



## Power line communications : Questions and Answers

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### Power line communications : Questions and Answers

#### What does "power line communications" mean?

Power Line Communications (PLC) is a broadband access technology that uses the low and medium voltage electricity grid to transmit voice, data and video.

Even if the names are different in different countries, the technology is the same: broadband data is sent into people's homes as a high-frequency signal piggybacked on the 50 or 60-hertz mains electricity supply. In fact, the electricity grid may be used to supply broadband communications, as in addition to electricity.

PLC constitutes a competitive way of providing a wide array of services such as Internet access, telephony, multimedia and audiovisual services, in-home services as well as electrical energy-related applications. Just like cable systems, PLC is a medium that is shared by end-users in a local area with aggregate speeds up to about 10 MB/sec.

The US government gave the go-ahead to broadband over power line (BPL) technology in October 2004. The European Commission has now approved its own version, a recommendation to the EU Member States on so-called power-line communications (PLC).

#### What does PLC require in technological terms?

Installing PLC is simple, fast and cheap. The broadband communications signal is normally brought, via fibre optic cable, wireless technology, or leased lines, to a local transformer station, from where it is carried by the power line to the end user. It takes an engineer about one hour to install PLC equipment in a transformer station to offer the PLC signal to the area served by the transformer. Typically, a transformer connects 150-250 households.

The PLC technology is used to bridge the "last mile" between the broadband core (fibre optic) network and the home or office and also within the home (similar to the function of a local area network). A "Head-End" (HE) device, installed at the transformer, distributes the signal to a number of users. If necessary, repeaters are installed in street cabinets or in the meters room of buildings to reach the customer premises and to prevent interference from the power grid.

PLC is a direct competitor to digital subscriber line (DSL) technology and uses similar modulation techniques. Both technologies exploit existing copper wire networks (DSL is a telephone copper network based technology). The use of existing cabling greatly reduces installation costs as it avoids the need for putting in extra cabling.

#### What advantages does PLC offer to the consumer?

PLC is an alternative to cable networks and DSL services for supplying broadband to the end user. Typically, the commercial offerings are competitive and cheaper than DSL. PLC operators' experience suggests that customer satisfaction with PLC is high.

#### How expensive is PLC?

PLC is not more expensive than other broadband offerings over DSL or cable. In Germany, for instance, PLC is generally offered at a price below that of the DSL service from the incumbent operator.

#### What equipment do I need to use it?

There is a variety of end-user modems (customer premise equipment or CPEs) on the market: data-only modems, modems with an integrated IP telephone, modems with a socket into which a normal telephone handset can be plugged etc. The characteristics of modern PLC modems are very similar to those of DSL modems.

#### How widespread is PLC in Europe?

Since 2001, over 100 trials in 40 different countries worldwide have confirmed the viability of PLC. Many PLC pilot projects are now undergoing technology-focused trials, or are being deployed commercially. The main commercial PLC networks in the EU are found in Germany, Austria and Spain, with tens of thousands of customers served by PLC.

Country	Provider	Homes passed	Actual users
Austria	Linz AG	37000	3000
	Tiwag	n.a.	n.a.
Czech Republic	PRE	n.a.	n.a.
France	EDF	35000	1500
	Cegetel	n.a.	n.a.
Germany	Drewag	15000	700
	Powerplus	90000	5000
	Statwerke Hameln	2500	1000
Italy	Enel	n.a.	2400
Poland	Pattern	n.a.	n.a.
	Stoen	n.a.	n.a.
Portugal	EdP	n.a.	1800
Spain	Endesa	20000	2000
	Iberdrola	60000	n.a.
	Union Fenosa	n.a.	30
Switzerland	Sunrise/EEF	n.a.	2000
UK	SSE Telecom	20000	n.a.

Source: PLC Utilities Alliance and PLC Forum

#### How widespread is PLC in the USA?

State	Provider	Homes passed	Actual users
Alabama	Cullman Electric	n.a.	n.a.

Georgia	Southern Company	1200	250
Idaho	Idacomm	1000	1000
Maryland	Pepco	n.a.	n.a.
Missouri	Ameren	500	70
New York	Consolidated Edison	n.a.	n.a.
North Carolina	Progress Energy	n.a.	500
Ohio	Cinergy	55000	1000
	American Electric Power	n.a.	100
Pennsylvania	EdP	3000	300
Virginia	City of Manassas	2000	n.a.

