

Town of Flower Mound Facilities' Energy Management Program

Prepared for:

Town of Flower Mound Executive Management Team

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Introduction to Energy Efficiency

Energy efficiency can result in numerous benefits. By using energy more efficiently, the Town of Flower Mound's vulnerability to energy prices is reduced, while its cost effectiveness is improved, and the environmental impacts of electricity production are avoided. The Facilities' Energy Management Program is presented as a component which is to be included into a broader program to be developed incrementally over time.

Frequently cities must choose between investing in energy efficiency or energy supply. Both of these choices have numerous issues surrounding these decisions.

Energy Supply

Investing in supply is a major capital undertaking. In many cities, a large part of the public investment budgets additional funds for the purpose of increasing supply. This has significant financial consequences and can create damaging environmental impact issues. It is very difficult to expand supply capacity quickly.

Increasing energy supply involves building generating facilities funded with equity and long-term debt. There are many funding sources, which include equity from developers, investment funds, venture capitalists, utilities, and debt from capital markets, development banks, or commercial banks. Revenue is realized from electricity generated and sold. In building additional supply capacity, there are many costs and risks that must be considered, such as fluctuation in fuel costs, environmental impact, operation expenses, designing and building.

Energy Efficiency

Energy efficiency reduces the need to build additional capacity by reducing energy demand. It decreases the environmental impacts of increased generation through avoided demand. Energy efficiency decreases life cycle costs to the Town while also decreasing system-wide capital costs. Energy efficiency can be achieved through improvements to a variety of systems including HVAC, motors, drives, lighting, and controls. Projects can be funded via grants, low-interest loans, market-rate loans, leases, or performance contracts from funding sources including energy services companies, utilities, capital markets, equipment vendors, or development banks. Energy cost savings result in cash flows for energy efficient projects. Direct project costs may include design, installation, and maintenance of energy efficiency measures. Energy efficiency projects tend to be on a much smaller scale than generation projects, occurring at numerous sites with highly engineered technology. They can be incrementally implemented thus spreading capital expenditures out over time. The risks involved in an energy efficiency project include the possibility that actual measured savings or return on investment, and the potential for facility operating changes may not meet projections.

Environmental Costs of Energy Use

There are a number of environmental costs associated with energy use. Electricity generation releases several pollutants into the air including air particles that cause health problems and impair visibility, sulfur dioxide (SO₂) and nitrogen oxides (NO_x) which cause acid rain, and greenhouse gases that contribute to climate change and global warming. Additionally, generation causes water pollution and waste accumulation through ash, sludge, and radioactive waste, depending on the type of generation facility.

Cost Benefit Analysis

There are both costs and benefits associated with pursuing energy efficient projects. Some costs may include debt service to cover cost of energy efficient measures or net customer costs. A few of the benefits are avoided supply costs and bill savings (lost revenues for the utility provider).

Energy Auditing

An energy audit is the first step in understanding how a facility uses energy. The purpose of an audit is to identify and prioritize cost-saving energy efficiency measures. Essential ingredients for a successful energy audit process include support of the top management, teamwork, and communication among those involved. Caution must be taken to avoid the gross over or under estimating of energy and cost savings that may result from a lack of understanding of the building systems and its interactions, inaccurate or incomplete gathering of system and operating data and, in some cases, the bias of the auditor.

There are several types of energy audits: Preliminary Audits, Utility Cost Analysis, Standard Energy Audits, and Detailed Energy Audits. Each have different scopes and costs. Audits will usually culminate in an energy audit report that must be easily readable and digested by technical and non-technical audiences. The report should include charts and graphs to display information graphically, whenever possible. All assumptions should be clearly stated and explained. Recommendations must be as clear as possible and include quantitative detail.

Audit Type	Description
Preliminary Audit	This type of audit consists of a one-day site visit to collect an overall facility profile and information on major energy using systems and equipment. Recommendations resulting from a preliminary audit include low to no-cost actions that can provide immediate energy use and/or operating savings.
Utility Cost Analysis	The purpose of this type of audit is to analyze the operating costs of the facility, and determine the potential for energy efficiency retrofits. The auditor may also perform a preliminary audit to familiarize himself with the facility. Utility data and the

