ASSESSING THE FEASIBILITY OF COLLABORATIVE UTILITY - MUNICIPAL TREE REMOVAL AND REPLANTING

by Kevin Eckert and Peter Simpson

Abstract. In June 1993, Newport Electric Company and the City of Newport, Rhode Island collaborated to complete a tree removal and replanting pilot project. This pilot project was initiated to address the situation that large city-owned trees in Newport are potential hazards to the delivery of safe and reliable electric service, and are costly to trim for adequate clearance. The two primary purposes of this project were: 1) to examine the operational feasibility of a collaborative tree removal and replanting project between the City of Newport and Newport Electric Company; and 2) to cost justify participation by Newport Electric in a tree removal and replanting project. Net Present Value (NPV) is offered as a defensible model for determining cost justified participation by the utility because this method for determining financial worthiness is consistent with other business analyzes conducted within the electric utility industry. If considered over the short-term, participation in a tree removal and replanting project cannot be cost justified, because a financial break-even point will not be realized. This project is cost effective when evaluated over the long-term, because the expense of trimming each tree by the utility is ongoing for several cycles. The willingness of the municipality to share the costs was critical in the decision of the utility to participate.

In June 1993, Newport Electric Company and the City of Newport, Rhode Island collaborated to complete a tree removal and replanting pilot project. This pilot project was initiated to address the situation that large city-owned trees in Newport are potential hazards to the delivery of safe and reliable electric service and are costly to trim for adequate clearance.

This project had two primary purposes: 1) to examine the operational feasibility of a collaborative tree removal and replanting project, and 2) to cost justify participation by the utility.

Overview of Newport's Urban-Community Forest

Based on dbh, 37 percent of the street trees in Newport's urban-community forest are mature. According to the Street Tree Inventory and Management Plan conducted by ACRT in 1992, 21 percent of the trees were in poor condition and 47 percent were judged as fair. There are approximately 3,200 street trees and 3,500 open planting sites. Even though there are 103 taxonomic groups of street trees, thirty two percent are Norway maples. Powerlines exist above 1003 street trees, with large-growing species at 857 sites.

Heightened public awareness and concern for Newport's trees is a relatively recent occurrence. In 1992, the City Council and administration worked together with the Newport Tree Society to initiate an urban tree management program by passing a tree ordinance and hiring a full-time tree warden. Begun in January 1993, hazardous street tree mitigation will remove 300 structurally dangerous or functionally marginal trees by March 1994. Federal grant funds and private donations enabled the city to plant 257 trees in 1993.

For this collaborative project to even get started, finding the highest-common-denominator between the paradigms of the utility and the municipality was essential. This was found to be the large-tree species of street trees growing under, or adjacent to, powerlines. They are the wrong species of tree in the wrong place requiring repeated trimming for powerline clearance. With continued pruning many of these trees are, or will become, dysfunctional. Categorically, the decision to remove these trees was based on the criteria that they were either: 1) mutually agreed upon hazards; or 2) trees with relatively high trimming costs that would not be viable trees in the urban-community forest over the long-term.

Removal criteria. The utility proposed removal of city-owned trees based on the following criteria: 1) The tree endangered the reliability of the

powerline from stem failure. A hazardous tree was defined as having a greater than average probability of affecting a powerline in a high wind, ice storm or heavy snow within the next 4 years; and

2) The long-term trimming expenditures exceeded the cost to Newport Electric Company to share the cost of removal of the tree below the powerlines and participate in replanting. These trees are costly to trim because they are large trees that cannot be properly trimmed for adequate powerline clearance.

The municipal arborist's criteria for removing a tree consisted of the following:

1) In 3-5 years, the tree was anticipated to be a public safety hazard along a city-owned right-of-way. These trees were not immediate hazards to a public right-of-way, but have some indication that they will become structurally marginal soon; and
2) The tree was not considered a viable street tree over the long-term. Long-term viability of the tree was based on function and aesthetics of a tree in the context of its location.

