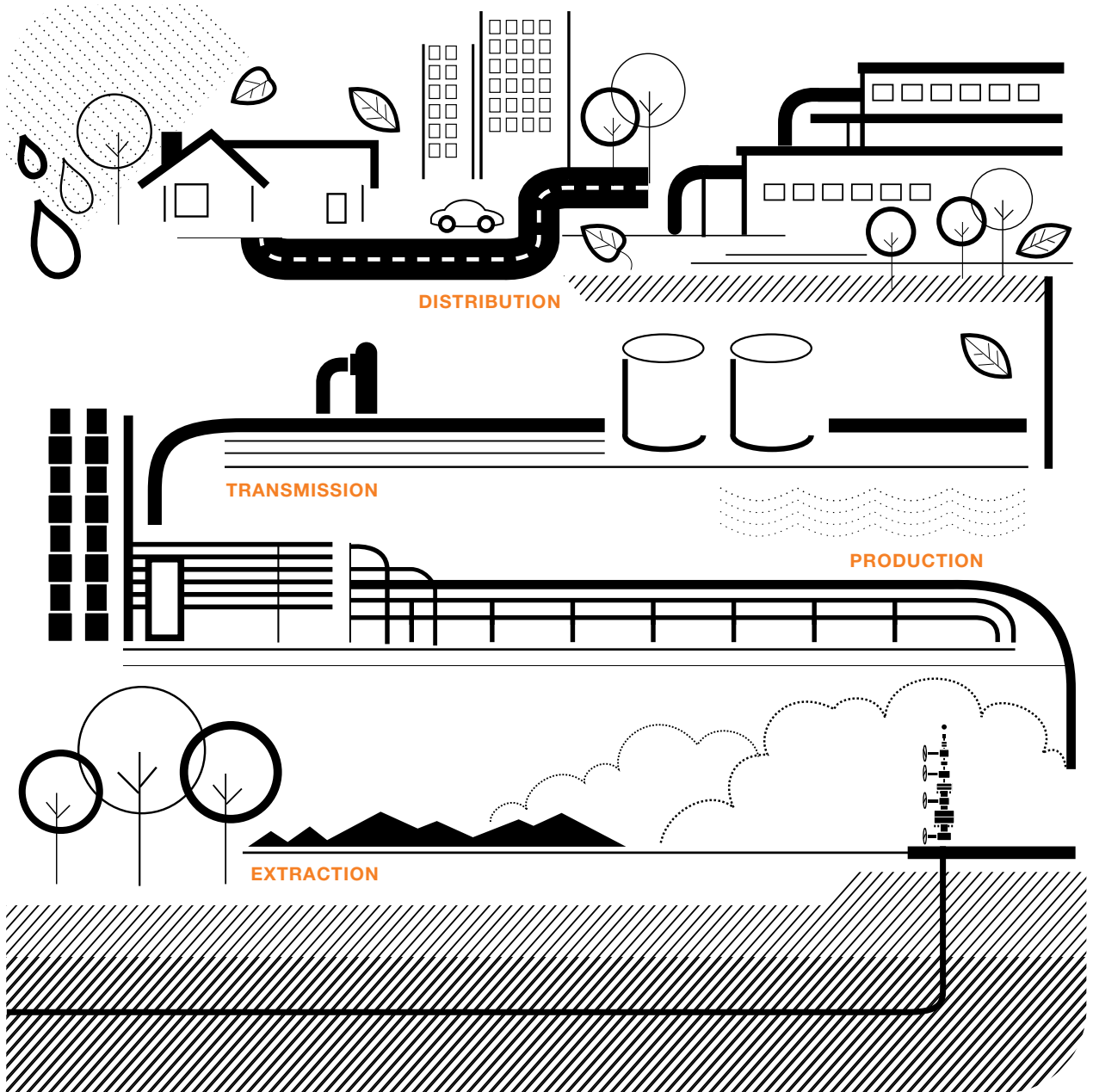
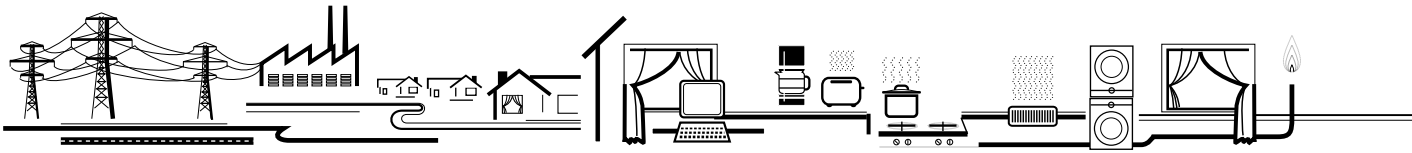


