“Renewable energy auctions”

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RENEWABLE ENERGIES, ENERGY EFF ENCY and CLIMATE CHANGE
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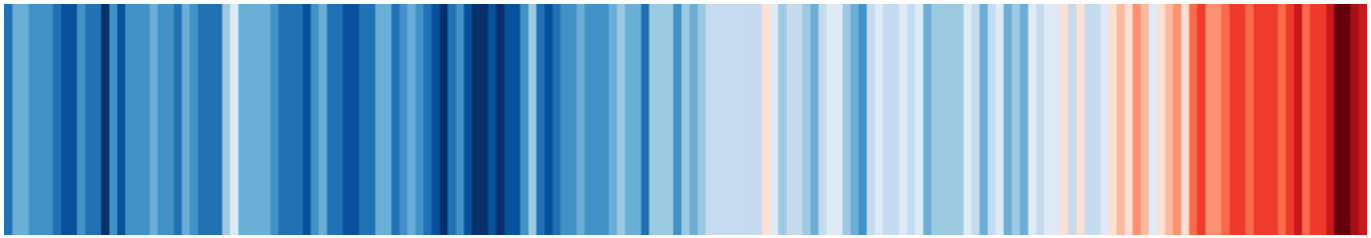
6. The design of SSA RE auctions

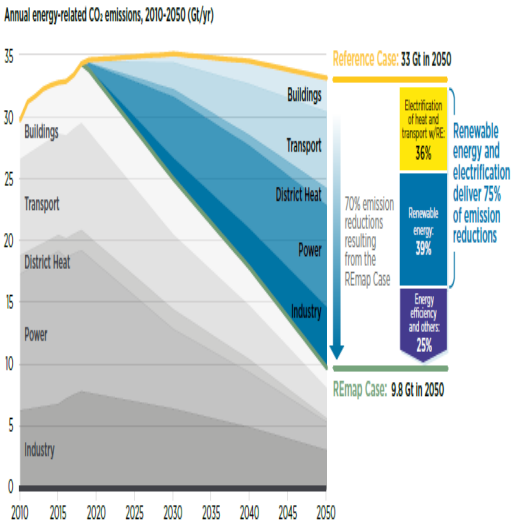


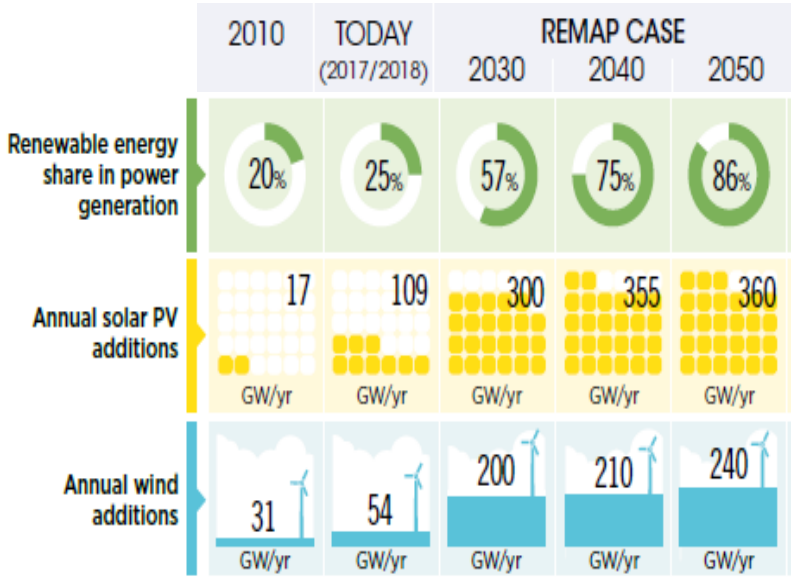

What are the options to promote RE

Descarbonisation



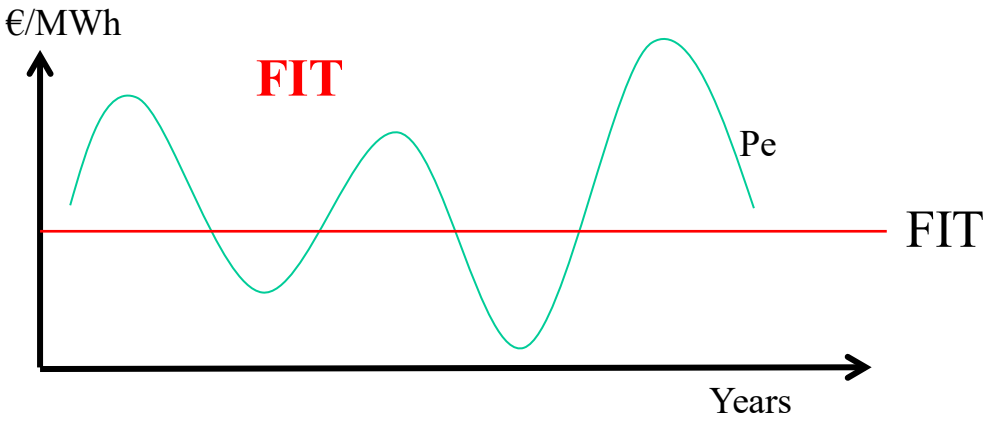
Energy transition

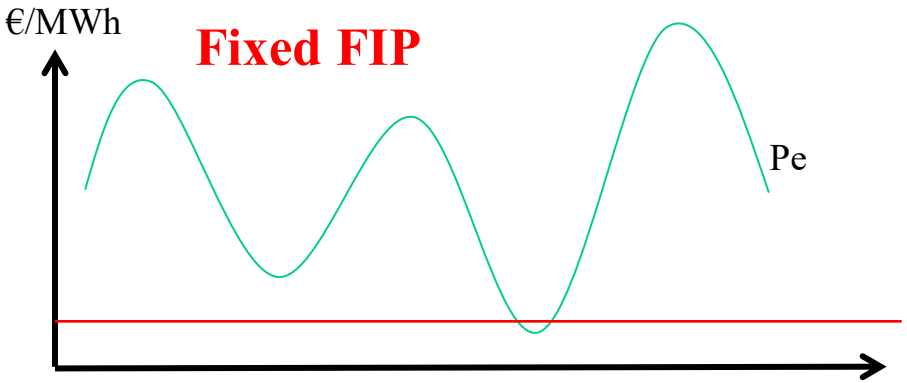


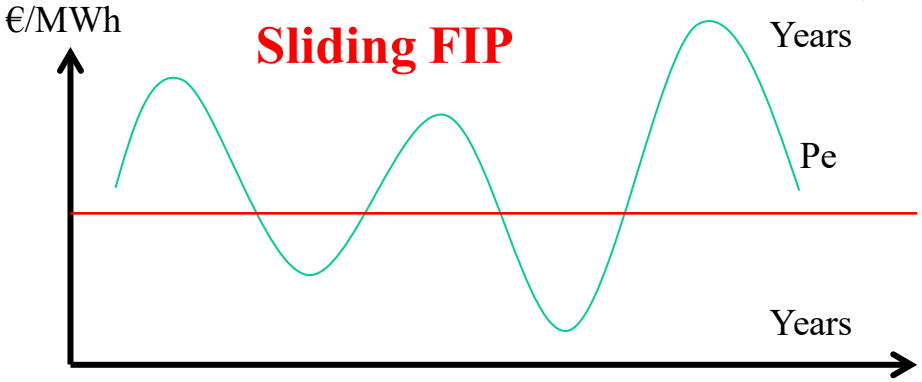


Source: IRENA (2019a), Global Energy Transformation: A Roadmap to 2050

What are the options to promote RE?







REMUNERATION

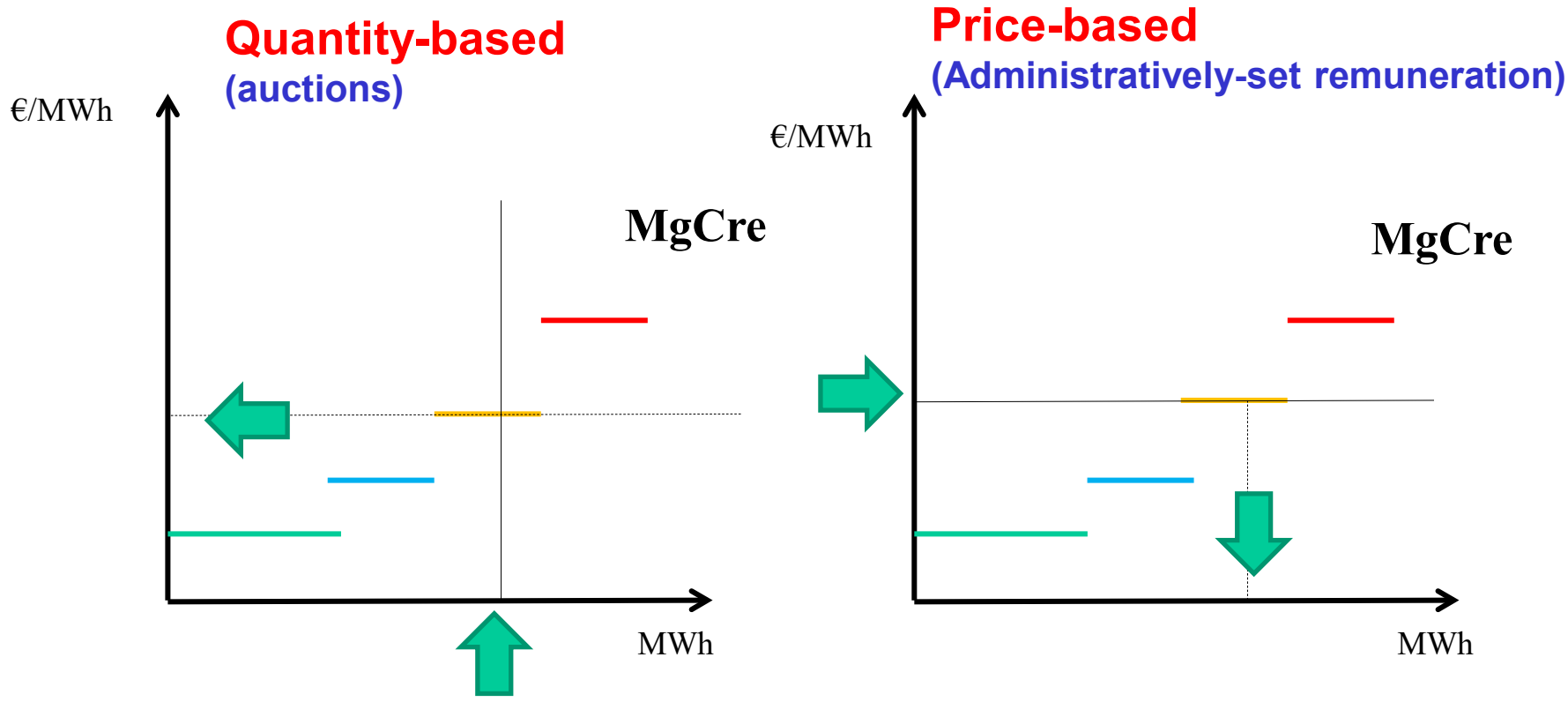
FIT: €/MWh

Fixed FIP: Pe + FIP

Sliding FIP: Depending on Pe

What are the options to promote RE?

