

**PUBLIC UTILITY COMMISSION OF TEXAS**

**REQUEST FOR PROPOSALS**

**FOR A CONTRACTOR TO ASSIST IN THE MANAGEMENT AND  
MARKETING OF THE MIDDLE SCHOOL ENERGY CONSERVATION  
OUTREACH PROGRAM**

**Authorized by**

**PUBLIC UTILITY REGULATORY ACT, SECTION 39.902**



**Public Utility Commission of Texas  
William B. Travis Building  
1701 North Congress Ave.  
Austin, Texas 78711**

**Closing Time and Date – 2pm, Central Time**

**06/08/2015**

**Project No. 44710  
RFP Number 473-15-00509  
NIGP CLASS ITEM  
915-22**

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**PUBLIC UTILITY COMMISSION OF TEXAS**  
**REQUEST FOR PROPOSALS NO. 473-15-00509**

**FOR A CONTRACTOR TO ASSIST IN THE MANAGEMENT AND MARKETING OF  
THE MIDDLE SCHOOL ENERGY CONSERVATION OUTREACH PROGRAM**

**SECTION 1 – INTRODUCTION**

The Public Utility Commission of Texas (PUCT) is issuing this request for proposals (RFP) for a contractor to assist in the management and marketing of the PUCT’s Power to Save Texas Middle School Program selected middle schools, preferably, but not limited to, in Dallas, Harris, Hidalgo, and Tarrant counties.

It is the PUCT’s goal that after engaging middle school students and faculty and educating them of the benefits of saving energy, the students, faculty, and their families will be diligent in energy conservation, especially during peak demand hours.

**Background Information**

In 1999, the Texas Legislature enacted Senate Bill 7, which restructured the electric industry and provided most Texas customers the ability to choose their electricity provider beginning January 1, 2002. Senate Bill 7 also provided for an educational program to inform customers about the deregulated market.

**PURA Section 39.902**

Senate Bill 7 directed the PUCT to design and implement an educational program that:

- Informs customers, including low-income and non-English-speaking customers, about changes in the provision of electric service resulting from the opening of the retail electric market and the customer choice pilot program
- Is neutral and non-promotional and provides customers with the information necessary to make informed decisions relating to the source and type of electric service available for purchase and other information the PUCT considers necessary
- Informs customers of their rights and of the protections available through the PUCT and the Office of Public Utility Counsel
- Does not duplicate customer information efforts undertaken by retail electric providers or other private entities
- Does not target areas served by municipally owned utilities or electric cooperatives that have not adopted customer choice

**Target Market/Audience**

The education program primarily targets the Texas population served by the present ERCOT investor-owned utilities and some areas served by co-operatives that have opted into electric deregulation.

**SECTION 2 – ELIGIBLE PROPOSERS**

Proposers **must** have a minimum of five (5) years’ experience managing similar projects of a similar size and scope as described in Attachment A, Statement of Work (SOW). An entity or company with fewer than five years’ experience is eligible to submit a proposal if key personnel on the proposal team (including subcontractors) have the minimum required experience. Proposers who do not meet this requirement are not eligible for award.

The PUCT encourages Historically Underutilized Businesses (HUBs) to compete for this award.

### **SECTION 3 – AUTHORITY**

This Request for Proposals is issued pursuant to Texas Utilities Code, Section 39.902.

### **SECTION 4 – ANTICIPATED SCHEDULE OF ACTIVITIES**

RFP Release	05/08/2015
Last day to submit written question(s) regarding the RFP	05/14/2015, 5:00 p.m. CT
Deadline for submission of proposals	06/08/2015, 2:00 p.m. CT
Post-proposal interviews or presentations, if required	06/11/2015
Staff Recommendation for selection	06/18/2015
Selection approved	06/18/2015
Contract negotiations	06/19/2015
Expected contract execution	07/2015

**Questions submitted to the PUCT will be answered within two business days after receipt and answers to all questions will be provided through an Addendum, posted on the ESBD**

**Disclaimer: Dates are subject to change at the PUCT’s discretion**

### **SECTION 5 – QUESTIONS**

The PUCT will accept **only written** questions and requests for clarification by e-mail to the attention of the personnel below. Inquiries and comments must reference RFP No. 473-15-00509.

Direct questions about the RFP to:

Erica Duque, CTPM, CTCM

[Purchasing@puc.texas.gov](mailto:Purchasing@puc.texas.gov)

**Please Note: Mrs. Duque is the only permitted point of contact. Contact or attempted contact with other PUCT employees, including Commissioners and their staffs, may result in a Proposer’s immediate disqualification.**

The PUCT will post additional information, responses to written questions, RFP modifications, and addenda on the PUCT website and the Electronic State Business Daily (ESBD). It is the responsibility of interested parties to periodically check the ESBD and PUCT’s website for updates to the procurement prior to submitting a bid. The Proposer’s failure to periodically check the ESBD and the PUCT’s website will in no way release the selected vendor from “addenda or additional information” resulting in additional costs to meet the requirements of the RFP.

<http://www.puc.texas.gov/agency/about/procurement/Default.aspx>  
<http://esbd.cpa.state.tx.us/>

Proposers should check both websites often to ensure they have the most current information.

## SECTION 6 – PROPOSAL REQUIREMENTS

Proposers must file their sealed proposals in Project No. 44710 at PUCT Central Records before 06/08/2015, 2:00 p.m., CT. Proposals submitted in response to this request must meet all requirements in this RFP to be considered for selection. Fax or email proposals will not be accepted under any circumstances.

The PUCT's Central Records Division is open to the public for filing Monday through Friday from 9:00 a.m. to 5:00 p.m. CT, excluding holidays. Central Records is also closed every Friday from 12 noon to 1 p.m. unless there is an Open Meeting of the Commission that day. Proposals will not be considered if received in the Central Records Division after 2:00 p.m. CT on the closing date.

### Delivery Address

Central Records Division  
Room 8-100  
William B. Travis Building  
1701 North Congress  
Austin, Texas 78701

### Mailing Address

Central Records Division  
Project No. 44710  
Public Utility Commission of Texas  
P.O. Box 13326  
Austin, TX 78711-3326

**Please Note: The PUCT WILL NOT accept a U.S. Postal Service postmark, round validation stamp, mail receipt with the date of mailing stamped by the U.S. Postal Service, a dated shipping label, invoice or receipt from a commercial carrier, or any other documentation as proof of timely submission of any proposal. The PUCT assumes no responsibility, under any circumstances, for the receipt of a proposal after the deadline time and date established in this RFP.**

**The PUCT will accept ONLY the time/date stamp of its Central Records Division as evidence of timely submission.**

### **6.1 Number and Appearance**

The proposal submission shall include an information sheet that clearly states the name of the Proposer; the name, address, and telephone number of the Proposer's point of contact, the project number; and the RFP title and number. The information sheet is the first page before the sealed proposal submission. Upon receipt of proposals, the PUCT will file the information sheets in Project No. 44710. All parts of the proposal after the information sheet shall be submitted in an envelope or other sealed container that is marked with the Proposer's name and "Project No. 44710: CONFIDENTIAL."

Proposers shall submit one (1) clearly marked "Original" of their proposal response with original signature and three (3) copies of their proposal. Proposers shall also submit one (1) electronic copy of the complete RFP response on a compact disk or memory stick (flash drive) in Microsoft Word. **Information required by Section 7.4 Compensation shall be included only in the original and electronic copy. No price information shall be included in any other portion of the response.** The three (3) copies of the proposal shall be identical to the original except for omitting the price information.

Proposals shall be written only on 8 ½" x 11" white paper using double or 1.5 spacing, and 12-point or larger Times New Roman font.

Proposals shall include all required attachments and certifications. The PUCT will not accept attachments and certifications submitted after the deadline. Failure to provide all required information shall make the proposal non-responsive and thus disqualified from consideration.

Proposals shall be bound in a three-ring binder.

Proposers shall not use the state seal or the PUCT seal in or on the proposal.

Proposals shall be free of any extrinsic items.

**Proposals are limited to 50 pages, including all attachments and certifications, but excluding section tabs or dividers. Proposals longer than 50 pages may be subject to immediate rejection without review. Evaluation team members will not read past the 50th page.**

## **SECTION 7 – PROPOSAL CONTENTS**

Proposals shall include the contents outlined below. Mark each section with an index tab. Within each section, pages shall be consecutively numbered. The PUCT may reject a proposal that fails to include required contents.

### **7.1 Statement of the Requirements**

Each Proposer shall state succinctly its understanding of this RFP's requirements and describe how it would perform the tasks in Attachment A, SOW. Each Proposer must demonstrate the capability to assist in the management and marketing of the energy conservation program in correlation with the PUCT's Power to Save Texas message at selected middle schools, preferably, but not limited to, in Dallas, Harris, and Hidalgo, and Tarrant counties. If a Proposer believes there are additional tasks needed to accomplish the PUCT's goals, identify them, explain why they are needed, and how the Proposer would perform them.

### **7.2 Competence and Knowledge**

Each Proposer shall demonstrate the competence and knowledge to fulfill the requirements identified in Attachment A, SOW. The Proposer should also describe any prior experience in providing similar services. The Proposer shall describe methods they intend to use to develop and implement these services and an organizational chart identifying the functions and reporting relationships of the personnel who would be assigned to this work.

### **7.3 Qualifications**

For each person a Proposer identifies to perform the work described in this RFP, provide a detailed resume that describes the services they would perform, their qualifications, and their experience.

### **7.4 Compensation**

Each proposal shall propose its firm fixed price to provide the services identified in Attachment A, SOW. If a Proposer believes that additional work is required to meet the PUCT's goals, the Proposer should identify the additional work and the associated price to accomplish that work. The PUCT requires Proposers to demonstrate how elements of the price correspond to elements of the proposed work plan.

### **Please note:**

**Compensation for the services outlined in Attachment A, SOW, will be based on a firm fixed price. Unless otherwise approved in writing by the PUCT, payments will be made based on the invoicing and payment terms of the resulting contract. The PUCT will not reimburse any out-of-pocket expenses or expenses not contemplated at the time of contract execution.**

### **7.5 References**

Each Proposer shall provide at least three references, including contact information. The PUCT prefers references from clients for whom the Proposer has performed similar work, including

other state commissions or boards. Do not use the PUCT or any individuals employed by the Commission as a reference. Any negative responses received may be grounds for disqualification of the proposal.

#### **7.6 Statement on Potential Conflicts of Interest and Prohibited Relationships**

Proposers must be neutral and impartial, must not advocate specific positions to the PUCT, and must not have a direct financial interest in the provision of electric, telephone, water or sewer service in the state of Texas. Proposers must identify any personal or business relationships with any electric, telecommunications, water or sewer utility or utility affiliate operating in Texas or any company participating in, or having a pending application at the PUCT to enter, the Texas retail electric market, telecommunications market, or water or sewer utility market. Proposers must identify the extent, nature, and time aspects of those relationships. Entities having a conflict of interest, as determined by the PUCT, will not be eligible for contract award.

**If a Proposer does not have any known or potential conflict of interest, the proposal must include such a statement. Failure to provide either a statement describing potential conflicts of interest or a statement that no potential conflicts exist shall automatically disqualify the Proposer. This statement shall be signed before a notary public by the highest-ranking officer of Proposer's entity having responsibility for vetting corporate conflicts of interest, e.g. a corporate Executive Vice President rather than the head of an operating or regional unit of the firm. If the circumstances described by a Proposer change or additional information is obtained subsequent to submission of proposals, the Proposer must supplement its response under this provision as soon as reasonably possible upon learning of any change to their affirmation.**

The PUCT will determine whether a conflict of interest or the perception of a conflict of interest exists from the perspective of a reasonable person uninvolved in the matters covered by the resulting contract. The PUCT is the sole arbiter of whether a conflict or the appearance of a conflict of interests exists. The PUCT encourages Proposers to provide complete disclosure of matters that might be considered a conflict of interest. Completeness of disclosure may be a factor in evaluating proposals.

Each Proposer also should address how the Proposer intends to ensure that no interest arising or potentially arising as a result of its activities or those of its parent, affiliate, or other related entity shall conflict with Proposer's duty should it be selected to provide these services.

Each Proposer shall identify its lobbyists registered with the Texas Ethics Commission and their compensation and shall include a statement of what involvement, if any, the lobbyists shall have in connection with (1) this engagement and (2) electric utility, telecommunication utility, or water and/or sewer utility legislation and policy.

The PUCT may not enter into a contract with a person who was a PUCT commissioner or executive director within the past 24 months, nor any person who has been employed by the PUCT within the past 12 months. Persons who have been employed by the PUCT or by another state agency in Texas more than 12 months but fewer than 24 months ago shall disclose in the proposal the nature of previous employment with the state agency and the date the employment ended.

## **7.7 Historically Underutilized Business Certification and Required HUB**

### **Subcontracting Plan**

If the Proposer is HUB certified by the Texas Comptroller of Public Accounts or the former Texas Building and Procurement Commission, now known as the Texas Procurement and Support Services Division (TPASS), the Proposer shall submit a copy of its HUB certificate.

In accordance with Texas Government Code Section 2161.252, the PUCT has determined that subcontracting opportunities are probable under this contract. Therefore, Proposers, including State of Texas certified Historically Underutilized Businesses (HUBs), must complete and submit a State of Texas HUB Subcontracting Plan (HSP) with their solicitation response if the total dollar amount of the proposal response is greater than \$100,000. Proposers must complete and submit their signed HUB Subcontracting Plan (HSP) with their solicitation response.

**Note: Responses that do not include a complete HSP shall be rejected pursuant to Texas Government Code Section 2161.252(b). See Attachment C.**

## **7.8 Required Certifications**

**Proposals must contain a signed statement certifying that:**

- A. All statements and information prepared and submitted in response to the RFP are current, complete and accurate;
- B. The Proposer has not given, offered to give, nor intends to give at any time hereafter any economic opportunity, future employment, gift, loan, gratuity, special discount, trip, favor, or service to a public servant in connection with this proposal;
- C. The Proposer is not currently delinquent in the payment of any franchise tax owed the State of Texas;
- D. The Proposer has not, nor has the firm, corporation, partnership, or institution represented by the Proposer, or anyone acting for such a firm, corporation, partnership or institution,(i) violated the antitrust laws of this state or federal antitrust laws, or (ii) communicated directly or indirectly the bid made to any competitor or any other person engaged in such line of business pursuant to 15 U.S.C. Section 1, et seq. and Texas Business & Commerce Code Section 15.01, et seq.;
- E. The Proposer has not received compensation from the PUCT, or any agent, employee, or person acting on the PUCT's behalf for participation in the preparation of this proposal pursuant to Texas Government Code § 2155.004(a);
- F. The Proposer is in compliance with Texas Government Code Section 669.003, relating to contracting with the current or former executive head of a state agency. If the Proposer is a current or former executive head of a state agency or employs a current or former head of a state agency, the Proposer shall provide (1) the executive's name; (2) the name of the state agency; (3) date of separation from the state agency; (4) current position with employer; and (5) date employment with Proposer began;
- G. The Proposer is not ineligible for contract award under Texas Government Code Section 2155.006 and acknowledges that any contract may be terminated and payment withheld if this certification is inaccurate; and
- H. The Proposer played no part in the development or drafting of this RFP.
- I. If a Texas address is shown as the address of the Proposer, Proposer qualifies as a Texas Resident Bidder as defined in Texas Administrative Code, Title 34, Part 1, Chapter 20, or Proposer has included in the proposal a statement that Proposer does not qualify as a

Texas Resident Bidder.

## **7.9 Other**

If incorporated in Texas, Proposer shall attach to the proposal a current franchise tax Certificate of Good Standing, issued by the Texas State Comptroller's office.

If incorporated in Texas, Proposer shall also provide to PUCT the corporation's charter number issued by the Texas Secretary of State's office.

Proposer shall provide its 9-digit Federal Employer's Identification Number (EIN) or 5-digit State of Texas Vendor's Identification Number (VIN).

Pursuant to Texas Family Code Section 231.006, Proposer shall include the name and social security number of the individual or sole proprietor and each partner, shareholder, or owner with an ownership interest of at least 25% of the business entity submitting the bid or application.

## **SECTION 8 – CONDITIONS**

All proposals and copies of proposals become the property of the PUCT upon receipt.

The PUCT reserves the right to amend or cancel this RFP at any time. After the proposal due date, amendments to the RFP shall be sent only to Proposers who submitted a proposal.

Neither the PUCT nor the State of Texas shall reimburse any Proposer for any costs related to preparing a response to this RFP.

The PUCT reserves the right to reject any and all proposals and to cancel the procurement at any time.

The PUCT may request a best and final offer. The PUCT may request an oral presentation or other additional information from one or more Proposers.

The PUCT reserves the right to negotiate all or portions of any proposal tentatively selected for award, including the proposed fee.

Proposers understand and agree that no public disclosures or news releases pertaining to this RFP, subsequent contract, or any results or findings based on information provided or obtained to fulfill the requirements of this RFP or subsequent contract shall be made without prior written approval of the PUCT.

Proposers understand that any proposal may be withdrawn in writing before the deadline for receipt of proposals. The PUCT will not return withdrawn proposals.

Proposers further agree that any proposal that is not withdrawn shall constitute an irrevocable offer for a period of 90 days from the RFP closing date to provide the services set forth in Attachment A, SOW, or until the PUCT has made a selection.

The PUCT reserves the right to seek proposal clarification from any Proposer to assist in making decisions. Conference calls and/or a meeting and presentation by selected Proposers may be called by the PUCT and held in Austin to obtain further information. Any cost incurred by the Proposer for the meeting and presentation shall be borne by the Proposer and the presentation shall become the property of the PUCT.

Section 2155.077 of the Texas Government Code provides that a vendor may be barred from participating in state contracts that are subject to Subchapter B, General Purchasing Requirements, Procedures, and Programs including contracts for which purchasing authority is delegated to a state agency. If a Proposer is barred from participating in state contracts, its proposal shall be disqualified and shall receive no further consideration.

A Proposer's past performance will be measured based upon pass/fail criteria, in compliance with applicable provisions of Texas Government Code Sections 2155.074, 2155.075, 2156.007, and 2157.125.

Proposers may fail this selection criterion for any of the following conditions:

- 1) Having a score of less than 90% in the Vendor Performance System;
- 2) Being currently under a Corrective Action Plan through the Texas Comptroller of Public Accounts (CPA);
- 3) Having repeated negative Vendor Performance Reports for the same reason; or
- 4) Having purchase orders that have been cancelled in the previous 12 months for non-performance (i.e. late delivery, etc.).

Contractor performance information is located on the CPA web site at:

[http://www.window.state.tx.us/procurement/prog/vendor\\_performance/](http://www.window.state.tx.us/procurement/prog/vendor_performance/).

CPA may conduct reference checks with other entities regarding past performance. In addition to evaluating performance through the Vendor Performance Tracking System (as authorized by 34 Texas Administrative Code § 20.108), CPA may examine other sources of vendor performance including, but not limited to, notices of termination, cure notices, assessments of liquidated damages, litigation, audit reports, and non-renewals of contracts. Any such investigations shall be at the sole discretion of CPA, and any negative findings, as determined by CPA, may result in non-award to the Proposer.

## **SECTION 9 – SELECTION CRITERIA**

The PUCT shall make the selection and award on the basis of the Proposer's demonstrated knowledge, competence, and qualifications to provide the services as indicated in the Table below. The criteria are listed in the order of importance to the PUCT.

- A. Clear Understanding of Statement of Work 30%
  1. Proposal Quality
  2. Thoroughness and practicality of approach
  3. Clarity regarding proposal objectives and quality of proposed approach for meeting those objectives
  4. Innovation and creativity
- B. Competence and knowledge 30%
  1. Demonstrated competence and experience in developing and implementing energy conservation outreach programs, especially in public schools
- C. Proposed Compensation 30%
  1. Total cost
  2. Billing and collection plan for payment
- D. Qualifications 10%
  1. Results of past energy conservation outreach programs

All other factors being equal, preference shall be given to a Proposer who is incorporated in Texas, whose principal place of business is in the state, or who has an established physical presence in the state.

### **SECTION 10 – REVIEW OF PROPOSALS**

The PUCT will assemble an evaluation team that will begin proposal evaluation as soon as practicable after the submission deadline. Evaluation team members will score each proposal individually using the criteria stated above. After individual scoring, the evaluation team will meet and discuss the proposals and will make a recommendation for selection or a recommendation to take further action. **No information will be provided to Proposers about the status of the proposals while they are under evaluation.**

After the evaluation team ranks each proposal based on individual scores, the evaluation team may pose clarifying questions of, or ask for best and final proposals from, the highest ranking proposals. The evaluation team may also hold discussion sessions with the highest ranked Proposers. The team may rate proposals again following questions, requests for best and final proposals, or oral presentations/discussion sessions.

Final recommendations will be presented to the Executive Director of the Public Utility Commission of Texas. The Executive Director may (1) approve the recommended selection in whole or in part, (2) disapprove the recommendation, or (3) defer action on the selection.

The PUCT will begin contract negotiations shortly after notification. The PUCT's standard contract terms are found in Attachment B. The successful Proposer may offer changes to these terms or additional terms in their proposal, but the PUCT may reject them. The parties will negotiate a final schedule for performance that will be incorporated into the final contract.

The PUCT will notify each Proposer of the final action taken upon execution of contract with the selected Proposer.

### **SECTION 11 – CONTRACT TERM**

The contract shall begin on the date signed by the last party to sign and shall continue in effect until August 31, 2016. The contract may be renewed for up to three (3) one (1) year renewal options, contingent upon appropriations.

### **SECTION 12 – TEXAS PUBLIC INFORMATION ACT**

Following award of a contract, all proposals are public information and subject to release. Some information in proposals may not be subject to release because it is business or financial information or a trade secret. Proposers are advised to consult legal counsel regarding disclosure issues and to take appropriate precautions to safeguard trade secrets and any other proprietary information, including copyrighted information. If a Proposer believes that parts of its proposal are confidential, then the Proposer **MUST** stamp the term “**CONFIDENTIAL**” in bold on the part(s) of the proposal that the Proposer believes to be confidential.

If the PUCT receives a request for any information submitted to the PUCT in connection with this RFP, the PUCT will follow the requirements of the Texas Public Information Act (Texas Government Code Chapter 552) by notifying Proposers and the Office of the Attorney General. The PUCT assumes no obligation for asserting legal arguments on behalf of Proposers. The PUCT may release parts of proposals that are **not** marked confidential without notifying the Proposer.

# **ATTACHMENT A**

## **STATEMENT OF WORK**

### **Overview**

The Public Utility Commission of Texas (PUCT) is issuing this request for proposals (RFP) for a contractor to assist in the management and marketing of the PUCT's Power to Save Texas Middle School Program to selected middle schools preferably, but not limited to, in Dallas, Harris, Hidalgo, and Tarrant counties.

It is the PUCT's goal that after engaging middle school students and faculty and educating them of the benefits of saving energy, the students, faculty, and their families will be diligent in energy conservation, especially during peak demand hours.

### **Contractor's Objectives**

1. Shall manage the current PUCT's Power to Save Texas Middle School Program;
2. Shall maintain the current PUCT's Power to Save Texas Middle School Program website as approved by the PUCT;
3. Shall make any needed modifications and updates to the current Power to Save Texas Middle School Program curriculum as approved by the PUCT;
4. Shall create and disseminate educational materials, classroom exercises, and lesson plans relating to the Power to Save Texas Middle School Program as approved by the PUCT;
5. Shall develop and help manage school challenges that engage students and encourage schools to participate in energy conservation during the school year as approved by the PUCT;
6. The selection of middle schools to implement the Power to Save Texas Middle School Program shall include low-income and minority areas that have electric choice;
7. Shall make program materials available in both English and Spanish;
8. Shall develop an implementation plan for the school year that begins August 2015 and ends June 2016 within 30 days of implementation of the contract for approval by the PUCT;
9. Shall include all outreach travel in the firm fixed price; and
10. Shall create a method for evaluating the total outreach effort of the program.

### **Project Management**

The contractor shall conduct required project management and reporting activities. This includes, but is not limited to, holding a project initiation meeting, quarterly meetings, and a final meeting between the contractor and the PUCT staff, at the end of the contract period, to discuss the program's goals and objectives and to review the contractor's performance under the contract.

The contractor will submit by e-mail a written monthly status report highlighting the first six objectives and accomplishments beginning in the second month the contract is awarded. The contractor shall be responsible for delivering the final report at the end of the contract period.

**ATTACHMENT B**  
**SAMPLE CONTRACT TERMS**

**Article 1. DEFINITIONS**

When used in this Agreement, the following terms shall have the following meanings:

**1.1 “Public Utility Commission,” “PUCT,” or “Commission”** means the Public Utility Commission of Texas acting through its Executive Director and the agency’s designated Contract Administrator.

**1.2 “Contractor”** includes **NAME**, and any successors, heirs, and assigns.

**1.3 “Services”** means any and all services performed and any and all goods and products delivered by Contractor as specified in Attachment A, Statement of Work (SOW).

**Article 2. COMPENSATION**

**2.1 Compensation.** Contractor agrees to provide all services (including labor, expenses, and any other services) described in Attachment A, SOW, as follows: **insert summary of payment terms**. Contractor understands that the PUCT is not responsible for payment of any costs or expenses exceeding this amount.

If Contractor believes that changes in the scope of services to be performed will require Contractor to increase its fee, it must request the PUCT’s written authorization to increase its fee. The Contractor must document the changes in the scope of services and why they will require additional effort. The PUCT must approve the increase in fee by written amendment to this Agreement before the Contractor performs any services or may invoice the increased fee.

**2.2 Payment Process.** Contractor shall submit a monthly statement for services or invoice to the PUCT Contract Administrator no later than the 15th day of the month after the month that the services were performed. The invoice must contain the name of the person performing services and a brief description of work performed. No payment will be made for administrative overhead, overtime, etc.

On the statement or invoice, Contractor must include a statement that the invoice accurately describes the services performed and the services were performed in compliance with the Agreement. The statement or invoice must include the vendor identification number issued by the Texas Comptroller or Contractor’s federal taxpayer identification number, a description of the services provided, and the name and division of the PUCT Contract Administrator.

Contractor shall submit the statement or invoice to the PUCT as follows:

By email to: Payables@puc.texas.gov

Or by mail to: Accounts Payable  
Public Utility Commission of Texas  
P.O. Box 13326  
Austin, TX 78711-3326

**2.3 Payment for Services.** Contractor’s acceptance of payment releases the PUCT of all claims for compensation owed in connection with this Agreement.

**2.4 Payments made to Subcontractors.** Contractor shall pay any subcontractor hereunder the appropriate share of payments received not later than the 10th day after the date Contractor

receives the payment. The subcontractor's payment shall be overdue on the 11th day after the date Contractor receives the payment. The PUCT must approve Contractor's use of any subcontractor before Contractor engages the subcontractor (see Sec. 5.1).

**2.5 Records.** Contractor and its subcontractors, if any, shall maintain records and books of account relating to services provided under this Agreement. Contractor shall, for a period of four (4) years following the expiration or termination of this Agreement, maintain its records (electronic and paper) of the work performed under this Agreement. Records include, but are not limited to correspondence concerning the subject of this Agreement between Contractor and the PUCT; Contractor's internal correspondence; and correspondence between Contractor and any third party. Contractor shall make all records that support the performance of services and payment available to PUCT and/or its designees or the State Auditor during normal business hours given reasonable notice, upon the request of the PUCT Contract Administrator.

**2.6 Sole Compensation.** Payments under this Article are Contractor's sole compensation under this Agreement. Contractor shall not incur expenses with the expectation that the PUCT or any other agency of the state of Texas will directly pay the expense to a third-party vendor irrespective of the reason for incurring those expenses.

### **Article 3. CONTRACT ADMINISTRATION**

**3.1 PUCT Contract Administration.** The PUCT designates **Gabriel Cardenas** to serve as its primary point of contact and Contract Administrator throughout the term of this Agreement. Contractor acknowledges that the PUCT Contract Administrator does not have any authority to amend this Agreement on behalf of the PUCT, except as expressly provided herein. Contractor further acknowledges that such authority is exclusively held by the Commission or its authorized designee, Executive Director Brian H. Lloyd.

**3.2 Contractor Contract Administration.** Contractor designates its Contract Administrator as follows: **[Insert Designee(s) Here]**

**3.3 Reporting.** Contractor shall report directly to the PUCT Contract Administrator and shall perform all activities in accordance with reasonable instructions, directions, requests, rules, and regulations issued during the term of this Agreement as conveyed to Contractor by the PUCT Contract Administrator.

**3.4 Cooperation.** The Parties' Contract Administrators shall handle all communications between them in a timely and cooperative manner. The Parties shall timely notify each other by email or other written communication of any change in designee or contact information.

**3.5 Inquiries and Prompt Referral.** Contractor understands that the PUCT does not endorse any vendor, commodity, or service. Contractor, its employees, representatives, other agents, or subcontractors may not issue any media release, advertisement, publication, or public pronouncement which pertains to this Agreement or the services or project to which this Agreement relates or which mentions the PUCT without the prior approval of the PUCT. Contractor will promptly refer all inquiries regarding this Agreement received from state legislators, other public officials, the media, or non-Parties to the PUCT Contract Administrator.

### **Article 4. REPORTS AND RECORDS**

**4.1 Written Reports.** Contractor will provide written reports to the PUCT in the form and with the frequency specified in Attachment A, SOW, or as agreed to between the parties.

**4.2 Distribution of Consultant Reports.** PUCT shall have the right to distribute any consultant report associated with this contract, or to allow another Texas state agency or the Texas legislature to distribute it. PUCT shall also have the right to post any consultant report

associated with this contract to the PUCT's website or to the website of a standing committee of the legislature. This provision does not waive any right to confidentiality that PUCT may assert for the report.

## **Article 5. SUBCONTRACTING PARTIES**

**5.1 Use of Subcontractors.** The Parties acknowledge and agree that at the time of execution of this Agreement, Contractor intends to perform the Services required under this Agreement using its own employees **[or intends to perform the Services required under this Agreement using the following subcontractors:].** Contractor will notify the PUCT Contract Administrator of any other proposed subcontract and will work with the PUCT HUB Coordinator to procure such other subcontractor and to submit appropriate subcontractor selection documentation for approval prior to engaging any other subcontractor, such approval not to be unreasonably withheld. Any such other subcontract or subsequent substitution of a subcontractor must be approved according to the terms of Article 7.

**5.2 Sole Responsibility.** Contractor is solely responsible for the quality and timeliness of the work produced by all subcontractors that Contractor may engage to provide Services hereunder and for the timely payment for all such work produced by all subcontractors that the PUCT accepts and pays for in accordance with the terms of this Agreement.

**5.3 Prime Vendor Contract.** The Parties expressly agree that this Agreement is intended to constitute a prime vendor contract, with Contractor serving as the prime vendor for delivery of the Services made the subject hereof. Contractor acknowledges and agrees that it is fully liable and responsible for timely, complete delivery of the Services described in this Agreement, notwithstanding the engagement of any subcontractor to perform an obligation under this Agreement.

## **Article 6. TERM, SUSPENSION, AND TERMINATION**

**6.1 Term.** The term of this Agreement shall begin on the date signed by the last party to sign and shall continue in effect until August 31, 2016 unless sooner terminated under Sections 6.3 and 6.4 of this Agreement.

**6.2 Options for Renewal.** This Agreement may be renewed for up to three (3) one (1) year renewal options, provided funding is available and both parties agree in writing, via an amendment, to do so prior to the expiration date.

**6.3 Termination for Cause by the PUCT.** If Contractor is in default of any material term of this Agreement, the PUCT may serve upon Contractor written notice requiring Contractor to cure such default. Unless within thirty (30) days after receipt of said notice by Contractor, said default is corrected or arrangements satisfactory to the PUCT, as applicable, for correcting the default have been made by Contractor, the PUCT may terminate this Agreement for default and shall have all rights and remedies provided by law and under this Agreement. If PUCT terminates Contractor under Article 18.12, PUCT need not provide any notice or opportunity for curing the default.

**6.4 Termination for the Convenience of the PUCT.** The PUCT may, upon thirty (30) days written notice to Contractor, terminate this Agreement whenever the interests of the PUCT so require. The PUCT will only reimburse those expenses already incurred at the time the notice is provided. The PUCT shall not be liable for any damages and/or loss to Contractor as a result of termination for convenience.

**6.5. Transfer of Duties.** In the event of termination, Contractor will provide reasonable cooperation to transfer its duties under the Agreement to another entity without disruption to the

provision of outreach services.

**6.6 Survival.** In the event that this Agreement expires or is terminated pursuant to its terms, the rights and obligations of the Parties under it shall end; provided that the provisions of Sections 2.5, 2.6, 3.5, 4.2, 6.5, 7.5, 9.2, 9.4 through 9.6, 17.2 and 19.1 through 19.4, 19.9 and Articles 1, 10, 11, 12, 14, 15, 16, 20, 21, 23, and 28 shall survive in their entirety.

## **Article 7. ASSIGNMENT, AMENDMENTS, AND MODIFICATIONS**

**7.1 Material Change Requests.** PUCT may propose changes to Attachment A, SOW. Upon receipt of a written request from the PUCT for a change to Attachment A, SOW, Contractor shall, within a reasonable time thereafter, submit to the PUCT a detailed written estimate of any proposed price and schedule adjustment(s) to this Agreement. No changes to Attachment A, SOW, will occur without the Parties' written consent as provided in accordance with the terms stated in this Agreement.

**7.2 Changes in Law, Rules, or Rulings.** Subsequent changes in federal or state legislation, rules and regulations or rulings by the PUCT may require modification of the terms of this Agreement, including an increase or decrease in Contractor's duties or compensation. In the event of such subsequent changes to statutes, rules, and/or regulations, the PUCT and Contractor shall negotiate the terms of a contract modification in good faith and incorporate such modification into this Agreement by written amendment.

**7.3 No Assignment of Duties.** This Agreement shall be binding upon and inure to the benefit of the permitted successors and assigns of any Party (including by merger of Contractor or otherwise by operation of law); provided however that Contractor shall not otherwise, without the prior written consent of the PUCT, assign or transfer this Agreement or any obligation incurred under this Agreement. Any attempt by Contractor to assign or transfer this Agreement or any obligation incurred under this Agreement, in contravention of this paragraph, shall be void and of no force and effect.