	facilities' utility bills are analyzed for the past several years to identify patterns of energy use, peak demand, and weather effects. The information is used to identify energy savings potential, calculate the energy utilization index, and determine the incremental cost of each unit of energy.
Standard Energy Audit	This audit is a comprehensive analysis of the energy systems of a facility. It includes both a preliminary audit and utility cost analysis. In addition, this audit includes the establishment of baseline energy use, evaluation of energy measures in terms of energy and cost savings and cost effectiveness. The auditor establishes the building's operational characteristics through drawings and discussions with building occupants. Standards and codes are reviewed and buildings and equipment use schedules are established. An inventory is taken of all energy consuming equipment using equipment nameplates for reference. Metering equipment is installed to verify the equipments energy consumption. Based upon drawings, site surveys, and utility analysis, the auditor creates a baseline energy model. Potential energy savings measures are then evaluated for their efficiency and payback.
Detailed Energy Audit	The detailed energy audit follows essentially the same steps as the standard audit. However, it is broader in scope and usually takes more time. Computer simulation tools are typically employed, and more detailed data is gathered from the metering of consumption. The economic analysis involves an integrated systems approach, which accounts for interactions in implementing multiple retrofit measures, such as lighting and HVAC.

End Use Analysis

End use demand forecasting is important because it provides the fundamental basis for planning energy purchases or efficiency improvements. The forecasting method used has a significant impact on the projection results. Projections are used to evaluate the potential of "conserved energy" (the demand-side resource) and provide a baseline for estimating savings. You can perform end use analysis using a bottom-up approach that relies on engineering costing methods as opposed to "top down" macroeconomic estimations. Some of the assumptions of this approach are that demand is for energy services, not energy commodities, and that energy efficient technologies can be identified and installed. This approach may identify many inefficiencies in the present energy system, as well as indicating that improving those inefficiencies can have zero or negative life cycle costs.

Baseline Growth Projections

If all parameters affecting total energy use remained stable during the project life, one would expect only a uniform cyclical annual pattern due to seasonal weather variations. However, baseline energy use can be expected to grow (or decrease) according to projected changes in the actual rate of production, hours of operation, etc. These deviations should be accounted for by normalization in the monitoring process. Building occupancy, weather and other non-technical parameters can vary and should be normalized. Energy savings are the actual, no-project (base) case, not the projected base.

Background

Energy is a component of our daily life and energy is necessary for continued productivity and comfort for Texas citizens. A major issue facing each one of us is how can we efficiently use energy resources, protect environmental health, and reduce energy costs. Texas has experienced economic and population growth over the last decade. While this is desirable, a substantial increase in Texas energy consumption has created unacceptable air quality in many areas of the state.

The Environmental Protection Agency (EPA) has established air quality standards which specific regions within Texas are required to meet. Unfortunately, many cities and communities in Texas are not meeting these standards. In 2001, the 77th Texas Legislature passed Senate Bill 5, also called the Texas Emissions Reduction Plan (TERP). The Texas Natural Resource Conservation Commission (TNRCC), in cooperation with various other participants, is administering the TERP. It was created to provide grants and incentives for improving air quality throughout the state of Texas, and lists specific objectives, which we are required to obtain.

Buildings and equipment owned by the Town utilize energy in the following forms: electricity for cooling, lighting, heating and motors; natural gas or propane for heating and petrol/diesel fuel for motor vehicles, heavy equipment, gardening equipment, and generators for generation of emergency power. The Facilities' Energy Management Program does not address energy conservation regarding Town-owned vehicles or heavy equipment. The implementation of a Facilities' Energy Management Program aims to conserve all forms of energy that are utilized to support the operation and function of Town-owned buildings by eliminating waste, encouraging efficient use, incorporating energy efficiency and automated controls for lighting and HVAC systems, including renewable energy sources into building construction and renovation projects, identifying upgrade opportunities, and implementing ongoing preventative maintenance (PM) procedures to maximize energy efficiency. Reducing energy usage does not necessarily mean a reduction in services or availability of facilities and may result in significant cost savings to the Town.

1.0.0 GOAL: To increase the efficiency of all Town facilities.

1.1.0 OBJECTIVE: To include energy efficiency in the identification and design of building construction and renovation projects.

- 1.1.1 The Facilities Management Division will make energy efficiency a primary consideration in the design or replacement of HVAC and lighting systems and related equipment.
- 1.1.2 The Facilities Management Division will annually perform research and evaluate potential energy efficiency upgrade projects. Projects found economically feasible will be submitted through the budget process for approval.
- 1.1.3 All Town departments and divisions responsible for providing input or making decisions for new construction and major renovation projects will work closely with architects and engineers during the design phase to ensure that short-term project cost containment does not override the goal of minimizing long-term operating costs.
- 1.1.4 The Engineering Services Division and Facilities Management Division shall ensure new construction and renovation projects are designed, where feasible, to meet the most current International Energy Conservation Code (IECC) and American Society of Heating, Refrigeration and Air Conditioning Engineers Standards (ASHRAE).
- 1.1.5 The Facilities Management Division and Information Technology Division shall ensure, when feasible, that new appliances and office equipment are specified to meet the EPA Energy Star rating.

