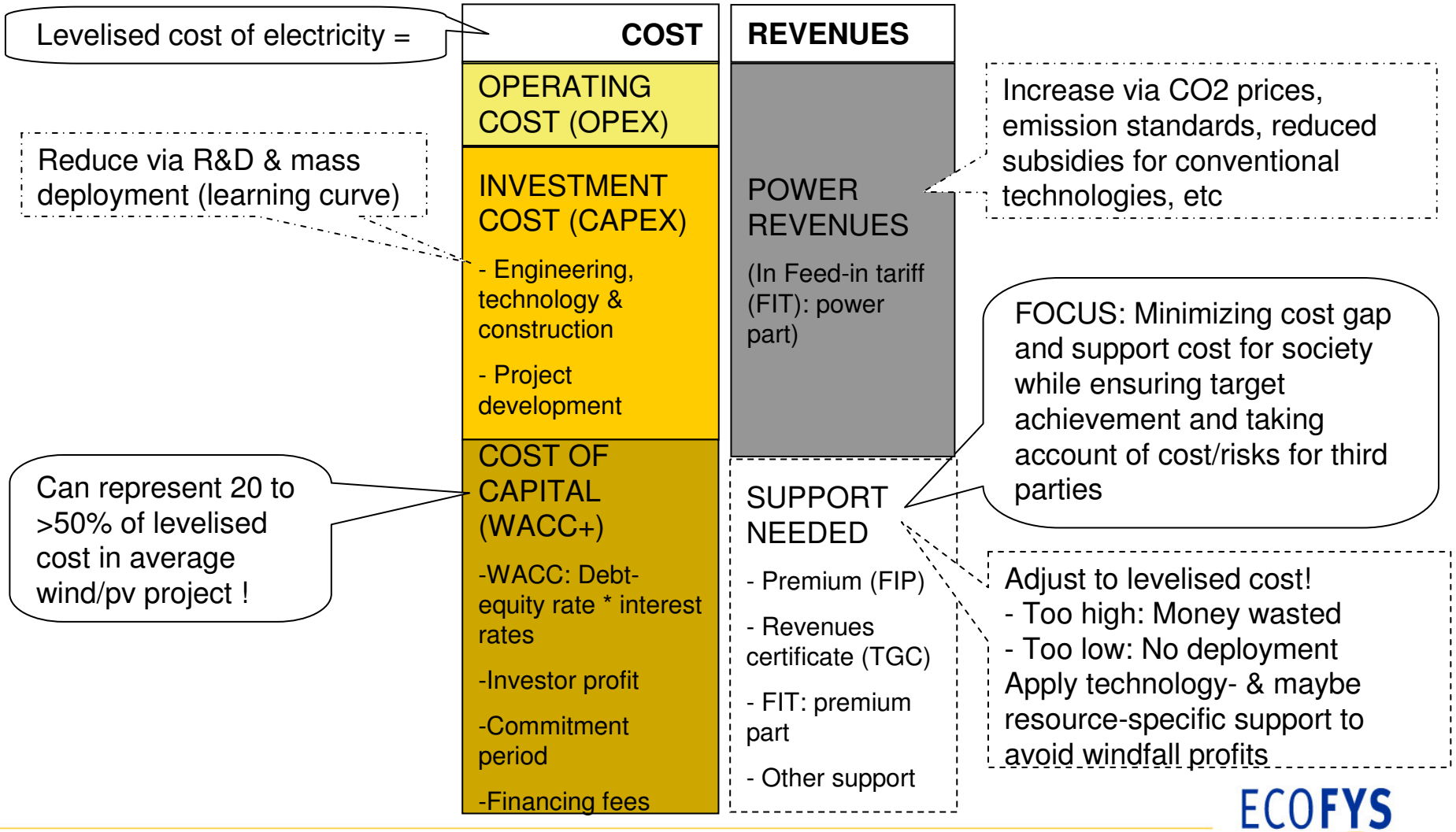
Move towards market

- Share in risk
- *"Put your money where your mouth is"*

Move towards societal responsibilities

- Accept lower return at lower risk

Cost categories for quantifying policy options & wider policy context



Triple-A policy options and their cost saving effect 1/3

Legend

Levelized cost saving potential:

- ■ = up to 10% and more
- ■ = up to 6%
- ■ = up to 4%
- ▪ = up to 2%

Removing growth constraint:

- = Strong effect
- = Medium effect
- = Small effect

		Levelized cost saving potential						Removing growth constraint
		Cost			Reve-nue		SUM	
		WACC+	CAPEX	OPEX	POWER	SUPPORT		
INCREASING POLICY STABILITY								
1 No retro-active policy changes for existing projects	☺	■				□	>20%	■
2 No abrupt policy changes for upcoming projects	?		■			□	>10%	■
3 Simple & transparent permitting & grid access procedures	😐		■				>10%	■
4 No budget/capacity caps & continual access to support	☺→?		■				>10%	■
APPLYING POLICY STABILIZERS								
5 Support financed off-budget via consumer surcharge	☺→?	▪	▪				3%	
6 (Temporary) government participation	☺	■					5%	
7 Loan guarantees		■					5%	▪
8 EU enforcement RE directive implementation & Member State support level coordination								

