



GlassPoint

# General Introduction

11 March, 2019

# Mission Statement

*To be the lowest cost renewable energy provider to the world's sunbelt*

# Overview

## GlassPoint delivers the lowest-cost steam to power industrial processes

- We're targeting the largest energy segment worldwide
- Low-cost, zero-carbon energy to reduce fossil fuel consumption

## Breakthrough cost reductions achieved with indoor solar thermal design

- Differentiated technology optimized for challenging industrial sites
- Proven in remote desert oilfields in USA and Oman
- Robust R&D program actively developing and fielding next gen solutions - SolaRISE

## Partnering with local oil and gas industry to build renewables hub in Oman

- Expanded to Oman in 2011 with PDO pilot and now Miraah
- First 100 MW<sub>t</sub> of Miraah online and meeting all production targets
- Construction ongoing to meet PDO's future demand for steam

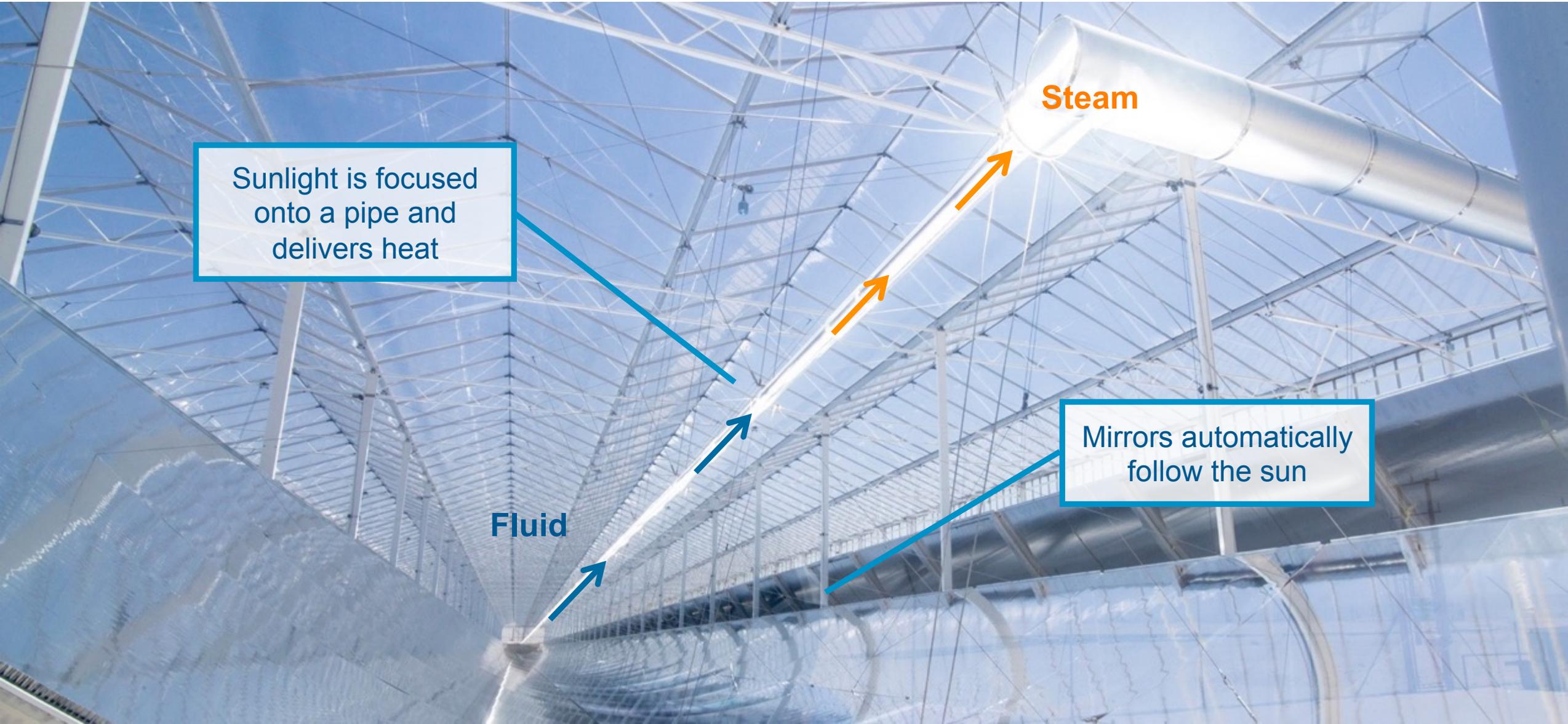
# Enclosed Trough Technology



Greenhouse enclosure protects mirrors and reduces capital cost

