In 1997 the Brazilian National Congress sanctioned the Petroleum Law (Law nº 9.478), which allowed the Government to contract private or public companies to execute research, exploration, refining, import, export and transport activities of crude oil, natural gas and oil products from any origin. It provided the premises for an open market in the oil and gas sector, thus ending Petrobras’ 44-year state monopoly. The law also asserted the fundamentals and objectives of the national energy policy, creating the CNPE (National Council for Energy Policy), the governmental organization responsible for setting policies for the country’s energy sector. It also created ANP (National Agency of Petroleum, Natural Gas and Biofuels), a federal institution and the authority that regulates all oil and gas activities in Brazil.

The opening of the Brazilian petroleum market was part of a series of decentralization of key industrial sectors and other privatization schemes promoted by the Fernando Henrique Cardoso administration (1995–2002) which intended to modernize the country’s industry. There was a need to integrate an outdated Brazilian industrial park to international standards, so its companies could compete globally. Thus, the Federal Government implemented several policies to rapidly promote the development of the sector either unilaterally or in joint operations with other public organizations, banks and private companies. The main objectives were to prepare the domestic industry – both companies and human resources – to absorb and respond to the influx of foreign investment the industry was about to receive from many international players willing to invest in Brazil’s newly open market.

These actions led to the creation of several programs throughout the late 1990s and early 2000s that offered funding mechanisms, subsidies, tax exemptions, incentives to R&D enterprises and several other strategic measures to structure the oil and gas value chain.

One of the key strategic aspects identified by the Government at the time was the need to build human capacity. To foster a strong domestic industry, it was necessary to improve the supply of domestic workers to the market, both in quantity and quality. A skilled domestic workforce is of strategic importance to a country because it generates income and jobs to the population. Moreover, a supply of highly qualified domestic human resources tends to improve the sector’s productivity in the provision of goods and services. It is an important and complementary feature of an all-encompassing Local Content policy in promoting the expansion of the supply chain’s capacity on a competitive basis, allowing for the local industry to compete under equal conditions with its foreign counterparts. Therefore, the Brazilian government identified the development of human capacity as a strategic tool to promote sustainable growth in the oil and gas industry.
Under the circumstances described above, the ANP created in 1999 the PRH – Programa de Recursos Humanos (Human Resources Program), whose main objective is to foster the development of specialized workforce in the oil and gas industry. It has increased the participation of the local workforce in key positions at domestic and international companies operating in the Brazilian market, supported technological development in the country and enhanced the competitiveness of domestic companies. In tandem with the Local Content Policy and the Research, Development & Innovation Clause in the Exploration & Production contracts, the PRH-ANP comprises the 3 major policies adopted by the Brazilian Government to build human capacity in the country. All of them have sought to improve the capacity of local workers and provide technological solutions to improve the competitiveness of local companies. These policies have been fundamental to the local development of the oil and gas industry in Brazil.

This paper will present the program’s main tenets, how it was implemented and funded, its achievements, shortcomings and analyze the lessons learned. This paper will provide an analysis with the proviso that the PRH-ANP has been a fundamentally sound program that has brought benefits to the sector. The program’s positive cost-benefit relation and high employability levels of former scholarship recipients in the industry attest the success of the platform. It has been successful in developing professionals for the market and enhancing the domestic industry’s capacity.

The Oil and Natural Gas Sector – Building Human Capacity

As international companies and foreign investment arrived in Brazil after the opening of the market in 1999, the sector rapidly expanded and demanded highly qualified human capital from the domestic market. The Government seized the opportunity to improve the academic side of human capital and increase the supply of local engineers, geologists, geophysicists to an expanding market in need of more qualified professionals. Thus, in 1999 the ANP created the PRH (Human Resources Program) within the Agency’s scope and responsibility. The program sought to provide higher level academic qualification for students in disciplines related to oil, natural gas and biofuels. The program was complementary to the emerging Local Content Policy, as a greater availability of highly qualified professionals could enhance the competitiveness of the domestic industry, as well as fitting the primary objective of the Local Content Policy of generating job and income to the Brazilian workforce.

