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

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1 Executive Summary

Executive Summary (1 of 3)

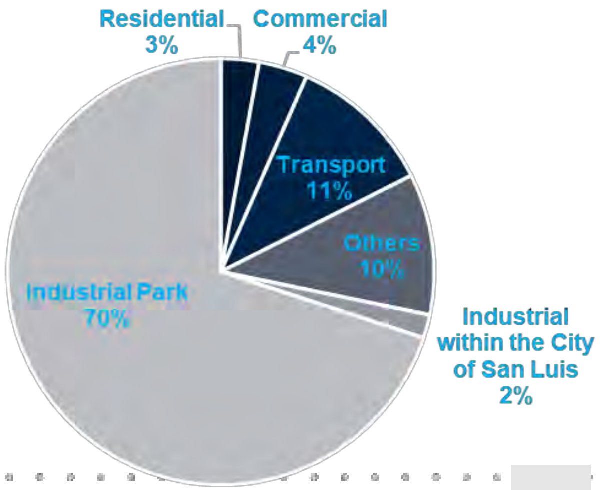
City of San Luis has latent demand for natural gas that been untapped and this demand is expected to grow in future

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.

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

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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.

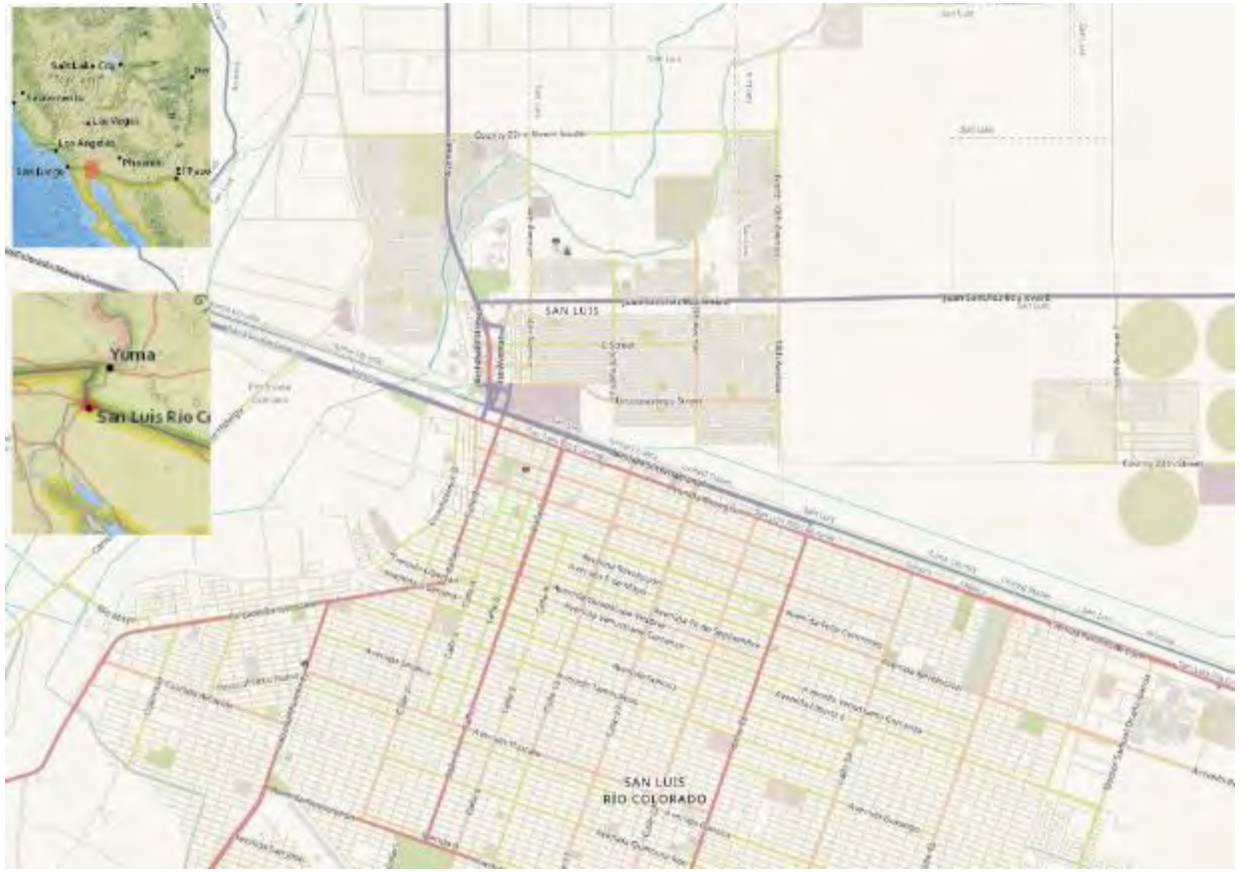
Project Background

- 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)

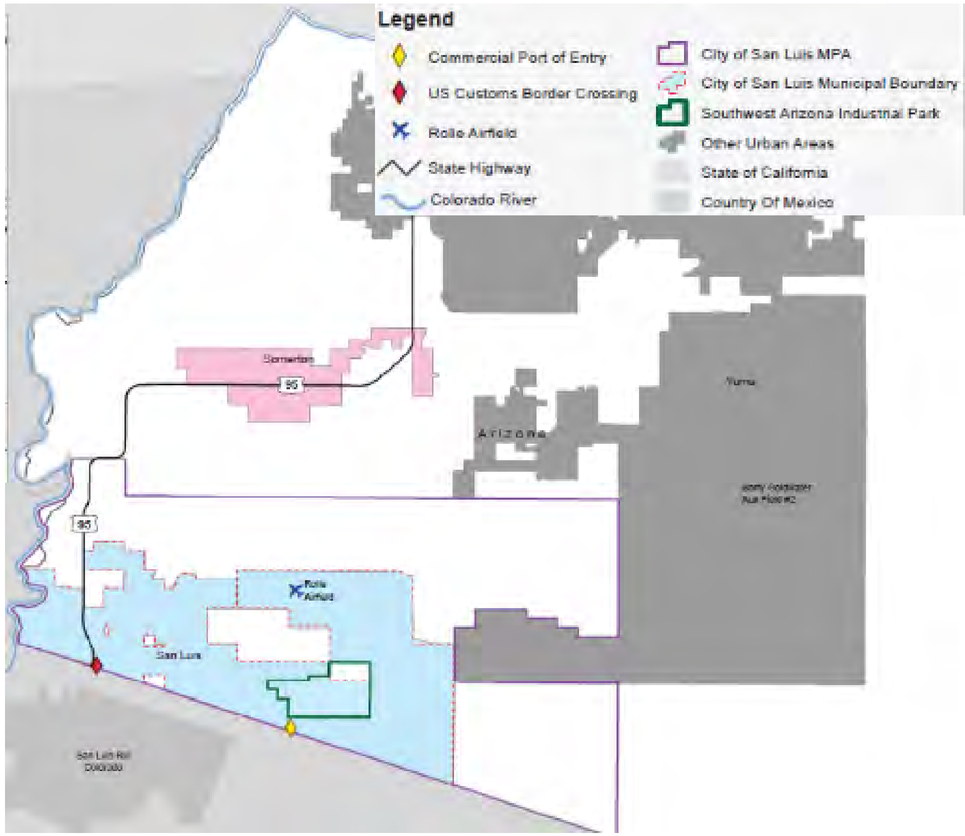
Location and Key Facts

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

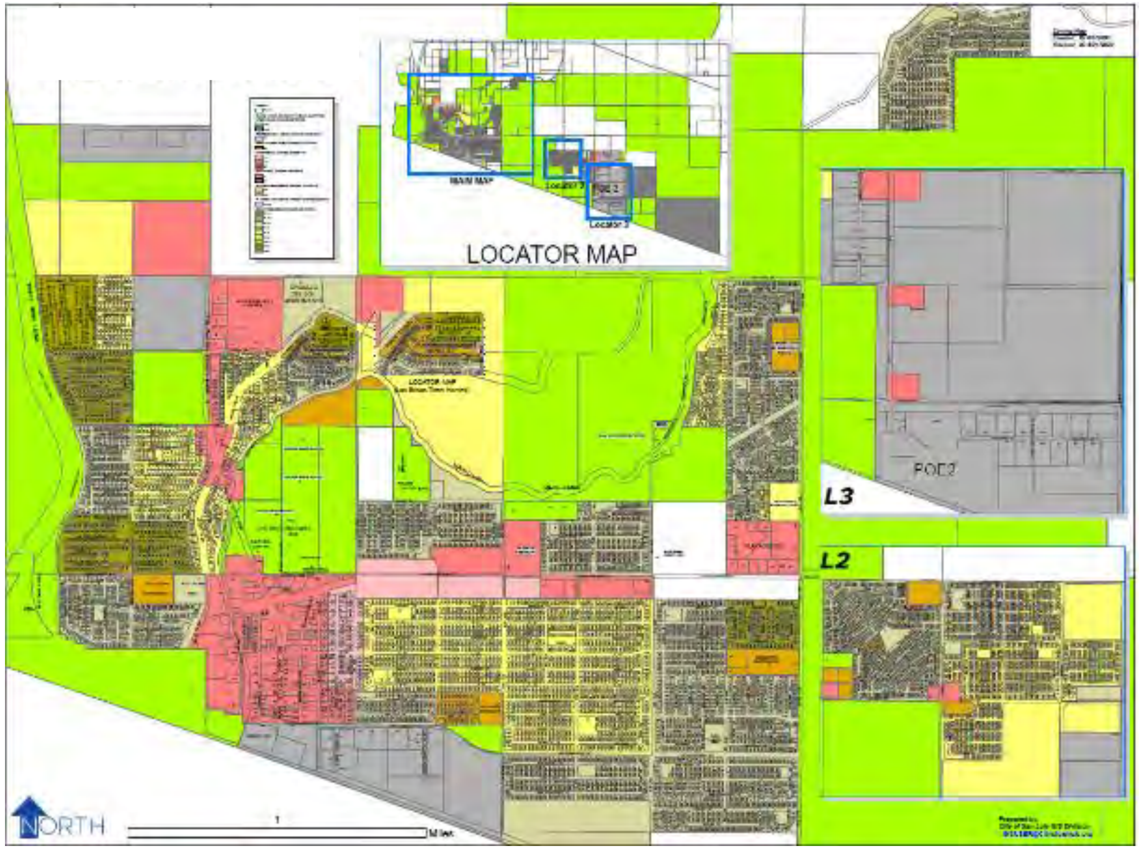
- Primary economic sectors in the City of San Luis include agriculture, retail and manufacturing. Currently, the three largest employers in the region are the school district, Advanced Center Technologies Call Center and Arizona State Prison.

- 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

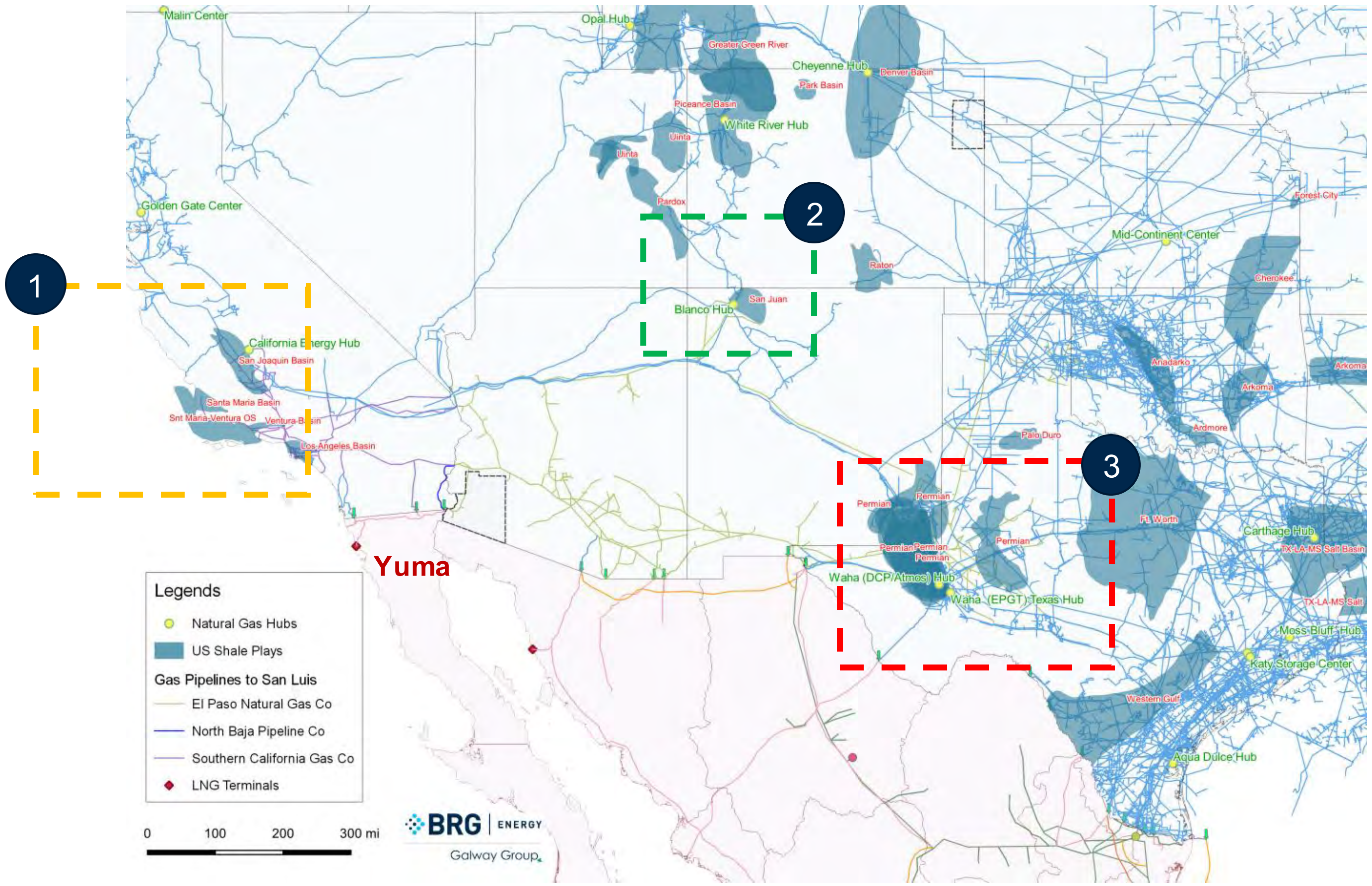


Existing Natural Gas Infrastructure

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.

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.

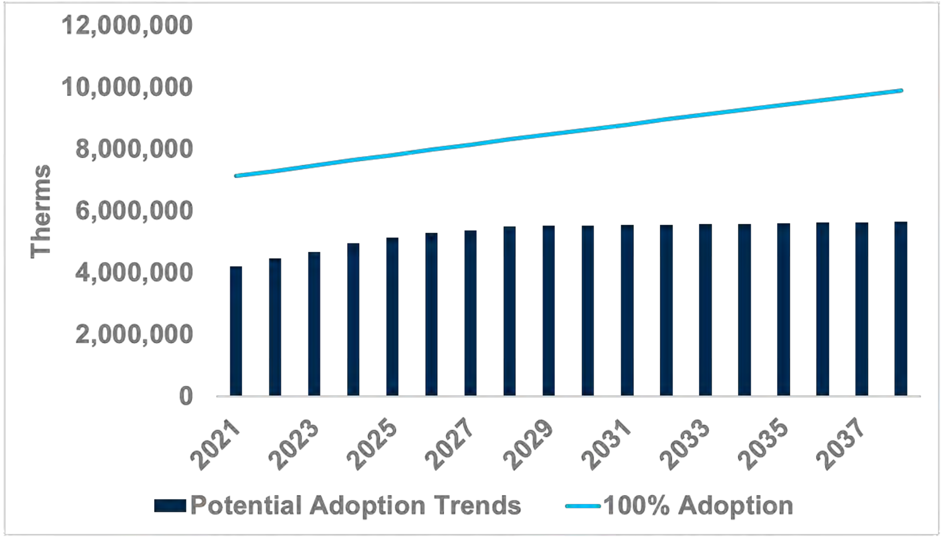
   Following slides provides the resulting demand from each of these scenarios

Summary of Results (1 of 6)

100% Adoption Scenario 2021-2038, Detailed

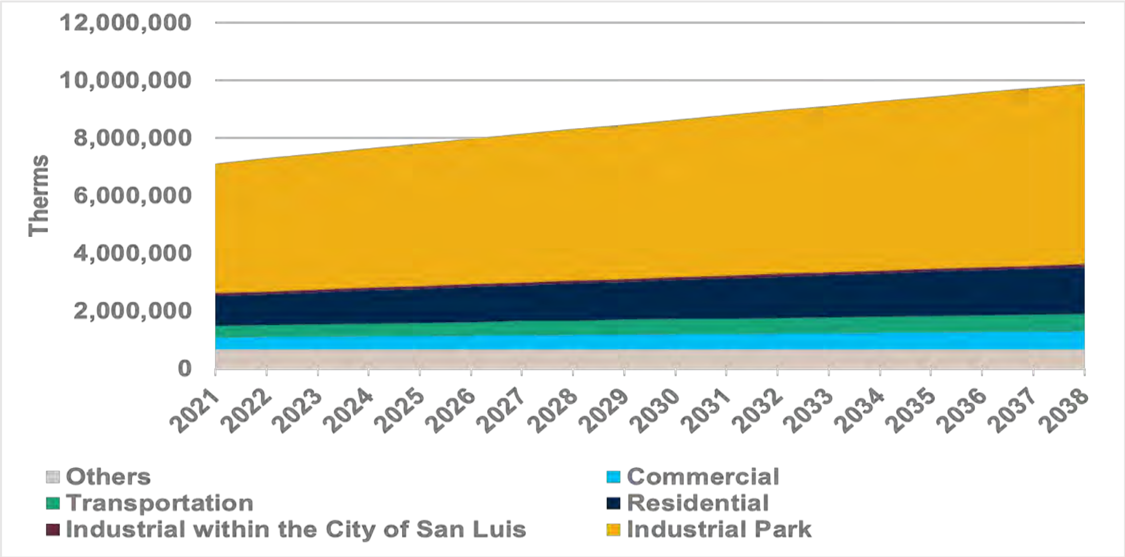
- The 100% Adoption scenario shows a higher potential demand, however, conversion in year 1 by all potential consumers unlikely due to cost, choice, and accessibility constraints.

