The regulation of undersea cables and landing stations

Steve Esselaar, Alison Gillwald and Ewan Sutherland

1. *Introduction*

One of the underlying causes of the high costs of telecommunications in Africa has been and continues to be the charges made for international capacity between countries and especially to other continents.

The cost of making telephone calls and of accessing the Internet remains disproportionately more expensive when compared to countries in the northern hemisphere. In part this is because the high charges are unaffordable for the majority of consumers and thus demand is low, so that the fixed costs must be borne by a smaller number of customers. This creates a vicious circle of unaffordability.

A major factor in the high costs has been the monopoly for voice and data transmission exercised by incumbent operators over:

- undersea cables
- landing stations
- international gateways

This was originally granted to operators because it was held to be a "natural monopoly" and that direct provision by the state was the most efficient option. It was also seen as a "cash cow" that might be used to fund the construction of national networks.

In recent years, the appearance of competing Mobile Network Operators (MNOs) and Internet Service Providers (ISPs) has created a growing demand for access to cheaper and competitive international connections. Moreover, where competition has been extended to the supply of international telecommunications it has proved to be successful, having driven down prices and driven up demand.

The original approach to the construction and operation of international telecommunications facilities was as cooperative ventures amongst sovereign states.

This began with an assessment of likely demand, followed by the laying of cables and the construction of landing stations in each of the participating countries. Invariably, the result was in the form of a cartel.

Today, opening up access to undersea cables is seen as means to increase economic growth and to reduce the digital divide. This contributes directly to the New Partnership for Africa's Development (NEPAD) goals on broadband access and to the action plan adopted by the World Summit on the Information Society (WSIS).[1]

The approaches that can be taken to control the monopolies associated with undersea cables have been:

- by the enactment of a statute
- by the application of competition law
- by the application of telecommunications regulations

These are not mutually exclusive – rather they can be combined in ways appropriate to the specific national setting. Whichever option is chosen it will require a solid legal basis to ensure certainty of success.

Any regulation that opens access to submarine cables at the landing station is highly likely to have to be coupled with measures to ensure the provision of "backhaul" capacity. It will be necessary for competing operators and service providers to be able to construct or to lease from third parties the links from their place of business to the cable landing station. This may require the regulation of:

- domestic leased lines
- the provision of spectrum for microwave point-to-point links
- the right to dig trenches for cables
- access to roof space for antennae

It may also be necessary to ensure that operators can purchase a leased line supplied by the incumbent operator or a rival from the landing station and then interconnect to their own networks. Where the incumbent operator supplies the leased lines it is likely to be necessary to regulate the prices charged to rivals.

This discussion paper covers the historical background to undersea cables. It then sets out the essential facilities doctrine and measure taken in the liberalization of telecommunications and the regulation of prices. The procedural and implementation issues are then set out. Finally, conclusions are drawn.

2. *Historical developments*

The historic approach to the creation of an undersea cable was to form a closed club of operators that would raise the capital for the investment needed to lay the cable. The members would then have the exclusive rights to use that capacity in their respective countries.

[1] http://www.itu.int/wsis/index.html

After construction, other operators would be allowed to purchase an Indefeasible Right of Use (IRU), a contract transferring to them the right to use a dedicated amount of capacity on the undersea cable system. This was an exclusive and irrevocable right to use the facility, typically for 20 to 25 years, but with no right to control or manage the cable. While an IRU owner does not have the risks of the construction process, the unit price for the capacity is usually higher than for the club members.

Other operators lease capacity from the club members for a half-circuit or full circuit. Leasing is for shorter terms and so is more costly. The club members control the availability and prices of IRUs and leases, with the capacities often being limited.

Developments in optical fibre technologies have reduced the unit cost of undersea cable systems. The periodic upgrading of the equipment on the ends of the cables greatly increases the transmission capacity.

Liberalization made it possible for newly approved private operators to construct their own cable systems instead of joining the clubs of incumbent carriers. The first non-club cable was PTAT-1 crossing the North Atlantic in 1989, linking New Jersey, Bermuda, Ireland and the UK. It broke the joint monopoly of AT&T and British Telecom. PTAT-1 was shut down in 2004 as being no longer viable, because the prices of other trans-Atlantic cables had fallen significantly.

