CO_2 as a Driver for EOR Projects in Mexico Based on Carbon Capture, Use and Storage (CCUS).

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Pemex Exploración y Producción

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CCS-EOR Project
Goal

The General Law on Climate Change has established several national measures to mitigate the effects of climate change. Mexico's main goal is to **reduce greenhouse gases emissions** by implementing **Carbon, Capture, Use and Storage (CCUS) technologies**.

CCUS Objectives:

- ✓Reduce CO_2 emissions
- ✓CO_2 storage in mature oil reservoirs
- ✓Increase the recovery factor of mature oil reservoirs
- ✓Get more oil reserves
- ✓Use of CO_2 as an EOR process in Mexico
- ✓Mutual collaboration with other areas in Mexico

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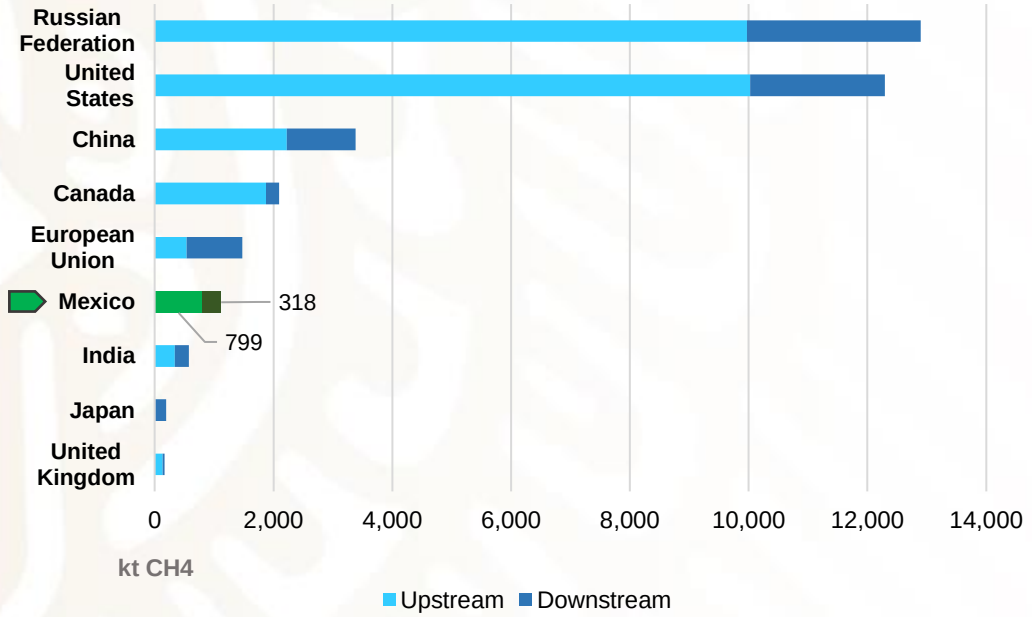
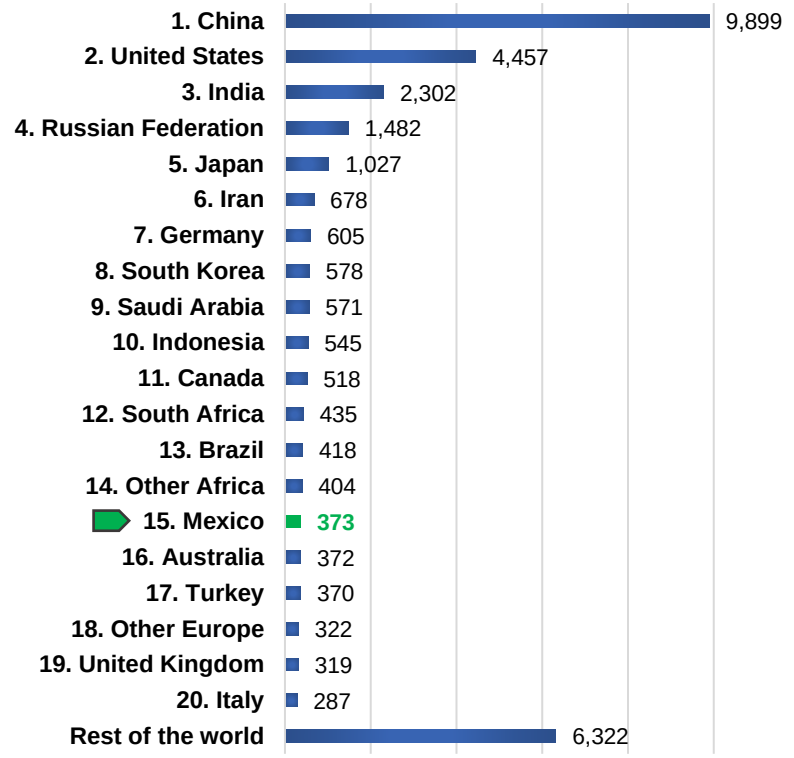
CCS-EOR Project
Overview.- Worldwide

