

GENERONIX

Leading innovator of Network Line Power products

SureReach in FTTX Networks



SureReach provides reliable battery backed “green power” to homes and offices, allowing the deployment of fiber optic network primary line phone services on FTTX networks, at lower cost, reduced customer hassle, fewer truck rolls, improved reliability, without hazardous premise batteries.

SureReach in FTTX Networks Whitepaper v1.0.6.doc

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Introduction

This white paper describes Generonix's solutions for powering optical termination equipment necessary for fiber-optic based public communication networks. Such networks, variously called Fiber-to-the-Home (FTTH), Fiber-to-the-Premise (FTTP), or in general, FTTX, provide "triple play" video, data, and voice services to homes, small offices, apartments, condos, co-ops, multi-family dwellings, and other premises. In 2007, there was 2.4% penetration of FTTH into the residential market, with a 100% CAGR over the previous year. Explosive growth is expected, but this market is still young and providers are discovering unexpected challenges as it is deployed. One major issue that has emerged from early deployment experience is the need for reliable voice service, a "life-saver" primary phone line that continues to provide service even when commercial AC utility power fails. Three solutions are presented, and a cost model comparing them shows the cost advantages of telco-grade network line power over commercial-grade local battery backed power, particularly when supplying fiber service to existing residential or office buildings, including multi-dwelling units, in "Brownfield" developments.

"Life-saver" power for phones

When commercial power fails, the first thing people do is to pick up a phone and expect it to work. This requires reliable power. Traditional "Plain Old Telephone Service" (POTS) and its standard telephones are powered over the copper lines of the network itself with the necessary DC power supplied down the wires from a centralized location where well maintained lead-acid batteries are proactively tested and kept charged. However, fiber optic based networks do not provide power over the fiber to attached line devices as copper networks do, since optical fiber does not transmit electricity. A separate local power supply or voltage converter connected to the AC utility network must be installed to power the **optical network terminal/unit (ONT/ONU)** that resides at the customer's premises, typically mounted outdoors where it is easily accessible to Service Provider technicians. However, if power fails, the ONT cannot function unless there is some form of local battery back up or **Uninterruptible Power Supply (UPS)**.

Recent FCC rulings, based on the Katrina hurricane experience, mandate twenty-four hour **Central Office (CO)** battery backup and eight-hour battery backup in **Outside Plant (OSP)** equipment for critical network telecom "assets" involved in voice telephone service. In order to provide reliable phone service in the event of emergencies, the so-called "life saver" emergency primary line phone service, not only do Service Providers require 24 hour battery backup in central offices and outside plant locations, as mandated by the FCC, but the local premise equipment needs four hour, eight hour, or longer battery back up as well. In extreme cases, utility power can be out for days, or even weeks, and customers must have emergency phone service to handle medical, police, or fire emergencies. Some form of battery back up is required for FTTX premises equipment even if Service Providers can argue that the FCC mandate does not apply to premises based equipment.

FCC 07-177 Oct 4, 2007 ORDER ON RECONSIDERATION In the Matter of Recommendations of the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks. “[This Order] requires that certain local exchange carriers (LECs), including incumbent LECs (ILECs) and competitive LECs (CLECs), and commercial mobile radio service (CMRS) providers have an emergency backup power source for all assets that are normally powered from local AC commercial power.”

Fiber optic technology is an exciting new way to bring advanced network services to homes, but its installation and ongoing support brings challenges to both Service Providers and Customers. In new developments (so called **Greenfield** locations) battery backup solutions can be more easily planned and deployed at lower cost, and either fiber only or copper and fiber cables can be installed at relatively low cost. However, if the wrong solution is chosen for existing (**Brownfield** or **Infill**) homes, retrofitting solutions to existing houses may require a separate visit to survey the installation, scheduling Service Provider installers due to access availability, possibly adding new three prong AC power outlets, installing batteries and voltage converters in basements, cellars, attics, or other locations.

