ENCINA WASTEWATER AUTHORITY

CLEAN WATER SoCAL
CREATING SUSTAINABLE SOLUTIONS

Encina Wastewater Authority Case Study – Hybrid Solution

CLEAN WATER SOCAL
WATER-ENERGY-AIR SERIES
DECEMBER 3, 2025

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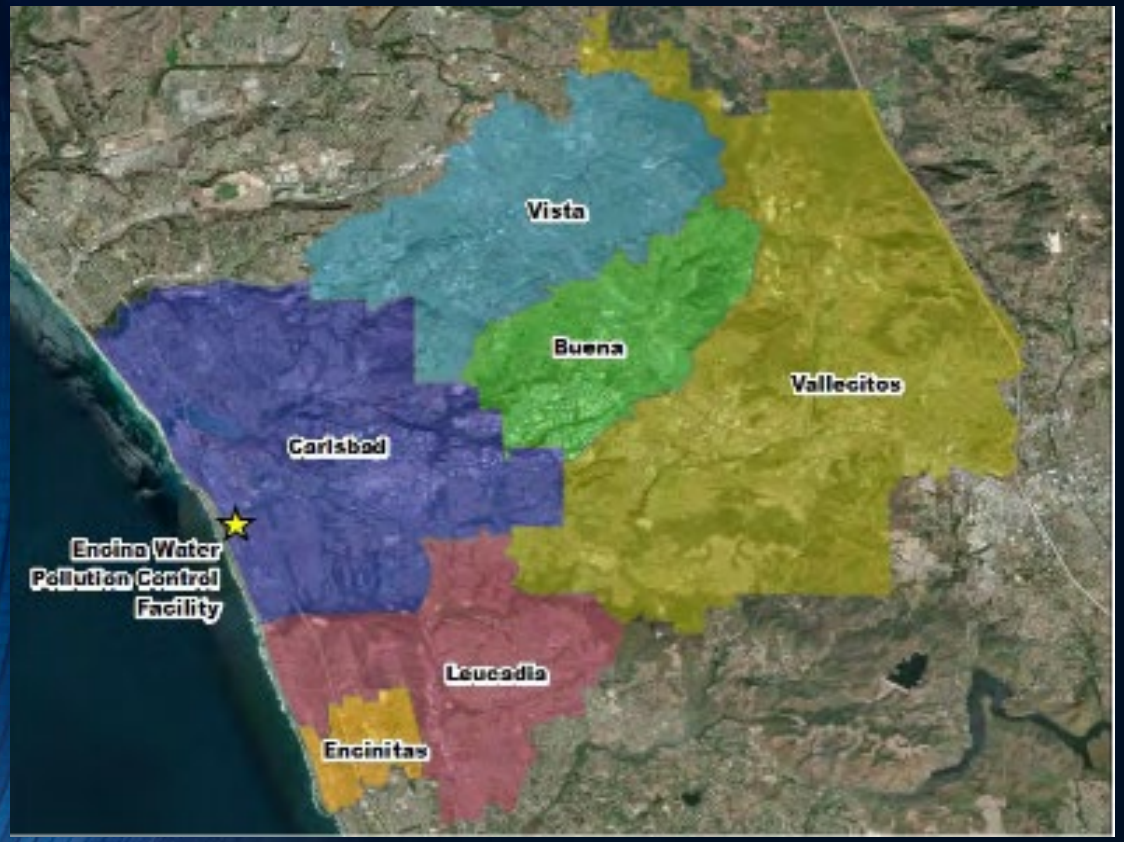
Presentation Outline