Oil and gas methane emissions in selected countries by sector, 2020



Carbon dioxide emissions, 2020
(Million tonnes of CO_2)



❖ **Mexico generates 799 kt of CH4** from upstream operations and **318 kt** from downstream processes*

❖ **Mexico ranks 15th** in carbon dioxide emissions with **373 millon tonnes****

* The case for regulating downstream methane emissions from oil and gas, International Energy Agency, September 2021
** Statistical Review of World Energy 2021, 70th Edition, BP

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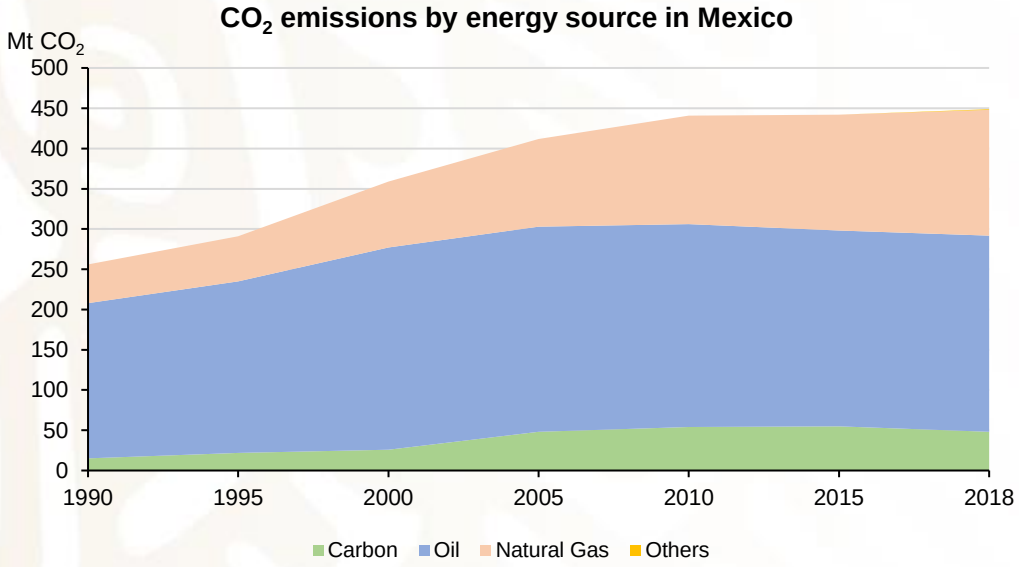
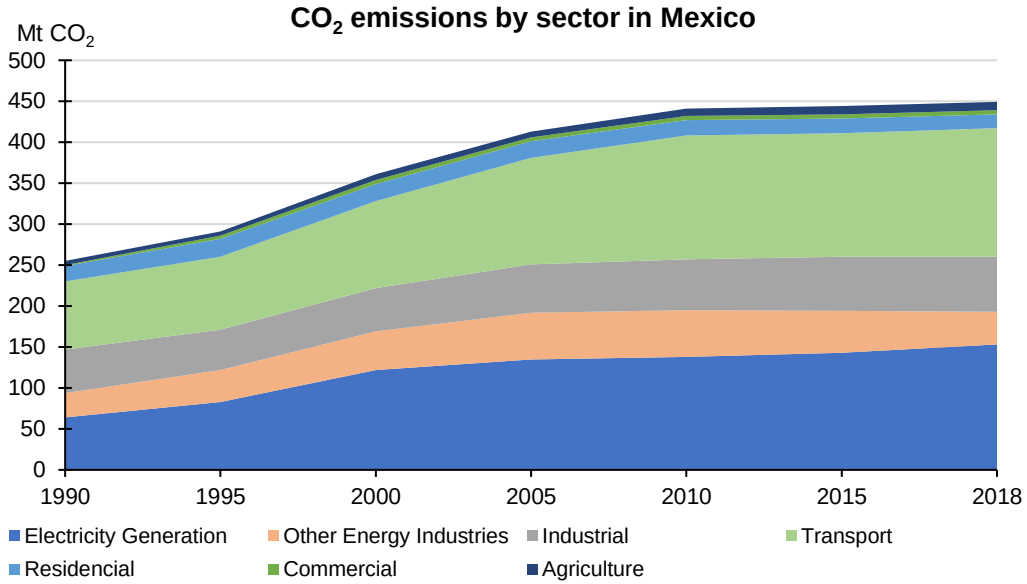
CCS-EOR Project
Overview.- Mexico