Since its inception, PRH has benefited more than 5,000 students, mostly graduates and post-graduates, by facilitating their entry into the oil and gas industry professional market. The program encouraged the inclusion of specific oil-related disciplines in the curriculum of learning and research institutions, as well as granting scholarships for graduation, master and doctoral students.

PRH-ANP – Program Outline

The program has been conducted by ANP in partnership with the Ministry of Science, Technology and Innovation (MCTI) and Brazilian universities.
PRH-ANP selected participating institutions through a public bidding and proposal process. Between 1999 and 2013, there were five Public Notices in the form of Tender Protocols held by ANP and addressed to learning institutions. At the end of each public call, ANP and the educational institutions celebrated their partnership and created a Management Committee administered by university professors.

Course evaluations took place on an annual basis with the participation of students from relevant institutions and representatives of the industry. These evaluations have confirmed the high level of research undertaken by students in possession of scholarships. The high employment rate of scholarship recipients in the oil and gas sector – which reached 87% in 2009 – and the national and international awards received by the students have been proofs of the success of the PRH-ANP program.

With regards to scholarships and program selections, the PRH-ANP has already awarded 8,290 scholarships in over 15 years of existence. The participating programs have assisted over 3,000 former scholarship recipients to attain employment in the oil and industry. These are outstanding numbers that attest the success and importance of the program in integrating qualified Brazilians professionals into the oil and gas industry.

At its peak, up until 2014, there were 55 programs running at 32 higher education institutions approved by ANP. The programs were spread around 16 states, covering several areas of knowledge of interest and relevance to the oil and gas sector, with emphasis on Engineering (Chemical, Mechanical, Metallurgical and Materials), Geosciences (Geology and Geophysics), Law, Economics, Mathematics and Chemistry. The program lost relevance after 2014 (see section “PRH-ANP – Dwindling Capacity Building” below), and as of September 2018, there are only 5 active programs in the country.

Figure 1. Map of Convened Institutions in 2014
Source: ANP (2014)
PRH-ANP – Grants

The PRH–ANP grants were:
- Scholarships;
- Bench Fees, which consist of financial support for program expenditures that are not related to scholarship fees, such as the acquisition of materials for research, books, periodicals, study travel and participation in seminars.

The PRH-ANP offered **six types of scholarship**: Undergraduate, Masters, Doctorate (DSc I and DSc II), Coordination and Visiting Researcher. The Visiting Researcher played an important role in the program. The VR brought experience and practical knowledge from many years in the industry to assist the students in the Research Papers.

The Management Committees from convening institutions set the **scholarship selection** requirements and managed the scholarships and bench fee resources following ANP’s criteria. The number of scholarships available were limited by ANP according to the programs run at convened institutions. Each academic program coordinator launched a selective process to applicants at the convening institutions, detailing the amount of scholarships available, the evaluation process and requirements from applicants.

The applicant / scholarship recipient had to comply with the selection requirements and the efficiency requirements from the convening institution, as well as with a set of conditions established by ANP.

PRH-ANP – Funding

Financial resources for PRH-ANP have come from the MCTI, via the Sector Fund CT-Petro (National Plan of Science and Technology of the Oil and Natural Gas Industry) and from the compensations established in the Research, Development and Innovation (RD&I) Clause in the Concession Contracts for the exploration and production of oil and natural gas.

CT-Petro was one of the 16 Sector Funds managed by FINEP, which is the Funding Authority for Research and Projects – an organization under the MCTI devoted to the funding of science, technology, research, development and innovation projects in companies, universities, technology institutes, and other public and private institutions. The Sector Funds were created to provide complementary source of funds to finance the development of strategic sectors for the country. At the time of their implementation, the Sector Funds were the main government instrument to boost science, technology and innovation in Brazil, fostering industrial development and linking the academia and research centers to the productive sector.

