

Energy Transition: the role of natural gas

Workshop “Diálogos União Europeia – Brasil: Governança da
Transição Energética – Desafios & Oportunidades

Giovani Machado

Director for Energy Economics and Environmental Studies

Brasília/DF
18 de novembro de 2019

ABOUT EPE

Energy Research Office – EPE

Brazil



www.epe.gov.br



Grade 10

4th Certification of Governance Indicator IG-SEST

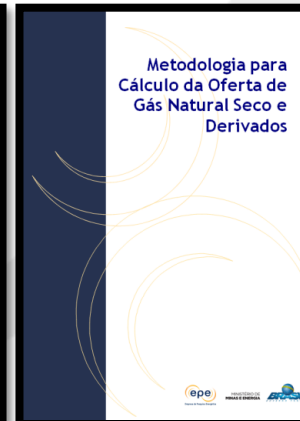
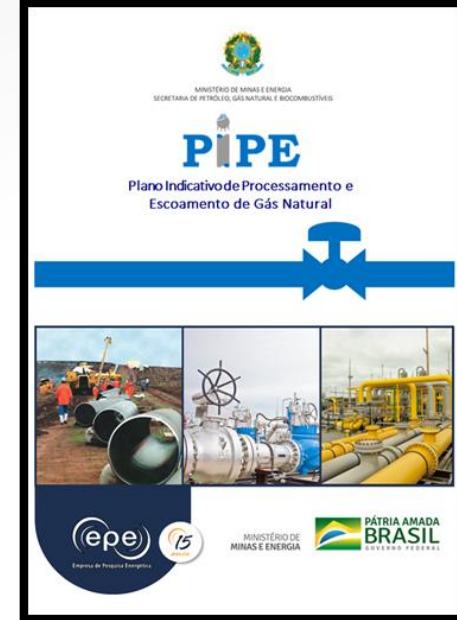
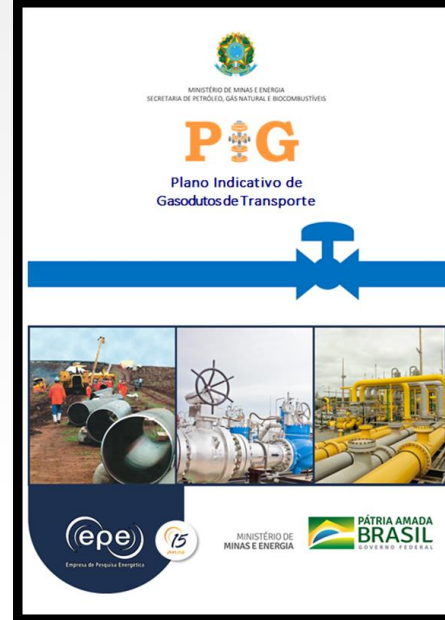
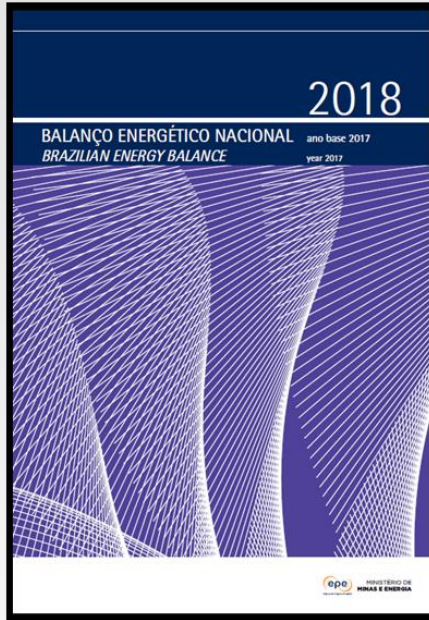


Federal office part of the structure of the Ministry of Mines and Energy
EPE develops studies and data/statistics to support formulation, implementation and evaluation of energy policies, as well as to promote efficient and competitive investments

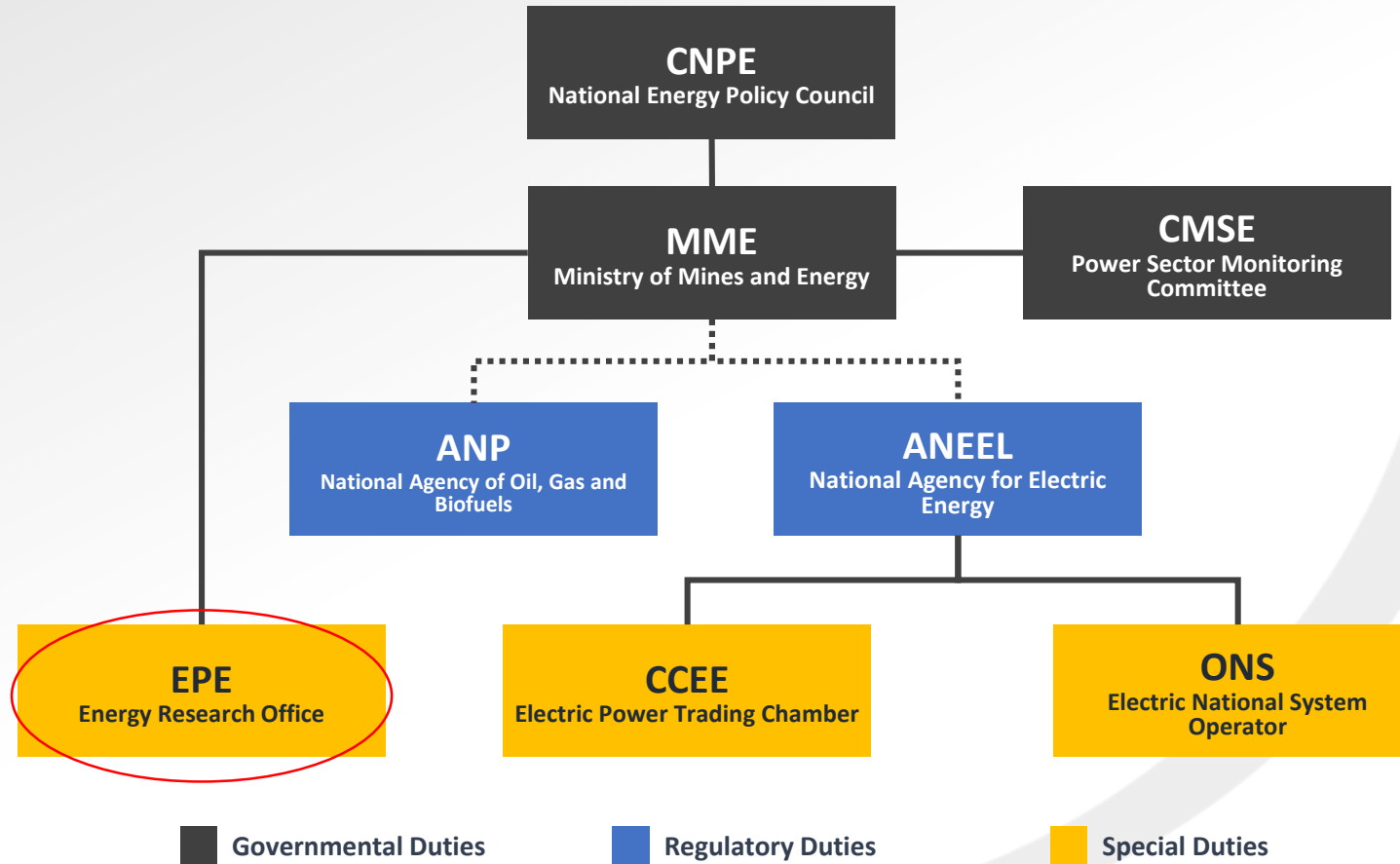


Member of the Board of the National Council for Energy Policy (CNPE)

