



ILLINOIS CENTURY NETWORK

POLICY COMMITTEE MEETING AGENDA

November 29, 2001 2:00 p.m.

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ACTION ITEMS

1. Addendum: Cost Recovery Policy

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ILLINOIS CENTURY NETWORK

ADDENDUM: COST RECOVERY POLICY

Submitted for: Action

Summary: At its November 14, 2001 meeting, the Policy Committee began discussion of a comprehensive cost recovery policy. The policy is designed to ensure that the ICN is able to continue providing uninterrupted services as demands upon the network grow.

Item number six addressed two primary issues:

- 1) At current funding and operational levels the ICN anticipates a budget shortfall in fiscal year 2003.
- 2) The creation of a comprehensive policy to provide guidelines for allocation of state appropriations and collection of necessary fees in order to allow the ICN to keep up with current growth in demand and services.

This addendum addresses the issues raised by the Policy Committee relative to the proposed cost recovery policy.

Action Requested: Approve staff recommendation of cost recovery policies.

Recommended Motion: *That the ICN Policy Committee adopts the proposed cost recovery model.*

ILLINOIS CENTURY NETWORK

ADDENDUM: COST RECOVERY POLICY

Introduction

At the Policy Committee meeting of November 14, 2001, staff presented agenda item six and presented a proposed cost recovery policy for consideration by the committee. The item discussed future planning for the network and options to finance current and anticipated growth. Three growth models were presented planning for anticipated growth, slower than anticipated growth, and faster than anticipated growth over a projected three-year period from fiscal year 2003-2005. The cost recovery model recommended by staff ensures necessary resources are available in correlation with network growth.

The Policy Committee raised several questions that this addendum to item six attempts to answer. The questions asked were as follows:

1. What is the effect upon the network without the cost recovery policy?
2. What provisions are there for constituent institutions that wish to remain at current service levels?
3. What will costs be for constituents in future years?
4. What is the impact of implementing the proposed cost recovery policies on existing constituents?

The addendum to item six is comprised of the staff response and recommendations regarding these questions and issues. The cost recovery steps proposed on November 14, 2001 are then presented with minor revisions for consideration by the Policy Committee.

Question 1: What is the effect upon the network without the cost recovery policy?

The Illinois Century Network is at a critical juncture in its deployment. To date, the network has been able to meet the majority of demands placed upon it. At the same time, some constituent requests have been delayed voluntarily to allow time to build additional capacity. Specific instances involve circuits to carry Internet2 traffic, permanent virtual circuits between multi-campus universities and colleges, and advanced video applications. Staff has also delayed mailings and advertising to growth sectors (e.g. municipalities, hospitals, medical centers, etc.) to stem the growth in utilization of the network and ensure that the shared backbone and Internet resources do not exceed capacity.

Where does growth originate? It is important to identify the three primary growth areas for which the ICN must plan. Increased demand for bandwidth from existing connections is the primary source of growth. This increase may be incremental for an individual constituent but the cumulative affect involves all areas of operation including point of presence equipment, backbone circuits, and Internet capacity. This growth comes from the continuing increase in implementation of bandwidth intensive network applications (e.g., video conferencing, streaming video, online courses, file sharing, etc.). While backbone circuits and Internet capacity are the primary areas affected, issues such as equipment, manpower, and service resources also become relevant as more intra-network traffic is carried. This drives a secondary growth area in the form of upgrades in physical circuits when existing constituents desire to add more bandwidth to meet increasing needs. If a constituent upgrades from a T1 circuit to a DS3 circuit, the ICN must have the necessary hardware to support the increased connection speed. A tertiary source for growth is new connections that in turn increase the rate at which the ICN must add point of presence equipment as well as backbone circuit upgrades and additional capacity to the Internet.

To summarize, growth comes from three sources: 1) increase in transit from existing connections either to the commercial Internet or within network, 2) upgraded access circuits, or 3) new connections.

