



CONNECT AND PROTECT

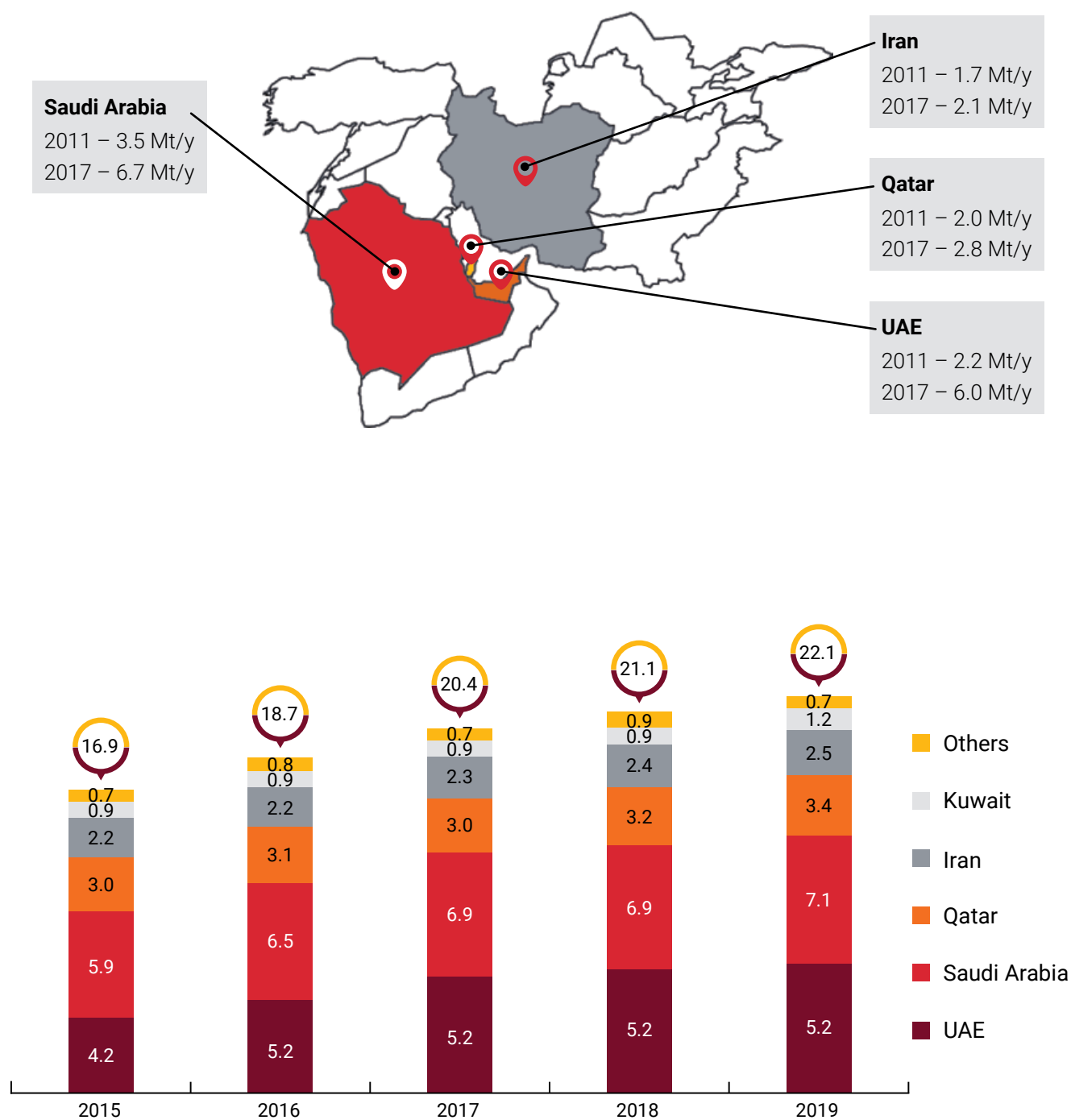
SAFE TRANSPORTATION OF
LIQUID SULPHUR

GLOBAL SULPHUR PRODUCTION

Production of global Sulphur increased by 25% from 2011 – 2015 (52.8 million tons to 65.8 million tons) and is expected to grow by 11% through 2017

MIDDLE EAST SULPHUR PRODUCTION

- UAE was the world's largest exporter of Sulphur in 2015
- Saudi Arabia's Sulphur production increased at a CAGR of 17.4% from 2011-15
- Middle East Sulphur production is expected to grow by a CAGR of 7% through 2019



Source: News Articles, CRISIL; GR&A Analysis

SULPHUR TRANSPORTATION ISSUES

- Liquid Sulphur should be stored and transported at carefully maintained temperatures, typically above 130°C
- Sulphur should not drop below 115-120°C to prevent solidification and should not exceed 154°C to avoid detrimental material property changes

TRADITIONAL TRANSPORTATION METHODS

- Sulphur temperature requirements place heavy demands on mobile transport cargo equipment
- Truck transportation is hazardous due to accidents and increased emissions during handling
- Truck capacity is limited and trips are usually 1-way, making it an inefficient option
- Roadway or rail infrastructure can be costly to develop and maintain in remote regions
- Truck fleets are a capital expense and costly to maintain



PIPELINES... A SAFER & MORE RELIABLE OPTION

- Sulphur can be transported safely through electrically heat-traced pipelines to maintain the temperature and to facilitate re-starting of the flow during upset conditions
- By incorporating adjacent technologies like pre-insulated pipe and thermally-isolated anchors and supports, it is possible to create a "uniform thermal profile" along the entire length of the pipeline
- Fiber optic Distributed Temperature Sensing (DTS) technology continually monitors the Sulphur condition (within 1°C & +/- 1m). It alerts the operator to any potential disruptions in "real time"
- Pipeline management software is available to provide operators with analytical and predictive tools
- These recent technology advancements result in efficient heat management solutions, which maximize the safety and reliability of Sulphur transportation



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