Products & publications



Institutional arrangements



Webmap EPE: an useful tool

Web Map EPE Sistema de Informações Geográficas do Setor Energético Brasileiro

Encontrar endereço ou lugar

Lista de Camadas

- Camadas Operacionais
 - Sistema Elétrico Planejado
 - Sistema Elétrico Existente
 - Eólicas - Existente
 - Biomassa - Existente
 - PCH - Existente
 - UFV - Existente
 - UHE - Existente
 - UTE - Existente
 - UTN - Existente
 - Linhas de Transmissão - Existente
 - Subestações - Existente
- Biocombustíveis
- Infraestrutura de Combustíveis
 - Instalações de Gás
 - Combustíveis Líquidos

UPGN: Cabiúnas

Nome	Cabiúnas
Município	Macaé
UF	RJ
Proprietário	PETROBRAS
Classificação	Existente
Entrada	2.017,00
Capacidade (milim3d)	15,90
Fonte	Boletim Mensal de Acompanhamento da Indústria de Gás Natural - MME dez 2018

Zoom para

Terminais GNL: Aquá

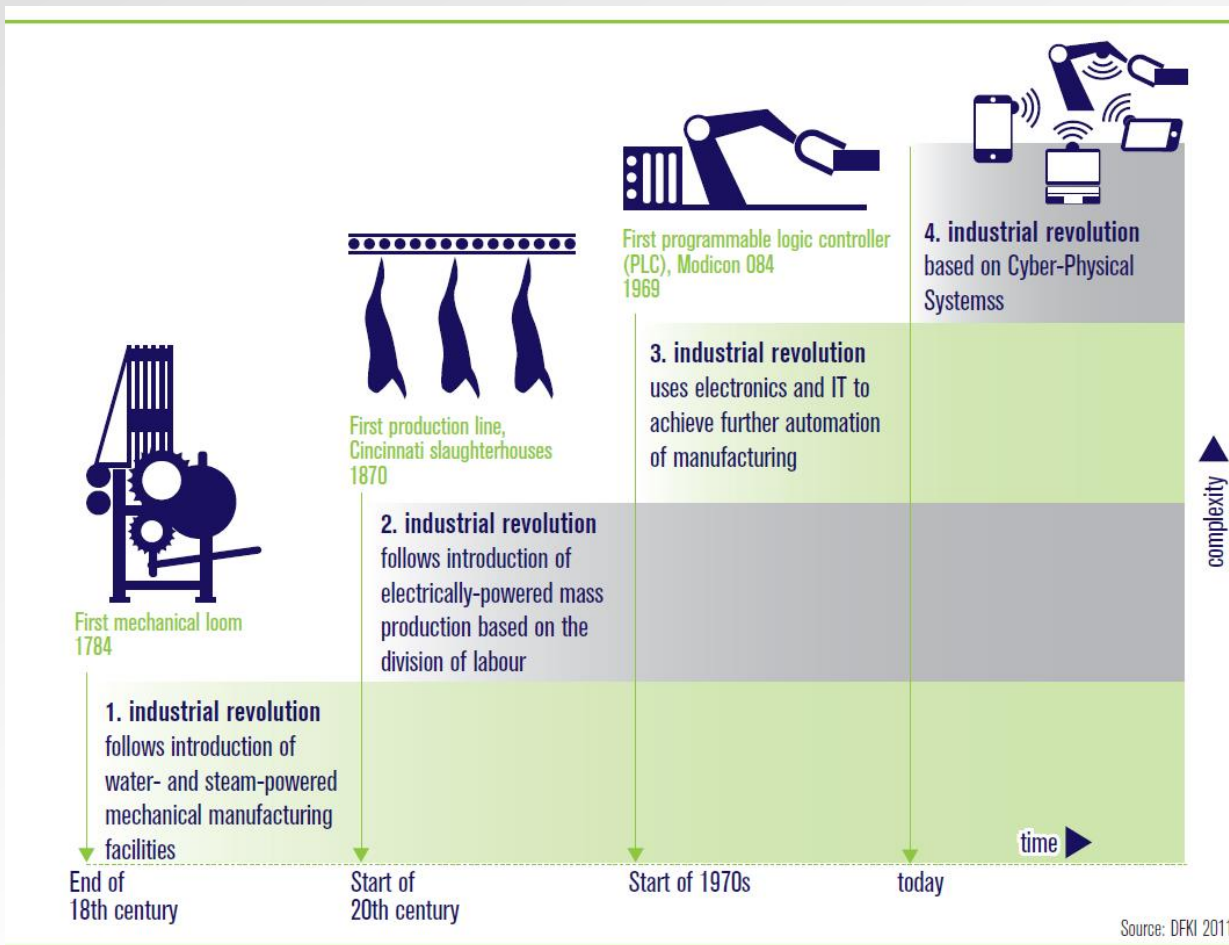
Nome	Aquá
Município	São João da Barra
UF	RJ
Proprietário	GNA
Classificação	Previsto
Arma_m3	
Cap_milim3d	0,00
Fonte	Elaboração EPE

Zoom para

<https://gisepeprd.epe.gov.br/webmapepe/>

ENERGY TRANSITION IN BRAZIL: THE ROLE OF NATURAL GAS

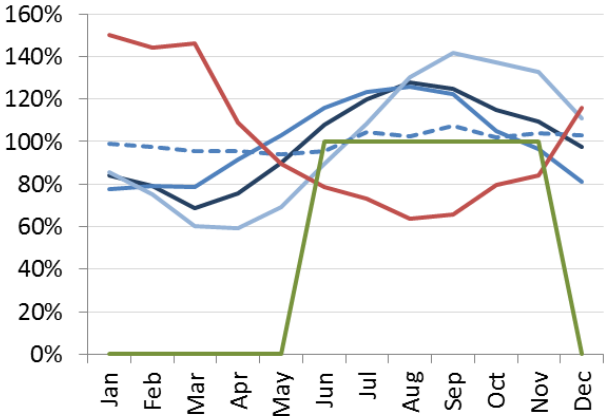
Energy transition is not only about energy...



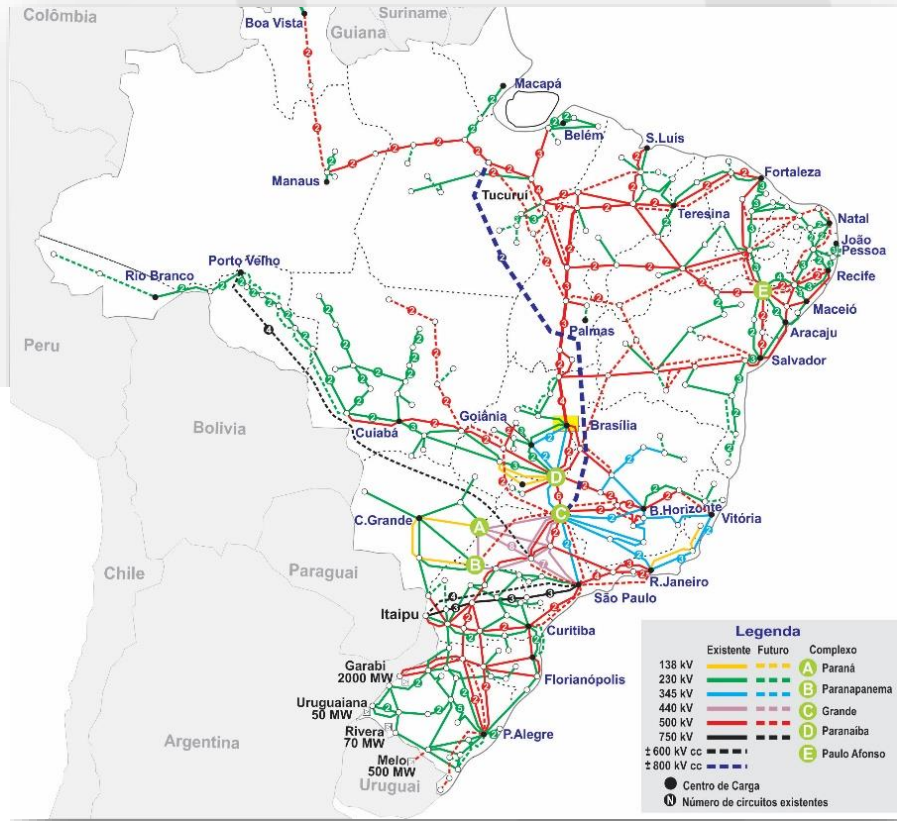
Power Sector: Integration of hydro, solar, wind & biomass