The 1990s saw forecasts of very rapid growth in traffic associated with the dot com boom. When this collapsed there was found to be considerable excess capacity in submarine cables. The bankruptcies of Global Crossing, Teleglobe and Tyco resulted in the disposal of the "distressed" assets with the result that a substantial transfer of assets was made to operators based in Asia.

Case: FLAG[2]

FLAG (Fiber-optic Link Around the Globe) started service 1997. It was one of the first private systems owned by an investment joint venture whose members included non-telecommunication corporations. The FLAG consortium comprised six entities, backed by more than thirty international financial institutions.[3]

FLAG Telecom views itself as a global carrier's carrier. Its target customers are the established carriers, rather than retail telecommunications consumers.

From the beginning, FLAG was not limited to members of the venture, but intended to offer capacity to other carriers. This was to meet demand from new entrants that had appeared as the result of the growing liberalization of international telecommunications service. FLAG let carriers purchase capacity as it was required, instead of compelling them to buy up-front fixed capacities a required by the traditional systems.

[2] http://www.flagtelecom.com/

[3] The founding members of FLAG were: NYNEX (now Verizon), Dallah Al Baraka Group from Saudi Arabia, the Asian Investment Fund of Hong Kong, the Telecom Holding Co. of Bangkok, the Marubeni Corp. in Tokyo and Gulf Associates in New York.

Figure *Map of the FLAG system*

FLAG Telecom entered bankruptcy under the joint jurisdictions of the authorities in the USA and Bermuda. This allowed it to reduce US$ 3 billions of debt to only US$ 75 millions. The relatively quick process lasted through the second and third quarters of 2002.

Today, FLAG owns and operates a low-latency, global MPLS-based IP network, which is connected to most of the principal international Internet eXchanges Points (IXPs). It offers: global bandwidth, IP, Internet, Ethernet and collocation services.

In December 2006, Reliance Communications announced that it would build the world's largest IP submarine cable network, to be known as the FLAG Next Generation Network (NGN). It would cost US$ 1.5 billion and require the laying of an additional 50,000 kilometers of undersea optic fibre cable. When complete the system would reach sixty countries and include over 115,000 km of cable.[4]

In the case of West Africa Submarine Cable (WASC) and Southern Africa Telecommunications cable (SAT-3) the investors were national incumbent operators in each of the countries where the cable landed, plus a group of northern hemisphere operators. The result of the exclusive control over landing rights has been little incentive on operators to increase traffic on the cable – it was estimated to operate at below one third of capacity in 2006 – rather it has been to maintain high prices and to reap the monopoly profits that result. In particular, operators have sought to avoid selling capacity at wholesale prices to operators who might resell to third parties.

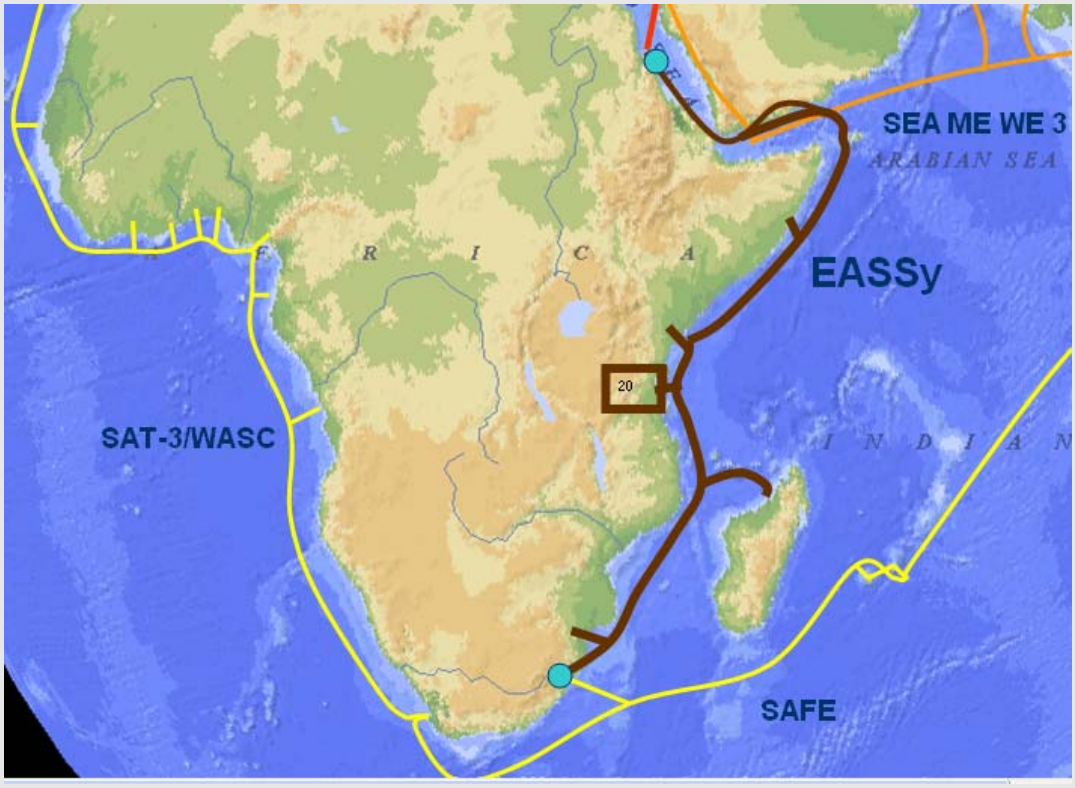
Some countries passed by the cable were excluded from the club and thus have no spur or landing station because of the perceived lack of traffic (e.g., Guinea, Liberia, Namibia, Sierra Leone). However, the position in East Africa was much worse, with no cable landing station between Djibouti and Durban.

