

# NUMBER PORTABILITY FOR PUBLIC MOBILE SERVICES IN HONG KONG

Statement of  
the Telecommunications Authority, Hong Kong  
9 June 1998

## PURPOSE

In May 1998, the Office of the Telecommunications Authority (OFTA) received the final report (the Final Consultancy Report) from the Consultants commissioned by OFTA on a study of the “Feasibility Study and Cost-benefit Analysis of Number Portability for Mobile Services in Hong Kong”. The study has concluded that the introduction of number portability for public mobile services would promote fair competition and create *net benefits of HK\$461 million in net present value terms over ten years*. Based on the views and comments of the industry, the Consultants’ findings and recommendations in the Final Consultancy Report, the Telecommunications Authority (TA) sets out his considered views and policy intention in this Statement on the introduction of Mobile Number Portability (MNP) in Hong Kong and the implementation plan of MNP *by a distributed database solution with Fixed Telecommunication Network Services (FTNS) operators providing the “look-up” services by the earliest target date. The TA considers 1 January 1999 is the earliest target date that can be achieved.*

## BACKGROUND

2. In July 1997, OFTA issued a consultation paper inviting views and comments from the industry and interested parties on whether Hong Kong should have number portability for mobile services, and if so, how it could be achieved and implemented. At the end of the consultation, OFTA received a total of 20 submissions from the respondents. Their comments and views together with OFTA’s responses are summarized at Annex 1. The industry generally shared the view that there was a genuine need to conduct a thorough study on the technical options, cost-benefit analysis, implementation schedule and cost-recovery framework for operators in implementing MNP in Hong Kong.

3. In December 1997, OFTA commissioned the National Economic Research Associates (NERA) and the Smith System Engineering (Smith), both UK consultants, to conduct such a study. The Consultants produced a preliminary report in February 1998. OFTA held an industry workshop on 25 February 1998 to consult the industry on the Consultants’ preliminary findings of the study and solicit further views and comments from the industry. Subsequently, OFTA received 13 submissions. These submissions were duly considered by the Consultants in the preparation of the Final Consultancy Report. A summary of the comments received in response to the

Consultants' preliminary findings and OFTA's responses is at Annex 2. In May 1998, the Consultants have completed the study and submitted a Final Consultancy Report to the TA for consideration. The Final Consultancy Report has now been published and can be downloaded from OFTA's Internet home page at address of <http://www.ofa.gov.hk>. The Executive Summary of the Final Consultancy Report is at Annex 3.

## **FEASIBILITY STUDY AND COST BENEFIT ANALYSIS OF MNP**

### Objectives of Study

4. The objectives of the MNP study by NERA/Smith were -
  - to identify the technical options for the implementation of MNP on all mobile networks;
  - to assess the costs, viability, and risks of each technical option;
  - to evaluate the direct and indirect benefits of the introduction of MNP;
  - to quantify the benefits and conduct a cost benefit analysis;
  - to make recommendations on the cost recovery framework amongst all relevant operators; and
  - to make recommendations on the implementation plan.

### Operator Interviews and User Survey

5. The project team started the study in early December 1997 and interviewed Hong Kong Telecom International (HKTI), all fixed and mobile network operators as well as other interested parties such as the Consumer Council, the Hong Kong Telecommunications Users Group and the Hong Kong Coalition of Service Industries in order to solicit their opinions and collect the information on the development of the mobile market, subscriber behaviour, churn rates, technical implementation options and costs. The collected information has been used to form the basic assumptions and parameters in the study.

6. The benefits of MNP are categorized into the following groups:
  - Type 1 benefits which are the benefits which accrue to subscribers who retain their number when changing operator, and include;
    - cost savings from not having to change mobile number; and
    - cost savings from switching to more efficient operators
  - Type 2 benefits which are the efficiency improvements and any associated price reductions which result from increased competition due to the availability of MNP; and

- Type 3 benefits which are the other cost savings that arise from fewer misdialled calls and fewer changes to information stored in customer equipment.

7. A user survey was conducted for 1,000 mobile phone subscribers, comprising 450 personal subscribers, 450 small to medium business users and 100 large corporate firms across Hong Kong. The users were asked to provide the information of their history of mobile use, attitudes towards switching operators, costs and barriers to switching operators etc. The survey data was used to estimate the switching costs for all types of subscribers, the price equivalent discount required for the subscribers to switch operators with and without MNP and the cost and time involved in searching for and/or altering changed numbers.

8. The user survey in the Final Consultancy Report shows that around 60% of users (personal and business subscribers) have considered that number change is the most significant problem they would encounter if they switch operators. The significance of number change as a switching constraint would also grow with time as differences in performance between networks diminish. The survey also shows that more than 72% of personal and business subscribers would be willing to consider switching operators if MNP is available. This demonstrates that the lack of MNP at present is a barrier to full competition in the market.

### Implementation Options

9. The Consultants have studied the feasibility of implementing different technical implementation options of MNP in Hong Kong's environment. These options have included simple call forwarding, call drop-back, mobile network look-up, fixed network operator look-up, all operators look-up and signaling relay solution. Having studied the technical feasibility, pros and cons and the possible implementation timeframe of each option, the Consultants have identified the following two implementation options of MNP which are considered feasible for implementation in Hong Kong within the shortest timeframe:

- Option 1: immediate rollout of off-switch solution with database look-up in local fixed networks;
- Option 2: migration through call forwarding functionality to off-switch solution with database look-up in local fixed networks.

The Consultants have assumed in their cost-benefit analysis that initially Hong Kong Telephone Company Limited (HKTC) would be the local fixed network providing the "look-up" services.

## Cost-benefit Analysis

10. A base case model has been developed to determine what would happen in the absence of MNP by taking account of the overall market penetration, penetration of different systems, revenue per subscriber and assumptions on the churn rates. The information from the operator interviews and the user survey was used to forecast the impact of the introduction of MNP on the churn rates and hence on the number of subscribers leaving and joining each system.

11. Having identified the preferred implementation options (Option 1 and 2 above) and the associated costs (the set-up and one-off costs, the per-subscriber costs and the on-going costs), the Consultants estimated the costs and benefits over ten years and performed cost-benefit analysis and sensitivity tests according to the criteria of (a) high and low additional churn rates; (b) high and low levels of porting rates; and (c) earlier and later implementation dates.

12. The results of the cost and benefit analysis in the Final Consultancy Report show that the net present value (NPV) of costs over ten years will be in the range from HK\$512 million to HK\$683 million if Option 1 is to be implemented and HK\$603 million to HK\$887 million if Option 2 is to be implemented. It should be noted that the implementation cost of Option 2 is about HK\$91 million to HK\$204 million more expensive than that of Option 1 because of the setting up and running cost of interim arrangement based on the call-forwarding functionality. The estimated benefits (NPV over 10 years) will be in the range from HK\$769 million to HK\$1,396 million. As a result, the net benefits (NPV over ten years) will be in the range from HK\$94 million (for the worst case) to HK\$668 million (for the best case). The net benefit of the “central” case identified by the Consultants is HK\$461 million. A summary of the costs and benefits of each implementation option tested under different scenarios is at Annex 4.

## **TA’S CONSIDERATIONS AND VIEWS**

13. After the workshop held on 25 February 1998, the Consultants received and studied the views and comments from the industry. As a result of the consideration of the received comments and views, the Consultants had made appropriate changes and refinements in the Final Consultancy Report, especially on the assumptions and cost/benefit data used, in order to provide a more accurate estimation and forecast of the cost elements and benefits of MNP.

