Digester Gas Beneficial Use Program

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Agenda


Summary
Background
Compliance Pathway
Projects
Support
Challenges
Costs
Thanks

Summary

- Digester Gas used to fuel process & generation engines
- SCAQMD amended Rule 1110.2 to reduce emissions in 2012
- January 1, 2019, Rule 1110.2 non-compliance
- SBMWD worked since 2012 on Demonstration POGT Project
- POGT technology not commercially viable at the time
- DGBU Study indicated fuel cell had the lowest 20-year life cycle cost
- SBMWD committed to completing DGBU Program to comply w/ SCAQMD
- 3-Year Variance granted by SCAQMD
- Multiple major challenges
- DGBU Program implemented 10 Projects over 4 years
- Substantial Completion May 26, 2022

Digester Gas

Wastewater treatment process produces digester gas

Made primarily of:

Methane (CH_4)

- Beneficial part

Carbon Dioxide (CO_2)

- Bad for the atmosphere

Hydrogen Sulfide (H_2S)

- Damages equipment

Siloxanes

- Damages equipment

Must be disposed by:

Flaring

Beneficial use as a fuel source

Cannot be vented to atmosphere

Rule 1110.2 Timeline

2012

SCAQMD Adopts Revised Rule 1110.2

January 1, 2018

Effective Date

2018

Quarterly Compliance Flexibility Fees

February 27, 2018

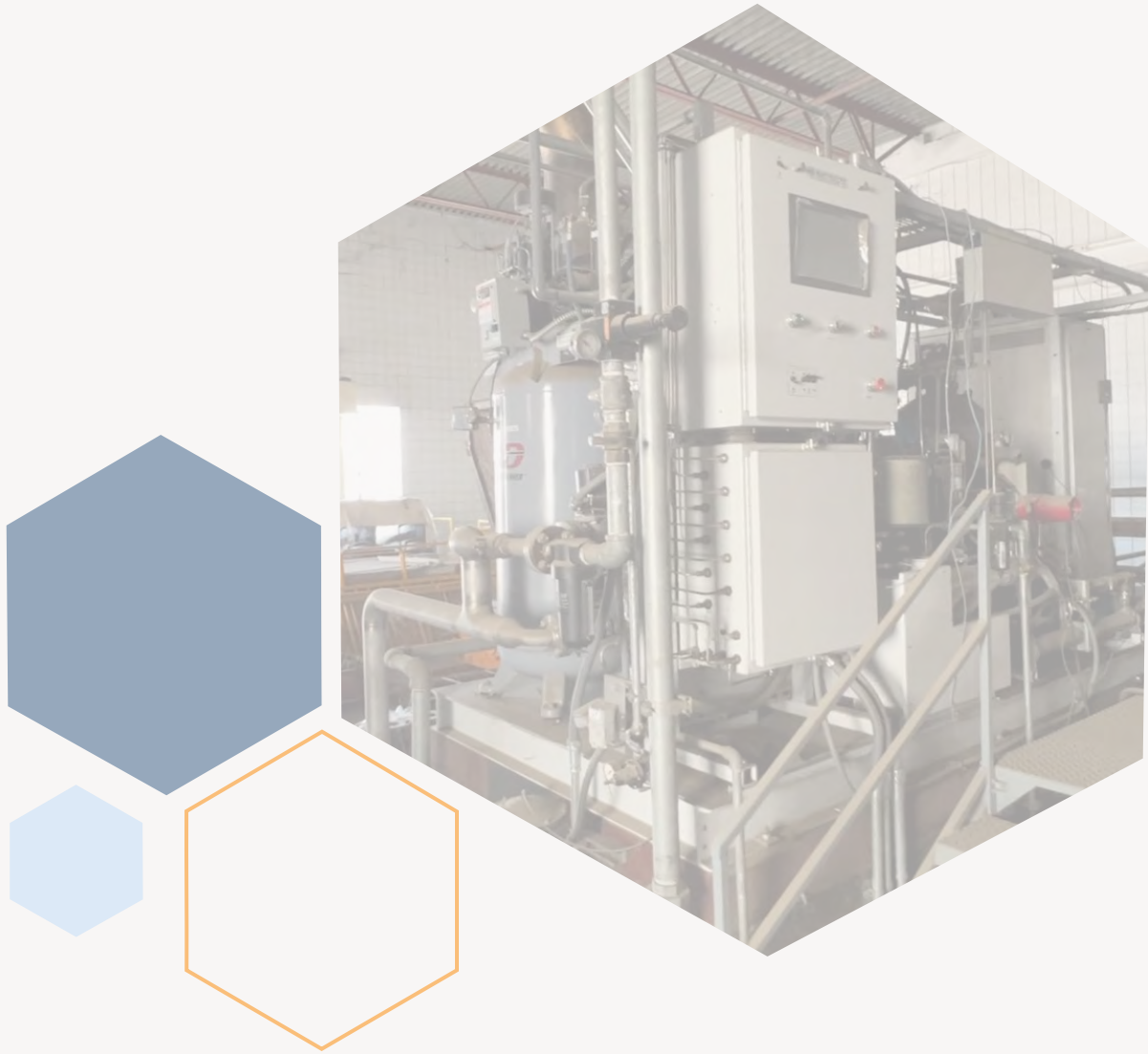
Meeting w/ SCAQMD

January 1, 2019

Compliance Deadline

Partially Oxygenated Gas Turbine (POGT) Demonstration Project

- 2012 to 2018
- February 2018: Round 5 Performance Testing
  - Not successful
- Determination
  - Not commercially viable at that time
- Discontinued SBMWD funding



Meeting SCAQMD

- February 27, 2018
- Active participation since 2012 (not a bystander)
- POGT Demonstration Project
- Need a form of relief (January 1, 2019, not possible)

