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CITY OF
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ARIZONA

Feasibility Study for Natural Gas Distribution in City of San Luis and San Luis Rio Colorado – Part I

Table of Contents

1 Executive Summary

Executive Summary (1 of 3)

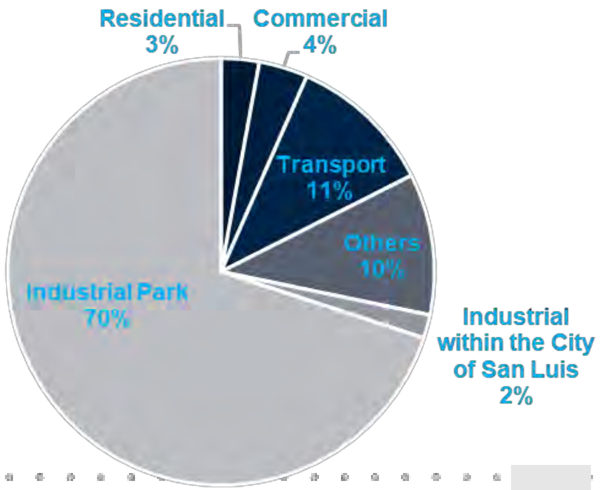
City of San Luis has latent demand for natural gas that been untapped and this demand is expected to grow in future

City and Economic Overview

- The City of San Luis is located on the southwestern corner of Arizona, adjacent to the Colorado River and immediately adjacent to the international border between Mexico and the United States. It is one of the fastest growing communities in Yuma County.
- Its proximity to Mexico and the maquiladora industry has been influential in this growth, which is expected to continue.
- San Luis population is expected to grow to a population of 39,390 (according to the Arizona Office of Economic Opportunity) by the year 2020. As economic conditions improve, additional residential, commercial and industrial development is expected.

Gas Demand in San Luis, Arizona

- Demand in San Luis is concentrated in two areas – San Luis City (mostly commercial, residential and other demand) and Magrino Industrial Park (mostly industrial and some residential).
- Total gas demand in San Luis is expected to reach 5,653,519 therms[1] by 2038. Of this demand, Industrial sector is expected to have the largest share of nearly 70% and additional demand is expected to come from growing industries. It is unlikely to achieve 100 percent market penetration in the first year that natural gas is made available.



[1] 1 Therm = 100,000 British Thermal Units (Btu)

Executive Summary (2 of 3)

There is sufficient transmission pipeline capacity in the region, but gas distribution infrastructure yet to be developed

Gas supply in San Luis, Arizona

- There are two transmission pipelines in the region – El Paso Natural Gas Pipeline and North Baja pipeline, which could be tapped for natural gas supply.
- San Luis gas distribution comes under jurisdiction of Southwest Gas, a local distribution utility active in Arizona, Nevada and California. The utility has contracted supplies from the transmission pipeline with a design capacity of over 1 million therms/day (which appears sufficient but additional discussions with SW gas is necessary).
- City of San Luis lacks gas distribution infrastructure and expansion of existing grid would be required.

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Gas Distribution Infrastructure Design

- Based on the projected demand profile, city of San Luis would conservatively require nearly 2 miles of 6” pipeline, 5.5 miles of 3” pipelines and nearly 23 miles of 1” residential service lines.
- Total infrastructure cost for this investment is estimated at nearly $3.1 million (this excludes cost of building a CNG station necessary to supply natural gas to transportation sector).

Executive Summary (3 of 3)

Based on conservative demand estimates and infrastructure plan, gas distribution system development seems feasible

Conclusion

- Based on estimated demand, estimated pipeline infrastructure costs, and existing tariffs on gas supply in Arizona published by Southwest gas, the expansion of existing gas distribution network appears to meet the target return requirement for the LDC.
- Investment in a CNG station is proposed for the city to reduce the cost of running school busses, while reducing the carbon footprint. Incremental investment in buses are expected to be recouped within 5-6 years, whereas overall investment (along with CNG station) could be recouped within 10-12 years.
- Comparing the commodity cost of alternative fuels, natural gas appears to be cheapest option and is expected to be adopted widely if available.

Thus, based on expectation of the demand estimates and favorable economics, development of natural gas infrastructure is feasible.

Next steps

In order to pursue the development of infrastructure two steps must be followed in parallel.

1. Gathering commitment from the customers for use of natural gas for mid-to-long term, which will provide Southwest gas necessary incentive to pursue the infrastructure development.
2. Start discussion with Southwest gas on gas availability and development of system hydraulics, cost validation and development timeline.

2 Project Overview

Project Overview

Communities along the U.S.-Mexico border, where natural gas infrastructure is limited or non-existent, are considering investing in new or tapping into existing cross-border or near pipelines for commercial, residential, transport, industrial, and governmental use. The City of San Luis, Arizona and San Luis Rio Colorado, Sonora are serviced by propane gas and would like to explore the possibility of bringing natural gas to the area.

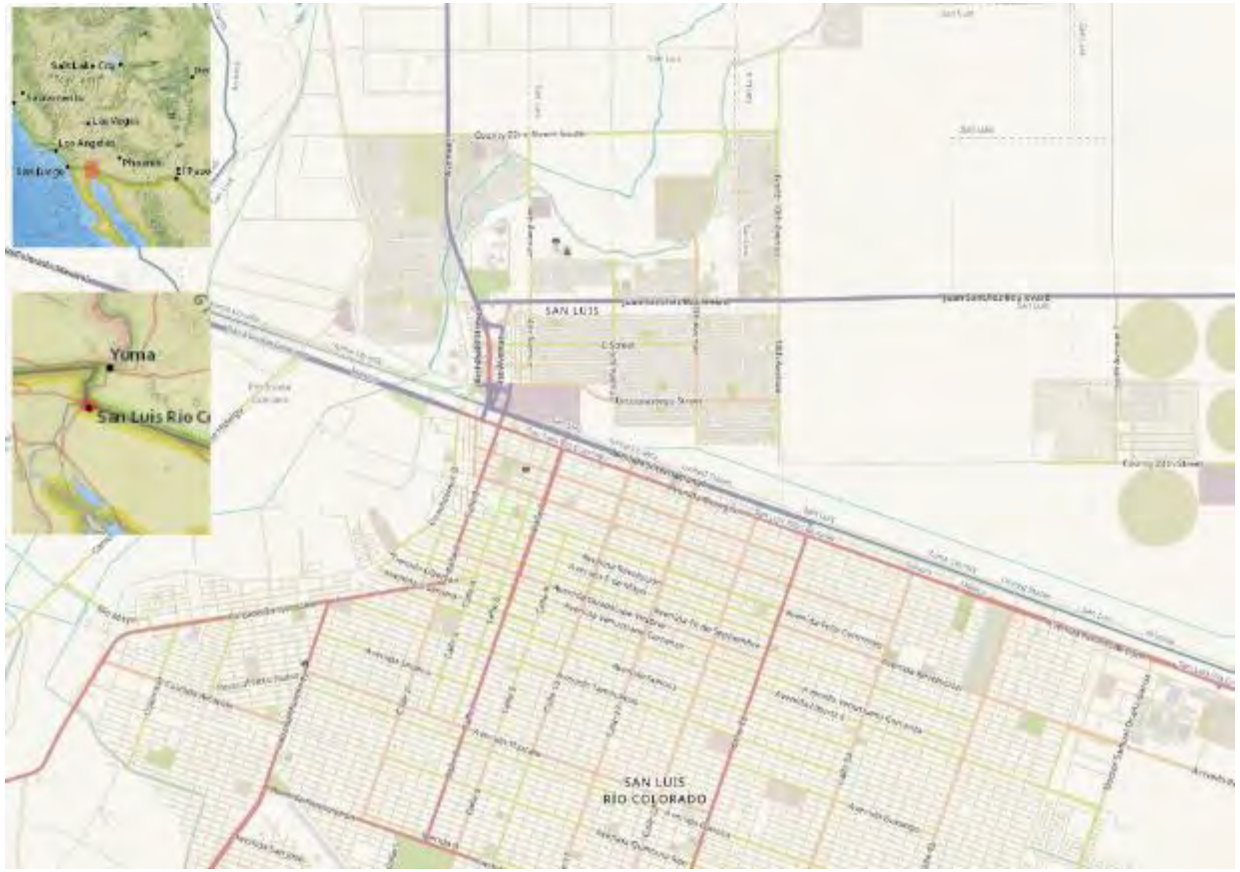
Project Background

- The City of San Luis has witnessed tremendous growth in population from ~17,000 in 2000 to ~35,000 in 2017. This growth is expected to continue, and the population may reach ~47,000 by 2025 as estimated by the Arizona Commerce Authority. To sustain the expected growth, the City intends to invest in infrastructure in order to meet the needs of residential, commercial, industrial and power generation segments. As part of this effort, the city has made additional land available for future development.

- On the other side of the border San Luis Rio Colorado is also experiencing growth, and current population is over 200,000 people. Together, the two regions have grown with nearly 3 million vehicles crossing the Land Ports of Entry ("LPOE") acting as a gateway to international commerce.

- Under these considerations, and in the interest of meeting future energy and infrastructure needs for the region, the City of San Luis has proposed this study for a feasibility review and evaluation into developing natural gas supply and distribution grid infrastructure for the communities of San Luis, Arizona and San Luis Rio Colorado, Sonora.

San Luis and San Luis Rio Colorado Location



Project Objectives

1. Quantification of existing and future gas demand in San Luis and San Luis Rio Colorado.

2. Evaluating potential sources of gas supply in the region.

3. Identifying various infrastructure and commodity options available to meet the demand.

4. Providing a preliminary design of pipeline infrastructure to the source and to the distribution network.

5. Identifying regulatory requirements that affect the development of this project.

6. Assessing the techno-economic feasibility of the project by combining the demand, supply, commodity options, design and costs.

Report Organization

The Preliminary Executive Summary Report, submitted in May 2020, provided an outline for the report as a whole, summarized the initial results, and laid the foundations for what would be considered in terms of market demand and gas distribution costs. This Part I expands upon the preliminary report to include:

- **Section 3** ***Current Situation*** **-** Explains the location and key population facts of the city, the business and economic planning outlook, the existing natural gas infrastructure, the customers and the need for the project.
- **Section 4** ***Demand Estimation*** **-** Presents a forecast model with two scenarios for the potential demand for San Luis, AZ and San Luis Colorado from 2021-2038. The model forecasts the demand for the residential, commercial, industrial and transport sectors, amongst others.
- **Section 5** ***Supply Analysis*** **-** Describes basins characteristics and pricing where natural gas could potentially be sourced from, explains the existing natural gas transmission infrastructure in the area and explains the local distribution network.
- **Section 6** ***Routing and Conceptual Design*** **-** Provides information on the conceptual background, the pipeline layout and proposed route, the pipeline sizing and considerations, initial cost estimates, development timeline, and layout for a compressed natural gas (CNG) station with cost estimate and development timeline.
- **Section 7** ***Supply Alternatives*** **-** Explains the project's supply alternatives: from the north, the east, and by LNG trucks.
- **Section 8** ***Economic Feasibility*** **-** Explains the project's feasibility from the perspectives of finance, supply, and demand. It also provides estimated savings of switching to natural gas when compared to the alternative options.
- **Section 9** ***Regulatory Requirements*** **-** Explains the different regulatory requirements for cross-border, federal, state and local levels.
- **Section 10** ***Conclusions and Recommendations*** **-** Provides the key conclusions from the study and recommendations.

3 | *Current Situation*

Overview (1 of 2)

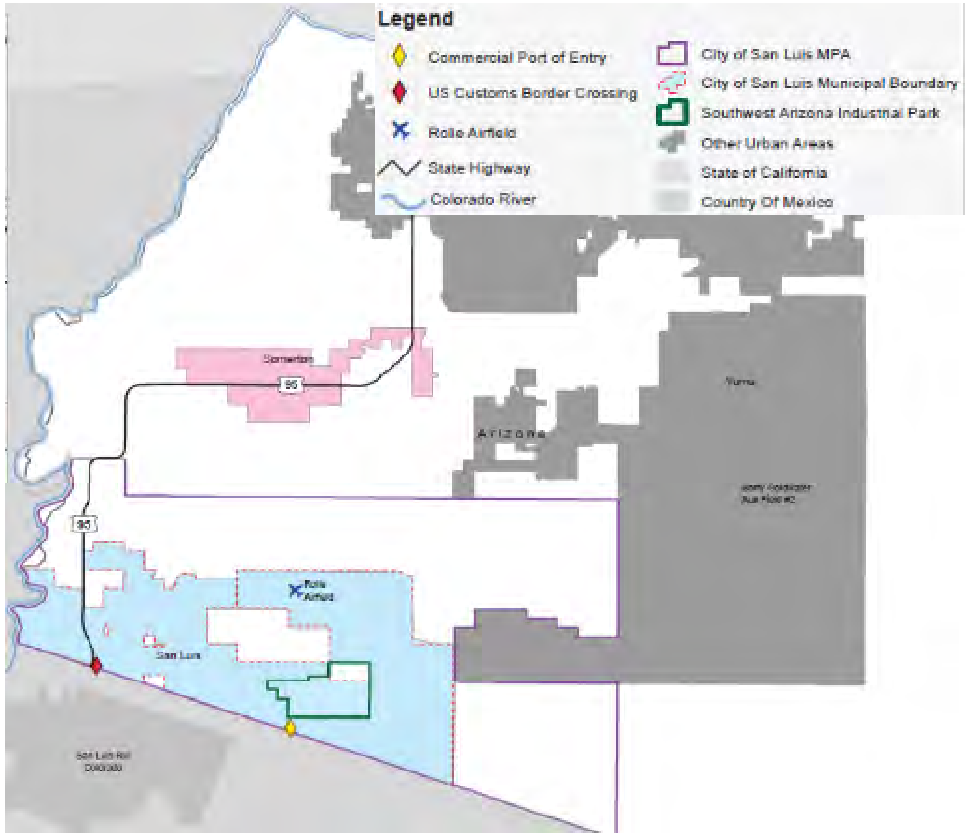
Location and Key Facts

City of San Luis is located at the international border of the United States and Mexico in Southern Arizona and acts as a key corridor to trade between the two countries. San Luis Municipal boundary spans nearly 33 square miles and is show in the blue color in the map. The city include two border crossings with Mexico as marked in the map: US Customs Border Crossing (mostly non-commercial traffic) and Commercial port of Entry. Since year 2000, the city has seen highest growth in population as compared with City of Yuma and Somerton. Following are some of they key facts about the city of San Luis:

- Between 2016 and 2017 the population of San Luis, AZ grew from 34,782 to 35,289, a 1.5% increase.
- Between 2018 and 2019 the population of San Luis, AZ grew from 36,250 to 37,843 a 4.4% increase.
- **2020** (Estimated): *39,390**
- Household **2020** (estimated): *9,849*

* Population of San Luis projects to increase rapidly to 54,123 by 2030. This report follows the population growth estimate of the Arizona Office of Economic Opportunity.

Map of the City of San Luis



Overview (2 of 2)

Key Businesses and Economic Planning outlook

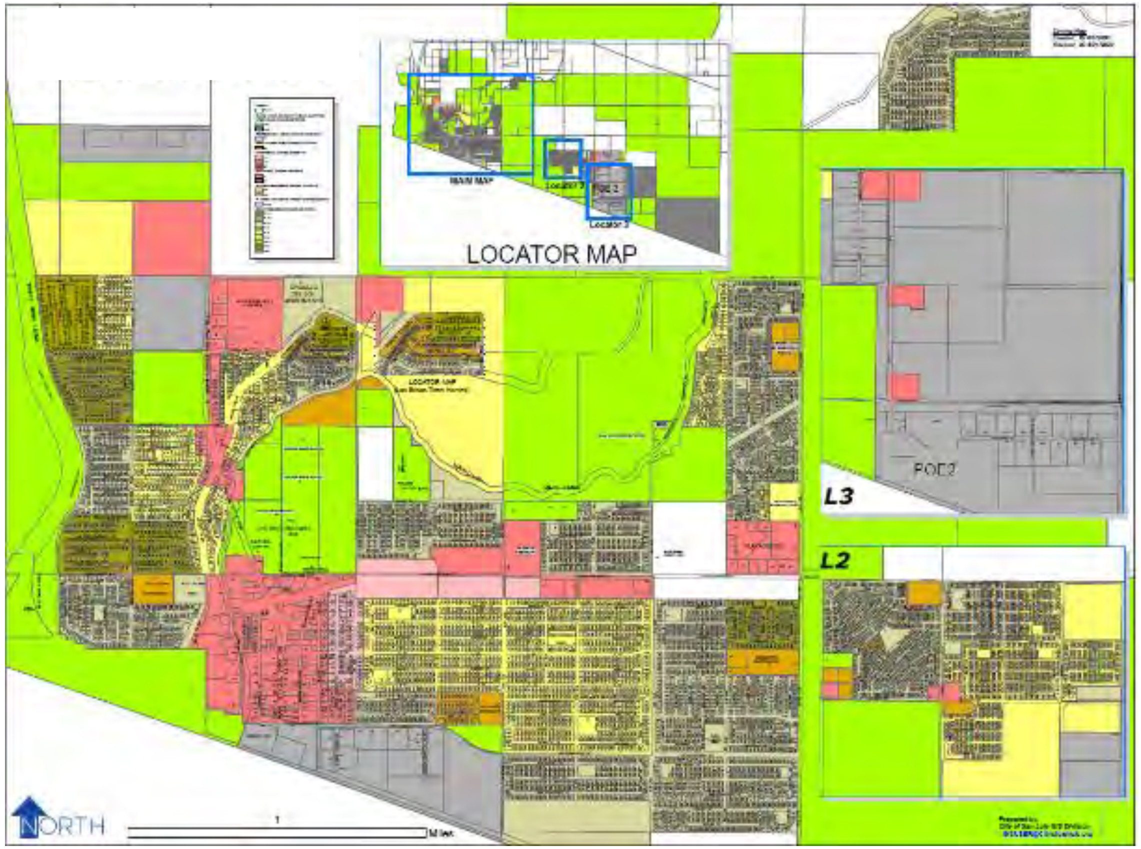
- Primary economic sectors in the City of San Luis include agriculture, retail and manufacturing. Currently, the three largest employers in the region are the school district, Advanced Center Technologies Call Center and Arizona State Prison.

- The City is witnessing tremendous growth in industrial, manufacturing and residential (real estate) investments. In fiscal year 2019, more than $50 million worth of investments was completed or were in planning stages including warehouses, textile manufacturing facilities, and a medical among other commercial and industrial initiatives.

Key commercial drivers:

- Cost competitiveness for electricity generation to expand industrial and commercial production.
- Alternative energy production including solar, wind, and natural gas.
- Alternative home fuels.

Zoning Map of the City of San Luis



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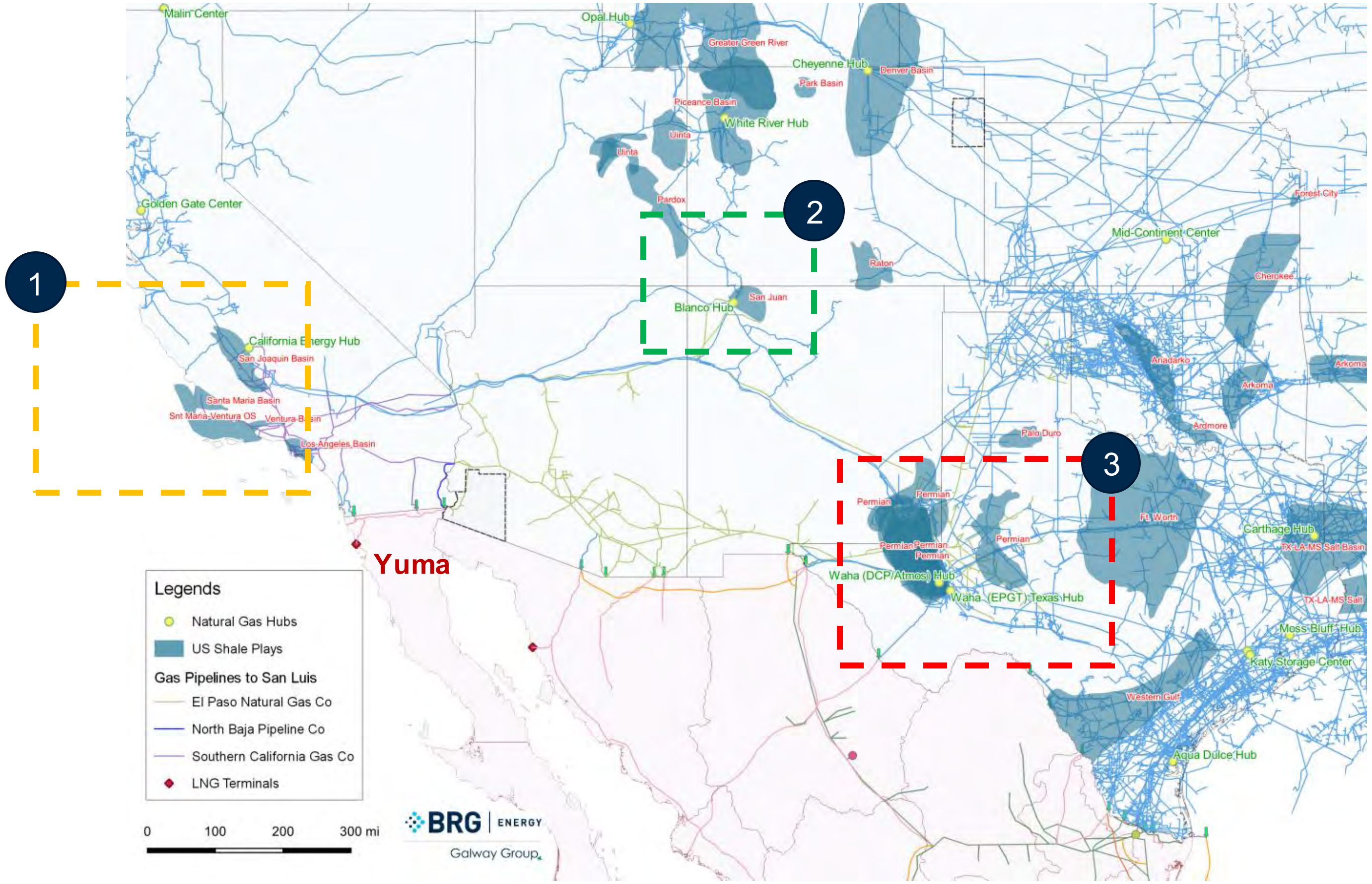
Existing Natural Gas Infrastructure

Two gas transmission pipelines with potential to supply into the San Luis region gas and an LDC – Southwest Gas

Natural gas in the Greater Yuma region is supplied from the San Juan (2 in the map) and Permian basins (3 in the map). The infrastructure players involved are:

- Two major transmission pipelines in the region:
  - ***El Paso Natural Gas Pipeline (EPNG)* - A** large network of pipelines passing through several states and owned by Kinder Morgan.
  - ***North Baja Pipeline* -** An 86 mile (138 km), bi-directional natural gas pipeline operating between Arizona, California, and Mexico, owned by TransCanada.
- A local gas distribution company (LDC):
  - **Southwest Gas -** A large LDC operating mostly in Arizona, California and Nevada.



Existing Customers Location

Customers are categorized in several key segments.

- ***Residential*** **-** Only a small community on the north side of the city is currently served with natural gas connections.
- ***Commercial*** **-** Gas supply is also available at Walmart, in the north part of the City, as well as some establishments in the industrial complex.
- ***Industrial*** **-** Gas supply is available at Piana Nonwovens on the north area of San Luis.
- ***Other*** **-** Existing customers include the Detention Center, the Arizona State Prison and the Arizona Western College in the north of the City.

The groups included herein within each of the segments are already served with natural gas, as such we have excluded them from the future demand projection.

>>>Detailed demand estimation in the following section.

4 | *Demand Estimation*

Demand Overview

Natural gas is a preferred low-cost fuel that can serve various customer segments

- Demand is the key driver for development of last mile natural gas infrastructure. It is imperative to understand the nature of demand as it directly impacts the considerations that must be taken into account for development of infrastructure.
- From a planning perspective, it is also necessary to understand how the demand is expected to evolve over the years to determine necessary flexibility that must be incorporated.
- In this report demand was estimated in two regions (the City of San Luis and the Southwest Arizona Industrial Park) and segmented as follows:
  - ***Residential -*** *D*emand in this segment is primarily for heating requirements and household appliances. Typical uses include cooking, space and water heating (e.g. fireplace), and usage in other appliances such as a dryer.
  - ***Commercial -*** *D*emand in this segment is mostly required for heating purposes in heavy duty gas burners and commercial kitchens.
  - ***Industrial -*** *T*his segment mostly uses natural gas for boilers, compressors, generators, space heating and for the processing of industrial goods.
  - ***Transport -*** This segment uses natural gas as an alternative to gasoline or diesel fuel. Vehicles could either be retrofitted or purchased new.
  - ***Other -*** Includes government buildings, schools, and other facilities.

Demand Estimation Methodology (1 of 4)

Demand estimation was carried out in two geographic region of San Luis:

- **City of San Luis -** covering 33 sq. miles and includes the incorporated city limits and land in unincorporated areas of Yuma County.
- **Southwest Arizona Industrial + Magrino Industrial Park -** covering over 250 acres.

Step 1: Classification of demand segments: Within these regions, the demand was further classified by segments as following:

- ***Residential*** **-** Natural gas could be used for space heating, cooking and water heating.
- ***Commercial*** **-** Covers grocery stores, Walmart, restaurants, retail stores and a brewery. Natural gas could be used for cooking and refrigeration, space heating and other processing needs.
- ***Industrial*** **-** Covers the medical waste incinerator, medical mall, food processing facilities, refrigerated and nonrefrigerated warehouses and residential projects (Belleza del Desierto Phase I and II, Santa Cecilia and a high-density residential area of 4 acres). Natural gas would be used for electricity generation and other manufacturing needs.
- ***Transportation*** **-** Covers school buses and refuse trucks. Natural gas would be used as an alternative fuel to gasoline or diesel fuel.
- ***Other*** **-** Covers schools and Government buildings (except for the Prison Complex and the Detention Center). Natural gas could be used for space heating, electricity generation, cooking and refrigeration, as applicable.

>>> The report estimates the demand for each segment in a bottom-up approach. The estimation methodology is explained in the next slides.

Demand Estimation Methodology (2 of 4)

Step 2: Identification of natural gas connections per segment: Following a bottom-up approach, the report quantified the number of potential natural gas connections in each of the segments as follows:

- ***Residential -*** For the demand of natural gas, each residential connection forms a single basic unit, with each residential unit equal to 1 household of four people.
- ***Commercial -*** *T*he data for this segment is collected via geographical information system (GIS) in the region and via documents provided by government officials of the City of San Luis.
- ***Industrial*** **-** The data for this segment is collected from information provided by government officials of the City of San Luis, GYEDC (confidential) and public sources.
- ***Transportation -*** The demand for this segment is aggregated at a CNG station, whereas the data on the number of vehicles is collected from information provided by the City of San Luis.
- ***Other -*** The demand for this segment is identified using GIS systems and validated via discussion with the City of San Luis team.

The number of connections estimated for each of the segments represents the maximum number of connections that could be possible today if each segment converts from their existing fuel to natural gas. The breakdown of these connections are provided separately in a spreadsheet format and can be found as Annex 1 of this report.

Demand Estimation Methodology (3 of 4)

Step 3: Forecasting increase in the number of natural gas connections per segment: After identifying the maximum number of connections that could be possible today, the report forecasts future potential connections, which will form the basis for decision regarding distribution pipeline capacity (sizing) and investment needs.

Drivers for growth in natural gas demand:

- ***Population -*** Projection for population growth was obtained from the Arizona Office of Economic Opportunity. Segments directly impacted by population changes are residential (number of households), commercial (number of set-ups to satisfy population needs), transportation (number of vehicles necessary to meet the transit requirement), and other segment.
- ***Industrial Segment -*** Under a conservative approach it is assumed natural gas demand will be from currently known industries solely. Still, it is likely that more industries will move into the region due to increasing skilled manpower and friendly industrial environment.

Penetration Rates Following a conservative approach, the model considers that only a fraction of the demand will convert to natural gas over time. This is represented in the model by the following penetration rates:

- ***Early Adopters -*** *S*egments assumed to adopt natural gas as their primary fuel source quickly such as grocery stores and new build buildings such as future developments in the Industrial Park, automobile factory, brewery, medical waste incinerator, medical mall, refrigerated and non-refrigerated warehouses and food processing facilities.
- ***Mid Adopters -*** *S*egments assumed to convert to natural gas at slower pace in the earlier years and grow towards a ceiling in time such as residential buildings near natural gas connection centers, retail stores near main street, schools and Government buildings.
- ***Step Adopters -*** Represent a segment where adoption of natural gas takes place in batches (eg. 10% buses every 2 years) such as and elementary buses, high school buses and refuse trucks.

Demand Estimation Methodology (4 of 4)

Step 4: Association of potential demand

- Natural gas consumption benchmark information was gathered from different sources (e.g. US Energy Information Administration, Department of Energy, Environmental Protection Agency, and several other public and private sources) for each of the identified connections in each of the five segments. The tables on the right side provides a brief summary of these breakdown of these benchmarks:
- The consumption benchmarks were used to derive the potential demand in the various segments.

Total estimated annual gas requirement in 2021 is around : 2,623,661 therms with a potential demand of 38,665,140 therms when industrial projects are developed

City of San Luis — 2021

Category	Count (# of units)	Demand per Unit (Therm/Year)
Residential	10,231	100
Commercial		
Restaurants	43	10,820
Stores	16	503
Brewery	1	42,391
Grocery store	5	2,611
Transport		
Elementary School Busses	32	2,501
Refuse Trucks	7	12,770
High School District	101	2,501
Others		
Schools	12	43,827
Government	6	5,708
Industrial		
Automobile Factory	1	100,000

Industrial Park — 2021

Category	Count (# of units)	Demand per Unit (Therm/Year)
Industrial		
Medical Waste Incinerator	1	2,978,400
Medical Mall (Other medical fa	1	24,343
Food Processing	2	450,472
Refrigerated Warehouse	3	5,392
Nonrefrigerated Warehouses	4	14,340
Medical Device	1	536,500
Industrial Projects to be Developed		
Industrial Projects to be Developed (San Luis Location)	17	1,024,711
Industrial Projects to be Developed (Undecided Location)	28	504,281
Residential		
Belleza del Desierto- Phase I	90	100
Belleza del Desierto Phase II	90	100
High Density Residential	96	100
Santa Cecilia	140	100

>>> In the next section, we estimate demand in each of the segments.

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San Luis Demand Summary

Overview

Demand Case Definition

For ease of understanding an expected penetration in the market, we have categorized our demand analysis covering two cases:

(a) **100% Adoption Scenario:** This scenario will define the demand ceiling for the region. Demand ceiling refers to an event when each of the identified participants/stakeholder decides to adopt natural gas its primary fuel for the mentioned purposes, displacing alternate fuel such as electricity, propane, gasoline or other.

(b) **Potential Adoption Trend Scenario:** This scenario will demonstrate a relatively more realistic case where adoption in various segments will follow a trend for adoption. These trends are further categorized into:

   (a) Early Adopters;

   (b) Mid Adopters; and,

   (c) Step Adopters;

Within each segment (as defined earlier) total penetration is defined to a maximum level. For example, maximum penetration in residential segment is assumed to 10%. Such conservative approach is reflective of choice that residential customer may make depending on ease and hassle of conversion.

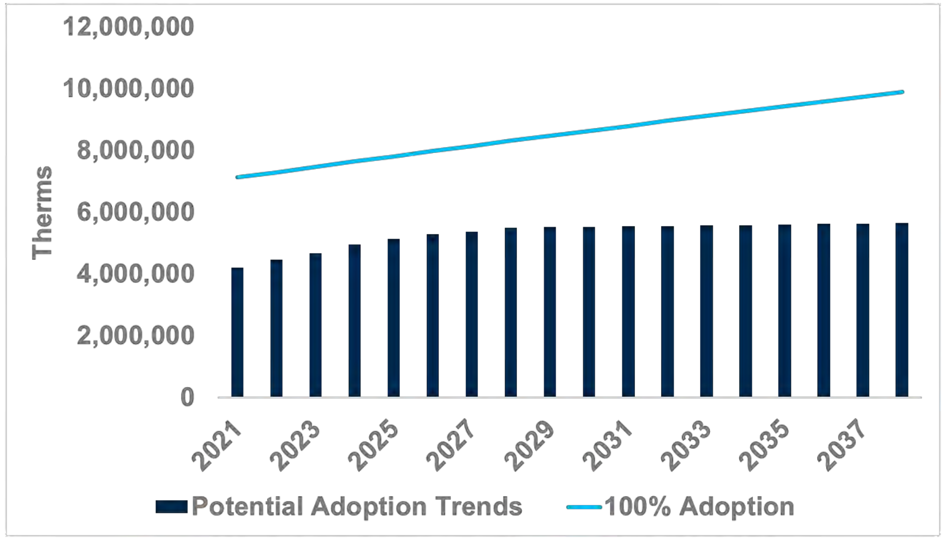
Following slides provides the resulting demand from each of these scenarios

Summary of Results (1 of 6)

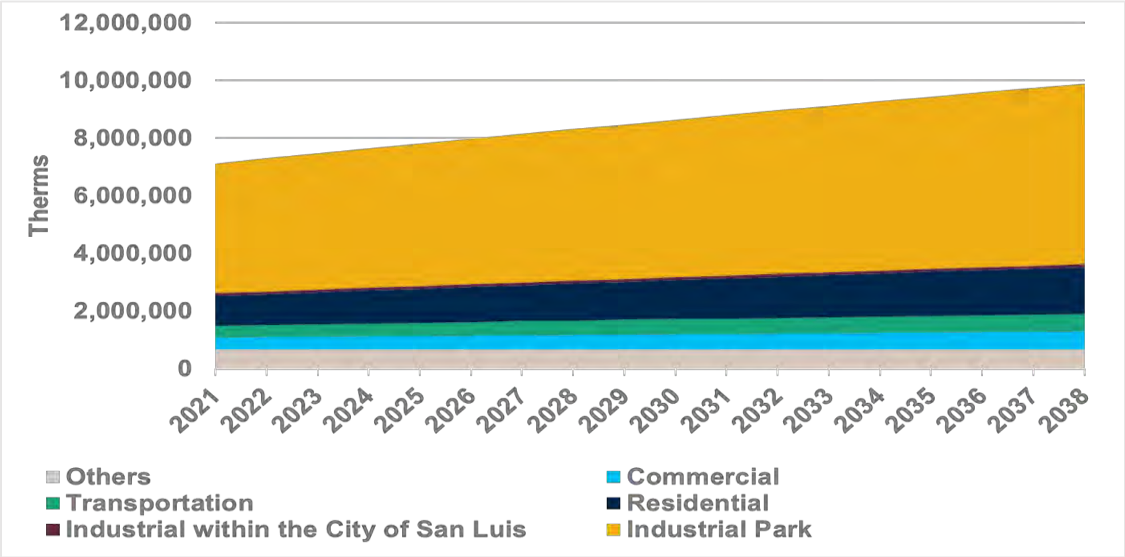
100% Adoption Scenario 2021-2038, Detailed

- The 100% Adoption scenario shows a higher potential demand, however, conversion in year 1 by all potential consumers unlikely due to cost, choice, and accessibility constraints.

100% Adoption vs. Potential Adoption Trends



Potential Gas Demand - 100% Adopters



Segment	% of NG Demand Increase
Residential	59%
Transport	52%
Commercial	50%
Industrial	44%
Other*	Demand not expected to change beyond adoption in year 1.

- This scenario reflects increase in the number of units due to increase in the size of the population and expansion in the industrial zone of San Luis Arizona.

* *Other encumbers schools, Government buildings, the medical device and the call center*

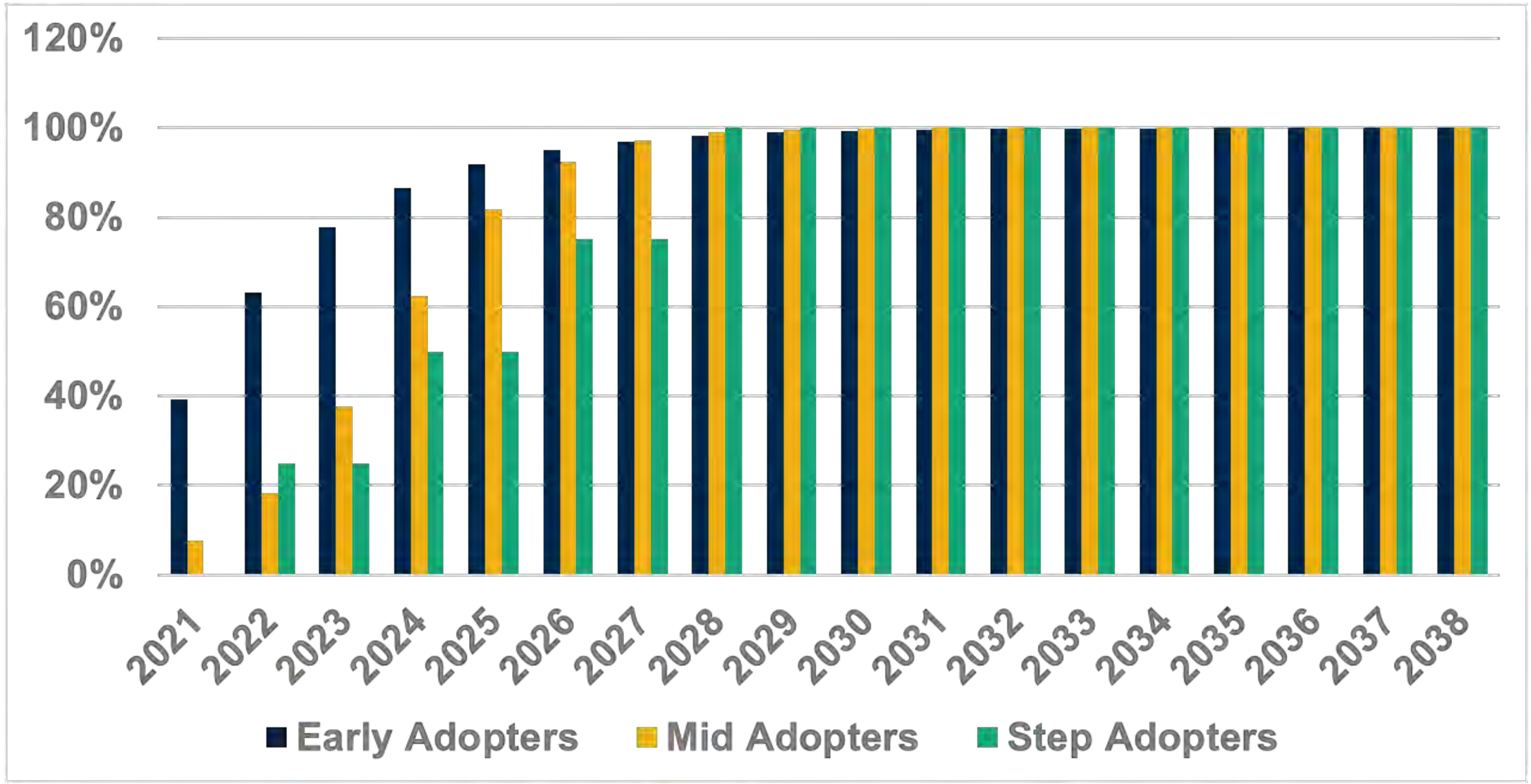
Summary of Results (2 of 6)

Potential Adoption Trends Scenario 2021-2038

- In this scenario, 39% of early adopters and 8% of mid adopters would transition towards natural gas in year 2021.
- In year 2022, 25% of step adopters will begin transitioning to natural gas.
- Early adopters will reach 100% adoption rate by year 2031, while mid and step adopters should reach full adoption by year 2029.
- This is because although early adopters show interest in changing quickly, cost and accessibility play a factor in when the transition actually takes place.

>>> The breakdown of this scenario is provided separately in a spreadsheet format and can be found as Annex 2 of this report.

Potential Gas Demand – Adoption Scenarios



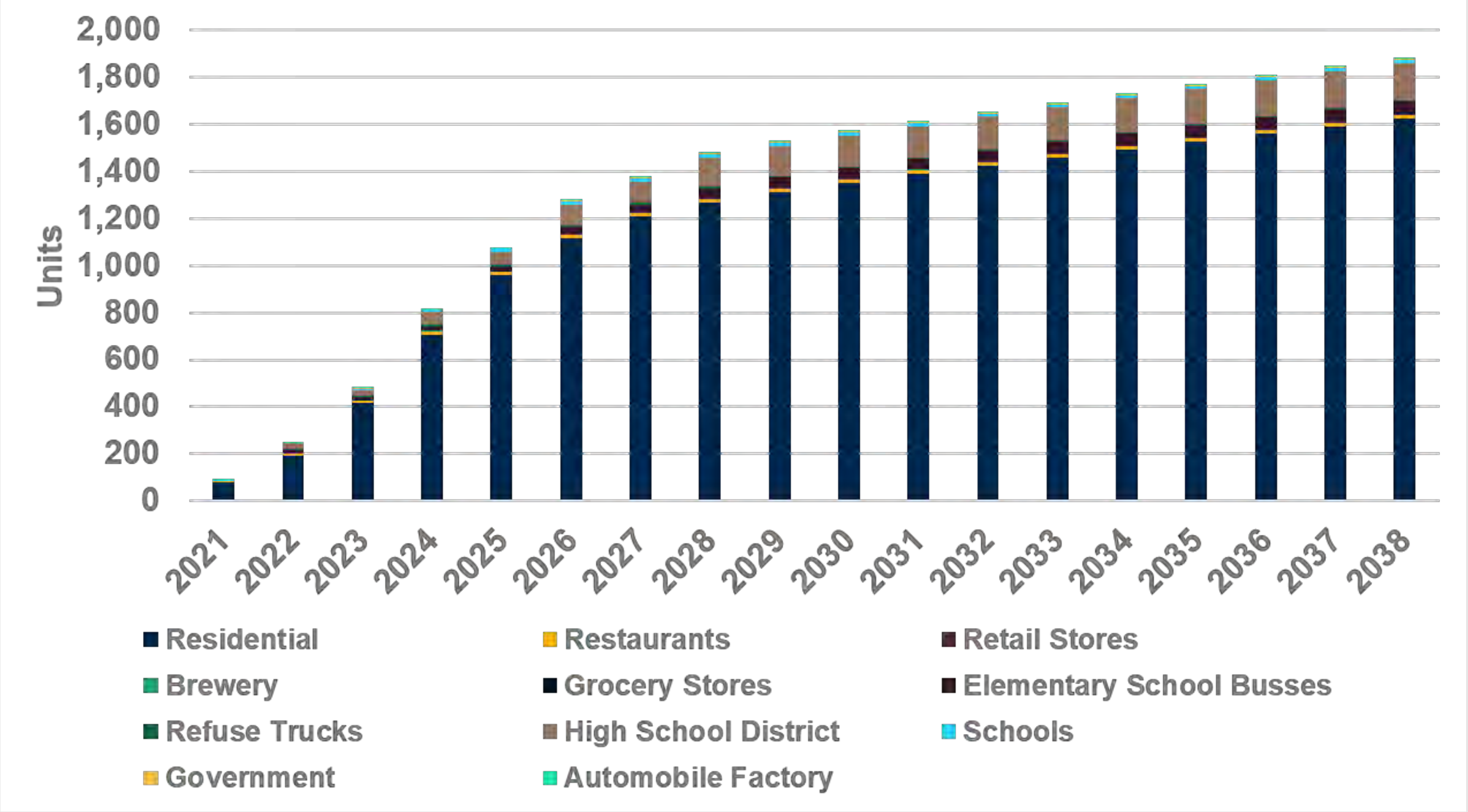
Summary of Results (3 of 6)

Potential Adoption Trends- Adoption per Units

- The database has identified over 10,000 residential units driven by the population growth. It is unlikely to achieve 100% market penetration in the first year that natural gas is made available .
- It is estimated than 78 residential units will have natural gas available by 2021 and adoption for natural gas is expected to increase every year.
- The following table provide more details on the estimates of the potential penetration of natural gas in the residential, commercial, government, schools, and transportation, sectors.

Sector	*% of Adoption*
Residential	10%
Restaurants	80%
Retail Stores	20%
Brewery	100%
Refuse Truck	100%
Elementary School Busses	100%
High School District (Transport)	100%
Automobile Factory	100%
Schools	100%
Government Buildings	80%
Grocery Stores	15%

Potential Adoption Trends by Unit- City of San Luis



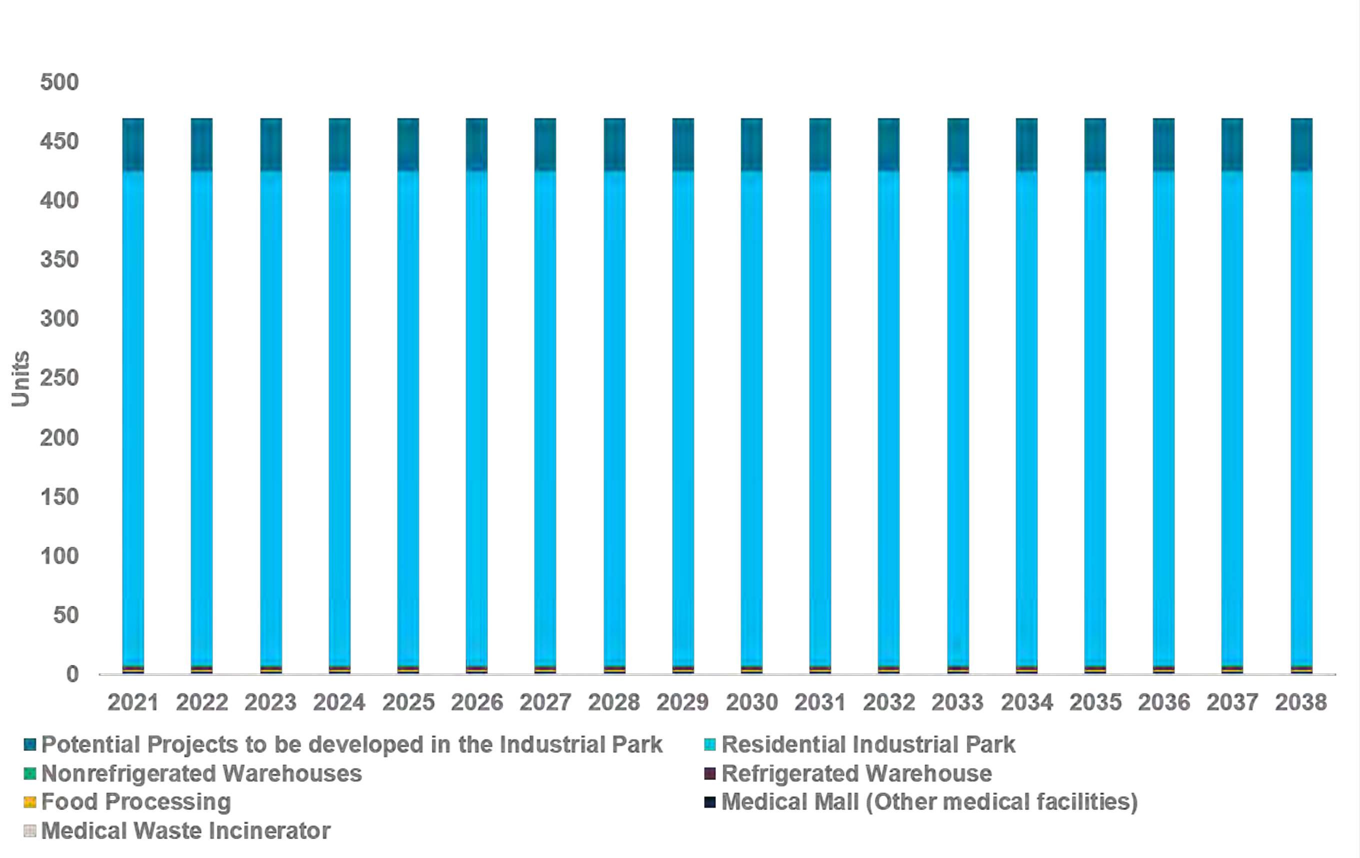
Summary of Results (4 of 6)

Potential Adoption Trends- Adoption per Units

- New-build facilities and residences in the industrial park will transition 100% towards natural gas demand.
- This may not the case, however, for facilities already existing.

Sector	*% of Adoption*
Residential Industrial Park	100%
Refrigerated Warehouses	50%
Nonrefrigerated Warehouses	60%
Food Processing	100%
Medical Mall (Other medical facilities)	100%
Medical Waste Incinerator	100%
Potential Projects to be Developed in the Industrial Park	100%

Potential Adoption Trends by Unit- Industrial Park



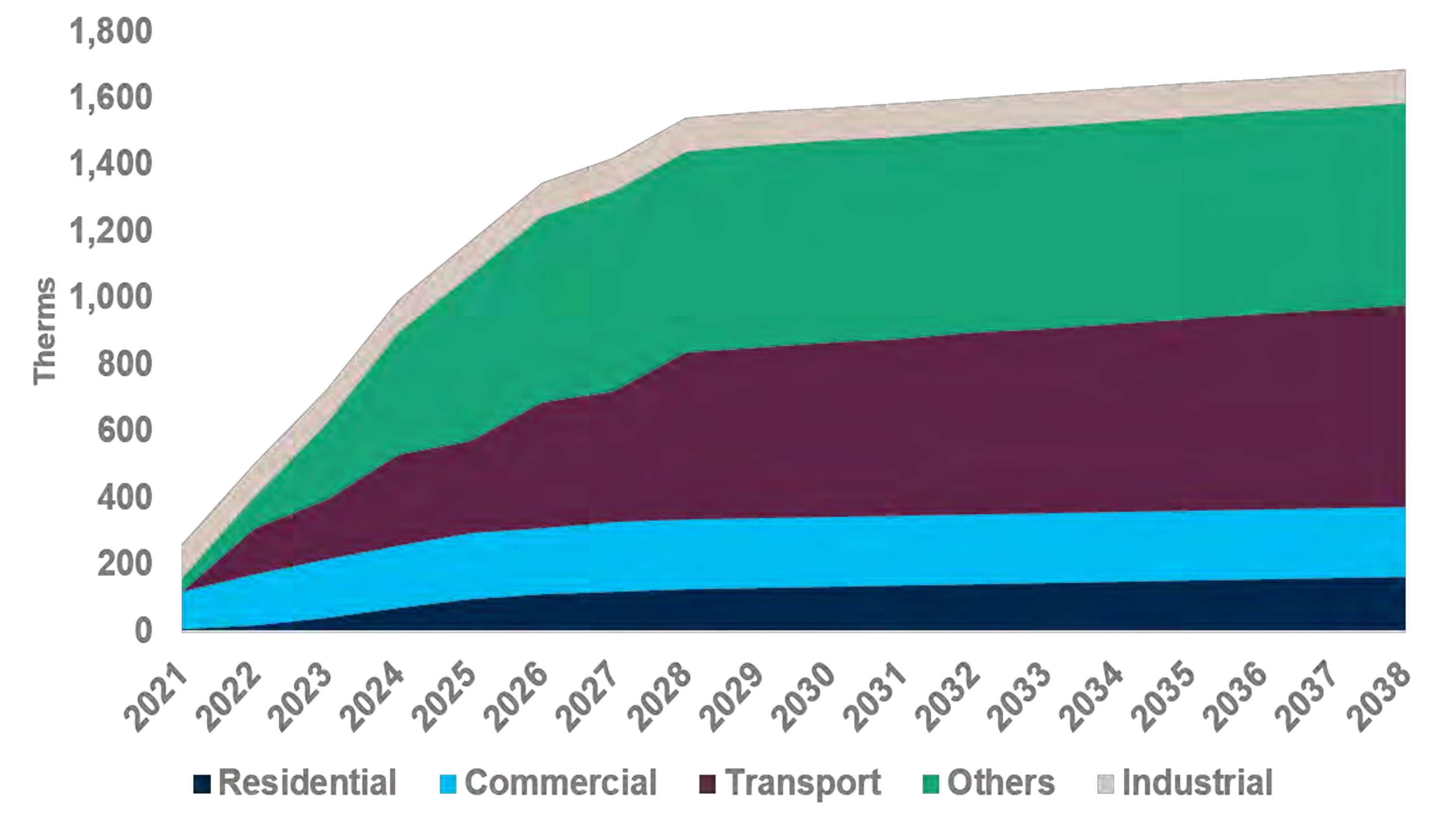
Summary of Results (5 of 6)

Estimated Gas Demand- Potential Adoption Trends 2021-2038 Projection (City Region)

Therms	*2021*	*2038*
Total Natural Gas Demand	262,095	1,697,469

- In year 2021, 78 residential units, 6 restaurants, the brewery, 1 grocery store and 1 school will have transitioned towards using natural gas.
- By year 2030, 1,388 residential units, 34 restaurants, 4 retail stores, 42 elementary school buses, 7 refuse trucks, 128 high school buses, 13 schools and 5 Government buildings will have transitioned towards using natural gas.
- By year 2018 these numbers are expected to have increased to 1,626 for residential, 5 retail stores, 50 elementary school buses and 157 high school buses.

