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SOUTHERN CALIFORNIA-EDISON

**Effects of Delay on  
PCS Market Potential**

Briefing To FCC PCS Study Group

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## Effects of Delay on PCS Market Potential

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**Over the past three years, there has been much discussion and debate as the FCC has deliberated regarding spectrum alternatives, licensing rules and auction procedures regarding PCS**

- As part of this process, the Commission has made considerable progress in reaching a variety of conclusions regarding how and when PCS will be available to the American public
- At this time, the Commission is attempting to deal with Reconsideration issues in the context of initiating PCS spectrum auctions in the next few months
- To provide input into this process, EDS Management Consulting Services has prepared material focused on the impact of licensing and start-up delays on PCS market development and size

## Effects of Delay on PCS Market Potential

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**To examine overall demand and cross-elasticities of demand between PCS and cellular, we carried out surveys of 3,400 households and business decisionmakers**

- Respondents were given a discrete choice task in which they had to select between PCS and cellular at different price levels
- Overall price elasticities and cross-elasticities were estimated from these data

**To examine the impact of delay on demand, we then used a “successive generation” diffusion of adoption model**

## Effects of Delay on PCS Market Potential

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**We have developed a model derived from Norton and Bass (University of Texas) which takes into account the performance of successive generations of products - in this case PCS as a new, improved generation of cellular**

Our perspective is that:

- The success of PCS will be built upon the earlier exposure of customers to cellular services
- The model accounts for the incremental impact of PCS in generating greater combined penetration of PCS and cellular
- We have examined the following propositions:
  - What will happen to cellular if PCS is never introduced?
  - What will happen to cellular and to PCS if PCS is introduced in 1996?
  - What will happen to cellular and to PCS if PCS is delayed by one or two years?

## Effects of Delay on PCS Market Potential

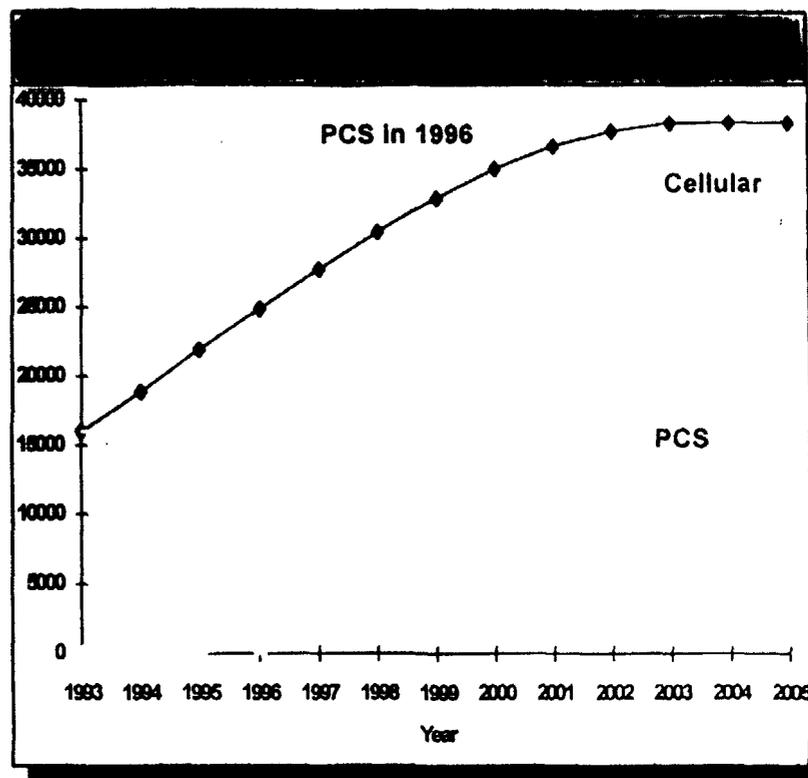
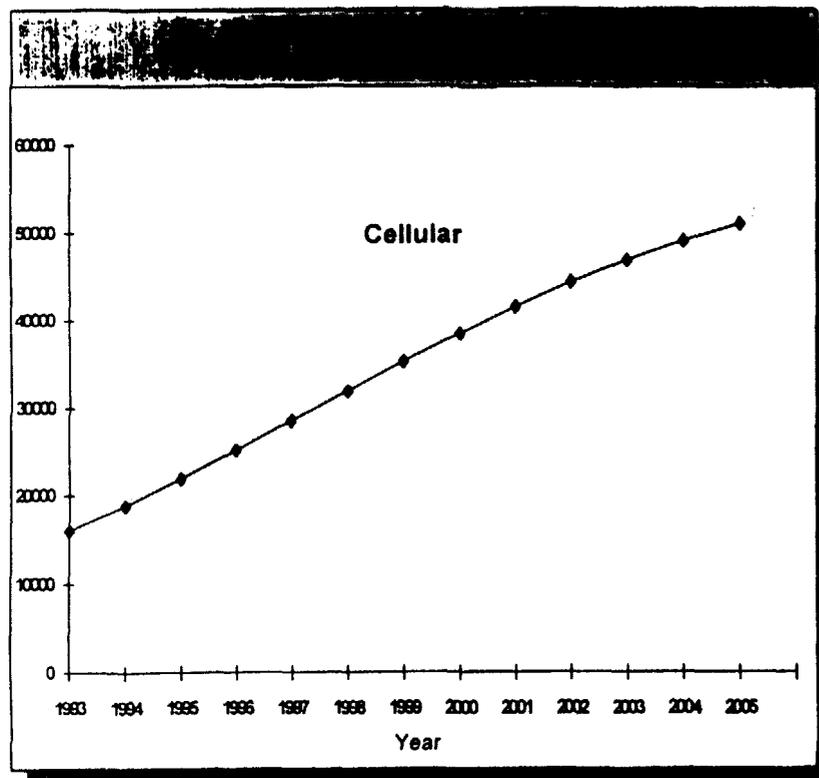
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### Modeling Assumptions