Source: PLC Utilities Alliance and PLC Forum

#### **How can PLC boost broadband penetration in Europe?**

Most end-users in the EU have only a limited range of broadband service offerings from which to choose. The lack of alternative telecoms infrastructure in Europe holds back competition and keeps broadband prices high. PLC could help to stimulate new competitive market dynamics, by introducing genuine infrastructure-based competition. This could stimulate investment in network technologies, product and services innovation, accelerate and widen technology dissemination, and help to reduce prices, by competing with or complementing existing access technologies.

PLC may offer important new business opportunities to European utility companies, particularly since these companies have significant resources including existing customer relations, a service organisation, rights of way, and knowledge of local conditions.

#### **Is PLC a technology that can help to connect remote areas in Europe?**

In major areas of Central Europe, fixed line penetration may be only 20 % or less. To enhance the fixed network by building new local loop infrastructures requires substantial investment. As a result, the barriers to broadband deployment using DSL technology in these areas are high. By contrast, the electricity grid reaches almost 100% of the population, so power line communications, based on existing infrastructure currently providing electrical power, has the potential to offer omnipresent broadband service reasonably quickly and at reasonable cost.

#### **Are utility companies ready to become internet service providers?**

Various business models are being tried in the marketplace. Some PLC operators also provide internet services. Other PLC operators provide only the transport "pipe" with a third party or parties providing the internet and other services.

#### **Are there risks associated with PLC?**

Extensive trials have not produced any systematic evidence of interference with the supply of household electrical power. There seems to be no evidence that, for instance, washing machines or TV sets are affected by the PLC signal on the power line. No incidents have been reported after years of testing.

In addition, there have been allegations of health risks associated with PLC. The concern was that power lines throughout the house would radiate energy affecting human health. The level of radiation from broadband signals on unshielded cables such as DSL, PLC and Ethernets is in fact about one million times lower than the internationally recommended level for maximum exposure to electromagnetic radiation.

#### **Does PLC interfere with short-wave radio?**

The Commission is aware of possible interference problems that may impede the free reception of analogue signals, as well as of future digital short wave broadcasting.

Interference was an issue with earlier generations of PLC technology, but today's third generation systems are much improved over earlier versions. Unwanted emission levels have been significantly reduced over time. Modern systems also give much better ability to correct problems with interference should it occur.

The purpose of the new Commission Recommendation on powerline communications is to enhance certainty about the rules governing broadband electronic communications over power lines, in particular on how to manage interference with radio reception should it occur. It recommends steps that Member States should take to ensure that harmonised and non-discriminatory technical and regulatory conditions are applied for PLC in the case of such interference.

The Commission Recommendation strikes a balance between the interests of radio users and those of power line communications network operators. It reflects a consensus of Member States' national regulatory and market surveillance authorities.

Although in the public debate a lot of emphasis is placed on interference with radio services, PLC deployments in Germany and Spain have shown that interference problems with radio that emerge in the field can be resolved in practice.

The Recommendation builds on the model and the requirements of the EU's Electromagnetic compatibility (EMC) Directive. To comply with this Directive, PLC networks must be composed of equipment that meets the relevant harmonised European standard and be installed and operated in line with good engineering practices.

#### **Is the Commission intending to promote PLC?**

It is of course for markets, not policy makers, to select winning technologies. The Commission's role is to ensure that the regulatory conditions for PLC deployment, in particular as regards the electromagnetic co-existence with radio services, are non-discriminatory vis-à-vis other broadband technologies and that a stable and predictable legal framework is created to support this market-driven process.

The EC also supports research on this technology through the Community research programme. OPERA is an Integrated Project under the IST Programme. It started on 1 January 2004, and includes practically all the PLC (Power Line Communications) players in Europe. OPERA is a €20 million project with around €9 million funded from the EU Research Programme. <http://www.ist-opera.org/index.html>

#### **What are the reactions from Member States?**

There is a wide recognition now that PLC is a potentially important technology.

The new Recommendation from the Commission to the Member States on the use of power lines in order to provide broadband was supported by a large majority in the Communications Committee (Member State representatives) in February this year.

#### **Can short-wave radio and broadband systems like Ethernet, DSL and PLC coexist in the future?**

In general, one could say that the shift to a modern broadband e-society and e-economy will put pressure on the lower part of the radio spectrum (1,5-30 MHz), where, even without PLC systems being active, the background noise that is found in any radio system has been increasing steadily for several decades now. We need to find a solution to an overall increase in background noise that allows our society and economy to evolve whilst protecting the radio systems from harmful interference.

The Commission Recommendation, which follows the principles of EMC law, supplies the necessary guidelines to deal with these problems in a way that balances and protects the interests of all parties.  
[Graphic in PDF & Word format]

Source: Arthur D. Little analysis (2004)