Potential Adoption Trends in the City of San Luis (Thousand Therms)



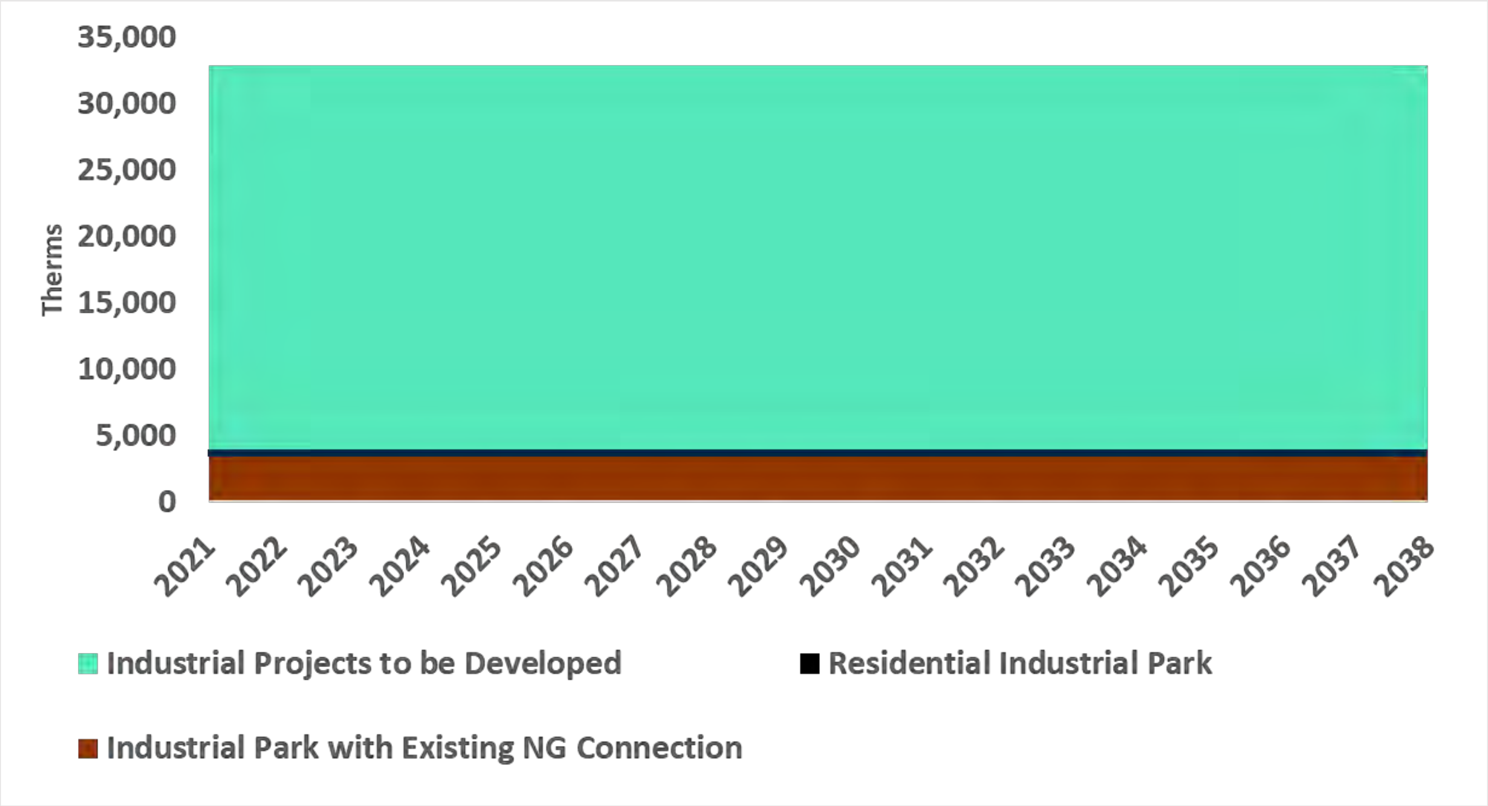
Summary of Results (6 of 6)

Estimated Gas Demand- Potential Adoption Trends 2021-2038 Projection (Southwest Arizona Industrial Park Region)

Therms	*2021*	*2038*
Total Natural Gas Demand	32,810,991	32,810,991

- Industrial sector consumption refers to two types of natural gas use – heating (and cooling), and fuel for industrial processing needs. The estimate of the total industrial sector demand for natural gas is about 32,810,991 therms per year.
- Total of 3,956,050 therms need of the existing infrastructure.
- Potential future demand and growth of 28,854,941 therms of the new infrastructure represent 100% market penetration.

Potential Adoption Trends in the Industrial Park (Thousand Therms)



San Luis by Sector

This section provides a revised estimate of the market potential for natural gas in the City of San Luis and Industrial Park. This market size is defined in terms of annual natural gas consumption for space and water heating, power generation, and industrial processing for structures and entities located in the city. The market demand estimates are used to size the gas transmission line and other facilities, and they are also key inputs to the financial, benefit-cost, and air quality analyses.

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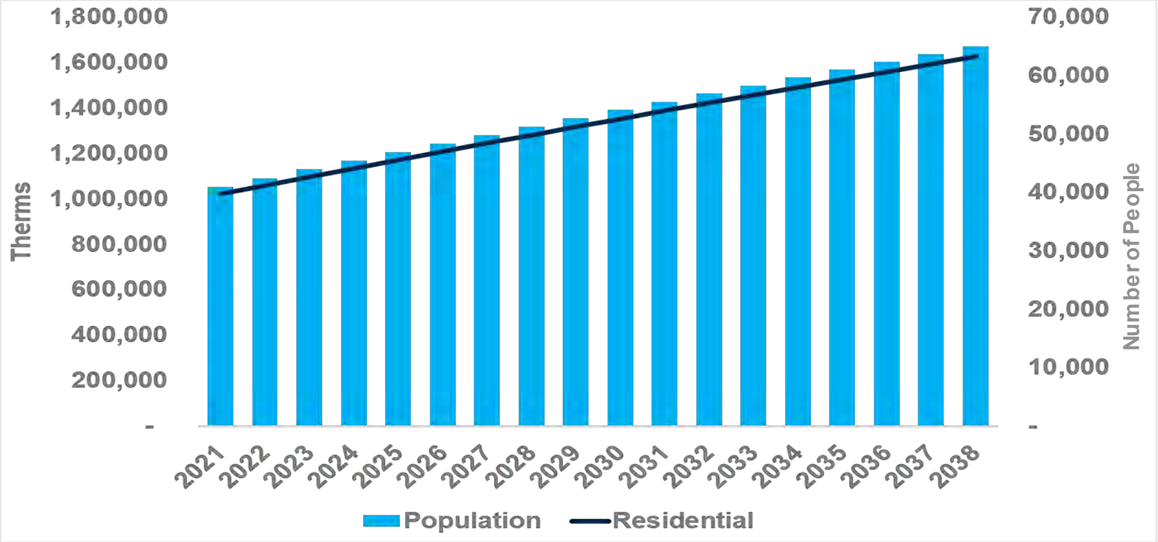
Residential

Residential Segment

100 % Adoption vs Adoption Trends Scenario 2021-2038

- This scenario envisions a lineal growth for adoption where all households adopt natural gas demand; assumes 100 therms of natural gas demand and 4 people per household.

100 % Adoption Scenario

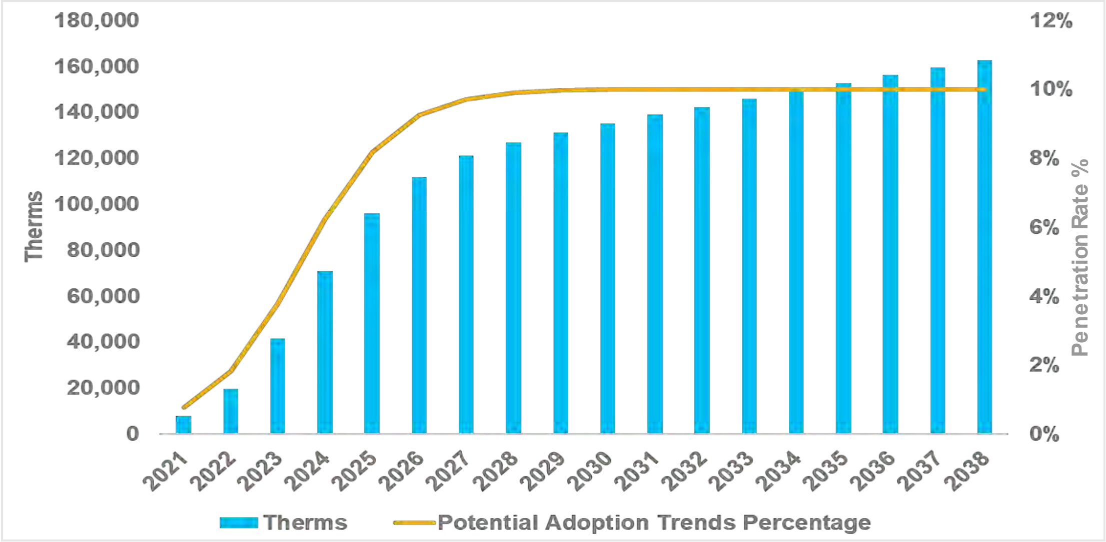


Residential	2021	2038
Therms	1,023,060	1,625,936
Units	10,231	16,259

- **2021** (estimated): *40,922*
- **2038** (estimated): 65,037

- Maximum adoption percentage (10%) will be reached by 2027.

Potential Adoption Trends Scenario



Residential	2021	2038
Therms	7,800	162,600
Total Units	78	1,626

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Commercial

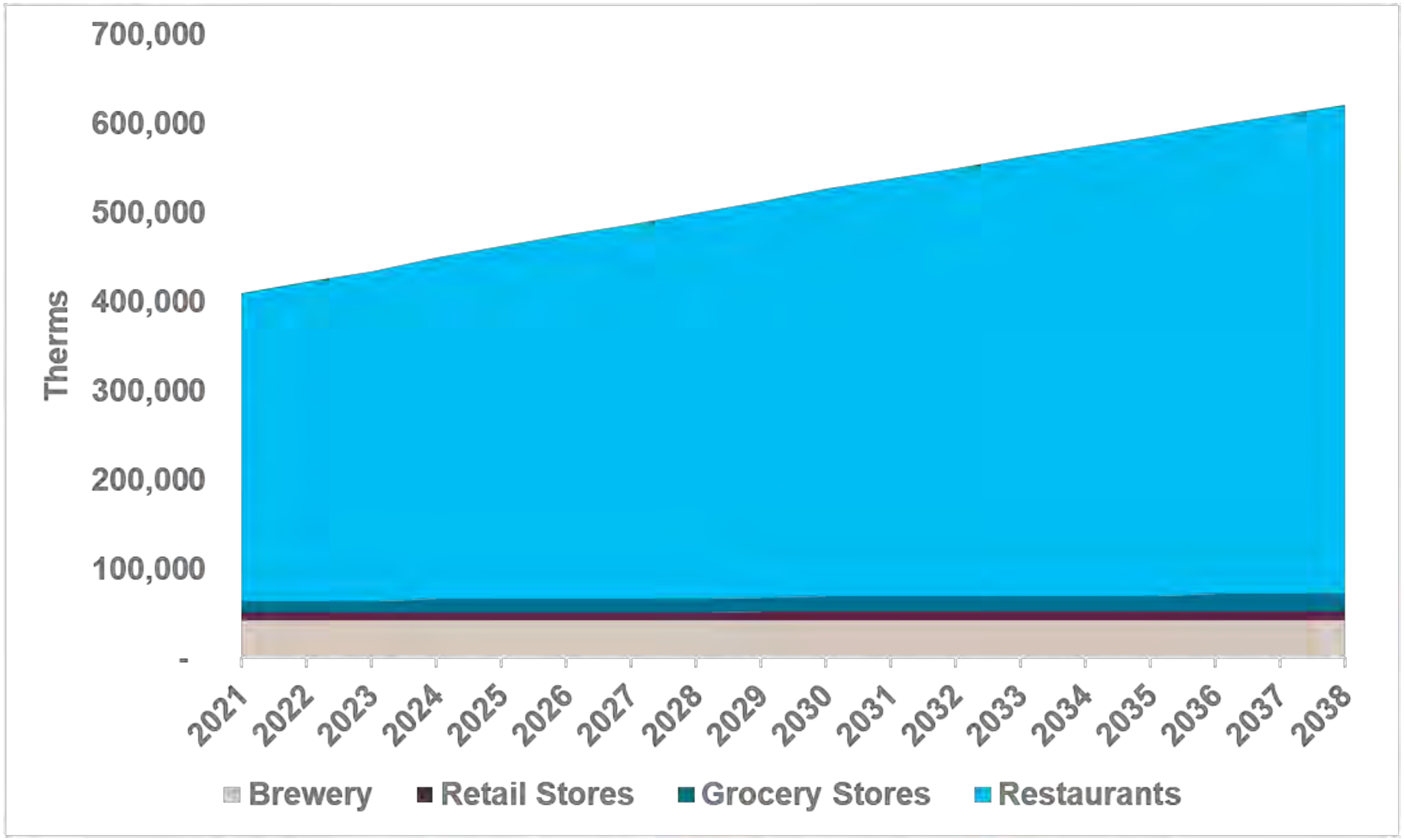
Commercial Segment (1 of 2)

100% Adoption Scenario 2021-2038 Detailed

- Only retail stores and grocery store units are expected to increase. Retail stores will increase from 16 to 25 units by 2038 and grocery stores from 5 to 8 units.
- Population growth is not a factor that influences natural gas demand patterns for the brewery, as the brewery's production capacity would be dependent upon other external factors, such as product demand. At this time we consider no capacity expansion for the brewery will take place, for which the demand for natural gas will remain constant.
- Our model assumed a rate of 78 restaurants per 100,000 habitants. Based on this, we do not forecast an increase in restaurant units however, we do expect an increase in demand for existing units as food preparation increases due to population growth.

	Therms	
Commercial	***2021***	***2038***
Restaurants	345,369	548,890
Retail Stores	8,040	9,045
Brewery	42,391	42,391
Grocery Stores	13,053	20,885

Potential Gas Demand in the Commercial Sector - 100% Adoption



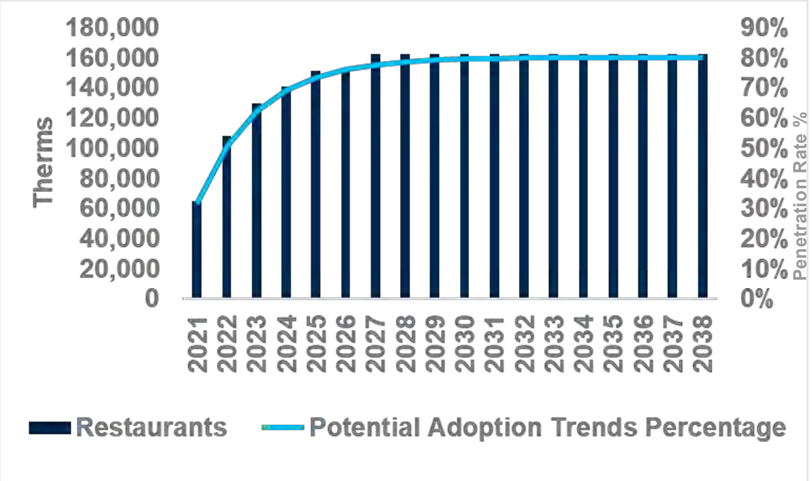
Commercial Segment (2 of 2)

Potential Adoption Trends 2021-2038 Detailed

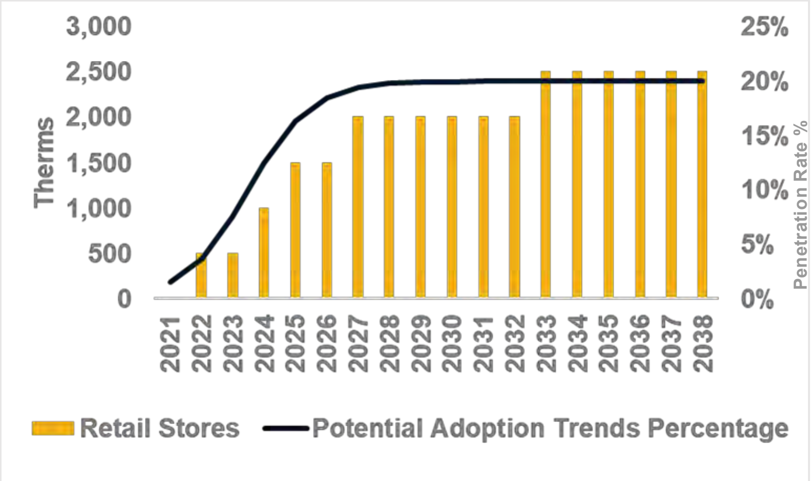
- We expect that approximately 80% of restaurants will switch to natural gas. We forecast that this penetration rate will be reached by 2031.
- On the other hand, we expect that only 20% of all retail stores will switch to natural gas and project that this penetration rate will be reached by 2028.
- We have assumed that, because it is a new-build, the brewery will operate on natural gas from the start.

	Therms	
Transport	***2021***	***2038***
Restaurants	64,920	162,300
Retail Stores	0	2,513
Brewery	42,391	42,391
Grocery Stores	2,611	2,611

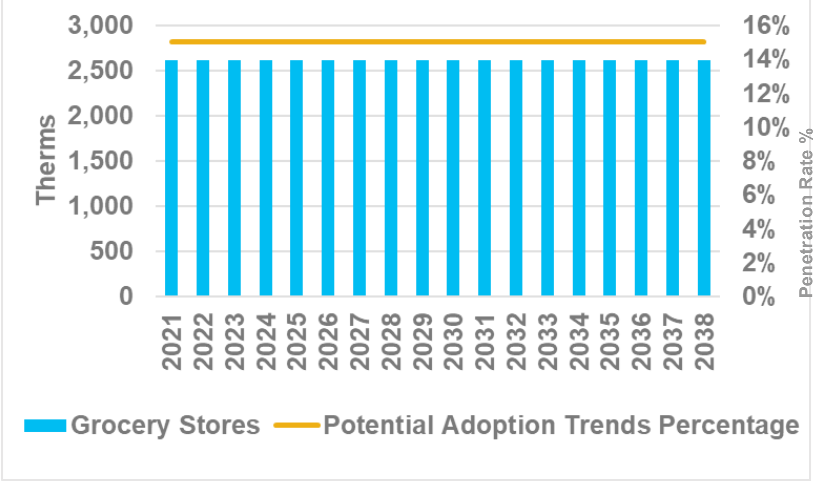
Restaurants



Retail Stores



Grocery Stores



Industrial

Industrial Segment (1 of 4)

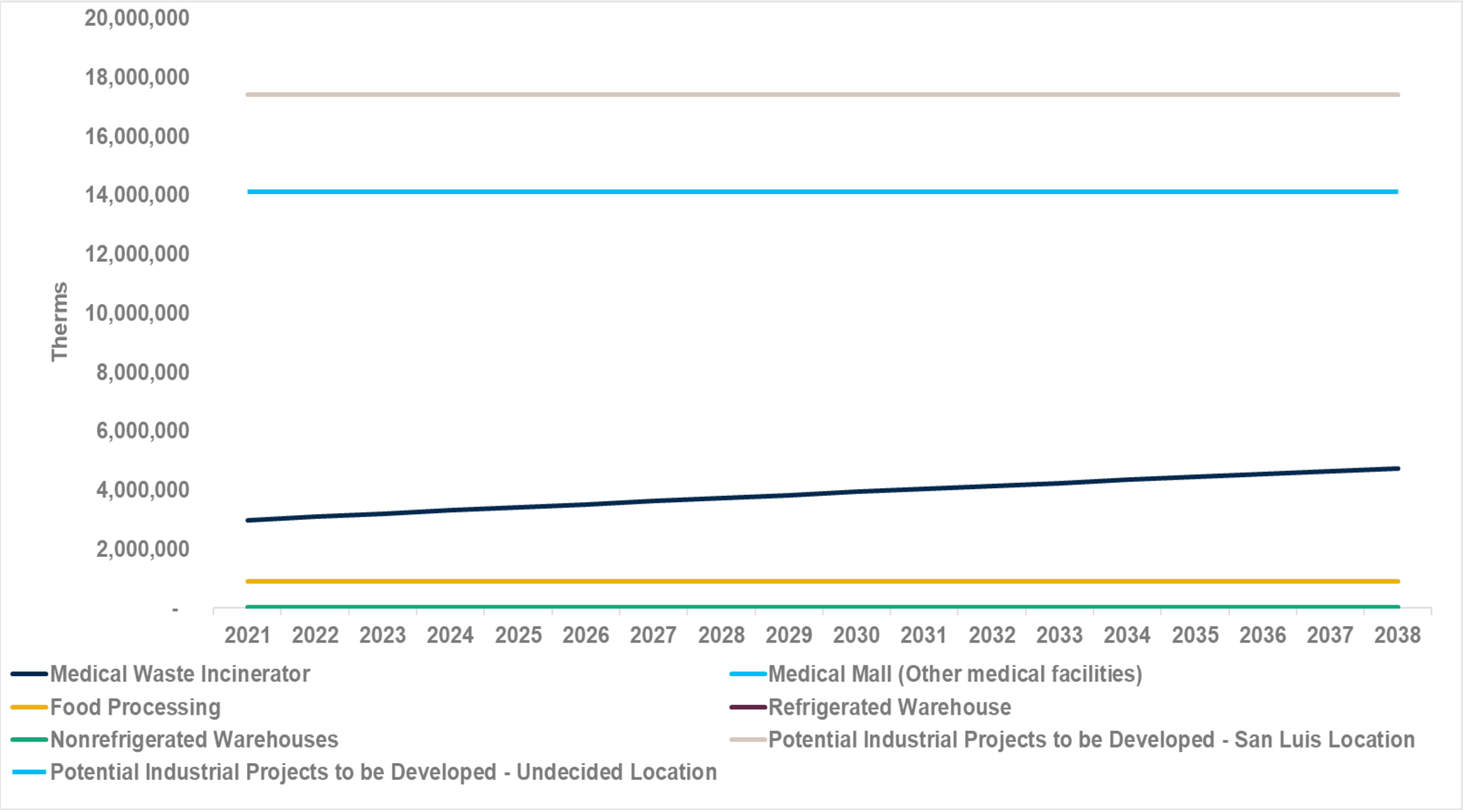
100% Adoption Scenario 2021-2038, Detailed Industrial Park with Existing NG Connection

- In the Industrial sector only the Medical Waste Incinerator is expected to show an increase in demand, correlating to an increase in the population, as the medical waste incinerator burns quantities in tons.

- No changes in demand are expected for the medical mall, food processing facilities, refrigerated and nonrefrigerated warehouse, potential projects to be developed nor the 416 lots planned for residential purposes.

		Therms	
Industrial	**Units**	**2021**	**2038**
Medical Waste Incinerator	1	2,978,400	4,733,534
Medical Mall	1	24,343	24,343
Food Processing	2	900,943	900,943
Refrigerated Warehouses	3	5,392	5,392
Nonrefrigerated Warehouses	4	14,340	14,340
Residential	416	41,600	41,600
Potential Industrial Projects to be Developed – Undecided Location	28	17,420,080	17,420,080
Potential Industrial Projects to be Developed – San Luis Location	17	14,119,882	14,119,882

100 % Adoption Scenario

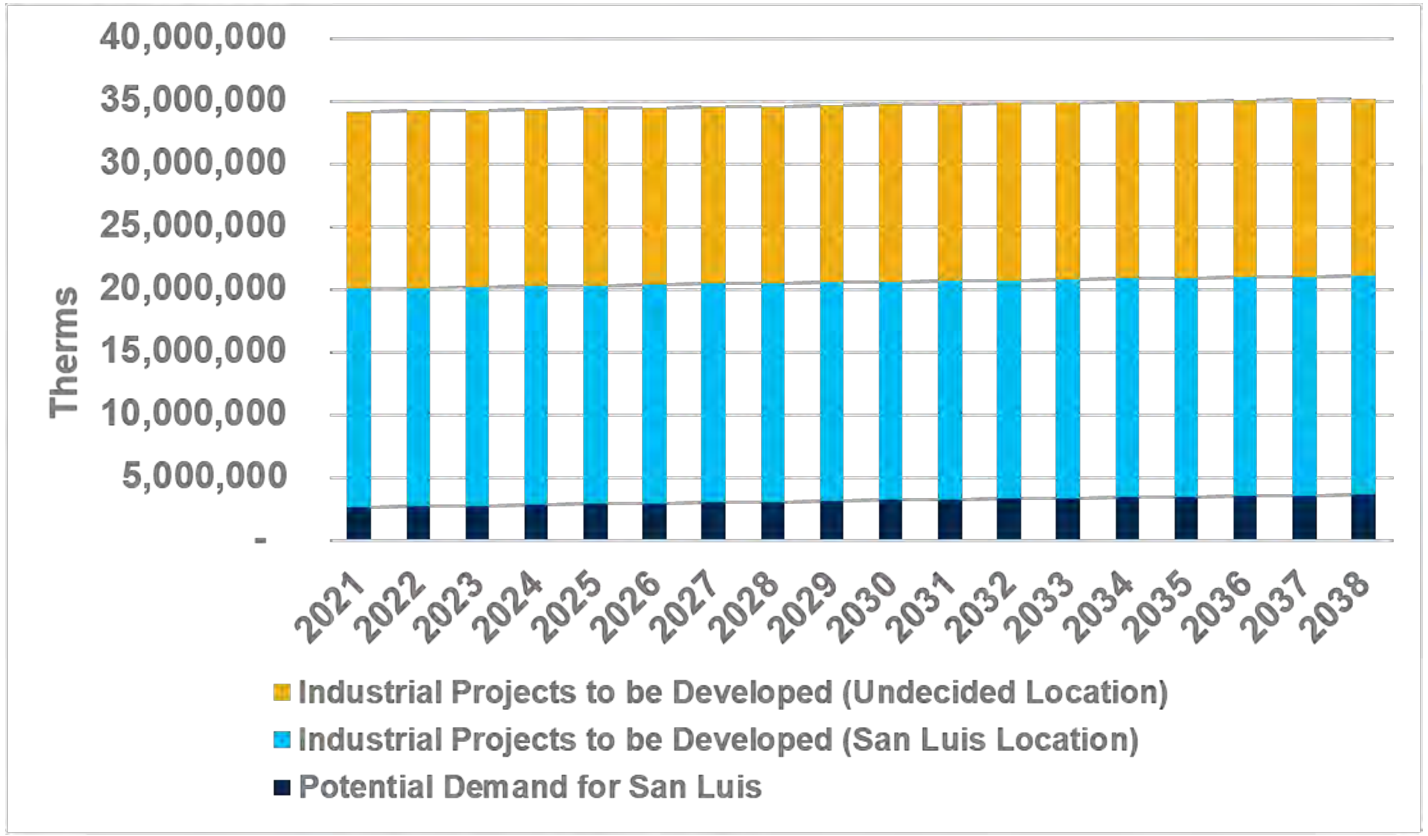


Industrial Segment-Potential Demand (2 of 4)

100% Adoption Scenario 2021-2038, Detailed Industrial Park with Existing NG Connection and Projects to be Developed

- If the facilities in the undecided and San Luis locations use natural gas, the requirement is estimated at approximately 31,539,962 therms per year.
- The potential demand for existing infrastructure grows from 7,182,988 therms in 2021 to 9,823,563 therms in 2038.
- Additional pipeline capacity would be required to meet this industrial demand in the future (larger pipeline connection from the transmission pipeline).

100 % Adoption Scenario in the Industrial Park and Potential Projects to be Developed



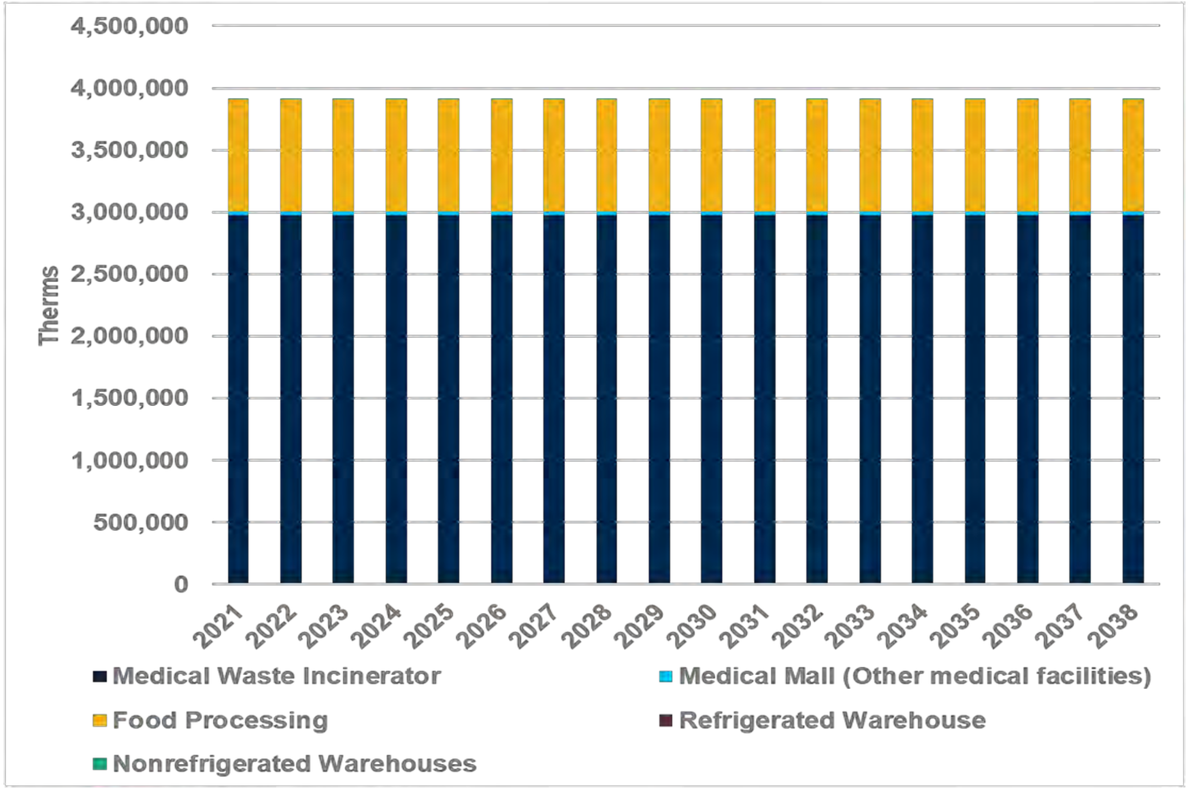
Industrial Segment (3 of 4)

Potential Adoption Trends 2021-2038- Industrial Park with Existing NG Connection

- The industrial sector and corresponding residential sectors are not expected to show an increase in natural gas consumption during the period.
- The adoption/transition towards the use of natural gas is likely to happen during year 2021, when infrastructure is available.

	Therms	
Industrial	***2021***	***2038***
Medical Waste Incinerator	2,978,400	2,978,400
Medical Mall	24,343	24,343
Food Processing	900,943	900,943
Refrigerated Warehouses	3,594	3,594
Nonrefrigerated Warehouses	7,170	7,170

Potential Adoption Trends Scenario



Industrial Segment- Potential Demand (4 of 4)

Potential Adoption Trends 2021-2038- Industrial Park with Existing NG Connection and Projects to be Developed.

– Because the facilities in the industrial projects in the San Luis and undecided locations would be newbuild natural gas is expected to be the primary choice. No increase in demand is projected for the facilities.

	Therms	
Transport	*2021*	*2038*
Industrial Park with Existing NG Connection	3,914,450	3,914,450
Industrial Projects to be Developed (San Luis Location)	17,420,080	17,420,080
Industrial Projects to be Developed (Undecided Location)	11,434,861	11,434,861
Residential Industrial Park	41,600	41,600

Potential Adoption Trends Scenario

BRG ENERGY & CLIMATE

Transport

Transport Segment (1 of 2)

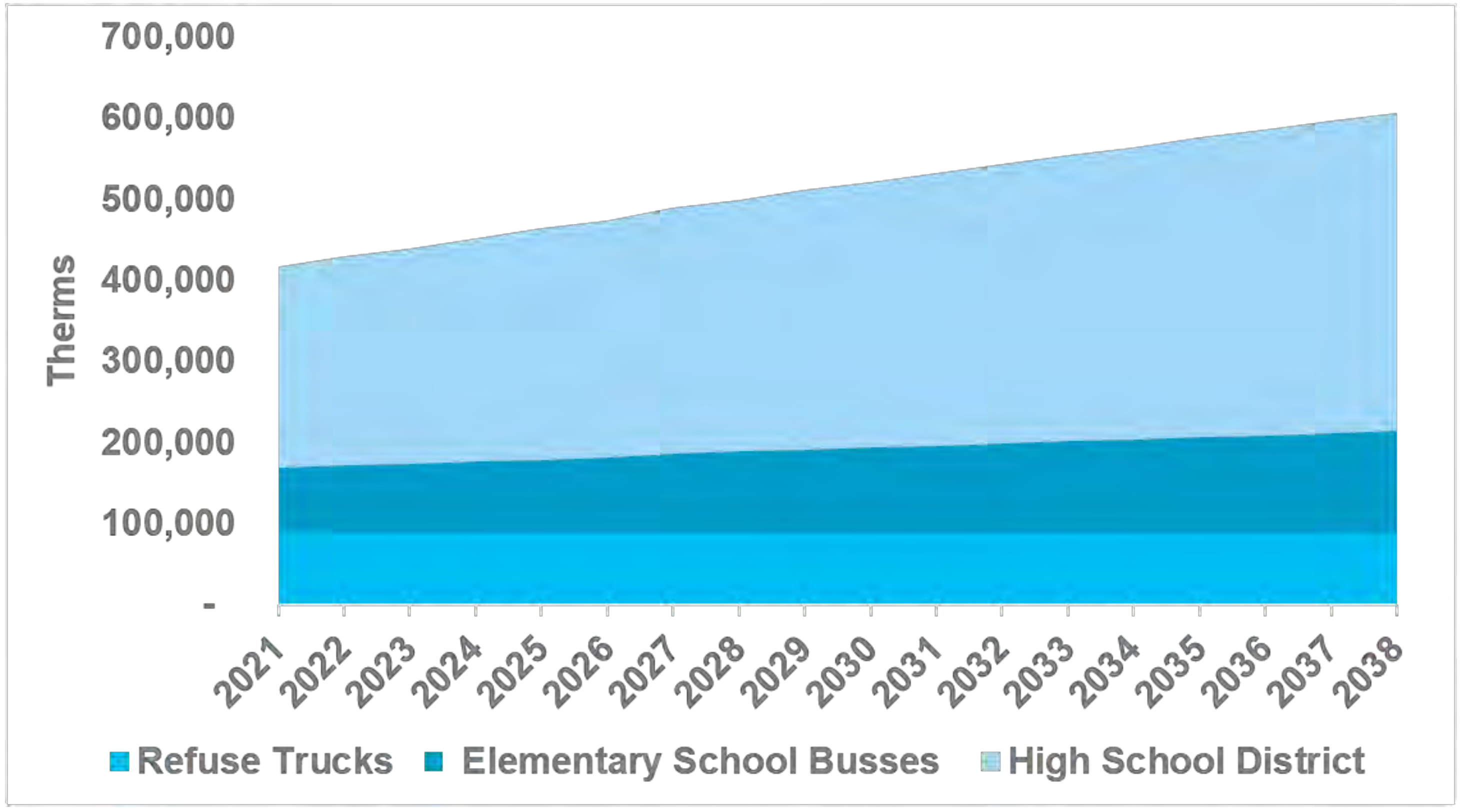
100% Adoption Scenario 2021-2038 Detailed

Potential adoption of natural gas was calculated for the following transportation systems:

- 32 elementary school buses with a seating capacity of 50 per bus.
- 7 refuse trucks, with each refuse truck serving a population of approximately 2,000 people.
- 101 high school buses.

Transportation	*2021*	*2038*
Elementary School Buses	80,042	125,065
High School Buses	247,629	392,705
Refuse Trucks	89,391	89,391
Total Therms	**417,062**	**607,161**

100% Adoption Scenario 2021-2038



Transport Segment (2 of 2)

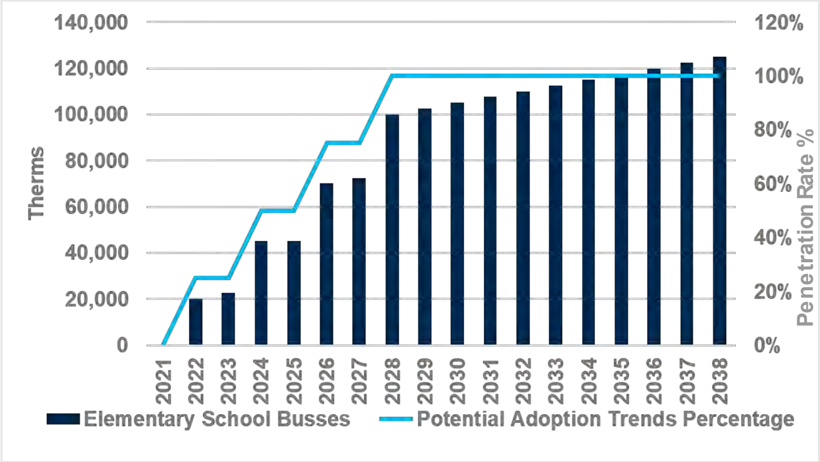
Potential Adoption Trends 2021 - 2038 Detailed

- Maximum adoption for elementary and high school buses will happen in 2028. Demand will continue to increase corresponding with the growth in population.
- Maximum adoption for refuse trucks will happen by 2023, after which demand is not expected to increase.

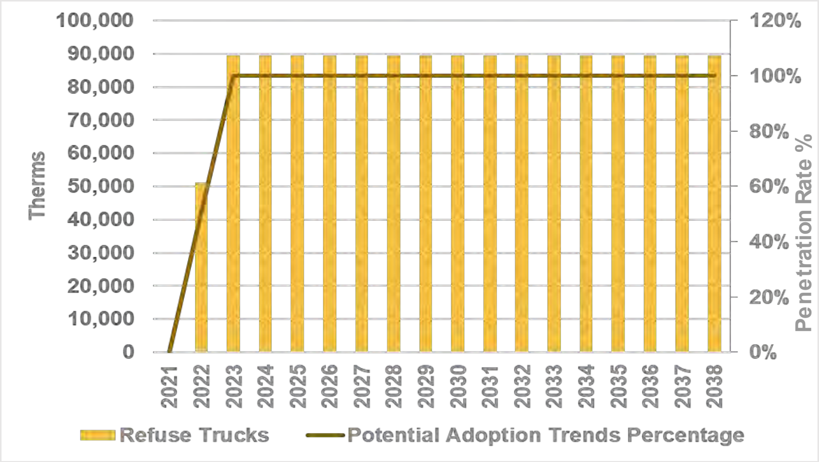
Therms

Transport	*2021*	*2038*
Elementary School Buses	0	125,065
High School Buses	0	392,705
Refuse Trucks	0	89,391

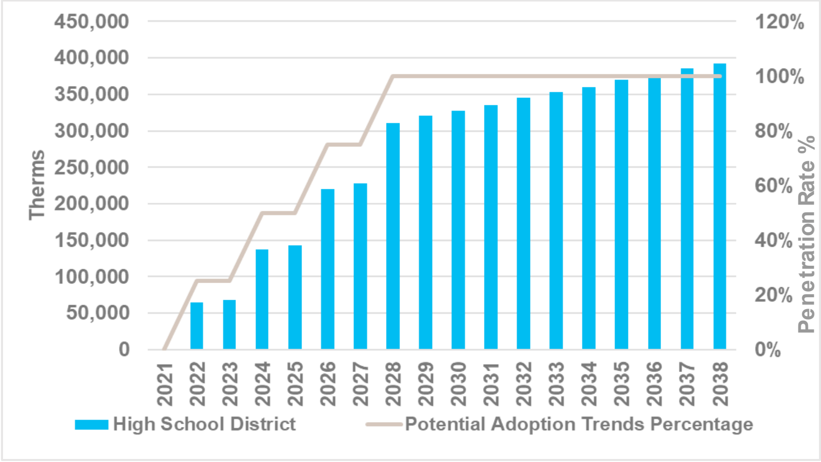
Elementary School



Refuse Trucks



High School District



Other

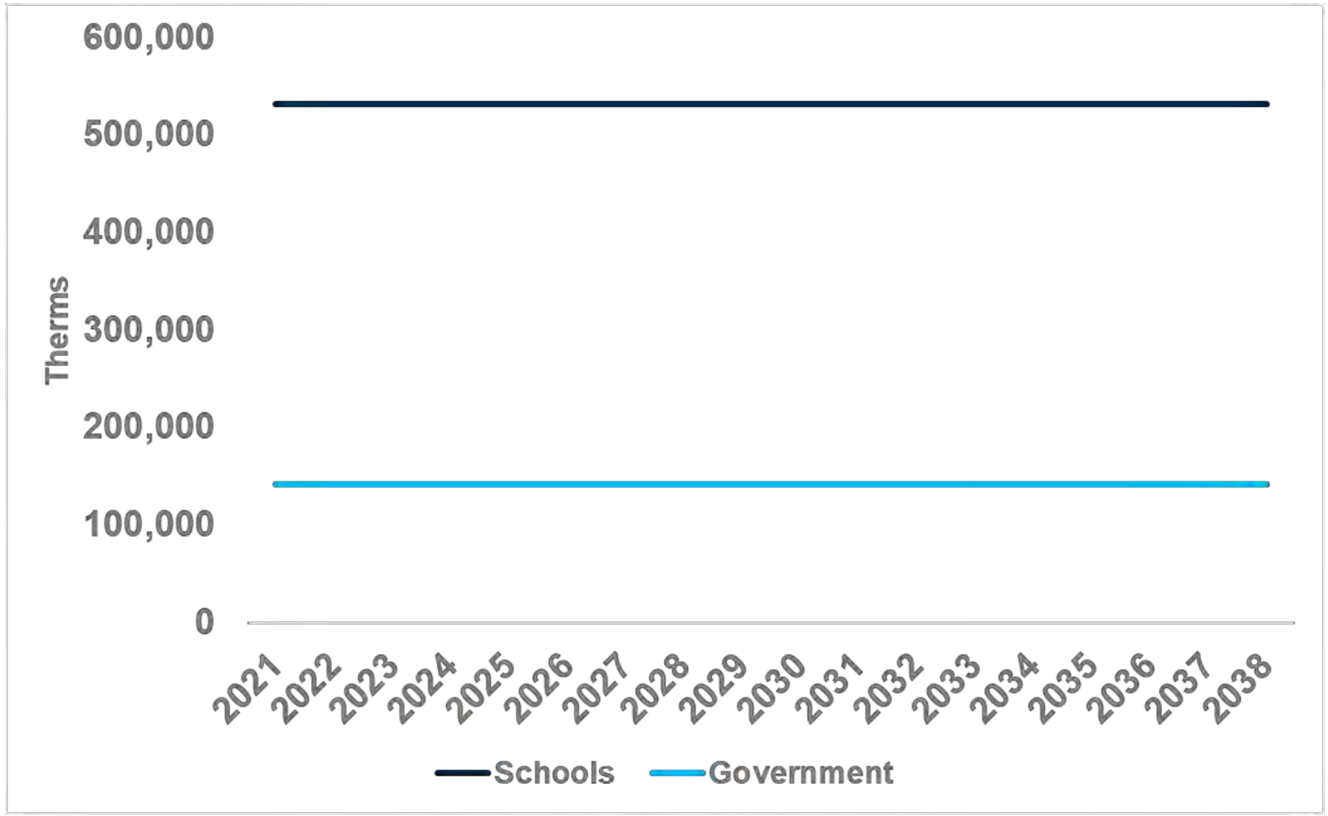
Other Segment

100% Adoption Scenario 2021-2038 Detailed

- This segment incudes local, state and federal government agencies, as well as schools.
- All schools and government buildings are expected to switch to natural gas in year 2021 under this scenario, and no increase in demand is expected during the period.

	Therms	
Other	***2021***	***2038***
Government	142,212	142,212
Schools	532,474	532,474

100% Adoption Scenario 2021-2038



Other Segment

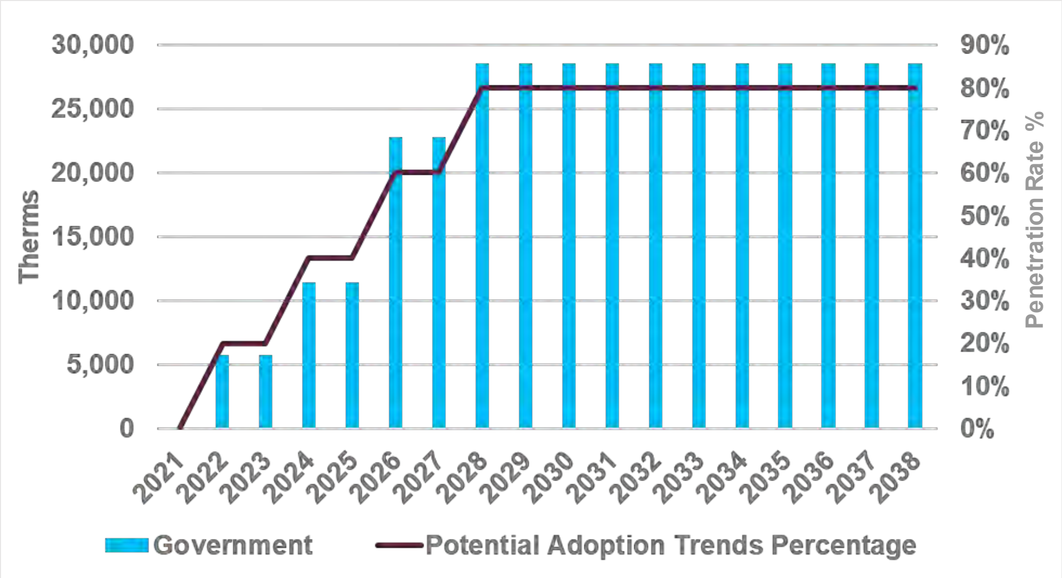
Potential Adoption Trends 2021-2038 Detailed

- Government buildings will reach their maximum adoption rate (80%) by 2028.
- Schools will reach 100% adoption by the year 2029.

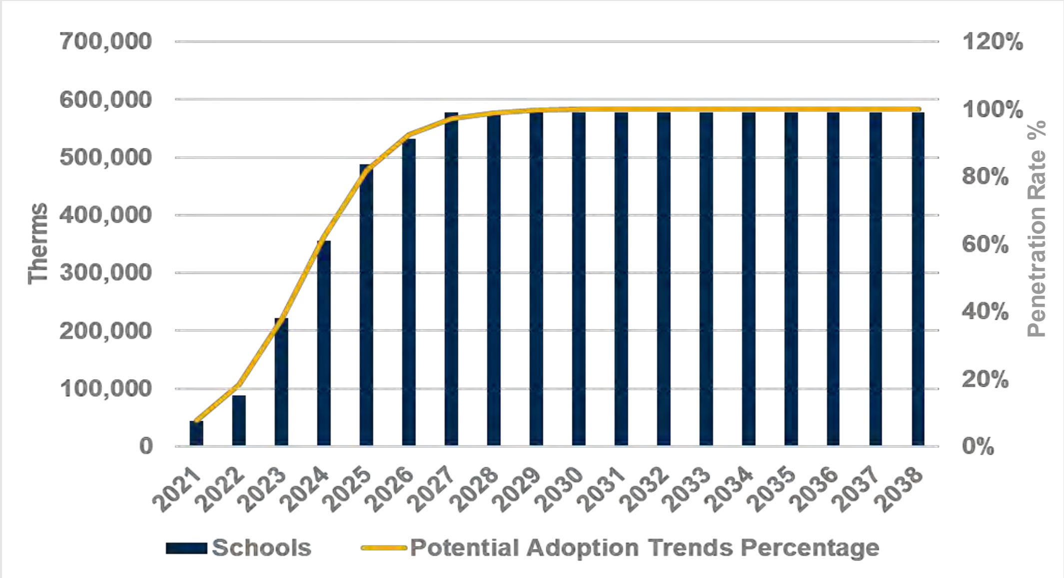
Therms

Other	*2021*	*2038*
Government	0	28,540
Schools	44,373	576,847

Government Buildings



Schools



5 | *Supply Analysis*

Supply Overview

Natural gas supply from the gas basins is transported via large pipelines (transmission) and is distributed locally via small diameter pipelines

The chain of natural gas supply to the end customers involves the following components:

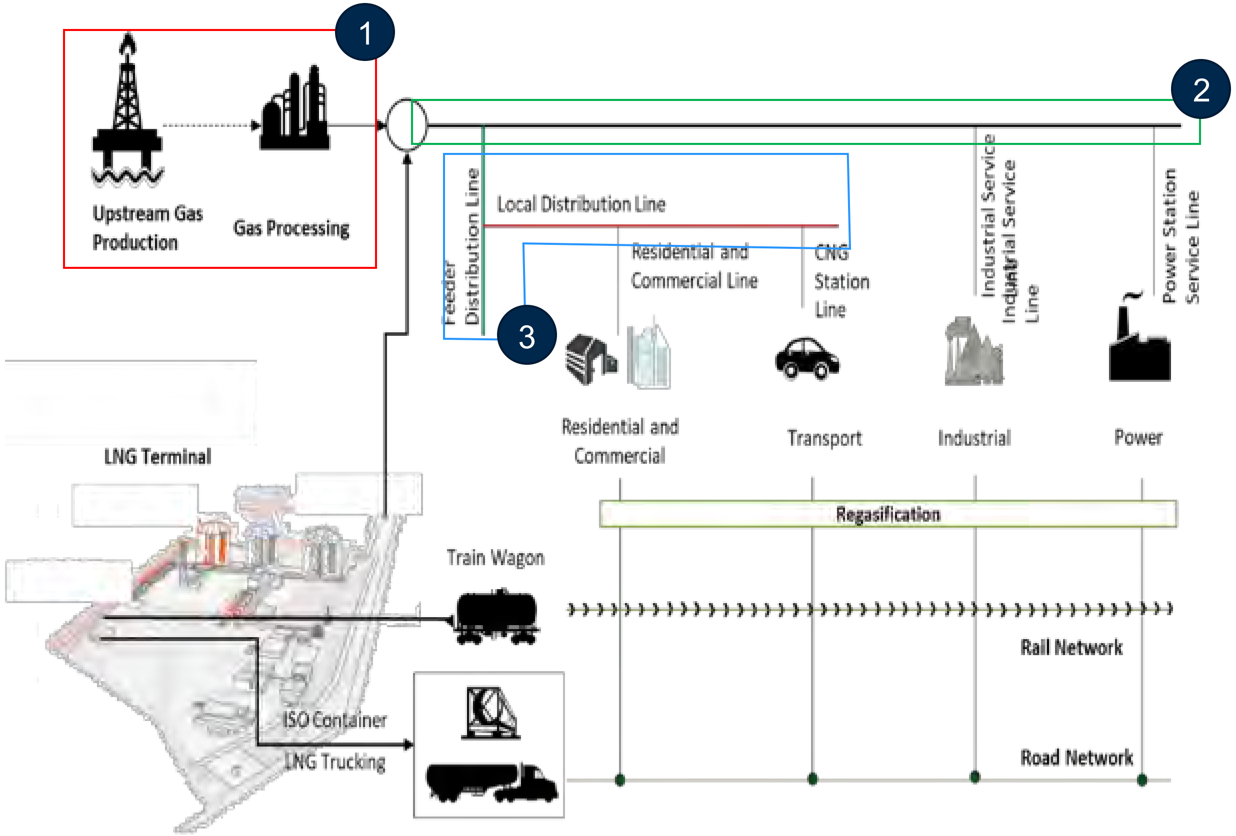
1. ***Production and processing***- natural gas can be sourced directly from upstream gas wells, where it is produced. This gas includes several unwanted impurities and hydrocarbons, which are then processed out of the gas stream to make it "pipeline quality" gas. When there is no accessibility to upstream gas wells, sourcing can be completed by importing liquefied natural gas (LNG).

2. ***Transmission pipelines***- after processing, natural gas is transmitted to the demand centers (which can be a distribution point or directly to large customers such as power stations) via large pipelines. For LNG, the process is to either regasify and transmit via pipelines or to load into trucks, ships, ISO containers or trains (in some cases) to send towards the demand centers.

3. ***Distribution pipelines***- for gas that arrives at distribution point, its pressure is decreased and then send through smaller diameter distribution pipelines to the end customers (e.g. residential homes).

>>> Different gas supply sources and infrastructure available for Yuma – San Luis and San Luis Rio Colorado are detailed in the next slides.

Natural Gas Distribution Value Chain



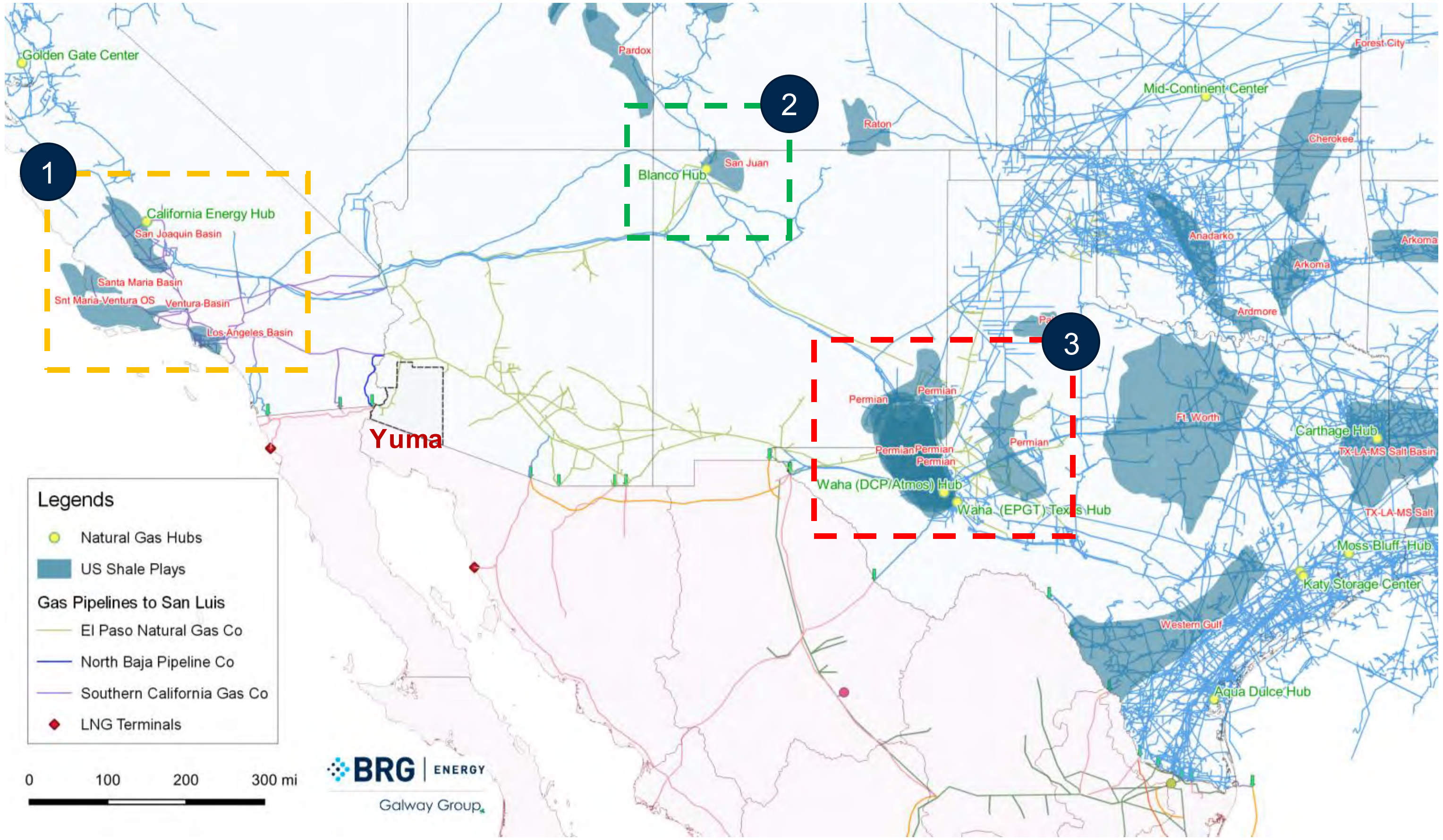
Natural Gas Sources

Two transmission pipelines serve Yuma County and San Luis markets– EPNG and North Baja Pipeline

The United states has one of the largest natural gas reserves in the world, enough to serve the country for more than 40 years at current production rates. Natural gas is produced in over 32 shale basins in the US and among them three regions have connectivity to Yuma:

- ***Gas Basins of California*** **-** 0.3 tcf (not considered).
- ***San Juan Basin*** **-** 23 tcf (28 years of production at current rate).
- ***Permian Basin*** **-** 289 tcf (44 years of production at current rate).