[4] See http://www.flagtelecom.com/index.cfm?channel=4328&NewsID=27318

Case: EASSY[5]

The East Africa Submarine System (EaSSy) was planned to fill a gap in undersea cable provision and also to link up to inland projects to provide optic fibre cables to land-locked countries.

Figure *Map of EaSSy with SAT-3, SAFE and SEA-ME-WE-3*



The initial plan, backed by the World Bank, was to have a non-club model, with open access to the cable landing stations. However, there were counter-proposals for a club system which some governments and operators considered to be more commercially attractive. Unfortunately, the result has been a sequence of meetings at which little agreement has been possible.[6]

Kenya, which currently has no undersea connections, is about to have not only a connection to EaSSy, but two other cables. By November 2007, construction is expected to be completed on The East African Marine System (TEAMS) project, a fibre link from Mombasa to Fujairah in the United Arab Emirates (UAE) in which the Kenya Government will have a 40 per cent holding. Kenya Data Networks (KDN) has separately entered into a contract with Flag Telecom to construct a fibre optic link that would connect Mombasa, Nairobi and Busia to a junction off the coast of Yemen. This is expected to be operational in the first quarter of 2008.

An obvious concern is that with so much capacity it may be difficult for all three to recover their costs. The risks are then of dumping capacity below cost or even bankruptcy.

[5] http://www.eassy.org/
[6] Further information is available at: http://www.FibreForAfrica.net/

The regulation of access to satellite connections has been contentious in many countries. Efforts to allow rivals to the incumbent operator to use the Very Small Aperture Terminal (VSAT) satellite service have been bitterly resisted. Nonetheless, they are extensively used for voice telephony, including domestic backhaul and international connections, and also for IP traffic. For example, in South-East Asia, Shin Satellite operates its IPStar service providing such services.[7] At the end of 2006, it had over 65,000 user terminals and ten gateways in: Thailand, Vietnam, Australia (2), New Zealand, Myanmar, China (3) and Cambodia.

There are special cases for land-locked countries which must obtain transit through another country to reach an undersea cable. For example, Ethiopia installed a fibre optic cable to Sudan at the end of 2005, allowing connection to the landing station at Port Sudan, ending its dependence on satellite. On a larger scale, the World Bank has helped to fund a fibre optic cable network as part of a project to interconnect electricity grids in South-East Africa.

Small Island Developing States (SIDS) such as São Tome & Principé, Seychelles and the Comoros Islands are unable to justify the expense of an undersea cable. Consequently, they seem likely to remain connected only by satellite. Some islands such as Mauritius and Réunion have been fortunate in obtaining a cable landing station, largely a result of their geographical location on or close to major international routes.