1 No retro-active policy changes for existing projects

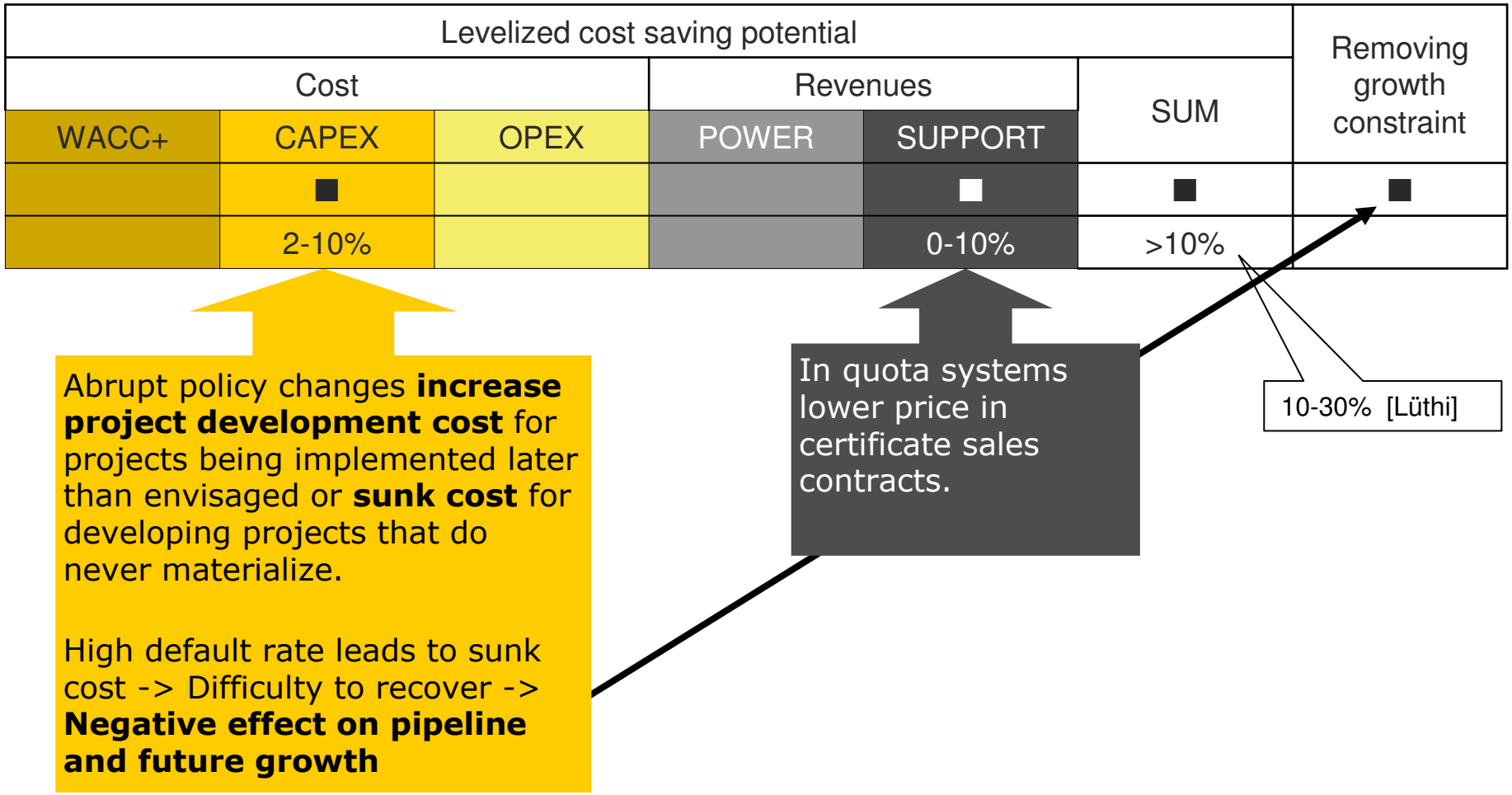
Levelized cost saving potential						Removing growth constraint
Cost			Revenues		SUM	
WACC+	CAPEX	OPEX	POWER	SUPPORT		
■				□	■	■
>10%				0-10%	>20%	

Risk of retro-active policy changes **reduces investment certainty** and leads to higher (policy) risk premiums.

In quota systems lower price in certificate sales contracts.

No-go criterion for some investors

2 No abrupt policy changes for upcoming projects



4 No budget or capacity caps & continual open access to support (in FIT/FIP)

Levelized cost saving potential						Removing growth constraint
Cost			Revenues		SUM	
WACC+	CAPEX	OPEX	POWER	SUPPORT		
	■				■	■
	2-10%				>10%	

Caps **increase project development cost** for projects being implemented later than envisaged or **sunk cost** for developing projects that do never materialize.