Together these basins can provide ample of natural gas to San Luis and can form as the basis for reliable and uninterrupted natural gas supply.

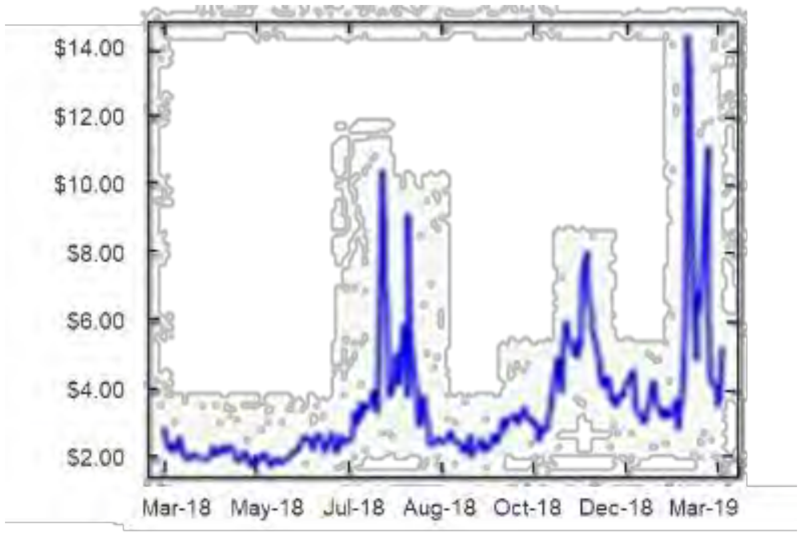


Natural Gas Pricing

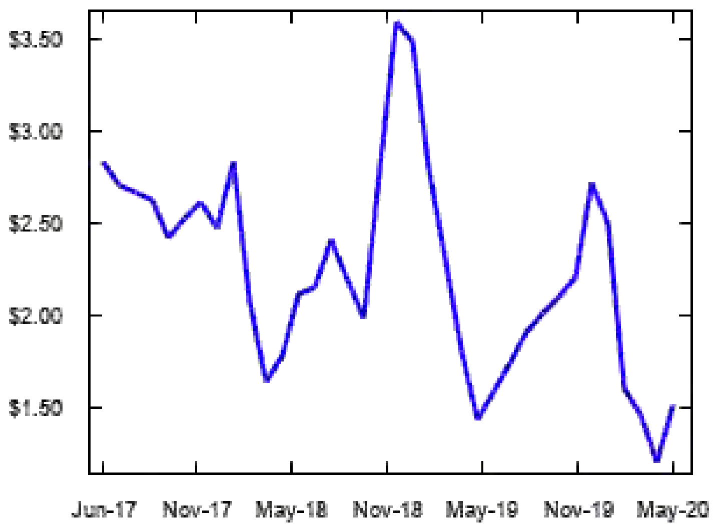
Natural gas prices from the San Juan's Blanco hub and the Permian's Waha hub are consistently lower than $0.24/therm

- Among the three sources of supply possible for San Luis and San Luis Rio Colorado, California Border Natural Gas price appears to be the most expensive in the last few years with several price spikes. It must be noted that natural gas cost is typically passed to the end consumer directly. Other two sources of gas on average appear to be positioned better in terms of price. San Juan basin seems to offer gas at ~ $2/MMBtu to $3/MMBtu ($0.20/therm to $0.30/therm), whereas in the Permian basin the prices often swung to negative prices in the last years.

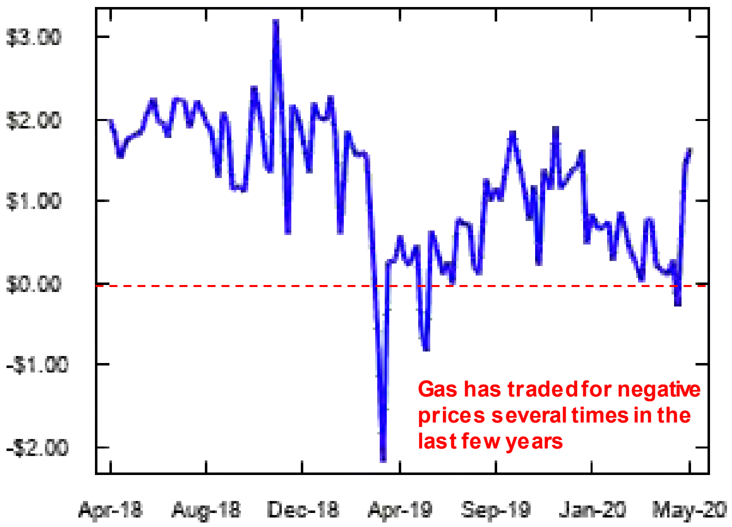
California Border Natural Gas Price ($/MMBtu)



San Juan's Blanco hub Gas Prices ($/MMBtu)



Permian's Waha hub Gas Prices ($/MMBtu)



** 1 MMBtu = 100,000 Therms*

Natural Gas Transmission (1 of 3)

El Paso Natural Gas Pipeline (EPNG)

- EPNG is one of the largest transmission pipelines in Texas. It spans from north to west Texas and is owned by Kinder Morgan. The pipeline carries gas from the San Juan, Permian and Anadarko basins to California, Arizona, Nevada, New Mexico, Oklahoma, Texas and northern Mexico.
- Gas flows from the Blanco hub in New Mexico and the Waha hub in Texas and meets at Wenden. This gas then moves west towards Yuma, Arizona and Ehrenberg, California.
- At the Ehrenberg compressor station, gas is transferred to the North Baja and SoCal Gas pipelines.

>>> Next, we look at the supply in Yuma.

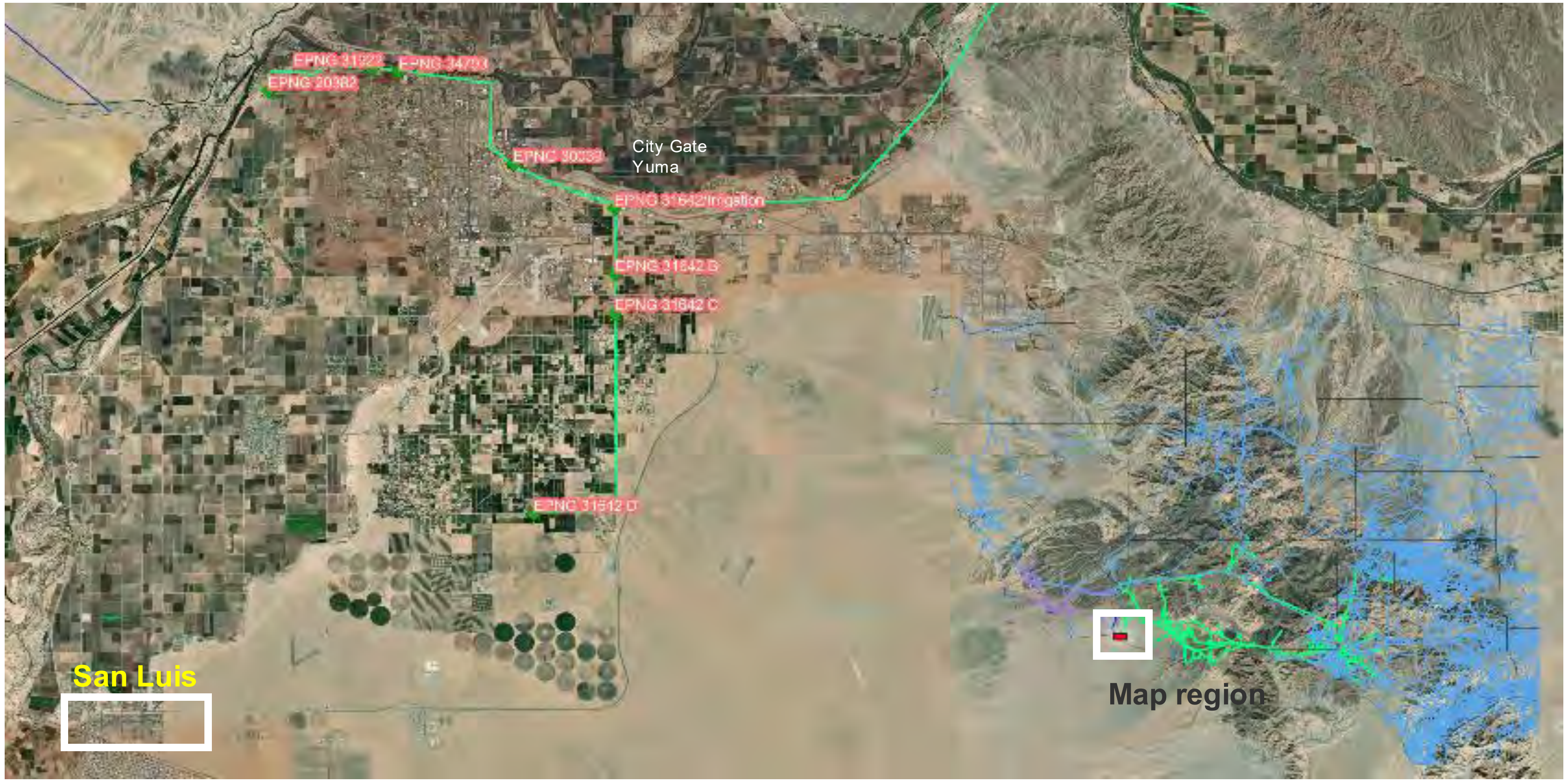
Overview of EPNGP

Natural Gas Transmission (2 of 3)

EPNGP offers several interconnect points in the vicinity of San Luis and Greater Yuma for tapping into gas sources.

- Within Greater Yuma region, El Paso Natural gas pipeline has several interconnect points from where gas is purchased currently.
- The map on the left shows several locations on the pipeline where local distribution company (LDC) has a tap.
- As of June 3, 2020, the two gas shippers in the region include:
  - **Arizona Public Service** – a capacity of 1,651,800 therms/day.
  - **Southwest Gas** – the company's delivery point has a design capacity of 1,314,800 therms/day, and an operating capacity of 680,535 therms/day. Company scheduled only 170,930 therms/day on this date (only 25% of total capacity).

EPNGP in the Greater Yuma Region

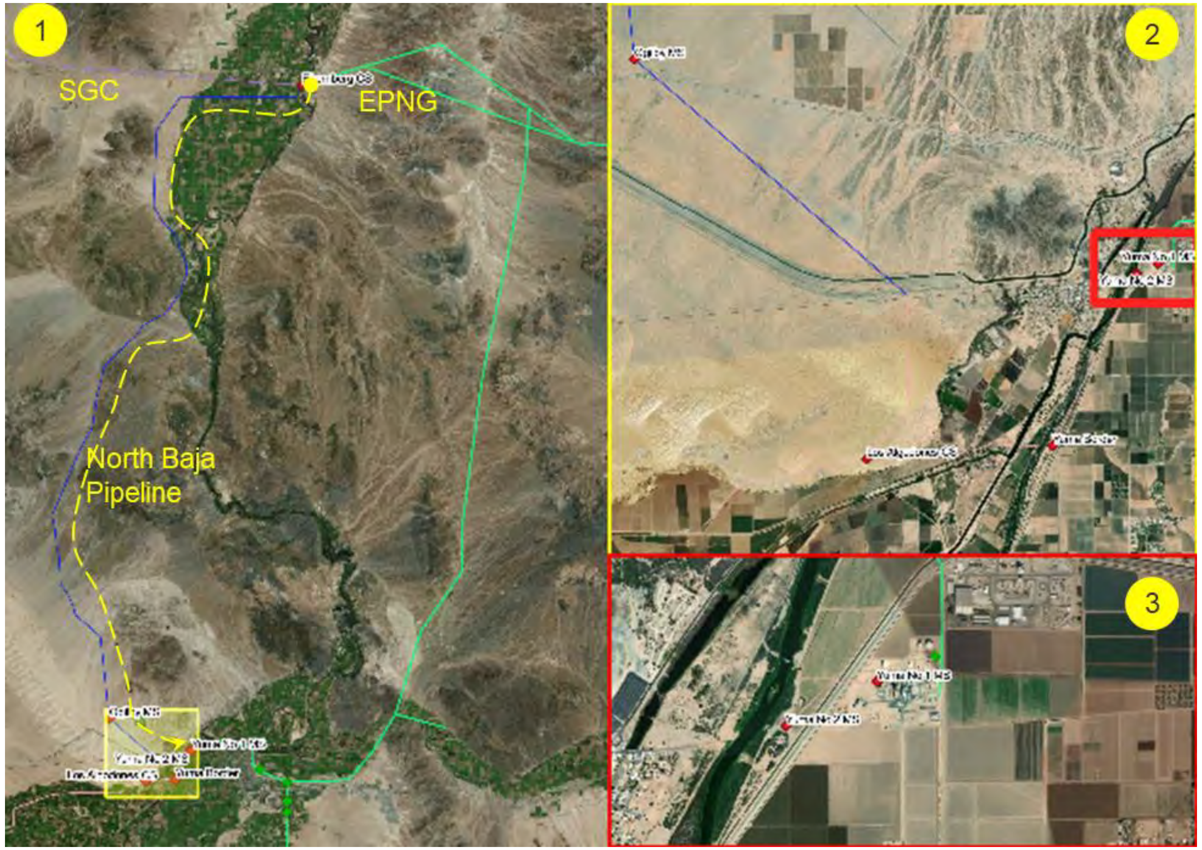


Natural Gas Transmission (3 of 3)

North Baja Pipeline

- North Baja Pipeline connection (30”) does not have a direct connection to Yuma county.
- The pipeline starts from the Ehrenberg Compressor Station, where it takes receipt from EPNGP. The pipeline then crosses the border and delivers gas to the Gasoducto Bajanorto in Mexico. Gas from the Gasoducto Bajanorto then re-enters the US via the North Baja Pipeline and connects with the Yucca power plant in Yuma.
- Details of gas supply from this pipeline in Yuma:
  - Receipt capacity at Yuma Border: 827,920 therms/day.
  - Scheduled Capacity at Yuma Border: 108,740 therms/day.
- Nearly 13% of North Baja Pipeline’s capacity is in usage.
- Because the pipeline is not connected to the LDC, there is limited potential to access this gas.
- Additionally, as most of the delivery to this pipeline is coming from EPNG itself, the supply may be more expensive from this source.

Overview o the North Baja Pipeline System



Local Distribution Network (1 of 2)

Local distribution network in Yuma county is under jurisdiction of Southwest Gas, covering Greater Yuma as well as the San Luis region

- Typically large industrial, commercial and power generation companies receive gas directly from interstate/intrastate pipelines. In comparison, smaller customers receive gas from local distribution utilities involved in delivery of gas within a specific geographic region.
- LDCs typically hold exclusive rights to distribute natural gas in a specific geographic area to avoid uneconomic multiple lines in a region.
- The local distribution company for San Luis and Yuma is Southwest Gas – a subsidiary of Southwest Holding Co (a publicly traded company). The area covered by Southwest Gas is shown with the dark shaded boundary in the map.
- Southwest Gas receives gas at the city gate and distributes it in the region. Based on current published information, the LDC has operating receipt flexible capacity of nearly 60,000 decatherm. Of this capacity, only 25% is being used. Southwest Gas, at the moment, does not have any interconnection points with the North Baja Pipeline.

Greater Yuma Local Distribution Network

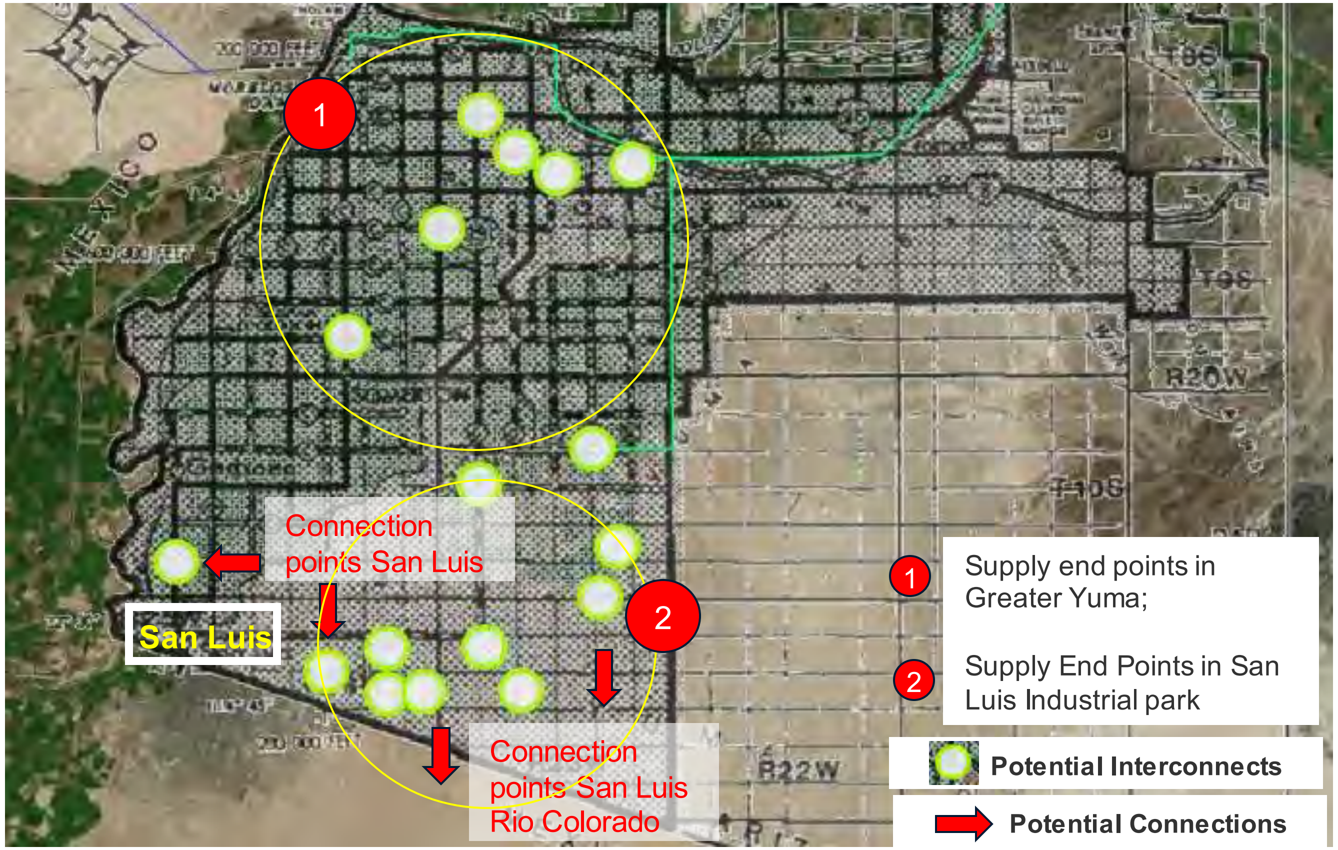
Local Distribution Network (2 of 2)

Southwest Gas has several interconnection points in the region that could be utilized to serve the City of San Luis and San Luis Rio Colorado

– Confidentiality requirements do not allow for the showing of the LDC network. Instead we have added the white and green circles on the map on the right which represent end points of the distribution pipeline, for better understanding. The key takeaways from the map are:

- ***Region 1*** has natural gas distribution pipeline available, covering Yuma City, and shows several points available for future expansion.
- ***Region 2*** has available Southwest Gas pipelines as well where the southwest Arizona Industrial Park is under development. This location can be further used to transport gas to Mexico.
- There is potentially one interconnect point in the north of San Luis, less than a mile away from the downtown, which potentially can act as a source for supply to the city.

Southwest Gas' Local Distribution Supply Network



Supply Conclusion

Based on the information gathered from various publicly and privately available sources, we can conclude the following about the supply of natural gas in the region:

- There is ample natural gas available in the region from several sources including the Permian and San Juan basins to support development of natural gas infrastructure in the region.
- El Paso Natural Gas Pipeline, which taps into both these resource basins, is expected to be the transportation vehicle for the natural gas to the region.
- The region has Southwest Gas' infrastructure, spanning Yuma City and the Southwest Arizona Industrial Zone, but there is no current infrastructure available in the San Luis region itself.
- Based on available information of supply at the city gas, it appears that Southwest Gas has access to nearly 60,000 decatherms of gas, of which the company is currently using only 25% of capacity. This means that there will be sufficient gas available if demand is topped.
- Current maps of the region suggest there could be two potential options of supply to San Luis region:
  - ***Supply from the north side* -** Less than a mile of natural gas pipeline would be required to reach the city center.
  - ***Supply from the east side* -** Nearly 2 – 3 miles of additional pipelines would be required to reach to San Luis city center; that may be cost prohibitive.

>>> In the next section, we will develop a concept layout for supply from north side of San Luis.

Next steps

Southwest gas and a long-term capacity at Yuma City Gate, which expired in March 2020, and most likely rolled over

- Based to meet the demand in San Luis as observed in the demand slides, Southwest gas will require over 50 million therms incremental therms per annum (~137,000 therms/day) to meet the city as well as industrial park potential demand, based on this we have further identified following:
  - Southwest Gas has a capacity of ~1,400,000 therms per day of capacity available at the point 301142 (Mesa Irrigation Tap via. Segment 2165).
  - Though the above capacity appears sufficient, a discussion should be carried out of with Southwest gas to ensure sufficient capacity is available after distribution of gas in Greater Yuma region.
  - The associated contract for 1,400,000 therms on EPNG (FT28M000-FTAEPNG) was a long-term contract active from 2004 to 2020, which expired in March, but is most likely rolled over. Status of this contract and new capacity would have to verified.
  - Additional bottlenecks on the supply capacity have to be discussed with the LDC to understand constraints in gathering supplies from Permian basin to Yuma, which is expected to be relatively lower cost gas as compared to San Juan basin.
- Additionally, as Southwest gas has expansion plans for their grid themselves, new expansions and peak supply capacity of available nodes would have to be discussed with the firm's supply team.
- Finally, the city team needs to discuss the key terms and conditions necessary and plan in place for Southwest gas to proceed with expansion of its network in the city of San Luis.

6 | *Routing and Conceptual Design*

Conceptual Design Background

- Natural gas distribution pipelines are typically low pressure pipelines, lower than 50 psig (pound per square inch gauge) and around 25 psig to 50 psig in the main distribution feeder lines. The pressure at the downstream of a meter in domestic connection could be as low as 0.14 to 0.25 psi. Maximum allowable pressure is regulated by the NFPA 54 code.
- Efficiency in a gas distribution pipeline requires pressure drops to be less than 10% in the system. For example, if a pipeline is operated at 20 psig, the pressure drop during distribution should be limited to no more than 2 psig. This pressure drop could be adequately used to calculate pipeline sizing for a flow rate and operating pressure.
- Various tables available provide sizing options based on pressure drop, length of pipeline, and pipeline diameter as shown on the image on the right.

Gas Distribution Pipeline Sizing (California Plumbing codes)

													GAS:	NATURAL
													INLET PRESSURE:	LESS THAN 2 psi
													PRESSURE DROP:	0.5 in. w.c.
													SPECIFIC GRAVITY:	0.60
	PIPE SIZE (inch)													
NOMINAL:	½	¾	1	1¼	1½	2	2½	3	4	5	6	8	10	12
ACTUAL ID:	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026	5.047	6.065	7.981	10.020	11.938
LENGTH (feet)	CAPACITY IN CUBIC FEET OF GAS PER HOUR													
10	172	360	678	1390	2090	4020	6400	11 300	23 100	41 800	67 600	139 000	252 000	399 000
20	118	247	466	957	1430	2760	4400	7780	15 900	28 700	46 500	95 500	173 000	275 000
30	95	199	374	768	1150	2220	3530	6250	12 700	23 000	37 300	76 700	139 000	220 000
40	81	170	320	657	985	1900	3020	5350	10 900	19 700	31 900	65 600	119 000	189 000
50	72	151	284	583	873	1680	2680	4740	9660	17 500	28 300	58 200	106 000	167 000
60	65	137	257	528	791	1520	2430	4290	8760	15 800	25 600	52 700	95 700	152 000
70	60	126	237	486	728	1400	2230	3950	8050	14 600	23 600	48 500	88 100	139 000
80	56	117	220	452	677	1300	2080	3670	7490	13 600	22 000	45 100	81 900	130 000
90	52	110	207	424	635	1220	1950	3450	7030	12 700	20 600	42 300	76 900	122 000
100	50	104	195	400	600	1160	1840	3260	6640	12 000	19 500	40 000	72 600	115 000
125	44	92	173	355	532	1020	1630	2890	5890	10 600	17 200	35 400	64 300	102 000
150	40	83	157	322	482	928	1480	2610	5330	9650	15 600	32 100	58 300	92 300
175	37	77	144	296	443	854	1360	2410	4910	8880	14 400	29 500	53 600	84 900
200	34	71	134	275	412	794	1270	2240	4560	8260	13 400	27 500	49 900	79 000
250	30	63	119	244	366	704	1120	1980	4050	7320	11 900	24 300	44 200	70 000
300	27	57	108	221	331	638	1020	1800	3670	6630	10 700	22 100	40 100	63 400

Conceptual Design Background

Pipelines sizing could be determined by two standard equations for operations at different pressures.

In addition to the tables, it is also possible to approximate the sizing of natural gas distribution pipelines based on two formulas:

For low gas pressure line (typically downstream of meter) – typically used for calculation of low pressure pipelines (less than 1.5 psi).

$$D = \frac{Q^{0.381}}{19.17\left(\frac{\Delta H}{C_r \times L}\right)^{0.206}}$$

For higher pressure distribution line (upstream of meter) – for pressures greater than 1.5 psi.

$$D = \frac{Q^{0.381}}{18.93\left[\frac{\left(P_1^2 - P_2^2\right)\times Y}{C_r \times L}\right]^{0.206}}$$

Where

D = Inside diameter of pipe, inches (mm).

Q = Input rate appliance(s), cubic feet per hour at 60°F (16°C) and 30-inch mercury column

P_1 = Upstream pressure, psia (P_1 + 14.7)

P_2 = Downstream pressure, psia (P_2 + 14.7)

L = Equivalent length of pipe, feet

ΔH = Pressure drop, inch water column (27.7 inch water column = 1 psi)

GAS	EQUATION FACTORS	
	C_r	Y
Natural gas	0.6094	0.9992
Undiluted propane	1.2462	0.9910

– Using the above two equations, the pipeline flow rates and diameter can be derived based on inlet pressure and allowed pressure drop.

>>> These calculations are done for the pipelines in the next slides.

Pipeline Layout and Proposed Route

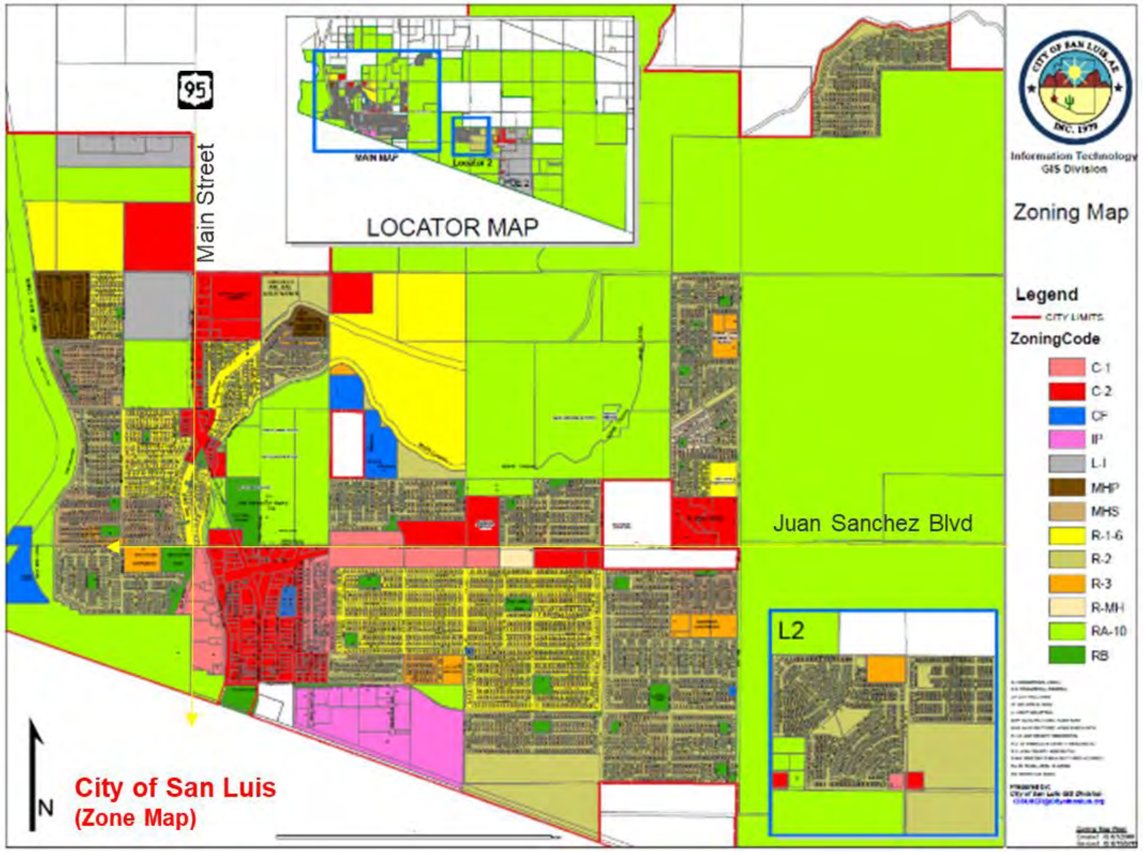
Distribution line sizing

– The zoning map of the City of San Luis to the right shows that most of the commercial space is on Main Street (North-South) and Juan Sanchez Blvd (East-West). The map also shows that most of the residential development is south of Juan Sanchez Blvd. Regarding to a potential pipeline route, it can be inferred that:

- High demand for gas is expected south of the intersection of Main street and César Chavez Blvd. This segment is expected to have larger diameter pipeline at high pressure;
- More than 50% of residences seems to be located on both sides of Juan Sanchez Blvd. This is considered the major residential demand center for this study;
- As there are several schools in the region, one of the potential gas demands could come from school buses as well as refuse trucks. To serve these trucks a compressed natural gas (CNG) station is envisaged at the intersection of Main Street and Juan Sanchez Blvd.

>>> Potential layout is presented in the next slides.

Zoning Map

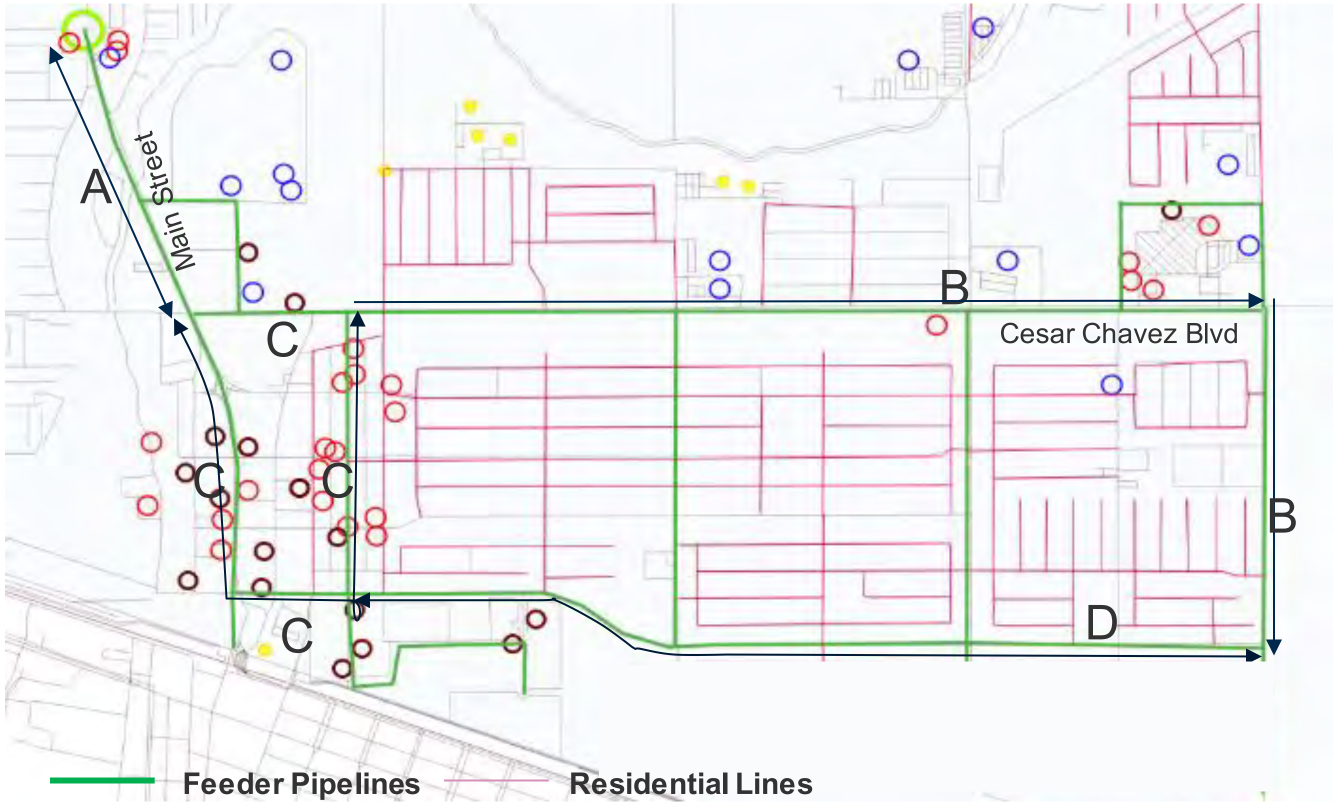


Concept Layout and Pipeline Sizing (1 of 3)

Distribution line sizing

- Network concept layout is shown on the map on the right with several segments:
  - ***Segment A*** **-** This segment runs parallel to main street coming down from north terminating at the intersection of Juan Sanchez Blvd. This pipeline carries the gas necessary for the whole grid.
  - ***Segment B*** **-** This segment carries the gas for schools, government offices and upper half of the residential complex.
  - ***Segment C*** **-** This segment loops around the commercial demand centers with restaurants and industries.
  - ***Segment D*** **-** This segment runs at the bottom length and provides gas to residential network.
  - ***Others*** **-** Residential distribution network (pink).

Network Concept Layout



Concept Layout and Pipeline Sizing (2 of 3)

Summary Lengths by Section

Following is the summary for the layout network

— 6" Pipeline

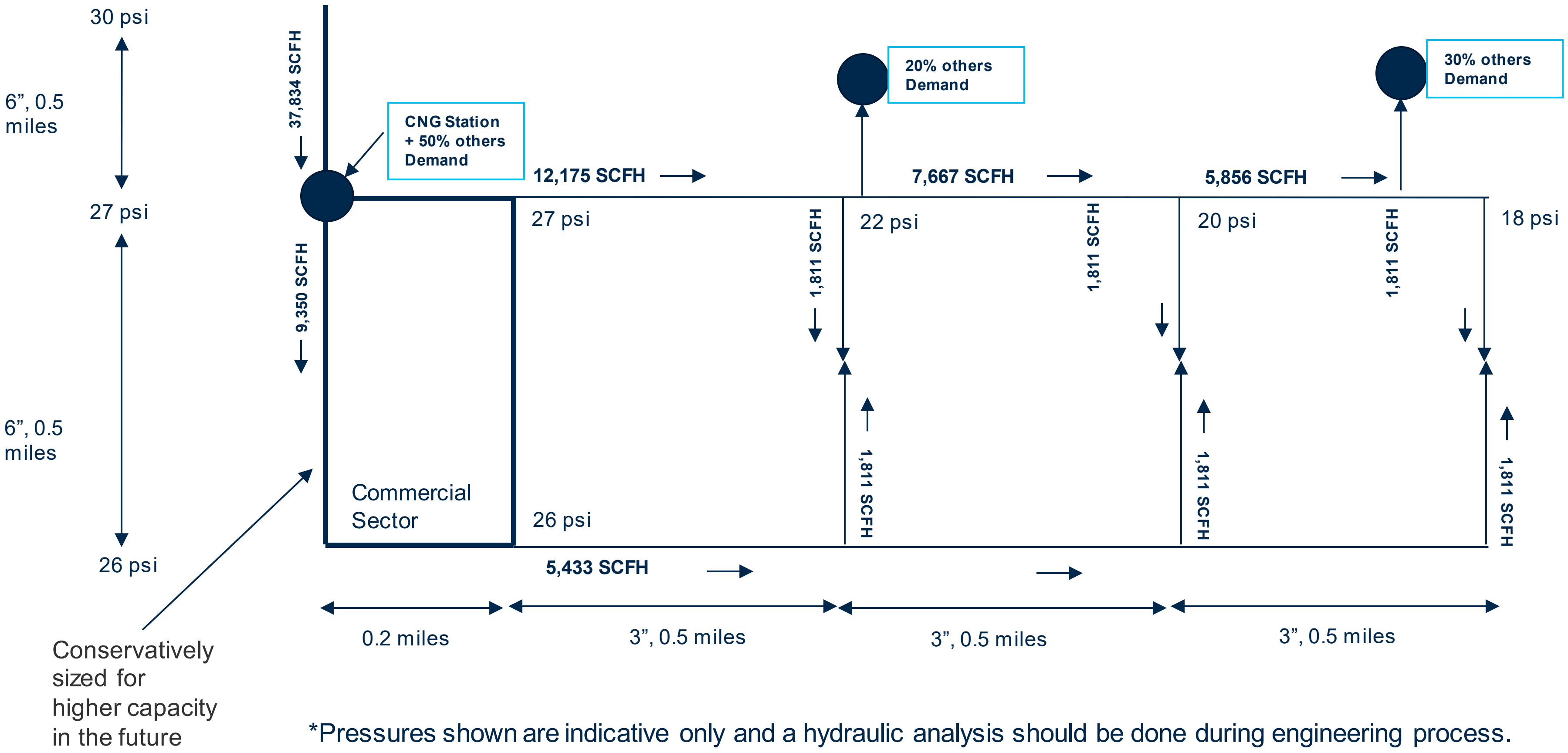
~ nearly 2 miles wrapping the commercial complex

— 3" Pipeline

~ nearly 5.2 miles wrapping the residential complex

* Residential distribution lines are not shown here to show the layout clearly.

Illustration of gas flow in the network



*Pressures shown are indicative only and a hydraulic analysis should be done during engineering process.

Considerations for the Pipeline

Additional assumptions in developing the pipeline sizing

- Several factors were considered while designing the pipeline system that impacts and the sizing. Some of these factors include:
- ***Peak Demand Considerations-*** typically address the issue of peak capacity of the pipeline. Usually, a detailed hydraulic pipeline distribution model will take load profile into account for a more robust modeling.
- ***Cost and Grades Requirement-*** pipe grade will typically define the thickness and maximum pressure of the pipeline and will directly impact the amount of sleet per linear foot of the pipeline. Additionally the cost of steel is uncertain and may severely impact the overall costing of the pipeline network.

>>> The development timeline is explained in next slide.

Demand Classification		SCFH (morning)	SCFH (night)
Residential Demand	Peak (4 Hr/day)	10,865	
Commercial Demand	Peak (10 Hr/day)	5,608	
Industrial	Peak (24 Hr/day)	1,114	1,114
Transport	Peak (12 Hr/day)	6,762	6,762
Others	Peak (12 Hr/day)	13,485	
Total		37,834	7,876

Other considerations

Density of steel	=	0.131916	kg/in3
Cost of steel	=	1.5	$/kg
Weight of 3" pipe / inch	=	0.293971	kg/in
Weight of 6" pipe / inch	=	0.736271	kg/in

*SCFH => Standard Cubic Feet per Hour; 1 Cubic Feet of Gas = 1025 Btu or 0.01025 therms

Concept Layout and Pipeline Sizing (3 of 3)

Service line

- ***Residential Demand* –** is the longest segment of the 1” residential pipeline and is expected to be nearly 0.5 mile. This line will have two 3” connection, one at each end. Maximum flow that can be obtained by this line is for a pressure of 15 psi, and a pressure drop of 5 psi for the first half of the line can be estimated using the following equation:

$$D = \frac{Q^{0.381}}{18.93\left[\frac{\left(P_1^2 - P_2^2\right)\times Y}{C_r \times L}\right]^{0.206}}$$

- At 100 therms/year gas requirement, this pipeline can serve nearly 100 houses (which is nearly 6.5 standard cubic feet per hour (SCFH) based on 4 hour per consumption per day). It must be noted, however, that a larger pressure drop could be considered as the residential gas pipeline would require very low pressure (less than 5 psi). In this case, using the above equation, the flow that can be achieved in the 0.5 mile,1” distribution line would be nearly 668 SCFH (averaging 6 SCFH per house for 100 houses).
- Thus, the pipeline size should be sufficient to fulfil the residential customer needs. Based on the layout proposed, there will be 23 miles of this pipeline laid in the region to meet the residential customer needs.

Initial Cost Estimates (1 of 3)

6” Pipeline

– The following table provides an estimate for the cost of material and construction of a 6” pipeline for the dimensions previously mentioned. The costs are estimated in US dollars, with the necessary considerations for installation. The pipeline is expected to extend for nearly 2 miles from the source.

Description	Class	Dia [in]	Quantity	Unit	Unit Cost	Total Cost	Remarks
Feeder 6" Pipes							
Construction							
Installation	60psig	6	10,560	LF	$40	$422,400	
HDD	60psig	6	0	LF	$300	$0	For rivers
Regulator stations	60psig	6	0	EA	$400,000	$0	For transmission lines
Materials							
Materials- Steel	60psig	6	10,560	LF	$13	$139,950	
Materials- Valves	60psig	6	1	EA	$13,300	$13,300	
Materials- Design allowance	varies	varies	5%	EA		$7,663	
Materials- Misc. Freight			2%	EA		$3,065	
Materials- Procurement			4%	EA		$6,130	
Materials- SQS			2%	EA		$3,065	
Section A			**10,560**	**LF**		**$595,573**	

Initial Cost Estimates (2 of 3)

3” Pipeline

– The following table provides an estimate for the cost of material and construction of a 3” pipeline for the dimensions previously mentioned. The costs are estimated in US dollars with the necessary considerations for installation. The pipeline is expected to span for nearly 5.2 miles.

Description	Class	Dia [in]	Quantity	Unit	Unit Cost	Total Cost	Remarks
Feeder 3" Pipes							
Construction							
Installation	60psig	3	27,456	LF	$15	$411,840	
HDD	60psig	3	0	LF	$300	$0	For rivers
Regulator stations	60psig	3	0	EA	$400,000	$0	For transmission lines
Materials							
Materials- Steel	60psig	3	27,456	LF	$5	$145,283	
Materials- Valves	60psig	3	1	EA	$8,500	$8,500	
Materials- Design allowance	varies	varies	5%	EA		$7,689	
Materials- Misc. Freight			2%	EA		$3,076	
Materials- Procurement			4%	EA		$6,151	
Materials- SQS			2%	EA		$3,076	
Section C + D			**15,840**	**LF**		**$585,615**	

Initial Cost Estimates (3 of 3)

1” Pipeline Section

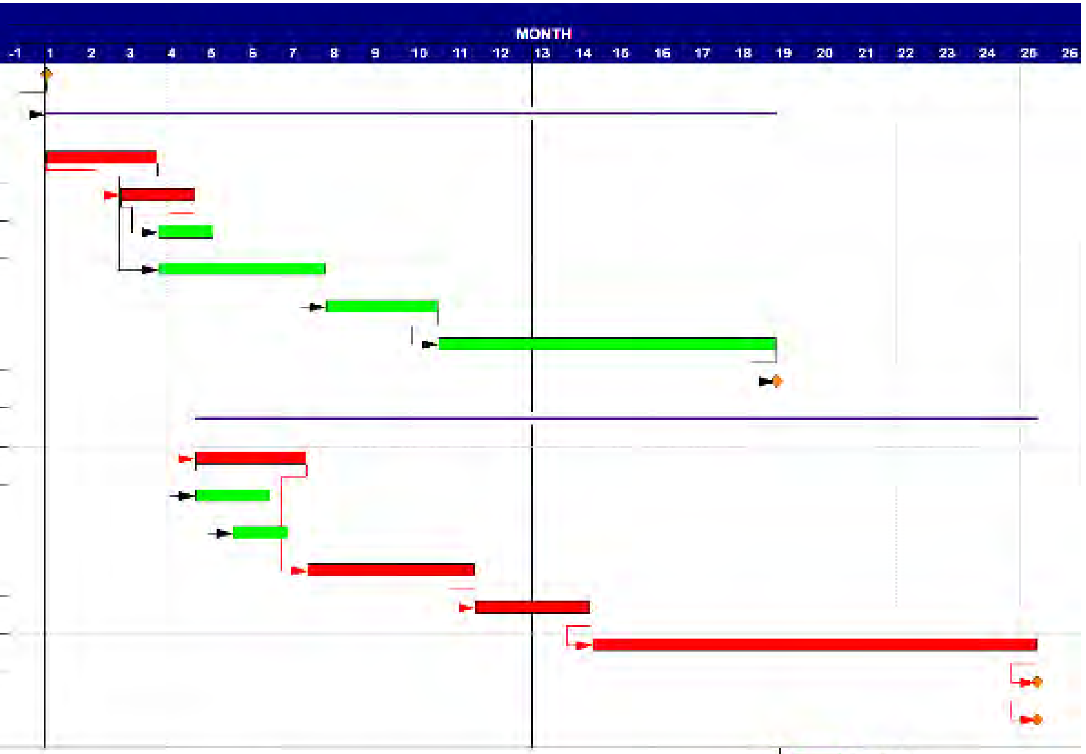
– The following table provides an estimate for the cost of material and construction of a 1” pipeline for the dimensions previously mentioned. The costs are estimated in US dollars with the necessary considerations for installation. The pipeline is expected to be nearly 23 miles long supplying residences.

Description	Class	Dia [in]	Quantity	Unit	Unit Cost	Total Cost	Remarks
SERVICE LINES (1")							
Construction							
Construction	60 psig	1	121,440	LF	$7	$850,080	
Materials							
Materials- Pipe HDPE	60 psig	1	121,440	LF	$3	$303,600	
Materials- Valves	60 psig	1	2,000	EA	$350	$700,000	1 unit per 75 LF
Materials- Design allowance			5%			$50,180	
Materials- Misc. Freight			2%			$20,072	
Materials- Procurement			4%			$40,144	
Materials- SQS			2%			$20,072	
Subtotal- Service Lines			**121,440**	**LF**		**$1,984,148**	

Development Timeline

San Luis Natural Gas Pipeline Project Timeline

#	Description
1	Start
2	Phase 1: Commercial & Industrial Demand
2.1	Preliminary Engineering
2.2	Environmental Studies & Permitting
2.3	ROW Activities
2.4	Detailed Design
2.5	Bidding & Source Selection
2.6	Pipeline Construction
2.7	Phase 1 System Start-up
3	Phase 2: Residential Demand Buildout
3.1	Preliminary Engineering
3.2	Environmental Studies & Permitting
3.3	ROW Activities
3.4	Detailed Design
3.5	Bidding & Source Selection
3.6	Pipeline Construction
3.7	Phase 2 System Start-up
4	End



San Luis Natural Gas Pipeline Project Timeline

- Early bar
- Progress bar
- Critical bar
- Summary bar
- Start milestone point
- Finish milestone point

First Phase of the project should be planned for commercial and industrial development in the City of San Luis. Easier to get commitment to kick-start the project.

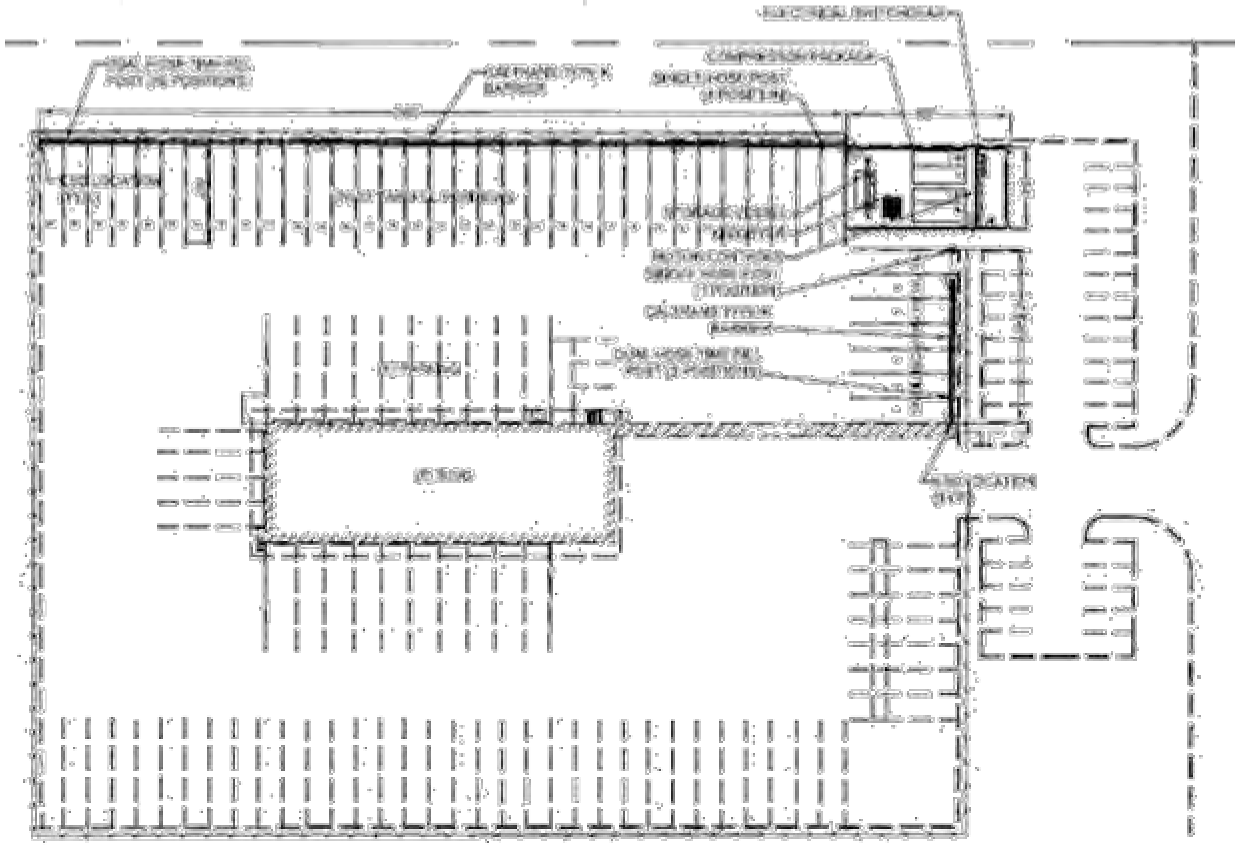
Second Phase should focus on connecting gas supplies to the residential regions and development should be pursued as interest is visible.

CNG Station Layout

Layout for a CNG station can be configured in 2 ways

- An expected key demand center for natural gas in San Luis are buses fueled by natural gas. A compressed natural gas station could be used to fill the busses, reducing operating costs as well as reducing carbon footprint in the city.
- A typical CNG station can be configured in two ways:
  - ***Time-fill*** **–** under this layout, buses are filled overnight, slowly and efficiently over 10 hours, and used during the day. These station are inexpensive to develop;
  - ***Fast-fill*** **-** usually are comparable to a familiar gasoline station, with dispensers, and filling time similar to that of a gasoline vehicle. These type of stations are usually expensive to build.
- A standard layout of a fast fill station is shown on the right. Based on the fleet of school busses and refuse haulers, such a station could satisfy significant demand in the region.

Illustrative Layout for a Fast-Fill Station.



CNG Station Cost Estimate

Cost of the construction and assumptions

- Based on available infomation, a CNG station with 100 time-fill slots and 2 fast-fill slot should be sufficient to meet the demand of the school district. The table below shows the construction cost and the assumptions behind such filling station.

San Luis CNG Station (100 slots Time-fill, 2 slots Fast-fill)

Item	Qty		Unit Price		Cost
Time-Fill (100 slots)					
Compressor (100 – 180 SCFM)	2	$	300,000	$	600,000
Dual-hose Time-fill Post	50	$	5,000	$	250,000
Fast-Fill (2 slots)					
Compressor (150 – 300 SCFM)	1	$	400,000	$	400,000
Dispenser	1	$	30,000	$	30,000
Storage Tank	1	$	100,000	$	100,000
Fuel Management System	1	$	30,000	$	30,000
Gas Dryer	1	$	300,000	$	300,000
Total				**$**	**1,710,000**

The proposed dimension should be sufficient for the school busses. Additional refuse hauls could possibly be adjusted in some slots. A total of (50 to 85 GGE) could be filed by each compressor every hour. These are expected to run for 10 hours in the night.

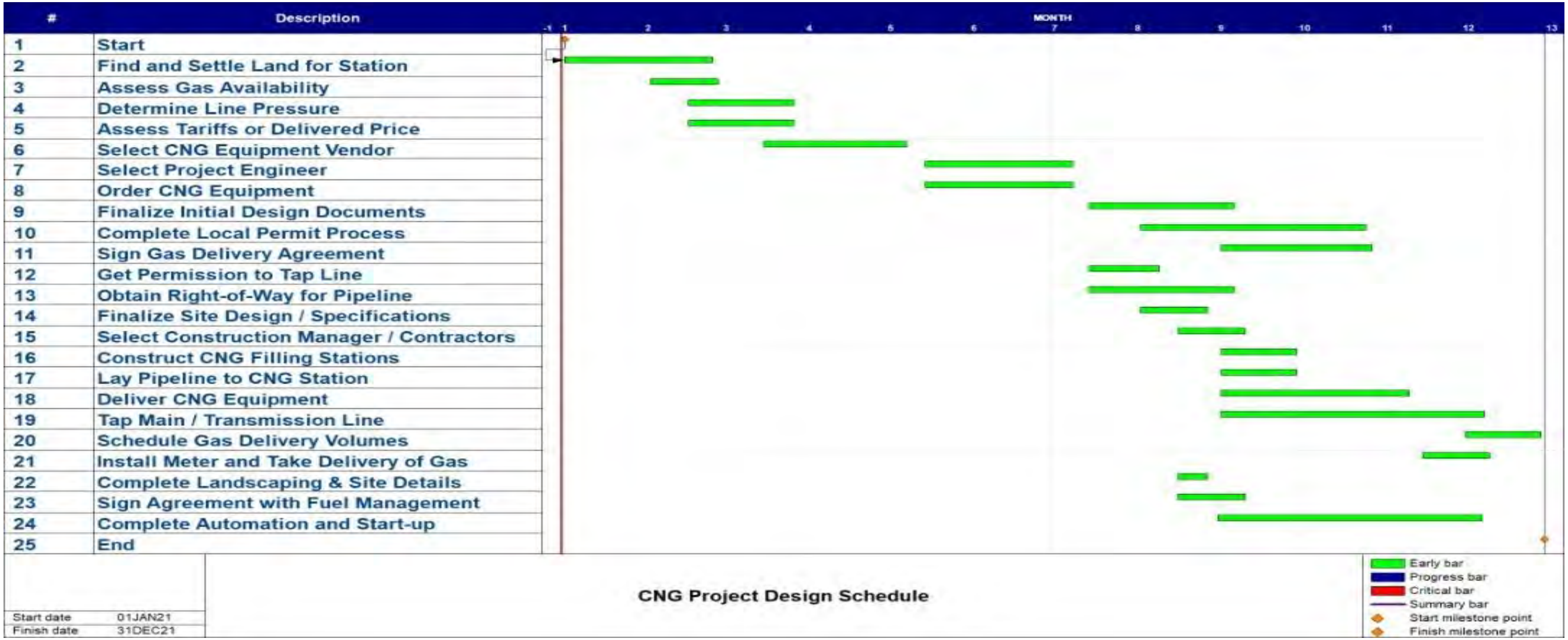
The fast fill station can have fill rates sufficient to fill nearly 50 to 80 light duty vehicles (12 GGE/day each). Thus, almost doubling the capacity

- Such sizing of CNG station would provide enough cushion for future demand development.

