

PROCUREMENT OPTIONS FOR THE ELECTRIC POWER SUPPLY OF TREN URBANO

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RESEARCH GOAL

- ◆ Evaluate various procurement options for ensuring an adequate and reliable electricity supply for the Tren Urbano.

POWER SUPPLY FOR THE TREN URBANO

RELIABILITY GOALS

- ◆ Meet or surpass reliability standards of other modern transit systems.
- ◆ Withstand severe and inclement weather
- ◆ Tropical climate necessitates air conditioning

VALUE OF RELIABILITY

- ◆ Affects Ridership and Revenue
- ◆ Impacts Public Perception

PUERTO RICAN POWER AUTHORITY (PREPA)

- ◆ Tren Urbano will increase the already increasing demand
- ◆ New leadership is working to address and remedy reliability issues that have occurred in the past

CURRENT SITUATION

Summary of Preliminary Frederick Harris Report

Electric Characteristics and Concerns of Tren Urbano

- ◆ Combination of single phase and 3 phase AC and DC power
- ◆ Four 38 KV, 60 Hz feeder stations provide power
- ◆ Secondary feeder stations connected to substations reduce voltage to 13.8 KV
- ◆ Increasing demand may lead to power outages or brownouts if PREPA finds summer of 2001 an impossible date by which to improve system
- ◆ Natural disasters: hurricanes and storms provide a challenge to making Tren Urbano run on schedule

Physical Options if Increased Demand Cannot be Met by Summer 2001

- ◆ Main Recommendation: Install 20 MW emergency backup power split between the Bayamon Centro and Sagrado Corazon sites, which will be fed to TU substations at 38 KV. Generators will be diesel or gas
- ◆ Install 1 MW generator at O&M facility for critical loads
- ◆ Upgrade interconnection between 2 halves of power distribution system
 - ◆ Deploy up to 10 MW of peak shaving during peak commuter periods

PROCUREMENT OPTIONS

◆ Procurement Options for Backup, Upgrade, and Long Term Power Requirements

Utility Provided Power: The Tren Urbano could contract with the Puerto Rican Power Authority

Tren Urbano Dedicated Facility: Tren Urbano would initiate a Request for Proposals to

- a) design-build a dedicated facility which is owned and operated by Tren Urbano,
- b) B-O-O a dedicated facility which is owned and operated by a third party (including PREPA)
- c) design-build-operate a dedicated facility which is owned by Tren Urbano but operated by a third party (including PREPA).

Energy Management: Tren Urbano could initiate a Request for Proposals, without specifying the particular physical facilities that may be built, to solve the energy problem for the Tren Urbano, given the physical, resource, time, and cost constraints. This option would leave it to the potential contractors to define, design, and build the solution. The solution(s) could be power plants, a mixture of power plants and demand management, or even a cooperation with PREPA.

Consortium: Tren Urbano could form a joint venture with Centro Medico and the University of Puerto Rico for any and all of the above

RESEARCH STATUS

CONTACTED ENTITIES WHICH HAVE DEALT WITH ADEQUATE POWER/RELIABILITY ISSUES

- ◆ MIT: uses continuously operating cogeneration; cheaper than Cambridge and was experiencing many outages between 1981-1991. Wanted direct control
- ◆ Harvard: similar system as MIT; economic reasons motivated decision. Late 1970's had legal issues since CELCO refused to run electric lines to Harvard's plants
- ◆ MATEP: cogeneration was economically sensible. and they needed steam and electricity. Has positively impacted reliability
- ◆ MBTA: owns gas turbine engines for backup although had own steam power many decades ago. Instrumental in buying wholesale power and getting legislation to approve them a wholesaler of power. 90% federal funding.
- ◆ Disney World: backup allows small part of their operation (rides) while disconnected from main power grid during lightning storms
- ◆ Partner's Health Care: constant demand throughout day and the summer peak requires extra backup capability; use gas turbine engines are used.
- ◆ MWRA: Boston Edison built a cable under harbor and a substation on Deer Island but have several backups

INSTITUTIONAL ISSUES

MIT/CELCO: It was cost-effective for MIT to generate its own power, Cambridge Electric Company, CELCO, imposed a kind of “exit fee” because their demand estimates included the MIT demand, yet MIT did not use CELCO.