CT-Petro was created in 1999 with set objectives to foster innovation in the oil and gas productive chain, promote the qualification of human resources, and support the development of projects through partnerships between companies, universities and research centers across the country. It appealed to universities and research centers of
private, public and non-profit nature. The projects that received financing from CT-Petro were usually selected through public calls.

CT-Petro was managed by a Management Committee headed by a member from the MCTI and comprised of representatives from other ministries, regulatory agencies, business and academic sectors, and FINEP. The Committee decided on the guidelines, project selection and investment plans for the Sector Fund.

CT Petro Funding: 25% of Royalties that exceed the 5% aliquot on production from producing fields -

The Research, Development and Innovation Clause has been another source of funding for the PRH-ANP program. It is a mandatory contractual clause found in all Exploration and Production Contracts under the 3 different regimes in place: Concession, Production Sharing and Onerous Transfer of Rights. The purpose of the clause is to support scientific research and adopt new technologies that will be beneficial to the sector and to the country, according to the responsibilities attributed to ANP (Law n° 9.478/1997).

In the events of fields generating substantial production volumes or high profitability, the concessionaire shall pay the Federal Government an additional compensation, which is the Special Participation. This compensation is measured and paid quarterly, and the value might vary between 10% to 40% of the field’s net income.

ANP is responsible for analyzing, approving, monitoring and inspecting whether the resources are correctly applied according to the terms set in the RD&I clause.

The table below summarizes the RD&I requirements from each contractual regime in place in the Brazilian upstream sector:

<table>
<thead>
<tr>
<th>Contract Type</th>
<th>RD&amp;I Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concession</td>
<td>1% of gross revenue from Special Participation fields</td>
</tr>
<tr>
<td>Production Sharing Agreement</td>
<td>1% of gross annual revenue from the field</td>
</tr>
<tr>
<td>Onerous Transfer of Rights</td>
<td>0.5% of gross annual revenue from the field</td>
</tr>
</tbody>
</table>

The allocation of resources can vary according to the fiscal regime in place, but in general, resources must be allocated to universities and R&D institutions accredited by ANP for the implementation of projects approved by ANP, or to R&D projects chosen by the concessionaire or consortium companies, provided they are located in Brazil. Since the values and percentage of allocations are interchangeable, and there were several projects approved by ANP beyond the PRH-ANP domain, it has been difficult to establish a definite percentage or allocation that went to PRH-ANP projects.
The COMTEC (Technical Scientific Committee) manages the implementation of the RD&I Clause. COMTEC establishes the guidelines for the allocation of resources from the contractual clause, as well as approval to projects seeking RD&I clause investment. The committee is headed by ANP’s General Director and comprised of 6 other representatives: 2 from ANP, 2 representatives from the industry, and 2 representatives from the academia.

**PRH-ANP – Amounts Invested**

From 1999 until 2015, over R$ 378 million (US$ 121 million) have been invested in the program. The following table breaks out the various investments and their corresponding programs.

![Table 1](image)

Table 1. Amounts Invested in the PRH-Program
Source: ANP (2015)
PRH-ANP – Achievements and Milestones throughout the years

The program has awarded over 8,000 scholarships since its inception. The overwhelming majority of scholarships were awarded with funding from the sector fund CTPetro, and the rest of the scholarships were funded by compensations derived from the RD&I Clause in the Concession Contracts for the exploration and production of oil and natural gas.

More than half of the scholarships were designated to Graduate programs, and 38% of them designated to Postgraduate programs. Until 2004, PRH-ANPP also awarded scholarships for technical education courses, the PRH-ANP/MEC program.