High default rate leads to sunk cost -> Difficulty to recover -> **Negative effect on pipeline and future growth**

"Cap = Gamble"

10-30% [Lüthi]

Alternative to cap: Frequent/growth-related/automatic tariff adjustment

Triple-A policy options and their cost saving effect 2/3

Legend

Levelized cost saving potential:

- ■ = up to 10% and more
- ■ = up to 6%
- ■ = up to 4%
- ▪ = up to 2%
- ☹

Removing growth constraint:

- = Strong effect
- = Medium effect
- = Small effect

	Levelized cost saving potential						Removing growth constraint
	Cost			Reve-nue		SUM	
	WACC+	CAPEX	OPEX	POWER	SUPPORT		
REDUCING REVENUE RISKS							
9 Quota: Long time-horizon & serious penalties ☺	■				▪	>10%	■
10 Quota: Price floor applied ☺	■				▪	7%	
11 Feed-in premium instead of quota system with TGC ☺ [1] incl. higher margins in quota system for technology suppliers and PPA counterparty)	■	■ [1]	■		▫ [1]	>10%	
12 Feed-in tariff instead of feed-in premium ☺ **- sliding FIP** [2] lower values in case of sliding feed-in premiums	■ [2]	▪	▪	▪		8%*	
13 Priority in case of grid congestion, priority dispatch + Compensation for forced curtailment	■ ▪			▪	▪ ▪	10% +4%	■
14 Compensation for annual variability wind/solar	▪					2%	

11 FIP instead of quota (Removing certificate revenue risk)

Levelized cost saving potential						Removing growth constraint
Cost			Revenues		SUM	
WACC+	CAPEX	OPEX	POWER	SUPPORT		
■	■ + ■	■		■ + ■	■	
4%	4 + 6%	4%		4 + 6%	>10%	
	(b1) (b2)			(e1) (e2)	(f)	

Revenue risk (risk of decreasing certificate prices)

Higher cost for structuring contracts.

Like (b1): Additional performance guarantees

(b1) Instead/ additional to higher WACC, banks may in quota system require only contracting established companies/ technology providers in order to minimize overall project risk.

(e1) Risk premium/margin for counterparty buying certificates

(e2) Project & counterparty taking upside (chance of unexpectedly high certificate prices) at consumer cost.

(b2) In most quota systems currently higher prices/ margins for technology and project development can be observed.
Due to / or causing high certificate prices?

12 FIT instead of FIP

(Removing power revenue risk & balancing cost/risk)

Levelized cost saving potential						Removing growth constraint
Cost			Revenues		SUM	
WACC+	CAPEX	OPEX	POWER	SUPPORT		
■	▪	▪	■		■	
2-4%	1-2%	1-2%	2-4%		8%	

Power revenue and balancing risk

-100 bp WACC [Pöyri]
-200 bp WACC [Giebel]
-130 bp WACC [Green-X]

Higher cost for structuring contracts.

Cost for forecasting / balancing.

Risk premium/margin for PPA counterparty

Project & PPA counterparty taking upside at consumer cost (in fixed premium, not in sliding premium).

Trade-off: Increased risk/cost for 3rd party: balancing

Power revenue risk is lower (close to FIT) if premium is not fixed but refers to the average annual electricity market price ('sliding premium', 'contract for difference') – **a sliding premium is from a risk perspective between a feed-in tariff and a fixed premium**, according to some respondents almost comparable to a feed-in tariff.

Triple-A policy options and their cost saving effect 3/3

Legend

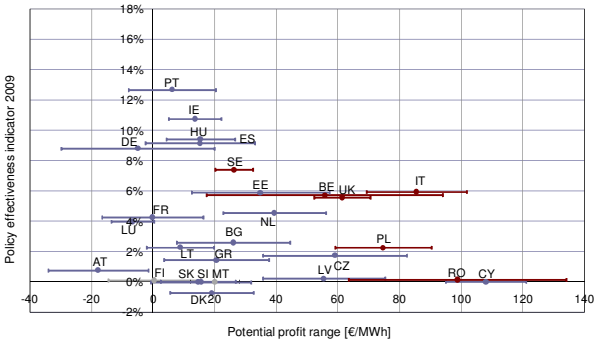
Levelized cost saving potential:
- ■ = up to 10% and more
- ■ = up to 6%
- ■ = up to 4%
- ▪ = up to 2%

Removing growth constraint:
- = Strong effect
- = Medium effect
- = Small effect

	Levelized cost saving potential						Removing growth constraint
	Cost			Reve-nue		SUM	
	WACC+	CAPEX	OPEX	POWER	SUPPORT		
USING RISK-FREE INTEREST RATE							
15 Front-loading the support payment stream	■					6%	
16 Soft loan	■					6%	
FACILITATING RISK ASSESSMENT & INSURANCE							
17 Availability of standardized risk assessment tools and ratings	■	▪				4%	
18 Availability of insurances for risks that are so far not insurable	▪					2%	■
MISCELLANEOUS							
19 TSO responsible for wind offshore grid connection	▪	▪				2%	