There are significant barriers to entry in the undersea cable and international telecommunications businesses. There is a requirement for quite significant volumes of traffic in order to justify the investment and the need to obtain all the necessary licences. It is unlikely that smaller operators will be able to enter the market.

While competition has grown and been proven successful in Internet access and in mobile telephony, the regimes for access to undersea cables have often remained unreformed. It is now an obstacle to the more complete development of affordable Internet access and international telephony in Africa.

3. Essential facilities

The doctrine of an "essential facility" is derived from antitrust or competition law in the United States of America. The original case concerned an association of railroads controlling access to traffic from competing railroad companies seeking to use a bridge over the Mississippi River. It was considered too expensive for rivals to build an alternative bridge, giving the owners of the existing bridge control over the prices charged for transporting railroad cars and also the priority given to different trains and individual wagons. On appeal the Supreme Court upheld the right of the administration to regulate the traffic across the bridge.

The test of being "essential" is not easily passed. The facility cannot be something that gives only a small or a short term advantage, it has to be a substantial and long term benefit. Alternative facilities would have to be such poor substitutes that they would not allow rivals to compete. The test is the ability to duplicate the input.

[7] http://www.ipstar.com/

In the case of a submarine cable landing station clearly there are alternatives. Theoretically it would be possible to purchase a leased line to the cable landing station in a neighbouring country or to use an international satellite link. However, in many countries these options may not be permitted in law or may be so obviously inferior in quality or so much more expensive that they are not equivalent. For example, satellite links have limited capacity, are expensive and have delays in transmission.

The incumbent operator in the neighbouring country also operates an essential facility and may collude with the operator in the first country, not wishing its own domestic rivals to follow such an example. Moreover, obtaining a leased line to the point of interconnection in a neighbouring country may be very expensive. Indeed, it is probably only available from the incumbent operator that also operates the cable landing station.

Given that the undersea landing station is an essential facility and cannot be economically duplicated, one option is for the authorities to require the operator to provide access to rivals. They could impose obligations on the operator in terms of the quality and the price of the facilities. This would require operators of a sufficient size to be able to negotiate with the cable partners.

Case: Singapore

The driver for opening access to the undersea cables in Singapore was to support growth of telecommunications markets and to increase the competitiveness of the country against its economic rivals. The regulator wanted to increase participation in the market from additional players and by allowing existing players to extend their range of services. The measures taken were to enhance competition and ensure greater choice and lower prices for businesses and consumers.

The justification given was that: "Access to SingTel's submarine cable landing stations is an essential input for many telecoms services. Unnecessary access restrictions limit operators' competitive scope to provide international telecoms services." [8]

The mechanism used was that the Infocomm Development Authority (iDA), the national regulatory authority in Singapore, directed SingTel to modify its Reference Interconnection Offer (RIO) to include the provision of access to its cable landing station under specified terms and prices.

The powers of the iDA arise from the Telecommunications Competition Code which in turn is based on statute.[9] SingTel is regulated as a dominant operator.

For most countries in Africa the prospect of obtaining access to more than one undersea cable is unlikely. The obvious exceptions are countries with coasts on the Mediterranean and Red Seas, where there are several cable routes from Europe to Asia which allow the possibility of access to competing offers. The Cape Verde Islands and Senegal have additional connections on cables running from Europe to South America. For the rest of Africa the cable itself may be an essential facility, with few possibilities

[8] iDA Deputy Chief Executive Officer and Director-General (Telecoms) Mr Leong Keng Thai. http://www.ida.gov.sg/News%20and%20Events/20050712175459.asp

[9] iDA (2005) *Telecommunications Competition Code* (Singapore, Infocomm Development Agency). http://www.ida.gov.sg/Policies%20and%20Regulation/20061010135522.aspx

of new and more competitive cable being laid, given the expense of installation and the high running costs of, for example, maintaining a repair ship on standby.

The essential facilities doctrine is a pre-requisite for the application of competition law. It is also likely to be very important to justify more traditional telecommunications regulatory approaches. It is a test that is very clear in the case law of many countries and so should present few problems in the event of an appeal against a decision by the regulator.

A statute may not require the use of this approach, unless it is likely to conflict with constitutional protections over the appropriation of private property. Nonetheless, it may be a useful justification.