*Gasoline Gallon Equivalent

CNG Station Development Timeline

CNG Project Design Schedule



7 | *Supply Alternatives*

Overview of Supply Alternatives

In this section, we will analyze other supply options available to the City of San Luis

- In previous sections we analyzed the possibility of natural gas supply from the north side of the City of San Luis. In this section, we discuss other supply options of supply as well as an alternate energy option. These includes:
  - Revisiting gas supply from the north side.
  - Gas supply from the east side of San Luis.
  - LNG supply from a liquefaction plant with a regasification station at the city.
- Each of the options were then analyzed by the report team to understand their advantages and disadvantages.
- A preliminary cost impact was assessed for each of the options.
- This analysis addresses the basics of available options and weighs these options against the status quo.

>>> This analysis is presented in detail in the next few slides.

Alternative I – North Supply

Supply Connection (A): Supply from the North side

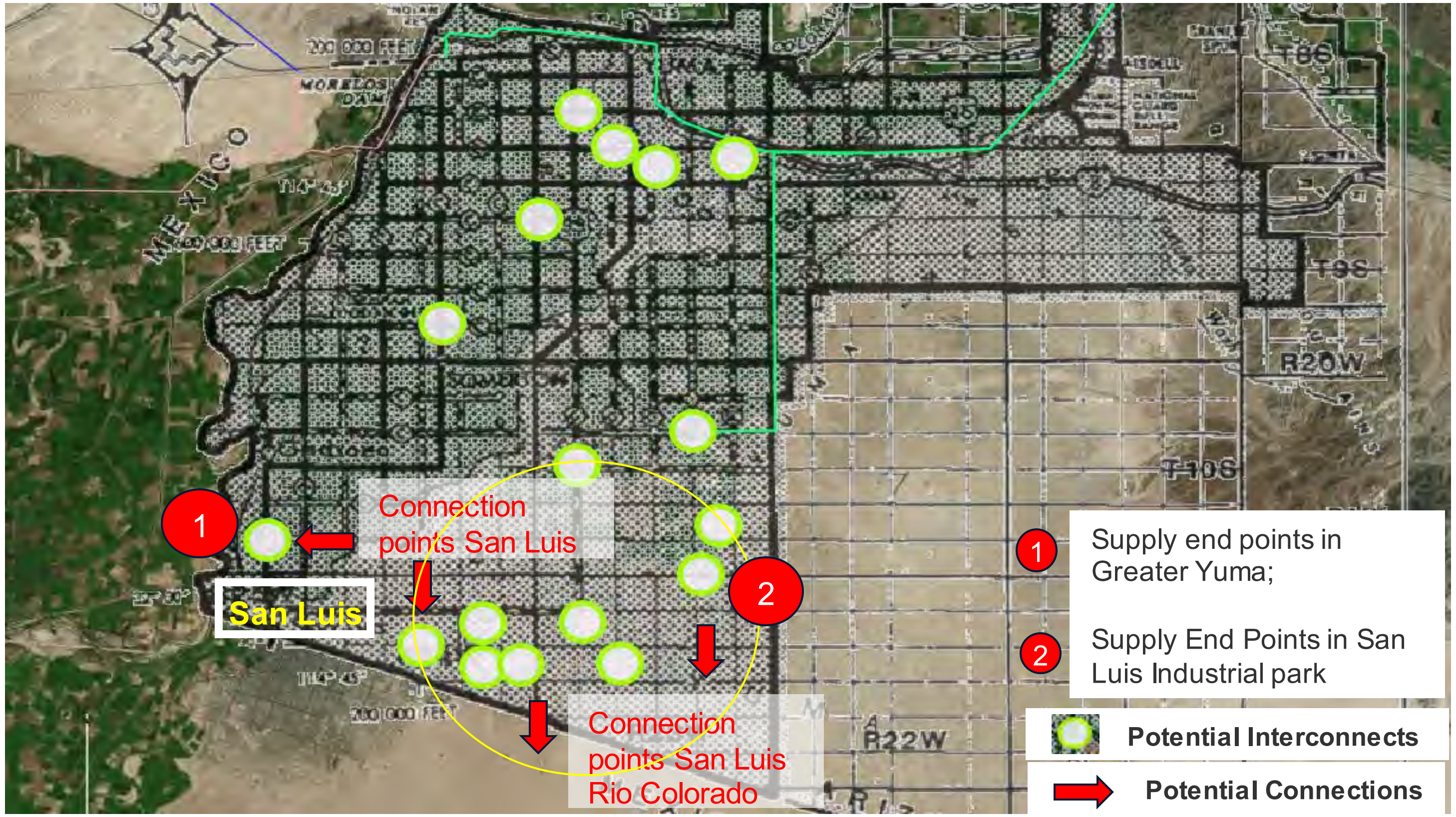
In the previous slides, we discussed the potential interconnect points that are available to supply the city of San Luis and we selected the point on the north labeled as Point "1" in the map on the right. The green-white circles represents interconnections.

This north point, as shown in the map, reaches the Walmart and the residential community to the left of the Walmart. The pipeline also connects to Arizona Western College and San Luis high school.

Following are some of the pros and cons of the pipeline route:

Advantages	Disadvantages
1. Proximity to San Luis commercial district at the intersection of Main St, and Juan Sanchez Blvd 2. Relatively lower construction cost; 3. Customer acquisition could be easier	1. Further from the transmission pipeline (EPNG) and may require additional expansion of north interconnect; 2. Crosses high population density region where permitting may take time

Supply from the North side map



Alternative II – East Supply

Supply Connection (B): Interconnect from East

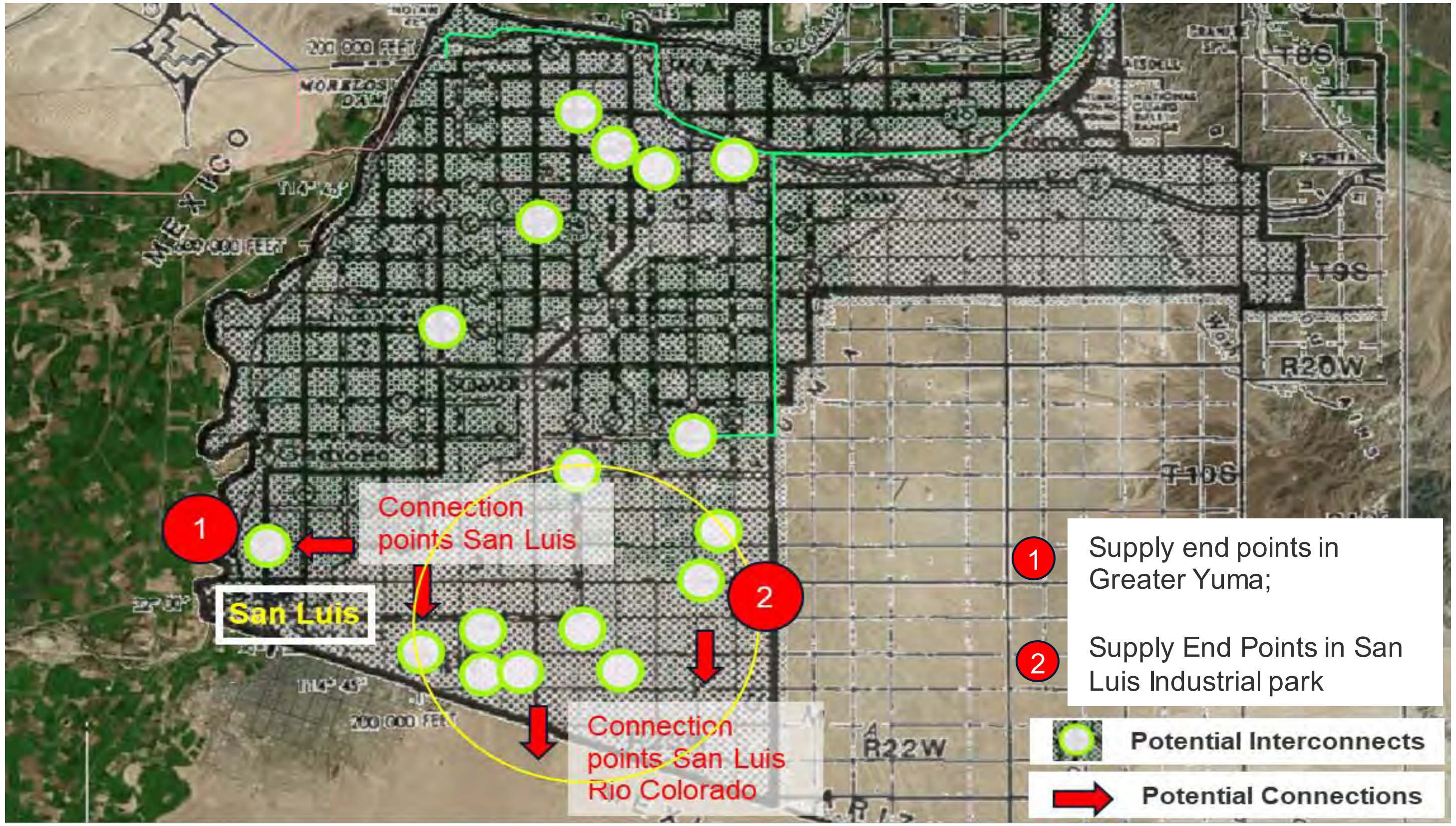
In this Alternative, the supply is explored from the east side labeled as "2" on the map, and there are several interconnection points available. The supply connections in the region labeled "2" include a gas supply to the detention center and the prison and reaches into the Southwest Arizona Industrial park.

A portion of demand (mostly industrial) is already met or would be met using the multiple connections available in the region. Following are some of the advantages and disadvantages for routing this supply from the east side:

Advantages	Disadvantages
1. Proximity to EPNG pipeline with high gas supply potential, thus could potentially support large expansions in the region;	1. 2-3 miles away from San Luis demand center adding to cost of construction; 2. Customer buy in may be necessary for construction.

In the future, it is likely that distribution grids will connect from points "1" and "2".

Supply from the East side map



Alternative III – LNG Trucking (1 of 2)

LNG trucking from the Southern Arizona LNG storage station in Tucson, AZ.

Another alternative option for supply could include transportation of liquefied natural gas (LNG) loaded on to trucks or ISO containers to be deliver to a location and then regasified. Following are some of advantages of this approach:

- Targeted customers base could be served, for example, a factory or several industrial customers could be served with truck delivery of LNG (similar to diesel or gasoline).
- A robust network of infrastructure could be developed which is decentralized and runs with an option of independently or collectively.
- Infrastructure could be bolstered significantly as this will not be dependent on transmission pipeline expansion needs.

>>> The logistics and cost associated are explained in the next slides.

LNG Trucking

Alternative III – LNG Trucking (2 of 2)

Potential truck route

In this case LNG can be acquired from Southern Arizona LNG terminal owned by Southwest Gas, which is nearly 270 miles away from the city of San Luis. Based on the demand information in the region the following could be concluded:

- LNG truck loading station would be needed at SW Gas' LNG terminal (2 bay loading) costing nearly $2 million.
- Three to four LNG trucks (each with 18 tons of LNG i.e. 9,615 therms of natural gas) would be required for meeting the demand. The cost of each truck would be nearly $150,000 or $0.6 million.
- Storage (32,000 therms – equivalent to 150 m^3 LNG) and regasification equipment would be required with total cost close to $0.75 million.

Thus total investment required will be of the order of ~$3.5 million. This investment would be additional to investment for the pipeline infrastructure cost as estimated in the study. Cost of gas delivered would be slightly higher than the cost of delivered gas to the end customers. Thus, could be a viable strategy in case of pipeline capacity bottlenecks.

Truck route

Conclusion Alternatives

Based on the information on alternatives, each of the options available in the region to provide natural gas to San Luis represent a trade off between advantages and disadvantages. That being said, the study has identified the north supply option to be the most cost competitive and have following key attributes:

- North option (labeled "1") is inside the city of San Luis boundary. This means that any infrastructure developed would eventually connect to this point either way.
- Investment required for the north supply option would be the lowest, followed by East option(s) (labeled "2"), followed by LNG option;
- In case of a phased development of infrastructure, the commercial and industrial segment of city of San Luis would be targeted first, which is less than a mile from the north option and nearly 4-5 miles from the east option.

Based on these attributes we recommend option 1 to be selected for further evaluation and pursuit. That being said, each of these options remain competitive to the alternative fuel: Propane and electricity. Thus, the economy would be better off selecting either of the option and still get economic and environmental benefits. Additionally, it is known that price trend for natural gas is expected to remain low in the near future.

Fuel Cost Comparison: Propane vs Electricity vs Natural Gas

Fuel Name	Assumptions and Cost estimates
Propane	Typically trades at a premium to natural gas. In the recent year, the propane prices have reduced significantly and has traded in the range of $1.1/therm.
Electricity*	Electricity prices in the region has been in the range of $0.10/kWh or $2.94/therm. If electricity is produced using natural gas, effectively >50% of energy in gas is lost (efficiency of power generator).
Natural gas	Based on Southwest gas tariff sheet, following is expected to be variable cost: Residential: $0.966/therm Commercial: $0.623/therm Industrial: $0.524/therm Transport: 0.354/therm Others: $0.623/therm

* Actual cost paid by a residential consumer could almost be double at times.

8 | *Economic Feasibility*

Financial Feasibility Analysis Overview

Feasibility of adoption of an alternative fuel requires careful analysis of value to each of the stakeholders. In very simplistic terms, we will evaluate:

- Gas infrastructure provider facing enough demand to justify making an investment; and,
- Gas buyer has sufficient incentive to switch to natural gas as it is made available.
- Consequently, this analysis develops:
  - For Infrastructure provider:

    An economic model based on existing tariff for different customers to evaluate if rate of return objective is met. In case of a regulated utility, the gas infrastructure allowed return of investment is assumed to be 10% (equivalent to cost of capital). In reality, this number would be slightly lower. Assumption are detailed in the later slides.
  - For Gas buyer:

    Transport User - Delivered/filled CNG price is compared against the Diesel price. CNG bus and station payback period is demonstrated.

    Commercial User - Delivered gas price is compared against propane price.

    Residential User - Fuel cost is compared against electricity cost in heating/cooking.

>>> These sections are detailed in the next slides.

Gas Supply Infrastructure Feasibility (1 of 3)

The table below shows the demand and connection number assumptions built in the model in line with the base scenario forecasted in Section 4:

- Table below assumes same demand from 2038 through 2040.

Therms/ Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential	7,800	19,400	41,500	70,700	95,900	111,800	120,900	126,800	131,200	135,100	138,800	142,300	145,800	149,300	152,700	156,000	159,300	162,600	162,600	162,600
Commercial	109,922	153,704	175,344	186,667	197,989	197,989	209,312	209,312	209,312	209,312	209,312	209,312	209,814	209,814	209,814	209,814	209,814	209,814	209,814	209,814
Industrial	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Transport	-	136,125	179,438	271,986	276,989	379,542	389,547	499,605	512,111	522,117	532,122	544,628	554,634	564,639	577,145	587,150	597,156	607,161	607,161	607,161
Others	44,373	94,454	227,572	366,399	499,517	555,306	599,679	605,387	605,387	605,387	605,387	605,387	605,387	605,387	605,387	605,387	605,387	605,387	605,387	605,387
# of Connections																				
Residential	78	194	415	707	959	1,118	1,209	1,268	1,312	1,351	1,388	1,423	1,458	1,493	1,527	1,560	1,593	1,626	1,626	1,626
Commercial	8	13	15	17	19	19	21	21	21	21	21	21	22	22	22	22	22	22	22	22
Industrial	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Transport	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Others	1	3	6	10	13	16	17	18	18	18	18	18	18	18	18	18	18	18	18	18

>>>These demand and connections number assumptions are the basis for the LDC's revenue calculation, which are shown in next slides.

Gas Supply Infrastructure Feasibility (2 of 3)

Key revenue sources for Southwest Gas was extracted from the published tariff sheet Revision No 348 MGC GCBA

– Earning for an LDC is typically driven by Service Fee and Delivery Charges. These are explained below:

- ***Service Fee -*** This fee typically is payable by the customer irrespective of whether a customer uses any gas in from the system. For a broadly categorized residential customer for example, this fee is $10.7/month. This number are usually revised by the regulator. Some portion of this fixed fee goes towards earning a rate of return for laying out gas pipeline infrastructure.
- ***Delivery Charges -*** Delivery charges are payable by a customer based on usage. For example, for a broadly categorized residential user is expected to pay 73 cents per therm of natural gas usage. Based on an average 100 therms consumption, a user of natural gas can expect to pay nearly 73 dollars in delivery fee every year. A portion of this fee goes towards return for the gas distributor.
- **Gas Cost -** Typically there is commodity cost associated with the gas which is the cost of gas paid by the LDC. Usually, there is no mark-up on the cost of gas i.e. a LDC typically does not make any profit on the sale of gas (alternately called pass-thru cost). Currently cost of gas is $0.24/therm (24 dollar/year for a residential customer).

>>> The service and delivery charges would cover for all the costs incurred by an LDC.

Service Fee	*Units*	Cost per Annum
Residential	*$/Connection*	128.4
Commercial	*$/Connection*	960
Industrial	*$/Connection*	5640
Transport	*$/Connection*	11400
Other	*$/Connection*	960

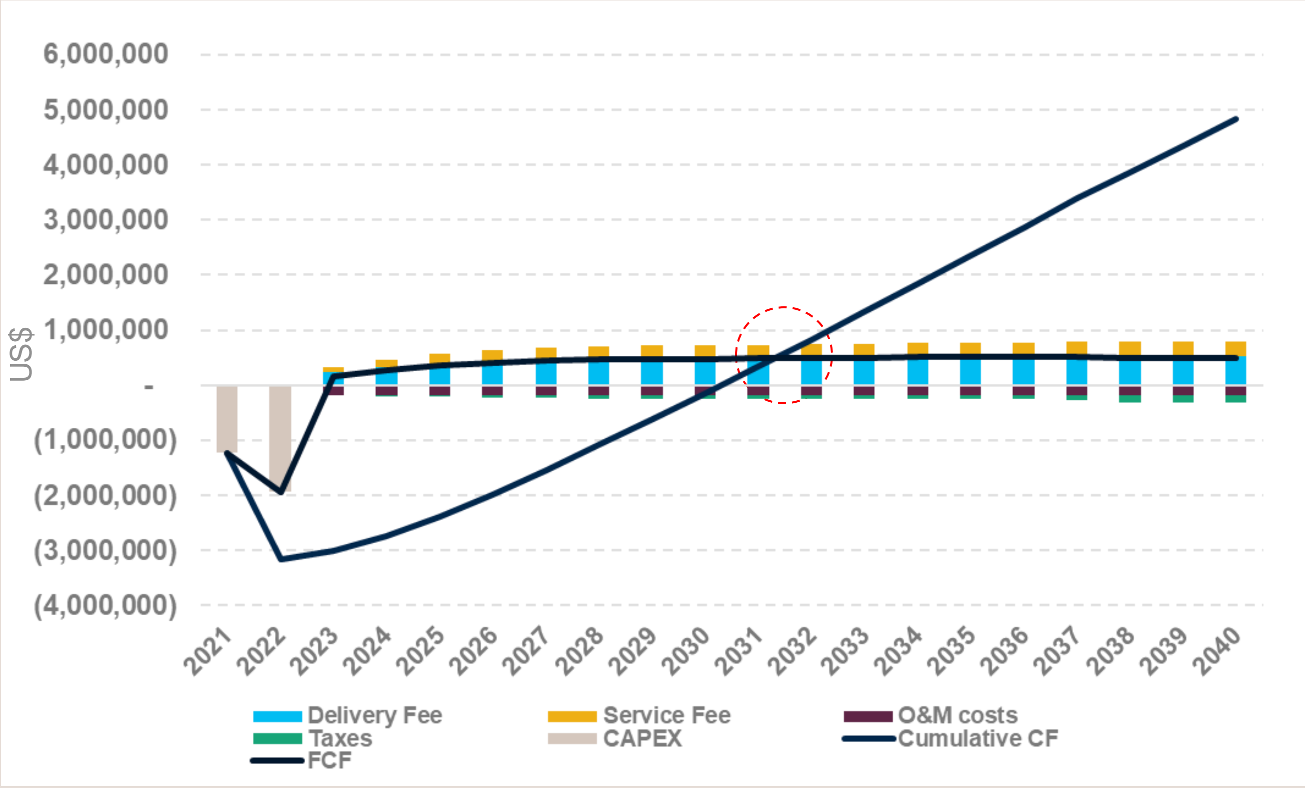
Delivery Charges	*Units*	Cost per Therm
Residential	*$/therm*	0.73
Commercial	*$/therm*	0.383
Industrial	*$/therm*	0.284
Transport	*$/therm*	0.114
Other	*$/therm*	0.383

Gas Supply Infrastructure Feasibility (3 of 3)

Southwest gas, with the projected demand profile, is expected to earn the required rate of return for the expansion

- Using the assumptions from the previous sides and the financial statement analysis, we can observe the following from the chart:
  - Delivery charges forms the largest section of review for the LDC. Thus, larger the demand center would be faster the capital would be returned (assuming no additional infrastructure is required).
  - Service fee is increasing in the later years, supported by increase in residential gas consumption.
  - Breakeven for infrastructure is achieved in 8 years from completion of infrastructure. If residential pipeline segments are developed slowly, the capital could be recovered faster.
- Based on this configuration, the infrastructure has a positive NPV of ~$27,000 over 18 years, with a project IRR of nearly 10.1%. Thus, based on projected demand profile, investment appears to be economically feasible for Southwest gas to City of San Luis.

San Luis Gas Distribution Cash Flow Analysis (US $)



Demand side feasibility – Transportation (1 of 2)

Demand for natural gas use in transport could be high in San Luis

- Traditionally, there has been a large cost differential between the price of CNG and Diesel. The difference is because of cost of natural gas which is typically cost lower for same energy content. Following example demonstrates the difference:
  - 1 gallon of Diesel contains nearly 130,000 Btu of energy (1.3 therms) and costs nearly $2.4/gallon;
  - As compared to the above, as per Southwest's tariff sheet, the delivered cost of natural gas to a CNG station would be:
    - ⇒ Commodity cost: $0.22/therm
    - ⇒ Cost of delivery: $0.219/therm
  - Thus for equivalent energy terms, 1 Diesel Gallon Equivalent of Energy costs nearly $0.57 (for 1.3 therms of energy).
- Comparing the above two, we can clearly observe that for every gallon equivalent of energy, one can save nearly $1.83/gallon.
- Typically, natural gas vehicles are slightly more expensive as compared to gasoline/diesel vehicles. For typical school busses, this incremental cost is of the order of $30,000/Bus.
- Additionally, some electricity would be used in the compressors to fill natural gas in the busses, that we have ignored as cost of electricity in the night time is expected to be low.

Compressor and Dual hose Time-fill post in Gulf Breeze, Florida

Demand side feasibility – Transportation (2 of 2)

A payback period analysis suggests CNG station breakeven within 10 – 12 years including the incremental cost of busses

- The calculations on the right are undertaken for a CNG station assuming the school busses are replaced with CNG school busses, which would cost nearly $30,000 higher as compared to the traditional school busses.
- Based on the differential in cost of Diesel and CNG, the can clearly observe that a simple payback period for a CNG bus would be nearly 7- 8years. If the buses run an average of more than 12,000 miles per year, the additional cost could be recouped within 9-10 years. This is compared with 16 years of life of the bus, which will result in nearly $25,000 incremental savings for each bus in 6 years (20% of cost of a school bus).
- Additionally, we can observe from the calculation that a CNG station facing a volume of such buses, not even adding any potential upside from fast-fill stations, including the additional cost of CNG busses would be recouped within 11 years.
- Thus, use of CNG appears to be feasible in the City of San Luis.

Additional Costs		
CAPEX (Difference CNG Bus vs Diesel Bus)	$	30,000
Operations & Maintenance Cost	$	-
Fuel Savings		
Fuel Price Differential (including Fuel Efficiency factor)	$/DGE	1.94
Annual Travel Distance	miles per year	16,000
Annual Fuel Consumed (Diesel)	gallons	2,286
Annual Fuel Consumed (NG)	DGE	2,667
Annual Savings per Bus	$	4,259
Payback Period per Bus	years	7.0
School Bus Life before Replacement	miles	200,000
Years before Replacement	years	12.5
Total Savings Over Life of a CNG Bus	$	53,231
Net Fuel Savings After Payback for Incremental Cost	$	23,231
Payback for a CNG Station		
Number of CNG Buses	nos.	101
Annual Savings for a District	$	430,109.94
Cost of a CNG Station+incremental cost of 101 CNG Busses	$	4,740,000
Payback in Years for the Combined Investment	**years**	**11.0**

Demand side feasibility – Commercial

Most of the commercial customers are restaurants and commercial kitchen, may find natural gas a cheaper alternative to Propane

- For commercial segment, propone and electricity are considered the alternative for natural gas. Following comparison of prices would set the stage for comparison:
  - **Propane gas cost**: on an average propane prices have declined in the recent years and hover around an average of $1/gallon of propane (only the cost of commodity). In addition to this, 1 gallon of propane costs nearly 91,500 Btu ~ 0.91 therm. Thus, price of propane per therm is nearly $1.10/therm.
  - **Cost of delivered natural gas**: as per the rate sheet from Southwest Gas, delivered cost of natural gas for a commercial outlet in San Luis region would be $0.24/therm for commodity, and 0.38/therm for delivery. Thus in total, the cost of delivered natural gas is $0.62/therm.
- When compared from above, we could clearly observe that natural gas cost is almost 40% lower than propane cost for commercial usage.
- Similarly, natural gas is the cheaper and efficient alternative to operate commercial heating as compared to electricity.

Comparison Between Commodity Prices

Natural gas: $0.62/therm – delivered by Southwest Gas

Propane: $1.10/therm – (as per average price observed in EIA)

Electricity: $0.1022/kWh => $3/therm

Thus, on a $/therm basis, it could be established that natural gas is the cheapest commodity among the three options, cost almost half to the cost of propane and a fifth of the cost of electricity.

Other sectors

Residential Savings could be estimate

– Within each of the other segments estimation of saving could be largely be viewed as necessary cost and switching cost differential that may result in consumers selecting to use natural gas as their primary source of heating/fuel. Following calculation can be done based on needs of segments:

› ***Residential Segment -*** As it is estimated that nearly each household is expected to use ~100 therms/year, if natural gas is used as an alternate fuel, the cost saving every year for 100 thems would be in range of 0 – 46 dollars per year as compared to propane. Propane piping installation cost could be higher. Thus, natural gas would be overall a better alternate.

› ***Industrial Segment -*** For industrial segment, use of natural gas would typically be cheaper and efficient for heating, drying, processing and other purposes. It must be noted, however, that depending on the type of equipment involved, the specific calculations have to be done to establish superiority of one fuel against the other.

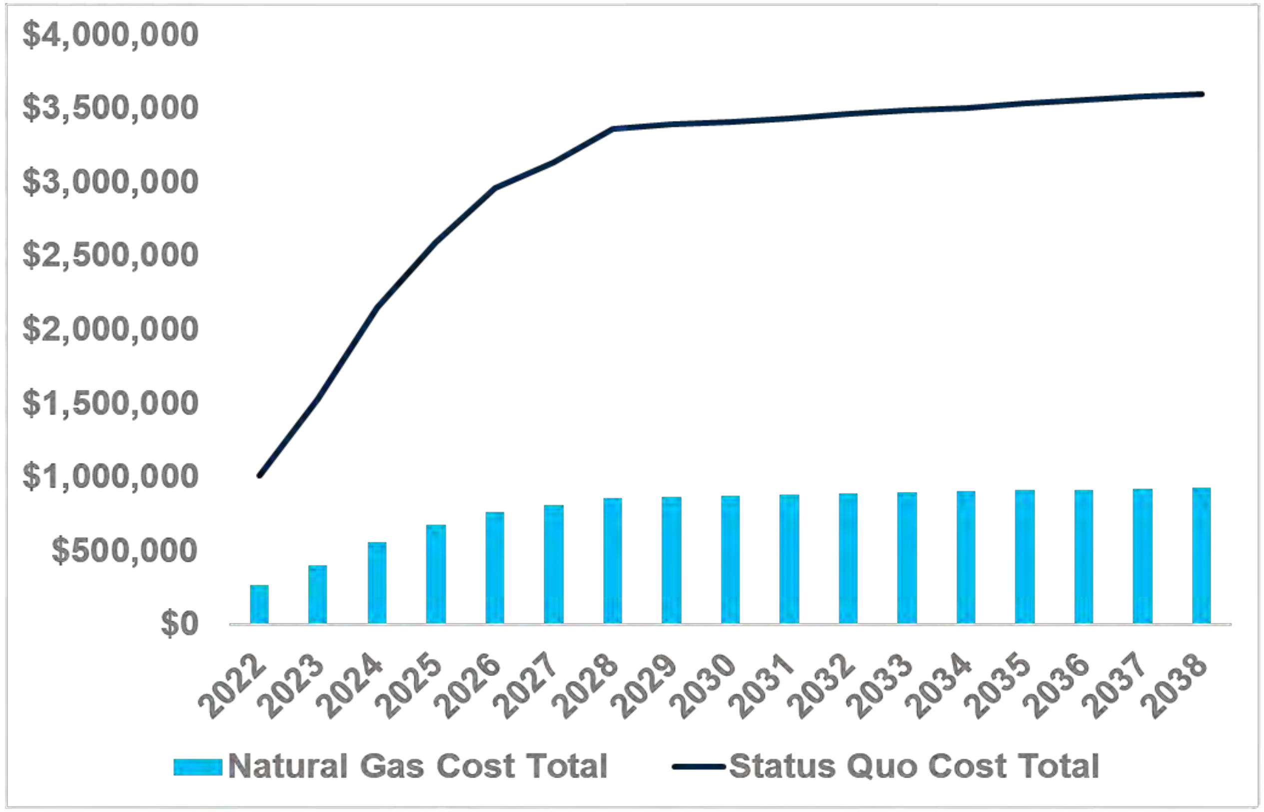
› ***Other Segments -*** In this report, we have categorized schools, government facilities, and other facilities in other segments. The main natural gas fuel alternative in these segment includes propane and electricity. Typically on the basis of economics, natural gas would result in lower operating costs as compared to the alternative fuels.

>>> In order to understand the magnitude of saving, in the next section, we have presented a table of potential saving from the use of natural gas on a commodity basis. The commodities compared against natural gas are propane, diesel and electricity.

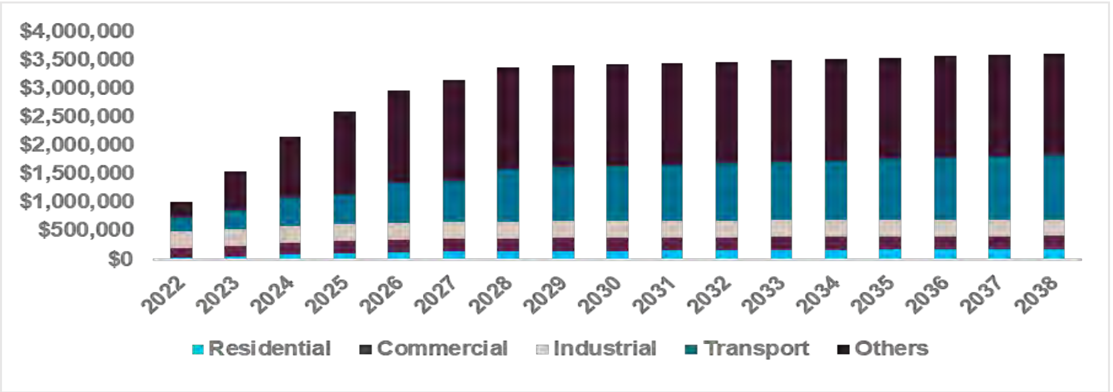
Savings Estimation

An estimated 72% saving is expected in a simplistic cost benefit analysis (without any switching costs) and underlying assumptions. Complete savings model is included as Annex 3 of this report

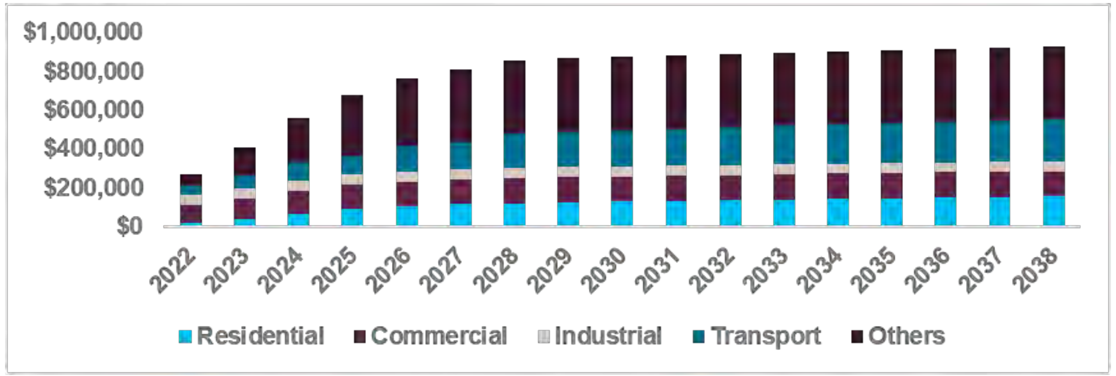
Natural Gas Cost vs Status Quo



Status Quo



Natural Gas Adoption



Conclusion

Natural gas offers tremendous potential for saving in San Luis and will encourage further movement of commerce in the region

Based on the economic feasibility analysis presented here, the following could be concluded:

- If the project demand profile materializes, infrastructure investments made by Southwest Gas would be sufficient to provide the required rate of return for the LDC. Thus, natural gas infrastructure development is feasible.
- On the demand side switching economics, it can be established that a CNG station in San Luis would serve as a stable anchor demand center for natural gas, with large savings if busses switch to natural gas. This will serve two purposes:
  - Cost saving in running the school districts.
  - Usage of environmentally cleaner fuel.
- Comparison of cost between natural gas and propane yields favorable economics for use of natural gas in commercial sector as well as residential sector.
- Finally, the industrial sector may require switching economics validated on case by case bases for existing machinery, but future industries could certainly benefit from natural gas availability.

>>> Thus, a nutshell, natural gas appears to be economically feasibility and a superior fuel that can serve the community reliably.

9 *Regulation, Rates and Permitting*

Regulatory Requirements

Natural gas access to the end customers requires two key participants: the gas supplier (or gas producer or shipper) and the gas distributor (or gas infrastructure owner/operator)

- Under the current US regulatory regime gas suppliers (also referred to as marketers or shippers) are not regulated. This means that gas producers and shippers' business are not subject to a regulators' oversight for day to day business; prices are determined by market forces.
- In contrast, pipeline companies and local distribution companies (LDCs) are regulated; service price is determined or approved by a regulator. The key objective for regulating the distribution infrastructure is to ensure non-discriminatory access to the gas source for all the gas buyers and to ensure fair pricing is established; returns are set by the regulator. The Yuma County's LDC, Southwest Gas, has seen return on its distribution infrastructure capped between 9% to 10% of cost of capital.
- Natural gas pipeline permitting requirements can fall within federal and/or state and local level jurisdictions. The jurisdiction is determined based on whether the pipeline is interstate or intrastate.
  - ***Interstate Pipelines*** **-** Are those which cross multiple states (eg. El Paso Pipeline) and are regulated by two federal agencies: the Federal Energy Regulatory Commission (FERC) and the Pipeline Safety and Hazardous Materials Administration (PHMSA) within the Department of Transportation (DOT). FERC reviews applications for construction and operations of interstate pipelines while PHMSA promulgates minimum federal safety standards for pipeline facilities and transportation.
  - ***Intrastate Pipelines*** **-** Those that operate within state borders. PHMSA delegates in appointed state regulators the responsibility for the sitting, construction and expansion of pipelines within state boundaries.
- Distribution pipelines fall in the intrastate category; as such are under state jurisdiction. For the City of San Luis, the Arizona Utility Commission is the entity that administers safety and consumer protection plans as well as regulates distribution pipeline operations and maintenance.

Permitting Requirements

State level permitting is a little more complex than local government permitting. Permitting may require, as needed:

State Level

- Submission of plans and stakeholder details to state regulators.
- Environmental agencies:
  - Specific permission for river or stream crossings.
  - Environmental assessments to outline endangered species and wetland impacts from large projects in the vicinity of environmental sensitive areas.
  - Air and other environmental pollution studies.
- Right of way (ROW) permissions are sought from the various landowners on the route.
- Depending on complexity of project and elements involved, the permitting timeline could be 6 to 12 months or longer.

Local Government

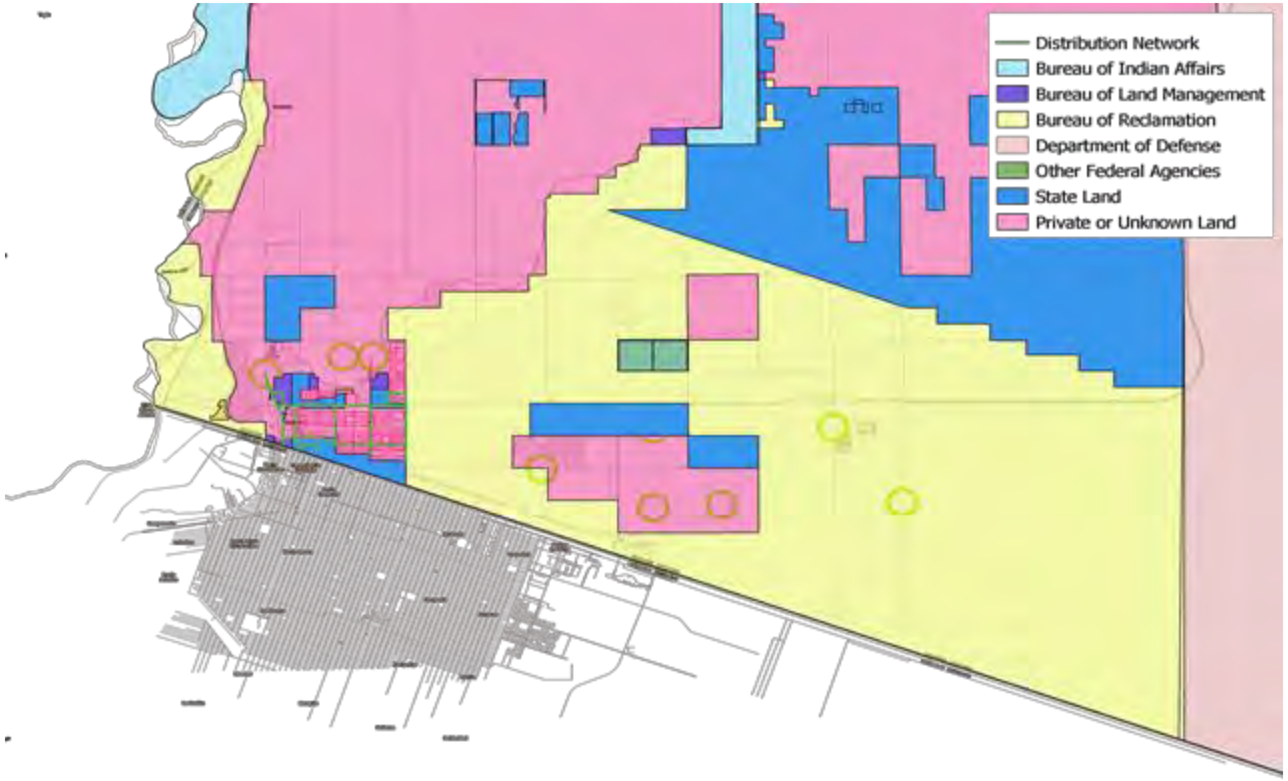
- Construction permit from town/municipal entities with necessary conditioned fulfilled. The representative for the construction company should meet with government representatives to discuss the scope and specifications of the permit.
  - Submission of plans outlining the project.
  - Municipality verifies that the plans do not conflict with roads, canals, sewers and other existing or planned infrastructure.
  - In case of any conflict special arrangements may be needed to agree on a solution.
- Municipal codes and specific requirements.
- Local government may or may not require inspection of the pipelines.
- The permitting timeline could take between 2-3 months for approval.

Route Stakeholders in the Region

Land ownership and permitting the region

- In terms of routing, permissions may be required from not only from private landowners, but also from the Bureau of Land Management (BLM), the Bureau of Reclamation (BOR) and the State of Arizona (under Arizona State Land Department) – in cases where the pipeline crosses their property.
- Similar permitting documentation may be required for BOR, BLM and municipal authorities. Individual landowners may have different arrangements and incentives.
- Looking at the map, it appears that if a northern supply option is chosen, land permits would be required from the municipal government, with a faster processing expected. Still some permission from the State may be necessary.
- If, on the other hand, an east gas supply option is chosen then the developer would have to apply for supply permits from the BOR, BLM, State and Municipal bodies – which may take between 6 – 8 months, unless a portion of ROW is already permitted.

Land ownership in San Luis region (source: BLM)



Regulatory Requirements for Cross-Border Pipelines

The following regulations would be applicable for a cross-border pipelines:

- A company must obtain a Presidential permit before constructing and operating a cross-border pipeline between the United States and a foreign country.
- Presidential permits for natural gas pipelines are requested through the Federal Energy Regulatory Commission (FERC) as per Executive Order 10485. FERC approves the requests if it determines that the pipeline is 'consistent with the public interest' and if the Secretary of Defense and the Secretary of State make favorable recommendations.
- FERC is also the agency in charge of authorizing the siting, construction and operation of the pipeline.
- Executive Order 13867 of April 10, 2019 designated the Secretary of State to receive all applications for the issuance or amendment of Presidential permits, however natural gas pipelines was exempted, and its designation falls to FERC.

>>> The process would be revisited with permits necessary for supply of natural gas across the border and permits would be discussed with the corresponding counterparties from San Luis Rio Colorado.

10 | *Conclusions and Recommendation*

Key Conclusions from the Study

To evaluate the feasibility of a natural gas distribution system in the City of San Luis, we have assessed the following items which are key for the undertaking of such a project:

- Establishment of long-term gas demand availability in the region. Several segments were investigated for potential demand and based on a conservative case demand in the region was forecasted till 2038 (15 years from projected start date for the infrastructure).
- Establishment of long-term low price gas supply availability in the region. Gas supplies are available from multiple supply sources and basins with sufficient gas for several decades. Additionally, price of gas from these basins have remained low and is expected to remain in that level for a long time.
- Evaluation of gas value-chain infrastructure and expansion concept development. There is existing gas infrastructure available in the region operated by Southwest Gas, an established regional LDC. The LDC has jurisdiction for gas distribution in the region and has several supply and interconnection points possible to serve the demand.
- Evaluation of feasibility of gas distribution network. Based on the cost estimated for the infrastructure, return estimation, switching economics, and commodity cost, an economy based on natural gas would be superior for the region.
- Commentary on permitting and regulations around such development. An initial analysis of the region shows limited delays because of permitting requirements.

>>> Based on the assessment, the development of the natural gas infrastructure appears highly feasible and would provide the region with energy security and an economic boost. At this stage, the city should look forward to the next steps to achieve the development as described in the following slides.

Recommendations

The steps described herein should be pursued in order to gain buy-in from various stakeholders, including the LDC:

1. **Gathering demand commitments** Acquiring customers is the foundational work for developing the capital-intensive infrastructure of gas distribution pipeline. Meeting with different customer segments and having firm commitments in the form of a letter of intent or a gas purchase agreement is imperative for reducing uncertainty of demand. Key customers within the segments would include:
   - ***Commercial segments*** **-** The City should hold discussions with restaurants, commercial kitchens, grocery stores and other retail stores to gather their interest in using/switching to natural gas in their businesses.
   - ***Industrial Customer*** **-** We understand there are several industrial players in the region who could benefit from natural gas availability in south San Luis near the commercial port of entry.
   - ***School District*** **-** A potential anchor customer for natural gas would be the school district, which can convert/purchase new buses to run on compressed natural gas. This conversion/purchase could result in a large demand center for natural gas.
2. **Discussion with Southwest Gas** The City should enter in discussions to run a hydraulic analysis and validate the sufficiency of the infrastructure and the availability of gas with the LDC. The City should work hand-in-hand with the LDC in getting demand commitments and permitting support.
3. **Create awareness** The City should also create more awareness in the general population on the benefits of natural gas and seek participation from residential customers to increase consumer benefit in the region.

Thank you!

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Annex 1: Connection Breakdown

Number of Units

In units	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Residential	10,231	10,610	10,986	11,359	11,728	12,094	12,457	12,817	13,175	13,531	13,884	14,235	14,582	14,926	15,266	15,602	15,933	16,259	16,259	16,259
Commerical																				
Restaurants	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
Retail Stores	16	17	17	18	18	19	19	20	21	21	22	22	23	23	24	24	25	25	0	0
Brewery	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Grocery Stores	5	5	5	6	6	6	6	6	6	7	7	7	7	7	7	8	8	8	0	0
Industrial																				
Medical Waste Incinerator	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Medical Mall (Other medical facilities)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Food Processing	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Refrigerated Warehouse	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Nonrefrigerated Warehouses	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Transportation																				
Others																				
Medical Device	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Call Center	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Schools	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13
Government	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6

Annex 1: Estimated Gas Demand- 100% Adoption 2021-2038 (cont.)

Industrial Park (Therm)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Industrial																		
Medical Waste Incinerator	*2,978,400*	*2,978,400*	*2,978,400*	*2,978,400*	*2,978,400*	*2,978,400*	*2,978,400*	*2,978,400*	*2,978,400*	*2,978,400*	*2,978,400*	*2,978,400*	*2,978,400*	*2,978,400*	*2,978,400*	*2,978,400*	*2,978,400*	*2,978,400*
Medical Mall (Other medical facilities)	*24,343*	*24,343*	*24,343*	*24,343*	*24,343*	*24,343*	*24,343*	*24,343*	*24,343*	*24,343*	*24,343*	*24,343*	*24,343*	*24,343*	*24,343*	*24,343*	*24,343*	*24,343*
Food Processing	*900,943*	*900,943*	*900,943*	*900,943*	*900,943*	*900,943*	*900,943*	*900,943*	*900,943*	*900,943*	*900,943*	*900,943*	*900,943*	*900,943*	*900,943*	*900,943*	*900,943*	*900,943*
Refrigerated Warehouse	*3,594*	*3,594*	*3,594*	*3,594*	*3,594*	*3,594*	*3,594*	*3,594*	*3,594*	*3,594*	*3,594*	*3,594*	*3,594*	*3,594*	*3,594*	*3,594*	*3,594*	*3,594*
Nonrefrigerated Warehouses	*7,170*	*7,170*	*7,170*	*7,170*	*7,170*	*7,170*	*7,170*	*7,170*	*7,170*	*7,170*	*7,170*	*7,170*	*7,170*	*7,170*	*7,170*	*7,170*	*7,170*	*7,170*
Medical Device	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Residential	*41,600*	*41,600*	*41,600*	*41,600*	*41,600*	*41,600*	*41,600*	*41,600*	*41,600*	*41,600*	*41,600*	*41,600*	*41,600*	*41,600*	*41,600*	*41,600*	*41,600*	*41,600*
Belleza del Desierto- Phase I (19 acres)	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*
Belleza del Desierto Phase II (18 acres)	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*	*9,000*
High Density Residential (4 acres)	*9,600*	*9,600*	*9,600*	*9,600*	*9,600*	*9,600*	*9,600*	*9,600*	*9,600*	*9,600*	*9,600*	*9,600*	*9,600*	*9,600*	*9,600*	*9,600*	*9,600*	*9,600*
Santa Cecilia (18 acres)	*14,000*	*14,000*	*14,000*	*14,000*	*14,000*	*14,000*	*14,000*	*14,000*	*14,000*	*14,000*	*14,000*	*14,000*	*14,000*	*14,000*	*14,000*	*14,000*	*14,000*	*14,000*
Total	*3,956,050*	*3,956,050*	*3,956,050*	*3,956,050*	*3,956,050*	*3,956,050*	*3,956,050*	*3,956,050*	*3,956,050*	*3,956,050*	*3,956,050*	*3,956,050*	*3,956,050*	*3,956,050*	*3,956,050*	*3,956,050*	*3,956,050*	*3,956,050*

Annex 2: Estimated Gas Demand- 100% Adoption 2021-2038

San Luis City (Therm)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Residential	7,800	19,400	41,500	70,700	95,900	111,800	120,900	126,800	131,200	135,100	138,800	142,300	145,800	149,300	152,700	156,000	159,300	162,600
Commercial	109,922	153,704	175,344	186,667	197,989	197,989	209,312	209,312	209,312	209,312	209,312	209,312	209,814	209,814	209,814	209,814	209,814	209,814
Restaurants	64,920	108,200	129,840	140,660	151,480	151,480	162,300	162,300	162,300	162,300	162,300	162,300	162,300	162,300	162,300	162,300	162,300	162,300
Retail Stores	0	503	503	1,005	1,508	1,508	2,010	2,010	2,010	2,010	2,010	2,010	2,513	2,513	2,513	2,513	2,513	2,513
Brewery	42,391	42,391	42,391	42,391	42,391	42,391	42,391	42,391	42,391	42,391	42,391	42,391	42,391	42,391	42,391	42,391	42,391	42,391
Grocery Stores	2,611	2,611	2,611	2,611	2,611	2,611	2,611	2,611	2,611	2,611	2,611	2,611	2,611	2,611	2,611	2,611	2,611	2,611
Transport	0	136,125	179,438	271,986	276,989	379,542	389,547	499,605	512,111	522,117	532,122	544,628	554,634	564,639	577,145	587,150	597,156	607,161
Elementary School Busses	0	20,010	22,512	45,023	45,023	70,036	72,538	100,052	102,553	105,055	107,556	110,057	112,559	115,060	117,561	120,063	122,564	125,065
Refuse Trucks	0	51,081	89,391	89,391	89,391	89,391	89,391	89,391	89,391	89,391	89,391	89,391	89,391	89,391	89,391	89,391	89,391	89,391
High School District	0	65,034	67,535	137,572	142,574	220,115	227,619	310,162	320,167	327,671	335,175	345,180	352,684	360,188	370,193	377,697	385,201	392,705
Others	44,373	94,454	227,572	366,399	499,517	555,306	599,679	605,387	605,387	605,387	605,387	605,387	605,387	605,387	605,387	605,387	605,387	605,387
Schools	44,373	88,746	221,864	354,983	488,101	532,474	576,847	576,847	576,847	576,847	576,847	576,847	576,847	576,847	576,847	576,847	576,847	576,847
Government	0	5,708	5,708	11,416	11,416	22,832	22,832	28,540	28,540	28,540	28,540	28,540	28,540	28,540	28,540	28,540	28,540	28,540
Industrial	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Automobile Factory	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Total	**262,095**	**503,683**	**723,855**	**995,752**	**1,170,396**	**1,344,638**	**1,419,439**	**1,541,104**	**1,558,011**	**1,571,916**	**1,585,621**	**1,601,628**	**1,615,635**	**1,629,140**	**1,645,047**	**1,658,352**	**1,671,657**	**1,684,963**

Annex 3: Savings Estimation

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Status Quo																	
Residential[1]	35,082	73,552	122,842	163,279	186,995	198,798	205,137	209,180	212,350	215,191	218,033	220,765	223,607	226,448	226,448	226,448	226,448
Commercial[1]	185,939	209,589	221,963	234,338	234,338	246,163	246,163	246,712	246,712	246,712	246,712	246,712	246,712	246,712	246,712	246,712	246,712
Industrial[2]	294,201	294,201	294,201	294,201	294,201	294,201	294,201	294,201	294,201	294,201	294,201	294,201	294,201	294,201	294,201	294,201	294,201
Transport[3]	251,308	326,652	492,893	521,086	687,327	691,945	872,038	904,850	914,085	918,703	932,556	960,750	974,603	979,221	979,221	979,221	979,221
Others[2]	274,672	661,489	936,161	1,322,979	1,485,504	1,614,444	1,631,237	1,631,237	1,631,237	1,631,237	1,631,237	1,631,237	1,631,237	1,631,237	1,631,237	1,631,237	1,631,237
Total	1,041,201	1,565,484	2,068,060	2,535,882	2,888,364	3,045,550	3,248,776	3,286,180	3,298,585	3,306,044	3,322,739	3,353,665	3,370,360	3,377,819	3,377,819	3,377,819	3,377,819
Natural Gas Adoption																	
Residential[1]	31,001	64,995	108,550	144,283	165,240	175,670	181,271	184,845	187,645	190,156	192,667	195,082	197,592	200,103	200,103	200,103	200,103
Commercial[1]	105,993	119,475	126,529	133,583	133,583	140,324	140,324	140,637	140,637	140,637	140,637	140,637	140,637	140,637	140,637	140,637	140,637
Industrial[2]	52,400	52,400	52,400	52,400	52,400	52,400	52,400	52,400	52,400	52,400	52,400	52,400	52,400	52,400	52,400	52,400	52,400
Transport[3]	48,188	62,636	94,512	99,918	131,795	132,680	167,213	173,505	175,276	176,161	178,818	184,224	186,880	187,766	187,766	187,766	187,766
Others[2]	58,164	140,077	198,241	280,154	314,570	341,875	345,431	345,431	345,431	345,431	345,431	345,431	345,431	345,431	345,431	345,431	345,431
Total	295,747	439,583	580,233	710,338	797,588	842,949	886,639	896,817	901,389	904,785	909,952	917,773	922,940	926,337	926,337	926,337	926,337
Savings																	
Residential[1]	4,081	8,557	14,291	18,996	21,755	23,128	23,865	24,336	24,705	25,035	25,366	25,684	26,014	26,345	26,345	26,345	26,345
Commercial[1]	79,945	90,114	95,434	100,755	100,755	105,839	105,839	106,075	106,075	106,075	106,075	106,075	106,075	106,075	106,075	106,075	106,075
Industrial[2]	241,801	241,801	241,801	241,801	241,801	241,801	241,801	241,801	241,801	241,801	241,801	241,801	241,801	241,801	241,801	241,801	241,801
Transport[3]	203,119	264,017	398,381	421,168	555,532	559,264	704,825	731,345	738,809	742,542	753,739	776,526	787,723	791,455	791,455	791,455	791,455
Others[2]	216,507	521,412	737,920	1,042,825	1,170,934	1,272,569	1,285,806	1,285,806	1,285,806	1,285,806	1,285,806	1,285,806	1,285,806	1,285,806	1,285,806	1,285,806	1,285,806
Total	745,454	1,125,901	1,487,827	1,825,544	2,090,776	2,202,601	2,362,136	2,389,363	2,397,196	2,401,259	2,412,787	2,435,892	2,447,419	2,451,482	2,451,482	2,451,482	2,451,482
Saving %	72%	72%	72%	72%	72%	72%	73%	73%	73%	73%	73%	73%	73%	73%	73%	73%	73%

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Feasibility Study for Natural Gas Distribution in City of San Luis and San Luis Rio Colorado – Part II

Table of Contents

1 Executive Summary

Executive Summary (1 of 3)

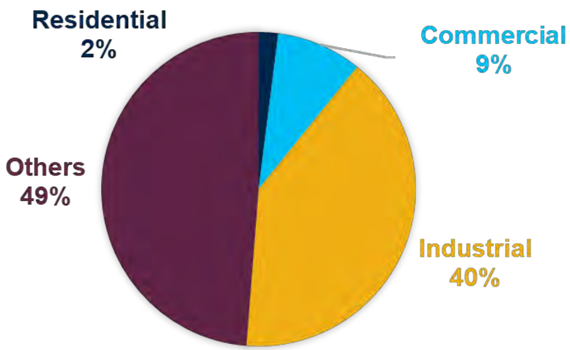
Taking advantage of its particular characteristics as a border city, San Luis Rio Colorado is anticipating growth in the areas of population, economic indices and income per capita.