100% Adoption vs. Potential Adoption Trends



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

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.

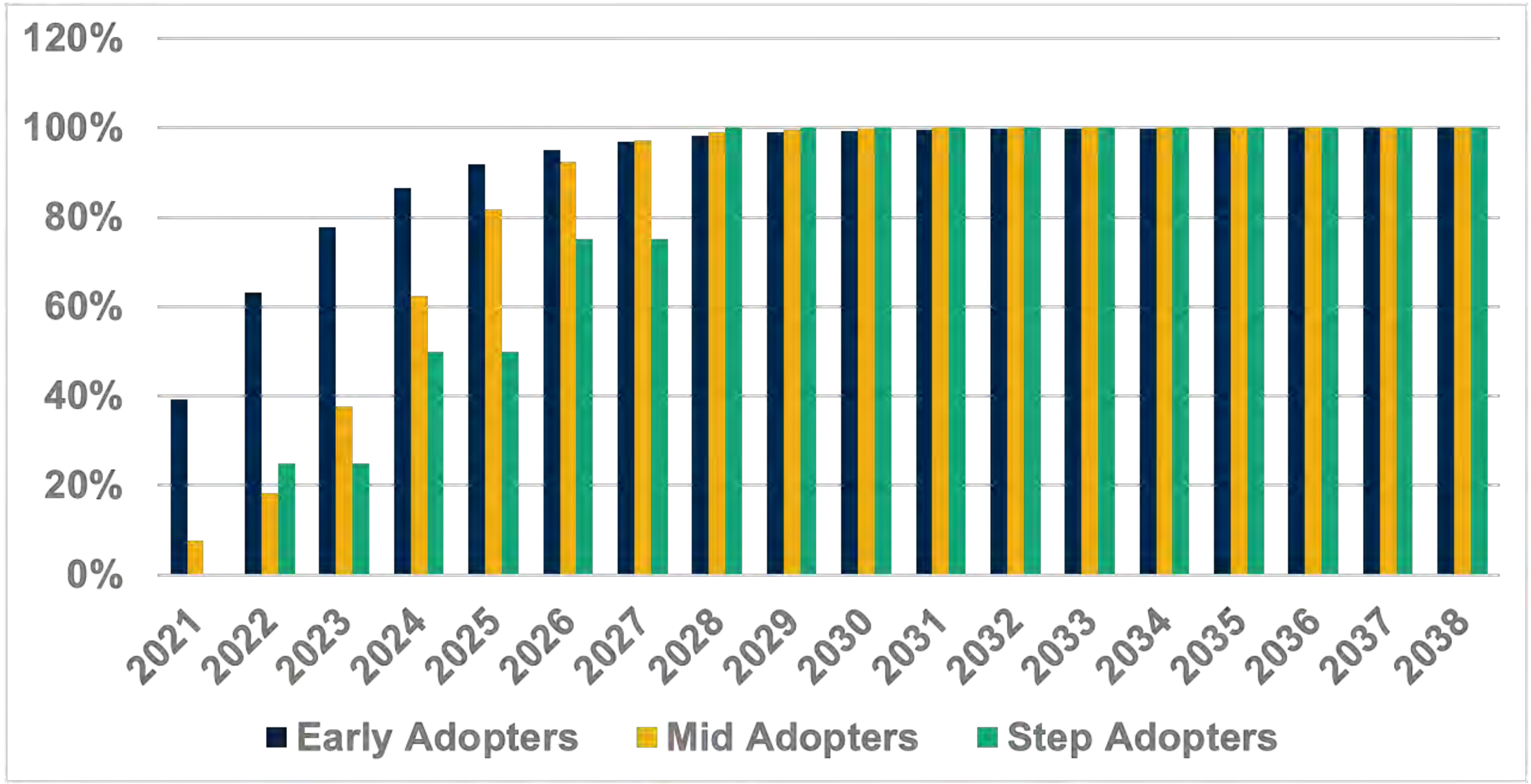
Summary of Results (2 of 6)

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



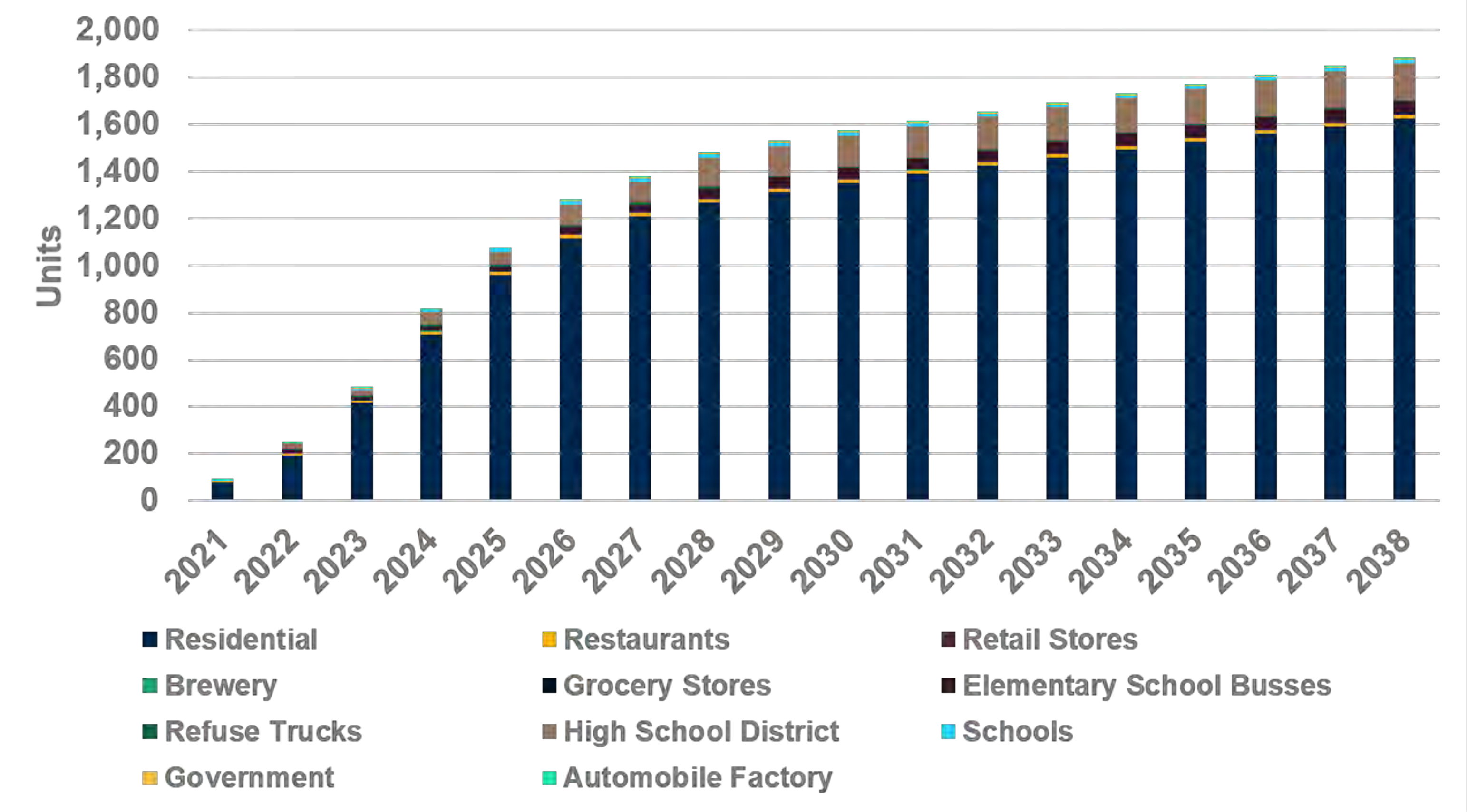
Summary of Results (3 of 6)

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



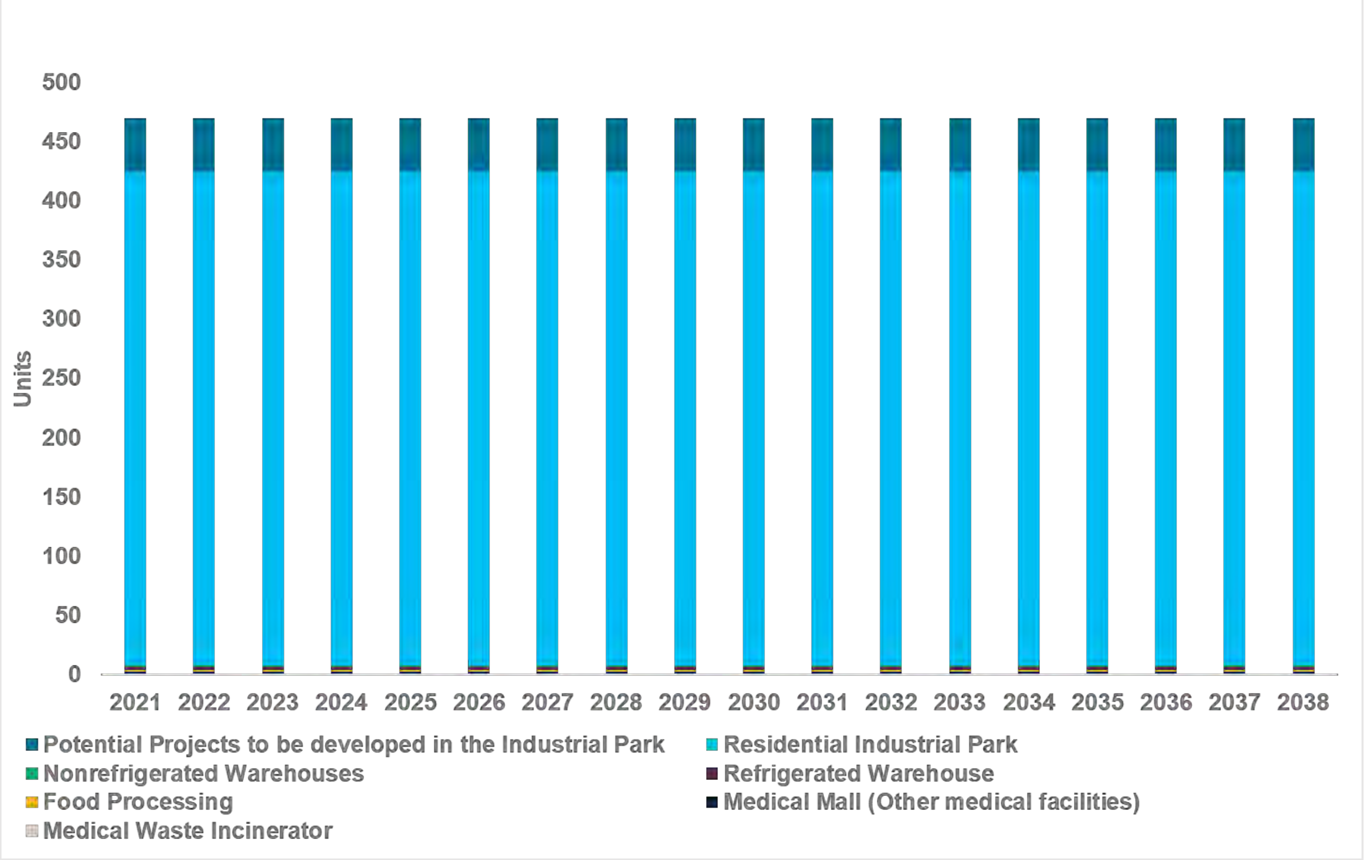
Summary of Results (4 of 6)

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



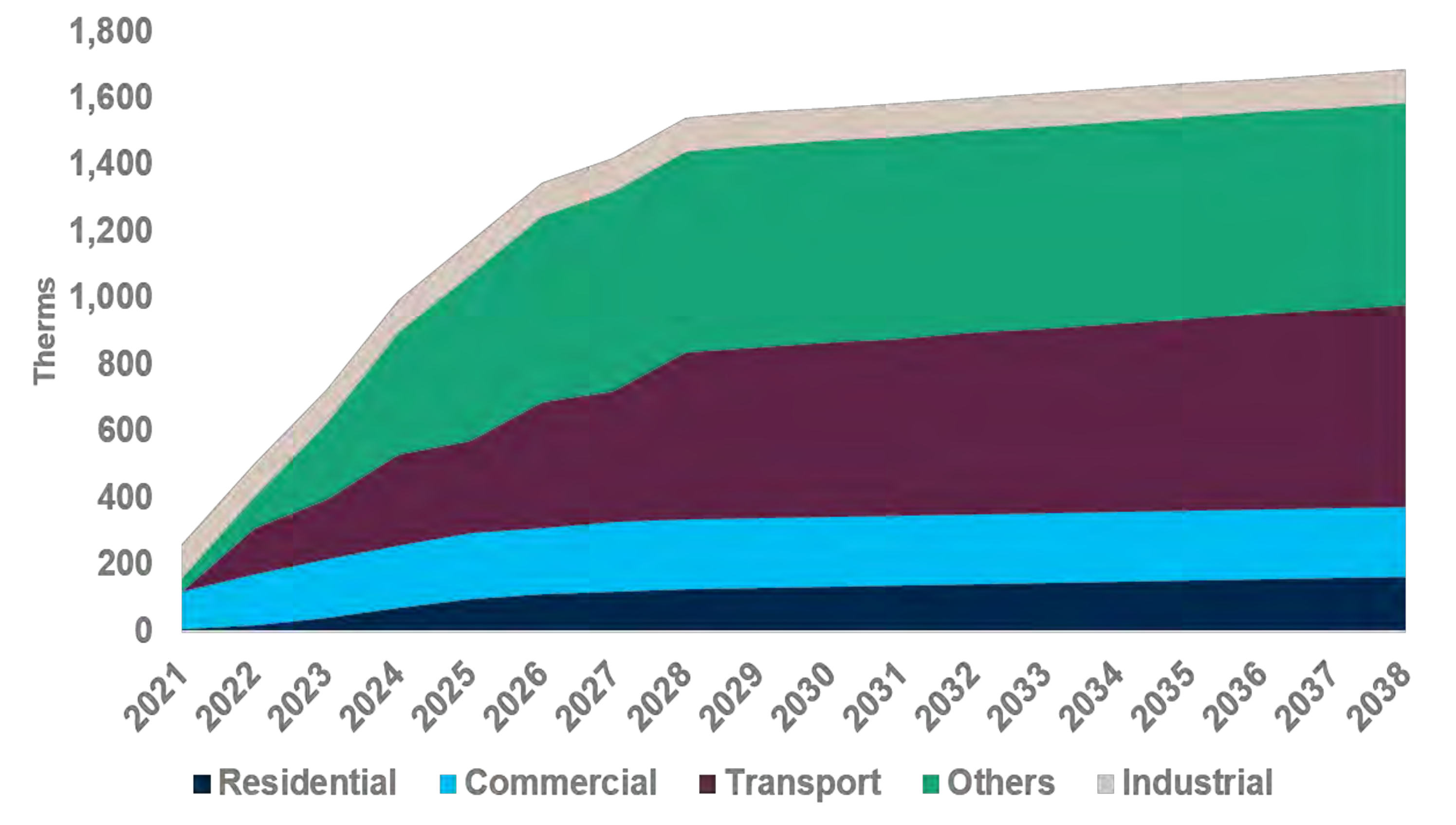
Summary of Results (5 of 6)

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)