4. Liberalisation

There are a number of steps that can be taken to remove legal barriers to entry on the market for international telecommunication services. These would allow operators to construct infrastructure and to resell spare capacity. However, it seems unlikely that an operator would seek to construct a new undersea cable or even a new landing station.

Case: South Africa

Historically, Telkom was the *de jure* monopoly provider of telecommunications, including all international capacity into and out of South Africa. Today, it remains overwhelmingly dominant in the provision of fixed telecommunications. This was recognized by the government and provision was made in the new statute.

The Electronic Communications Act of 2005 includes provisions for the regulation of all areas of telecommunications.[10] The Act defines an ''electronic communications facility'' to include undersea cables and landing stations, while an "electronic communications network" includes undersea fibre optic cables.

Article 43 (8) designates submarine cables and satellite earth stations as being essential facilities. Thus they can be subject to regulation by pro-competitive measures set out in Article 67 (7), including non-discrimination, accounting separation and price controls.

Article 43 (10) proscribes licensed operators from entering into any agreement that would create exclusive rights, undue barriers or otherwise restrict access or resale. Additionally, Article 43 (11) allows the Minister to invalidate any existing agreements which are exclusive.

One advantage that could not readily have been foreseen was the appearance of the Tata Group as the strategic investor in the Second Network Operator (SNO), now known as Neotel. The Tata Group is a very old conglomerate from India that, since 2002, has owned Videsh Sanchar Nigam Limited (VSNL) which acquired the extensive undersea networks of Tyco and Teleglobe, including capacity on SAT-3. Thus the SNO has, with the exception of the bottleneck of the undersea cable landing station, the capacity needed to compete with Telkom. It has begun to construct its own national network in addition to the capacity provided to it from InfraCo.

The high cost of capacity on SAT-3 means that many ISPs elect to use the alternative of satellite links to Europe and the United States of America. This results in download "caps" for retail customers, limiting the amount of data they can use and additional charges for data. Instead of being 120 milliseconds end-to-end from the USA, the satellite route is around 800 milliseconds, causing some applications to fail and many to operate

[10] Electronic Communications Act (No. 36 of 2005).

poorly. The beach-to-beach latency on SAT-3 for the 12,000 kilometres from South Africa to Portugal is 60 milliseconds.

At the time of writing, the outcome of these policy changes is still unknown. It is likely to take many months to determine how effective the measures will have proved.

In 2004, the Telecom Regulatory Authority of India (TRAI) began the process of regulating the price of International Private Leased Circuits (IPLCs).[11] It was able to calculate a cost-based tariff for an E1 (2 Mbits/second) at INR 1,200,000 (or €21,600) per annum and used the ratios of 1:8:23 for E1, DS3 and STM1 lines.[12] The effect was a price reduction of about 40% in the case of E1 and about 70% in the case of DS3 and STM1. This was based on the use of both a cost-based accounting approach and an annual recurring cost model, which both gave similar figures. The TRAI also made extensive comparisons with other countries.

The TRAI launched a further consultation in December 2006 on measures concerning the resale of IPLCs. While it acknowledged there were economic limits on the numbers of Facilities-Based Operators (FBOs), it noted the enormous differences in the numbers of resellers in other countries. It would seem very likely that India will open the market for resale in order to encourage competition.

Table *IPLC operators in selected countries in 2005*

	FBO	*Resellers*	*Total*
UK	4	29	33
USA	6	26	32
Germany	5	27	32
South Korea	4	10	14
India	3	0	3

In April 2007, TRAI proposed to the government a regulation to open cable landing stations to competitors.[13]

Case: Mauritius

Mauritius or *Île Maurice* is connected to SAT3/WASC/SAFE which runs from Portugal to Malaysia by way of South Africa with a capacity of more than 100 Gigabits per second.

The cable was installed by Tyco[14] and Alcatel[15], covering some 28,800 kilometres at a cost of US$ 600 million. It is jointly owned by a consortium of 36 companies. The *Chamarel*, a dedicated repair vessel with a crew of fifty, remains on standby should a break occur in the cable.