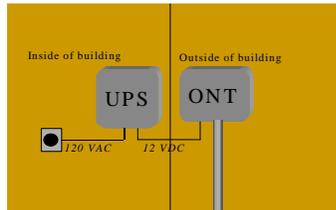
Note that According to the National Association of Realtors between July 2007 and 2008, 515,000 new living units were sold. According to "Greenfield Development Without Sprawl: The Role of Planned Communities", a 1999 paper by Jim Heid, "Portland, Oregon, projects in its metropolitan regional plan that 70 percent of near term growth will be on greenfield land versus built-up areas Other U.S. jurisdictions predict numbers closer to 90 percent." If 80% Greenfield is taken as a reasonable estimate, only about 412,000 homes in 2007-8 were on Greenfield housing developments.. According to US census bureau estimates, there were 127,901,934 housing units in the United States in 2007. This means that only 0.3 % of housing is Greenfield, not a large market compared to the total FTTH market.

Furthermore, local battery solutions require a high degree of support. Some solutions put a proactive maintenance burden on untrained homeowners or premise managers, which if not strictly followed may result in not having phone service when you need it the most. Phone companies that can provide “zero-complaint” service have a major competitive advantage. A Customer maintained UPS not only pushes expenses onto the customer, but also results in many complaints, customer confusion, and even unnecessary truck rolls. What is needed is a way to support emergency primary line power to premises ONT/ONU equipment.

Industry studies have shown that Customer Loyalty is driven by the number of services purchased and service quality. If a customer has a service with you, they will stay with you up to six months, and if there is a second major outage or service problem, they will try someone else. With two services, they will stay with you for fourteen months. With three services, two years. “Triple-play” and “Zero-Complaint” services are a competitive necessity to retain customer loyalty and maintain revenue.

FTTP emergency powering solutions

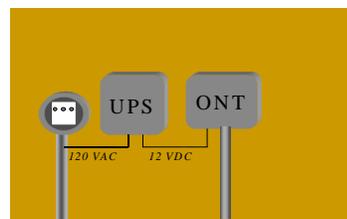
There are three main solutions for powering emergency fiber optic based primary phone services deployed today, two of which require some form of premises based battery back up in the form of an Uninterruptible Power Supply (**UPS**).



1. Customer Managed Inside UPS. The UPS is an indoor (not hardened) UPS containing a large replaceable non-standard 12 VDC backup battery along with alarm, display and voltage regulation circuitry, and an AC/DC converter driven by AC utility power. After some form of site survey, it is installed in the customer's basement, heated garage, in a closet or on an interior wall. It must be connected to the nearest

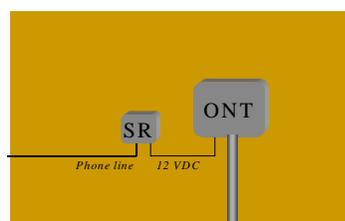
three-prong AC utility outlet via a grounded power cord. A 12 VDC wire is run back outdoors to the ONT/ONU. The homeowner pays for the AC power consumed by the UPS and ONT/ONU (for an unheated ONT of less than 20 watts running 24/7, about \$20-\$30 per year), and is also responsible for proactively testing and maintaining the UPS, and replacing the battery every 2-3 years. The UPS initially costs about \$50; the non-standard replacement batteries cost \$50 as well, and the customer must locate a store that provides the battery, and follow proper replacement and toxic material recycling/disposal procedures as per US government regulations. Some Service Providers proactively mail replacement batteries on a predetermined schedule to ease this burden on the customer. While there is no mandated standard for customer battery back up time, most indoor batteries provide eight hours of standby and two to four hours of talk time. This is sufficient to meet the FCC mandate, but is certainly not able to survive a several day utility power outage.

2. Service Provider Managed Outside UPS. The UPS is a weatherproof outdoor hardened enclosure with a field replaceable battery and embedded power supply and alarm circuitry mounted next to the ONT/ONU and easily accessible by a Service Provider technician. You connect the outdoor UPS to an AC utility connection on the premise's exterior. This outdoor UPS costs about \$125, much more than the indoor version, as it requires environmental hardening and supplemental heating to handle harsh weather conditions, and must meet the eight-hour back up time mandated by the FCC. The homeowner pays for



the AC power consumed (somewhat higher than with the indoor UPS to provide unit heating) but the Service Provider is responsible for periodic maintenance and battery replacement. Once again, this is sufficient to meet the FCC mandate, but is certainly not able to survive a several day utility power outage.