**7.4 Amendments and Modifications.** This Agreement may not be amended or modified in any manner except by written instrument executed by authorized representatives of the Parties in accordance with the terms of this Agreement.

**7.5 Binding on Successors.** The terms of this Agreement shall be binding on any successor organization of any of the Parties.

## **Article 8. REPRESENTATIONS, WARRANTIES AND COVENANTS**

**8.1 Warranty of Performance.** Contractor represents, warrants, and covenants that it will perform the services outlined in Attachment A, SOW, in a professional and workmanlike manner, consistent with professional standards of practice in the professional industry.

**8.2 Warranty of Services.** Contractor warrants that the services shall be rendered by the qualified personnel named in Section 19.8 of this Agreement. If Services provided under this Agreement require a professional license, then Contractor represents, warrants, and covenants that the activity will be performed only by duly licensed personnel.

## **Article 9. RISK OF LOSS AND PROPERTY RIGHTS**

**9.1 Risk of Loss.** The risk of loss for all items to be furnished hereunder shall remain with Contractor until the items are delivered to the PUCT, at which time the risk of loss shall pass to the PUCT.

**9.2 Ownership.** Except for materials where any intellectual property rights are vested in a third party, such as software or hardware, in which case such rights shall remain the property of the

third party, all finished materials, conceptions, or products created and/or prepared for on behalf of the PUCT and purchased by the PUCT, or on behalf of the PUCT, that the PUCT has accepted as part of the performance of services hereunder, shall be the PUCT's property exclusively and will be given to the PUCT either at the PUCT's request during the term of the Agreement or upon termination or expiration of the Agreement. Notwithstanding the foregoing, materials created, prepared for, or purchased exclusively by the PUCT or on behalf of the PUCT are the PUCT's exclusive property regardless of whether delivery to the PUCT is effectuated during or upon termination or expiration of this Agreement.

**9.3 Licensed Software.** With PUCT's advanced written consent, contractor may obtain software licenses as an agent of the PUCT for software that is used by Contractor solely for the purpose of providing services under this Agreement. Contractor shall provide the PUCT with a copy of any software license obtained by Contractor as an agent for the PUCT for the purpose of providing services under this Agreement.

**9.4 Prior Works.** Except as provided herein, all previously owned materials, conceptions, or products shall remain the property of Contractor and nothing contained in this Agreement will be construed to require Contractor to transfer ownership of such materials to the PUCT.

**9.5 Trademarks.** The Parties agree that no rights to any trademark or service mark belonging to another Party or to any non-Party are granted to any other Party by this Agreement, unless by separate written instrument. The PUCT acknowledges and agrees that use of any trademark associated with any software provided by Contractor under this Agreement does not give the PUCT any rights of ownership in the trademark or the software.

**9.6 Program Information.** Program information, data, and details relating to Contractor's services under this Agreement shall be maintained separately from Contractor's other activities. Contractor shall undertake all reasonable care and precaution in the handling and storing of this information.

**9.7 Provision to be Inserted in Subcontracts.** Contractor shall insert an article containing paragraphs 9.2 and 9.6 of this Agreement in all subcontracts hereunder except altered as necessary for proper identification of the contracting Parties and the PUCT under this Agreement.

## **Article 10. PUBLIC INFORMATION**

**10.1 Texas Public Information Act. (Texas Government Code Chapter 552).** The Parties acknowledge that notwithstanding any other provisions of this Agreement, the Texas Public Information Act ("PIA") governs the treatment of all information held by or under the control of the Commission. The Commission will notify Contractor of requests for Contractor's information as provided under the PIA.

**10.2 Agreement Not Confidential.** The Parties acknowledge that not all terms of this Agreement may be confidential pursuant to the Texas Public Information Act, regardless of whether those terms are marked "Proprietary," "Trade Secret," or "Confidential." Contractor further acknowledges that in the event of a dispute over the release of a proposal or part of a proposal the PUCT is bound by the decision made by the Office of the Attorney General of Texas.

**10.3 Contractor's Duty to Provide Public Information.** Contractor is required, at no additional charge to the state, to make available in a format that is accessible by the public any information created or exchanged with the state pursuant to this contract. If information created or exchanged with the state pursuant to this contract is excepted from disclosure under the Texas

Public Information Act, Contractor will not be required to make the information available to the public, but may be required to facilitate the PUCT's provision of the information to the Texas Attorney General for a decision on the information's confidentiality.

## **Article 11. CONFLICTS OF INTEREST AND EMPLOYMENT RESTRICTION**

**11.1 No Conflicting Relationships.** Contractor certifies to the Commission that no existing or contemplated relationship exists between Contractor and the Commission that interferes with fair competition or is a conflict of interest, and that no existing or contemplated relationship exists between Contractor and another person or organization, whether or not located within the State of Texas, that constitutes or will constitute a conflict of interest for Contractor with respect to the Commission.

**11.2 Prohibition on Transactions with Parties Adverse to Commission.** Contractor agrees that during performance of this Agreement, it will neither provide contractual services nor enter into any agreement, oral or written, to provide services to a person or organization that is regulated or funded by the Commission or that has interests that are directly or indirectly adverse to those of the Commission. The Commission may waive this provision in writing if, in the Commission's sole judgment, such activities of the Contractor will not be adverse to the interests of the Commission.

**11.3 Notice of Conflict.** Contractor agrees to promptly notify the PUCT of any circumstance that may create a real or perceived conflict of interest, whether arising prior to or during the term of the contract. Contractor agrees to use its best efforts to resolve any real or perceived conflict of interest to the satisfaction of the PUCT. Contractor's failure to do so shall be grounds for termination of this contract for cause, pursuant to Section 6.3.

## **Article 12. INDEMNIFICATION**

Contractor shall indemnify, defend and hold harmless the PUCT, the State of Texas, and its officers, agents, employees, representatives, contractors, assignees, and designees from any and all liabilities, claims, demands or causes of action, and all related costs, attorney fees and expenses of whatever kind or nature asserted by a third party and occurring in any way incident to, arising out of, or in connection with acts or omissions of Contractor, its agents, employees and subcontractors, committed in the conduct of this Agreement. Any defense shall be coordinated by contractor with the Office of the Attorney General when Texas State Agencies are named defendants in any lawsuit. Contractor may not agree to any settlement without first obtaining the concurrence from the Office of the Attorney General. Contractor and the PUCT agree to furnish timely written notice to each other of any such claim.

## **Article 13. INSURANCE**

Contractor agrees to comply with all state and federal laws applicable to the liability and payment of Contractor and Contractor's employees, including laws regarding wages, taxes, insurances, and workers' compensation. Neither the PUCT nor the State of Texas shall be liable to the Contractor, its employees, agents, or others for the provision of unemployment insurance and/or workers' compensation or any benefit available to a state employee.

**13.1 Minimum Insurance.** Contractor shall, at its sole cost and expense, secure and maintain as a minimum, from the Effective Date and thereafter during the term of this Agreement, for its own protection and the protection of the PUCT and the State of Texas:

(a) commercial liability insurance, covering, at a minimum, the following categories of liability within the following limits: (i) bodily injury and property damage - \$1,000,000 limit per occurrence, \$2,000,000 aggregate, (ii) medical expense - \$5,000 limit per person, (iii) personal injury and advertising liability - \$1,000,000 limit, (iv) products/completed operations –

\$2,000,000 aggregate, (v) damage to premises rented - \$50,000 limit;

(b) automobile liability coverage for vehicles driven by Contractor's employees (\$500,000 per occurrence); and

(c) workers' compensation insurance in accordance with the statutory limits, as follows: (i) employer's liability - \$1,000,000 each incident, (ii) disease - \$1,000,000 each employee and \$1,000,000 policy limit.

The PUCT and the State of Texas shall be named an additional insured on the commercial liability and automobile policies.

Insurance coverage shall be from companies licensed by the State of Texas to provide insurance with an "A" rating from A.M. Best and authorized to provide the corresponding coverage.

**13.2 Certificates of Insurance.** Contractor shall furnish to the PUCT certificates of insurance, signed by authorized representatives of the surety or insurers, of all such bonds and insurance and confirming the amounts of such coverage within ten (10) days of the Effective Date of this Agreement, and upon request thereafter. Contractor shall provide the PUCT Contract Administrator with timely renewal certificates as the coverage renews. Failure to maintain such insurance coverage specified herein, or to provide such certificates promptly, shall constitute a material breach of this Agreement. Contractor shall provide thirty (30) days written notice of any notice for renewal and/or cancellation of insurance.

#### **Article 14. DISPUTE RESOLUTION**

The Parties agree to resolve disputes arising under this Agreement through the dispute resolution process provided for in Chapter 2260 of the Texas Government Code and Subchapter C of the PUCT Rules for Administrative Services.

#### **Article 15. SOVEREIGN IMMUNITY**

The State of Texas and the PUCT do not waive sovereign immunity by entering into this Agreement and specifically retain immunity and all defenses available to them under the laws of the State of Texas or the common law.

#### **Article 16. GOVERNING LAW**

Notwithstanding anything to the contrary in this Agreement, this Agreement shall be deemed entered into in the State of Texas and shall be governed by, construed and interpreted in accordance with the laws of the State of Texas that apply to contracts executed in and performed entirely within the State of Texas, without reference to any rules of conflict of laws. The Parties consent to the exclusive jurisdiction of the State of Texas. The Parties hereby submit to the jurisdiction of the courts located in, and venue is hereby stipulated to, the state courts located in Travis County, Texas. Each Party stipulates that it is subject to the jurisdiction of the courts located in Travis County, Texas, for any cause of action arising from any act or omission in the performance of this Agreement. Further, each Party hereby waives any right to assert any defense to jurisdiction being held by the courts located in Travis County, Texas, for any cause of action arising from any act or omission in the performance of this Agreement.

#### **Article 17. COMPLIANCE WITH LAW**

**17.1 General.** Contractor shall comply with all federal, state, and local laws, executive orders, regulations, and rules applicable at the time of performance. Contractor warrants that all services sold hereunder shall have been produced, sold, delivered, and furnished in strict compliance with all applicable laws and regulations to which they are subject, including, but not limited to, Equal Employment Opportunity laws. All laws and regulations required in agreements of this character

are hereby incorporated by this reference.

**17.2 Taxes.** Contractor agrees to comply with any and all applicable state tax laws that may require any filing with and/or payment to the State of Texas as a result of any action taken as a result of this Agreement.

**17.3 Workers' Compensation.** Contractor agrees that it shall be in compliance with applicable state workers' compensation laws throughout the term of this Agreement.

**17.4 Conflicts.** Contractor agrees to abide by the requirements of and policy directions provided by the Texas statutes and the rules and regulations of the PUCT, and will inform and consult with the PUCT when further interpretations or directions are needed in order to fully implement the rules and regulations of the Commission. In the event that Contractor becomes aware of inconsistencies between this Agreement and a Texas statute or PUCT rule, Contractor will so advise the PUCT and will cooperate fully to revise applicable provisions of this Agreement as necessary.

**17.5 Compliance with Deceptive Trade Practices Act.** Contractor shall comply with Texas Business and Commerce Code Chapter 17.

**17.6 Compliance with Americans with Disabilities Act.** Contractor shall Comply with the Americans with Disabilities Act, 42 U.S.C. Chapter 126.

**17.7 Prohibited Use of Appropriated/Other Funds.** Contractor shall comply with Texas Government Code Sections 556.005 and 556.0055 related to prohibited uses of appropriated and other funds.

## **Article 18. CONTRACTOR'S CERTIFICATION**

By accepting the terms of this Agreement, Contractor certifies that, to the extent applicable, it is in compliance with the following requirements and prohibitions. Contractor understands and agrees that a false certification may lead to termination of this Agreement for cause.

**18.1 Prohibitions on Gifts.** Contractor has not given, offered to give, nor intends to give at any time hereafter any economic opportunity, future employment, gift, loan, gratuity, special discount, trip, favor, or service to a public servant in connection with this Agreement.

**18.2 Delinquent Obligations.** Contractor is not currently delinquent in the payment of any franchise or sales tax owed to the State of Texas, and is not delinquent in the payment of any child support obligations under applicable state law.

**18.3 Terrorist Financing.** The PUCT is federally mandated to adhere to the directions provided in the President's Executive Order (EO) 13224, Executive Order on Terrorist Financing – Blocking Property and Prohibiting Transactions With Persons Who Commit, Threaten to Commit, or Support Terrorism, effective 9/24/2001 and any subsequent changes made to it, via cross referencing proposers/vendors with the Federal General Services Administration's System for Award Management (SAM), <https://www.sam.gov/>, which is inclusive of the United States Treasury's Office of Foreign Assets Control (OFAC) Specially Designated National (SDN) list.

<http://www.treasury.gov/resource-center/sanctions/SDN-List/Pages/default.aspx>

Contractor certifies that the Contractor and its principals are eligible to participate in this transaction and have not been subjected to suspension, debarment, or similar ineligibility determined by any federal, state or local governmental entity and that Contractor is not listed on the federal government's terrorism watch list as described in Executive Order 13224. Entities ineligible for federal procurement are listed at: <https://www.sam.gov/>

**18.4 Antitrust.** Neither Contractor nor anyone acting for Contractor has violated the antitrust laws of this State, codified in Section 15.01, et seq. of the Texas Business and Commerce Code or the Federal Antitrust Laws, nor has communicated directly or indirectly to any competitor or any other person engaged in such line of business for the purpose of obtaining an unfair price advantage.

**18.5 Family Code.** Contractor has no principal who is ineligible to receive funds under Texas Family Code Section 231.006 and acknowledges that this Agreement may be terminated and payment may be withheld if this certification is inaccurate.

**18.6 Prohibited Compensation.** Contractor has not received compensation from the PUCT, or any agent, employee, or person acting on the PUCT's behalf for participation in the preparation of this Agreement.

**18.7 Government Code.** Under Texas Government Code Section 2155.004, Contractor certifies that the individual or business entity named in this contract is not ineligible to receive the specified contract and acknowledges that this contract may be terminated and/or payment withheld if this certification is inaccurate.

**18.8 Outstanding Obligations.** Payments due under the contract will be applied towards any debt that is owed to the State of Texas, including but not limited to delinquent taxes and child support.

**18.9 Contracting with Executive Head of State Agency.** Contractor certifies this Agreement is in compliance with Texas Government Code Section 669.003 relating to contracting with the executive head of a State agency. If Texas Government Code Section 669.003 applies, bidder will complete the following information in order for the bid to be evaluated: Name of Former Executive; Name of State Agency; Date of Separation from State Agency; Position with Bidder; and Date of Employment with Bidder.

**18.10 Buy Texas.** Contractor will comply with Texas Government Code Section 2155.4441, pertaining to service contracts regarding the use of products produced in the State of Texas.

**18.11 Hurricane Recovery.** Under Texas Government Code Section 2155.006, Contractor certifies that the individual or business entity named in this proposal is not ineligible to receive the specified contract and acknowledges that this contract may be terminated and payment withheld if this certification is inaccurate.

**18.12 E-Verify.** Contractor certifies and ensures that it utilizes and will continue to utilize, for the term of this Contract, the U.S. Department of Homeland Security's E-Verify system to determine the eligibility of:

1. All persons hired to perform duties within Texas, during the term of the Contract; and
2. All persons (including subcontractors) hired by the Proposer to perform work pursuant to the Contract, within the United States of America.

The Contractor shall provide, upon request of PUCT, an electronic or hardcopy screenshot of the confirmation or tentative non-confirmation screen containing the E-Verify case verification number for attachment to the Form I-9 for the three most recent hires that match the criteria above, by the Contractor, and Contractor's subcontractors, as proof that this provision is being followed.

If this certification is falsely made, the Contract may be immediately terminated, at the discretion of the state and at no fault to the state, with no prior notification. The Contractor shall also be responsible for the costs of any re-solicitation that the state must undertake to replace the

terminated Contract.

**18.13 Debarred Vendors List.** Contractor certifies that it is not on the Debarred Vendors List located at [http://www.window.state.tx.us/procurement/prog/vendor\\_performance/debarred/](http://www.window.state.tx.us/procurement/prog/vendor_performance/debarred/).

## **Article 19. GENERAL PROVISIONS**

**19.1 Relationship of Parties.** Contractor is and shall remain at all times an independent contractor, and nothing in this Agreement shall be deemed to create a joint venture, partnership, employment, franchise, master-servant, or agency relationship between the Parties. Except as expressly provided to the contrary elsewhere in this Agreement, no Party has any right or authority to act on behalf of another Party, nor to assume or create any obligation, liability or responsibility on behalf of another Party. Under no circumstances shall the relationship of employer and employee be deemed to arise between the PUCT and Contractor's personnel. Contractor shall be solely responsible for achieving the results contemplated by this Agreement, whether performed by Contractor, its agents, employees or subcontractors.

**19.2 Non-Exclusivity.** Nothing in this agreement is intended nor shall be construed as creating any exclusive arrangement between Contractor and PUCT. This agreement shall not restrict PUCT from acquiring similar, equal, or like goods and/or services from other entities or sources.

**19.3 Taxes and Statutory Withholdings.** Contractor acknowledges that it is not a PUCT employee, but is an independent contractor. Accordingly, it is Contractor's sole obligation to report as income all compensation received by Contractor under the terms of this Agreement. Contractor is solely responsible for all taxes (federal, state, or local), withholdings, social security, unemployment, Medicare, Workers' Compensation insurance, and other similar statutory obligations (of any governmental entity of any country) arising from, relating to, or in connection with any payment made to Contractor under this contract. Contractor shall defend, indemnify and hold the PUCT harmless to the extent of any obligation imposed by law on the PUCT to pay any tax (federal, state, or local), withholding, social security, unemployment, Medicare, Workers' Compensation insurance, or other similar statutory obligation (of any governmental entity of any country) arising from, relating to, or in connection with any payment made to Contractor under this Agreement. Further, Contractor understands that neither it nor any of its individual employees is eligible for any PUCT employee benefit, including but not limited to holiday, vacation, sick pay, withholding taxes (federal, state, local), social security, Medicare, unemployment or disability insurance, Workers' Compensation, health and welfare benefits, profit sharing, 401(k) or any employee stock option or stock purchase plans. Contractor hereby waives any and all rights to any such PUCT employment benefit.

**19.4 Notice.** Except as otherwise stated in this Agreement, all notices provided for in this Agreement shall be (a) in writing, (b) addressed to a Party at the address set forth below (or as expressly designated by such Party in a subsequent effective written notice referring specifically to this Agreement), (c) sent by FedEx, with proper postage affixed and (d) deemed effective upon the third business day after deposit of the notice in the U.S. Mail.

### **IF TO THE PUCT:**

ATTENTION: Brian H. Lloyd, Executive Director  
1701 N. Congress Ave., 7<sup>th</sup> Floor  
Austin, TX 78701

With copies to the PUCT Contract Administrator, and Erica Duque, CTPM, CTCM, at the same address.

**IF TO CONTRACTOR:**

ATTENTION:

ADDRESS

CITY, STATE, ZIP CODE

**19.5 Headings.** Titles and headings of paragraphs and sections within this Agreement are provided merely for convenience and shall not be used or relied upon in construing this Agreement or the Parties' intentions with respect thereto.

**19.6 Export Laws.** Contractor represents, warrants, agrees and certifies that it (a) shall comply with the United States Foreign Corrupt Practices Act (regarding, among other things, payments to government officials) and all export laws and rules and regulations of the United States Department of Commerce or other United States or foreign agency or authority and (b) shall not knowingly permit any non-Party to directly or indirectly, import, export, re-export, or transship any intellectual property or any third Party materials accessed by Contractor during the course of this Agreement in violation of any such laws, rules or regulations.

**19.7 Preprinted Forms.** The use of preprinted forms, such as purchase orders or acknowledgments, in connection with this Agreement is for convenience only and all preprinted terms and conditions stated thereon are void and of no effect. The terms of this Agreement cannot be amended, modified, or altered by any conflicting terms, provisions, or conditions contained in a proposal or a preprinted form, such as purchase orders or acknowledgements. If any conflict exists between this Agreement and any terms and conditions on a proposal, purchase order, acknowledgment, or other preprinted form, the terms and conditions of this Agreement will govern.

**19.8 Specific Personnel.** Contractor has identified the personnel for this assignment ("Team"), as follows: **[list]**

Contractor warrants that it shall use its best efforts to avoid any changes to the Team during the course of this Agreement. Should personnel changes occur during the contract period, Contractor will recommend to the PUCT personnel with comparable experience and required qualifications and training. The PUCT must approve any change in personnel on this project in writing. Contractor shall provide individuals qualified to perform the tasks assigned to such individual. At the PUCT's request, Contractor shall remove from the project any individual whom the PUCT finds unacceptable. Contractor shall replace such individual with another individual satisfactory to the PUCT as soon as practicable.

**19.9 Publicity.** Contractor understands and agrees that no public disclosures or news releases pertaining to this Agreement or any results or findings based on information provided, created, or obtained to fulfill the requirements of this agreement shall be made without the prior written approval of the PUCT.

**Article 20. NO IMPLIED WAIVER**

The failure of any party, at any time, to enforce a provision of this contract will not constitute a waiver of that provision; will not affect the validity of this contract or any part of it; and will not affect the right of any party to enforce each and every provision.

## **Article 21. ORDER OF PRECEDENCE**

In the event of conflicts or inconsistencies between the provisions of this contract and its attachment(s), the following are given preference in the order listed below:

- 1) The terms and conditions of this contract;
- 2) Attachment A, SOW, including any exhibits;
- 3) The contractor's proposal.

## **Article 22. FORCE MAJEURE**

Neither the PUCT nor Contractor will be considered in default in the performance of its obligations under this contract to the extent that the performance of such obligations is prevented or delayed by any cause beyond the reasonable control of the affected party, which such party could not, by due diligence have avoided, including but not limited to acts of God, severe weather, explosions, riots, acts of war, or orders of legal authority. Such causes will not relieve either party of liability in the event of its failure to use due diligence to remedy the situation and remove the cause in an adequate manner, with all reasonable dispatch, and to give notice and full particulars of the same in writing to the other party as soon as possible after the occurrence of the cause that prevented or delayed performance of the obligations. If the event of Force Majeure continues for a period of more than one hundred and eighty (180) days, either party thereafter may terminate this contract upon giving at least ten (10) days prior written notice to the other party.

## **Article 23. SEVERABILITY**

If any provision of this contract is held unlawful or otherwise unenforceable, such provision will be severed and deemed deleted and the remainder of this contract will continue in full force and effect, as if such provision had never existed.

## **Article 24. FUNDING OUT CLAUSE**

This contract is contingent upon the continued availability of funding. If funds become unavailable through lack of appropriations, legislative or executive budget cuts, amendment of the Appropriations Act, state agency consolidations, or any other disruptions of current appropriations, provisions of the Termination Article shall apply. Any contract resulting from this solicitation is contingent upon the continued availability of lawful appropriations by the Texas Legislature. *See* Texas Constitution, Article III Section 49, State Debts; and Texas General Appropriations Act for the 2014-2015 Biennium, Article IX, Section 6.03, Excess Obligations Prohibited.

## **Article 25. DRUG FREE WORKPLACE POLICY**

The contractor shall comply with the applicable provisions of the Drug-Free Work Place Act of 1988, 41 U.S.C. § 8102, et seq., and 48 CFR § 52.223-6 Drug-Free Workplace) and maintain a drug-free work environment. The requirements of the Drug Free Workplace Act and the rules interpreting it are incorporated by reference and the contractor shall comply with the relevant provisions thereof, including any amendments that may hereafter be issued.

## **Article 26. SUBSTITUTIONS**

Substitutions are not permitted without written approval of the PUCT.

## **Article 27. RIGHT TO AUDIT**

Pursuant to Section 2262.003 of the Texas Government Code, the State Auditor may conduct an audit or investigation of Contractor or any other entity or person receiving funds from the state

directly under this Agreement or indirectly through a subcontract under this contract. The acceptance of funds by Contractor or any other entity or person directly under this contract or indirectly through a subcontract under this contract acts as acceptance of the authority of the state auditor, under the direction of the legislative audit committee, to conduct an audit or investigation in connection with those funds. Under the direction of the legislative audit committee, Contractor or any other entity that is the subject of an audit or investigation by the state auditor must provide the state auditor with access to any information the state auditor considers relevant to the investigation or audit. Contractor will ensure that this clause concerning the authority to audit funds received indirectly by subcontractors through the vendor and the requirement to cooperate is included in any subcontract awards.

**Article 28. ENTIRE AGREEMENT**

This contract, including Attachment A, SOW, constitutes the entire agreement and understanding between the parties with regard to its subject matter and supersedes and merges all prior discussions, writings, negotiations, understandings, and agreements concerning the provision of these services. Any terms and conditions attached to a solicitation will not be considered unless specifically referred to in this Agreement.

In WITNESS WHEREOF both parties by their duly authorized representatives have executed this contract effective as of **[DATE]**.

**The Public Utility Commission of Texas      Contractor**

By:

\_\_\_\_\_

Brian H. Lloyd  
Executive Director

By:

\_\_\_\_\_

Name  
Title

Date Signed: \_\_\_\_\_

Date Signed: \_\_\_\_\_

**ATTACHMENT C**  
**HUB SUBCONTRACTING PLAN INFORMATION**

In accordance with Texas Government Code Section 2161.252, the PUCT has determined that subcontracting opportunities are probable under this contract. Therefore, Proposers, including State of Texas certified Historically Underutilized Businesses (HUBs), must complete and submit a State of Texas HUB Subcontracting Plan (HSP) with their solicitation response.

**NOTE: Responses that do not include a completed HSP shall be rejected pursuant to Texas Government Code Section 2161.252(b).**

Proposers can find the HUB Subcontracting Plan forms and instructions for filling out the forms on the Comptroller of Public Accounts' website at

<http://www.window.state.tx.us/procurement/prog/hub/hub-subcontracting-plan/>.

# Power to Save Texas School Program

The Power to Save Texas School Program is an initiative to educate Texans on energy conservation brought to you by the Public Utility Commission of Texas. This education program instructs middle school students about energy conservation, showing them that they have the *Power to Save Texas*. An in-school presentation primers a series of teacher-led lessons which can be easily integrated with existing curriculum.



## Complete materials are provided in an online format:

- Dedicated program website for Teachers, Students, and Parents
- Access to a Teacher Portal for online program materials
- Parent/Guardian Letter for distribution
- Five distinct, TEKS-aligned lessons
- Activities structured for Limited English Proficient, At Grade Level, and Advanced learners
- Interactive Teacher Guides for each lesson
- Pre- and Post-Program Surveys for Students
- Program Evaluation for Teachers
- Final open-ended program test
- Optional Poster, Essay, and Video contests



Student Lessons

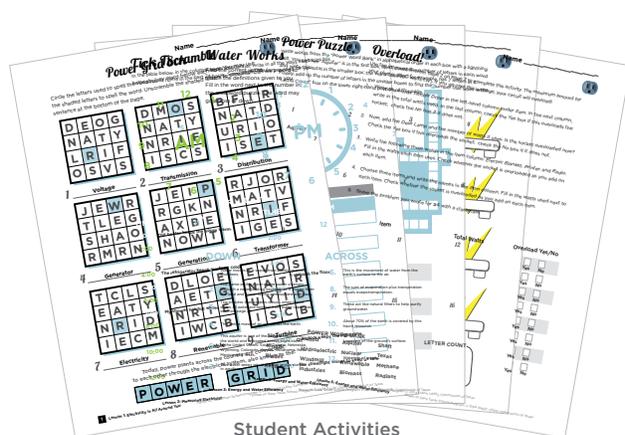
## Students will learn:

- Electricity is All Around You
- Measuring Electricity
- Energy and Water Efficiency
- Sources of Electricity
- How Electricity is Saved and Using Electricity Safely

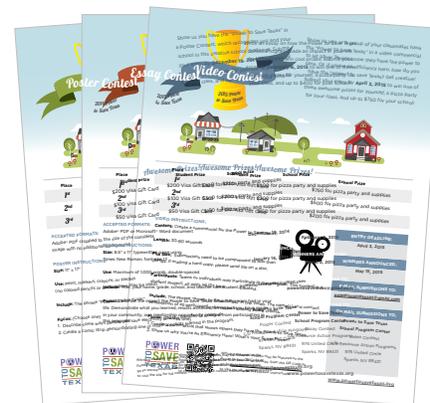


Teacher Lessons

Students can extend participation in one of three school challenges/contests to win prizes for themselves and their school throughout the school year!



Student Activities



Contests



## LESSON 1:

# *Electricity is All Around You*

There aren't a lot of places that you can see electricity. The most common form of electricity you may know is lightning. Lightning is a big spark that occurs when lots of electrons move from one place to another very quickly. An **electron** is a tiny piece of electricity, too small to see even with a powerful microscope.

Even though we may not realize it, electricity is everywhere. There is even electricity everywhere in space. There are electrons inside stars and on all planets. Lightning is just one expression of natural electricity. Inside your body, even your thoughts are very small bursts of electricity traveling along your nerves and between cells in your brain.

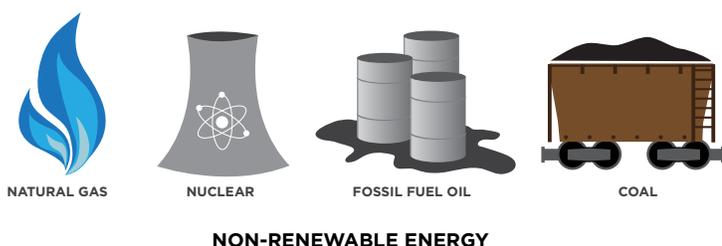
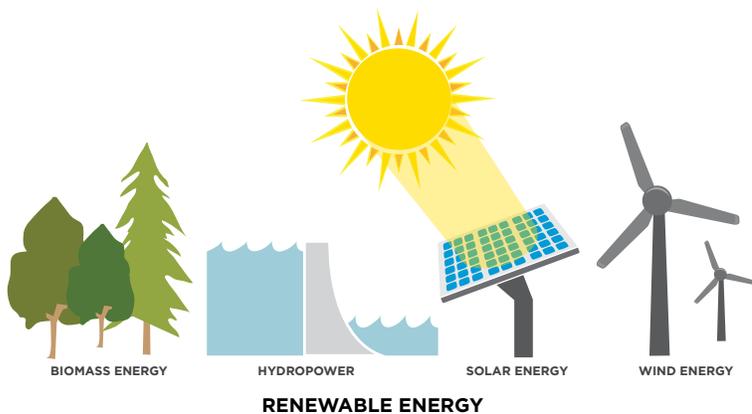
Without electricity, you would not be able to read this article right now. Your nervous system sends

**POWER**  
**SAVE**  
**TEXAS**

“signals” to the brain, telling our eyes to follow the words on the page. These signals are little bursts of electricity that carry messages from one point to another within our body. With so much electricity jumping around, it may seem like the body is a really great power source. But, the human body generates only about 0.1 volts—not even enough to power your TV remote.<sup>1</sup>

It’s easy to see the uses of electricity around you. When electricity is captured, it is constantly flowing through insulated wires. These wires bring power to your home and your town. As the population of Texas grows, so does the need for electricity. Texas currently creates and uses more electricity than any other state.<sup>2</sup>

The good news is Texas has a variety of climates and natural resources.



