

Co-generation Utilizing Biogas from Sludge Treatment

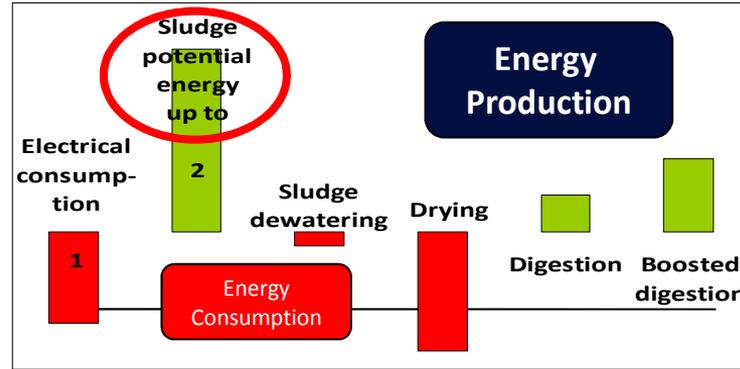
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April 17, 2018

Presentation Outline

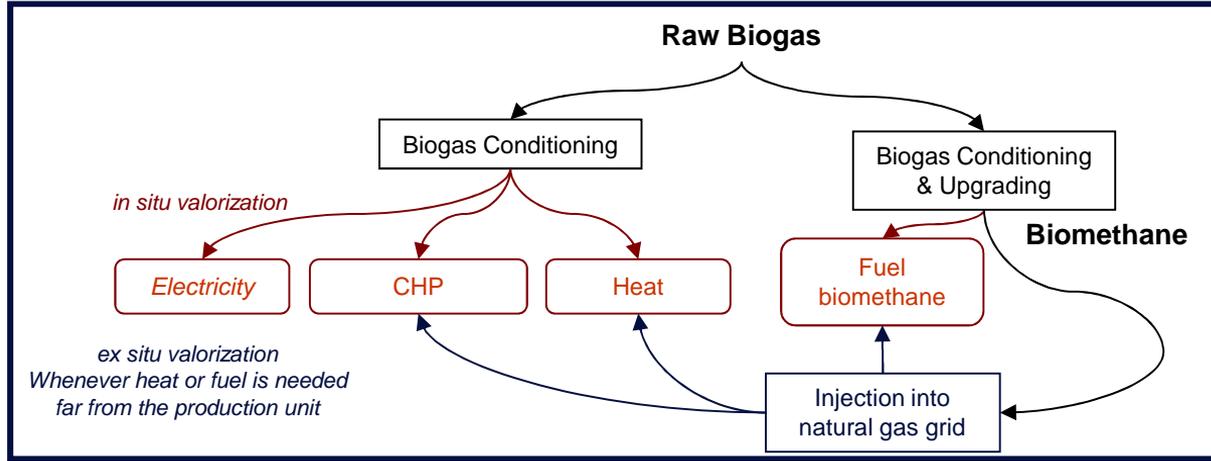
- **Capturing Energy Value in Sludge**
- **Utilization of Biogas Generated from Sludge Treatment**
- **Case Study: Cd. Juarez**
- **Additional Co-generation References**
- **Summary**