3. Service Provider managed Network Line Power (NLP). In this case there are no premises or field batteries; the central office batteries are used to provide backup power in an emergency. They are often supported by generators, and are capable of at least the mandatory 24-hour backup. There is a voltage converter module in the central office that sends boosted DC power out into the network; multiple drops share the one line to power the ONT/ONU. A **SureReach (SR)** premises



based voltage converter is installed next to the ONT/ONU to drop the network line voltage to 12 VDC. The Service Provider (telephone company) pays for the power used by the network, which can be a substantial cost on large networks, but is offset by lower “bulk rate” pricing advantages, and the possibility of charging customers for NLP as a billable service offering. Network line power usually requires transmitting 10-20 watts of high voltage low amperage power down long reaches to a local drop. UL or other approved safety protection (based on NEC Article 830 and other appropriate standards) is required to protect against breaks, disconnects, and accidents. However, this solution requires no homeowner maintenance or periodic Service Provider truck rolls to the premises.

A similar solution can also be used to support multi-family dwelling units (**MDU**), where paying for the powering of a shared ONT/ONU is a problem when multiple units share a single ONT/ONU device.

Lastly, the NLP solution can be used in places where there is no commercially available AC power, or where putting in AC power is not feasible, as there is no common owner to pay the bill, or the common owner (often a landlord) doesn't pay the utility bill and the AC power is terminated, or there is not basement or closet or common area with shared power to hold equipment.

FTTP emergency powering challenges

The average replacement time of a USP's battery is between two and three years. This brings up the question on whether the Service Provider replaces the battery, or the customer/homeowner, and in the case of multiple dwelling units, which customer or family maintains the equipment and pays the power bill? This is an expensive burden for the customer, and fraught with practical problems. What if the UPS is in the basement (which might get flooded)? What if the equipment is several years old, and the homeowner doesn't look at the LED warnings or alarms with any great frequency? You can push the burden of replacement totally onto the customer, or alternatively, you can mail a replacement battery on some fixed schedule to the customer every two-three years and charge them for it. But then what becomes of the used toxic battery? It must be recycled or disposed in accordance with Environmental Protection Agency (EPA) regulations. What if the customer doesn't check the alarms, or replace the battery in a timely fashion?

The initial home installation is invasive, and may require an “ugly” mounting of the UPS and voltage converter in highly visible locations. In some cases only two prong outlets exist, or there are no-outlets available near the mounting location, and the electrical system must be brought up to code and new outlets installed; who pays for that? Who schedules that? Even if the outside UPS solution is used, visiting customer premises to replace batteries is still expensive and may require a scheduled visit, particularly in cases where there is a fence, security gate, or menacing guard dog. Homeowners may need to be present during the visit; how do you schedule appointments to visit people's homes if they work all day; will they agree to take time off and lose income just to replace an outdoor battery?

Also, some batteries are dangerous: they explode. ATT recently had to replace a large number of outside cabinet batteries after two explosions in their network. An exploding battery is dangerous outdoors, but a nightmare indoors. If there is a power outage, and a relative has a medical emergency, and you can't call 911, juries are unlikely to blame the homeowner but go after the deep pockets of the phone company; lawsuits may cost far more than providing a FCC approved Service Provider installed and maintained solution.

And today the major marketing differentiator for phone companies is reliable service. If the phone company is not perceived to offer a better, reliable, complaint free solution, customers will go to competing voice solutions, such as wireless, third party VOIP, or cable.

Deciding on which solution is best appears to be a complex judgment between 5-year costs vs. reliability vs. risk vs. brand image vs. esthetics vs. complexity of maintenance. So far cost has driven the choice, but field experience is beginning to change this perception. In addition, some phone companies see the value of “zero-complaint” service as an important customer goal.

