Postal Rate Commission
Submitted 10/4/2006 11:59 am
Filing ID: 53794
Accepted 10/4/2006

BEFORE THE
POSTAL RATE COMMISSION
WASHINGTON, D.C. 20268–0001

EVOLUTIONARY NETWORK DEVELOPMENT SERVICE CHANGES, 2006	Docket No. N2006-1

RESPONSES OF THE UNITED STATES POSTAL SERVICE
TO QUESTIONS 1 THROUGH 6
IN PRESIDING OFFICER'S RULING NO. N2006-1/37

The United States Postal Service hereby files these institutional responses to Questions 1 through 6 in Presiding Officer's Ruling No. N2006-1/37, dated September 19, 2006. The Questions are stated verbatim and followed by the responses. A response to Question No. 7 is forthcoming.

Respectfully submitted,

UNITED STATES POSTAL SERVICE

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October 4, 2006

RESPONSE OF THE UNITED STATES POSTAL SERVICE
TO QUESTIONS POSED IN PRESIDING OFFICER'S RULING NO. N2006-1/37

1. How does the model determine which facilities will become Regional Distribution Centers (RDC), e.g., is the decision based on physical features of specific facilities, geographic features such as proximity to highways and airports, or physical location? Is the initial decision made within or outside of the model?

RESPONSE

Before responding to the question posed, the Postal Service is obliged to respond to a misconception regarding the Opportunity List provided by witness Williams that is referenced in footnote 1 of Presiding Officer's Ruling No. N2006-1/37. That footnote asserts:

> Currently, virtually all AMP proposals are initiated by the recommendations of the END model, and none can go forward unless it is consistent with those recommendations. The END model's recommendations would be peripheral to network realignment only if the large majority of the AMP "opportunities" that it initiates were ultimately rejected by management. Such an outcome appears unlikely."

Of the list of 139 AMP candidates provided to the Commission on that Opportunity List, 83 were not identified through END modeling. The Opportunity List was generated largely by the submission of the names of facilities that each Area office considered might make candidates for AMP review as part of the END initiative. Second, of the 44 AMP feasibility studies announced in 2006, in 6 cases, a determination was made that the porposed consolidaton was not presently feasible.

The model determines which facilities will become Regional Distribution Centers based on available capacity and required capacity and minimized overall network costs. This

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RESPONSE TO QUESTION 1 (continued):

initial decision is made within the model, except for the case of BMCs which were designated as only to be selected as RDCs. The model is a mixed integer optimization. For further detail, please see *Integer and Combinatorial Optimization* by Laurence A. Wolsey and George L. Nemhauser. See also, the response of the United States Postal Service to POIR 5, Question 11.

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2. Is the ZIP Code assignment problem solved before, after, or simultaneously with the processing role problem?

RESPONSE

The ZIP Code assignment problem is solved simultaneously with the processing role problem. See the responses of the United States Postal Service to POIR 5, Question 11, and POIR 4, Question 7. See also, *Integer and Combinatorial Optimization* by Laurence A. Wolsey and George L. Nemhauser.

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3. How does the model assign turnaround mail, and is turnaround mail the only mail that has an overnight service standard under the RDC concept?

RESPONSE

The model assigns turnaround mail the same way all other capacity is assigned. The model does not distinguish overnight capacity from non-overnight capacity. The model assigns all workload capacity for each 3-Digit ZIP code. In an early iteration of the model, there was an assumption that turnaround mail would modeled as that which only has an overnight service standard. Subsequent iterations have changed this constraint.

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4. Does the model allow additional transportation costs to be incurred, such as substituting air for highway transportation, if this would make it feasible to consolidate additional processing operations without violating service standards?

RESPONSE

No, the objective of the transportation model is consistent with existing USPS corporate goals of maximizing surface transportation. If an origin-destination pair can be service responsive on surface, surface will be selected. See the response of the United States Postal Service to POIR 4, Question 7b.

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5. What criteria are used to assign ZIP Codes to facilities after the initial run? What aspect of this task is performed outside the model, and why is it performed outside of the model? (See Tr. 2/334).

RESPONSE

The optimization model was not designed as a tactical roadmap and does not consider capital investments for new equipment, relocation of assets or retrofitting of facilities. These issues must be reviewed outside the model by headquarters, area and local level experts familiar with site specific issues such as facility infrastructure, building age, actual drive times and reliability of road conditions. See the response of the United States Postal Service to APWU/USPS-T1-1(b); also, the response of the United States Postal Service to OCA/USPS-54; and the response of the United States Postal Service to POIR 5, Question 7a.

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6. With respect to Question No. 5, please answer the following more specific questions.

Library Reference N2006-1/17, at page 18, describes the steps followed by the optimization model. Steps 2 and 3 assume that each facility is "large" for purposes of determining its processing cost characteristics. (A further ambiguity arises from the documentation repeatedly referring to "facilities" and the costs saved by "closing" them, although the Postal Service has also said that the END model recommends closing operations, but not facilities.) Library Reference N2006-1/17, however, does not indicate how the model would assign ZIP Code workload to plants under a variety of circumstances.

a. For example, what decision rules would the model apply to implement Steps 2 and 3 where sufficient processing capacity is available at several different plants? To illustrate, the model might encounter situations in which all of a particular 3-digit ZIP Code/product workload could be processed by any of three facilities — one small, one medium, and one large.

