Costing a National System

including consolidation point variables

(5/1/03 revision)

Definitions:

Collection Sites: A location where electronics are dropped off or brought to from individual residents or commercial users. This could include one day collection events, permanent collection facilities, retail stores participating in a drop off program, curbside collection (ending in electronics picked up at curbside being accumulated at a collection site or consolidation point).

Consolidation Points: A location where electronics from collection sites are brought to for accumulating large enough loads (minimum load=1 trailer ~53' long, ~20,000 lbs/load) for efficient transportation to processing facilities. Collection sites and consolidations points may be the same in some instances.

Note: We believe that the assumptions made below are sound, the numbers used can be changed, based on other sources and estimates, and the results compared.

1. Number of consolidation points on a population basis:
1 for every 500,000 people

Assume 1 consolidation point per 500,000 people. With a July 2002 population estimate of 280,000,000, that would mean 560 consolidation points nationwide. It is assumed that the placement and density of these consolidation points would be reflective of the population density. (The population figure of 500,000 was used instead of the Seattle Assessment number of 600,000 for ease of calculation.) Here is a calculation of how that would work out on a state-by-state basis (selected states):

CA 70	NY 38
CT 7	OR 7
FL 33	PA 25
IL 25	TX 44
IA 6	VT 1
MA 12	VA 15
MN 10	WA 12
NH 3	WI 11
NJ 17	WY 0

Note: This does not mean that a national system would have to have a minimum of 560 consolidation points. There could be fewer or more depending on system needs and available funding. The number per state could also vary from these preliminary estimates.

2. Equating consolidation points with number of trailer loads: 20-40 trailer loads per year/consolidation point

Assuming 1 consolidation point/500,000 people and 1.5 pounds of electronic scrap/person/year, that means each consolidation point would generate 750,000 lbs of e-scrap/year. At 40,000 lbs/trailer load (double stacked pallets), that would be 19 (say 20) loads/year for each consolidation point. At 20,000 lbs/trailer load (single stacked pallets), that would be 38 (say 40)loads/year for each consolidation point. 20,000 lb trailer loads are far more common than 40,000 lb loads (per an electronics recycler in the northeast US). At 25 cents/pound for transport from consolidation point and processing, that's $5,000/20,000 lb trailer load or $10,000/40,000 trailer load.

3. Flexibility: Consolidation point = a trailer load wherever it is located

Since we can now equate number of consolidation points with number of trailer loads, a state or the market place could plan for a combination of X consolidation points and Y trailer loads picked up from wherever a trailer load can be accumulated. For example, if FL was allotted 33 consolidation points, FL could decide to have 30 fixed consolidation points and 120 trailer loads (33-30=3 consolidation points x 40 20,000 lb trailer loads = 120 trailer loads) transported from any point at which a trailer load was accumulated. Thus, 30 fixed consolidation points + 120 trailer loads would be the same as 33 fixed consolidation points.

4. Total cost of transportation from consolidation and for processing: Assuming 280,000,000 people in US x 1.5 lbs of electronics scrap/person x $0.25/lb to transport from consolidation point and process (per an electronics recycler in the northeast US), it would cost $105,000,000 to transport from consolidation and process 100% of the electronic scrap generated in a year. If our collection and recycling rate was 50%, it would cost $105,000,000 x 50% = $52,500,000. If our collection rate was 25%, it would cost $26,250,000, etc.

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Transport from consolidation and processing:

If our collection and recycling rate was. . . ,	it would cost . .
100%	$105 million
50%	$52.5 million
25%	$26.2 million

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If we assume annual US sales of TVs at 30,000,000 (*a major TV manufacturer* said this was close to the manufacturers figures), it would take $3.50/TV sold to finance a 100% recovery system; $1.75/TV sold to finance a 50% recovery system; $0.90/TV sold to finance a 25% recovery system; etc. The cost/TV sold could be an advance recycling fee, internalized by the manufacturer, or split between advance recycling fee and internalized by the manufacturer.

Important total system cost note: The above cost analysis does not include the costs of collection and transport to the consolidation point or the costs of maintaining the consolidation point. Collection costs and consolidation operating costs may be half of or equal to costs of transport from consolidation and processing (internal NEPSI working document). For example, assuming a $105 million annual cost for transporting from consolidation and processing 100% of the electronics available for recycling, it may cost between $176 and $210 million for the whole program (collection, consolidation, transportation and processing.)