Seasonal generation patterns



- Wind-RN
- Wind-BA
- Wind-CE
- - - Wind-RS
- Hydro
- Biomass



Energy transition: towards low carbon, competitive, decentralized and efficient markets

▶ Increasing role of Distributed Energy Resources



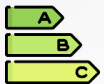
Distributed generation (DG)



Energy storage



Electric vehicles / recharging stations



Energy efficiency



Demand-side management

▶ Massive integration of variable renewables

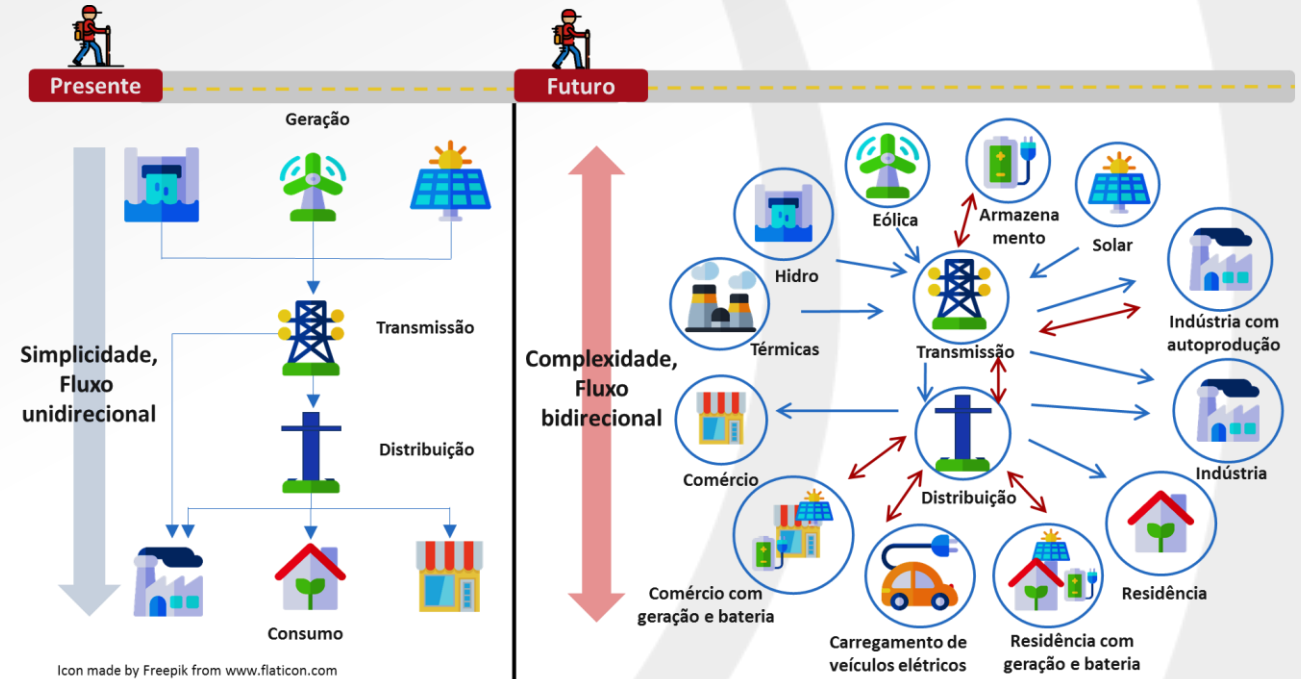
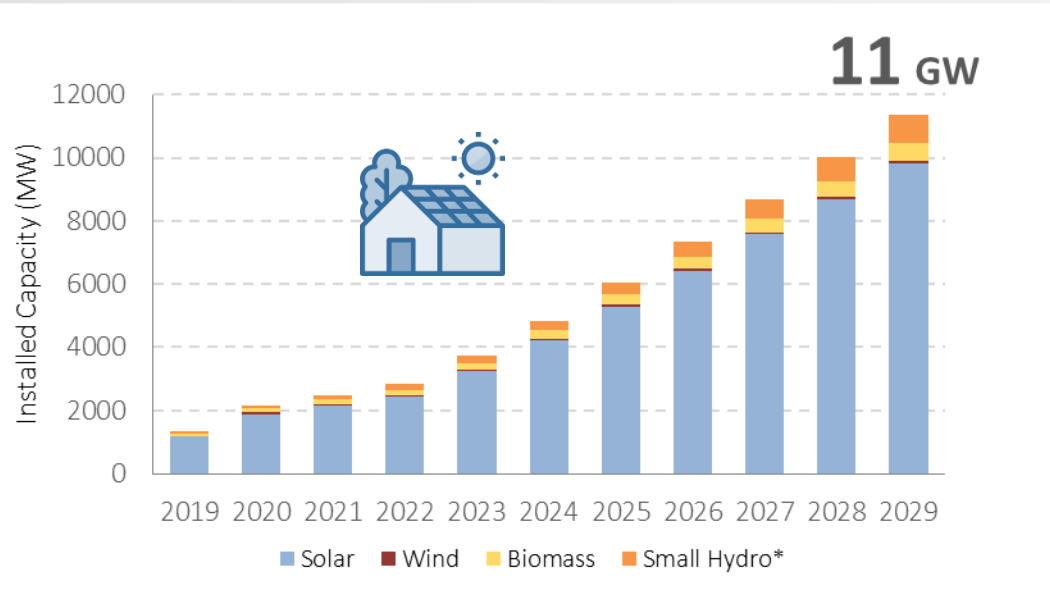
Wind and Solar PV getting cheaper and cheaper...

And driving demand for transmission, storage and flexible generation such as hydro reservoirs and gas-fired power plants

There are opportunities for gas cogeneration too!

The challenge of expansion...