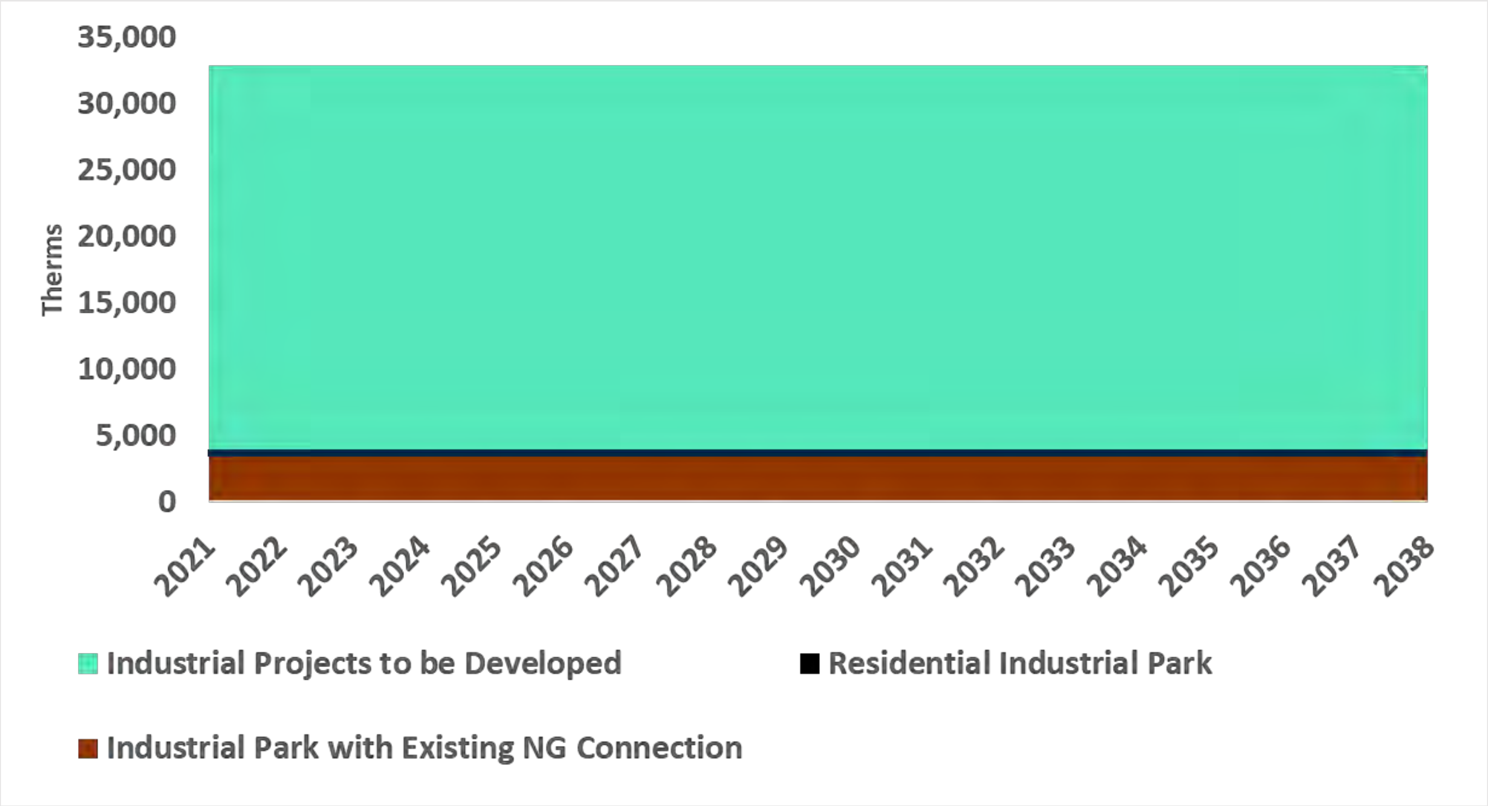
Summary of Results (6 of 6)

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.

Residential

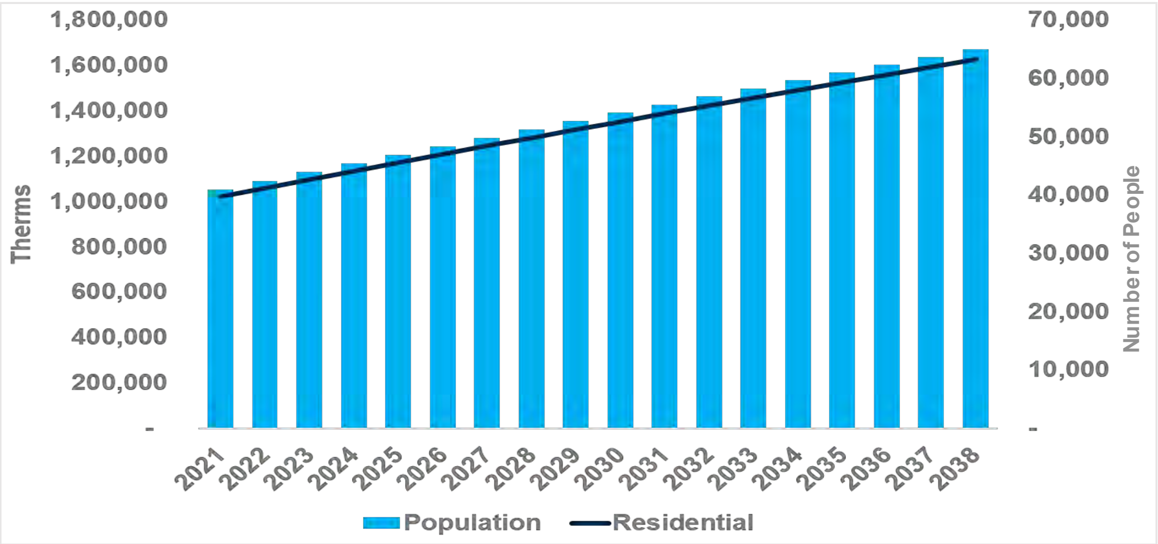
Residential Segment

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.

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

100 % Adoption Scenario

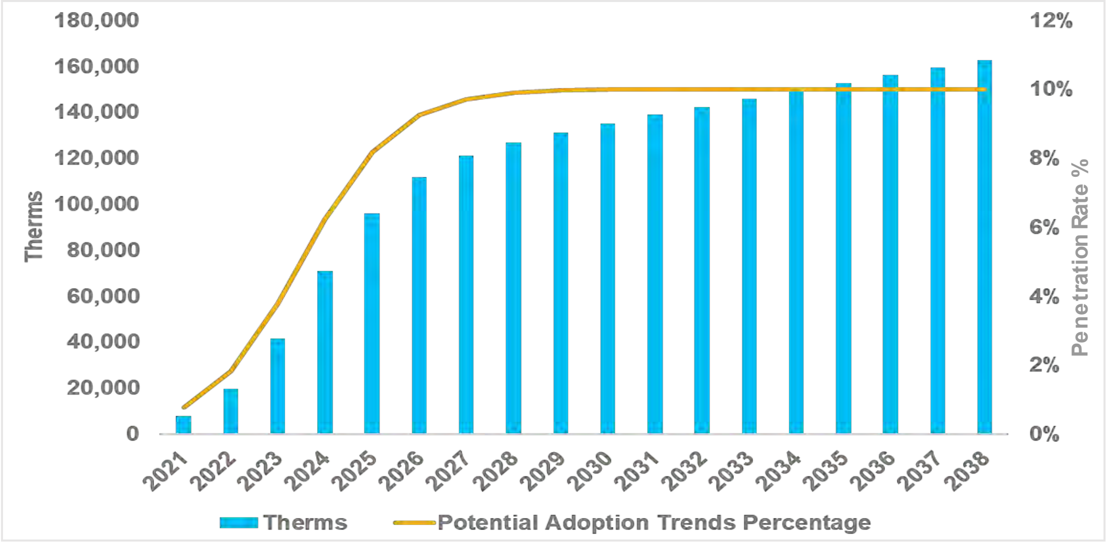


Residential	*2021*	*2038*
Therms	1,023,060	1,625,936
Units	10,231	16,259

– **2021** (estimated): *40,922*

– **2038** (estimated): 65,037

Potential Adoption Trends Scenario



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

Commercial

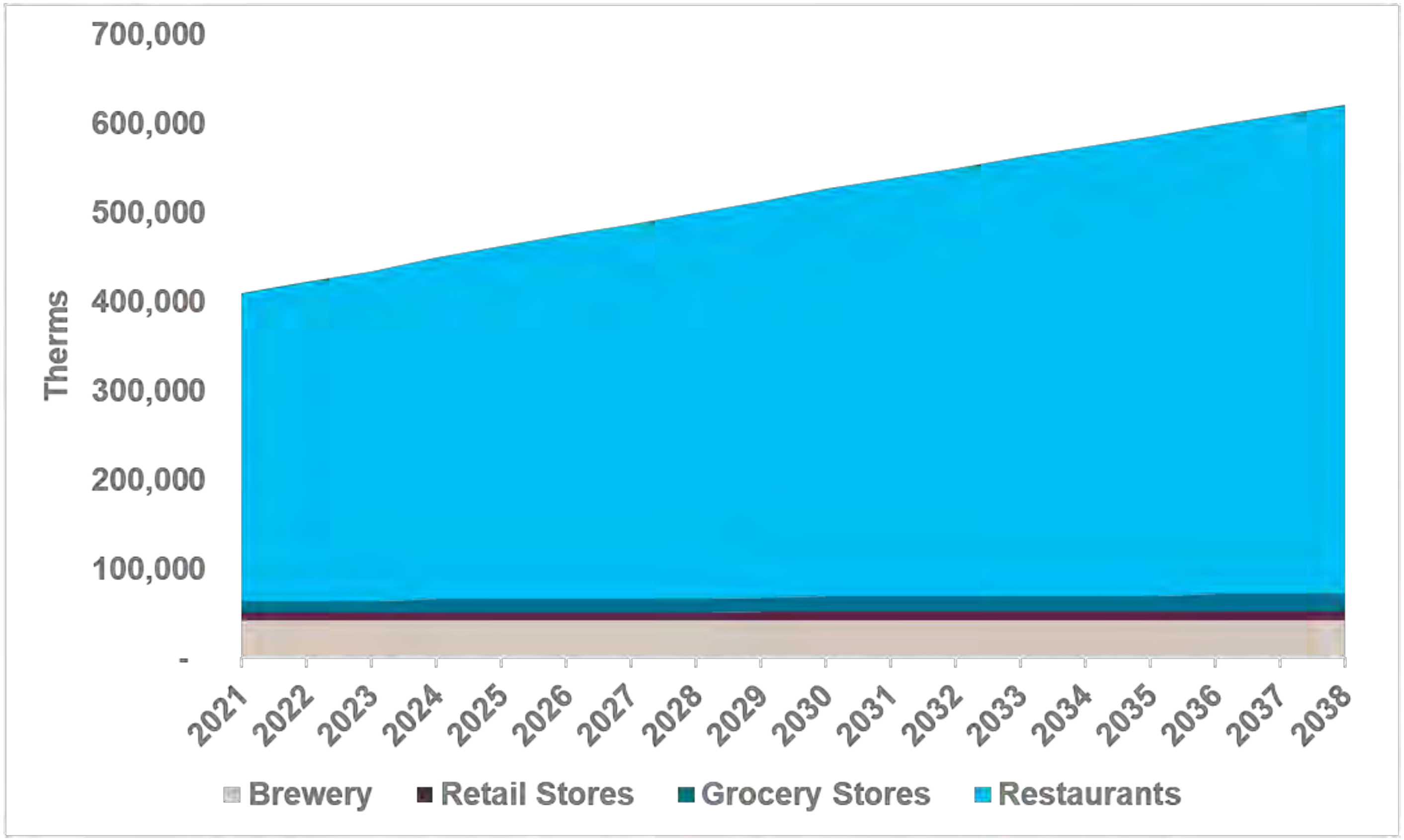
Commercial Segment (1 of 2)

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



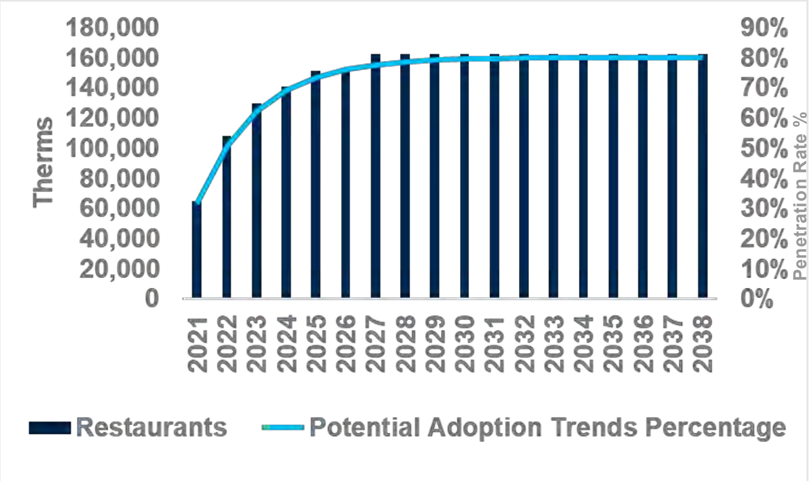
Commercial Segment (2 of 2)

Potential Adoption Trends 2021-2038 Detailed

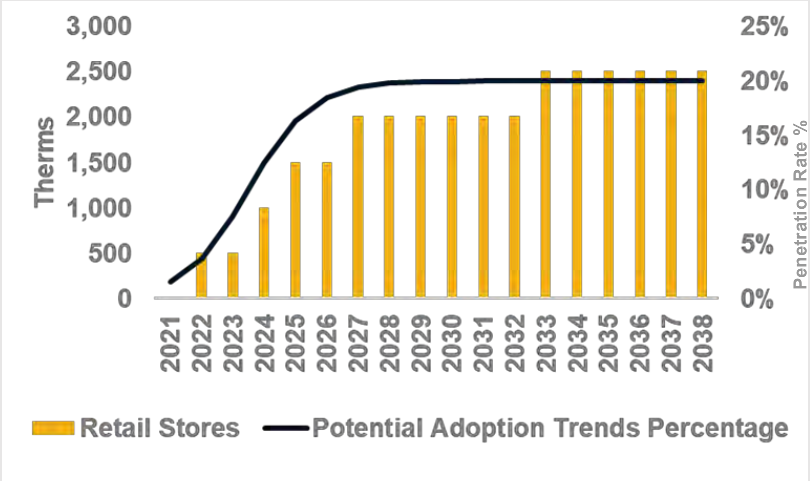
- We expect that approximately 80% of restaurants will switch to natural gas. We forecast that this penetration rate will be reached by 2031.
- On the other hand, we expect that only 20% of all retail stores will switch to natural gas and project that this penetration rate will be reached by 2028.
- 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

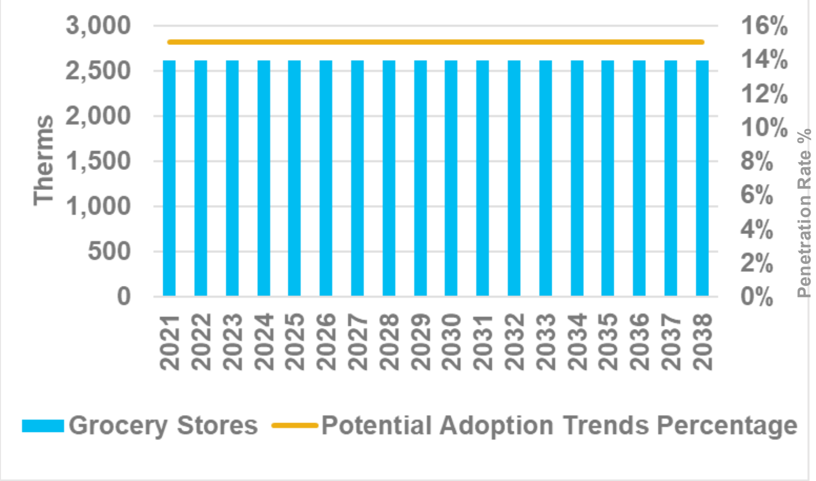
Restaurants



Retail Stores



Grocery Stores



Industrial

Industrial Segment (1 of 4)