# NG/101 NATURAL GAS END USE

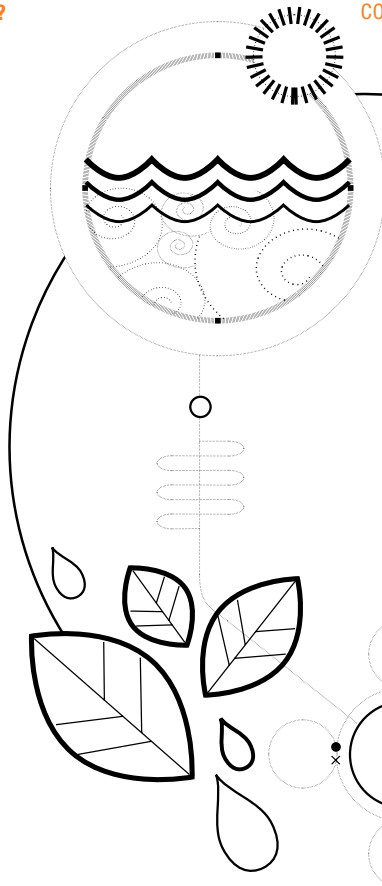


# NG/101 NATURAL GAS END USE

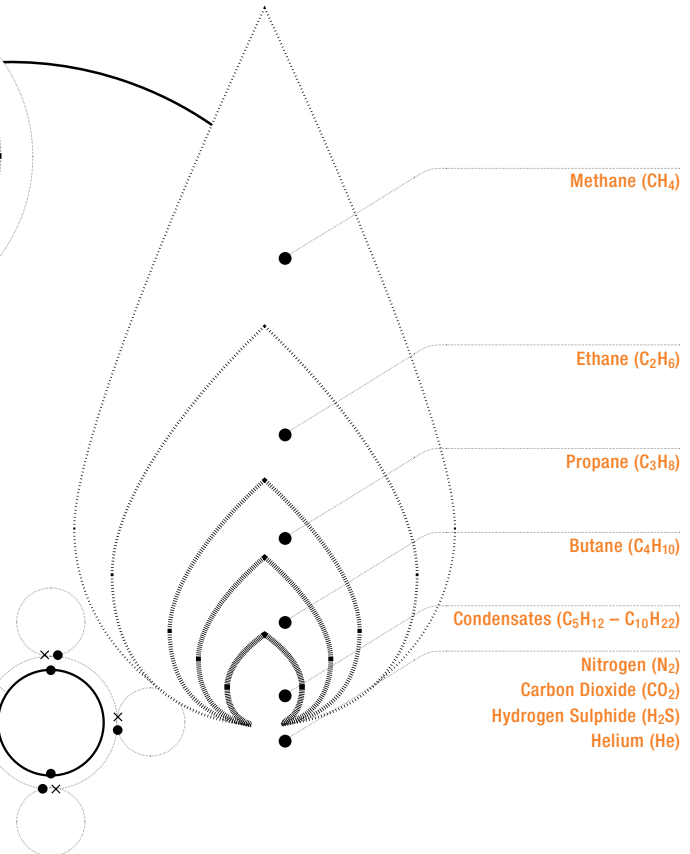


## WHAT IS NATURAL GAS?

Natural gas originated from the decomposition of organic matter under many layers of sediment deposits. Heat, underground pressure and other factors created chemical changes over time, forming hydrocarbons such as natural gas. The primary component of natural gas is methane – the chemical compound  $CH_4$  – one atom of carbon and four hydrogen.