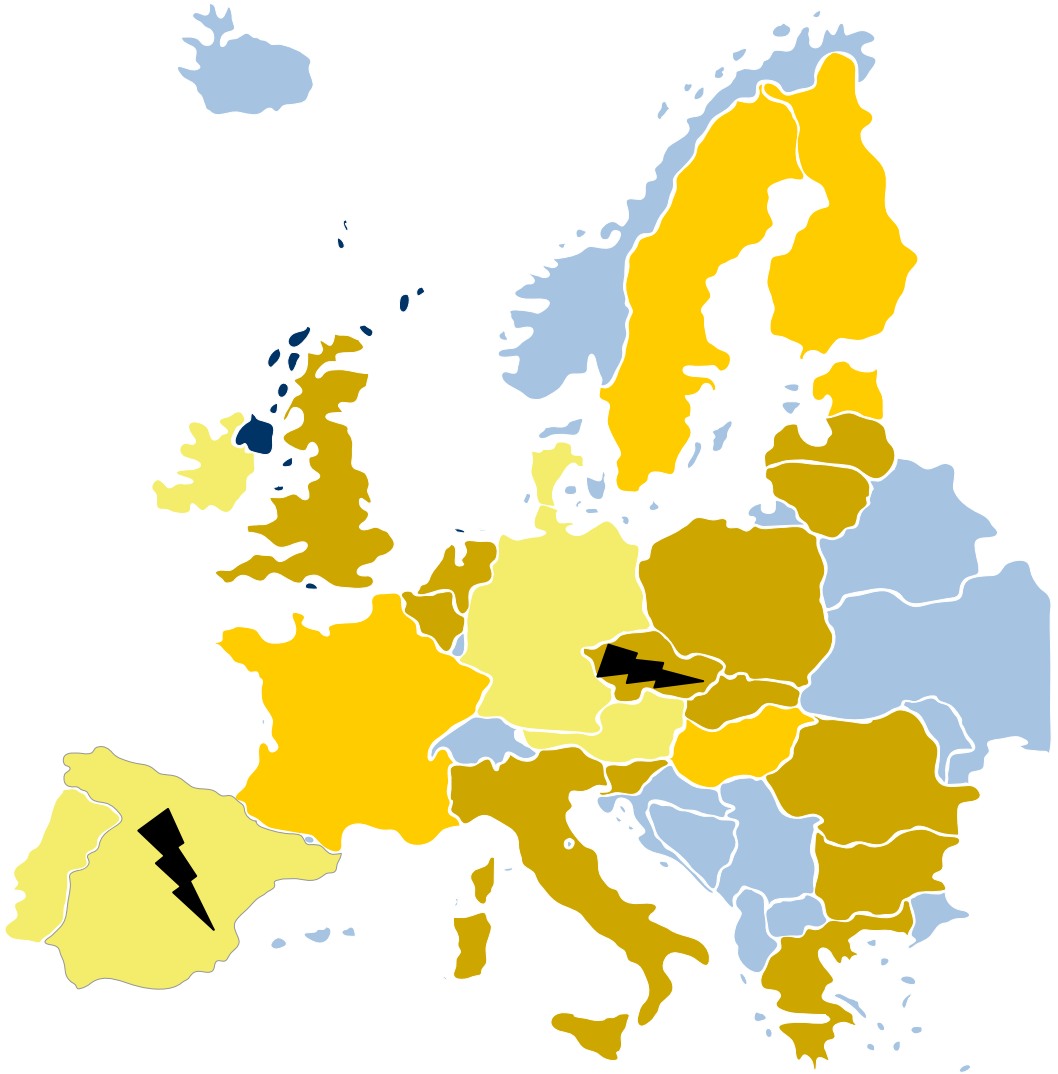
Note: Not all options apply to all Member States or can be cumulated.

Country-specific cost saving potential



Saving potential	
	Large
	Medium
	Small

In Member States with too low support levels or too high barriers Triple-A policies would not reduce cost but enable growth to start in the first place.



Conclusions

- Triple-A policies can increase growth & reduce support (policy) cost by up to 50% for specific technologies/Member States & 10% on EU average
  - As already observed in best practice MS/technologies
  - Market player perception of policy option's can explain observed differences in policy efficiency & effectiveness

- Triple-A policies
  - consider risk perception by investors/lenders
  - consider effect on all cost categories, not just on WACC
  - reconsider risk allocation/sharing between project and public
  - avoid unnecessary risk
  - distinct between Member State specific status of technologies & electricity markets – RE-Shaping indicators give first estimate
  - are only one of several necessary policy actions to close cost gap and mainstream RE (R&D, CO2, conventional subsidies, windfall profits ..)

- Most effective policy options:
  1. Policy stability & removal of barriers
  2. Reducing project revenue risks
  3. Applying 'Policy stabilizers' (sharing risk)

Thank you for your attention!