Traditional discussion in environmental economics: price-based vs. quantity-based instruments



Pros and cons of ASR FITs in the past

ASR= Administratively-set remuneration or "administrative remuneration"

(+)

- Kick-start the market.
- Low risks for investors
- Market creation (value chain).
- Actor diversity

Pros and cons of ASR FITs in the past

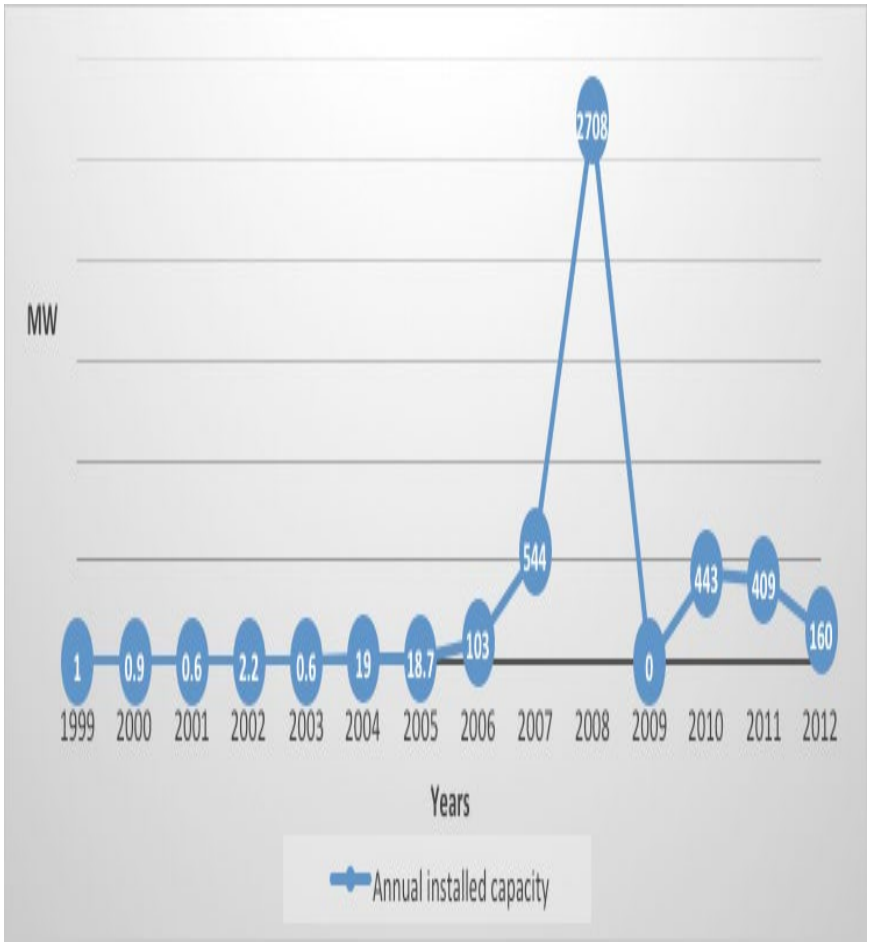
(-) Administratively-set remuneration.

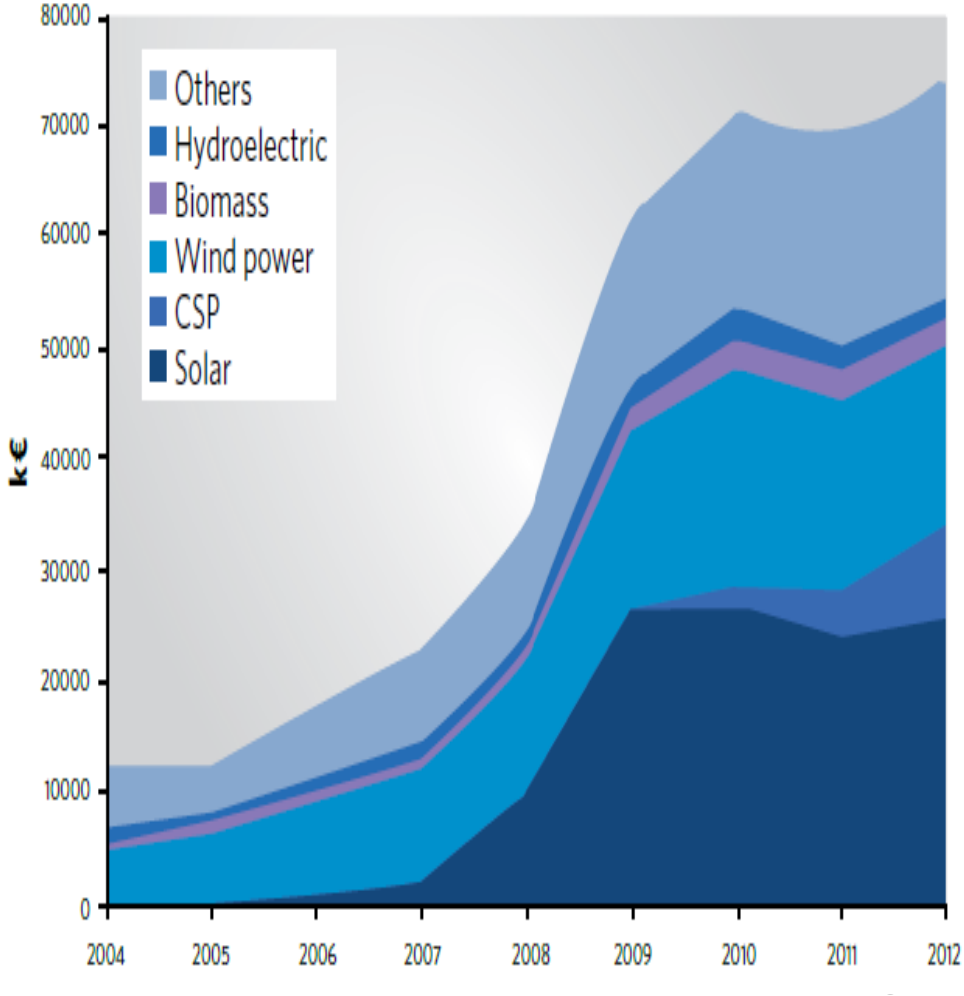
- Asymetric information problem
- Price-based instrument. Lack of quantity control. Booms.
- Particularly problematic for dynamic technologies, with large cost-reduction potentials and uncertainty about costs.
- Lack of competitive pressure.

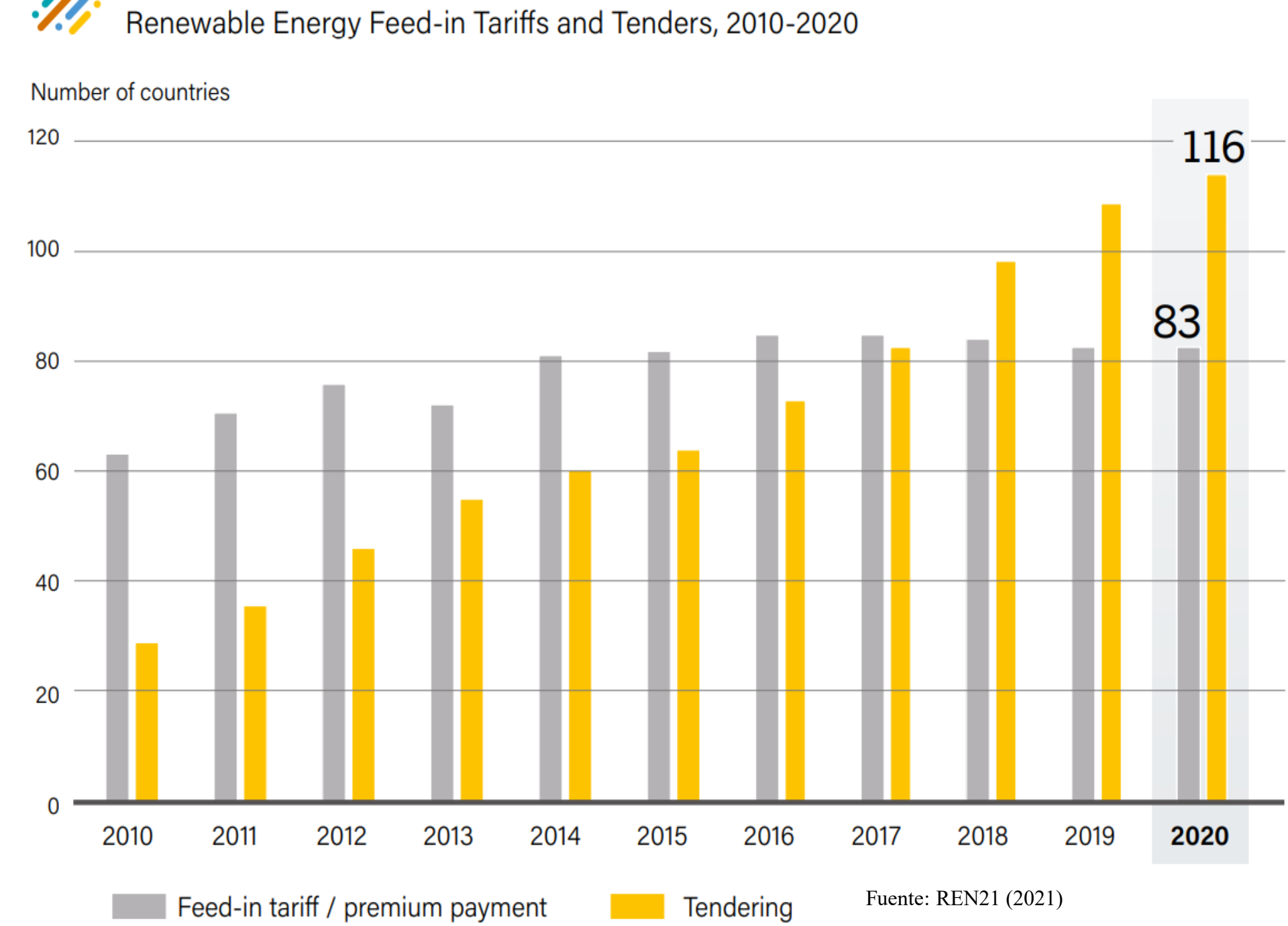



Pros and cons of ASR FITs in the past

BOOMS







Fuente: REN21 (2021)

How do RE auctions work?

RE auctions are procurement auctions…

How do RE auctions work?

How do RE auctions work?