14. The TA notes that there are two camps of opinion in the industry regarding the justification for the implementation of MNP in Hong Kong. The TA considers that telecommunication numbering is a limited resource of the community. Therefore it should not be under the control of any operator for commercial interests. In taking a final decision in the face of conflicting opinion, the primary consideration of the TA is the interest of the consumers and the community.

15. The TA considers that operators should compete on the basis of prices and quality of services to customers, rather than relying on an artificial barrier which hinders customers to switch operators to safeguard market share. Churn is not an undesirable market phenomenon if it means that consumers have the freedom of choice. Churn also does not necessarily work against the interest of a particular operator.

16. The Final Consultancy Report has shown that the net benefit of introducing MNP would be HK\$461 million over ten years for the “central” case identified by the Consultants. Even for the worst case, the net benefits would be HK\$94 million. Thus the estimates of the net benefits are sufficiently robust. The report has also confirmed that the introduction of MNP is technically feasible. The TA therefore considers that MNP should be introduced in Hong Kong.

17. More specific views on various aspects covered in the Final Consultancy Report are given below:

(A) **Demand and Need of MNP in Hong Kong**

**NERA/Smith:**

- a) *The mobile market in Hong Kong is currently very competitive. By the end of 1997, seven mobile operators operated eleven digital networks with over 2 million subscribers. The market shows signs of continued growth. We forecast that the penetration rate will grow to 60 per cent in 2007.*
- b) *OFTA believes that there is scope for future improvements. It considers the availability of number portability as essential for the further development of telecommunications in Hong Kong and for the delivery of enhanced benefits to consumers.*
- c) *A wide range of consumers will benefit from the MNP in Hong Kong. Mobile subscribers will be able to switch operators and avoid the costs and inconvenience associated with a number change. Competition in the industry will be heightened as a barrier to switching is removed further benefiting residential and business users. Callers to mobile phone subscribers will be able to complete calls successfully in those cases where the subscriber has changed their mobile operator.*

**TA's Views:**

- a) The number of mobile subscribers in Hong Kong in the recent years and months has been increasing very rapidly. The penetration rate has now reached a landmark figure of 35% which is one of the highest penetrations in the world and more than 2.27 million users (end of April

1998 figure) have subscribed to the mobile services. The penetration rate, as predicted by the Consultants in the Final Consultancy Report, will further grow up to 60% in the year 2007. In other words, the number of mobile phone users in ten years' time will roughly double the existing figure, reaching out to about 4.5 million subscribers. Therefore, there will be substantial growth in Hong Kong's mobile market in future.

- b) As indicated in the user survey in the Final Consultancy Report, around 60% of users (personal and business subscribers) consider that the number change as a result of the lack of MNP is the largest problem they would encounter if they switch operators and more than 72% of personal and business subscribers will be willing to switch operators if MNP is available. *Therefore, it affirms the TA's belief that number change has been conceived by users and operators as a major barrier for switching operators and enhancing competition in the market.*
- c) *Based on the findings in the user survey, the TA firmly believes that there exists genuine and substantial demand from mobile subscribers for MNP in Hong Kong.* MNP amongst mobile operators will remove the main obstacle (i.e. number change) of mobile subscribers switching to their preferred operators which can offer them with cheaper handset and service charges, better quality of services, better coverage and more enhanced and innovative network/service features and functionality. It will also further promote and encourage competition in the mobile industry.

**(B) Costs and Benefits of MNP**

**NERA/Smith:**

- a) *There are also considerable benefits from the introduction of MNP. In total, the net present value of benefits ranges from HK\$769 million, under our most pessimistic scenario, to over HK\$1,396 million under the most optimistic scenario.*
- b) *The costs of implementing mobile number portability vary according to the technical option and migration path chosen. Depending on the assumptions made, however, we estimate that the NPV of costs of MNP lies between HK\$512 million and HK\$1,044 million over 10 years. These estimates are based on information gained from interviews with operators and users in Hong Kong, relevant industry contacts, previous international studies and our knowledge of the telecommunications industry.*

- c) *Our cost benefit analysis shows that there will be a net benefit to Hong Kong from the introduction of MNP. The introduction of an interim call forwarding solution - while involving slightly higher costs than a solution that moves straight to a distributed database - still returns net benefits for our central cases and under all of our sensitivity tests.*

**TA's Views:**

- a) The Final Consultancy Report has provided very clear evidence that there is substantial user demand for MNP and concluded that the benefits outweigh the costs with considerable net benefits (net present value) of HK\$461 million over the first ten years if MNP is implemented. *Therefore, the TA considers that MNP should be introduced in Hong Kong as early as possible such that the benefits of MNP could be passed to the community earlier.*

**(C) Technical Implementation Solutions**

**NERA/Smith:**

- a) *We reviewed the technical options for Hong Kong and believe that MNP could be introduced through call forwarding in 6 - 12 months. This would only be an interim solution.*
- b) *In the medium to long term, MNP could be implemented through a distributed database solution with fixed network operators performing the look-up. HKTC, however, appears to be well placed to perform the look-up for all other operators as the vast majority of calls to and from mobile telephones pass through HKTC and HKTI's networks. The existing infrastructure from the introduction of number portability in the fixed network would also help to expedite the introduction of MNP. Over time, other operators could provide the number translation services for themselves or other operators.*

**TA's Views:**

- a) *The TA agrees that the two implementation options, Option 1 and 2, as identified by the Consultants in the Final Consultancy Report, are technically feasible for implementation in Hong Kong.* According to the Consultants, Option 1 is the direct implementation of distributed database solution using FTNS operator look-up which can be implemented by the earliest on 1 July 1999. Option 2 is the migration to distributed database approach via interim call forwarding solution which can be implemented by the earliest on 1 January 1999. It can be seen that the advantage of Option 2 is that it can be implemented earlier than Option 1 by six months. Since fixed network operators are not required

to modify their existing databases and switching infrastructure at the call forwarding interim stage, Option 2 would provide a quicker and more straightforward implementation path of MNP than Option 1 as far startup is concerned.

b) However, there are some disadvantages of Option 2 -

⇒ Due to the implementation of the additional call forwarding stage, the Consultants have already pointed out that the implementation cost of Option 2 will be more expensive than that of Option 1 by about HK\$91 million to HK\$204 million (NPV) over ten years. The reason is that mobile operators need to install additional conveyance circuits and switch resources (particularly at the donor mobile networks) to process and forward the traffic of users with ported numbers to the recipient mobile networks. However, this additional cost, as explained by the Consultants, could be off-set by the additional benefits associated with the earlier introduction of MNP in Hong Kong. However, the expanded circuits and switch resources may no longer be needed after migration to the database solution is completed.

⇒ In the call forwarding interim period, mobile operators have to work out the details and arrangements on the routing of incoming international calls to the ported mobile customers and the settlement of the associated call delivery charges among them. It would not be worthwhile to spend resources to work out such details and arrangements when resources could be better spent in planning and implementing the longer term solution based on database look-up.