![Scholarships Awarded](image)

Figure 3. Scholarships Awarded  
Source: ANP (2017)

<table>
<thead>
<tr>
<th>Scholarships Awarded (CTPetro + R, D &amp; I Investment Clause)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ANO</strong></td>
<td><strong>TEC</strong></td>
</tr>
<tr>
<td>1999</td>
<td>0</td>
</tr>
<tr>
<td>2000</td>
<td>0</td>
</tr>
<tr>
<td>2001</td>
<td>672</td>
</tr>
<tr>
<td>2002</td>
<td>0</td>
</tr>
<tr>
<td>2003</td>
<td>141</td>
</tr>
<tr>
<td>2004</td>
<td>0</td>
</tr>
<tr>
<td>2005</td>
<td>0</td>
</tr>
<tr>
<td>2006</td>
<td>0</td>
</tr>
<tr>
<td>2007</td>
<td>0</td>
</tr>
<tr>
<td>2008</td>
<td>0</td>
</tr>
<tr>
<td>2009</td>
<td>0</td>
</tr>
<tr>
<td>2010</td>
<td>0</td>
</tr>
<tr>
<td>2011</td>
<td>0</td>
</tr>
<tr>
<td>2012</td>
<td>0</td>
</tr>
<tr>
<td>2013</td>
<td>0</td>
</tr>
<tr>
<td>2014</td>
<td>0</td>
</tr>
<tr>
<td>2015</td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>813</td>
</tr>
</tbody>
</table>
Another relevant achievement is the employment rate, that stands around 87%. This attests to the success of the program via the industry’s recognition and the contribution that the PRH gives to the sector development.

**PRH-ANP – Dwindling Capacity Building**

The most obvious challenge that has emerged for continued implementation and success of PRH-ANP is funding. By the end of 2014, the CT-PETRO fund ceased to exist and its capital was integrated to the Pre-Salt Social Fund. Since then, the PRH program has been gradually losing its main sponsor and funding source. An alternative funding solution has been the PFRH – Petrobras’ Human Re-sources Training Program. PFRH is run by Petrobras in direct partnership with educational institutes, offering a similar concept of scholarships to students enrolled at courses linked to the oil & gas industry.

As lack of funding turned into a major issue, the institutions have been unable to maintain the scholarships. UFRJ from Rio de Janeiro, the most prolific institution in the program, that used to count 30 students on scholarships, currently only has 3 scholarship recipients. Thus, there is an unfortunate trend line that points to the program possibly shrinking further in the future.

The lack of funds may also impact the number of participating institutions. As of September 2018, there are only 5 active programs in the country, as shown in the following figures.

Figure 4. Map of Convened Institutions in 2018
Source: ANP (2018)
PRH-ANP – Conclusions

The PRH has been a fundamentally sound policy that brought benefits to the sector. As shown earlier in this paper, the amount of scholarships awarded and high employment rates of former scholarship recipients in the industry attested to the success of the program. The PRH has been considered a positive cost benefit program, as it required relative low expenditure to implement and yielded large returns.

Among the benefits listed, associated institutions praised the program’s ability to engage academic disciplines that addressed the industry’s needs. Moreover, these specific disciplines have been beneficial not only to scholarship recipients directly involved in the program, but also to regular students from accredited institutions that could either attend classes as part of their own graduate schedule or attend lectures from prestigious Visiting Researchers. Below there are some of the specific disciplines engaged by the institutions due to the PRH program: Petroleum Engineering, Geology for non-geologists, Petroleum Economics, Petroleum History among others.

Furthermore, the academic and scientific communities also praised the exchanges generated by the PRH. The Annual PRH Meetings created several opportunities for different institutions and different disciplines to exchange information with each other; created interactions between universities, faculty and students; between academia, research & technology centres and the productive sector. These exchanges benefited the Brazilian society, both at academic and industry level, as it created shared knowledge between subjects that did not have much interaction prior to the establishment of the program. It is also important to stress that these academic liaisons can be considered an unexpected by-product of the PRH as they were not originally expected when the program was conceived.

