



USAID CLEAN POWER ASIA

Auctions 2.0: From renewables cost reduction to system cost reduction

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Agenda

- 1. Navigant**
- 2. Auctions 1.0: Reflecting and stimulating cost reductions**
- 3. Auctions 2.0: Addressing system integration of renewables**
- 4. Auctions 2.0: Promoting energy efficiency and integrated resource management**
- 5. Learnings**

Ecofys – Navigant at a glance



Global consulting company founded in 1984 with the **mission** to enable **sustainable energy for everyone** – since 2016, Ecofys has been part of **Navigant’s global Energy practice**



Ecofys has **five offices** in four countries: Utrecht, the Netherlands; Cologne & Berlin, Germany; Brussels, Belgium; London, United Kingdom – as part of Navigant, our experts are based in **more than 60 offices in the US and Canada, Hong Kong, and the Middle East**. Navigant is publicly traded since 1996 (NYSE: NCI), with 2015 revenues of \$919 million, and 60 offices globally.



We have over **600 experts** skilled in energy, climate, environment, economy, communication and law– in 2007, 11 of our experts supporting the Intergovernmental Panel on Climate Change were awarded the Nobel Prize

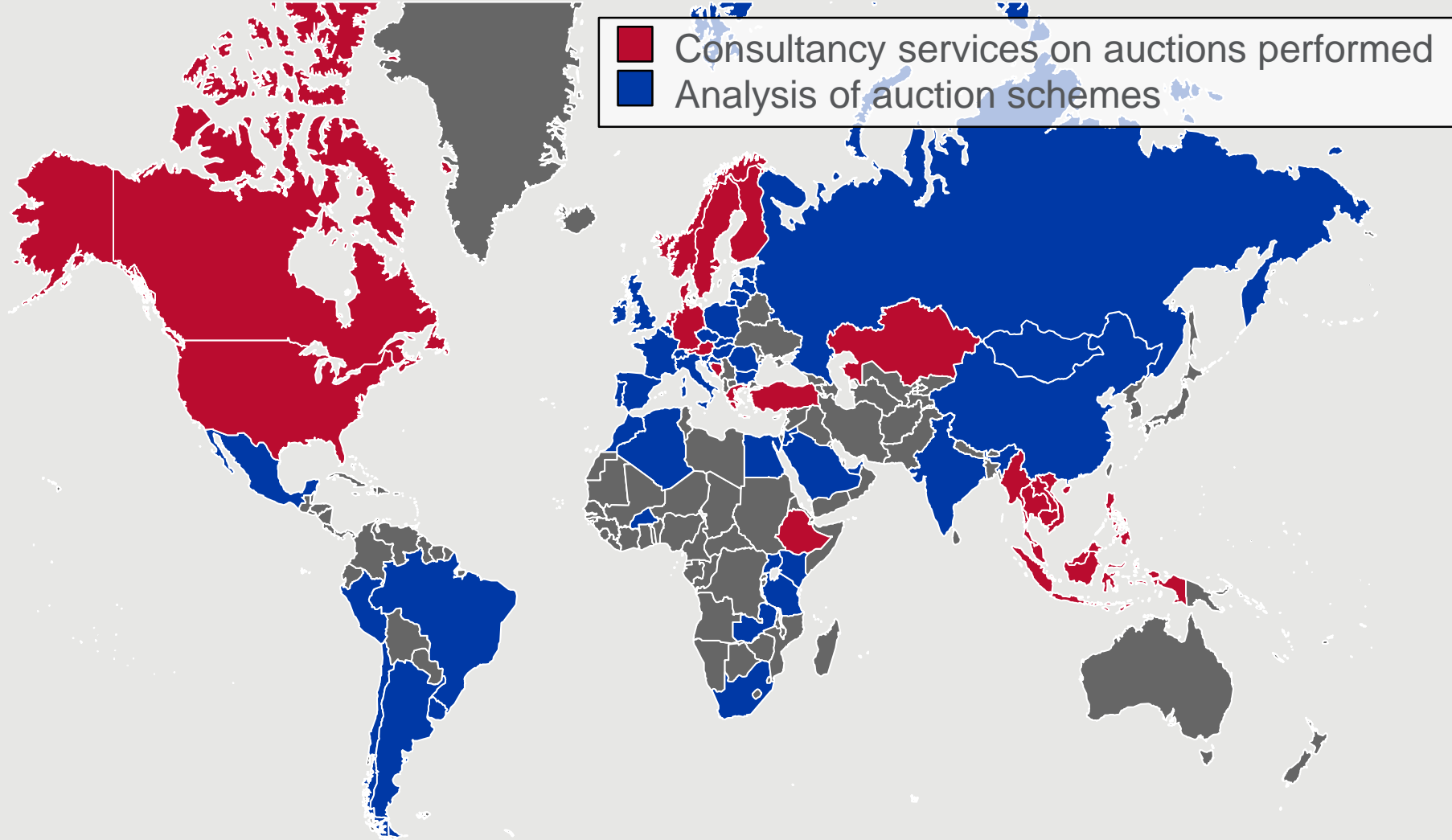


More than 20 years of experience in designing and implementing competitive procurement schemes and auctions for energy. Clients include governments, development agencies, utilities and investors all around the globe.