Texans can take advantage of these resources to help generate electricity. When we talk about using **renewable resources** to create energy, we mean using they power created from the use of natural resources, which replace themselves quickly and dependably. These energy sources can never be used up, like sunlight and wind. Renewable energy is clean and is considered unlimited. When we use these resources, we reduce the demand for **non-renewable sources** of energy. The non-renewable resources are formed deep within the earth from plant and animal remains and are millions of years old, like coal and oil. These resources can only be used once for energy.<sup>3</sup>

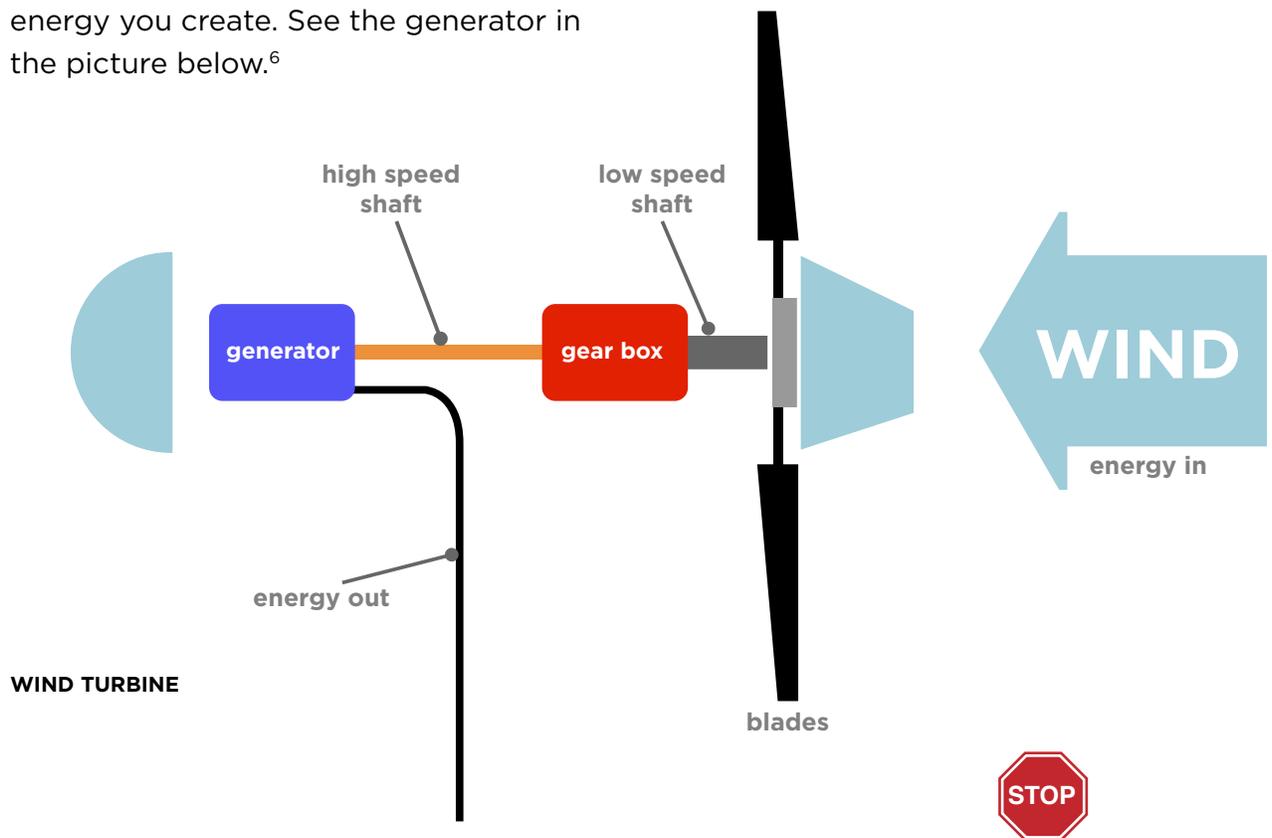
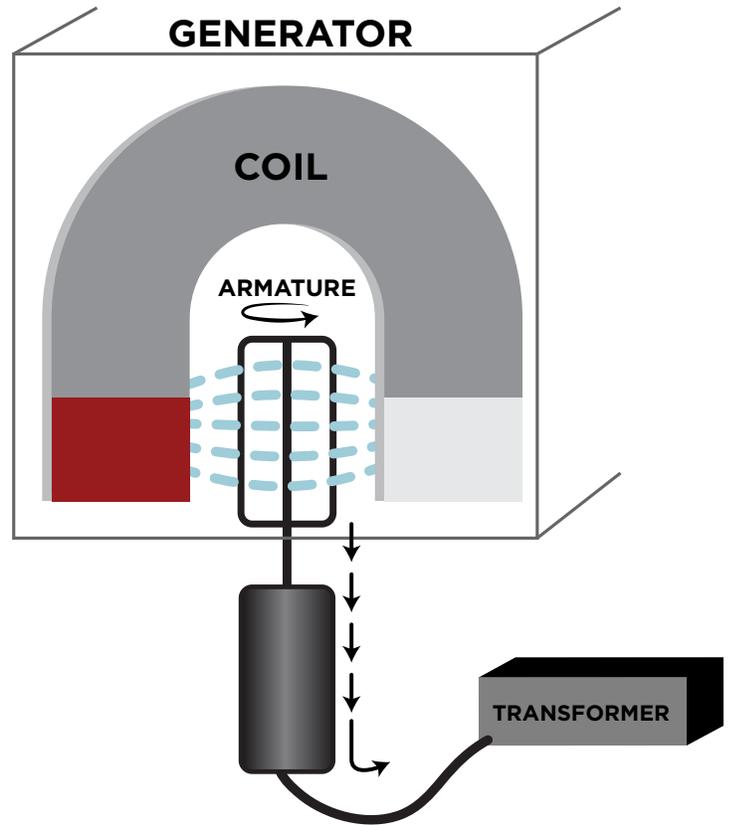


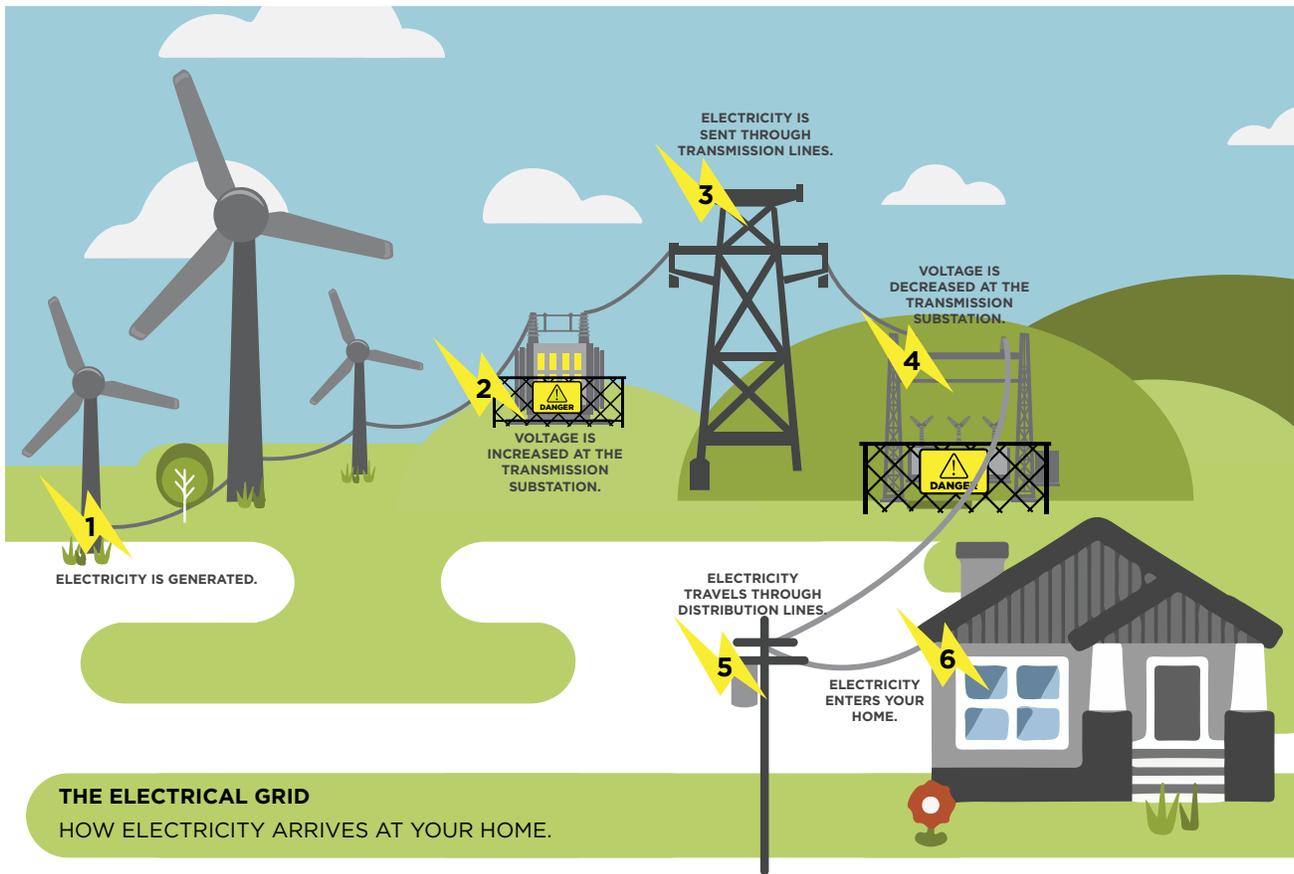
Everyone can enjoy renewable energy, and some even install their own solar panels or wind turbines to generate power for themselves. This is called **Distributed Renewable Generation**, or a DRG system.<sup>4</sup> At times, these customers produce more power than they can use. Depending on where the customers live, this extra power may be sold back to an electric company.

When we talk about electrical power, you may wonder how electricity was captured and forced to travel through the power lines. We really depend on this form of energy, and without it our world would be very different; we would be much less comfortable. If we were without electricity for a long time, water could not be pumped into our homes.

When you think about ways to create or make electricity, you are talking about **electric generation**. Most of the ways to do this involve a machine called a **generator**. The generator transfers the energy of motion into electricity. Take a look at the picture on the right.<sup>5</sup> A magnetic coil is located inside the generator. An armature spins in between the magnetic coil. This spinning action creates electricity.

You might wonder if it is hard to make the armature spin. The good news is, it's not hard at all. In fact, there are many ways of spinning the armature that you may already know about! These include using the power of the wind, water, or sun, and also by using something called biomass. We will learn about biomass in Lesson 4. The bigger the generator, the faster the armature spins, and the more energy you create. See the generator in the picture below.<sup>6</sup>





In the case of a wind turbine, these turbines work the opposite of a fan. Instead of using electricity to make wind, these turbines use wind to make electricity. The wind turns the blades, which spin a shaft, which connects to a generator and makes electricity.

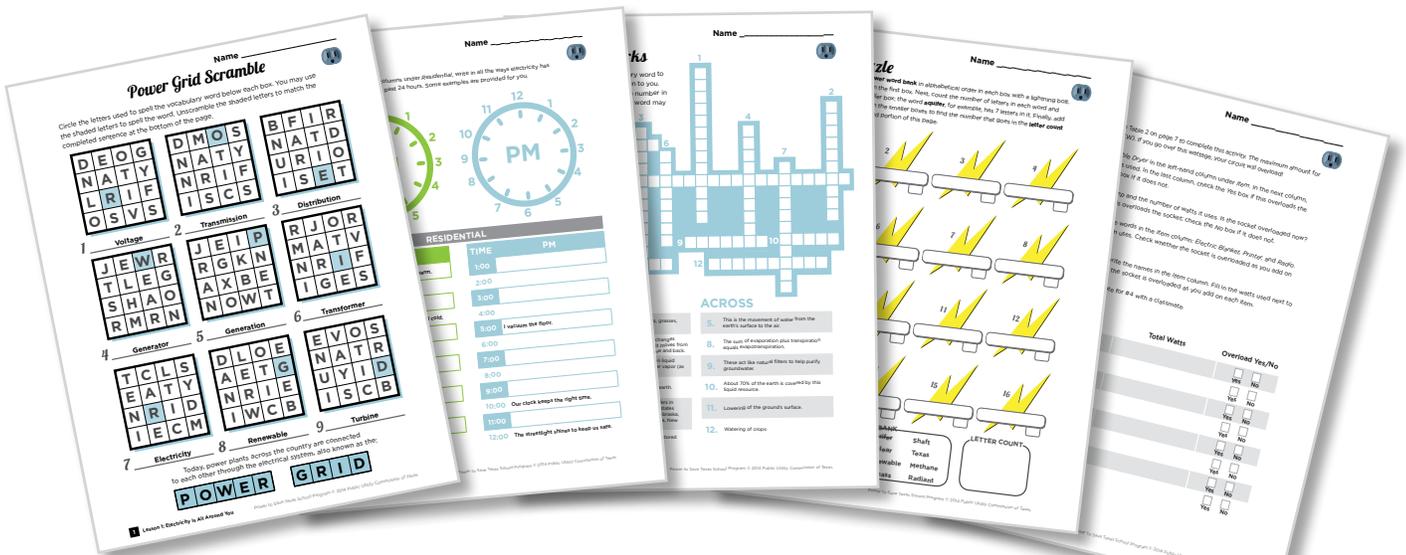
The state of Texas is unique. Texas is able to rely on many sources for generating its own electrical power. We will read about these in the next lesson.

Electricity is an enormous part of our lives. It makes our lives comfortable and safe. Electricity is so important that most of the time we simply take it for granted. Do you know how electricity reaches your home or school? Actually, it travels a long way. The power plant where your electricity is made

or generated might be hundreds of miles away!

First, (1) the electricity is generated by using either renewable or non-renewable resources. Second, (2) the voltage is increased at a transmission substation. Then, (3) the electricity is sent through uninsulated transmission lines on very high poles or structures to a distribution substation (4) where the voltage is decreased. Next, the electricity is carried to individual neighborhoods by distribution lines that are held up on power poles or buried deep underground. Before reaching your home, (5) smaller transformers decrease the voltage one more time. Finally, (6) electricity safely arrives at your home for you to use.<sup>7</sup>





# Power Grid Scramble

Ask your teacher for the Power Grid Scramble activity. You will receive one of three versions. The Power Grid Scramble uses vocabulary words from a word bank to spell, unscramble, match, or complete sentences.

## Long-Term Savings for Homes Tips

### COMPUTERS, APPLIANCES & ELECTRONICS

-  Set your computer and monitor to sleep when idle for more than a few minutes.
-  Don't use screen savers. They prevent computers and monitors from going into power-saver mode.
-  Make sure the dryer air vent outside your house is properly sealed.
-  When buying a new appliance, look for ENERGY STAR® qualified products. These options use 10-50% less energy than standard models.

See more at [www.powertosavetexas.org](http://www.powertosavetexas.org).

Scan this QR Code with your smartphone to visit the program website.



# Career Connection / Job Profile:



*Do you like helping people?*

*Are you interested in how electrical equipment works?*

*Are you good at fixing things?*

If you answered, “Yes,” to these questions, you might like to be a line installer and repairer, also known as a lineman. Line installers and repairers build, maintain, and repair electrical power systems and cables. Some install and fix the power lines that move electricity from power plants to customers. Others work on the lines and cables that carry telephone service, television, and the Internet.

## ***As a line installer and repairer you would:***

- Install, maintain, and fix power lines, cables, and poles.
- Set up cable service for customers and explain how it works.
- Drive work trucks to job sites and coordinate jobs with other workers.
- Dig holes, set poles, and climb poles or use lifts to reach equipment.
- String lines and cables between poles, towers, and buildings.
- Dig trenches and lay cable into trenches.
- Inspect and test lines, electric parts, and signal strength.
- Check lines and poles from helicopters or airplanes to get clear views.
- Use power tools and equipment to install and fix poles and lines.
- Follow rules to keep workplaces safe and keep tools in good repair.

## ***Will There Be Jobs in the Future?***

In Texas, this occupation has high growth potential. Nationally, this occupation is growing at an average rate.

## ***Education Required:***

To work as a line installer, you typically need to:

- Have a high school diploma or GED; and
- Complete an apprenticeship program or long-term, on-the-job training.

*Provided courtesy of: [www.onetonline.org](http://www.onetonline.org)*

## Career Connection / Job Profile:



*Are you good at math?*

*Are you interested in helping keep people safe?*

*Are you organized and able to focus on tasks?*

If you answered, “Yes,” to these questions, you might like to be an environmental scientist. Environmental scientists study problems in the natural world. They measure electromagnetic fields; do research about how these problems affect the health of people, plants, and animals in order to protect them. Many environmental scientists work for federal, state, and local governments. Others work for companies that help clients plan projects and solve problems.

### ***As an environmental scientist you would:***

- Study how what people do affects the world around them.
- Do research and create programs that limit harm to land, water, and air.
- Collect water, soil, or air samples and test them.
- Suggest ways to use land that will help clean and protect it.
- Prepare permits and codes to protect the land, water, and air.
- Inspect sites and decide what to do if codes have not been followed.
- Give advice to clients, the government, and the public.
- Train students, other scientists, or staff.
- Meet with clients, staff, or the public to explain research findings.
- Write reports and make charts or graphs to help explain research.

### ***Will There Be Jobs in the Future?***

In Texas and nationally, this occupation is growing at an average rate.

### ***Education Required:***

To work as an environmental scientist, you typically need to:

- Have a high school diploma or GED; and
- Have a college degree in science.

*Provided courtesy of: [www.onetonline.org](http://www.onetonline.org)*



## LESSON 2:

# Measuring Electricity

Now that you understand a little more about electricity, let's take a look at how it is measured. As you know, electric energy is produced when electrons in an atom are excited due to movement or added heat. When electrons move quickly, they produce a charge. The result is a current we call electricity.

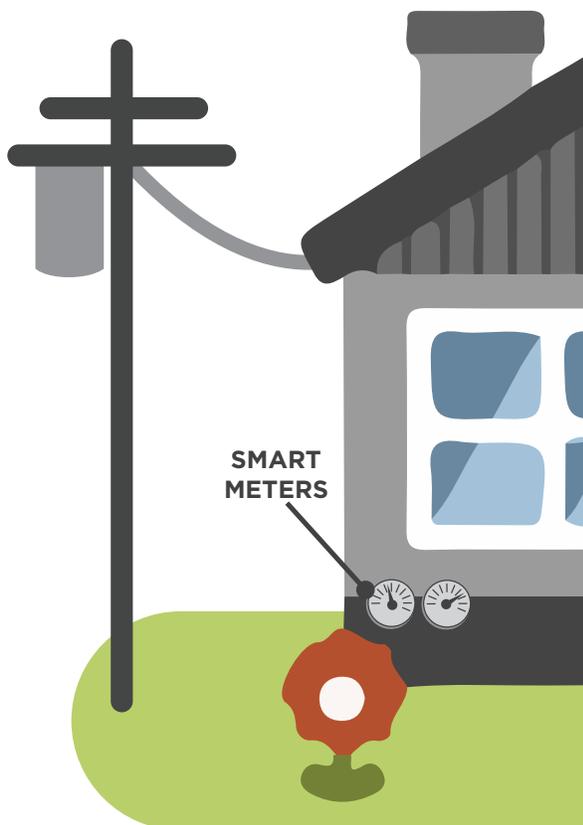
It is easy to overlook all the good things about electricity and its value because we use it all the time. As you're reading this lesson, there may be lights on in the room. The room is conditioned to be cool enough or warm enough to keep you comfortable. Let's take a minute and think of all the ways electricity has helped you in the past 24 hours.

In Lesson 1, we learned how electricity is first generated at the power plant and then moves along



the grid. We discussed how substations on the grid act to lower the voltage of electricity. **Voltage** is a measure of electric pressure or electric force.<sup>8</sup> When this pressure is low enough, the electricity can travel through transmission wires on tall towers. At substations, the voltage is lowered again and the electricity travels through insulated wires to smaller power lines, which can be above or below the ground.

When the electricity reaches homes and buildings, it is through wires that connect to a meter. The meter used for measuring electricity by many homes and businesses today is sometimes called a **smart meter**. The meter measures how much electricity is being used by the electric appliances within the home or business. You might



wonder how electricity is able to be measured correctly. When gasoline is put in cars, the fuel pump shows the price per gallon. When enough gasoline has poured into the car, you can see the total number of gallons you put in, as well as how much it costs. Is the method similar when you use electricity? Thanks to smart meters, the answer is yes.

Smart meters are able to measure the amount of electricity you use, and record the time of day too! You can learn which appliances use more energy, and even see the time of day when your family uses the most energy. The smart meter helps you to actively participate in the process of using energy. It also helps you to take action to save energy. With new technologies like the smart meter, less energy was used in the United States during the past several years.

Smart meters measure electricity in amounts from small to large. Much like there are 16 ounces in a pound, the basic unit for measuring electricity is called a **watt (W)**. You have probably seen some lightbulbs printed with its wattage, stating 100W.

The larger measurements are called **kilowatts (kW)** and are equal to **1,000 watts**. When the electrical bill comes to your home, it usually shows electricity measured in **kilowatt hours (kWh)**.<sup>9</sup> This is just an easy way to say that 1,000 watts of electricity were used for one hour. The chart on the next page shows common household devices and watts consumed.<sup>10</sup>



**Table 1**

DEVICE	WATTS CONSUMED
Alarm clock	5-100
Ceiling fan	65-175
Cell phone charger	4
Clock radio	10
Clothes dryer	1,800-5,000
Clothes washer	350-500
Color television (36")	133
Dishwasher	1,200-2,400
DVD player	23
Game console	195
Hair dryer	1,200-1,875
Heater (portable)	750-1,500
Microwave oven	750-1,100
Printer	25-35
Refrigerator (16 cu. ft)	725
Toaster	1,225
Water heater (40 gallon)	4,500-5,500

*Andy Average* works in the city and enjoys going for hikes on weekends. When he is home, he doesn't like to pay too much attention to his bill, but does



turn off the lights most of the time when leaving a room. Even so, he is known to fall asleep with the television on, and sometimes it's on all night long. Andy turns up the heat on cold winter days, but once in a while tries to wear an extra sweater instead of really cranking up the thermostat. In the summer, when it gets really hot, Andy will try to help keep the house cool by closing the blinds. Andy has replaced a couple of light bulbs with CFLs (compact fluorescent lamps), but hasn't made many other changes to help lower his utility bill. He knows he should only run the dishwasher and washing machine when there's a full load, but sometimes it's just easier to run these machines when he's in the mood. He knows he can check his smart meter online, and will try to do it one day soon.

**CALCULATING KW CONSUMPTION**

$$\frac{\text{watts or demand}}{\text{watts or demand}} \times \frac{\text{actual \# of hours used}}{\text{actual \# of hours used}} = \frac{\text{watt-hrs used in a day}}{\text{watt-hrs used in a day}}$$

$$\frac{\text{watt-hrs used in a day}}{\text{watt-hrs used in a day}} \div \frac{1,000 \text{ kilowatt}}{1,000 \text{ kilowatt}} = \frac{\text{kWh used in a day}}{\text{kWh used in a day}}$$

$$\frac{\text{kWh used in a day}}{\text{kWh used in a day}} \times \frac{\text{cost of a kWh}}{\text{cost of a kWh}} = \frac{\text{cost of use in a day}}{\text{cost of use in a day}}$$

$$\frac{\text{cost of use in a day}}{\text{cost of use in a day}} \times \frac{\text{days used per year}}{\text{days used per year}} = \frac{\text{annual cost of use}}{\text{annual cost of use}}$$

## **Shane Smart**

works in the city and makes sure that everything is turned off before he leaves for work. He pays close attention to his bill, turns off lights every time he leaves a room, and unplugs appliances when he's not using them. On cold winter days, Shane keeps the heat at a reasonable temperature, wears extra clothing to keep warm, and keeps a blanket on the couch in case he gets cold. In the summer, Shane keeps the house cool by closing the blinds and leaving the doors and windows closed. Shane takes advantage of the warm weather by hanging his clothes outside on the clothesline to dry; the clothes always smell fresh this way. When Shane has to use his clothes dryer, he makes sure that it is during off-peak hours. Shane has replaced all light bulbs with CFLs. He only turns on the dishwasher when it's full, and does the same when washing a load of clothes, while also checking to make sure it's around 8:00 PM. Shane keeps an eye out for new ways to save on his utility bill by following his smart meter online.



winter days, Whitney cranks up the heat until she's comfortable and wears extra sweaters only when she goes outside. In the summer, Whitney keeps the house cool by running the air conditioning all day long. If Whitney comes home for lunch, she'll open the side door to enjoy the warm summer air and may forget to close it again when she leaves. Whitney has heard of CFLs and is considering buying one someday. She turns on the dishwasher a couple of times a week when she runs out of spoons, and uses her washer and dryer whenever she needs blue socks. Whitney complains about her utility bill and thinks a smart meter is used for the parking spaces downtown.



Now that you understand a little more about the special way electricity is measured, we can look at some other things unique to electricity. The utility company needs to have electricity ready when people need it. If people don't use all the electricity provided, the utility company cannot send it back through the power poles to the place where it was generated. If there is a sudden increase in the need for electricity, the utility company can't quickly install more power poles and string up new transmission lines.

Utility companies have to keep a balance between the amount of electricity they generate and the amount people need. You might think of it like this: if you were going to have a couple of friends come over this weekend, you would probably make sure there were enough snacks in case someone got hungry. But, what would you do if each of your friends brought their entire family with them? Would you still have enough snacks for everyone? It's the same with electricity.

At certain times of the day, people use more electricity. You would probably guess that there is not a high demand for electricity at three o'clock in the morning, and you would be right. When most families come home from school or work, you would think people use more electricity, and you would be right again. It makes sense that the utility company tries to balance the need for electricity so everyone can enjoy it.

The times during the day when everyone wants to use electricity is called **On-Peak**. During this time the utility company is producing and delivering more electricity and the risk for the electrical grid getting out of balance is high. **Off-Peak** time is the time of day when there is less demand for electricity. To help prevent a shortage in

electricity during on-peak time, the utility company asks that we practice **load shifting**.<sup>11</sup>

Basically, it is suggested that we not run the dishwasher or a load of laundry during on-peak times. It makes sense to shift activities, and you probably do this in your life anyway. If you try to avoid being the last one in the lunch line when

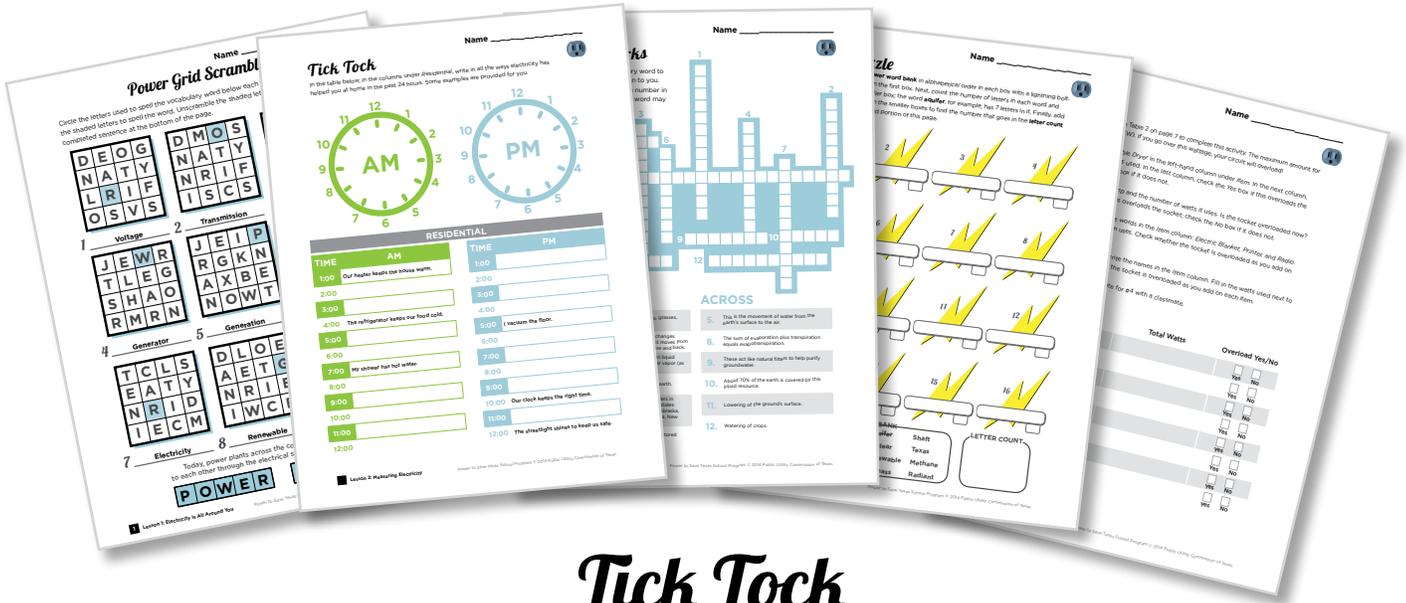
there is a big crowd of people in front of you, you have made a shift in your routine to help things go smoothly. The same is true with electricity.

You can be smart about how you use electricity. You understand how power plants generate electricity, and you know about the concept of on-peak time. You might be surprised to learn

that only 80% of the people in the world have access to electricity, yet the average American household uses 4,500 kWh per year in their home - that's six times more than the global average!<sup>12</sup>

In the next lesson, you will learn about new ways to save energy, and where energy is wasted in your home without you even knowing it. You will be prepared with the knowledge to make a difference in the way you and your family use [energy](#).





# Tick Tock

Ask your teacher for the Tick Tock activity. You will receive one of three versions. Tick Tock asks you to think of all the ways electricity helps you in your daily life. This activity uses clocks for both morning and evening to identify how electricity works or can be saved.

## Long-Term Savings for Homes Tips

### AC & HEAT

-  Do not use humidifiers or swamp coolers with the AC.
-  If your AC or heater is more than 15 years old, consider replacing it with a more efficient model.
  - Newer models use up to 40% less energy.
-  Consider installing a whole-house fan for better circulation.
-  Maintain your AC and heater so they work efficiently.
  - Check your air and/or furnace filters every month when in use. Replace them at least every three months.
  - If you can, have your HVAC unit inspected and maintained by a licensed professional in the spring and/or fall.

See more at [www.powertosavetexas.org](http://www.powertosavetexas.org).

Scan this QR Code with your smartphone to visit the program website.



# Power to Save



*Andy Average*



*Shane Smart*



*Whitney Wasteful*

My Average Monthly kWh usage:	2750 KWH	1000 KWH	4500 KWH
Cost I pay per kWh:	\$0.11/KWH	\$0.06/KWH	\$0.18/KWH
In the summer I will raise my thermostat by:	3°	1°	5°
In the winter I will lower my thermostat by:	3°	5°	1°
I will lower my water heater temperature by:	10°	10°	10°
Number of 100 watt incandescent bulbs I will replace with CFLs:	2 bulbs	10 bulbs	1 bulb
Number of hours I currently leave my incandescent bulb on per day:	5 hours	3 hours	10 hours
I will hang dry my laundry:	No	Yes	No
I will use a power strip to turn off 6 electronic devices when not in use:	Yes	Yes	No

Go to [www.powertosavetexas.org/Home/SavingsCalculator](http://www.powertosavetexas.org/Home/SavingsCalculator) to fill in their potential savings.

*Andy Average*  
Monthly Summer

\$

Monthly Winter

\$

Annually

\$

*Shane Smart*  
Monthly Summer

\$

Monthly Winter

\$

Annually

\$

*Whitney Wasteful*  
Monthly Summer

\$

Monthly Winter

\$

Annually

\$

## Career Connection / Job Profile:



*Do you like to draw?*

*Do you like to figure out how things are put together?*

*Are you good at math?*

If you answered, “Yes,” to these questions, you might like to be a draftsman. Draftsmen change the designs that engineers and architects make into technical drawings and plans. Workers use these plans to build everything from computer chips to skyscrapers. Draftsmen use computer-aided drafting (CAD) equipment to do most of their drawings. They do some work by hand with drafting tools.

### ***As a draftsman, you would:***

- Visit job sites and talk with clients to learn about designs.
- Study work orders, drawings, and maps and measure sites.
- Check building codes and laws to see how they will affect designs.
- Decide what types of drawings to do and how to order the work tasks.
- Figure what materials will be needed and how much they will cost.
- Use CAD equipment or drafting tools to make drawings and plans.
- Review finished plans to make sure they are right and make copies.
- Write instructions to go with plans and explain them to workers.
- Help workers and staff solve problems and change designs if needed.
- Direct and train drafters and other staff.

### ***Will There Be Jobs in the Future?***

In Texas, this occupation has high growth potential. Nationally, this occupation is growing at an average rate.

### ***Education Required:***

To work as a draftsman, you typically need to:

- Have a high school diploma or GED; and
- Have an associate degree.

*Provided courtesy of: [www.onetonline.org](http://www.onetonline.org)*

## Career Connection / Job Profile:



*Are you good at selling things?*

*Do you like working with other people?*

*Do you like to plan and organize activities?*

If you answered, “Yes,” to these questions, you might like to be a marketing specialist. Marketing specialists are among the top managers in companies. They are in charge of how companies sell their products or services. First, they figure out which groups of people might buy certain products. Then, they work with other departments to advertise and sell products to those people.

### ***As a marketing specialist, you would:***

- Talk to experts and do surveys to see what products people might buy.
- Do research on business trends to see if new products are worth making.
- Discuss designs with staff and track costs as products are made.
- Make lists of products and figure out how much to charge for them.
- Create plans for how to sell a company’s products.
- Work with other managers to create ads and go to trade shows.
- Write contracts with those who will distribute the products.
- Hire, train, and be in charge of the marketing and sales staff.
- Study green ideas and plan to make products that protect resources.
- Make green information part of product sales plans.

### ***Will There Be Jobs in the Future?***

In Texas and nationally, this occupation is growing at an average rate.

### ***Education Required:***

To work as a marketing specialists, you typically need to:

- Have a high school diploma or GED; and
- Have a bachelor’s degree.

*Provided courtesy of: [www.onetonline.org](http://www.onetonline.org)*



### LESSON 3:

## *Energy and Water Efficiency*

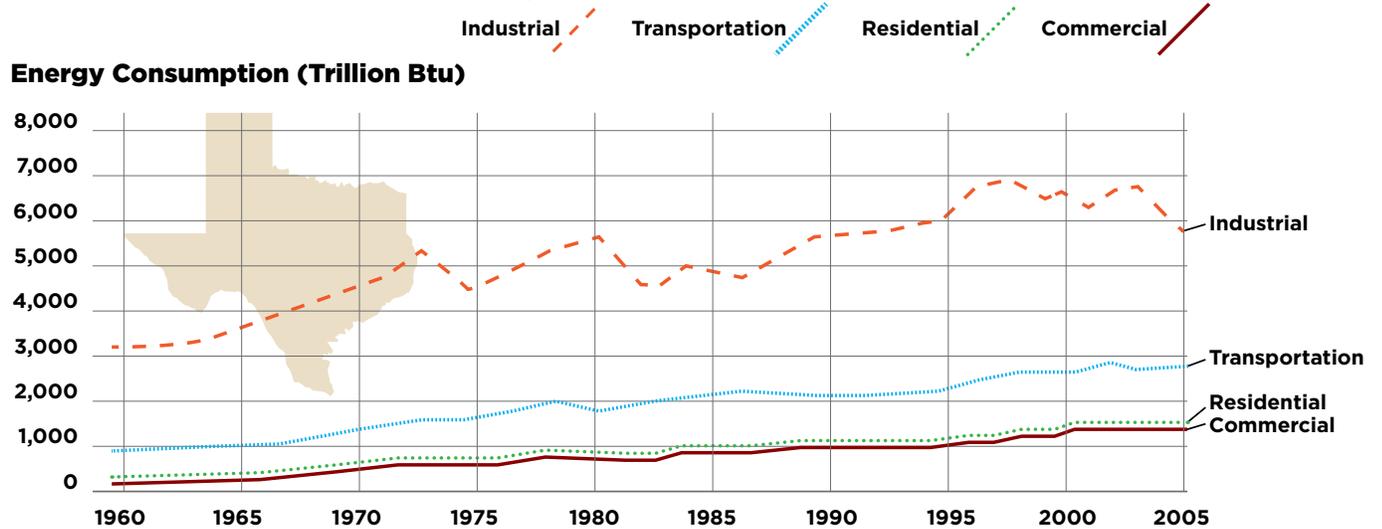
As the population in the state of Texas continues to grow, many are taking a good look at ways to increase energy and water efficiency. Could the state known as the biggest user of energy also become known as the most efficient user of energy? Many in the state of Texas think so and also hope Texas will become a leader in the field of energy efficiency.