An important perspective to realize is that the ICN provides services based on constituent demand, which is beyond ICN control. Without cost recovery and no limits on utilization, hardware, and new connections, the outcome is predictable and certain. Although the problem is a common resource allocation issue, perhaps it can be more clearly understood if likened to a school building. The building is designed for a certain number of students and classes. Incremental increases in enrollment might be met with temporary steps to secure more desks or workstations in a classroom or perhaps an additional hour of classes may be added to the schedule.

Together, we have built the network and made it available for use. The students have arrived. The ICN must continue to fulfill its promise to education.

While these techniques work well to a point, eventually, existing heat, air conditioning, electrical, and space resources are exhausted (not to mention human resources from taking on greater loads). A new classroom building must be constructed or students must be bussed to another school or sent home. The ICN is no different. The equivalent of “bussing institutions to different networks” or “sending them home” is not a viable alternative for the ICN.

Several steps are in process to address the elasticity of the network to respond to growth. The ICN is moving forward on recommendations by the Advanced Engineering Taskforce to install caching and continues to develop peering relationships to reduce costs and expand capacity. Some recreational applications that require large amounts of bandwidth have been rate limited on the backbone and therefore recreational traffic is restricted to a degree. Even further, the ICN continues to negotiate contracts that are more competitive and is working to secure dark fiber resources. With the exception of

If the ICN is to meet the increasing demands and remain the vibrant and robust statewide resource it is today, the backbone circuits, point of presence equipment, and Internet capacity must likewise increase in step with demand.

dark fiber, these steps are the equivalent of adding extra desks to the classroom. While certainly not a panacea, dark fiber takes away some of the resource issues by dramatically reducing the cost of the backbone network component while providing a manifold increase in capacity.

What is the effect of not implementing a cost recovery policy? In the next fiscal year, constituent demands will exceed the capacity of the network beyond the ability of the ICN to compensate. If the ICN is unable to add incremental capacity in advance of the increasing load then it will have no choice but to begin restricting constituent use or even removing non-primary constituents from the network.

Let us explore the “option” of providing adequate resources for education or primary constituents by restricting or removing non-education constituents. Is it really an option? Since the network provides a greater benefit to all constituents by aggregating traffic and capacity, restriction of the network or removal of constituents is a temporary “band-aid” approach that speeds the demise of the network as a usable tool. Since education represents ninety-two percent of network connections and similarly, almost ninety-two percent of network utilization, restriction of non-education constituents has minimal effect.

Further, since most education entities are already connected to the network, the growth that will come from these constituents will be primarily increased utilization and incremental upgrades to access greater bandwidth. Other sectors in the state represent higher growth capacity and, as such, have the ability to assist in the aggregation of traffic and further lower the costs for all involved. An analogy that helps illustrate the dynamics of network operation is that of a modern airline. The potential cost per passenger is far less when flying fully loaded larger planes. We have but to look at the evening news to understand the effect of trying to operate at a certain scale with less than full loads. A network is no different. Education, as the largest constituent group, demands that the ICN operate at a certain scale to be effective. Restricting the constituents served by the network may provide a temporary window of growth for remaining constituents but will ultimately decrease the intermediate and long-term ability of the network to recognize meaningful economies of scale.

If the network is limited to current funding with no ability to secure corresponding funds to match ever increasing utilization, the network becomes limited as a viable resource beginning as early as fiscal year 2003 and becoming progressively worse as time goes on. Now that institutions are beginning to use the network, it is imperative to take steps to sustain what we have built.

Question 2: What provisions are there for constituent institutions that wish to remain at current service levels?

Without implementation of cost recovery funding, the answer is “None.” While the constituent institution is free to remain at the same connection speed with the same

equipment, and maintain the same utilization; without all other constituents doing the same, service will diminish over time. Why is this the case? Let us assume that an existing institution has a T1 circuit (1.5mbps) to the backbone. In this example, assume that the current throughput (or performance) of the circuit serves all of the current and anticipated needs long into the future. Since this is not true for all connected constituents and all share common resources such as backbone circuits, switching and routing equipment, and Internet access, the ability of the institution to maintain throughput is not possible unless the shared resources upon which it depends remains static.