Capturing the Energy Value in Sludge – Target Energy Neutrality



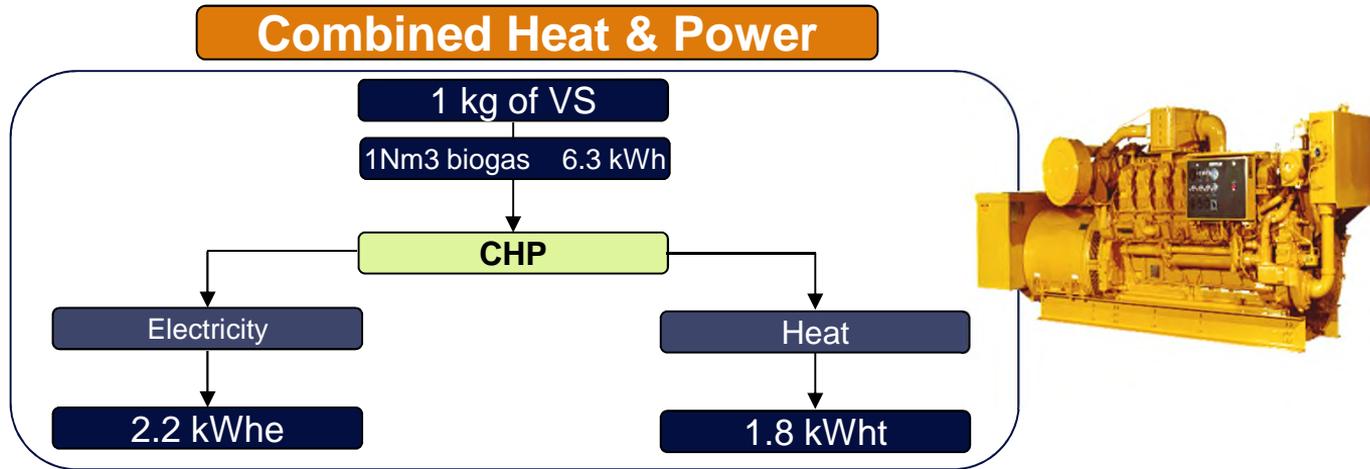
- **Context:**
 - Energy potential in Sludge represents twice the electrical consumption in treatment plants
 - Sludge treatment represents **15% of the total electrical consumption in the plant**
 - **Digestion** produces **biogas**, which can have a significant impact on the plant Energy balance
- **Objectives:**
 - **Implement sludge treatment to limit Energy consumption**
 - **Aspire to achieve Energy Neutrality**

Utilization Options for Biogas from Sludge Treatment



- **Renewable Heat Source:** Heat recoverable and usable within digestion/drying processes (reducing the need for import natural gas)
- **Co-generation(CHP):** Simultaneous Heat & Power Production
- **Biomethane Production:** Upgrade biogas to Biomethane for pipeline injection or transformed into biofuel to offset diesel

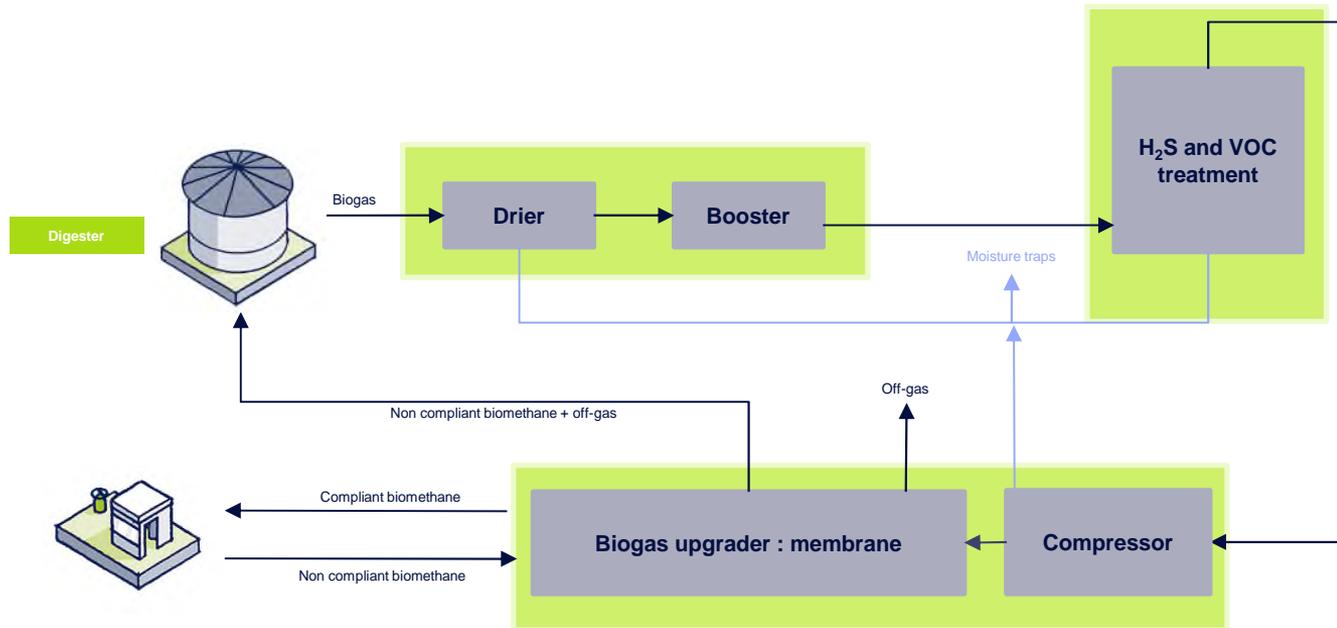
Utilization of Biogas from Sludge Treatment – Co-generation



