

R&D opportunities in Brazil

October, 2020



Net zero emissions

First company in energy sector to set the goal of reaching net zero emissions by 2050



Global company

Integrated energy company, we market our products in over 90 countries



Oil & gas

2,139 billion barrels of oil equivalent
709,000 barrels of oil equivalent/day



01

Levy fund and preferred arrangement



➤ How much?

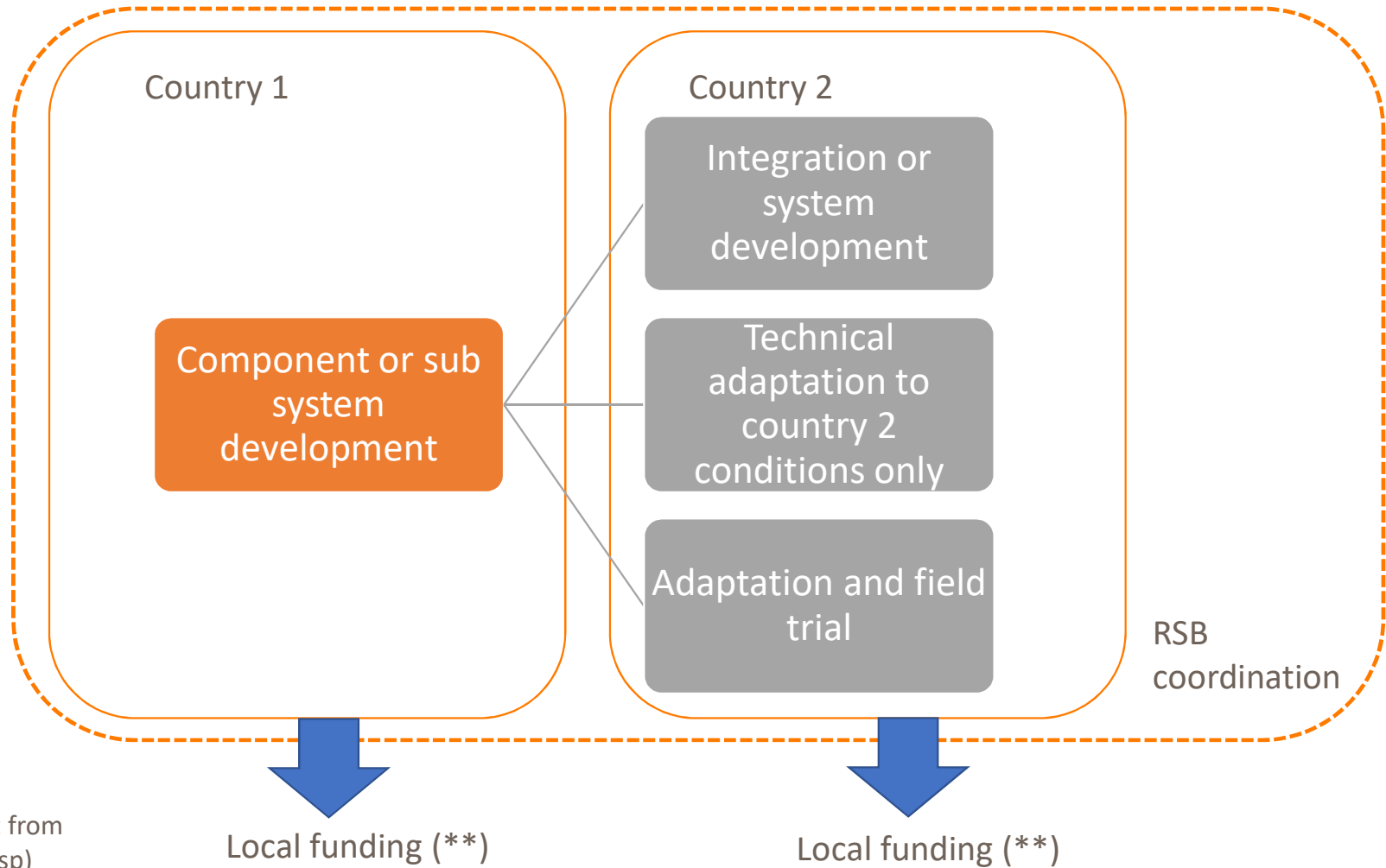
In general, 1% of
gross production
revenue

➤ Where?