(1) In Steps 2 and 3, would the model choose the facility that best matches workload to capacity (the small facility) without regard to the cost characteristics that are assumed to accompany its size?

(2) In Steps 4 through 6, does the model "re-size" this facility to match its assigned volume, thereby recognizing that it has the cost characteristics of a small facility/operation? Consequently, would estimated costs increase as the model moves from Steps 2 and 3 to Steps 4 through 6, even though the documentation asserts that costs move further toward the minimum with each iteration?

b. Where processing capacity is a constraint, it is not clear what decision rules the model would apply to implement Steps 2 and 3. For example, the model could encounter circumstances in which there are three plants eligible to process a particular 3-digit ZIP Code/product workload. The workload would fit exactly into two eligible small plants, but would occupy only half of the processing capacity of an eligible large plant (perhaps enough to fit a medium facility).

(1) What decision rules would the model apply to select one of these options? In selecting operations to consolidate, would the model's choice assume that the operation-specific and the facility-specific fixed costs at both of the small facilities would be saved by consolidating them to the large plant?

(2) In Steps 4 through 6, under the circumstance just described, would the model

(i) choose the large facility, assuming that its variable costs would convert to those of a medium facility, but that it would continue to operate at half capacity, and continue to incur the fixed costs of a large facility/operation;

Question 6 (continued):

(ii) choose the large facility, assuming that its variable costs would convert to those of a medium facility, but the plant would be reconfigured to match its new "medium" workload;
(iii) choose a small facility on the assumption that it would be reconfigured to handle its new "medium" workload, with a corresponding change in its "core" fixed and variable costs;
(iv) allocate the workload to the two small facility/operations, rather than operate one large facility/operation at half capacity?

c. What the "core" fixed cost of an operation, and the fixed cost of a facility represent is unclear.
(1) If the cost of fuel, rents, and other facility specific costs are included in the "core" fixed costs of an operation, would the model consider them reduced to zero if the operation is consolidated into another facility? Wouldn't these costs actually remain at the donating facility?
(2) If the model treats such costs as facility-specific, would the "core" fixed costs of an operation then consist primarily of the set-up and take-down labor costs for that operation?
(i) When an operation is consolidated into another plant, would there be any need to set-up or tear-down the operation at the donating plant?
(ii) Would this imply that such costs are not actually fixed?
(iii) If the donated operation still requires a separate sort scheme when performed at the receiving plant, would the same set-up and tear-down costs be incurred before and after consolidation?
(iv) Under these circumstances, would the model count the "core" fixed costs of the consolidated operation as "saved?"

RESPONSE

(a)

(1) The model would match workload which has been translated into capacity to facility square feet. All operations are assumed large at this step, therefore the model minimizes cost through operation consolidation. For

RESPONSE TO QUESTION 6 (continued):

more information on optimization, please see *Integer and Combinatorial Optimization* by Laurence A. Wolsey and George L. Nemhauser. See the response to OCA/USPST1-21d. See also the response of the United States Postal Service to POIR 5, Question 11.

(2) While the model assumes a large cost operation size to begin, this cost is only used as a starting point to begin to assign capacity, not estimate network cost. Once the initial run is complete, the operations are resized based on the actual volume that was assigned to the facilities generated by the model. Therefore, the network is resized based on the actual workload assigned. This produces a network cost for this resized network. This result is then utilized in steps 4 – 6 for the second iteration. Within steps 4-6 the model will look for a least cost solution beyond this, therefore, as we iterate, total network cost may decrease.

(b)

(1) The decision rules that the model would apply are the overall decision rules used within the optimization model. The model is a cost minimization problem. See the response to OCA/USPS-T1-3c. Therefore, in selecting operations to consolidate, the model would select the decisions that led to a least cost solution for the overall optimization

RESPONSE TO QUESTION 6 (continued):

problem which would be the overall network, and not a particular facility selection; individualized local decisions may not be optimal in every case since the model is minimizing the overall network cost. See the response of the United States Postal Service to POIR 5, Question 11.

(2) There is one and only one theoretical optimal least cost solution within the optimization problem. All decisions are made iteratively, moving from one decision point to a better decision point until the optimal solution is obtained. Since we are looking for an overall network solution, individualized local decisions may not be optimal in every case in order to minimize the overall network cost. Therefore, there is simply not a single answer to this question; the answer is that it depends on all other decision variables within the model. Please see, *Integer & Combinatorial Optimization* by Laurence A. Wolsey and George L. Neuhauser for further discussion of optimization. See also the response of the United States Postal Service to OCA/USPS-T1-21d; and the response of the United States Postal Service to POIR 5, Question 11.