- Demand: set by the government
- Supply: bids and bidders

Example:

DEMAND: 3 MWh.

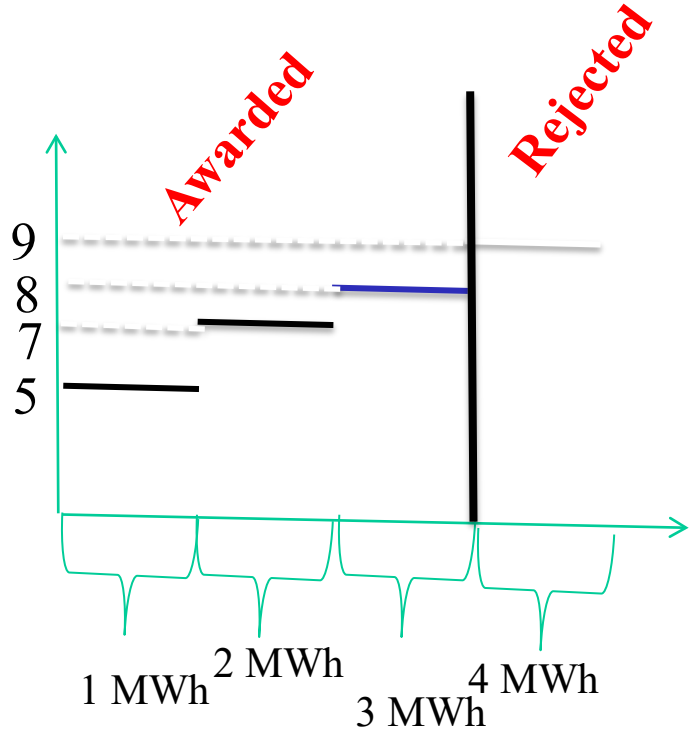
SUPPLY:

- Bid 1 = 5€/MWh
- Bid 2 = 7€/MWh
- Bid 3 = 8€/MWh

} **Awarded**

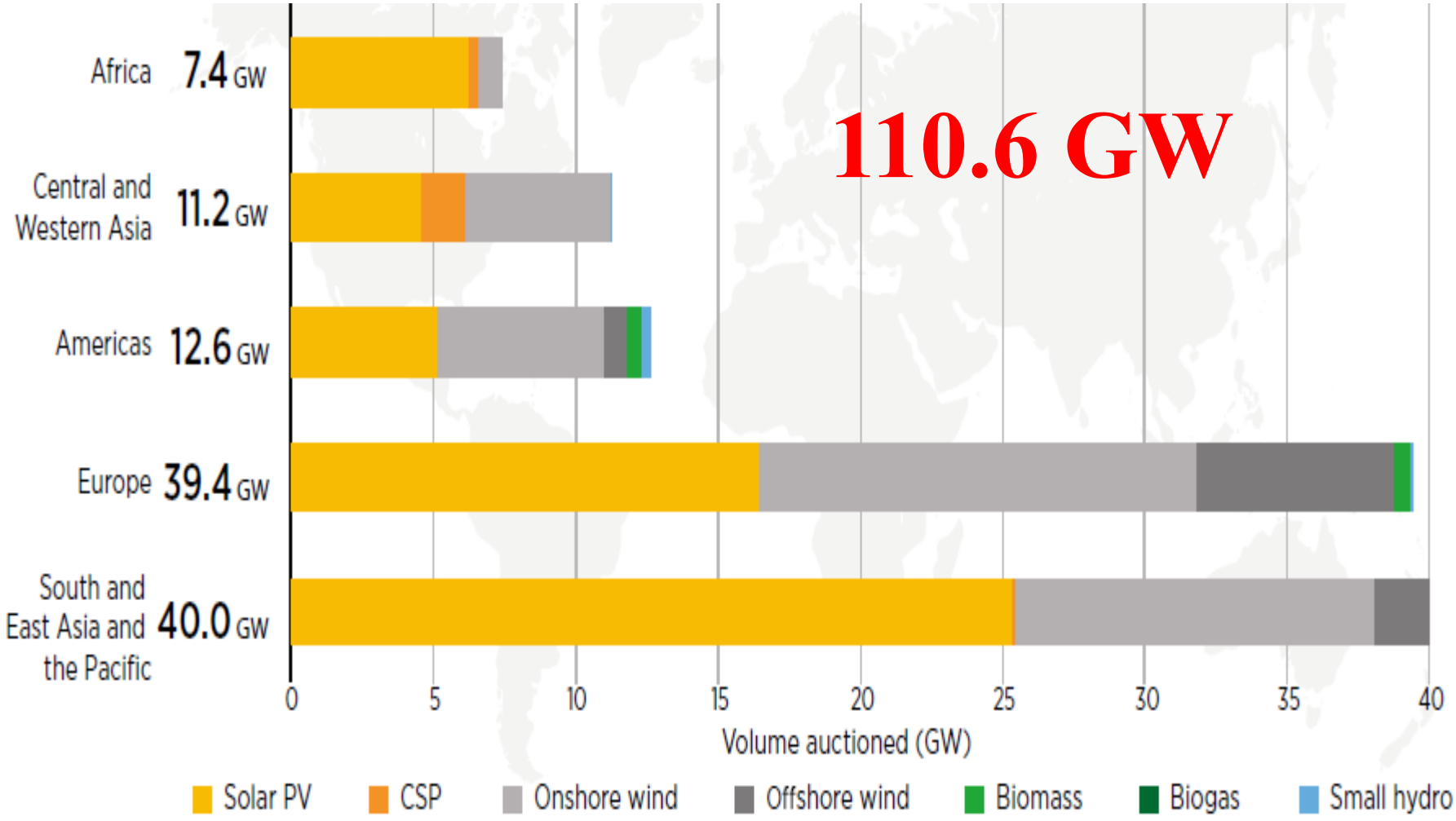
- Bid 4 = 9€/MWh

} **Not awarded**



Auctions as an alternative

Volume auctioned (by region and technology, 2017-2018).



Source: IRENA (2019)

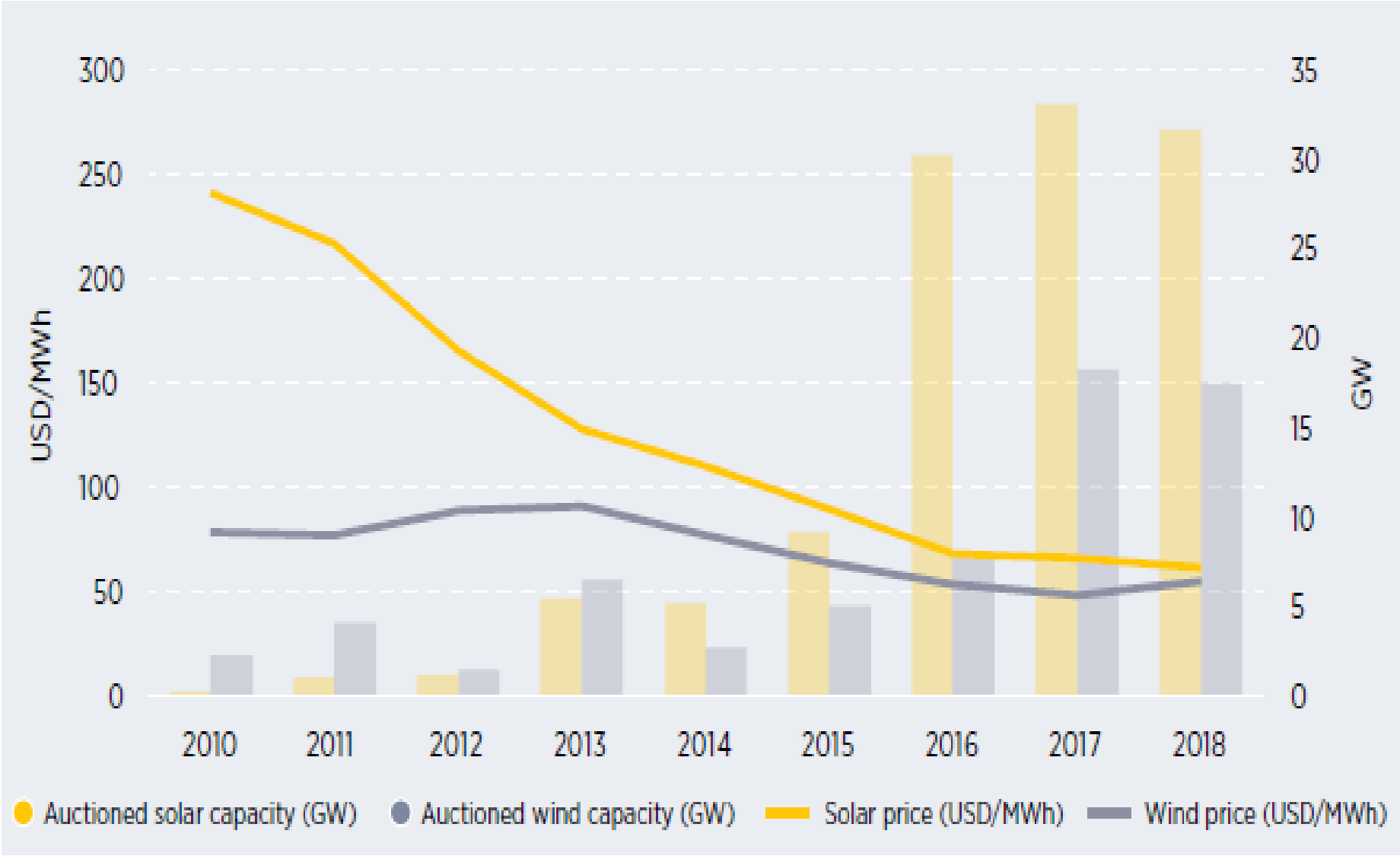
Auctions as an alternative

What are the (+) features traditionally associated to auctions?

- Support cost and expansion control
- Static efficiency.
- Incentive for innovation?