## COMMON COMPONENTS OF UNPROCESSED NATURAL GAS



## NATURAL GAS IS THE CLEANEST BURNING FOSSIL FUEL

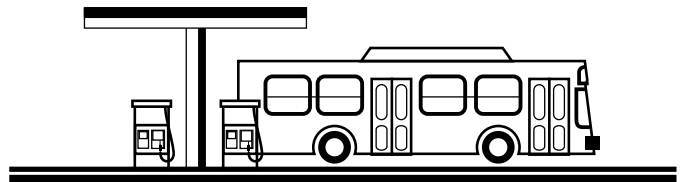
The main combustion byproducts are carbon dioxide ( $CO_2$ ) and water vapour, the same compounds we exhale. Combustion produces 25 percent less  $CO_2$  than oil and about 50 percent less than coal.<sup>(1)</sup> But because of higher efficiency power plants, this results in  $CO_2$  emissions per kWh that are up to 65 percent less than coal.

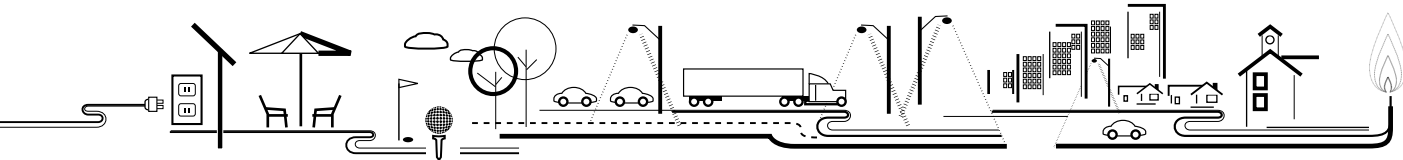
Natural gas emits almost no particulates into the atmosphere: particulates from natural gas combustion are 90 percent lower than oil and 99 percent lower than coal combustion.<sup>(2)</sup>

## DIFFERENCE BETWEEN CNG AND LNG

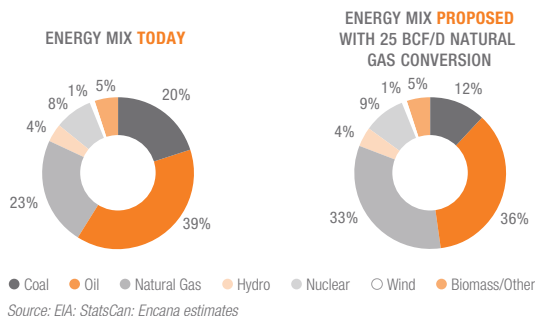
**Compressed Natural Gas (CNG):** Natural gas condensed under high pressures – between 2,000 and 3,600 pounds per square inch (psi) – and held in a special, reinforced container; the gas expands when released for use as a fuel.

**Liquefied Natural Gas (LNG):** Natural gas converted temporarily to a liquid form for ease of storage or transport by cooling it to approximately  $-162^\circ C$  ( $-260^\circ F$ );<sup>(3)</sup> LNG takes up 1/600 of the volume of natural gas in a gaseous state.<sup>(4)</sup>

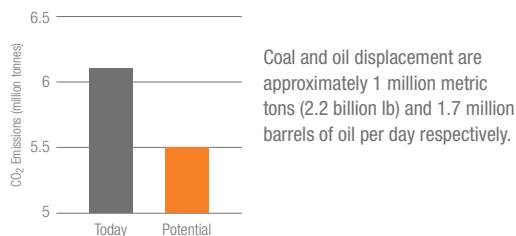




## ENERGY MIX & EMISSIONS BY SOURCES: USA + CANADA



## CO<sub>2</sub> EMISSIONS REDUCTIONS: WITH 25 BCF/D NATURAL GAS CONVERSION



Natural gas is measured in millions, billions and trillions of cubic feet.