1. Encina Background
2. Project Goals and Drivers
3. Energy Resiliency Assessment Development
4. CLEAR Project

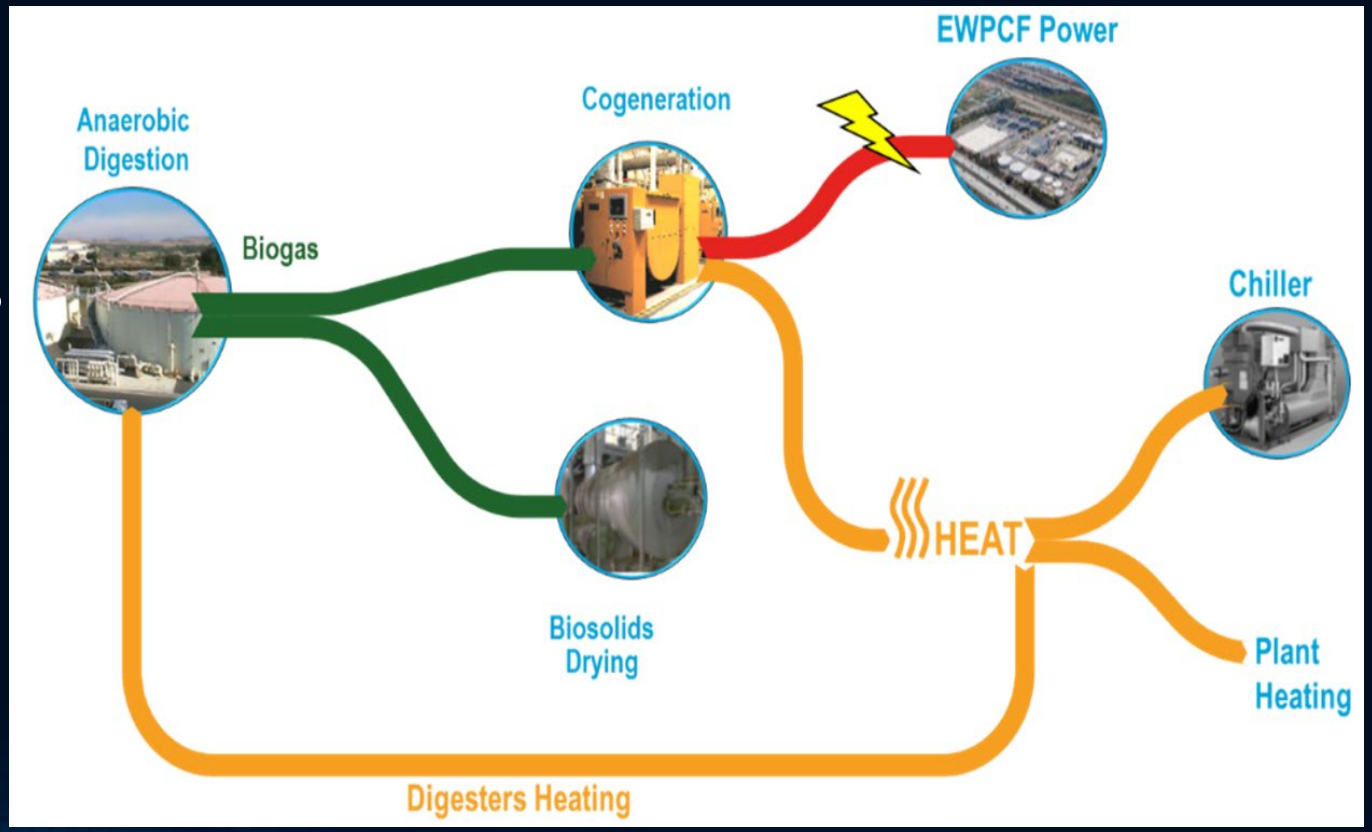
Encina Water Pollution Control Facility



- North San Diego County, Carlsbad, CA
- Serve approx. 400,000 Residents
- ADWF of 23 MGD
- Permit Capacity of 43 MGD

Current Status

- Meet ~80% of plant demand for power via 3+1 x 750kw biogas-fuelled engines
- Provide emergency backup power
- Meet heat demands for digesters
- Beneficially use most of the biogas produced in the anaerobic digesters
- Title V Emitter (2025)
- $0.34 / kWh electricity rate