The participation of Mauritius Telecom in the SAFE project was subject to a US$28 million guarantee by the Export-Import Bank of the United States (Ex-Im Bank). This

[11] TRAI (2004) Consultation paper on fixation of ceiling tariff for International Private Leased Circuit (Half Circuit).
[12] INR 1 = US$ 0.022 = € 0.018
[13] http://www.trai.gov.in/trai/upload/PressReleases/448/pr13apr07no34.pdf
[14] Acquired by the Tata Group through VSNL International.
[15] Merged with Lucent to form Alcatel-Lucent.

enabled Tyco to sell equipment and services to Mauritius Telecom (MT), for the construction of its portion of SAFE, providing it with competitive long-term financing. The Chairman of Ex-Im said: "The development of telecommunications infrastructure in Africa represents one of the big growth sectors for US exporters." The project was to assist the development of the island as a telecommunication hub and an offshore banking centre.

Mauritius Telecom (MT), the government-owned domestic and international telecommunications operator owns 12% of the SAFE cable; Telkom Communications International, a private Mauritius company, 22%; France Telecom 20%; Verizon (formerly MCI) 4%; VSNL 22% and Telekom Malaysia 20%.

The Information and Communications Technology Authority (ICTA) used its legal powers under §28 of the Information and Communications Technologies Act 2001. This is a general provision for interconnection, allowing the regulator to facilitate and, if necessary, arbitrate in an interconnection dispute under the *Code de Procedure Civile*. It allows the application of general costing principles. It was held that the Consortium Agreement could not be disclosed, being confidential. Where data were not provided an international benchmark was used.

The ICTA chose a model that combined the Weighted Average Cost of Capital (WACC) for the investment in the cable with a Fully Allocated Historical Costing (FAHC) methodology. This was used to derive a price for each E1 circuit (2 Megabits per second) which was discounted to ensure that wholesale purchasers had a "sufficient" margin to provide value added services. The regulator continues to work to improve the costing model to further reduce the prices charged.

The parameters used were the following, in US$:

x	MT direct investment in SAFE
y	MT investment in cable landing station
z = x +y	MT total investment in SAFE
a = z/25	Annual depreciation (over 25 years)
b = z * 0.1	Return on capital (estimated @ 10% per annum)
c	Annual operational cost of SAFE
d	Annual operational cost of the landing station (estimated at 8% of cost of the landing station assuming the same factor as for the fibre cable)
e = (a+b+c+d)	Total annual expenses of MT
q	Minimum Investment Unit (MIU) km available to MT
r = (e/q)	Annual cost per MIU km
s	Cable distance from Mauritius to Portugal (kilometres)
t = (r * s)	Total cost per MIU (E1 = 2 Mbps) from Mauritius to Portugal
u = (t/12)	Monthly cost
v	Other costs including cost of transmission from Portugal to Paris
w = u + v	Total cost for an E1 from Mauritius to Paris

The monthly cost of a full-circuit E1 (2 Mbits/second) from Mauritius to France was reduced from US$ 12,600 in December 2005 to US$ 7,900 in July 2006. A volume discount was available allowing the price to be as low as US$ 5,925.

The range of approaches taken has been wide and each needs to be weighed carefully before being applied in other countries. Nonetheless, they provides a number of precedents and pragmatic solutions.

5. *Price regulation*

The use of benchmarking is often criticized by operators as a crude tool that fails to capture specific national circumstances. However, it is a vital first step in determining the position of a country *vis-à-vis* its neighbours and its economic competitors. It can be effective both in policy analysis and also as a "first cut" at a potential price reduction.

The use of regulation based on Rate Of Return (ROR) was developed in the USA to control local incumbent operators across the full scope of their business. However, it is now largely discredited since it is recognized as an inefficient tool. With a rate of return model there are few incentives to reduce costs incurred by the business and many to increase them.

Price caps have been used extensively to drive down telecommunications charges. These usually fix an initial price level and then use a formula that allows for any increases in the inflation and a factor for the expected efficiency gains. By imposing an efficiency gain that is greater than any increase in the Retail Price Index (RPI) or Consumer Price Index (CPI), the price is gradually pushed down. This sort of "glide path" allows operators sufficient time to adjust prices and operational practices. Where the price is substantially above cost, then it may be reduced by a reasonable factor before the price cap is applied.

There are then a range of economic models using historic costs and Long Run Incremental Costs (LRIC). The relative merits of these have been discussed at length by academics and regulators.