1.2.0 OBJECTIVE: To incorporate alternative and renewable energy sources, where economically feasible, in new building and renovation projects.

- 1.2.1 The Environmental Compliance Manager will be responsible for maintaining an ongoing awareness of sources of renewable and alternative energy technology and shall work with the Facilities Management Division to determine if applications for these technologies exist.
- 1.2.2 The Environmental Compliance Manager will require that architects and engineers address options for incorporating passive solar design into new building construction or major renovation projects.
- 1.2.3 The Environmental Compliance Manager will require architects to consider the feasibility of incorporating a photovoltaic energy system into the design of any new building with high utility demand costs.
- 1.2.4 The Environmental Compliance Manager will compare the life cycle cost of purchasing a small photovoltaic energy system with that of a new electric service when new, small utility demand buildings are planned. Examples are: equipment storage sheds, concession stands, ball field restrooms, communications systems and exterior lighting.
- 1.2.5 The Engineering Division and Facilities Management Division will ensure that architects and engineers assess life cycle costs of incorporating a solar thermal water heating system for new building construction or renovation projects which will have a large and constant water heating demand load and natural gas

service is not available. Some examples are: recreational facilities such as a gymnasium or a swimming pool.

- 1.2.6 The Facilities Management Division shall consider solar thermal technology for existing facilities that have large and constant water heating loads and where the water is heated by the use of electricity.
- 1.2.7 The Facilities Management Division will assess the feasibility of installing geothermal systems in existing buildings that have a water source heat pump system that needs renovation.
- 1.2.8 The Engineering Division and Facilities Management Division will request the architect and engineer to study the viability of incorporating a geothermal system when planning new construction projects for medium to small buildings.

1.3.0 OBJECTIVE: To reduce the energy used for heating and cooling buildings.

- 1.3.1 The Facilities Management Division will replace existing outdated HVAC systems and related equipment with new, energy efficient systems upon system failure, or as funding is available.
- 1.3.2 The Facilities Management Division will perform preventative maintenance on all air handling and HVAC systems by: completing required daily, weekly, monthly or annual visual inspections which include changing air filters, checking and adjusting belts, checking and maintaining refrigerant pressures, greasing bearings and motors, cleaning humidifiers, checking piping and chilled water chemical balances, cleaning cooling coils, calibration of thermostats and control systems, cleaning of chiller condenser tubes, inspection of fan sheaves for wear and tightness, testing fan freeze-stat controls, checking bearing alignment, inspecting units for rust and bacterial growth, inspecting electrical connections, inspecting vibration isolators, cleaning fan wheels, and inspecting fan blades for damage and wear.
- 1.3.3 The Facilities Management Division will calibrate thermostats annually ensuring temperature settings can be accurately maintained.
- 1.3.4 The Facilities Management Division will identify and provide training for maintenance staff on the efficient operation of HVAC systems.
- 1.3.5 The Facilities Management Division will ensure existing HVAC economizer systems are set and operating efficiently; and will ensure that HVAC systems in new buildings are designed with economizer systems to provide natural cooling cycles and heat reclamation from exhaust air streams.
- 1.3.6 The Facilities Management Division will complete annual energy audits for all facilities and implement “no” and “low cost” operations and maintenance improvements for HVAC equipment.
- 1.3.7 The Facilities Management Division will ensure that the thermostats in all facilities are set for the most cost-effective setting for cooling and heating. Recommended settings are 78° for cooling and 70° for heating during periods of occupancy periods and during non-occupancy periods settings would be 55° for heating and 83° for cooling. They will ensure energy management control systems are programmed to reflect the recommendations stated above.

1.3.8 The Facilities Management Division shall coordinate with the Environmental Compliance Manager to ensure that all cost-effective energy conservation and efficiency measures are evaluated and submitted for approval during the budget process.

1.3.9 The Facilities Management Division shall ensure, where applicable, for new construction and major renovations, that the HVAC system controls with state-of-the-art direct digital controls, energy management control systems, or smart clocks are considered by the design team.

1.4.0 OBJECTIVE: To reduce the energy used for lighting facilities.

1.4.1 The Facilities Management Division will conduct lighting surveys of existing facilities to identify opportunities for light level reductions, lighting upgrades, task light applications, and lighting controls applications.