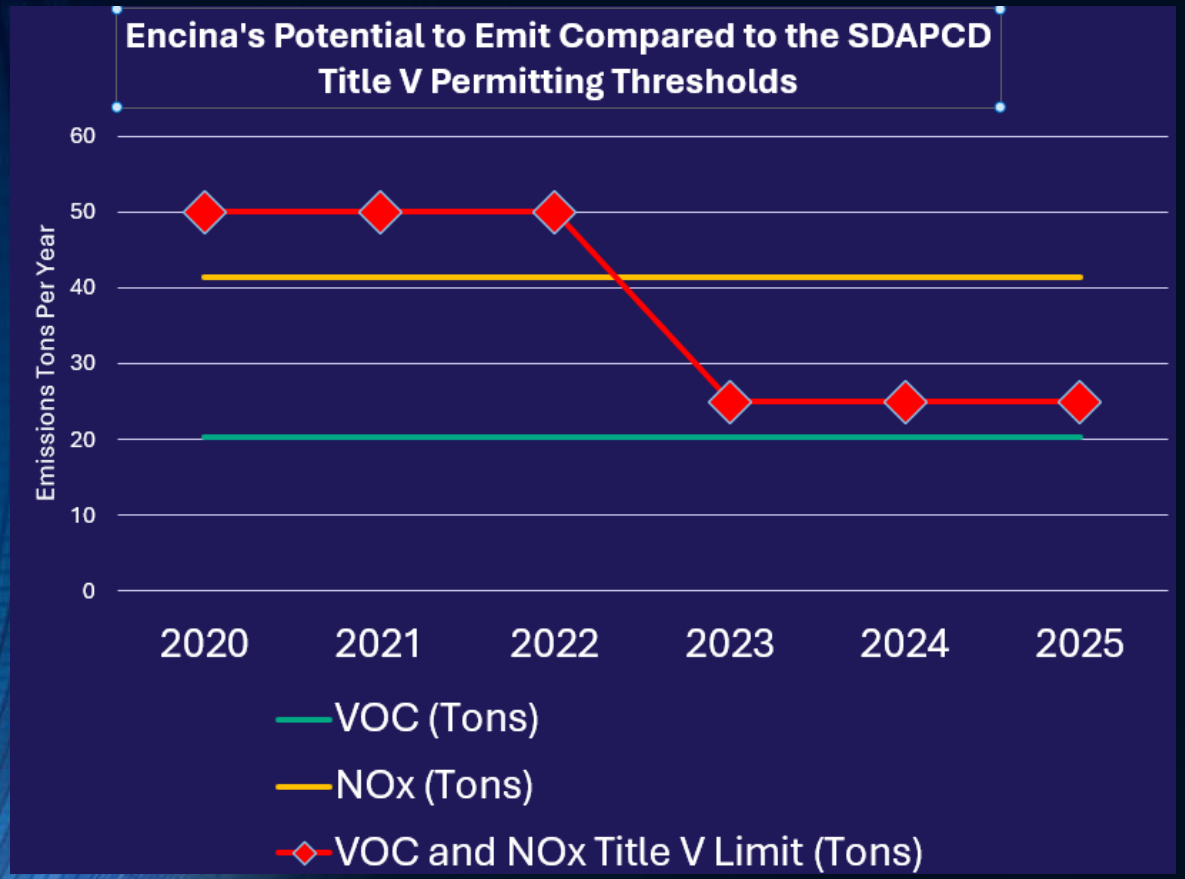
Sustainable Resiliency Goals

- **Regulatory:**
  - Comply with increasingly stringent air permit requirements (primary driver)
- **Economic:**
  - Adaptable to changing energy costs and value; use existing assets where feasible; beneficially use biogas for energy cost savings
- **Energy:**
  - Backup power for short- and long-term gas and electric outages from utility
- **Operation:**
  - Reliable digestion/biogas production, and heat and power production