City and Economic Overview

- San Luis Rio Colorado is located on the northwestern corner of Sonora, adjacent to the Colorado River and immediately adjacent to the international border between Baja California and Sonora in Mexico and California and Arizona in the United States.
- San Luis Rio Colorado has a well-established maquiladora and medical tourism industries, which have been influential in the region's economic expansion, which is expected to continue.
- Population is envisaged to increase at a rate of 1.42% per year, to approximately 254,464 habitants in 2038. As economic conditions improve, additional residential, commercial and industrial developments are likely.

Gas Demand in San Luis Rio Colorado

- Total gas demand is anticipated to reach 31,717,031 therms[1] by 2038. The Others sector, in particular schools, is expected to have the largest share of nearly 49% and additional demand is expected to come from growing industries. It is unlikely to achieve 100 percent market penetration in the first year that natural gas is made available. In case a planned powerplant is confirmed, the demand will exceed more than 200 million therms.



[1] 1 Therm = 100,000 British Thermal Units (Btu) and assuming no pow erplant

Executive Summary (2 of 3)

There is sufficient pipeline design capacity in the region, but gas distribution infrastructure is yet to be developed.

Gas supply in San Luis Rio Colorado

- The region itself does not have any transmission pipelines and gas is expected to be supplied from the United States. There are some existing distribution pipelines laid in the area, but was not accessible for the study.

Gas Distribution Infrastructure Design

- Based on the projected demand profile, without a powerplant demand, San Luis Rio Colorado would conservatively require one main feeder line and five regional feeder lines. The location would be:
  - nearly 18 miles of 10.5" main feeder line, connecting at Somerton supply
  - nearly 6 miles of 6.5" feeder line 1 – running along the border of US and Mexico;
  - nearly 4 miles of 6.0" feeder line 2, 3, and 4, each with length of 6 miles, 4 miles, and 9 miles respectively – running through the densely populated region of city, parallel to feeder line 1
  - nearly 11 miles of 7" feeder line 5 – which will diverge south to meet additional relatively less dense population.
- Total infrastructure cost for this investment is estimated at nearly $34.1 million (this includes main and subsidiary feeder lines).
- In case a powerplant demand is available, the 10.5" main feeder line can be replaced with a 25 miles 12" transmission pipeline [from Yuma]

Executive Summary (3 of 3)

Based on conservative demand estimates and infrastructure plan, gas distribution system development seems feasible.

Conclusion

- Based on estimated demand, estimated pipeline infrastructure costs, and existing tariffs (as derived from Southwest Gas' existing tariffs), the development of the gas distribution network appears to meet the regulated target unlevered rate of return of nearly 10%.
- The project's target return remains in the viable range for investment, with or without the construction of the power plant.
- Comparing the commodity cost of alternative fuels, natural gas appears to be cheapest option on an energy equivalent basis and is expected to be adopted widely if available.
- Thus, based on expectation of the demand estimates and favorable economics, development of natural gas infrastructure is feasible.

Next steps

In order to pursue the development of infrastructure two steps must be followed in parallel.

1. Gathering commitment from the customers for use of natural gas for mid-to-long term, which will provide the project developers with the necessary incentive to pursue the infrastructure development.
2. Start discussion with Southwest Gas and EPNG on gas and pipeline capacity constraints and availability and development of system hydraulics, cost validation and development timeline.

2 | *Project Overview*

Part II Overview

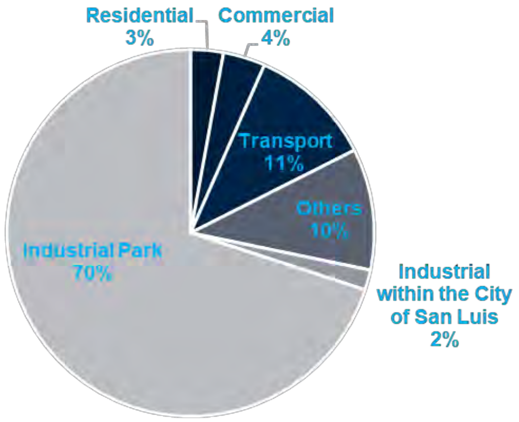
Part II (SLRC) will address the following objectives: quantify existing and future gas demand; evaluate the potential sources of gas supply in the region; identify various infrastructure and commodity options available to meet demand; provide a preliminary design of pipeline infrastructure to the source and to the distribution network; identify regulatory requirements that affect the development of this project; assess the techno-feasibility of the project by combining demand, supply, commodity options, design and costs.

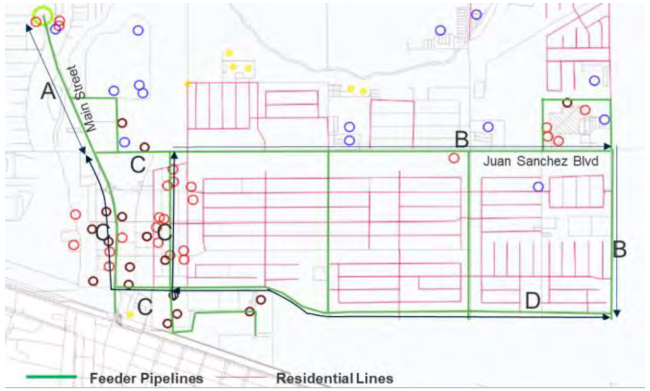
This section begins with a brief summary of the results of Part I.

Summary of Results for San Luis, AZ (1 of 2)

Review of gas demand, supply and infrastructure design.

- **Gas Demand** ***Location-*** concentrated in two areas – San Luis City (mostly commercial, residential and other demand) and Industrial zones east of the city. ***Total gas demand-*** expected to reach 5,653,519 therms[1] by 2038. Of this demand, the industrial sector is expected to have the largest share of nearly 70%. Additional demand is expected to come from growing industries.
- **Gas Supply-** ***Transmission pipelines-*** two in the region which could be tapped for natural gas supply: El Paso Natural Gas Pipeline and North Baja pipeline. ***Distribution-*** comes under the jurisdiction of Southwest Gas, a local distribution utility ("LDC") active in Arizona, Nevada and California. The utility has contracted supplies from the transmission pipeline with a design capacity of over 1 million therms/day. City of San Luis lacks gas distribution infrastructure and expansion of existing grid would be required.
- **Gas Distribution Infrastructure-** ***Design-*** would conservatively require nearly 2 miles of 6" pipeline, 5.5 miles of 3" pipelines and nearly 23 miles of 1" residential service lines. ***Total infrastructure cost-*** estimated at nearly $3.1 million (this excludes cost of building a CNG station necessary to supply natural gas to transportation sector).





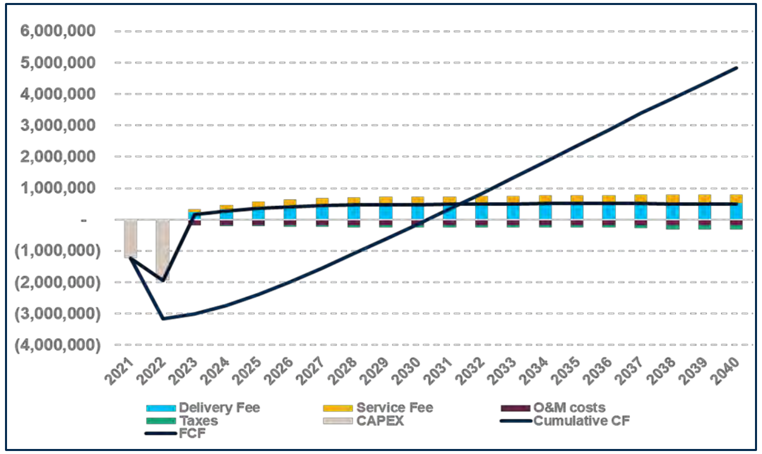
[1] 1 Therm = 100,000 British Thermal Units (Btu)

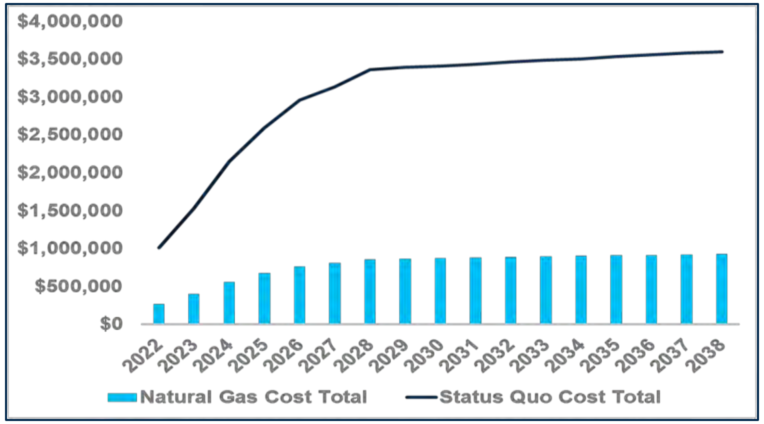
Summary of Results for San Luis, AZ (2 of 2)

Conclusions and Recommendations Provided

- **Conclusions-** ***Investment-*** expansion of the existing gas distribution network appears to meet the target return requirement for the LDC. A CNG station is proposed for the city to reduce the cost of running school busses as well as reducing carbon footprint. Incremental investment in buses are expected to be recouped within 5-6 years, whereas overall investment (along with CNG station) could be recouped within 10-12 years. ***Commodity comparison-*** natural gas appears to be cheapest option and is expected to be adopted widely if available. ***Awareness-*** create more awareness in the general population on the benefits of natural gas and seek participation from residential customers to increase consumer benefit in the region.

- **Recommendations-** ***Incentive-*** commitment from customers for mid-to-long term use of natural gas will incentivize Southwest Gas to pursue the infrastructure development. ***Discussion-*** with Southwest Gas on gas availability and development of system hydraulics, cost validation and development timeline.





Report II Organization

The Preliminary Executive Summary Report, dated August 2020, provided an outline, summarized the initial results, and laid the foundations for market demand and gas distribution costs. Part II expands upon that preliminary report.

- **Section 3** ***Current Situation*** **-** Explains the location and key population facts of the city, the business and economic planning outlook, the existing natural gas infrastructure, the customers and the need for the project.
- **Section 4** ***Demand Estimation*** **-** Presents a forecast model with two scenarios for the potential demand for San Luis Rio Colorado from 2021-2038. The model forecasts the demand for the residential, commercial, industrial and other sectors. It also presents two sub-scenarios, one that includes the development of the combined-cycle generation plant and one that does not.
- **Section 5** ***Supply Analysis*** **-** Describes basins characteristics and pricing where natural gas could potentially be sourced from, explains the existing natural gas supply infrastructure in the area and explains the local distribution network and the El Paso Natural Gas Pipeline.
- **Section 6** ***Routing and Conceptual Design*** **-** Provides information on the conceptual background, the pipeline diameter calculation, layout and proposed route, the pipeline sizing and considerations, and initial cost estimates and development timeline.
- **Section 7** ***Supply Alternatives*** **-** Explains the project's supply alternatives: from the north, the east, and by LNG trucks.
- **Section 8** ***Economic Feasibility*** **-** Explains the project's feasibility from the perspectives of finance, supply, and demand. It also provides estimated savings of switching to natural gas when compared to the alternative options.
- **Section 9** ***Regulatory Requirements*** **-** Explains the different regulatory requirements.
- **Section 10** ***Environmental Assessment-*** Describes the key environmental resources and conclusion on impacts on various resources.
- **Section 11** ***Conclusions and Recommendations*** **-** Provides the key conclusions from the study and recommendations.

3 | *Current Situation*

Overview (1 of 3)

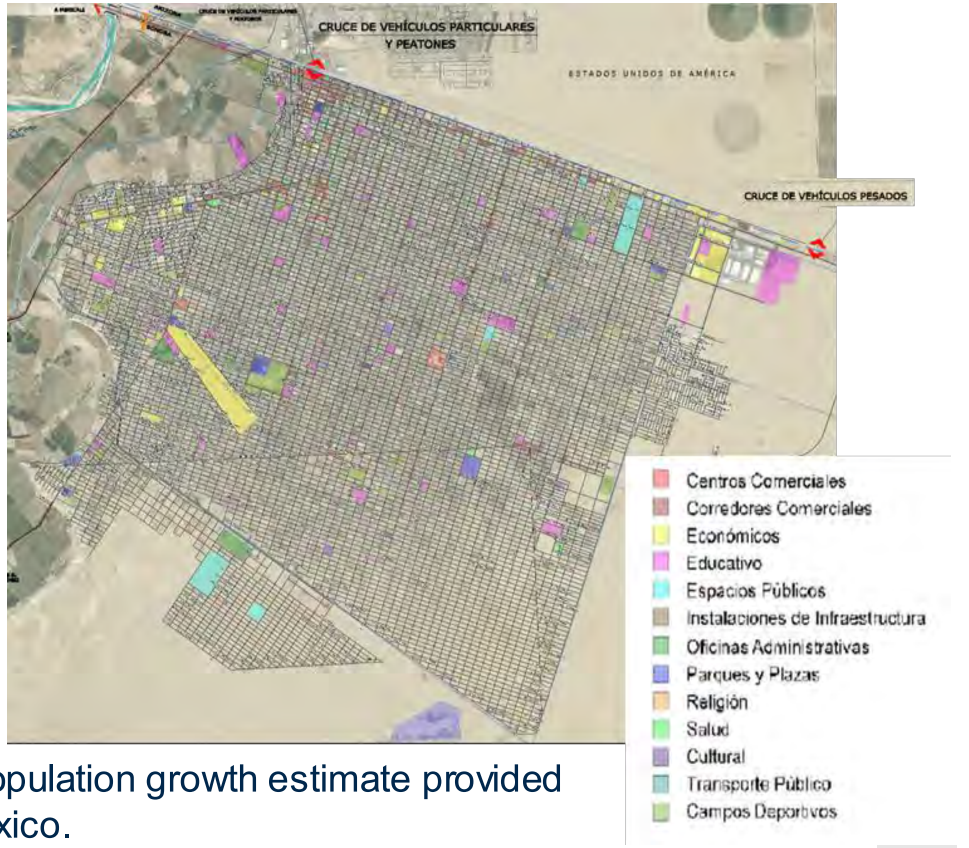
Location and Key Facts

The city of San Luis Rio Colorado, area of 8,412.75 km^2, is located on the northwest corner of the state of Sonora, Mexico, border with the state of Arizona, United States. It is a major agricultural center due to its access to the Colorado River in addition to having an established medical tourism industry for more affordable dental and medical services in the proximity with the US border. The city concentrates about 88% of the municipality's population.

Following are some of they key facts about the city of San Luis Rio Colorado:

- Government estimated a population growth of 1.4% for the city.
- Population estimations are: 2016- 196,447; 2017-199,223; 2018- 201,898; and 2019 204,484.
- **2020** (Estimated): *206,982**
- Household **2020** (estimated): *51,746*

Zoning Map of the City of San Luis Rio Colorado



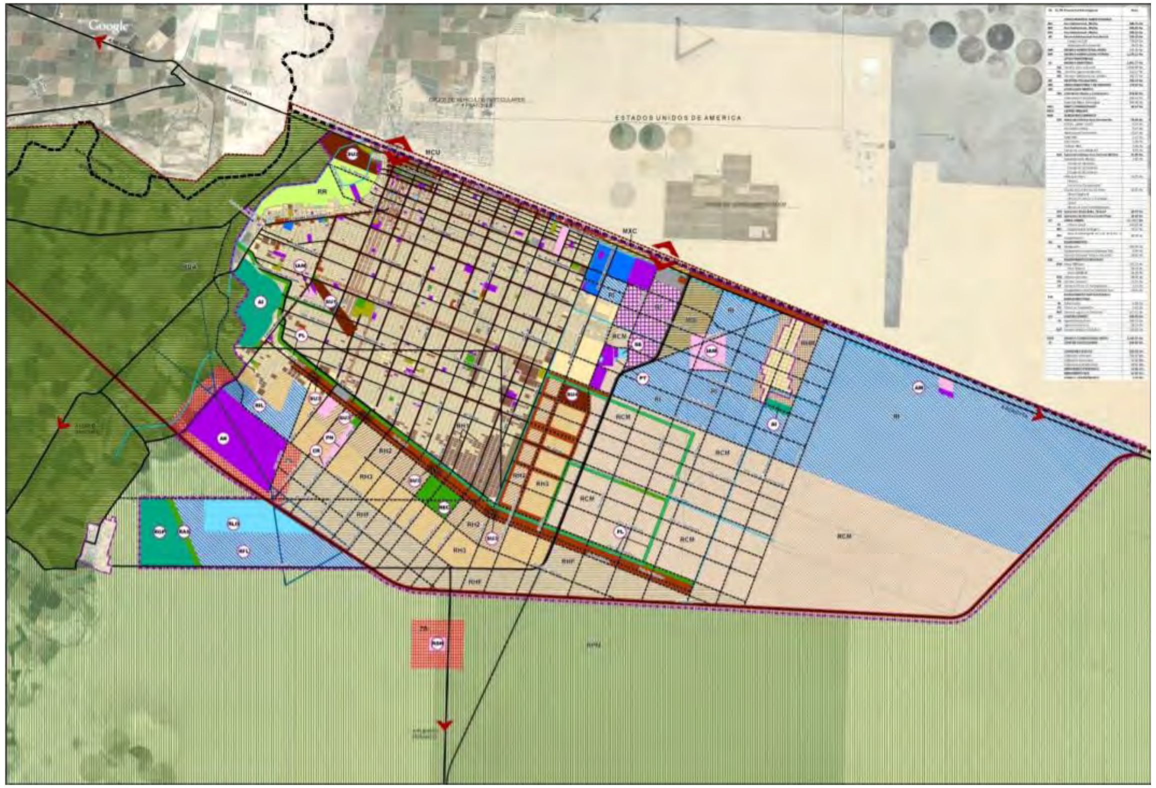
* Population growth is expected to remain constant at 1.4% per year. This report follows the population growth estimate provided by the Consejo Nacional de Poblacion, Proyecciones de la Poblacion de los Municipios de Mexico.

Overview (2 of 3)

Key Businesses and Economic Planning outlook

- Primary economic sectors in the City of San Luis Rio Colorado include agriculture, cattle, fishing, manufacturing, commerce and tourism.
- The city has a well-established 'maquiladora' industry in areas such as textiles, electronics, food production, toys, furniture and automobile, amongst others.
- The City has put together an urban development plan until 2040. Some points included development plan are:
  - Growth of the medical tourism industry
  - Optimization and correct distribution and mixture of land use including defining areas for primary residential zoning, generic economic (commercial/industrial) use and future economic development areas
  - Construction of a new airport
  - Introduction of natural gas as a fuel

San Luis Rio Colorado Planned Land Distribution



Overview (3 of 3)

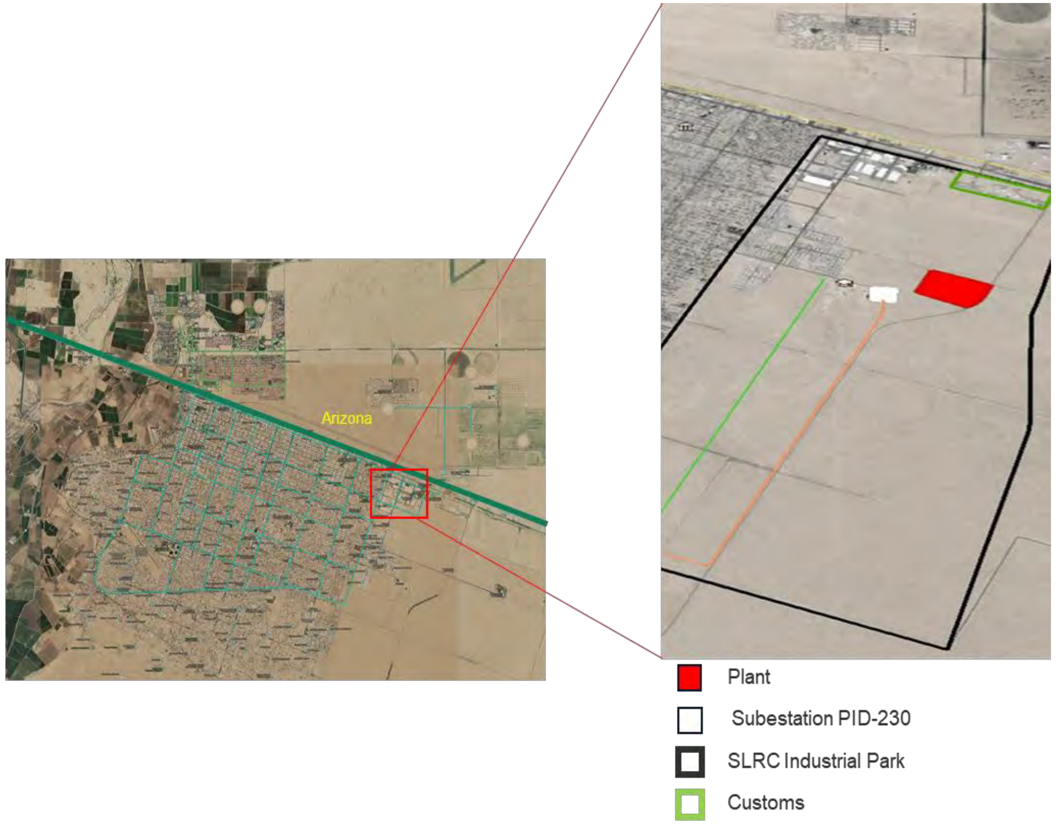
Combined Cycle Electricity Generation Plant

- The CC Plant is planned to be located in 30 hectares within the International Industrial Park ("PII"). The PID-230 substation will be the interconnection point and is located 300 meters from the planned site.
- The Master Plan for the development of the CC Plant also includes additional 65,000 homes within a 20-year period.

Technical information

- Phase 1- Open Cycle:
  - 1 gas turbogenerator
  - 1 auxiliary chimney
  - Main current transformer for gas turbine, interconnection infrastructure to CFE's transmission line.
- Phase 2- Combined Cycle:
  - 1 Heat recovery vapor generator with 3 levels of pressure and reheat.
  - 1 vapor turbogenerator
  - Cooling system with condensator
  - Main current transformer for gas turbine with additional bay for substation interconnection

Planned CC Plant Site



Source: Empresa de Grupo ACS Industrial en Mexico

Existing Natural Gas Infrastructure

No information was available as it was deemed confidential.

Two companies have shown interest in developing natural gas pipeline infrastructure and it is likely that some speculatively built infrastructure already exists in the region. The companies are:

- Isagamex
- Gas Natural del Noroeste S.A.

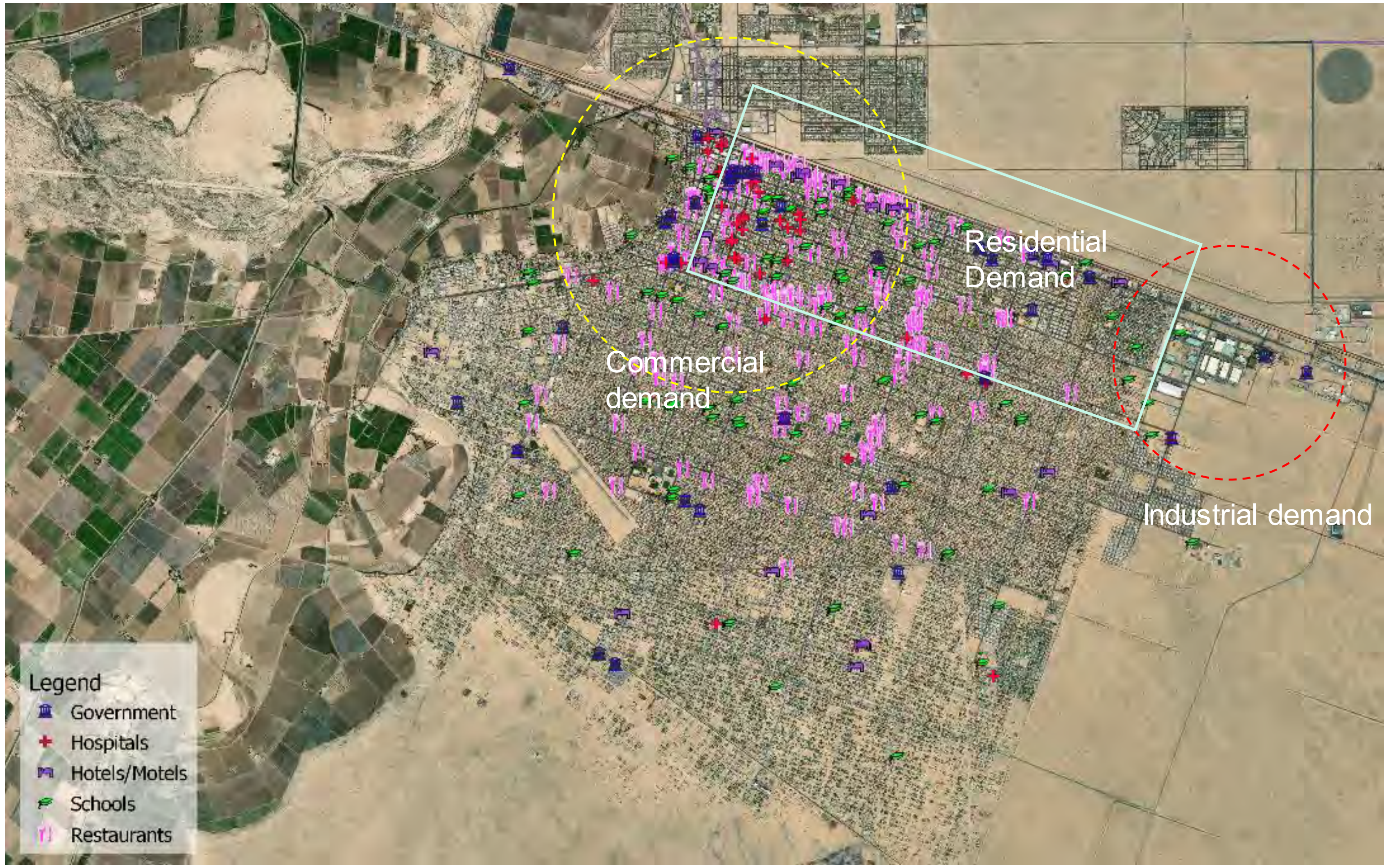
GAS NATURAL DEL NOROESTE S.A. DE C.V.

Igasamex

Existing Customers Location

Customers are categorized in several key Sectors.

- ***Residential*** **–** Residential and Commercial areas are intermingled in the same zone.
- ***Commercial*** **–** Includes restaurants, retail stores, shopping malls, grocery stores and hotels.
- ***Industrial*** **–** Most demand is located at the commercial port of entry, next to the southwest Arizona industrial park area in the US. There is an existing natural gas pipeline in that region, which could be extended.
- ***Other*** **-** Existing customers include government buildings, schools and hospitals.



>>>Detailed demand estimation can be found in the following section.

4 | *Demand Estimation*

Demand Estimation Methodology Overview (1 of 4)

For consistency purposes, methodology and sectors used in this report follows those used in Part I.

Step 1: Classification of demand segments

- ***Residential -*** This Sector consists solely on households. Demand in this Sector is primarily for heating requirements (e.g. fireplace) and household appliances (e.g. cooking, water heating, dryer, etc.)
- ***Commercial -*** This Sector includes restaurants, retail stores, grocery stores, hotels and shopping malls. Demand in this Sector is mostly required for heating purposes in heavy duty gas burners and commercial kitchens.
- ***Industrial -*** This Sector includes a series of different industries including food preparation, textiles and machinery, amongst others. Demand in this Sector is mostly used for boilers, compressors, generators, space heating and for the processing of industrial goods.
- ***Transport -*** This Sector is not included in the present report due to lack of information.
- ***Other -*** This Sector includes government buildings, schools and hospitals. Demand in this Sector is mostly required for cooking, heating and appliances.

- For Part I, gas demand was estimated in two regions, the City of San Luis and the Industrial Park. San Luis Rio Colorado, however, has a more intermingled customer based, which is not clearly defined. The City's urban development plans are not currently defined, nor do they have specific timeframe, reason for which they have not been considered in this report.

Demand Estimation Methodology Overview (2 of 4)

Following a bottom-up approach, the report quantified the number of potential natural gas connections in each of the Sectors as follows:

Step 2: Identification of natural gas connections per Sector:

- ***Residential -*** For the demand of natural gas, each residential connection forms a single basic unit, with each residential unit equal to 1 household of 4 people. Increase in number of household is corelated to expected population growth.
- ***Commercial -*** The data for this Sector is collected via geographical information system (GIS) in the region.
- ***Industrial -*** The data for this Sector is collected from information provided by government officials of the City of San Luis Rio Colorado, and public sources.
- ***Other -*** The demand for this Sector is identified using GIS systems and validated via discussion with the City of San Luis Rio Colorado team.

The number of connections estimated for each of the Sectors represents the maximum number of connections that could be possible today if each Sector converts from their existing fuel to natural gas. The breakdown of these connections are provided separately in a spreadsheet format and can be found as Annex 1 of this report.

Demand Estimation Methodology Overview (3 of 4)

The report forecasts future potential connections, which will form the basis for decision regarding distribution pipeline capacity (sizing) and investment needs.

Step 3: Forecasting increase in the number of natural gas connections per Sector:

Drivers for growth in natural gas demand:

- *Population* - Projection for population growth was obtained from the Consejo Nacional de Poblacion, Proyecciones de la Poblacion de los Municipios de Mexico. Sectors directly impacted by population changes are residential (number of households), commercial (number of set-ups to satisfy population needs), and schools.
- *Industrial Sector* **-** it is currently assumed natural gas demand will be from known industries solely.

Penetration Rates

Following a conservative approach, the model considers that only a fraction of the demand will convert to natural gas over time. This is represented in the model by the following penetration rates:

- *Early Adopters* - Sectors assumed to adopt natural gas as their primary fuel source quickly such as grocery stores, and food processing facilities.
- *Mid Adopters* - Sectors assumed to convert to natural gas at slower pace in the earlier years and grow towards a ceiling in time. Includes retail stores, schools and Government buildings.
- *Step Adopters* - Represent a Sector where adoption of natural gas takes place in batches, such as hospitals and industry.

Demand Estimation Methodology Overview (4 of 4)

Same consumption benchmarks as Part I were used to derive the potential demand in the various Sectors, while other information was directly provided by the City of San Luis Rio Colorado

Step 4: Association of potential demand

- Natural gas consumption benchmark information was gathered from different sources, including the US Energy Information Administration, the Department of Energy, the Environmental Protection Agency, and several other public and private sources.
- The tables on the right side provides a summary of the breakdown of these benchmarks for each of the identified connections in each of the Sectors.

Total estimated annual gas requirement in 2021 is around 40,521,330 therms for 100% adoption

San Luis Rio Colorado — 2021

Category	Count (# of units)	Demand per Unit (Therms/Year)
Residential	52,349	100
Commercial		
Restaurants	202	10,820
Retail Stores	145	205
Grocery Stores	44	52
Hotels	33	44
Shopping Malls	11	17,569
Industrial		
Food Processing	2	450,472
Shelter Services	2	5,392
Textile	4	268,645
Iron and Steel	1	675,501
Furniture	2	19,853
Computer and Electronic Products	2	71,831
Miscellaneous	1	21,776
Machinery	2	51,878
Transportation		
N/A		
Others		
Schools	154	40,960
Government	52	5,708
Hospital	44	5,269

Provided by the City of San Luis Rio Colorado

Category	Count (# of units)	Demand per Unit (Therm/Year)
Industrial		
Agricultural	5	29,775
Automobile	4	133,301
Electronic	3	34,747
Food	6	73,251
Other Furniture	4	59,622
Medical Products	2	23,820
Metal-machinery	8	225,099
Recycling	1	0
Other Textile	10	1,861,928
Combined Cycle Generation Plant	1	173,700,000

>>> In the next section, we estimate demand in each of the Sectors.

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San Luis Rio Colorado Demand Summary

Overview

Demand Case Definition

Equal to Part I, we have categorized our demand analysis covering two scenarios:

(a) **100% Adoption Scenario:** This scenario will define the demand ceiling for the region. Demand ceiling refers to an event when each of the identified participants/stakeholder decides to adopt natural gas its primary fuel for the mentioned purposes, displacing alternate fuel such as electricity, propane, gasoline or other.

(b) **Potential Adoption Trend Scenario:** This scenario will demonstrate a relatively more realistic case where adoption in various Sectors will follow a trend for adoption. These trends are further categorized into:

i. Early Adopters;

ii. Mid Adopters; and,

iii. Step Adopters;

Reflective of the needs of the Client, we have performed each of the scenarios in two cases: one that includes the planned combined cycle generation plant (“CC Plant”) and one that does not. The next slides provide the resulting demand from each scenario and case.

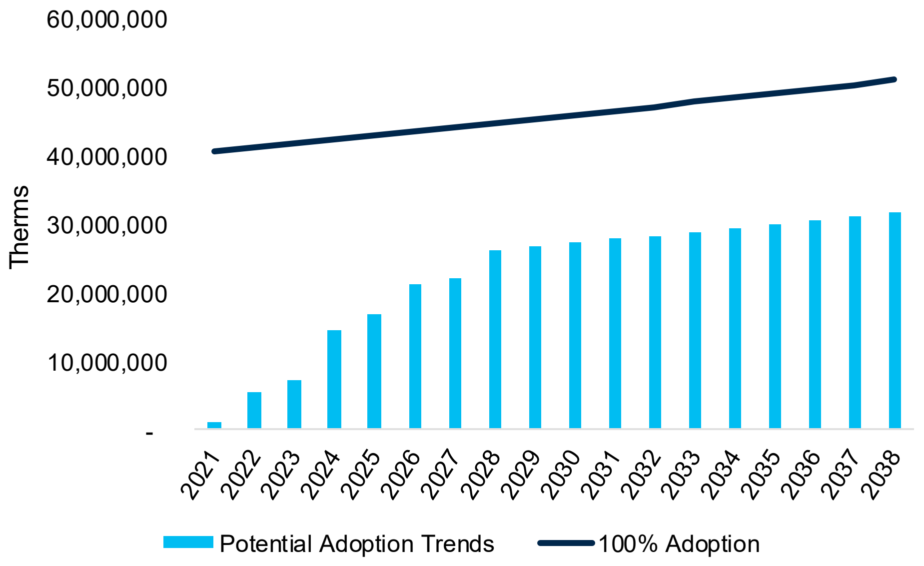
The breakdowns for each scenario are provided separately in a spreadsheet format. Annex 2 shows the estimated gas demand for the 100% Adoption Scenario and Annex 3 shows the estimated gas demand for the Potential Adoption Trend Scenario.

Summary of Results (1 of 6)

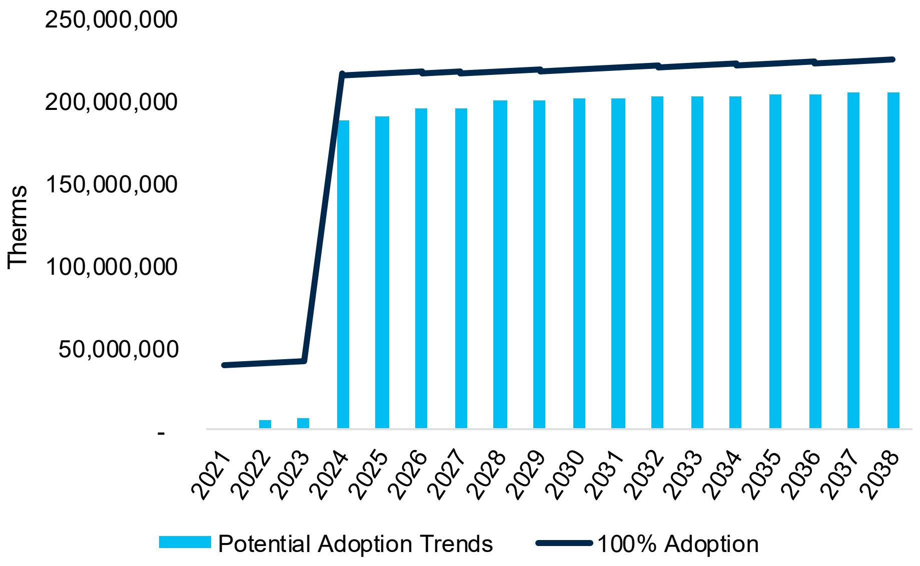
100% Adoption vs. Potential Adoption Trends

- When compared with 100% Adoption Scenario, potential trends shows higher demand growth for the first few years.
- Like Part I, conversion in year 1 by all potential consumers is unlikely due to cost, choice, and accessibility constraints.

100% Adoption vs. Potential Adoption Trends- No CC Plant



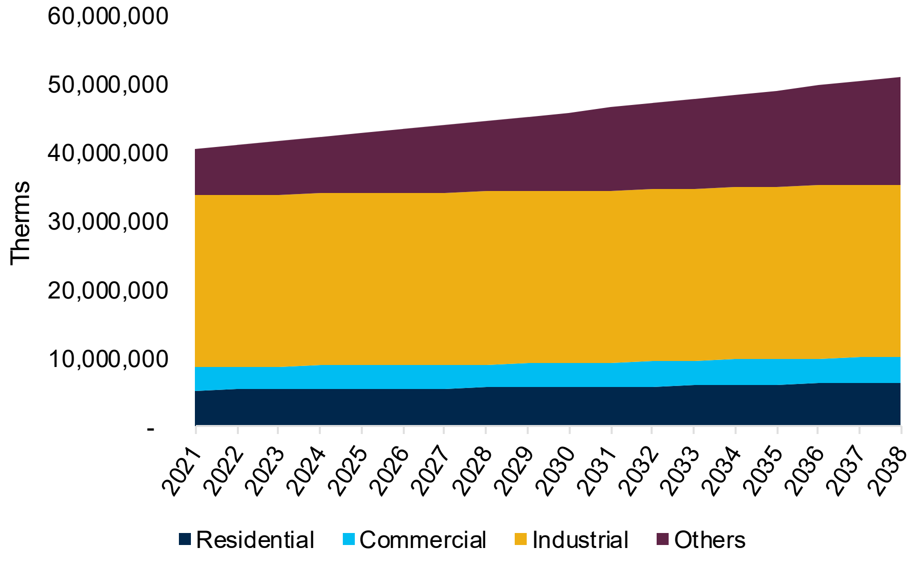
100% Adoption vs. Potential Adoption Trends- With CC Plant



Summary of Results (2 of 6)

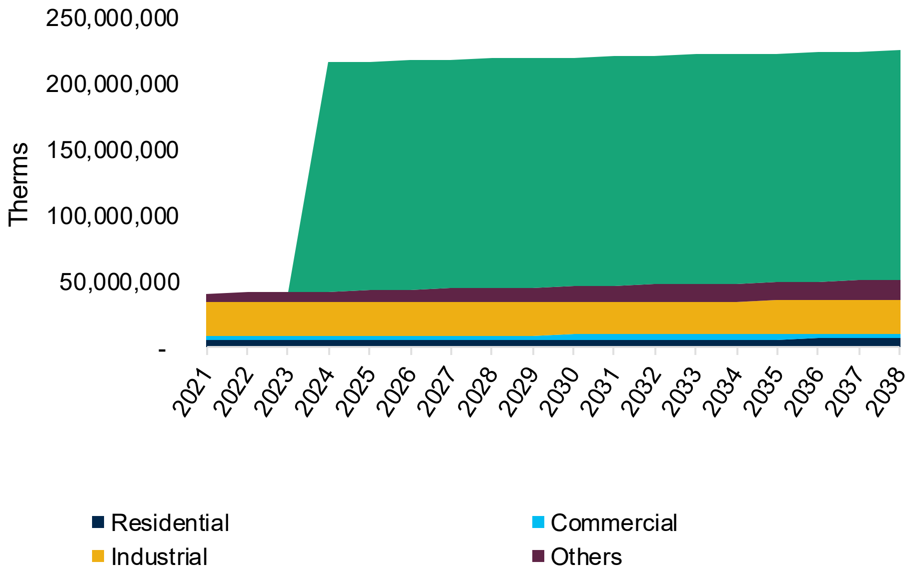
100% Adoption Scenario 2021-2038

Potential Gas Demand - 100% Adopters- No CC Plant



Therms	2021	2038
Total Natural Gas Demand	40,521,330	50,988,700

Potential Gas Demand - 100% Adopters – With CC Plant



Therms	2021	2038
Total Natural Gas Demand	40,521,330	224,688,700

Sectors	*% of NG Demand Increase*
Residential	21%
Commercial	17%
Industrial	0%
*Other**	129%

** Others encumbers schools, government buildings and hospitals.*

Summary of Results (3 of 6)

100% Adoption Scenario- Growth of Connections

Number of Connections

Sector	2021	2038
Residential	52,349	63,566
Commercial		
Restaurants	202	245
Retail Stores	145	176
Grocery Stores	44	53
Hotels	33	33
Shopping Malls	11	13
Others		
Schools	154	369
Government Buildings	52	52
Hospitals	44	44
Industrial	60	60

100% Adoption Scenario- Penetration Rate Connections

Number of Connections

Industrial details	2021-2038
Food Processing	2
Shelter Services	2
Textile	4
Iron and Steel	1
Furniture	2
Computer & Electronics	2
Miscellaneous	1
Machinery	2
Agricultural	5
Automobile	4
Electronic	3
Food	6
Other Furniture	4
Medical Products	2
Metal-Machinery	8
Recycling	1
Other Textile	10

- All sectors are expected to grow, except for Industrial, government buildings, hotels and hospitals.
- Our model assumptions for restaurant growth uses 2020 base case of 202 restaurants/ population to rate of approximately 94 restaurants per 100,000 habitants.

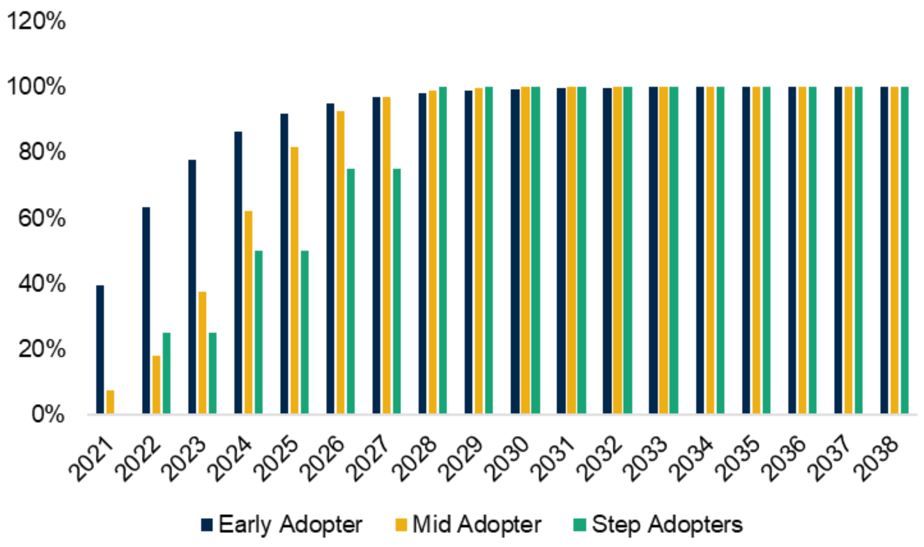
Summary of Results (4 of 6)

Potential Adoption Trends Scenario 2021-2038

To keep consistency with Part I, this scenario considers the following:

- 39% of early adopters and 8% of mid adopters would transition towards natural gas in year 2021.
- 25% of step adopters will begin transitioning to natural gas in year 2022,
- Early adopters will reach 100% adoption rate by year 2031, while mid and step adopters should reach full adoption by year 2029.

Potential Gas Demand – Adoption Scenarios



Sector	% of Adoption
Residential	10%
Commercial	
Restaurants	80%
Retail Stores	20%
Grocery Stores	15%
Hotels	80%
Shopping Malls	20%
Others	
Schools	100%
Government Buildings	80%
Hospitals	50%
Industrial	50%

- The penetration rates for each sector are the same used for Part I. As previously stated, such conservative approach is reflective of choice that residential customer may make depending on ease and hassle of conversion.

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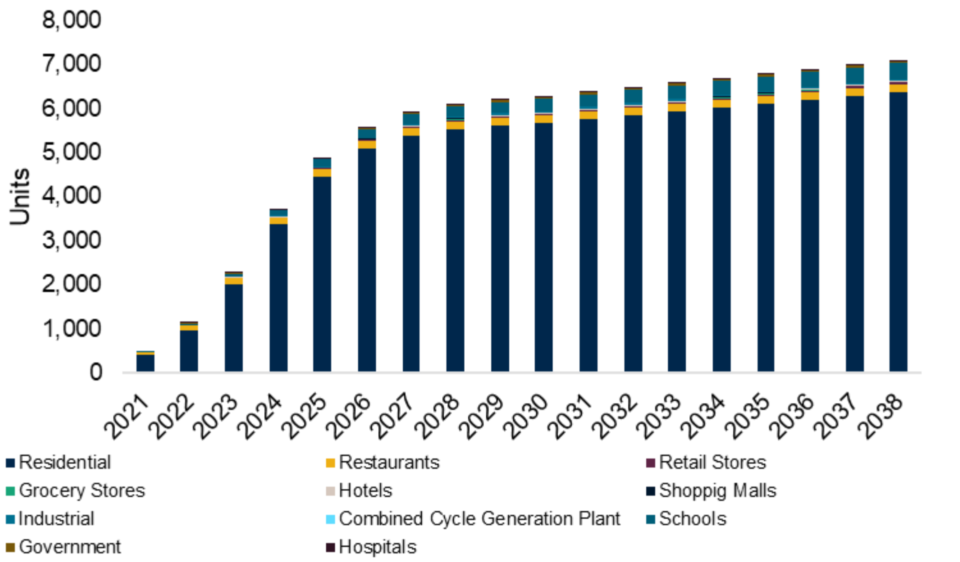
Summary of Results (6 of 6)

Potential Adoption Trends- Growth of Connections

Number of Connections

Sector	2021	2038
Residential	397	6,357
Commercial		
Restaurants	64	196
Retail Stores	2	35
Grocery Stores	3	8
Hotels	0	26
Shopping Malls	0	3
Others		
Schools	12	369
Government Buildings	0	42
Hospitals	0	22
Industrial	0	32

Potential Adoption Trends- Penetration Rate Connections



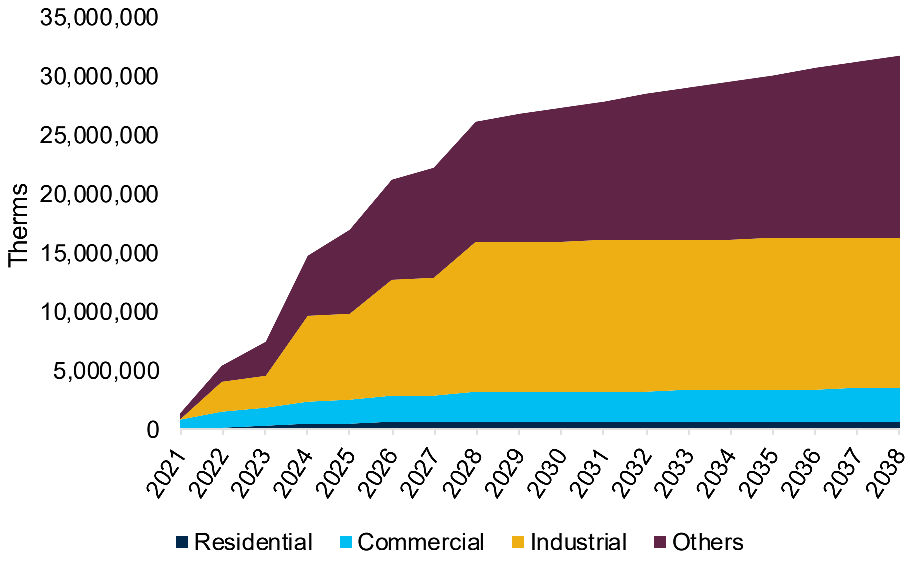
Number of Connections

Industrial details	2038
Food Processing	1
Shelter Services	1
Textile	2
Iron and Steel	1
Furniture	1
Computer & Electronics	1
Miscellaneous	1
Machinery	1
Agricultural	3
Automobile	2
Electronic	2
Food	3
Other Furniture	2
Medical Products	1
Metal-Machinery	4
Recycling	1
Other Textile	5

Summary of Results (6 of 6)

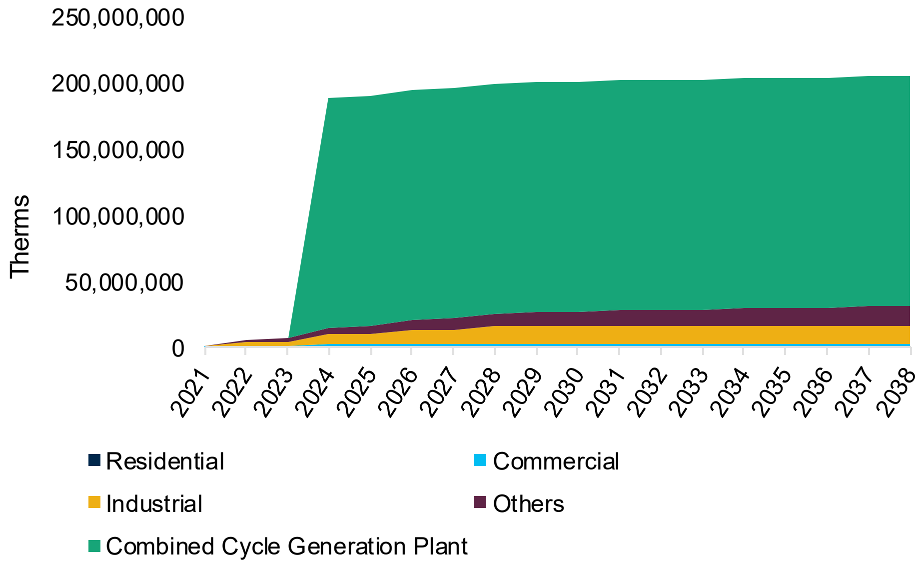
Potential Adoption Trends- Estimated Gas Demand Projections 2021-2038

Potential Adoption Trends- No CC Plant



Therms	*2021*	*2038*
Total Natural Gas Demand	1,219,520	31,717,031

Potential Adoption Trends- With CC Plant



Therms	*2021*	*2038*
Total Natural Gas Demand	1,219,520	205,417,031

San Luis Rio Colorado by Sector

This section provides a revised estimate of the market potential for natural gas in San Luis Rio Colorado. As in Part I, market size is defined in terms of annual natural gas consumption for space and water heating, power generation, and industrial processing for structures and entities located in the city. The market demand estimates are used to size the gas transmission line and other facilities, and they are also key inputs to the financial, benefit-cost, and air quality analyses.

Residential

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Residential Sector

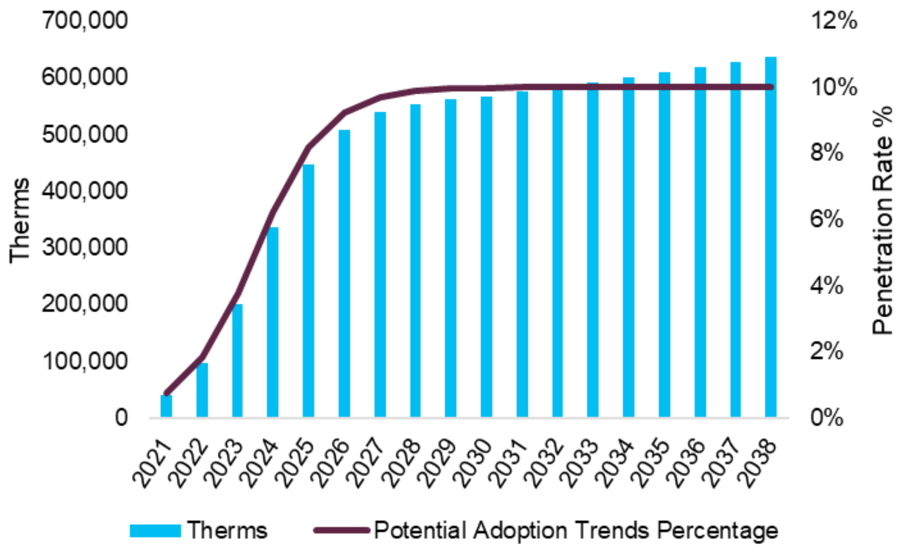
100 % Adoption vs Potential Adoption Trends Scenario 2021-2038

100 % Adoption Scenario

Residential	2021	2038
Therms	5,234,850	6,356,593
Connections (Households)	52,349	63,566

2021 (estimated): *209,394*
2038 (estimated): 254,264

Potential Adoption Trends Scenario



Residential	2021	2038
Therms	39,700	635,700
Connections (Households)	397	6,357

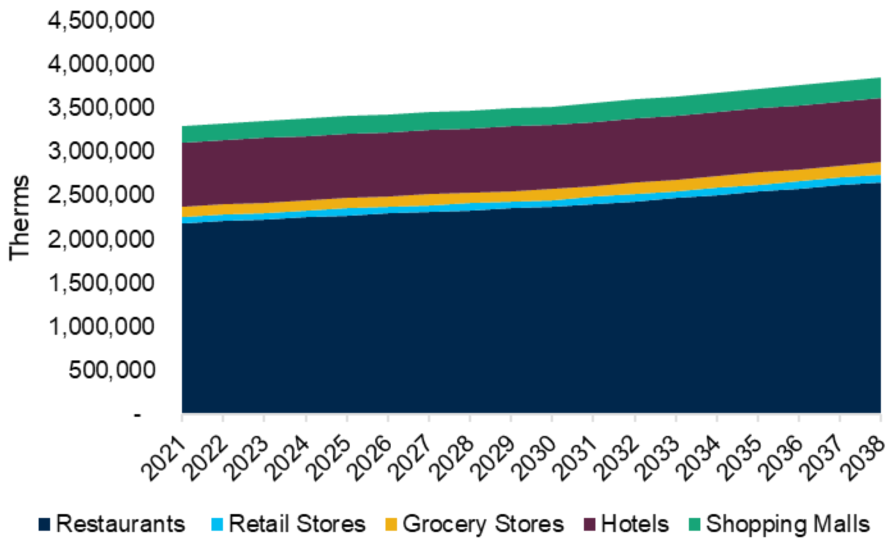
- This scenario envisions a lineal growth for adoption where all households adopt natural gas demand; assumes 100 therms of natural gas demand.
- Maximum adoption percentage (10%) will be reached by 2028.