“Green Power” power for FTTP phones

Another problem with battery backed solution is environmental. By definition, lead acid batteries are hazardous. All solutions have some form of lead-acid battery backup. Network Line Power solutions use a well maintained central bank of lead acid batteries: in a controlled environment: they may last 25 years, and one central location shares the load over many customers, which is efficient. CPE Batteries UPS are heavy and intrusive, most are considered toxic; some are flammable: all are considered hazardous. They have an unpredictable life: 50% decay is between 1 and 8 years depending on:

- 1) manufacture claims, which often differ from reality, 2-3 years is a good rule of thumb
- 2) usage, which depends on grid failures, and
- 3) ambient temperature

This variability inhibits proactive replacement. Also, local batteries require monitoring of alarms and scheduling of field replacements: every 45 to 60 days, you have to test the battery; once the battery has degraded to about 70% of its service capacity (typically from 8 to 5.4 amp-hours), an LED illuminates. This requires a lot of education of service technicians and customers. Recycling of hazardous waste material such as lead acid batteries is expensive and comes with legal liabilities.

For example a 7.4 amp-hour battery will supply a 18 watt ONT with 3.4 hours of operation. The battery cost is between \$20 and \$99, depending on quality. Lower cost batteries require more frequent replacement. Lead acid batteries require hazardous waste recycling every 1-3 years; this is about a \$150 truck roll, unless the customer is responsible for recycling, in which case a battery recycle kit costs \$34.50 including UPS shipping costs. A conscientious homeowner who replaces a battery twice in 5 years will pay \$157. The service provider also has to enter the “stocking” business, which typically has at least 10% cost overheads for storage and processing spares. But in addition to cost, the environmental impact is significant.

Starting with a baseline assumption of 128M housing units in the US in 2007, and a potential for 23 million other locations (utility poles, businesses, etc.), and a 1% growth rate, if everyone were to go to fiber to the building/home with 100% penetration you would have something like 191M battery locations in 2007-2016 decade, growing to 284M by the 2047-2056 decade. If you replace/recycle batteries in each location four times per

decade, this is about 12 Billion batteries over 50 years. While this is a worse case estimate at an unlikely 100% penetration, it still is certain that there will have to be billions of batteries made, and billions recycled in the coming decades to support customer supplied battery solutions.

Clearly, even if there were enough recycled lead, plastic, and chemicals to support this volume, there are serious questions about whether customers would actually recycle or not, or just not bother with the battery, and thus be exposed in an emergency.

Existing customers who have cut over to SureReach also pointed out the expensive consequences of customer supplied maintenance. When a power outage occurs- even when one customer throws a circuit break- they get an alarm they have to check out. When a neighborhood or city outage occurs, they get a flood of alarms they have to handle just when they need their support and service staff the most to handle real emergencies.

Depending on how you calculate market penetration of fiber-to-the-customer, growth rate, and demographics, there will be as many as 12 billion batteries. that will have to be recycled over a 50 year period.

SureReach

Generonix's **SureReach** product is designed to support Fiber to the Premises/Home (FTTP/FTTH) networks. It is a small (4" by 5" by 1.25") system sealed after installation which safely converts battery backed centrally provided network line power to 12 or 48 VDC to power ONT/ONU units. It contains no batteries. It is mounted on the outside of a house, multi-dwelling unit, or building, and eliminates the need for local or neighborhood battery backup systems.

The total network solution has two parts (see Figure 1): the premises based **SureReach**, and a Central Office shelf-mounted power unit connected to 48 volt battery fields. Both

