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Network partner



www.solrico.com

Colaboradora



www.solarthermalworld.org

Fundadora y coordinadora



www.heat-changers.com

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Estrategia de Calor Solar para la Industria en Brasil

Marisol Oropeza

20/02/2020

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- Proyecto internacional financiado por la Iniciativa Internacional para la Protección del Clima (IKI) del gobierno alemán.
- Objetivo: promover el uso del Calor Solar para Procesos Industriales (SHIP) en Sudáfrica, la India, México y Brasil.

Countries

Brazil



Mexico



India



South Africa



Coordinator

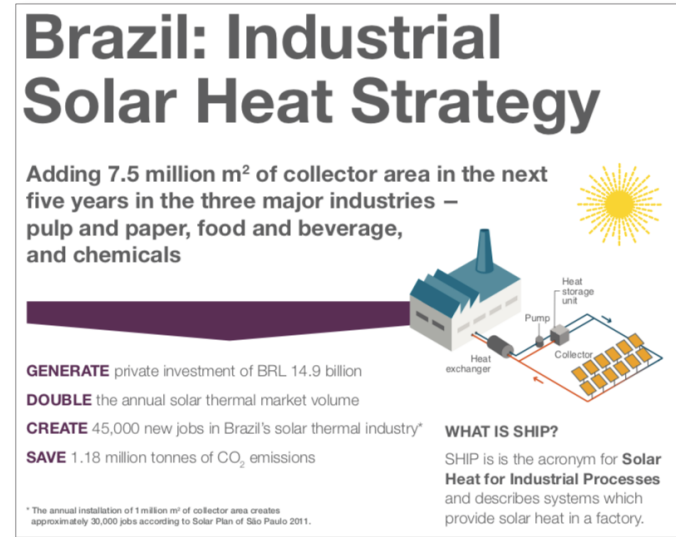


German Implementing Partners

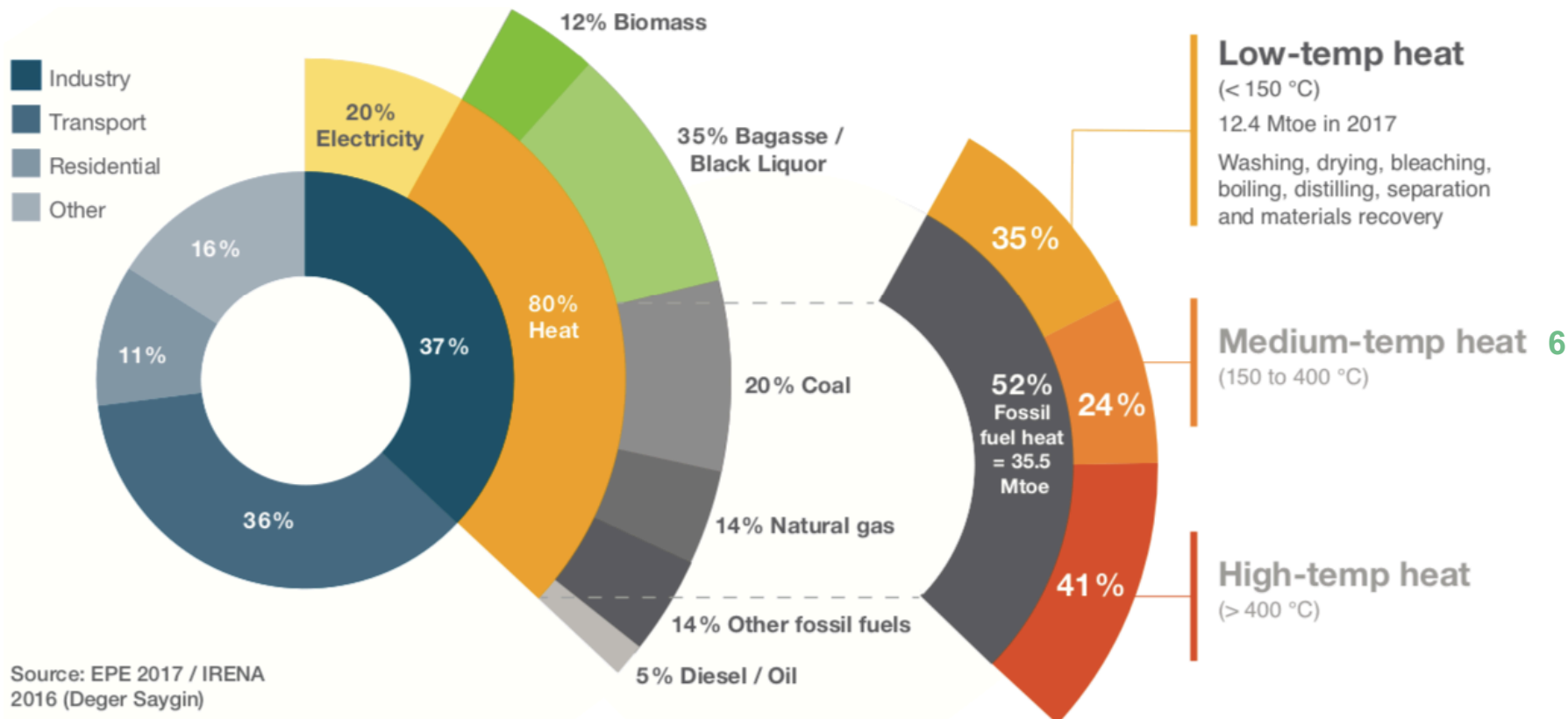


Estrategia de calor solar industrial en Brasil

1. Consumo final de energía para calor (hasta 150 °C) en tres industrias clave de Brasil.
2. Análisis financiero: tasa de retorno de inversión (IRR), periodo de recuperación del capital (equity payback period), costo promedio ponderado del capital (WACC).
3. Acciones necesarias para impulsar la implementación de 7.5 millones de m² para calor solar en la industria en Brasil.



