Mobile Operators: their Contribution to Universal Service and Public Access

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It is evident today that in many developing countries mobile technology is a substitute for traditional basic fixed services and extends access to formerly unserved population groups such as the urban poor and rural users. Thus mobile technology and mobile operators are making significant contributions to Universal Service and Universal Access, both in terms of serving individual users and through mobile payphones.

The question this article is addressing is how and to what extent are mobile services providing access to the unserved, and how should regulators respond? The article focuses on the nature and characteristics of the mobile contribution, the limits of mobile technology, and the implications and opportunities for policymakers and regulators.

How mobile reaches the low-income users

Mobile access is more affordable

Based on a minimal package for the marginal users with few outgoing calls, mobile service provides more affordable access to telecom services. The table[1] below compares the affordability of fixed vs mobile service, using two cost elements:

1. the *start-up* costs to get access for the first time to telephone services (i.e. handset & SIM card activation or fixed-line connection costs), and
2. the *monthly recurring* costs to stay connected (i.e. monthly rental or min. monthly usage) incl. a minimum number of calls.

For handsets we can assume that the cost used in the table is often a maximum as customers are likely to have cheaper options. Especially in developing countries, black markets and used

[1] The table is using web-page published pricing data from the most inexpensive mobile operator per country. For the fixed service costs we used published data from the ITU's World Telecommunications Development Report 2002. The start-up cost for the fixed phone service comprises the full connection fee, and for mobile service the handset plus the SIM card and activation charge where applicable. The marginal monthly recurring costs used here for fixed service include the monthly rental and just 15 minutes of outgoing local calls. For mobile service, we investigated the minimum usage required for a customer to stay connected on a prepaid account (which may include some calls) and then added 15 mobile-to-mobile call minutes to come to a comparable volume of usage. For Brazil and Argentina we used available data of second hand handsets.

handset markets[2], fuelled by the developed world where consumers replace their handsets more often, effectively reduce entry costs for many.

Table 1

	Start-up costs		Monthly costs/ calls	
Countries	**Fixed**	**Prepaid Mobile**	**Fixed**	**Prepaid Mobile**
Argentina	$150.00	$50.00	$13.65	$7.95
Brazil	$27.00	$40.00	$7.90	$4.50
Chile	$43.00	$67.10	$11.40	$8.10
Colombia	$168.00	$49.25	$3.70	$4.20
Hungary	$71.00	$60.00	$8.50	$7.35
India	$18.00	$91.85	$5.70	$6.15
Jordan	$141.00	$62.40	$4.10	$2.55
Malaysia	$13.00	$60.00	$5.40	$8.80
Mexico	$119.00	$46.20	$16.25	$6.90
Morocco	$47.00	$45.80	$6.50	$2.10
Peru	$131.00	$60.40	$13.95	$4.50
Philippines	$12.00	$56.30	$28.80	$5.10
Poland	$129.00	$53.50	$7.40	$8.40
S. Africa	$30.00	$51.50	$9.45	$3.00
Thailand	$84.00	$89.60	$2.85	$1.80
Uganda	$103.00	$121.35	$6.80	$4.65
Venezuela	$102.00	$54.00	$11.60	$6.15
Average	**$81.65**	**$62.31**	**$9.64**	**$5.42**

The majority of selected countries examined show a clear trend of mobile service being considerably more affordable, both in start-up costs as well as in monthly recurring costs for the marginal user. The start-up cost of mobile is on average almost 25% less than fixed service. The recurring monthly costs incl. a minimum number of calls of mobile services are more than 40% less.

However, mobile services is only the more affordable choice for providing access to service with a *minimum* number of calls as shown above. Mobile call tariffs are generally more expensive than fixed tariffs, especially local calls as mobile operators often offer a single averaged tariff network-wide. As soon as outgoing calls increase, fixed services are the more affordable choice. Partly this is still due to un-balanced tariffs where local fixed calls are very cheap as, for example, in India. Still, overall mobile call charges are generally much higher than fixed.