- 1 Bcf/d of natural gas could fuel 3.9 million mid-sized cars to travel 25,000 kilometres (15,000 miles) per year<sup>(5)</sup>
- 1 Bcf/d of natural gas = 8.3 million U.S. gallons or 31.5 million litres per day of gasoline equivalent

# 35 THOUSAND NORTH AMERICAN JOBS

35,000 North American jobs are created with each additional Bcf/d of production.<sup>(6)</sup>

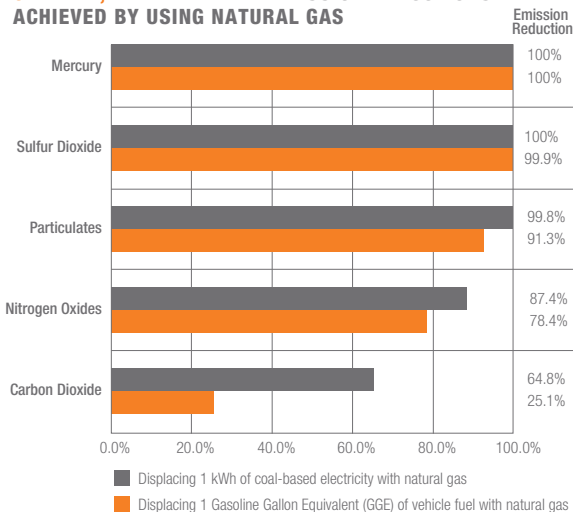
## NATURAL GAS IS AN ESSENTIAL PART OF OUR DAILY LIVES

Canadians and Americans use more than 6.7 trillion cubic feet of natural gas annually<sup>(7)</sup> to heat and cool their homes, heat water, dry their clothing and cook their food.

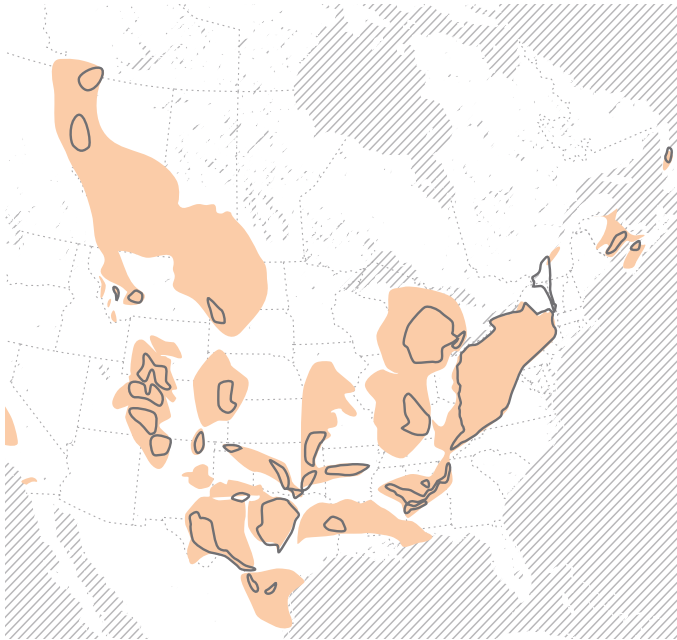
- A very efficient fuel for cooking, 460 Bcf of natural gas is used in the kitchen each year<sup>(8)</sup>
- Although gas-powered appliances may currently be more expensive than electrical, they are cheaper to operate, have a longer expected life and require relatively low maintenance
- With 55 percent of homes using natural gas for space heating,<sup>(9)</sup> the natural gas delivery infrastructure is already in place, making it very simple and affordable to install natural gas appliances in those homes

Combined, Canada and the U.S. import approximately 45 percent of the crude oil they use.<sup>(10)</sup>

## CLEANER, HEALTHIER AIR: EMISSION REDUCTIONS ACHIEVED BY USING NATURAL GAS



## NATURAL GAS IS ONE OF NORTH AMERICA'S MOST VALUABLE RESOURCES



● Natural gas basins    ▨ Shale gas plays

Combined, Canada and the U.S. have approximately 100<sup>(11)</sup> years of clean-burning, abundant, affordable natural gas.