In order to make changes in energy usage, it is a good idea to understand how Texans use energy. The graph on page 2 shows where energy is consumed.<sup>13</sup> The category for industrial use includes the manufacturing of petroleum and coal products, as well as computers. The transportation category includes fueling vehicles, trucks, and buses. Residential and commercial use includes keeping the lights on inside buildings and homes as well as heating and cooling them.

**POWER**  
**TO SAVE**  
**TEXAS**



## Texas Annual Consumption by Sector

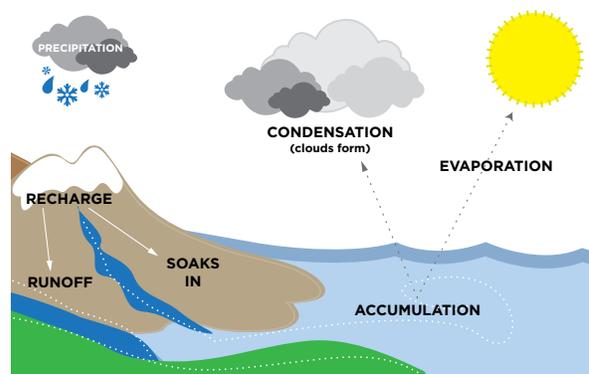


When talking about becoming more energy efficient with the resources in Texas, one resource that probably comes to mind is water. Water is the most important resource on the planet. Without it, there would be no plants, animals, or people. A person can survive for a month or more without eating food, but only for about a week without drinking water. Water must be managed carefully.

It may sound funny, but our water is old! All the water on Earth, the water in your glass, the water with which you brush your teeth, all that water is about 4.4 billion years old. No water is being made or destroyed on the globe. Earth has always held the same amount of water. The water we have today has been used over and over again. Dinosaurs drank the water, and so did George Washington, long before we ever did.

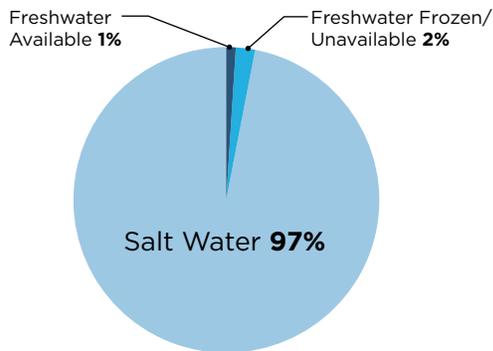
Water is considered a **renewable resource** because it does not disappear, it simply gets moved around in Earth's natural

recycling system. This system is called the water cycle, or **hydrologic cycle**. Water is constantly changing through this never-ending process as it moves from the land and ocean to the atmosphere and back. The atmosphere is the entire mass of air surrounding the earth. Water evaporates, condenses (forms clouds), falls back to Earth as precipitation, collects in bodies of water (lakes, rivers, and oceans), and then the cycle begins again. See the picture below.<sup>14</sup>



**Water** covers about 70% of the earth, yet less than one percent (<1%) of the world's fresh water (~0.007% of all water on

Earth) is available to use. This includes all the water found in lakes, rivers, reservoirs, and even underground water that is shallow enough to be reached. This very small amount of freshwater, replenished by rain and snowfall through the hydrologic cycle, is all there is for us to use.<sup>15</sup>



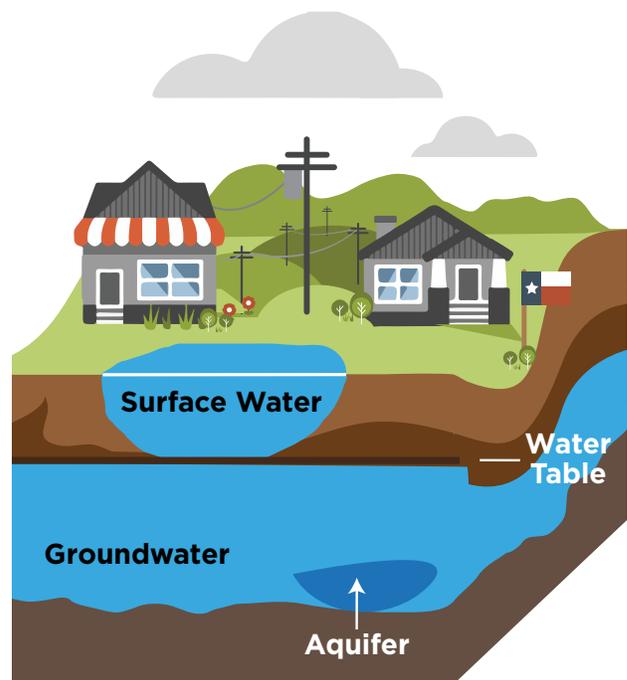
It may be hard to believe there is so much water on our planet, yet so little available to us. Most freshwater returns to the atmosphere by **evapotranspiration**. This simply means that water moves to the air from the earth's surface (**evaporation**), and the water moves as vapor (**transpiration**) from plants, grasses, and trees. The sum of evaporation plus transpiration equals evapotranspiration. In this part of the water cycle, fresh water we could have used simply returns to the atmosphere.<sup>16</sup>

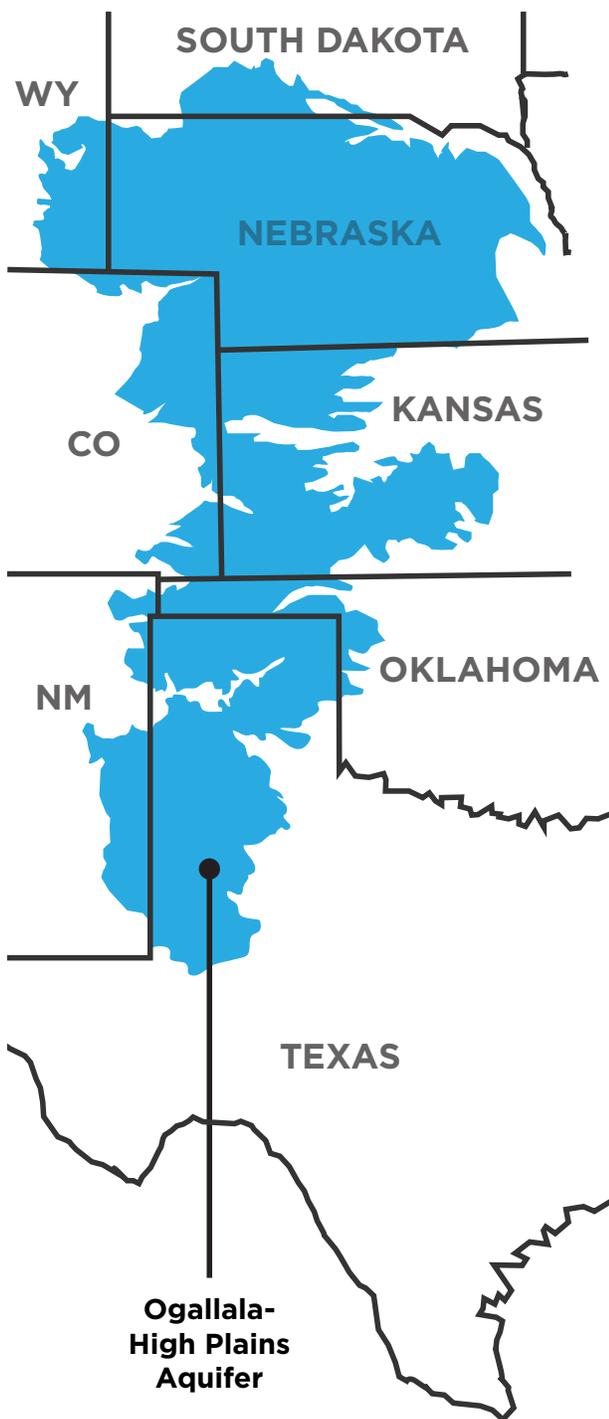
As the picture to the right shows, water on top of the earth's surface is called **surface water**.<sup>17</sup> Examples of surface water include creeks, lakes, streams, rivers, wetlands, and oceans. When you pass a natural spring and water appears to be flowing as if from nowhere, the source is often groundwater. **Groundwater** is the water that seeps into the earth and is stored in aquifers.

This underground water makes its way into lakes and rivers. Sometimes this water is tapped by wells for drinking or irrigation.

Aquifers are areas of soil, sand, and rock that are able to hold liquid. Groundwater sits in the aquifer and is usually replenished by rain and snow. Groundwater stored in aquifers can be found either close to the earth's surface or hundreds of feet below. As groundwater moves through aquifers, sediment and other particles are trapped within the spaces of aquifer rock. In this way, aquifers act like natural filters to help purify groundwater.

The word aquifer means water-bearing, formed from the Latin "aqua" (water) and "ferre" (to bear). This underground source is in more danger today due to population increases. Even though polluted water from agricultural and





urban runoff seeps into groundwater sources, the biggest threat of this limited resource is overuse.

The Ogallala Aquifer is one of the largest aquifers in the world and is located across eight states in the United States: South Dakota, Nebraska, Wyoming, Colorado, Kansas, Oklahoma, New Mexico, and Texas. Like many aquifer systems throughout the world, the Ogallala Aquifer is shrinking.<sup>18</sup>

In 2005, the groundwater in the Ogallala Aquifer was recorded at 3,600 cubic kilometers. Between 2005 and 2010, the amount of water in the aquifer reduced by 300 cubic kilometers. One cubic kilometer equals 264 billion gallons!

As the graph on page 5 displays, the biggest use for groundwater in Texas is **irrigation**.<sup>19</sup> Although other sources of groundwater usage exist, the irrigation of crops like corn and cotton is especially heavy in West Texas and South Texas. Farming and ranching make up about 10 percent of the state's economy, and this translates into jobs for many Texans.

When considering the 300 cubic kilometers of groundwater lost by the Ogallala Aquifer, you might wonder how the land above the aquifer changed. One result is a lowering of the ground's surface, or **subsidence**. The basic cause of land subsidence is a loss of support below ground. When too much water is taken out of the soil, the soil collapses, compacts, and drops. Land subsidence leads to many problems including changes in elevation, flooding, and sinkholes.

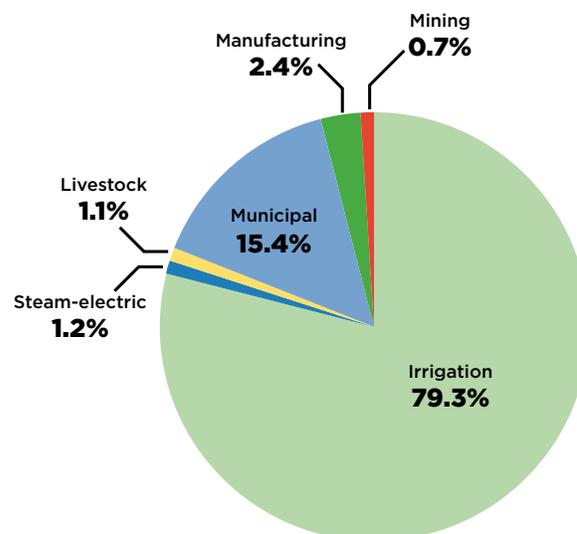
In some of the land areas along Galveston Bay, the land surface has sunk as much as 10 feet since 1906. Flooding becomes a concern because the land is lower, drier, and usually compacted from shrinking. One hundred years of intense groundwater pumping in the Houston area has collapsed the layers of the Gulf Coast Aquifer, causing the land above it to sink. These changes in elevation can cause major damage to buildings, roads, and bridges.<sup>20</sup>



As we study using and valuing water, it is good to know that water use is described in two ways: water withdrawal and water consumption. There is a big difference between the two terms.

**Water withdrawal** refers to water that is redirected or withdrawn from its source – surface water or groundwater. **Water consumption** refers to water withdrawn from its source permanently; it is no longer available for other uses because it has evaporated, been used by plants, or consumed by people or livestock. Once consumed, the water needs to be treated before it can be used again.

People commonly think of water use and water consumption together. However, this is not accurate because water withdrawal refers to water that can be used over and over again, as in the case of a hydroelectric power plant. Water is used temporarily to cool the power plant, then is returned to its original location, perhaps a reservoir. The next lesson will discuss this concept



Sources: Texas Water Development Board and Texas Comptroller of Public Accounts

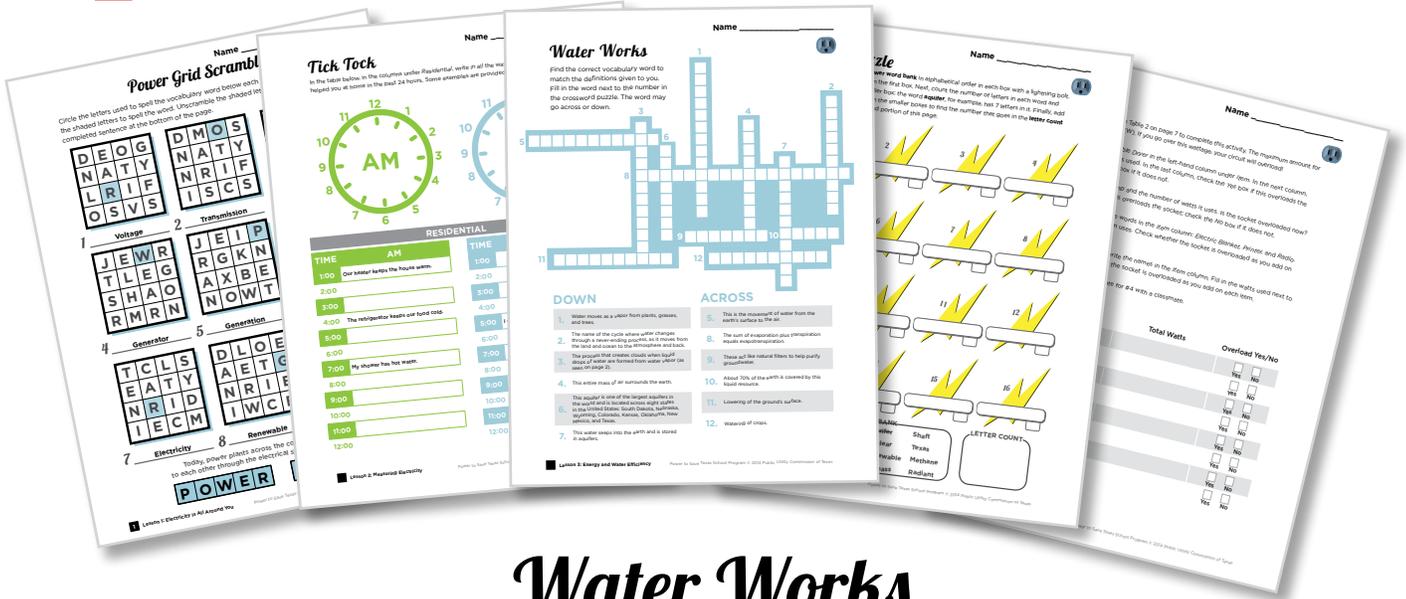
in more detail. Understanding how water is used, or more specifically, how water is withdrawn or consumed, is key to using it more wisely.<sup>21</sup>

The idea of land subsidence and depleting aquifers may start you thinking about becoming more efficient with your water use. Wasting water just doesn't make sense. Even so, the average American wastes thousands of gallons of water each year. Gallons of water are wasted during daily activities, such as taking long showers, running the hose while washing the car, or simply letting the water run straight down the drain.

In America, our water consumption has increased 127% from 1950, while much of the world lives off 3 gallons of water per day or less. To put that into perspective, we can waste 3 gallons of water with one flush of the toilet.<sup>22</sup> That's a lot!

## *Easy Changes to Start Making Today*

<b>1</b>	Throw used tissue into the wastepaper basket rather than the toilet.
<b>2</b>	Keep an eye out for leaky faucets.
<b>3</b>	When brushing your teeth, pour some water in a cup to use for rinsing instead of letting the water run.
<b>4</b>	When trying to get the faucet water warm or cold, catch the running water for plants or animals in or around the home.
<b>5</b>	Time yourself when taking a shower.
<b>6</b>	Run the dishwasher only when you have a full load. The same is true for washing clothes in the washing machine.
<b>7</b>	If you wash dishes by hand, don't leave the water running.
<b>8</b>	Use a broom for sweeping the driveway or sidewalk, not water from the hose.
<b>9</b>	Keep a bottle of drinking water in the fridge; it will always be cold.
<b>10</b>	Water lawns and shrubs early in the day when the air is still cool, and the wind is usually calm. <sup>23</sup>



# Water Works

Ask your teacher for the Water Works activity. You will receive one of three versions. Water Works uses vocabulary words to match definitions, complete a traditional crossword, or create definitions.

## Long-Term Savings for Homes Tips

### ELECTRIC WATER HEATER

-  Repair leaks on warm-water faucets. These leaks just drain your water heater, which means it has to heat more water. That process costs you more.
-  Drain your hot water tank regularly to remove sediment.
-  If buying a new water heater, consider a tankless unit. These systems are 35-45% more efficient. Plus, you'll never run out of hot water.

See more at [www.powertosavetexas.org](http://www.powertosavetexas.org).

Scan this QR Code with your smartphone to visit the program website.



## Career Connection / Job Profile:



*Are you interested in how machines work?*

*Do you like using math?*

*Are you good at following rules and laws?*

If you answered, “Yes,” to these questions, you might like to be a water treatment plant operator. These workers run plants that treat water so it is safe to drink. They also treat water after it is used so it is safe for it to go back into rivers, lakes, and the ocean.

### ***As a water treatment plant operator, you would:***

- Use machines to clean water, remove sewage, and make power.
- Check equipment to make sure it works correctly.
- Use tools to maintain and repair machines.
- Use chemicals to clean water.
- Test water samples to make sure it is clean.
- Use tools to clean and maintain water tanks and filters.
- Keep daily records of the work at the plant.
- Manage other plant workers.

### ***Will There Be Jobs in the Future?***

In Texas, this occupation has high growth potential. Nationally, this occupation is growing at an average rate.

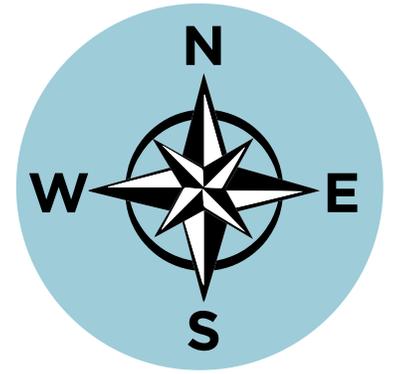
### ***Education Required:***

To work as a water treatment plant operator, you typically need to:

- Have a high school diploma or GED; and
- Complete long-term, on-the-job training; and
- Pass state or local licensing exams.

*Provided courtesy of: [www.onetonline.org](http://www.onetonline.org)*

## Career Connection / Job Profile:



*Are you good at reading maps?*

*Do you like using a computer?*

*Are you interested in where people live?*

If you answered, “Yes,” to these questions, you might like to be a geographer. Geographers study the features of the earth and how people use the land they live on. They often use special computer software called GIS (geographical information systems) to do tasks. Many geographers work for the federal government. Others work for private companies or colleges and universities.

### ***As a geographer, you would:***

- Study the earth and its people on a local or global scale.
- Collect data from maps, satellite photos, and from trips to sites.
- Study land features of an area, such as the plants, rocks, and climate.
- Study the culture of a group of people in a region.
- Use GIS to create maps, graphs, or diagrams.
- Give GIS data to companies that need it.
- Keep GIS software and devices in good working order.
- Give advice on issues such as where to put a new shopping center.
- Write reports and give talks about research findings.
- Teach courses to college students.

### ***Will There Be Jobs in the Future?***

In Texas and nationally, this occupation is growing at an average rate.

### ***Education Required:***

To work as a geographer, you typically need to:

- Have a high school diploma or GED; and
- Have at least a bachelor’s degree in geography.

*Provided courtesy of: [www.onetonline.org](http://www.onetonline.org)*



## LESSON 4:

# *Sources of Electricity*

Most days, Texas has more diverse weather than any other state in the United States. The variety of weather conditions found within the state of Texas is not only due to its size, but also to its unique position on the North American continent.

The climate in Texas is different from one area to the next. Part of the reason is because there is such a difference in the geography throughout the state. There are coastal regions, mountains, deserts, and wide open plains. Another reason the weather is so diverse from one region to another is that the state is located at a junction where several climate zones meet.

There are three main climate zones in Texas; the coastal region, which is humid and subtropical; the northern plains, where you will see the coldest and

**POWER**  
**TO SAVE**  
**TEXAS**



hottest temperatures in the state; and western Texas, which is mostly desert. In the center of Texas there are hills and its climate is similar to the Texas Panhandle, but not as extreme.

The warm air blowing from the warm waters of the Gulf of Mexico influences the Texas atmosphere. This moist air affects cities, like Houston, located in the flat plains along the coast. Houston is humid and, during the summer, morning humidity levels average over 90%. Houston is one of the most humid cities in the United States.<sup>24</sup>

As a result of warm, moist Gulf air mixing with cool air from the Rocky Mountains and dry air from the desert, tornadoes are common in Texas. In fact, Dallas-Fort Worth lies at the lower end of “Tornado Alley.” The United States has more tornadoes than any other country in the world and, to some, Texas is known as the “Tornado Capital.”<sup>25</sup>

With the variety of climates found in Texas, Texas has become rich in renewable and non-renewable energy resources. Here is a short list of interesting facts about the energy sources found in Texas:

- Texas is the leading producer of crude oil in the nation.
- More than one-quarter of all natural gas production occurs in Texas.
- Texas leads the U.S. in the ability to generate wind power.
- The world’s largest single wind power facility is in central Texas.
- Texas solar power potential is among the nation’s highest.
- Biomass energy resources are abundant in the state of Texas.
- The two nuclear power plants in Texas generate 7.9% of the state’s electricity.
- Texas produces and consumes more electricity than any other state.

In the list, the last line shows Texas as the leader in producing and consuming electricity.<sup>26</sup> In Lesson 3, you learned that industries consume about half of all of the energy used in Texas. With industries like cement production, petroleum refining, and aluminum and glass production, it is no wonder these are such major energy consumers.

In the list, the last line also states that Texas produces more electricity than any other state. As you may remember from Lesson 1, electricity can be produced

from renewable and non-renewable resources. Yet, how much is produced by each source in the state of Texas? Below, Table 1 and Table 2 answer this question.<sup>27</sup>

TABLE 1

<i>Net Electricity Generation (share of total)</i>	<i>Texas</i>
Petroleum-Fired	-
Natural Gas-Fired	44.7%
Coal-Fired	36.5%
Nuclear	7.9%
Hydroelectric	0.2%
Other Renewables	10.0%

TABLE 2

<i>Generation (thousand megawatt hours)</i>	<i>Value (,000)</i>	<i>Percent of State Total</i>
<b>Total Electricity Net Generation</b>	<b>411,695</b>	<b>100.0</b>
<b>Total Renewable Net Generation</b>	<b>28,967</b>	<b>7.0</b>
Geothermal	-	-
Hydro Conventional	1,262	0.3
Solar	8	*
Wind	26,251	6.4
Wood/Wood Waste	900	0.2
MSW/Landfill Gas	449	0.1
Other Biomass	96	*

\* = Absolute percentage less than 0.05.

- = Not data reported.



As non-renewable resources will eventually run out, it is a good idea to take a second look at our list of renewable resources. As you studied the list and answered the questions, you may have wondered what exactly some of the resources were. The next few paragraphs will explain more about these types of energy.

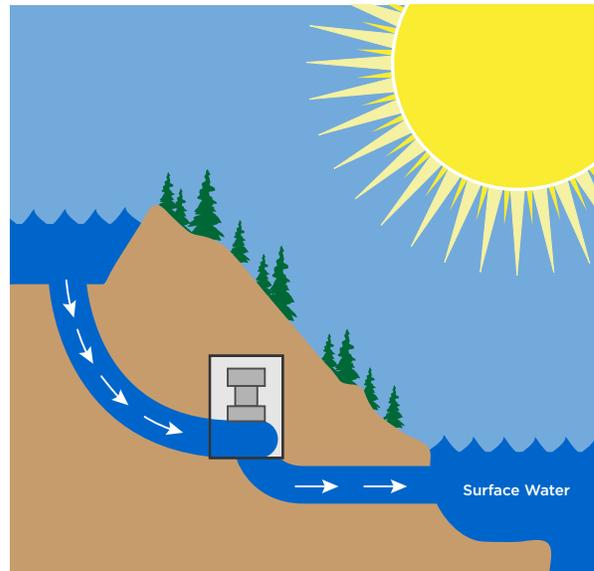
A source of energy is considered renewable when the source is easily replaced, and does not pollute the air, land, or water. About 20% of the electricity produced on the globe in 2009 came from renewable sources. Texans rely on four main sources for generating their electrical power:

1. Hydro Conventional
2. Solar
3. Wind
4. Wood/Wood Waste/  
Landfill/Other Biomass

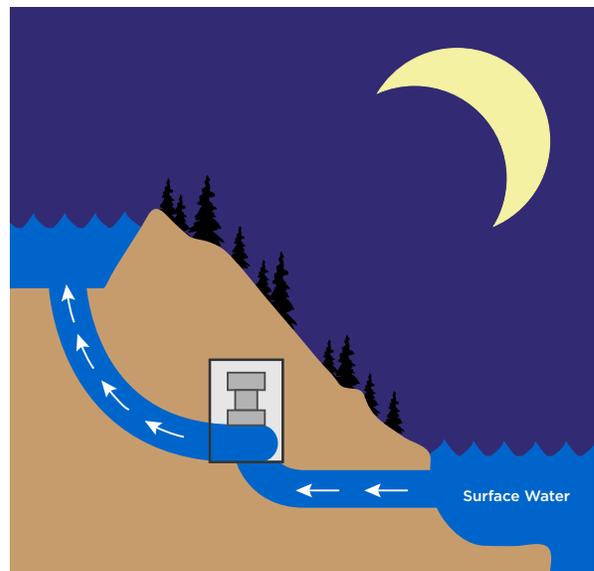
Many are familiar with hydroelectric power and may not even know it. Some believe this form of generating power must be one of the oldest methods because people have used moving water to help them in their work throughout history. A hydroelectric power plant uses a dam or reservoir to hold back water. The picture shows how dams work both day and night to [generate electricity](#).<sup>28</sup>

Solar power is another form of power that many people know about because the power comes from the sun. In fact, the word solar is from the Latin word

for sun (Sol). This form of energy is available most of the time, except at night or on cloudy days. When sunlight hits the earth, it arrives in the form of solar, or radiant, energy. Solar panels absorb radiant energy and convert it to electricity.



Water flows downhill through turbines, producing electricity.

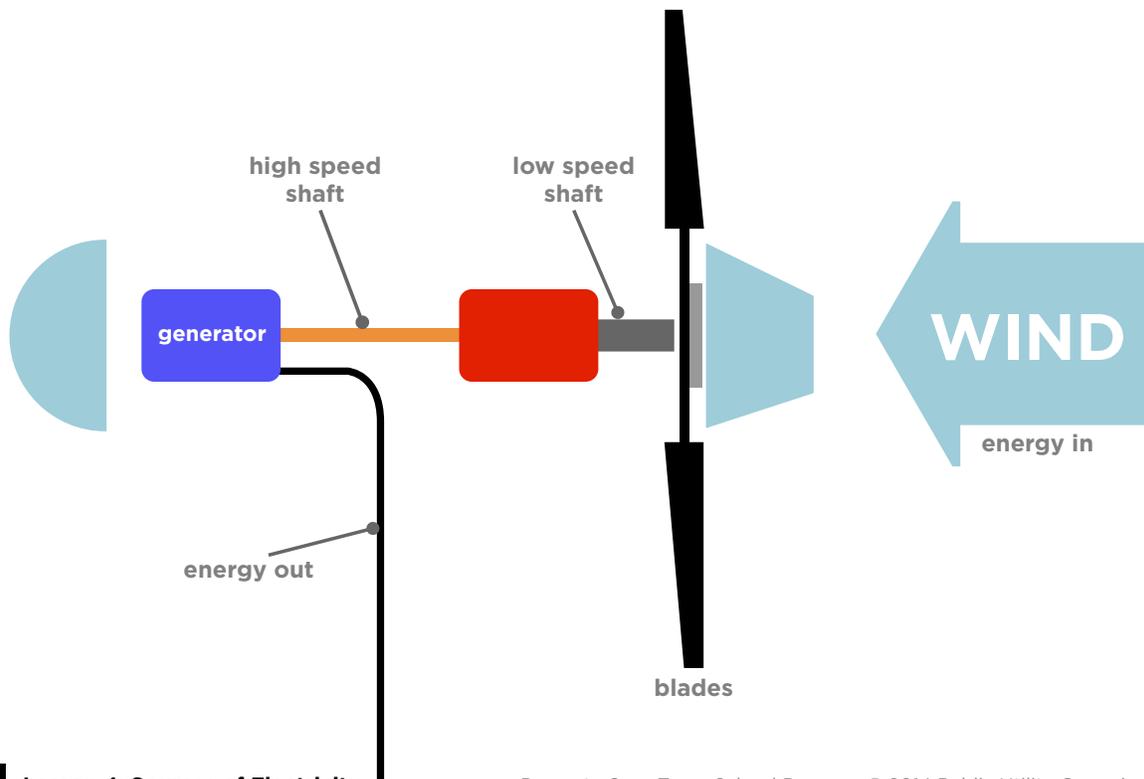


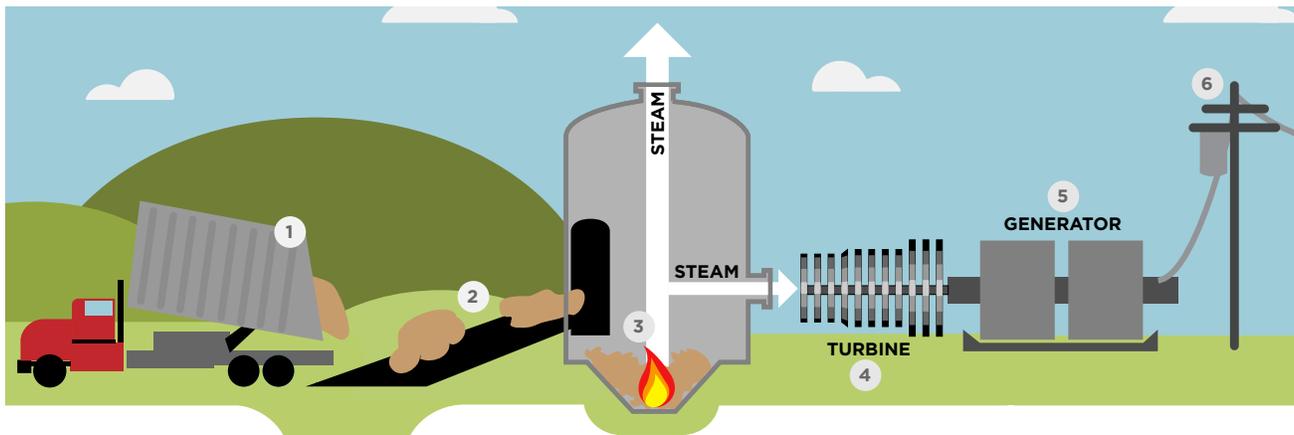
Water is pumped uphill to the reservoir for use the next day.

When thinking about renewable energy in the state of Texas, the most popular way to generate power is by taming the wind. Texas leads the nation in wind-powered generation, with seven of the 10 largest wind farms in the nation, including four of the top five.

Texas has more installed wind power capacity than all but five countries worldwide. Although wind power cannot completely replace other ways to generate electricity, it set a record in March of 2014 when it powered five million Texas homes. Almost one third of the power provided to Texans came from wind power!<sup>29</sup>

So how do wind turbines work? Moving air (wind) has huge amounts of kinetic energy. All moving things have kinetic energy. The faster something moves, the more kinetic energy it has. Just like windmills, wind energy turbines have been around for over 1,000 years.<sup>30</sup>





Biomass is burned to heat water, which makes steam to turn the turbines and generators to make electricity.

A wind turbine works like a giant fan, but in reverse. Fans use electricity to make wind, but wind turbines use wind to make electricity. When wind passes over the blades, the turbine rotates, spinning a generator to produce electricity. When it comes to the size of wind turbines, bigger is better! The tallest wind turbines reach over 400 feet tall. This height is about the same as a 40-story building, or the Bryan Tower in downtown Dallas.

Wind turbines need winds of about 14 miles per hour (mph) to operate. A taller wind turbine is able to reach faster winds more easily. Most large turbines produce their maximum power at wind speeds around 33 mph. At 45 mph most large turbines shut down.<sup>31</sup>

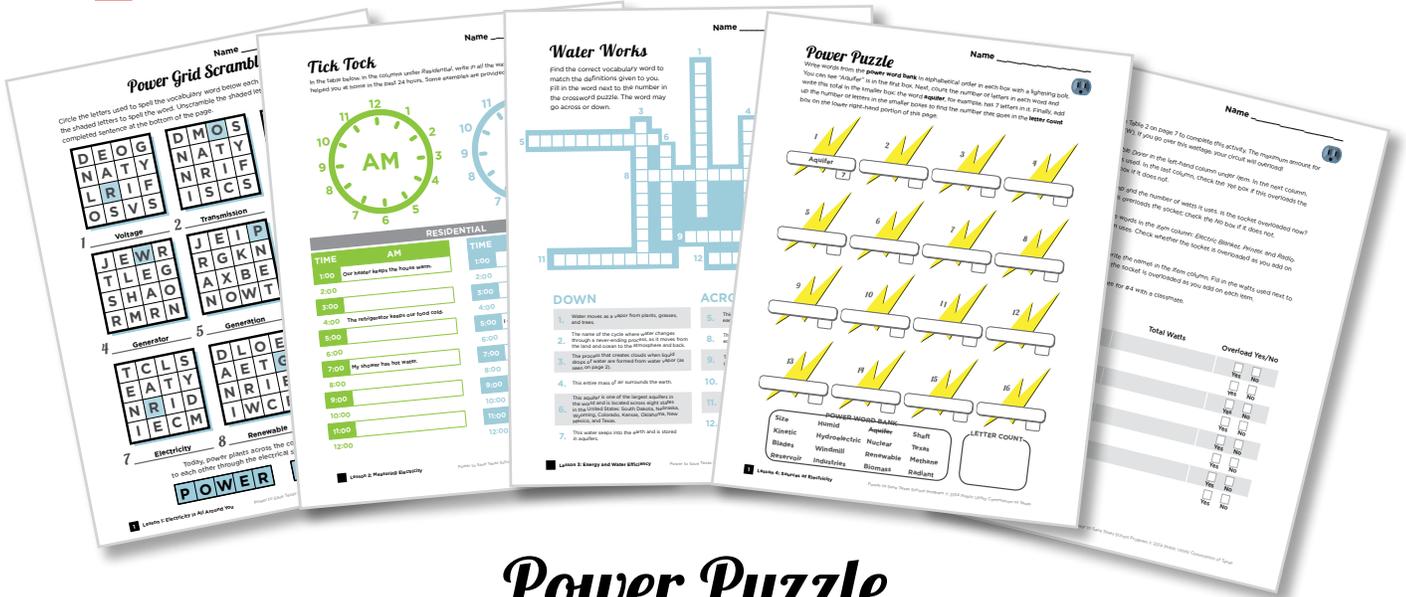
There are a number of safety systems that can turn off a wind turbine if the wind speed becomes too much and puts the structure in danger. Perhaps the most interesting system is the most simple. A metal ball is attached to a chain and sits on a tiny pedestal or pillar. If the turbine starts vibrating above a certain limit, the ball falls off the pedestal, pulls on the

chain, and begins putting on the brakes to stop the turbine blades from spinning.