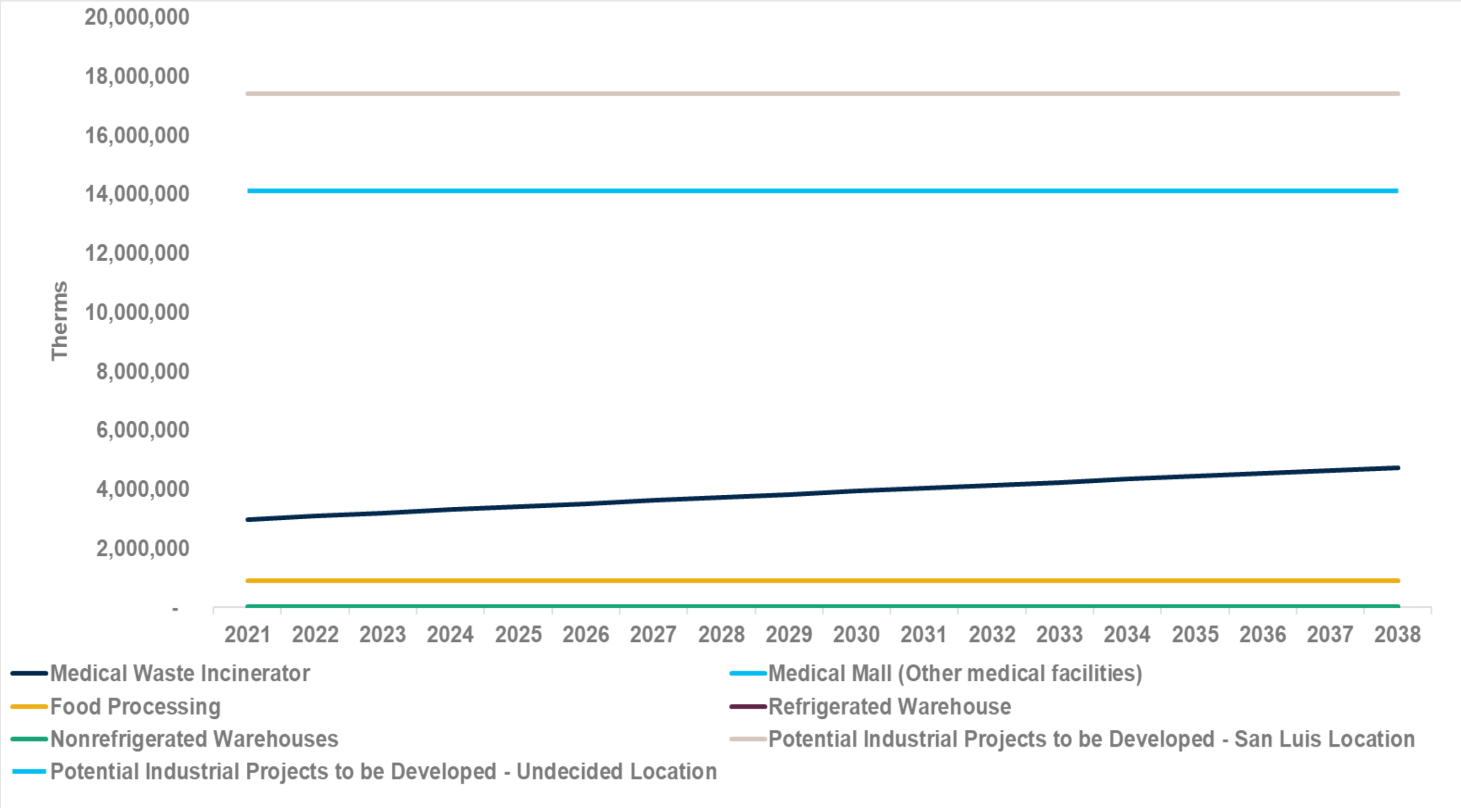
100% Adoption Scenario 2021-2038, Detailed Industrial Park with Existing NG Connection

- 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.

Industrial	Units	Therms 2021	Therms 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

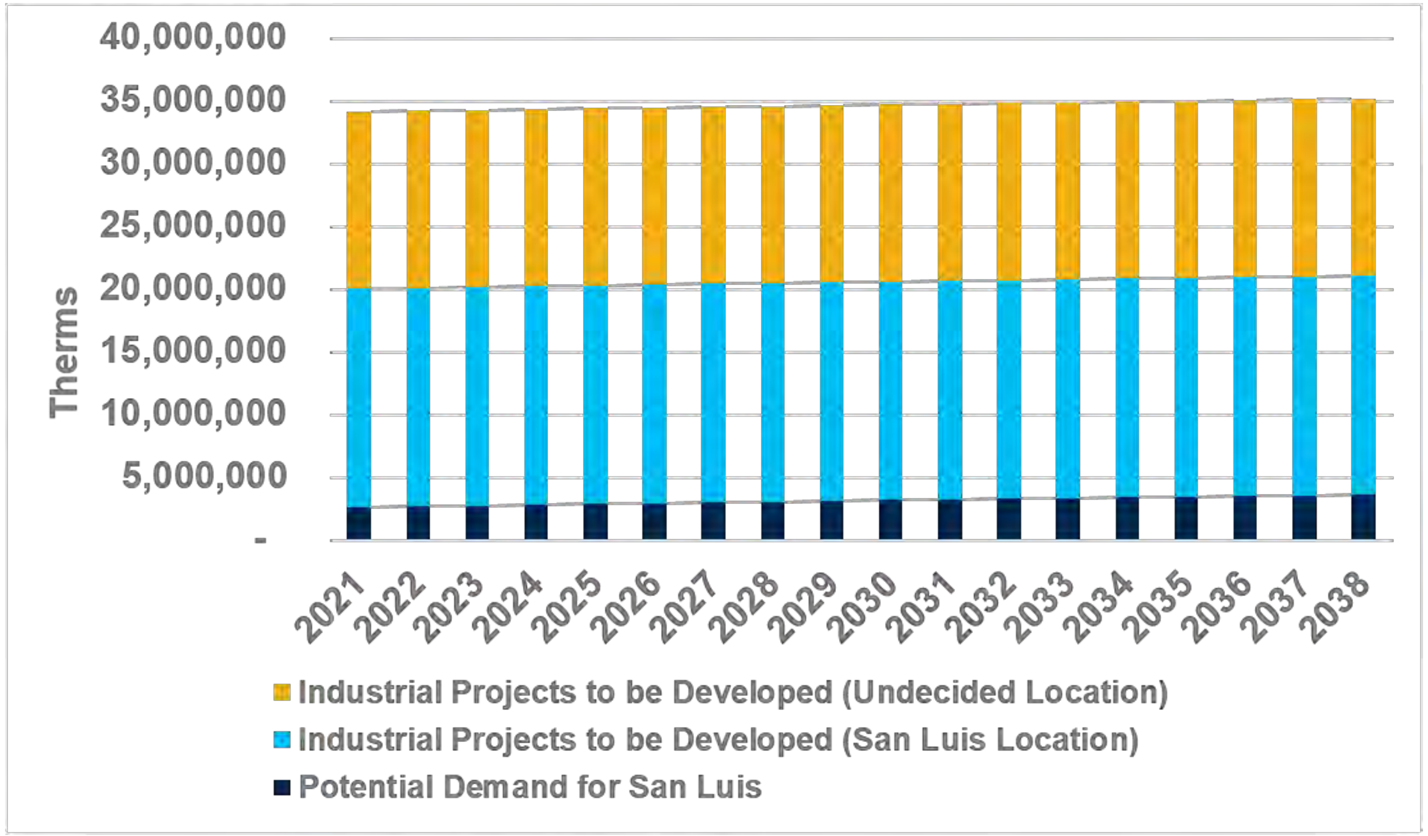


Industrial Segment-Potential Demand (2 of 4)

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



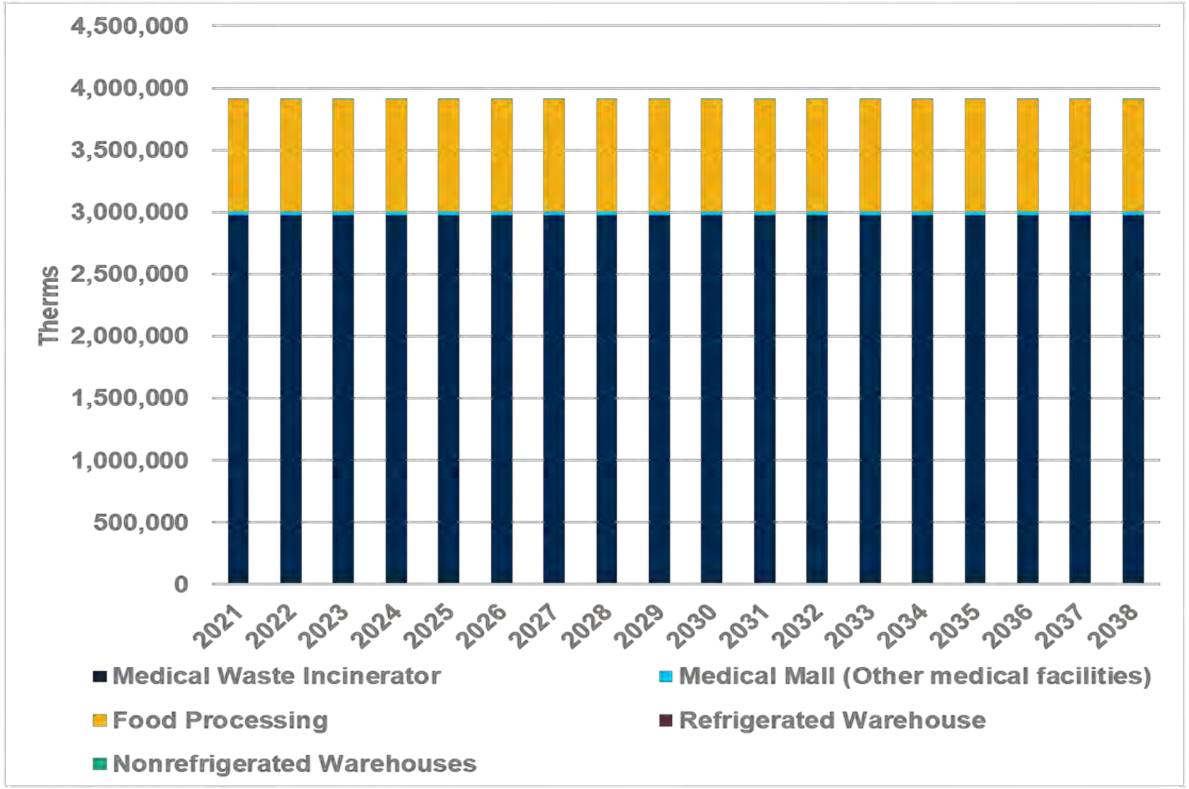
Industrial Segment (3 of 4)

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

Transport

Transport Segment (1 of 2)

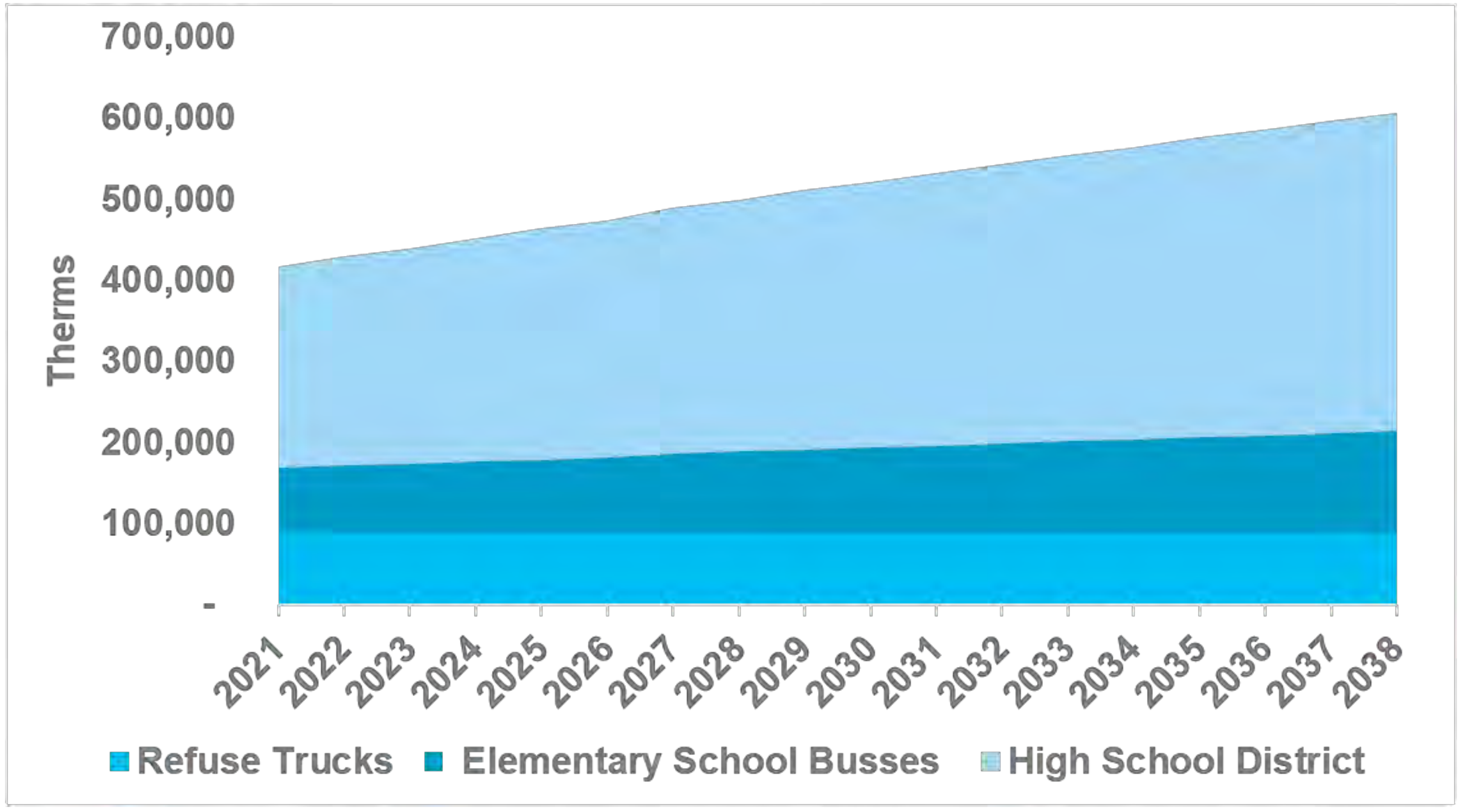
100% Adoption Scenario 2021-2038 Detailed

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



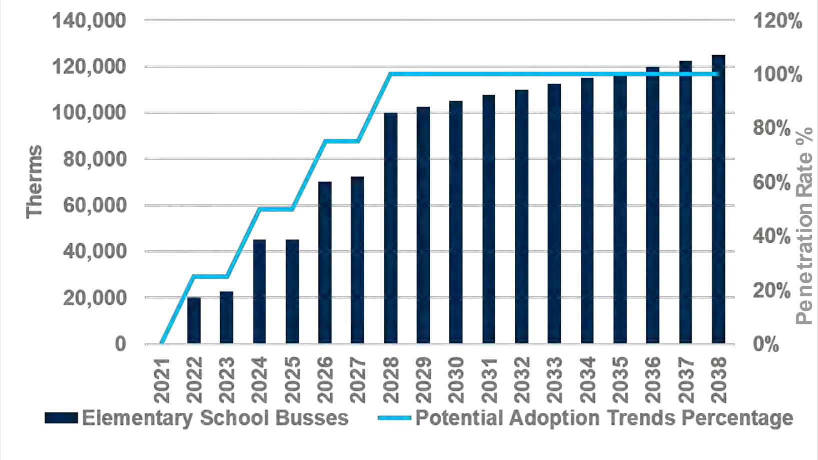
Transport Segment (2 of 2)

Potential Adoption Trends 2021 - 2038 Detailed

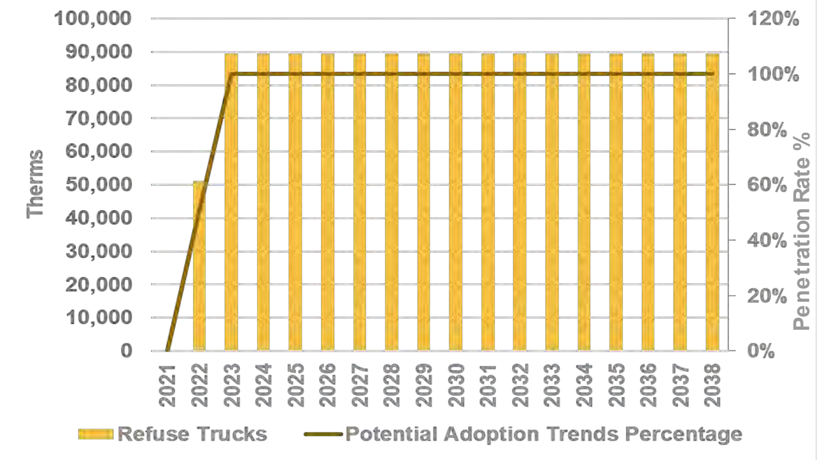
- Maximum adoption for elementary and high school buses will happen in 2028. Demand will continue to increase corresponding with the growth in population.
- Maximum adoption for refuse trucks will happen by 2023, after which demand is not expected to increase.

