Why ILECs Won't Invest

Michael Weingarten and Bart Stuck

The answer is simple: They can't without losing money. The problem is the FCC's cost model.

Unless you're a government affairs specialist or a telecom regulatory attorney, you're probably not aware of the FCC's Hybrid Cost Proxy Model (HCPM). That's not good, because HCPM is one of the most important forces driving the telecom industry today; indeed it's at the epicenter of telecom regulation/litigation.

HCPM is used to set prices for unbundled network elements (UNEs) and it determines the level of universal service subsidies. The incumbent local exchange carriers (ILECs) blame results from the HCPM model for the lack of incentives to invest in next-generation networks, even after the FCC's February 20 ruling exempting ILEC advanced networks from UNE obligations.

So this article takes a look at HCPM. Unlike most people who write about HCPM and the related Total Element Long Run Incremental Cost (TELRIC) costing methodology, we have not been hired by a party-at-interest to defend a sectarian position.

HCPM Background

HCPM was designed to generate "forward-looking" TELRIC rates—the rates at which ILECs would wholesale POTS components to their competitors. The Telecom Act of 1996 mandates that these rates represent "cost plus a reasonable margin" to the ILECs, which the FCC, in its August 1996 *Local Competition Order*, concluded should be based on costs and margins that would exist in a free market environment.

Since such prices will fall to long-run, greenfield plant incremental cost, the FCC mandated TELRIC pricing—i.e., forward-looking—rather than historical embedded costs. The FCC then decided that it needed a cost proxy model to generate TELRIC rates. After, reviewing models proposed by different groups, the FCC put elements together from the various proposals and created the Hybrid Cost Proxy Model in October 1998 (subsequently modified in October 1999).

The HCPM models greenfield costs for each ILEC, using actual ILEC wire center locations and most-recent-year access line counts. Importantly, it includes *national* average costs, because the FCC isn't persuaded that there is sufficient evidence to support ILEC-specific differences.

The model is to be run annually, with updated line counts and inputs to reflect the combined effect of improved productivity and inflation. The output of the model is TELRIC rates applicable to each unbundled network element in each jurisdiction.

Capital Costs

HCPM begins by identifying, with great specificity, where end-customers are located. It relies on distance-minimization algorithms to then aggregate customers into clusters and to create detailed outside plant constructs for building facilities to these clusters.

This outside plant architecture is based on standard POTS—copper, T1 and fiber. Optimizations take into account the specific soil type in each micro-geography, as well as the availability of aerial versus subterranean street wiring. The outside feeder plant connects to a distribution plant that goes to existing ILEC wire centers; all of this is based on cost minimization. At the central office, switching and transport capacity is added, again using conventional technology and cost minimization algorithms.

The selection of capital cost inputs is based on regression analyses of historical spending patterns (adjusting for inflation and productivity differences by vintage year). These regression analyses explain the differences in observed historical costs as a combination of scale, customer density, terrain and time-productivity factors. By introducing a productivity-based time variable (5 percent per year for digital switching—much less than the 37 percent annual cost reductions associated with Moore's Law), the FCC intended that in future years, the model would be run with lower capital input costs, which in turn would result in lower TELRICs.

In the model, the Federal Communications Commission only allows for use of technologies that currently are *installed* in the ILEC plant. It does not allow the use of new technologies, even if commercialized.

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Depreciation And Operating Expenses

HCPM's depreciation calculations are complex. The FCC characterizes HCPM as using "straight line-equal life group" depreciation, but that's a misnomer. Instead of simply projecting out in a straight line, the Commission used an algorithm called Gompertz-Makeham to develop a depreciation model based on survivor life curves. In the end, however, Gompertz-Makeham winds up yielding annual charge factors within 1 percent of straight-line results; one wonders why the FCC went to all the extra trouble.

The inputs for the Gompertz algorithm are based on historical experience, using information going back several decades—an ironic approach for a forward-looking model.