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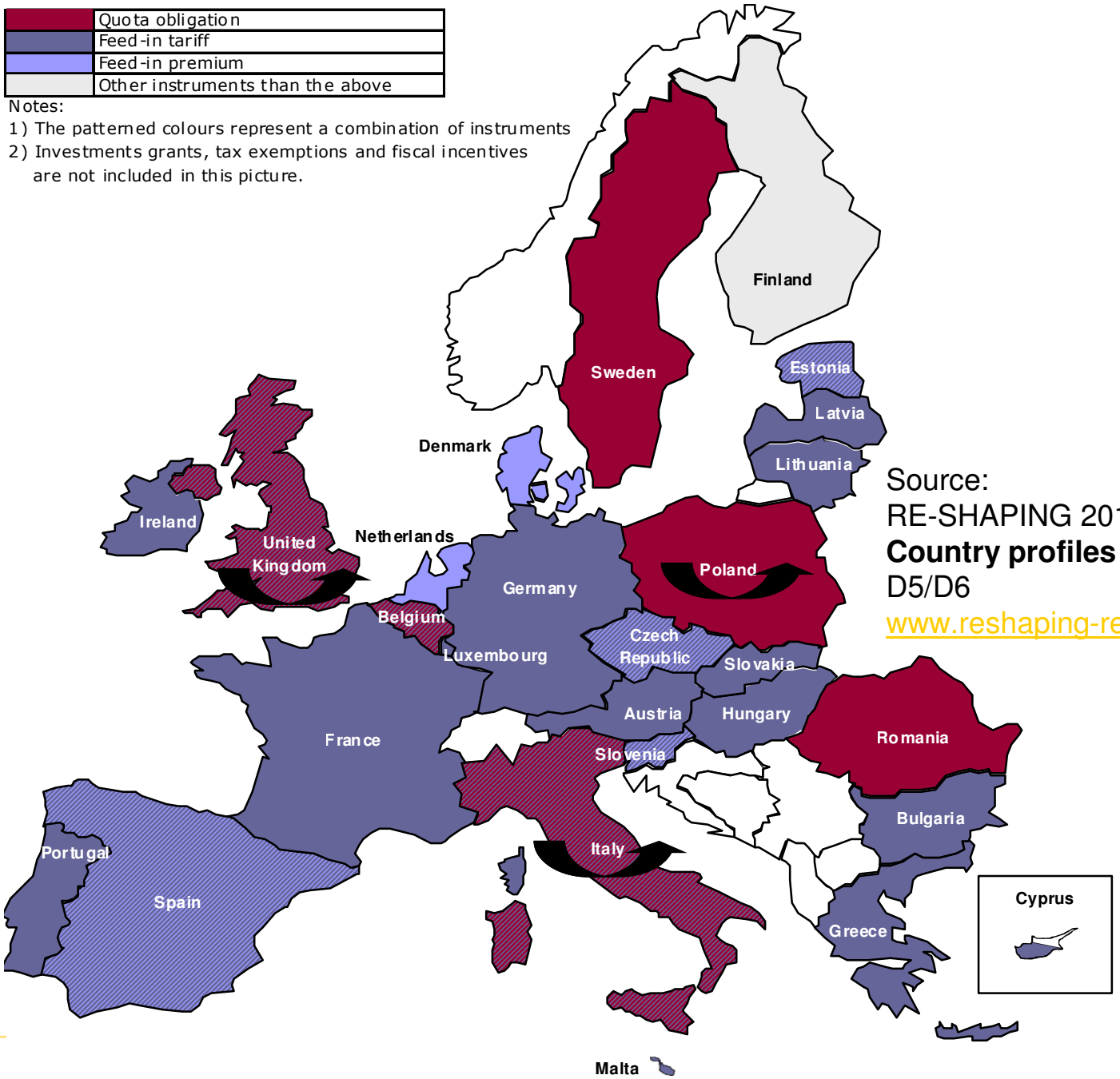
Report will be soon available on

www.reshaping-res-policy.eu



Source:
RE-SHAPING 2010
Country profiles & indicator report D5/D6
www.reshaping-res-policy.eu

Triple-A policy options shown here …

- … are based on
  - consortium expertise in RE policy evaluation
  - literature, partly based on conjoint analysis
  - **Perception of market parties**: > 20 interviews with lenders, equity investors, project developers and project financing experts – each active in several Member States and able to compare RE policy frameworks in different Member States
    - Quantification is no exact science!
- … are work in progress
  - Feedback on qualitative & quantitative description of policy options is highly appreciated!

Literature used

[Lüthi]

Sonja Lüthi, Rolf Wüstenhagen 2010: *The price of policy risk – Empirical insights from choice experiments eith European photovoltaic project developers.*

[Ecofys 2008]

Ecofys 2008: *Policy instrument design to reduce financing costs in renewable energy technology projects.*

[Ecofys 2010]

Ecofys, Ernst&Young, TU Vienna EEG, Fraunhofer-ISI 2010: *Financing Renewable Energy in the European Energy Market*

[Giebel]

Olaf Giebel 2011: *Influence of renewable energy support mechanisms on financing cost.*

[Taskforce NL]

Taskforce Offshore wind energy Netherlands 2010: *Eindrapport Taskforce Windenergie op zee.*

Simple & transparent permitting & grid access procedures

Cost			Revenues		Levelized cost saving potential	Removing development constraint
Cost of capital	Investment cost	Operating cost	Power revenues	Support		
	>€€€€€				>10%	+++

10-40% [Lüthi]

1) Long, complex procedures increase project development cost.