- The **main CO_2 emissions sources by sector are oil and natural gas**. Over time, a trend of increasing CO_2 emissions is observed*
- The sector with the highest CO_2 emissions is transport, representing **35% of total emissions in 2018**, followed by the electricity generation sector with 34%*

*International Energy Agency

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CCS-EOR Project
Background

2008

Mexican Government starts actions to implement processes of Carbon Capture, Use and Storage (CCUS)

2010

Project RoadMap (PR) definition

Organization of the main participants in the CCUS project **(SENER, PEMEX, SEMARNAT, CFE)**

2013

Feasibility study

CCUS in Mexico analysis

2014

SENER defines Project Roadmap establishing 6 main steps

PEP gathers a team to fulfil the task

IMP performs laboratory studies and diagnoses the available pipelines to transport CO_2 from Petrochemical Plant Cosoleacaque (PPC) to Brillante oil field

2015

PEMEX signs "Joint Statement of Collaboration" among 10 oil companies in the Oil and Gas Climate Initiative (OGCI)

New Energy and Industrial Technology Development Organization (NEDO) conducts a feasibility study of CCS-EOR Projects in the South of Mexico

Mitsubishi Research Institute (MRI) and **Toyo** perform a feasibility study of CCS in Brillante oil field

2016

PEMEX/INPEX built a compositional simulation model for Brillante oil field

PEMEX-MITSUI sign an agreement for corrosion studies on wells and facilities during CO_2 injection

2017

World Bank supports Huff & Puff pilot test

SENER, PEMEX and World Bank strongly promote the proposal of the Huff & Puff pilot test

2018

PEMEX/INPEX-JOGMEC Signed a memorandum of understanding (MoU) that allow the cooperation to exchange technical knowledge and experiences without financial obligations