Of a system in change

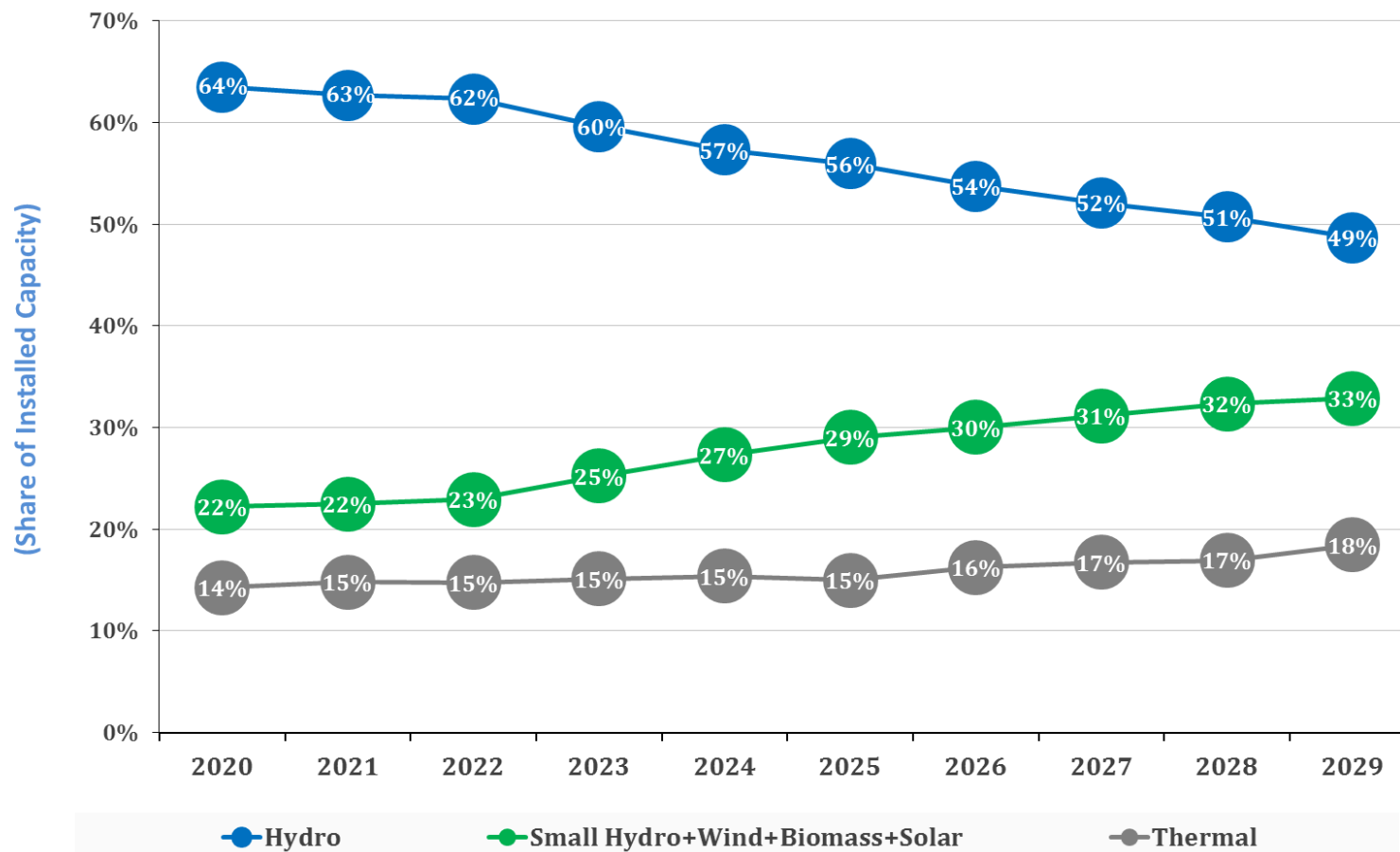


- Tariff components
- Model for micro and mild DER
- DSM, etc...

Already in the agenda:
Planning, Policy and Regulation

The challenge of expansion...

Of a system in change



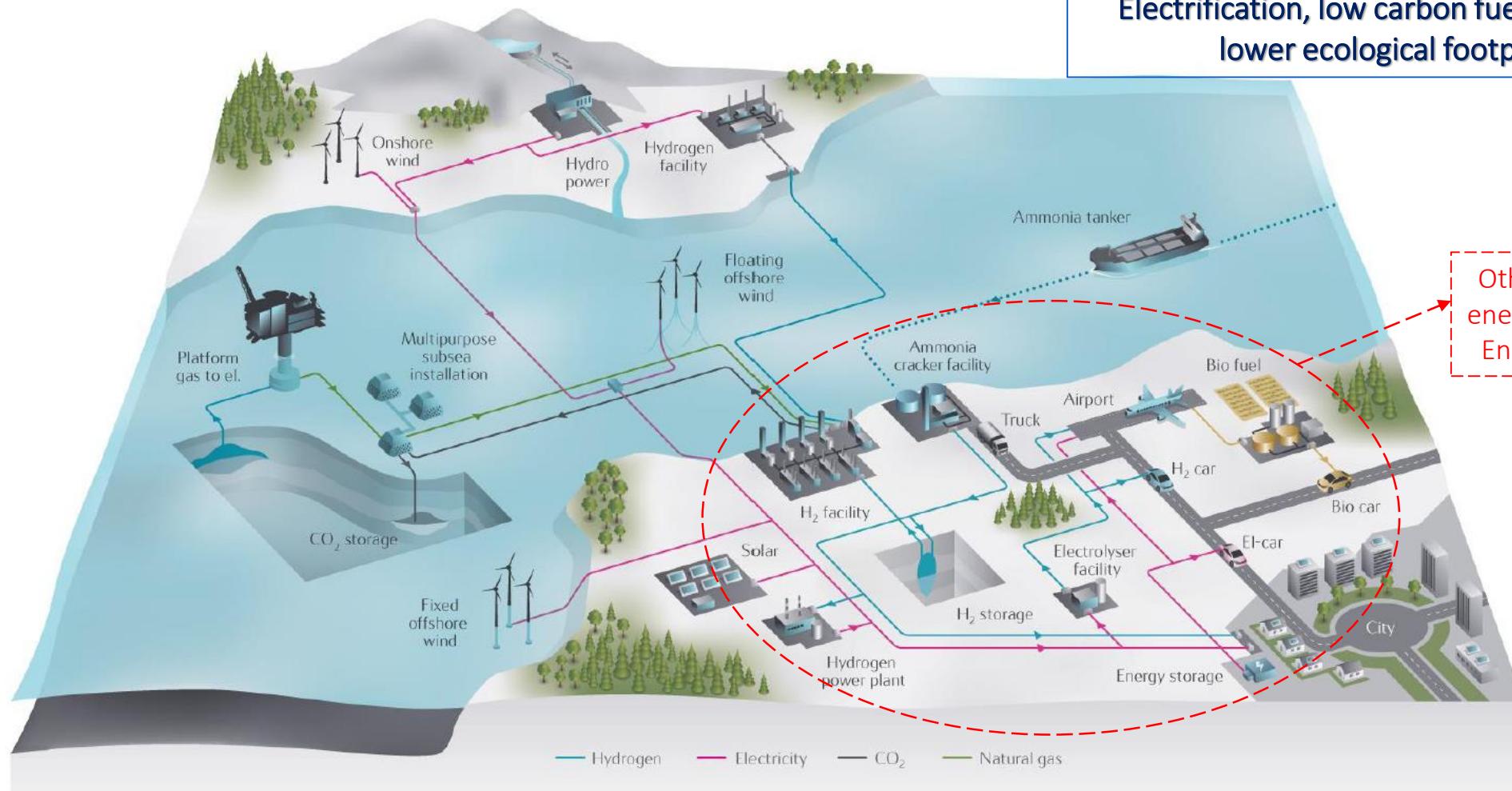
Hydropower
Share decreases,
but its role
changes

Renewables
Increases due to its
economics in a system
approach

Natural Gas
Important to satisfy
demand growth and to
provides reliability

Energy transition is not only about electricity either...