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

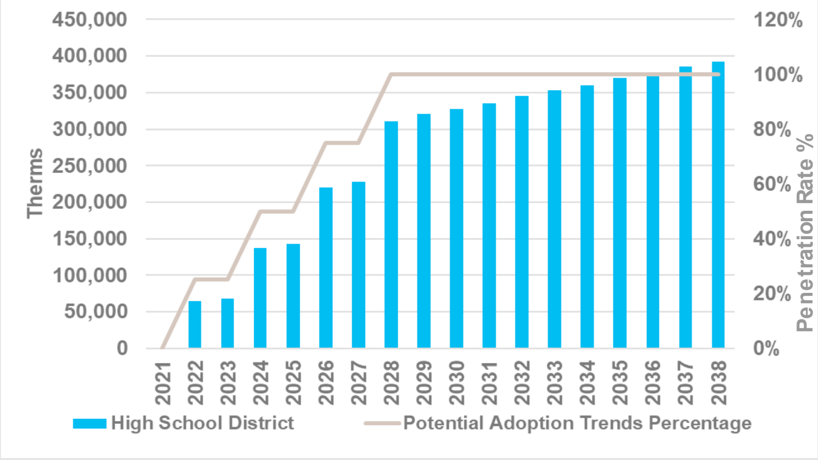
Elementary School



Refuse Trucks



High School District



Other

Other Segment

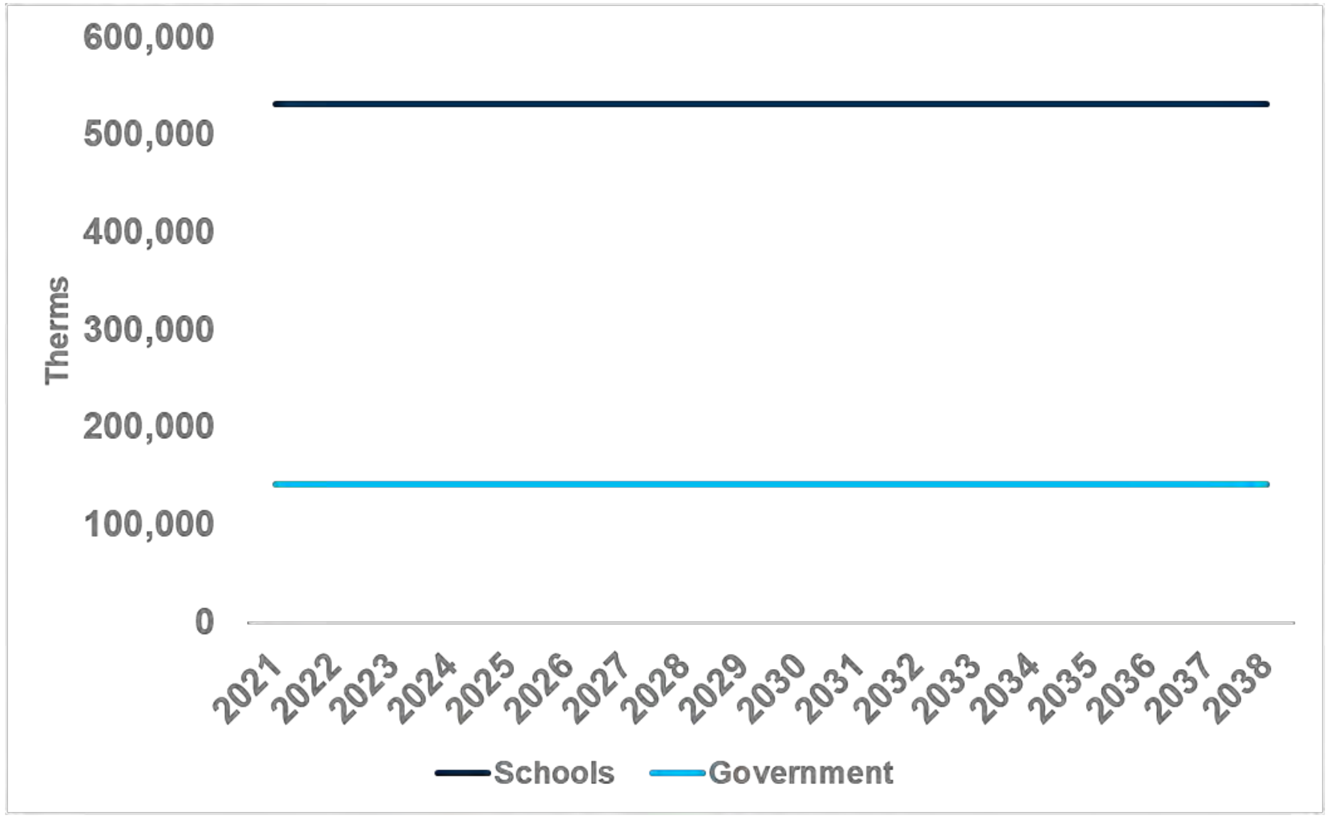
100% Adoption Scenario 2021-2038 Detailed

- 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

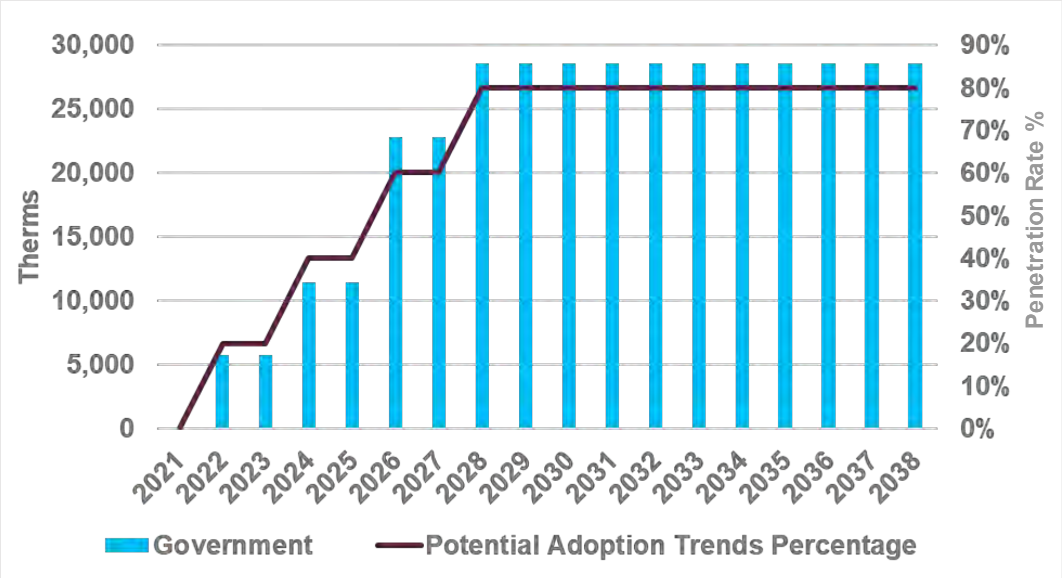
Potential Adoption Trends 2021-2038 Detailed

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

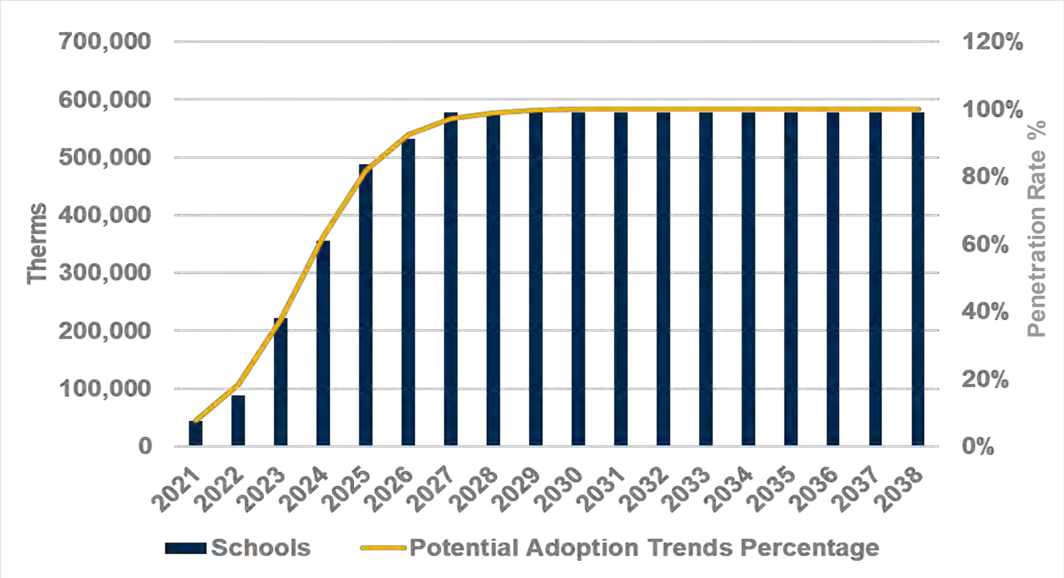
Therms

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

Government Buildings



Schools



5 Supply Analysis

Supply Overview

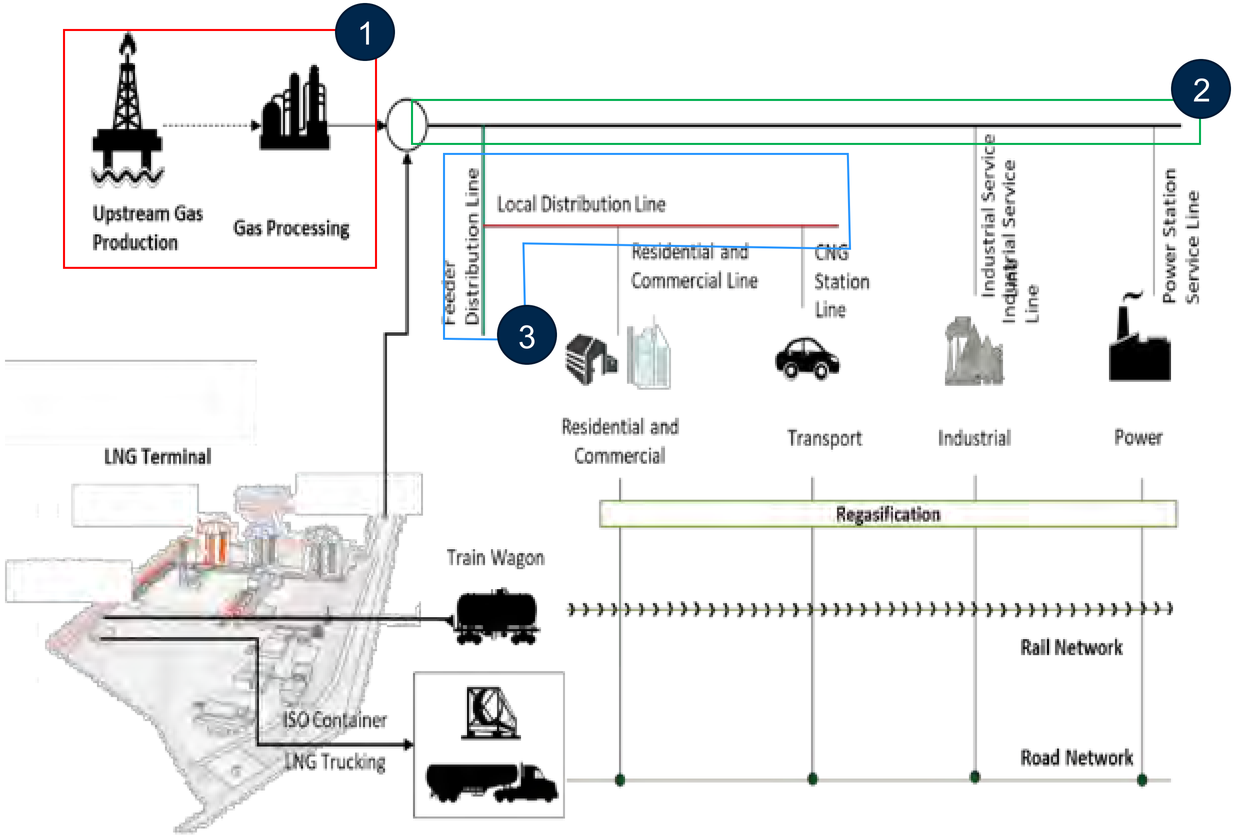
Natural gas supply from the gas basins is transported via large pipelines (transmission) and is distributed locally via small diameter pipelines

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



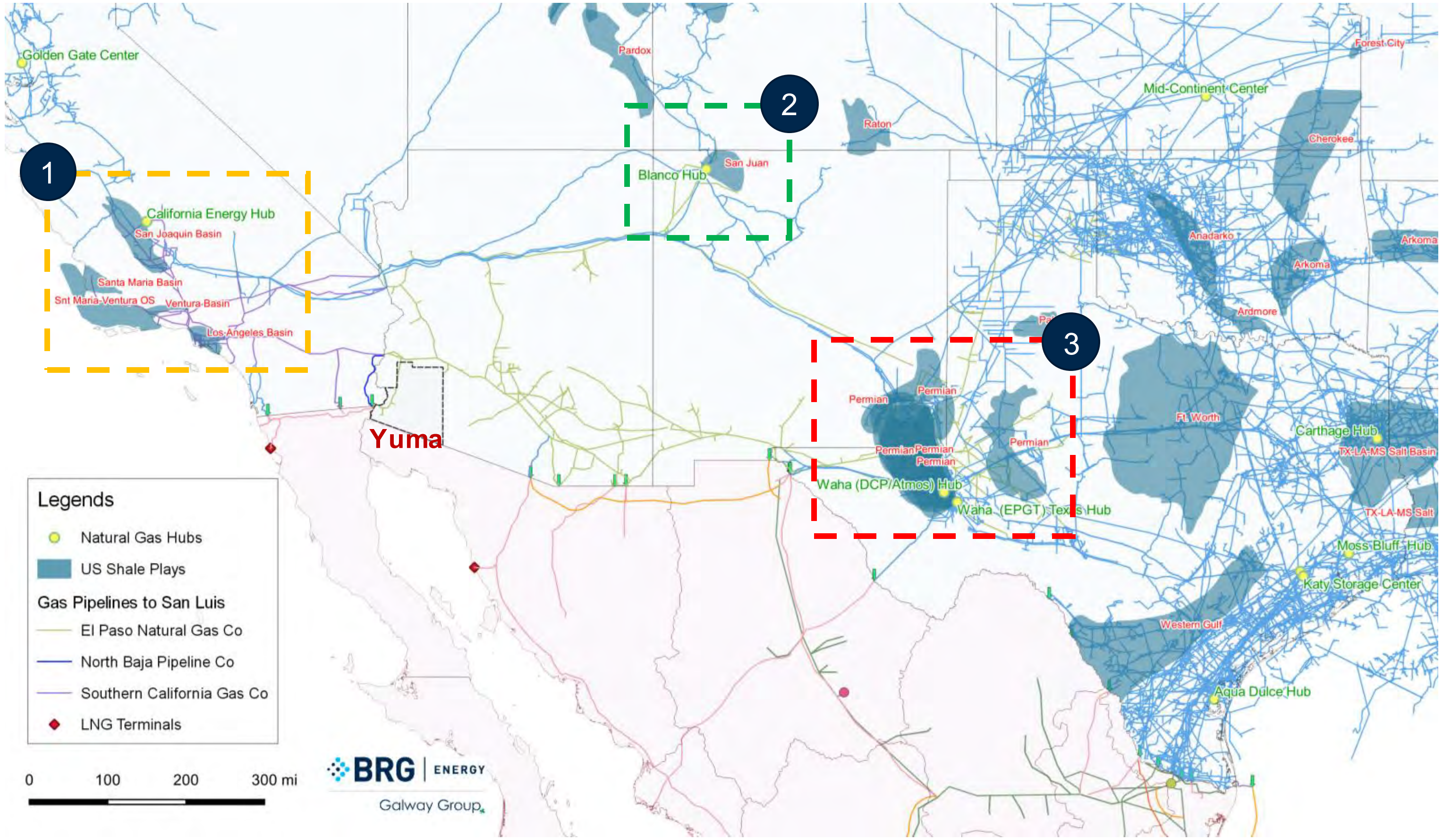
Natural Gas Sources

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.

