

# Argentina: “Country of Eternal Promise and Second chances”\*

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## Introduction

I read the words of this headline in a local paper in Buenos Aires on my way to Neuquén to celebrate the official inauguration of the first Shell-operated Early Production Facility in Vaca Muerta. These words have since stuck with me, as I can personally identify with them. My father was stationed in Argentina as a Shell seismologist in the early 1960s, during which time I attended my first years of elementary school there. Childhood memories of visiting a seismic field camp, playing soccer on dusty street corners in General Roca near Shell’s field office and raising the Argentine flag every morning at school have left me with a sense of belonging for this special country. Its potential is undeniable, but opinions have been, and probably will remain, divided on how to realize it. A combination of stamina and faith will be required, not unlike the traits of true explorers.

To illustrate this, let’s look at the 100-year history of Shell’s oil and gas exploration efforts in Argentina. In the early years of the last century, Argentina ranked seventh on the global GDP chart. Walking in Buenos Aires, one can still imagine the grandeur of cities like Paris and Rome carried over the Atlantic by the immigrants during the 19th century. Energy needs in those heydays were largely met through the import of expensive coal, kicking off the search for domestic oil.

## Exploration and Discovery in Argentina

The first discovery was made accidentally on December 13, 1907, in the San Jorge Basin in southern Patagonia: the Bureau of Mines found oil while drilling for water. This fortuitous event is still celebrated every year as the “Dia del Petroleo.”

By 1910, the Argentine government had created a State Oil Enterprise with preferential rights and authority over all hydrocarbon resources in the country. This would lead to the founding of the world’s first entirely state-run national oil company, Yacimientos Petroliferos Fiscales (YPF), in 1922.

In 1914, Shell established an office in Buenos Aires and the first shipments of bitumen and other oil-derived products soon arrived. Just three years later in 1917, geologists from Shell visited the San Jorge basin, where oil production was ramping up. Drilling was done by percussion, and prospect mapping was done on horseback. Following several years of negotiation, Shell – one of just a few private enterprises – was granted a lease of 9000 hectares near the settlement of Diadema and started drilling in 1922 ([Figure 1](#)). Diadema became part of Shell's official name in Argentina. By the time of the first commercial discovery in 1925, Shell had built a small village to house some 500 operators and their families. Shell also built a refinery in 1930 in Buenos Aires to process the crude and expanded its retail network. In 1955, Shell drilled the then deepest well in the basin (D-129) and penetrated the rich, lacustrine source rock, which had charged most of the oil discoveries. This lower Cretaceous source rock is since known by the name D-129.

Shell Diadema drilled its last production well in 1960, producing up to 150 million barrels (MMb) until 1977, when it sold the field to Compañías Asociadas Petroleras SA (CAPSA); the field is still in production. The San Jorge basin has yielded over four billion barrels of oil (Bbo) for more than 100 years with nearly 20,000 wells. Shell made a brief return to the offshore extension of this prolific basin in the early 1980s. After shooting 2-D seismic and drilling two dry wells, it seemed that the prolific D-129 source rock was largely confined to the onshore part of the basin.

### **Politics and Exploration**

As Shell started production at the end of the 1920s, Argentina had slid down on the GDP table, and a prolonged period of populist governance began, punctuated by several military coups. In the late 1950s, during the democratically elected government of President Arturo Frondizi, some foreign companies returned, including Shell. Frondizi called for the “Battle for Oil” to eliminate the expensive imports that had crippled the Argentinian economy. Shell signed contracts with YPF in the Colorado Basin (1959-61) and the eastern Neuquén basin (1961-64). The former was deemed a risky venture, but was deemed a strategic entry into a country with significant oil and gas potential. After shooting 2-D seismic and drilling seven dry wells, Shell exchanged the license for 20,000 square kilometers of Neuquén acreage. Shell moved its field operations base from the Atlantic village of Carmen de Patagones to General Roca in Rio Negro province and shot more than 4000km of seismic lines ([Figure 2](#)).

Whereas the official focus on oil and gas exploration helped triple domestic supply in just over two years, President Arturo Illia annulled the contracts with foreign companies over concerns that YPF would be deprived of adequate returns for its exploration investments. Shell thus packed up in 1964 before it could drill any wells on the recently shot seismic. For me personally, this meant saying farewell to my friends.

In 1966, Illia was removed from power by a military coup. Nevertheless, conditions were still adequate at times for business in this large, still under-explored country with steadily growing energy needs. Offshore oil and gas exploration started to make inroads. In 1970, Shell shot over 12,000 kilometers of marine seismic (12-fold coverage) from the Salado basin in the north to the Austral/Magallanes basin in the far south, using its own airgun-equipped vessel, the Lady Glorita. Incidentally, my father ([Figure 3](#)) happened to be the seismologist on board.