⇒ The Operational Support System (OSS) of each mobile operator has to be modified to exchange information about the ported mobile number, to calculate the additional interconnection charges to be paid back by the recipient mobile operator to the donor mobile operator for traffic of ported mobile calls passed between the fixed network and the donor mobile network. The OSS is also required to handle customers' porting requests. The procedures to be established in the interim stage may have to be modified once again when migrating to the longer term solution such as the distributed database solution with FTNS operator look-up as recommended by the Consultants.

c) With regard to Option 1, further discussions with operators have indicated that the 12 months lead-time estimated by the Consultants may be too pessimistic. Taking into account the fact that the existing fixed network operators have already implemented the database and switching

infrastructure for the operation of operator number portability in the fixed networks, the TA does not think that it would take too long a lead time for the fixed network operators to re-dimension or upgrade their existing infrastructure and systems to cater for MNP. In fact, one of the fixed network operators has advised the TA that it will be able to upgrade the existing database and switching equipment within six months and can provide number portability translation services to mobile operators by 1 January 1999. *The TA is therefore quite optimistic that the rest of the fixed network operators should be able to upgrade their systems in this similar time frame i.e. six months to cater for MNP.*

- d) By using the Consultants' given model and spreadsheets, the TA has performed an analysis of the costs and benefits of implementing Option 1 on 1 January 1999, i.e. six months earlier than the Consultants have suggested. The results of the analysis are given as follows -

Migration Option	Churn/Porting Rate	Benefits HK\$ million	Costs HK\$ million	Net Benefits (Benefits - Costs) HK\$ million
Option 1	low churn / low port	814	560	254
	low churn / high port	1267	578	689
	high churn / low port	942	679	263
	high churn / high port	1396	697	699

It can be seen that by advancing the implementation date of Option 1 to 1 January 1999, there would be an improvement in the net benefits compared with the "central case" identified by the Consultants and other scenarios evaluated by the Consultants and summarized in Annex 4.

- e) *After considering the two technical implementation options and the associated net benefits, the TA considers that Option 1 is considered to be a more direct, viable, cost-effective, efficient and sustainable longer term solution than Option 2 to be implemented in Hong Kong. The TA is of the view that with the joint effort and cooperation among all operators, Option 1 could be implemented by 1 January 1999 such as to minimize the costs (about HK\$91 million to HK\$ 204 million NPV over ten years) and maximize the additional benefits (about HK\$102 million NPV over ten years) caused by earlier implementation.*

**(D) Cost Recovery Principles**

**NERA/Smith:**

- a) *In determining how the costs of MNP should be recovered, we have drawn on the principles developed by OFTA for fixed network portability. In short, under our medium term solution, we recommend that mobile operators pay a charge to fixed network operators to provide the look-up service. The way the charge is determined will depend on the way the market develops. If none of the fixed operators were prepared to offer a look-up service to all operators, then a fixed operator may need to be encouraged to provide the service. HKTC appears to be best placed to offer the service if a competitive market could not develop. If HKTC is the only operator offering the look-up service or is requested to provide the service, then this charge would need to be reviewed by OFTA and should be based on the long run average incremental cost of the system set-up costs incurred by HKTC to upgrade its distributed database. If, however, a competitive market develops in the short term, then OFTA may consider leaving the charge to the market and commercial negotiation.*
- b) *Our reasoning is discussed in detail in Chapter 7 but can be summarized in the Table below.*

**Allocating the costs of MNP**

<b>Cost</b>	<b>Technology</b>	
	<b>Call forwarding</b>	<b>Distributed database</b>
<i>System set-up cost</i>	<i>Each operator bears its own costs</i>	<i>Fixed operators or HKTC to recover its costs from all mobile operators</i>
<i>Additional conveyance costs</i>	<i>Donor network operator to recover interconnect charge from recipient network operator. Each operator to bear its own remaining costs</i>	<i>Fixed operators or HKTC to recover its costs from all mobile operators</i>
<i>Per subscriber set-up costs</i>	<i>Donor network operator to recover from recipient network operator</i>	<i>Donor network operator to recover from recipient network operator</i>

**TA's Views:**

- a) *The TA considers that the above cost-recovery framework on the distributed database solution is reasonable and acceptable and in line*

*with the framework and principles already adopted by the TA for the operator number portability in fixed networks.*

- b) Based on this cost-recovery framework, mobile and fixed network operators could enter into commercial negotiations on the provision of fixed network look-up service by the fixed network operators to the mobile operators. *The TA considers that if there is any failure among operators to reach any agreement, they can seek the TA's determination according to the procedures laid down in section 36A of the Telecommunication Ordinance (Cap. 106).*

(E) **International Development and Implementation of MNP**

**NERA/Smith:**

- a) *Singapore has already implemented MNP from April 1997 onwards using simple call forwarding solution. The United Kingdom and the Netherlands have made a decision to implement MNP by the signaling relay solution by 1 January 1999 whereas the United States have mandated MNP to be ready by 30 June 1999. MNP is also under active consideration by many other countries such as New Zealand, Australia and Denmark and is being reviewed at the European Community level. These countries generally agree that the absence of MNP is one of the main barriers to competition in the mobile market.*

**TA's Views:**

- a) *The TA considers that Hong Kong is not the sole place in the world to study and consider MNP. After the successful implementation of operator number portability in the fixed networks by database solution in Hong Kong in January 1997, Hong Kong is well placed for the implementation of MNP. The TA considers that it would be cost-effective and efficient to base on the existing databases and switching infrastructure of the fixed networks for providing MNP for Hong Kong.*

**IMPLEMENTATION ISSUES**

18. *The TA concludes that MNP should be introduced in Hong Kong by the distributed database solution with fixed telecommunication network services operator look-up by the earliest target date. The TA considers that the earliest target date is 1 January 1999.*

19. Under section 3 of the Telephone Ordinance, the TA may issue Codes of Practice relating to the use of numbers and codes in the numbering plan and any Code

so issued may include provisions relating to number portability (section 3(3)(b)). The TA may also issue directions to require a licensee to observe the Codes of Practices issued under section 3(3)(b). Under Special Condition 11 of all licences for Personal Communications Services, the licensee is obliged to conform to any direction by the TA to facilitate the portability of mobile telephone numbers between them. These provisions and licence conditions will form the legal basis for any direction issued by the TA for the implementation of MNP. All mobile operators (i.e. Public Mobile Radiotelephone Services and Personal Communications Services operators) will be directed by the TA to comply with this MNP requirement by a target date to be specified by the TA. The TA intends that this target date be 1 January 1999. The mobile operators are free to set up their own systems to do the database look-up for themselves or acquire database look-up service from any fixed network operators who are capable of providing this service to them.

20. For the efficient and successful implementation of MNP, the fixed networks, especially the network of HKTC, should also be equipped with the capability to handle MNP because most of the traffic nowadays are between fixed and mobile customers. If the database look-up capability were only provided in the mobile networks, there would be inefficiencies due to the need to “trombone” calls to and from the mobile networks for database look-up. The TA intends to use competition to provide the commercial incentive for fixed network operators to upgrade and expand their existing databases and switching equipment to provide database look-up service for the mobile operators. All FTNS operators will be invited to advise the TA the earliest target date by which they are able to provide database look-up service. If the FTNS operators are unable to provide the database look-up service by the target date which the TA has suggested, the TA will consider licensing non-FTNS operators to provide the database look-up service on a competitive basis and mandate interconnection between such databases and the FTNS networks under section 36A of the Telecommunication Ordinance.

## **IMPLEMENTATION PLAN**

21. ***OFTA will set up an Implementation Task Force in the 3rd week of June 1998 and invite the representatives of all fixed and mobile operators to participate.*** The terms of reference of this Implementation Task Force will be to discuss and work out the technical and operational details of implementing the distributed database solution with fixed network operator look-up among operators in Hong Kong. This Implementation Task Force will also discuss and confirm the target date of 1 January 1999 suggested by the TA for implementation. It is hoped that the Task Force will complete all the discussions and works by the end of July 1998 such that operators would have time for the implementation of MNP.

22. As a parallel process, operators should also start their commercial discussions and negotiations on MNP. All fixed and mobile operators should provide regular reports to the TA on their progress of commercial discussions and MNP

implementation in order that the TA can monitor the situation to ensure that MNP could be provided on time by 1 January 1999. If the progress of negotiations among operators and the implementation is unsatisfactory, the TA may consider to intervene.