The last source we will discuss for generating electrical power is biomass. You might have heard of this and thought, “How do we use trash to make electricity?” Biomass is organic material that comes from plants and animals. Some examples are wood, crops, animal manure, and human sewage.

Another form of energy from biomass is methane gas, which is produced as organic material decays. Methane captured from landfills or other organic material such as manure can be used to power a gas turbine and thus generate electricity. When methane gas is ignited, the energy (released in the form of natural gas) can be used to heat homes and buildings.

As the picture above shows, chemical energy in biomass is released as heat when it is burned. First, (1) the biomass is delivered to the plant; then, (2) it is carried to the boiler. Biomass is then (3) burned to heat water and make steam. Finally, (4) the steam turns turbines, which turn generators (5) to make electricity(6).<sup>32</sup>



# Power Puzzle

Ask your teacher for the Power Puzzle activity. You will receive one of three versions. The Power Puzzle uses vocabulary words from a word bank to identify words. Count the letters in each word and add them for a final letter count.

## Long-Term Savings for Homes Tips

### LIGHTING

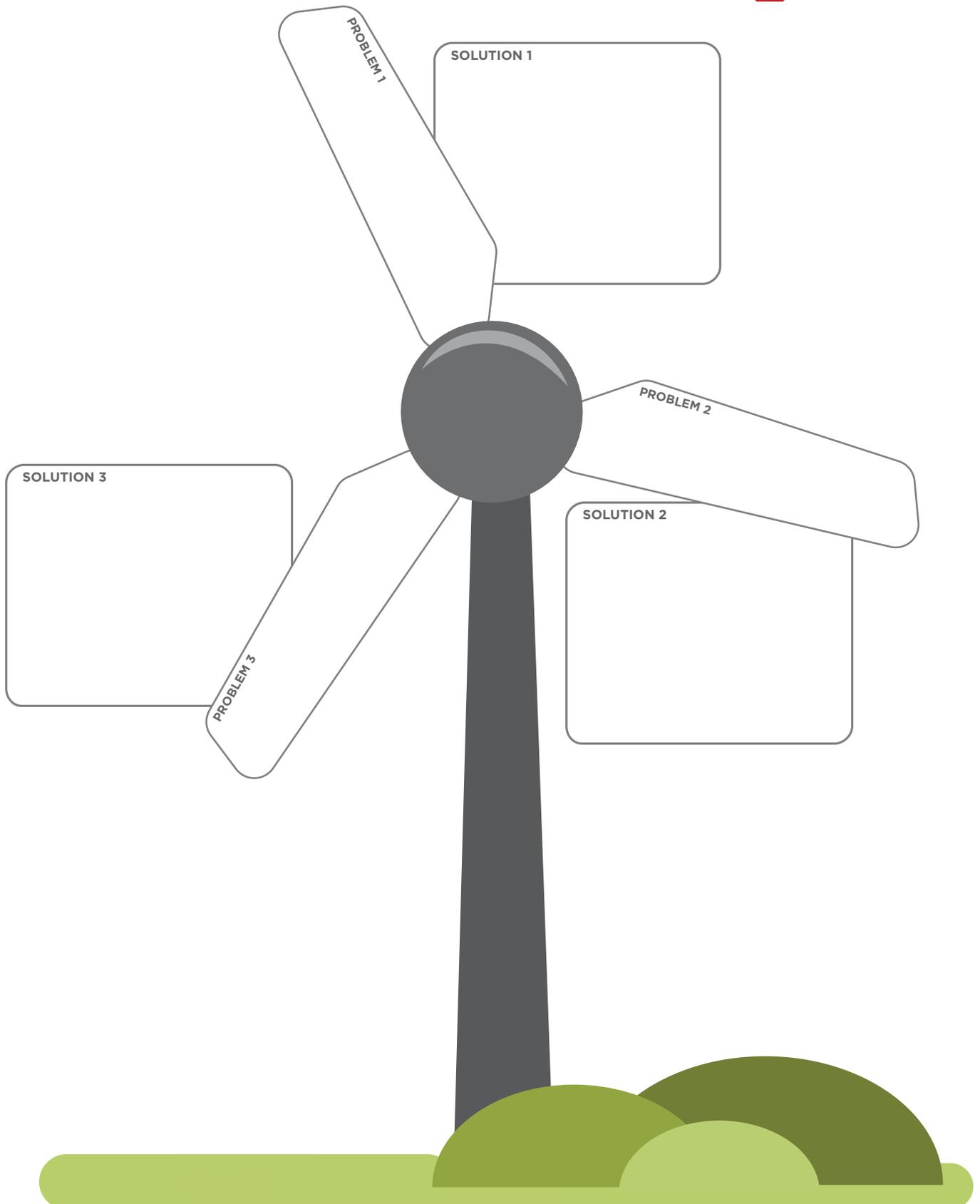
- ⚡ Check light sockets for the recommended bulb wattage for each lamp or light. Don't use a higher-wattage bulb; it wastes energy and can be a fire hazard. If you need more light, consider using a CFL bulb that produces more light with lower wattage.
- ⚡ When you can, use one higher-watt bulb instead of two lower-watt bulbs. A single higher-watt bulb is more efficient

See more at [www.powertosavetexas.org](http://www.powertosavetexas.org).

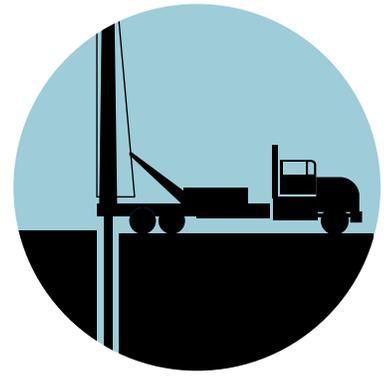
Scan this QR Code with your smartphone to visit the program website.



# Turn It for Texas



## Career Connection / Job Profile:



*Are you interested in what is under the earth?*

*Are you good at figuring out how things work?*

*Do you like to do things in exactly the right order?*

If you answered, “Yes,” to these questions, you might like to be a construction and well driller. Construction and well drillers use heavy equipment to drill holes in the earth. They drill wells or get samples of rocks for clients.

### ***As a construction and well driller, you would:***

- Run drilling rigs to dig for water or bore holes in the earth.
- Study drilling sites and figure clients’ costs.
- Design pumping systems for wells.
- Drive trucks or drilling rigs to work sites and put drills in position.
- Set up drills for the conditions at each site.
- Operate drills and change speed and pressure as needed.
- Pump water to clean holes drilled and to cool drill bits.
- Put well parts together, test them, and make sure water is clean.
- Keep machines in good working order and replace worn parts.
- Keep records of drilling progress and types of rocks found.

### ***Will There Be Jobs in the Future?***

In Texas, this occupation has high growth potential. Nationally, this occupation is growing at an average rate.

### ***Education Required:***

To work as a construction and well driller, you typically need to:

- Have a high school diploma or GED; and
- Have on-the-job training.

*Provided courtesy of: [www.onetonline.org](http://www.onetonline.org)*

## Career Connection / Job Profile:



*Do you like working with other people?*

*Do you like to plan and organize activities?*

*Are you good at explaining ideas and giving directions?*

If you answered, “Yes,” to these questions, you might like to be a human resources manager. Human resources managers oversee how companies recruit, interview, and hire new employees. They also manage employee training, wages, and benefits and direct the human resources staff. Human resources managers often help top executives and employees work together to solve problems.

### ***As a human resources manager, you would:***

- Plan and manage how companies recruit, hire, train, and fire staff.
- Direct the work of the human resources or training staffs.
- Create budgets and be in charge of wages and benefits for staff.
- Work with managers on staff planning and help solve staff problems.
- Plan and direct staff training, create courses, and train teachers.
- Run classes for new staff and tell them about pay, benefits, and rules.
- Keep records, write reports, and talk to staff to find out why they quit.
- Study staff policies and find ways to make them better.
- Study laws and court rulings and work on contracts with unions.
- Get facts about accidents on the job and go to court if needed.

### ***Will There Be Jobs in the Future?***

In Texas and nationally, this occupation is growing at an average rate.

### ***Education Required:***

To work as a human resources manager, you typically need to:

- Have a high school diploma or GED;
- Have a bachelor’s degree; and
- Have one to five years of work experience in human resources.

*Provided courtesy of: [www.onetonline.org](http://www.onetonline.org)*



## LESSON 5:

# *How Electricity is Saved and Using Electricity Safely*

After reading through the first four lessons of this program, you may understand a lot more about electricity than before. You know how electricity is made and how it is measured. You know the types of resources needed to make electricity. You also know the creative ways people use to generate energy from renewable resources.

When people work together to save electricity, building new power plants can be delayed or even reduced. Practicing load shifting helps make sure you are using less electricity during on-peak hours. Small changes like these make a big difference. Now, we'll take a look at a way to save energy that is used in your home invisibly.

**POWER**  
**TO SAVE**  
**TEXAS**

Invisible power? It may sound strange, but it exists. Another phrase for invisible power is standby power. This kind of power is fairly new to some of us because this wasn't even a problem until the 1970s. Before the 70s, when an appliance was turned off, it was really off. In today's world, when we push the off button, it may not truly be off. It was during the decade of the 1970s that the first remote controls for televisions and stereos became available.

Before this time, when you turned on the television set or changed the channel, you got up out of your chair and flipped a switch on the set. Many times people would watch several programs in a row on the same channel, just because they didn't feel like getting up to change the station. It also took a minute for televisions to warm up before they were ready to be watched. The same was true for stereos and other electrical appliances in the home.

Then came the first television remote. No longer did folks wait around for the television to be ready to watch. Pushing the "on" button meant the television came right on. The station could be changed with the push of a button without ever leaving the couch! The remote changed how we watched television. Instead of getting a bit of exercise every time people wanted to change a channel, they could stay in their chairs for hours. This is when the term "couch potato" was heard for the first time.

People did not know that there was a small price to pay for the convenience of having appliances turn on so easily. Televisions and other appliances needed to be ready

to turn on in seconds. To be able to do this, they never really turned off. A tiny amount of power was always flowing to the appliance; this is what it means to have standby power.

Soon, most appliances had clocks, timers or remotes, and were using energy even when they were turned off. People began to learn about this energy use and wanted to do something about it. There are ways to reduce or stop wasting energy in this way. There is even a phrase for this invisible power; it is called **Phantom Load**.

Phantom Load describes the electricity that is being used when an appliance or device is not doing its main job and is either turned off or in standby mode. A good example of this is the microwave. Microwaves are always on so the clock can keep running, even when you are not cooking food. These phantom loads hide in game consoles, DVD players, printers, computers, cordless appliances, and many other devices.

The easiest way to spot a phantom load is to look for devices with clocks on them, or those that have a small white or black box between the plug and the appliance. For any single appliance, the load is never very large; however, when you add up the many phantom loads in a typical home, it can equal up to 10% of the electricity your home uses.

So how can you help shut down these phantoms? The only sure way to eliminate a phantom load is to unplug the appliance or device. As you might have guessed, this

# Spotting Phantom Load Devices



is not always possible; a certain amount of phantom load may always exist. For example, it would be difficult to unplug the stove every night. However, there is a lot you can do. Here are a few easy suggestions:

- Unplug all battery chargers when they are not in use.
- Unplug all appliances in the home that you only use now and then, especially those in rooms you do not use often.
- When you are leaving for several days, unplug as many gadgets or appliances as possible.
- When you buy new products, buy ones with low standby energy demand.
- Use a power strip designed to switch off clusters of electronic products.

The chart on page shows how much different items will typically cost each year. Let's see how much you can save by [unplugging](#) these items or plugging them into a smart strip. Read the questions carefully. See if you can "do the math" and save some money! The right-hand column shows how much the phantom load on each item in the left-hand column costs for one year.<sup>33</sup>



**TABLE 1**

Cable Box with DVR	\$43.01
Video Recorder (DVR)	\$36.98
Window Fan	\$27.52
Cable Box (without DVR)	\$17.65
Satellite Cable Box	\$15.50
Laptop Computer	\$8.81
Fax	\$5.35
CD Player	\$4.99
VCR	\$4.38
Desktop Computer	\$3.96
Power Tool	\$3.96
Microwave Oven	\$3.05
Handheld Vacuum	\$2.97
Television	\$2.97
Answering Machine	\$1.99
Battery Charger	\$1.98
Printer	\$1.98
MP3 Player	\$1.98
Cordless Phone	\$1.98
Electric Toothbrush	\$1.98
DVD	\$1.53
Gas Range Oven	\$1.14
Coffee Maker	\$1.12
AM/FM Radio	\$1.11
Video Game Console	\$1.00
Cell Phone Charger (Unattached to Phone)	\$0.26

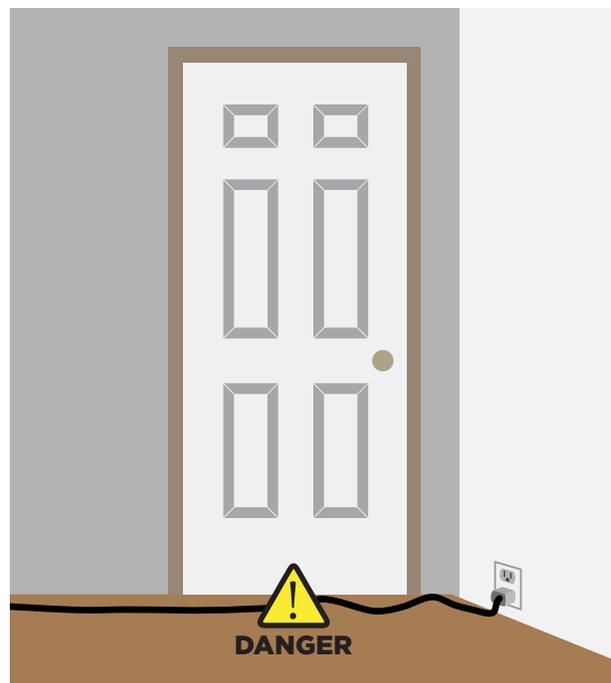
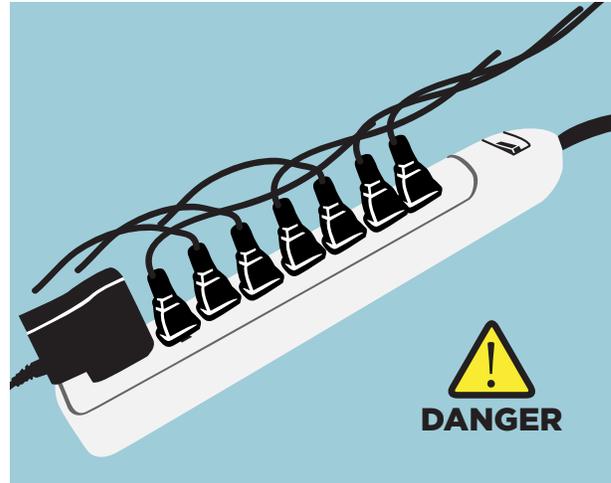
There is one more area of energy use that must be discussed: the topic of using energy safely.<sup>34</sup> As you have learned, electricity is all around you, so it is important to be careful. When using electricity think about these tips:

1. Never put your fingers, or anything other than an electrical plug, in a socket. Remember, just like water in a faucet, the electricity waits inside the socket until you plug something into it.
2. When unplugging an appliance, never yank the cord out of the socket. Pulling a cord out in this way can damage the appliance, the plug, or the outlet.
3. Don't use an electrical appliance, like a hairdryer, when you are either wet, have wet hands, or are standing in water. Many electrical accidents happen when people use electricity near water.
4. Don't plug too many appliances into a socket; this could lead to a fire. The more current that flows from a socket, the hotter it becomes. An overheated socket can start a fire.
5. Keep an eye out for damaged plugs and cords. Let an adult know about the problem.
6. It is impossible to tell if an electric wire is on or off simply by looking at it. Consider any electric wire to be "live," or on, and be careful when near it.
7. Make sure appliances, like the television, have a free flow of air around them so they do not overheat and start a fire.

8. Do not place electric cords so that they run through doorways or under carpets. There is a danger of electric shock if someone trips and the cord is yanked out or broken.
9. If you are outside flying a kite, watch out for power lines overhead. You can't always tell where a kite is going to land. Be sure your kite does not have any wire, metal, or foil on it. If your kite does get caught on a power line, let go immediately.
10. Never climb a tree with a power line running through it.

Now that you've finished the lessons in this program, you have new knowledge about electricity. The more you know about electricity, the easier it is to conserve it. Have you thought a little bit about your own electricity habits? Do you use electricity as if it were unlimited? Do you save electricity, but only sometimes? Or are you someone who likes to go the extra mile and save electricity whenever you can?

Saving electricity is everyone's job. But, you might think, "Hey, I'm just a kid!" Kids actually use as much or more energy than most adults. The clothes kids wear are usually washed more often, especially if they play on a team or spend a lot of time outside. Kids are at home a lot more often than most adults with jobs. When kids are home, most pass the time by playing electronic games or watching television.



Although everyone in the house uses the refrigerator to keep food cold, younger family members may stand in front of the fridge thinking about their choice for a longer time and more often. All family members need lights on in the evenings, but younger family members may leave lights or appliances on when leaving a room. Since kids use a lot of electricity, they are very important members, if not the most important members, of the team to save energy.

# *Be a Power Partner!*

Share your knowledge with others and help everyone use energy wisely. Be aware of the time of day you use electrical items, and keep an eye out for phantom loads. Use electricity wisely to make sure there will be enough for the future, because life is more comfortable and more enjoyable with electricity!



# Overload!

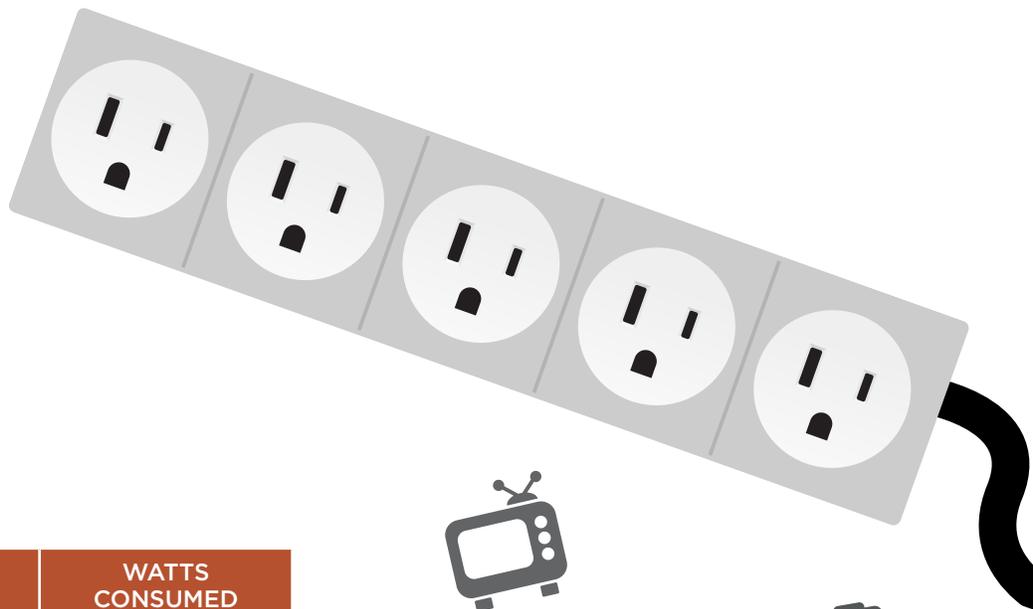
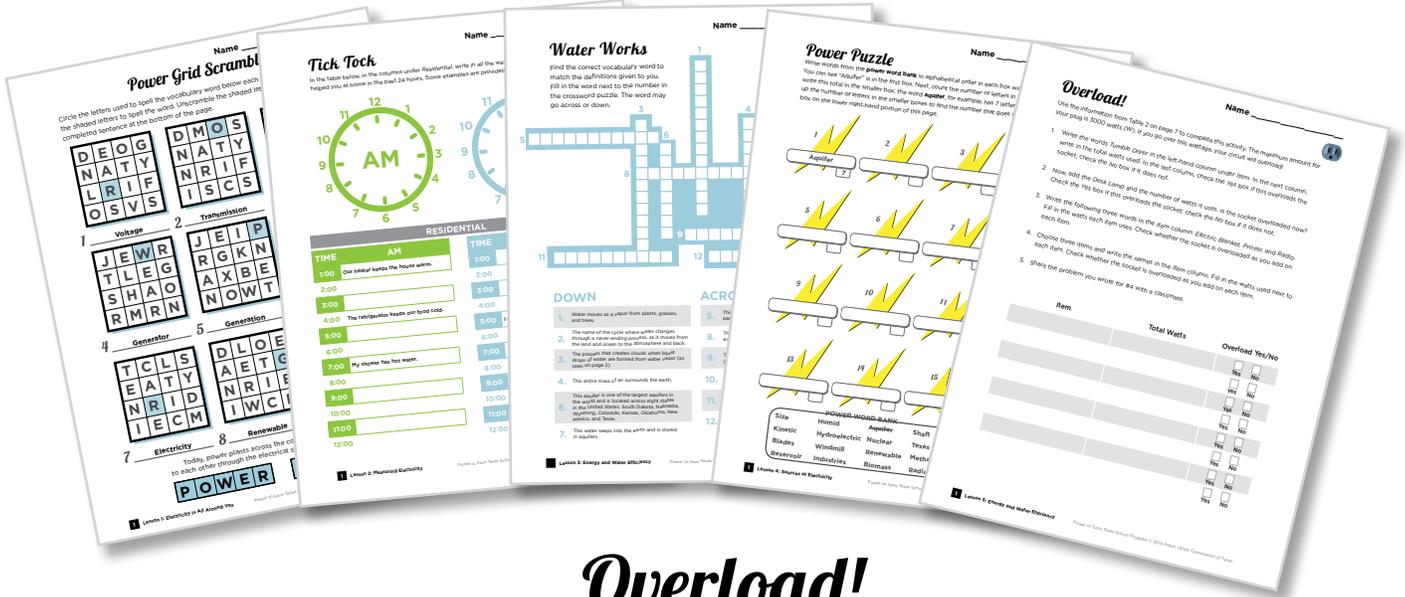


TABLE 2

DEVICE	WATTS CONSUMED
Computer Monitor	100 W
Desktop Computer	700 W
Desk Lamp (with 60-watt lamp)	60 W
Dishwasher	2200 W
DVD Player	28 W
Electric Blanket	60 W
Game Console	200 W
Hair Dryer	2200 W
Hair Straighteners	100 W
Iron	2800 W
Microwave	100 W
Mobile Phone Charger	700 W
Printer	60 W
Radiator (Electric)	2200 W
Radio	28 W
Satellite TV Box	28 W
TV 42" HD	60 W
Toaster	200 W
Tumble Dryer	2200 W
Vacuum Cleaner	100 W
Washing Machine	2800 W
Wi-Fi Router	2800 W





# Overload!

Ask your teacher for the Overload! activity. You will receive one of three versions. Overload! uses wattage from common household items to discover which items can be plugged in at the same time without overloading a smart strip or outlet.

## Long-Term Savings for Homes Tips

### WINDOWS, DOORS & INSULATION

-  Save up to 10% on cooling costs by caulking windows and weather-stripping doors.
-  Upgrade to energy-efficient windows.
-  Add solar screens or window tint.
-  Check your ducts for leaks and seal them if needed.
-  Consider getting an energy audit.
-  Make sure your attic has proper ventilation and high R-value insulation. This will help your AC be more efficient and keep more cool air inside your home.
-  Use heavy-duty, clear plastic film on the inside of your window frames during the cold winter months.
-  Install tight-fitting, insulating drapes or shades on windows that feel drafty.

See more at [www.powertosavetexas.org](http://www.powertosavetexas.org).

Scan this QR Code with your smartphone to visit the program website.



## Career Connection / Job Profile:



*Do you like to figure out how things work?*

*Are you good at building things?*

*Are you good at math?*

If you answered, “Yes,” to these questions, you might like to be an electrician. Electricians put in and maintain electrical systems in homes, businesses, and factories. They work on wiring, light fixtures, and other equipment through which electricity flows.

### ***As an electrician, you would:***

- Put in, test, and fix wiring, lights, and other equipment.
- Read blueprints, plan wiring layouts, and figure costs.
- Pull wire through walls and connect to switch boxes or outlets.
- Use hand tools, power tools, and testing devices.
- Work from ladders and roofs, dig trenches, and lift heavy objects.
- Inspect and test systems to make sure they work and are safe.
- Keep work records, write reports, and order supplies.
- Train others to put in and fix wiring, lights, and other equipment.
- Set up lights and place flares during an emergency.
- Keep license up to date to meet government rules.

### ***Will There Be Jobs in the Future?***

In Texas and nationally, this occupation is growing at a high rate.

### ***Education Required:***

To work as an electrician, you typically need to:

- Have a high school diploma or GED; and
- Complete an apprenticeship program; and
- Pass a state licensing exam.

*Provided courtesy of: [www.onetonline.org](http://www.onetonline.org)*

## Career Connection / Job Profile:



*Do you like using computers?*

*Do you like working with other people?*

*Are you good at math?*

If you answered, “Yes,” to these questions, you might like to be a database administrator. Database administrators use software to organize and store data for companies. They manage data such as financial records or Internet customer information. They make sure data is available to employees who need it and that the data stays private and safe.

### ***As a database administrator, you would:***

- Work with project teams to plan the best ways to store data.
- Use math to figure how much data new systems can handle.
- Draw models on computers to show how systems will work.
- Write codes and revise software so all parts of systems work together.
- Plan ways to keep data safe and create guidelines for use.
- Set up and test new systems, fix errors, and watch how they perform.
- Limit users to only the parts of systems that they need to work with.
- Train users and answer their questions.
- Figure time and cost needed to make changes asked for by users.
- Use systems manuals as guides to making changes.

### ***Will There Be Jobs in the Future?***

In Texas and nationally, this occupation is growing at a high rate.

### ***Education Required:***

To work as a database administrator, you typically need to:

- Have a high school diploma or GED;
- Have a bachelor’s degree; and
- Have one to five years of related work experience.

*Provided courtesy of: [www.onetonline.org](http://www.onetonline.org)*



## LESSON 1:

# *Electricity is All Around You*

There aren't a lot of places that you can see electricity. The most common form of electricity you may know is lightning. Lightning is a big spark that occurs when lots of electrons move from one place to another very quickly. An **electron** is a tiny piece of electricity, too small to see even with a powerful microscope.

Even though we may not realize it, electricity is everywhere. There is even electricity everywhere in space. There are electrons inside stars and on all planets. Lightning is just one expression of natural electricity. Inside your body, even your thoughts are very small bursts of electricity traveling along your nerves and between cells in your brain.

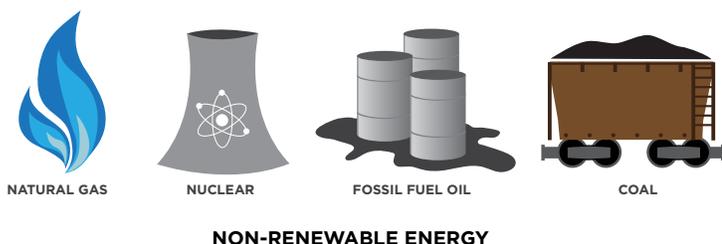
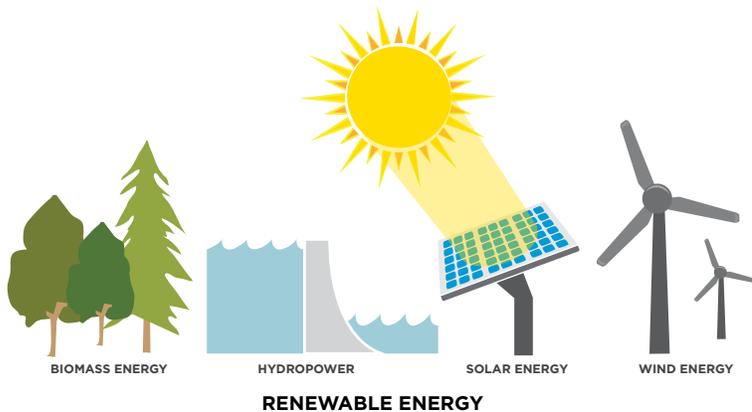
Without electricity, you would not be able to read this article right now. Your nervous system sends

**POWER**  
**SAVE**  
**TEXAS**

“signals” to the brain, telling our eyes to follow the words on the page. These signals are little bursts of electricity that carry messages from one point to another within our body. With so much electricity jumping around, it may seem like the body is a really great power source. But, the human body generates only about 0.1 volts—not even enough to power your TV remote.<sup>1</sup>

It’s easy to see the uses of electricity around you. When electricity is captured, it is constantly flowing through insulated wires. These wires bring power to your home and your town. As the population of Texas grows, so does the need for electricity. Texas currently creates and uses more electricity than any other state.<sup>2</sup>

The good news is Texas has a variety of climates and natural resources.