Auctions as an alternative



Source: IRENA (2019)

Auctions as an alternative

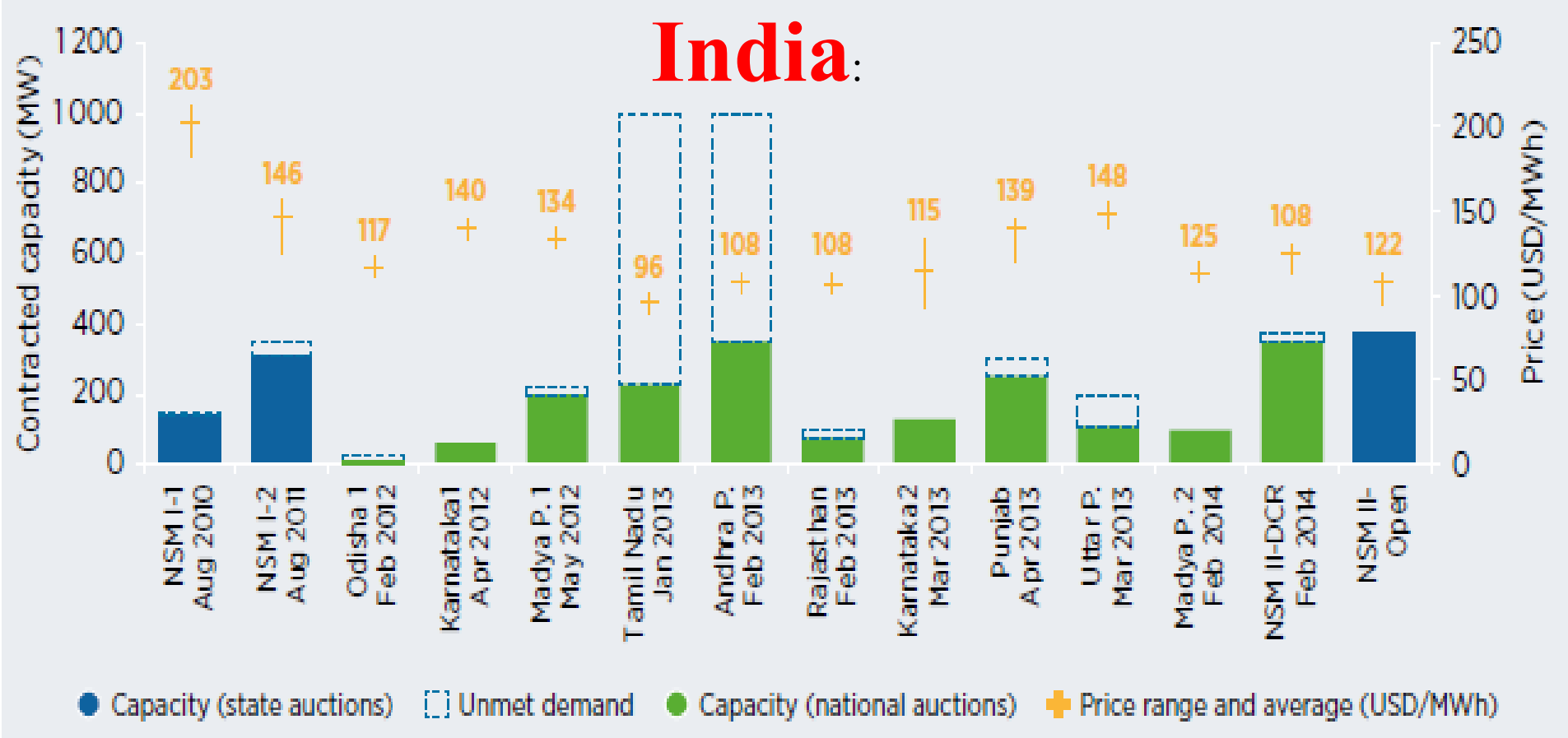
What are the (-) features traditionally associated to auctions?

- Undercontracting and underbidding.
- Delays. Are projects built?
- Dynamically inefficient?
- Detrimental for small actors.
- Low competition, high bids




Auctions as an alternative

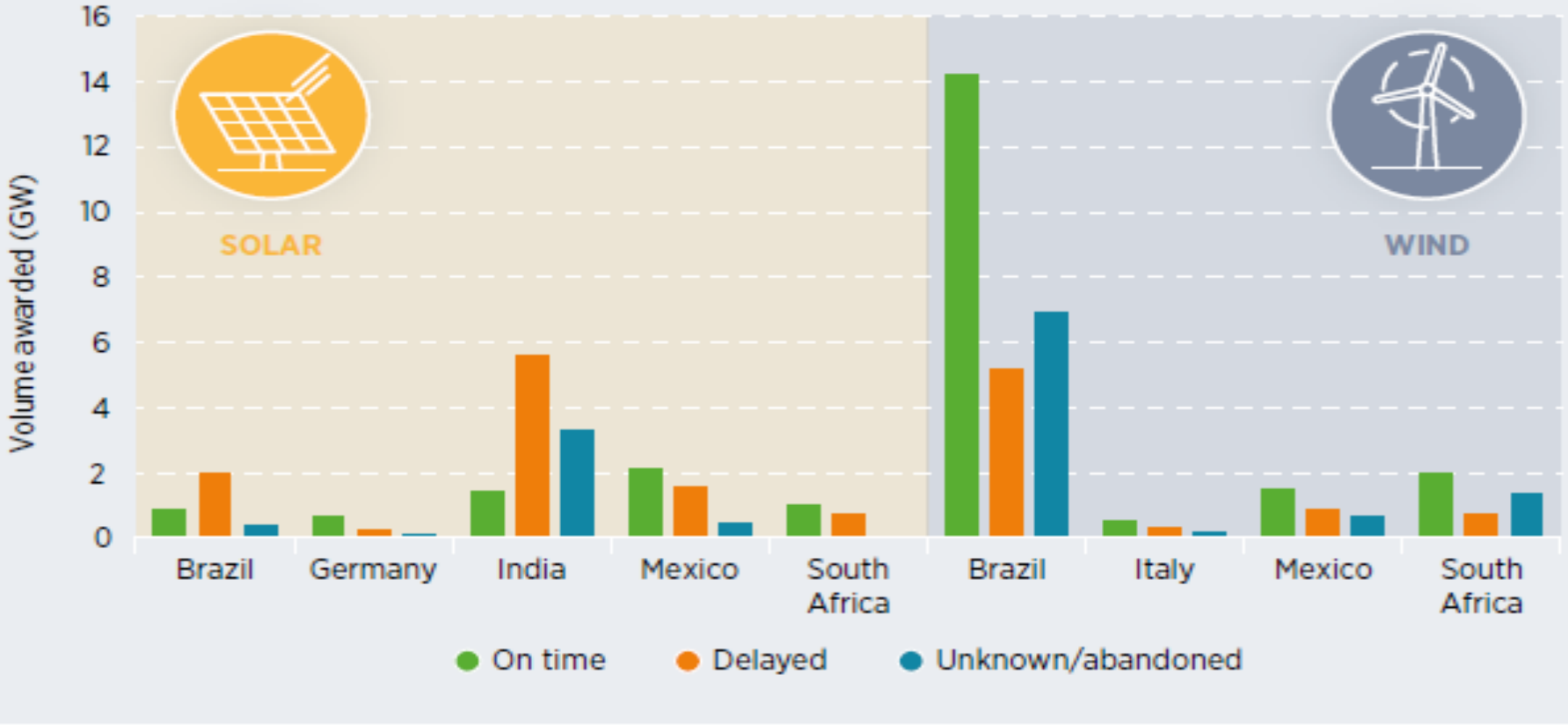
– Undercontracting and underbidding.



Source: IRENA (2019).

Auctions as an alternative

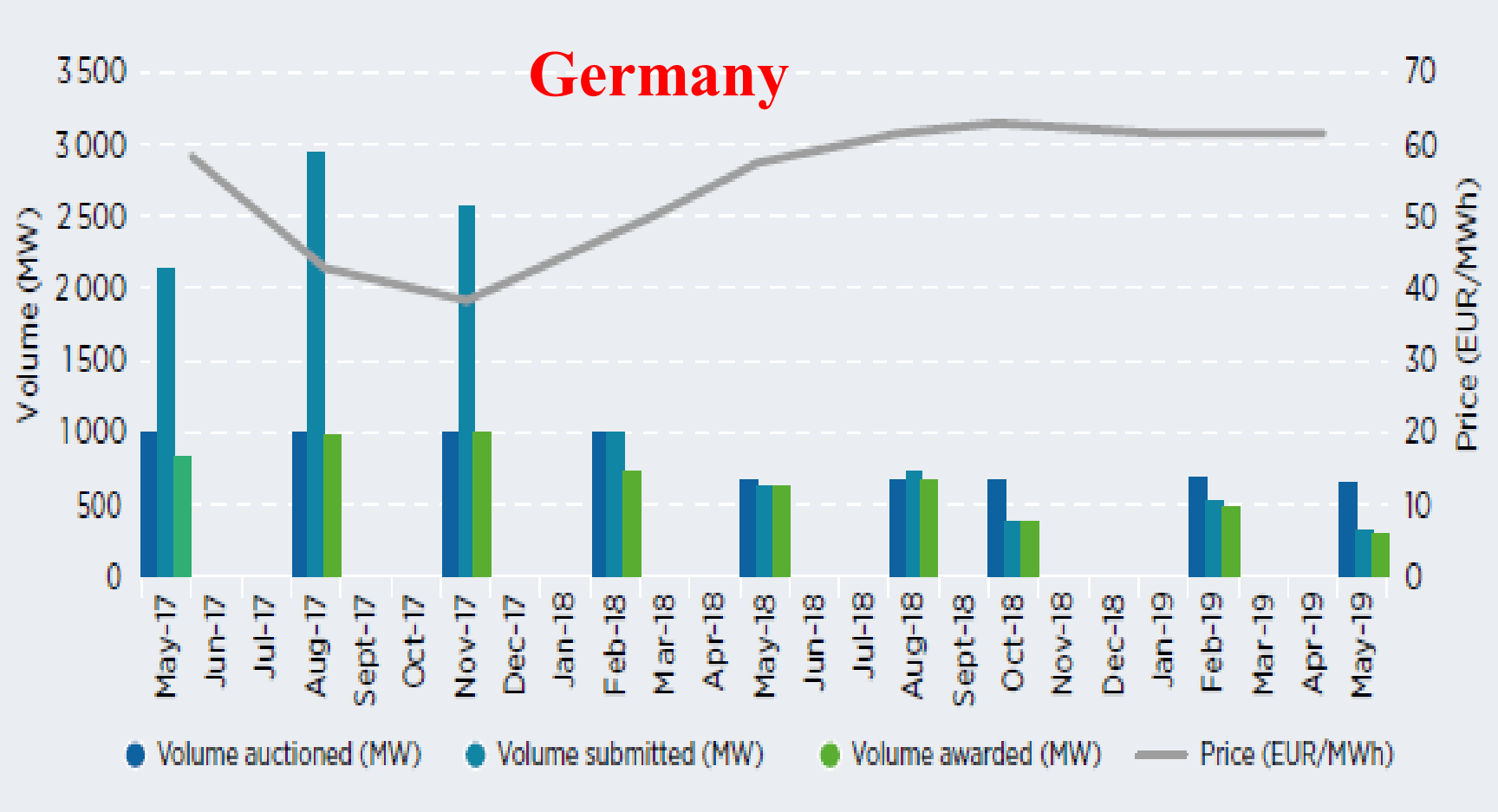
– Delays. Are projects built?



Source: IRENA (2019).

Auctions as an alternative

– Low competition, high bids



Source: IRENA (2019).

Auctions as an alternative

ARE AUCTIONS GOOD OR BAD?

WRONG question!!