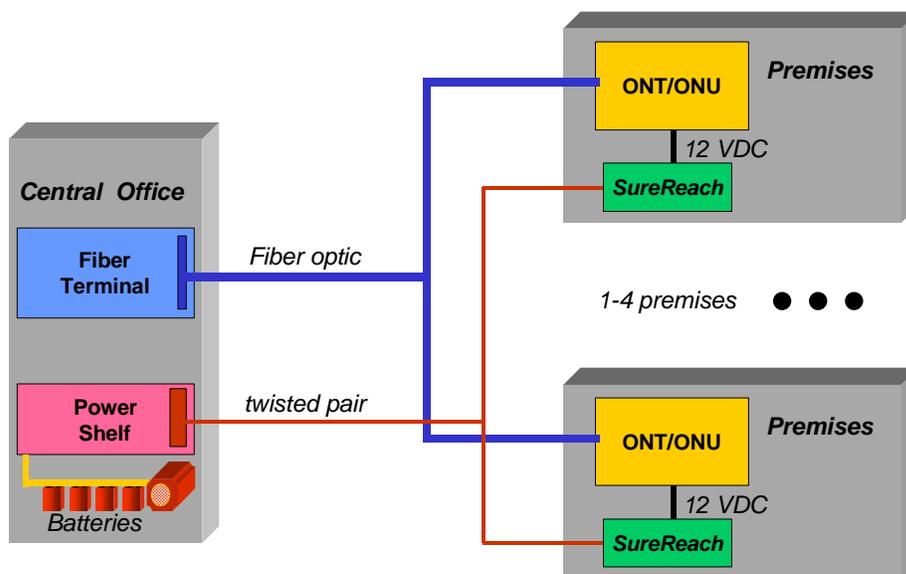


Figure 1: SureReach in Network

Fiber optic and copper cables connect customer premises to the Central Office. A **SureReach** unit is installed next to the premises based ONT/ONU and provides it with 12 VDC power. The Central Office contains shelf-mounted equipment that provides high-voltage power to the remote premises units (Note: proper safety procedures for high-voltage network line power should be followed as per the provisions of NEC Article 830 UL 60950-1, and other appropriate standards). Central Office DC power is derived from large strings of batteries with 24 hour back up capacity optionally backed by a generator; these power plants are well maintained, operate under ideal conditions and provide reliable and economical power.

Each **SureReach** premise unit is a temperature hardened, weatherproof power system designed to operate in harsh outdoor environments. It can be quickly installed next to the ONT/ONT using basic hand tools, and requires no periodical maintenance after installation.

Multiple **SureReach** units are fed from one upstream voltage converter off one or two twisted pairs, saving the cost of the central office voltage converter modules and copper lines. The exact number is a function of the power required by the ONT/ONU, and the distance of the twisted pair drop from the Central office to the premises, but between 1-4 units can be fed off one twisted pair line. For example, depending on the power requirements of the ONT, up to four ONTs can be fed from one upstream port on loops of less than 10 Kft. Some Service Providers prefer a one-line one **SureReach** solution, as it allows them to take only one customer out of service at a time if the line requires servicing. In addition, a 48-volt version of **SureReach** can be used to provide power for Multi-Dwelling Units (MDUs), without requiring a local metered AC utility power and the billing issues involved with power sharing.



SureReach converts battery backed high voltage network power created by upstream power modules in the central office installed in a power shelf. This power is provided as a local exchange carrier service to ONT/OTU. Since the central office is battery backed, this power is unaffected by commercial power outages and does not require local battery backup. **SureReach** eliminates the need for periodic truck-rolls to replace field batteries, or for homeowners to periodically test or replace batteries. In many cases, inside premises batteries are inaccessible and are subject to customer interference. **SureReach**

solves these problems, while allowing the Service Provider to offer network line power either in place of local power, or as a premium service offering that can generate monthly recurring revenue.

Network Line Power: a zero-complaint solution

SureReach with network line power provides both the Service Provider and the customer with major advantages. For the Service Provider:

- It provides reliable power for fiber terminal equipment at premises locations
- It replaces large expensive outdoors UPS solutions with a small easily installed outdoor hardened module
- No local battery means no scheduled maintenance or battery replacement, no scheduling working hours visits with customers, no dealing with security fences or dogs, no recycling or disposal of toxic battery or violation of local or federal government guidelines, no customer danger or interference
- It exceeds FCC emergency power requirements for network battery back-up for OSP assets
- It allows the Service Provider to recoup investment and DC power operation costs with monthly recurring revenue stream, and offer reliable DC power as a “service offering”

For the customer:

- It is installed by the Service Provider on the outside of the premises along with the ONT/ONU
- It is small, and connects to existing copper lines in Infill locations (or using composite fiber/copper lines in Greenfield or some Brownfield locations from the curb to the premise) without requiring new AC utility outlets or other cabling.
- There are no requirements for homeowner training, periodic maintenance, battery replacement, and alarm monitoring.
- No large ugly interior wall mounts clutter up internal spaces with UPS boxes and AC power cords taking up plug space
- It offers peace of mind and emergency service availability. When AC utility power fails, the customer retains a voice service as reliable as the existing copper network

The best solution turns out to also be the lowest cost solution

The financial advantage of using **SureReach** can be seen when compared with various other solutions for deploying powering fiber based premise equipment, not only for single-family dwellings, but also for multi-family dwelling units and shared office premises.

Model Assumptions

In order to create an apples-to-apples comparison, a common or average deployment “model” was developed for both Single and Multiple-family dwellings. It totals 5-year costs to deliver reliable power for both Customers and Service Providers. Included in the model are the initial site survey and installation costs, the cost of installed equipment that supplies power to an ONT/ONU, recurring costs for battery replacement every 2-3 years, truck rolls to replace outside batteries if they are equipped, and AC utility costs.

Not included in the model are the costs of running fiber, copper, or “composite” fiber/copper cables, the cost of fiber-termination, line circuit, battery, rectifier, and other equipment in the Central Office, and the cost of other customer located equipment, such as the ONT/ONU, set-top boxes, phones, televisions, computers, routers or other inside premises equipment. Note that in Greenfield locations, putting in composite copper-fiber cables (copper lines along with the fiber) is prudent and cost-effective for emergency network power applications and for setting up the customer premises to handle future line options, at a small incremental cost of initial deployment.

Inside solutions require powering an ONT/ONU with an indoor UPS and a replaceable battery, and a separate AC/DC converter module with a power cord that can be safely run to a three-prong utility outlet. This outlet may not be available in all cases: closets, garages, and cellars may not have an existing connection, or in older premises, three prong sockets may not be available. A 12 VDC power cord must be run back from the UPS to the ONT/ONU. A Greenfield location probably doesn't have these issues; a Brownfield or Infill location requires a site survey to determine UPS location, and possibly a power utility electrician to install an AC receptacle.

Outside solutions require an ONT/ONT connected to a UPS that contains an AC/DC converter and an outdoor replaceable battery. In this case the models assume that no outside AC utility socket exists, and a safe power connection must be installed on the outside of the premises, or to the power utility meter. This increases the installation cost, and may involve power utility installation scheduling: an estimate of \$300 is assumed based on actual prices charged by a NY power utility.

A typical copper line with two twisted pairs can deliver up to 120 watts of power to a neighborhood device. Though as many as 12 premises can share one NLP central office power module, the model assumes that only four premises share a single copper line, since power drops on lines are subject to distance loss, and some neighborhoods may have spotty penetrations or houses in rural or suburban locations may have wide street front separations.

The cost of an OSP truck roll varies widely depending on the Service Provider; it is between \$125-\$600, according to *OSP Magazine*. (July 2005); the model assumed a low-end estimate of \$150. Even if the outdoor UPS (or indoor UPS) supports some form of telemetry to notify the CO of a battery failure (an expensive feature not included in the model) the battery will have to be quickly replaced to avoid any outage. A typical battery lasts 2-3 years, so it is assumed a battery will be replaced every 2.5 years. For the multi-family dwelling analysis, an average MDU is assumed to have four families sharing a single ONT/ONU and its associated NLP power source. Note also that the inside UPS deployment has resulted in a number of customer initiated truck rolls, some of which are unnecessary, others to handle customer confusion: these customer support truck rolls are not included in the model.