Texans can take advantage of these resources to help generate electricity. When we talk about using **renewable resources** to create energy, we mean using they power created from the use of natural resources, which replace themselves quickly and dependably. These energy sources can never be used up, like sunlight and wind. Renewable energy is clean and is considered unlimited. When we use these resources, we reduce the demand for **non-renewable sources** of energy. The non-renewable resources are formed deep within the earth from plant and animal remains and are millions of years old, like coal and oil. These resources can only be used once for energy.<sup>3</sup>

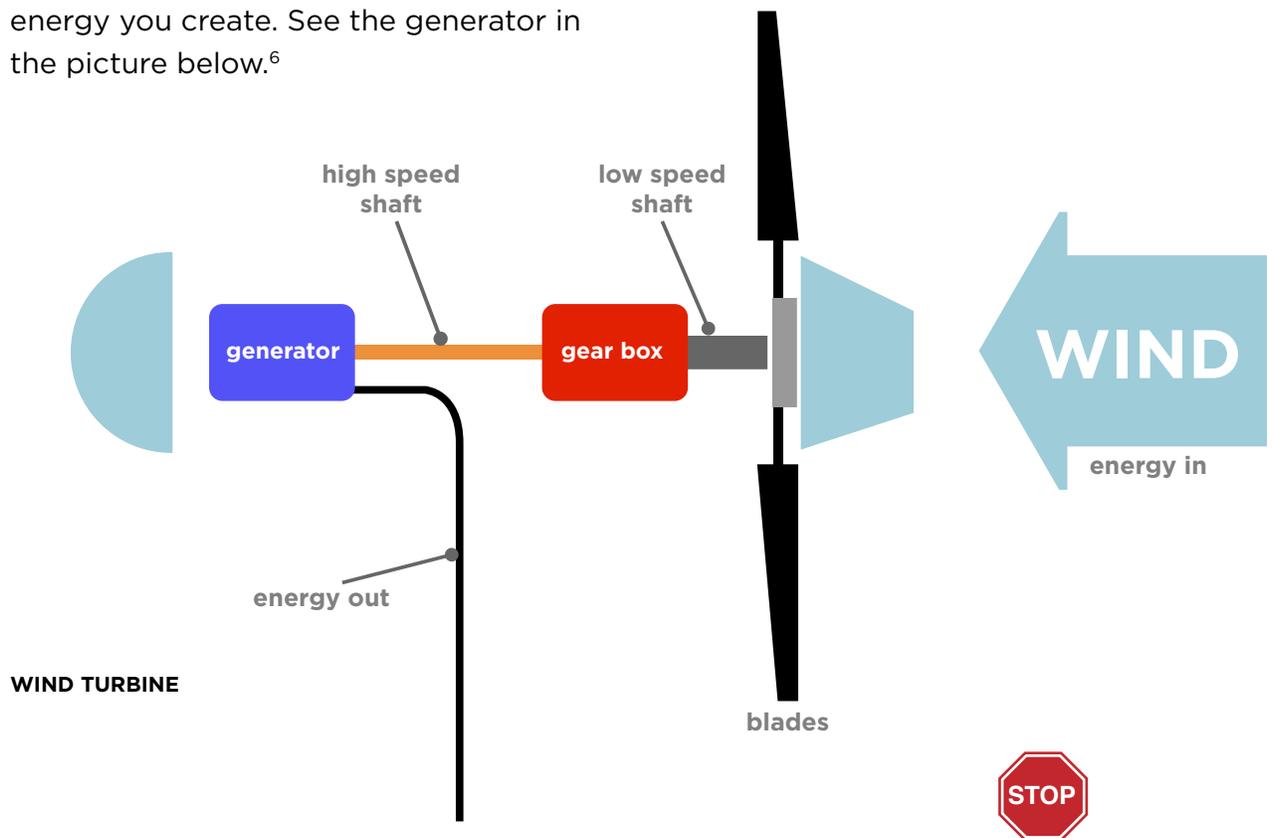
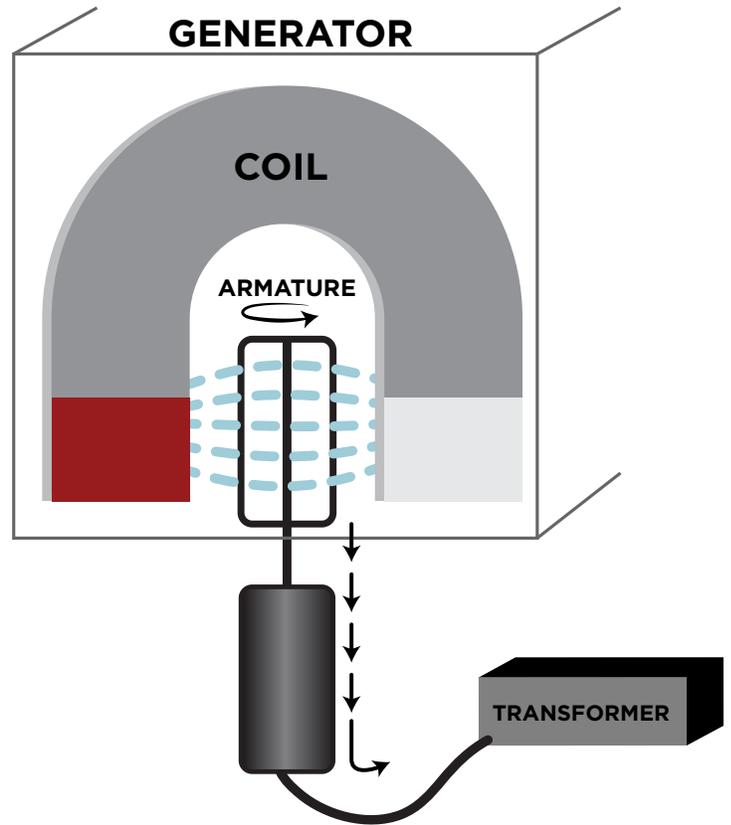


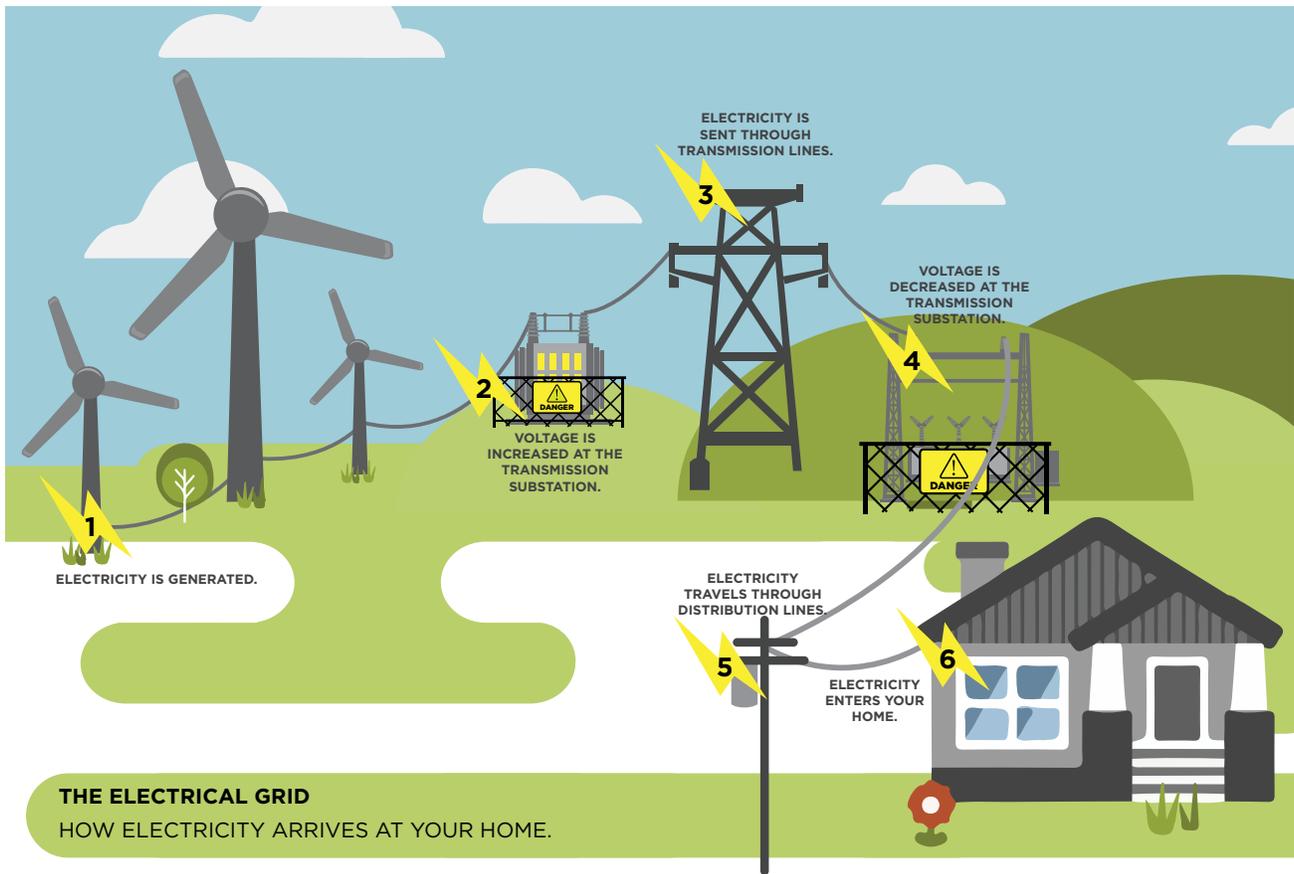
Everyone can enjoy renewable energy, and some even install their own solar panels or wind turbines to generate power for themselves. This is called **Distributed Renewable Generation**, or a DRG system.<sup>4</sup> At times, these customers produce more power than they can use. Depending on where the customers live, this extra power may be sold back to an electric company.

When we talk about electrical power, you may wonder how electricity was captured and forced to travel through the power lines. We really depend on this form of energy, and without it our world would be very different; we would be much less comfortable. If we were without electricity for a long time, water could not be pumped into our homes.

When you think about ways to create or make electricity, you are talking about **electric generation**. Most of the ways to do this involve a machine called a **generator**. The generator transfers the energy of motion into electricity. Take a look at the picture on the right.<sup>5</sup> A magnetic coil is located inside the generator. An armature spins in between the magnetic coil. This spinning action creates electricity.

You might wonder if it is hard to make the armature spin. The good news is, it's not hard at all. In fact, there are many ways of spinning the armature that you may already know about! These include using the power of the wind, water, or sun, and also by using something called biomass. We will learn about biomass in Lesson 4. The bigger the generator, the faster the armature spins, and the more energy you create. See the generator in the picture below.<sup>6</sup>





In the case of a wind turbine, these turbines work the opposite of a fan. Instead of using electricity to make wind, these turbines use wind to make electricity. The wind turns the blades, which spin a shaft, which connects to a generator and makes electricity.

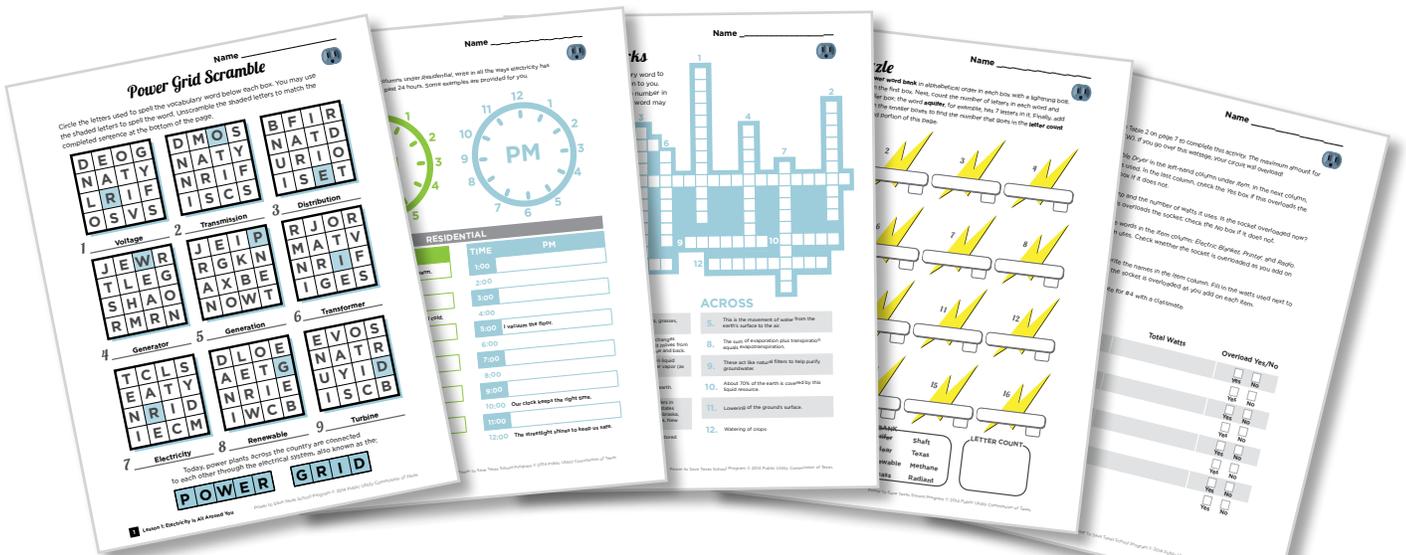
The state of Texas is unique. Texas is able to rely on many sources for generating its own electrical power. We will read about these in the next lesson.

Electricity is an enormous part of our lives. It makes our lives comfortable and safe. Electricity is so important that most of the time we simply take it for granted. Do you know how electricity reaches your home or school? Actually, it travels a long way. The power plant where your electricity is made

or generated might be hundreds of miles away!

First, (1) the electricity is generated by using either renewable or non-renewable resources. Second, (2) the voltage is increased at a transmission substation. Then, (3) the electricity is sent through uninsulated transmission lines on very high poles or structures to a distribution substation (4) where the voltage is decreased. Next, the electricity is carried to individual neighborhoods by distribution lines that are held up on power poles or buried deep underground. Before reaching your home, (5) smaller transformers decrease the voltage one more time. Finally, (6) electricity safely arrives at your home for you to use.<sup>7</sup>





# Power Grid Scramble

Ask your teacher for the Power Grid Scramble activity. You will receive one of three versions. The Power Grid Scramble uses vocabulary words from a word bank to spell, unscramble, match, or complete sentences.

## Long-Term Savings for Homes Tips

### COMPUTERS, APPLIANCES & ELECTRONICS

-  Set your computer and monitor to sleep when idle for more than a few minutes.
-  Don't use screen savers. They prevent computers and monitors from going into power-saver mode.
-  Make sure the dryer air vent outside your house is properly sealed.
-  When buying a new appliance, look for ENERGY STAR® qualified products. These options use 10-50% less energy than standard models.

See more at [www.powertosavetexas.org](http://www.powertosavetexas.org).

Scan this QR Code with your smartphone to visit the program website.



# Career Connection / Job Profile:



*Do you like helping people?*

*Are you interested in how electrical equipment works?*

*Are you good at fixing things?*

If you answered, “Yes,” to these questions, you might like to be a line installer and repairer, also known as a lineman. Line installers and repairers build, maintain, and repair electrical power systems and cables. Some install and fix the power lines that move electricity from power plants to customers. Others work on the lines and cables that carry telephone service, television, and the Internet.

## ***As a line installer and repairer you would:***

- Install, maintain, and fix power lines, cables, and poles.
- Set up cable service for customers and explain how it works.
- Drive work trucks to job sites and coordinate jobs with other workers.
- Dig holes, set poles, and climb poles or use lifts to reach equipment.
- String lines and cables between poles, towers, and buildings.
- Dig trenches and lay cable into trenches.
- Inspect and test lines, electric parts, and signal strength.
- Check lines and poles from helicopters or airplanes to get clear views.
- Use power tools and equipment to install and fix poles and lines.
- Follow rules to keep workplaces safe and keep tools in good repair.

## ***Will There Be Jobs in the Future?***

In Texas, this occupation has high growth potential. Nationally, this occupation is growing at an average rate.

## ***Education Required:***

To work as a line installer, you typically need to:

- Have a high school diploma or GED; and
- Complete an apprenticeship program or long-term, on-the-job training.

*Provided courtesy of: [www.onetonline.org](http://www.onetonline.org)*

## Career Connection / Job Profile:



*Are you good at math?*

*Are you interested in helping keep people safe?*

*Are you organized and able to focus on tasks?*

If you answered, “Yes,” to these questions, you might like to be an environmental scientist. Environmental scientists study problems in the natural world. They measure electromagnetic fields; do research about how these problems affect the health of people, plants, and animals in order to protect them. Many environmental scientists work for federal, state, and local governments. Others work for companies that help clients plan projects and solve problems.

### ***As an environmental scientist you would:***

- Study how what people do affects the world around them.
- Do research and create programs that limit harm to land, water, and air.
- Collect water, soil, or air samples and test them.
- Suggest ways to use land that will help clean and protect it.
- Prepare permits and codes to protect the land, water, and air.
- Inspect sites and decide what to do if codes have not been followed.
- Give advice to clients, the government, and the public.
- Train students, other scientists, or staff.
- Meet with clients, staff, or the public to explain research findings.
- Write reports and make charts or graphs to help explain research.

### ***Will There Be Jobs in the Future?***

In Texas and nationally, this occupation is growing at an average rate.

### ***Education Required:***

To work as an environmental scientist, you typically need to:

- Have a high school diploma or GED; and
- Have a college degree in science.

*Provided courtesy of: [www.onetonline.org](http://www.onetonline.org)*



## LESSON 2:

# Measuring Electricity

Now that you understand a little more about electricity, let's take a look at how it is measured. As you know, electric energy is produced when electrons in an atom are excited due to movement or added heat. When electrons move quickly, they produce a charge. The result is a current we call electricity.

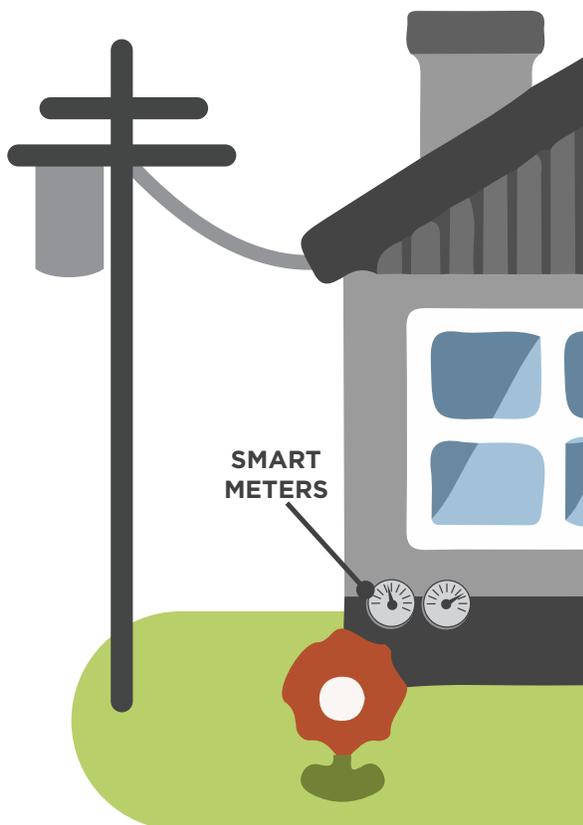
It is easy to overlook all the good things about electricity and its value because we use it all the time. As you're reading this lesson, there may be lights on in the room. The room is conditioned to be cool enough or warm enough to keep you comfortable. Let's take a minute and think of all the ways electricity has helped you in the past 24 hours.

In Lesson 1, we learned how electricity is first generated at the power plant and then moves along



the grid. We discussed how substations on the grid act to lower the voltage of electricity. **Voltage** is a measure of electric pressure or electric force.<sup>8</sup> When this pressure is low enough, the electricity can travel through transmission wires on tall towers. At substations, the voltage is lowered again and the electricity travels through insulated wires to smaller power lines, which can be above or below the ground.

When the electricity reaches homes and buildings, it is through wires that connect to a meter. The meter used for measuring electricity by many homes and businesses today is sometimes called a **smart meter**. The meter measures how much electricity is being used by the electric appliances within the home or business. You might



wonder how electricity is able to be measured correctly. When gasoline is put in cars, the fuel pump shows the price per gallon. When enough gasoline has poured into the car, you can see the total number of gallons you put in, as well as how much it costs. Is the method similar when you use electricity? Thanks to smart meters, the answer is yes.

Smart meters are able to measure the amount of electricity you use, and record the time of day too! You can learn which appliances use more energy, and even see the time of day when your family uses the most energy. The smart meter helps you to actively participate in the process of using energy. It also helps you to take action to save energy. With new technologies like the smart meter, less energy was used in the United States during the past several years.

Smart meters measure electricity in amounts from small to large. Much like there are 16 ounces in a pound, the basic unit for measuring electricity is called a **watt (W)**. You have probably seen some lightbulbs printed with its wattage, stating 100W.

The larger measurements are called **kilowatts (kW)** and are equal to **1,000 watts**. When the electrical bill comes to your home, it usually shows electricity measured in **kilowatt hours (kWh)**.<sup>9</sup> This is just an easy way to say that 1,000 watts of electricity were used for one hour. The chart on the next page shows common household devices and watts consumed.<sup>10</sup>



**Table 1**

DEVICE	WATTS CONSUMED
Alarm clock	5-100
Ceiling fan	65-175
Cell phone charger	4
Clock radio	10
Clothes dryer	1,800-5,000
Clothes washer	350-500
Color television (36")	133
Dishwasher	1,200-2,400
DVD player	23
Game console	195
Hair dryer	1,200-1,875
Heater (portable)	750-1,500
Microwave oven	750-1,100
Printer	25-35
Refrigerator (16 cu. ft)	725
Toaster	1,225
Water heater (40 gallon)	4,500-5,500

*Andy Average* works in the city and enjoys going for hikes on weekends. When he is home, he doesn't like to pay too much attention to his bill, but does



turn off the lights most of the time when leaving a room. Even so, he is known to fall asleep with the television on, and sometimes it's on all night long. Andy turns up the heat on cold winter days, but once in a while tries to wear an extra sweater instead of really cranking up the thermostat. In the summer, when it gets really hot, Andy will try to help keep the house cool by closing the blinds. Andy has replaced a couple of light bulbs with CFLs (compact fluorescent lamps), but hasn't made many other changes to help lower his utility bill. He knows he should only run the dishwasher and washing machine when there's a full load, but sometimes it's just easier to run these machines when he's in the mood. He knows he can check his smart meter online, and will try to do it one day soon.

**CALCULATING KW CONSUMPTION**

$$\frac{\text{watts or demand}}{\text{watts or demand}} \times \frac{\text{actual \# of hours used}}{\text{actual \# of hours used}} = \frac{\text{watt-hrs used in a day}}{\text{watt-hrs used in a day}}$$

$$\frac{\text{watt-hrs used in a day}}{\text{watt-hrs used in a day}} \div \frac{1,000 \text{ kilowatt}}{1,000 \text{ kilowatt}} = \frac{\text{kWh used in a day}}{\text{kWh used in a day}}$$

$$\frac{\text{kWh used in a day}}{\text{kWh used in a day}} \times \frac{\text{cost of a kWh}}{\text{cost of a kWh}} = \frac{\text{cost of use in a day}}{\text{cost of use in a day}}$$

$$\frac{\text{cost of use in a day}}{\text{cost of use in a day}} \times \frac{\text{days used per year}}{\text{days used per year}} = \frac{\text{annual cost of use}}{\text{annual cost of use}}$$

## **Shane Smart**

works in the city and makes sure that everything is turned off before he leaves for work. He pays close attention to his bill, turns off lights every time he leaves a room, and unplugs appliances when he's not using them. On cold winter days, Shane keeps the heat at a reasonable temperature, wears extra clothing to keep warm, and keeps a blanket on the couch in case he gets cold. In the summer, Shane keeps the house cool by closing the blinds and leaving the doors and windows closed. Shane takes advantage of the warm weather by hanging his clothes outside on the clothesline to dry; the clothes always smell fresh this way. When Shane has to use his clothes dryer, he makes sure that it is during off-peak hours. Shane has replaced all light bulbs with CFLs. He only turns on the dishwasher when it's full, and does the same when washing a load of clothes, while also checking to make sure it's around 8:00 PM. Shane keeps an eye out for new ways to save on his utility bill by following his smart meter online.



**Whitney Wasteful** works close to home and doesn't worry about her utility bill at all. Her bill is higher than most, but, oh well. Whitney leaves lights on every time she leaves a room and never unplugs any of her appliances. On cold

winter days, Whitney cranks up the heat until she's comfortable and wears extra sweaters only when she goes outside. In the summer, Whitney keeps the house cool by running the air conditioning all day long. If Whitney comes home for lunch, she'll open the side door to enjoy the warm summer air and may forget to close it again when she leaves. Whitney has heard of CFLs and is considering buying one someday. She turns on the dishwasher a couple of times a week when she runs out of spoons, and uses her washer and dryer whenever she needs blue socks. Whitney complains about her utility bill and thinks a smart meter is used for the parking spaces downtown.



Now that you understand a little more about the special way electricity is measured, we can look at some other things unique to electricity. The utility company needs to have electricity ready when people need it. If people don't use all the electricity provided, the utility company cannot send it back through the power poles to the place where it was generated. If there is a sudden increase in the need for electricity, the utility company can't quickly install more power poles and string up new transmission lines.

Utility companies have to keep a balance between the amount of electricity they generate and the amount people need. You might think of it like this: if you were going to have a couple of friends come over this weekend, you would probably make sure there were enough snacks in case someone got hungry. But, what would you do if each of your friends brought their entire family with them? Would you still have enough snacks for everyone? It's the same with electricity.

At certain times of the day, people use more electricity. You would probably guess that there is not a high demand for electricity at three o'clock in the morning, and you would be right. When most families come home from school or work, you would think people use more electricity, and you would be right again. It makes sense that the utility company tries to balance the need for electricity so everyone can enjoy it.

The times during the day when everyone wants to use electricity is called **On-Peak**. During this time the utility company is producing and delivering more electricity and the risk for the electrical grid getting out of balance is high. **Off-Peak** time is the time of day when there is less demand for electricity. To help prevent a shortage in

electricity during on-peak time, the utility company asks that we practice **load shifting**.<sup>11</sup>

Basically, it is suggested that we not run the dishwasher or a load of laundry during on-peak times. It makes sense to shift activities, and you probably do this in your life anyway. If you try to avoid being the last one in the lunch line when

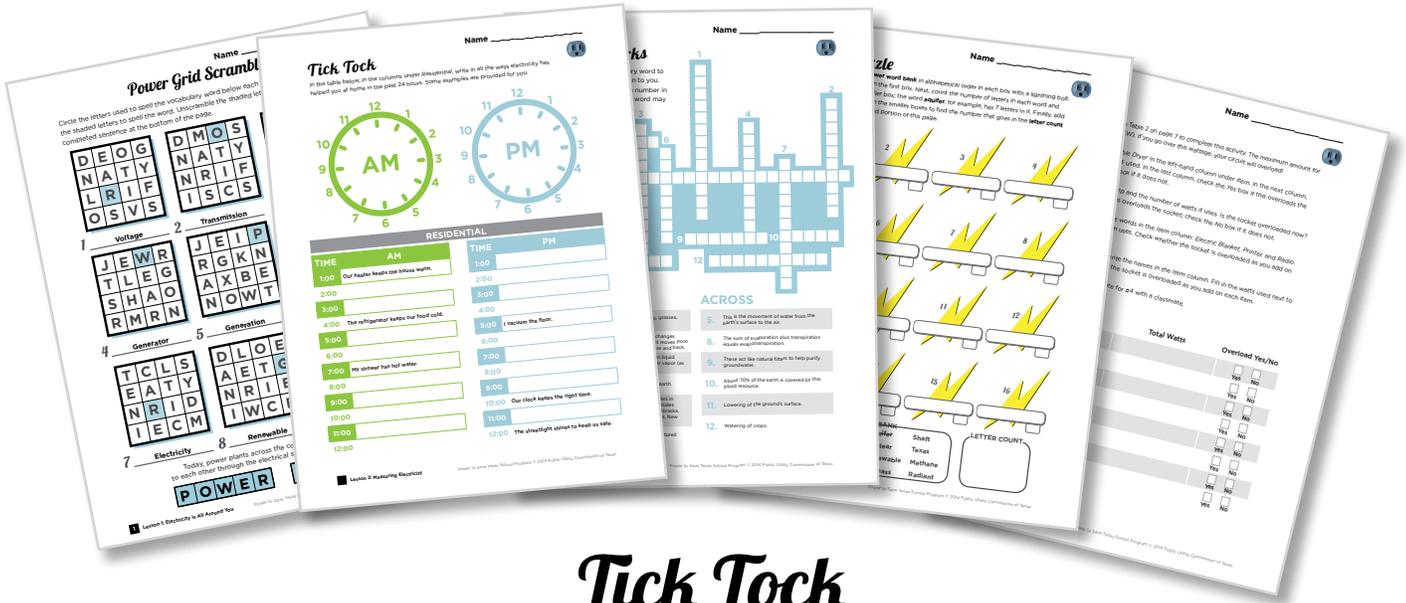
there is a big crowd of people in front of you, you have made a shift in your routine to help things go smoothly. The same is true with electricity.

You can be smart about how you use electricity. You understand how power plants generate electricity, and you know about the concept of on-peak time. You might be surprised to learn

that only 80% of the people in the world have access to electricity, yet the average American household uses 4,500 kWh per year in their home - that's six times more than the global average!<sup>12</sup>

In the next lesson, you will learn about new ways to save energy, and where energy is wasted in your home without you even knowing it. You will be prepared with the knowledge to make a difference in the way you and your family use [energy](#).





# Tick Tock

Ask your teacher for the Tick Tock activity. You will receive one of three versions. Tick Tock asks you to think of all the ways electricity helps you in your daily life. This activity uses clocks for both morning and evening to identify how electricity works or can be saved.

## Long-Term Savings for Homes Tips

### AC & HEAT

-  Do not use humidifiers or swamp coolers with the AC.
-  If your AC or heater is more than 15 years old, consider replacing it with a more efficient model.
  - Newer models use up to 40% less energy.
-  Consider installing a whole-house fan for better circulation.
-  Maintain your AC and heater so they work efficiently.
  - Check your air and/or furnace filters every month when in use. Replace them at least every three months.
  - If you can, have your HVAC unit inspected and maintained by a licensed professional in the spring and/or fall.

See more at [www.powertosavetexas.org](http://www.powertosavetexas.org).

Scan this QR Code with your smartphone to visit the program website.



# Power to Save



*Andy Average*



*Shane Smart*



*Whitney Wasteful*

My Average Monthly kWh usage:	2750 KWH	1000 KWH	4500 KWH
Cost I pay per kWh:	\$0.11/KWH	\$0.06/KWH	\$0.18/KWH
In the summer I will raise my thermostat by:	3°	1°	5°
In the winter I will lower my thermostat by:	3°	5°	1°
I will lower my water heater temperature by:	10°	10°	10°
Number of 100 watt incandescent bulbs I will replace with CFLs:	2 bulbs	10 bulbs	1 bulb
Number of hours I currently leave my incandescent bulb on per day:	5 hours	3 hours	10 hours
I will hang dry my laundry:	No	Yes	No
I will use a power strip to turn off 6 electronic devices when not in use:	Yes	Yes	No

Go to [www.powertosavetexas.org/Home/SavingsCalculator](http://www.powertosavetexas.org/Home/SavingsCalculator) to fill in their potential savings.

*Andy Average*  
Monthly Summer

\$

Monthly Winter

\$

Annually

\$

*Shane Smart*  
Monthly Summer

\$

Monthly Winter

\$

Annually

\$

*Whitney Wasteful*  
Monthly Summer

\$

Monthly Winter

\$

Annually

\$

## Career Connection / Job Profile:



*Do you like to draw?*

*Do you like to figure out how things are put together?*

*Are you good at math?*

If you answered, “Yes,” to these questions, you might like to be a draftsman. Draftsmen change the designs that engineers and architects make into technical drawings and plans. Workers use these plans to build everything from computer chips to skyscrapers. Draftsmen use computer-aided drafting (CAD) equipment to do most of their drawings. They do some work by hand with drafting tools.

### ***As a draftsman, you would:***

- Visit job sites and talk with clients to learn about designs.
- Study work orders, drawings, and maps and measure sites.
- Check building codes and laws to see how they will affect designs.
- Decide what types of drawings to do and how to order the work tasks.
- Figure what materials will be needed and how much they will cost.
- Use CAD equipment or drafting tools to make drawings and plans.
- Review finished plans to make sure they are right and make copies.
- Write instructions to go with plans and explain them to workers.
- Help workers and staff solve problems and change designs if needed.
- Direct and train drafters and other staff.

### ***Will There Be Jobs in the Future?***

In Texas, this occupation has high growth potential. Nationally, this occupation is growing at an average rate.

### ***Education Required:***

To work as a draftsman, you typically need to:

- Have a high school diploma or GED; and
- Have an associate degree.

*Provided courtesy of: [www.onetonline.org](http://www.onetonline.org)*

## Career Connection / Job Profile:



*Are you good at selling things?*

*Do you like working with other people?*

*Do you like to plan and organize activities?*

If you answered, “Yes,” to these questions, you might like to be a marketing specialist. Marketing specialists are among the top managers in companies. They are in charge of how companies sell their products or services. First, they figure out which groups of people might buy certain products. Then, they work with other departments to advertise and sell products to those people.

### ***As a marketing specialist, you would:***

- Talk to experts and do surveys to see what products people might buy.
- Do research on business trends to see if new products are worth making.
- Discuss designs with staff and track costs as products are made.
- Make lists of products and figure out how much to charge for them.
- Create plans for how to sell a company’s products.
- Work with other managers to create ads and go to trade shows.
- Write contracts with those who will distribute the products.
- Hire, train, and be in charge of the marketing and sales staff.
- Study green ideas and plan to make products that protect resources.
- Make green information part of product sales plans.

### ***Will There Be Jobs in the Future?***

In Texas and nationally, this occupation is growing at an average rate.

### ***Education Required:***

To work as a marketing specialists, you typically need to:

- Have a high school diploma or GED; and
- Have a bachelor’s degree.

*Provided courtesy of: [www.onetonline.org](http://www.onetonline.org)*



### LESSON 3:

# *Energy and Water Efficiency*

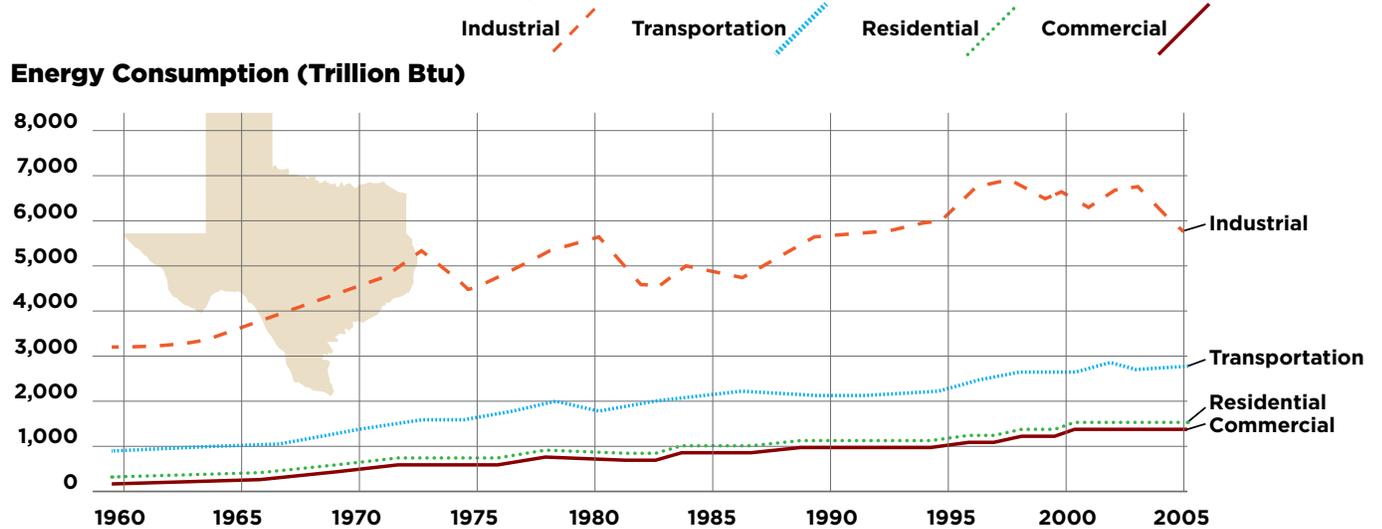
As the population in the state of Texas continues to grow, many are taking a good look at ways to increase energy and water efficiency. Could the state known as the biggest user of energy also become known as the most efficient user of energy? Many in the state of Texas think so and also hope Texas will become a leader in the field of energy efficiency.

In order to make changes in energy usage, it is a good idea to understand how Texans use energy. The graph on page 2 shows where energy is consumed.<sup>13</sup> The category for industrial use includes the manufacturing of petroleum and coal products, as well as computers. The transportation category includes fueling vehicles, trucks, and buses. Residential and commercial use includes keeping the lights on inside buildings and homes as well as heating and cooling them.