Rural and low-income users know this and use the mobile and fixed networks in a complementary fashion. Morocco, for example, has a booming fixed-line "teleboutique" market (public payphones run by entrepreneurs). It has been witnessed that many rural and low-income mobile pre-paid customers use their mobile phone mostly for receiving incoming calls but use available

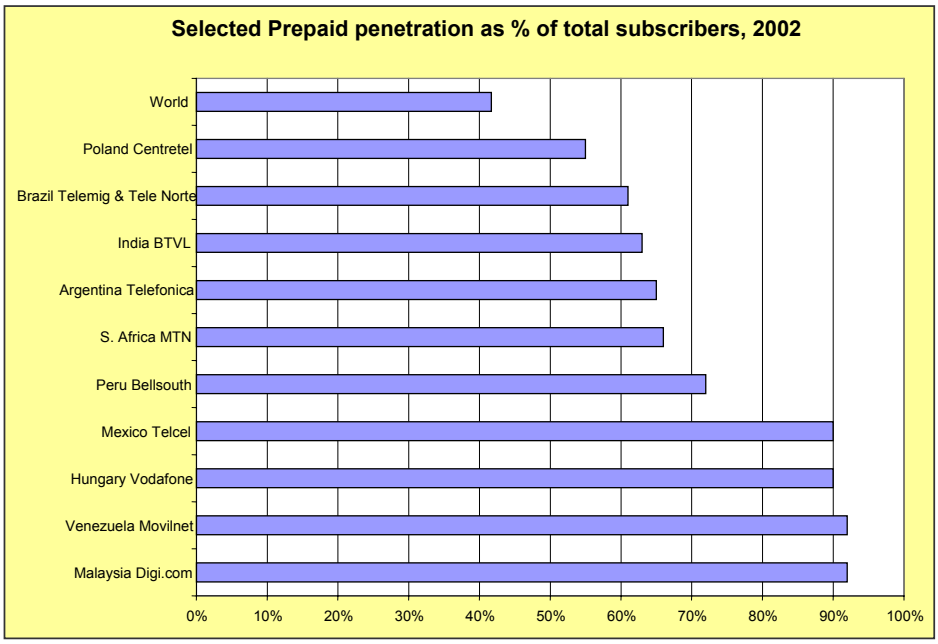
[2] A Pyramid Reseach report estimates that the black and used handset market in Latin America will represent 11% of all terminals sold in the market between 2002 and 2006. The upgrade to GPRS and 3rd generation networks in Europe and elsewhere is a factor here.

teleboutiques for making outgoing calls. The traffic volume generated on pre-paid is comparatively low compared with the traffic of teleboutiques. A similar usage pattern combining mobile with fixed service is visible in India and is likely occurring in other countries as well.

The appeal of pre-paid mobile

Affordability is in many cases only one reason mobile service is chosen by low-income users. Another important factor is ease of use through pre-paid services. Low-income customers need more than low prices: the ability to control their expenditure, being able to switch to just receiving calls in times of economic difficulty, hassle-free sign-up, and other similar features. Many Universal Service schemes in Western Europe and OECD countries recognise that. Prepaid offers crucial advantages for low-income users beyond affordability. Prepaid avoids credit checking, the need for a bank account and a binding long-term service contract and can therefore also be used by people who already have bad debt and no steady income.

The graph below illustrates how prevalent prepaid is among various developing countries and emerging markets.



It is likely that the trend towards prepaid will continue - in South Africa, for example, although the overall use of prepaid is 66%, more than 90% of new mobile connections are now prepaid. In Africa (excluding South Africa), approximately between 90 and 95% of total mobile customers use prepaid accounts.

Mobile operation is often commercially more viable

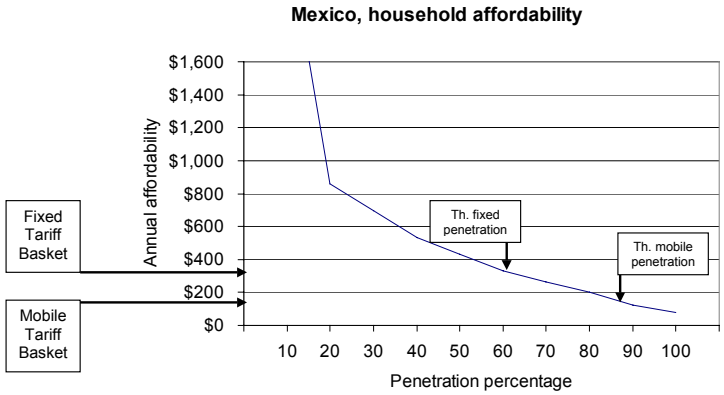
In low-income countries, mobile networks can serve formerly unserved areas, including rural and marginal low-income customers, more economically due to certain features of its network economics, operation and other factors:

- Within total capacity limits, every additional marginal customer improves the bottom-line, since mobile investment per user is a function of economies of scale. The base-station is a single bulk investment and costs per user decreases continually as more mobile users share the service. In contrast, fixed-line investment can only capture the revenue of a single user unless it is a public payphone.
- In countries with a limited fixed network, the mobile operator is in many areas the "first-in" without competition from fixed services and can capture *all* pent-up demand. Users then often develop preferences for mobile service.
- Additional geographic coverage, outside of cities and along major roads is an important selling point to urban customers who travel throughout the country. Mobile operators often invest in coverage for roaming urban users. Capturing additional rural users is added income.
- The mobile operator can also benefit if the mobile user in rural areas makes only a few calls. It is a well-known fact that urban relatives generate a larger percentage of incoming calls to rural users. Attractive interconnect rates from fixed-to-mobile generate a considerable revenue stream for the mobile operator.
- Pre-paid service eliminates costly customer administration for the mobile operator: there is no credit checking, no billing and no money collection, and no exposure to bad debt. This reduces operating costs considerably, provides cash up-front and the savings can be passed on to the customers.[3]
- Economies of scale have reduced the cost of base-stations and other cellular infrastructure considerably (far more than for example WLL equipment). In some cases cellular infrastructure is re-used, lowering costs even further.
- Mobile operators are often not encumbered by heavy tariff regulation. Their growth has and is taking place in the context of minimal price regulation, allowing them flexibility to meet their operating, investment and expansion requirements and plans. For example tariffs could be higher in the network build-out phase but drop considerably later.
- A major enhancement of GSM technology for rural areas is the option to implement "range extension". The reach of a GSM-900 base station can be stretched from its theoretical limit of 35km to 70km, or even as far as 120 km. This is achieved at the expense of cell sector coverage (i.e. the geographical spread of the signal is focused into one direction) and cell capacity (i.e. the number of possible simultaneous conversations in the cell is reduced). In some rural areas, this is a practical and cost-efficient trade-off.

[3] Fixed operators seem to have finally caught on to the benefits of pre-paid. Examples of fixed operators having introduced pre-paid recently are N-Soft in Gabon, Brasil Telecom, PLDT in Philippines, Telmex in Mexico and CANTV in Venezuela.

Evidence for the mobile contribution to US and UA

A theoretical model shows that mobile services can indeed penetrate lower income classes. The following graph shows the household affordability for Mexico modelling income distribution using the gini curve. Mexico spends more than 2.3% of its GDP on telecommunications. It is assumed that every household spends slightly less of its income than the country as a whole: in this case we assume 2%[4]. Tariff baskets for both fixed and mobile service are based on an annual minimum cost including connection or handset, 12 times monthly rental or minimum charges and 180 local call minutes (15 per month) during business hours/peak-time. The fixed basket comes to $314 while the mobile basket is at $156. The model can be used to give an illustration of how many households can theoretically afford fixed services and how many households can afford mobile services.



The model indicates that slightly over 60% of households should be able to afford fixed services whereas almost 90% could afford mobile services at the marginal tariff basket. Comparing this with reality, Mexico's current fixed household penetration is no more than 45%[5]. Whereas the model can give us only theoretical figures, it nevertheless indicates that the fixed operator does not serve customers up to the margin of affordability, or that customers able to afford fixed services are opting for mobile instead. Indeed, the latter seems to be supported by the data: mobile teledensity in Mexico is about a third higher than fixed teledensity (20.1 per 100 for mobile compared with 13.5 for fixed.). Mobile services are approximately half the cost of fixed services to marginal customers and are apparently more attractive to them.

Mobile is reaching users previously unconnected

Mobile operators have extended services to areas and customers that were previously un-served including many semi-rural and rural areas, and become a substitute for (fixed) basic telephony.

[4] This is to some extent an arbitrary assumption. However, it is well known that usually consumers spend from 1 to 3% in various countries and situations. Therefore 2% is a good average of what economies, communities and households will typically afford, almost irrespective of income level, if given the opportunity to access and benefit from a decent level of service.