Digester Gas Beneficial Use Study

Engineers...Working Wonders With Water®

March and April 2018

Evaluate and recommend selection of technology

5 Technologies Considered

Selective Catalytic Reduction

Microturbines

Fuel Cell

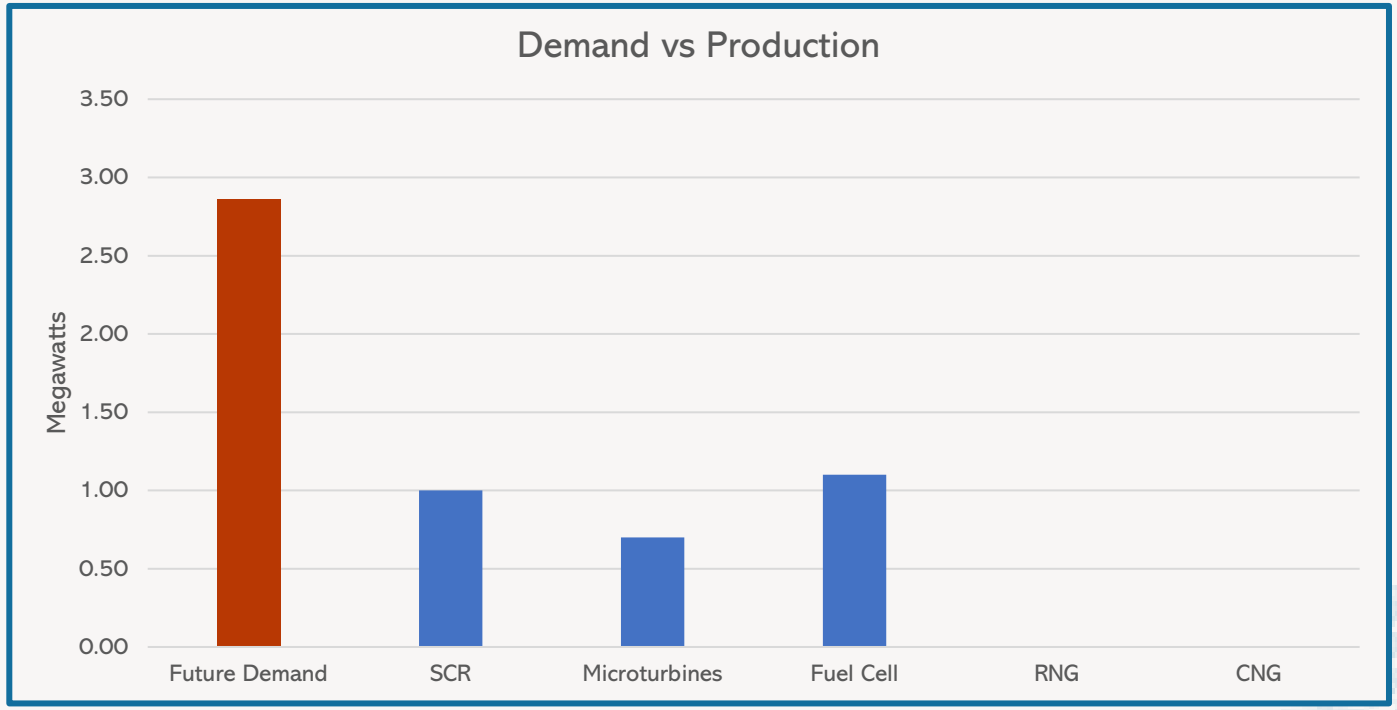
RNG Injection

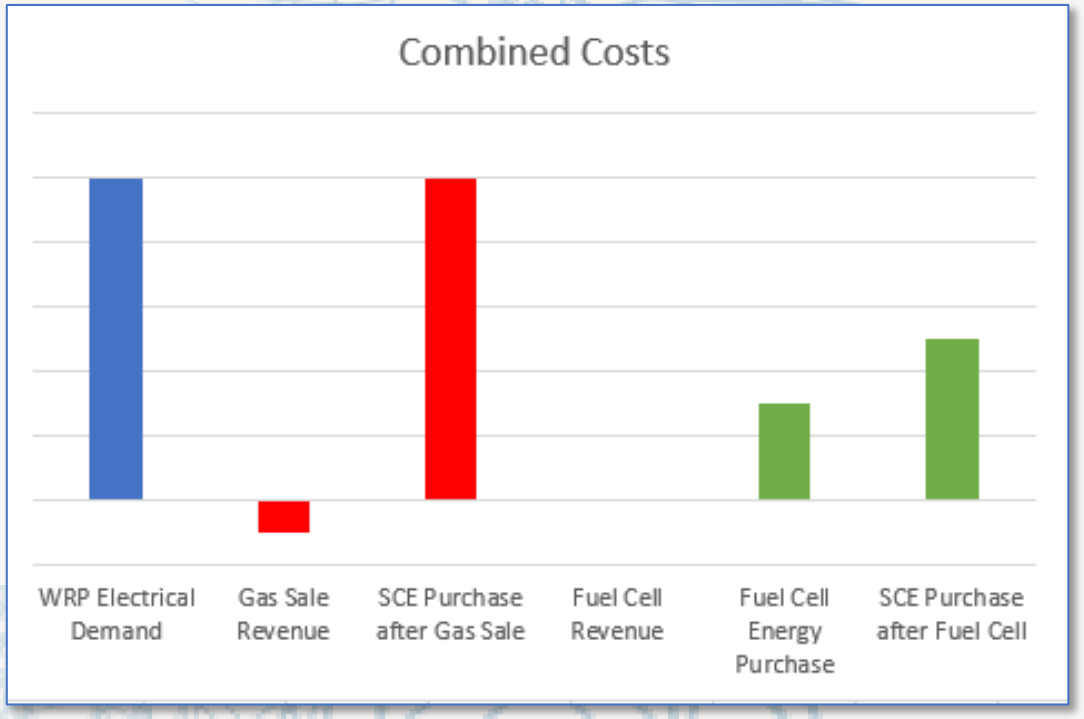
CNG Fueling

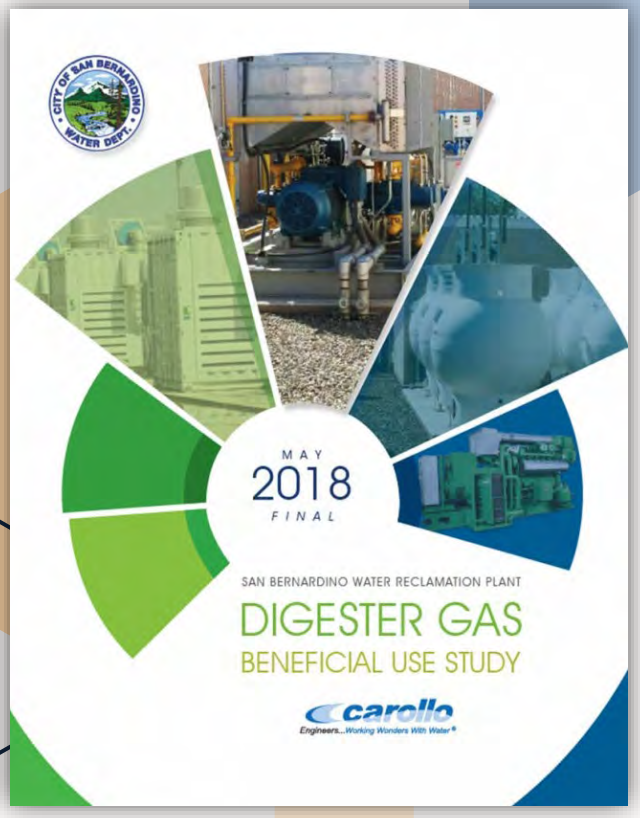
Power generation options

Power

- Existing plant was powered by Digester Gas
- Selection of technology that doesn't produce energy means 100% utility power procurement
    - RNG and CNG sale prices are MUCH lower than SCE electrical purchase price