2022

PEMEX/INPEX-JOGMEC Started procedures to renew the MoU

Start

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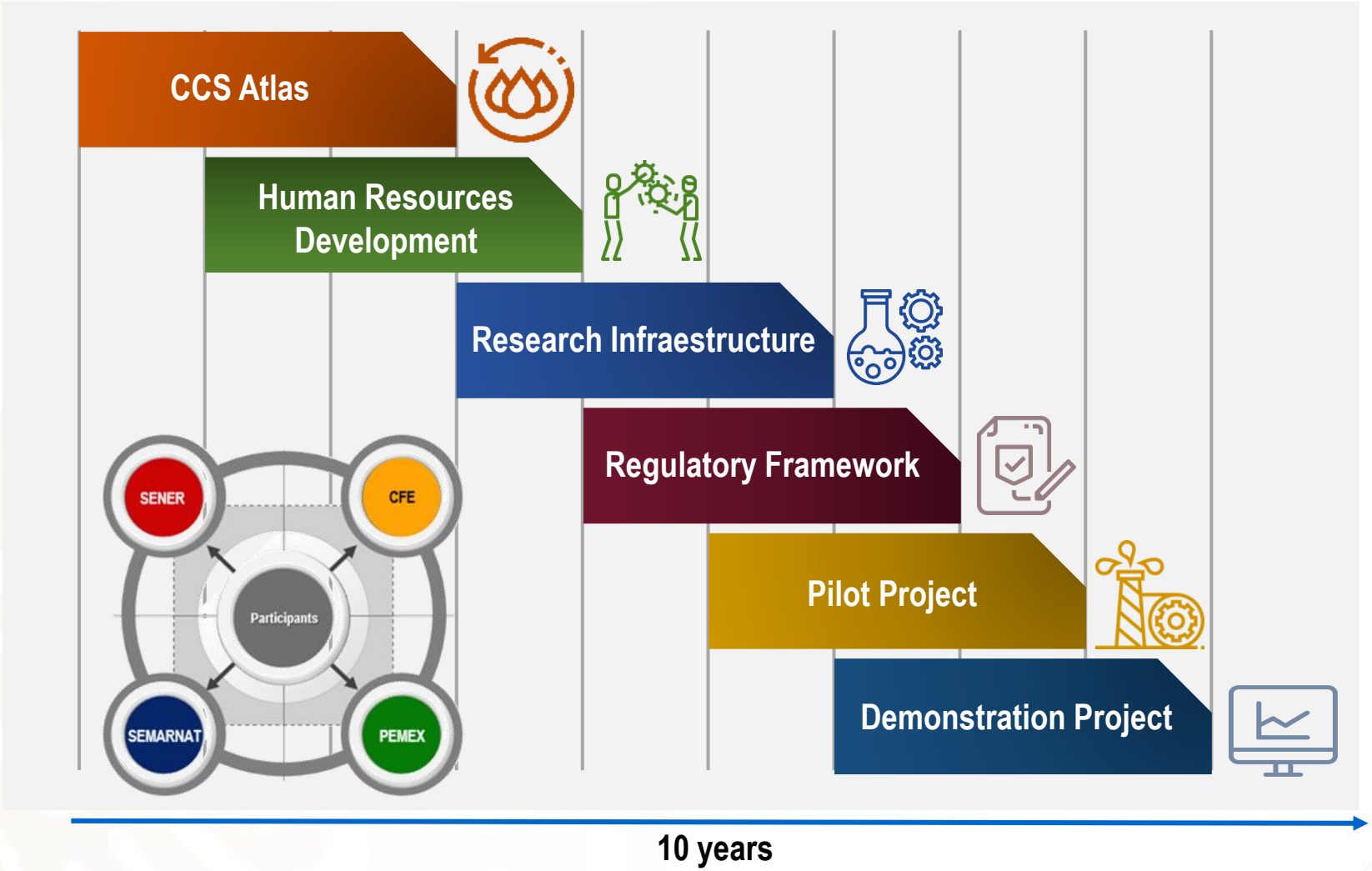
CCS-EOR Project
Project Roadmap of CCUS in Mexico



* Geologic CO_2 Storage Atlas. Secretary of Energy-CFE, 2014

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CCS-EOR Project
CO_2 Opportunities for EOR

- **24 potential reservoirs to obtain 774 MMb** of oil by CO_2 injection
- **9.2 Tcf** of CO_2 storage resource
- Additionally, there is an **opportunity to store around 160 Tcf** of CO_2 storage resource

PP: Petrochemical Plant - TP:Thermoelectric Plant - OR:Oil Refinery - GP:Gas Plant