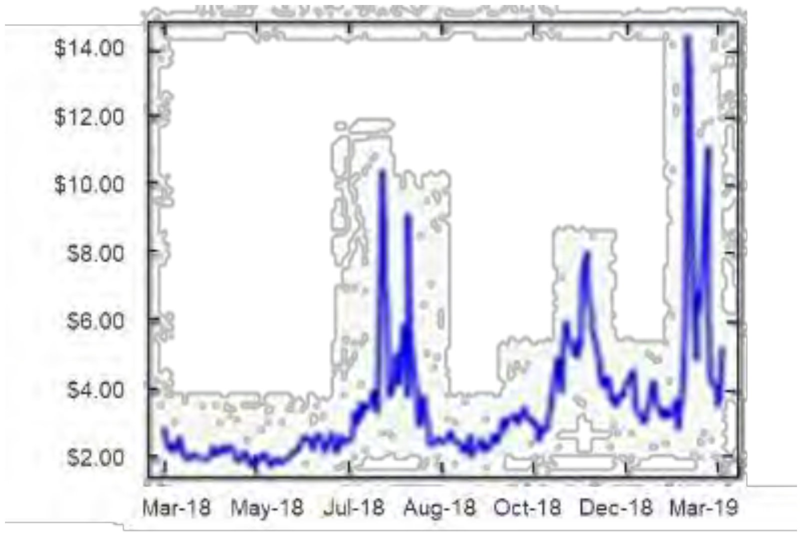


Natural Gas Pricing

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

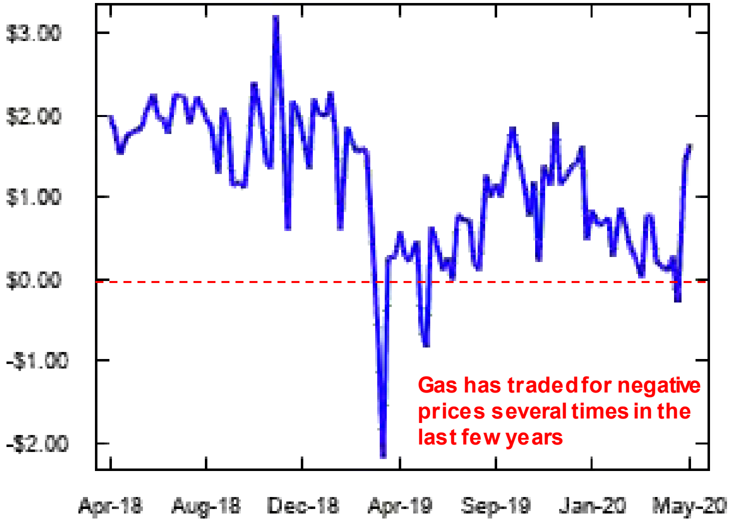
- Among the three sources of supply possible for San Luis and San Luis Rio Colorado, California Border Natural Gas price appears to be the most expensive in the last few years with several price spikes. It must be noted that natural gas cost is typically passed to the end consumer directly. Other two 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.

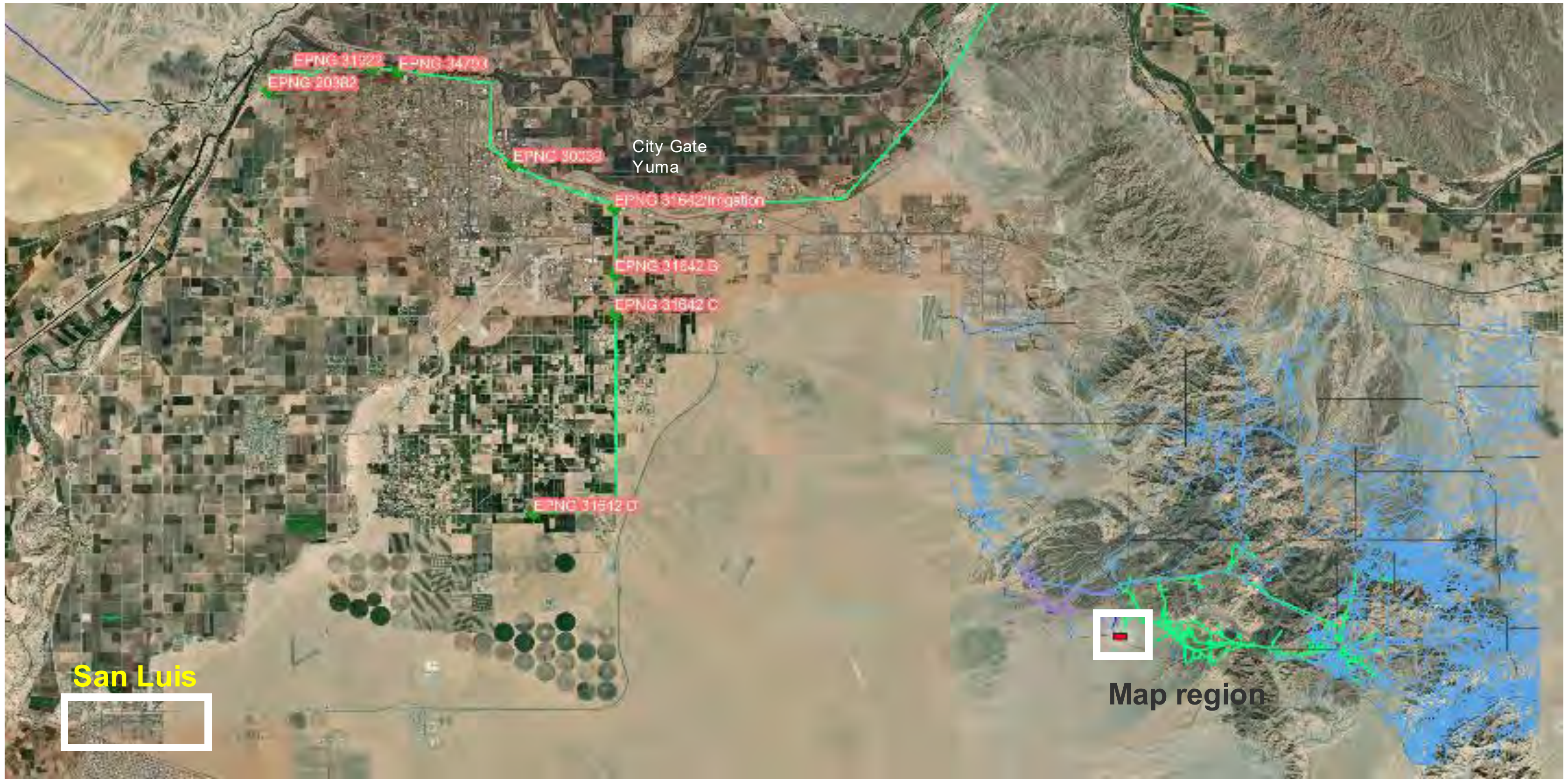
Overview of EPNGP

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

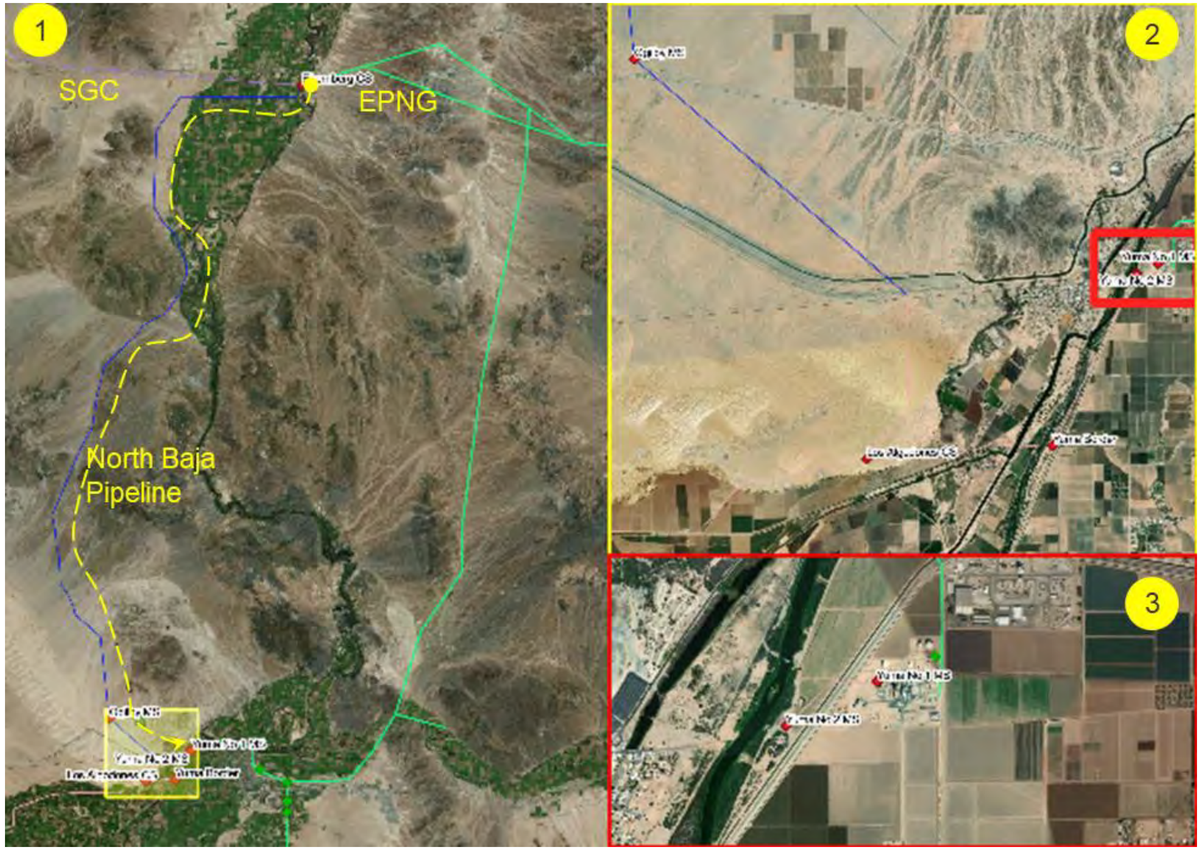


Natural Gas Transmission (3 of 3)

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

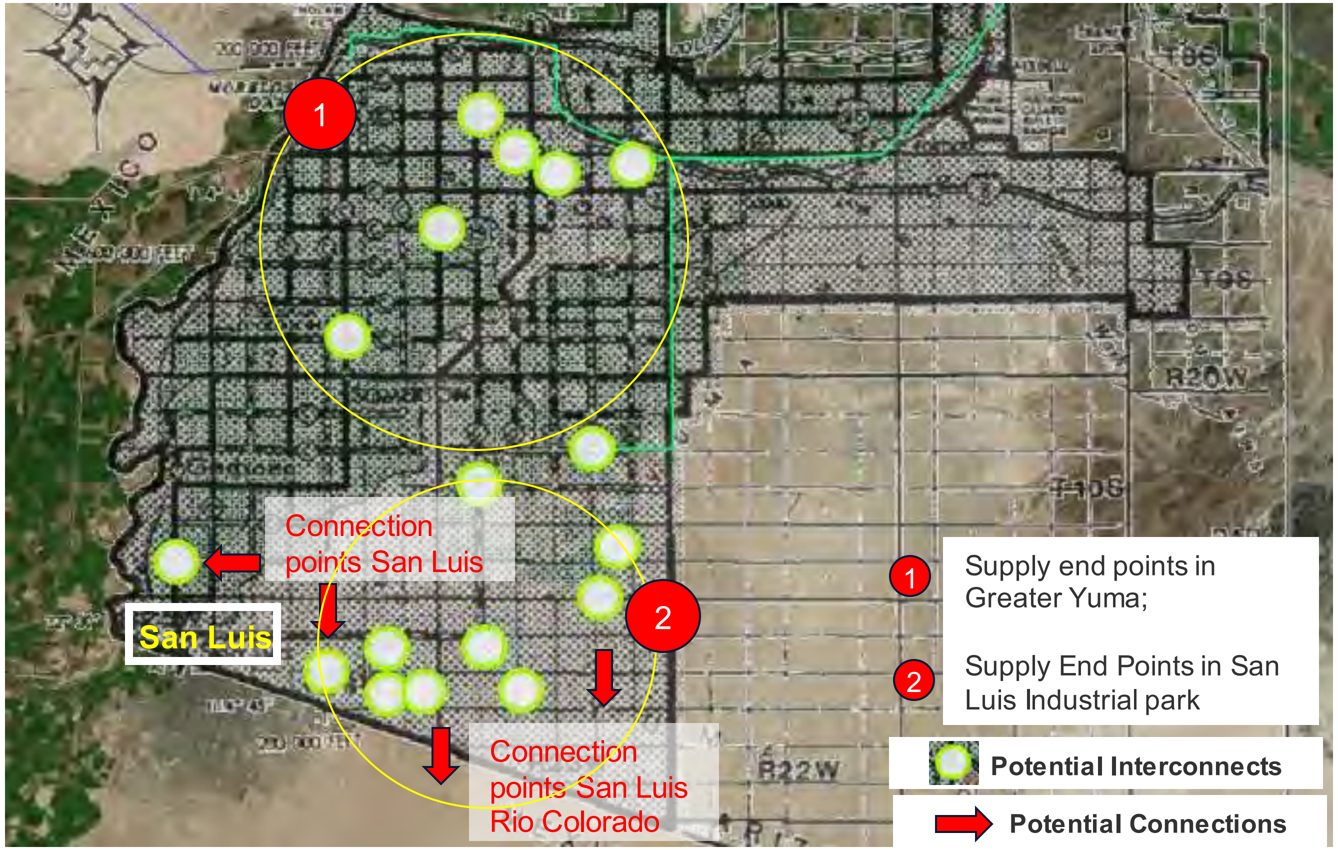
– Confidentiality requirements do not allow for the showing of the LDC network. Instead we have added the white and green circles on the map on the right which represent end points of the distribution pipeline, for better understanding. The key takeaways from the map are:

› ***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:

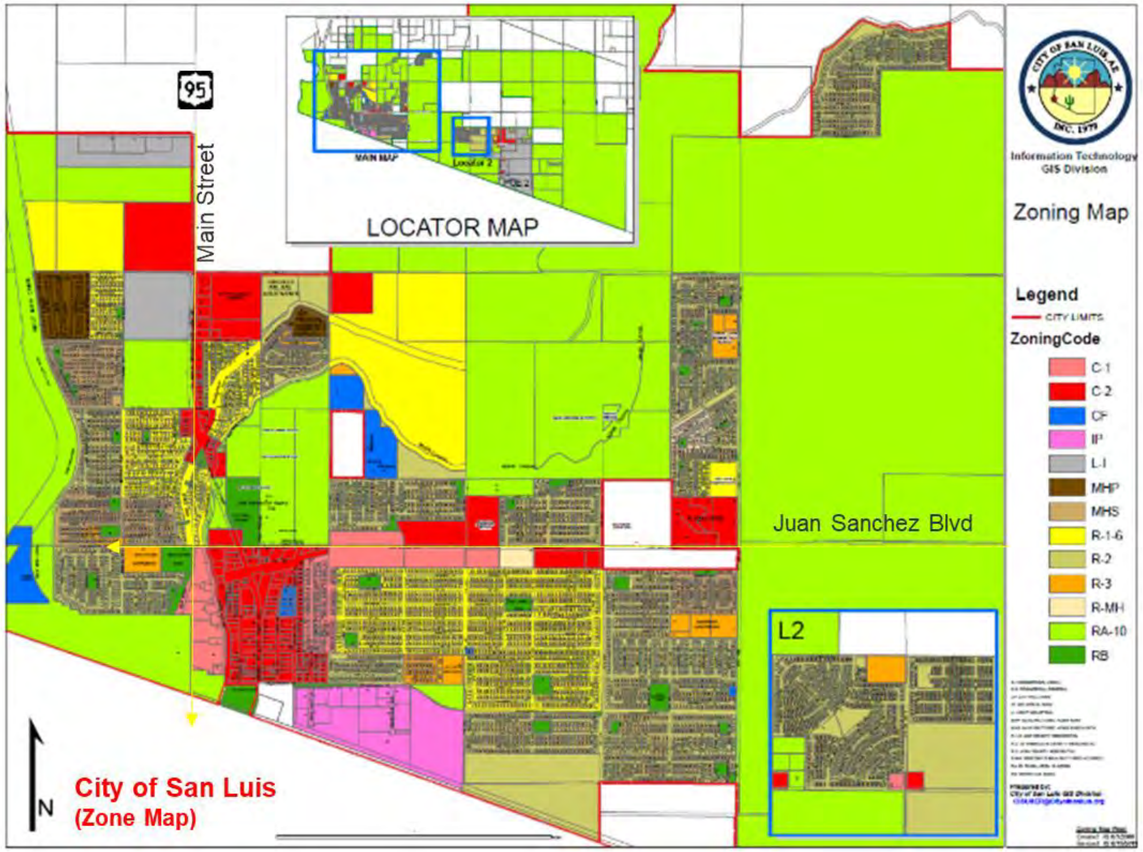
› High demand for gas is expected south of the intersection of Main street and César Chavez Blvd. This segment is expected to have larger diameter pipeline at high pressure;