Electrification, low carbon fuels, CCS and lower ecological footprint



Other low carbon energy sources and Energy efficiency

Fonte: Equinor (2018)

Natural gas in transportation

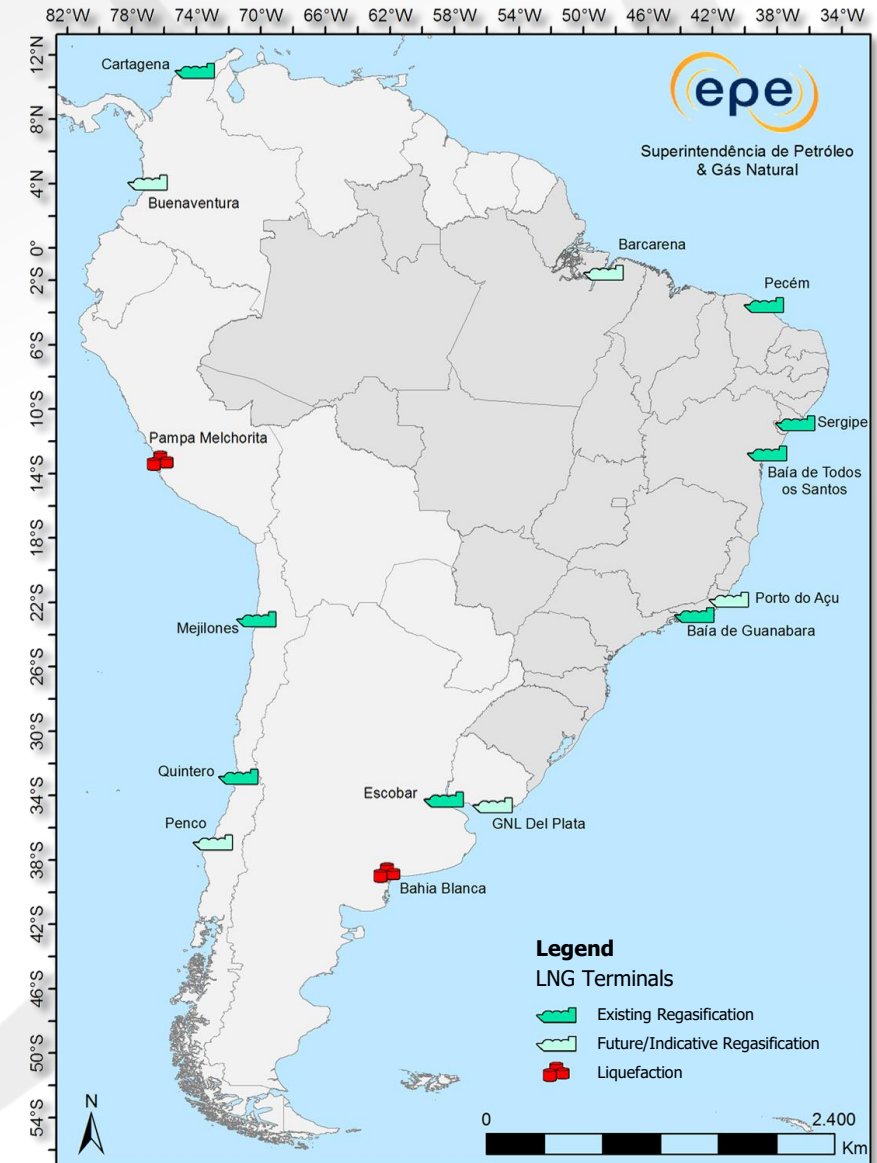
- LNG for Bunker
- LNG for long-haul trucks
 - Running range: 1,100-1,600 km
 - LGN Blue Corridors
 - Up to 15% of energy efficiency gains
 - LNG price savings vs. diesel in Europe: 38% (NE) - 52% (IT)
 - Can be fueled by Bio-LNG (CO₂ emissions reduction of 95%)
- Small Scale LNG for Brazilian gas markets integration
- South America LNG Integration and Optimization



World's largest LNG-powered container ship, Jacques Saadé, in Shanghai (South China Morning Post, 2019).



Shacman LNG truck imported from China: to be tested in Sergipe in december 2019 (Golar Power, 2019).



Liquefaction and Regasification terminals in South America (source: EPE).

Sustainable aviation fuels - SAF

Carbon Offsetting and Reduction Scheme for International Aviation – **CORSIA**
-50% CO₂ na aviação internacional em 2050 (base 2005)

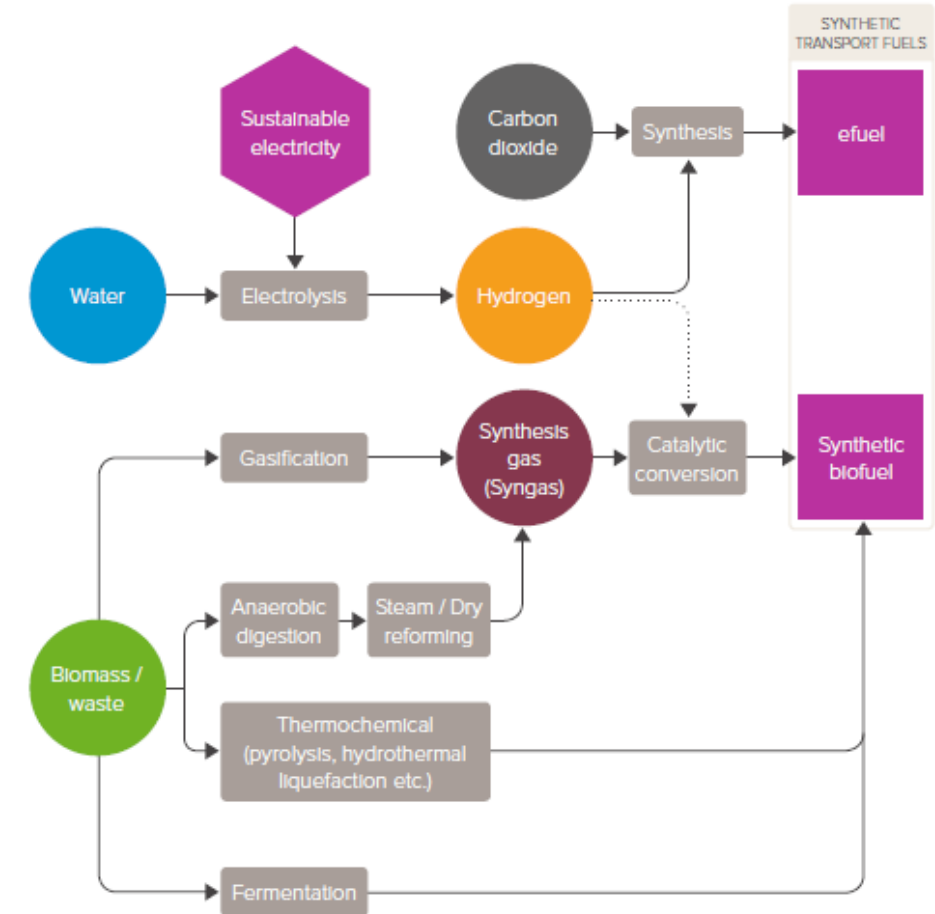


Current technologies, maximum blend allowed and most common feedstocks for drop-in SAFs as defined under standard ASTM D7566

Technology	Maximum blend (%v/v)	Feedstocks
FT & FT-SKA	50	Wastes (MSW, etc.), coal, gas , sawdust
HEFA	50	Vegetable oils: palm, camelina, jatropha, used cooking oil.
SIP (Synthesized Iso-Paraffin)	10	Sugarcane, sugar beet
ATJ (Isobutanol and Ethanol)	50	Sugarcane, sugar beet, sawdust, lignocellulosic

Source: IATA (2018). Sustainable Aviation Fuels - Fact Sheet 2. SAF Technical Certification

Routes to carbon based sustainable liquid synthetic fuels.