Consumo final energía para calor en Brasil



Selección de tres sectores industriales clave

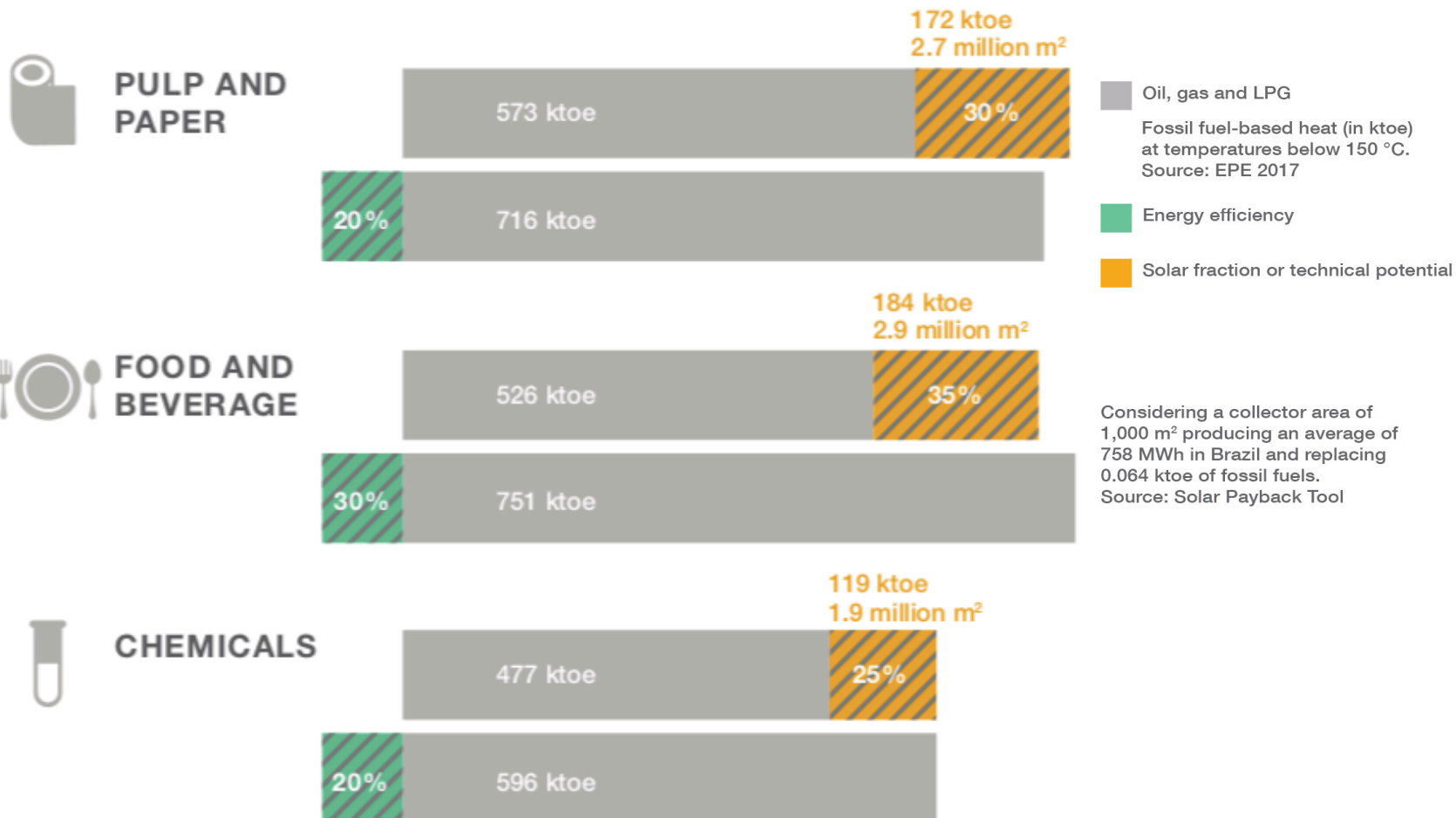
- Número de empresas
- Alta demanda de energía para calor
- Información sobre consumo de energía

INDUSTRIES	NO. OF BUSINESSES IN THE 10 MOST POWERFUL STATES ECONOMICALLY	HEAT DEMAND MET BY FOSSIL FUELS Low-temp (< 150 °C)	INCREASE IN HEAT DEMAND BETWEEN 1996 AND 2016
PULP & PAPER	4,960	716 ktoe	146%
FOOD & BEVERAGE	45,865	751 ktoe	13%
CHEMICALS	8,727	596 ktoe	24%

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Source: EPE 2017 / CNI 2015 / IBGE 2015

Potencial técnico: 7.5 millones de m²



Rentabilidad de un proyecto SHIP

La inversión es rentable si la TIR (IRR) es más alta que el WACC (costo promedio ponderado de capital). Es decir, cuando la tasa de rendimiento neto excede el costo del financiamiento.

THE PROJECT IRR DEPENDS HEAVILY ON ...



... **FUEL PRICES**, which vary a lot from state to state. The table on the right shows the minimum and maximum prices across every state, as well as the average value used as a basis for assessing profitability.



... **LEVEL OF SOLAR IRRADIATION**, which is much higher in the northeast (2 MWh per m² and year) than in the southeast (1.6 MWh to 1.7 MWh).






LPG



Fuel/Oil



Gas

FUEL	FUEL OIL PRICES INCL. TAX (2,000 m ³ of natural gas a day)	AVERAGE
	165 to 275	220 BRL/MWh
	218 to 258	238 BRL/MWh
	495 to 597	546 BRL/MWh

