
Bidding and Matching Procedures

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Some of the procedures described herein are subject to issued or pending patents.

Some Recent Market Designs

- ◆ Innovations involving...
 - Multi-item, multi-round, mostly monotonic procedures
- ◆ Auction procedures
 - Radio spectrum (\$)
 - Asset sales (\$)
 - Electrical power (\$, term)
 - CO₂ emissions reductions (tons of pollutants)
- ◆ Matching procedures
 - Redesign of the National Resident Matching Program

Outline

- ◆ Bids including cash
 - FCC spectrum auctions (cash only)
 - Electricité de France power auctions (cash & terms)
- ◆ Non-cash bids only
 - British CO₂ auctions (emissions reductions)
 - National Resident Matching Program
- ◆ Package procedures
 - FCC Auction #31
 - Redesigned NRMP

FCC Spectrum Auctions

Auction No.	Auction Name	Licenses Auctioned	Net High Bids (M)
1	<u>Nationwide Narrowband PCS</u> 7/25/1994-7/29/1994, Nationwide	10	\$617.0
4	<u>A & B Block PCS</u> 12/5/1994-3/13/1995, <u>MTA</u>	99	\$7,019.4
5	<u>C Block PCS</u> 12/18/1995-5/6/1996, <u>BTA</u>	493	\$9,197.5
8	<u>DBS (110 W)</u> 1/24/1996-1/25/1996, Nationwide	1	\$682.5
10	<u>C Block PCS Reauction</u> 7/3/1996-7/16/1996, <u>BTA</u>	18	\$904.6
11	<u>D, E, & F Block PCS</u> 8/26/1996-1/14/1997, <u>BTA</u>	1479	\$2,517.4
17	<u>Local Multipoint Distribution Service (LMDS)</u> 2/18/1998-3/25/1998, <u>BTA</u>	986	\$578.7
33	<u>Upper 700 MHz Guard Bands</u> 9/6/2000-9/21/2000, <u>MEA</u>	104	\$519.9
35	<u>C & F Block PCS</u> 12/12/2000-1/26/2001, <u>BTA</u>	422	\$16,857.0

FCC Rule Assessment

- ◆ *The Simultaneous Multiple Round Auction*
 - All items for sale simultaneously
 - Ascending auction for each item
 - Minimum bid increments
 - Bidding closes on all items simultaneously
 - Facilitating electronic interfaces
 - Activity rule
 - *The international standard for spectrum auctions*
- ◆ **Successes**
 - About 40 auctions completed
 - 9 “large” (> \$500 million revenues)
 - Generally very favorable reviews

Simultaneous “Clock” Auctions



- ◆ Sales of generating capacity
 - September 2001
 - December 2001
 - March 2002
- ◆ Bidders bid on contracts of various lengths
- ◆ Clock auction designed & run by Market Design, Inc
 - Larry Ausubel
 - Peter Cramton



αγορα
market design inc.

PRICEWATERHOUSECOOPERS 


Bidder Training Example

EDF Generating Capacity Auction - Microsoft Internet Explorer provided by PricewaterhouseCoopers

File Edit View Favorites Tools Help

Back Forward Stop Refresh Home Search Favorites History Size Print Edit PwC KC Links Address Y! >>

EDF Generating Capacity Auction
September 2001

 EDF
Electricité de France

19 July 2001, 17:31
Auction started on 9 September, 10:00
Round 1 started on 9 September, 10:00 and will end on 9 September, 10:59.

Bidder ABC logged in.

[\[Current Round\]](#) [\[Generate Confirmation\]](#) [\[Bidder Round Summary\]](#)
[\[Round Summary\]](#) [\[Round Schedule\]](#) [\[Messages\]](#) [\[Download\]](#) [\[Logout\]](#)

Add New Bid

Please choose the price point for which you would like to change your demand. The quantities demanded will stay in effect until the next price point or the end-of-round price.

Group A: Base-Load VPP, 01/01/2002

- Round 1 Start Price for 3 month Product: 0 €
- Round 1 End Price for 3 month Product: 1,000 €

Enter Price Point : %

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Internet zone

Start Exploring - C:\D... Workspace at 0... EDF Generat... Microsoft Photo... Microsoft Power... 18:29

Round 1: Bid Example

EDF Generating Capacity Auction - Microsoft Internet Explorer provided by PricewaterhouseCoopers