Methodology

A cost-sharing arrangement was utilized to remove and replant trees. The utility's tree contractor removed the tree below the powerline and disposed of the debris that could be chipped. Newport Electric spent $2,100 to purchase the trees that were replanted. City crews completed removal of the trunk, disposed of the wood, did the stump-grinding and planted the trees. Even though some trees were not a top priority for the municipality, they were removed because of the opportunity to reduce the cost of removal and replanting by sharing the expense with the utility.

Criteria for removal. Mutually agreed upon hazards were trees with a preliminary indicator of structural weakness, such as a symptom of significant decay, diminished anchor capability of the root system or poor branching structure. When an indicator of structural weakness was positioned so that the tree would endanger a powerline or public right-of-way, it was removed. These trees were not immediate hazards, but were anticipated to be problematic within 5 years.

The trees removed were considered not viable as shade trees over the long-term. During past years, many of these trees required drastic trimming to maintain adequate powerline clearance. Viability over the long-term was based on at least one of the following three conditions: 1) at least 30 percent of the foliage consisted of sucker growth from previous trimming cuts; or 2) the central leader had to be removed; or 3) 25 percent of the scaffold branches had previously been stubbed, or had to be removed.

The growth habit of these trees fit one of two categories. The first category were species of trees with excurrent habits. Most of these trees had previously had the central leader removed, or were young trees with the central leader growing into the powerlines. As a result, these tree appeared vigorous because of sucker-growth that had filled-in the crown area adjacent to the powerline. Pin oaks and lindens typified this category. The second category of trees had a decurrent habit, and included Norway or sycamore maple and london plane trees. This group of trees had not been directional trimmed away from powerlines as young trees, and many scaffold limbs were previously stubbed-out, or had to be removed.

Location was not a direct factor of viability but was important, because a group of non-viable trees might line an entire street where the residents were sensitive to wholesale tree removal. If the homeowner adjacent to the tree objected to its removal, and it was not an immediate hazard to a right-of-way, the tree was left standing. Almost 30 percent of the trees removed were perceived by the adjacent resident as a nuisance.

Discussing the fate of a tree with the adjacent homeowner, or neighborhood group was critical to the overall success of the project. The project was outlined to the Newport Tree Commission, and a joint press release published in the local newspaper two weeks before it started. Where there was no organized neighborhood association, the residents adjacent to removal candidates were canvassed door-to-door by the municipal arborist at least 48 hours before removals began.

The decision regarding placement and number of newly planted trees was determined by three factors: 1) desired street 'treescape'; 2) the col-

lective emotional-ownership towards the street trees by the adjacent residents; and 3) the distribution of trees in a neighborhood compared with the distribution throughout the city. Replacing trees in the exact site of, or one-for-one for a tree removed, was done only when the adjacent homeowner insisted. A tree was not planted unless the adjacent homeowner agreed to be a steward by helping to water and monitor. The utility required that the species of tree planted beneath the powerlines grow less than 30 feet at maturity.

Results and Discussion

Twenty eight trees were removed and 14 were replanted. The median dbh of trees removed was approximately 20 inches with a range of 9-37 inches.

The Time Estimates, in Exhibit 1., are calculated from averages of estimates of the utility forester, the contractor supervisor and the truck foreman. The Time Estimates for years 4 and 8 are discounted mathematically to reflect reductions in the amount of time needed to trim resulting from the recent change in Newport Electric's trimming specifications to implement Dr. Shigo's recommended techniques for utility line-trimmers.

Net Present Value (NPV) is offered as a defensible model for determining cost justified participation by the utility because this method for determining financial worthiness is consistent with other business analyzes conducted within the electric utility industry. In Exhibit 2, NPV is used to adjust all future costs and savings to 1993 dollars.

Removal cost to Newport Electric was $1,398 with an average of $49.93 per tree, which is 21.50 total crewhours (a crewhour is an aerial lift operator, groundman or chipper operator for one hour) or 0.77 crewhours per tree (Exhibit 1, TIME ESTIMATES Removal). Crown area was more of a determining factor for the utility's contractor removal time than dbh. The city crew averaged 2 manhours and 1 hour for a backhoe to complete the tree removal. Grinding the stumps averaged 2.5 manhours per tree. Planting time averaged 2 manhours per tree with a backhoe for 1 hour. By evaluating the project over the short-term, i.e. a single cycle, Newport Electric's expenditures to remove and replant trees exceeded their cost to trim by a cost differential of $2,074, or $74 per tree (Exhibit 2, SUMMARY Year 1). The estimated cost that Newport Electric would have incurred for trimming the first cycle-removed trees was $1,424, averaging $50.86 per tree. This represents 21.90 total crewhours or 0.78 crewhours per tree (Exhibit 1, TIME ESTIMATES Est'd Y1-Y8 Trim).