Source: MEE 2018 / Sindigás 2018

Variables financieras

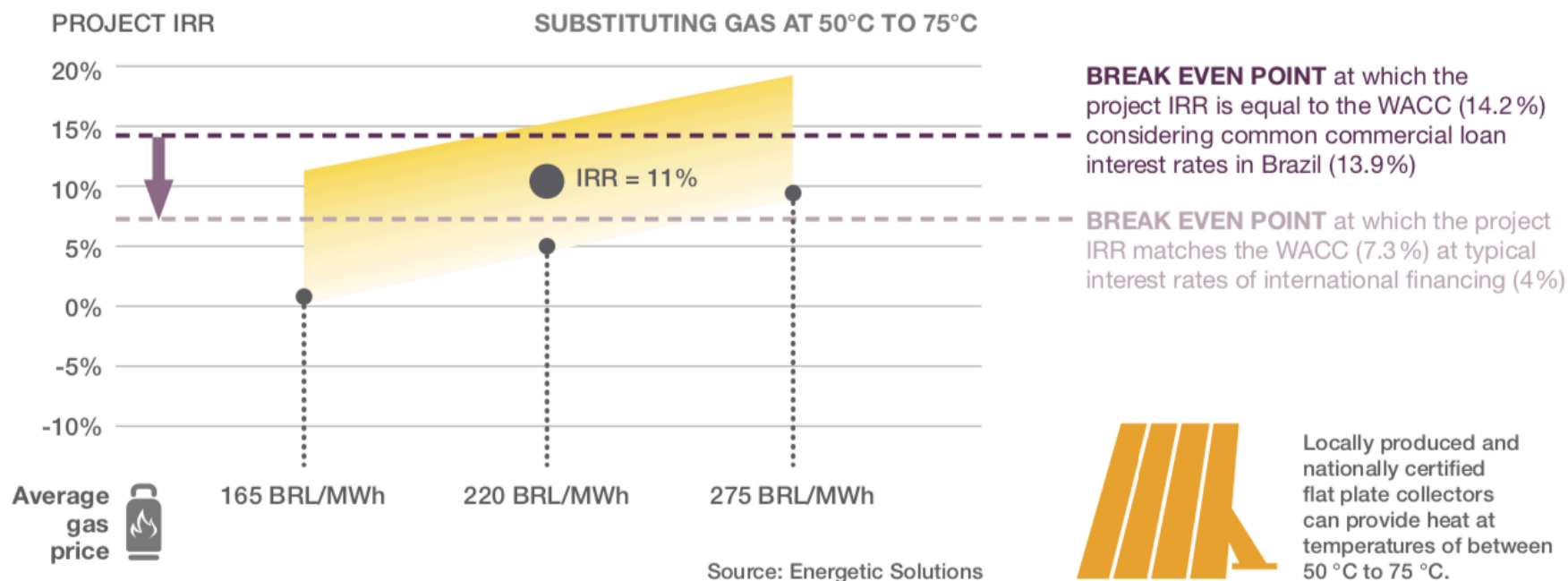
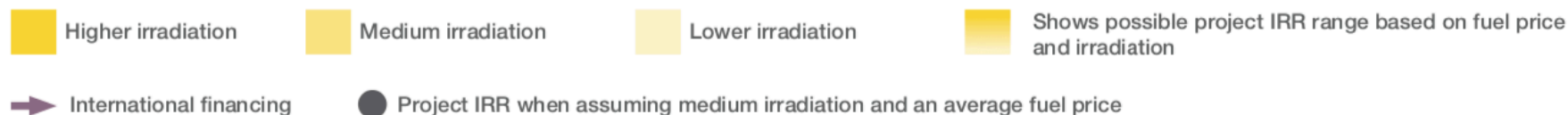
KEY FIGURES FOR DYNAMIC IRR CALCULATION IN THE BASELINE CASE

Project duration	20 years
Size of solar field	1,000 m ²
SHIP investment, incl. installation, at 50 °C to 75 °C	BRL 1.7 million
SHIP investment, incl. installation, up to 150 °C	BRL 2.7 million
Effective interest rate on loans	13.9%
Expected return on equity capital	15%
Loan-to-equity ratio	70 : 30
Annual fuel price increase for year 1 to 10*	4.8% p.a.
Annual fuel price increase for year 11 to 20*	2.5% p.a.