› 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



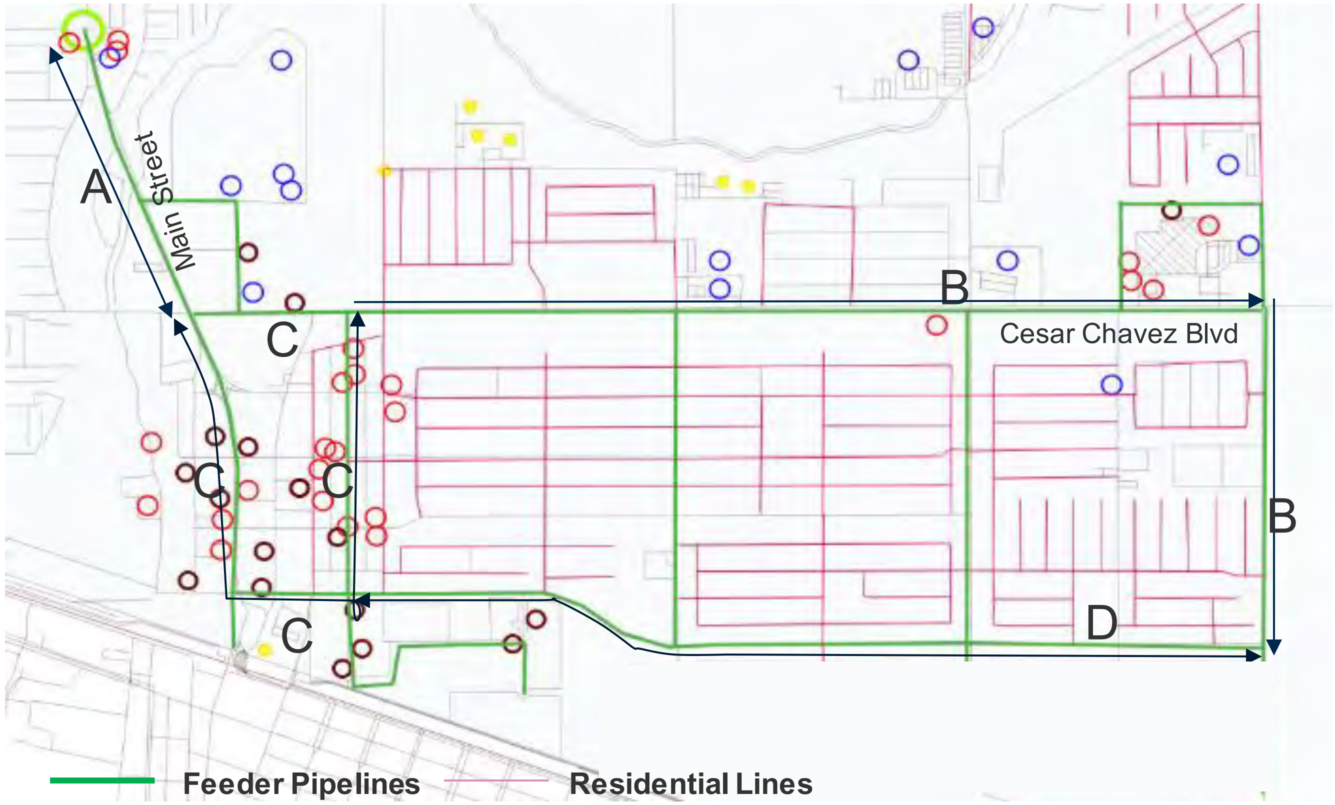
Concept Layout and Pipeline Sizing (1 of 3)

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

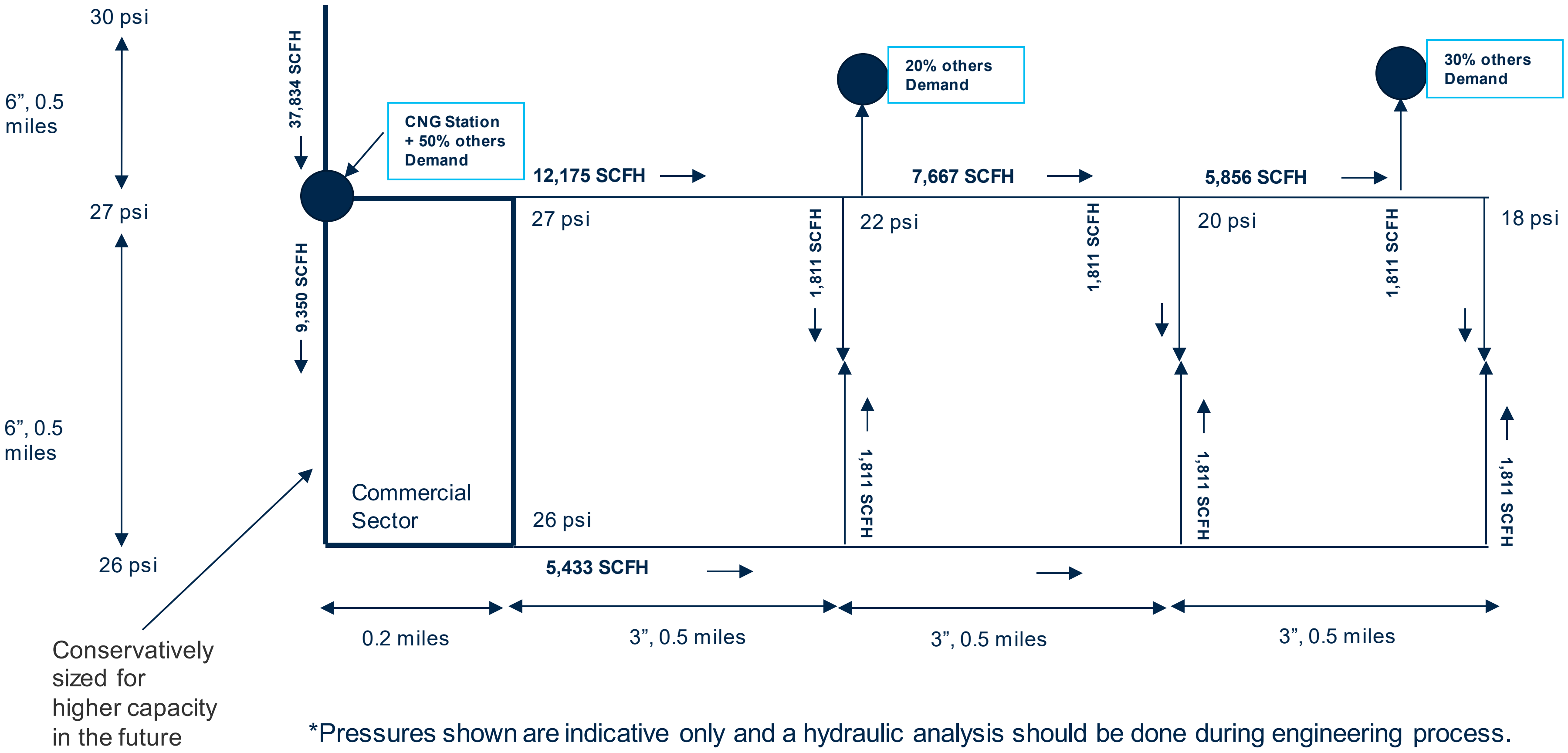
~ nearly 2 miles wrapping the commercial complex

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

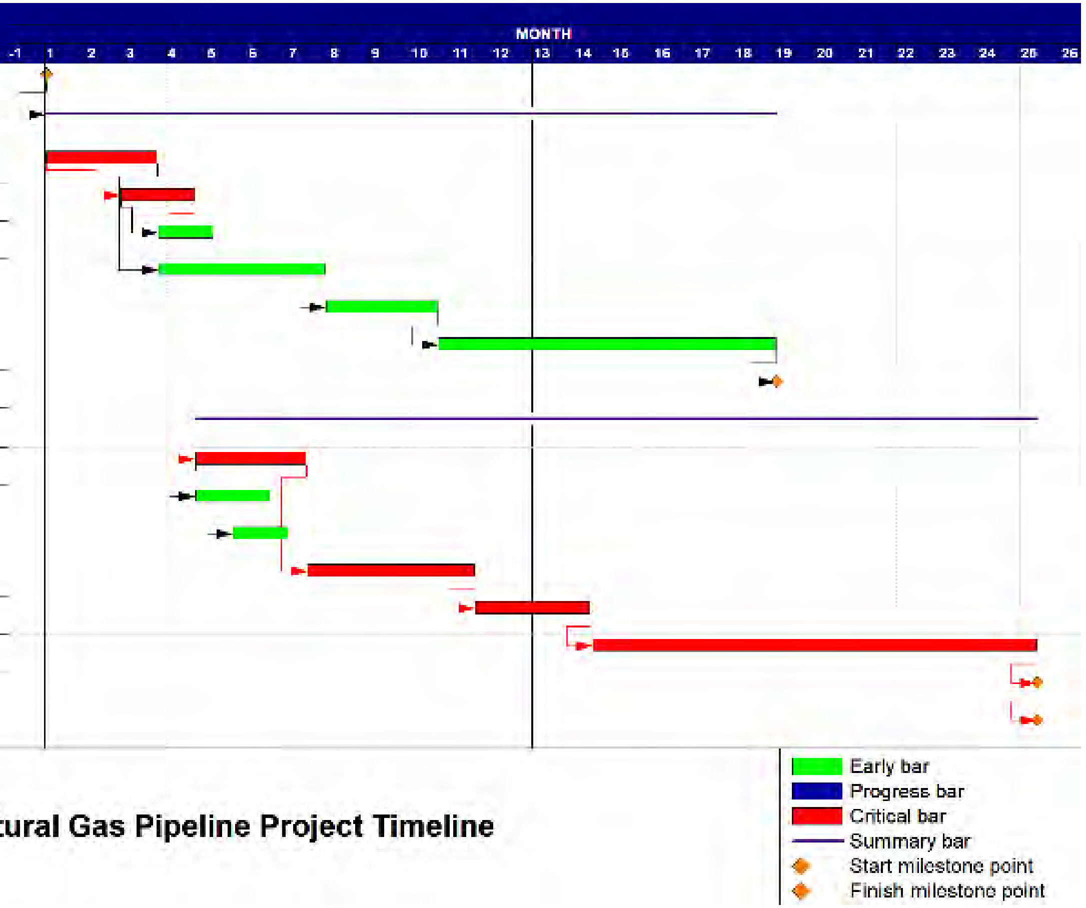
– The following table provides an estimate for the cost of material and construction of a 1” pipeline for the dimensions previously mentioned. The costs are estimated in US dollars with the necessary considerations for installation. The pipeline is expected to be nearly 23 miles long supplying residences.

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

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.

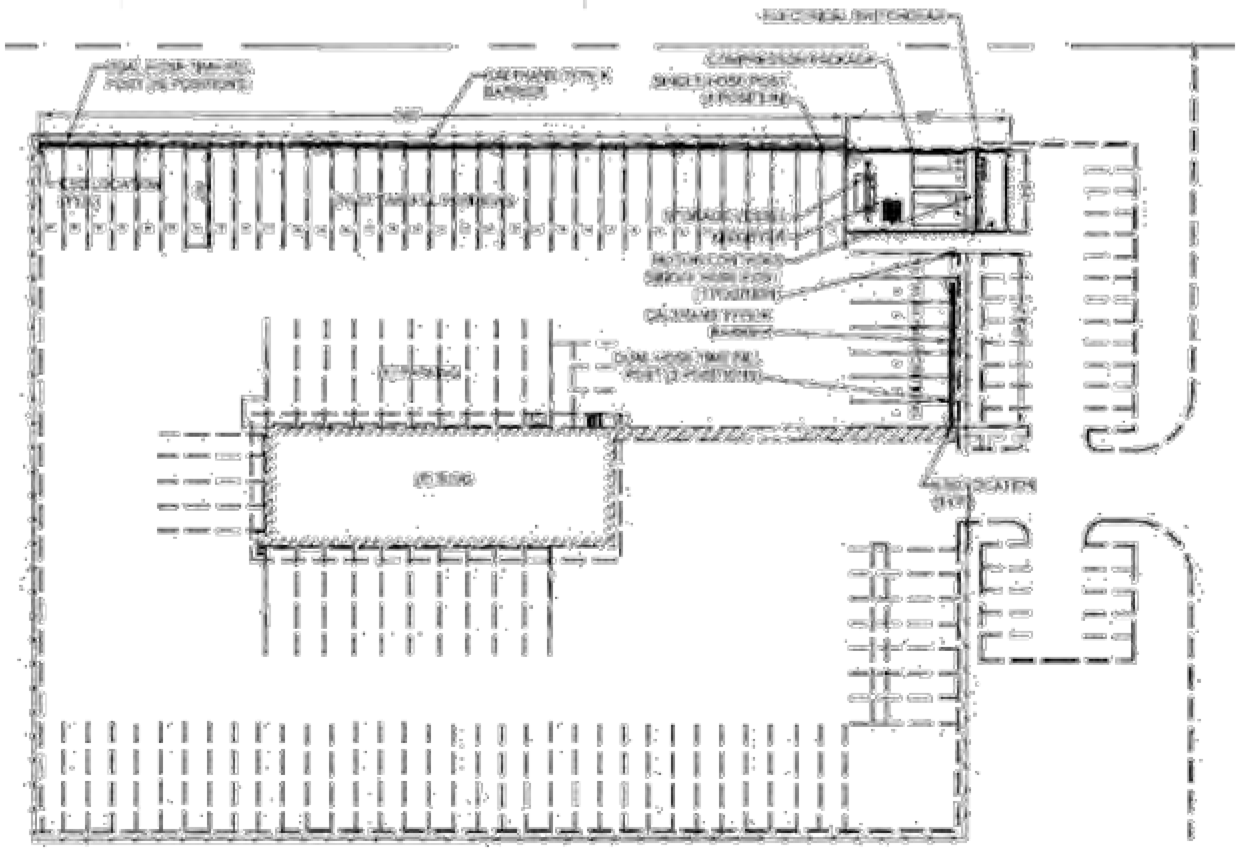
Second Phase should focus on connecting gas supplies to the residential regions and development should be pursued as interest is visible.

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.

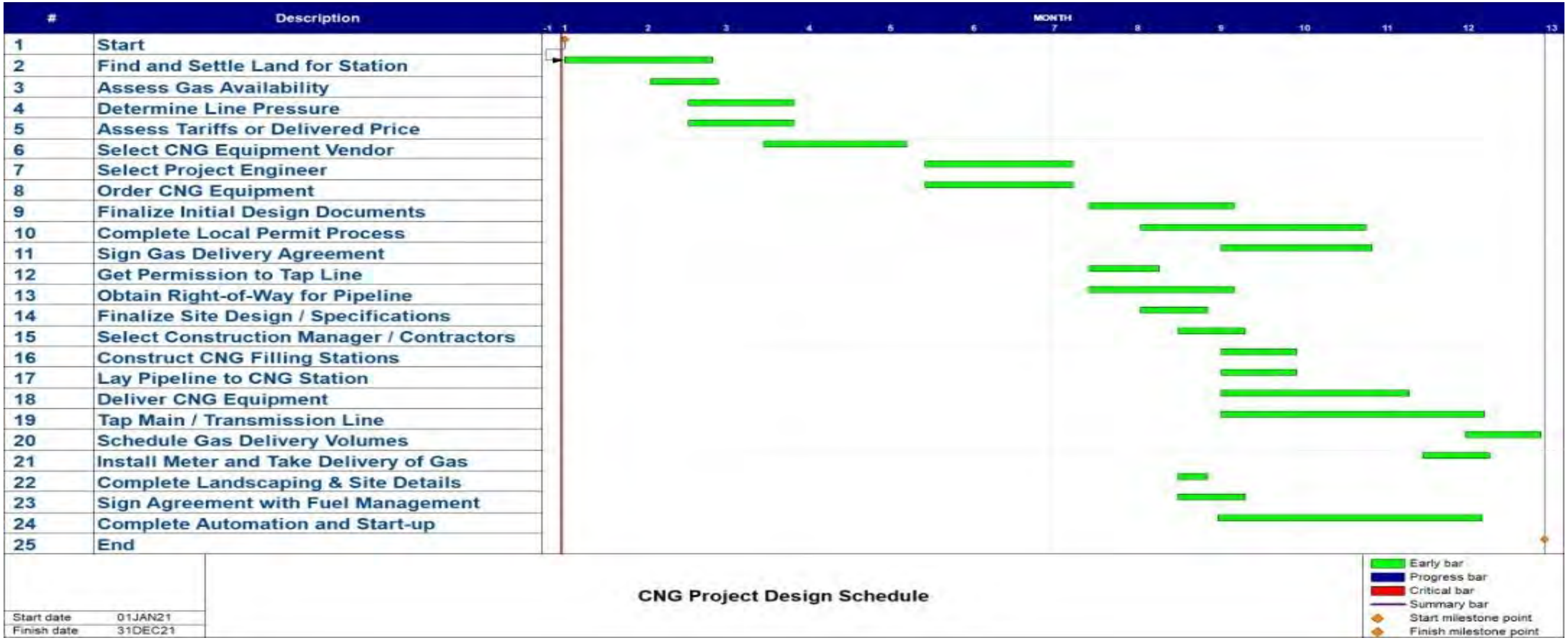
The fast fill station can have fill rates sufficient to fill nearly 50 to 80 light duty vehicles (12 GGE/day each). Thus, almost doubling the capacity