Substantially less detail and attention is spent modeling operating costs than is devoted to depreciation. For *plant-specific* expenses, a ratio of expenses to gross capital plant is developed offline for each category; this percentage is then applied in the HCPM model for each year going forward.
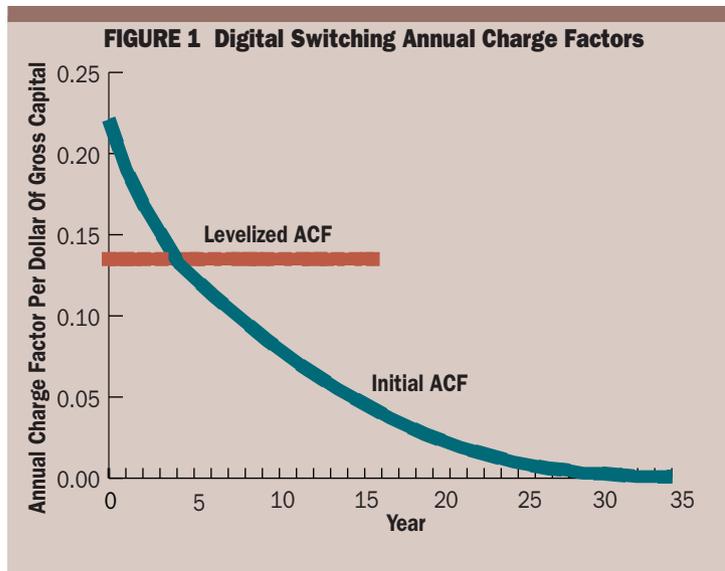
For example, the 1997 model run for New Jersey Bell assumes an annual switching operations expense that is 5.58 percent of switching capital cost. Costs for general support facilities (i.e., trucks, computers) are amortized into the final percentages. The FCC estimates *non-plant-specific* expenses (i.e., network operations, marketing, customer support and general overhead) at $7.32 per line per month, based on historical expenses.

Levelizing Annual Charges

For each equipment category (e.g., digital switching), HCPM calculates an allowable annual charge factor that includes depreciation, operating expense and allowed profit (based on an 11.75 percent cost of capital return on net plant). Adjustments are made to reflect the impact of taxes so the model generates an 11.75 percent after-tax return on capital.

Since annual depreciation and return on net plant decline over time, the HCPM generates raw charge factors that are highest in Year 1 of equipment life and fall in each succeeding year. However, since the FCC doesn't want to charge customers high rates in Year 1, it "levelizes" the stream of declining charge factors into a single average charge factor that is the same for every year of plant life (Figure 1).

This is done by taking the net present value (NPV) of the charge factor stream, discounted at 11.75 percent, and then using it to calculate an annual levelized charge factor for each year of equipment life. This process is analogous to figuring out a monthly mortgage payment, based on knowing the initial value of the mortgage, the interest rate and the number of years for the mortgage. Here, we know the NPV, the interest rate (11.75 percent) and the plant life (16.4 years).

Figure 1 shows both a levelized and unlevelized charge factor stream for digital switches using the process described above. For digital switches, the levelized charge factor is 13.5 percent of gross plant for each year. This compares to a 22.1 percent charge in Year 1 using unlevelized annual charge factors.

HCPM Critique

You can't help but be impressed with the sheer audacity of modeling an entire telco, particularly an effort that is so extremely geo-specific. That said, however, we also come away disturbed about a number of aspects related to HCPM; below are the Top 10 reasons why.

1. Use of Old Technology: If HCPM is supposed to be forward-looking, it should be using best commercialized technology. Instead, HCPM uses best *installed* technology; it uses an infrastructure that could have been designed in 1985. In this sense, HCPM isn't forward-looking at all; no new telecom market entrant would build a *circa* 1985 plant.

2. Use of Historical Inputs: As inputs to the capital infrastructure model, the FCC relies on regression analyses of publicly available, historical ILEC spending rather than engineering studies, in order to remove subjective elements.

This put the FCC in a trap. How can you be forward-looking when, by definition, the databases contain *historical* costs? The FCC tried to talk its way around the problem by developing a productivity factor based on historical regression trends and then applying it in future years.