Finally, the PRH program has also triggered an entrepreneurial vision amongst students and technology centres. ANP conducted annual evaluations of institutions and courses based on performance indicators. One of them was entrepreneurship, which represented the development of projects, products or companies, headed by students, that interacted with the market. Most of these micro companies were start-up incubators related to research and development. The existence of these independent micro companies have fostered domestic technological innovation in the market. In principle, these start-ups are important players in the process, working together with large companies and research centres to improve the national technology park.

Despite the positive impact of the PRH program in the Brazilian oil and gas industry, its execution has not always been seamless and smooth. There have been setbacks along the way and some of the original ideas did not succeed as intended. Indeed, funding has been a major problem and it has strongly hindered the institutions’ ability of retaining scholarships.

As explained earlier in this paper, funding came from two sources: Sector Fund CT-Petro, and the RD&I Clause in Concession Contracts. Since 2015, funding from CT-Petro
has practically come to a halt. CT-Petro funding came from royalty payments, which are associated to oil prices. Given that oil prices were consistently lower in the mid-2010s from the high levels of $80-100/barrel sustained during the first decade of the century, the resources available became sparser. Add in the economic turmoil the country has faced over the last years and political decisions that have influenced the allocation of resources. Thus, CT-Petro funding was no longer an urgent necessity according to the political agenda.

CT-Petro was the main financial sponsor of the program. The lack of available funds greatly impacted the program. At COPPE/UFRJ, the Postgraduate Engineering institute from the Federal University of Rio de Janeiro and one of the leading institutions associated with the PRH program, the amount of scholarships granted to students dropped from 30 to 3 over the last few years.

An alternative solution to convening institution has been the PFRH – Petrobras’ Human Resources Training Program. It is run by Petrobras in direct partnership with educational institutes, offering a similar concept of scholarships to students enrolled at courses linked to the oil & gas industry. Between 2013 and 2014, Petrobras was authorized to invest R$ 23 million (source: ANP) in the PRH program. It has offered a new breath to some of the institutions, but it is not considered a long-term replacement.

Another funding issue affecting the program relates to the RD&I Clause. Operators have the right to choose the programs from which they will charge their compensation value. Hence, the Human Resources area does not have guaranteed funding, as operators might choose to employ their resources in other areas. ANP has tried to stimulate more involvement from operators that pay Special Payment compensation into projects directly related to building human resources.

Another criticism relates to employment rates experienced by the program. Even though the high employment rate of scholarship recipients in the industry is a positive factor, the majority of them tended to go to the major companies – operators and service companies. This concentration left a lack of supply of professionals to work for the medium and small independent companies. The lack of the development of an independent midsize E&P market is a concern in the domestic industry, and the lack of suitable human resources is one of the issues. The PRH-ANP program could also provide stimulus to develop this submarket that is crucial to a healthy oil and gas sector.

Similarly, there was a concentration of equivalent courses run by the participating institutions across the country. This paper understands that the PRH-ANP program could also provide support to tackle specific issues faced by the industry and improve its efficiency. For instance, on top of the oil-related subjects available to scholarship recipients, the program could also invest in training in specific industry needs, such as EOR (Enhanced Oil Recovery) techniques, Reservoir Characterization and Decommissioning. These are strategic topics constantly discussed by the industry and ones were specialized human resources could help the sector in providing solutions to improve efficiency.
Overall, the program has a few shortcomings and the operation of certain aspects did not go as well as the original plan. However, the concept, execution and industry approval have been deemed extremely successful by a wide range of stakeholders. The program has graduated thousands of professionals and placed them in the market, was extremely relevant filling a supply gap of local geologists and geophysicists in the first half of the 2000s, and created a profitable interaction between companies, students and research centres. It thus has met the objective and government’s goal of successfully developing professionals for the Brazilian oil and gas market while enhancing domestic industry capacity.

The Institute of the Americas’ Energy & Sustainability Program works to foster a deeper understanding of the Western Hemisphere’s most critical energy and sustainability issues. For more information and upcoming events, follow us on Twitter @IOA_Energy or visit www.instituteoftheamericas.org/energy.