1. Assumes 90% of households are covered by both PCS and cellular services
2. PCS handsets are lightweight, inexpensive (under \$200) and have several hours of talk-time
3. PCS is priced at \$35/month; cellular at \$50/month
4. One adoption of services in each household -- households do not have more than one service (this assumption is, of course, not correct)
5. We have assumed that it will take at least 18 months to get a PCS business into full operation

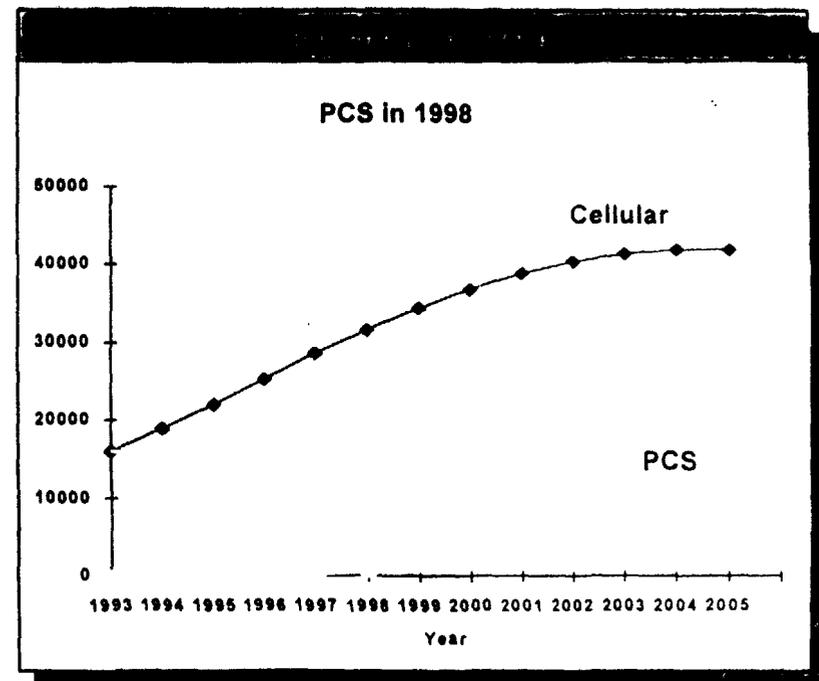
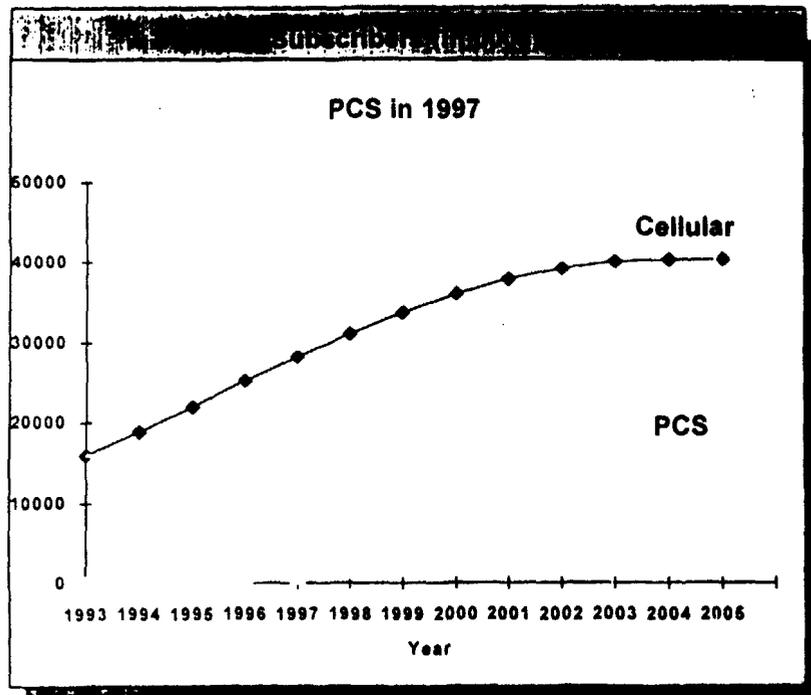
## Effects of Delay on PCS Market Potential

In the absence of PCS, cellular grows to 51 million subscribers by 2005; if PCS is introduced in 1996, cellular only grows to 38 million and PCS reaches 17 million by 2005



## Effects of Delay on PCS Market Potential

If PCS is delayed by one year (1997), PCS demand is reduced to 14.5 million and if it is delayed two years (1998) demand is further reduced to 12 million



## Effects of Delay on PCS Market Potential

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### Implications

1. These results suggest ultimate PCS demand levels are reduced by roughly 15% for each year of delay
2. This appears to be the case primarily because of the continuing growth of cellular which serves some but not all of the pent-up demand for PCS
3. Reduction in demand for PCS due to delay may make for a less than attractive business proposition-- particularly since the cash flow in early years has a great influence on the attractiveness of the business case
4. Slowing of licensing will strengthen the cellular position
5. Licensing delays may lead some potential bidders to "sit out" the auction because ventures may appear to be less profitable

# COMPARING AUCTIONS OF 20 MHz AND 40 MHz PCS ASSIGNMENTS

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# The Question:

- Are FCC Goals better served by
  - auctioning larger assignments (e.g. 40 MHz) or
  - auctioning smaller assignments (e.g. 20 MHz) and allowing aggregation
  - given that inherent limitations of 20 MHz assignments and the fundamentally superior economics of larger assignments will drive PCS providers to plan for larger assignments?
- Conclusion: Larger assignments serve FCC goals better
  - Aggregation can lead to inefficient and unattractive outcomes, delay, and transactions costs

# Argument

- The secondary market cannot be relied upon
- Does an auction of 20 MHz assignments yield the same results from a policy standpoint as directly auctioning 40 MHz assignments?
- Simple examples to understand plausible behavior
- Aggregation can lead to inefficient or otherwise undesirable outcomes that may not be fixed in or fixable in the secondary market