Resiliency is  *!!*

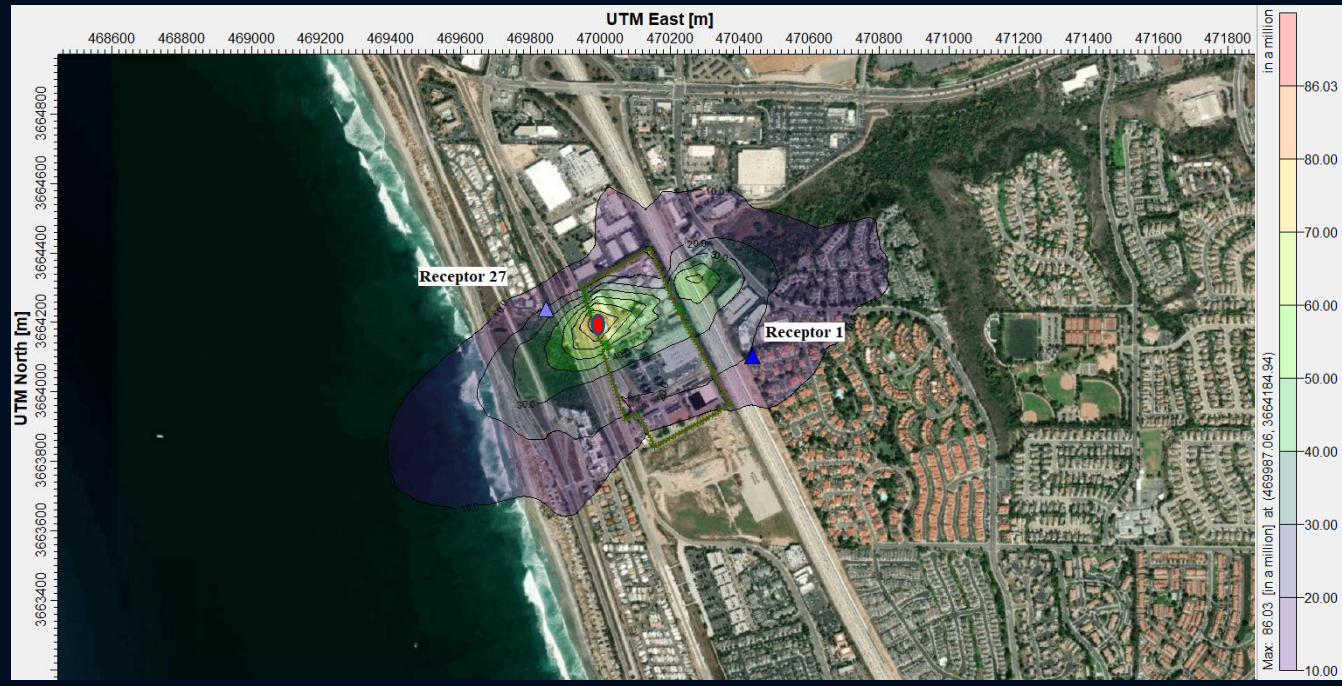
Increasingly Stringent Air Regulations: Known Regulations

Title V Permitting Program



Title V Source: Increased permit obligations

Health Risk Reduction Rules



SDAPCD Health Risk Rules were updated in 2021. Prior to revisions, Encina was below the risk reduction level (MEIR = 100).

Health Risk Rules: Require Emissions Reduction Plan

Likely Future Air Regulations

- **PM 2.5** Soot is concern from cogeneration, diesel generators.
  - EPA has reduced the compliance threshold for PM 2.5
  - Expected SD Region deemed out of compliance in 4-5 years
    - **Result** – *Further restrictions / prohibition of cogen / diesel generators*
- **Flare Rules** Could require BACRT OR accept a minimization plan which requires sending to other uses.
    - **Result** – *Push Encina to beneficially use more of its biogas*
- **Diesel Generator Rules** – In place at SCAQMD, may require switching to Tier 4 generators.
    - **Result** – *reduction / elimination of diesel generators, or push to Tier 4 generators*

- ***Reduce Reliance on Engines*** ✓
- ***Reduce Reliance on Diesel Generators*** ✓
- ***Use more biogas (no flaring)*** ✓

Energy Resiliency Assessment (ERA) Project Development

- ERA effort commenced in August 2023
- Two technical memos generated
  - TM#1 - Data analysis
  - TM #2 - Solutions evaluation
- RFQ/RFP effort June to Sept 2024
  - 6 proposals received

Proposal Summary

- Energy Services Agreement
  - NG for power generation on existing Cogen (1.3 – 1.7 MW)
  - NG for power generation on LGen/SFC (1 MW)
  - Biogas to 750 cfm RNG on pipeline (across the street)
- Proposal Breakdown ($50M-$80M)
  - 2 – SFC (Bloom) w/ RNG
  - 2 – SFC (Fuel Cell Energy) w/ RNG
  - 2 – Lgen (Mainspring) w/ RNG

Revelations from Proposal Effort

- RNG Sale Not Feasible
  - Capital costs higher than expected (Range = $50M to $80M)
  - Differential between NG purchase price and RNG sale price too small