23. Any enquiries on this Statement should be addressed to the Telecommunications Authority to the following address:-

Office of the Telecommunications Authority  
29/F, Wu Chung House  
213, Queen's Road East  
Wanchai  
Hong Kong

[Attn: Senior Telecommunications Engineer (Technical Support 2)  
Telephone no. 2961 6611  
Fax no. 2803 5112]

**Office of the Telecommunications Authority**  
9 June 1998

**Summary of Comments/Views from Respondents on  
Consultation Paper - Number Portability for Mobile Services in Hong Kong**

By the end of the consultation on 31 August 1997, OFTA received altogether 20 submissions from the industry on the Consultation Paper - Number Portability for Mobile Services in Hong Kong. Their major comments and views are summarised below -

<p><b>Hong Kong Telecom CSL Ltd. (HKTCSL) :</b></p>	<ul style="list-style-type: none"> <li>• HKTCSL suggests that a comprehensive study including quantifiable figures would be required before the decision is made on mobile number portability (MNP).</li> <li>• It is doubtful whether the option of number portability is the most favourable method of further enhancing competition among other alternatives.</li> <li>• Flexibility should be allowed in fulfilling the number portability user requirements and the technology neutral policy should be upheld.</li> <li>• It may not be appropriate to simply adopt the call forwarding approach in FTNS as an interim solution to the mobile industry.</li> <li>• HKTCSL expects that there will be another opportunity to consult the industry and interested parties regarding the implementation issues, if it is decided to introduce MNP.</li> </ul> <p><i>OFTA's Response: The workshop held on 25 February 1998 with the industry on the preliminary findings and recommendations of MNP was very successful and OFTA had received many useful comments from the industry including those from HKTCSL.</i></p>
<p><b>Hutchison Telecommunications (HK) Ltd. (Hutchison) :</b></p>	<ul style="list-style-type: none"> <li>• Hutchison comments that Hong Kong should not implement MNP for at least the next three years at which point the availability and cost of proven technology can be weighed against a proper understanding of the real benefit of number portability.</li> </ul> <p><i>OFTA's Response: In fact, some countries in the</i></p>

	<p><i>world have realised the benefits of MNP and have already decided to implement MNP using either call forwarding solution or database solution. OFTA does not agree with Hutchison to delay the implementation of MNP if there are net benefits accrued from it.</i></p> <ul style="list-style-type: none"> <li>• It comments that call forwarding is definitely not a feasible interim solution since most cellular switches currently in use are not designed for a high volume of call forwarded traffic.</li> <li>• It proposes that the TA should conduct a comprehensive market research and cost benefit analysis to establish the demand for and actual benefits of MNP in Hong Kong.</li> <li>• It considers that it is totally inappropriate to mandate very substantial financial investment in unproven technology in pursuit of perceived consumer benefits which have yet to be quantified or the demand for which established.</li> </ul>
<p><b>SmarTone Mobile Communications Ltd. (SmarTone) :</b></p>	<ul style="list-style-type: none"> <li>• SmarTone comments that the costs to implement and maintain the facilities of number portability is substantial and such costs would impose a heavy financial burden on the mobile industry. Further studies should be carried out to ascertain if it is justified to implement number portability.</li> <li>• It comments that further investigation should also be undertaken on the quantified and intangible burden on Hong Kong due to the longer time delay in connecting calls under number portability environment.</li> <li>• It considers that call forwarding is not a viable interim solution.</li> <li>• Hong Kong already has one of the highest rate of subscribers' change of operators. Such high rate of change is already facilitated by handset subsidisation and various inducements to change operators. Further studies should be carried out on whether it is desirable to further facilitate such change arising from number portability.</li> <li>• Consumers' demand for MNP should be further studied on the basis that the substantial costs in</li> </ul>

	<p>implementing number portability would at least be partly borne by the consumers.</p>
<p><b>Pacific Link Communications Ltd. (Pacific Link) :</b></p>	<ul style="list-style-type: none"> <li>• Pacific Link recommends OFTA and the industry to jointly conduct an extensive study on IN and database solutions, as well as on the genuine demand for MNP and the impacts of cost recovery on the demand of the service.</li> <li>• It strongly objects the use of call forwarding as an interim measure of MNP.</li> </ul>
<p><b>Joint Submission by 4 PCS operators - Mandarin Communications Ltd., Peoples Telephone Company Ltd., P Plus Communications Ltd. and New World PCS Ltd. :</b></p>	<ul style="list-style-type: none"> <li>• The PCS operators unequivocally support the introduction and implementation of MNP in Hong Kong.</li> <li>• They comment that the TA should set out an industry forum for the purpose of discussing the matter both technically and commercially in detail.</li> <li>• The mobile operators would be allowed to have the flexibility in determining whether to “buy or build” based on their own technical and commercial decision.</li> <li>• The TA should immediately give direction as to the commencement of all the necessary technical works and mandate the full implementation of this number portability for mobile solution (i.e. call forwarding as an interim solution) by the end of 1997.</li> </ul> <p><i>OFTA’s Responses: OFTA has commissioned the Consultants to conduct a thorough study of MNP.</i></p> <ul style="list-style-type: none"> <li>• IN solution Option 3 should be implemented no later than the end of 1998.</li> </ul>
<p><b>Joint Submission on cost recovery principles by 3 PCS operators - Mandarin Communications Ltd., Peoples Telephone Company Ltd., and P Plus Communications Ltd. :</b></p>	<ul style="list-style-type: none"> <li>• The PCS operators comment that the cost recovery must be clearly defined before any technical option is concluded.</li> <li>• HKTI should be responsible for routing the call and distributing the relevant incoming international call delivery fee to the correct terminating network.</li> <li>• For IN or database solution, the underlying principle should be that the originating network should be responsible for performing the number translation or database dip function. If originating network is a</li> </ul>

	<p>mobile network, it may choose to rely on another network to perform this function on its behalf with the paying of relevant interconnection charge to that network.</p> <ul style="list-style-type: none"> <li>• FTNS operators are obliged to perform number translation function for calls originated from its own direct access customers without any compensation.</li> <li>• A fixed network will be responsible for the number translation for calls to ported mobile numbers originated from mobile network interconnected with the fixed network concerned. FTNS operators may be compensated through the interconnection fee they received from the originating mobile networks.</li> <li>• The Donor Network and relevant FTNS operators may be compensated for an one-off per-number set-up cost only. This fee should cover the relevant administrative cost only and be paid by the Recipient Network.</li> </ul>
<p><b>New World PCS Ltd. (NW PCS) :</b></p>	<ul style="list-style-type: none"> <li>• NW PCS urges the TA to reconsider various technical approaches together with the actual cost involved altogether, so that all the mobile operators will have the chance to make a proper decision.</li> <li>• It believes that the TA should impose a ceiling price pursuant to Section 36A of the Telecommunication Ordinance which the FTNS operators may charge on the mobile operators. It is up to the mobile operators to negotiate with any of the FTNS operators for a lower competitive price for the provision of number portability or translation services.</li> </ul>
<p><b>Peoples Telephone Company Ltd. (Peoples Telephone) :</b></p>	<ul style="list-style-type: none"> <li>• Peoples Telephone favours the rapid introduction of Number Portability and see Call Forwarding Option as the ideal method, as an interim solution. The adoption of an interim solution will allow all parties involved the time to consider the most effective and efficient long term solution.</li> </ul>