First:

What are your context conditions?
What are your goals?
What are the criteria you prioritise to assess the auction?




Auctions as an alternative

Which are the **context conditions**?

-Characteristics of the country and its electricity system.

-Existence of a local value chain

Preconditions for successful auctions:

Energy policy targets.

Enough competition. Market analysis.

Coordination of administrative, grid-access and auction procedures.

Communication/transparency.

Auctions as an alternative

Which are the **goals**?

To expand the renewable energy capacity?

To contain support costs?

To promote actor diversity?

To facilitate the creation of a local industry?

What are the **criteria** you prioritise to assess the auction?

-Effectivenes. High realisation rates.

-Efficiency. Low generation costs.

-Minimisation of support costs paid by consumers.

-Encouraging diversity of technologies and actors.

-Maximising positive local impacts.

-Social acceptability/political feasibility

The importance of auction design

- **Since auctions are here to stay, focus on their design**…

  -*The devil is in the details*.
  -Some flexibility.

- What are the alternatives?

- Not all the alternatives are equally adopted…

The importance of auction design

GENERAL AUCTION DESIGN ELEMENTS

Selection criteria
- Price-only
- Multi-criteria (tenders)

Auction format
- Single-item
- Multi-item (homogenous or heterogeneous)

Auction type
- Sealed-bid (static auctions)
- Descending clock (dynamic auctions)
- Hybrid designs

Pricing rules
- Pay-as-bid (in single-item auctions: first price)
- Vickrey (in single-item auctions: second price)
- Uniform price

Price limits
- Price ceilings
- Minimum prices

Other
- Seller concentration rules
- Information provision
- Web-based vs. in-person
- Secondary market

RES-SPECIFIC AUCTION DESIGN ELEMENTS

Scope
- Auction volume
- Periodicity (number and frequency of rounds)
- Target achievement safeguards (dealing with amounts not awarded/built)

Support
- Remuneration type (energy or capacity-related)
- Duration of contract
- Updating of remuneration over time

Diversity
- Technological diversity
- Size diversity
- Geographical diversity
- Actor diversity
- Other diversity types

Prequalification criteria
- Technical requirements
- Documentation requirements
- Preliminary licences
- Deposits and other guarantees
- Financial capability requirements
- Experience

Penalties
- Penalising non-compliance
- Penalising delays

Other
- Local content rules
- Deadlines and grace periods

Source: AURES project

The design of RE auctions

Methodology

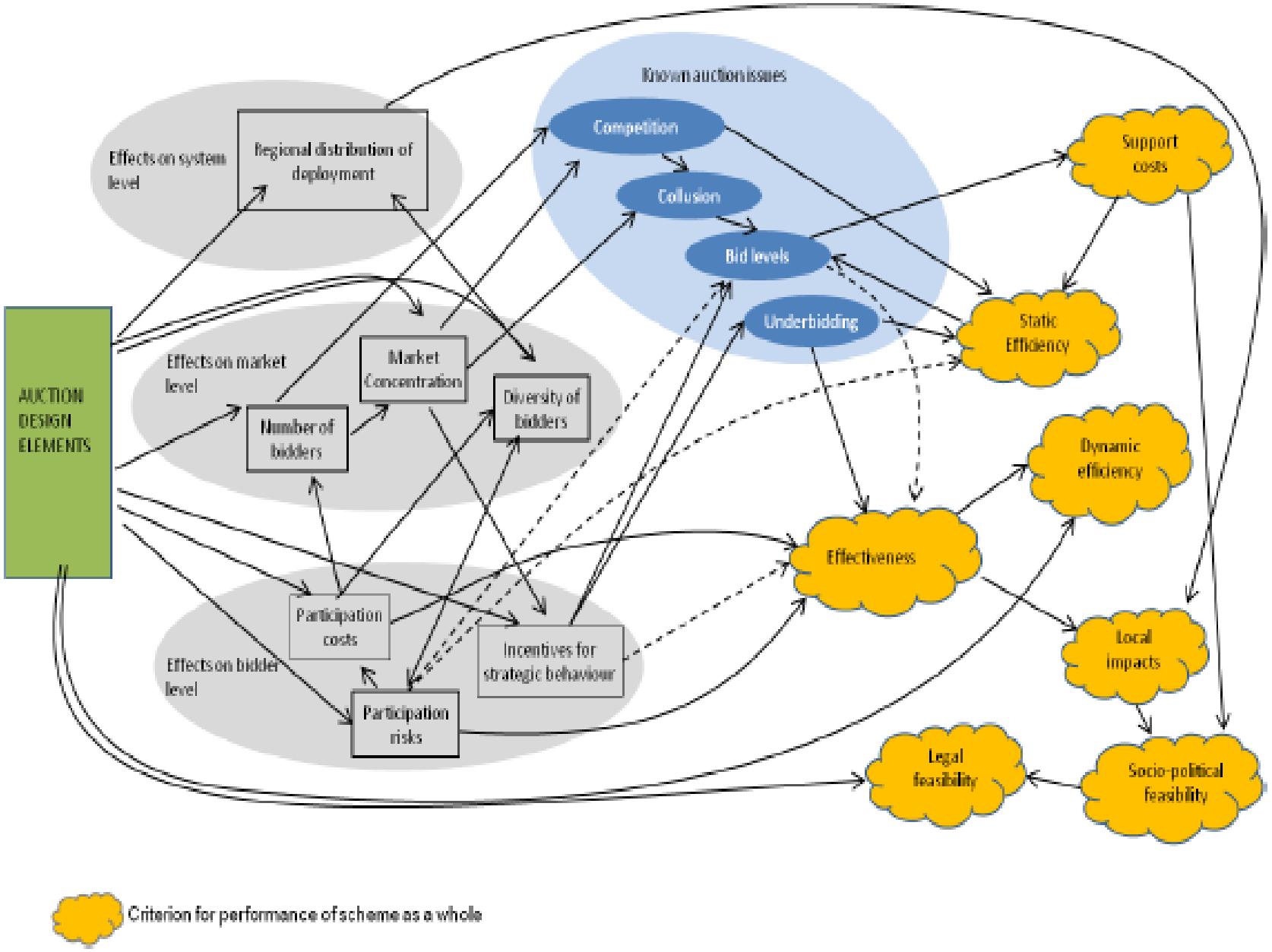
1) Case studies (AURES, AURES II, IRENA, USAID, CEER, academic literature…), data bases, official documents, expert consultations.

   -90 auctions (1990-2019) (about 2/3 of all RE auctions being conducted around the world).

   -Triangulation

2) Information on design elements adopted in each country.

3) Evaluation of the impact of design elements on the functioning of auctions according to different assessment criteria.



Source: del Río (2015). A methodological note on the links between components for the assessment of design elements in auctions for RES. AURES project

AURES II – objectives

AURES

- A coordination and support action under the EU Horizon2020 programme
- Project runs from January 2015 to December 2017
- Eight partners from seven EU countries
- Cooperation with policy makers, market participants and other stakeholders.

DTU Fraunhofer ISI University of Exeter CONCITO ECOFYS CSIC TU Wien Technische Universität Wien Vienna University of Technology Takon

1. Generate and communicate new insights on the applicability, performance, and effects of **specific auction designs**
2. Provide **tailor-made policy support** for different types of auction applications
3. Facilitate **knowledge exchange** between stakeholders

AURES II: EU funded research collaboration on auctions for renewable energy support

AURES II

CSIC Consejo Superior de Investigaciones Científicas · University of Exeter · REKK · formica blu · NAVIGANT · Fraunhofer ISI · Factor Ideas for change · TU Wien Technische Universität Wien · eclareon · Takon GmbH Spieltheoretische Beratung · DTU

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The design of RE auctions

Energy for Sustainable Development 41 (2017) 1–13

Contents lists available at ScienceDirect

Energy for Sustainable Development

Designing auctions for renewable electricity support. Best practices from around the world

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ABSTRACT

Auctions have recently been regarded as a useful alternative to other support schemes for the setting of the remuneration of renewable electricity (RES-E) worldwide. However, whether auctions will fulfill the expectations depends on the choice of design elements. The aim of this article is to analyze the advantages and drawbacks of

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Design and Assessment of Renewable Electricity Auctions in Sub-Saharan Africa

Hugo Lucas,[1] Pablo del Rio[2] and Mohamed Youba Sokona[3]

Abstract Auctions have recently been regarded as a useful alternative to other support schemes for setting the remuneration of renewable electricity (RES-E) worldwide. They have also been increasingly adopted in the sub-Saharan Africa (SSA) region, mostly due to their promise to support the deployment of RES-E projects cost-effectively. The aim of this article is to identify the design elements of RES-E auctions in SSA and assess their pros and cons with respect to different criteria. The results show that the design elements adopted in the SSA auctions are similar to other countries, but some design elements are deemed very relevant in order to address specific constraints to RES-E investments in SSA countries, including pre-selection of sites, technology-specific (solar PV), and price-only auctions. However, the main distinctive feature of auctions in SSA is that they are part of a broader policy mix of support mechanisms aimed at de-risking and providing technical support.

Keywords: sub-Saharan Africa, renewable energy, auctions, PV, design elements, policy mix.

1. Introduction

Many countries in sub-Saharan Africa (SSA) have experienced or are currently experiencing an energy crisis. Six-hundred million people in SSA lack access to electricity (Castellanos *et al.* 2015). With an electrification rate of only 26 per cent (World Bank 2017), the region has 13 per cent of the world's population, but 48 per cent of the share of the global population without access to electricity. SSA is the only region in the world where the absolute number of people living without electricity is increasing (IEA 2014: 30).

Some authors provide in-depth analyses of the SSA electricity sector (see Castellanos *et al.* 2015; KPMG 2016; Quitzow *et al.* 2016; Eberhard *et al.* 2016; Climatescope 2016; IEA 2014). Several factors are behind the energy crisis, including high-demand growth, low installed capacity, non-cost recovering tariffs, low utilisation rate of existing capacity,

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Energy for Sustainable Development

Analysing patterns and trends in auctions for renewable electricity

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ABSTRACT

Auctions have become the main instrument of choice to support renewable electricity around the world. This is probably due to their alleged virtues in terms of efficiency. However, whether auctions will meet their expectations and be successful will depend on the choice of design elements in particular settings. Although the analysis of the advantages and drawbacks of different design elements has received considerable attention in the literature, this is not the case with the real-world adoption of different design elements across different regions and renewable electricity technologies and overtime. The aim of this paper is to cover this gap in the literature. Using a database of 90 renewable electricity auctions from around the world, built by the authors, this article analyzes different patterns of adoption of design elements overtime, across continents and technologies. The results of the analysis show that, indeed, large differences across regions and overtime can be observed for some design elements. Regarding regional differences, this is the case for geographical diversity, local content requirements, remuneration form, auction form and disclosure of ceiling prices. Some design elements clearly show a distinct pattern over time: volume metric, size diversity, selection criteria, auction format, auction type, pricing rule and ceiling prices. In contrast, the differences across technologies are less marked and are circumscribed to geo-

Renewable and Sustainable Energy Reviews 35 (2014) 42–56

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Renewable and Sustainable Energy Reviews

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Back to the future? Rethinking auctions for renewable electricity support

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ABSTRACT

The effectiveness and cost-effectiveness of two main types of instruments (feed-in tariffs and quotas with tradable green certificates) have usually been compared in the literature on renewable electricity promotion. Due to negative past experiences with a third instrument (auctions), this instrument has been broadly dismissed in academics and, until recently, also in policy practice. However, and based on an in-depth review of experiences with auction schemes for renewable electricity around the world, this paper argues that some of the problems with auctions in the past can be mitigated with the appropriate design elements and that, indeed, auctions can play an important role in the future implementation of renewable electricity support instruments around the world. The paper provides a proposal for the coherent integration of several design elements.