*based on long-term compound inflation rate in Brazil

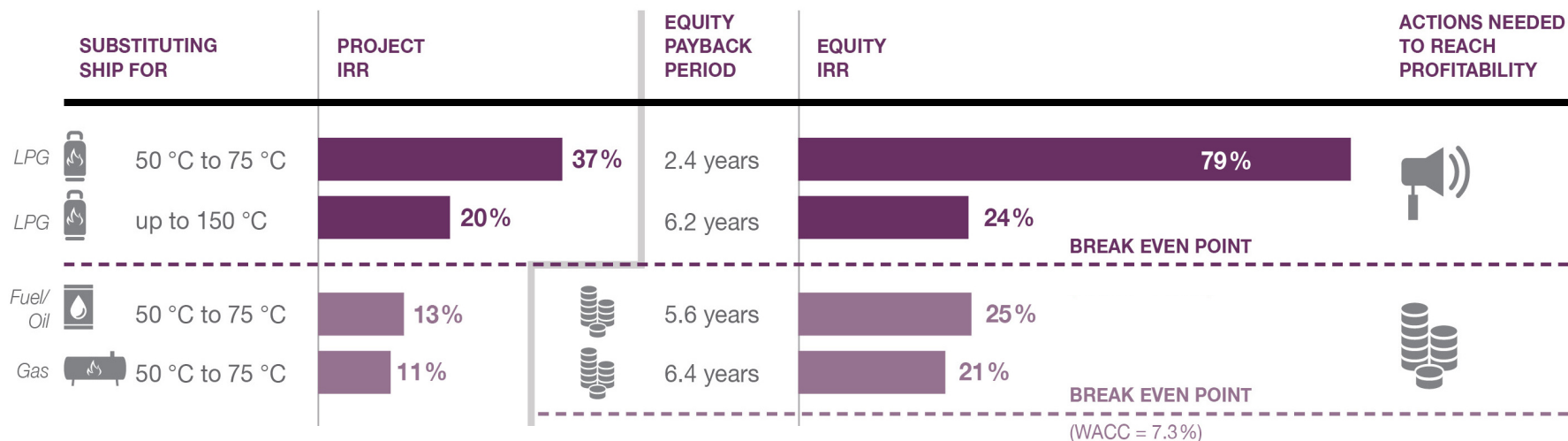
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Ejemplo 1: sustitución de gas para procesos con temperaturas de hasta 75 °C