FIGURE 1 Digital Switching Annual Charge Factors

The "forward-looking" model assumes a circa 1985 infrastructure

The model's long
depreciation
periods are no
longer realistic

TABLE 1: HCPM Versus Currently Available Cost Inputs		
	HCPM	**Current Costs**
Add-Drop Mux	$50,000 for 48 DS3s in an OC-48 ADM	$20,000
Channel bank lines	$5,000 for 24 lines	$3,500
Signal Transfer Points	$2-5 million for two pairs of STPs	$500,000 for two pairs of multiprotocol packet switching routers
Digital loop carrier line cards	Not available	$1000
Fiber optic transmission equipment per-trunk port investment	$100	$10
Switching price per port	Proprietary switching @ $75–80	Softswitch @ $50 or less

Source: 1997 HCPM model, Signal Lake analysis

That's nice, but it only results in single-digit cost declines each year, not the double-digit declines associated with disruptive technologies driven by Moore's Law. The impact of using old equipment with old costs is illustrated by some of the HCPM capital cost model inputs (Table 1).

3. Limited Focus on Expenses: HCPM devotes considerable attention to developing capital plants using specific, geographically-based, activity-based drivers. The model also spends considerable time developing esoteric depreciation curves and detailed tax treatments.

This is in marked contrast to the very cursory treatment the model gives to annual expenses. Here, the model relies on broad percentages of gross plant or price per line that are based on historical averages.

For example, the model allows 5.58 percent of capital plant for digital switches, based on the actual historical experience with proprietary switches. What happens if we migrate from proprietary to softswitches? Will maintenance stay the same in absolute dollars per port, making the 5.58 percent ratio too low? Or will the ILECs' ability to avoid paying for expensive parts from Lucent and Nortel allow the ratio to drop?

Offhand, we don't know the answers to those questions. But we do know that the percentage of gross capital is not an activity-based driver of plant expenses. It is an historical coincidence with limited predictive value.

We have similar problems with the $7.32 allowance for network operations plus SSG&A expenses. This figure, which represents 37 percent of total TELRIC costs in the 1997 Jersey Bell HCPM model, is based on historical averages rather than activity-based cost drivers. In the HCPM model output, it shows up as a *single cell input*, which is hidden in an otherwise unused worksheet with no identification and then buried as part of the cost of network interface devices (NIDs)—irrespective of the fact that SSG&A has nothing directly to do with NIDs. Something that represents 37 percent of total TELRIC deserves much more attention.

Since expenses represent a substantially larger component of TELRIC than depreciation or cost-of-capital return, HCPM needs to spend more time developing forward-looking expenses. The limited modeling detail on expenses and the apparent lack of effort in making the model activity-based make it difficult to explore opportunities for cost reduction.

4. Overly Long Depreciation: We find it amusing that a "forward-looking" model would use depreciation rates that were established back in the days of local phone monopolies.

There are two things wrong with this: First, accelerating technological change and, with it, accelerating obsolescence. When there was a phone monopoly and no threat from CATV, wireless or the Internet, ILECs could allow old technology to depreciate fully over long depreciation cycles. Today they can't.

Second, what happens if an ILEC with close to 100-percent share in Year 1 (on a wholesale basis) drops to 50-60 percent share in 10 years? This would result in stranded assets.
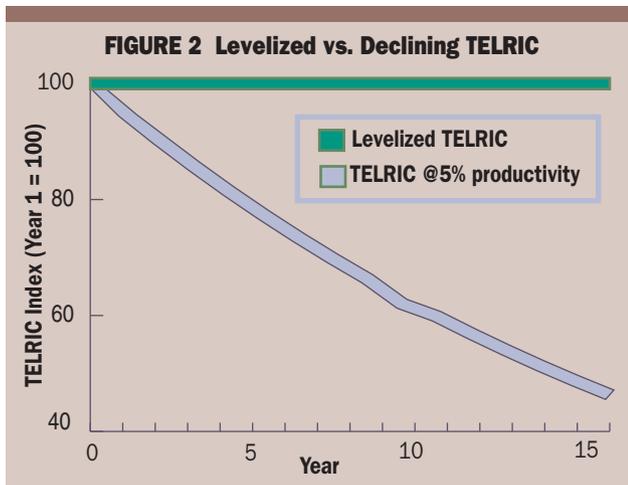
In its February 20 press release on the new UNE rules, the FCC said that it may allow shorter depreciation periods. Since God is in the details, we'll see.

5. Low Cost of Capital: HCPM is supposed to measure TELRIC in free-market environments, which are inherently more risky than monopoly environments. Given that the FCC previously set 11.75 percent as the cost of capital for ILEC monopolies, shouldn't the HCPM rate be higher, since HCPM is supposed to be modeling a competitive environment?