The design of RE auctions: pros and cons

CATEGORY	OPTIONS	PROS AND CONS
VOLUME	Metric used: generation/capacity/budget Appropriate levels.	Effectiveness, control of support costs, signal to supply chain
TIMING	Schedule/no, frequent/no.	< risks, < *underbidding*, > participation, competition and benefits for the value chain.
REALISATION PERIOD	Short/long	SHORT: > risks for investors, <participation, < competition, > bids LONG: > risks of *underbidding*, inefectiveness.
PREQUALIFICATION REQUIREMENTS	Material and financial. Level of stringency	Effectiveness vs. support costs.
PRICING RULE	PAB vs. Uniform.	Incentive-compatibility, risks of too aggressive bidding (under restrictive assumptions)
PRICE CEILINGS	Existence / absence	Limit the risk of high support costs (relevant with low competition). Anchoring. Should it be published?

Source: del Río (2017)

The design of RE auctions: pros and cons

CATEGORY	OPTIONS	PROS AND CONS
DIVERSITY (TECHNOLOGICAL)	Specific / multi-technological / neutral	(+) Neutrality: > competition, > eficiency, < support costs (principle of third degree discrimination). (+) Specific auctions. Other goals: Promotion of technologies with different maturity levels, Local industry, system integration
DIVERSITY (GEOGRAPHICAL)	Specify the project location, correction factors in merit order, additional remuneration	(-) < allocative efficiency, > support costs, > administrative costs (identification of sites) (+) System costs?, < risks of administrative permits (> effectiveness, > participation).
Local content rules (LCR)	Yes/no	(+) Impact on local industry and jobs, social acceptability. (-) >risks and costs, <participation, < efficiency, >bids
REMUNERATION TYPE	Capacity vs. Generation.	Early assessment of effectiveness vs. productive efficiency.

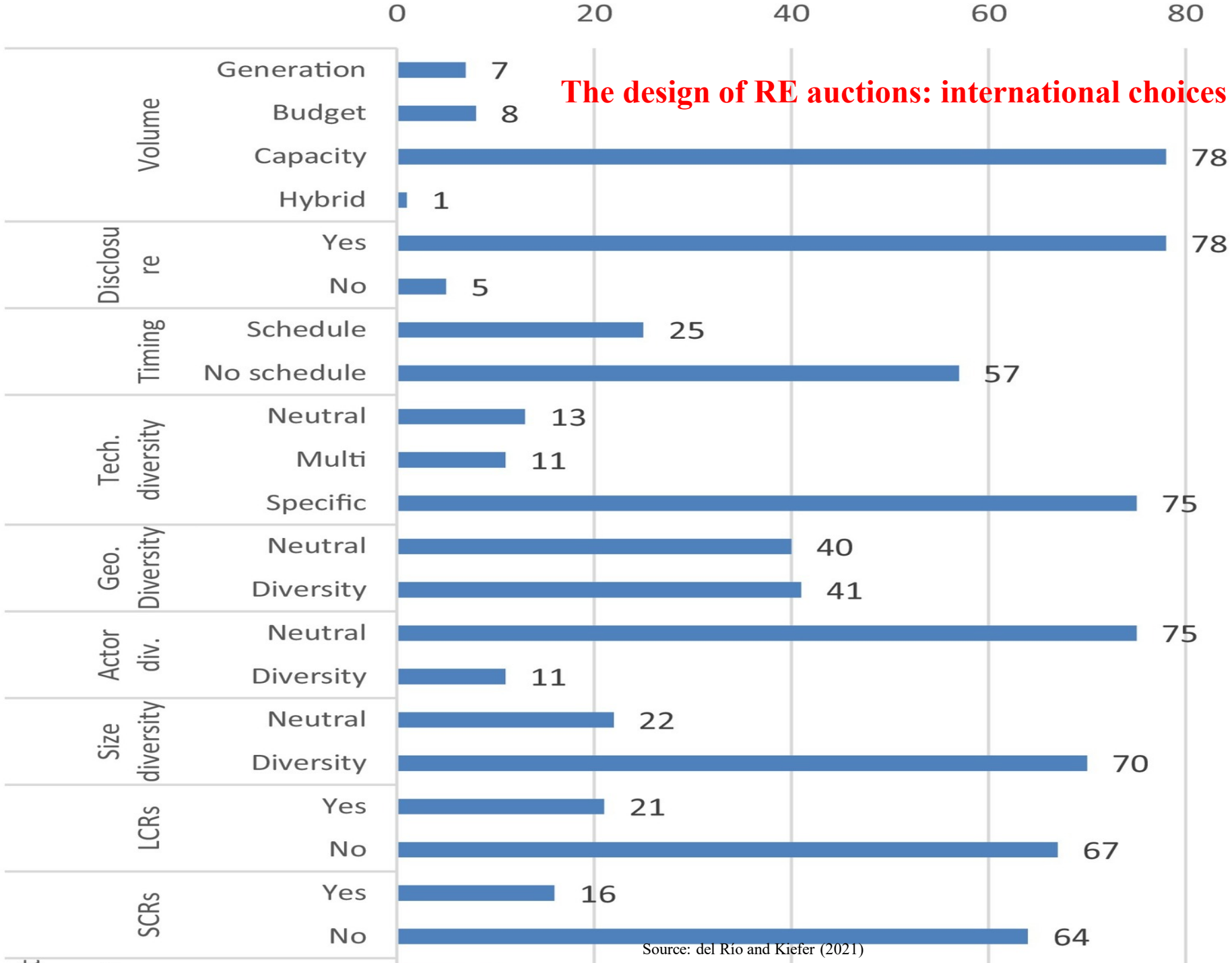
Source: del Río (2017)

The design of RE auctions: pros and cons

CATEGORY	OPTIONS	PROS AND CONS
REMUNERATION FORM	FIT, FIP fixed, FIP sliding	(+)(-) Integration of RES-E in the electricity market vs. Risks for investors
SELECTION CRITERIA	Price-only/ Multicriteria	(+) < support costs, > transparency, > efficiency. (-) Social acceptability?, local economic development
AUCTION FORMAT	Single-item vs. Multi-item	(+/-) Single-item: > economies of scale, > efficiency. Multi-item: effectiveness (diversification of non-compliance risk), diversity of actors. Limited choice in practice for some technologies (off-shore wind and CSP).
AUCTION TYPE	Static /dynamic /hybrid	Dynamic (+): More information. <risks of winners' curse. (-): more complex, more vulnerable to implicit collusion, >administrative costs.
PRICING RULE	PAB vs. Uniform.	Incentive-compatibility, risks of too aggressive bidding (under restrictive assumptions)
PRICE CEILINGS	Existence / absence	(+/-): Limit the risk of high support costs (relevant with low competition). Anchoring. Should it be published?

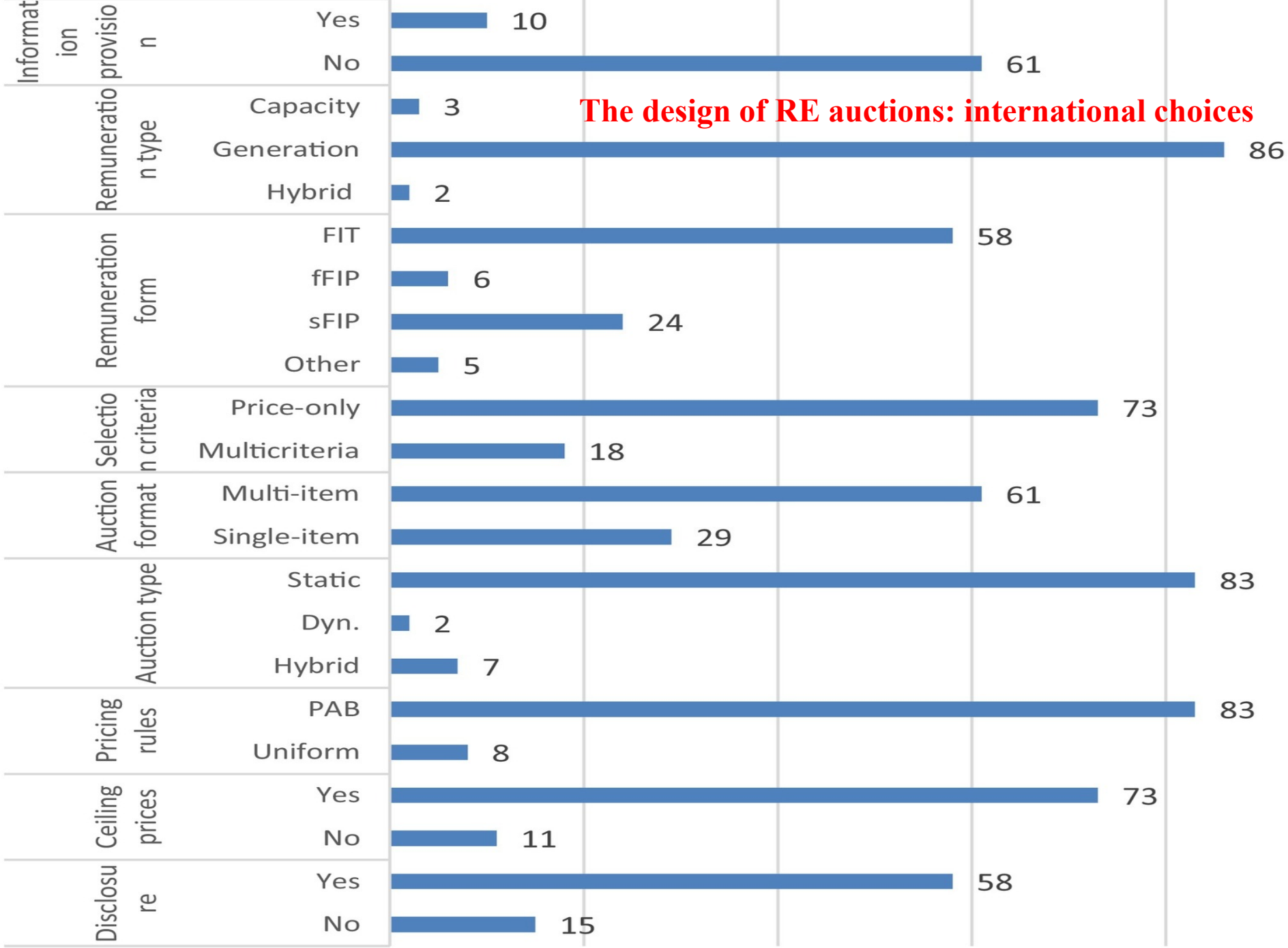
Source: del Río (2017)