Commercial

Commercial Sector (1 of 4)

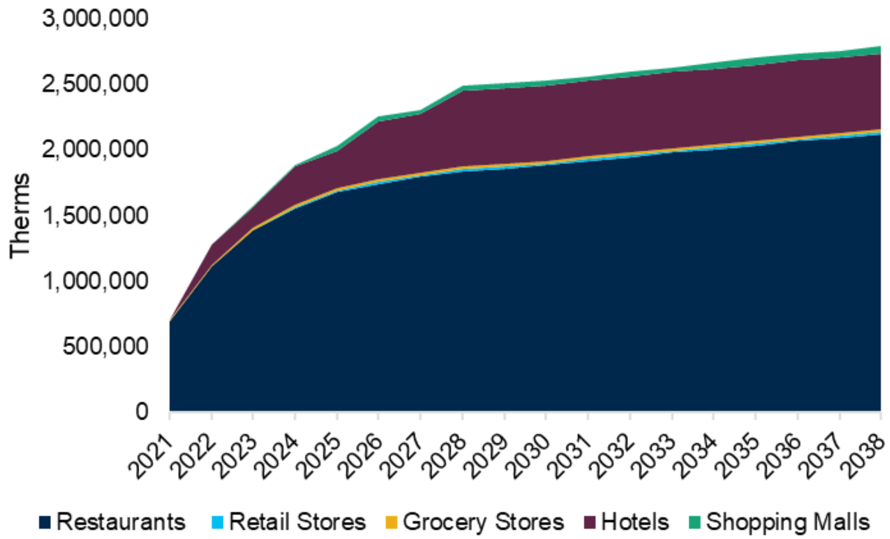
100 % Adoption vs Potential Adoption Trends Scenario 2021-2038

100% Adoption Scenario



Therms	2021	2038
Restaurants	2,185,640	2,653,987
Retail Stores	72,935	88,564
Grocery Stores	114,884	139,502
Hotels	733,656	733,656
Shopping Malls	193,259	234,671

Potential Adoption Trend Scenario

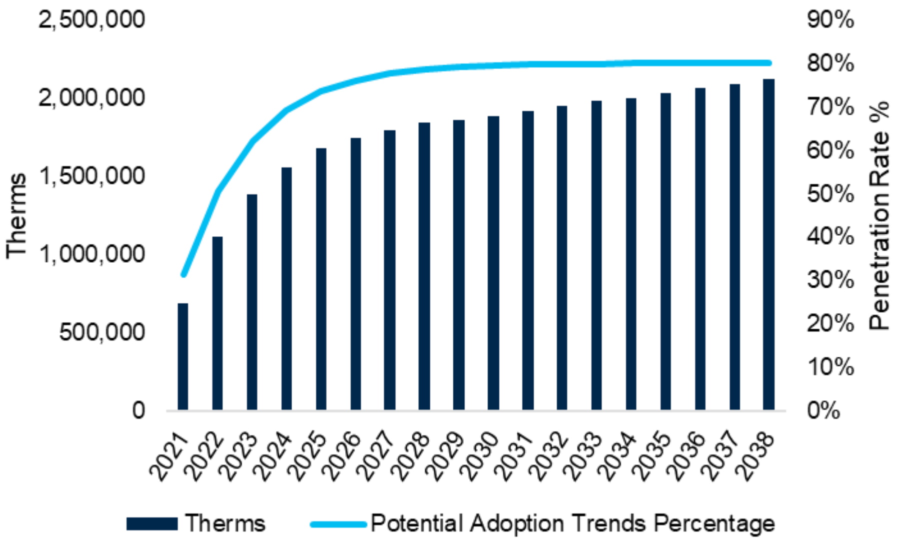


Therms	2021	2038
Restaurants	692,480	2,120,720
Retail Stores	1,006	17,605
Grocery Stores	7,833	20,888
Hotels	0	578,032
Shopping Malls	0	52,707

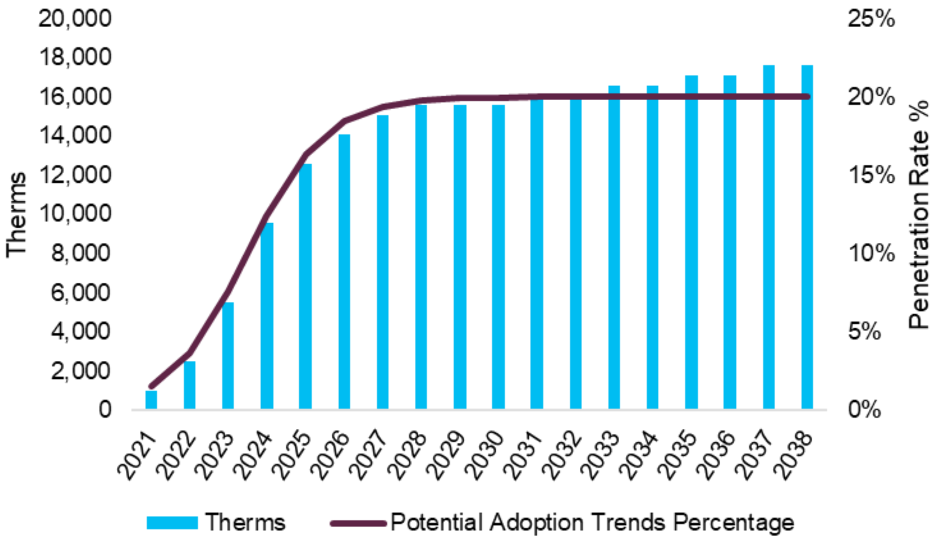
Commercial Sector (2 of 4)

Potential Adoption Trends 2021-2038 Detailed

Restaurants



Retail Stores

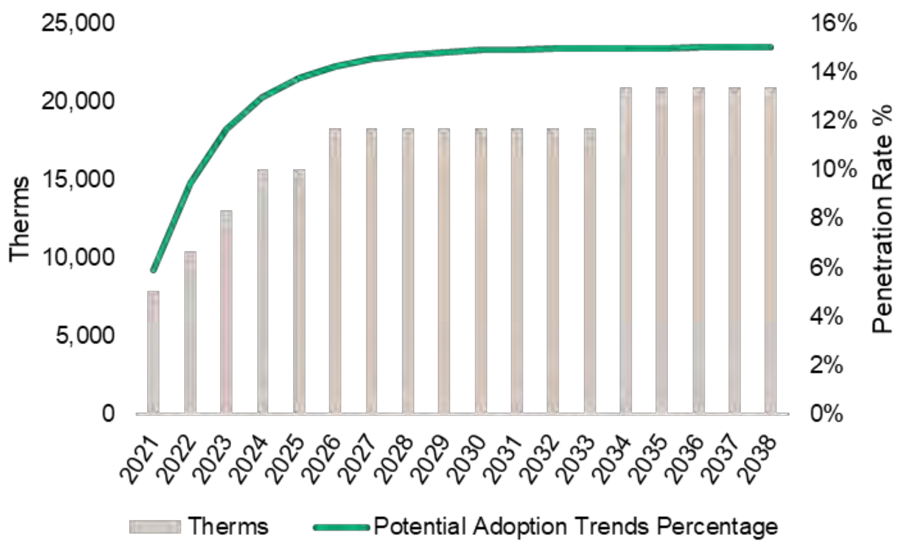


Commercial	*% of Adoption*	*Full Reach Year*
Restaurants	*80%*	*2032*
Retail Stores	*20%*	*2029*

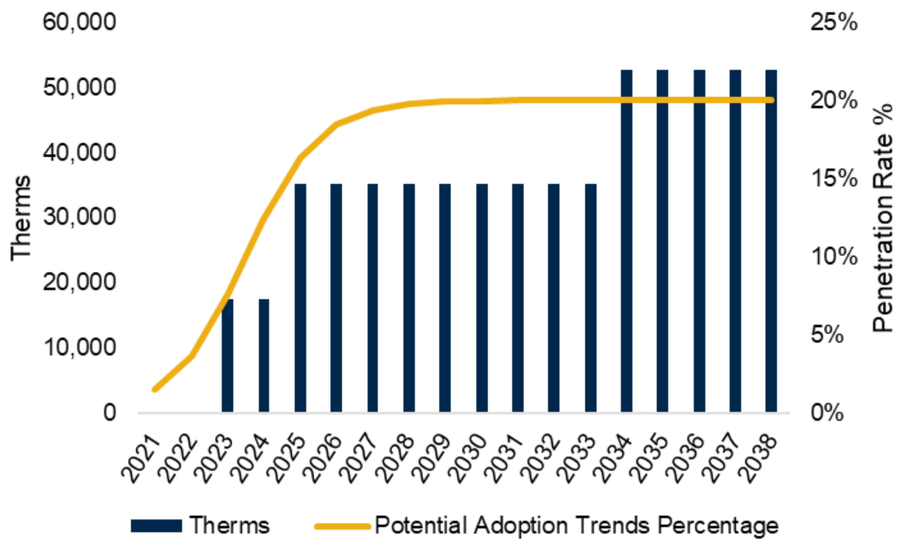
Commercial Sector (3 of 4)

Potential Adoption Trends 2021-2038 Detailed

Grocery Stores



Shopping Malls

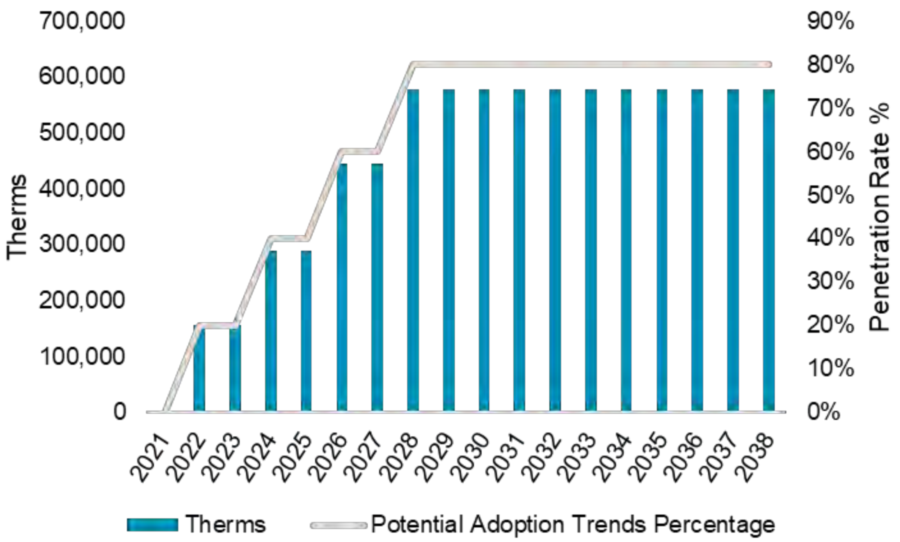


Commercial	*% of Adoption*	*Full Reach Year*
Grocery Stores	15%	2028
Shopping Malls	20%	2029

Commercial Sector (4 of 4)

Potential Adoption Trends 2021-2038 Detailed

Hotels



Commercial	*% of Adoption*	*Full Reach Year*
Hotels	80%	2029

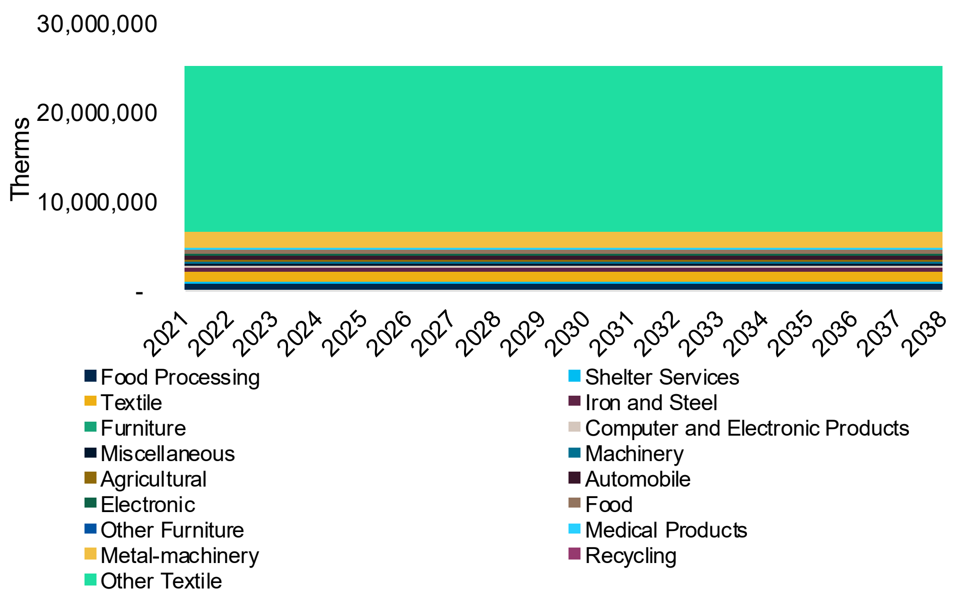
- The city of San Luis Rio Colorado has prospective investment projects planned which, if they come to fruition, will significantly increase natural gas demand. Amongst these planned projects, the city visualizes developing a golf course and increasing the number of hotel rooms.
- As of the date of this report, these planned projects do not have an expected commencement of operations date.
- In line with the conservative approach we have used throughout the report, and lacking a set operations commencement date, we have not included these potential projects in this analysis.
- Number of hotel connections remains unchanged throughout the period as we do not forsee population growth having any effect on number of connections.

Industrial

Industrial Sector (1 of 2)

100% Adoption Scenario 2021-2038

100 % Adoption Scenario



Therms

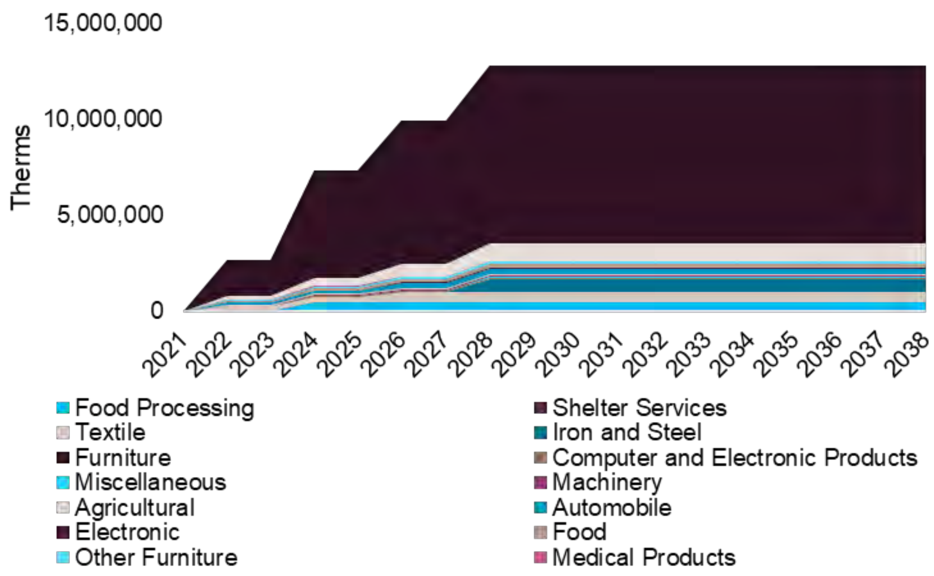
Industrial details	*2038*
Food Processing	*900,944*
Shelter Services	*10,784*
Textile	*1,074,580*
Iron and Steel	*675,501*
Furniture	*39,706*
Computer & Electronics	*143,662*
Miscellaneous	*268,645*
Machinery	*103,757*
Agricultural	*148,875*
Automobile	*533,206*
Electronic	*104,241*
Food	*439,508*
Other Furniture	*238,490*
Medical Products	*47,640*
Metal-Machinery	*1,800,792*
Recycling	*-*
Other Textile	*18,619,284*

- Industrial Sector is not dependent upon population growth; therefore it is assumed that natural gas demand will remain constant.

Industrial Sector (2 of 2)

Potential Adoption Trends 2021-2038

Potential Adoption Trends Scenario



Therms

Industrial details	2021	2038
Food Processing	0	450,472
Shelter Services	0	5,392
Textile	0	537,290
Iron and Steel	0	675,501
Furniture	0	19,853
Computer & Electronics	0	71,831
Miscellaneous	0	21,776
Machinery	0	51,878
Agricultural	0	89,325
Automobile	0	266,603
Electronic	0	69,494
Food	0	219,754
Other Furniture	0	119,245
Medical Products	0	23,820
Metal-Machinery	0	900,396
Recycling	0	0
Other Textile	0	9,309,642

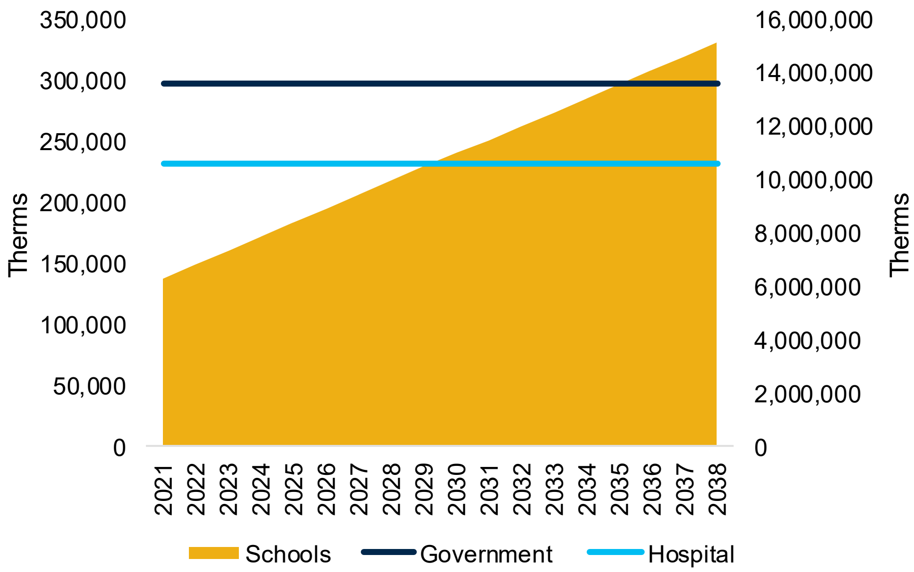
- We assume and adoption rate of 50% for Industry sector. This considering additional costs required for established industries.
- All industries are expected to switch to natural gas by year 2029 under this scenario, and no increase in demand is expected after this year.

Other

Other Sector (1 of 3)

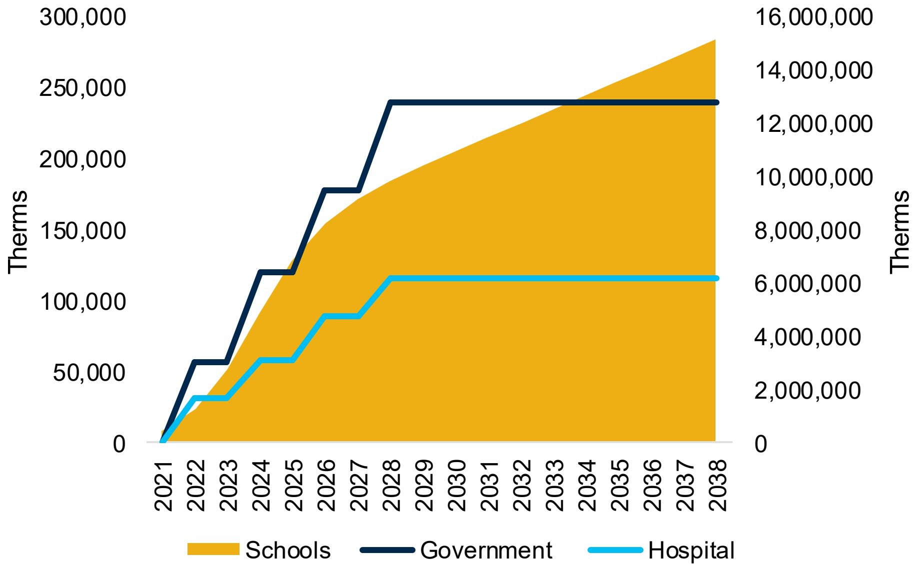
100 % Adoption vs Potential Adoption Trends Scenario 2021-2038

100% Adoption Scenario



Therms	2021	2038
Schools	6,307,840	15,103,461
Government	296,816	296,816
Hospital	231,836	231,836

Potential Adoption Trend Scenario



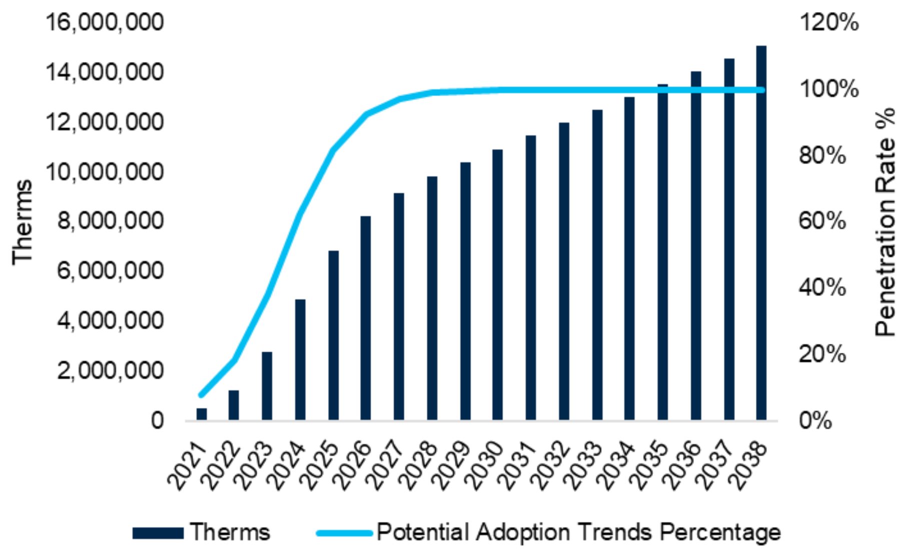
Therms	2021	2038
Schools	478,501	15,103,453
Government	0	239,736
Hospital	0	115,918

- Government refers to all municipal, state and federal government agencies.
- Schools refer to elementary, middle and high school, and colleges/ universities.
- Hospitals includes inpatient and outpatient facilities, private and public.

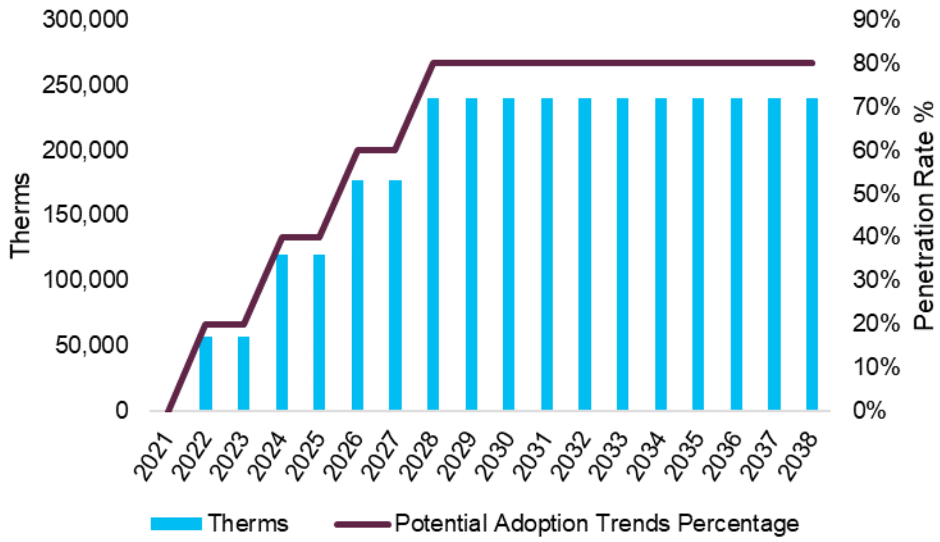
Other Sector (2 of 3)

Potential Adoption Trends 2021-2038 Detailed

Schools



Government

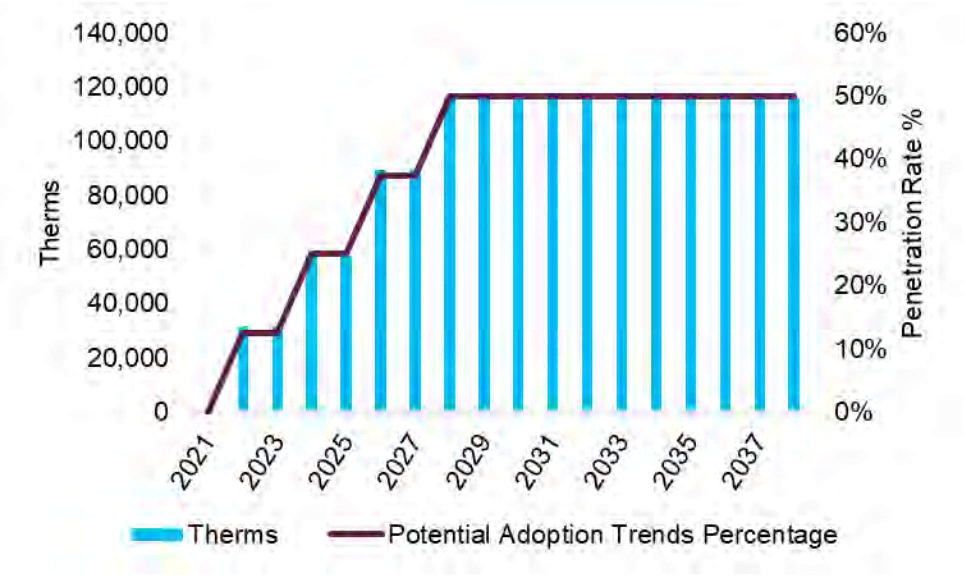


Other	*% of Adoption*	*Full Reach Year*
Schools	100%	2030
Government	80%	2029

Other Sector (3 of 3)

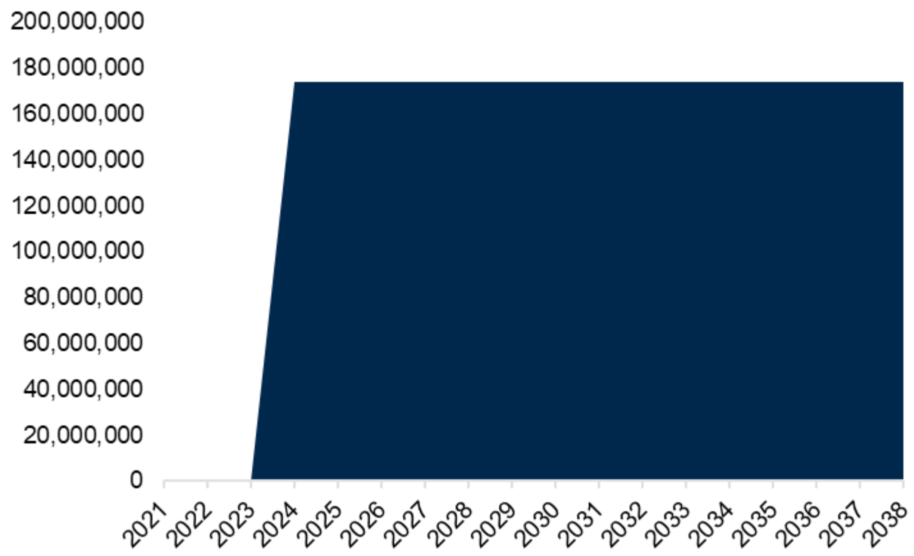
Potential Adoption Trends 2021-2038 Detailed

Hospitals



Other	% of Adoption	Full Reach Year
Hospitals	50%	2029

CC-Plant



Therms	173,700,000
Assumed Commencement of operations	2024

5 | *Supply Analysis*

Supply Overview

Natural gas supply from the gas basins is transported via large pipelines (transmission) and is distributed locally via small diameter pipelines

The chain of natural gas supply to the end customers involves the following components:

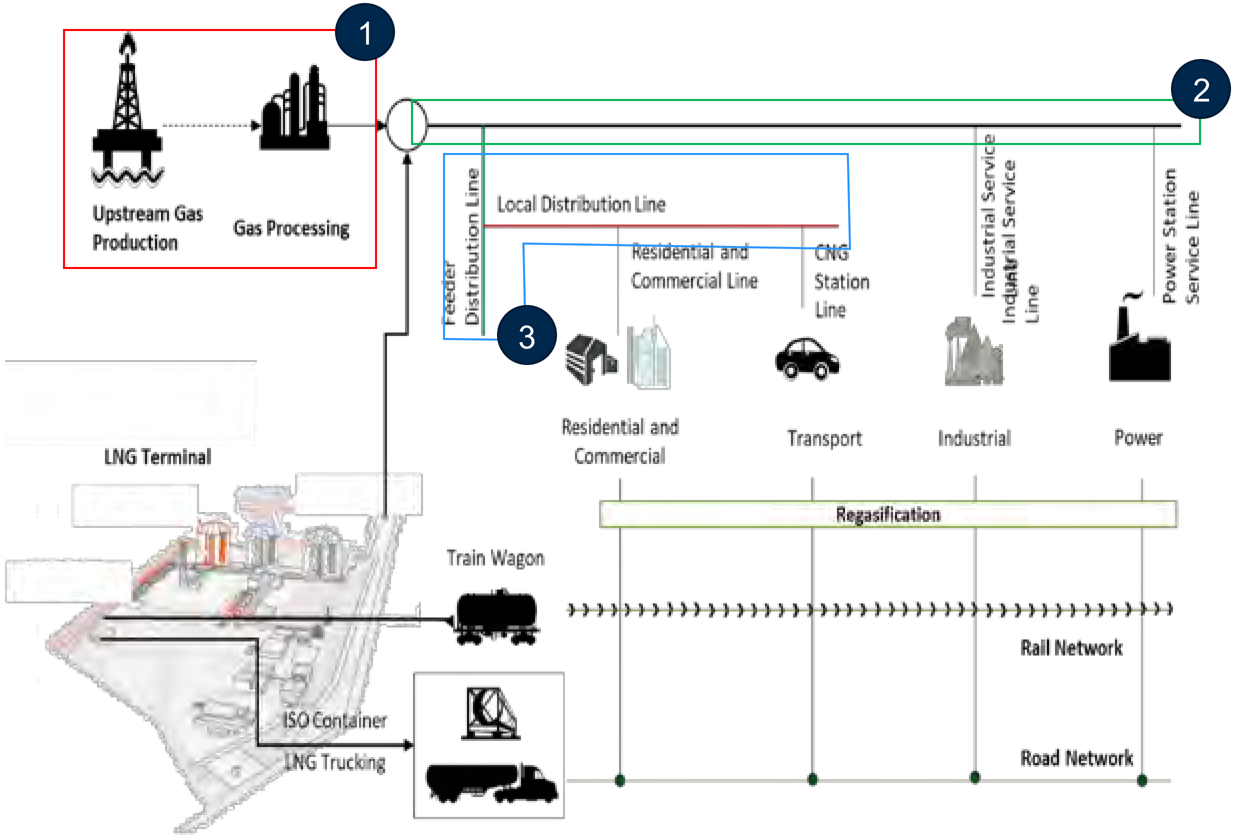
1. ***Production and processing***- natural gas can be sourced directly from upstream gas wells, where it is produced. This gas includes several unwanted impurities and hydrocarbons, which are then processed out of the gas stream to make it "pipeline quality" gas. When there is no accessibility to upstream gas wells, sourcing can be completed by importing liquefied natural gas (LNG).

2. ***Transmission pipelines***- after processing, natural gas is transmitted to the demand centers (which can be a distribution point or directly to large customers such as power stations) via large pipelines. For LNG, the process is to either regasify and transmit via pipelines or to load into trucks, ships, ISO containers or trains (in some cases) to send towards the demand centers.

3. ***Distribution pipelines-*** for gas that arrives at distribution point, its pressure is decreased and then send through smaller diameter distribution pipelines to the end customers (e.g. residential homes).

>>> Different gas supply sources and infrastructure available for San Luis Rio Colorado are detailed in the next slides.

Natural Gas Distribution Value Chain



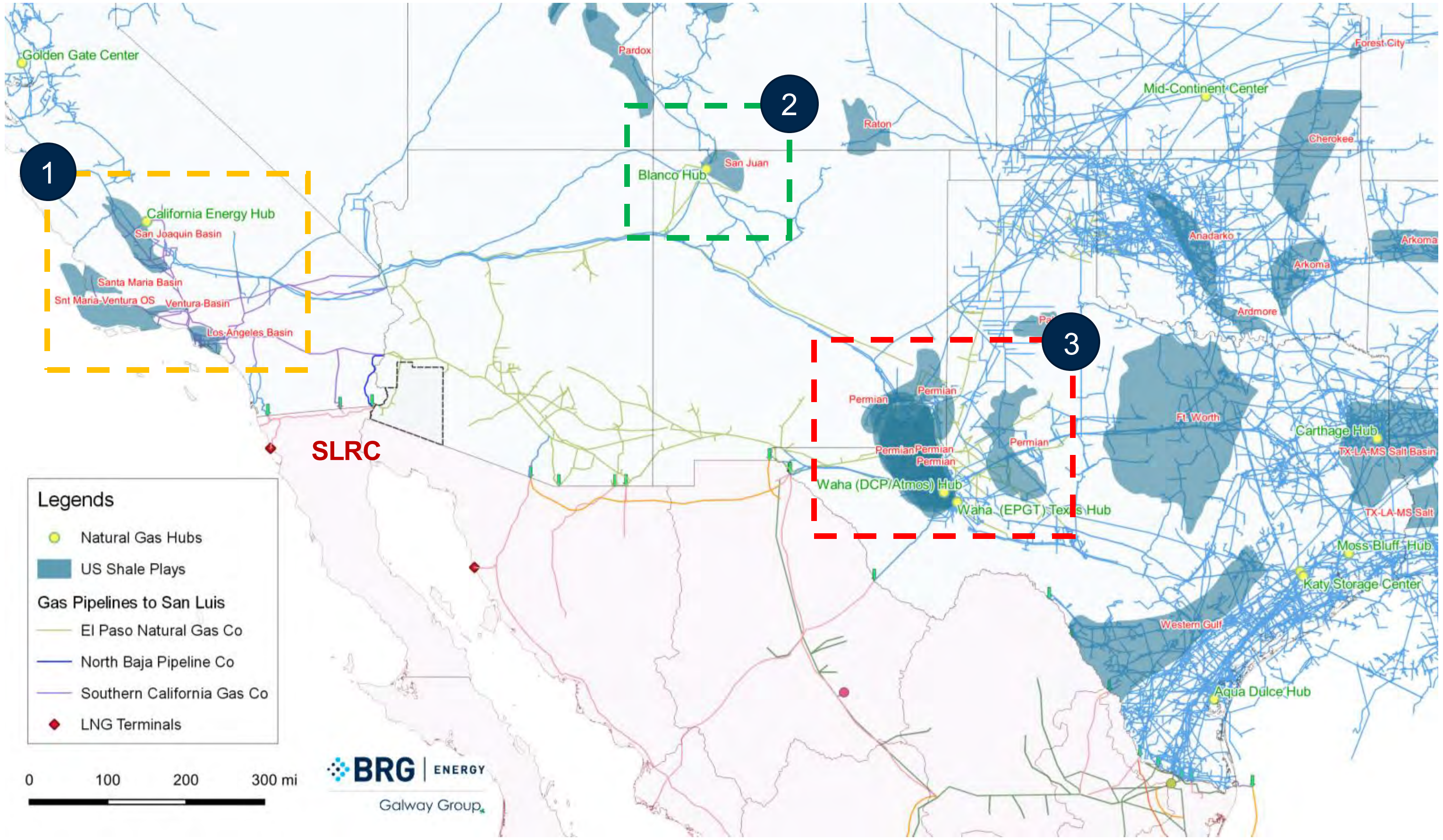
Natural Gas Sources

San Luis Rio Colorado can receive gas from San Juan Basin or Permian Basin in the United States

As discussed in Part I, the following basins have connectivity to Yuma and the SLRC region:

- ***[1] Gas Basins of California -*** 0.3 tcf (not considered as there is no drilling in this basin).
- ***[2] San Juan Basin -*** 23 tcf (28 years of production at current rate).
- ***[3] Permian Basin -*** 289 tcf (44 years of production at current rate).

Either the San Juan or Permian basins can be the sources for reliable, uninterrupted natural gas supply to San Luis Rio Colorado.

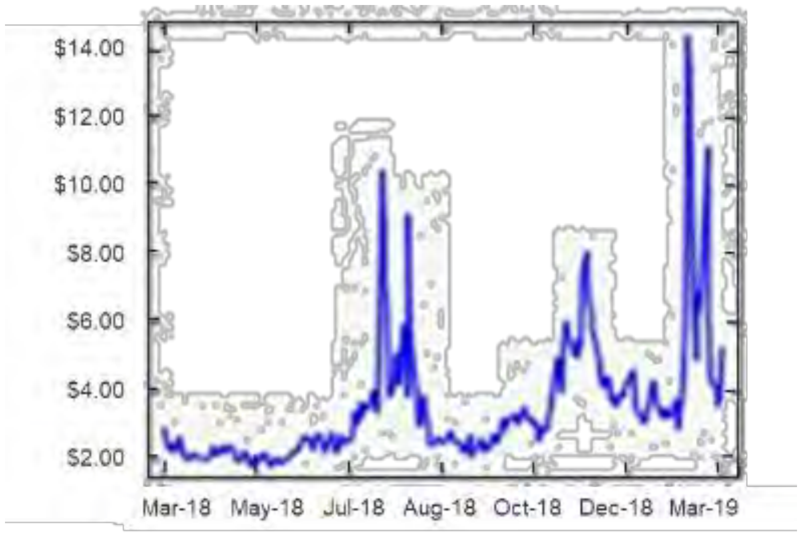


Natural Gas Pricing

Natural gas prices from the San Juan's Blanco hub and the Permian's Waha hub are consistently lower than $0.24/therm

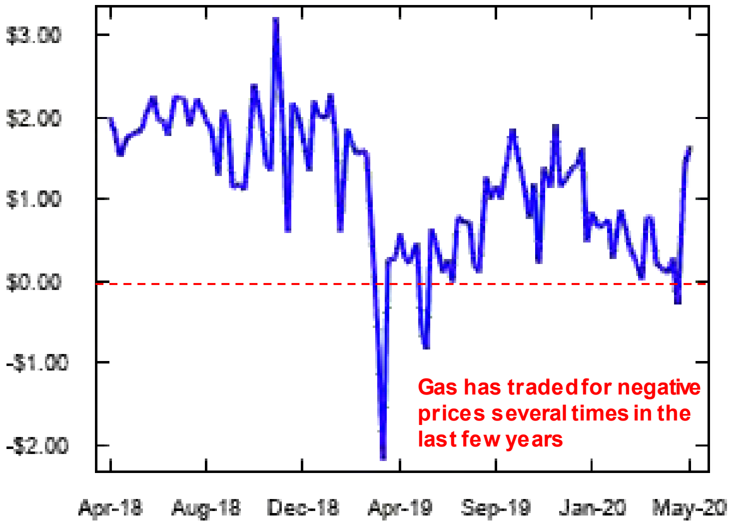
– As discussed in Part I, the California Border Natural Gas price appears to be the most expensive in the last few years with several price spikes. It must be noted that natural gas cost is typically passed to the end consumer directly. Other two sources of gas on average appear to be positioned better in terms of price. San Juan basin seems to offer gas at ~ $2/MMBtu to $3/MMBtu ($0.20/therm to $0.30/therm), whereas in the Permian basin the prices often swung to negative prices in the last years.

California Border Natural Gas Price ($/MMBtu)



San Juan's Blanco hub Gas Prices ($/MMBtu)

Permian's Waha hub Gas Prices ($/MMBtu)



** 1 MMBtu = 100,000 Therms*

Supply Pipelines – Connection overview

Key Supply Infrastructure Points

Following are some key supply infrastructure points:

1. The <u>three</u> pipelines which can be considered for supply source to SLRC are:
   i. Pipeline 1: El Paso Natural Gas Pipeline (EPNG);
   ii. Pipeline 2: IENova Pipeline;
   iii. Pipeline 3: Samalyuca - Sasabe Pipeline;
2. For all practical purposes, supply could only be considered from El Paso Natural Gas Pipeline because:
   i. Gas for the IENova Pipeline is sourced from EPNG. Although, supply from Pipeline 2 would be within Mexico, new infrastructure must be developed to reach that segment including crossing the Colorado River;
   ii. Pipeline 3 is too far to be considered;

Local Distribution Network (1 of 2)

The local distribution network in Yuma county, discussed in Part I, will act as a source for SLRC gas demand for Residential, Industrial and Commercial sectors.

- Typically large industrial, commercial and power generation companies receive gas directly from interstate/intrastate pipelines. In comparison, smaller customers receive gas from local distribution utilities involved in delivery of gas within a specific geographic region.
- LDCs typically hold exclusive rights to distribute natural gas in a specific geographic area to avoid uneconomic multiple lines in a region.
- The local distribution company for San Luis and Yuma is Southwest Gas – a subsidiary of Southwest Holding Co (a publicly traded company). The area covered by Southwest Gas is shown with the dark shaded boundary in the map.
- Southwest Gas receives gas at the city gate and distributes it in the region. Based on current published information, the LDC has operating receipt flexible capacity of nearly 60,000 decatherm. Of this capacity, only 25% is being used. Southwest Gas, at the moment, does not have any interconnection points with the North Baja Pipeline.

Greater Yuma Local Distribution Network

Dark region above represents Southwest Gas' jurisdiction

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Local Distribution Network (2 of 2)

Southwest Gas has several interconnection points in the region that could be utilized to serve the City of San Luis and San Luis Rio Colorado

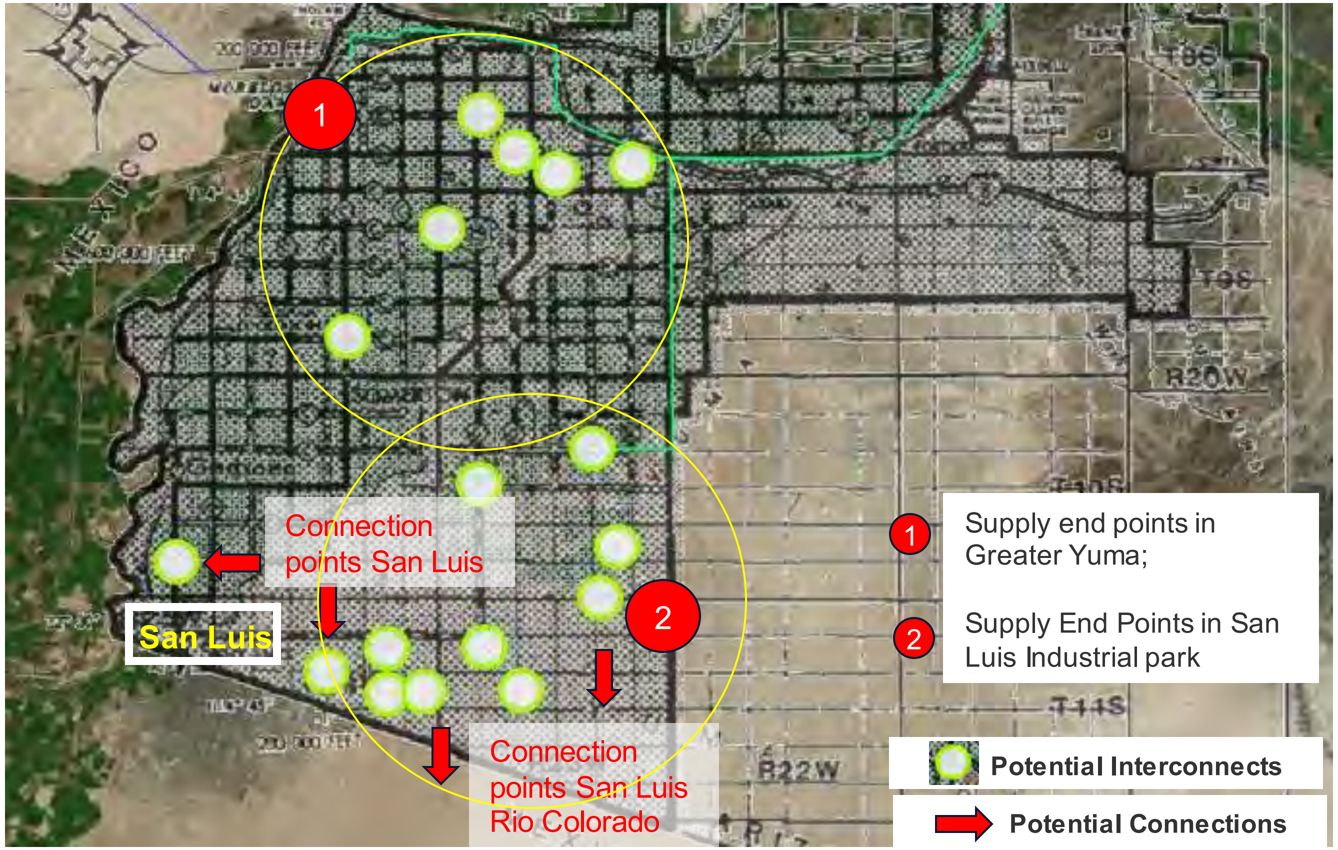
– Confidentiality requirements do not allow for the showing of the LDC network. Instead we have added the white and green circles on the map on the right which represent end points of the distribution pipeline, for better understanding. The key takeaways from the map are:

› ***Region 1*** has natural gas distribution pipeline available, covering Yuma City, and shows several points available for future expansion.

› ***Region 2*** has available Southwest Gas pipelines as well where the Industrial Park is under development. This location can be further used to transport gas to Mexico.

› As the demand for SLRC may include a power plant, a large pipeline may have to be laid from the Greater Yuma region for sufficient capacity.

Southwest Gas' Local Distribution Supply Network



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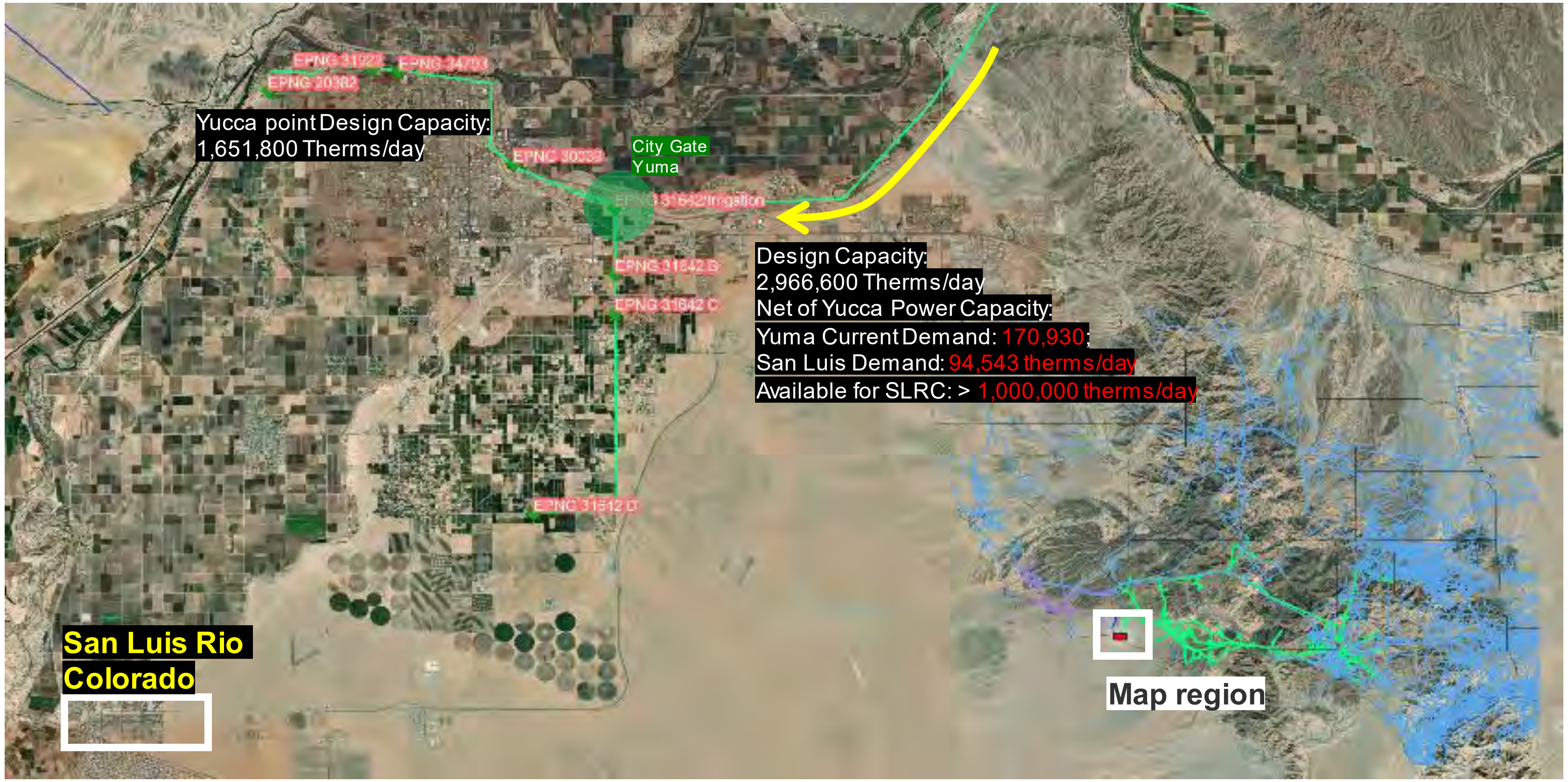
El Paso Natural Gas Pipeline [EPNG]

EPNG pipeline offers several interconnect points in the vicinity of San Luis Rio Colorado and Greater Yuma for tapping into gas sources.

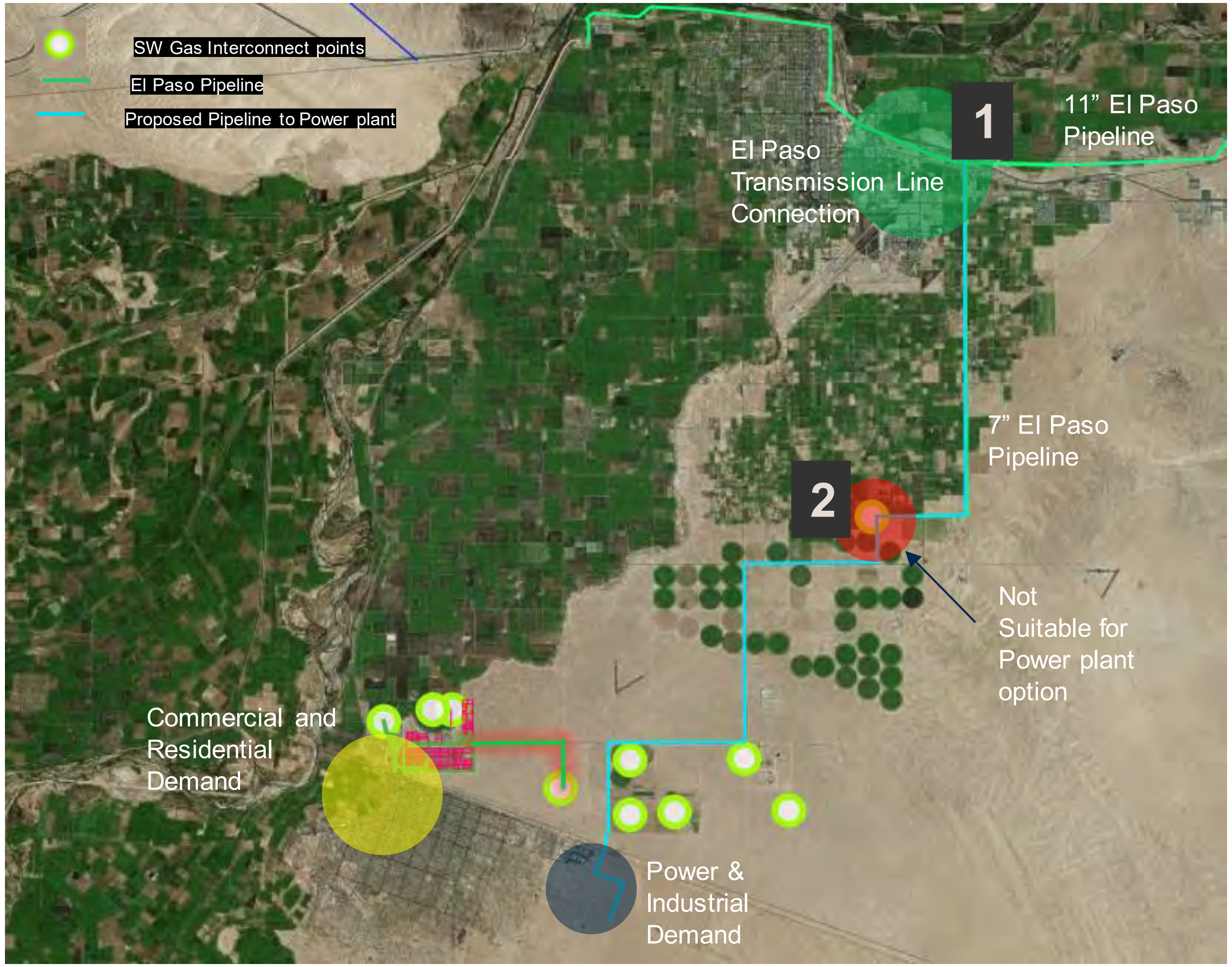
- EPNG has several interconnection points within the Greater Yuma region from where gas is purchased currently.
- EPNG's segment 2165 (highlighted with the yellow incoming line) currently provides operating capacity of 503,350 therms/day to APS for the Yucca power plant and 594,620 therms/day for Southwest Gas.
- Design capacity[1] of these points are 1,651,800 and 1,314,800 therms respectively. Thus, enough design capacity is available to meet SLRC's demand with and without power plant.