Long-term analysis reveals that the estimated cumulative trimming costs, during the eight years analyzed, for the removed trees would have been $3,575, or $128 per tree. (Exhibit 2, SUBTOTAL CUMULATIVE NPV COST TRIM Y1-Y8). By removing a tree, the cumulative costs and the effects of inflation are forgone, and this potential expense becomes the NPV savings of $1,171 in Year 4 and $980 in Year 8 (Exhibit 2, SUMMARY Year 4 and Year 8). The accumulated cost differential of $78 for all three trim cycles is the net savings gained by the utility in this project (Exhibit 2, SUMMARY Total). If this accumulated cost differential were $0, it would represent a financial break-even point, determining the level of monetary participation by the utility in the project.

Removal:replanting ratio. The actual removal to replanting ratio for this project was 2 for 1. The determining financial factor for this ratio was not the number of trees removed, but the estimated accumulated savings - a financial break-even point. This financial break-even point will vary depending on the cost sharing arrangement for removal and replanting. Other factors influencing the removal-replanting ratio include the policies of the utility and municipality, the relationship between utility and municipal staff, and the sensitivities and expectations of residents. Establishing a removal:replanting ratio on either a 1-for-1, or cumulative dbh basis was not justified for this project because the trees that were removed were considered to be liabilities over the long-term, and the newly planted trees are long-term assets used to rebuild the community forest.

Conclusions

From an accounting-finance perspective, undertaking a collaborative tree removal:replanting project with a municipality should be evaluated like any other financial decision. Good business

EXHIBIT 1 Time Estimates and Costs

		TIME ESTIMATES				UNADJUSTED COSTS			
						Note: Dollar amounts in parenthesis represent cost			
Tree Species	Location	Est'd Y1 Trim	Est'd Y4 Trim	Est'd Y8 Trim	Remove	Est'd Y1 Trim	Est'd Y4 Trim	Est'd Y8 Trim	Remove
A. Removal Based on High Trimming Cost Criteria									
L. Plane	Ledge Rd	0.80	0.76	0.57	1.00	($52)	($49)	($37)	($65)
Sy. Maple	Ledge Rd	1.00	0.80	0.72	0.90	($65)	($52)	($47)	($59)
Sy. Maple	Ledge Rd	1.00	0.75	0.68	0.90	($65)	($49)	($44)	($59)
N. Maple	Broadway	0.75	0.60	0.60	0.50	($49)	($39)	($39)	($33)
Sv. Maple	Broadway	0.75	0.68	0.68	0.80	($49)	($44)	($44)	($52)
Sy Maple	Morton Pk	0.80	0.80	0.80	0.70	($52)	($52)	($52)	($46)
N. Maple	Green Ln.	0.60	0.48	0.43	0.40	($39)	($31)	($28)	($26)
N. Maple	Green Ln.	0.80	0.72	0.58	0.50	($52)	($47)	($37)	($33)
N. Maple	Green Ln.	0.70	0.56	0.62	0.40	($46)	($36)	($40)	($26)
N. Maple	Green Ln.	0.70	0.56	0.62	0.50	($46)	($36)	($40)	($33)
N. Maple	Green Ln.	0.70	0.56	0.56	0.50	($46)	($36)	($36)	($33)
N. Maple	Green Ln.	0.70	0.63	0.69	0.40	($46)	($41)	($45)	($26)
L. Linden	Morton Av	1.00	1.50	1.35	0.70	($65)	($98)	($88)	($46)
L. Linden	Morton Av	1.00	1.50	1.35	0.70	($65)	($98)	($88)	($46)
N. Maple	Mumford	0.40	0.40	0.40	0.50	($26)	($26)	($26)	($33)
R. Maple	Storer Pk	1.00	0.85	0.94	0.60	($65)	($55)	($61)	($39)
P. Oak	Carroll	0.50	0.65	0.65	0.60	($33)	($42)	($42)	($39)
P. Oak	Carroll	0.50	0.65	0.65	0.60	($33)	($42)	($42)	($39)
N. Maple	Kay St	0.70	0.84	0.84	1.20	($46)	($55)	($55)	($78)
N. Maple	Kay St.	0.80	0.80	0.68	1.20	($52)	($52)	($44)	($78)
Catalpa	Lakeview	0.50	0.50	0.40	0.60	($33)	($33)	($26)	($39)
B. Removal Based on Mutual Hazard Criteria									
N. Maple	Second	0.80	0.00	0.00	1.20	($52)	$0	$0	($78)
N. Maple	Slocum	0.80	0.96	0.96	0.80	($52)	($62)	($62)	($52)
L. Plane	Bry-Hosp	0.60	0.66	0.66	1.20	($39)	($43)	($43)	($78)
N. Maple	Dudley	1.50	1.28	1.28	1.20	($98)	($83)	($83)	($78)
Ash	Morton Av	0.80	0.00	0.00	1.00	($52)	$0	$0	($65)
N. Maple	Ruggles	0.80	0.72	0.72	1.10	($52)	($47)	($47)	($72)
N. Maple	Broadway	0.90	0.77	0.77	0.80	($59)	($50)	($50)	($52)
	TOTAL	21.90	19.97	19.17	21.50	($1,424)	($1,298)	($1,246)	($1,398)