The design of RE auctions: international choices



Source: del Río and Kiefer (2021)

The design of RE auctions: international choices



Source: del Río and Kiefer (2021)

The design of RE auctions: trade-offs

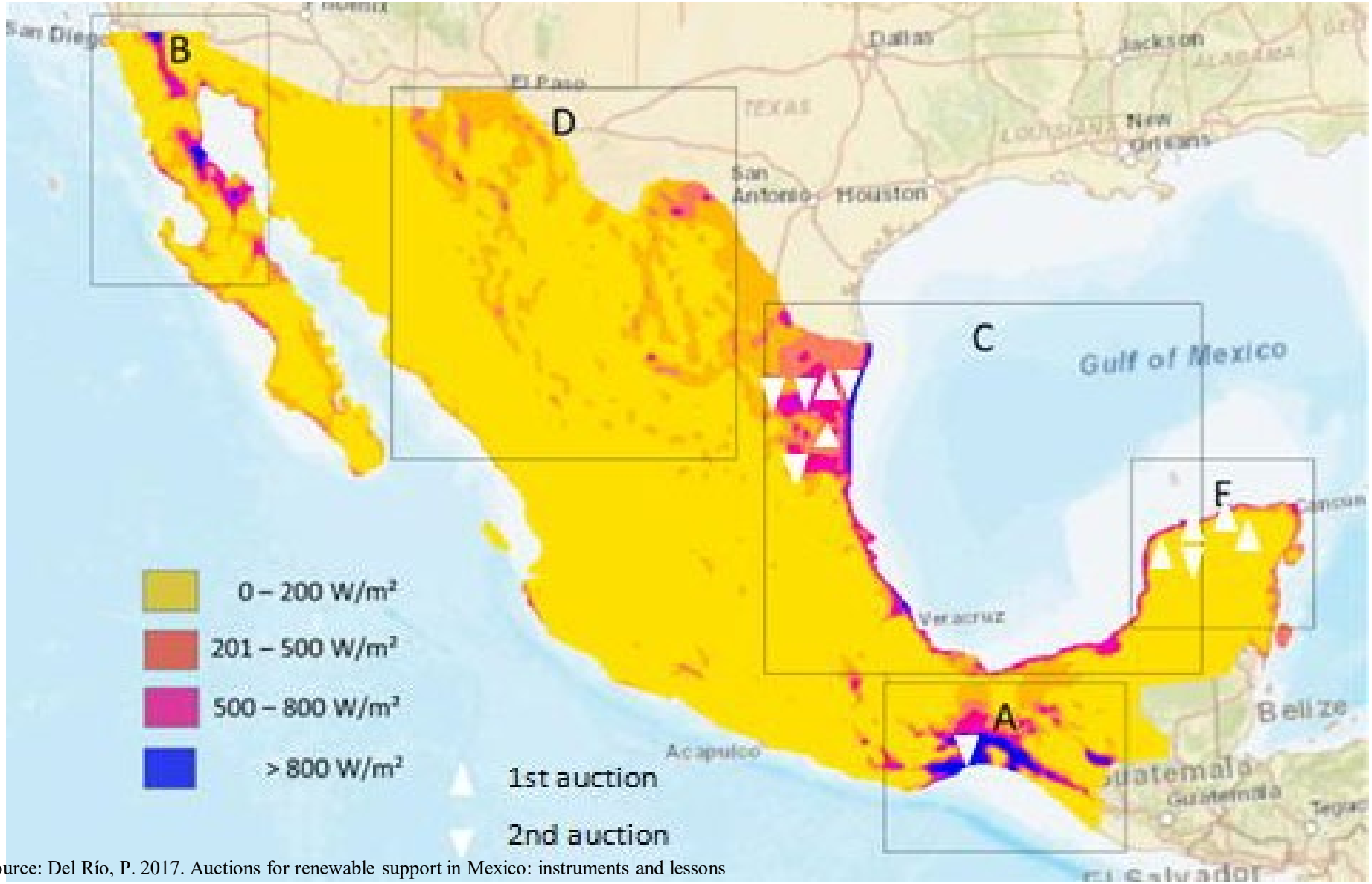
Trade-offs are unavoidable….

The design of RE auctions: trade-offs

Design elements		Effect	Support costs	Alloc. EF	Indirect costs	local impacts	Dyn EF	Actor DIV	Social accept.
1. Volume	Generation-based	+	=	=	+	=	=	=	?
	Budget-based	−	+	=	−	−	−	=	?
	Capacity-based	=	−	=	−	=	+	=	?
	level too high	+	−	−	=	+	+	+	?
	level too low	−	+	+	=	−	−	−	?
	Disclosure (vs. non-disclosure)	=	+	=	=	=	+	=	=
2 Periodicity	long lead times	=	+	+	=	=	=	=	=
	Short lead times	=	−	−	=	=	=	=	=
	Schedule (vs. no schedule)	+	+	+	=	=	+	=	=
3 Diversity (vs. its absence)	Technology-neutral	=	+	+	−	−	−	−	?
	Geographically-neutral	=	+	+	−	?	=	−	?
4 Participation conditions	Improving administrative procedures*	+	+	+	+	+	+	+	+
	Supporting dialog with stakeholders*	+	?	?	=	=	=	=	+
	Prequalification requirements*	+	−	−	=	=	=	−	?
	Prequalification too strong	+	−	−	=	=	=	=	=
	Prequalification too weak	−	+	+	=	=	=	=	=
	LCRs*	=/−	−	−	=	+/=	+	=	?
	Information provision*	=	?	+	=	=	=	+	=/+
5 Support cost conditions	Generation-based (vs. investment-based)	=	−	+	+	=	=	=	=
	FIT	+	+	+	−	=	+	+	+
	FIP fixed	−	−	−	+	=	−	−	−
	FIP sliding	=	=	=	=	=	=	=	=
6 selection criteria	Multicriteria (vs. price-only)	=	−	−	=	+	+/=	=	?
7 auction format	Single-item (vs. multi-item)	−	=	+	=	−	=	−	?
8 auction type	Static (vs. dyn.)	−	+	?	=	=	=	+	+
9 pricing rules	PAB (vs. uniform)	+	−	−	=	=	=	=	?
10 pricing rules	Ceiling prices (vs. their absence).	=	+	+	=	=	=	=	+
	High ceiling prices	+	−	=	=	=	=	=	?
	low ceiling prices	−	+	=	=	=	=	=	?
	Disclosed (vs. non-disclosed)	=	?	?	=	=	=	=	+
11 Realization period	Too short	+	−	−	=	=	=	=	?
	Too long	−	+	+	=	=	=	=	?
12 penalties	Too high	+	−	−	=	+	=	−	?
	Too low	−	+	+	=	=	=	+	?

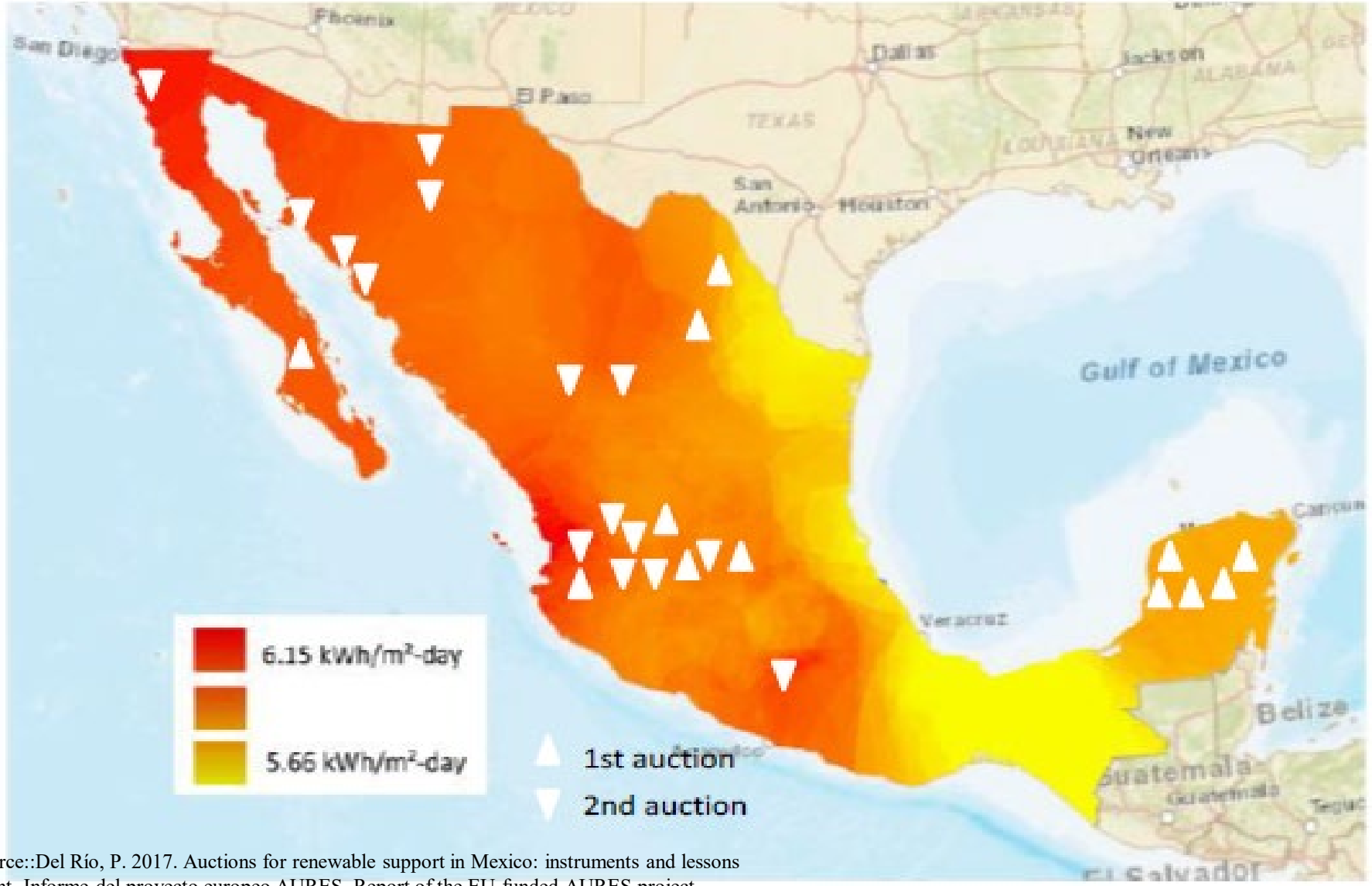
DEL RÍO, P. Designing auctions for renewable electricity support. Best practices from around the world. Energy for Sustainable Development 41, 1-13.