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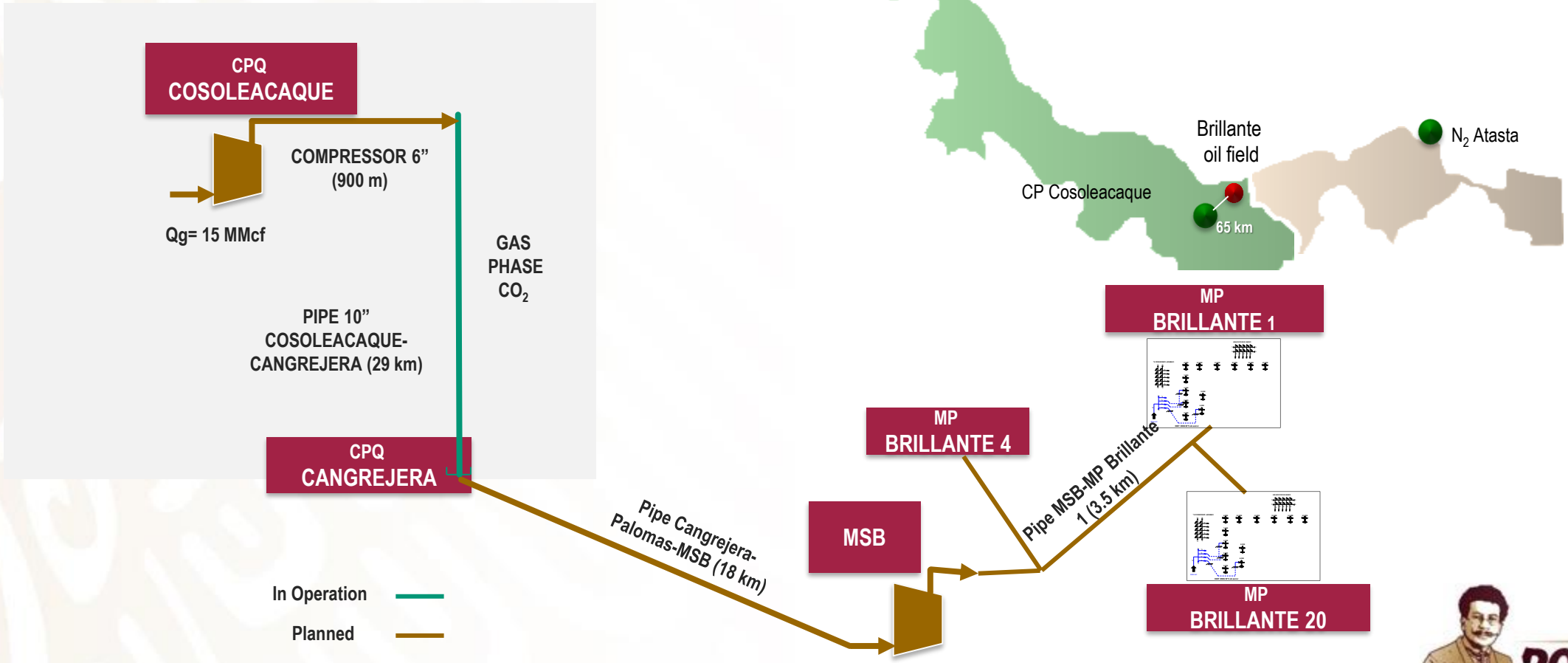
CCS-EOR Project
Potential Candidate