    (RNG sale price would need to be $35 to $40/MMBtu)
- With no RNG, conditioned biogas must be used for onsite for heat + power
  - Existing engines
  - Low Emission System (Fuel Cells or Linear Generators)

Linear Generator

Fuel Cell

- Initial full conversion to low emission system not recommended to manage risk
  - Operations
    - Marginal experience running on wastewater biogas to-date
  - Financial
    - Capital and O&M Costs significantly higher than expected

100% Utility Power

ENCINA WASTEWATER AUTHORITY RENEWABLE ENERGY GENERATION
UTILITY POWER OPTION

NO On-Site Power Generation

SDGE/CEA

100% of power purchased from the grid.

WASTEWATER

ENCINA WASTEWATER AUTHORITY

COGENERATION POWER
To be decommissioned. Replace with diesel generators.

HIGH STRENGTH WASTE

As capacity increases, amount of biogas produced will increase.

BIOGAS

FLARE BIOGAS
Not likely to be permitted in the future

Water quality discharged to the ocean is **9 times** higher than required.

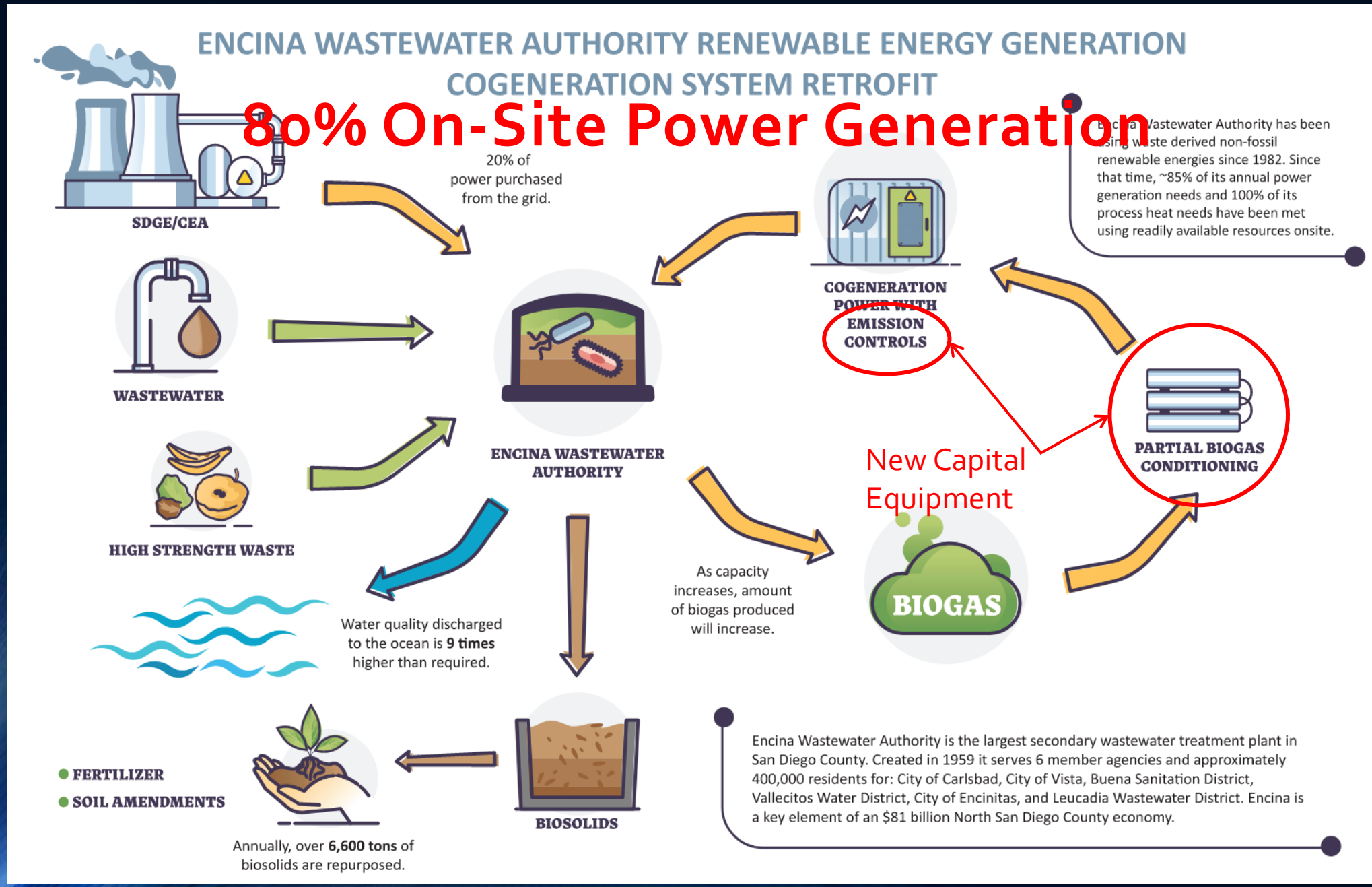
BIOSOLIDS

- FERTILIZER
- SOIL AMENDMENTS

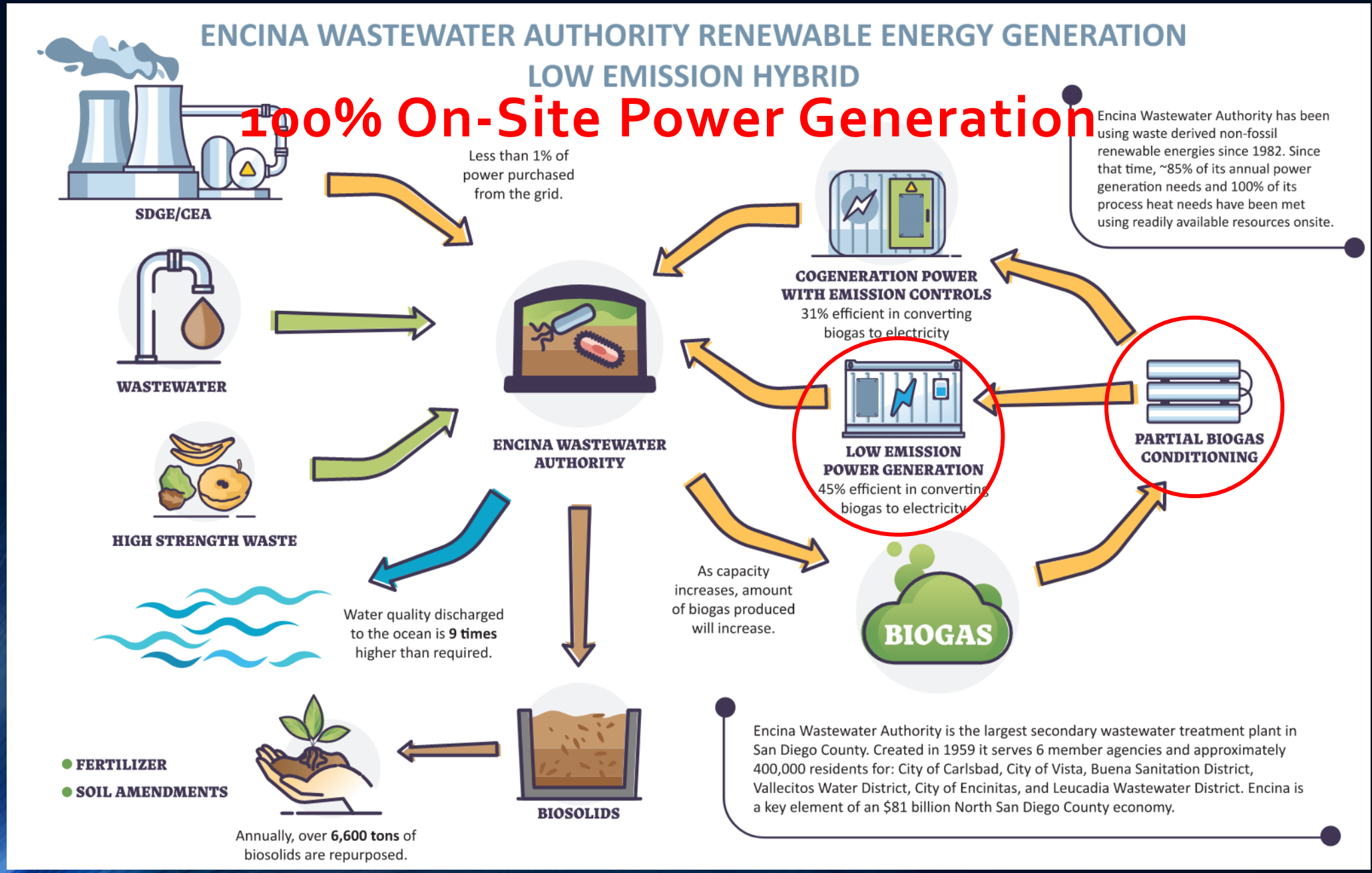
Annually, over **6,600 tons** of biosolids are repurposed.