- Simultaneously produces electricity & heat from biogas
- Renewable Heat is used for digester & building heating
- **Renewable (Green) electricity is either used within the plant to offset import, or sold to the grid**

Electrical Efficiency: 30-42%
Thermal Efficiency: 35-45%

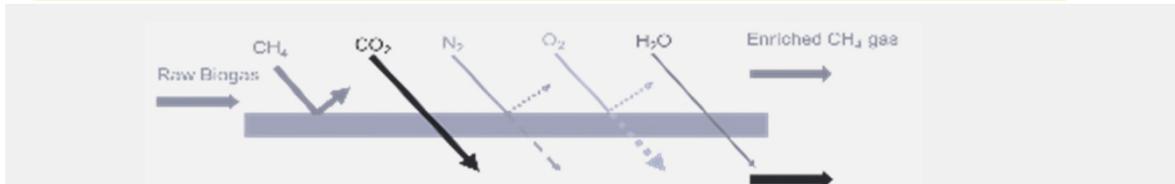
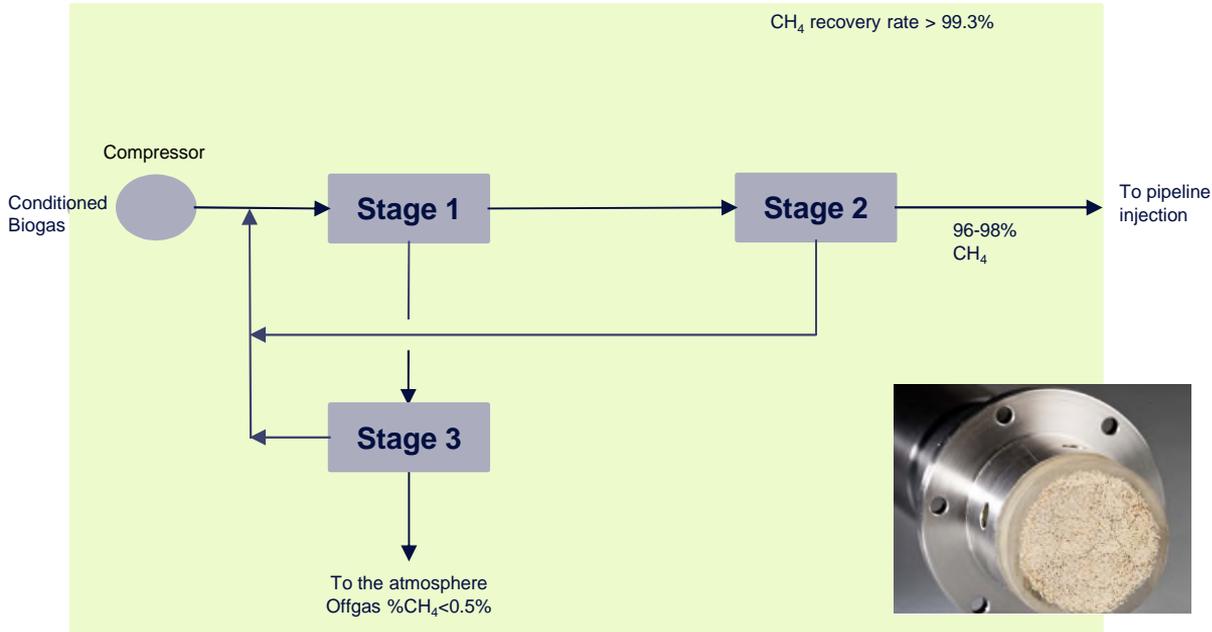
Biogas Upgrading to Biomethane