Automated washing with water recapture reduces operating costs

# Indoor, Zero-Wind Solar Collectors



Sunlight is focused onto a pipe and delivers heat

Steam

Fluid

Mirrors automatically follow the sun

# Wind = Capex



Traditional trough **30 kg/m<sup>2</sup>**



Enclosed trough **2.3 kg/m<sup>2</sup>**

*Wind shielding = less materials = lowest capex*

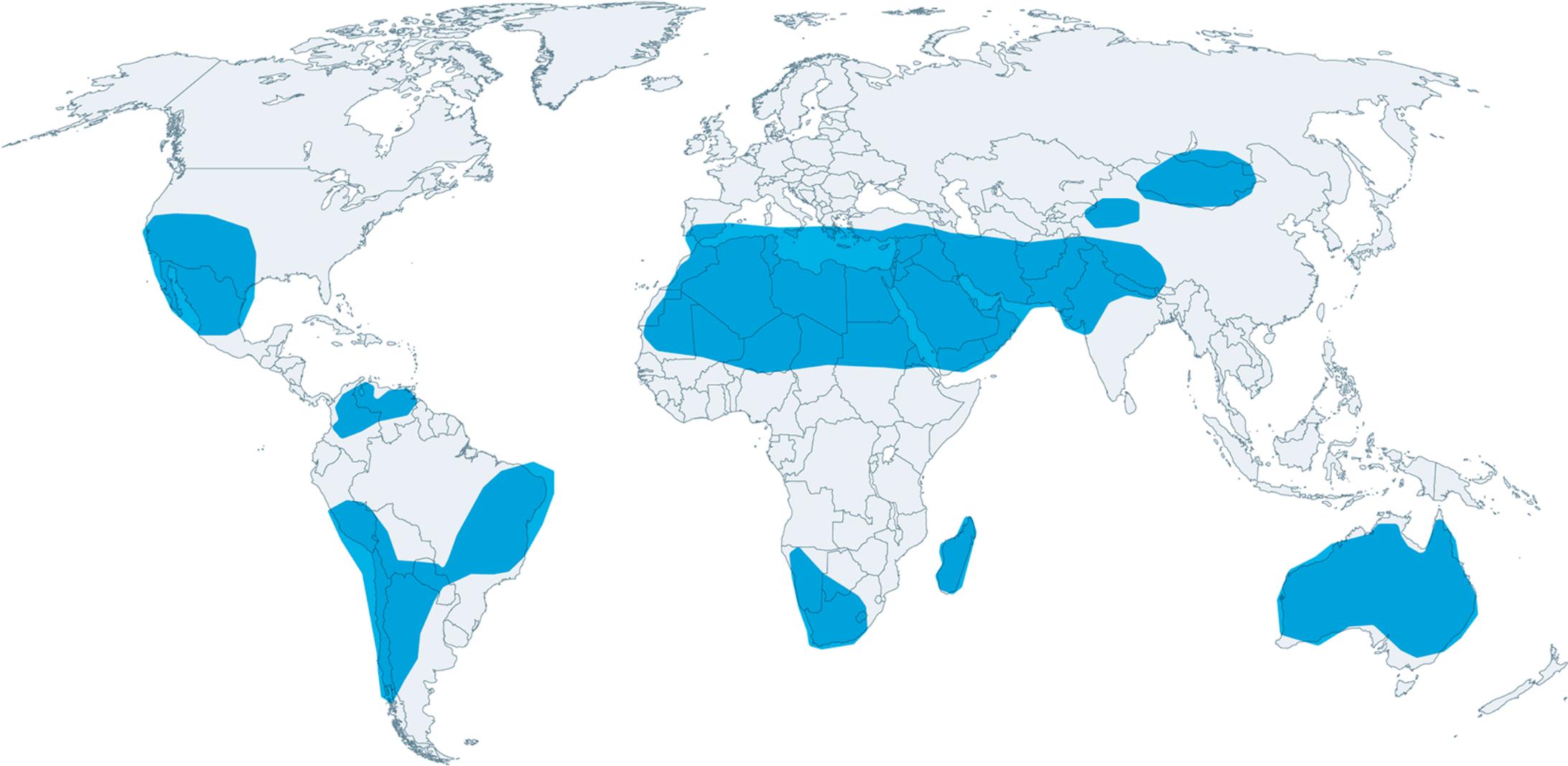
# Dust = Opex



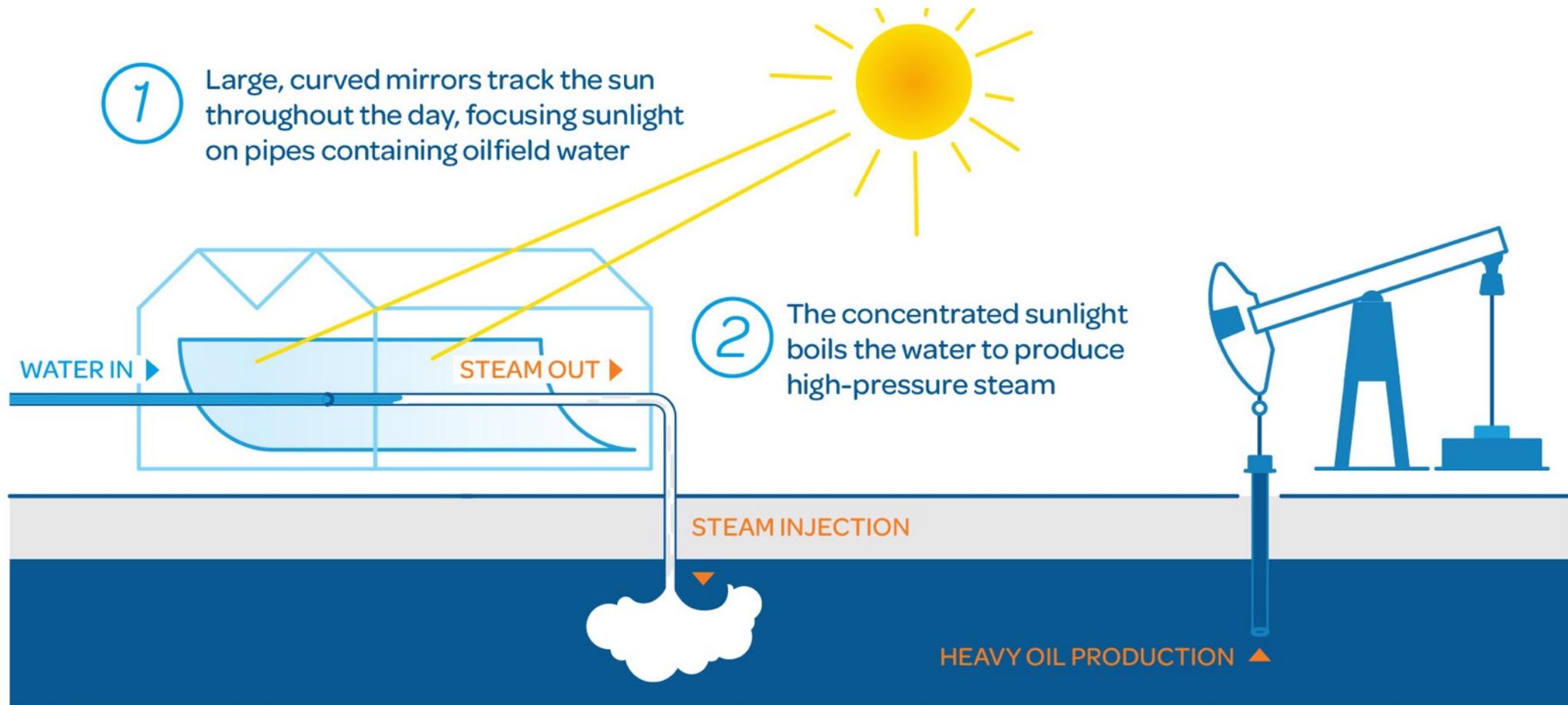
- Fully automatic – saves on manpower costs
- Cleaning water is recycled – saves utility costs
- Quick process – nightly cleaning

*Automated dust removal = lowest opex*

# The “Sunbelt” is GlassPoint’s Market



# How Solar Enhanced Oil Recovery (EOR) works



# Solar Steam for Heavy Oil Production

More than half of the world's remaining reserves is heavy oil

- Heavy oil is growing from 12 to 24% of PDO's production in next 5 years
- Same trend in Kuwait, Saudi Arabia and around the world
- In California, heavy oil accounts for 40% of production

On a heavy oil field, steam is 96% of total energy demand

- Fuel to produce this steam can be 60% or more of total production cost

GlassPoint offers a lower-cost, zero-carbon steam alternative

- Solar steam helps operators reduce costs and carbon footprint

# PDO Amal, Oman



50 tonnes of steam per day

# Miraah at the Amal Oilfield in Oman



6,000 tonnes of steam per day

- Built for Petroleum Development Oman (Shell, Total and Oman Government)
- Solar steam used to produce heavy oil
- Saves gas and diversifies economy
- 1 GW peak thermal capacity
- On schedule, on budget, safe
- Online since October 2017, steam production ramping
- Built in standard blocks and scaled to meet oilfield steam demand

# Miraah – December 2018



# Satisfied Customer

“Miraah, and our partnership with GlassPoint, reflects our firm belief in the importance of deploying innovative technology and the potential of renewable energy in Oman. GlassPoint’s solution has **proven to be simple to implement, effective and reliable**, which is key for meeting our oilfield requirements.”