1.4.2 The Facilities Management Division will identify lighting upgrade opportunities (during renovation projects, when rooms are painted, when use schedules change, and during the annual budget process) and evaluate the feasibility of energy efficient lighting upgrades at that time.

1.4.3 The Facilities Management Division will ensure that the Town takes advantage of all cost-effective lighting upgrade opportunities, as resources are available.

1.4.4 The Environmental Compliance Manager and Facilities Management Division shall coordinate and be mutually responsible for maintaining an ongoing awareness of energy efficient lighting technologies, upgrade preferences (retrofit existing fixtures vs. replacement), and upgrade goals.

1.4.5 The Environmental Compliance Manager and Facilities Management Division will provide building occupants with annual training and information on the energy savings benefits and proper use of day lighting, task lighting, and lighting controls applications.

1.4.6 The Environmental Compliance Manager and the Facilities Management Division shall ensure that energy efficient lighting technologies are considered for new construction projects.

1.4.7 The Environmental Compliance Manager shall provide status reports, as required, to Texas regulatory agencies regarding the Town's energy saving initiatives.

1.5.0 OBJECTIVE: To implement operations and maintenance procedures to maximize energy efficiency on a continual basis.

1.5.1 The Facilities Management Division shall maintain a continuous inventory and audit of all electric motors and gas fired appliances and equipment associated with Town-owned buildings. The inventory shall include building address, equipment the motor serves, horsepower, revolutions per minute, enclosure types, connected load and annual operating hours, etc.

1.5.2 The Facilities Management Division shall maintain an ongoing predictive failure and replacement schedule of all motors in their inventory. New motors shall be high efficiency motors.

1.5.3 The Facilities Management Division will analyze and verify that automated energy management systems programs and settings are appropriate to maximize energy efficiency. This includes settings for temperature, night setbacks, load shedding, economizers, and run-times.

1.5.4 The Facilities Management Division shall provide training in the proper operation of all new HVAC and energy management control systems.

1.6.0 OBJECTIVE: To fund energy efficiency projects.

1.6.1 The Facilities Management Division shall compile a list of the facilities which consume energy. The list will prioritize the facilities from the least efficient to the most efficient.

1.6.2 The Facilities Management Division shall examine opportunities where energy efficiency could be improved starting with the least efficient facility.

1.6.3 The Facilities Management Division shall explore technical and financial programs that may provide funding for these projects.

1.6.4 The Facilities Management Division, assisted by the Environmental Compliance Manager, shall maintain an energy reduction action project list of energy efficiency projects which could be implemented as funding becomes available. The current list is attached and made part of this program.

1.6.5 The Environmental Compliance Manager shall research grant opportunities for energy saving programs.

2.0.0 GOAL: Increase energy efficiency in all Town operations and services.

2.1.0 OBJECTIVE: To integrate energy efficiency into the Town's internal operations and support services.

2.1.1 The Town will implement an energy management plan and update the plan on an annual basis during the budget process. The Environmental Compliance Manager shall serve as the central point of contact for energy management information.

2.1.2 The Town staff shall increase by 10% the amount of materials recycled through the recycling program for office paper, cardboard, newspaper, laser printer toner cartridges, glass, aluminum, batteries, fluorescent lamps and ballast.

2.1.3 The Environmental Compliance Manager will facilitate the efficient use of lights, appliances, and other energy consuming equipment by posting signs reminding employees to turn off equipment when not in use.

2.1.4 The Environmental Compliance Manager will develop an incentive program for Town employees who meet or exceed predetermined objectives for energy reduction.

2.1.5 The Town Manager will send a memo semi-annually reminding employees of the Town's commitment to energy conservation and to promote energy conservation measures. The memo will remind employees to turn off unnecessary lights and appliances and to maintain thermostat settings at 78

degrees in the summer for cooling and 70 degrees in the winter for heating of all occupied spaces.

- 2.1.6 The Town will request improvements to increase energy efficiency when negotiating leases to ensure that rental costs do not cover excessive energy usage due to inefficient equipment installed in the space.
- 2.1.7 Town staff will reduce the wasteful use of supplies and materials in the workplace, using techniques such as double-sided copying, reducing reproductions, reusing materials, etc.
- 2.1.8 The Town will purchase cost effective, energy efficient products to minimize life cycle costs.
- 2.1.9 The Purchasing Division will emphasize the importance of energy efficiency when evaluating and securing services.
- 2.1.10 Town staff will utilize computer networks and electronic mail to reduce the use of paper products in the office.
- 2.1.11 The Environmental Compliance Manager will provide staff with information on the efficient operation of energy saving systems, such as computers and copiers.
- 2.1.12 The Town will increase the purchase of recycled supplies, such as stationary, envelopes, photocopy paper, and business cards by 10%.

