



# INDUSTRY SECTOR DECARBONIZATION

ASPEN GLOBAL CHANGE INSTITUTE

Thomas Koch Blank | Aspen | November 15, 2018



Transforming global energy use to create a clean, prosperous, and secure low-carbon future.

# ROCKY MOUNTAIN INSTITUTE

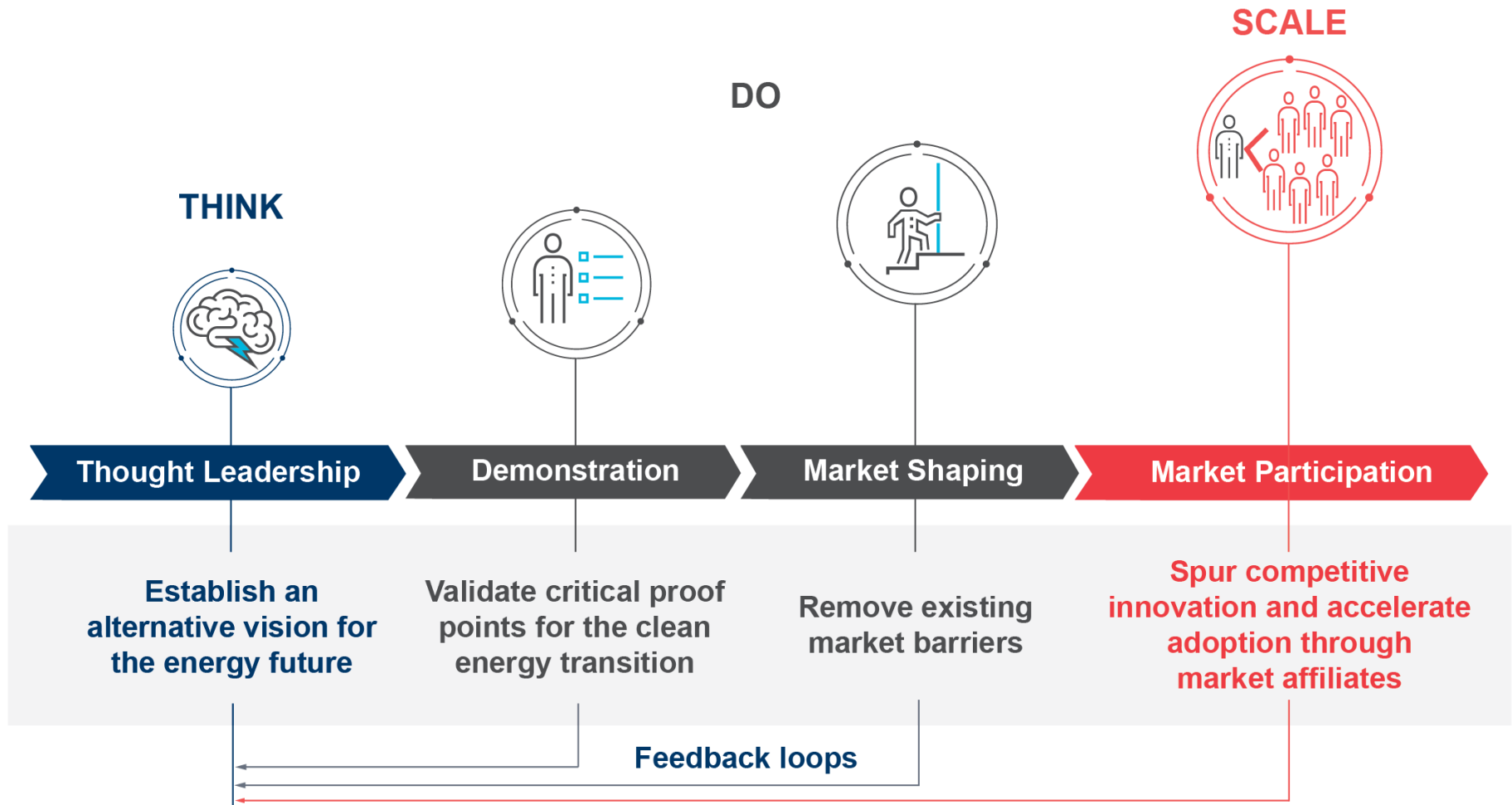
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TRANSFORMS GLOBAL ENERGY USE  
TO CREATE A CLEAN, PROSPEROUS,  
AND SECURE LOW-CARBON FUTURE.