<p><b>Hong Kong Telecom International Ltd. (HKTI) :</b></p>	<ul style="list-style-type: none"> <li>• HKTI believes that it has no licence obligation to provide the MNP but they will be prepared to consider to upgrade its network for MNP on the condition that it is entitled to recover all the relevant costs to be incurred</li> <li>• If a regulatory framework which ensures that HKTI will be able to recover all relevant costs, HKTI is prepared to negotiate with the mobile operators on the amount involved. If HKTC cannot reach commercial agreements with other mobile network operators, it will continue to route mobile calls to the mobile network operators according to the numbering prefixes originally allocated to each mobile network.</li> <li>• With no upgrade/expansion on the current database platform, HKTI cannot handle the requirement of number portability for mobile services.</li> <li>• MNP should only be implemented provided that there must be a fair cost recovery mechanism in place.</li> </ul>
<p><b>Hong Kong Telephone Co. Ltd. (HKTC) :</b></p>	<ul style="list-style-type: none"> <li>• HKTC does not believe that it has any obligation to provide number portability for mobile networks but they are prepared to consider on the condition that it is entitled to recover all the relevant costs to be incurred.</li> <li>• It will not take any action to implement MNP without assurance that it will recover full costs. If HKTC cannot reach commercial agreements with other mobile network operators, it will continue to route mobile calls to the mobile network operators according to the numbering prefixes originally allocated to each mobile network.</li> <li>• It considers that the IN/database approach might not be the optimum option for MNP.</li> <li>• If the existing IN/Database platform at HKTC is to be used to handle the additional mobile number portability, HKTC will need a major system upgrade and significantly expand the capacity in order to cater for the forecast demand of ported mobile traffic. The upgrade and expansion will take a certain lead time depending on the forecast demand.</li> <li>• It suggests OFTA to conduct a detailed study on the</li> </ul>

	<p>technical and interconnection aspects of the Call Forwarding with Drop-back approach to implement MNP.</p> <ul style="list-style-type: none"> <li>• It is of the view that OFTA should take a technology-neutral approach towards the implementation of number portability for mobile services in Hong Kong.</li> <li>• MNP should only be introduced provided that there must be a fair cost recovery mechanism in place.</li> </ul>
<b>New T &amp; T Hong Kong Ltd. (New T&amp;T) :</b>	<ul style="list-style-type: none"> <li>• New T&amp;T supports MNP.</li> <li>• IN option should be used from the beginning.</li> <li>• A combination of approaches should be considered depending on the specific needs of each mobile operator.</li> <li>• It strongly supports TA's view on the need for cost recovery and encourages the TA to establish a fair and efficient system.</li> <li>• It supports the establishment of the proposed industry forum.</li> </ul>
<b>Consumer Council</b>	<ul style="list-style-type: none"> <li>• Consumer Council agrees that the growing customer base and the choice of networks available will create a demand for MNP in Hong Kong.</li> <li>• Consumer Council believes MNP should be introduced using the same architectural options as fixed number portability.</li> <li>• The arrangements should follow the cost recovery principles for FTNS.</li> </ul>
<b>Mr. Paul Berriman, A Member of the Telecommunications Numbering Advisory Committee(TNAC)</b>	<ul style="list-style-type: none"> <li>• Mr. Berriman suggests to mandate the implementation of MNP as soon as possible.</li> <li>• He suggests to implement the call routing/number translation in exactly the same way as that for FTNS.</li> <li>• The TA should implement Option 1 and mandate the management system to comply and conform to and integrate with the agreed fixed network reference database system and performance specifications.</li> </ul>

	<ul style="list-style-type: none"> <li>• The cost recovery should conform to the same principles as that for the FTNS.</li> </ul>
<p><b>Dr. Charles Lam, A Member of the Telecommunications Users and Consumers Advisory Committee (UCAC)</b></p>	<ul style="list-style-type: none"> <li>• Dr. Lam supports there would be some genuine demands and requirements from customers for MNP.</li> <li>• He supports that the IN approach would be adopted for MNP as the long-term solution and call forwarding technique could be used as an interim solution.</li> <li>• He queries about that as the progress of negotiation amongst fixed operators on the compensation arrangements are not satisfactory. This means that the current approach does not seem to be effective, why does OFTA need to repeat it? OFTA should have the responsibility to intervene any potential anti-competitive tactics from more powerful operators.</li> </ul>
<p><b>Hong Kong Coalition of Service Industries c/o The Hong Kong General Chamber of Commerce (HKCSI) :</b></p>	<ul style="list-style-type: none"> <li>• HKCSI agrees with OFTA's view that there are considerable merits in introducing number portability for mobile services for Hong Kong. In order to remove the barrier to competition, it supports to implement MNP as soon as practicable.</li> <li>• The architectural options would be selected by the network operators whichever they prefer and the main criteria should be that the calls should arrive at the gateway between networks in an agreed or standardised format.</li> <li>• Option 1 is supported.</li> <li>• It believes that the cost recovery on MNP should conform to the same principles as applied to the FTNS.</li> </ul>
<p><b>Contactica (Asia) Ltd. (Contactica) :</b></p>	<ul style="list-style-type: none"> <li>• Contactica supports OFTA to mandate MNP in Hong Kong.</li> <li>• IN solution is the preferred technology in long term.</li> <li>• The launch of MNP should not be hindered by cost recovery negotiation as any cost incurred could be remitted retrospectively by retrieving the past traffic data, if necessary.</li> </ul>

<p><b>Nokia Telecommunications (HK) Ltd. (NTC) :</b></p>	<ul style="list-style-type: none"> <li>• NTC suggests the use of call drop back as a means of call re-route from originating to the recipient network.</li> <li>• The mobile numbers are used in some existing GSM features and the fact that ported subscriber owns two directory numbers in the donor and recipient networks may create confusion and hence restrictions on a few GSM services (Short Message Service and Calling Line Identification Presentation when roaming, CLIP)</li> <li>• NTC believes further fine-tuning of Option 2 suggested by OFTA can be optimised solution for number portability. However, there are still some fundamental challenges in cost recovery and implementation which requires further rounds of discussion among concerned parties.</li> </ul>
<p><b>Hong Kong Communications Equipment Co. Ltd. (HKC) :</b></p>	<ul style="list-style-type: none"> <li>• HKC supports the idea of implementing MNP for the reasons of more choices of operators for consumers, promotion of healthy competition among operators and larger market for handsets and thus benefiting the economy.</li> <li>• The cost recovery should be minimal since the operators would benefit in the long term.</li> </ul>
<p><b>New World Telephone Co. Ltd. (NWT) :</b></p>	<ul style="list-style-type: none"> <li>• NWT shares the views of NWPCS and supports that MNP should be implemented as soon as it is technical feasible. It concurs that if IN is chosen as the long term solution, Option 3 is the most cost and technically effective solution.</li> <li>• It thinks that the TA should also consider other forms of technologies such as call drop back or call rerouting as the alternative of number translation and routing arrangement.</li> <li>• It basically supports the application of the cost recovery principles as delineated in Statement No. 1 and the TA should make reference to the corresponding cost recovery principles for FTNS as depicted in the recent consultation.</li> <li>• It recommends that the additional cost incurred by NWT in upgrading its IN platform and database to cater for MNP should be recoverable from the mobile</li> </ul>