Methanis Biogas Upgrading membrane plant

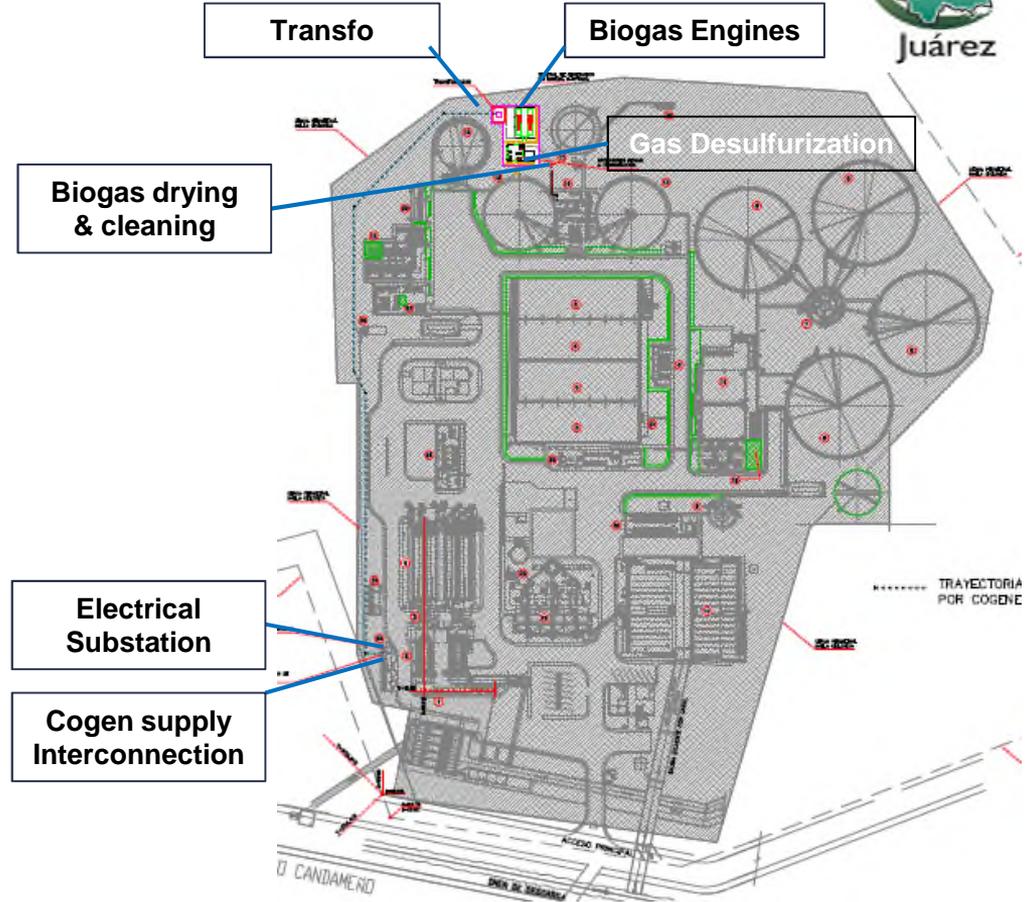
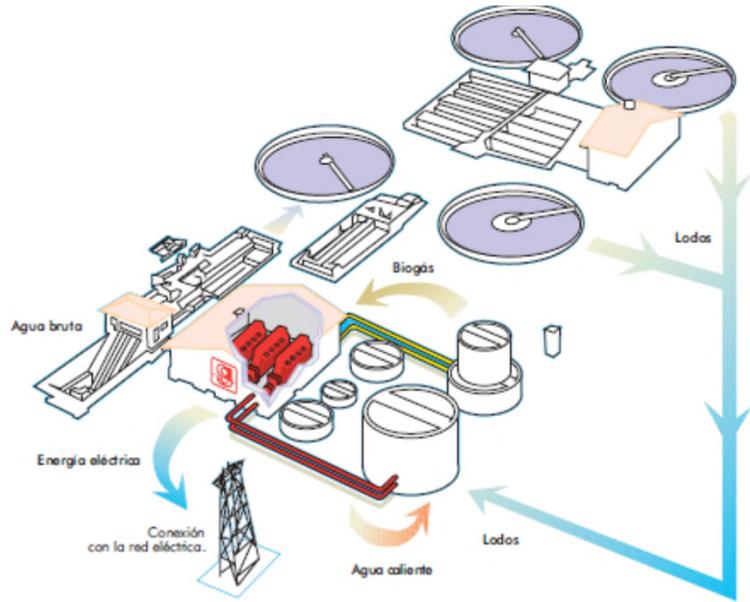