Lack of a cost recovery policy to add incremental resources to match incremental growth absolutely assures that constituents desiring to remain “as is” cannot do so. Even if an individual institution stays the same, network performance will erode over time..

Is increasing utilization simply a factor of increasing circuit size? The answer is no. In fact, if all institutions stay at the exact same circuit size as today, the ICN still faces the same problem. Why is this the case? For the most part, the smallest circuit connecting to the network is a T1. Do all of the institutions connecting with T1 circuits utilize the full bandwidth available around the clock? No. Utilization patterns vary but access circuits connecting to the network comprise a large percentage of unused bandwidth. If bandwidth for all constituents directly connecting to the network is added together it represents over 5,000 million bits per second (5 Gigabits per second). Since the network only has 600 million bits per second capacity that it can currently carry, it is safe to assume that the aggregate utilization of the network at any one time is about ten percent (10%) of all access circuits combined.

In network parlance, the ICN is “oversubscribed” by a ratio of about seven to one (7:1). This means that we have approximately seven times more bandwidth in access circuits than what we can carry on the backbone to the Internet or between locations on the network. For sake of comparison, commercial Internet service providers oversubscribe at approximately twenty to one (20:1) – hence the incredible value of the ICN to its subscribers.

What does this mean? In layman’s terms, if utilization increases by only a fraction of the national average or the amount predicted by the Advanced Engineering Taskforce, it is impossible for the ICN to maintain service levels with current funding. The backbone, equipment, and Internet egress resources must be renewed in accordance with utilization levels. An institution wishing to remain at current levels may not change anything but it can only continue ‘as is’ if growth is held static for all institutions.

Question 3: What will costs be for constituents in future years?

The short answer is “less with the ICN than any other option.” The ICN has no way to predict growth of any particular constituent individually or by sector. National and state trends indicate varying growth levels with some components of the network growing at one hundred percent per year. For a comprehensive discussion of cost functions and growth estimates based on Illinois patterns, please refer to Item 6: Cost Recovery Policy, from the November 14, 2001 Policy Committee agenda.

While the ICN cannot predict future costs, a safe rule of thumb is that the ICN will remain the best possible value for institutions to secure access to one another and to the Internet even with implementation of proposed cost recovery steps. There is no reason whatsoever to expect that the ICN will not be the best possible bargain available.

Question 4: What is the impact of implementing cost recovery on existing constituents?

The cost recovery proposal presented on November 14, 2001 is reproduced verbatim below with the exception of point one and minor edits throughout (*identified throughout in bold italics*). After each step, information is provided regarding the direct impact upon constituents and cost recovery funds to the ICN revolving fund. Staff has reviewed the first step and modified it as presented below.

- 1. Effective July 1, 2002, all constituents will pay for costs to access the network including direct circuits and portions of circuits allocated for constituent use with the exception of point of presence local loop circuits, which the ICN provides for primary constituents. Staff estimates that provision of these circuits allows the ICN to recognize lower overall costs and that some of the associated costs will be defrayed by increased e-rate revenues. Non-primary constituents will be charged for all access-related costs.*

This equates to \$75/month per T1 equating to \$11,285/month or \$135,420 annually for non-primary constituents directly connected to the network (with the current number of circuits connected directly to ICN point of presence facilities). As a result, primary constituents receive an even greater incentive to connect directly to the network.

Staff will continue to monitor the growth of these circuits and report to the Policy Committee annually to ensure that the ICN appropriation remains allocated in accordance with priorities established by the committee. In accordance with the direction of the Policy Committee at the June 1, 2001 meeting, staff will routinely evaluate all access-related expenditures relating to CT3 circuits, grooming sites, and support for community networks to ensure that the aggregate cost of such services (the ICN contribution plus the constituent contribution) is less expensive than if the ICN were not contributing. The goal is not to shift costs from the constituent to the ICN while paying a higher aggregate cost. Staff will further address issues of strategic placement of grooming points throughout the state and potential collaborations with telecommunications providers and Internet service providers to continue extending the network to all areas of the state.