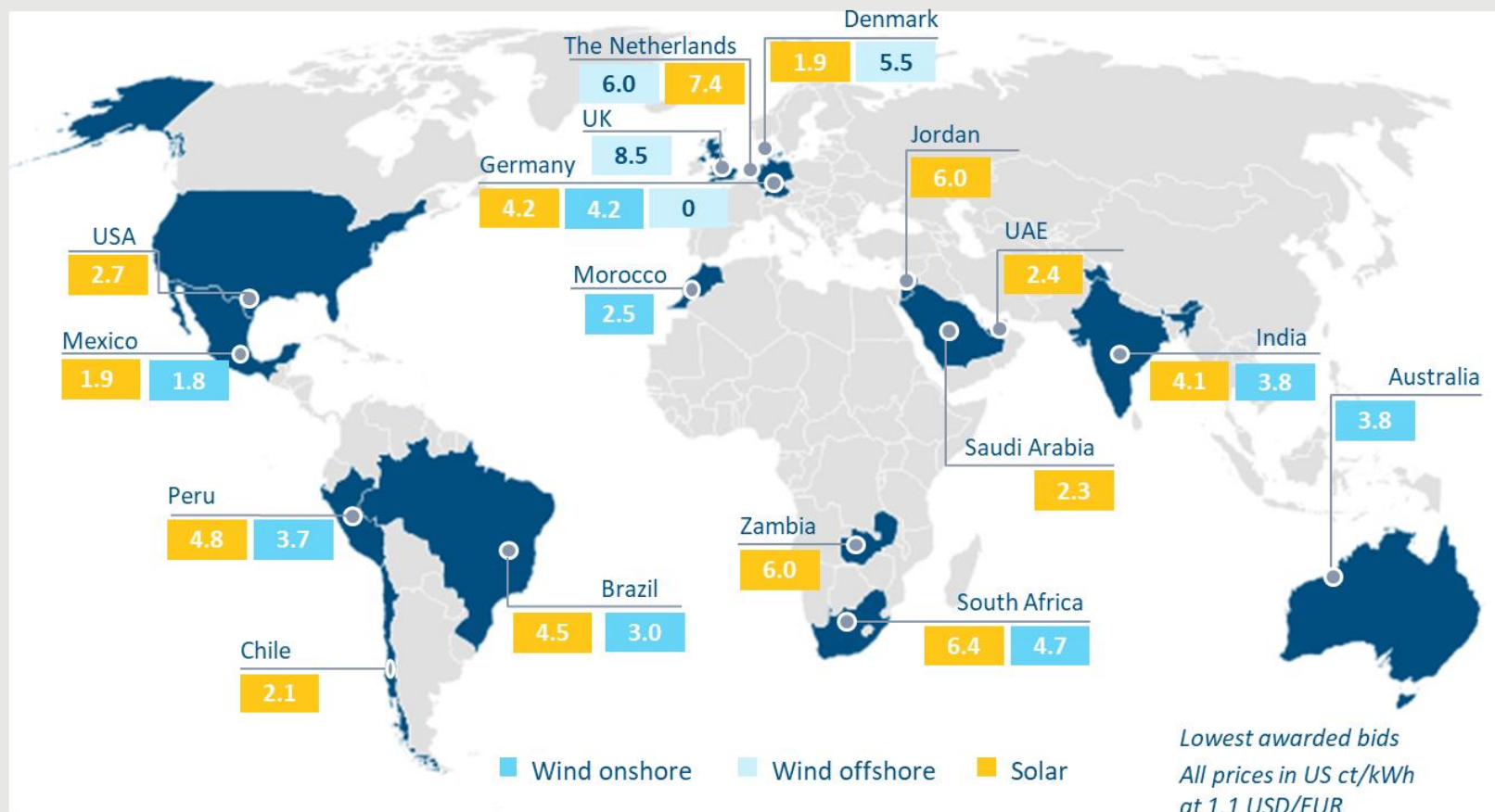


Our strength lies in our strategic understanding of complex energy and climate transition issues: Ecofys **connects the dots** within the triangle between **governments, energy players, and energy-intensive end-users**

Ecofys-Navigant auctions country coverage



2. Auctions 1.0: Reflecting and stimulating cost reductions



Source: Ecofys 2018 based on BNetzA 2018, PV Magazine, Bloomberg

Drivers for recent cost reductions: Components (modules & inverters)! Also reduced project margins through competition, growing experience and rapid price adjustment with auctions

3. Auctions 2.0: Addressing system integration of renewables – the price does not reflect all costs

New challenges emerge

- System integration costs and policy/support costs are different.

Investment and operational costs

+ Cost of capital (debt, equity)

= **Electricity production costs (focus of policy/support costs)**

+ Grid expansion costs related to RE

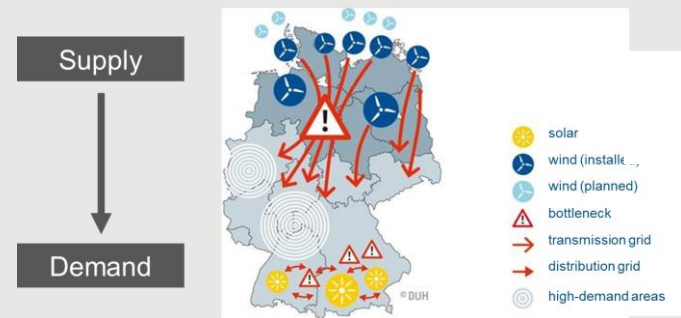
+ Costs of control and balancing energy related to RE, including the provision of capacity

+ Transaction costs

= **System costs of RE generation**

- System integration readiness:
 - Insufficient capacity to connect electricity supply and demand

Example: Germany



- In developing countries with increasing energy demand, stress on the grid is accentuated as RE deployment gains pace

System integration becomes more relevant with increasing shares of renewables
Renewables are located where the best resources sites are, not where the optimal grid connection (from a system perspective) is or could be located.

Auctions 2.0: addressing system integration of renewables – reflect costs in or outside auction

How to address system integration?

As part of the bidding evaluation

- Developer prices grid connection price
 - E.g. UK offshore wind auction: ~ 16.5 USD per MWh
- Additional measures in auction:
 - Applying bonus/malus to bid prices, e.g. in Germany and Mexico
 - Defining capacity limits (quotas) in certain areas

Independent of bid evaluation

- Restricting project sites to areas with grid availability or where grid expansion would be affordable
 - E.g. Renewable Energy Development Zones (REDZ) in South Africa