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Collection, consolidation, transport and processing:

If our collection and recycling rate was. . . ,	it would cost . .
100%	$176 - 210 million
50%	$79 - 105 million
25%	$40 – 52.5 million

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One Possible Scenario Using the Assumptions Above:
If an aggressive national system were implemented we could expect, at best during the early years of implementation, a 50% recovery/recycling rate. Using the median collection, consolidation, transport and processing cost of $92 million (the mid-point between $79-105 million) would equal a $3.00/TV charge (92 million dollars divided by 30 million TVs sold). Under a total ARF system that would be a $3.00 ARF for every TV sold. Under a full cost internalization system that would be $92 million dollars of cost internalization. Under a hybrid, partial cost internalization system a $2.00 ARF could be charged with $1.00 being internalized. The $2.00 would pay for collection (at a base service level to be determined) and the rest to offset transport from consolidation to processors and the balance to be funded by industry through the $1.00 internalized cost.

5. Cost per pound

Cost per pound obviously is used in calculating total cost but it may be a useful perspective. Transport from consolidation and processing varies from **21-30 cents/lb** with processing accounting for 20 cents and transportation varying from 1 to 10 cents/lb depending on transportation distance (per an electronics recycler in the northeast US). This falls within the range of cost estimates of 0 cents/lb (low for CPUs) to 56 cents/lb (high for TVs) from the 12/17/02 internal NEPSI working document.

Ending Notes:

Recovery rates can vary depending on assumptions used. For the purposes of this paper 1.5 pounds per capita was used. This figure is based on actual collection rates in Mass. If recovery rates/end of life products available for collection and recycling were bases on sales the result has been estimated to be 4-6 pounds per capita. The Seattle Assessment is using a rate of 1.75 pounds per capita.

The system costs are only based on 30,000,000 TVs sold. If other NEPSI products were considered, like computer monitors, PCs and laptops several millions more products and the resultant fee would be figured in, which would lower the final system cost.

A "ramp up" time would have to be considered in any system. It is impossible to establish and operate 560 consolidation points in the first year and likewise it is not feasible to think that a 50% recovery rate would be achieved in the first year(s) of system operation.

It is important to note that the collection calculations are based on a full trailer. It does not matter how long it takes to get full. (Some densely populated areas will make do with one trailer per 1 million population and have it pulled quite frequently while others will have a trailer per 10,000 people and have it pulled occasionally.

Some processors will be so close to urban areas that they themselves would act as the direct consolidation point.

In addition to the stated costs in this document other costs borne by local governments and industry are not included here. Planning, education, PR, etc., at the local level may be 40% of the stated collection costs which are "internalized" by local government. Industry

also covers ("internalizes") costs that would not be reimbursed by the system.

Other examples of system costs, using different Lbs./Capita and Products Sold, look as follows:

NEPSI System Cost Scenarios 3/14/03 Draft

Lbs/capita	System Cost (Millions)	Products Sold (Millions)	Cost per Product	Products Sold (Millions)	Cost per Product
1.5	$92	30 (TVs)	$3	44 (TVs, Monitors, Laptops)	$2
1.75	$108	30 (TVs)	$4	44 (TVs, Monitors, Laptops)	$2
4.5	$276	30 (TVs)	$9	44 (TVs, Monitors, Laptops)	$6
6	$368	30 (TVs)	$12	44 (TVs, Monitors, Laptops)	$8

1.5 pounds/capita from reporting of actual collections in MA
1.75 pounds/capita used in Seattle Assessment Project
4.5 pounds/capita is near the lower end of estimate
from consolidation workgroup call 2/25/03
6 pounds /capita is the upper end of estimate
from consolidation workgroup call 2/25/03

$92 million system cost includes collection, consolidation, transport and processing for 50% of NEPSI products that are available for recycling. This is the midpoint of the $79-105 million range in 3/14/03 NEPSI Consolidation Points Workgroup internal working document.

Products Sold includes only household and small businesses (< 10 employees) uses

Products Sold:
30 millon TVs from consolidation points workgroup call 2/25/03
44 million TVs, Monitors, Laptops from NEPSI internal working document (details proprietary);
This does not include PC/CPUs

A market-driven approach to infrastructure development: *Instead of trying to figure out in advance how many processors, consolidation points and collection points an effective national system would need and where they should be, it may make sense to agree on a certain annual level of system funding, such as the $92 million level used in this estimate, and then let the infrastructure evolve from, and within the constraints of, that funding level. The apportionment of what fraction manufacturers and government entities contribute to that system cost and where the funding comes from (ARF, internalized costs, etc.) would be a separate and necessary issue to resolve.*