ABC
COMMUNICATIONS

British Columbia
Broadband Association

Spectrum Auctions

CanWISP
March 2019

Outline

o **Auction Goals**

o **Auction Design Considerations**

o **Auction Formats**

o **Spectrum Auctions**

Auction Goals

o **Get the highest price**

o **Sell everything quickly**

o **Discover the "right" price**

o **Display of fairness**

o **Further a policy goal**

Design Considerations

- **Illegal bidding practices**
  - **Collusion**
  - **Cartel Bidding**
- **Mitigation**
  - **Pre-defined increments**
  - **Stiff Penalties**
  - **Full Transparency**

Design Considerations

o **Gaming**
- o **Sniping**
- o **Bid Shading**
- o **Jump Bidding**
- o **Shill Bidding**

o **Mitigation**
- o **Candle Auction or Activity Rules**
- o **Second-Price Rule**
- o **Pre-defined Bid Increments**

Design Considerations

o **Information**

    o **Anonymous Bidders**

    o **Anonymous Bids**

    o **Anonymous Sellers**

    o **Limited product information**

Auction types

o **Ascending auction**

o **Reverse auction**

o **Sealed-bid auction**

o **Descending auction**

o **Multiunit auction**

Ascending Auction

- Price increments from bidders or from auctioneer
- Ongoing price information
- Can maximise price

Reverse Auction

o **Buyer and Seller are reversed**

o **Has been used for funding awards in some countries**

o **Requires seller to precisely define the product**

Sealed-Bid Auction

o **One secret bid per bidder**

o **Fast**

o **No ongoing pricing information**

o **First-price or second-price**

Descending Auction

- 1 item – price descends
- Multi item – Bidders submit quantity & price in sealed bids
- Fill orders from top down
- First or second price
- Fast clearing of large market

SMRA Auction

- Simultaneous Multiple-Round Ascending
- Multiple products (ex. licences)
- All auctioned at the same time
- At each round, auctioneer announces prices for each product
- If there is more than one bid for each product, the price is incremented
- Auction ends when supply = demand

Opening Bids

- 600 MHz auction
- Service Area 2-06
- Eastern Ontario and Outaouais
- Pop 2,435,880
- 270 Eligibility Points
- Opening bid for 10 MHz @ $0.539/MHz/pop = $13,129,000