“After evaluating both economic and non-economic considerations, … it is concluded that SBMWD consider power generation using a Fuel Cell under a PPA…”

Carollo Engineers

Compliance Pathway

- SCAQMD HEARING BOARD CASE #6124-1 DECEMBER 20, 2018
- REQUESTED RELIEF FROM SPECIFIC PORTIONS OF RULE 1110.2 THROUGH SEPTEMBER 1, 2021
- VARIANCE GRANTED

DGBU Program

Ell Project

Fuel Cell Project

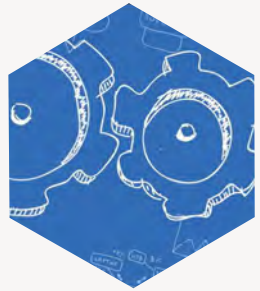
1110.2 Resultant Projects

ALS Reliability Projects

Backup Flare Project

Permitting Support

Staff Support



Engineering & CM Support

Electrical Infrastructure Improvements (EII) Project

Serves 5 different projects:

- 1110.2 Resultant Projects
- 0.06 Flare Project
- Arrowhead Lift Station Reliability Projects
- Fuel Cell Project
- Tertiary Treatment System Project

EII Project

SCE Primary Metering

- Consolidate multiple SCE service feeds
  - 480V Hoffman Service
  - 4160V BLM Service
- FuelCell Energy produces 1.4MW electricity
  - Hoffman Service used 0.6MW electricity
  - BLM Service used 1.1MW electricity
  - Had to consolidate to use all generated electricity

EII Project

ALS Electrical Supply

- Provides power to the Arrowhead Lift Station
- Needed for the Pump #2 Electrification

EII Project

BLM Expansion

- No spaces to plug in:
  - Fuel Cell
  - Hoffman feeder
  - Tertiary Treatment System project