**POWER**  
**TO SAVE**  
**TEXAS**



## Texas Annual Consumption by Sector

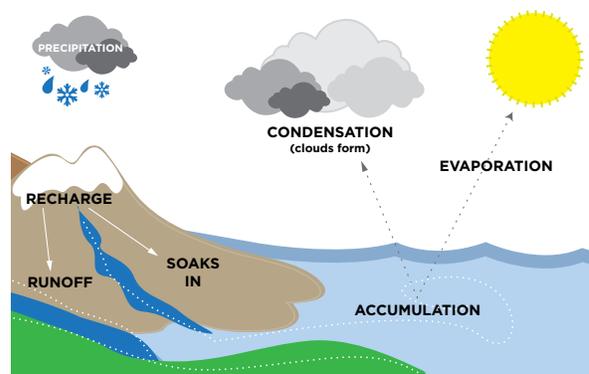


When talking about becoming more energy efficient with the resources in Texas, one resource that probably comes to mind is water. Water is the most important resource on the planet. Without it, there would be no plants, animals, or people. A person can survive for a month or more without eating food, but only for about a week without drinking water. Water must be managed carefully.

It may sound funny, but our water is old! All the water on Earth, the water in your glass, the water with which you brush your teeth, all that water is about 4.4 billion years old. No water is being made or destroyed on the globe. Earth has always held the same amount of water. The water we have today has been used over and over again. Dinosaurs drank the water, and so did George Washington, long before we ever did.

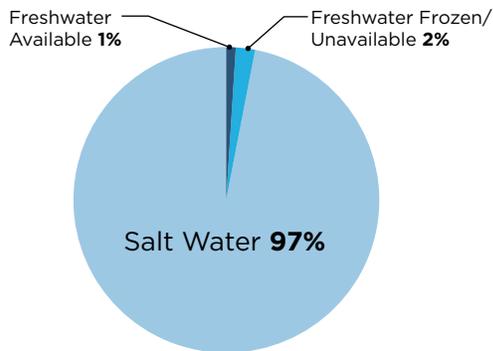
Water is considered a **renewable resource** because it does not disappear, it simply gets moved around in Earth's natural

recycling system. This system is called the water cycle, or **hydrologic cycle**. Water is constantly changing through this never-ending process as it moves from the land and ocean to the atmosphere and back. The atmosphere is the entire mass of air surrounding the earth. Water evaporates, condenses (forms clouds), falls back to Earth as precipitation, collects in bodies of water (lakes, rivers, and oceans), and then the cycle begins again. See the picture below.<sup>14</sup>



**Water** covers about 70% of the earth, yet less than one percent (<1%) of the world's fresh water (~0.007% of all water on

Earth) is available to use. This includes all the water found in lakes, rivers, reservoirs, and even underground water that is shallow enough to be reached. This very small amount of freshwater, replenished by rain and snowfall through the hydrologic cycle, is all there is for us to use.<sup>15</sup>



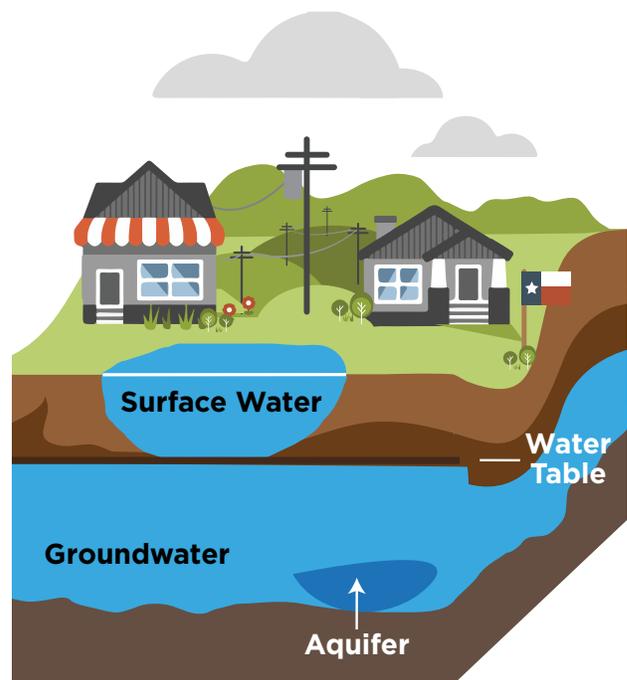
It may be hard to believe there is so much water on our planet, yet so little available to us. Most freshwater returns to the atmosphere by **evapotranspiration**. This simply means that water moves to the air from the earth's surface (**evaporation**), and the water moves as vapor (**transpiration**) from plants, grasses, and trees. The sum of evaporation plus transpiration equals evapotranspiration. In this part of the water cycle, fresh water we could have used simply returns to the atmosphere.<sup>16</sup>

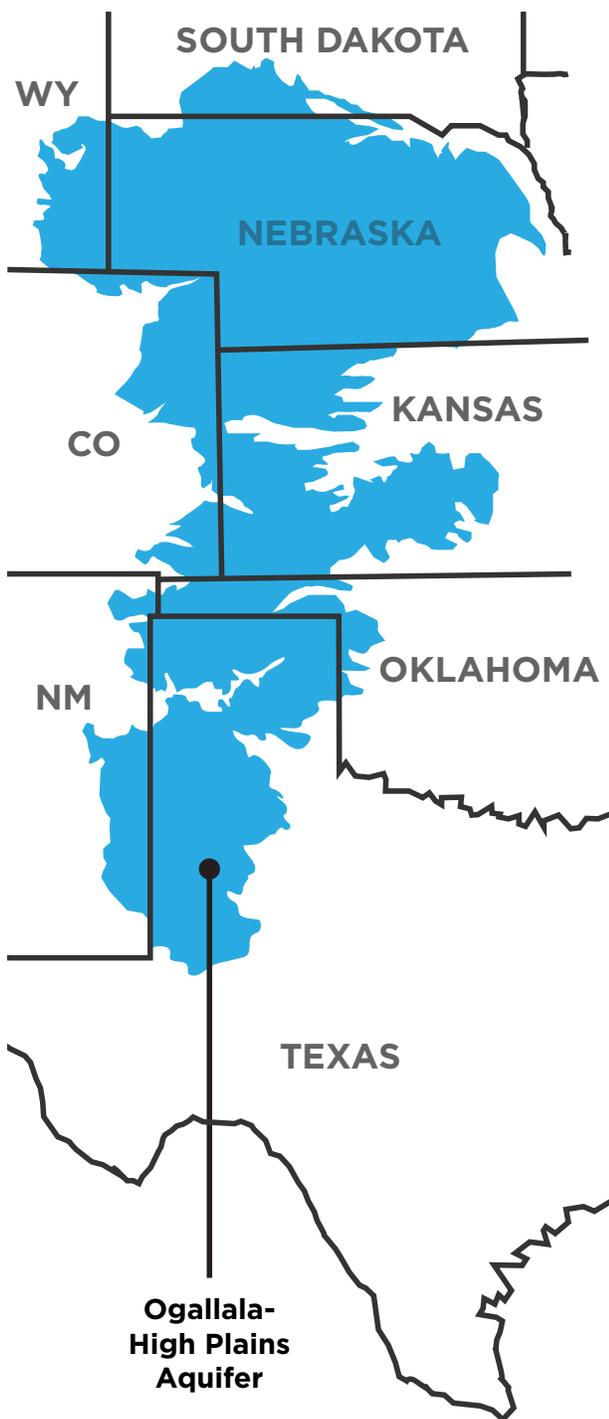
As the picture to the right shows, water on top of the earth's surface is called **surface water**.<sup>17</sup> Examples of surface water include creeks, lakes, streams, rivers, wetlands, and oceans. When you pass a natural spring and water appears to be flowing as if from nowhere, the source is often groundwater. **Groundwater** is the water that seeps into the earth and is stored in aquifers.

This underground water makes its way into lakes and rivers. Sometimes this water is tapped by wells for drinking or irrigation.

Aquifers are areas of soil, sand, and rock that are able to hold liquid. Groundwater sits in the aquifer and is usually replenished by rain and snow. Groundwater stored in aquifers can be found either close to the earth's surface or hundreds of feet below. As groundwater moves through aquifers, sediment and other particles are trapped within the spaces of aquifer rock. In this way, aquifers act like natural filters to help purify groundwater.

The word aquifer means water-bearing, formed from the Latin "aqua" (water) and "ferre" (to bear). This underground source is in more danger today due to population increases. Even though polluted water from agricultural and





urban runoff seeps into groundwater sources, the biggest threat of this limited resource is overuse.

The Ogallala Aquifer is one of the largest aquifers in the world and is located across eight states in the United States: South Dakota, Nebraska, Wyoming, Colorado, Kansas, Oklahoma, New Mexico, and Texas. Like many aquifer systems throughout the world, the Ogallala Aquifer is shrinking.<sup>18</sup>

In 2005, the groundwater in the Ogallala Aquifer was recorded at 3,600 cubic kilometers. Between 2005 and 2010, the amount of water in the aquifer reduced by 300 cubic kilometers. One cubic kilometer equals 264 billion gallons!

As the graph on page 5 displays, the biggest use for groundwater in Texas is **irrigation**.<sup>19</sup> Although other sources of groundwater usage exist, the irrigation of crops like corn and cotton is especially heavy in West Texas and South Texas. Farming and ranching make up about 10 percent of the state's economy, and this translates into jobs for many Texans.

When considering the 300 cubic kilometers of groundwater lost by the Ogallala Aquifer, you might wonder how the land above the aquifer changed. One result is a lowering of the ground's surface, or **subsidence**. The basic cause of land subsidence is a loss of support below ground. When too much water is taken out of the soil, the soil collapses, compacts, and drops. Land subsidence leads to many problems including changes in elevation, flooding, and sinkholes.

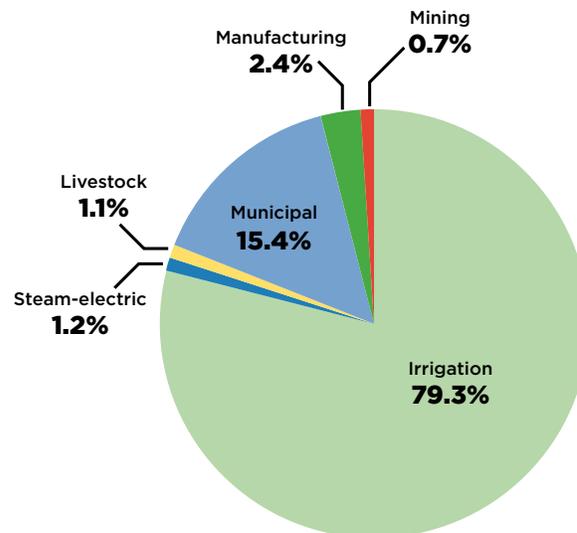
In some of the land areas along Galveston Bay, the land surface has sunk as much as 10 feet since 1906. Flooding becomes a concern because the land is lower, drier, and usually compacted from shrinking. One hundred years of intense groundwater pumping in the Houston area has collapsed the layers of the Gulf Coast Aquifer, causing the land above it to sink. These changes in elevation can cause major damage to buildings, roads, and bridges.<sup>20</sup>



As we study using and valuing water, it is good to know that water use is described in two ways: water withdrawal and water consumption. There is a big difference between the two terms.

**Water withdrawal** refers to water that is redirected or withdrawn from its source – surface water or groundwater. **Water consumption** refers to water withdrawn from its source permanently; it is no longer available for other uses because it has evaporated, been used by plants, or consumed by people or livestock. Once consumed, the water needs to be treated before it can be used again.

People commonly think of water use and water consumption together. However, this is not accurate because water withdrawal refers to water that can be used over and over again, as in the case of a hydroelectric power plant. Water is used temporarily to cool the power plant, then is returned to its original location, perhaps a reservoir. The next lesson will discuss this concept



Sources: Texas Water Development Board and Texas Comptroller of Public Accounts

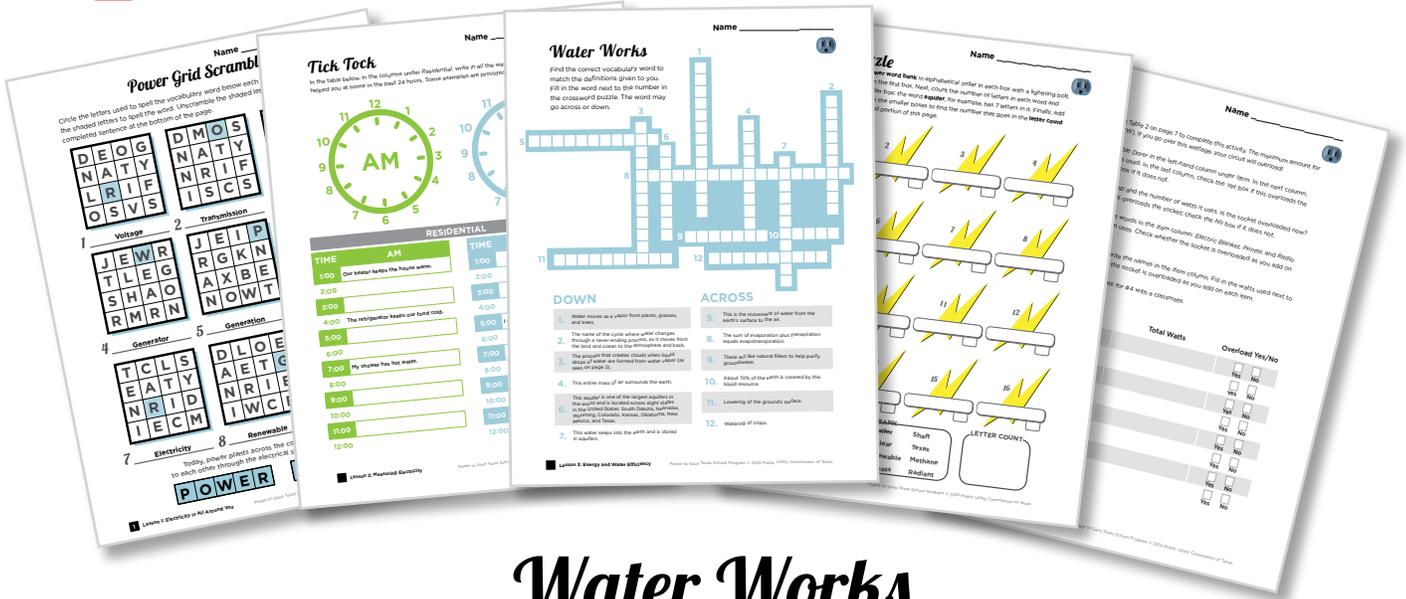
in more detail. Understanding how water is used, or more specifically, how water is withdrawn or consumed, is key to using it more wisely.<sup>21</sup>

The idea of land subsidence and depleting aquifers may start you thinking about becoming more efficient with your water use. Wasting water just doesn't make sense. Even so, the average American wastes thousands of gallons of water each year. Gallons of water are wasted during daily activities, such as taking long showers, running the hose while washing the car, or simply letting the water run straight down the drain.

In America, our water consumption has increased 127% from 1950, while much of the world lives off 3 gallons of water per day or less. To put that into perspective, we can waste 3 gallons of water with one flush of the toilet.<sup>22</sup> That's a lot!

## *Easy Changes to Start Making Today*

<b>1</b>	Throw used tissue into the wastepaper basket rather than the toilet.
<b>2</b>	Keep an eye out for leaky faucets.
<b>3</b>	When brushing your teeth, pour some water in a cup to use for rinsing instead of letting the water run.
<b>4</b>	When trying to get the faucet water warm or cold, catch the running water for plants or animals in or around the home.
<b>5</b>	Time yourself when taking a shower.
<b>6</b>	Run the dishwasher only when you have a full load. The same is true for washing clothes in the washing machine.
<b>7</b>	If you wash dishes by hand, don't leave the water running.
<b>8</b>	Use a broom for sweeping the driveway or sidewalk, not water from the hose.
<b>9</b>	Keep a bottle of drinking water in the fridge; it will always be cold.
<b>10</b>	Water lawns and shrubs early in the day when the air is still cool, and the wind is usually calm. <sup>23</sup>



# Water Works

Ask your teacher for the Water Works activity. You will receive one of three versions. Water Works uses vocabulary words to match definitions, complete a traditional crossword, or create definitions.

## Long-Term Savings for Homes Tips

### ELECTRIC WATER HEATER

-  Repair leaks on warm-water faucets. These leaks just drain your water heater, which means it has to heat more water. That process costs you more.
-  Drain your hot water tank regularly to remove sediment.
-  If buying a new water heater, consider a tankless unit. These systems are 35-45% more efficient. Plus, you'll never run out of hot water.

See more at [www.powertosavetexas.org](http://www.powertosavetexas.org).

Scan this QR Code with your smartphone to visit the program website.



## Career Connection / Job Profile:



*Are you interested in how machines work?*

*Do you like using math?*

*Are you good at following rules and laws?*

If you answered, “Yes,” to these questions, you might like to be a water treatment plant operator. These workers run plants that treat water so it is safe to drink. They also treat water after it is used so it is safe for it to go back into rivers, lakes, and the ocean.

### ***As a water treatment plant operator, you would:***

- Use machines to clean water, remove sewage, and make power.
- Check equipment to make sure it works correctly.
- Use tools to maintain and repair machines.
- Use chemicals to clean water.
- Test water samples to make sure it is clean.
- Use tools to clean and maintain water tanks and filters.
- Keep daily records of the work at the plant.
- Manage other plant workers.

### ***Will There Be Jobs in the Future?***

In Texas, this occupation has high growth potential. Nationally, this occupation is growing at an average rate.

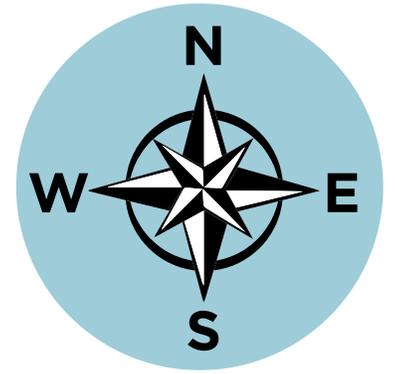
### ***Education Required:***

To work as a water treatment plant operator, you typically need to:

- Have a high school diploma or GED; and
- Complete long-term, on-the-job training; and
- Pass state or local licensing exams.

*Provided courtesy of: [www.onetonline.org](http://www.onetonline.org)*

## Career Connection / Job Profile:



*Are you good at reading maps?*

*Do you like using a computer?*

*Are you interested in where people live?*

If you answered, “Yes,” to these questions, you might like to be a geographer. Geographers study the features of the earth and how people use the land they live on. They often use special computer software called GIS (geographical information systems) to do tasks. Many geographers work for the federal government. Others work for private companies or colleges and universities.

### ***As a geographer, you would:***

- Study the earth and its people on a local or global scale.
- Collect data from maps, satellite photos, and from trips to sites.
- Study land features of an area, such as the plants, rocks, and climate.
- Study the culture of a group of people in a region.
- Use GIS to create maps, graphs, or diagrams.
- Give GIS data to companies that need it.
- Keep GIS software and devices in good working order.
- Give advice on issues such as where to put a new shopping center.
- Write reports and give talks about research findings.
- Teach courses to college students.

### ***Will There Be Jobs in the Future?***

In Texas and nationally, this occupation is growing at an average rate.

### ***Education Required:***

To work as a geographer, you typically need to:

- Have a high school diploma or GED; and
- Have at least a bachelor’s degree in geography.

*Provided courtesy of: [www.onetonline.org](http://www.onetonline.org)*



## LESSON 4:

# *Sources of Electricity*

Most days, Texas has more diverse weather than any other state in the United States. The variety of weather conditions found within the state of Texas is not only due to its size, but also to its unique position on the North American continent.

The climate in Texas is different from one area to the next. Part of the reason is because there is such a difference in the geography throughout the state. There are coastal regions, mountains, deserts, and wide open plains. Another reason the weather is so diverse from one region to another is that the state is located at a junction where several climate zones meet.

There are three main climate zones in Texas; the coastal region, which is humid and subtropical; the northern plains, where you will see the coldest and

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**TO SAVE**  
**TEXAS**



hottest temperatures in the state; and western Texas, which is mostly desert. In the center of Texas there are hills and its climate is similar to the Texas Panhandle, but not as extreme.

The warm air blowing from the warm waters of the Gulf of Mexico influences the Texas atmosphere. This moist air affects cities, like Houston, located in the flat plains along the coast. Houston is humid and, during the summer, morning humidity levels average over 90%. Houston is one of the most humid cities in the United States.<sup>24</sup>

As a result of warm, moist Gulf air mixing with cool air from the Rocky Mountains and dry air from the desert, tornadoes are common in Texas. In fact, Dallas-Fort Worth lies at the lower end of “Tornado Alley.” The United States has more tornadoes than any other country in the world and, to some, Texas is known as the “Tornado Capital.”<sup>25</sup>

With the variety of climates found in Texas, Texas has become rich in renewable and non-renewable energy resources. Here is a short list of interesting facts about the energy sources found in Texas:

- Texas is the leading producer of crude oil in the nation.
- More than one-quarter of all natural gas production occurs in Texas.
- Texas leads the U.S. in the ability to generate wind power.
- The world’s largest single wind power facility is in central Texas.
- Texas solar power potential is among the nation’s highest.
- Biomass energy resources are abundant in the state of Texas.
- The two nuclear power plants in Texas generate 7.9% of the state’s electricity.
- Texas produces and consumes more electricity than any other state.

In the list, the last line shows Texas as the leader in producing and consuming electricity.<sup>26</sup> In Lesson 3, you learned that industries consume about half of all of the energy used in Texas. With industries like cement production, petroleum refining, and aluminum and glass production, it is no wonder these are such major energy consumers.

In the list, the last line also states that Texas produces more electricity than any other state. As you may remember from Lesson 1, electricity can be produced

from renewable and non-renewable resources. Yet, how much is produced by each source in the state of Texas? Below, Table 1 and Table 2 answer this question.<sup>27</sup>

TABLE 1

<i>Net Electricity Generation (share of total)</i>	<i>Texas</i>
Petroleum-Fired	-
Natural Gas-Fired	44.7%
Coal-Fired	36.5%
Nuclear	7.9%
Hydroelectric	0.2%
Other Renewables	10.0%

TABLE 2

<i>Generation (thousand megawatt hours)</i>	<i>Value (,000)</i>	<i>Percent of State Total</i>
<b>Total Electricity Net Generation</b>	<b>411,695</b>	<b>100.0</b>
<b>Total Renewable Net Generation</b>	<b>28,967</b>	<b>7.0</b>
Geothermal	-	-
Hydro Conventional	1,262	0.3
Solar	8	*
Wind	26,251	6.4
Wood/Wood Waste	900	0.2
MSW/Landfill Gas	449	0.1
Other Biomass	96	*

\* = Absolute percentage less than 0.05.

- = Not data reported.



As non-renewable resources will eventually run out, it is a good idea to take a second look at our list of renewable resources. As you studied the list and answered the questions, you may have wondered what exactly some of the resources were. The next few paragraphs will explain more about these types of energy.

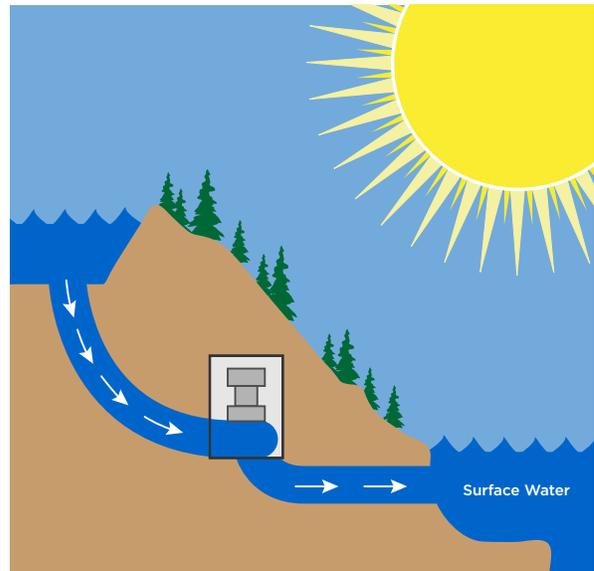
A source of energy is considered renewable when the source is easily replaced, and does not pollute the air, land, or water. About 20% of the electricity produced on the globe in 2009 came from renewable sources. Texans rely on four main sources for generating their electrical power:

1. Hydro Conventional
2. Solar
3. Wind
4. Wood/Wood Waste/  
Landfill/Other Biomass

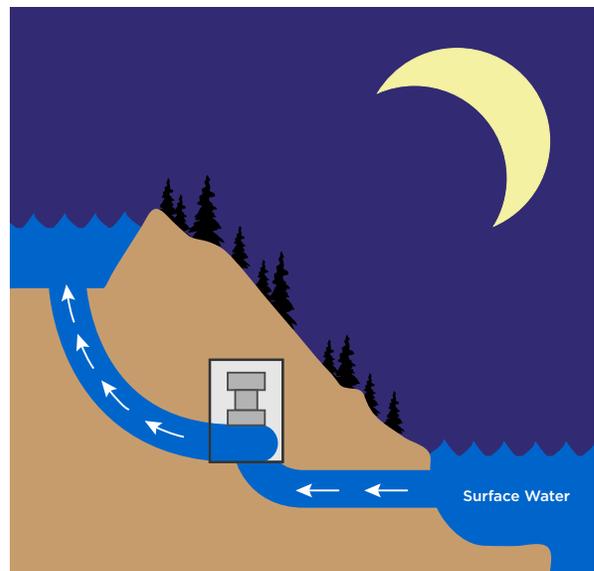
Many are familiar with hydroelectric power and may not even know it. Some believe this form of generating power must be one of the oldest methods because people have used moving water to help them in their work throughout history. A hydroelectric power plant uses a dam or reservoir to hold back water. The picture shows how dams work both day and night to [generate electricity](#).<sup>28</sup>

Solar power is another form of power that many people know about because the power comes from the sun. In fact, the word solar is from the Latin word

for sun (Sol). This form of energy is available most of the time, except at night or on cloudy days. When sunlight hits the earth, it arrives in the form of solar, or radiant, energy. Solar panels absorb radiant energy and convert it to electricity.



Water flows downhill through turbines, producing electricity.

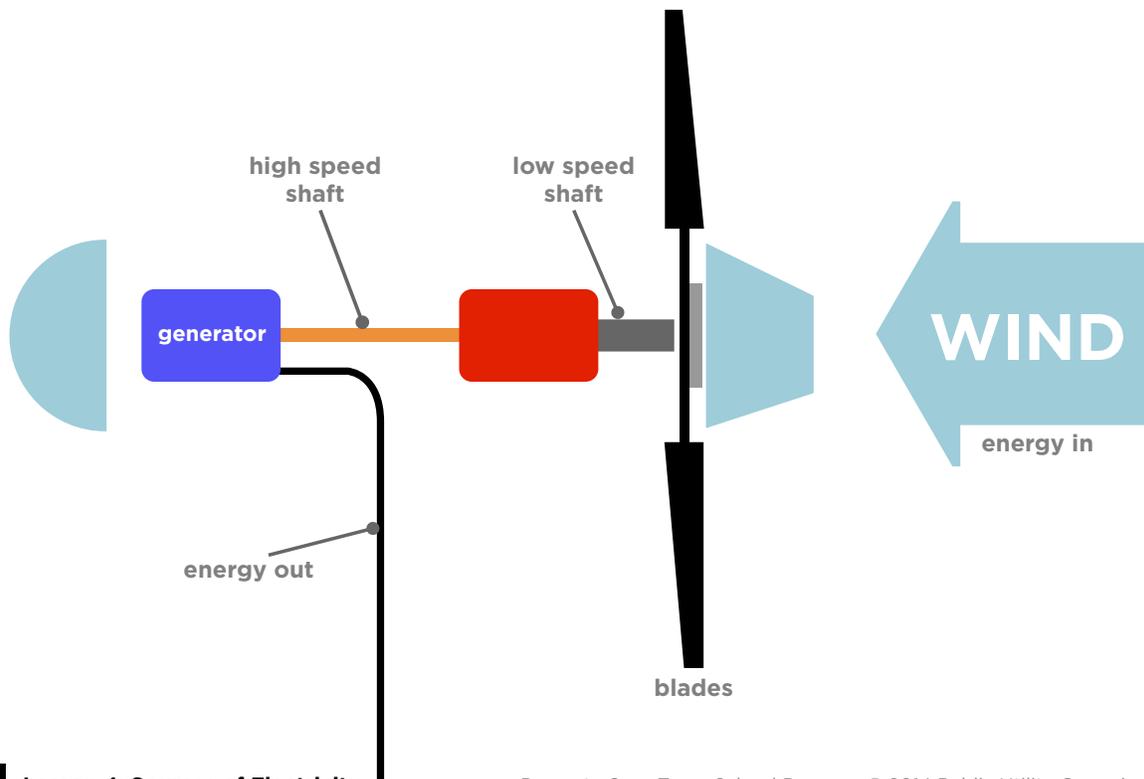


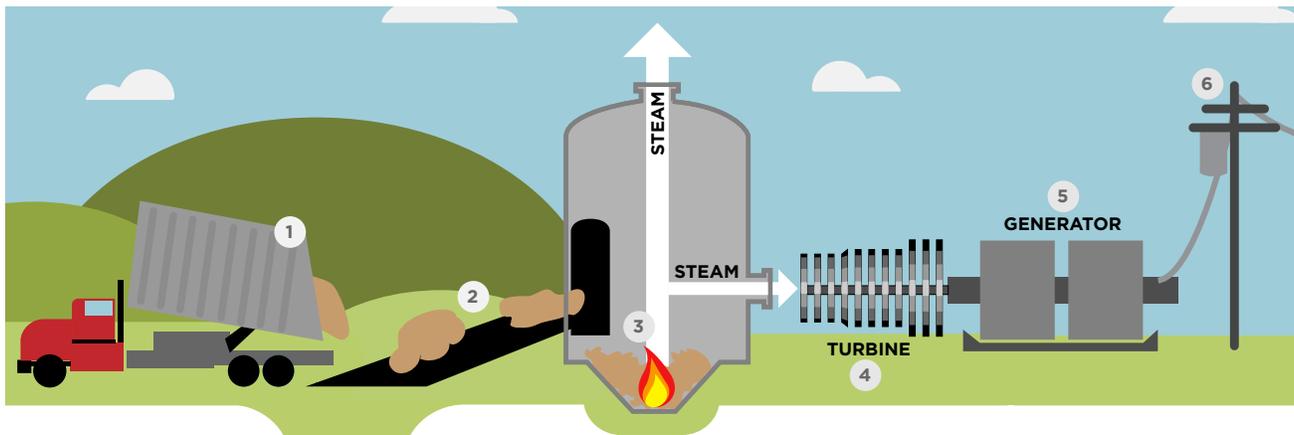
Water is pumped uphill to the reservoir for use the next day.

When thinking about renewable energy in the state of Texas, the most popular way to generate power is by taming the wind. Texas leads the nation in wind-powered generation, with seven of the 10 largest wind farms in the nation, including four of the top five.

Texas has more installed wind power capacity than all but five countries worldwide. Although wind power cannot completely replace other ways to generate electricity, it set a record in March of 2014 when it powered five million Texas homes. Almost one third of the power provided to Texans came from wind power!<sup>29</sup>

So how do wind turbines work? Moving air (wind) has huge amounts of kinetic energy. All moving things have kinetic energy. The faster something moves, the more kinetic energy it has. Just like windmills, wind energy turbines have been around for over 1,000 years.<sup>30</sup>





Biomass is burned to heat water, which makes steam to turn the turbines and generators to make electricity.

A wind turbine works like a giant fan, but in reverse. Fans use electricity to make wind, but wind turbines use wind to make electricity. When wind passes over the blades, the turbine rotates, spinning a generator to produce electricity. When it comes to the size of wind turbines, bigger is better! The tallest wind turbines reach over 400 feet tall. This height is about the same as a 40-story building, or the Bryan Tower in downtown Dallas.

Wind turbines need winds of about 14 miles per hour (mph) to operate. A taller wind turbine is able to reach faster winds more easily. Most large turbines produce their maximum power at wind speeds around 33 mph. At 45 mph most large turbines shut down.<sup>31</sup>

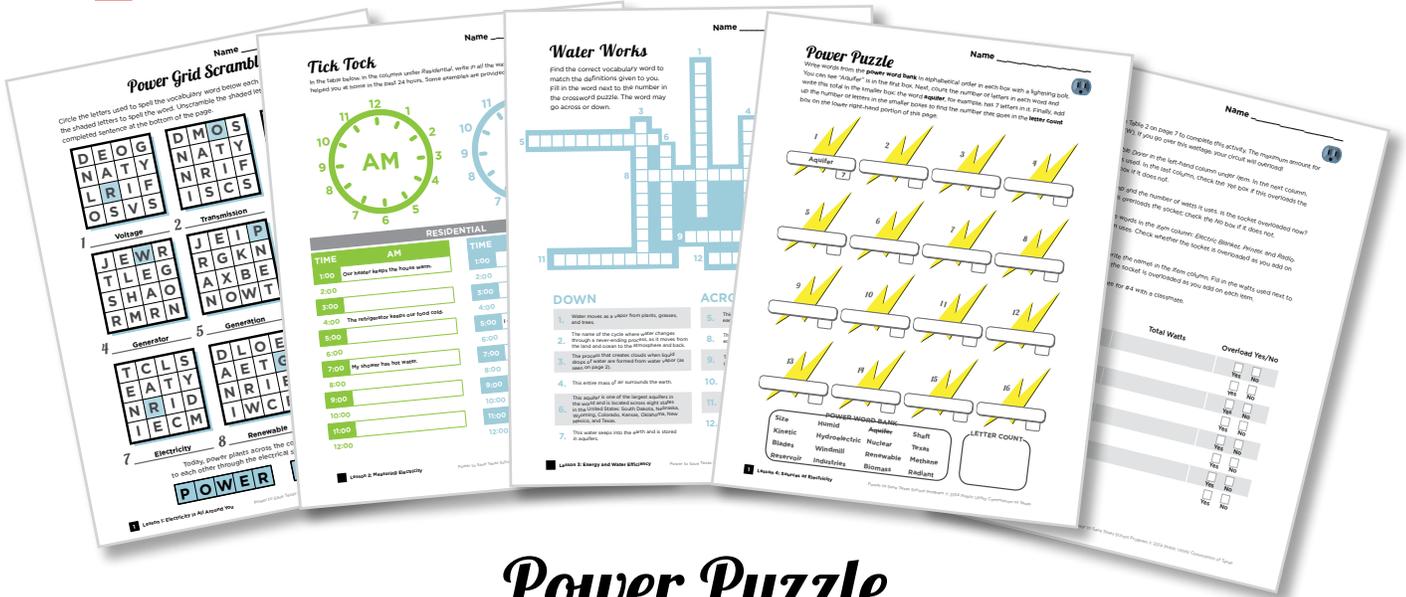
There are a number of safety systems that can turn off a wind turbine if the wind speed becomes too much and puts the structure in danger. Perhaps the most interesting system is the most simple. A metal ball is attached to a chain and sits on a tiny pedestal or pillar. If the turbine starts vibrating above a certain limit, the ball falls off the pedestal, pulls on the

chain, and begins putting on the brakes to stop the turbine blades from spinning.