The design of RE auctions: trade-offs



Source: Del Río, P. 2017. Auctions for renewable support in Mexico: instruments and lessons learnt. Informe del proyecto europeo AURES. Report of the EU-funded AURES project.

The design of RE auctions: trade-offs



Source::Del Río, P. 2017. Auctions for renewable support in Mexico: instruments and lessons learnt. Informe del proyecto europeo AURES. Report of the EU-funded AURES project.

Pros and cons of design elements in auctions

- **Is there a uniquely "best way" to design auctions?**

NO, since this depends on goals/context conditions.

But it cannot be pure relativism…

Pros and cons of design elements in auctions

- **We know some things should not be done. Can we recommend some "best practices"?**

-Volumes set at appropriate levels.
-Frequency (not necessarily a schedule).
-Prequalification requirements and penalties.
-Technology specific.
-Remunerating generation (vs. remunerating investment).
-Static.
-Price-only
-Neither too long nor too short realization periods/neither large nor low volumes
-Coordinate auction / administrative permits / grid connection procedures.

The design of SSA RES auctions

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Design and Assessment of Renewable Electricity Auctions in Sub-Saharan Africa

Hugo Lucas,[1] Pablo del Río[2] and Mohamed Youba Sokona[3]

Abstract Auctions have recently been regarded as a useful alternative to other support schemes for setting the remuneration of renewable electricity (RES-E) worldwide. They have also been increasingly adopted in the sub-Saharan Africa (SSA) region, mostly due to their promise to support the deployment of RES-E projects cost-effectively. The aim of this article is to identify the design elements of RES-E auctions in SSA and assess their pros and cons with respect to different criteria. The results show that the design elements adopted in the SSA auctions are similar to other countries, but some design elements are deemed very relevant in order to address specific constraints to RES-E investments in SSA countries, including pre-selection of sites, technology-specific (solar PV), and price-only auctions. However, the main distinctive feature of auctions in SSA is that they are part of a broader policy mix of support mechanisms aimed at de-risking and providing technical support.

Keywords: sub-Saharan Africa, renewable energy, auctions, PV, design elements, policy mix.

1 Introduction

Many countries in sub-Saharan Africa (SSA) have experienced or are currently experiencing an energy crisis. Six-hundred million people in SSA lack access to electricity (Castellanos *et al.* 2015). With an electrification rate of only 26 per cent (World Bank 2017), the region has 13 per cent of the world's population, but 48 per cent of the share of the global population without access to electricity. SSA is the only region in the world where the absolute number of people living without electricity is increasing (IEA 2014: 30).

Some authors provide in-depth analyses of the SSA electricity sector (see Castellanos *et al.* 2015; KPMG 2016; Quitzow *et al.* 2016; Eberhard *et al.* 2016; Climatescope 2016; IEA 2014). Several factors are behind the energy crisis, including high-demand growth, low installed capacity, non-cost recovering tariffs, low utilisation rate of existing capacity,

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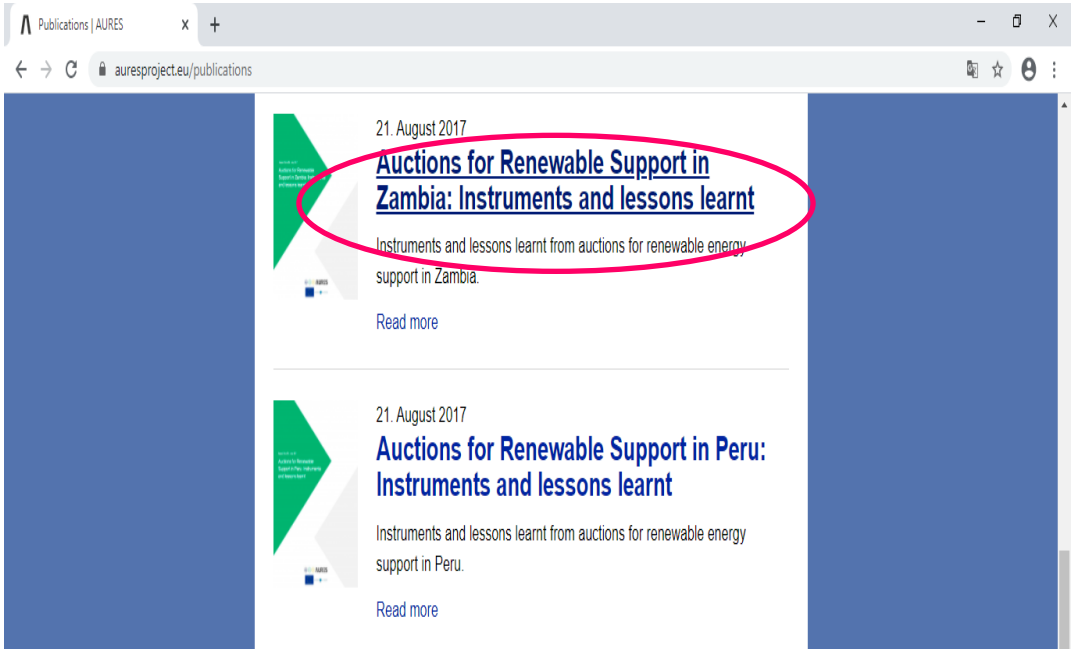
This article is part of IDS Bulletin Vol. 48 No. 5-6 November 2017: 'Green Power for Africa: Overcoming the Main Constraints': the Introduction is also recommended reading.



The design of SSA RES auctions

	UGANDA	ZAMBIA	GHANA
Period and technological scope	January-December 2014. Small PV (< 5 MW)	2016 PV	November 2015 – November 2016. PV

The design of SSA RES auctions

	UGANDA	ZAMBIA	GHANA	REST OF THE WORLD*
Generation (GEN), budget (BUD) or capacity-based (CAP)	CAP (20MW)	CAP (2x50 MW)	CAP (20MW)	CAP: 21 BUD: 4 GEN: 4
Schedule (Y/N)	N	N	N	Y: 10 N:16

The design of SSA RES auctions

	UGANDA	ZAMBIA	GHANA	REST OF THE WORLD*
Technology-neutral (TN), multi-technology (MT) and technology-specific (TS)	TS (solar PV)	TS (solar PV)	TS (Solar PV)	TS: 20 MT: 2 TN: 5
Geographically-neutral (Y/N)	N; preferred zones for the location identified.	N (site-specific)	Y; the developer chooses the site in coordination with the off taker (ECG)	Y: 17 N: 9
Actor neutral (Y/N)	Y	Y	Y	Y: 25 N:1
Size neutral (Y/N)	N Maximum project capacity 5MW	N	N Maximum project capacity 20 MW	Y:10 N:16

The design of SSA RES auctions

	UGANDA	ZAMBIA	GHANA	REST OF THE WORLD*
Prequalification requirements	Previous experience, financial capability. Bids and performance bonds.	Experience, expertise and financial resources. Bid bonds. Technical requirements	Technical Criterion : Successful track record of developing PV projects Financial Criterion : Submission of financial statement for at least 3 years ; Show positive value of equity and profits for each of the last 3 years.	Variable.
Local content rules (Y/N)	N	N	Y (minimum of 20%)	Y:11 N:15
Information provision (Y/N)	Y	N	Y	Y:6 N:20

The design of SSA RES auctions

		UGANDA	ZAMBIA	GHANA	REST OF THE WORLD*
Support cost condition	Type of remuneration (capacity vs. generation)	Generation	Generation	Generation	GEN: 24 CAP: 3
	Form of remuneration (FIT, sliding FIP, fixed FIP).	Sliding FIP (difference between winning bid prices and a FIT 11USc/kWh)	FIT	FIT	FIT: 17 sFIP: 8 fFIP: 1

The design of SSA RES auctions

		UGANDA	ZAMBIA	GHANA	REST OF THE WORLD*
Selection criteria	Price-only vs. multicriteria	Multicriteria 70% price 30% (technical, financial, environmental and social parameters)	Price	Price	Price: 18 Multicriteria: 8

The design of SSA RES auctions

		UGANDA	ZAMBIA	GHANA	REST OF THE WORLD*
Auction format	Multi vs. single-item	Multi	Single (project-specific)	Single-item	Single: 6 Multi: 20
Auction type	Static, dynamic and hybrid	Static	Static	Static	Static: 25 Dynamic: 0 Hybrid: 1
Pricing rules	PAB vs. uniform	PAB	PAB	PAB	PAB: 21 Uniform: 3 First-price: 3
Ceiling prices	Ceiling prices (Y/N)	Y	N	Y (ceiling price is the FIT)	Y: 19 N: 7

The design of SSA RES auctions

		UGANDA	ZAMBIA	GHANA	REST OF THE WORLD*
Realization period	Deadlines for construction (years)	2	1	2	Variable
Penalties		Contract termination, confiscation of bids and performance bonds.	Contract termination, bid bond withheld	Contract termination, confiscation of bids and performance bonds.	Variable

THANKS FOR YOUR ATTENTION!!

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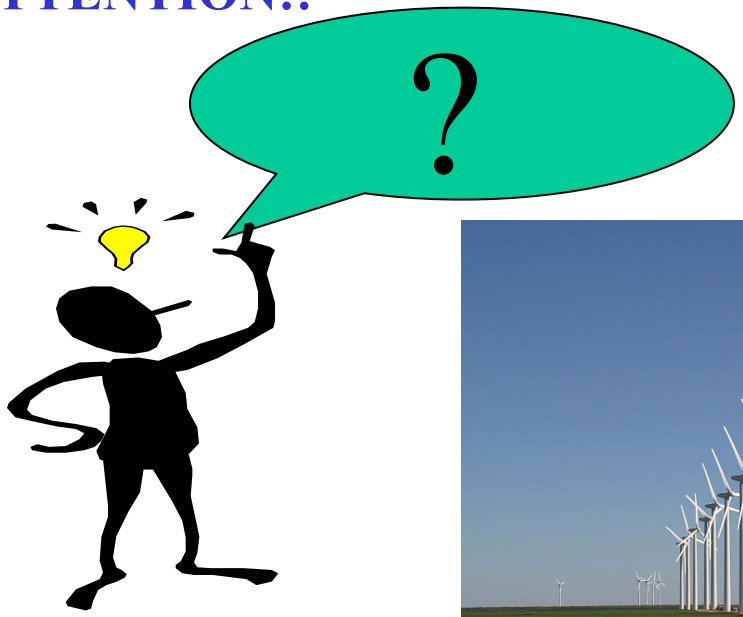

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