Mexico considers system integration costs as part of the evaluation criteria

Example - Expected congestion prices



Example - System restriction in the 1st auction round

Area	Interconnection zone	Capacity with priority (MW)	Available capacity (MW)
Central	Central	1331	No capacity available
East	Ixtepec (400kV)	400	300
West	Cañada 230 kV	200	200
Peninsula	Valladolid 230 kV	0	250

Germany reflects system integration costs in transmission & distribution grid in auctions



Design elements reflect grid and system integration costs in the technology-neutral auction pilot 2018-20

- **Transmission grid constraints: grid expansion area** with maximum quota in auction limits the Wind capacity additions in Northern Germany (where higher congestion occurs)
- **Distribution grid: distribution grid factor** with malus applied to bids from areas where additional RES capacity would further increase grid expansion

4. Auctions 2.0: promoting energy efficiency & integrated resource management

Auctions are also used beyond RE procurement

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Energy efficiency

Auctions allocate support to the projects offering energy efficiency gains

Integrated resource planning

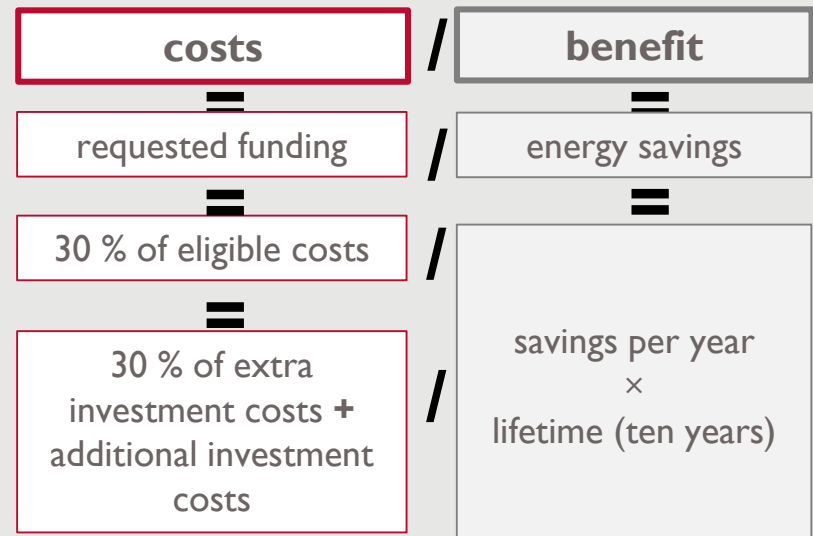
Auctions used for the integrated procurement/ promotion of RE & energy efficiency

Examples of energy efficiency auctions from Germany



Germany's pilot project STEP up!

- Competitive tendering scheme for electrical energy efficiency
- Pilot period (2016-2018) with funding budget of 300 million Euro
- Type of bidders: companies (not project developers) optimizing a process resulting in electricity savings
- Funding is awarded based on the most economic cost-benefit ratio



So far modest success – heterogeneous projects & limited appetite for long-term efficiency measures

Efficiency auctions in Germany: So far, a only modest number of project applications/ bids



- Funding rate is not sufficiently attractive for companies
- Three-month auction deadline perceived by some actors as too short
- Application process perceived as complex - formal errors observed in applications
- Great differences in quality of project applications, e.g. regarding project description & calculation of electricity savings
- Need for communication measures and training for potential applicants
- Systemic issue: companies do not implement efficiency measures with payback periods of more than three years - energy is still cheap and energy costs are only a small part (varies per company, but often only 7%) of the total costs.