The last source we will discuss for generating electrical power is biomass. You might have heard of this and thought, “How do we use trash to make electricity?” Biomass is organic material that comes from plants and animals. Some examples are wood, crops, animal manure, and human sewage.

Another form of energy from biomass is methane gas, which is produced as organic material decays. Methane captured from landfills or other organic material such as manure can be used to power a gas turbine and thus generate electricity. When methane gas is ignited, the energy (released in the form of natural gas) can be used to heat homes and buildings.

As the picture above shows, chemical energy in biomass is released as heat when it is burned. First, (1) the biomass is delivered to the plant; then, (2) it is carried to the boiler. Biomass is then (3) burned to heat water and make steam. Finally, (4) the steam turns turbines, which turn generators (5) to make electricity(6).<sup>32</sup>



# Power Puzzle

Ask your teacher for the Power Puzzle activity. You will receive one of three versions. The Power Puzzle uses vocabulary words from a word bank to identify words. Count the letters in each word and add them for a final letter count.

## Long-Term Savings for Homes Tips

### LIGHTING

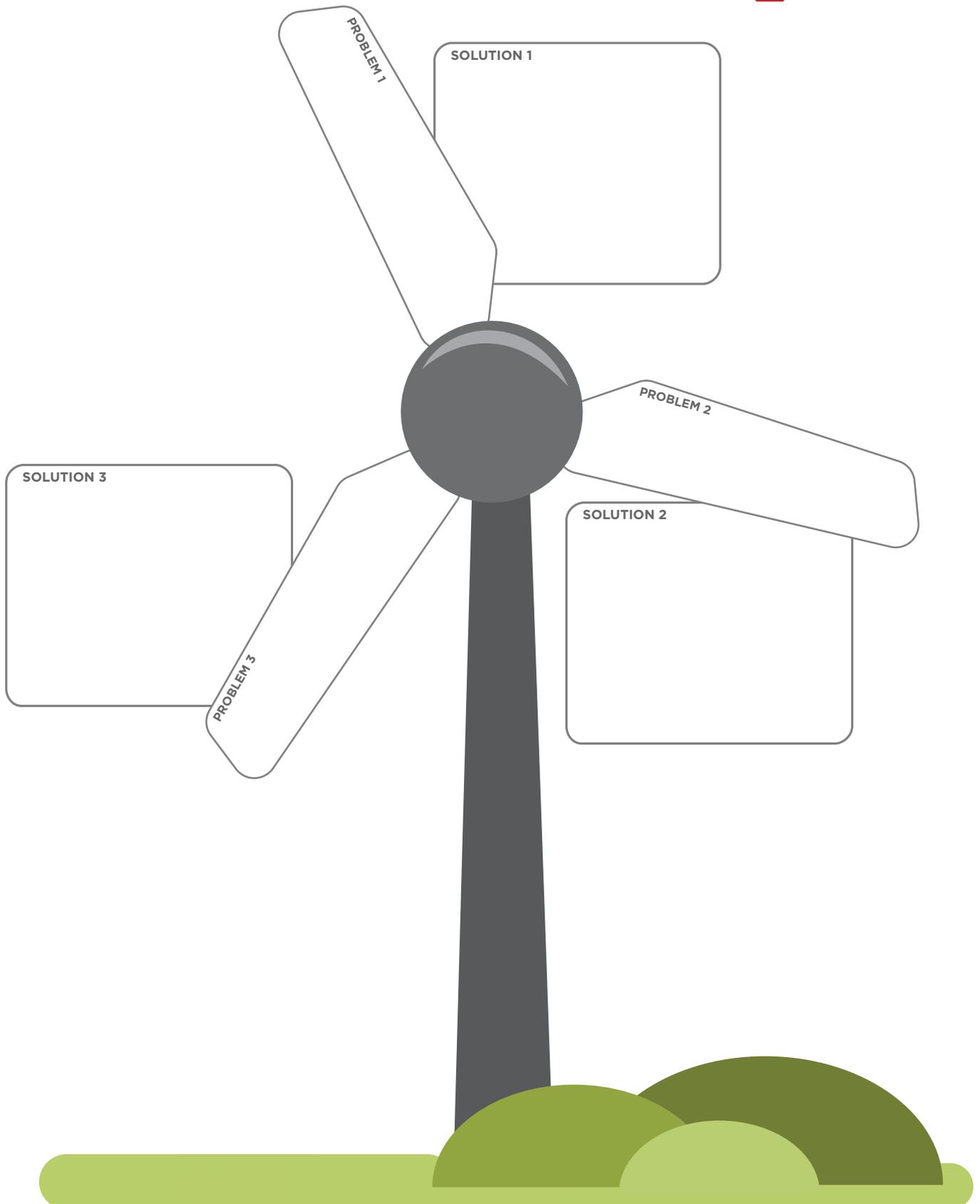
- ⚡ Check light sockets for the recommended bulb wattage for each lamp or light. Don't use a higher-wattage bulb; it wastes energy and can be a fire hazard. If you need more light, consider using a CFL bulb that produces more light with lower wattage.
- ⚡ When you can, use one higher-watt bulb instead of two lower-watt bulbs. A single higher-watt bulb is more efficient

See more at [www.powertosavetexas.org](http://www.powertosavetexas.org).

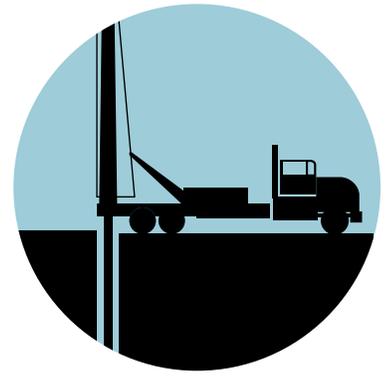
Scan this QR Code with your smartphone to visit the program website.



# Turn It for Texas



## Career Connection / Job Profile:



*Are you interested in what is under the earth?*

*Are you good at figuring out how things work?*

*Do you like to do things in exactly the right order?*

If you answered, “Yes,” to these questions, you might like to be a construction and well driller. Construction and well drillers use heavy equipment to drill holes in the earth. They drill wells or get samples of rocks for clients.

### ***As a construction and well driller, you would:***

- Run drilling rigs to dig for water or bore holes in the earth.
- Study drilling sites and figure clients’ costs.
- Design pumping systems for wells.
- Drive trucks or drilling rigs to work sites and put drills in position.
- Set up drills for the conditions at each site.
- Operate drills and change speed and pressure as needed.
- Pump water to clean holes drilled and to cool drill bits.
- Put well parts together, test them, and make sure water is clean.
- Keep machines in good working order and replace worn parts.
- Keep records of drilling progress and types of rocks found.

### ***Will There Be Jobs in the Future?***

In Texas, this occupation has high growth potential. Nationally, this occupation is growing at an average rate.

### ***Education Required:***

To work as a construction and well driller, you typically need to:

- Have a high school diploma or GED; and
- Have on-the-job training.

*Provided courtesy of: [www.onetonline.org](http://www.onetonline.org)*

## Career Connection / Job Profile:



*Do you like working with other people?*

*Do you like to plan and organize activities?*

*Are you good at explaining ideas and giving directions?*

If you answered, “Yes,” to these questions, you might like to be a human resources manager. Human resources managers oversee how companies recruit, interview, and hire new employees. They also manage employee training, wages, and benefits and direct the human resources staff. Human resources managers often help top executives and employees work together to solve problems.

### ***As a human resources manager, you would:***

- Plan and manage how companies recruit, hire, train, and fire staff.
- Direct the work of the human resources or training staffs.
- Create budgets and be in charge of wages and benefits for staff.
- Work with managers on staff planning and help solve staff problems.
- Plan and direct staff training, create courses, and train teachers.
- Run classes for new staff and tell them about pay, benefits, and rules.
- Keep records, write reports, and talk to staff to find out why they quit.
- Study staff policies and find ways to make them better.
- Study laws and court rulings and work on contracts with unions.
- Get facts about accidents on the job and go to court if needed.

### ***Will There Be Jobs in the Future?***

In Texas and nationally, this occupation is growing at an average rate.

### ***Education Required:***

To work as a human resources manager, you typically need to:

- Have a high school diploma or GED;
- Have a bachelor’s degree; and
- Have one to five years of work experience in human resources.

*Provided courtesy of: [www.onetonline.org](http://www.onetonline.org)*



## LESSON 5:

# *How Electricity is Saved and Using Electricity Safely*

After reading through the first four lessons of this program, you may understand a lot more about electricity than before. You know how electricity is made and how it is measured. You know the types of resources needed to make electricity. You also know the creative ways people use to generate energy from renewable resources.

When people work together to save electricity, building new power plants can be delayed or even reduced. Practicing load shifting helps make sure you are using less electricity during on-peak hours. Small changes like these make a big difference. Now, we'll take a look at a way to save energy that is used in your home invisibly.

**POWER**  
**TO SAVE**  
**TEXAS**

Invisible power? It may sound strange, but it exists. Another phrase for invisible power is standby power. This kind of power is fairly new to some of us because this wasn't even a problem until the 1970s. Before the 70s, when an appliance was turned off, it was really off. In today's world, when we push the off button, it may not truly be off. It was during the decade of the 1970s that the first remote controls for televisions and stereos became available.

Before this time, when you turned on the television set or changed the channel, you got up out of your chair and flipped a switch on the set. Many times people would watch several programs in a row on the same channel, just because they didn't feel like getting up to change the station. It also took a minute for televisions to warm up before they were ready to be watched. The same was true for stereos and other electrical appliances in the home.

Then came the first television remote. No longer did folks wait around for the television to be ready to watch. Pushing the "on" button meant the television came right on. The station could be changed with the push of a button without ever leaving the couch! The remote changed how we watched television. Instead of getting a bit of exercise every time people wanted to change a channel, they could stay in their chairs for hours. This is when the term "couch potato" was heard for the first time.

People did not know that there was a small price to pay for the convenience of having appliances turn on so easily. Televisions and other appliances needed to be ready

to turn on in seconds. To be able to do this, they never really turned off. A tiny amount of power was always flowing to the appliance; this is what it means to have standby power.

Soon, most appliances had clocks, timers or remotes, and were using energy even when they were turned off. People began to learn about this energy use and wanted to do something about it. There are ways to reduce or stop wasting energy in this way. There is even a phrase for this invisible power; it is called **Phantom Load**.

Phantom Load describes the electricity that is being used when an appliance or device is not doing its main job and is either turned off or in standby mode. A good example of this is the microwave. Microwaves are always on so the clock can keep running, even when you are not cooking food. These phantom loads hide in game consoles, DVD players, printers, computers, cordless appliances, and many other devices.

The easiest way to spot a phantom load is to look for devices with clocks on them, or those that have a small white or black box between the plug and the appliance. For any single appliance, the load is never very large; however, when you add up the many phantom loads in a typical home, it can equal up to 10% of the electricity your home uses.

So how can you help shut down these phantoms? The only sure way to eliminate a phantom load is to unplug the appliance or device. As you might have guessed, this

# Spotting Phantom Load Devices



is not always possible; a certain amount of phantom load may always exist. For example, it would be difficult to unplug the stove every night. However, there is a lot you can do. Here are a few easy suggestions:

- Unplug all battery chargers when they are not in use.
- Unplug all appliances in the home that you only use now and then, especially those in rooms you do not use often.
- When you are leaving for several days, unplug as many gadgets or appliances as possible.
- When you buy new products, buy ones with low standby energy demand.
- Use a power strip designed to switch off clusters of electronic products.

The chart on page shows how much different items will typically cost each year. Let's see how much you can save by [unplugging](#) these items or plugging them into a smart strip. Read the questions carefully. See if you can “do the math” and save some money! The right-hand column shows how much the phantom load on each item in the left-hand column costs for one year.<sup>33</sup>



**TABLE 1**

Cable Box with DVR	\$43.01
Video Recorder (DVR)	\$36.98
Window Fan	\$27.52
Cable Box (without DVR)	\$17.65
Satellite Cable Box	\$15.50
Laptop Computer	\$8.81
Fax	\$5.35
CD Player	\$4.99
VCR	\$4.38
Desktop Computer	\$3.96
Power Tool	\$3.96
Microwave Oven	\$3.05
Handheld Vacuum	\$2.97
Television	\$2.97
Answering Machine	\$1.99
Battery Charger	\$1.98
Printer	\$1.98
MP3 Player	\$1.98
Cordless Phone	\$1.98
Electric Toothbrush	\$1.98
DVD	\$1.53
Gas Range Oven	\$1.14
Coffee Maker	\$1.12
AM/FM Radio	\$1.11
Video Game Console	\$1.00
Cell Phone Charger (Unattached to Phone)	\$0.26

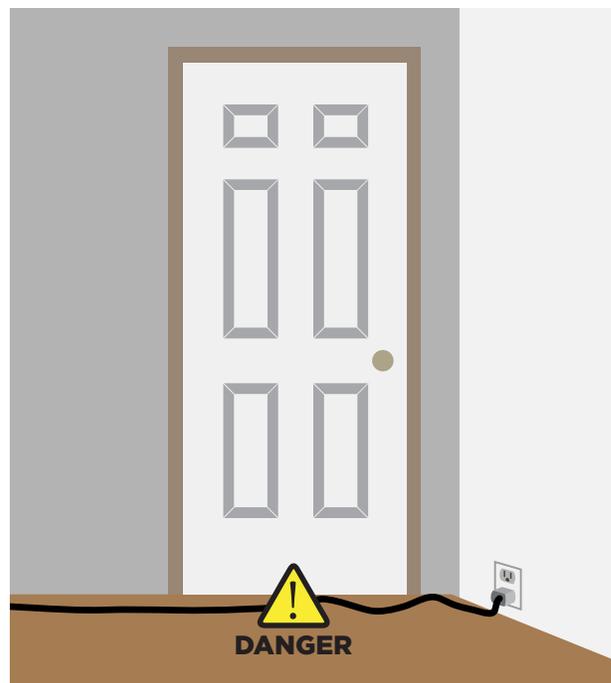
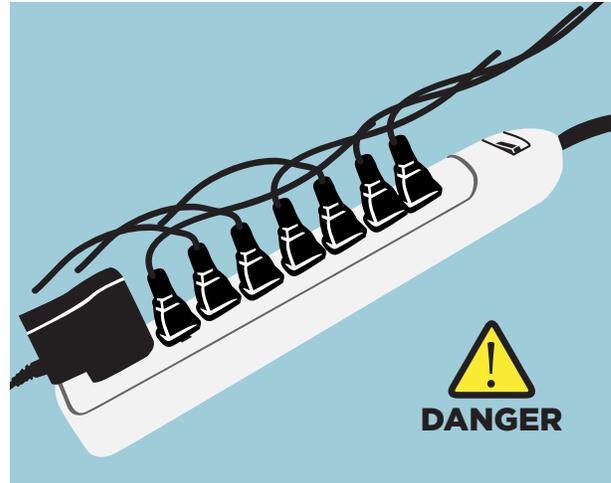
There is one more area of energy use that must be discussed: the topic of using energy safely.<sup>34</sup> As you have learned, electricity is all around you, so it is important to be careful. When using electricity think about these tips:

1. Never put your fingers, or anything other than an electrical plug, in a socket. Remember, just like water in a faucet, the electricity waits inside the socket until you plug something into it.
2. When unplugging an appliance, never yank the cord out of the socket. Pulling a cord out in this way can damage the appliance, the plug, or the outlet.
3. Don't use an electrical appliance, like a hairdryer, when you are either wet, have wet hands, or are standing in water. Many electrical accidents happen when people use electricity near water.
4. Don't plug too many appliances into a socket; this could lead to a fire. The more current that flows from a socket, the hotter it becomes. An overheated socket can start a fire.
5. Keep an eye out for damaged plugs and cords. Let an adult know about the problem.
6. It is impossible to tell if an electric wire is on or off simply by looking at it. Consider any electric wire to be "live," or on, and be careful when near it.
7. Make sure appliances, like the television, have a free flow of air around them so they do not overheat and start a fire.

8. Do not place electric cords so that they run through doorways or under carpets. There is a danger of electric shock if someone trips and the cord is yanked out or broken.
9. If you are outside flying a kite, watch out for power lines overhead. You can't always tell where a kite is going to land. Be sure your kite does not have any wire, metal, or foil on it. If your kite does get caught on a power line, let go immediately.
10. Never climb a tree with a power line running through it.

Now that you've finished the lessons in this program, you have new knowledge about electricity. The more you know about electricity, the easier it is to conserve it. Have you thought a little bit about your own electricity habits? Do you use electricity as if it were unlimited? Do you save electricity, but only sometimes? Or are you someone who likes to go the extra mile and save electricity whenever you can?

Saving electricity is everyone's job. But, you might think, "Hey, I'm just a kid!" Kids actually use as much or more energy than most adults. The clothes kids wear are usually washed more often, especially if they play on a team or spend a lot of time outside. Kids are at home a lot more often than most adults with jobs. When kids are home, most pass the time by playing electronic games or watching television.



Although everyone in the house uses the refrigerator to keep food cold, younger family members may stand in front of the fridge thinking about their choice for a longer time and more often. All family members need lights on in the evenings, but younger family members may leave lights or appliances on when leaving a room. Since kids use a lot of electricity, they are very important members, if not the most important members, of the team to save energy.

# *Be a Power Partner!*

Share your knowledge with others and help everyone use energy wisely. Be aware of the time of day you use electrical items, and keep an eye out for phantom loads. Use electricity wisely to make sure there will be enough for the future, because life is more comfortable and more enjoyable with electricity!



# Overload!

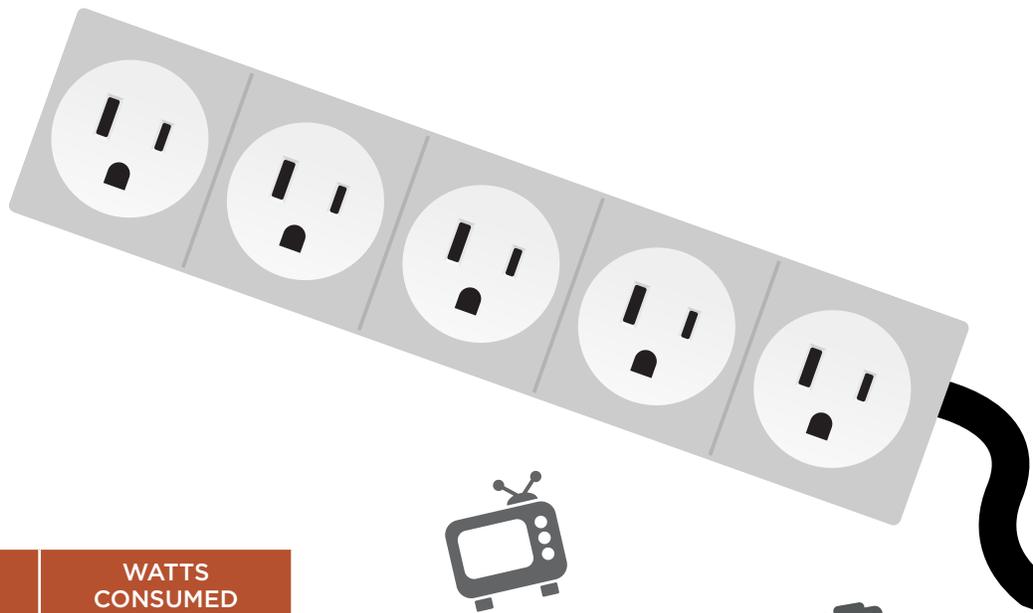
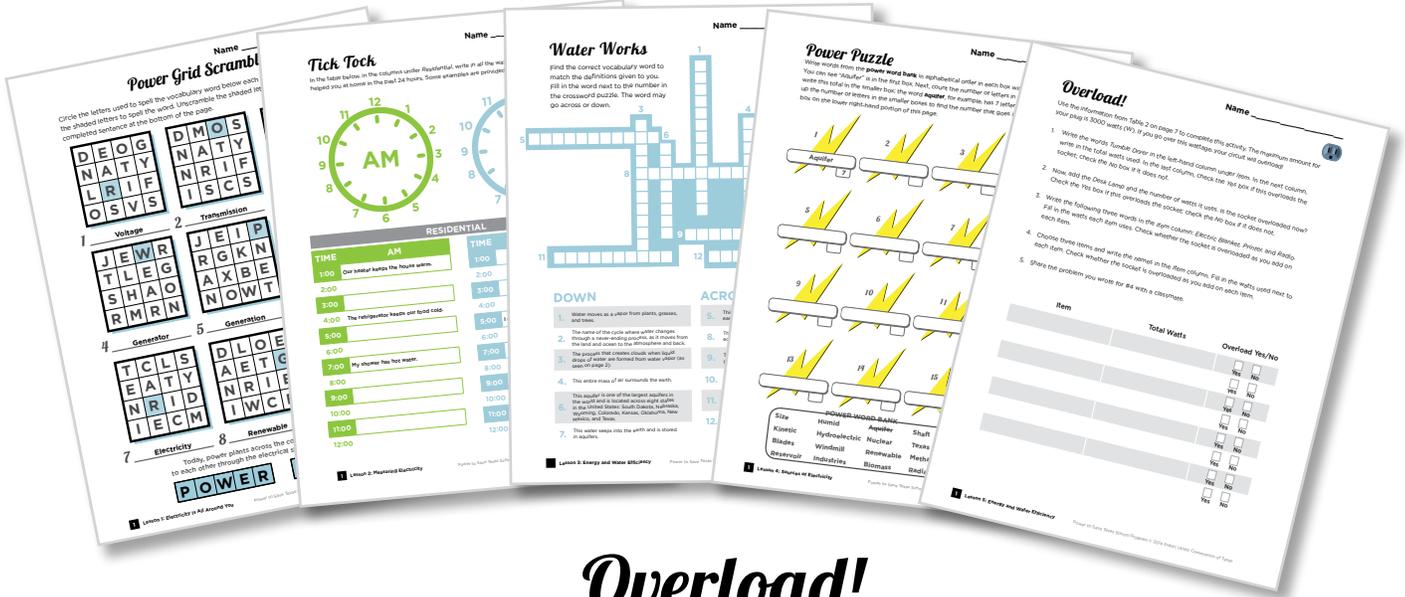


TABLE 2

DEVICE	WATTS CONSUMED
Computer Monitor	100 W
Desktop Computer	700 W
Desk Lamp (with 60-watt lamp)	60 W
Dishwasher	2200 W
DVD Player	28 W
Electric Blanket	60 W
Game Console	200 W
Hair Dryer	2200 W
Hair Straighteners	100 W
Iron	2800 W
Microwave	100 W
Mobile Phone Charger	700 W
Printer	60 W
Radiator (Electric)	2200 W
Radio	28 W
Satellite TV Box	28 W
TV 42" HD	60 W
Toaster	200 W
Tumble Dryer	2200 W
Vacuum Cleaner	100 W
Washing Machine	2800 W
Wi-Fi Router	2800 W





# Overload!

Ask your teacher for the Overload! activity. You will receive one of three versions. Overload! uses wattage from common household items to discover which items can be plugged in at the same time without overloading a smart strip or outlet.

## Long-Term Savings for Homes Tips

### WINDOWS, DOORS & INSULATION

-  Save up to 10% on cooling costs by caulking windows and weather-stripping doors.
-  Upgrade to energy-efficient windows.
-  Add solar screens or window tint.
-  Check your ducts for leaks and seal them if needed.
-  Consider getting an energy audit.
-  Make sure your attic has proper ventilation and high R-value insulation. This will help your AC be more efficient and keep more cool air inside your home.
-  Use heavy-duty, clear plastic film on the inside of your window frames during the cold winter months.
-  Install tight-fitting, insulating drapes or shades on windows that feel drafty.

See more at [www.powertosavetexas.org](http://www.powertosavetexas.org).

Scan this QR Code with your smartphone to visit the program website.



## Career Connection / Job Profile:



*Do you like to figure out how things work?*

*Are you good at building things?*

*Are you good at math?*

If you answered, “Yes,” to these questions, you might like to be an electrician. Electricians put in and maintain electrical systems in homes, businesses, and factories. They work on wiring, light fixtures, and other equipment through which electricity flows.

### ***As an electrician, you would:***

- Put in, test, and fix wiring, lights, and other equipment.
- Read blueprints, plan wiring layouts, and figure costs.
- Pull wire through walls and connect to switch boxes or outlets.
- Use hand tools, power tools, and testing devices.
- Work from ladders and roofs, dig trenches, and lift heavy objects.
- Inspect and test systems to make sure they work and are safe.
- Keep work records, write reports, and order supplies.
- Train others to put in and fix wiring, lights, and other equipment.
- Set up lights and place flares during an emergency.
- Keep license up to date to meet government rules.

### ***Will There Be Jobs in the Future?***

In Texas and nationally, this occupation is growing at a high rate.

### ***Education Required:***

To work as an electrician, you typically need to:

- Have a high school diploma or GED; and
- Complete an apprenticeship program; and
- Pass a state licensing exam.

*Provided courtesy of: [www.onetonline.org](http://www.onetonline.org)*

## Career Connection / Job Profile:



*Do you like using computers?*

*Do you like working with other people?*

*Are you good at math?*

If you answered, “Yes,” to these questions, you might like to be a database administrator. Database administrators use software to organize and store data for companies. They manage data such as financial records or Internet customer information. They make sure data is available to employees who need it and that the data stays private and safe.

### ***As a database administrator, you would:***

- Work with project teams to plan the best ways to store data.
- Use math to figure how much data new systems can handle.
- Draw models on computers to show how systems will work.
- Write codes and revise software so all parts of systems work together.
- Plan ways to keep data safe and create guidelines for use.
- Set up and test new systems, fix errors, and watch how they perform.
- Limit users to only the parts of systems that they need to work with.
- Train users and answer their questions.
- Figure time and cost needed to make changes asked for by users.
- Use systems manuals as guides to making changes.

### ***Will There Be Jobs in the Future?***

In Texas and nationally, this occupation is growing at a high rate.

### ***Education Required:***

To work as a database administrator, you typically need to:

- Have a high school diploma or GED;
- Have a bachelor’s degree; and
- Have one to five years of related work experience.

*Provided courtesy of: [www.onetonline.org](http://www.onetonline.org)*

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**OUTREACH PROGRAM**  
**ADDENDUM 1**

Written questions and answers (in red):

1. How many individual schools and/or school districts do you expect the vendor to reach within the suggested counties?

A minimum of 24 middle schools in the four counties (Dallas, Harris, Hidalgo, and Tarrant) will participate in this program.

2. Is there a preference for any additional counties? How should these counties be selected?

The counties will be determined by the PUCT and based on whether the majority of the county is in electric choice and the number of low income discount (LITE-UP Texas) participants.

3. Can you provide login information for vendor access to the teacher portal section of the website?

For security reasons, PUCT is unable to provide a password. The PUCT Program Content Sheet is attached as Exhibit A. The complete curriculum will be provided to the chosen vendor.

4. How many schools participated last year? How many school districts?

Fifteen schools in three counties (Dallas, Harris and Hidalgo) participated in the middle school program.

5. Not including the website, is there curriculum training for educators?

Yes, at the initial orientation meeting at each school the contractor will provide curriculum training for educators.

6. What is the annual budget for this program?

Please see the link below to the existing contract (Resource Action Programs), see Article 2 for the not to exceed amount.

<http://www.puc.texas.gov/agency/resources/reports/Contracts.aspx>

7. Who is the prior vendor?

Resource Action Programs

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8. What other communications will be happening in relation to "Power to Save"?

Communications will include, but will not be limited to: (1) initial outreach to ISD superintendents regarding selected schools about the program; (2) outreach to principals regarding program; (3) initial orientation and presentation of program and how to access lesson plans and contests; (4) periodic follow ups and reminders via email and voice regarding deadlines; (5) production of certificates of acknowledgements at the end of programs; (6) drafting of press releases regarding program and winners; (7) presentation of rewards to winners.

9. How many schools does the program work with?

Fifteen schools participated during the 2014 – 2015 school year.

10. How many students?

All of the students at each of the 24 targeted schools. While we do not have precise numbers for each of those schools, the average number of students per middle school in Dallas, Harris, Hidalgo, and Tarrant counties, based on information from the National Center for Education Statistics (NCES), is approximately 794. The average number of classes (grades 6-8) is about 12 in each school, based on NCES.

11. How many trainings are provided at each school?

One training will be conducted during the initial orientation at each school.

12. Can you provide last year's program budget?

Please see the link below to the existing contract (Resource Action Programs), see Article 2 for the not to exceed amount.

<http://www.puc.texas.gov/agency/resources/reports/Contracts.aspx>

13. Can you send a copy of the curriculum?

PUCT Program Content Sheet and student lesson plans are attached as Exhibit A. The complete curriculum will be provided to the awarded vendor.

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14. With respect to Contractor's Objective #3, it appears the current Power to Save Texas Middle School Program curriculum is only accessible through an undisclosed Teacher ID. Can we have access to review and suggest modifications and updates?

For security reasons PUCT is unable to provide a password. The PUCT Program Content Sheet and student lesson plans are attached as Exhibit A. The complete curriculum will be provided to the awarded vendor.

15. With respect to Contractor's Objective #10, could you further explain your desired outcome? Is there a current method for evaluating the total outreach effort of the program? If so, could you share the methodology?

The goal is to engage middle school students, their families, and faculty in low income areas on the benefits of saving energy, especially during the peak demand hours. The contractor is expected to develop a methodology that would measure current knowledge and lessons learned after the program.

16. With respect to Attachment B, Article 6.2, should we submit a proposed annual budget for each potential renewal year? **No.**

17. Is the program targeting an entire middle school or a specific grade level within the middle school? If a specific grade level, which one?

This program targets selected middle schools grades 6 through 8.

18. Is it the Contactor's responsibility to solicit middle school participation in the targeted areas? **Yes.** If so, will the PUCT provide a list of schools to solicit? **Yes**

19. How many schools / teachers are expected to participate?

A minimum of 24 middle schools in the four counties (Dallas, Harris, Hidalgo, and Tarrant) will participate in this program. Based on NCES statistics, the average number of teachers per school in the four counties is approximately 51 and the average number of classes is about 12. It is not expected for all schools or teachers to participate. The schools and teachers have the liberty of adopting our lesson plans into their class curriculum.

20. How many schools / teachers participated during this school year?

Fifteen schools participated in this past year's middle school program.

21. Given parts of the current website are an iframe, should the PUCT opt to change vendors will the new vendor have access to all current art, content and web pages? **Yes.** It is also expected for the contractor to maintain the PUCT's Power to Save Texas Middle School Program website in a similar format.

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22. Is there a maximum annual budget allocated for this projected? If so, will you share it?

PUCT does not choose to disclose this information. Proposers should submit their best offers.

23. What is the maximum number of schools, students, cities, communities, that the project is limited to during the contract period?

A minimum of 24 middle schools in the four counties (Dallas, Harris, Hidalgo, and Tarrant) will participate in this program. There is no maximum number of schools, but please keep in mind that this program is contingent upon legislative appropriations.

24. What is the maximum number of additional materials to be produced and provided for the project during the contract period?

Production of additional material would probably be in the form of editing existing program materials such as student and teacher lesson plans.

25. Is there a “Not to Exceed” budget that the project is limited to during the contract period?

PUCT does not choose to disclose this information.

26. Who is the incumbent for this RFP?

Resource Action Programs

27. What is the budget amount set aside for this program?

PUCT does not choose to disclose this information.

28. What was the dollar amount awarded to the incumbent?

Please see the link below to the existing contract (Resource Action Programs); see Article 2 for the not to exceed amount.

<http://www.puc.texas.gov/agency/resources/reports/Contracts.aspx>

29. Will the selected contractor actually be presenting the information to the schools and if so how many schools will be visited per year?

Yes. A minimum of 24 middle schools in the four counties (Dallas, Harris, Hidalgo, and Tarrant) will participate in this program. The contractor must visit each middle school at least once during the program year for presentation of the program and orientation and training.

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30. Are visits only during the school year August through the first of June?

The contractor will begin visiting the schools and school districts as soon as the contract is signed by both parties to ensure outreach and participation.

31. Is the “outreach travel” specifically for visiting the schools to educate the students and faculty about these benefits?

Outreach travel to each school would be the initial contact, orientation, training, and follow up (i.e. award presentation) regarding the energy conservation program.

32. Is there any existing material that will be accessible to the contractor to assist with creating the educational material, classroom exercises or lesson plans relating to the Power to Save Texas Middle School Program?

Yes, the complete Middle School Program Curriculum will be provided to the awarded vendor. See attached Exhibit A for the PUCT Program Content Sheet and student lesson plans.

33. Has PUCT recently had a contract with a vendor for similar program?

Yes, Resource Action Programs.

34. Does this contract replace a similar recent contract?

Yes.

35. If so, who were the vendors on the prior contracts, and are they eligible to win this contract?

Resource Action Programs is the current vendor. They are not ineligible to win this contract. PUCT will consider all proposals that meet the requirements of the RFP.

36. Are there agencies or firms that could be considered the incumbents for advertising/marketing work with PUCT?

Resource Action Programs is the current vendor for this contract.

37. If so, who are those incumbents and how satisfied is PUCT with their performance?

Resource Action Programs is the current vendor and their services are satisfactory.

38. Can you share any examples of recent similar campaigns by the PUCT?

<http://powertosavetexas.org/>

39. Is PUCT aware of any specific campaigns in other states or by other entities that it believes serve as model examples for this effort? No.