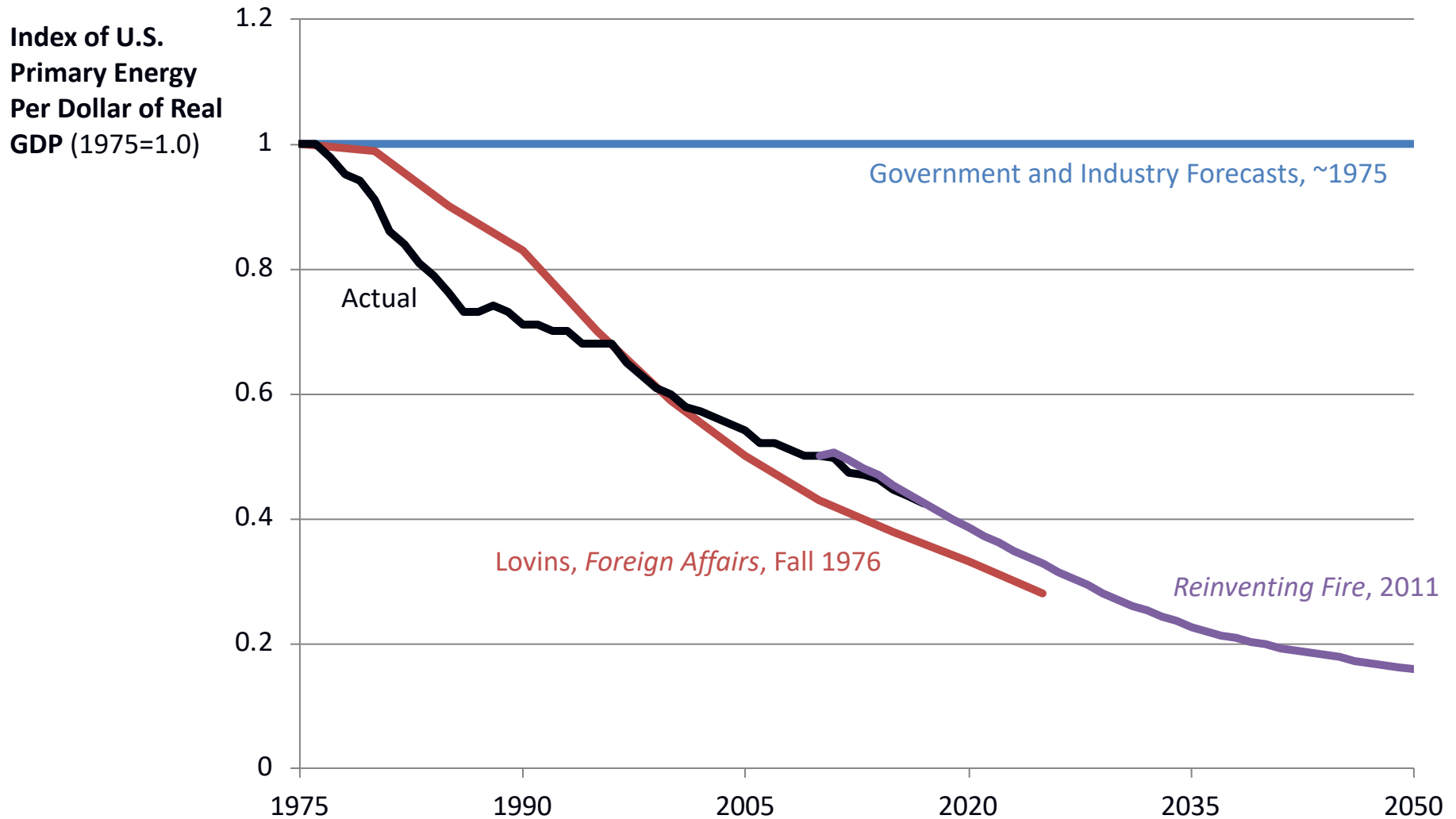
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# ROCKY MOUNTAIN INSTITUTE'S THEORY OF CHANGE