Note:

1. The trim times for Y4 and Y8 are adjusted to reflect change in trimming technique; and
2. The cost factor per hour is the median rate for the industry in New England

EXHIBIT 2 Eight Year Projected Savings (Costs)

Tree Species	Location	ADJUSTED COST COST TRIM Y1	NPV TRIM Y4	NPV TRIM Y8	CUMULATIVE NPV COST TRIM Y1-Y8	COST REM Y1
A. Removal Based on High Trimming Cost Criteria						
L. Plane	Ledge	($52)	($45)	($29)	($126)	($65)
Sy. Maple	Ledge Rd	($65)	($47)	($37)	($149)	($59)
Sy. Maple	Ledge Rd	($65)	($44)	($35)	($144)	($59)
N. Maple	Broadway	($49)	($35)	($31)	($115)	($52)
Sv. Maple	Broadway	($49)	($40)	($35)	($123)	($52)
Sy Maple	Morton Pk	($52)	($47)	($41)	($140)	($46)
N. Maple	Green Ln.	($39)	($28)	($22)	($89)	($26)
N. Maple	Green Ln.	($52)	($42)	($29)	($124)	($33)
N. Maple	Green Ln.	($46)	($33)	($32)	($110)	($26)
N. Maple	Green Ln.	($46)	($33)	($32)	($110)	($33)
N. Maple	Green Ln.	($46)	($33)	($29)	($107)	($33)
N. Maple	Green Ln.	($46)	($37)	($35)	($118)	($26)
L. Linden	Morton Av	($65)	($88)	($69)	($222)	($46)
L. Linden	Morton Av	($65)	($88)	($69)	($222)	($46)
N. Maple	Mumford	($26)	($23)	($20)	($70)	($33)
R. Maple	Storer Pk	($65)	($50)	($48)	($163)	($39)
P. Oak	Carroll	($33)	($38)	($33)	($104)	($39)
P. Oak	Carroll	($33)	($38)	($33)	($104)	($39)
N. Maple	Kay St	($46)	($49)	($43)	($138)	($78)
N. Maple	Kay St.	($52)	($47)	($35)	($134)	($78)
Catalpa	Lakeview	($33)	($29)	($20)	($82)	($39)
B. Removal Based on Mutual Hazard Criteria						
N. Maple	Second	($52)	$0	$0	($52)	($78)
N. Maple	Slocum	($52)	($56)	($49)	($157)	($52)
L. Plane	Bry-Hosp	($39)	($39)	($34)	($111)	($78)
N. Maple	Dudley	($98)	($75)	($65)	($238)	($78)
Ash	Morton Av	($52)	$0	$0	($52)	($65)
N. Maple	Ruggles	($52)	($42)	($37)	($131)	($72)
N. Maple	Broadway	($59)	($45)	($39)	($143)	($33)
SUBTOTAL		($1,424)	($1,171)	($980)	($3,575)	($1,398)
				Newport Electric Tree Planting Cost		($2,100)
TOTAL						($3,498)