	<p>operators.</p> <ul style="list-style-type: none"> <li>• The Recipient Network Operator should be responsible for the per line set up cost incurred by the Donor Network Operator for a Number Portability Request made by the RNO.</li> <li>• For any calls originating from a FTNS network and terminating at a ported mobile network under Options 1 and 3 of the IN solution, the relevant FTNS operator would have to route all such calls to the appropriate ported numbers and the cost should not be recoverable by the FTNS operators from mobile network operators.</li> <li>• Under Option 3 IN solution, FTNS operators can recover the cost from mobile network operators for a call originating from a mobile network and terminating at a ported mobile network through commercial agreement between relevant parties.</li> </ul>
<p><b>Hong Kong Telecommunications Users Group (HKTUG) :</b></p>	<ul style="list-style-type: none"> <li>• HKTUG is in total agreement with the TA’s view that the introduction of MNP would remove the hindrance for mobile customers to move to their preferred operators therefore promote and encourage competition in the mobile industry.</li> <li>• HKTUG is concerned about the approach of implementation of MNP as the cost will ultimately be transferred to the end-users. Therefore, the most cost-effective approach should be agreed and adopted.</li> <li>• It looks forward to OFTA to set the framework for MNP.</li> </ul>

**Summary of Comments and Views from Industry on  
the Preliminary Report on the Feasibility Study and Cost Benefit  
Analysis of Number Portability for Mobile Services in Hong Kong**

The Office of the Telecommunications Authority (OFTA) held an industry workshop on 25 February 1998 to present to and discuss with the industry on the preliminary findings and recommendations of the Consultants, National Economic Research Associates (NERA) and Smith System Engineering (Smith) in the “Preliminary Report on the Feasibility Study and Cost Benefit Analysis of Number Portability for Mobile Services in Hong Kong”. Subsequently, OFTA received in total 13 submissions from the industry and had passed them to the Consultants for consideration and incorporation into the Final Consultancy Report. Their major views and comments are summarized in the tables below :

**General Comments on MNP Introduction in Hong Kong**

<p><b>Shun Hing Technologies Company Ltd. (Shun Hing)</b></p>	<p>Shun Hing welcomes the introduction of number portability for mobile services in Hong Kong. It supports the following major findings :</p> <ul style="list-style-type: none"> <li>a) MNP in Hong Kong will yield significant net benefits.</li> <li>b) Simple call forwarding could be implemented as an interim solution as soon as January 1999.</li> <li>c) A distributed database solution is the preferred medium term solution and this could be implemented by January 2000.</li> </ul>
<p><b>Dr. Charles Lam - A member of the Telecom User and Consumer Advisory Committee (UCAC)</b></p>	<p>Dr. Charles Lam supports MNP in Hong Kong. He believes consumers would like it.</p> <p>Once MNP is to go ahead, the operational and administrative procedures should be made as simple as possible. For example, the time required to port numbers should be in terms of hours if not minutes, and not days.</p> <p>All network operators should be allowed to choose freely whether they would provide the look-up services for themselves and which network operators to do the</p>

	look-up for them.
<i>OFTA's response</i>	<i>Noted. No major disagreement. Simple call-forwarding would not be adopted as the implementation approach.</i>

### **Technical Implementation Options - Call Forwarding Solution**

<b>Hong Kong Telephone Company Ltd. (HKTC)</b>	HKTC disagrees to adopt the call forwarding approach, rather MNP should go direct to distributed database solution considering the extra efforts and risks in implementing a two-stage solution (i.e. from call forwarding as interim followed by distributed database solution).
<b>SmarTone Mobile Communications Ltd. (SmarTone)</b>	SmarTone considers it not justified to introduce MNP by call forwarding because of substantial costs to be incurred. SmarTone urges OFTA not to consider call forwarding option as the potential solution for MNP in Hong Kong.
<b>Hong Kong Telecom International Ltd. (HKTI)</b>	If the interim call forwarding solution is adopted, HKTI will route incoming international mobile calls to the mobile networks according to the numbering prefixes originally allocated to mobile operators. HKTI will settle the delivery fees with the mobile network operators for which the calls are routed in accordance with the numbering prefixes. The donor, transit and recipient network operators should settle among themselves if the concerned mobile numbers have been ported from one mobile network to another.
<b>Hong Kong Telecom CSL Ltd. (HKTCSL)</b>	In view of the issues of call forwarding interim arrangement, HKTCSL considers that there is no justification to recommend any two-stage approach in the final report.
<b>Joint Submission by 4 PCS Operators :- Mandarin Communications Ltd.,</b>	The PCS operators consider that call forwarding is a viable interim solution for MNP in Hong Kong which requires minimal modifications to the switching equipment.

<b>Peoples Telephone Company Ltd., New World PCS Company Ltd.; and P Plus Communications Ltd. (The PCS operators)</b>	
<i>OFTA's response</i>	<i>After considering the pros and cons of the two-stage approach, call forwarding will not be adopted in the implementation. Detailed reasons are given in the Statement.</i>

**Technical Implementation Options - Distributed Database Solution with Fixed Network Look-up Service**

<b>Hong Kong Telecom CSL Ltd. (HKTC)</b>	HKTC agrees that “Fixed Network Look-up” solution achieves close to optimum routing of calls to ported numbers.
<b>Joint Submission by 4 PCS Operators</b>	The PCS operators agree that “External Database - Fixed Network Lookup” is the recommended approach for medium term solution. Nevertheless, they object to the proposal that only HKTC performs the MNP database look-up. MNP database lookup should be treated as a new service which can be provided by any Fixed Network Operators (FNO) and mobile operators in Hong Kong.
<b>Hong Kong Telephone Company Ltd. (HKTC)</b>	HKTC considers that using the distributed database service of HKTC to provide MNP will be a pragmatic approach and the most cost-effective solution.
<b>Hong Kong Telecom International Ltd. (HKTI)</b>	HKTI regards the distributed database solution more cost effective in consideration of the routing and billing arrangements required.
<b>New T &amp; T (Hong Kong) Ltd. (New T &amp; T)</b>	New T & T supports the distributed database look-up solution. To cope with the problems of administration and database synchronization, the number of Number Portability (NP) databases should be minimized by deploying a common NP for Fixed Network Operators (FNO) and Mobile Network Operators (MNO). FNOs would provide NP translation for MNO's traffic or FNOs would provide direct NP database look-up for MNOs.

<b>New World Telephone Company Ltd. (NWT)</b>	NWT supports the “Fixed Network Look-up” option under distributed database solution but disagrees that HKTC be the only FTNS operator who performs the database lookup.
<i>OFTA’s response</i>	<i>The TA agrees that fixed network operators should be encouraged to provide the database look-up services on a competitive basis.</i>

### Technical Implementation Options - Migration Options

<b>Hutchison Telecommunications (HK) Ltd. (Hutchison)</b>	<p>The early implementation of MNP by January 1999 cannot be supported.</p> <p>The adoption of the medium term solution saves unnecessary resources being wasted in migration, as well as reducing the risk of service interruption during migration.</p>
<b>Hong Kong Telecom CSL Ltd. (HKTCSL)</b>	A two-stage migration would cost more if not much more than a direct migration path.
<b>Joint Submission by 4 PCS Operators</b>	<p>If MNP implementation can start from April 1998, the effective date for MNP launch will be October 1998 using “Call Forwarding” interim solution. Six months would be sufficient for finalizing porting procedures, OSS developments and network testing.</p> <p>With the experience gained from the implementation of fixed number portability, the medium-term solution of using “External Database - Fixed Network Lookup” should be able to be implemented within 12 months after the “Call Forwarding” interim solution is in place.</p>
<i>OFTA’s response</i>	<i>The TA will work out with the operators the earliest implementation date for the database look-up solution. There is evidence to show that the database look-up services can be made available by 1 January 1999.</i>