Steps two through five detail a strategy to allocate current ICN services according to headcount and status as a primary constituent institution.

- 2. Effective July 1, 2002, publicly funded primary constituents will receive baseline transit across the network and to the commercial Internet **at no cost to the constituents**. These ICN-provided transit levels will be based on*

headcount associated with direct connections to the network within the limits of funds appropriated to the ICN.

Step two establishes a policy to provide baseline levels of transit at no cost to the primary constituents connected to the network.

3. Effective July 1, 2002, *all existing and future* non-public primary constituents will receive services through individually negotiated facilities-based leases to provide connectivity to the network. Transit levels will be based on the individual facilities-based leases at rates to be negotiated with the constituent institution.

Step three moves to change the legal manner in which constituents receive services from the network in keeping with best practices for private networks and private carriage of network traffic.

4. Baseline transit levels for publicly funded primary constituents will be evaluated annually in relation to available funds and staff will recommend modifications to the Policy Committee accordingly. Any adjustment to baseline transit provided by the ICN will be communicated to constituents accordingly. Table 1 provides the staff recommendation for fiscal year 2003 (July 1, 2002 through June 30, 2003).

Table 1
Establishment of Baseline Transit Amounts for Public Primary Constituent Direct Connections

| Institution(s) FTE Headcount | ICN Provided Base Bandwidth/Transit (Mbps) |
|--|---|
| Less than 1,000 (and entities without FTE) | 1.5 |
| 1,001-3,000 | 3 |
| 3,001-6,000 | 6 |
| 6,001-12,000 | 12 |
| More than 12,000 | 20 |

While staff believes that the proposed rates will serve constituents and the ICN well into the future, changing dynamics (e.g. the use of dark fiber, lower telecommunications costs, lower equipment costs, etc.) may enable greater bandwidth provided at no cost to primary constituents over time. This will be updated annually.

5. Effective July 1, 2002, transit required above the baseline provided by the ICN for publicly-funded institutions will be charged back quarterly at ICN costs. ICN costs will be based on actual and anticipated expenditures and revised annually for consideration by the Policy Committee. The cost per

megabit of transit *above the provided baseline amount* will be communicated to constituents annually.

The cost for transit above the provided baseline is currently \$300/mbps/month. This represents a “port” charge that allows constituent institutions access to the ICN backbone, Internet access, network management resources, monitoring, support staff, and other ICN features and services. The impact of this policy at current network implementation levels is summarized in Table 2 with detailed information following in Table 3.

Many of the institutions using greater bandwidth than provided by the proposed baseline may be able to groom existing traffic and pay less than presented.

Table 2
Implementation of Baseline Transit Levels
 (Cost Recovery Steps 2-5, Projected for Fiscal Year 2003)

| Sector | Primary Constituents Impacted | Total Monthly Cost Recovery Funds |
|---------------------------------|-------------------------------------|--|
| K12 | 1 | 5,010 |
| Community Colleges | 0 | - |
| Public Colleges & Universities | 4 | 7,800 |
| Private Colleges & Universities | 6 | 19,650 |
| Libraries | 0 | - |
| Museums | 1 | 360 |
| Total | 12 | \$ 32,820 |
| Total (Annual) | | \$ 393,840 |