Utilization of Biogas from Sludge Treatment – Biomethane

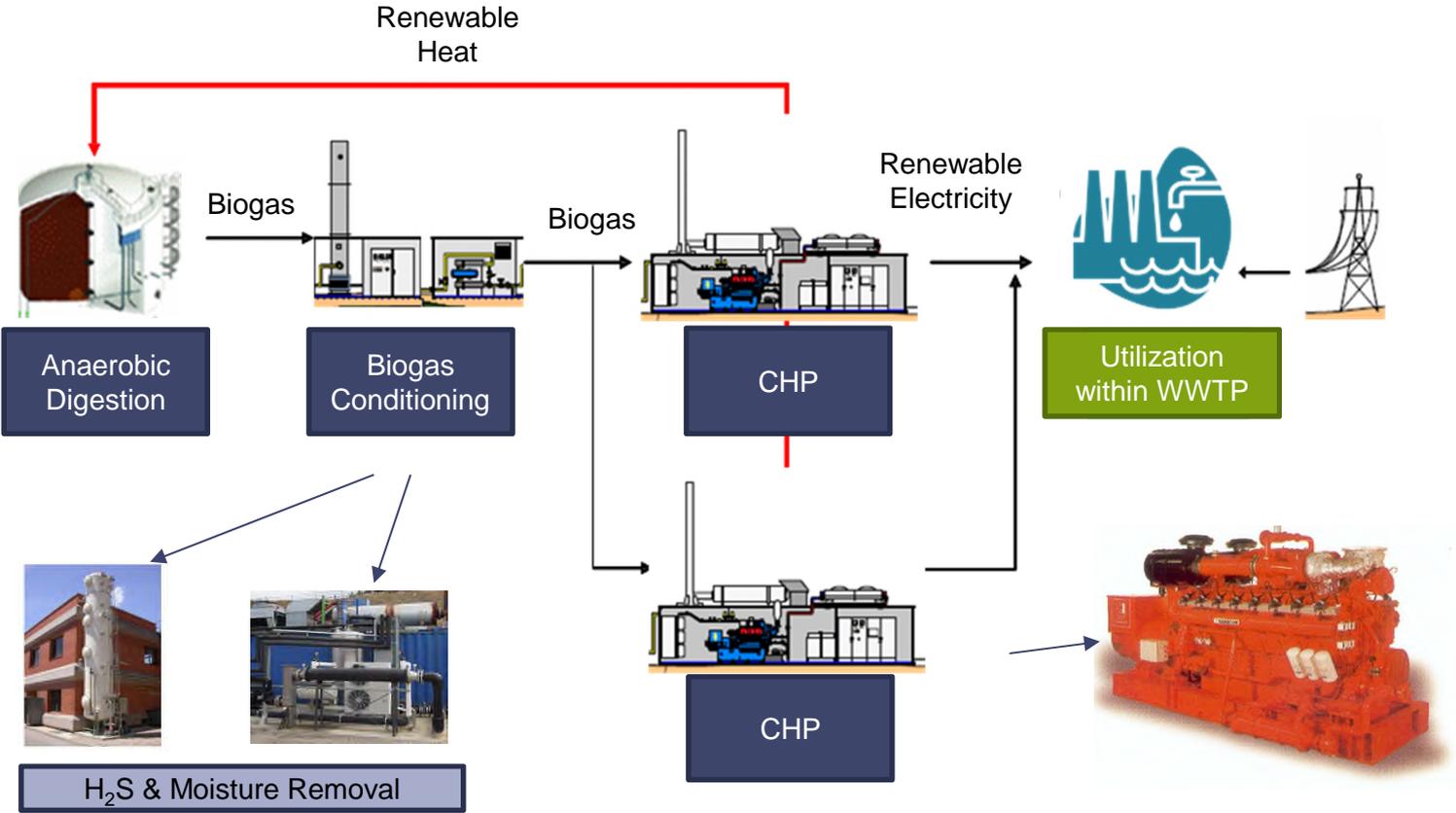


The CO₂ is separated from the methane

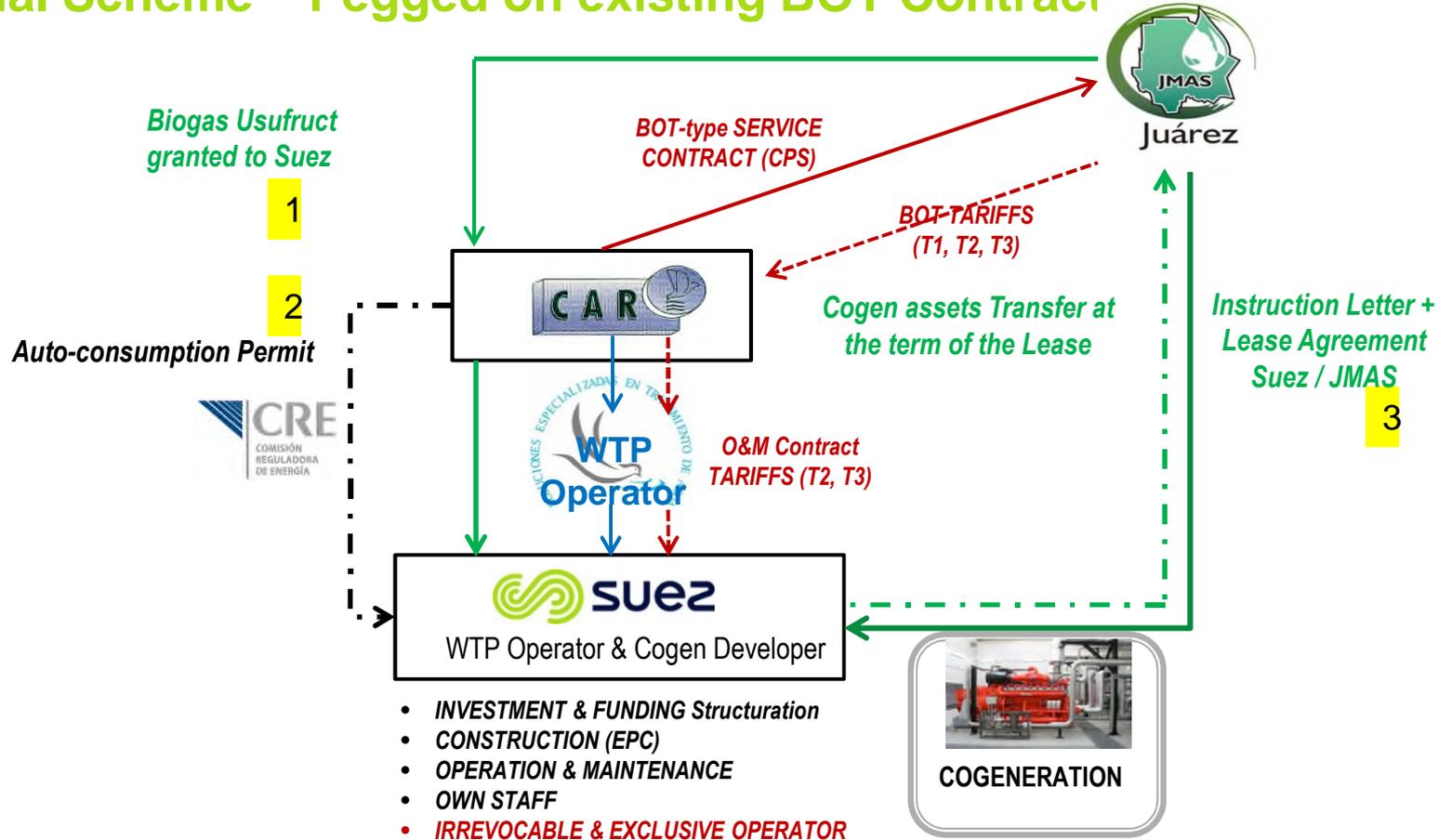
Case Study: Co-Generation at Cd. Juárez



Components of Co-Generation



Contractual Scheme – Pegged on existing BOT Contract



Combined Heat & Power Units

- Fuel = Biogas (Desulfurized & Dried)
(60-64% methane)
- Electrical Output: 2x 604 kWe @ 1,800 rpm
(Net, altitude corrected)
- Continuous Service: 24 hrs/day, 330 days/yr
(>90% availability)
- Useful Life: 234,000 effective hours (26 years)



Resultant Performance

Parameter	Units	Value