Source: The Royal Society (2019). Sustainable synthetic carbon based fuels for transportation: policy briefing

GAS FIGURES & PERSPECTIVES IN BRAZIL

Natural gas infrastructure in Brazil

Main figures about natural gas infrastructure in Brazil

9.409 km transmission pipelines

187 delivery stations (*citygates*)

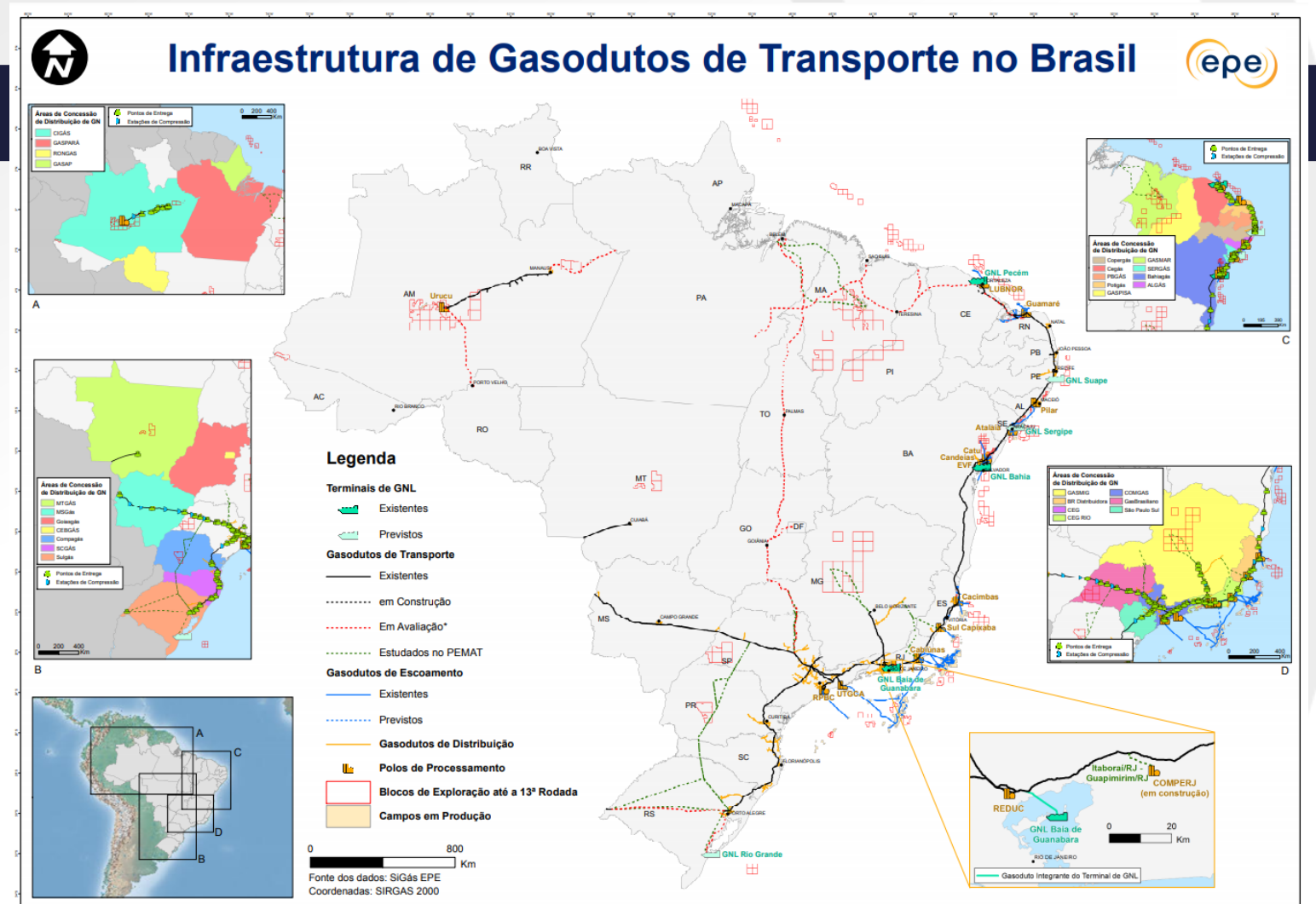
33 compression stations

14 processing plants
(96 million m³/d)

3 LNG regasification terminals
(47 million m³/d)



Available at
www.epe.gov.br



The New Gas Market Program

NOVO
MERCADO
DE GÁS



Objective: formation of an open, dynamic and competitive natural gas market in Brazil



Pillars:

- To promote competition
- To integrate gas industry to power and industrial sectors
- To harmonize federal and states regulations
- To reduce tax barriers