[1]To achieve design capacity, additional EPNG will need to evaluate the its pipeline constraints upstream

EPNGP in the Greater Yuma Region



Pipeline Layout and proposed route - City of San Luis Rio Colorado



Gas Supply to the power plant

Based on the available interconnections, the following routes are suggested for a robust grid in SLRC:

1. With power plant – power plant gas volume requirements are high (500,000 therms/day), which Southwest Gas may not be able to serve from their existing network close to Somerton. Consequently, a direct connection to the transmission line should be established as shown with the light blue line in the map on the left [labelled as 1]. This line could support additional gas for SLRC, if necessary;

2. Without power plant – Based on information retrieved from EPNG postings, we expect sufficient operational capacity available in the transmission pipeline, from where SW gas receives its gas [labeled as 2]. Thus, in case a power plant is not considered a connection to closest distribution pipeline node should be selected as a potential source for Commercial, industrial, and residential supply – a total of 80,000 therms/day (further discussion with SW Gas necessary);

Supply Conclusion

Based on the information gathered from various publicly and privately available sources, we can conclude the following about the supply of natural gas in the region:

- There is ample natural gas in the Permian and San Juan basins to support development of natural gas infrastructure in the region.
- El Paso Natural Gas Pipeline, which taps into both these resource basins, is expected to be the transportation pipeline for the natural gas to the region.
- The region has Southwest Gas' infrastructure, spanning Yuma City and the industrial area on the east of the city, but there is no current infrastructure connection with San Luis Rio Colorado region itself.
- Based on available information of supply at the city gate, it appears that Southwest Gas has access to nearly 60,000 decatherms of operating gas receiving capacity, of which the company is currently using only 25%. The design capacity of the section is larger than 1 million therms/day. This means that there is sufficient design capacity available in the pipeline.
- Current maps of the region suggest there could be two potential options of supply to San Luis Rio Colorado region:
  - ***Somerton Supply* -** Less than 16 mile of natural gas pipeline would be required to serve demand for industrial, commercial, and residential customers.
  - ***Yuma Supply* -** Nearly 25 miles of pipelines would be required to meet the to San Luis Rio Colorado power plant.

>>> In the next section, we will develop a concept layout for supply from each of the points to San Luis Rio Colorado.

Next steps

Southwest Gas had long-term capacity at Yuma City Gate, which expired in March 2020, and most likely rolled over

- To meet the demand in San Luis Rio Colorado, Southwest Gas will require to provide over 30 million therms incremental therms per annum (~137,000 therms/day) to meet the SLRC's potential demand (without powerplant), whereas for powerplant additional 500,000 therms/day gas would be required. Based on this we have further identified following:
  - Southwest Gas has a capacity of ~1,400,000 therms per day of capacity in EPNG pipeline section 2165, but constraints must be identified.
  - Though the above capacity appears sufficient, a discussion should be carried out of with Southwest Gas to ensure sufficient capacity is available after distribution of gas in Greater Yuma region.
  - The associated contract for 1,400,000 therms on EPNG (FT28M000-FTAEPNG) was a long-term contract active from 2004 to 2020, which expired in March, but is most likely rolled over. Status of this contract and new capacity would have to verified.
  - Additional bottlenecks on the supply capacity have to be discussed with the LDC to understand constraints in gathering supplies from Permian basin to Yuma, which is expected to be relatively lower cost gas as compared to San Juan basin.
- Additionally, as Southwest Gas has expansion plans for their grid themselves, new expansions and peak supply capacity of available nodes would have to be discussed with the firm's supply team. APS also have a large capacity in this pipeline used for Yucca power plant. Based on current scheduling, this capacity is not fully utilized and could potentially be made available.
- Finally, the city team needs to discuss the key terms and conditions necessary and plan in place for Southwest Gas to proceed with expansion of its network in the city of San Luis Rio Colorado.

6 | *Routing and Conceptual Design*

Conceptual Design Background – Transmission Pipeline

Gas Transmission Pipeline Concepts

Gas Transmission pipelines are typically characterized by following:

(a) Large pipeline diameters – commonly greater than 8”;

(b) High pipeline pressure – typically more than 60 psi up to 1440 psi;

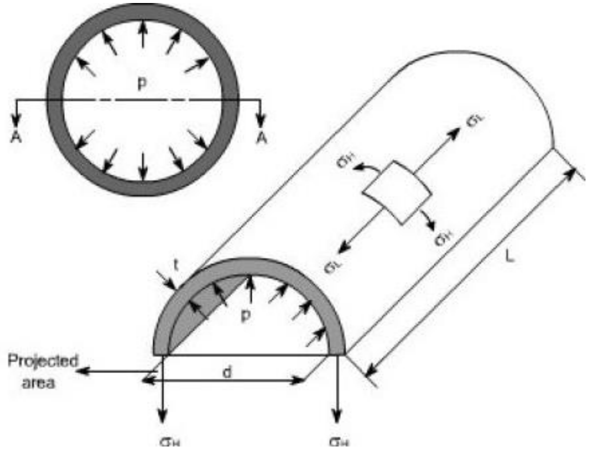
These pipelines are ideal for transporting gas through large distances and for providing economies of scale for large amounts of gas. Considering the high demand for the power plant near the Parque Industrial area, a transmission pipeline would be most suitable. Current demand at the power plant is considered nearly 500,000 therms per day (equivalent to 50 mmcfd).

Pipelines are designed using DOT Code of Federal Regulations Part 192 and ASME Code B31.8. They require a minimum wall thickness to be able to withstand the internal pressure. This wall thickness is based on a calculation that considers pipeline diameter and pressure: the larger the diameter or greater the pressure, the thicker the walls required. This relationship connecting pipeline diameter, thickness, and stress is shown on right.

Maximum allowed stress (SMYS) could be referenced from ASME Code B31.8 steel pipes. Typically pipelines operate at a lower stress limited by the factors[1].

Pipeline Design Parameters (Barlow’s Equation)

$$P = \frac{2tSEFT}{D}$$



Where:
P = Internal pipeline design pressure (Maximum Operating Pressure)
t = pipe wall thickness;
S = specified minimum yield strength (SMYS) of pipe material;
E = seam joint factor;
F= Design factor – depends on class location and type of construction (shown in the table below);
T = temperature deration factor (considered 1 below 250 F)

[1]Discussed in Slide 60

Pipeline Diameter Calculation

Gas Transmission Pipeline Calculations

The Panhandle A equation was used for pipeline diameter estimation, with the following parameters:

(a) Current demand at the power plant is considered nearly 500,000 therms per day (equivalent to 50 mmcfd);

(b) P_1 = pipeline pressure at EPNG node, assumed ~ 600 psia

(c) P2 = pressure at power plant, assumed ~ 300 psia;

(d) Length = 25 miles => 132,000 feet;

(e) Temperature at 80 °F => 540 °R;

(f) Specific Gravity of gas = 0.6;

(g) Compressibility factor = 0.95

With these values, the flow equates to the need of an internal diameter of approximately 11”. Thus, a pipeline with internal diameter of 11” or higher would be suitable for 50 mmcfd flow with given pressure (~68 mmcfd). At 11" diameter the pipeline can also support gas demand in SLRC along with the powerplant.

Panhandle A Equation for Pipeline Flow Estimation

$$Q = 435.87E\left(\frac{T_b}{P_b}\right)^{1.0788}\left(\frac{P_1^2 - e^s P_2^2}{G^{0.8539} T_f L_e Z}\right)^{0.5394} D^{2.6182}$$

Where:

Q	=	gas-flow rate, mmcfd,
D	=	pipe inside diameter, in.,
P_1	=	upstream pressure, psia,
P_2	=	downstream pressure, psia,
L_e	=	length, ft,
T_f	=	average gas flow temperature, °R,
G	=	specific gravity of gas,
Z	=	gas compressibility factor
T_b	=	Base temperature
P_b	=	Base temperature
e^s	=	1 for no elevation difference
E	=	Efficiency factor (0.92)

Transmission Pipeline – Sizing Considerations

Gas Transmission Pipeline Sizing Considerations

A safety assessment must be undertaken for setting the operating parameters, in addition to Barlow's equation (slide 58). For the transmission pipeline from EPNGP to the Co-gen plant following safety factors have been considered in the design parameters:

(a) SYMS = Considering X42 grade, 42,000 psi

(b) Seam Factor (E) = 1 (assuming seamless and submerged arc welded pipes)

(c) Design Factor (F) = 0.5 (assuming a conservative class 3 design factor)

(d) Temperature (T) = 1

(e) Assuming a outside diameter of 12 inch

Pipeline thickness is calculated at nearly 0.11". Thus the total internal diameter for the pipeline should be 11.78", considering pipeline outside diameter being 12". This internal diameter is larger than required for the safe flow of 50 mmcfd of natural gas and thus, pipeline would be able to achieve the required flow to the powerplant. At the internal diameter of 11.78", the pipeline with pressure conditions stated before can flow nearly 81 mmcfd (~830,000 therms/day), sufficient for both powerplant and SLRC demand.

Pipeline Safety Factors

Class 1: 10 of fewer buildings intended for human occupancy in 220 yards

Class 2: More than 10 but less than 46 buildings for human occupancy in 220 yards;

Class 3: 46 or more buildings intended for human occupancy or an area where the pipeline is within 100 yards of a building or a playground, recreation area, outdoor theatre, or other place of public assembly that is occupied by 20 or more people at least 5 days a week for 10 weeks in any 12-month period. The days and weeks need not be consecutive.

Class 4: buildings with four or more stories above ground exist.

Class Location	Design Factor
Class 1	0.72
Class 2	0.60
Class 3	0.50
Class 4	0.40

Initial Cost Estimates

Based on the pipeline length, a pipeline with a diameter sizing of 12” is appropriate for the power plant supply

- The following table provides an estimate for the cost of material and construction of a 12” pipeline for the nearly 25 miles of pipeline from Yuma to the power plant. The costs are estimated in US dollars, with the necessary considerations for installation.

TRANSMISSION PIPELINE (12”)									
	Length (LF)	Length (miles)	Construction	Materials	Engineering	Permitting	Total Cost	Cost/Foot	Cost/Mile
Section									
Transmission Pipeline (12")	132,000	25.0	$ 15,580,000	$ 5,317,240	$ -	$ -	$ 20,897,240	$ 158.31	$ 835,889.59
Pig Launcher and Receiver			$ -	$ -	$ -	$ -	$ -		
Contingency (30%)			$ 4,674,000	$ 1,595,172	$ -	$ -	$ 6,269,172		
Total	132,000	25.0	$ 20,254,000	$ 6,912,412	$ -	$ -	$ 27,166,412	$ 205.81	$ 1,086,656.47
COST RANGE (-30% to +50%):						**-30%**	**$ 19,016,488**	**+50%**	**$ 40,749,618**

Description	Class	Dia [in]	Quantity	Unit	Unit Cost	Total Cost	Remarks
Transmission Pipeline (12")							
Construction							
Installation		12.0	132,000	LF	$115	$15,180,000	
HDD		12.0	0	LF	$300	$0	For rivers
Regulator stations		12.0	1	EA	$400,000	$400,000	For transmission lines
Materials							
Materials - Steel		12.0	132,000	LF	$35	$4,569,522	
Materials - Valves		12.0	4	EA	$34,000	$136,000	
Materials - Design allowance	varies	varies	5%	EA		$235,276	
Materials - Misc. Freight			2%	EA		$94,110	
Materials - Procurement			4%	EA		$188,221	
Materials - SQS			2%	EA		$94,110	
Section 0 (10.5")			**132,000**	**LF**		**$20,897,240**	

Conceptual Design Background – Distribution pipeline

- Natural gas distribution pipelines are typically low pressure pipelines, remaining lower than 50 psig (pound per square inch gauge) and around 25 psig to 50 psig in the main distribution feeder lines. The pressure at the downstream meter in a domestic connection could be as low as 0.14 to 0.25 psig. Maximum allowable pressure is regulated by NFPA 54 code, the US national standard that applies to the installation of fuel gas piping systems.

- Typically for a gas distribution pipeline it has been observed that, for efficient distribution, a pipeline should be sized such that only acceptable pressure drop is observed in the system. The next slides discuss several equations that can be used to evaluate pipeline flow using various pressure drops.

- In addition to sizing equations, there are various sizing tables available based on pressure drop, length of pipeline, and pipeline diameter. An example is shown on the image at the right.

Gas Distribution Pipeline Sizing (California Plumbing codes)

									GAS:	NATURAL				
									INLET PRESSURE:	LESS THAN 2 psi				
									PRESSURE DROP:	0.5 in. w.c.				
									SPECIFIC GRAVITY:	0.60				
	PIPE SIZE (inch)													
NOMINAL:	½	¾	1	1¼	1½	2	2½	3	4	5	6	8	10	12
ACTUAL ID:	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026	5.047	6.065	7.981	10.020	11.938
LENGTH (feet)	CAPACITY IN CUBIC FEET OF GAS PER HOUR													
10	172	360	678	1390	2090	4020	6400	11 300	23 100	41 800	67 600	139 000	252 000	399 000
20	118	247	466	957	1430	2760	4400	7780	15 900	28 700	46 500	95 500	173 000	275 000
30	95	199	374	768	1150	2220	3530	6250	12 700	23 000	37 300	76 700	139 000	220 000
40	81	170	320	657	985	1900	3020	5350	10 900	19 700	31 900	65 600	119 000	189 000
50	72	151	284	583	873	1680	2680	4740	9660	17 500	28 300	58 200	106 000	167 000
60	65	137	257	528	791	1520	2430	4290	8760	15 800	25 600	52 700	95 700	152 000
70	60	126	237	486	728	1400	2230	3950	8050	14 600	23 600	48 500	88 100	139 000
80	56	117	220	452	677	1300	2080	3670	7490	13 600	22 000	45 100	81 900	130 000
90	52	110	207	424	635	1220	1950	3450	7030	12 700	20 600	42 300	76 900	122 000
100	50	104	195	400	600	1160	1840	3260	6640	12 000	19 500	40 000	72 600	115 000
125	44	92	173	355	532	1020	1630	2890	5890	10 600	17 200	35 400	64 300	102 000
150	40	83	157	322	482	928	1480	2610	5330	9650	15 600	32 100	58 300	92 300
175	37	77	144	296	443	854	1360	2410	4910	8880	14 400	29 500	53 600	84 900
200	34	71	134	275	412	794	1270	2240	4560	8260	13 400	27 500	49 900	79 000
250	30	63	119	244	366	704	1120	1980	4050	7320	11 900	24 300	44 200	70 000
300	27	57	108	221	331	638	1020	1800	3670	6630	10 700	22 100	40 100	63 400

Conceptual Design Background

Pipelines sizing could be determined by two standard equations for operations at different pressures.

These are the formulas mentioned in the prior slide to approximate the sizing of natural gas distribution pipelines:

For low gas pressure line (e.g. downstream of meter) – typically used for calculation of pipelines with less than 1.5 psi of pressure.

$$D = \frac{Q^{0.381}}{19.17\left(\frac{\Delta H}{C_r \times L}\right)^{0.206}}$$

For higher pressure distribution line (upstream of meter) – for pipelines with pressures greater than 1.5 psi.

$$D = \frac{Q^{0.381}}{18.93\left[\frac{\left(P_1^2 - P_2^2\right) \times Y}{C_r \times L}\right]^{0.206}}$$

Where

D = Inside diameter of pipe, inches (mm).

Q = Input rate appliance(s), cubic feet per hour at 60°F (16°C) and 30-inch mercury column

P_1 = Upstream pressure, psia (P_1 + 14.7)

P_2 = Downstream pressure, psia (P_2 + 14.7)

L = Equivalent length of pipe, feet

ΔH = Pressure drop, inch water column (27.7 inch water column = 1 psi)

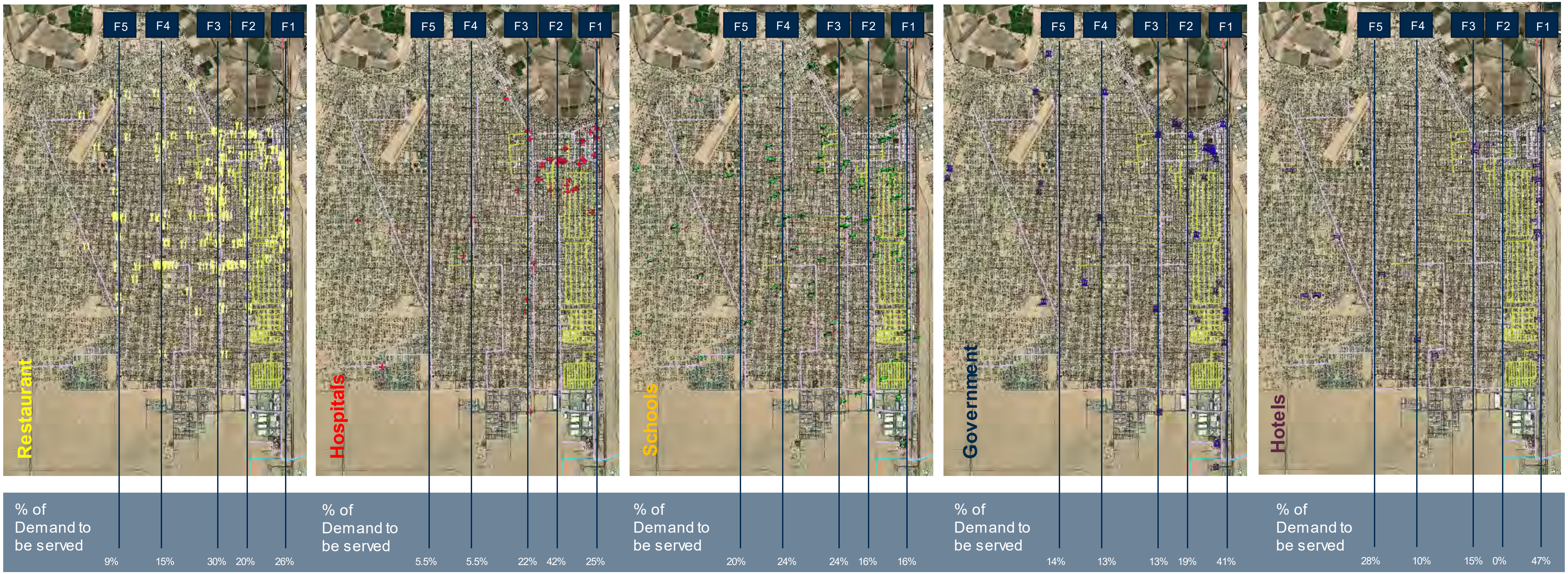
GAS	EQUATION FACTORS	
	C_r	Y
Natural gas	0.6094	0.9992
Undiluted propane	1.2462	0.9910

– With these formulas pipeline flow rate and diameter can be derived based on inlet pressure and allowed pressure drop.

>>> Calculations for San Luis Rio Colorado pipelines can be found in the following slides

Gas Distribution in San Luis Rio Colorado- Combination of Feeder and Service Lines

Five feeder lines are proposed to meet non-power plant demand, penetrating various demand centers as shown in the figure below



Considerations for Feeder and Service Lines

Additional assumptions in developing the pipeline sizing for the feeder and service lines

– Other factors considered while designing the San Luis Rio Colorado pipeline system include:

– ***Peak Demand Considerations***- addresses the issue of peak capacity of the pipeline. A detailed hydraulic pipeline distribution model takes the load profile into account for a more robust modeling.

– ***Cost and Grades Requirement***- pipe grade defines the thickness and maximum pressure of the pipeline and will directly impact the amount of sleet per linear foot of the pipeline. Additionally the cost of steel is uncertain and may severely impact the overall costing of the pipeline network.

>>> The table on the right details the assumptions BRG used for the development of the recommended pipeline sizing.

Feeder Line	Residential	Restaurants	Retail Stores	Grocery Stores	Hotels	Shopping Malls	Schools	Government	Hospital	SCFH
F1	871	1,511	24	29	744	72	6,625	269	111	96,801
F2	871	1,162	24	29	0	72	6,625	125	133	86,831
F3	0	1,743	0	0	238	0	9,938	85	70	97,878
F4	0	872	0	0	158	0	9,938	85	17	89,936
F5	0	523	0	0	443	0	8,282	92	17	76,007
F0	1,742	5,810	48	57	1,584	144	41,409	657	349	447,454
Peak Hours	4	12	12	12	12	24	12	12	24	

Therms/day

Other considerations

Density of steel	=	0.131916	kg/in3
Cost of steel	=	1.5	$/kg
Weight of 3" pipe / inch	=	0.293971	kg/in
Weight of 6" pipe / inch	=	0.736271	kg/in

*SCFH => Standard Cubic Feet per Hour; 1 Cubic Feet of Gas = 1025 Btu or 0.01025 therms

Pipeline Layout and Proposed Route (without powerplant)

Diameter of the main feeder line connecting to the EPNG pipeline interconnect is expected to be 10.5” and other lines are in the 6” to 8” range

Distribution Feeder Lines to SLRC

Following are the pressure, length and peak flow information on pipelines distributing gas to SLRC

Feeder Line #	Diameter (Inches)	Length (Miles)	Peak Flow (SCFH[1])	Upstream PSI[2]
Feeder 0	10.5”	18	447,454	100
Feeder 1	6.5”	6.0	96,801	50
Feeder 2	6.0”	4.0	86,831	50
Feeder 3	8.0”	9.0	97,878	40
Feeder 4	7.5”	5.5	89,936	35
Feeder 5	7.0”	11	76,007	15

[1]SCFH is peak standard cubic feet of gas per hour flow requirement, as discussed; [2]PSI upstream refers to the pipeline pressure on the upstream of the segment. Pressure indicated above are concept level only.

Initial Cost Estimates – Feeder Line 0

An 18 miles, 10.5” diameter pipeline would be appropriate to source gas from Southwest Gas via the EPNG connection point

- The following table provides an estimate for the cost of material and construction of an 18 miles long, 10.5” diameter pipeline. The costs are estimated in US dollars, with the necessary considerations for installation. The estimates with appropriate range of cost is provided in the table.

FINAL COST ESTIMATE SUMMARY: Feeder line 0									
	Length (LF)	Length (miles)	Construction	Materials	Engineering	Permitting	Total Cost	Cost/Foot	Cost/Mile
Section									
Feeder Line 0 0 (10.5")	95,040	18.0	$ 8,953,600	$ 3,340,306	$ -	$ -	$ 12,293,906	$ 129.36	$ 682,994.75
Pig Launcher and Receiver			$ -	$ -	$ -	$ -	$ -		
Contingency (30%)			$ 2,686,080	$ 1,002,092	$ -	$ -	$ 3,688,172		
Total	95,040	18.0	$ 11,639,680	$ 4,342,397	$ -	$ -	$ 15,982,077	$ 168.16	$ 887,893.18
COST RANGE (-30% to +50%):						**-30%**	**$ 11,187,454**	**+50%**	**$ 23,973,116**

Description	Class	Dia [in]	Quantity	Unit	Unit Cost	Total Cost	Remarks
Feeder Line (10.5")							
Construction							
Installation		10.5	95,040	LF	$90	$8,553,600	
HDD		10.5	0	LF	$300	$0	For rivers
Regulator stations		10.5	1	EA	$400,000	$400,000	For transmission lines
Materials							
Materials- Steel		10.5	95,040	LF	$30	$2,854,023	
Materials- Valves		10.5	3	EA	$34,000	$102,000	1 every 42,000 LF
Materials- Design allowance	varies	varies	5%	EA		$147,801	
Materials- Misc. Freight			2%	EA		$59,120	
Materials- Procurement			4%	EA		$118,241	
Materials- SQS			2%	EA		$59,120	
Section 0 (10.5")			**95,040**	**LF**		**$12,293,906**	

Initial Cost Estimates – Summary Feeder Line 1 to 5

Total cost of installing the Feeder Lines 1 – 5 are expected in the range of ~ $22 million

– The following table provides a range for the cost of material and construction of Feeder pipelines as discussed previously. The costs are estimated in US dollars, with the necessary considerations for installation. The estimates with appropriate range is provided in the table.

FINAL COST ESTIMATE SUMMARY: PIPELINE LAYOUT NETWORK									
	Length (LF)	Length (miles)	Construction	Materials	Engineering	Permitting	Total Cost	Cost/Foot	Cost/Mile
Section									
Feeder Line 1 (6.5")	31,680	6.0	$ 2,217,600	$ 545,226	$ -	$ -	$ 2,762,826	$ 87.21	$ 460,470.92
Feeder Line 2 (6")	21,120	4.0	$ 1,478,400	$ 331,317	$ -	$ -	$ 1,809,717	$ 85.69	$ 452,429.19
Feeder Line 3 (8")	47,520	9.0	$ 3,326,400	$ 1,101,000	$ -	$ -	$ 4,427,400	$ 93.17	$ 491,933.39
Feeder Line 4 (7.5")	29,040	5.5	$ 2,032,800	$ 610,827	$ -	$ -	$ 2,643,627	$ 91.03	$ 480,659.47
Feeder Line 5 (7")	58,080	11.0	$ 4,065,600	$ 1,109,353	$ -	$ -	$ 5,174,953	$ 89.10	$ 470,450.29
Pig Launcher and Receiver			$ -	$ -	$ -	$ -	$ -		
Contingency (30%)			$ 3,936,240	$ 1,109,317	$ -	$ -	$ 5,045,557		
Total	187,440	35.5	$ 17,057,040	$ 4,807,040	$ -	$ -	$ 21,864,080	$ 116.65	$ 615,889.57
SUBTOTAL COST RANGE (-30% to +50%):						**-30%**	**$ 15,304,856**	**+50%**	**$ 32,796,120**

Initial Cost Estimates – Feeder line 1

Feeder Line 1, 6 miles and 6.5” diameter, should run along the US and Mexico border

– The following table provides an estimate for the cost of material and construction of a 6 miles long 6.5” pipeline as discussed previously. The costs are estimated in US dollars, with the necessary considerations for installation.

Description	Class	Dia [in]	Quantity	Unit	Unit Cost	Total Cost	Remarks
Feeder Line 1 (6.5")							
Construction							
Installation		6.5	31,680	LF	$70	$2,217,600	
HDD		6.5	0	LF	$300	$0	For rivers
Regulator stations		6.5	0	EA	$400,000	$0	For transmission lines
Materials							
Materials- Steel		6.5	31,680	LF	$15	$469,200	
Materials- Valves		6.5	1	EA	$13,300	$13,300	1 every 46,000 LF
Materials- Design allowance	varies	varies	5%	EA		$24,125	
Materials- Misc. Freight			2%	EA		$9,650	
Materials- Procurement			4%	EA		$19,300	
Materials- SQS			2%	EA		$9,650	
Feeder Line 1 (6.5")			**15,840**	**LF**		**$2,762,826**	

Initial Cost Estimates – Feeder line 2

4 miles of 6.0” diameter Pipeline should run parallel to Feeder line 1

– The following table provides an estimate for the cost of material and construction of a 4 miles long 6.0” pipeline as discussed previously. The costs are estimated in US dollars, with the necessary considerations for installation.

Description	Class	Dia [in]	Quantity	Unit	Unit Cost	Total Cost	Remarks
Feeder Line 2 (6")							
Construction							
Construction		6.0	21,120	LF	$70	$1,478,400	
HDD		6.0	0	LF	$300	$0	For rivers
Regulator stations		6.0	0	EA	$400,000	$0	For transmission lines
Materials							
Materials- Steel		6.0	21,120	LF	$13	$279,901	
Materials- Valves		6.0	1	EA	$13,300	$13,300	1 every 46,000 LF
Materials- Design allowance	varies	varies	5%			$14,660	
Materials- Misc. Freight			2%			$5,864	
Materials- Procurement			4%			$11,728	
Materials- SQS			2%			$5,864	
Feeder Line 2 (6")			**21,120**	**LF**		**$1,809,717**	

Initial Cost Estimates – Feeder Line 3

9 miles of 8" diameter pipeline, running parallel to Feeder line 2

– The following table provides an estimate for the cost of material and construction of a 9 miles long, 8.0" diameter pipeline. The costs are estimated in US dollars, with the necessary considerations for installation.

Description	Class	Dia [in]	Quantity	Unit	Unit Cost	Total Cost	Remarks
Feeder Line 3 (8")							
Construction							
Construction		8.0	47,520	LF	$70	$3,326,400	
HDD		8.0	0	LF	$300	$0	For rivers
Regulator stations		8.0	0	EA	$400,000	$0	For transmission lines
Materials							
Materials- Steel		8.0	47,520	LF	$20	$947,737	
Materials- Valves		8.0	2	EA	$13,300	$26,600	1 every 46,000 LF
Materials- Design allowance	varies	varies	5%			$48,717	
Materials- Misc. Freight			2%			$19,487	
Materials- Procurement			4%			$38,973	
Materials- SQS			2%			$19,487	
Feeder Line 3			**47,520**	**LF**		**$4,427,400**	

Initial Cost Estimates – Feeder Line 4

A 5.5 miles of 7.5” diameter pipeline, running parallel to Feeder line 3

– The following table provides an estimate for the cost of material and construction of a 5.5 miles long 7.5” diameter pipeline. The costs are estimated in US dollars, with the necessary considerations for installation.

Description	Class	Dia [in]	Quantity	Unit	Unit Cost	Total Cost	Remarks
Feeder Line 4 (7.5")							
Construction							
Construction		7.5	29,040	LF	$70	$2,032,800	
HDD		7.5	0	LF	$300	$0	For rivers
Regulator stations		7.5	0	EA	$400,000	$0	For transmission lines
Materials							
Materials- Steel		7.5	29,040	LF	$18	$527,255	
Materials- Valves		7.5	1	EA	$13,300	$13,300	1 every 46,000 LF
Materials- Design allowance	varies	varies	5%			$27,028	
Materials- Misc. Freight			2%			$10,811	
Materials- Procurement			4%			$21,622	
Materials- SQS			2%			$10,811	
Feeder Line 4			**29,040**	**LF**		**$2,643,627**	

Initial Cost Estimates – Feeder Line 5

A 7” diameter pipeline with cumulative length of 11 miles, running parallel to Feeder Line 4 and diverging to southwest SLRC

– The following table provides an estimate for the cost of material and construction of a 7” diameter pipeline. The costs are estimated in US dollars with the necessary considerations for installation. The pipeline is expected to span for nearly 11 miles.

Description	Class	Dia [in]	Quantity	Unit	Unit Cost	Total Cost	Remarks
Feeder Line 5 (7")							
Construction							
Construction		7.0	58,080	LF	$70	$4,065,600	
HDD		7.0	0	LF	$300	$0	For rivers
Regulator stations		7.0	0	EA	$400,000	$0	For transmission lines
Materials							
Materials- Steel		7.0	58,080	LF	$16	$955,128	
Materials- Valves		7.0	2	EA	$13,300	$26,600	
Materials- Design allowance	varies	varies	5%			$49,086	
Materials- Misc. Freight			2%			$19,635	
Materials- Procurement			4%			$39,269	
Materials- SQS			2%			$19,635	
Feeder Line - 5			**58,080**	**LF**		**$5,174,953**	

Initial Cost Estimates – Residential and Commercial Lines

A total of 30 miles of service lines of 2" diameter is initially envisaged

– The following table provides an estimate for the cost of material and construction of 30 miles long, 2.0" diameter pipeline to be laid for providing natural gas to residential and commercial properties close to the US border. The costs are estimated in US dollars, with the necessary considerations for installation.

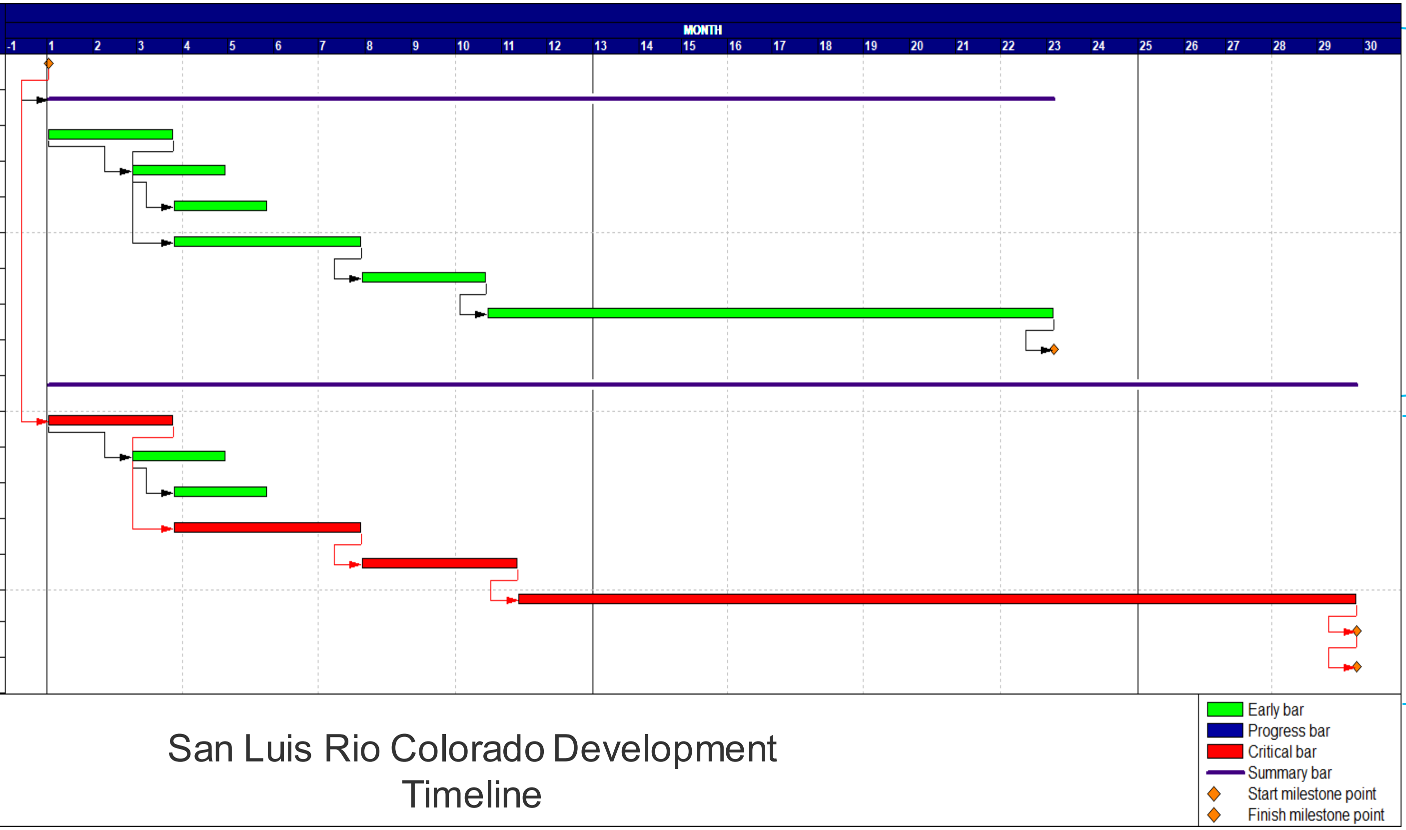
FINAL COST ESTIMATE SUMMARY: 2" Service Line									
	Length (LF)	Length (miles)	Construction	Materials	Engineering	Permitting	Total Cost	Cost/Foot	Cost/Mile
Section									
2" Section	158,400	30.0	$ 3,960,000	$ 1,649,972	$ -	$ -	$ 5,609,972	$ 35.42	$ 186,999.06
Pig Launcher and Receiver			$ -	$ -	$ -	$ -	$ -		
Contingency (30%)			$ 1,188,000	$ 494,992	$ -	$ -	$ 1,682,992		
Total	158,400	30.0	$ 5,148,000	$ 2,144,963	$ -	$ -	$ 7,292,963	$ 46.04	$ 243,098.78
SUBTOTAL COST RANGE (-30% to +50%):						**-30%**	**$ 5,105,074**	**+50%**	**$ 10,939,445**

Description	Class	Dia [in]	Quantity	Unit	Unit Cost	Total Cost	Remarks
2" Section							
Construction							
Construction		2.0	158,400	LF	$25	$3,960,000	
HDD		2.0	0	LF	$300	$0	For rivers
Regulator stations		2.0	0	EA	$400,000	$0	For transmission lines
Materials							
Materials - Steel		2.0	158,400	LF	$3	$404,152	
Materials - Valves		2.0	2,112	EA	$500	$1,056,000	
Materials - Design allowance	varies	varies	5%			$73,008	
Materials - Misc. Freight			2%			$29,203	
Materials - Procurement			4%			$58,406	
Materials - SQS			2%			$29,203	
Subtotal - 2" Lines			**158,400**	**LF**		**$5,609,972**	

Development Timeline

San Luis Rio Colorado Natural Gas Pipeline Project Timeline

#	Description
1	Start
2	Option 1: Gas Network Without Powerplant
2.1	Preliminary Engineering
2.2	Environmental Studies & Permitting
2.3	ROW Activities
2.4	Detailed Design
2.5	Bidding & Source Selection
2.6	Pipeline Construction
2.7	Phase 1 System Start-up
3	Option 2: Gas Network with Powerplant
3.1	Preliminary Engineering
3.2	Environmental Studies & Permitting
3.3	ROW Activities
3.4	Detailed Design
3.5	Bidding & Source Selection
3.6	Pipeline Construction
3.7	Phase 2 System Start-up
4	End



San Luis Rio Colorado Development Timeline

Option 1: This is the timeline if powerplant is not considered a demand center.

Option 2 This is the option to be considered if powerplant is considered a demand center.

7 | *Supply Alternatives*

Overview of Supply Alternatives

In this section, we will analyze other supply options available to the City of San Luis Rio Colorado

- In previous sections we analyzed the possibility of natural gas supply from the Somerton EPNG connection point. In this section, we discuss other supply options of supply as well as an alternate energy options. These includes:
  - Revisiting gas supply from the Somerton EPNG connection point.
  - Gas supply from EPNG Mesa Irrigation Tap in the north.
  - LNG supply from a liquefaction plant with a regasification station at the city.
- Each of the options were then analyzed by the report team to understand their advantages and disadvantages.
- A preliminary cost impact was assessed for each of the options is provided.
- This analysis addresses the basics of available options and weighs these options against the status quo.

>>> This analysis is presented in detail in the next few slides.

Alternative I – Somerton Supply

Supply Connection (A): Supply from Somerton

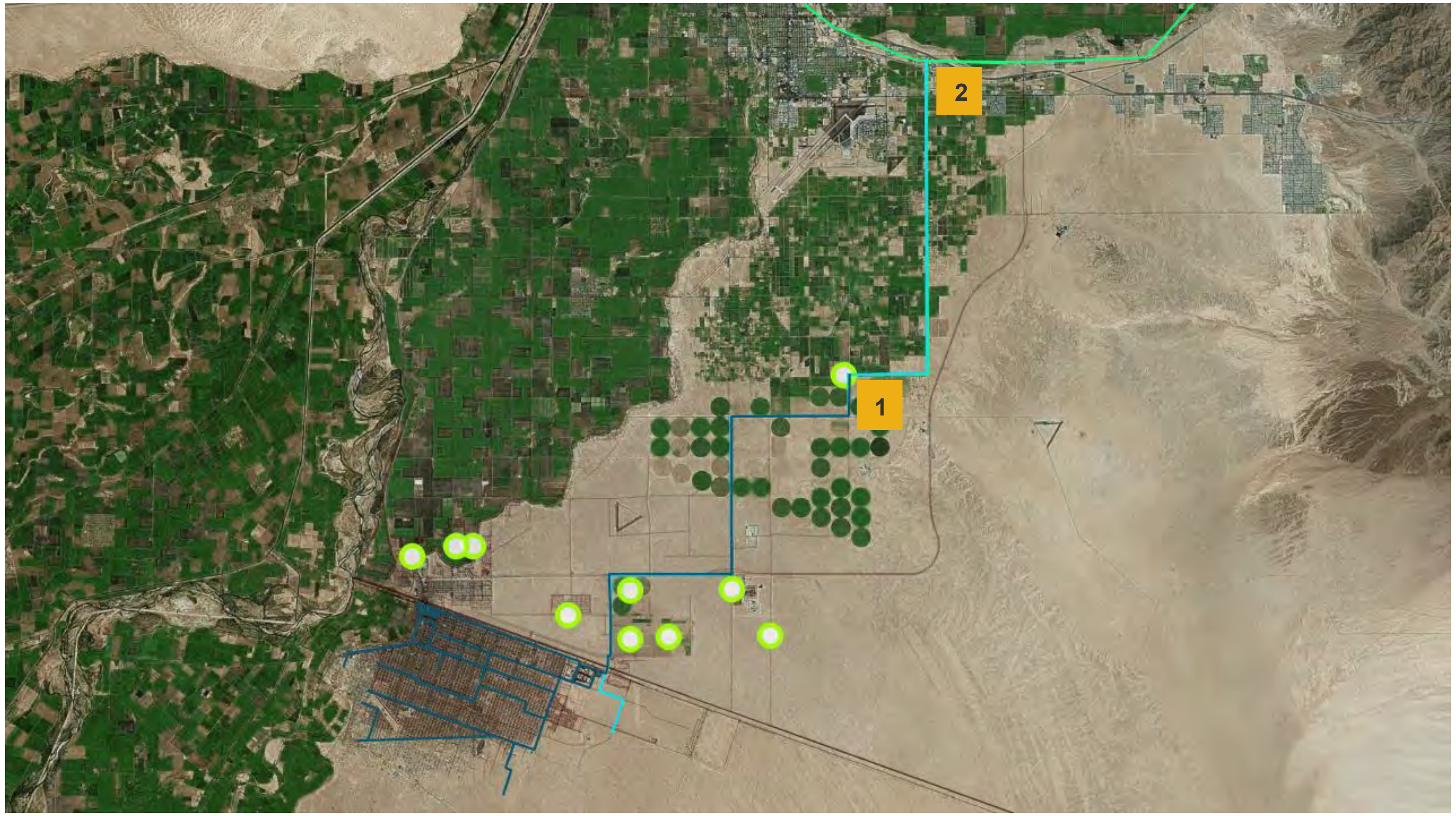
Somerton is labeled as Point "1" in the map on the right.

Southwest Gas has capacity at that point and most likely uses it to supply industrial and commercial segment on the East SLRC. This supply point is nearly 13-14 miles from the border and could likely support Industrial. residential and commercial sector.

Following are some of the pros and cons of the pipeline route:

Advantages	Disadvantages
1. Proximity to San Luis Rio Colorado's industrial zone close to POE II; 2. Relatively lower construction cost; 3. Construction timeline could be faster because of proximity	1. EPNG pipeline at this interconnect may be limited by its design capacity and may have limitations in scaling;

Supply from Somerton Interconnect [1]



Alternative II – Mesa Irrigation Tap

Supply Connection (B): Interconnect Mesa Irrigation Tap

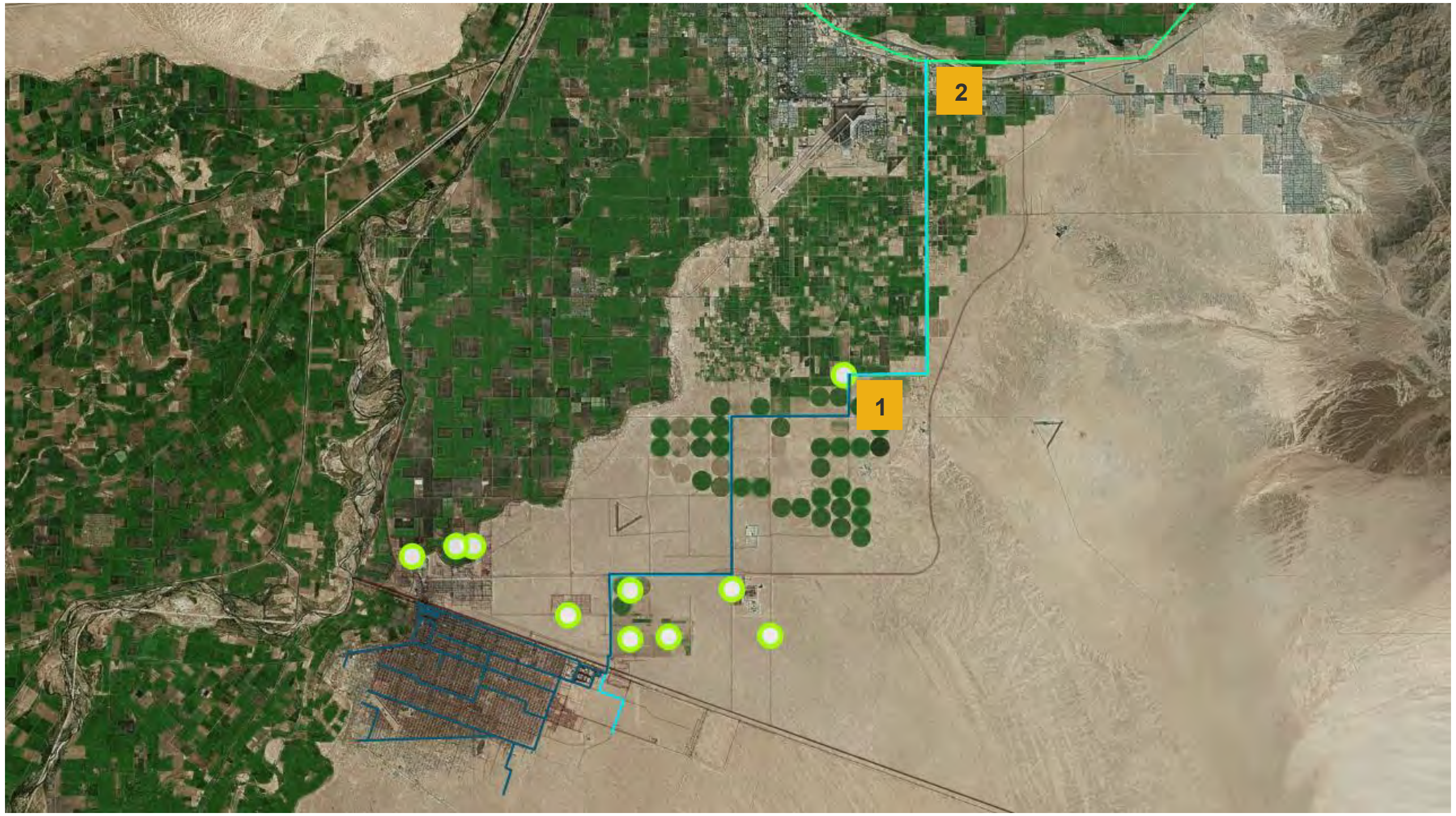
The supply connections, labeled "**2**" on the map, connects to an EPNG segment that brings gas for both SW gas and APS power plant supply in San Luis, Arizona.

The EPNG pipeline segment coming from the north has a large design capacity, making it suitable for large natural gas requirements, such as the power plant being planned in SLRC, next to the industrial zone. Following are some of the advantages and disadvantages of the pipeline connection point:

Advantages	Disadvantages
1. Large design capacity that can support high future gas needs in SLRC and can have additional available gas capacity for new projects;	1. ~10 miles files away from the bottom most point on EPNG, resulting in additional cost of pipeline; 2. Customer buy in may be necessary for construction.

>>Gas purchase commitment from power plant may result in the selection of point "**2**" to support all demand in SLRC

Supply from Mesa Irrigation Tap [2]



Alternative III – LNG Trucking (1 of 2)

LNG trucking from the Southern Arizona LNG storage station in Tucson, AZ.

Another alternative option for supply could include transportation of liquefied natural gas (LNG) loaded on to trucks or ISO containers to be deliver to a location and then regasified. Following are some of advantages of this approach:

- Targeted customers base could be served, for example, a factory or several industrial customers could be served with truck delivery of LNG (similar to diesel or gasoline).
- A robust network of infrastructure could be developed which is decentralized and runs with an option of independently or collectively.
- Infrastructure could be bolstered significantly as this will not be dependent on transmission pipeline expansion needs.

>>> The logistics and cost associated are explained in the next slides.

LNG Trucking

Alternative III – LNG Trucking (2 of 2)

Potential truck route

In this case LNG can be acquired from Southern Arizona LNG terminal owned by Southwest Gas, which is nearly 270 miles away from San Luis Rio Colorado. Based on the demand information in the region the following could be concluded:

- LNG truck loading station would be needed at SW Gas' LNG terminal (2 bay loading) costing nearly $2 million.
- Five to six LNG trucks (each with 18 tons of LNG i.e. 9,615 therms of natural gas) would be required for meeting the demand. The cost of each truck is approximately $200,000 or $1.2 million.
- Storage (32,000 therms – equivalent to 150 m^3 LNG) and regasification equipment would be required with total cost close to $1.0 million.

Thus total investment required will be in the order of ~ $4 - $5 million. This investment would be additional to investment for the pipeline infrastructure cost as estimated in the study. Cost of gas delivered would be higher[1] than the cost of delivered gas to the end customers. Thus, could be a viable strategy in case of pipeline capacity bottlenecks.

Truck route

[1]Additional cost for converting gas to LNG + Transport

Conclusion for Alternatives

Either option "1" or "2" would be appropriate to follow subject to commitment from the power plant on taking gas supply

Each of the options discussed present a trade-off between advantages and disadvantages. The study has identified:

- Somerton supply option (labeled "**1**") would be appropriate if only Industrial, Residential and Commercial demand is concerned.
- Mesa Irrigation Tap (labeled "**2**"), would be slightly more expensive, but would be a better option in the case the power plant demand is realized;
- Any shortage of gas could be supplemented with LNG, although the cost of gas would be high.
- In case of a phased development of infrastructure, the Commercial and Industrial sectors should be targeted first, located less than 15 miles from the Somerton point.

Discussions should be held with Southwest Gas if option "1" is chosen and both Southwest Gas and APS if option "2" is chosen.

Fuel Name	Assumptions and Cost estimates
Propane	Typically trades at a premium to natural gas. In the recent year, the propane prices have reduced significantly and has traded in the range of $2.4/therm.
Electricity[1]	Electricity prices in the region has been in the range of $0.11/kWh or $3.21/therm. If electricity is produced using natural gas, effectively >50% of energy in gas is lost (efficiency of power generator).
Natural gas[2]	Based on Southwest Gas tariff sheet, following is expected to be variable cost: Residential: $0.986/therm Commercial: $0.643/therm Industrial: $0.544/therm Transport: 0.374/therm Others: $0.643/therm

[1]Actual cost paid by a residential consumer could almost be double at times;
[2]Additional pipeline tariff should be added on the Southwest tariff for appropriate cost estimates

8 | *Economic Feasibility*

Financial Feasibility Analysis Overview

Feasibility of adoption of an alternative fuel requires careful analysis of value to each of the stakeholders.

In very simplistic terms, we will evaluate:

– Gas infrastructure provider facing enough demand to justify making an investment; and,

– Gas buyer has sufficient incentive to switch to natural gas as it is made available.

Consequently, this analysis develops:

– **For infrastructure provider**- An economic model based on existing tariff for different customers to evaluate if rate of return objective is met. In case of a regulated utility, the gas infrastructure allowed return of investment is assumed to be 10% (equivalent to cost of capital). In reality, this number would be slightly lower. Assumption are detailed in the later slides.

  - The economic model has two CAPEX/OPEX scenarios, one with Power Plant and one without the Power Plant.

– **For Gas buyer-**

  Commercial User - Delivered gas price is compared against propane price.

  Residential User - Fuel cost is compared against electricity cost in heating/cooking.

>>> The results are detailed in the next slides.

Gas Supply Infrastructure Feasibility (1 of 4)

The table below shows the demand and connection number assumptions built in the model in line with the base scenario forecasted in Section 4:

– Table below assumes same demand from 2038 through 2040.

Therms/ Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Residential	39,700	96,600	201,900	336,300	446,000	508,700	538,900	553,500	561,600	567,000	575,600	584,000	592,300	600,800	609,300	618,000	626,800	635,700
Commercial	701,319	1,283,043	1,576,741	1,889,888	2,029,495	2,254,159	2,309,265	2,486,440	2,508,080	2,529,720	2,562,683	2,595,143	2,628,106	2,669,926	2,702,889	2,735,349	2,757,492	2,789,952
Industrial	0.00	2,651,623	2,651,623	7,331,823	7,331,823	9,910,194	9,910,194	12,832,272	12,832,272	12,832,272	12,832,272	12,832,272	12,832,272	12,832,272	12,832,272	12,832,272	12,832,272	12,832,272
Others	478,501	1,333,790	2,860,831	5,070,363	7,026,974	8,486,566	9,402,806	10,176,125	10,760,089	11,303,540	11,831,042	12,352,337	12,871,231	13,389,198	13,906,809	14,424,284	14,941,706	15,459,107
CC Plant	-	-	-	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000
# of Connections																		
Residential	397	966	2,019	3,363	4,460	5,087	5,389	5,535	5,616	5,670	5,756	5,840	5,923	6,008	6,093	6,180	6,268	6,357
Commercial	69	119	152	183	201	218	225	236	238	240	244	247	251	255	259	262	265	268
Industrial	-	7	7	18	18	24	24	32	32	32	32	32	32	32	32	32	32	32
Others	12	46	84	151	199	249	271	304	318	331	344	357	370	382	395	407	420	433
CC Plant	-	-	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Gas Supply Infrastructure Feasibility (2 of 4)

Costs were based on Southwest Gas information, same as with the San Luis, Arizona

– Incremental cost was added to the delivery charges based on BRG's experience.

› ***Service Fee -*** This fee typically is payable by the customer irrespective of whether a customer uses any gas in from the system. For a broadly categorized residential customer for example, this fee is $10.7/month. This number are usually revised by the regulator. Some portion of this fixed fee goes towards earning a rate of return for laying out gas pipeline infrastructure.

› ***Delivery Charges -*** Delivery charges are payable by a customer based on usage. For example, for a broadly categorized residential user is expected to pay 73 cents per therm of natural gas usage. Based on an average 100 therms consumption, a user of natural gas can expect to pay nearly 73 dollars in delivery fee every year. A portion of this fee goes towards return for the gas distributor.

› **Gas Cost -** Typically there is commodity cost associated with the gas which is the cost of gas paid by the LDC. Usually, there is no mark-up on the cost of gas i.e. a LDC typically does not make any profit on the sale of gas (alternately called pass-thru cost). Currently cost of gas is $0.24/therm (24 dollar/year for a residential customer).

>>> The service and delivery charges would cover for all the costs incurred by an LDC.