Biogas Production	Nm ³ /d	13,130
	Nm ³ /h	547
Potential Electricity Generation	kWhe	948
Number of CHPs		2
CHP Capacity (per unit)	kWhe	604
	kWht	879
Actual Renewable Energy Generation	kWhe kWht	900 1,313
Percentage of Biogas Utilized in CHPs	%	100



Commissioned September 2016

Sample of Additional Co-generation References - Suez



Avonmouth (Bristol, UK)

- 5.75 MW electricity Generation
- Energy Positive WWTP
- Co located digestion Sludge & Food Waste
- Export > 1.5 MW to grid

Installation	Location	Production (kWh)
Gabal	Egypt	11,600
Mapocho	Chile	9,000
Acheres	France	7,600
As Samra	Jordan	6,000
Avonmouth	UK	5,750
Rhitala	India	3,000
Gdansk	Poland	2,500
Tripoli	Lybia	2,400
La Gabia	Spain	1,900
Marseille	France	1,900
Bordeaux	France	1,200

Summary

- **Wastewater Sludge holds energy potential that can be captured to reduce the energy consumption**
- **Utilization of Biogas Generated from Sludge Treatment can be used beneficially both to create heat & electricity, as well as renewable natural gas**
- **Co-generation at Cd. Juarez was successfully implemented in 2016 creating 900kW of renewable electricity and 1,313 kW of renewable heat to offset the parasitic demands of the plant**

Thank You

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