(c)

(1) The facility specific costs are included within the fixed costs of the facility. Within the optimization model, there is an unavoidable facility cost associated with each facility, representing the costs that will be at that

RESPONSE TO QUESTION 6 (continued):

facility regardless of whether mail is processed or not. These costs would reduce to zero within the context of the model if all operations were removed from a facility. From a practical perspective, the proper use of a facility in the future would depend on organizational decision making. Please see the response of the United States Postal Service to APWU/USPS-T1-31b&c; also, the response of the United States Postal Service to POIR 2, Question 7a&b.

(2) The core component of the cost equation is a mathematical device to represent the linear version of the non-linear cost curve. In order to do so, a "core component" was developed to match the central value of piece handlings for each range of TPH to the nonlinear equation. The following 2 diagrams represent the linear version of the nonlinear curve. (Note, these diagrams are not to scale and are used for only for conceptual explanatory purposes).

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RESPONSE TO QUESTION 6 (continued):

Figure 1:

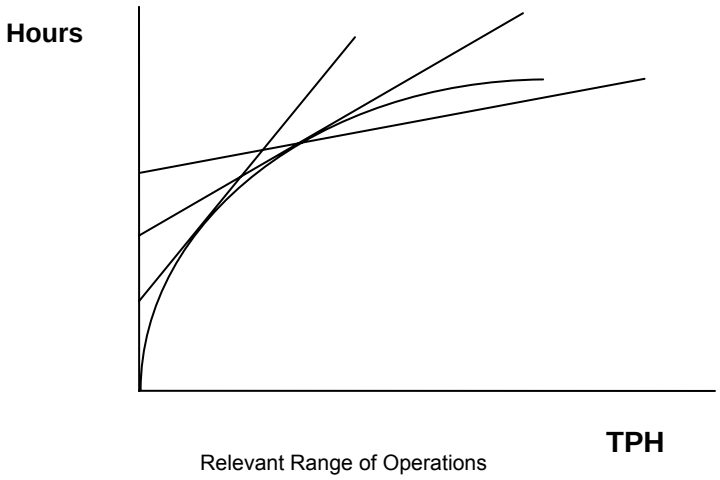
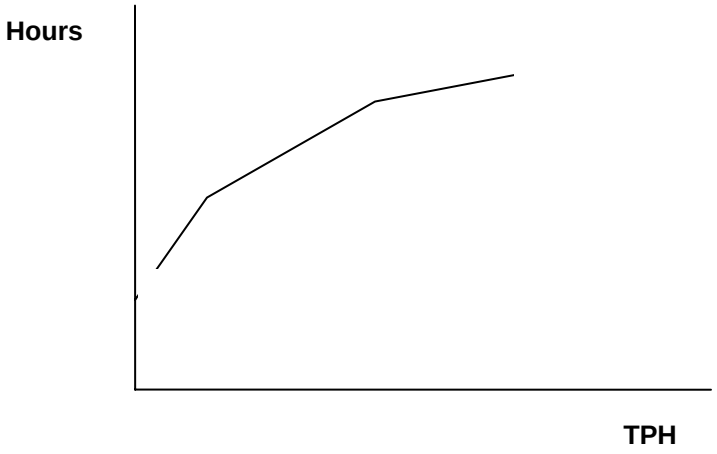


Figure 2:



The first figure represents the non-linear cost curves, and the three tangent lines which have been termed Small, Medium and Large within the END optimization construct. The use of three curves was to develop a

RESPONSE TO QUESTION 6 (continued):

reasonable representation of the nonlinear cost curve. If computing resources were infinite, an infinite number of curves could have been utilized which would have been the non-linear cost curve, but the END optimization model is a linear optimization model. Figure 2 represents the three sizes with the non-linear cost curve removed. This also has the ends of the curve removed which do not represent the linear version of the nonlinear cost curve underneath. What this figure shows is three distinct lines which END uses to represent the structural equations of the United States Postal Service. The format of the equation that fits these lines is the linear function: Hours = $\alpha + \beta$(TPH) depending on what part of the curve you are on. Therefore this "core" term represents the term that moves the linear function to the tangent of the nonlinear cost curve. In other words, the core component moves the linear cost function onto the non-linear cost curve.

See the response of the United States Postal Service to POIR 7 Question 5 for the detailed step by step derivation of the linear cost functions.

(i) No, if a particular operation is no longer performed at a facility there would be no need to set up or teardown that operation.

(ii) We define them as part of the operation specific cost.

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RESPONSE TO QUESTION 6 (continued):

(iii) It is assumed that as workload is consolidated, that workload will not be run on separate sort schemes, but rather the sort schemes would be aligned to achieve economies for some operations. These consolidations of mail volume onto the same sort schemes reduces the amount of set up and tear down costs incurred for the same amount of mail volume, which is part of the economies of scale achieved. *See*, Direct Testimony of Linda A. Kingsley on Behalf of the United States Postal Service, Docket R2001-1, USPS-T-39 at 28-30.

(iv) Under these circumstances, would the model count the "core" fixed costs of the consolidated operation as "saved?" Based on the mathematical formulation of the END cost equations, if an operation were completely removed from a facility, all costs of that operation would be removed. By definition within the END optimization model, $Hrs = \alpha + \beta * TPH$, and α cannot exist in isolation. The core component of the curve only exists if the operation is present.