

**IMPLEMENTATION MODEL: TEXAS****INDUSTRIAL ENERGY EFFICIENCY AND COMBINED HEAT AND POWER (CHP)**

Texas has experienced one of the fastest growth rates of combined heat and power (CHP) in the nation in recent years, parallel to its growth trajectory for all distributed generation (DG) resources. From 2001 to 2015, the state added 8.3 gigawatts (GW) of CHP at 46 sites, nearly doubling CHP capacity to 18 GW. Since 2001, total distributed energy systems have more than tripled to over 700 GW. To combat the potential for grid congestion, the state's grid operator, the Electric Reliability Council of Texas (ERCOT) had to modify its interconnection guidelines. ERCOT's updated guidelines required additional detail (e.g., technical data and modeling of expected system operations) from developers on DG projects greater than 10 megawatts (MW). This information would help ERCOT ensure that larger DG systems (10 MW or greater) would not adversely impact grid operations.

CHP developers, however, struggled to keep up with the increasingly complex guidelines for project approval – when to file certain forms, details needed for engineering and financial feasibility studies, etc. State officials found themselves reviewing submissions with data and modeling errors, and also spending significant time clarifying the interconnection process for applicants. As a result, the interconnection application process could last over 1000 days. Such a long process ran the risk of discouraging CHP developers from helping the state realize its more than 12,000 MW of CHP potential. To address these challenges, the Texas State Energy Conservation Office (SECO) and the Houston Advanced Research Center (HARC) launched a project to clarify the interconnection process for larger DG systems. With support from a 2013 U.S. Department of Energy (DOE) State Energy Program competitive award, SECO and HARC developed a Tool to help CHP developers move through the process in a fraction of the time. Based on ERCOT's analysis of project-level interconnection timeframes, the team estimated that the Tool could result in a 70 percent reduction in the time needed to approve a CHP interconnection application, reducing an application approval to 270 days.

**Goal****CLARIFY ERCOT'S EXISTING  
DG INTERCONNECTION PROCESS**

Clarify ERCOT's existing DG interconnection process so developers could better navigate it. With roughly 300 CHP projects in the pipeline, improving the transparency of the interconnection process has the potential to significantly increase the deployment of these systems.

**Barrier****COMPLEX  
AND TIME-CONSUMING**

The process to connect large CHP systems to the transmission grid was complex and time-consuming, often leading to project delays and potentially contributing to project cancellations.

**Solution**

SECO and HARC developed [the DG Interconnection Tool for Texas](#), an interactive step-by-step guide to interconnection designed to ensure CHP project developers experience a successful and timely interconnection development process.

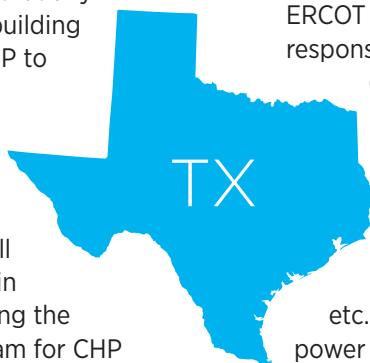
**Outcome**

The DG Interconnection Tool for Texas (the Tool), rolled out in 2016, can help developers and their partners realize up to a 70 percent reduction in the time needed to approve a CHP interconnection application. For developers using the Tool to manage a CHP interconnection application, the Tool has the potential to reduce the average time to complete the application from over 1000 days to an estimated 270 days. When aggregated across some 300 CHP systems currently in the ERCOT interconnection pipeline, project developers can be expected to save years in terms of staff time and costs. One facility in Texas has already used the Tool to move through the early stages of interconnection to advance a 40 MW CHP system.

## POLICIES

Texas leads the United States in CHP generation with more than 18 GW of installed capacity at an estimated 150 facilities. CHP has broad support in the state – the Texas legislature approved two pieces of legislation to boost the use of commercial and industrial CHP systems that took effect in 2013:

- [House Bill 1864](#) directed SECO to establish guidelines for CHP developers to assess the feasibility of CHP and other distributed generation at critical government facilities. This bill encourages CHP by requiring that any new or substantially retrofitted state building must include a financial analysis of CHP to move forward.
- [House Bill 2049](#) allows cogeneration facilities (like CHP) to sell both electricity and heat energy to customers on contiguous sites. This bill was intended to help developers obtain financing for CHP systems by facilitating the creation of an additional revenue stream for CHP systems.



Both bills are representative of efforts by the state government and industry stakeholders in Texas to create policies that support cost-effective DG including CHP.

ERCOT is the primary grid operator in Texas and has a core responsibility of managing the interconnection for the growing number of DG systems that require access to the electric grid. While larger systems – those greater than 10MW – have contributed significantly to CHP growth in the state, they required ERCOT to update its grid operation software systems to include more detailed project information (e.g., energy supply performance, reactive load controls, etc.). While the upgrades helped ensure a reliable power grid in Texas, developers faced a more burdensome application process that slowed the growth of large CHP installations.