Encina Wastewater Authority is the largest secondary wastewater treatment plant in San Diego County. Created in 1959 it serves 6 member agencies and approximately 400,000 residents for: City of Carlsbad, City of Vista, Buena Sanitation District, Vallecitos Water District, City of Encinitas, and Leucadia Wastewater District. Encina is a key element of an $81 billion North San Diego County economy.

Cogen Retrofit



Low Emission Hybrid



Cost Comparison

Alternative	Capital ($M) (w/o grant)		Capital ($M) (w/ grant)	O&M ($M/yr) Year 1 $	Rate ($/kWh)	NPC (20-yr) ($M)
Current Operation				$2^	$0.10	
Utility Power	$9.8		$9.5	$4.5	$0.38	$88
Cogen Retrofit	$14		$12	$2.5*	$0.25	$58
Low-Emission Hybrid (cogen retrofit + 1 MW linear generator)	$25		$16	$1.5	$0.15	$38

^ - Current Annual Cogen O&M cost basis = 19% @ $0.34/kwh (grid), 81% @ $0.04/kwh (onsite)

* - Cogen Retrofit cap on biogas-fueled generation, remainder from grid

- Encina 5-year CIP budget allocated for energy infrastructure = $12M

CLEAR Project

Cogeneration Low-Emission Augmentation and Retrofit

- **Biogas Treatment** – for use in both the existing cogeneration system and linear generators
- **Emission Controls** – retrofit of existing cogeneration system
- **Battery System** – energy redundancy during islanded operation
- **Linear Generators** – efficient low-emission energy production using conditioned biogas

CLEAR Project Drivers

- **MEET APCD REGULATORY MANDATES**
- Maximize value and utilization of Encina energy resources (power, biogas, heat)
- Redundant and resilient energy operations

Revised Scoping / Selection

- Linear Generators determined to be best low-emission power generation technology
  - Lower capital and operating cost and confidence running on biogas
- 2 firms proposed Linear Generators
- Revised scope – Progressive Design Build
- Conducted site walks/visits with each of the shortlisted firms
- Solicited revised cost proposal for the CLEAR Project specifically (1/6/25)
- Interviews conducted on 1/17
- Willdan found to be the most qualified, unanimously selected

Existing Linear Generators – Issues and Lessons Learned

- Napa Sanitation District has the only current installation of a linear generator running on wastewater biogas.
  - Issues Specific to the Napa Sanitation District Installation
    - Incompatible biogas quality resulting from existing biogas conditioning system
    - Low biogas feed pressure
    - LG Gas control valve challenges
- Many installations running on natural gas + ~12 running on landfill gas
  - Numerous biogas installations in design and some in construction
- Global Issues with Linear Generators
  - Improvements and fixes deployed in the field and applied to newer models

Progressive Design Build Financials

- Phase 1 – 60% Design and Guaranteed Maximum Price development
  - Phase 1 Pre-Construction Services - $990,000
- Phase 2 – Final Design and Construction
  - Phase 2 Cost Estimate ~$28M
    - Not including grant funding

Path Forward

Off Ramp

Secure ITC Funding
- End 2024

SGIP Applications
- Q4 2025

Shortlist from RFP Process
- Q4 2024

Scoping Meeting with Shortlisted Firms
- Q4 2024

Request Revised Proposals
- Q4 2024

ITC Qualified Contract
- End of 2024

Status Update
- Q1 2025

Select DB Contractor
- Q1 2025

Guaranteed Max Price Negotiations
- Q1 2026

Start Construction
- Q3 2026

Project Startup and Commissioning
- Q1 2028

Final Project Acceptance
- Q2 2028

Off Ramp

Questions?