Spectrum Auctions
BCBC
May 2019

Outline

- Auction Goals
- Sealed-Bid Auctions
- SMRA (Simultaneous Multiple-Round Ascending) Auctions
- CCA (Combinatorial Clock) Auctions
- Spectrum Valuation Outcomes

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**

Sealed-Bid Auction

- o **aka "Silent Auction"**
- o **Used for residual licences**
- o **One secret bid per bidder**
- o **First-price or second-price**

SMRA Auction

o **Simultaneous Multiple-Round Ascending**

o **Multiple products (ex. licences)**

o **All auctioned at the same time**

o **At each round, auctioneer announces prices for each product**

o **If there is more than one bid for each product, the price is incremented**

o **Auction ends when supply = demand**

Opening Bids

o **Recent 600 MHz auction**

o **Service Area 2-03 British Columbia**

o **Pop 4,647,973**

o **520 Eligibility Points**

o **Opening bid for 10 MHz @ $0.539/MHz/pop = $25,053,000**

Opening Bids

- 600 MHz auction $/MHz/pop
  - $0.133 North
  - $0.360 Rural
  - $0.539 AB / BC / East ON
  - $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**
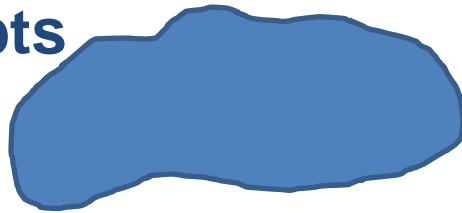- o **$0.11 South ON**
- o **$0.12 South QC**

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**

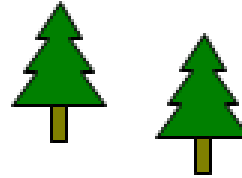o **Bidder's eligibility is reduced as bids are reduced**