EII Project

“Mega Duct Bank”

- Provided power raceways throughout plant
- Reduced future project costs
- Reduced buried infrastructure clutter

Fuel Cell Project

- SBMWD provides DG, make-up NG, and water
- FCE provides electricity and hot water
- FCE's costs are lower than anticipated for SCE

Fuel Cell Construction

July 2020

September 2020

July 2021

PPA Executed

April 29, 2019

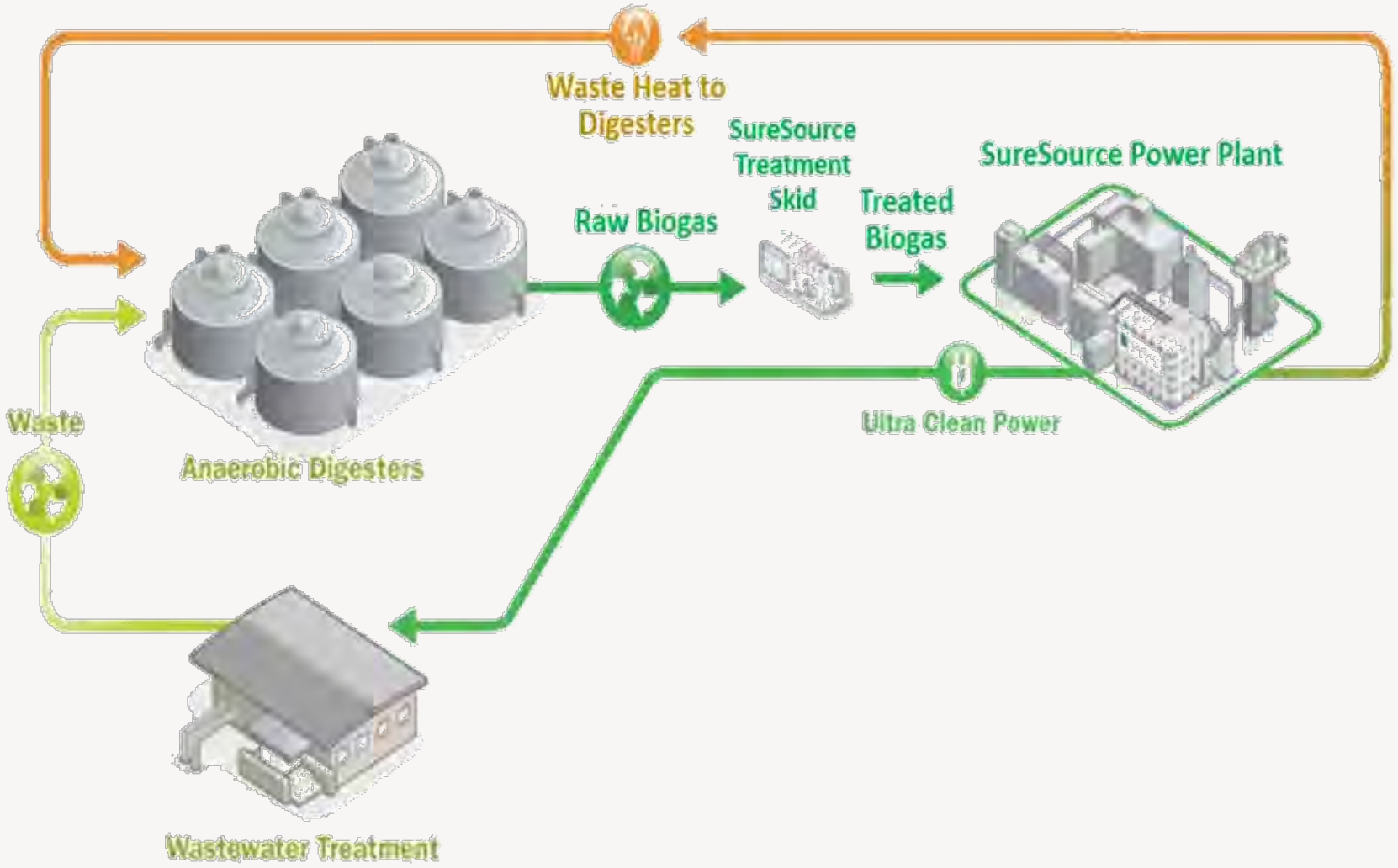
Design

Construction

Commercial Operation

June 25, 2021

Fuel Cell Operation



Fuel Cell Experience

- Met the terms of the PPA
- Providing approximately 52% of the WRP's power to date
- September 6, 2021 – October 22, 2021 Outage
  - Mixer Eductor Oxidizer (MEO) failure
  - September 29, 2021 delivery of new module
  - October 6, 2021 restart
  - October 22, 2021 fully operational

1110.2 Resultant Projects

- Blower Electrification Project
- 0.025 ULE Duty Flare Project
- Gas Storage Project

1110.2 Resultant Projects

Blower Electrification

- Decentralized electric turbo-style blowers
- 5 Neuros NX350 10,000 SCFM direct-drive, single-stage centrifugal blowers
- Stationary emergency backup generator (permitted)
- Automated Dissolved Oxygen (DO) control system

1110.2 Resultant Projects

0.025 ULE Duty Flare

- Primary duty flare
- Meets SCAQMD's LAER/BACT 0.025 LBS NOx/MMBTU
    - LAER – Lowest Achievable Emissions Rate
    - BACT – Best Available Control Technology

1110.2 Resultant Projects

Gas Storage Holder

- DG flow equalization
- WesTech 175,000 ft^3 Slab-Mounted DuoSphere
  - dual membrane ¾-sphere
- PVC-coated polyester fabric membranes
- ~8.8 hours of gas storage (operational flexibility)

ALS Reliability Projects

- Pump #2 Electrification Project
- Pump #3 Conversion Project

ALS Reliability Projects

Pump #2 Electrification

- Replace DG-fueled Internal Combustion Engine with a 200-HP electric motor
- Installation nearing completion