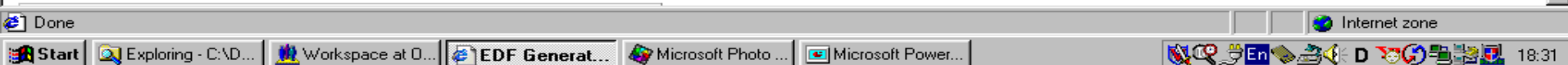


Round 1 bids for Bidder ABC Electric

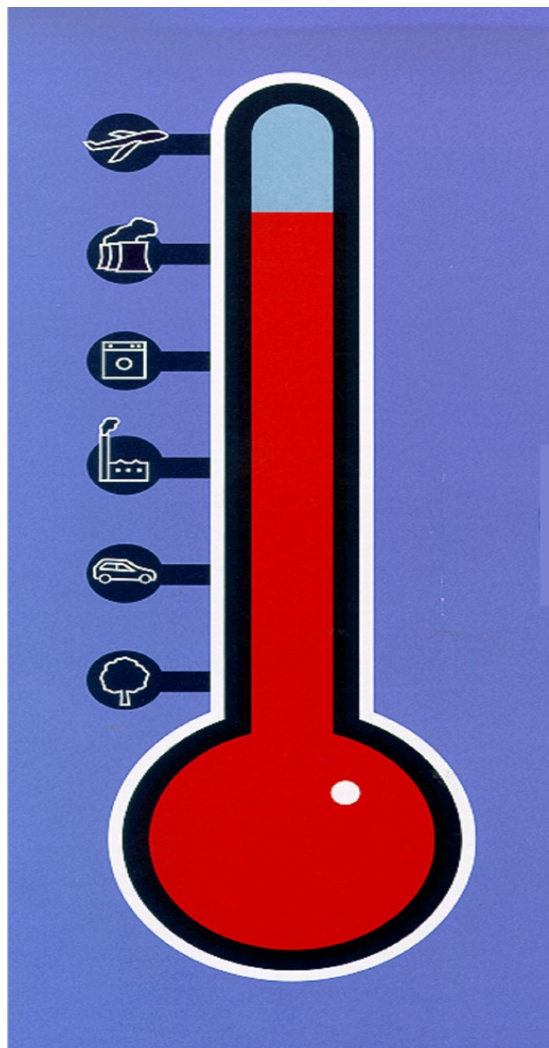
Group A: Base-Load VPP, 01/01/2002

Product	Round 1 Start Price	Round 1 [Change]	Round 1 [Change]	Round 1 [Change]	Enter New Bid	Round 1 End Price
Price Point	START	0.00%	25.00%	50.00%		END
3 month Price and Quantity	0 €	Price: 0 € 100 MW	Price: 250 € 100 MW	Price: 500 € 100 MW		Price: 1,000 € 100 MW
6 month Price and Quantity	0 €	Price: 0 € 100 MW	Price: 262 € 100 MW	Price: 525 € 100 MW		Price: 1,050 € 100 MW
10 month Price and Quantity	0 €	Price: 0 € 100 MW	Price: 272 € 75 MW	Price: 545 € 50 MW		Price: 1,090 € 50 MW
12 month Price and Quantity	0 €	Price: 0 € 0 MW	Price: 275 € 0 MW	Price: 550 € 0 MW		Price: 1,100 € 0 MW
24 month Price and Quantity	0 €	Price: 0 € 0 MW	Price: 288 € 0 MW	Price: 575 € 0 MW		Price: 1,150 € 0 MW
36 month Price and Quantity	0 €	Price: 0 € 0 MW	Price: 300 € 0 MW	Price: 600 € 0 MW		Price: 1,200 € 0 MW
Total Quantity		300 MW	275 MW	250 MW		250 MW

Group B: Peak-Load VPP, 01/01/2002



British CO₂ Auctions



- ◆ **Greenhouse Gas Emissions Trading Scheme Auction
United Kingdom
March 11-12, 2002**
 - ◆ **38 bidders**
 - ◆ **34 winners**
 - ◆ **4 million metric tons
of CO₂ emission reductions**

NRMP: Doctors & Hospitals

- ◆ 20,000 doctors per year assigned to US hospital residencies
- ◆ Evidence indicates
 - Well-designed market mechanisms encourage participation
 - Drastic improvements in mobility compared to unorganized markets
 - Less “early-mover lock-up”
- ◆ Redesign begun in 1995, implemented in 1998
 - Response to the concerns of dual career couples

Basic Design & Changes

◆ Basic Design

- Hospitals and doctors submit rank order lists
- Algorithm has hospitals make offers to doctors
- Doctors hold at most one offer.
- Hospitals eliminate rejections, make new offers.
- Iterate.
- Outcome is a “stable match.”

◆ Main Problems

- Doctors may enter match as a couple
- Doctor’s second year programs attached to first year program.
- Reversions of slots

◆ Revised Procedure

- Lists rank pairs of offers.
- It is possible that there exists no stable match, but
- Algorithm seeks to expand the set of parties included in a stably matched group.

Vickrey Auctions & the Core

- ◆ Example: 3 identical items
 - Bidders 1-3 have values of \$1M for one item only
 - Bidder 4 has value of \$2M for a package of 3, no value for smaller packages.
 - Vickrey outcome is not in the core.
- ◆ Example: modified
 - Bidders 1-3 have values of \$0.5 for 1 item only
 - Vickrey outcome is vulnerable to collusion by losers
- ◆ Theory
 - These problems are “typical” when items are not substitutes for all bidders

Mostly Monotone Mechanisms

- ◆ In all these auction & matching mechanisms
 - Bidders rank alternative outcomes from most to least preferred
 - The auctioneer holds its “best” combination of offers at every round
 - Each excluded bidder at each round makes its most preferred new offer
 - Algorithm terminates at a “core” outcome.
- ◆ Theory is rapidly evolving new, useful mechanisms
 - Multi-item, multi-stage, mostly monotonic

...and a Sample Application

- ◆ If an auction or matching procedure is to be run by a regulator...
 - Regulator should establish a criterion function
 - » Revenues generated
 - » Concentration of rights
 - Bidders should establish a ranked list of offers
- ◆ A generalized (Ausubel-Milgrom) matching auction leads to outcomes in the core with respect to the reported rankings.
<http://www.milgrom.net/PATW-PackageBidding.pdf>
- ◆ Design decisions
 - Criterion function
 - Packages? Multiple identities? Proxy agents?

The End