One concern is that these models are so complex that they require the use of external and expensive consultants, without necessarily transferring skills to the regulator. Moreover, such models can be opaque and can result in highly technical debates over individual factors in the model.

Case: La Réunion

The island of La Réunion is a French overseas territory which operates under the laws of metropolitan France and the European Union (EU). Thus it was the French regulator sitting in Paris on application from the *Conseil de la Réunion* that applied the EU directives to the price of access to the SAFE/SAT-3 cable.

It was recognized that the undersea cable was not going to be duplicated because of the high cost and the low levels of demand. Moreover, the exclusive access of France Telecom to the cable represented a blockage in the achievement of a range of policy objectives.

The French LRIC model *Coût Moyen Increméntal de Long Terme* (CMILT) was used, taking the investment in the landing station at € 2.5M and the cable itself at € 41.4M, with a cost of capital of 14.3 per cent.

The regulator reduced the price for the route from La Réunion to France from €15,000 to €1,500 per Megabit per second per month.[16] Its decision was affirmed by the Court of Appeal of Paris.

Regardless of the model used, it is necessary to gather a considerable volume of information from the operators in order to arrive at an accurate cost. This requires the power to force operators to collect and to supply specific information in order to undertake the necessary calculations. Authorities also require the skills to ensure that the information provided is accurate and complete.

A key concern in any price regulation is to ensure sufficient regulatory certainty to protect future investment.

6. Procedural issues

The approach taken to regulation – global best practice – is to conduct one or more "public" consultations.

The first step is the preparation of an analytical document. This sets out the general socio-economic policies of the government and any growth targets that have been set. It identifies the role of international telecommunications in the economy and any sectors expected to be particular beneficiaries of the proposed policy changes. For example, it might help trading in agricultural products, boost the tourist industry or encouraging populations living and working abroad to take a greater interest in their homeland, with a view to investing or returning. It should set out costs compared with neighbouring countries and economic competitors.

The consultation should set out different options with their relative merits. It needs to do so in sufficient detail for the parties responding to be able to explain their preferences and to raise issues that favour one option over another or to propose an alternative. Some countries allow a period after the deadline for the filing of comments for responses or rebuttals of other positions. All comments should be published, except for those elements shown to be confidential.

It is unreasonable to expect the general public to respond to a consultation on submarine cable landing stations, even when presented in clear language. It may therefore be appropriate to undertake surveys of public opinion and public meetings on the affordability of different levels of charges and types of services. It will help at a political level if the public is strongly in favour of reducing prices and that there is evidence of willingness to increase usage of the services.

If the consultation is especially contentious, it may be appropriate to conduct a second consultation based on a draft text of the proposed regulatory measure. This ensures that all voices have been heard.

[16] http://www.regionreunion.com/fr/spip/spip.php?article692

The regulatory measure should, ideally, be accompanied by an impact assessment. This sets out the likely effects on the operators and markets.

It is considered good practice to include in any new regulatory measure a provision for a review after a period of time, usually from three to five years. This allows the public authority to assess the effects of the measures it has imposed, to invite comments from the public and the industry stakeholders on the effectiveness. It is an opportunity also to review experience in other countries. The result should be a revised regulation that ensures the achievement of national socio-economic development goals, in line with global best practice. However, the period should not be so short as to create regulatory uncertainty about any access being granted to the undersea cable.

7. Implementation

Once the regulations are in place it is necessary to ensure sufficient resources are available to monitor their implementation. There will have to be regular reporting by the incumbent operator that will be published.

It will be necessary to monitor retail prices to ensure that savings are being passed on. This may require little additional work to the normal business of price monitoring. However, in the case of Australia it was found that although market forces had caused a drop of 40 per cent in trans-Pacific leased line charges there had been no corresponding reductions in the prices for Internet access.

In some instances the failure to pass on cost savings to the end customers may be due to the lack of downstream competition. This may require further work in opening markets.

One of the measures could be to allow rivals to install their own equipment in the cable landing station. Collocation is notoriously difficult, with problems that might seem trivial becoming major obstacles. It is necessary to determine a wide range of prices for floor space, roof space (for microwave antennae), electricity and so on. There is a need for secure access for staff from all operators.