Opening Bids

o **600 MHz auction $/MHz/pop**

  o **$0.133 North**

  o **$0.360 Rural**

  o **$0.539 AB / BC / East ON**

  o **$0.804 South ON / South QC**

Opening Bids

o **2 GHz AWS-3 auction (2015) $/MHz/pop**

  o **$0.05 North**

  o **$0.06 NL, NS, NB, SK**

  o **$0.08 East QC, East ON**

  o **$0.09 MN, AB**

  o **$0.10 BC**

  o **$0.11 South ON**

  o **$0.12 South QC**

SMRA - Activity Rules

o **Each licence is assigned an opening price and eligibility points**

o **Initial deposit is opening price ($/point)**

o **Bidder's initial eligibility equals the points of the deposit**

o **Each bid has an associated number of eligibility points**

o **Bidder's eligibility is reduced as bids are reduced**

Revealed Preference Rule

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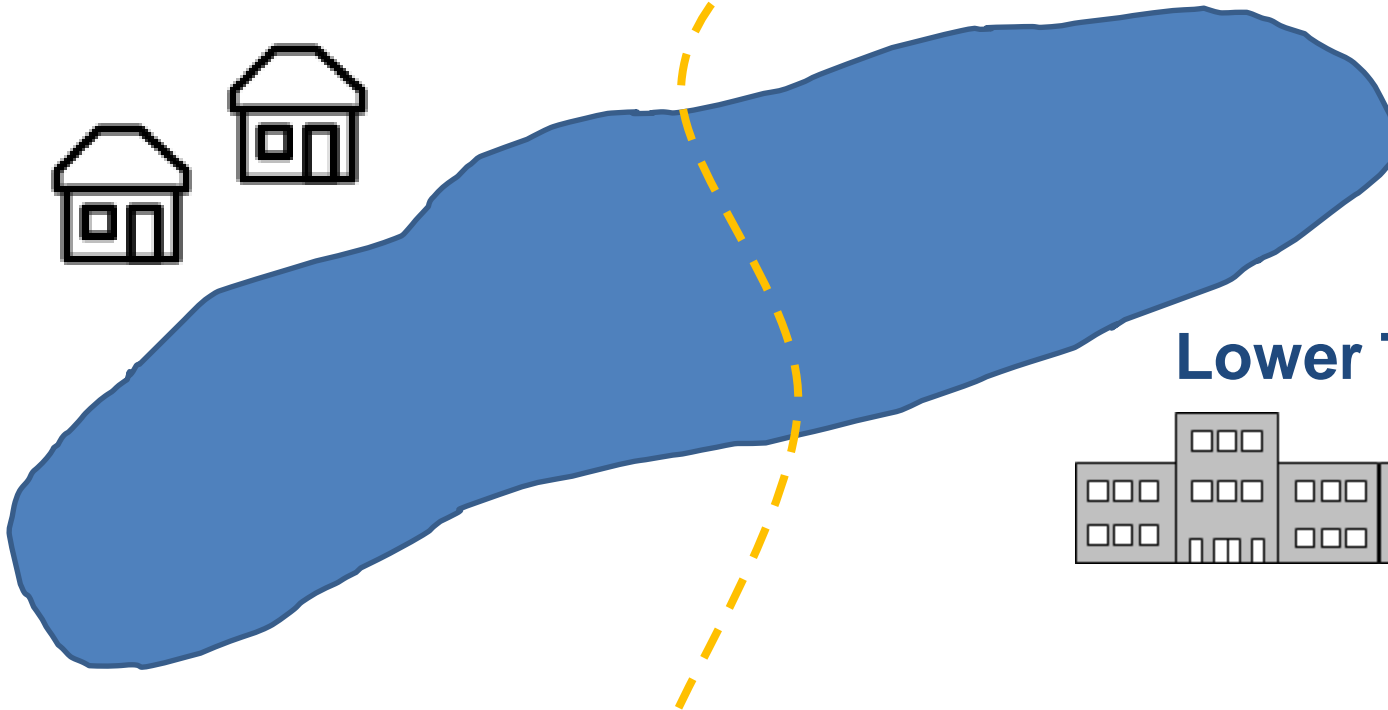**Trout Lake**   **Pine Valley**

15 pts   **10 pts**

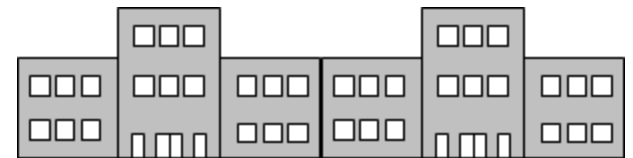| 1	$60	☑		$40	☑	
			…			
12	$200	☒		$150	☑	Δ=$50
			…			
19	$250	☑		$245	☒	Δ=$5

○ **Points parking**
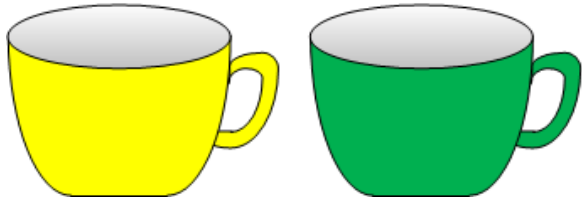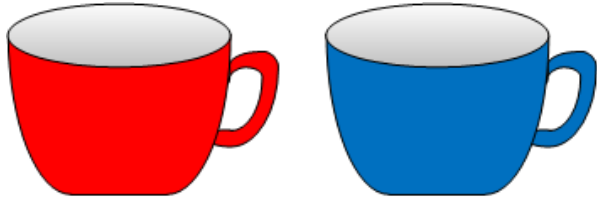
Orphan Licences