# Simplest possible example

- Two 20 MHz assignments A and B
- Three bidders: BP1, BP2 and SP
- BP1 and BP2 see synergy in getting A and B together
- In Example 1
  - BP1 is fiscally conservative
  - BP2 is a risk taker

# Example 1: Defensive Escalation

## VALUE OF SPECTRUM BLOCKS TO BIDDERS

(A and B are 20 MHz spectrum assignments; A & B combines the two into a 40 MHz assignment)

BIDDER	A	B	A & B
BP1	7	8	22
BP2	3	7	20
SP	13	11	14

# Example 1: Defensive Escalation

## SIMULTANEOUS MULTIPLE ROUND BIDDING FOR TWO 20 MHZ BLOCKS

ROUND	A ALONE	B ALONE
3	(7*,6,6)	(6,7*,5)
4	(7,9*,8)	(8*,7,8*)
5	(-,9,10*)	(8,9*,8.5)
6	(-,11*,10)	(-,9,10*)
7	(-,11,12*)	(-,12*,10)
8	(-,13*,12)	(-,12*,10)
9	(-,13*,-)	(-,12*,-)

(Note: (x,y,z) represent the bids of BP1, BP2, and SP respectively, where \* indicates that the marked bid is the highest bid for the spectrum assignment at the time)

# Example 1: Defensive Escalation

- 40 MHz auction would easily lead to efficient outcome:  
BP1 gets A & B for 20+
- 20 MHz Auction: Aggregation can lead to result that BP2 gets A & B for 25, which is higher than his valuation of 20 or BP1's higher valuation of 22
- Consequences
  - Inefficient Allocation
  - Hurts goal of rapid deployment of affordable service
  - Default?

# Example 2

- Both BP1 and BP2 are fiercely competitive
- Their valuations are the same as
- SP values A and B at really low values

# Example 2: Offensive Escalation

## SIMULTANEOUS MULTIPLE ROUND BIDDING FOR TWO 20 MHZ BLOCKS

ROUND	A ALONE	B ALONE
5	(8,9*,-)	(10*,9,-)
6	(10*,9,-)	(10,11*,-)
7	(10,11*,-)	(12*,11,-)

(Note: (x,y,z) represent the bids of BP1, BP2, and SP respectively, where \* indicates that the marked bid is the highest bid for the spectrum assignment at the time)

## Example 2: Offensive Escalation

- 40 MHz auction: BP1 buys A & B for 20+
- 20 MHz auction: Competitive pressures and ego cause bidding to escalate beyond valuations
- Consequences
  - Efficiency?
  - Hurts goal of rapid deployment of affordable service
- Much like bidding for Paramount by QVC and Viacom

# Example 3: Opportunism

- BP1 and BP2 are risk averse
- SP is not worried about default

# Example 3: Opportunism

## VALUE OF SPECTRUM BLOCKS TO BIDDERS

(A and B are 20 MHz spectrum assignments; A & B combines the two into a 40 MHz assignment)

BIDDER	A	B	A & B
BP1	3	5	16
BP2	5	7	18
SP	4	3	6

## Example 3: Opportunism

- 40 MHz auction: BP2 wins at 16+
- 20 MHz auction: SP wins the bid for A betting that it will be worth the while of the other players to buy A from him at a profit. BP2 does.
- Consequences
  - Reduced public revenue
  - Transaction costs
  - Likely delay
- Existence of smaller blocks may stimulate new entrants to the bidding who are primarily motivated by profit to be made by opportunism

# Other Possible Undesirable Outcomes

- Prudent risk-taking leads to overpaying for a 20 MHz assignment
- Rivalrous behavior
  - Cellular incumbents, others with existing infrastructure have an interest in preventing the formation of formidable competitors
  - May bid to prevent aggregation or make it slow and expensive
  - Defensive hostage-taking
- Capital Constraints
- Misjudging a competitor