

CASE STUDY / **CARLSBAD ENERGY CENTER**

# FLEXIBLE POWER COMES WITH REDUCED ENVIRONMENTAL IMPACT

NRG Energy needed to replace a major generation source with a more efficient option that also met changing environmental needs in a coastal community. Utilizing a small brownfield site, the project overcame complications to complete design and construction of a new peaking plant.



# FIVE INDEPENDENTLY DISPATCHABLE ENGINES OFFER FAST RAMP-UP

New peaking plant is constructed on a portion of the existing facility's footprint.

## PROJECT STATS

### CLIENT

NRG Energy

### LOCATION

Carlsbad, California

### COMPLETION DATE

December 2018

5

INDEPENDENTLY  
DISPATCHABLE  
LMS100 GAS TURBINES

10

MINUTES TO  
FULL-RATED POWER

39%

REDUCTION IN  
GREENHOUSE GAS  
EMISSIONS

300+

ON-SITE PERSONNEL DURING  
PEAK CONSTRUCTION

## CHALLENGE

The iconic Encina Power Plant supplied power to a coastal California community for more than 60 years. The aging 965-megawatt natural gas-fired plant provided baseload support but could take up to 18 hours to ramp up. It was further challenged by changing environmental regulations that ruled against the plant's once-through cooling process, which involved siphoning water from the nearby Agua Hedionda Lagoon.

NRG Energy decided to replace the plant with a simple-cycle natural gas-fired peaking facility for faster and more flexible response to energy demand. The proposed Carlsbad Energy Center would need to be designed for a small, challenging brownfield site, with the facility constructed on the site of a fuel oil tank farm within the existing plant's footprint.

With a contract in place to provide power to the local grid, NRG would need to maintain the project schedule to achieve the agreed-upon completion date.

## SOLUTION

NRG selected a joint venture of Burns & McDonnell and ARB Inc. for engineer-procure-construct (EPC) project delivery on a turnkey basis for the Carlsbad Energy Center.

The new plant is a five-engine, simple-cycle natural gas peaking plant capable of providing more than 500 MW. Designed to complement California's increasing renewable generation resources and clean energy initiatives, the new facility has independently dispatchable engines that produce full-rated power in 10 minutes or less. This allows the plant to respond rapidly to demand peaks in coordination with fluctuations in the availability of intermittent renewable sources.

The plant utilizes new coolant technology, allowing both air and reclaimed water to be used as coolant sources in the closed-loop cooling system. In combination with other efficiencies and technologies, the plant's environmental footprint is much smaller than that of the Encina plant.

Before construction could begin, more than 2 million gallons of water from heavy rainfall had to be pumped out of the bowl-shaped site, filtered and treated. The old diesel fuel tanks had to be removed from the brownfield site and soil remediation had to be conducted to address any previous environmental concerns.

Additionally, there was a unique aspect of on-site safety because of high-speed railroad traffic





immediately adjacent to the project. Weather events on-site and during the project led to extensive planning and sequencing efforts, which helped the project maintain its aggressive schedule and meet the required commercial operation date.

## RESULTS

Working within a tight brownfield footprint while allowing for ongoing operation of the Encina Power Plant during construction, the project was safely completed despite weather and permitting complications.

Given the potential hazards at the below-grade project site and the presence of high-speed rail traffic at all hours of the day, a behavior-based site-specific safety plan was an essential element in the success of the project. The result was minimal safety incidents during 1.2 million worker hours on the job, even as construction personnel put in 60-hour work weeks to stay on schedule. NRG Energy recognized the project as its Safety Program of the Year.

The project, which also earned the Award of Merit South in *Engineering News-Record California's* 2019 Best Projects, delivered on NRG's aim to provide flexible, efficient power with reduced environmental impact. The peaking plant's engines are able to ramp up faster than the previous facility in response to demand. It employs cooling technology that better protects the waters of the coastal community, and other features help the plant achieve a 39% reduction in greenhouse gas emissions, compared to the existing plant.