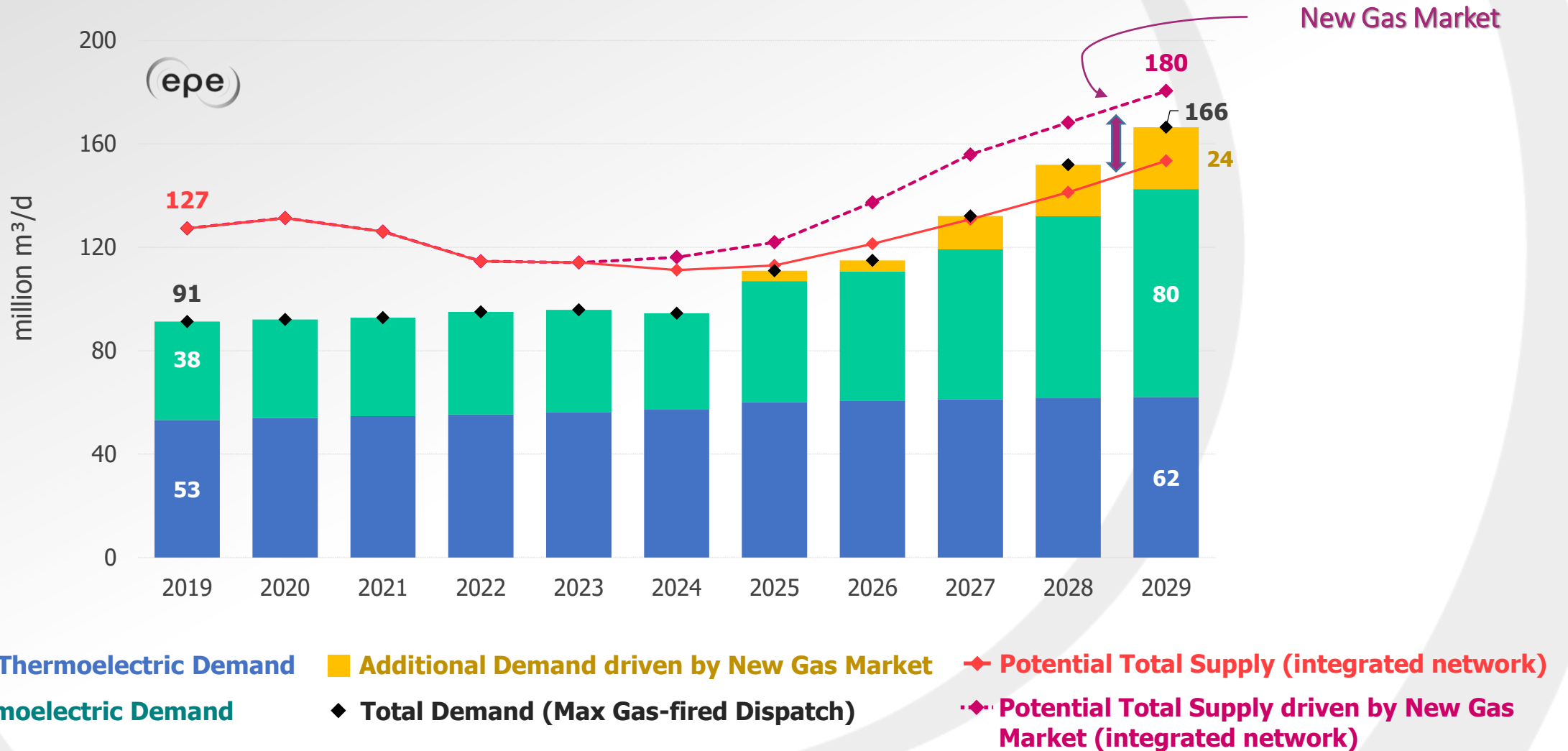


Participants: MME, Ministry of Economy, Casa Civil, EPE, ANP e CADE



Release: July 23, 2019

Natural gas supply-demand balance forecast – integrated network

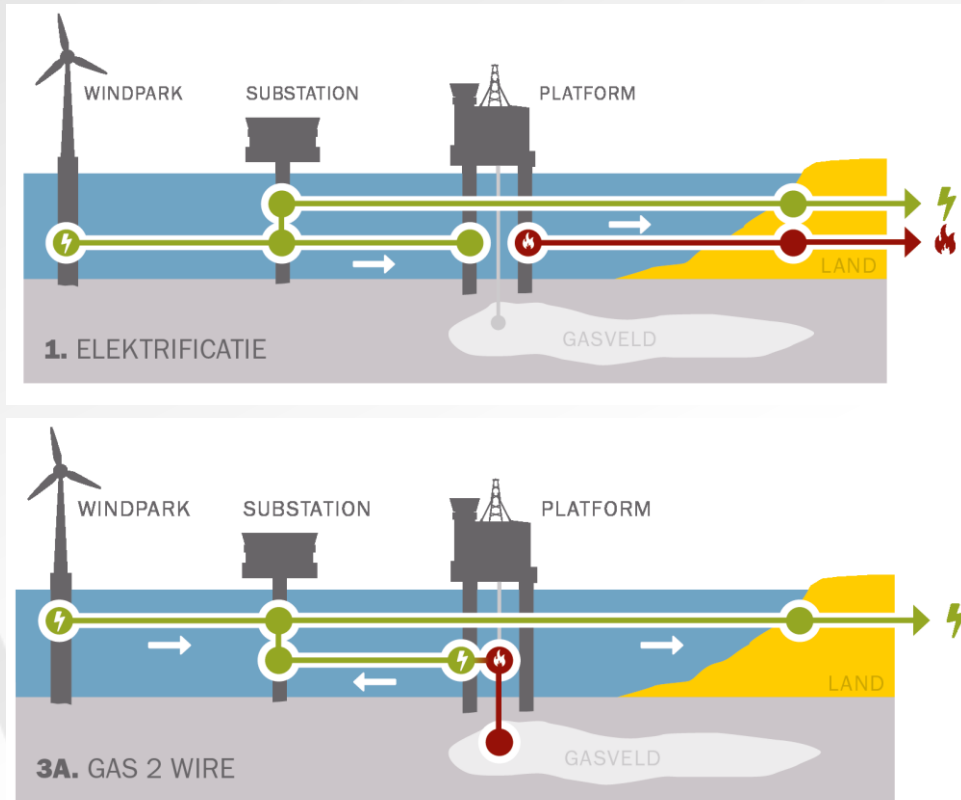


Source: EPE

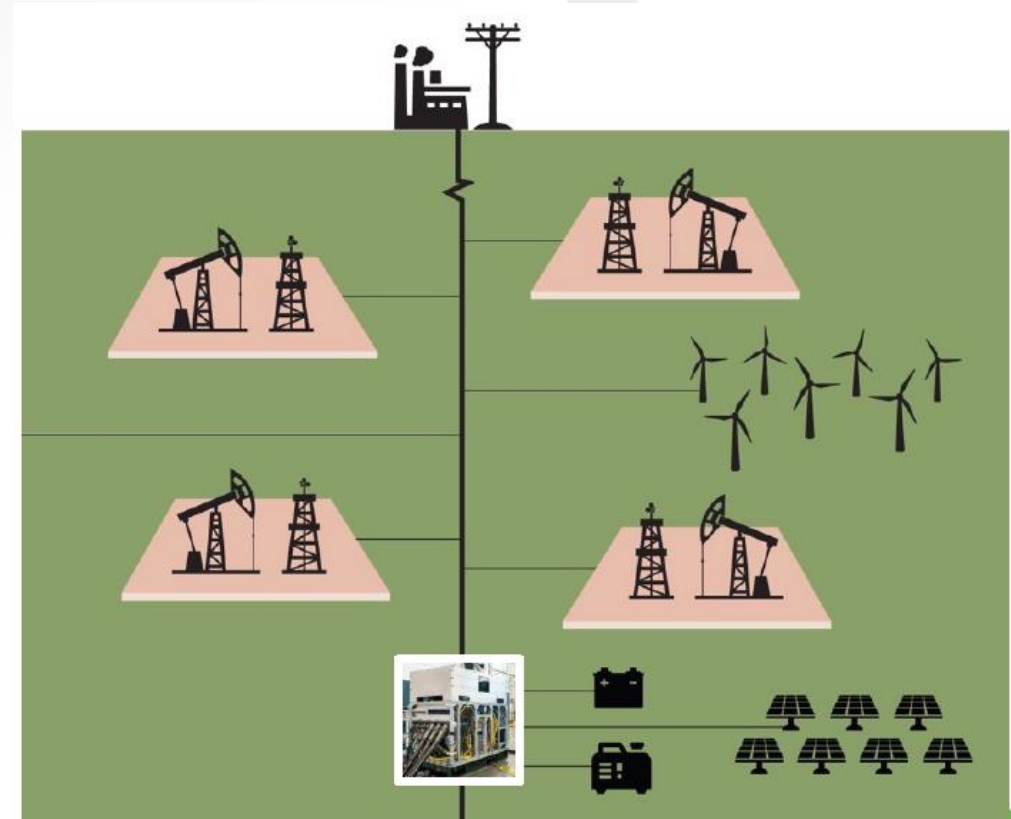
REDUCING CARBON FOOTPRINT OF THE O&G INDUSTRY IN THE ENERGY TRANSITION

O&G industry in the energy transition: new business models

Electrification, integration to renewables and carbon footprint reduction



Fonte: North Sea Energy (2018)



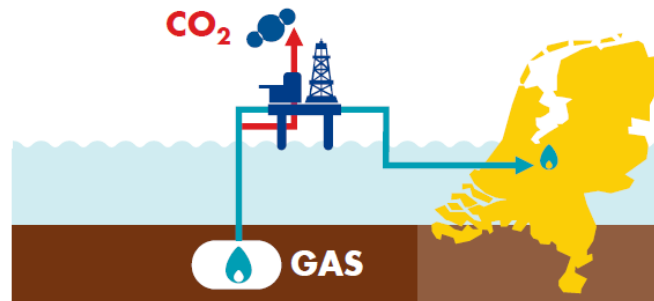
Fonte: Joint Institute for Strategic Energy Analysis (2018)

O&G industry in the energy transition: new business models

Electrification, integration to renewables, CCS and carbon footprint reduction

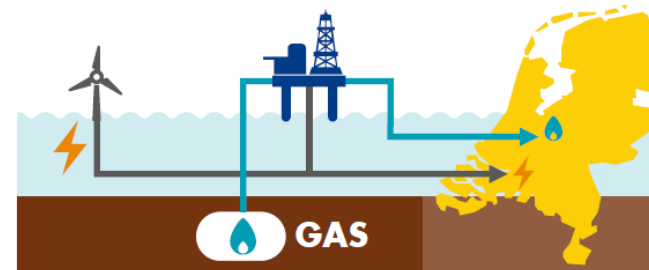
CURRENT

Self-sufficient offshore gas production



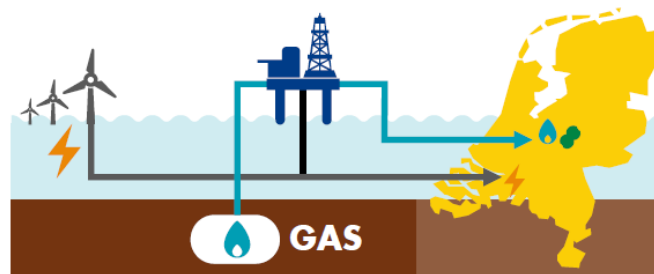
2021 -2025

CO₂ neutral gas production; electricity from offshore wind
Extended production lifetime



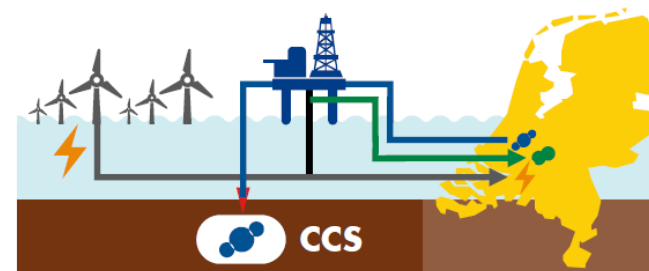
2025 - 2030

Demonstration power to gas (green H₂)