MBTA: Bought power and was in a struggle between being considered a wholesaler or distributor. Edison pays the T to run the T generators in case supply shortage, ex: NEPP. Perhaps TU could explore this method since it offers financial benefits

MWRA: Environmental Laws and Massachusetts procurement laws heavily influenced the procurement of secondary power sources and operation of facilities. Chose a third party (Boston Edison) because the MWRA’s procurement process would take too long.

INSTITUTIONAL ISSUES (CONTINUED)

Deregulation: of the utility industry will impact the various procurement options and their relative benefits and drawbacks. More opportunities for procurement and more skilled experts involved in electricity procurement.

Availability of Natural Resources in San Juan: This will affect the procurement strategies if the contractors cannot secure natural gas or diesel at a reasonable price.

Needs of other Institutions/Agencies in San Juan: The hospital, university, and perhaps financial institutions will find it to their advantage to participate in sharing the costs and benefits of reliable power for Tren Urbano

Improvement of PREPA: As PREPA's service is made more dependable, they may be the most obvious source for reliable power.

◆ Potential Criteria Used to Evaluate Procurement Options

Timeliness: Options must be able to meet summer 2001 opening date.

Quality: The draft Frederick R. Harris report has made several recommendations for ensuring adequate and reliable power. Additional studies may be conducted by Tren Urbano, Siemens, and/or others. The procurement options must meet the specified technical, environmental, and reliability requirements.

Price /Cost(Initial Life Cycle): In order for the Tren Urbano to stay a viable alternative to automobile use in San Juan, the project must meet cost targets to keep fares reasonable. Thus, any procurement option for electricity must stay within both operating and capital cost targets of the project. Third party involvement could help financing of the project (tax exemptions). Financing of a turnkey, for example, is slightly different from other approaches.

Risk-Sharing: The ability of one or more organizations or agencies to share financial and legal risk for delivering power to the Tren Urbano will be paramount to ensure that costs are not “passed-through”. This criteria would need to be specified in the RFP

RESEARCH PLAN

I. CONTINUE ASSESSMENT OF PROCUREMENT OPTIONS:

- A. Continue Ongoing Discussions with Siemens, Tren Urbano, and Frederick Harris regarding current plans.
- B. Continue Ongoing Discussions with MBTA, MIT, MATEP, Partner's Health Care, and MWRA on various procurement options.
- C. Contact UPR, Centro Medico, PREPA, Financial Institutions, and others involved in securing reliable and adequate power.
- D. Contact Electric Power Research Institute, New England Electrical Systems, Department of Public Utilities, PGH Wong, Energy Investors, Public Utilities Commission for guidance on procurement and utility regulation.
- E. Review trade journals and articles on the procurement of power and on independent power producers (IPP).

II. ANALYZE CASE STUDIES:

Possible transit case studies: in Atlanta, Miami, DC, New Delhi.

III. DEVELOP AND EVALUATE PROCUREMENT SCENARIOS FOR VIABLE ALTERNATIVES

RESEARCH PROPOSAL FOR TREN URBANO:

SECURING AN ADEQUATE AND RELIABLE ELECTRICITY SUPPLY

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1. RESEARCH OBJECTIVE:

Tren Urbano will provide a viable alternative to driving on congested, polluted roadways of the San Juan Metropolitan Area. The Tren Urbano must operate reliably, safely, and on schedule to attract passengers and keep ridership high. To realize each of these goals, a dependable power supply must be obtained. This research will detail several options and determine the best method for securing an adequate and reliable electricity supply for the Tren Urbano.

2. BACKGROUND AND MOTIVATION:

Background on the Project:

The Tren Urbano is a high capacity and high frequency electric train. It requires electricity to both move its cars and to run its on-board systems such as automatic doors and air-conditioning. If power were to fail, the train would stop and by default, lock its car doors. The passengers would be literally trapped (possibly above grade). Furthermore, passengers would experience extreme discomfort and anxiety when the air-conditioning failed and windows and doors could not be opened. (Thus far, the train does not have a manual override to open windows or doors.) This scenario is not unthinkable; the mechanism for securing power for the project is currently unspecified and vague. To date, the project has not considered possible consequences of depending on the island's unreliable electricity supply.