*Gasoline Gallon Equivalent

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

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

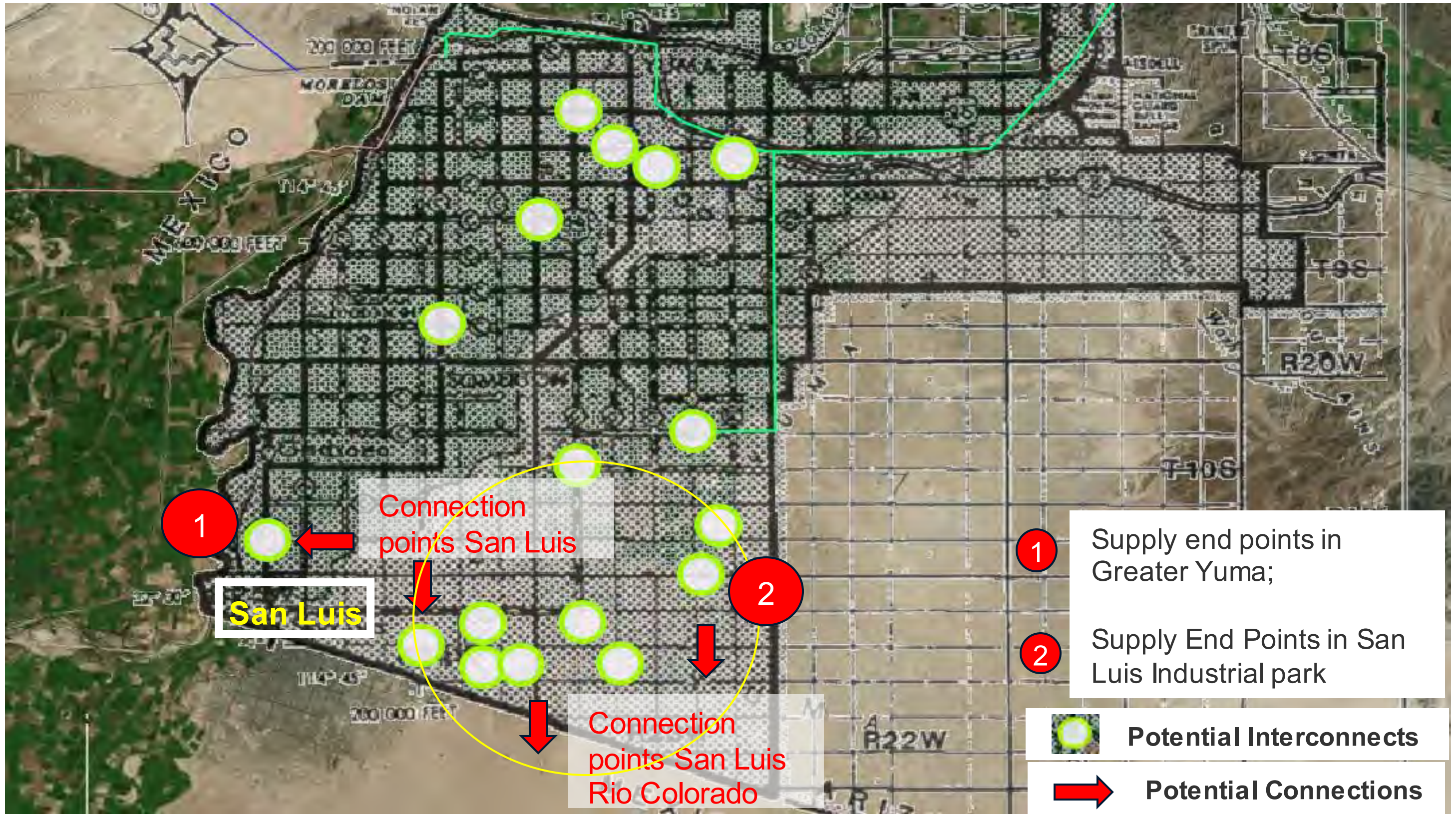
In the previous slides, we discussed the potential interconnect points that are available to supply the city of San Luis and we selected the point on the north labeled as Point "1" in the map on the right. The green-white circles represents interconnections.

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

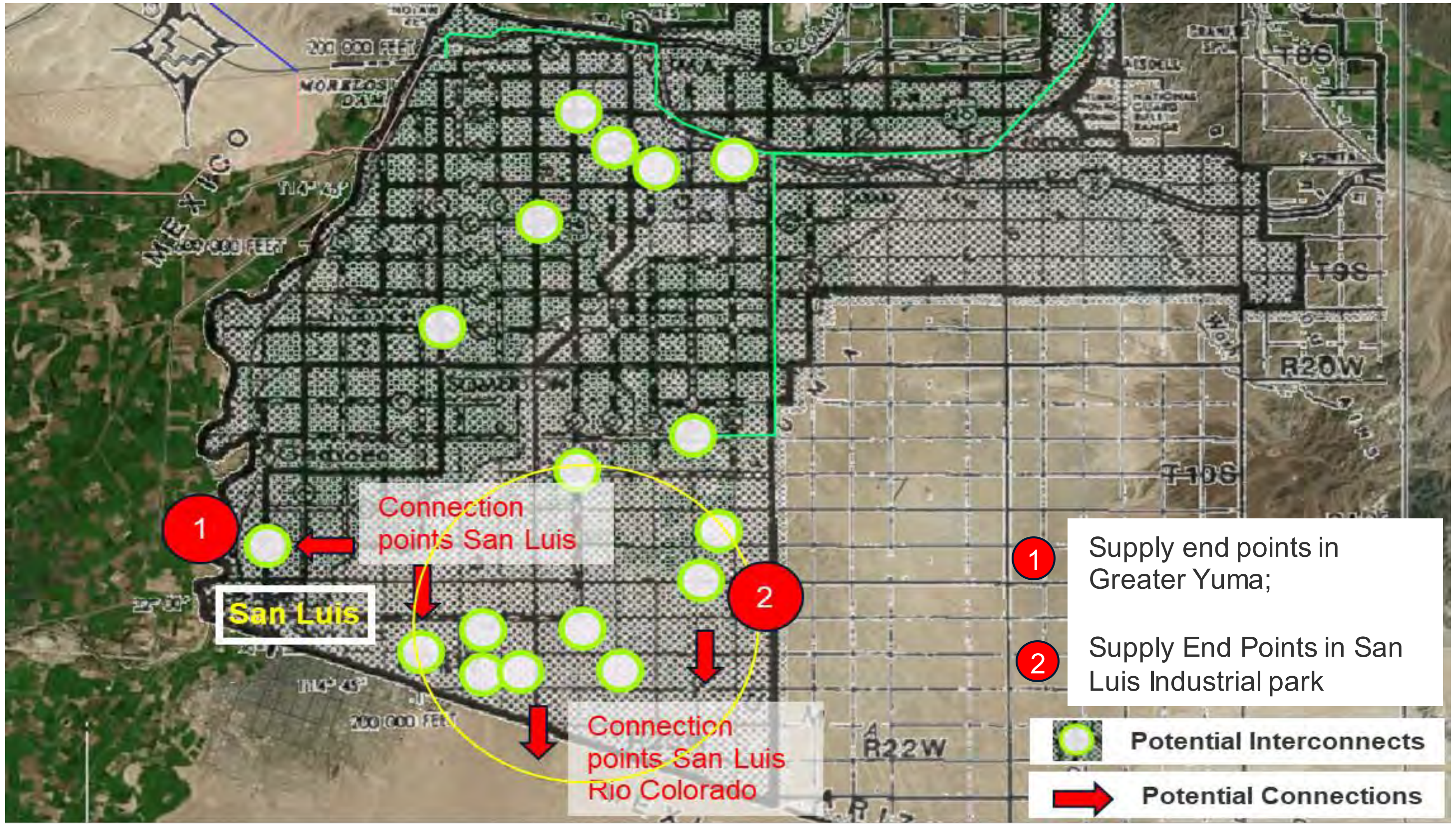
In this Alternative, the supply is explored from the east side labeled as "2" on the map, and there are several interconnection points available. The supply connections in the region labeled "2" include a gas supply to the detention center and the prison and reaches into the Southwest Arizona Industrial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

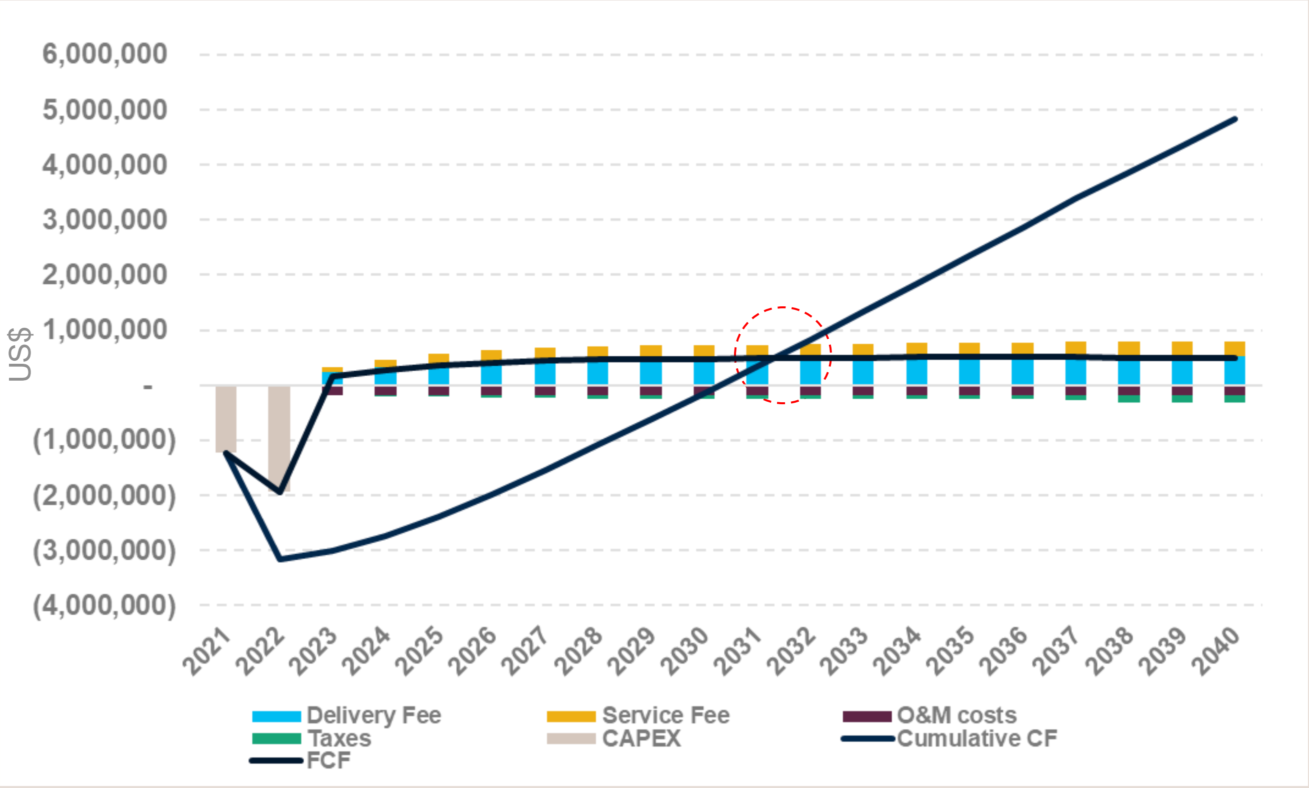
Delivery Charges	*Units*	Cost per Therm
Residential	*$/therm*	0.73
Commercial	*$/therm*	0.383
Industrial	*$/therm*	0.284
Transport	*$/therm*	0.114
Other	*$/therm*	0.383

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.

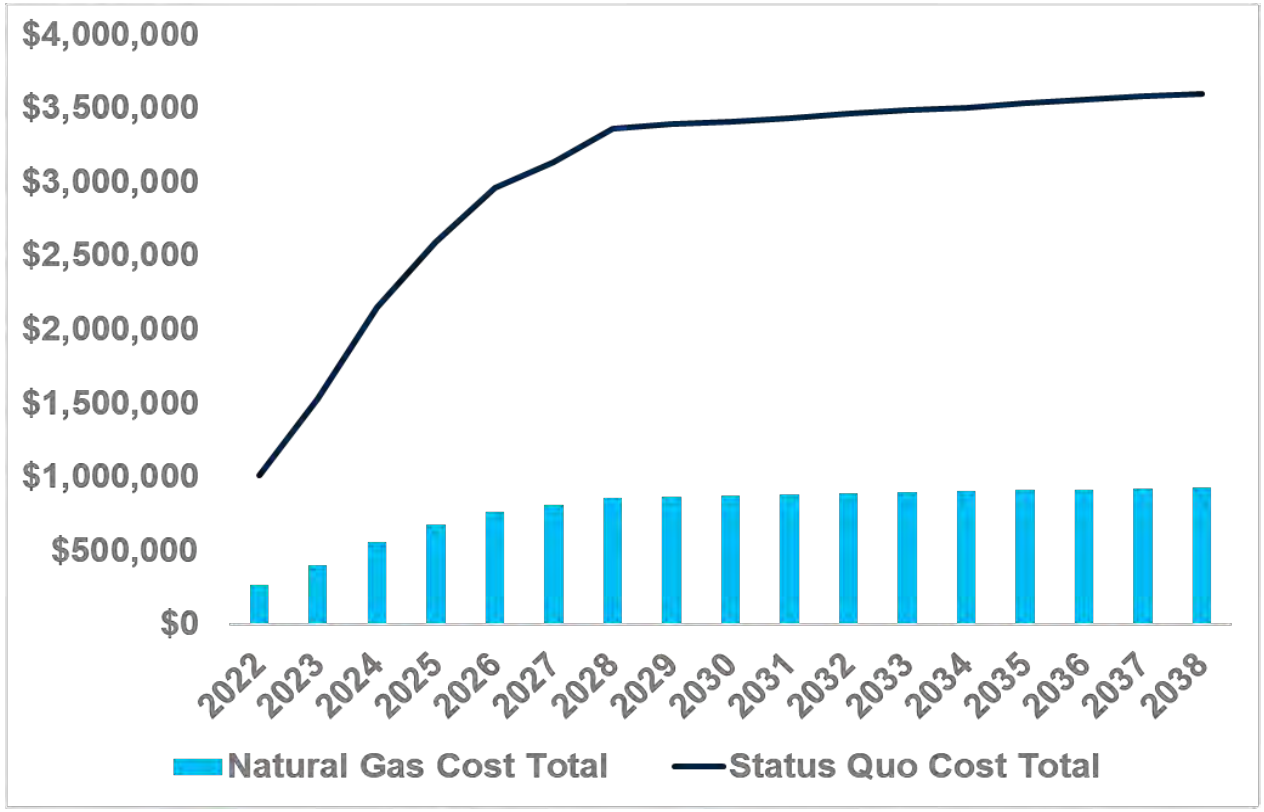
› ***Other Segments -*** In this report, we have categorized schools, government facilities, and other facilities in other segments. The main natural gas fuel alternative in these segment includes propane and electricity. Typically on the basis of economics, natural gas would result in lower operating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

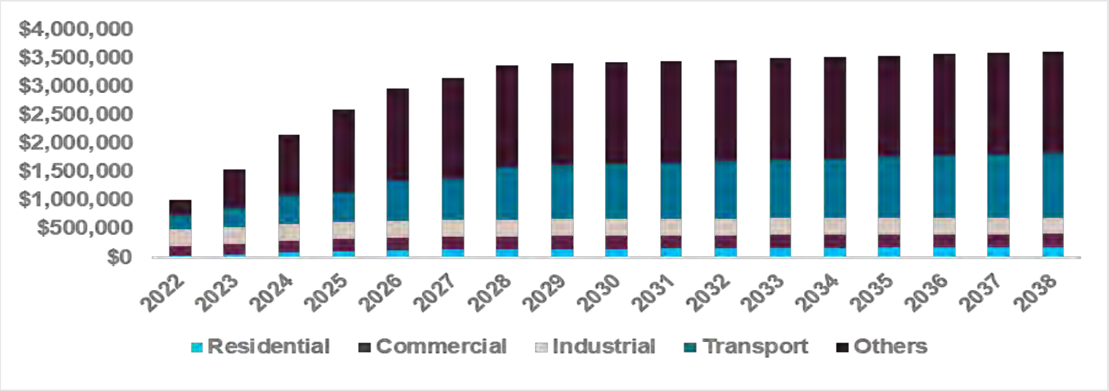
Savings Estimation

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

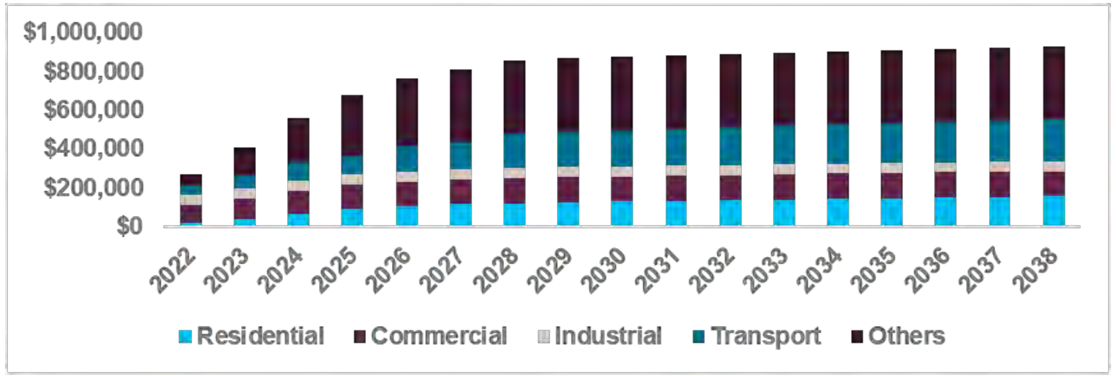
Natural Gas Cost vs Status Quo



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%