CP Cosoleacaque-CP Cangrejera-MS Brillante-MP Brillante 1



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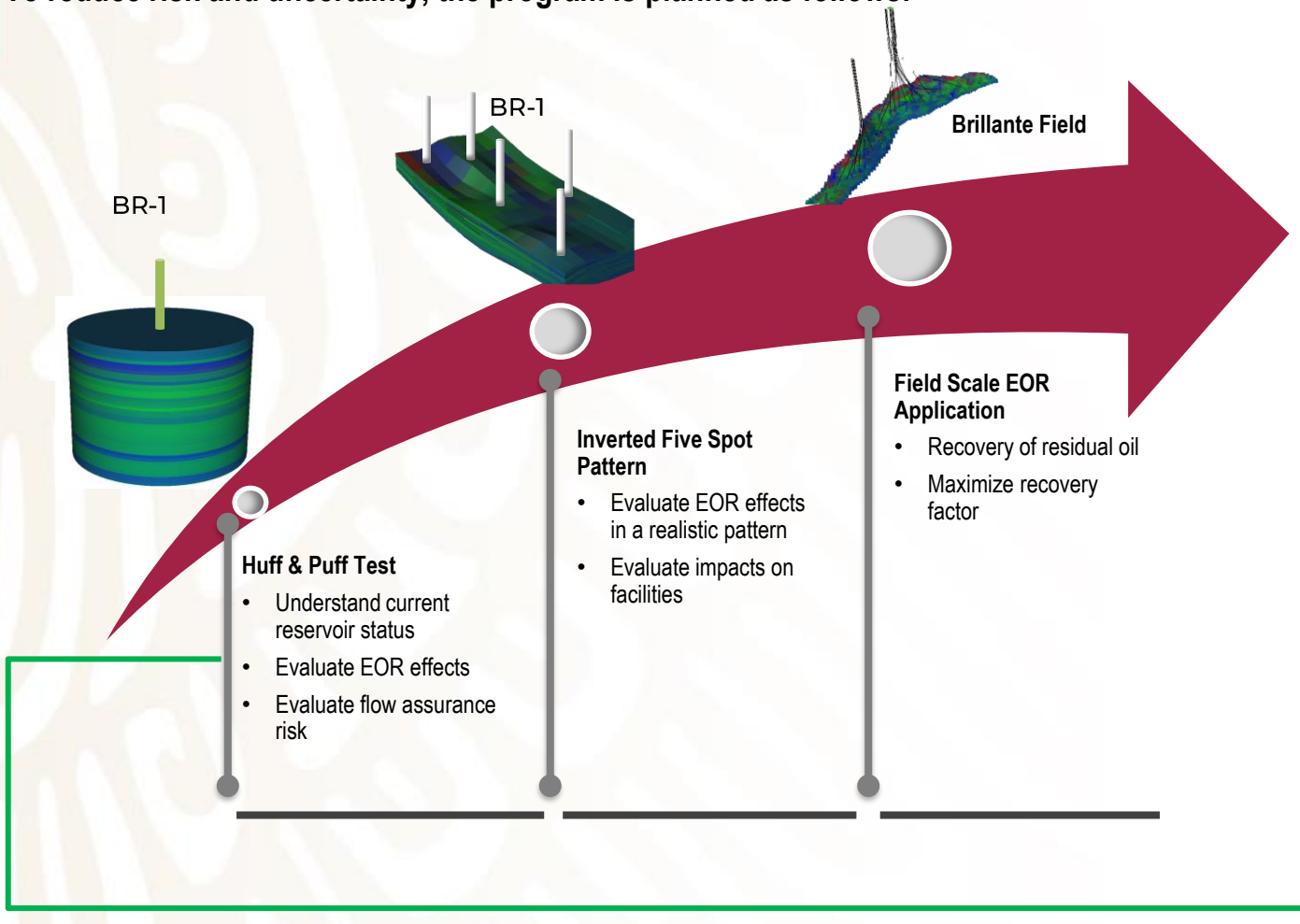
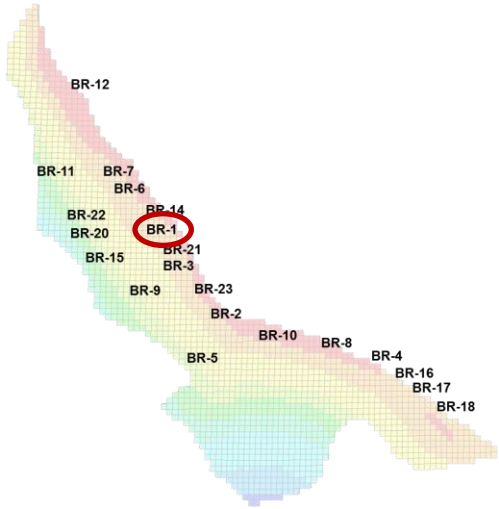
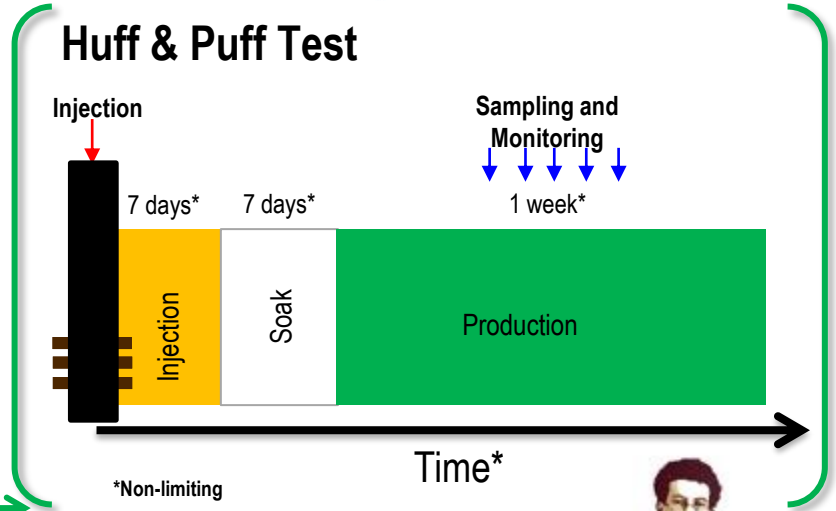
CCS-EOR Project
Pilot Test to Field Scale