2030+

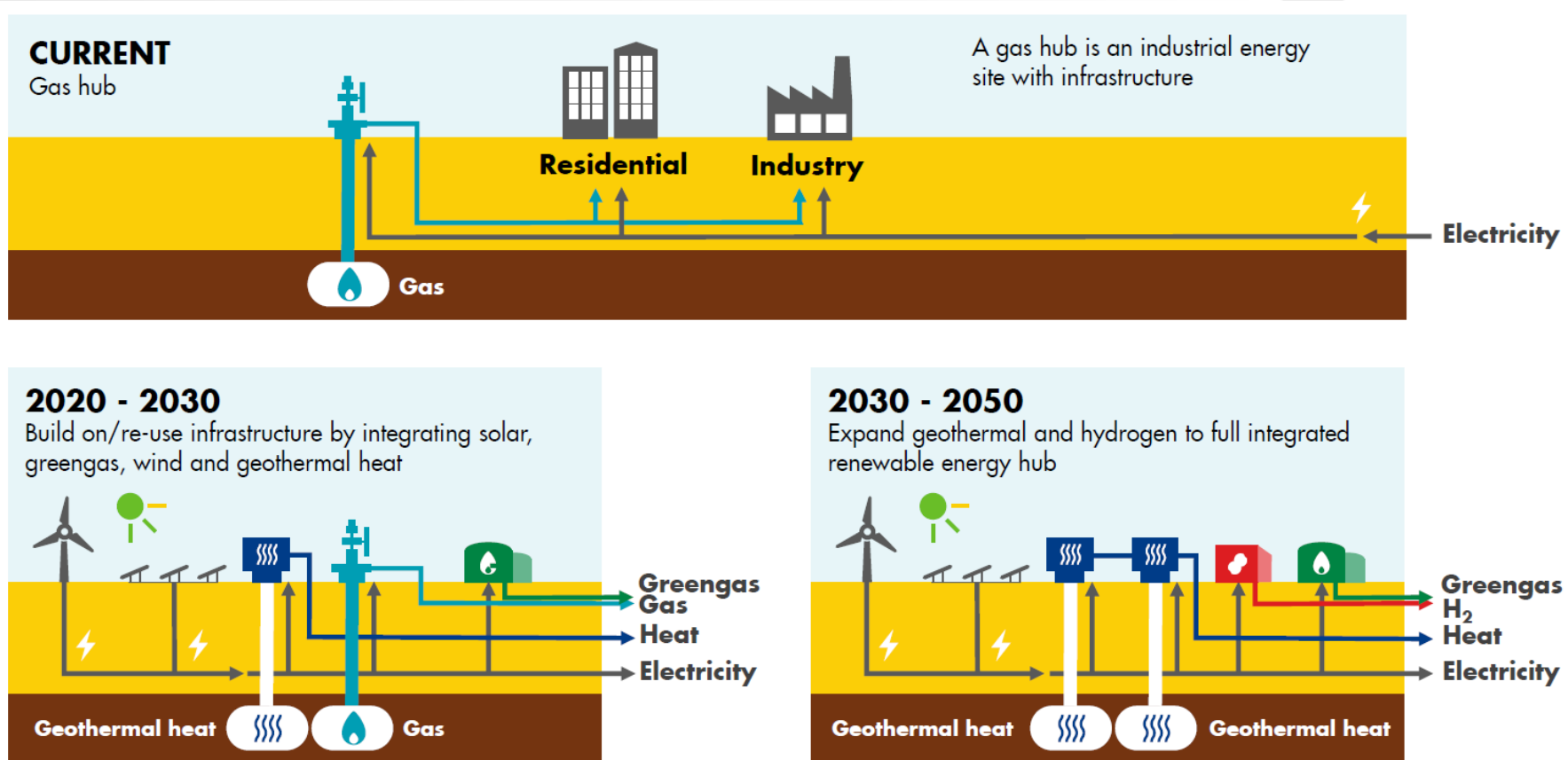
CCS in depleted gas field; power to gas (green H₂)
Repurposed platform



Fonte: NAM (2018)

O&G industry in the energy transition: new business models

Electrification, integration to renewables and carbon footprint reduction



Fonte: NAM (2018)

Biogas & biomethane potential: "greening" gas supply



Combustíveis



SI Energia Fluxo Modelagem Culturas Produção Energéticos **Combustíveis**

Módulo: Agropecuário | Florestal | Industrial | Urbano

Modelos: Histórico IBGE

Linha do Tempo: 2017 | 2017

Setor: Agrícola | Pecuário

Selecione os Fatores de Rota

Energia Primária Disponível (tep)

Milho 28 Mi	Soja 18 Mi	Cana-de-açúcar 14 Mi	Ave 3 Mi	Ar...
Centro-Oeste 29 Mi	Sul 22 Mi	Sudeste 17 Mi	Nord...	5 Mi

Fatores de Rota dos Resíduos Agrícolas (Rota Combustão - Rota Digestão)

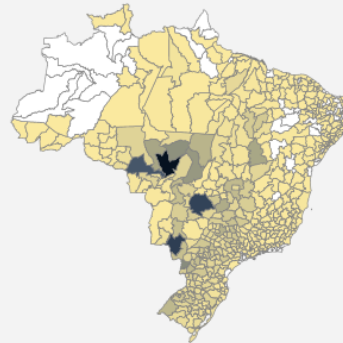
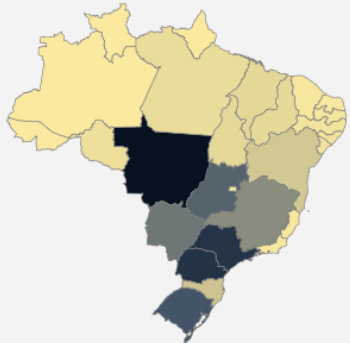
A (100-0)	B (75-25)	C (50-50)	D (25-75)	E (0-100)
-----------	-----------	-----------	-----------	-----------

Potencial Energético

Município	Energia P. (tep)	(%)	CH4 (mil m3)	E.Elétrica (MWh)	Pot (MW)
Abadia dos Dourados	1.408	0%	1.600		
Abadiânia	10.942	0%	2.340	20.662	2,95
Abaeté	1.399	0%	1.590		
Abdon Batista	7.576	0%	0	17.623	2,51
Abel Figueiredo	597	0%	679		
Abelardo Luz	57.513	0%	6.224	121.034	17,27
Abre Campo	1.996	0%	2.268		
Abreulândia	8.471	0%	519	18.641	2,66
Açailândia	27.839	0%	4.765	55.000	7,85
Acarí	547	0%	621		
Aceguá	30.796	0%	1.466	68.631	9,79
Acopiara	2.544	0%	2.890		
Acorizal	690	0%	784		
Acrelândia	869	0%	988		
Acreúna	114.261	0%	672	264.396	37,73
Açucena	633	0%	719		
Total	74.522.186	100%	7.136.638	158.730.763	22.649,94

Resultados

Brasil
 3.070
 Nº Municípios
 74.522.186
 Energia P. (tep)
 100%
 Energia (%)
 7.136.638
 Biometano (mil m3)
 158.730.763
 E.Elétrica (MWh)
 22.649.94
 Pot (MW)



FINAL REMARKS

A new role for Energy Planning

As we move into the future, Energy Planning is more and more focused on how to prepare energy systems to better deal with and benefit from innovation and new solutions



Not to predict the future, but get prepared to make the most of it

And improve **COMMUNICATION !**

Obrigado!

Avenida Rio Branco, 1 - 11º andar
20090-003 - Centro - Rio de Janeiro
www.epe.gov.br