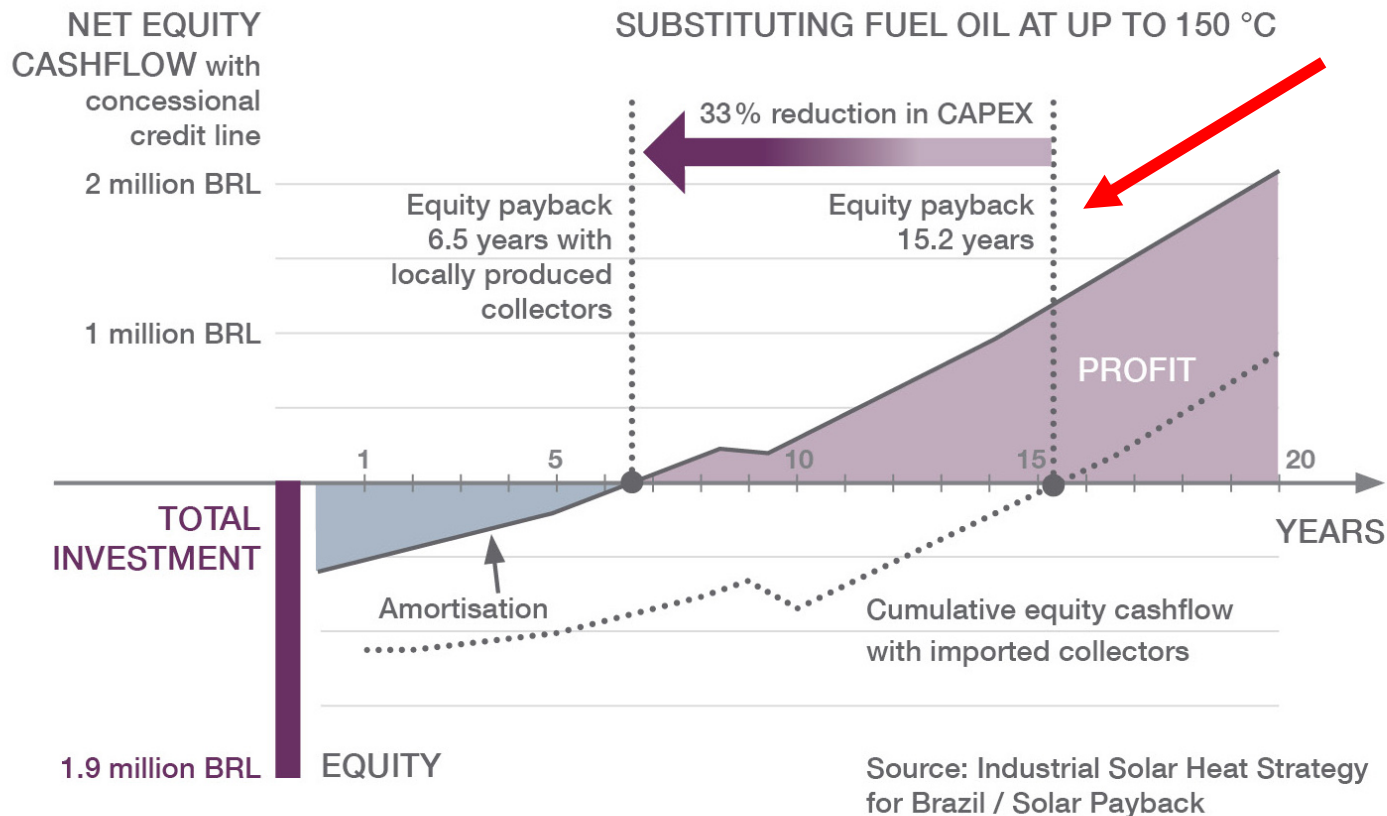


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Acciones requeridas para lograr que los proyectos SHIP sean rentables