### Costs of MNP Introduction

<b>Hong Kong Telephone Company Ltd. (HKTC)</b>	HKTC expresses reservations on the costs associated with switch software upgrades, OSS development and implementation, AD systems, procedural changes, off-switch solution, migration and extra signalling given in Chapter 4 of the Preliminary Report.
<b>Hong Kong Telecom CSL Ltd. (HKTCSL)</b>	HKTCSL points out that the assumption in Preliminary Report that a 10 % cost reduction annually for equipment might suggest that the later the MNP project is implemented, the lower the value will be.
<i>OFTA's response</i>	<i>In the final report, the annual reduction of equipment cost has been changed to 5 per cent. Although the late implementation MNP will reduce the cost, it will also reduce the benefits. Since the amount of benefits will outweigh the amount of costs, late implementation of MNP is considered not desirable.</i>

### **Benefits of MNP**

<b>Hutchison Telecommunications (HK) Ltd. (Hutchison)</b>	<p>Hutchison does not agree with the penetration rate and churn rate assumptions used in calculating Type 1A benefits and considers the results inaccurate and over-estimated.</p> <p>Hutchison considers that a proper evaluation of the benefit of MNP can only be carried out after a detailed analysis of the user study carried out by SOFRES FSA.</p>
<b>SmarTone Mobile Communications Ltd. (SmarTone)</b>	SmarTone expresses reservation on the magnitude as well as the basis, methodology and calculation of the costs and benefits in the Preliminary Report.
<i>OFTA's Response</i>	<p><i>The survey questionnaire and the results of the survey have been attached as appendices in the final report for operators' reference.</i></p> <p><i>As explained by NERA/Smith, the assumptions used in calculating costs and benefits came from discussions</i></p>

	<p><i>with operators and their responses to questionnaire. Indeed, the estimates used in the report were drawn from the survey of mobile users in Hong Kong, interviews with mobile operators and other parties, international experience, and other available data. The user survey was conducted by SOFRES FSA between December 1997 and February 1998. They interviewed 450 personal subscribers, 450 small to medium business users, and 100 large corporate firms across Hong Kong in order to determine their views on mobile services, their switching behaviour and their attitude to MNP. The survey composition - determined by NERA and agreed by OFTA - is generally consistent with the relative size of each group of those subscribers in the UK.</i></p>
<p><b>Hong Kong Telecom CSL Ltd. (HKTCSL)</b></p>	<p>HKTCSL considers the calculation of Type 1A benefits using average switching costs inappropriate.</p> <p><i>OFTA's response :</i></p> <p><i>As explained by NERA/Smith, the weighted average switching costs have been used for the cost benefit analysis in the final report.</i></p>
<p><b>Hong Kong Telecom CSL Ltd. (HKTCSL)</b></p>	<p>HKTCSL considers that the estimates of Type 1A benefits will change significantly the estimated discount rate. It considers that 6 per cent discount rate is not appropriate for a dynamic business like mobile. A higher percentage should be considered and a sensitivity test should be taken.</p> <p><i>OFTA's response :</i></p> <p><i>As explained by NERA/Smith, the cost-benefit analysis is being undertaken from a national perspective, the discount rate used is one typically used for public sector projects, namely 6 per cent in real terms. The chosen rate ought ideally to reflect the rate of social time preference and the opportunity cost of capital (i.e. the marginal return on private sector projects).</i></p>

## Cost Recovery Principles

### System Setup Costs under Call Forwarding Solution

<b>Hong Kong Telephone Company Ltd. (HKTC)</b>	If call forwarding is chosen as interim solution, HKTC should not be responsible for such setup costs. HKTC should be properly recovered especially considering that such an expanded setup may only be utilized for a short period of time.
<b>Hong Kong Telecom CSL Ltd. (HKTCSL)</b>	For call forwarding interim solution, the Recipient Network Operator (RNO) should bear the set-up cost of the Donor Network Operator (DNO).
<b>Joint Submission by 4 PCS Operators</b>	The PCS operators supports that each operator should bear its own system setup costs.
<b>Hong Kong Telephone Company Ltd. (HKTC)</b>	HKTC finds that under both the call forwarding and distributed database solutions, HKTC needs to expand its network to cater for MNP requirements. While it is recommended that HKTC can have setup cost recovery from all mobile operators under the distributed database solution, it should be applied to the call forwarding solution rather than “each operator bears its own setup costs”.
<b>OFTA’s response</b>	<i>The Consultants have now proposed the cost recovery principles. The TA considers that the principles proposed by the consultants are sound. The principles recognize that in the Hong Kong environment, all fixed-to-mobile calls are paid for by the mobile customers. There is also a lack of obligations on the part of the fixed network operators to implement MNP. It is therefore fair for the mobile industry to bear the costs of MNP. When the mobile operators pass the costs on to the mobile users would be their commercial decisions.</i>

### Additional Conveyance Cost under Interim Call Forwarding Solution

<b>Hong Kong Telecom CSL Ltd. (HKTCSL)</b>	The additional conveyance costs incurred by the donor network should be reimbursed by the recipient network.
<b>Joint Submission by 4 PCS Operators</b>	Additional conveyance costs should not be charged to RNO only. DNO and RNO shall each be responsible for half of the additional conveyance cost. Alternatively, RNO pays all the additional conveyance costs and OFTA needs to mandate “direct interconnection” between DNO and RNO, justifiable by cost minimization.
<b>Hong Kong Telephone Company Ltd. (HKTC)</b>	HKTC supports the recommendation that the recipient network should reimburse the donor network for additional conveyance costs.
<i>OFTA’s response</i>	<i>Comments noted. No longer applicable as call forwarding would not be used.</i>

### Per Subscriber Setup Cost Under Call Forwarding

<b>Joint Submission by 4 PCS Operators</b>	RNO should pay the DNO for “reasonable relevant cost based on LRAIC”.
<b>Hong Kong Telephone Company Ltd. (HKTC)</b>	The costs incurred by the DNO should be recovered from the RNO.
<b>New T &amp; T (Hong Kong) Ltd. (New T &amp; T)</b>	New T & T considers that the DNO should recover the per subscriber set-up cost from the RNO.
<i>OFTA’s response</i>	<i>Comments noted. No longer applicable as call forwarding would not be used.</i>

### System Setup Costs for Database Solution

<p><b>New T &amp; T (Hong Kong) Ltd.</b> (New T &amp; T)</p>	<p>An FNO providing number portability database lookup should be fairly compensated by the Mobile Network Operators (MNOs). For a FNO supporting MNP look-up, they should be compensated for system setup cost by : a) the MNO who uses its database look-up service for all its originating calls to both MNOs and FNOs; and b) the terminating MNO to which the FNO's owns calls are destined.</p>
<p><b>Joint Submission by 4 PCS Operators</b></p>	<p>The PCS operators support that each party (mobile operators, HKTC and other FTNS operators, and international carriers) shall bear its own system setup costs.</p>
<p><i>OFTA's response</i></p>	<p><i>Comments noted. No longer applicable as call forwarding would not be used.</i></p>

### Database Lookup Cost under Distributed Database Solution

<p><b>Hong Kong Telecom CSL Ltd.</b> (HKTC SL)</p>	<p>HKTC SL recommends that the conveyance charge be divided into two categories : (1) the charge per database lookup and (2) the traditional call conveyance cost without database lookup. The charge per database lookup should be paid by the recipient network for both calls originated from the fixed network and any mobile network. The current interconnection charges for call conveyance would still be applied and no modification is required.</p>
<p><b>Joint Submission by 4 PCS Operators</b></p>	<p>The PCS operators object to the proposal that database lookup have to be paid by the RNO because there is no contractual relationship between the RNO and FNO. The PCS operators considers that originating network operator pays for look-up with OFTA setting the price cap on the FTNS operators.</p>
<p><i>OFTA's response</i></p>	<p><i>In the Hong Kong environment, all fixed-to-mobile calls are paid for by the mobile customers. There is also a lack of obligations on the part of the fixed network operators to implement MNP. It is therefore fair for the RNO to bear the costs of database look-up.</i></p>