[5] The data on household penetration is calculated using total residential lines divided by number of households in the country. This does not discount for households that have two or more fixed lines, thus actually household penetration is likely below the calculated penetration. However, this calculation has been chosen as cross-country data available on household penetration has considerable gaps and inconsistencies.

As previous data and studies have shown[6] mobile service has overtaken fixed service in a number of countries, but for different reasons. In some OECD countries there are more mobile phones than fixed lines because every household with fixed service has, in addition, several mobile phones (e.g. Austria, Belgium, Spain, UK, Australia)[7]. In another group of countries, including many Least Developed Countries (LDC) and African countries, first-time users opt for a mobile service as their primary basic telecommunication service instead of fixed service. This is often the case in countries where fixed service is still a monopoly while the mobile sector is liberalized. Examples are Uganda, South Africa and Morocco among others, and we will probably see a similar development in Nigeria. At the end of 2001, 28 low-income countries already had more mobile than fixed telephones. The mobile operators are reaching customers that have not been served by the fixed incumbent for a variety of reasons, e.g. limited network reach, affordability or long waiting lists.

A good indicator that mobile indeed reaches large groups of formerly unserved populations is that mobile is still growing much faster than fixed services as shown in the Compound Annual Growth Rates (CAGR) of selected countries in the following table. Also, mobile communication has overtaken fixed services as the dominant means in 12 out of the 19 countries as demonstrated through the mobile as percentage of fixed ratio in the table below.

	Fixed CAGR 1999-2001	Mobile CAGR 1999-2001	Mobile as % of Fixed (2001)
Argentina	-6.8%	134.7%	86.0%
Botswana	3.3%	16.3%	158.9%
Brazil	14.4%	24.1%	76.8%
Chile	6.0%	32.6%	142.3%
Colombia	3.1%	17.1%	43.3%
Ghana	6.2%	15.1%	80.0%
Hungary	7.4%	37.6%	133.2%
India	2.6%	19.7%	16.5%
Jordan	5.3%	84.6%	113.0%
Malaysia	15.2%	40.4%	150.4%
Mexico	-3.3%	20.4%	148.8%
Morocco	3.6%	79.3%	400.5%
Peru	9.4%	44.8%	76.4%
Philippines	2.3%	33.6%	340.9%
Poland	2.3%	54.8%	88.2%
S. Africa	0.0%	45.0%	185.1%
Thailand	3.9%	36.4%	126.4%
Uganda	5.3%	84.6%	506.6%
Venezuela	4.6%	47.8%	235.3%

Another indicator that mobile operators are serving low-income users is prepaid's low Average Revenue Per User (ARPU). For many mobile operators monthly pre-paid ARPU is just around

[6] ITU's World Telecommunications Development Report 2002. Peter Smith, What the Transformation of Telecom Markets Means for Regulation, July 1997, Viewpoint Note No. 121

[7] In Finland the trend is to abandon fixed for mobile services. Fixed line penetration has decreased by around 24% over the last decade or so.

$10 whereas mobile subscription ARPU is often between $30-40 and higher. Thus prepaid users are spending considerably less, and are in many cases synonym with users having a low-income.

As witnessed by Intelecon in several countries, low-income users maximize the benefits of their mobile service through innovative low-cost usage such as “beeping”. By calling, for example a better-off relative or business associate in the city, and hanging up before the other person answers, the receiving party has the ID of the caller and calls back. This emulates traditional “Call me” schemes of Universal Service Programs in the developed world. Short Messaging System (SMS) is another feature of mobile services and widely used application allowing communication at very low cost.

Mobile payphones

Mobile technology also reaches more users through the use of mobile public payphones. These are appearing in a number of ways: as individual entrepreneurs (e.g. India, Uganda, Nepal, Cambodia), mandated in some mobile licenses (e.g. South Africa), chosen by some rural operators as least-cost solution (e.g. Chile), or a separate business managing a network of small entrepreneurs (e.g. Uganda, Bangladesh). Mobile technology has been used to provide fixed-wireless public payphones as well as truly mobile payphones, and stand-alone as well as manned phoneshops. The following table gives examples of the various types of mobile public payphones.