## PROCESS – PROGRAM DESIGN



HARC and SECO worked together to develop the Tool to address the complexity of the permitting process in order to help support a self-sustaining market for CHP. As a team, they engaged a diverse group of stakeholders, but critical to their success was the engagement and buy-in from ERCOT and CenterPoint, an electricity and natural gas utility. ERCOT and CenterPoint staff both provided valuable information, guidance and feedback on the Tool. The Public Utility Commission of Texas (PUCT), which develops state interconnection rules, has a limited role in the DG interconnection process managed by ERCOT. However, HARC and SECO kept PUCT staff aware of the project's progress, and the PUCT was supportive of development of the Tool.

## PROCESS – IMPLEMENTATION

The growing complexity of the CHP interconnection process in Texas led the team to prioritize information gathering and obtaining stakeholder input to identify barriers to the existing process.

### 1 GUIDANCE REVIEW

HARC staff first reviewed the CHP guidance available from ERCOT, PUCT, and the National Electricity Reliability Council (NERC) in order to have a clear understanding of the interconnection process. Relevant materials included:

- ERCOT’s Interconnection Handbook and technical planning guides to a standard Interconnection Agreement (IA);
- the PUCT’s DG project registration process;
- the PUCT’s existing interconnection rule for companies seeking IAs; and
- the (NERC) transmission criteria for standards and protocols covering the state’s bulk power system.

Overlapping timelines added confusion throughout the Interconnection Agreement process.

HARC staff synthesized this information into a preliminary outline of the Tool that underscored key decision points in the process – both technical and administrative – where confusion was possible. ERCOT’s guidance lacked clarity on the inputs developers

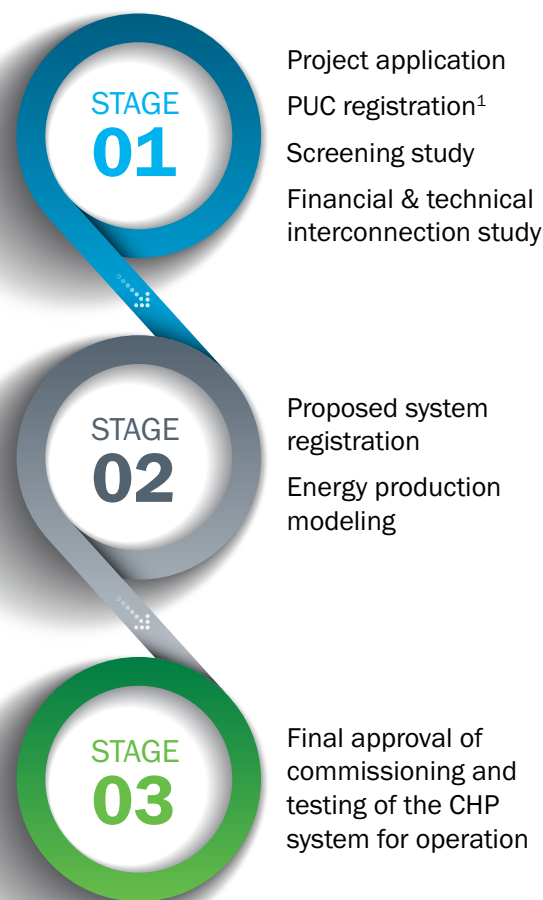
needed to provide to ERCOT to inform its grid operations model (e.g., fuel consumption, maintenance needs, power flexibility, etc.). HARC also found that overlapping timelines for providing these deliverables added confusion throughout the IA process.

### 2 STAKEHOLDER INTERVIEWS

HARC staff interviewed a dozen experts familiar with CHP interconnection in Texas, including large CHP project developers, ERCOT officials, and municipal and investor-owned utilities. The interviews helped HARC better understand the interconnection process, identify key barriers, and pinpoint likely areas of confusion for developers or other end users. HARC also met with PUCT staff to gain a greater understanding of how the key barriers and areas of confusion identified by developers might impact the regulatory application review process.

### 3 INTERCONNECTION PROCESS MAP

The information gained from the guidance review and stakeholder interviews was used to develop a “process map” that defined the steps and associated timing of the complete interconnection process. The process map outlined the three basic stages for CHP interconnection, as defined by ERCOT guidelines:



Across the three stages, over 30 separate actions are required of developers. Each has specific, often overlapping deadlines, and many actions require developers to partner with technical or administrative firms to conduct detailed CHP system engineering or financial studies. The process map clearly outlined the stages, decision points, and time estimates for key steps and associated deliverables.

<sup>1</sup>Section 25.109 of PUC Regulations

## 4

## ERCOT ENGAGEMENT

After clarifying the steps in the interconnection process map, the project team met with ERCOT to verify their work. ERCOT staff shared their past experience on interconnection applications, and noted that applications often lacked complete information – likely due to errors in project management and/or confusion on required application information in the following areas:

- Engineering details on type and operating cycles of CHP power generation technology, such as turbine or fuel cell;
- Operation parameters of the proposed CHP system, including reactive loads, frequency response, and reserve margins, and/or
- Necessary modeling outputs of system performance during normal and critical grid situations.