Since network line power currently requires the Service Provider to provide all power to the ONT/ONU, even in emergencies, the cost of providing NLP power is assumed to be offset by a monthly recurring NLP power service charge of \$2.5 per month, which is roughly the cost a power utility charges to power a ONT/OUT (a NY state average of .17 per KWH was assumed). It may also be possible to offset this cost, or even generate revenue, by treating reliable network line power as a profit-making billable service, but that was not assumed here. In this model, a supplementary service charge of \$2.50 per month was assumed only to balance the ~\$30 per year in power costs. This is a typical cost only; different combinations of different ONT/ONUs and UPSs with and without heating, may cause the power utility cost to vary, and Service Providers as opposed to Customers typically pay bulk rates for power, so their costs may be lower as well. In practice, this NLP charge may simply be buried in the monthly customer service charge.

Disclaimer: this is a cost model for comparison purposes only, and actual prices may vary widely from region to region and vendor to vendor, and prices may change without notice.

Five year costs

All the dollar values are 5-year costs, about the time to replace a battery twice. The major difference between a UPS inside best case (for a greenfield solution) and worst Case (for a particularly old or difficult brownfield or Infill solution) is due to the extra costs of an initial site survey and the assumption that a new electrical outlet must be installed in the customer location: not every inside brownfield requires the new outlet. The cost of installing a copper “plain old telephony subscriber” POTS line and the network interface unit is given as a reference.

5 Year Costs

	POTS	USP inside Best case	USP inside Worst case	UPS outside	<i>SureReach</i>	<i>SureReach</i> MDU
Installation & Equipment	\$190	\$220	\$650	\$595	\$424	\$229
Service Provider recurring	\$0	\$0	\$0	\$688	-\$150	-\$30
Customer recurring	\$0	\$238	\$238	\$138	\$150	\$28
Service Provider total	\$190	\$220	\$650	\$1,283	\$274	\$229
Customer total	0	\$238	\$238	\$138	\$150	\$28
Total cost per Customer	\$190	\$458	\$888	\$1,420	\$424	\$257

As seen above, ***SureReach's*** network line “life-saver” power solution has lowest 5-year cost for a single family (see the *SureReach* column) or multi-family solution (see the *SureReach* MDU column) for the Service Provider and for the Customer both, except in the best case Greenfield, where the Service Provider puts the cost and maintenance burden on the Customer by deploying inside-UPS solutions; even here the total cost per Customer is higher than *SureReach*. Note that the cost of a single truck roll customer visit by a baffled greenfield customer will more than eradicate the small cost savings to the greenfield best case service provider, and while not factored into the model, is a significant cost.

Conclusion

Most current FTTH/FTTP deployments put the cost, maintenance-hassle, and risk of failure onto customers, who must continuously monitor and maintain UPS equipment and replace expensive and special batteries. Even so, such a solution will result in no cost savings except for a small amount in the “best case” greenfield market, which is only

about 0.3% of the total number of homes; and the cost overheads of supporting different greenfield and brownfield solutions is hardly worth the savings. And such premises based UPS has shorter availability times, and the eventual failure of service in an emergency due to battery drain or weakened or untested battery will damage brand reputation, and increase risks for a Service Provider no longer protected by FFC mandate. It will also encourage churn as the customer grows fed up with the self-maintained solution and switches to cell phone, copper, or other less burdensome technologies. And if a confused customer calls for support, either due to malfunctioning equipment, or confusion, a single truck roll will prove costly. Requiring Customer maintenance will only increase customer complaints against the service and decrease Customer satisfaction.

SureReach with network line power results in lower five-year costs for the Service Provider and for the Customer, allows the possibility of additional revenue for providing the service, greatly reduces the probability of loss of service in emergencies, reduces legal liabilities, retains the phone companies reputation for reliability, improves competitive advantage, reduces field maintenance, eliminates toxic environmental hazards, and removes the burden of support from the Customer, all while reusing the existing copper network. And the solution is cost-effective for Greenfield, Brownfield and Infill neighborhoods, allowing the Service Provider to use the same solution everywhere.

When the hurricane hits, or the roads flood, or the blizzard takes out your power, reliable phones are not just important, they are critical: they may save lives. Generonix's **SureReach** provides "life-saver" power to fiber networks, "zero-complaint" customer experience, with lower five-year cost than premises based battery solutions. It is easy to install, and it is green.

For more information

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