Table	
Country & mobile operator	**Type of payphone**
Bangladesh, Grameen Phone	Woman, recruited by Grameen bank and given a micro-finance loan to buy a handset, operating mobile phones as public phones in rural areas
Nigeria, MTN	MTN launched its “Ogene Community phone project” where it is using a micro-credit scheme providing women with a GSM handset, expecting to be paid back within a year
India, Spice Telecom	Mobile operator recruiting small entrepreneurs to operate mobile phones as payphones
South Africa, MTN and Vodacom	Both mobile operators are obligated to provide fixed-wireless public payphones in container
Uganda, MTN	Mobile operator created subdivision MTN Publicom to provide fixed-wireless payphones using a franchise-type arrangement
Colombia	Mobile technology is used for the Compartel program/ Rural telecom fund including payphones
Ecuador, BellSouth	Over 600 payphones; They offer public payphones also to be housed to restaurant and shop owners, gas stations and similar establishments.

Conclusion

In the countries examined, marginal mobile phone service is often more affordable than fixed phones. This applies to the actual cost and to the way in which mobile service may be bought.

The mobile offering is generally more flexible, and elements such as the ability to control expenditure through prepaid, and the avoidance of credit checking and contracts are important. Mobile service can penetrate the low-income classes deeper than fixed in many cases, and mobile public payphones increase the access to rural and low-income users which cannot afford individual services. Thus there is strong evidence that mobile operators make a significant contribution to provide Universal Service and Access.

What are the limits of the mobile miracle?

Network coverage

Whereas the costs of incremental coverage of rural areas decreases with an expanding network, there will undoubtedly remain areas which are not viable due to topography (e.g. mountainous, distances) and/or socio-demographics (e.g. very low population density combined with low income). Other difficulties are harsh environmental conditions and the lack of power supply.[8] Thus regulatory measures such as universal access and rural communications development funds are still required. They can bridge the true access gap that cannot be covered on a commercial basis, even if the regulatory framework and conditions are supportive to operations in rural and low-income areas.

Implications for Internet access

The dominance of mobile networks in many LDCs does not really contribute to rapid take-up of Internet in rural areas. Internet access is increasingly seen as important for developing countries and the disenfranchised to participation in the information society. The trend in the developed world and in some emerging markets is to include Internet in the Universal Access/Service definition, if not as an obligation then at least as a goal. Whereas mobile service provision can be considered as a leapfrogging opportunity now, it might restrict the uptake of Internet later.

Mobile technology already poses barriers for simpler functions regarded part of Universal Service/ Access, such as documents transfer via fax. As telecommunications takes root in former unserved areas and parts of societies, the demand is likely to increase for document exchange. Mobile technology does not currently meet those needs.

Already delayed in the developed world and urban centers, it is uncertain whether and when mobile networks in LDCs will be upgraded to support Internet/data access in rural and low-income areas. The business case for GPRS or 3G mobile networks is likely not attractive enough in marginal segments. On the other hand, innovations in mobile devices and the wireless Internet could also provide opportunity for bypassing low PC penetration and PC literacy rate. However, if that is not the case soon, policymakers and regulators need to concern themselves with what

[8] Though the recent deployment of a mobile network in Afghanistan and from Vodacom in DR of Congo show considerable resilience of mobile operators and their investors.

measures best encourage Internet infrastructure development and public access such as telecentres.[9]

Key issues and lessons for regulators

Liberalizing fast and removing technology barriers leads to better growth

C*ompetition in the mobile sector and pricing flexibility* was the prerequisite to its growth and to its replacing the fixed operator as the basic service provider in some areas and customer groups. That the introduction of competition drives the growth of telecom networks and services is not a new insight. However, the development of mobile networks in many developing countries and particularly LDCs is a very good example of how telecom sectors can grow or not grow depending on whether the regulator has liberalized it.

But mobile expansion has not eliminated the need to liberalize the fixed sector. It has merely shown the way towards competition for all technologies - satellite, fixed, fixed-wireless and IP telephony. Regulators should also move towards technology neutral regulation, in line with latest trends. The recent new EU regulatory regime shows a clear direction towards a single regulatory regime for all types of networks and services, aiming ultimately to achieve technology-neutral regulation.[10]

Mobile operators then would be free to use fixed network elements where they see fit (e.g. possibly to serve business and corporate users), or satellite, fixed wireless or IP telephony. Similarly fixed operators could seek frequency rights to use mobile or wireless technology where that proves more economical. This would enable operators to be efficient and provide services to the limit of the market, enhancing their ability to give attention to marginal users.