**Per Subscriber Setup Cost under Distributed Database Solution**

<b>Joint Submission by 4 PCS Operators</b>	The PCS operators agree that DNO should be able to recover a reasonable relevant sum from the RNO. The basis of charges should be based on LRAIC plus a reasonable share of common costs.
<b>New T &amp; T (Hong Kong) Ltd. (New T &amp; T)</b>	New T & T considers that the DNO should recover the per subscriber setup cost from the RNO. For FNO providing database lookup service to an MNO, the FNO should be able to recover from MNO a reasonable portion of the per-subscriber setup cost for each instance of ported mobile and FTNS number.
<b><i>OFTA's response</i></b>	<i>As the RNO is benefiting from the MNP arrangement, it is fair for the DNO and the FNO to recover a reasonable amount of the per-subscriber set up costs from the RNO.</i>

Annex 3

**FEASIBILITY STUDY & COST BENEFIT  
ANALYSIS OF NUMBER PORTABILITY  
FOR MOBILE SERVICES  
IN HONG KONG**

**Final Report for OFTA**

**Prepared by NERA and  
Smith System  
Engineering**

May 1998  
London

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## **EXECUTIVE SUMMARY**

- 1) In December 1997, the Office of the Telecommunications Authority (OFTA) in Hong Kong commissioned National Economic Research Associates (NERA) and Smith System Engineering to conduct a feasibility study and a cost benefit analysis of mobile number portability (MNP). The main issues considered were:
  - technical options for MNP in Hong Kong;
  - costs of implementing MNP;
  - demand for, and estimates of, MNP;
  - options to recover the costs of portability.
- 2) This is the final report to OFTA. The assumptions made in this report to determine the costs and benefits follow discussions we have had with the industry and other telecommunications experts. This report also incorporates the comments received on the preliminary report which was presented to the industry in Hong Kong in February 1998.
- 3) The mobile market in Hong Kong is currently very competitive. By the end of 1997, seven mobile operators operated eleven digital networks with over 2 million subscribers. The market shows signs of continued growth. We forecast that the penetration rate will grow to 60 per cent in 2007.
- 4) OFTA believes that there is scope for future improvements. It considers the availability of number portability as essential for the further development of telecommunications in Hong Kong and for the delivery of enhanced benefits to consumers.
- 5) We reviewed the technical options for Hong Kong and believe that MNP could be introduced through call forwarding in 6-12 months. This would only be an interim solution.
- 6) In the medium to long term, MNP could be implemented through a distributed database solution with fixed network operators performing the look-up. HKTC (Hong Kong Telephone Company Limited), however, appears to be well placed to perform the look-up for all other operators as the vast majority of calls to and from mobile telephones pass through HKTC and HKTI's (Hong Kong Telecom International Limited) networks. The existing infrastructure from the introduction of number portability in the fixed network would also help to expedite the introduction of MNP. Over time, other operators could provide the number translation services for themselves or other operators.
- 7) The costs of implementing mobile number portability vary according to the technical option and migration path chosen. Depending on the assumptions made, however, we estimate that the NPV (Net Present Value) of costs of MNP lies between HK \$512 million and HK \$1,044 million over 10 years. These estimates are based on

information gained from interviews with operators and users in Hong Kong, relevant industry contacts, previous international studies and our knowledge of the telecommunications industry.

- 8) A wide range of consumers will benefit from the MNP in Hong Kong. Mobile subscribers will be able to switch operators and avoid the costs and inconvenience associated with a number change. Competition in the industry will be heightened as a barrier to switching is removed further benefiting residential and business users. Callers to mobile phone subscribers will be able to complete calls successfully in those cases where the subscriber has changed their mobile operator. We have captured these benefits in the following categories:
- Type 1 benefits which accrue to subscribers who retain their telephone number when switching operator, and include:
    - cost savings from not having to change mobile number; and
    - cost savings from switching to more efficient operators.
  - Type 2 benefits which are the efficiency improvements and any associated price reductions which result from increased competition;
  - Type 3 benefits which are the savings as a result of there being fewer number changes.
- 9) There are also considerable benefits from the introduction of MNP. In total, the net present value of benefits ranges from HK\$769 million, under our most pessimistic scenario, to over HK\$1,396 million under our most optimistic scenario.
- 10) Our cost benefit analysis shows that there will be a net benefit to Hong Kong from the introduction of MNP. The introduction of an interim call forwarding solution - while involving slightly higher costs than a solution that moves straight to a distributed database - still returns net benefits for our central cases and under all of our sensitivity tests.
- 11) In determining how the costs of MNP should be recovered, we have drawn on the principles developed by OFTA for fixed network portability. In short, under our medium term solution, we recommend that mobile operators pay a charge to fixed network operators to provide the look-up service. The way the charge is determined will depend on the way the market develops. If none of the fixed operators were prepared to offer a look-up service to all operators, then a fixed operator may need to be encouraged to provide the service. HKTC appears to be best placed to offer the service if a competitive market could not develop. If HKTC is the only operator offering the look-up service or is requested to provide the service, then this charge would need to be reviewed by OFTA and should be based on the long run average incremental cost of the system set-up costs incurred by HKTC to upgrade its distributed database. If, however, a competitive market develops in the short term, then OFTA may consider leaving the charge to the market and commercial negotiation.

- 12) Our reasoning is discussed in detail in Chapter 7 but can be summarised in the Table below.

### Allocating the costs of MNP

<b>Cost</b>	<b>Technology</b>	
	<b>Call forwarding</b>	<b>Distributed database</b>
System set-up cost	Each operator bears its own costs	Fixed operators or HKTC to recover its costs from all mobile operators
Additional conveyance costs	Donor network operator to recover interconnect charge from recipient network operator. Each operator to bear its own remaining costs	Fixed operators or HKTC to recover its costs from all mobile operators
Per subscriber set-up costs	Donor network operator to recover from recipient network operator	Donor network operator to recover from recipient network operator

**Cost Benefit Analysis of MNP (NPV over 10 years in HK\$ million) of 6% Discount Rate**  
**(Based on Scenarios Examined by NERA/Smith)**

Migration Option	Scenario	Churn/Porting Rate	Benefits	Costs	Net Benefits (Benefits - Costs)
Option 1	Realistic implementation date of 1 July 1999	low churn / low port	795	548	247
		low churn / high port	1233	565	668
		medium churn / low port	855	666	189
		medium churn / high port	1294	683	611
	Pessimistic implementation date of 1 January 2000	low churn / low port	769	512	257
		low churn / high port	1191	529	662
		high churn / low port	883	630	253
		high churn / high port	1306	647	659
Option 2 (for 12 months migration period from call- forwarding to database lookup)	Optimistic implementation date of 1 January 1999	low churn / low port	814	620	194
		low churn / high port	1267	695	572
		high churn / low port	942	803	139
		high churn / high port	1396	878	518
	Realistic implementation date of 1 July 1999	low churn / low port	795	603	192
		low churn / high port	1233	686	547
		medium churn / low port	855	750	105
		medium churn / high port	1294	833	461
	Pessimistic implementation date of 1 January 2000	low churn / low port	769	613	156
		low churn / high port	1191	711	480
		high churn / low port	883	789	94
		high churn / high port	1306	887	419

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