3.0.0 GOAL: Monitor and evaluate the Town Facilities' Energy Management Program.

3.1.0 OBJECTIVE: Collect data, perform progress measurement and reporting capabilities of the Facilities' Energy Management Plan.

- 3.1.1 The Facilities Management Division, in conjunction with the Budget Services Division, shall monitor the Town's energy cost and consumption for all Town buildings.
- 3.1.2 The Facilities Management Division will manage and maintain the database and provide quarterly energy costs and consumption reports to the Deputy Town Manager/CFO, Environmental Compliance Manager and Budget Services Division.
- 3.1.3 The Environmental Compliance Manager will provide reports, as required, to governmental agencies documenting energy reduction savings and initiatives.
- 3.1.4 The Budget Services Division will share the energy use information with the Executive Team to ensure that management is informed, when required, to make decisions on energy reducing efforts or when determining which facilities to target for energy reduction efforts, i.e., during the annual budget process.

3.2.0 OBJECTIVE: To monitor and promote the Facilities' Energy Management Program.

- 3.2.1 The Facilities Management Division will design a reporting system to monitor the progress of the Facilities' Energy Management Program and it's implementation. The reports will be forwarded to the Environmental

Compliance Manager for inclusion into any required reports to governmental agencies.

3.2.2 The Environmental Compliance Manager and the Facilities Management Division shall work together to promote the Facilities' Energy Program to Town management and employees.

3.2.3 The Environmental Compliance Manager will provide feedback to Town management and employees on the results of energy conservation initiatives (i.e. through newsletters, e-mail, etc).

4.0.0 GOAL: Implement Facilities' Energy Management Program.

4.1.0 OBJECTIVE: Strategy for implementation of Facilities' Energy Management Program.

4.1.1 Facilities Management will request assistance from Development & Environmental Services staff in reviewing the program.

4.1.2 Facilities Management will include Development & Environmental Services suggestions into the program.

4.1.3 Facilities Management will submit the program to the Deputy Town Manager/CFO for review and comments.

4.1.4 Facilities Management shall include the Deputy Town Manager/CFO's suggestions into the program.

4.1.5 Facilities Management shall submit the Facilities' Energy Management Program to the Town Manager for approval.

4.1.6 Once the program is approved, the Facilities Management Division, with assistance from Development and Environmental Services, shall implement the "no cost" energy reducing initiatives immediately throughout Town facilities.

4.1.7 The Facilities Management Division and Environmental Compliance Manager shall develop a list of projects by facility and priority.

4.1.8 The Facilities Management Division shall prepare cost estimates, and request funding during the budget process for high priority energy retrofits, replacements or reduction projects.

4.1.9 The Environmental Compliance Manager shall research alternative funding sources for the projects and present findings to management.

4.1.10 Once established and implementation has begun, continue the Facilities' Energy Management Program per the approved written procedure.

4.1.11 The Facilities Management Division shall implement the energy retrofits or replacement projects, as approved, during the budget process by the Town Council.

5.0.0 Goal: Obtain long-term, low-cost, reliable energy services.

5.1.0 Objective: Utilize energy audit reports, perform end-use forecasting and baseline projections required to obtain long-term, low-cost, reliable energy services.

- 5.1.1 The Facilities Management Division will perform and provide annual audit information as required to the Budget Services Division to be utilized in the negotiation process of energy services.
- 5.1.2 The Facilities Management Division shall assist the Budget Services Division by providing data to perform the end-use forecasting and baseline projections required to effectively negotiate for energy services.
- 5.1.3 The Budget Services Division shall prepare the end-use forecasting and baseline projection calculations required to compile the information into the desired format for use during negotiations.
- 5.1.4 The Budget Services Division will prepare requests for information (RFI's) and requests for quotes (RFQ's) to be used to obtain pricing information from energy service providers.
- 5.1.5 The Budget Services Division shall evaluate the RFI or RFQ information and negotiate the best prices for energy services. The Facilities Management Division will assist, as required.
- 5.1.6 The Budget Services Division shall present the information to management for approval.
- 5.1.7 If the energy service provider, as a result of the above process, will install new infrastructures, the Facilities Management Division shall coordinate the installation and service outages with Town employees and the service provider. Every effort will be made to perform service outages after working hours to minimize the impact on Town operations.