Switzerland has been implementing efficiency auctions since 2010



Switzerland's ProKilowatt program

- Auction item: reduction in electricity consumption of appliances, plants, vehicles and buildings
- Auction segments: auctions for projects and auctions for programs. Projects and programs do not compete directly for the same funding.
- Type of bidders:
 - Auctions for projects: focus on industrial, commercial and service companies (implementation of in-house measures)
 - Auctions for programs: associations or other operating agents that bundle multiple similar projects into one program.
- Bid evaluation: multi-criteria → cost-benefit (highest weight) + innovation

Efficiency auctions in Switzerland have been more successful



- By 2016, a total of 699 applications (472 projects and 227 programs) were submitted.
 - 348 projects (about 74%) and 125 programs (about 55%) were awarded
- 53.5 GWh/a in electricity savings resulting from projects/programs 2010-2015
- Programs have accounted for a growing proportion of total energy savings;
 - Aggregating & bundling similar individual projects through programs allows tapping into larger savings potential and achieving economies of scale.
- Overall cost-benefit ratio seen across projects and programs ~2.64 Rp./kWh
- Need to balance application process: rigorous enough to ensure good projects, simple enough to encourage applications
 - Significant efforts for auctioneer to verify achievements

Auctions are also used for the integrated procurement of renewables & energy efficiency

- The integrated consideration of supply- and demand-side measures is key for a transition towards an energy system with lower energy consumption and higher shares of renewables
- In the EU, Energy Union communication/Clean Energy Package ask for Efficiency First principle & demand-side participation in market
- Efficiency first concept is also discussed more internationally
- However, implementing integrated policy approach to energy efficiency (EE) & renewable energy (RE) promotion can be challenging

Integrated resource planning can be implemented in or before auction

Identification of optimal technologies

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Integrated procurement of RE & EE

Criteria are predefined, technology volumes are determined in the technology-neutral auction

Integrated resource planning before procurement

Criteria are predefined, but technology volumes are determined before auction, auctions are technology-specific

In integrated procurement of renewables & efficiency success for non-wires alternatives



Con Edison, NY - Brooklyn Queens Demand Management Program

Type of auction	Technology-neutral auction
Aim of auction	Contracting of demand & supply services to manage future demand-side loads
Purpose	Avoidance of distribution grid investments
Participating technologies	Demand-side management, renewable energy,

Results

- High number of bidders, ten awarded (6 storage, 4 demand-side management)
- Generation technologies not successful as limited land and time available
- Delays in storage commissioning, therefore more strict qualification requirements for next round
- Program seen as piloting alternatives to investments in distribution grid (non-wires alternatives) – but: grid capacity extension avoided or just delayed?

Integrated resource planning more frequently used to determine technology shares before auction



Preferred Resources Pilot by Southern California Edison

Type of planning

Pilot for contracting of decentral energy sources

Aim of planning

Managing future load

Technologies

Renewable energy, storage, demand-side measures

Process

1. Identification of future hourly load
2. Definition of procured resources: energy efficiency, demand-response, renewable energy incl. self-consumption, storage, CHP
3. Market analysis on availability of resources (technical potential, not so much competition)
4. Definition of technology-specific volumes and execution of auction

Results

- Too small areas with too low competition increase costs, long lead times needed
- Pilots suitable to test methodologies & designs

Integrated planning and procurement in emerging economies: South Africa



- Integrated resource planners evaluate both demand-side (energy efficiency measures, demand-side management – DSM) and supply-side options (renewable energy, fossil fuels, distributed generation, and integrated solutions e.g. combined heat and power)
- South Africa’s links its Integrated Resource Plan with its RE auction program
 - The Department of Energy (DoE) issues “ministerial determinations” defining how much new power generation is needed and from which sources, based on the Integrated Resource Plan (IRP).
 - Ministerial determinations are translated into separate auction rounds – each round with specific technology bands
 - The National Energy Regulator (NERSA) can only license new capacity within the IRP limits

5. Learnings

- RE auctions are increasingly implemented worldwide, with resulting bid prices reflecting and stimulating further cost reductions
- Increasing shares of renewables and the need to speed up the decarbonization of the energy sector highlight the potential of auctions beyond RE procurement.
- Addressing system integration of renewables means recognizing that system integration costs and policy costs are different and that renewables should be deployed in consideration of current and planned grid capacities
- As a mechanism to competitively allocate funding, auctions can help promote energy efficiency and integrated resource management
- Examples show auctions can be used to competitively select supply- or demand-side measures, either in technology-neutral auctions (Con Edison) or before auction (Southern California Edison)



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