2) High default rate leads to sunk cost for developing projects that do never materialize

-> Sunk cost need to be recovered in successful projects

-> higher project development cost

3) Often sunk cost cannot be fully recovered (e.g. due to support level limiting maximum % of project development cost in CAPEX)

-> less new project development will be started – developers stop or focus on other countries.

-> Project pipeline dries up, less future growth opportunities.

➔ In permitting & grid access procedures: Requirements to project (=investment at stake) should not increase faster than success chance

FIT/FIP: Financed via consumer surcharge (off-budget)

Cost			Revenues		Levelized cost saving potential	Removing development constraint
Cost of capital	Investment cost	Operating cost	Power revenues	Support		
€	€				3%	

Reduces **risk of retro-active policy changes** due to state budget constraints

Reduces **risk of policy changes affecting project development**

Quota: Long time-horizon and serious penalties

Cost			Revenues		Levelized cost saving potential	Removing development constraint
Cost of capital	Investment cost	Operating cost	Power revenues	Support		
€€€€€				€€	14%	++

Reduced risk of lower certificate prices/revenues due to low future demand.

Lower certificate prices/revenues due to uncertain future demand.

Quota: Price floor applied

Cost			Revenues		Levelized cost saving potential	Removing development constraint
Cost of capital	Investment cost	Operating cost	Power revenues	Support		
€€				€€	7%	

Reduced certificate revenue risk

Lower risk premium for certificate counterparty

Price floor =

UK headroom + buy-out

BE minimum prices

Large share of certificate value ensured, part remains risky

The quota system comes closer to a feed-in premium system.

'Upside' for projects remains -> cost to consumer

Priority in case of grid congestion
or Compensation for forced curtailment

Cost			Revenues		Levelized cost saving potential	Removing development constraint
Cost of capital	Investment cost	Operating cost	Power revenues	Support		
€€ + €			**€€ + €**	€€ + €	10% + 4%	

Reduced/no risk of lost power (& support) revenues due to reduced production in case of grid congestion (curtailment)

Effect compensation on top of grid priority:
-0.9% WACC
[Giebel]

Reduced/ no power revenue losses.

Reduced / no support revenue losses.

Compensation for annual variability wind/solar

Cost			Revenues		Levelized cost saving potential	Removing development constraint
Cost of capital	Investment cost	Operating cost	Power revenues	Support		
€					2%	

Reduced/no risk of lost power (& support) defaulting project due to one or more exceptionally bad wind/solar years -> better financing conditions (leverage)

-0.5% WACC [Giebel]

Comparable to wind derivatives

Front-loading the support payment stream (FIT, FIP, Quota)

Cost			Revenues		Levelized cost saving potential	Removing development constraint
Cost of capital	Investment cost	Operating cost	Power revenues	Support		
€ + €€					2% + 4%	

Less risk due to earlier repayment of loan & equity.

Interest subsidy:

Interest has to be paid over shorter period and/or for less loan/equity.

Support has to be paid earlier, but for support risk-free discount rate can be assumed.

Comparable to cash grants or flexible depreciation

Overall cost saving only if for public actually low interest rate applies

Soft loans

Cost			Revenues		Levelized cost saving potential	Removing development constraint
Cost of capital	Investment cost	Operating cost	Power revenues	Support		
€ + €€					2% + 4%	+

Soft loan conditions set standard which may lead to **longer loan tenure / shorter tail.** Observed e.g. in Germany with bank loan tenure being influenced by KfW refinancing tenure.

Less 'commercial' loan required.

More banks triggered to engage in RE financing may lead to **improved loan availability**.

Interest subsidy:

Project pays lower interest. For public risk-free interest rate applies.

Overall cost saving only if for public actually low interest rate applies

Loan guarantee

Cost			Revenues		Levelized cost saving potential	Removing development constraint
Cost of capital	Investment cost	Operating cost	Power revenues	Support		
€€€					5%	

Lenders have lower risk in case of default or underperformance of the project.

-> **Higher leverage, or lower interest rate, or longer debt terms.**

More projects become financeable.

Overall cost saving: Minus cost for public for defaulting projects

Sharing risk to build trust & as lever to policy stability (self-discipline due to own investment at stake)

(Temporary) government participation

Cost			Revenues		Levelized cost saving potential	Removing development constraint
Cost of capital	Investment cost	Operating cost	Power revenues	Support		
€€€					5%	

Increased trust by investors and banks.