Operators, tech companies
and accredited institutions
(universities and research
institutes) based in Brazil

Law nº 9.478, de 06/08/1997, established, among others, the responsibility for the National Petroleum Agency (ANP), to stimulate the research activities and the adoption of new technologies by the sector

Expected arrangement for multi countries R&DI projects(*)

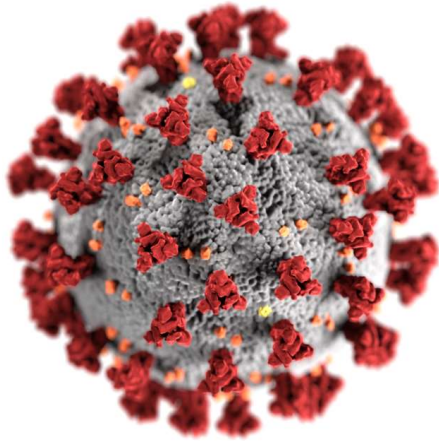


(*) Qualification not allowed
 (**) Possibility to have investment from Brazil to abroad (Embrapii or Fapesp)

02

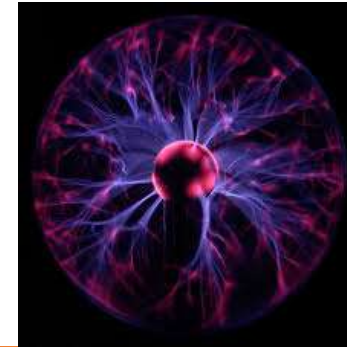
Drilling & Completions





Pandemic ready rigs

Necessity of severe crew reduction, rigs ready for remote operational control (e.g. ROVs), multiskilling crew, IoT, high speed/large bandwidth comms to shore, increase of rig reliability, automation protocol for critical incident protocols (blowout, kicks, etc)



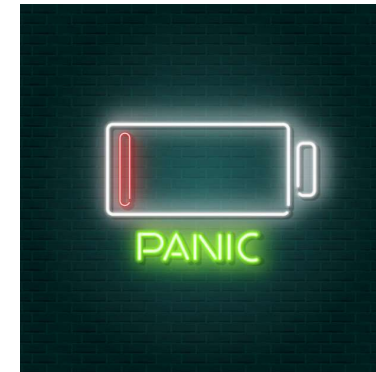
Alternative drilling methods

Plasma drilling, laser, voltaic arc, hyper drill and others (faster ROP, less tripping in and tripping out)



Fewer or simpler interventions

Autonomous robot for well intervention, permanent robots for degradation monitoring, remote downhole welding devices, rigless intervention



Low consumption downhole sensors

+10 yrs battery life, high reliability, autonomous, wireless sensors to monitor well integrity parameters (corrosion level, components fatigue, acidification exposition along the life, etc) or flow assurance growth rate (scale, paraffin, hydrate, etc)

Plug & Abandonment - Challenges

- Streamline P&A execution
- New materials to replace Portland cement
- Solutions to eliminate completion cables around production tubing allowing through tubing cement plug placement (laser, plasma, etc)
- Cement bond through tubing logging
- Salt creeping as a replacement for cement barrier
- Artificial rock to replace Portland cement (time to cure?)
- Wireline/Coil tubing deployable through tubing sensors able to re-characterize rocks after reservoir depletion
- Barrier verification during and after P&A
- Fugitive GHG emission at seabed measurement solutions
- Self abandonable wells



03

Energy transition





Offshore carbon storage

Depleted reservoirs, salt cavern, aquifers; new materials; conversion of existing wells in CCS wells



Carbon utilization

Offshore utilization of CO₂ (synthetic fuels, algae farm, hydrogen production, chemical); circular economy applied to offshore units and support vessels/helicopters



Offshore power generation

Solar, tyde, waste energy utilization, geothermal (existing or new wells). Offshore units electrification, battery recharge station (e.g. support vessels) or shore to grid



Geothermal wells

Solutions to allow high temperature & high depth drilling of geothermal wells (on and offshore wells)

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