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*Raoul Restucci*

*Managing Director  
Petroleum Development Oman*



# Decarbonizing Industry

## Miraah in Oman



**300,000**

TONS OF CO<sub>2</sub> EMISSIONS  
SAVED EACH YEAR



**63,000**

EQUIVALENT OF REMOVING  
63,000 CARS OFF THE ROAD

OR

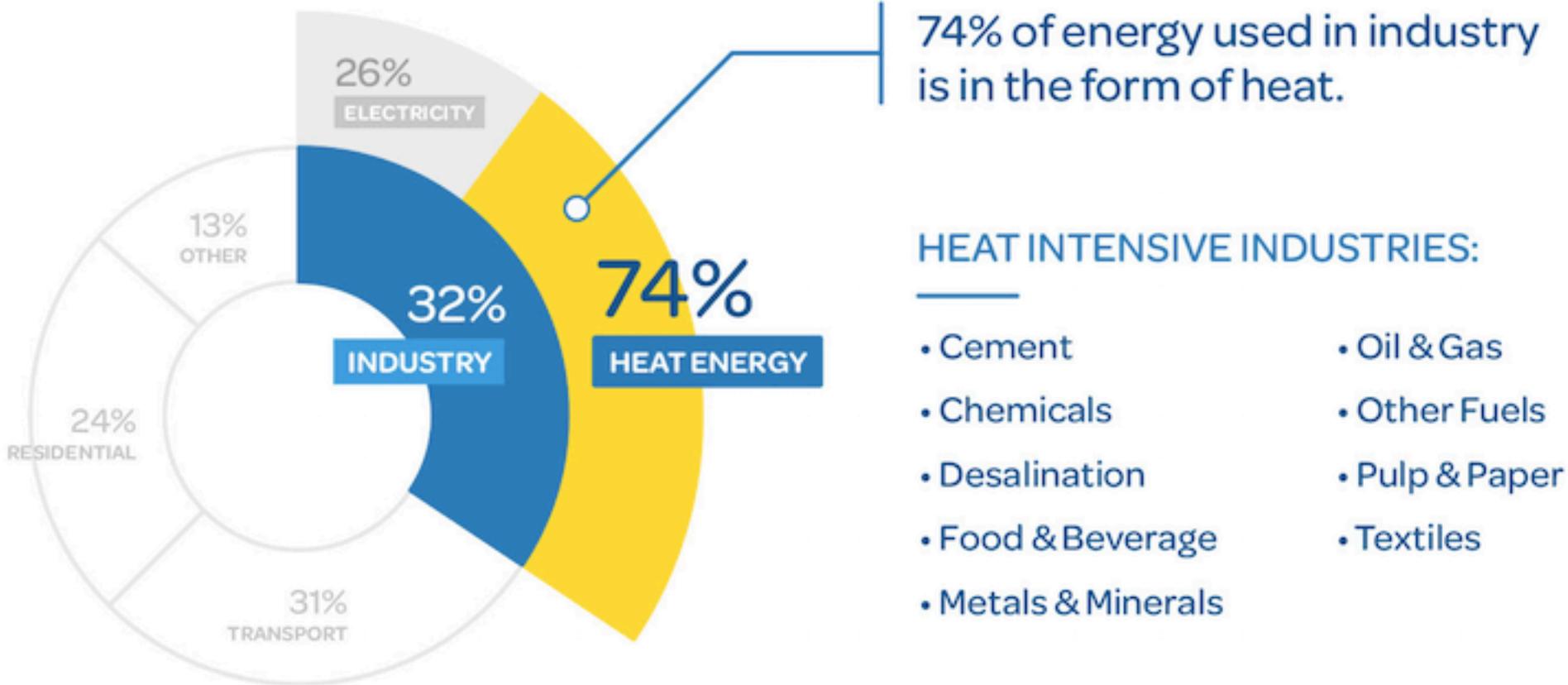


MORE CARBON SAVINGS  
THAN ALL THE ELECTRIC CAR  
SOLD IN THE US IN 2015

- Miraah is just one project on one oilfield
- Globally, industry is responsible for 25%+ of total greenhouse gas emissions
- GlassPoint is targeting this overlooked and growing source of climate pollution

# Solar Energy for Industry

Industry is the largest consumer of energy worldwide



# Belridge Solar in California



5,600 tonnes of steam per day

- Announced project in Nov 2017 with Aera Energy (Shell and ExxonMobil)
- California's largest solar project
- 850 MW<sub>t</sub> generating steam and 26.5 MW<sub>e</sub> generating electricity
- First integrated solar project of its kind
- Replaces gas imported from out of state with California technology
- 500 jobs at peak construction
- Reduces CO<sub>2</sub> emissions by 376,000 tons per year

# Oxy Mukhaizna in Oman



- Largest heavy oilfield in Oman
- Signed MOU with Oxy Oman for 16,300 tons of steam per day
- Proposed project over 2x the size of Miraah
- Engineering work initiated

**Thank you!**