## NATURAL GAS IS A CLEAN AND EFFICIENT SOURCE OF ELECTRICITY

It takes 60 percent more coal than natural gas to produce one kilowatt-hour of electricity.<sup>(12)</sup>

Even if coal generation were as efficient, natural gas would still have almost 50 percent lower CO<sub>2</sub> emissions, 99 percent less sulphur dioxide (SO<sub>2</sub>) emissions and zero mercury emissions.<sup>(13)</sup>

The most advanced coal plants (new technology for completion in 2012 to 2016) can achieve 38 percent efficiency.<sup>(14)</sup> They cost twice as much as advanced combined cycle natural gas plants to build and operate.<sup>(15)</sup>

About 35 Bcf/d of natural gas in advanced combined cycle natural gas generation would displace all coal-based generation in the U.S. and yield emission reductions of about 50 percent in the electricity sector.<sup>(16)</sup>

What is combined cycle natural gas generation? Waste heat from gas turbine generated electricity is used to make steam, which is then used to fuel steam turbines to generate additional electricity, enhancing efficiency as a result.

## THE GROWTH PICTURE

Primary growth opportunities are in unconventional gas – natural gas from reservoir rocks that are less porous and permeable than conventional reservoirs.

Simply put, unconventional gas does not readily flow to the well bore. Examples are tight gas, shales and coalbeds.

Unconventional reservoirs were once thought to be too difficult to develop. Advanced technologies, such as horizontal drilling, hydraulic fracturing and multi-lateral wellbores, have made it possible to profitably unlock these reservoirs at lower and lower costs. Now about 40 percent of current North American natural gas production is from unconventional sources.<sup>(17)</sup>

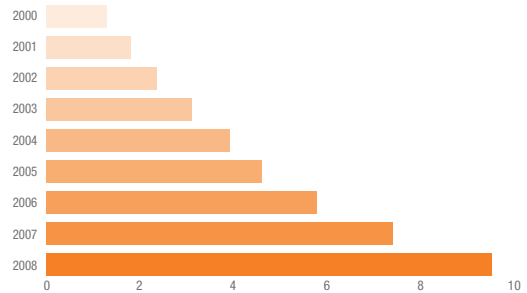
By 2020, it is expected that nearly 70 percent of Canadian and American natural gas will be from unconventional reservoirs.<sup>(18)</sup>

## NATURAL GAS PROVIDES FUEL FOR

# 10 MILLION VEHICLES<sup>(19)</sup>

and is considered safer and cheaper than gasoline.<sup>(20)</sup>

Natural Gas Vehicles Yearly Growth Worldwide (Millions of vehicles) (Source: iangv.org)



## ENDNOTES

1. United States Energy Information Administration (EIA); Encana estimates
2. EIA
3. Sempra LNG; EIA
4. EIA
5. Encana estimate
6. IHS Insights; CERl
7. EIA; Statistics Canada; Encana estimates
8. EIA; Encana estimate
9. EIA; Encana estimate
10. EIA; Statistics Canada; Encana estimate
11. Potential Gas Committee (PGC); Encana estimate
12. EIA; Encana estimate
13. EIA; Encana estimate
14. EIA; Encana estimate
15. EIA; Encana estimate
16. EIA; Encana estimate
17. IHS Encana estimate
18. IHS Encana estimate
19. International Association for Natural Gas Vehicles
20. Clean Vehicle Education Foundation