Monitoring such issues can be facilitated by an industry forum of all the providers participating on the market. The NRA can be an observer to ensure a proper understanding of developments, but leaving it free to intervene when that is necessary.

On 27 December 2007 earthquakes off the southern coast of Taiwan disconnected much of Asia from the Internet and caused problems for international telephony. This massive outage affected seven undersea cables each with multiple breaks spread over 300 kilometres of ocean floor. It generated considerable publicity throughout the region, where broadband Internet access has been widely adopted. In Hong Kong SAR both the regulator and the legislature expressed concern about the issue and the need for greater resilience in the networks.

The success of a policy for undersea cables will depend on implementation and careful monitoring of developments. It will also be important to share experiences through groups of regulators in the region and more widely.

8. Conclusion

The objectives of regulating access to undersea cables and landing stations are to reduce the costs of international voice and data communications. In turn, this can be shown to benefit national competitiveness, to boost economic growth and to create jobs. It also helps to reduce the digital divide, to make services more affordable and thus to improve social cohesion.

Many ISPs and MNOs are being frustrated in offering more affordable international services because they cannot obtain cost-effective access to international transmission capacity. If undersea cables could be opened to them, it would contribute to the achievement of widening service provision and deepening competition.

Reduced prices for international services will cause a substantial increase in demand.

The first challenge for the authorities is to find a solid legal basis on which to build the necessary regulations, both information gathering and enforcement powers. Thereafter, an appropriate initial costing methodology is required, one that can be refined over time as more information becomes available. The next challenge is to ensure sufficient political support for action.

Conditions in one country are never identical to those in another. While it is vital to learn from the experiences of other countries, it is never appropriate to copy without very careful consideration of local circumstances.

While the objective is to reduce prices, it is important to do so while encouraging investors.

9. Stocktaking exercise

Identify the existing legal powers available for regulating access to undersea cable landing stations:

- Gathering information from operators
- Setting prices for services and elements
- Enforcing collocation for equipment in and around the landing station
- Regulation of national leased lines to reach the landing station
- Legal instruments that might be used
- The basis for any legal appeals

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11. Speeds of leased lines

	Megabits per second
T-1/DS1	1.544
E1	2.048
E2	8.448
E3	34.368
T-3/DS3	44.736
E4	139.264
E5	565.264
OC-3	155.52
OC-12/STM-4	622.08
OC-24	1,244
OC-48/STM-16	2,488
OC-192/STM-64	10,000
OC-256	13,271

12. Abbreviations

AU	African Union
CMILT	Coût Moyen Increméntal de Long Terme
DWDM	Dense Wavelength Division Multiplexing
EASSY	East Africa Submarine cable System
ECA	Electronic Communications Act (of South Africa)
EU	European Union
FAHC	Fully Allocated Historical Costing
FBO	Facilities-Based Operator
ICTA	Information and Communications Technology Authority (of Mauritius)
ICPC	International Cable Protection Committee
IDA	Infocomm Development Authority (of Singapore)
IP	Internet Protocol
IPLC	International Private Leased Circuit
IRU	Indefeasible Right of Use
ISP	Internet Service Providers
IXP	Internet eXchange Point
ITU	International Telecommunication Union
KDN	Kenya Data Networks
LRIC	Long Run Incremental Cost
MNO	Mobile Network Operator
MT	Mauritius Telecom
NCA	National Competition Authority
NEPAD	New Economic Partnership for African Development
NRA	National Regulatory Authority
OECD	Organisation for Economic Co-operation and Development
PTAT	Private Trans-Atlantic Telecommunications cable
ROI	Return On Investment
ROR	Rate Of Return
RPI	Retail Price Index
SAFE	South Africa and Far East cable
SAT-3	Southern Africa Telecommunications cable
SCLS	Submarine Cable Landing Stations
SIDS	Small Island Developing States
SNO	Second Network Operator
TEAMS	The East African Marine System
TRAI	Telecom Regulatory Authority of India
VOIP	Voice Over Internet Protocol
VSAT	Very Small Aperture Terminal
VSNL	Videsh Sanchar Nigam Limited
WASC	West Africa Submarine Cable
WACC	Weighted Average Cost of Capital
WDM	Wavelength Division Multiplexing
WTO	World Trade Organisation