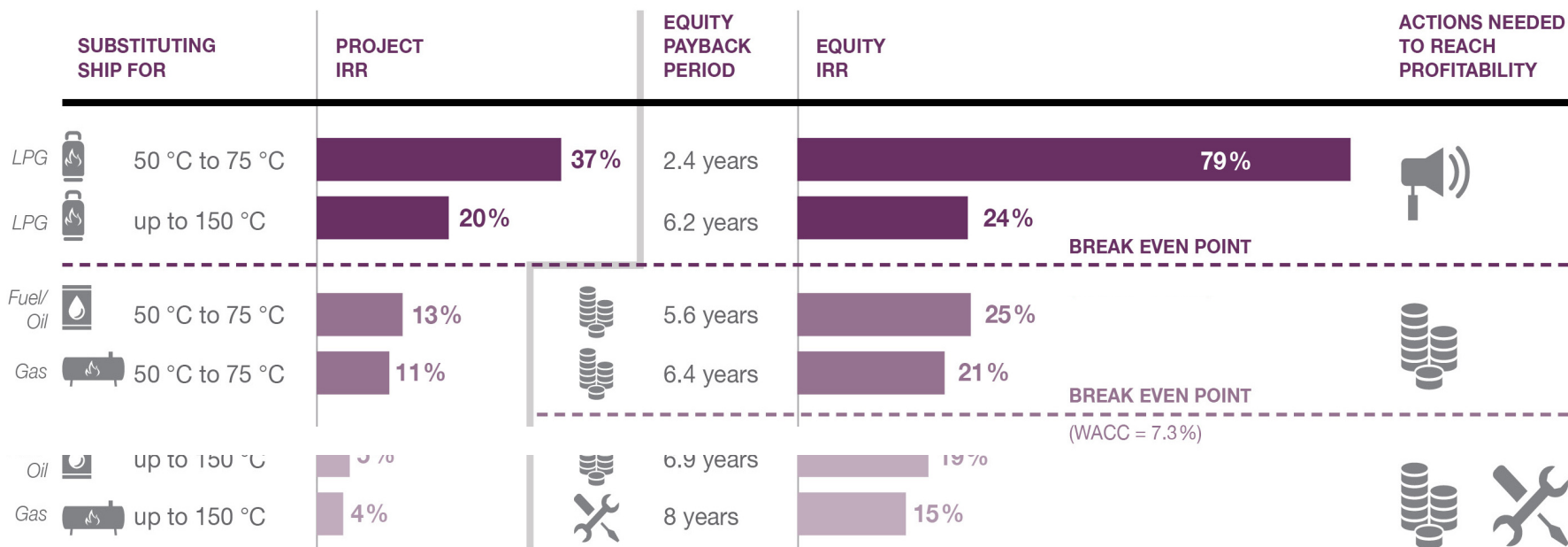


Ejemplo 2: sustitución de **combustóleo** para procesos con temperaturas de hasta **150 °C**



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Acciones requeridas para lograr que los proyectos SHIP sean rentables



Resumen

Three key actions are needed to implement the Industrial Solar Heat Strategy



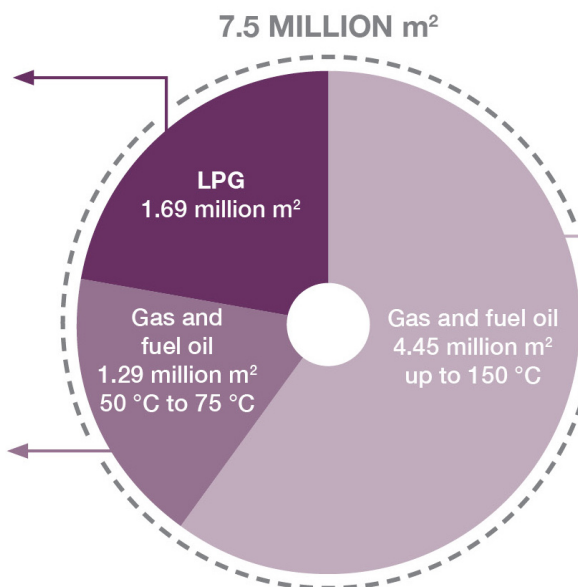
RAISE AWARENESS

among industrial costumers, because SHIP is already cost competitive for many factories (especially LPG driven processes), but is not known well enough yet.



PROVIDE LOW INTEREST LOANS (4%) via Fundo

Clima with the support of concessional financing for factories that use natural gas and fuel oil.



Profitability even without support

Profitability with concessional financing

Profitability with concessional financing and local collector production



ENCOURAGE LOCAL PRODUCTION

of concentrating collectors to bring down CAPEX of SHIP systems for process temperatures up to 150 °C.

Source: Industrial Solar Heat Strategy for Brazil / Solar Payback

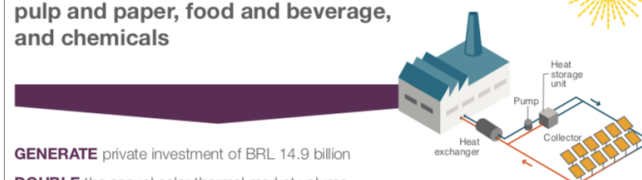
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Brazil: Industrial Solar Heat Strategy

Adding 7.5 million m² of collector area in the next five years in the three major industries – pulp and paper, food and beverage, and chemicals



GENERATE private investment of BRL 14.9 billion

DOUBLE the annual solar thermal market volume

CREATE 45,000 new jobs in Brazil's solar thermal industry*

SAVE 1.18 million tonnes of CO₂ emissions

WHAT IS SHIP?

SHIP is the acronym for **Solar Heat for Industrial Processes** and describes systems which provide solar heat in a factory.

* The annual installation of 1 million m² of collector area creates approximately 30,000 jobs according to Solar Plan of São Paulo 2011.

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Thank you • Obrigado • Gracias