Revealed Preference Rule

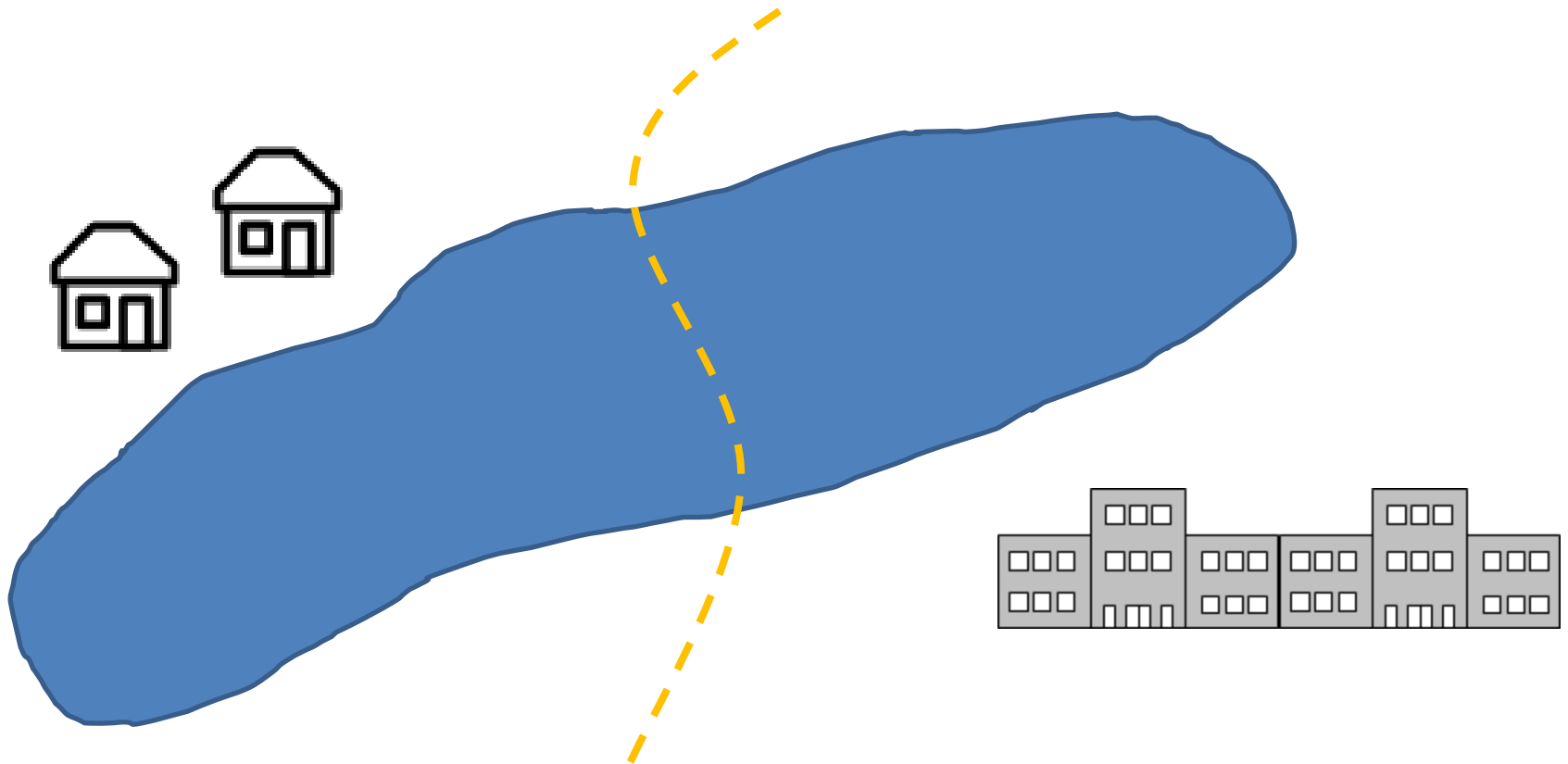**Trout Lake**   **Pine Valley**

15   **10**
pts   **pts**

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

o **Points parking**

Orphan Licences

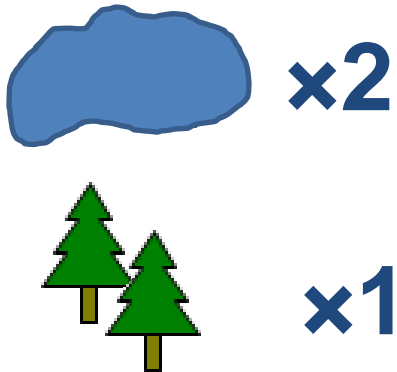**Upper Trout Lake**
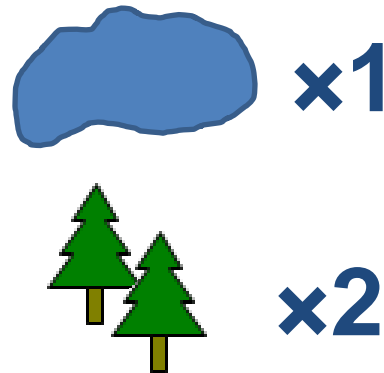
Combinatorial Clock Auction

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

o **Like products are grouped**

o **Three stages**

    o **Clock Rounds**

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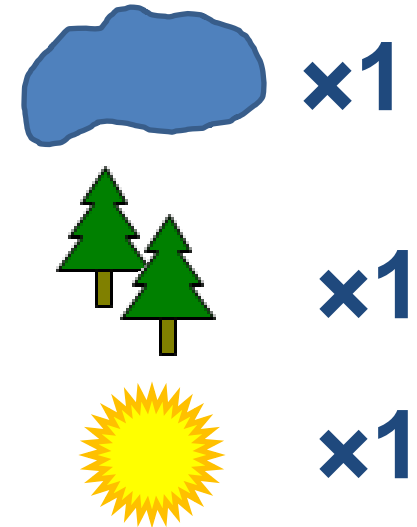
    o **Assignment Round**

Supplementary Rounds

Final Clock Round Package $10M

×2

×1

Alternate Package $8M

×1

×2

Alternate Package $6.5M

×1

×1

×1

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

o **Each bid 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**

o **Contiguous spectrum in a licence area**

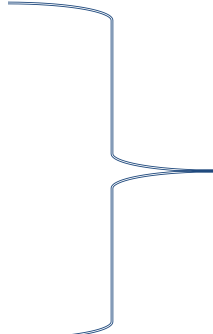o **Same spectrum in adjacent licence areas**

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

ABC
COMMUNICATIONS

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

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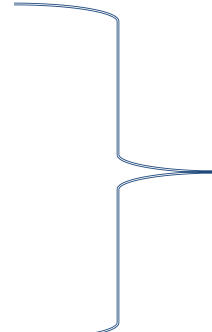- *20 MHz of spectrum*   **$400,000**
- *@ $1.00/MHz/pop*

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

Some Valuations

- 600 MHz auction (2019) – CCA format
  - About $0.35-$1.00 /MHz/pop for set-aside spectrum
  - About $2/MHz/pop for open spectrum
  - Bell did not win any spectrum
- *Community of 20,000*
- *20 MHz of spectrum*
- *@ $0.50/MHz/pop*

$200,000

Looking Ahead

o **600 MHz auction full data**

o **Tier-5 service areas**

o **ISED consideration of rural service**

o **3 GHz spectrum plan and auction**

Thank You