Of course, one might argue the opposite—that with the recent decline in prime rate, the cost of debt and therefore the cost of capital is lower than in 1996. However, this needs to be demonstrated in an FCC proceeding rather than retaining 11.75 percent from force of habit.

Again, this is an area that the FCC said it was going to revamp, so we'll see what happens.

6. No Allowance For Productivity-Driven TELRIC Declines Over Time: When the FCC

FIGURE 2 Levelized vs. Declining TELRIC

Levelized TELRIC
TELRIC @5% productivity

Chart: TELRIC Index (Year 1 = 100) vs. Year (0 to 15)

established HCPM, it stated that the model would be re-run each year with updated inputs to reflect productivity improvements. For example, the FCC's regression analysis for digital switches yielded a 5 percent annual productivity X factor, which should be factored into each year's inputs.

We have no problem with re-running the model using inputs that include productivity improvements. However, HCPM erred in not factoring in productivity improvements within each year's model run.

To illustrate, if we run an HCPM in Year 1 and the (levelized) TELRIC rate for digital switches is $100, for the ILEC to fully recoup its capital cost, it would have to continue charging $100 throughout the 16.4-year depreciation period.

But that's not what happens under the TELRIC-HCPM regime. Instead of being able to charge $100 in Year 2, the ILEC only will be allowed to charge $95, because in Year 2, the FCC will have re-run HCPM with 5 percent lower digital switching costs.

And it gets worse for the ILEC over time. Given continuing productivity improvements and a new HCPM run each year, the TELRIC rate will continue to fall 5 percent a year, so that by Year 16 of the switch's life, the ILEC only will be allowed to charge $46 (Figure 2).

To drive the point home, let's go back to the mortgage analogy. Imagine that I buy a home and take out a mortgage with a levelized payment stream, expecting that I can rent out my home for an amount slightly higher than I paid for it (i.e., returning an 11.75% return on capital employed). Instead, each year, let's say that the price I can charge for renting the use of my home drops 5 percent, because the price for rentals is set by the price of the newest homes, and these are dropping each year. Obviously, it wouldn't take many years before I would be in financial trouble.

That's the bind the ILECs are in. Effectively, the FCC has created a deflationary environment in which real-world investment is inhibited by the prospect of ever-lower TELRIC prices.

How serious is this problem? In the case of digital switching, if one calculates NPVs for the two streams in Figure 2 discounted at 11.75 percent, we get a levelized NPV of $707 and a productivity-adjusted NPV of $553. This is a differential of 22 percent—arguably a substantial undercounting.

There is a way out: Adjust HCPM so it adjusts for forward-looking X factors while maintaining levelized prices; simply raise the HCPM's unadjusted TELRIC output by a ratio that offsets the undercounting. In this particular case, take the annual $100 TELRIC and multiply by 1/(1-.22) = $128. If we start in Year 1 with a price of $128 and allow for a 5-percent decline per year going forward due to competitive pressures from new entrants in each successive year, we end up with a NPV of $707—just enough to generate an 11.75 percent return on capital.

7. Whose Cost Should We Be Modeling, Anyway? The FCC's justification for forward-looking models is that TELRIC is supposed to represent long run incremental cost (LRIC) for new entrants in a competitive market. If prices are higher than the LRIC, new entrants will build new plant and enter the market, forcing prices to decline to LRIC. We have no problem with this concept; it's basic Econ 101.

However, we have a problem regarding *which* player HCPM is supposed to model. If the point of forward-looking models is to approximate free-market prices by calculating TELRIC cost for new entrants, TELRIC should be calculated for a new entrant, not an incumbent monopolist.

To illustrate, let's consider a market with relatively vibrant competition in which the incumbent retains a 50-percent share, the leading new entrant has 20 percent, the next entrant 15 percent and the next 10 percent, with others sharing the remaining 5 percent. Assuming that the four largest players remain in business, we arguably should be modeling the TELRIC costs for a 10-percent share player, with market prices being equivalent to that player's TELRIC. For players with greater than 10 percent share, their TELRIC costs will be lower than market rates, and they will make a profit. For potential entrants with less than a prospective 10 percent share, their TELRICs will be below market prices, and they will be deterred from entering the market. There's nothing wrong or evil about this; it's the way free-market capitalism works.