To reduce risk and uncertainty, the program is planned as follows:







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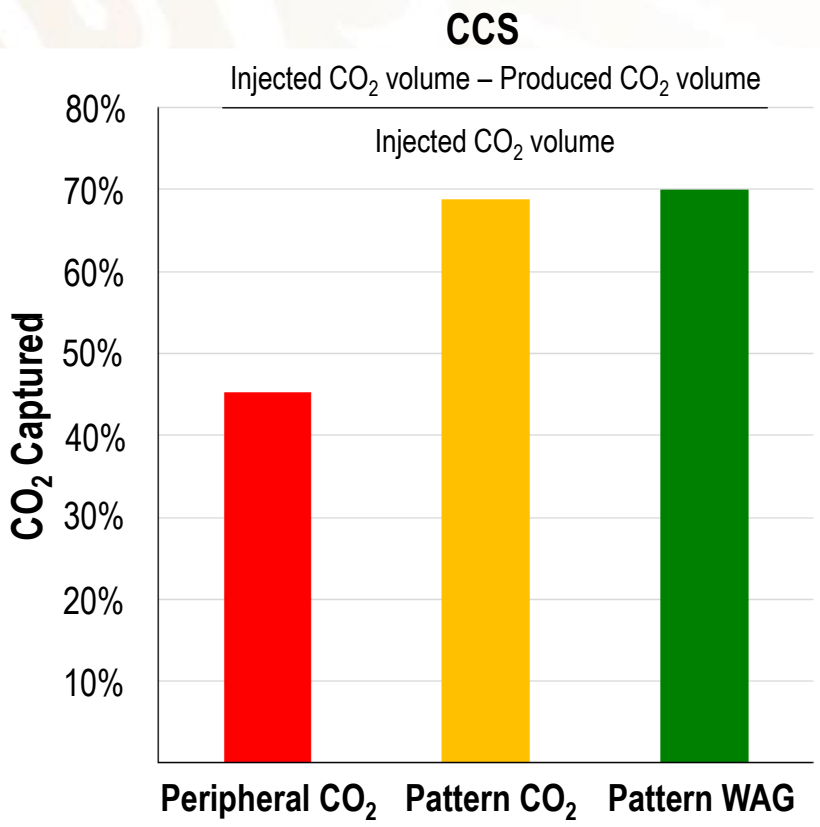
CCS-EOR Project
Field Development



~70 % of injected CO_2 is stored in the reservoir

Next Steps

- **Mexico is committed to reducing 50% of greenhouse gas** emissions by 2050, which 19% of must come from Carbon Capture and Sequestration (CCS) technologies.
- Mexican government is implementing policies to **generate electricity by clean energies (solar and wind).**
- Mexico has **boosted the use of public transportation** to reduce the use of particular vehicles. Moreover, since 2015, the **increasing use of hybrid electric vehicles in metropolises** has promoted GHC reduction.
- **Pemex** is strongly committed to reducing GHG emissions. Therefore, it will continue the following activities: **analysis of carbon markets** (short, medium and long term), **analysis of potential fields to apply CO_2** as an EOR method and **documentation of CCUS strategy**.
- Implementation of the first **CCS-EOR pilot test in Brillante oil field.**
- Continue with the **linkages with International Organizations of Science and Technology** at CCUS to acquire knowledge about CCUS technology.

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THANKS

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