Service Fee	*Units*	Cost per Annum
Residential	*$/Connection*	128.4
Commercial	*$/Connection*	960
Industrial	*$/Connection*	5640
Transport	*$/Connection*	11400
Other	*$/Connection*	960

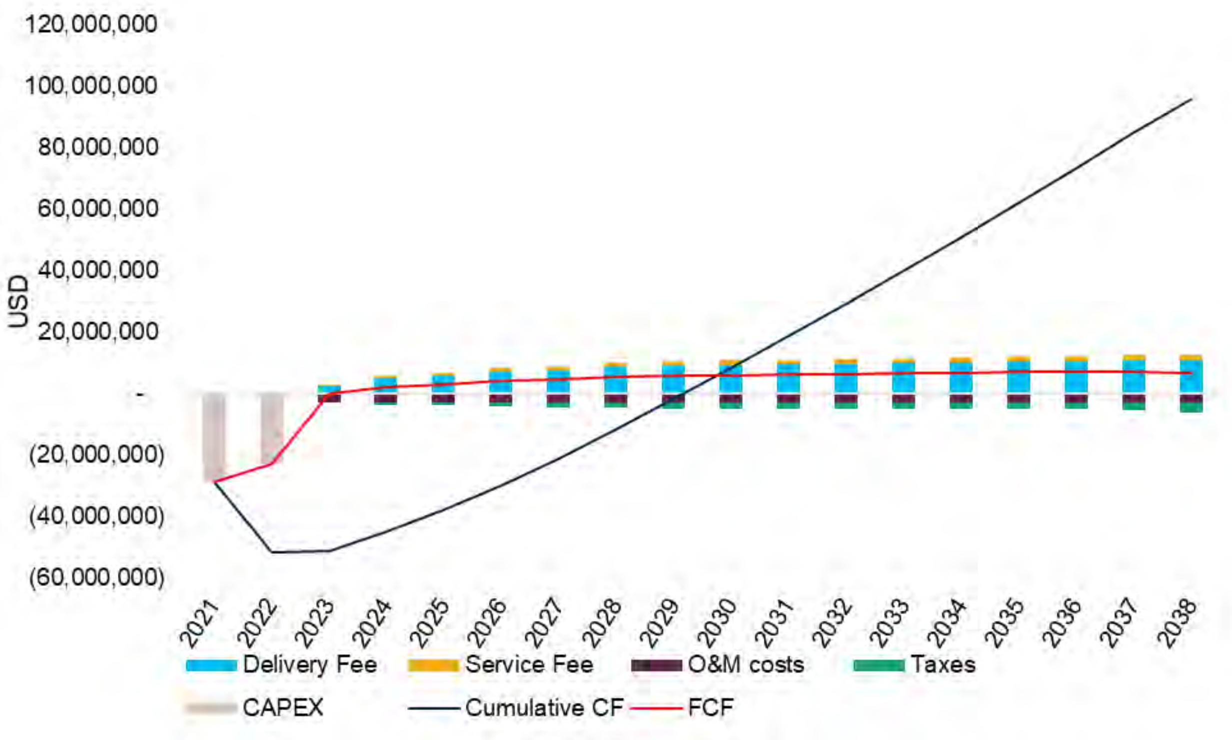
Delivery Charges	*Units*	Cost per Therm
Residential	*$/therm*	0.75
Commercial	*$/therm*	0.40
Industrial	*$/therm*	0.30
Transport	*$/therm*	0.13
Other	*$/therm*	0.40

Gas Supply Infrastructure Feasibility (3 of 4)

Scenario 1: With Power Plant

- Using the assumptions from the previous slides and the financial statement analysis, we can observe the following from the chart:
  - Delivery charges forms the largest section of review for the LDC. Thus, the larger the demand center is, the faster return of capital (assuming no additional infrastructure is required).
  - Service fee is increasing in the later years, supported by increase in residential gas consumption.
  - Breakeven for infrastructure is achieved in 8 years from completion of infrastructure. If residential pipeline Sectors are developed slowly, the capital could be recovered faster.
- Based on this configuration, the infrastructure has a positive NPV of ~$7,988,942 over 18 years, with a project IRR of nearly 12.2%. Thus, based on projected demand profile, investment appears to be economically feasible in San Luis Rio Colorado.

San Luis Rio Colorado Gas Distribution Cash Flow Analysis (US $)

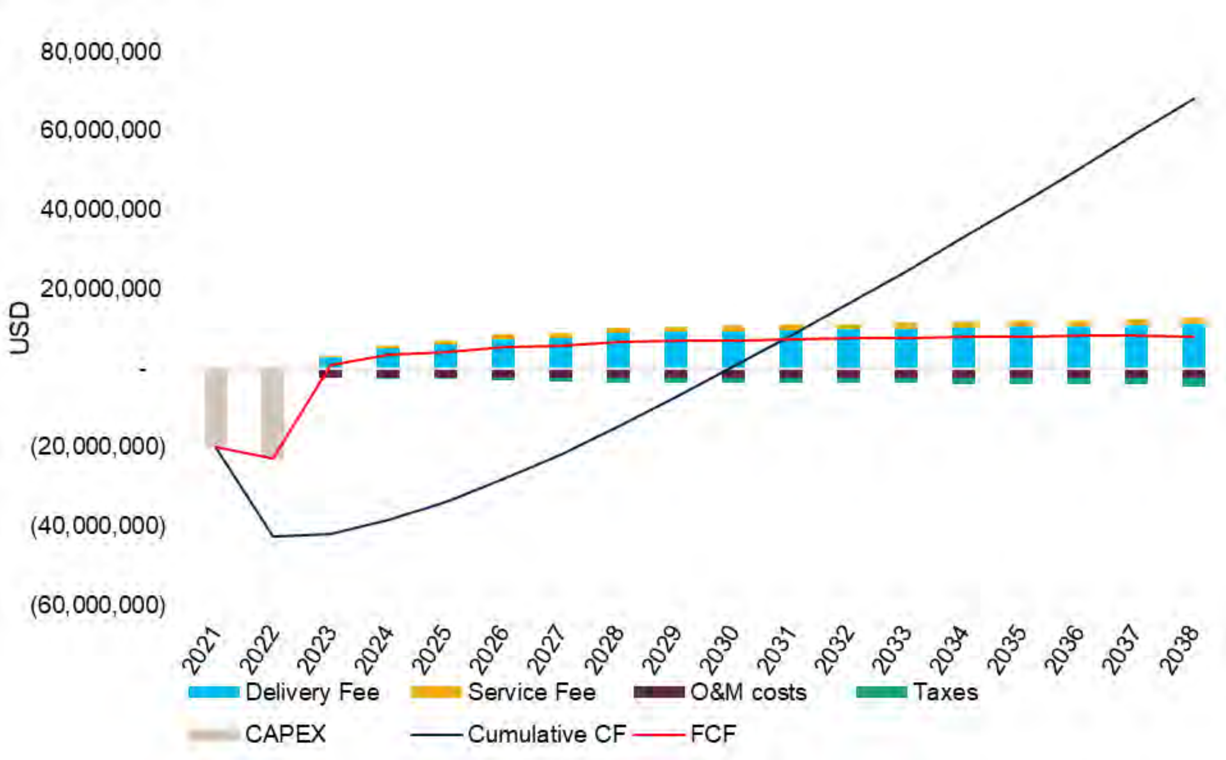


Gas Supply Infrastructure Feasibility (4 of 4)

Scenario 2: Without Power Plant

- Using the assumptions from the previous slides and the financial statement analysis, we can observe the following from the chart:
  - Delivery charges forms the largest section of review for the LDC. Thus, the larger the demand center is, the faster return of capital (assuming no additional infrastructure is required).
  - Service fee is increasing in the later years, supported by increase in residential gas consumption.
  - Breakeven for infrastructure is achieved in 9 years from completion of infrastructure. If residential pipeline Sectors are developed slowly, the capital could be recovered faster.
- Based on this configuration, the infrastructure has a positive NPV of ~$2,091,573 over 18 years, with a project IRR of nearly 10.7%. Thus, based on projected demand profile, investment appears to be economically feasible in San Luis Rio Colorado.

San Luis Rio Colorado Gas Distribution Cash Flow Analysis (US $)



Demand side feasibility – Commercial

Most of the commercial customers are restaurants and commercial kitchen, may find natural gas a cheaper alternative to Propane

- For commercial Sector, propone and electricity are considered the alternative for natural gas. Following comparison of prices would set the stage for comparison:

Propane gas cost: information provided by client shows the prices per liter of propane, raging between 11.85-11.99 MXN, an average price of US $0.57/liter. 1 liter of propane is nearly 23,820 Btu ~ 0.238 therm. Thus, price of propane per therm is nearly $2.39/therm.

Cost of delivered natural gas: as per the rate sheet from Southwest Gas, delivered cost of natural gas for a commercial outlet in San Luis Rio Colorado region would be $0.24/therm for commodity, and 0.40/therm for delivery. Thus in total, the cost of delivered natural gas is $0.64/therm.

- When compared from above, we could clearly observe that natural gas cost is almost 73% lower than propane cost for commercial usage.
- Similarly, natural gas is the cheaper and efficient alternative to operate commercial heating as compared to electricity.

Comparison Between Commodity Prices

Natural Gas Price: $0.64/therm- based on delivered price by Southwest

Propane: $2.39/therm

Electricity: $0.11/kWh => $3.21/therm

Thus, on a $/therm basis, it could be established that natural gas is the cheapest commodity among the three options, cost almost half to the cost of propane and a fifth of the cost of electricity.

Savings Estimation (1 of 2)

Commercial sector could benefit from the biggest savings.

– Savings estimation for each Sector could be largely be viewed as necessary cost and switching cost differential that may result in consumers selecting to use natural gas as their primary source of heating/fuel. Following calculations can be done based on needs of Sectors:

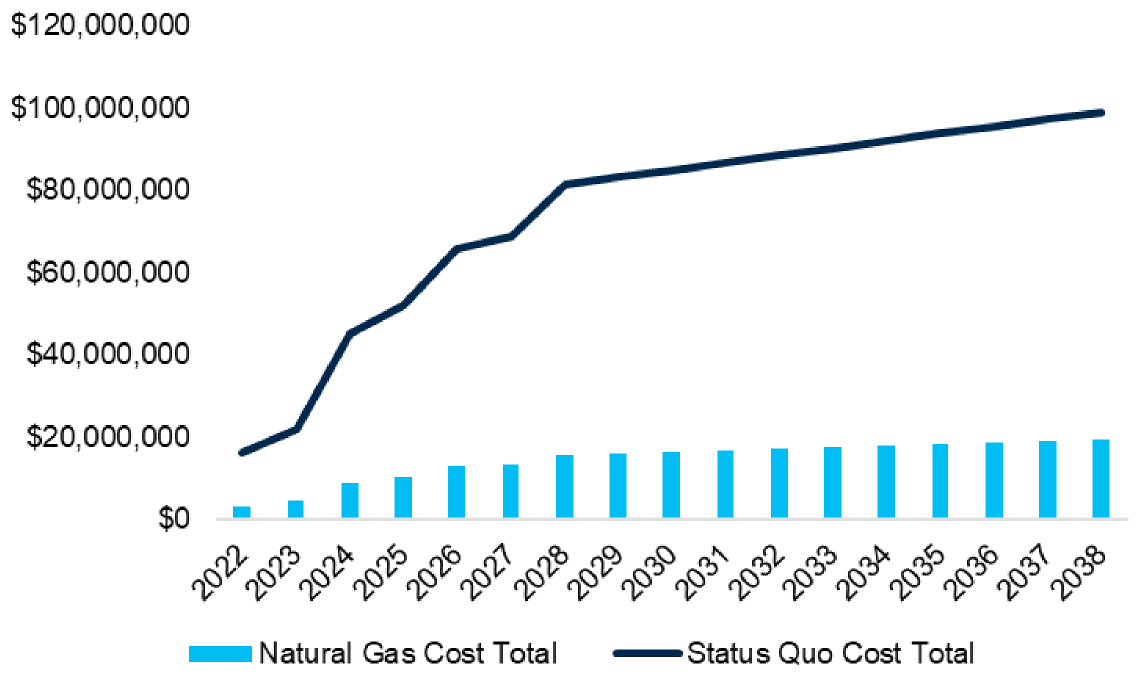
- ***Residential Sector -*** As it is estimated that nearly each household is expected to use ~100 therms/year, if natural gas is used as an alternate fuel, the cost saving every year for 100 therms would be in range of 0 – 46 dollars per year as compared to propane. Propane piping installation cost could be higher. Thus, natural gas would be overall a better alternate.
- ***Industrial Sector -*** For industrial Sector, use of natural gas would typically be cheaper and efficient for heating, drying, processing and other purposes. It must be noted, however, that depending on the type of equipment involved, the specific calculations have to be done to establish superiority of one fuel against the other.
- ***Other Sectors -*** In this report, we have categorized schools, government facilities, and hospitals in other Sectors. The main natural gas fuel alternative in these Sector includes propane and electricity. Typically on the basis of economics, natural gas would result in lower operating costs as compared to the alternative fuels.

>>> In order to understand the magnitude of saving, in the next section, we have presented a table of potential saving from the use of natural gas on a commodity basis. The commodities compared against natural gas are propane, diesel and electricity.

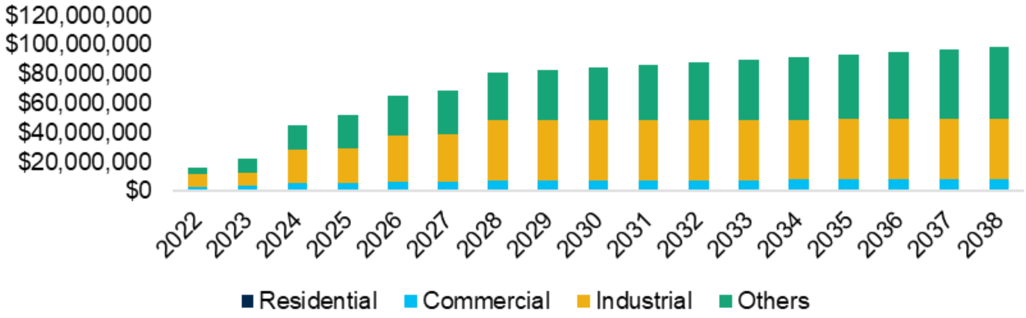
Savings Estimation (2 of 2)

An estimated 80% saving is expected in a simplistic cost benefit analysis (without any switching costs) and underlying assumptions. Complete savings model is included as Annex 4 of this report

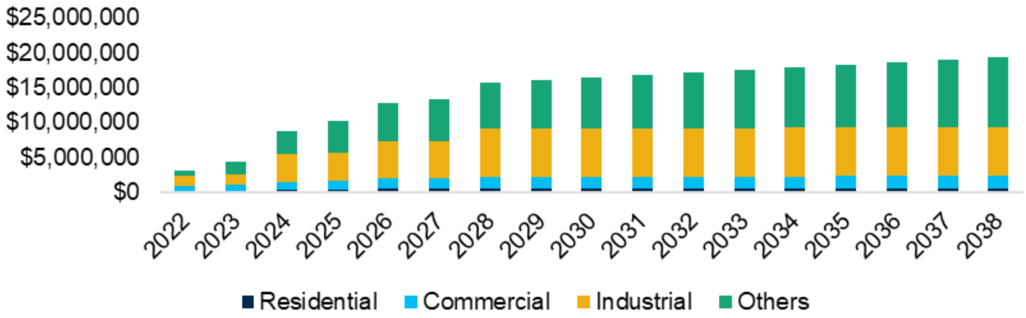
Natural Gas Cost vs Status Quo



Status Quo



Natural Gas Adoption



Conclusion

Natural gas offers tremendous potential for saving in San Luis Rio Colorado

Based on the economic feasibility analysis shown here, the following can be concluded:

- If the project demand profile materializes, infrastructure investments made would be sufficient to provide the required rate of return for the LDC. Thus, natural gas infrastructure development is feasible.
- The project is feasible with or without the construction of the power plant.
- Comparison of cost between natural gas and propane yields favorable economics for use of natural gas in commercial sector as well as residential sector.
- Finally, the industrial sector may require switching economics validated on case by case bases for existing machinery, but future industries could certainly benefit from natural gas availability.

>>> Thus, a nutshell, natural gas appears to be economically feasibility and a superior fuel that can serve the community reliably.

9 Regulation, Rates and Permitting

Regulatory Bodies and Permit Requirements

Natural gas transmission and distribution activities require permits from the Energy Regulatory Comission (CRE) and are subject to non-discriminatory, open access.

- The Energy Regulatory Commission (CRE) and the National Center for Natural Gas Control (CENEGAS) regulate and supervise activities related to natural gas.
  - > CRE, regulates the midstream and downstream activities; issues all permits related to natural gas activities as well as verifying compliance and imposing sanctions.
  - > CENAGAS manages, administers and operates the national natural gas transportation and storage system and ensures safety.

> ASEA is the entity charged with the supervision of health, safety and environment protection.

> Permits are required from the Federal, Municipal and Local Government levels. Some of these permits include:

Permits

> Environmental impact assessment

> Preparation of the SASISOPA (Industrial Security, Operational Security and Environmental Protection Administration System) requirements.

> Social impact assessment

> Consultation from indigenous communities, if applicable

> Archaeological permits, if applicable

> Land use change authorization (in forests)

> Environmental permits are issued by federal authorities including the Environmental and Natural Resources Ministry (“SEMARNAT”).

> Operating permits are issued by the Energy Regulatory Commission (“CRE”).

> Construction permits are usually provided by municipal governments.

> Surface rights need to be obtained for the area where the pipeline will be laid and need to be registered in the Property Public Registry

10 Environmental Assessment

Overview

Environmental and social impacts for San Luis Rio Colorado

- This section explores the environmental and social impact that could be expected from the construction of this pipeline.
- As the gas source starts on the Arizona side where the pipeline is exposed to greater environmental disturbance, the report focuses on several aspects that are unique to San Luis rather than SLRC

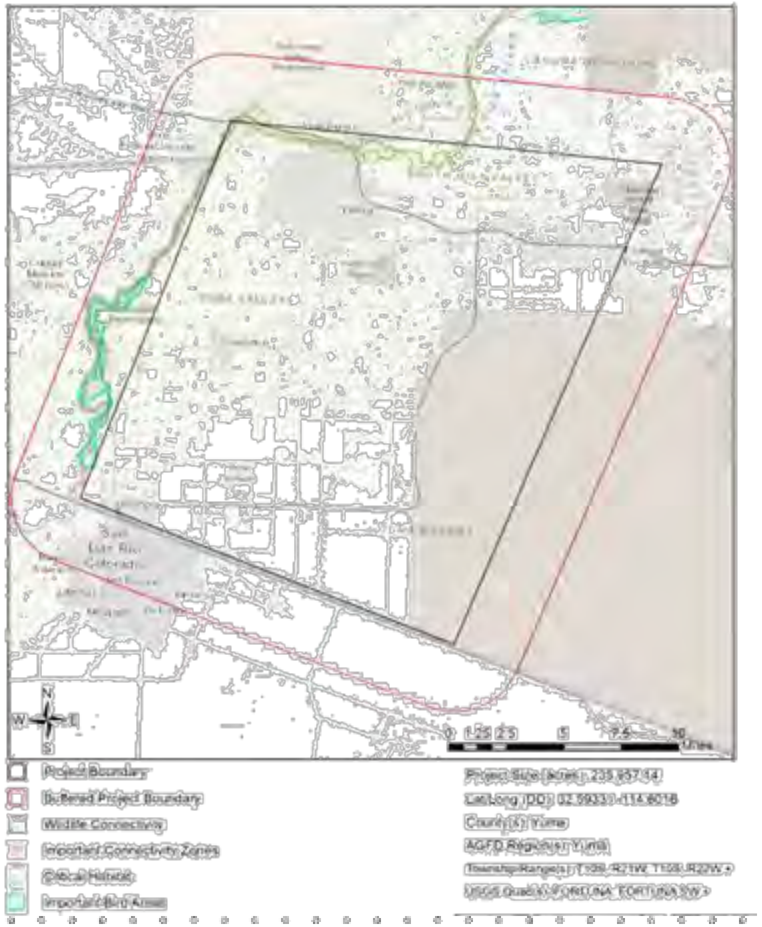
INTELLIGENCE THAT WORKS

BRG | ENERGY & CLIMATE

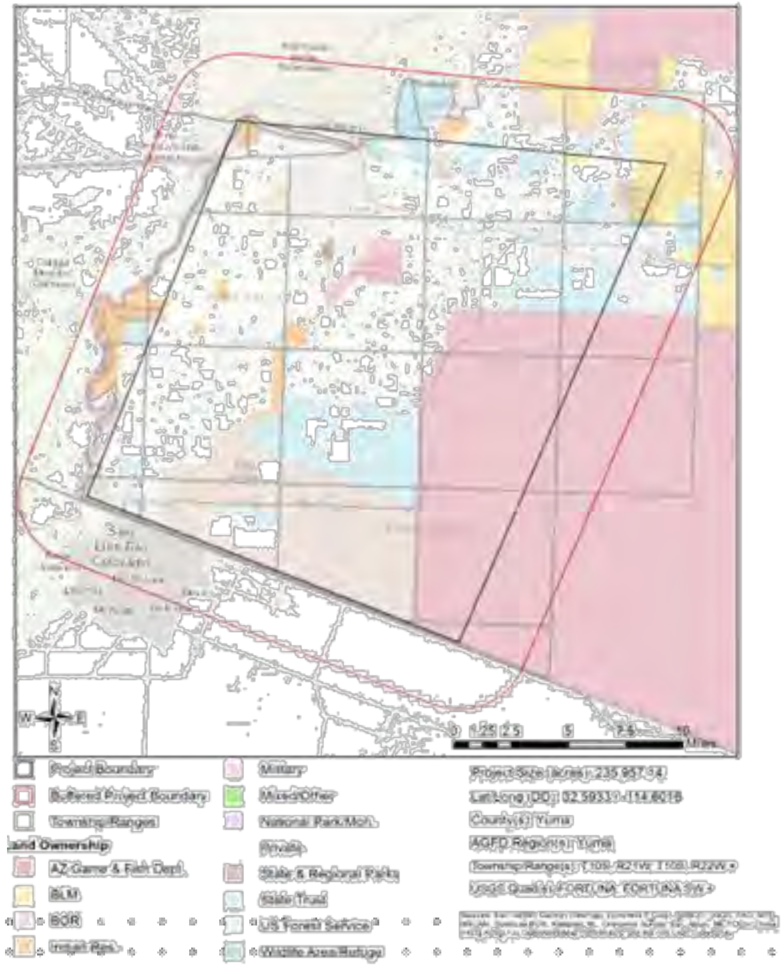
Region of Assessment for EIA

1. Region of Assessment

2. Important Areas



3. Township/Ranges and Ownership



Environmental Considerations Summary (1 of 3)

The region is expected to have limited, short-term and no long-term environmental impacts

The following table describes the key environmental resources and conclusion on impacts on various resources. Air quality and biological resources are described in detail in the later slides to understand the precautions that must be undertaken during the project planning

Environmental Resources	Description	Conclusions
Aesthetics	Addresses visual resources potentially affected by the Proposed Action	As the pipeline would be underground, there will be limited visual impacts. During construction, however, excavation, machinery movement, and backfilling may lower visibility temporarily, but this will clear as soon as construction is over, with little to no impact in future. Only visible component of the pipeline would be pipeline markers. For SLRC: Mitigation approach: (a) Existing road networks should be used to reach to the pipeline route with minimal new disturbance in the area; (b) When new access roads are developed, it should align with the landform contours where practicable with limited additional visual resources impacts;
Air Quality	Air quality and climate are components of air resources which may be affected by the Proposed Action	Temporary emission from dust particles, construction equipment and worker transit are expected to occur during the construction period of the project, but limited air pollution is expected during the operations period. Once the pipeline is installed, it will remain in the ground till a major repair or overhaul is necessary. There will be a very few number of equipment using fuel and will not be energy intensive

Environmental Considerations Summary (2 of 3)

Environmental Resources	Description	Conclusions
Biological Resources	Minimal disturbance to flora and fauna	There may be temporary impact for several plants and animal species in the region. Long-term impacts on biological resources would be expected. Details available in next slides.
Cultural/Historical Resources	Assessment of impacts on cultural/historical resources in the region	No short- or long-term impacts on cultural resources would be expected.
Geology and Soil	Identification of impacts on Geology and Soil in the region	Minor soil erosion may be possible during excavation and backfilling of the trenches. No long-term impact is expected. The site area also has moderate risk of earthquakes
Hazardous and Solid Waste	Hazardous materials and solid waste that have the potential to occur in the project area that may be affected	The hazardous and solid waste associated with the project area would not have impact on the surrounding environment as proper OSHA guidelines Similar regulations will be applicable in SLRC
Water Resources	Impact on water resources of the region including water use, water quality, groundwater, surface water, and the regulatory aspects of waters	No short- or long-term impacts on water resources would be expected from the Project

Environmental Considerations Summary (3 of 3)

Environmental Resources	Description	Conclusions
Land Use/Ownership	Defined as how a specific area is utilized	Permits may be required for laying the pipelines from BOR, BLM and State Land and some restriction on ROW may be applicable. Similar permits may be required from the city of San Luis Rio Coloradao
Noise	Noise is defined as any sound that is undesirable.	Noise during construction is possible because of construction activities, but such noise would be of temporary nature. Long-term, minor, adverse impacts on the noise environment would be expected.
Indian Trust Assets	It is Reclamation policy to protect Indian Trust Assets (ITAs), whenever possible, from adverse impacts caused by its programs and activities.	No Indian Trust Assets have been identified.
Socio Economics	The analysis of socioeconomic resources identifies those aspects of the social and economic environment that are sensitive to changes and that may be affected by actions	Limited short or long-term socio-economic impact is expected from the project.
Environmental Justice	Executive Order (EO) 1289 (in the US) requires consideration of any disproportionately high and adverse human health or environmental effects to minority and low-income populations	Short-term, minor to moderate impacts on minority populations and children from noise, air emissions, and increased traffic during construction. Limited long-term impacts are expected during long term.

Air Quality (1 of 3)

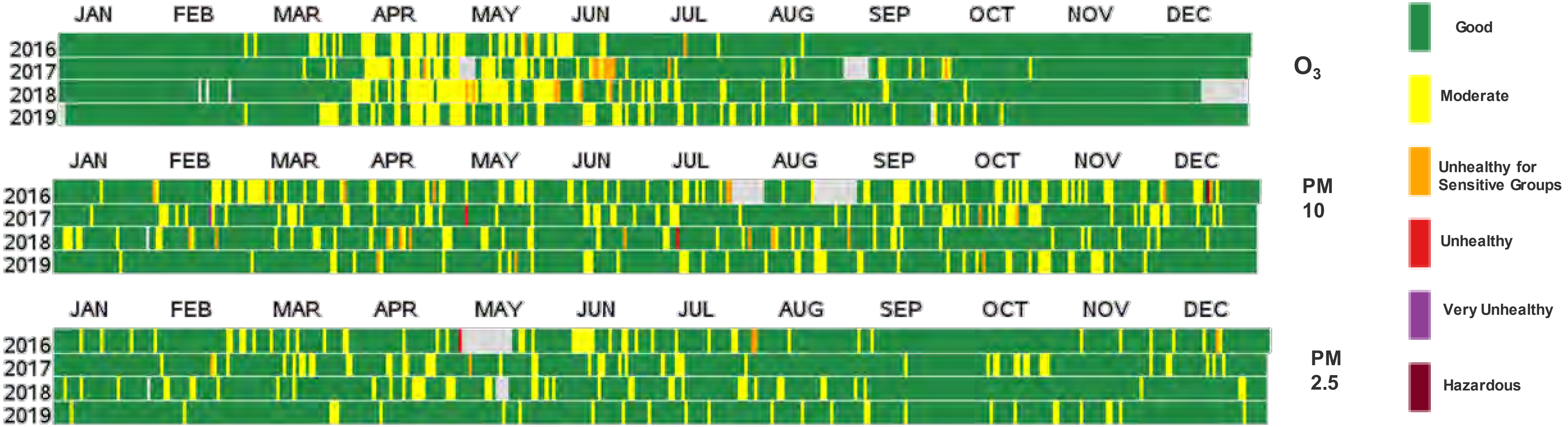
Clear Air Act (CAA) (42 U.S.C. §7401 et seq. (1970)) – a Federal Law – regulates air emissions from stationary and mobile sources. The stationary sources include factories, chemical plants, power plants etc., whereas mobile sources includes motor vehicle engines and off-road vehicles. This law provides the Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) to protect public health and public welfare and to regulate emissions of hazardous air pollutants. NAAQS sets standards on six major pollutants called the "criteria air pollutants" in the US including, Carbon Monoxide (CO), Nitrogen Dioxide (NO_2), Sulphur Dioxide (SO_2), Ozone (O_3), Lead (Pb), and Particulate Matter (PM). Criteria for these pollutants are shown below:

Pollutant	Averaging time	Primary Standard	Secondary Standard	Form
CO	1 hour	35 ppm	-	Not to exceed more than once per year
	8 hour	9 ppm	-	Not to exceed more than once per year
NO2	1 hour	100 ppb	-	98th percentile, averaged over 3 years
	Annual	53 ppb	53 ppb	Annual mean
SO2	1 hour	75 ppb	-	99th percentile of 1-hour daily maximum concentration, averaged over 3 years
	3 hour	0.35 ppb	0.5 ppm	Not to exceed more than once per year
O3	8 hour	0.07 ppm	.070 ppm	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
PM10	24 hour	150 µg/m3	150 µg/m3	Not to be exceeded more than once per year on average over 3 years
PM2.5	24 hour	35 µg/m3	35 µg/m3	98th percentile, averaged over 3 years
	Annual	12 µg/m3	15 µg/m3	Annual mean, averaged over 3 years
Pb	3 month	0.15 µg/m3	0.15 µg/m3	Not to be exceeded

Source: Environmental Protection Agency (https://www.epa.gov/criteria-air-pollutants/naaqs-table)

Air Quality (2 of 3)

In Arizona, the air quality is enforced by Arizona Department of Environmental Quality (ADEQ). In CAA, each states' regulator can apply a stricter air quality criteria than proposed under NAAQS, however, ADEQ has adopted for NAAQS standards for Air Quality in Arizona. EPA classifies a geographical region as in attainment of for a pollutant when the primary and secondary standards are met for a pollutant, the areas which do not meet the standards are designated as being in nonattainment and areas cannot be classified with the information are designated as unclassified. Yuma county, as shown seems susceptible to PM10 pollution with multiple unhealthy spikes over last four years. The source of PM10 includes agricultural activities, paved and unpaved road dust, and disturbed areas.



Source: Environmental Protection Agency (https://www.epa.gov/outdoor-air-quality-data/air-data-multiyear-tile-plot)

Air Quality (3 of 3)

As clear from the previous charts, the pipelines have to laid in nonattainment area for PM10 and therefore project should be subject to General Conformity and emission thresholds for PM10 should be 100 tons/year. A summary of the applicable ADEQ, and Yuma County, fugitive dust rules, regulations, and ordinances with which the construction of pipeline must comply includes fugitive dust rules by ADEQ and Yuma county Ordnance 05-01 (Requires project information signage for construction activities within the Yuma PM10 nonattainment area). We preliminarily anticipate that:

(a) Most of the construction would be of short term in nature and should ensure the emission thresholds of PM10;

(b) There are no permanent sources of emission and air permitting may not apply;

(c) Limited air quality impacts are anticipated; however, periodic review of EPA attainment status should be conducted for alignment with the environmental and air quality guidelines.

(d) Operations of underground pipelines is expected to have limited impacts on air quality;

The developers and contractors for the infrastructure development should develop an elaborate plan for negligible impact to air quality. Some of the mitigation measures may include limited speed of construction vehicles on dirt roads, proper maintenance of the equipment, covering the excavated earth and covered haul trucks.

Biological Resources (1 of 3)

The gas distribution pipelines pass along the roadways in the residential and commercial region and on the vicinity of large agricultural regions and open desert in outer city region. In conducting the environmental review, we used Heritage Data Management System (HDMS) data from Arizona Game and Fish Department (AGFD) and gathered supporting information from several environmental reports conducted in the region.

The project area contains a low diversity and density of plants. Rolle Airfiled conducted an environmental review in 2016 and General Services Administration conducted an environmental review in the region and confirms that creosote bush (Larrea tridentata) is widespread in the region. Various desert trees such as white bursage (Ambrosia dumosa), Arizona honeysweet (Tidestromia oblongifolia), cryptantha (Cryptantha sp.), Schott's wire lettuce (Stephanomeria schottii), whitestem milkweed (Asclepias albicans), Mediterranean grass (Schismus sp.), etc. are mentioned in the Rolle Airfield report (closer to the pipeline route), which are not covered under Arizona Native Plant Law (ANPL). This is verified in the data gather from Heritage Data management System.

US Fish and Wildlife Service (USFWS) maintains a database of protected species that may occur in Yuma county. The species are currently listed or are proposed for listing as endangered or threatened under the Endangered Species Act (ESA). ESA prohibits harming any of these listed species, but only provides protection for species listed[1].

AGFD monitors the species of greatest conservation (SGCN) and are the vertebrates, crustaceans, and mollusks that rank high in the vulnerability category for immediate action. Each species was assessed in terms of vulnerability and assigned as either a Tier 1a, 1b, or 1c ranking, with Tier 1a being the highest threat level.

Some bird species receive legal protection under the federal Migratory Bird Treaty Act. Some of the nesting habitat observed on AGFD's HDMS was along the Colorado river further away from the project location. If an active Bird nest is observed during construction, measures should be taken to protect the nest to avoid violation of federal Migratory Bird Treaty Act (MBTA).

[1]USFWS list for Endangered Plants and Wildlife is provided in the Appendix

Biological Resources (2 of 3)

Following are some of the Special Status Species Documented within 3 Miles of Project Vicinity and respective agencies. The several environmental reports conducted in the region indicate that Flat-tailed Horned Lizard and Sand Food are likely to occur in this region.

Scientific Name	Common Name	FWS	USFS	BLM	NPL	SGCN
Athene cunicularia hypugaea	Western Burrowing Owl	SC	S	S		1B
Coccyzus americanus	Yellow-billed Cuckoo (Western DPS)	LT	S			1A
Empidonax traillii extimus	Southwestern Willow Flycatcher	LE				1A
Helianthus niveus ssp. tephrodes	Algodones Sunflower	SC				
Lasiurus xanthinus	Western Yellow Bat		S			1B
Macrotus californicus	California Leaf-nosed Bat	SC		S		1B
Pholisma sonorae	Sandfood	SC		S	HS	
Phrynosoma goodei	Goode's Horned Lizard					1B
Phrynosoma mcallii	Flat-tailed Horned Lizard	CCA		S		1A
Rallus obsoletus yumanensis	Yuma Ridgway's Rail	LE				1A
Sigmodon hispidus eremicus	Yuma Hispid Cotton Rat	SC				1B
Stephanomeria exigua ssp. exigua	Small Wirelettuce			S		
Triteleiopsis palmeri	Blue Sand Lily			S	SR	
Uma rufopunctata	Yuman Desert Fringe-toed Lizard	SC		S		1B

Biological resources (3 of 3)

During the construction of the pipeline, the vegetation that are on the route of pipeline would be removed from the site, although the portion of this removal is expected to be low. However, no additional impact to the vegetation is expected during operations of the pipeline project. Project pipeline is expected to follow already disturbed land and should result in minimal incremental disturbance.

Due to construction related activities, there could be loss of habitat. However, as in the project region there already have been development (transmission pipelines, distribution pipelines, industrial zones, residential and commercial properties, etc.) the incremental loss is expected to be low. As some of these wild species may come under the construction vehicles, it is recommended that construction vehicle speed should be limited in the region to minimize such impacts.

Additionally, excavation of land could result in trapped wildlife in the trenches during construction. Consequently, appropriate precaution should be taken including covered trench or escape ramps and trenches should be checked prior to work every day. Noise and vibration may also temporarily change the habitat pattern in the region.

With temporary nature of construction and limited disturbance during operations, it appears unlikely that there would be any long-term or population level dangers for the species in the region.

The construction in the region should be prepared to mitigate any disturbance to Flat-tailed horned lizard in region and appropriate measure should be planned from project initiation to completion.

11 | *Conclusions and Recommendation*

Key Conclusions from the Study

To evaluate the feasibility of a natural gas distribution system in San Luis Rio Colorado, we have assessed the following items which are key for the undertaking of such a project:

- **Establishment of long-term gas demand availability in the region -** Several Sectors were investigated for potential demand and based on a conservative case demand in the region was forecasted till 2038 (15 years from projected start date for the infrastructure).
- **Establishment of long-term low price gas supply availability in the region -** Gas supplies are available from multiple supply sources and basins with sufficient gas for several decades. Additionally, price of gas from these basins have remained low and is expected to remain in that level for a long time.
- **Evaluation of gas value-chain infrastructure and expansion concept development-** Existing gas infrastructure available in the region was not considered as the information became unavailable.
- **Evaluation of feasibility of gas distribution network-** Based on the cost estimated for the infrastructure, return estimation, switching economics, and commodity cost, an economy based on natural gas would be superior for the region.
- **Commentary on permitting and regulations around such development-** An initial analysis of the region shows limited delays because of permitting requirements driven promoted by Mexico's energy reform.

>>> Based on the assessment, the development of the natural gas infrastructure appears highly feasible and would provide the region with energy security and an economic boost. At this stage, the city should look forward to the next steps to achieve the development as described in the following slides.

Recommendations

The steps described herein should be pursued in order to gain buy-in from various stakeholders:

1. **Gathering demand commitments-** Following the suggestion provided in Part I, meeting with different customer Sectors and having firm commitments in the form of a letter of intent or a gas purchase agreement is imperative for reducing uncertainty of demand. Key customers within the Sectors would include:
   - ***Commercial Sectors* –** including restaurants, commercial kitchens, grocery stores, retail stores and shopping malls to gather their interest in using/switching to natural gas in their businesses.
   - ***Industrial Customer* -** we understand there are investment projects and future land use plans, which include the expansion of the industrial base in San Luis Rio Colorado. We suggests meeting with these potential customers early on to gather their interest/perfom an economic analysis of adding natural gas infrastructure to their construction plans.
   - ***Other customers-*** potential anchor customers for natural gas could be the school district and government buildings.
2. **Discussion with LDCs-** San Luis Rio Colorado should commence discussions with Isagamex and Gas Natural del Noroeste, discussing the preliminary economics, and work hand-in-hand with the LDCs in getting demand commitments and permitting support.
3. **Create awareness-** in conjunction with San Luis, Arizona, San Luis Rio Colorado should create more awareness in the general population on the benefits of natural gas and seek participation from residential customers to increase consumer benefit in the region.

Thank you!

CELEBRATING 10 YEARS

2010 / *2020*

BRG

Annex 1: Connection Breakdown

Units	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Residential	52,349	52,931	53,491	54,030	54,547	55,042	55,513	55,962	56,386	56,785	57,592	58,409	59,239	60,080	60,933	61,798	62,676	63,566
Commercial																		
Restaurants	202	204	206	208	210	212	214	216	218	219	222	225	229	232	235	238	242	245
Retail Stores	145	147	148	150	151	152	154	155	156	157	160	162	164	166	169	171	174	176
Shopping Malls	11	11	11	11	11	12	12	12	12	12	12	12	12	13	13	13	13	13
Grocery Stores	44	44	45	45	46	46	47	47	47	48	48	49	50	50	51	52	53	53
Hotels	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
Industrial	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Food Processing	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Shelter Services	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Textile	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Iron and Steel	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Furniture	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Computer and Electronic Products	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Miscellaneous	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Machinery	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Agricultural	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Automobile	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Electronic	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Food	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Other Furniture	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Medical Products	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Metal-machinery	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Recycling	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Other Textile	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Combined Cycle Generation Plant	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Others		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schools	154	167	179	192	205	217	230	242	255	268	280	293	306	318	331	343	356	369
Government	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52
Hospitals	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44

Annex 2: Estimated Gas Demand- 100% Adoption 2021-2038

In therms	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Residential	5,234,850	5,293,050	5,349,075	5,403,025	5,454,650	5,504,150	5,551,275	5,596,175	5,638,600	5,678,525	5,759,160	5,840,940	5,923,881	6,008,001	6,093,314	6,179,839	6,267,593	6,356,593
Commercial																		
Restaurants	2,185,640	2,209,940	2,233,331	2,255,856	2,277,410	2,298,077	2,317,753	2,336,499	2,354,213	2,370,882	2,404,548	2,438,693	2,473,323	2,508,444	2,544,064	2,580,189	2,616,828	2,653,987
Retail Stores	72,935	73,746	74,526	75,278	75,997	76,687	77,344	77,969	78,560	79,117	80,240	81,379	82,535	83,707	84,896	86,101	87,324	88,564
Grocery Stores	114,884	116,161	117,391	118,575	119,708	120,794	121,828	122,814	123,745	124,621	126,391	128,185	130,005	131,852	133,724	135,623	137,549	139,502
Hotels	733,656	733,656	733,656	733,656	733,656	733,656	733,656	733,656	733,656	733,656	733,656	733,656	733,656	733,656	733,656	733,656	733,656	733,656
Shopping Malls	193,259	195,408	197,476	199,468	201,374	203,201	204,941	206,598	208,165	209,638	212,615	215,634	218,697	221,802	224,952	228,146	231,386	234,671
Industrial																		
Food Processing	900,944	900,944	900,944	900,944	900,944	900,944	900,944	900,944	900,944	900,944	900,944	900,944	900,944	900,944	900,944	900,944	900,944	900,944
Shelter Services	10,784	10,784	10,784	10,784	10,784	10,784	10,784	10,784	10,784	10,784	10,784	10,784	10,784	10,784	10,784	10,784	10,784	10,784
Textile	1,074,580	1,074,580	1,074,580	1,074,580	1,074,580	1,074,580	1,074,580	1,074,580	1,074,580	1,074,580	1,074,580	1,074,580	1,074,580	1,074,580	1,074,580	1,074,580	1,074,580	1,074,580
Iron and Steel	675,501	675,501	675,501	675,501	675,501	675,501	675,501	675,501	675,501	675,501	675,501	675,501	675,501	675,501	675,501	675,501	675,501	675,501
Furniture	39,706	39,706	39,706	39,706	39,706	39,706	39,706	39,706	39,706	39,706	39,706	39,706	39,706	39,706	39,706	39,706	39,706	39,706
Computer and Electronic Products	143,662	143,662	143,662	143,662	143,662	143,662	143,662	143,662	143,662	143,662	143,662	143,662	143,662	143,662	143,662	143,662	143,662	143,662
Miscellaneous	268,645	268,645	268,645	268,645	268,645	268,645	268,645	268,645	268,645	268,645	268,645	268,645	268,645	268,645	268,645	268,645	268,645	268,645
Machinery	103,757	103,757	103,757	103,757	103,757	103,757	103,757	103,757	103,757	103,757	103,757	103,757	103,757	103,757	103,757	103,757	103,757	103,757
Agricultural	148,875	148,875	148,875	148,875	148,875	148,875	148,875	148,875	148,875	148,875	148,875	148,875	148,875	148,875	148,875	148,875	148,875	148,875
Automobile	533,206	533,206	533,206	533,206	533,206	533,206	533,206	533,206	533,206	533,206	533,206	533,206	533,206	533,206	533,206	533,206	133,301	133,301
Electronic	104,241	104,241	104,241	104,241	104,241	104,241	104,241	104,241	104,241	104,241	104,241	104,241	104,241	104,241	104,241	104,241	34,747	34,747
Food	439,508	439,508	439,508	439,508	439,508	439,508	439,508	439,508	439,508	439,508	439,508	439,508	439,508	439,508	439,508	439,508	73,251	73,251
Other Furniture	238,490	238,490	238,490	238,490	238,490	238,490	238,490	238,490	238,490	238,490	238,490	238,490	238,490	238,490	238,490	238,490	59,622	59,622
Medical Products	47,640	47,640	47,640	47,640	47,640	47,640	47,640	47,640	47,640	47,640	47,640	47,640	47,640	47,640	47,640	47,640	23,820	23,820
Metal-machinery	1,800,792	1,800,792	1,800,792	1,800,792	1,800,792	1,800,792	1,800,792	1,800,792	1,800,792	1,800,792	1,800,792	1,800,792	1,800,792	1,800,792	1,800,792	1,800,792	225,099	225,099
Recycling	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other Textile	18,619,284	18,619,284	18,619,284	18,619,284	18,619,284	18,619,284	18,619,284	18,619,284	18,619,284	18,619,284	18,619,284	18,619,284	18,619,284	18,619,284	18,619,284	18,619,284	1,861,928	1,861,928
Others																		
Schools	6,307,840	6,825,229	7,342,619	7,860,008	8,377,398	8,894,787	9,412,177	9,929,566	10,446,956	10,964,345	11,481,735	11,999,124	12,516,514	13,033,903	13,551,293	14,068,682	14,586,072	15,103,461
Government	296,816	296,816	296,816	296,816	296,816	296,816	296,816	296,816	296,816	296,816	296,816	296,816	296,816	296,816	296,816	296,816	296,816	296,816
Hospital	231,836	231,836	231,836	231,836	231,836	231,836	231,836	231,836	231,836	231,836	231,836	231,836	231,836	231,836	231,836	231,836	231,836	231,836
Total Demand w/o CC Plant	**40,521,330**	**41,125,456**	**41,726,340**	**42,324,132**	**42,918,459**	**43,509,619**	**44,097,240**	**44,681,544**	**45,262,160**	**45,839,050**	**46,476,611**	**47,115,879**	**47,756,877**	**48,399,630**	**49,044,164**	**49,690,503**	**50,338,673**	**50,988,700**
Combined Cycle Generation Plant	-	-	-	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000
Total Demand with CC Plant	**40,521,330**	**41,125,456**	**41,726,340**	**216,024,132**	**216,618,459**	**217,209,619**	**217,797,240**	**218,381,544**	**218,962,160**	**219,539,050**	**220,176,611**	**220,815,879**	**221,456,877**	**222,099,630**	**222,744,164**	**223,390,503**	**224,038,673**	**224,688,700**

INTELLIGENCE THAT WORKS

BRG ENERGY & CLIMATE

Annex 3: Estimated Gas Demand- Potential Adoption Trends 2021-2038

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Residential	39,700	96,600	201,900	336,300	446,000	508,700	538,900	553,500	561,600	567,000	575,600	584,000	592,300	600,800	609,300	618,000	626,800	635,700
Commercial																		
Restaurants	692,480	1,114,460	1,384,960	1,558,080	1,677,100	1,742,020	1,796,120	1,839,400	1,861,040	1,882,680	1,915,140	1,947,600	1,980,060	2,001,700	2,034,160	2,066,620	2,088,260	2,120,720
Retail Stores	1,006	2,515	5,533	9,557	12,575	14,084	15,090	15,593	15,593	15,593	16,096	16,096	16,599	16,599	17,102	17,102	17,605	17,605
Grocery Stores	7,833	10,444	13,055	15,666	15,666	18,277	18,277	18,277	18,277	18,277	18,277	18,277	18,277	20,888	20,888	20,888	20,888	20,888
Hotels	0	155,624	155,624	289,016	289,016	444,640	444,640	578,032	578,032	578,032	578,032	578,032	578,032	578,032	578,032	578,032	578,032	578,032
Shopping Malls	0	0	17,569	17,569	35,138	35,138	35,138	35,138	35,138	35,138	35,138	35,138	35,138	52,707	52,707	52,707	52,707	52,707
Industrial																		
Food Processing	0	0	0	450,472	450,472	450,472	450,472	450,472	450,472	450,472	450,472	450,472	450,472	450,472	450,472	450,472	450,472	450,472
Shelter Services	0	0	0	5,392	5,392	5,392	5,392	5,392	5,392	5,392	5,392	5,392	5,392	5,392	5,392	5,392	5,392	5,392
Textile	0	268,645	268,645	268,645	268,645	537,290	537,290	537,290	537,290	537,290	537,290	537,290	537,290	537,290	537,290	537,290	537,290	537,290
Iron and Steel	0	0	0	0	0	0	0	675,501	675,501	675,501	675,501	675,501	675,501	675,501	675,501	675,501	675,501	675,501
Furniture	0	0	0	19,853	19,853	19,853	19,853	19,853	19,853	19,853	19,853	19,853	19,853	19,853	19,853	19,853	19,853	19,853
Computer and Electronic Products	0	0	0	71,831	71,831	71,831	71,831	71,831	71,831	71,831	71,831	71,831	71,831	71,831	71,831	71,831	71,831	71,831
Miscellaneous	0	0	0	0	0	0	0	21,776	21,776	21,776	21,776	21,776	21,776	21,776	21,776	21,776	21,776	21,776
Machinery	0	0	0	51,878	51,878	51,878	51,878	51,878	51,878	51,878	51,878	51,878	51,878	51,878	51,878	51,878	51,878	51,878
Agricultural	0	29,775	29,775	29,775	29,775	59,550	59,550	89,325	89,325	89,325	89,325	89,325	89,325	89,325	89,325	89,325	89,325	89,325
Automobile	0	133,301	133,301	133,301	133,301	266,603	266,603	266,603	266,603	266,603	266,603	266,603	266,603	266,603	266,603	266,603	266,603	266,603
Electronic	0	0	0	34,747	34,747	34,747	34,747	69,494	69,494	69,494	69,494	69,494	69,494	69,494	69,494	69,494	69,494	69,494
Food	0	73,251	73,251	146,503	146,503	146,503	146,503	219,754	219,754	219,754	219,754	219,754	219,754	219,754	219,754	219,754	219,754	219,754
Other Furniture	0	59,622	59,622	59,622	59,622	119,245	119,245	119,245	119,245	119,245	119,245	119,245	119,245	119,245	119,245	119,245	119,245	119,245
Medical Products	0	0	0	23,820	23,820	23,820	23,820	23,820	23,820	23,820	23,820	23,820	23,820	23,820	23,820	23,820	23,820	23,820
Metal-machinery	0	225,099	225,099	450,198	450,198	675,297	675,297	900,396	900,396	900,396	900,396	900,396	900,396	900,396	900,396	900,396	900,396	900,396
Recycling	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Textile	0	1,861,928	1,861,928	5,585,785	5,585,785	7,447,714	7,447,714	9,309,642	9,309,642	9,309,642	9,309,642	9,309,642	9,309,642	9,309,642	9,309,642	9,309,642	9,309,642	9,309,642
Transportation																		
No information Available	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Others																		
Schools	491,520	1,228,800	2,785,280	4,874,240	6,840,320	8,232,960	9,134,080	9,830,400	10,403,840	10,936,320	11,468,800	12,001,280	12,533,760	13,025,280	13,557,760	14,049,280	14,581,760	15,114,240
Government	0	57,080	57,080	119,868	119,868	176,948	176,948	239,736	239,736	239,736	239,736	239,736	239,736	239,736	239,736	239,736	239,736	239,736
Hospitals	0	31,614	31,614	57,959	57,959	89,573	89,573	115,918	115,918	115,918	115,918	115,918	115,918	115,918	115,918	115,918	115,918	115,918
Total Demand w/o CC Plant	**1,232,539**	**5,348,760**	**7,304,238**	**14,610,078**	**16,825,465**	**21,172,534**	**22,158,960**	**26,058,266**	**26,661,446**	**27,220,966**	**27,795,009**	**28,368,349**	**28,942,092**	**29,483,932**	**30,057,875**	**30,590,555**	**31,153,978**	**31,727,818**
Combined Cycle Generation Plant	0	0	0	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000	173,700,000
Total Demand with CC Plant	**1,232,539**	**5,348,760**	**7,304,238**	**188,310,078**	**190,525,465**	**194,872,534**	**195,858,960**	**199,758,266**	**200,361,446**	**200,920,966**	**201,495,009**	**202,068,349**	**202,642,092**	**203,183,932**	**203,757,875**	**204,290,555**	**204,853,978**	**205,427,818**

Annex 4: Savings Estimation

	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038
Status Quo																	
Residential[1]	230,831	482,452	803,609	1,065,743	1,215,569	1,287,733	1,322,621	1,341,976	1,354,880	1,375,430	1,395,502	1,415,336	1,435,647	1,455,958	1,476,747	1,497,776	1,519,043
Commercial[1]	3,065,907	3,767,716	4,515,999	4,849,598	5,386,446	5,518,125	5,941,495	5,993,205	6,044,915	6,123,682	6,201,247	6,280,014	6,379,946	6,458,713	6,536,278	6,589,190	6,666,755
Industrial[2]	8,515,719	8,515,719	23,546,242	23,546,242	31,826,714	31,826,714	41,211,004	41,211,004	41,211,004	41,211,004	41,211,004	41,211,004	41,211,004	41,211,004	41,211,004	41,211,004	41,211,004
Transport[3]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Others[2]	4,231,149	9,229,804	16,224,777	22,538,868	27,296,191	30,190,149	32,712,641	34,554,251	36,264,318	37,974,384	39,684,450	41,394,516	42,973,039	44,683,105	46,261,628	47,971,694	49,681,761
Total	16,043,607	21,995,691	45,090,627	52,000,452	65,724,920	68,822,722	81,187,761	83,100,437	84,875,117	86,684,500	88,492,204	90,300,870	91,999,636	93,808,780	95,485,657	97,269,664	99,078,562
Natural Gas Adoption																	
Residential[1]	95,223	199,023	331,508	439,645	501,451	531,221	545,613	553,597	558,920	567,398	575,678	583,860	592,239	600,617	609,194	617,868	626,641
Commercial[1]	824,997	1,013,844	1,215,198	1,304,965	1,449,424	1,484,857	1,598,781	1,612,695	1,626,610	1,647,805	1,668,677	1,689,872	1,716,762	1,737,958	1,758,829	1,773,067	1,793,939
Industrial[2]	1,442,483	1,442,483	3,988,512	3,988,512	5,391,146	5,391,146	6,980,756	6,980,756	6,980,756	6,980,756	6,980,756	6,980,756	6,980,756	6,980,756	6,980,756	6,980,756	6,980,756
Transport[3]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Others[2]	847,149	1,847,965	3,248,479	4,512,669	5,465,166	6,044,586	6,549,633	6,918,355	7,260,739	7,603,124	7,945,509	8,287,893	8,603,941	8,946,325	9,262,373	9,604,757	9,947,142
Total	3,209,851	4,503,315	8,783,696	10,245,790	12,807,187	13,451,810	15,674,782	16,065,403	16,427,025	16,799,083	17,170,619	17,542,381	17,893,698	18,265,656	18,611,151	18,976,449	19,348,478
Savings																	
Residential[1]	135,608	283,429	472,101	626,099	714,118	756,513	777,008	788,379	795,960	808,032	819,824	831,476	843,408	855,341	867,554	879,908	892,401
Commercial[1]	2,240,910	2,753,871	3,300,801	3,544,633	3,937,022	4,033,268	4,342,714	4,380,510	4,418,305	4,475,877	4,532,571	4,590,142	4,663,183	4,720,755	4,777,449	4,816,123	4,872,816
Industrial[2]	7,073,237	7,073,237	19,557,731	19,557,731	26,435,569	26,435,569	34,230,248	34,230,248	34,230,248	34,230,248	34,230,248	34,230,248	34,230,248	34,230,248	34,230,248	34,230,248	34,230,248
Transport[3]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Others[2]	3,384,000	7,381,839	12,976,298	18,026,199	21,831,025	24,145,563	26,163,009	27,635,897	29,003,578	30,371,260	31,738,942	33,106,623	34,369,098	35,736,780	36,999,255	38,366,937	39,734,619
Total	12,833,755	17,492,376	36,306,931	41,754,662	52,917,733	55,370,912	65,512,979	67,035,034	68,448,091	69,885,417	71,321,584	72,758,489	74,105,938	75,543,124	76,874,506	78,293,215	79,730,084
Saving %	80%	80%	81%	80%	81%	80%	81%	81%	81%	81%	81%	81%	81%	81%	81%	80%	80%

1= Propane as alternative fuel at $0.57/liter; 2 electricity as an alternative fuel at 11 cents/kWh; Diesel as an alterntive fuel at $0.97/liter