Table 3
Implementation Detail of Cost Recovery Steps 2-5
(Current Utilization Levels, Projected for Fiscal Year 2003)

| Institution by Sector | Full Time Equivalent (FTE) Headcount | Baseline (Mbps) | Average Utilization (Mbps) | Circuit Type | Monthly Cost |
|---|---|------------------------|-----------------------------------|---------------------|---------------------|
| Private Colleges & Universities | | | | | |
| Knox College | 1,183 | 3 | 5 | DS3 | 600 |
| Bradley University | 5,071 | 6 | 9.5 | DS3 & T1 | 1,050 |
| Trinity Christian College | 839 | 1.5 | 2.4 | 4 T1s | 270 |
| Rush University-St. Luke's Medical Center | 976 | 1.5 | 3.6 | DS3 | 630 |
| DePaul University | 15,594 | 20 | 63 | Peering | 12,900 |
| Illinois Institute of Technology | 4,492 | 6 | 20 | OC3 | 4,200 |
| Subtotal | | | | | \$ 19,650 |
| Public Colleges & Universities | | | | | |
| Southern Illinois University - Carbondale | 18,598 | 20 | 28 | Ethernet | 2,400 |
| Eastern Illinois University | 9,673 | 12 | 24 | DS3 | 3,600 |
| Northern Illinois University | 18,603 | 20 | 23 | Ethernet | 900 |
| Western Illinois University | 10,929 | 12 | 15 | Ethernet | 900 |
| Subtotal | | | | | \$ 7,800 |
| K-12 Schools | | | | | |
| Illinois Math and Science Academy | 642 | 1.5 | 18.2 | DS3 | 5,010 |
| Museums | | | | | |
| The Art Institute of Chicago | | 1.5 | 2.7 | DS3 | 360 |
| Total Monthly Cost to Constituent Institutions (Cost Recovery Income to ICN) | | | | | \$ 32,820 |
| Total Annual Cost to Constituent Institutions (Cost Recovery Income to ICN) | | | | | \$ 393,840 |

- Effective July 1, 2002, existing secondary and permissive constituents will pay for connection to the network via facilities-based leases tailored to the needs of the constituent. Any access, transit, and egress facilities, inclusive of equipment port connections at the point of presence (POP) will be sized according to *constituent* requirements. New ICN secondary constituents will pay these costs effective immediately based upon the successful execution of a facilities-based lease.

In essence, step six recommends that all non-primary and other permissive customers pay for all costs associated to connect to the network. Regardless of whether an institution connects to a commercial Internet service provider or to the ICN, costs for the access circuit are paid to a telecommunications provider. This is a static charge independent of the ICN. Today, the ICN subsidizes some transit costs for non-primary constituents. Table 4 provides a summary of the current costs by type of connection. It is important to realize that the ICN provides immense value above and beyond mere transit to the commercial Internet. Phasing out this subsidy provides over \$2 million to reinvest in the shared resources for the primary constituents of the network, which comprise ninety-two percent (92%) of all connections and almost ninety-two percent (92%) of all utilization.

Table 4
Recovery of Non-Primary Constituent Transit Costs
 (Cost Recovery Step 6, Projected for Fiscal Year 2003)

| Circuit Type | Quantity | Monthly Costs |
|-----------------------|-----------------|----------------------|
| 56K Frame | 6 | 101 |
| 128K Frame | 7 | 269 |
| 256K Frame | 1 | 77 |
| 384K Frame | 1 | 115 |
| Cable Modem | 24 | 7,200 |
| 2MB Dry Pair | 21 | 6,300 |
| 10MB Ethernet | 31 | 9,300 |
| 100MB Ethernet | 17 | 5,100 |
| Fiber | 24 | 7,200 |
| Wireless | 20 | 6,000 |
| XDSL | 1 | 300 |
| 56K | 14 | 235 |
| T1s | 213 | 113,662 |
| DS3 & Above | 1 | 12,500 |
| TOTAL | 381 | \$ 168,359 |
| TOTAL (Annual) | | \$ 2,020,306 |

7. Effective July 1, 2002, all current ICN constituents will pay for existing added-value services provided at the request of ICN constituents on the basis of a facilities-based lease. All new ICN constituents or any new services requested by current constituents will be charged on a cost recovery basis effective immediately. [Note: The Policy Committee will be presented a comprehensive item in January 2002 detailing planned and potential ICN service offerings complete with implementation timeframes in response to an ongoing statewide survey of constituents.]