ALS Reliability Projects

Pump #3 Conversion

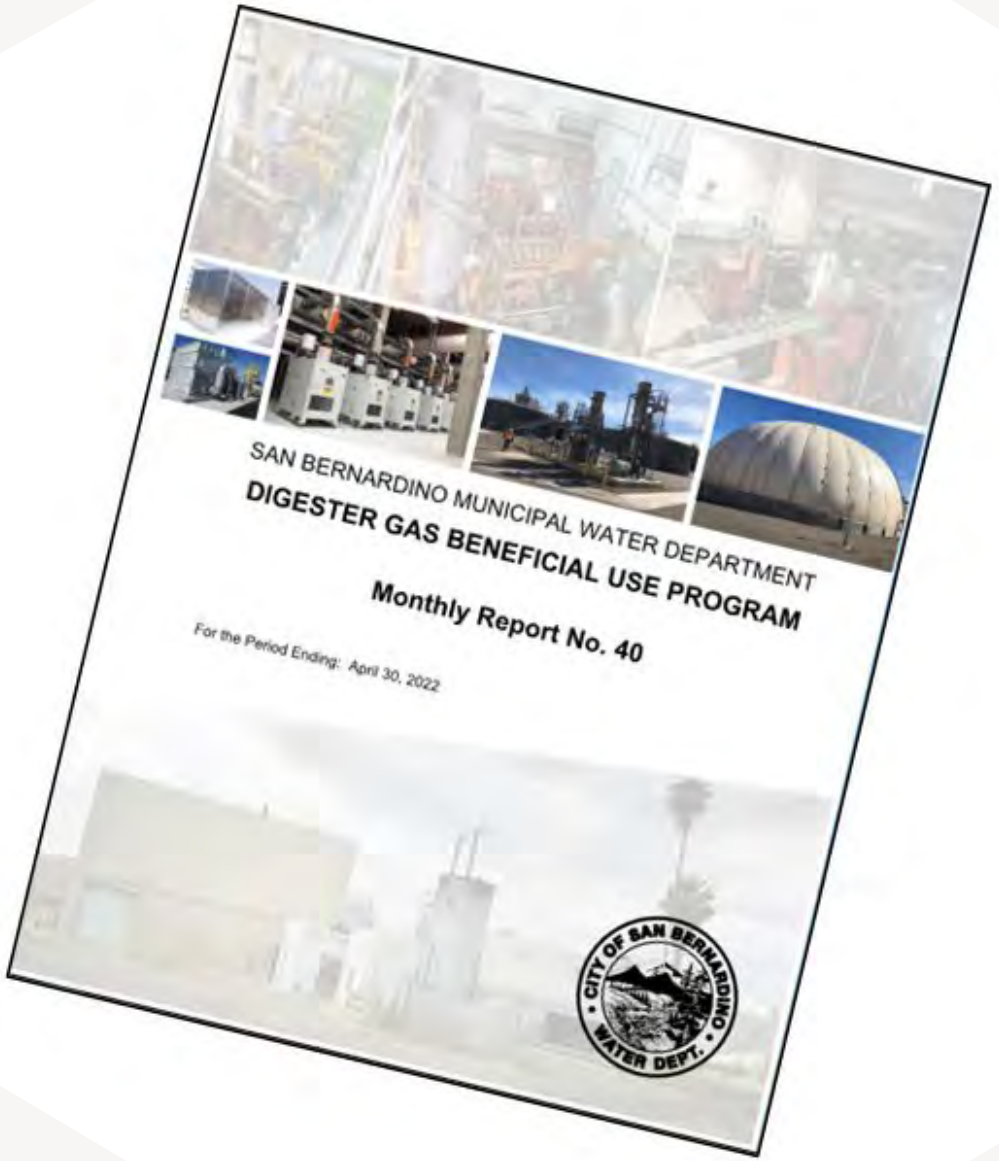
- Convert DG-fueled Internal Combustion Engine to run on LP (propane)
- Source testing and engine tuning in progress

0.06 LE Backup Flare Project

- Backup flare
- Meets SCAQMD's current 0.06 LBS NOx/MMBTU

Permitting and Regulatory Support

- Permit applications and correspondence
- Monthly, Quarterly, and Annual Reporting
- Excess Emissions Fees Payments



Staff Support

- Staff actively engaged in spotting and resolving problems
- Staff actively engaged in design and development questions and planning
- Staff actively engaged in administering the project and the myriad Agreements

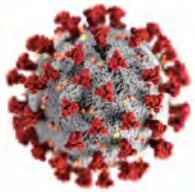
Engineering & Construction Management Support

- All parties were actively engaged in meeting aggressive deadlines imposed by SCAQMD
- Active engagement by Department Staff and 3rd Party Engineer and Construction Manager resulted in:
  - Better quality of construction
  - Longer life cycle for infrastructure
  - Lower initial and lifetime costs to perform rework or replacement

Meet our challenges

So Cal Edison

Utility Provider



COVID-19

Pandemic

Supply Chain

Commerce Network

Inflation

Economic Principle

Timeline

Imposed Limits

Costs

Project	Actual Capital Costs to Date
Fuel Cell	$0
Blower Building (CO 00200)	$15,178,000
Flares (CO 00199)	$5,404,000
DG Storage Holder (CO 00201)	$3,365,000
ALS Reliability (CO 00222)	$1,614,000
Primary Metering Project (CO 00231)	$1,202,000
Total	$26,763,000

Some EII Project costs and CM costs attributed to Tertiary Treatment System Project


BS
GW
SCE


HIGH HEA
AUTHORIZE
PERSONNE
ONL




Thank you