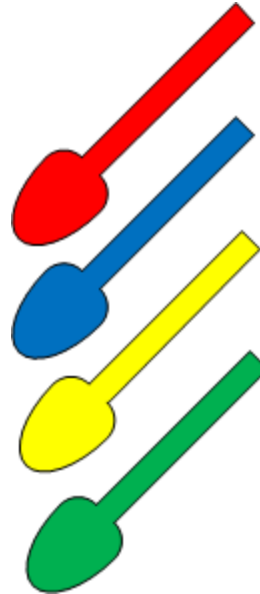Upper Trout Lake

Lower Trout Lake

Combinatorial Clock Auction

o **Bid on packages, not individual licences**

o **Like products are grouped**

o **Three stages**

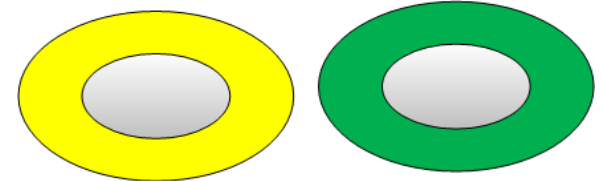   o **Clock Rounds**

    o **Supplementary Round**
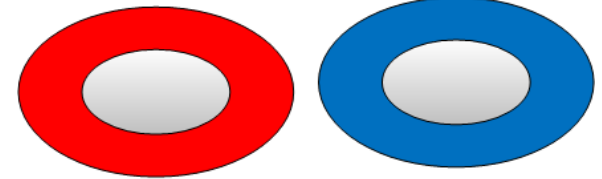
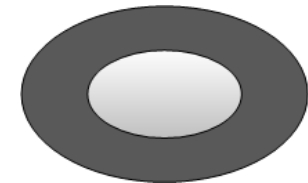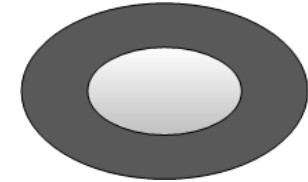   o **Assignment Round**

CCA Format

Category 1: Cups
$0.20 each

Category 2: Spoons
$0.10 each

Category 3: Saucers
$0.20 each

Clock Rounds

	Category 1: Cups	Category 2: Spoons	Category 3: Saucers
1	$0.20 : qty 12	$0.10 : qty 12	$0.20 : qty 12
2	$0.50 : qty 10	$0.30 : qty 9	$0.50 : qty 8
3	$1.00 : qty 8	$0.60 : qty 6	$0.80 : qty 7
4	$1.30 : qty 6	$0.80 : qty 4	$1.10 : qty 5
5	$1.50 : qty 4	$0.80 : qty 4	$1.20 : qty 3

Supplementary Rounds

$3.50

**Final clock package**

$2.00

$1.50

alternate packages

o **All participants may enter supplementary bid packages for different combinations**

o **Cannot exceed eligibility**

o **Winning combinations are solved to maximize total value**

Vickrey Price

o **Vickrey price is an extension of second price to multiple products and combinations**

o **With multiple products, this is an algorithm that solves for the price such that no other bidders would pay more.**

o **Winning bids announced as packages.**

Assignment Rounds
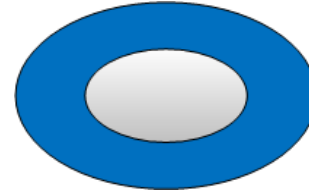
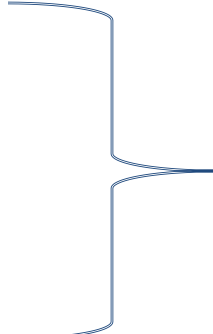o **Opportunity to express value of particular items within category**

2015 AWS Auction

Licence Winner	Supp. Bids	Licences Won	Vickery Price Paid ($M)	Final Clock Price ($M)	Vickery / Clock
Bell	501	51	$28.99	$76.97	0.38
Eastlink	20	11	$4.82	$12.09	0.40
CCI	503	13	$2.30	$13.78	0.17
MTS	19	2	$2.24	$2.61	0.86
Rogers	195	41	$24.09	$73.49	0.33
TBayTel	5	2	$1.73	$1.73	1.00
TELUS	28	122	$478.82	$1,038.47	0.46
Vidéotron	6	18	$186.95	$440.05	0.42
Xplornet	29	42	$25.44	$64.39	0.40

Some Valuations

o **700 MHz auction (2014)**
   o **$0.30 to $13 /MHz/pop**
   o **Most $1.50 to $3.50 /MHz/pop**

o *Community of 20,000*
o *20 MHz of spectrum*
o *@ $2.50/MHz/pop*

$1,000,000

Some Valuations

- 2500 MHz BRS auction (2015)
  - Most < $1.00 /MHz/pop
  - Tier-3 service areas
  - Not all licences available

- *Community of 20,000*
- *20 MHz of spectrum*   } **$400,000**
- *@ $1.00/MHz/pop*

Some Valuations

- AWS-3 auction (2015) – CCA format
  - About $0.20-$0.30 /MHz/pop for set-aside spectrum
  - About $4 to $10 /MHz/pop for open spectrum

- *Community of 20,000*
- *20 MHz of spectrum*
- *@ $0.25/MHz/pop*

$100,000

Looking Ahead

- ○ **600 MHz auction results**
- ○ **Tier-5 service areas**
- ○ **ISED consideration of rural service**
- ○ **3 GHz spectrum plan and auction**

Thank
You

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