-1.4% WACC (-3.5% RoE/-0.5% debt) [Taskforce NL].
-5% LCe [Ecofys 2010]

Sharing risk to build trust & as lever to policy stability (self-discipline due to own investment at stake)

Establishing process standards for risk assessment & rating

Cost			Revenues		Levelized cost saving potential	Removing development constraint
Cost of capital	Investment cost	Operating cost	Power revenues	Support		
€€	€				4%	

Standardized independent opinion / rating on the likelihood of a project's ability to deliver the expected returns **increases investor/lender confidence.**

Reduced cost for risk assessment / structuring finance

Availability of insurance for risks not yet insurable

Cost			Revenues		Levelized cost saving potential	Removing development constraint
Cost of capital	Investment cost	Operating cost	Power revenues	Support		
€	€				2%	++

Lower, due to risk being covered by insurance.

Reduced cost in structuring finance.

Facilitate e.g. by making empirical data (internationally) available.

TSO responsible for grid connection (esp. offshore)

Cost			Revenues		Levelized cost saving potential	Removing development constraint
Cost of capital	Investment cost	Operating cost	Power revenues	Support		
	€				2%	

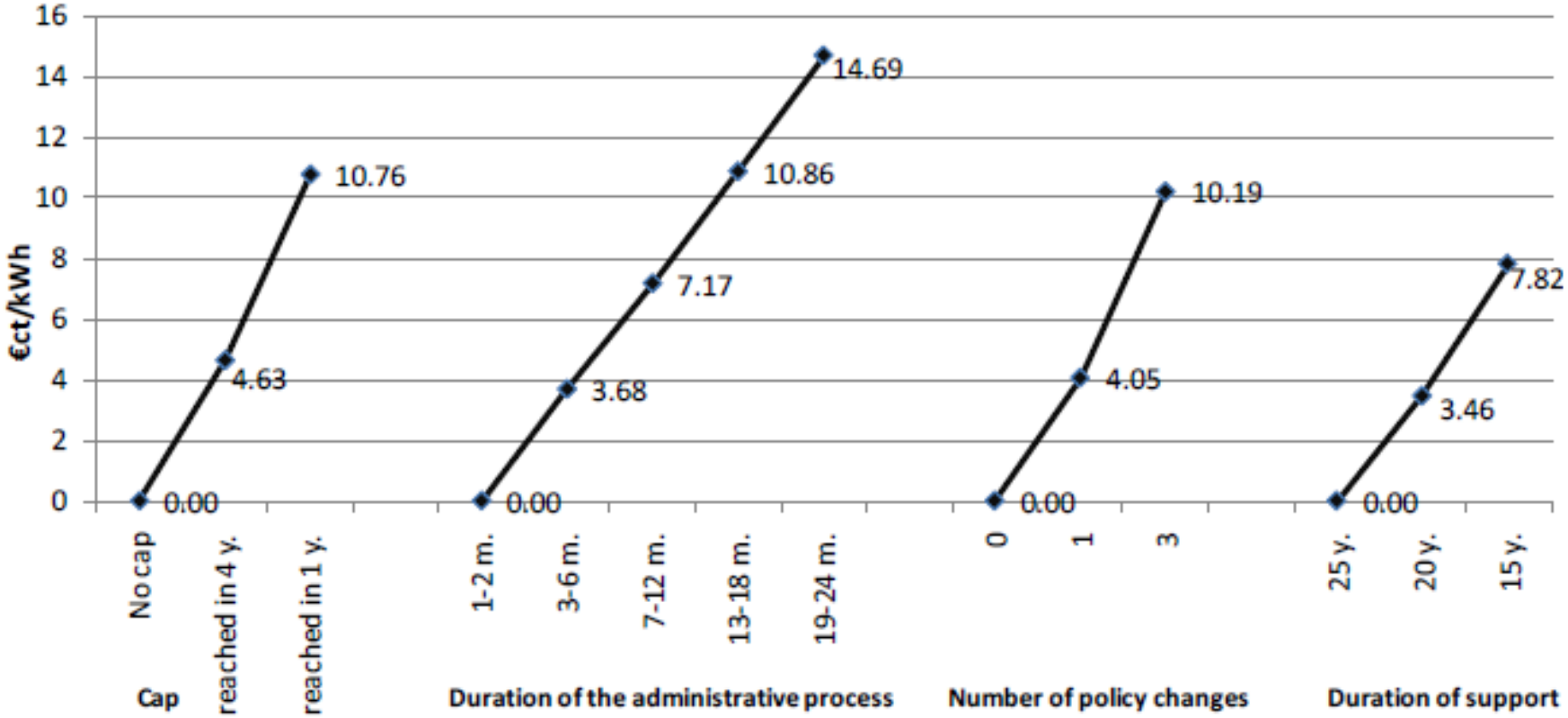
Investment for a (offshore wind) project can be reduced by up to one third, however, cost for TSO increase in almost the same order of magnitude.

But 2% investment cost can be saved because TSO core business, can buy cables cheaper, design grid more efficient, gets cheaper loans, can depreciate over cable lifetime (40a) instead of wind farm lifetime (20a).