This could also be a solution for the incumbent fixed operators in many African countries which are struggling with privatization. Having the freedom to choose and mix technologies would reduce their disadvantage and make them more attractive to investors[11]. In Uganda, the second national operator MTN has technological flexibility and the new SNO license in South Africa allows the use of mobile technology. Following through with technology-neutral liberalization and regulation could elevate many developing countries still pondering liberalization and create rapid market response to their challenges.

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[9] For a review on the success of various telecentre models: Sonja Oestmann, Andrew Dymond, Telecentres — Experiences, Lessons and Trends, in: Telecentres: Case studies and key issues, The Commonwealth of Learning, 2001, also Bjoern Wellenius, Sustainable telecentres – A Guide for Government Policy, in Public Policy for the Private Sector Note Nr 251, Jan 2003

[10] The EU "Regulatory Framework for electronic communications infrastructure and associated services" is currently to be translated into national legislation, and is to be implemented by July 2003. It consists of 5 Directives: Framework Directive, Access and Interconnection Directive, Authorization Directive, Universal Service Directive and Data Protection Directive.

[11] For example Nigeria has found that there is limited investor interest in their incumbent Nitel but much more interest in green-field mobile licences.

Universal Access and Universal Service regulation for mobile operators

Consequently, in developing countries mobile operators should be part of universal access and universal service policy for areas and groups of the population that cannot be served commercially. As in many developing countries the mobile operators already play a significant or even dominant role in providing basic services, it is logical to include the mobile operators in universal access or universal service policy. This will become increasingly important with the convergence of mobile and fixed for basic service delivery in developing countries and the world-wide trend to technology-neutral regulation.

Regulators could therefore include payphone obligations, rural roll-out obligations and contributions to US, UA and/or rural telecom funds for mobile operators into licences and policies. However, regulators need to get the balance right and not impose excessive obligations or restrictions which would hurt viability or flexibility of operation. Mobile operators should not only be part of the US or UA obligations but also have access to the incentives and subsidies the policy provides.

In some cases the spread of mobile public payphones has been hampered by regulatory hurdles. Licences of mobile operators did not include or allow the provision of public payphone services, especially if fixed-wireless was used, and the fixed incumbent considered this to be an infringement on its monopoly rights. Regulators should consider how they can reverse that and avoid imposing restrictions in the future. Also, often public payphone tariffs are regulated and very low in order to ensure affordability. However, it is better to allow mobile public payphones at a higher and minimally regulated tariff than having no access to a public payphone at all. Competitive pressures are likely to decrease mobile payphone tariffs over time in any case.

Tariff regulation and interconnection

Traditionally mobile tariffs have not been subject to much regulation. But if mobile services are predominant, how should that change? As there is usually more competition in mobile services than in fixed services and, as we have seen, mobile access is often more affordable to the marginal user, there is no need to start regulating mobile tariffs now. However, the urgency of re-balancing fixed tariffs to reflect costs becomes greater and needs to be undertaken rapidly. Otherwise fixed service providers continue to subsidize the residential segment and local calls from their long-distance and business revenue and limit the benefits of a level playing field between operators and technologies.

Also, to increase the affordability of mobile services a Calling Party Pay (CPP) policy is important as otherwise mobile users bear the cost of both incoming and outgoing calls. In order to create a level playing field mobile operators should be subject to cost-based interconnection principles, which is already an area of intense discussion and revision in developed countries. Whereas high interconnection fees have benefited mobile operators and network expansion, it has been applied indiscriminately. Rather than uniformly applying high interconnection fees, a disaggregated, asymmetric regime should be considered with different rates for urban and rural areas, acknowledging the differing costs of providing services.

The combination of competitive forces and unregulated pricing has achieved the surprising result that mobile operators, initially seen as providing premium services, have become over time the "unofficial" providers of universal service and universal access in an increasing number of developing countries as well as in some more developed countries. Some regulators have contributed to it through coverage and rural roll-out obligations. They have an opportunity to maximize the mobile contribution by including mobile operators in their universal service/ access policy, creating a level playing field between operators, and different technologies, and providing the regulatory framework and incentives to serve rural areas and marginal customers.

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