By the end of the 1970's, Shell had entered into offshore contracts in these basins, drilling 24 wells and discovering one large accumulation in the inhospitable offshore of Tierra del Fuego. However, the relatively large gas proportion rendered it uneconomic in those days.

Following this disappointing offshore campaign, Shell geologists in Houston, The Hague and Buenos Aires studied the onshore basins again and decided to try their luck once more in the Neuquén Basin. Meanwhile, democracy was reestablished in 1983 with the election of President Raul Alfonsín. During the late 1980s and early 1990s, Shell drilled a few wells in the Neuquén Basin and made one oil discovery. Regrettably, the promising production of the drillstem test watered out just hours after the telex with the happy news had reached head office.

Until then, Shell's exploration focus had been mostly on oil, not least to provide feedstock for its refinery in Buenos Aires, which had grown to a capacity of 100,000 barrels per day. However, in the 1990s gas became increasingly important as markets in Brazil, Chile and Argentina were developing quickly. Shell's explorers looked at the northwest basins, including the extension of Bolivia's prolific, gas-prone Tarija Basin. This area in Salta and Jujuy was already known for its seeps and bituminous marls in the 1860s, and YPF had started the first oil production there in 1927. Large discoveries of gas in the early 1950s (Campo Duran and Madrejones) led to the construction in 1960 of a pipeline all the way to Buenos Aires. However, the costs in this tropical and mountainous terrain delayed further exploration until the late 1970s, when YPF discovered the large Ramos Field in Silurian-Devonian rocks. This discovery demonstrated that the tight, quartzitic Devonian sandstones of the Huamampampa Formation could be excellent reservoirs in the core of the anticlines of the eastern fold- and thrust-belt of the Andes due to an extensive, interconnected fracture system.

In 1998 Shell acquired a 22.5-percent share of the northern Acambuco block, operated by Pan American Energy. This block contained two fields under appraisal, which, to this day, steadily produce gas (albeit at slowly declining rates). Later that year, Shell acquired a 55-percent working interest and operatorship of the Valle Morado gas discovery, until then the deepest hydrocarbon discovery in Argentina in the fractured, uppermost Cretaceous shallow-water carbonates of the Yacoraite Formation. Shell managed to put production facilities in place in less than a year in this challenging environment, but the high rate discovery well (35 million standard cubic feet per day) watered out in a few months. That led to a decade without any Shell E&P operated activity in Argentina.

### **Argentina's Super-Basin**

In 2012 and 2013 Shell farmed in to several exploration blocks in Neuquén to pursue the Vaca Muerta unconventional oil and gas shales. Since the discovery of oil at Plaza Huincul in 1918, this basin has continued to deliver a steady stream of oil and gas discoveries, including the giant Loma la Lata Field in 1977. This basin is an exceptional case study for sequence stratigraphy: the extensive subsurface dataset, coupled with excellent outcrops of most formations along the margins of the basin, makes a geoscientist feel like the proverbial kid in a candy store! More than five billion barrels of oil equivalent (boe) have been produced to date from multiple plays and layers. Now, thanks to shale resources, it is likely to deliver at least another five billion boe more, branding the Neuquén Basin as one of the world's 25 "super-basins" by IHS Markit in 2016.

Following encouraging results, Shell has meanwhile increased its footprint to some 200,000 net acres. Recently, Shell inaugurated its first Early Production Facility and over the next two years, results of this and other pilot projects will inform Shell's decisions on larger scale developments, such as we see today, for example, in the Permian Basin. This will also allow for some time to let operating costs come down to global competitive levels, and for reforms and infrastructure promises made by the current government to take hold.

Argentina has thus found itself at a crossroads once again. During the past 100 years it has become clear that explorers and Argentinians have much in common: they are resilient, perseverant and, above all, optimistic. However, both sometimes fail to confront their historic track record without bias and can be prone to repeat mistakes. Nevertheless, the oil and gas shale resources of this country are truly world-class: now is the time to grab this second chance and help Argentina develop to its true potential.

### **Author**

Laurens Gaarenstroom ([Figure 3](#)) has worked for Shell for more than 35 years. He has had assignments as a geoscientist and exploration leader in Holland, Spain, United Kingdom, Nigeria, the United States and now Argentina.

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Figure 1. Drilling the early wells in Shell Diadema in the 1920s.



Figure 2. Shell seismic party in the Neuquén Basin in the early 1960s.



Figure 3. Laurens Gaarenstroom (left) hands his father, Laurens, Sr., a copy of the commemorative book on 100 years Shell in Argentina issued in 2014. His father worked as seismologist in Argentina during his 36-year career with Shell, but left a few months before the 50-year celebration in 1964.