If the FCC wants to model ILEC line counts, it should come clean and admit that it is regulating the ILECs as owners of bottleneck facilities on a levelized, forward-looking, rate-of-return basis, and stop pretending that the result is a "free-market" rate.

8. Can a Forward-Looking Model Be POTS-Only? Simply put, if the HCPM is going to be

The system makes it impossible for the ILECs to charge enough to recoup their investment

"forward looking," it needs to move beyond POTS. If forward-looking models are supposed to reflect long run, incremental costs for new entrants in a free-market environment, POTS-only models make no sense. No one starting from scratch today would ever build a POTS network. Instead, they'd build multiservice wireline networks that support broadband Internet, video/cable, Wi-Fi wireless as well as voice telephony.

Related to this, HCPM's elaborate outside plant algorithms may need to be revamped substantially to support next-generation constructs.

9. Can a Forward-Looking Model Be Based on Cost Minimization? In most cases, next-gen, "bundled services" networks will cost more than POTS-only plants. As a result, even if HCPM considered them, they would never survive HCPM's cost minimization metric.

For example, the HCPM model suggests that the New Jersey Bell network could be built for $680 per access line (including dedicated access lines; versus $1,121 on an historical basis). What if for $10 higher capital cost ($690 per line), customers could get broadband coverage? This obviously would be the right answer, but HCPM would have us go for the least-cost solution.

The model logic needs to take into account the fact that a bundled network would generate substantially higher revenues from customers in a manner that would cover the incremental cost of these services and reduce the allocated cost of traditional POTS.

10. The "Taking-of-Property" Issue: Perhaps the single loudest complaint from the ILECs regarding HCPM is that it contributes to an unconstitutional taking of property (see *BCR*, March 1999, pp. 35–38). They have argued that a government regulatory restriction on their free-market pricing is a "taking" of private property without "just compensation."

The Supreme Court heard arguments on this taking-of-property issue last year, and it ruled: First, there is nothing inherently wrong with TELRIC as a methodology; second, taking of property needs to be decided not on economic theory but on the observable real impact on property owners.

We agree with the Court—this issue needs to be examined based on practical economic results, not theory—and on that basis, here are some comparisons between HCPM model output and real telco costs, using New Jersey Bell as an example:
- The HCPM model output for New Jersey Bell has total capital costs of $5 billion. This is approximately one-half New Jersey Bell's actual 1997 $9.2 billion gross plant
- The HCPM model has a total combined expense cost, depreciation and capital cost of $1.743 billion—45 percent lower than the $3.2 billion *actual* telco figure for 1997 (including a 11.75 percent capital charge on net plant).

Does this mean that HCPM contributes to the taking of property? Not necessarily. In its brief to

the Supreme Court, the FCC stated that HCPM-derived TELRIC inputs were not definitive and could be changed by individual states based on local circumstances. However, given the amount of time the FCC spent creating detailed inputs, this sounds disingenuous. In any case, the Court bought the argument—taking-of-property claims need to be based on specific state TELRIC rates, not on the HCPM model.

However, the large discrepancy between TELRIC and actual ILEC costs is a real concern. By definition, an ILEC plant built over many years with older technology cannot be as efficient as a new technology plant built all at once. There needs to be some mechanism for recapturing the difference.

Conclusion

Based on the discussion above, a number of improvements to HCPM are possible to make it forward-looking, even within the framework of a POTS-only model of the costs of an ILEC controlling a bottleneck facility:
- Use best available rather than best-installed technology.
- Use the best, forward-looking input costs based on engineering studies, instead of relying on historical data.
- Significantly improve expense detail.
- Adjust depreciation and cost of capital to reflect the ILECs' need to operate in a competitive environment.
- Adjust TELRIC to account for probable productivity improvements, thereby reducing TELRIC rates in future years.

If you're keeping score, our first two recommendations favor CLECs, the last two favor ILECs and the middle one is indeterminate. While this was unplanned, as neutral observers we're not unhappy with the result!

The FCC also needs to start thinking about a next-generation HCPM that incorporates advanced services. Even though the FCC's February 20 decision punted on advanced networks by not making them subject to UNE rules, the need for a new model is inevitable, as more and more ILEC real-world capacity comes in the form of next-generation as opposed to POTS-only networks□

Companies Mentioned In This Article
Lucent (www.lucent.com)
Nortel (www.nortelnetworks.com)