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Licensed Radio vs Cellular Modem Cost Comparison

RECURRING COSTS of Cell vs an owned RF system

Economics are always a factor to consider when engineering a project. Pro-Tech has over 28 years of implementing telemetry systems consisting from hard-wire, leased phone line and POTS dial-up lines, internet based DSL and cable, licensed and non-licensed RF systems.

When comparing new installs of RF (licensed or non-licensed) systems to cellular based systems, the complexity of the terrain and network architecture have a lot to do with costs of an RF system, i.e. hills and topography, local structures (elevated highways, industrial structures, other RF communication towers, etc.) Existing obstacles are the easiest to design around. It is the new ones that spring up over time that can play havoc on an RF system's performance and be costly to contend with.

Using averages for antenna heights for this territory and using average data usage and rates, it is estimated between 10-15 years for a break even between RF and Cell based systems, meaning the cost of a cell site after 10 years including data costs will equal the initial cost of an RF system. Please see attached spreadsheet.

PROVIDERS

Providers were one of a kind in the past and still are today, especially when competition is limited or non-existent. That was truer than ever when Ma Bell was the only player in town to run copper phone line to our sites, and who or what you got you were stuck with. I am sure some of you can remember the LM phone circuits that were managed by a small string attached penciled in tag on each circuit, it took days and multiple persistent calls just to identify outages. Deregulation, monopoly break-ups and multiple providers across the same medium have created competition while elevating customer satisfaction. This is more prevalent with cell providers than others because most territories have the option to switch among several providers with a minimal intervention. The wireless providers have invested heavily in their cell base infrastructure and need to keep their subscribers content in order to make it pay-off. When GTE Mobile Net was the only player in town it was like dealing with Ma Bell, but now with 4 - 6 new wireless providers in the cell data arena all fighting for subscriber base, it is a different ball game, a ball game that is in favor for the end user.

"I want to own and control my RF system and not have to rely on any middle-man providers"

With a client owned RF system several providers are automatically involved.

1. **FCC** They regulate the RF industry. There have been and will be national frequency rules that have split the frequency spacing by $\frac{1}{2}$ which includes mandatory equipment upgrades and obsolescence and a tighter operating tolerance which yields a higher probability of interference due to the tighter tolerance requirements. This has definitely created more service requirements due to the tighter tolerances as well as the growing number of license free devices combined with the residential, commercial and industrial wireless boom such as hot spots and Wi-Fi. With Cell we have escalated from the initial analog cell to digital which analog has finally reached its end of life, but 1g to 4g (g=generation) and the new LTE are all somewhat backwards compatible due to the large existing consumer base.



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2. **Radio Manufacturer's.** With the advent of digital radios 99% of RF systems require "same manufacturer only." Proprietary is the term. Once you select a manufacturer only that manufacturer's equipment can be used from that point on, unless a total system replacement is executed. We have had manufacturers discontinue a line of equipment with no direct replacement. This has caused full radio equipment replacement/upgrade in order to maintain a working system. With Cell, a mixture of manufacturers of equipment as well as service providers is a seamless process.
3. **Mother Nature** With most of the RF infrastructure outside exposed to the elements, service requirements have been due to high wind, icing, lightning, bird, moisture infiltration, and UV damage to name a few. This is all minimized with cell due to antennas that can be placed indoors or with minimal exposure to the outside elements.

TOWER LIABILITIES

When installing an RF system it is inevitable that a tower will be required. In the past we handled it. Get a safety harness and climb it was the adage. Tower climbing, or any high structure without safety rail and stairways has become a special classification and certification requirements along with renewals and ongoing climbing equipment inspections have basically created an industry in itself. This has turned Telemetry RF systems into a three part maintenance procedure.

A typical service request from an end user "My Tank site is not communicating"30 years in controls we are used to it being the "controllers fault"

1. We dispatch a control service tech to inspect the site. The PLC is fine but the Radio is not communicating. We do level 1 inspection of the RF system and even exchange out the radio. All seems good but still no communications.
2. Client contacts Radio/RF contractor who brings in highly specialized equipment to analyze coax cable and antenna. Spectrum analyzer reported weak point in cable 80ft up tower. RF contractor sold new cable and antenna to client, but was not able to do install on water tower due to liability and mounting complexities.
3. Client contracts tower climbers to install new coax and antenna.
4. Client connects radio and still no communications,
5. Pro-Tech revisited site and was unable to establish communications. To this day all we can contribute the non-communication issue to is a new structure, increased ground interference (taller trees/foilage) or other RF interference from new towers (cell or others, industries like weld shops on other electrical/RF interfering processes)
6. Pro-Tech converted the site successfully to a cell site not for economic reasons, but per necessity.
7. Pro-Tech has even instigated cell as a backup to existing RF systems. This has become proven solution when that untimely catastrophic failure occurs (Christmas Eve) or when the schedule tank painting takes down a repeater site rendering a whole water system in operable.

MAINTANCE

With RF systems there is the greater degree of system maintenance requisite as compared to a cell site. All RF systems require larger and more expensive and complex coax cable due to antenna placement and dB loss requirements. These cables require special tools and training for mounting and terminations.



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Wall penetrations, securing and proper mounting, weather (wind, rain, and ice) along with UV degradation all play a factor in a system's longevity. If we had the choice of mounting and more importantly maintaining a small 4" antenna inside or affixed outside an enclosure with minimal weather exposure vs mounting an antenna on a mast, tower, or tank; lower, closer and shorter runs wins hands down. This is not to say the cell system is infallible, but 99% of all installs can be trouble shot and replaced with simple tools and non-technical personnel. Also remote performance and configuration can be done by the plant or your integrator without the necessity of a physical site visit.

Other Cell pros to consider

1. Being a universal (nonproprietary) equipment configuration allows Pro-Tech to easily stock standby equipment for emergency support.
2. Remote accessibility, diagnostics, and configuration allows quick efficient maintenance without sending the hands-on service team member combined with an IT technical service team member saving additional man hours and travel expenses.
3. Universal data usage: Cell with I.P. Ethernet allows combining control and cameras and/or other systems like analytical equipment, and security. A great deal of RF systems only support one single PROTOCOL (usually limited to the PLC) which forces additional equipment to be on another system or ran through the control system which can be cost prohibited.
4. A cell system with proper security can provide (LIKE ON SITE ACCESS) to the control system programmer from anywhere. This is a big plus when problems need addressed or additions take place.

Please contact Pro-Tech Systems Group with any additional questions you may have.

Best regards,

Mark Headley

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5 and 10 Year Life Span

Maintenance and Service

Initial Costs	Licensed Radio	Cellular Modem	2nd 5 year Span	2nd 5 year Span
			Licensed Radio	Cell Modem
Radio / Modem	\$1,200	\$500	\$120	\$20
Lightning Arrestor	\$150	n/a	\$25	
Coax Cable & Connectors (\$2.00/ft, 75 ft)	\$150	n/a	\$35	
Antenna	\$350	\$40	\$50	
Mast	\$500	n/a	\$50	
Material Cost	\$2,350	\$540		
Installation	\$800	\$100		
Maintenance (5 years)	\$500	\$100	\$500	\$100
Subscription (5 years)	\$0	\$1,200		\$1,000
Propagation / Path Study	\$400	\$40		
5 Year Costs	\$4,050	\$1,980	\$780	\$1,120
10 Year Total Costs	\$4,830	\$3,100		

About \$2000 per site difference over 5 year
 About \$1000 difference over 10 years (end of equipment useful life)
 About Equal after 15 year