Motivation:

The Tren Urbano Environmental Impact Statement specifies several goals for the project. One goal is to improve levels of transportation mobility within the San Juan Region with objectives of maximizing regional public transit ridership and reducing travel time. Another goal is to improve public transit service efficiency, convenience, and reliability with the objectives of increasing service frequency and improving operating speeds and schedule reliability. Other goals of the project stated in the Environmental Impact Statement (EIS) are ensuring and improving safety, reliability, cost-effectiveness, steady tourism, and preventing or slowing the shift away from transit to cars. A reliable electricity supply is essential in ensuring that the Tren Urbano meets the goals specified in the EIS.

According to the EIS, 3.2 million tourists currently tour Puerto Rico by highway. Tren Urbano, if reliable, would provide an alternative form of transportation for the tourists. The train would thus be an economic stimulus as well as a project to reduce congestion and increase mobility.

Finally, Tren Urbano would require less government support if its power supply could be secured below the current island's cost. If the train ran despite the island's variable electric supply and ran below the market cost of electric power, ridership would be high and the project would succeed economically.

3. RESEARCH STRATEGY:

Given the technical issues of how much electricity is needed for the project, how the demand will vary with different time periods, and what fraction of the Puerto Rican power supply Tren Urbano will be, this research will address the institutional issues related to securing an adequate electricity supply.

First, this research will involve investigating Puerto Rico's utility transmission and distribution grid system and the current situation and plans Puerto Rico has on these issues. Second, the work will delve into the features of the Tren Urbano/Siemens contract regarding financial risk and power supply. Third, research will explore the reliability of Puerto Rico's power system and construct a model of reliability based on hours of power outages per month or year.

The research will then begin to involve interviews and literature searches both in Massachusetts and in Puerto Rico. Research will include at least:

- Contacting the Puerto Rican Electric Power Authority (PREPA) and the New England Power about financial agreements, contracts, and any problems regarding the terms of the agreements.
- Conducting research on organizations which have set up their own dedicated power plant.
- Contacting Massachusetts Bay Transit Authority (MBTA)
 - Contacting MIT regarding power supply for the university
 - Researching and contacting Medical Area Total Energy Plan (MATEP) at Harvard
 - Contacting the University of Puerto Rico and the Hospital (Medical center)
- Conducting literature searches on electric supply and transit
 - Researching ENRON and India
 - Analyzing Case Studies on Manila, New Delhi, Paris, and Bombay
- Contacting consulting firms or companies working on power supply issues

Using the information gained from the research, options will be formulated. Some currently known alternatives to relying on the current system are (1) to contract out, (2) to create a "unique relationship" (via an institutional or financial agreement) with PREPA, (3) to coordinate with the University of Puerto Rico (UPR) and the Hospital to form a coalition with Tren Urbano, or (4) to build a dedicated Tren Urbano electric generator. Then, a decision matrix can be constructed with the options and formulating criterion to be used for evaluating the options. By assigning appropriate weighting coefficients to the criterion, alternatives will be evaluated. Positive and negative aspects of the options will be presented.

4. IMPLICATIONS:

If an adequate and reliable electricity supply is not secured for the Tren Urbano, the financial and political costs could be very high. The train may not operate on schedule and may have many problems when completed in 2001. On the other hand, securing a reliable electricity supply will positively affect other aspects of the project:

- Ridership would stay high and constant.
- The public would perceive the project as worthy, reliable, and safe.
- Major public health and safety concerns regarding power outages while above-grade or during hot weather would be minimized.
- Tourism would stay high or increase due to convenience and reliability of an alternative to highway transportation and road sightseeing.
- Financing the Tren Urbano would become easier with a lower cost electricity supply.

Tren Urbano's electricity supply affects other aspects of the project. It is important to plan for both the short- and long- term phases of the project, focusing on procurement issues. This research will plan for the phase one completion in 2001 and will recommend actions and research for expansion of Tren Urbano in the future.