Step seven is a broad-based oversight policy that intends to recover costs for services added in the future at constituent request. These services may include specific network applications (e.g. filtering, e-mail, web-hosting, co-location, etc.) or services (wide area network consultation beyond connectivity to the ICN, network design and implementation, cost analysis, network operations center services beyond the ICN, etc.). This policy enables the ICN to continue adding services required by constituent institutions on a cost recovery basis. The policy encourages the aggregation of services by which economies of scale may be recognized on behalf of ICN constituents and adds value to the network activities.

8. The Policy Committee has approved the ICN to discontinue funding for constituent premise equipment to connect to the network. However, the ICN currently owns a large quantity of such equipment that it has made broadly available on a long-term sign out basis. This equipment remains the property of the state. Effective immediately, any hardware upgrades for constituent-based equipment will become the responsibility of the constituent institution. Ongoing maintenance contracts and software upgrades are paid in advance by the ICN through July 1, 2002, at which time these items will also be the responsibility of the constituent institutions. The ICN may elect to provide some equipment installations used as grooming sites or other resources in a local region when it is cost effective to do so. At the request of the institution, the ICN may bundle hardware costs or upgrades into ongoing facilities-based leases to serve specific constituent needs.

Staff will either transfer ownership of this equipment to constituent institutions or establish a lease arrangement by which necessary upgrades can be provided. The annual amount for software upgrades and hardware maintenance (excluding human resources, training, etc.) is about \$250,000 per year. Some institutions will desire to own their own equipment while others will prefer that the ICN own and manage the equipment on their behalf. Table 5 provides an overview of annual equipment maintenance costs for constituent-based equipment.

Table 5
Annual Constituent-Based Equipment Maintenance Costs
 (Cost Recovery Step 8, Projected for Fiscal Year 2003)

| Sector | Constituents Impacted | Annual Cost |
|-------------------------|-----------------------|----------------|
| K12 | 91 | 42,930 |
| Community Colleges | 52 | 134,208 |
| Colleges & Universities | 23 | 37,440 |
| Libraries | 239 | 35,263 |
| Museums | 5 | 1,312 |
| Municipalities | 11 | 3,680 |
| TOTAL | 421 | 254,833 |

Conclusions

To remain true to the legislative intent, the state appropriation must directly benefit primary constituents while indirectly reducing costs for all non-primary constituents. The aggregate network procurement, paid by state appropriation on behalf of primary constituents, indirectly benefits other permissive constituents by reducing the total cost of doing business. Implementation of reasonable, incremental cost recovery policies provides necessary resources to sustain growth. Projected funds from cost recovery in fiscal year 2003 are just over \$2.5 million. Table 6 provides a summary of anticipated cost recovery funds for the next fiscal year.

Table 6
Aggregate Effect of Implementation of Cost Recovery Steps
(Projected for Fiscal Year 2003)

| Cost Recovery Steps | Annual Cost Recovery Funds at Current Levels of Operation |
|---|--|
| Implementation of Baseline Transit Levels (Steps 2-5) | 393,840 |
| Non-Primary Constituent Transit Costs (Step 6) | 2,020,306 |
| Constituent-Based Equipment Maintenance (Step 8) | 254,833 |
| TOTAL | \$2,668,979 |

The proposed cost recovery steps accomplish the following:

- Provides the greatest benefit directly to the primary constituents of the network
- Protects those institutions that are sufficiently served currently
- Provides resources to allow the network to grow incrementally in step with future demand
- Perpetuates the ICN as the best option for all constituents of the network and continues to maximize recognized economies of scale
- Creates a framework by which added-value services may be implemented to meet constituent needs
- Continues the investment by the state in Illinois students and education resources

The staff recommends the following motion:

The ICN Policy Committee adopts the proposed cost recovery model.