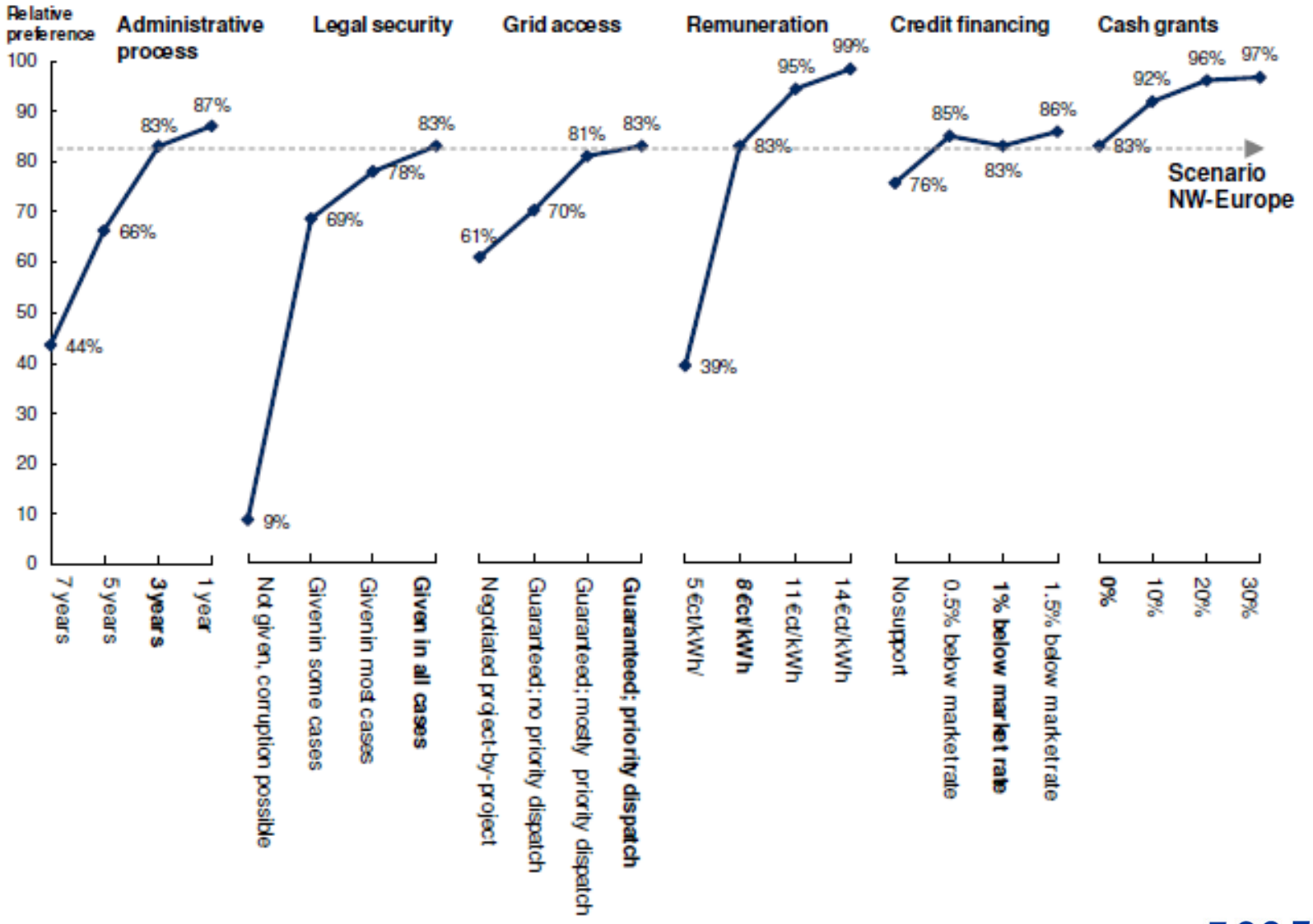
Quantifying the impact of policy options on levelised cost of electricity and support needed

	Expenditure (=lev. cost of electricity)			Income		SUM
	Cost of capital (WACC + time + fees)	Investment cost (CAPEX)	Operating cost (OPEX)	Revenues from power sales	Support (TGC, FIP, FIT, etc.)	
Example case: Wind onshore	**20% equity, 18a loan**	**1,100-1,500 €/kW**	**35-45 €/kW/a**			
Levelised cost of electricity decrease by ~ 2% caused by either of the following changes: (symbolised by € in following slides)	**~ -0.5% (-50 base points)**	**~ -2.5%**	**~ -8%**	depending on share of power revenues / support in total income		
In comparison:						
Wind offshore ▪ Relevance of cost category in LCE compared to onshore	More equity ↑	2,500-3,500 €/kW ↓	90-120 €/kW/a ↑			
Photovoltaics ▪ Relevance of cost category in LCE compared to wind onshore	↔	2,000-3,000 €/kW ↑	30-40 €/kW/a ↓			
Biomass ▪ Relevance of cost category in LCE compared to wind onshore	More equity ↑	↓	Fuel cost ↑			
Smaller projects	Higher share of project development cost in CAPEX ↑					

Conjoint analysis Luethi/Wuestenhagen - PV



Conjoint analysis Luethi/Wuestenhagen - Wind



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