SUMMARY

Cost Differential for Remove and Replant versus Trimming

Year 1	Year 4	Year 8	Total
($2,074)	$1,171	$980	$78

Note:

1. Inflation rate of 4.6% used reflects the increase in tree contractor costs for Newport Electric during the past 5 years; and
2. Interest Rate is the Cost of Capital used by Newport Electric; 8.3%.

dictates that there must be a means to evaluate an investment's financial worthiness versus other competing opportunities. If considered over the short term, participation in a tree removal and replanting project cannot be cost justified, because a financial break-even point will not be realized. This project is cost effective when evaluated over the long term, because the expense of trimming each tree by the utility is ongoing for several cycles. The willingness of the municipality to share the costs was critical in the decision of the utility to participate.

It is important to recognize however, that this removal and planting collaboration is temporary because: 1) the mutual hazard criteria is a finite number of trees: and 2) the category of trees that are more cost effective to remove than to trim will approach the group of trees that do not cost as much to trim; a point of diminishing returns. When this point of diminishing returns is reached Newport Electric's involvement in tree removal and replanting is expected to end.

The project also led to benefits that can not be directly measured nor are necessarily related to the goals of the project. Previously, many tree-related situations involving the city and the utility had been viewed as conflicts between both organization. With increased familiarity, resulting from this project, many problems were addressed by representatives of both organizations looking for win-win outcomes. From both of our perspectives the most significant benefit was a closer dialogue that was established between the utility and the city. This dialogue led to familiarity, which led to greater cooperation in meeting the needs of both the utility forester and the municipal arborist in other matters.

System Forester
Eastern Utilities Associates
West Bridgewater, Massachusetts
and
Tree Warden
City of Newport
Newport, Rhode Island

Résumé. En juin 1993, la Newport Electric Company (Cie électrique de Newport) et la Ville de Newport au Rhode Island s'unissaient pour compléter un projet d'abattage et de remplacement d'arbres. Les intentions premières étaient 1) d'examiner la faisabilité opérationnelle d'un tel projet et 2) de justifier la participation aux coûts par la Newport Electric Company. La valeur actuelle nette a été offerte comme un modèle acceptable pour la détermination des coûts de participation justifiables auprès de la compagnie de service public. Si cela est pris en considération à court terme seulement, la participation ne peut être justifiable étant donné que le point de rentabilité économique ne sera pas atteint. Ce projet est rentable lorsqu'il est évalué à long terme parce que la dépense pour l'élagage de chaque arbre par la compagnie de service public se reproduit sur plusieurs cycles de travail. Le désir de la municipalité de partager les coûts dans le cadre de ce projet à l'essai a été critique dans la décision de participation de la compagnie.

Zusammenfassung. Im Juni 1993 erarbeiteten die Elektrizitätsgesellschaft Newport und die Stadt Newport zusammen ein Projekt zur Beseitigung von Altbäumen und zur Neuanpflanzung. Die primären Zielsetzungen waren erstens die technische Durchführbarkeit für solch ein Projekt und zweitens die finanzielle Beteiligung der Elektrizitätsgesellschaft zu untersuchen. Der gegenwärtig Nettowert wird als Grundlage herangezogen, um eine dem Nutzen angemessene kostengerechte Beteiligung festzustellen. Über einen kurzen Zeitraum scheint eine Beteillgung nicht gerechtfertigt, da die Kosten den Gewinn überwiegen würden. Das Projekt ist nur dann kosteneffektiv, wenn es über einen langen Zeitraum berechnet ist, weil sich die Kosten für die Pflege über mehrere Zyklen verteilen. Die Bereitschaft der Stadtverwaltung die Kosten dieses Projekts zu tellen ist fraglich und von dem Nutzen der Beteiligung abhängig.