ERCOT staff helped the project team devise clear guidance language and add tips to help developers and other users understand the basic submission requirements. These adjustments will help ensure applicants submit more accurate information.

## 5

## CODING

Once the project team had incorporated ERCOT's input into the final process map, they engaged HARC's in-house web developer to code and launch the Tool online. The online platform allowed the Tool to add unique interactive features not available elsewhere, such as:

- automated notifications for upcoming deadlines,
- storage of completed applications,
- links to required CHP interconnection documents and templates,
- links to ERCOT technical guidance, and
- an online help feature to allow regulators to answer questions expeditiously prior to submission of key application documents.

Prior to its launch, the project team held several meetings with the key players in the interconnection process. Select industry, end-users, and vendors beta-tested the Tool to ensure it would simplify the interconnection process. Beta-testers identified key steps where the project team could add “helpful hints.” Beta testing also led the team to add estimates on time windows for ERCOT staff to review the application materials.

HARC launched the Tool in September 2016. The Tool has its own dedicated website, and is also prominently featured on the HARC and SECO websites.

## Outreach

Once the site was up and running, the project team kicked off a major effort to engage potential end users and promote the new Tool. HARC and SECO jointly hosted a webinar to provide future users and stakeholders with a general understanding of the benefits of using the Tool to manage a CHP project. The team also used the webinar to provide basic information on the Tool and demonstrate how to create an account and enter essential project information.



HARC also hosted several presentations and discussions at industry, utility, and trade association meetings to promote the Tool. Through its role as the DOE Southwest CHP Technical Assistance Partnership, HARC also met with stakeholders informally, targeting specific project developers likely to benefit from the Tool in the near-term.

HARC continues to conduct outreach to utilities and their partners on the benefits of CHP and the use of the Tool. The Tool includes a survey to solicit feedback from users and potential users, which HARC monitors to ensure its usefulness.

Moving forward, Texas will continue to track applications started through the Tool, as well as the time needed to approve a CHP interconnection.

HARC has received over a dozen requests from developers and utilities seeking more information or assistance with an application since launching the Tool. HARC also began developing a training module after one Texas utility expressed interest in having its industrial sector account managers use the Tool to help developers in their service territory deploy CHP projects.



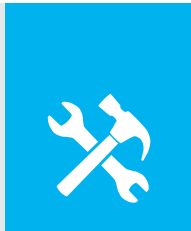
## Outcomes

Texas's DG Interconnection Tool has the potential to benefit developers and state utility regulators immediately. ERCOT expects DG (which includes CHP) to continue to grow in the coming years, based on a March 2017 study prepared for the Texas grid. As a result, the Tool is expected to be vital for efficient growth of DG and CHP in the near term.

By centrally locating clear information on the necessary steps to complete the interconnection process and related paperwork, developers can complete each step with confidence. As a result, state regulators will receive more timely and complete applications with the required information better presented.

Currently, two facilities are using the CHP Interconnection Tool for new systems, each around 40 MW. If fully realized, these two new systems would represent a 5% increase in statewide CHP capacity. While still in the early stages, these users have reported that the Tool is particularly useful in clarifying required information for feasibility analyses (e.g., payback and total operating costs), and detailed project management checklists and guidance.

Texas has made significant progress in developing CHP system capacity, and its extensive commercial and manufacturing base provides room for additional growth. A 2016 study commissioned by DOE estimated 7,027 MW of CHP technical potential in the commercial and public sector and another 5,216 MW of industrial CHP technical potential. By clarifying application requirements and timing, the Tool will dramatically reduce the time needed for developers to achieve interconnection for their CHP systems, and ensure the Texas is well-positioned to expand CHP alongside the other DG resources.



## TOOLS AND RESOURCES

### TOOLS

[HARC Interconnection Tool](#)

### RESOURCES

[ERCOT Interconnection Handbook](#)

[ERCOT Distributed Energy Resources - Reliability Impacts and Recommended Changes](#)

[SECO Website](#)

[HB 1864 Energy Security Technologies for Critical Governmental Facilities](#)

[Guidelines Energy Security Technologies at Critical Government Facilities](#)

PUCT rules: <http://www.puc.texas.gov/industry/electric/business/pgc/Pgc.aspx>.

ERCOT Protocols: <http://www.ercot.com/content/mktrules/nprotocols>.

ERCOT Planning Guides Section 5: <http://www.ercot.com/mktrules/guides/planning/index>

### COMMUNICATION PRODUCTS

[HARC Distribugen Presentation – Dynamic Mapping of ERCOT Interconnection Process](#)

[HARC DistribuGen Presentation – Navigating through CHP Permitting in Texas](#)

[HARC Website - Blog](#)