# U.S. energy intensity since 1975



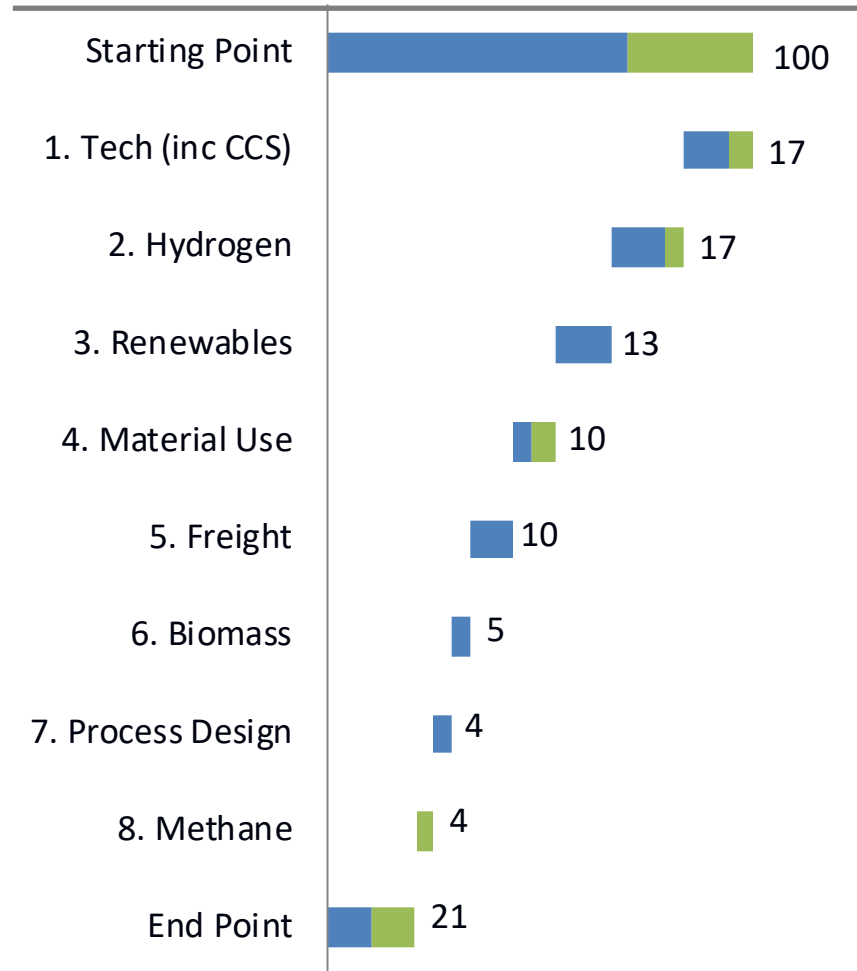


# The challenge – we have to do “everything” to achieve 80% emission reduction

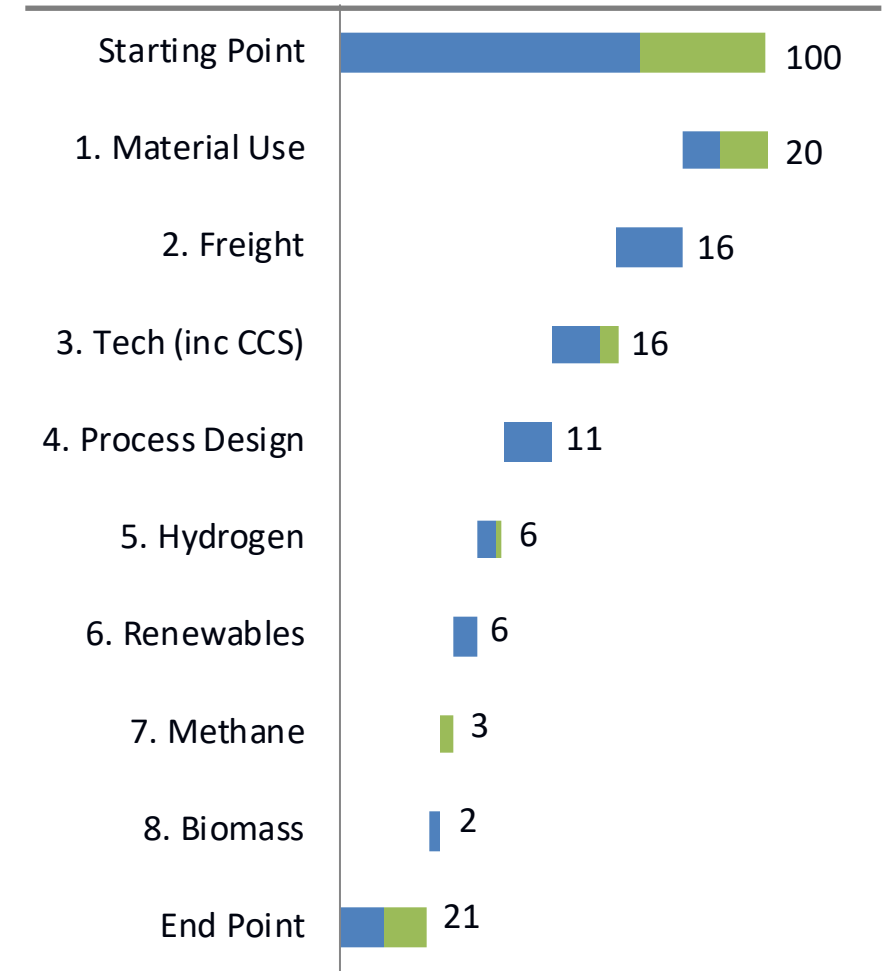
Energy  
Non-energy

GHG emissions - Indexed

## Implementation by order of stand-alone impact



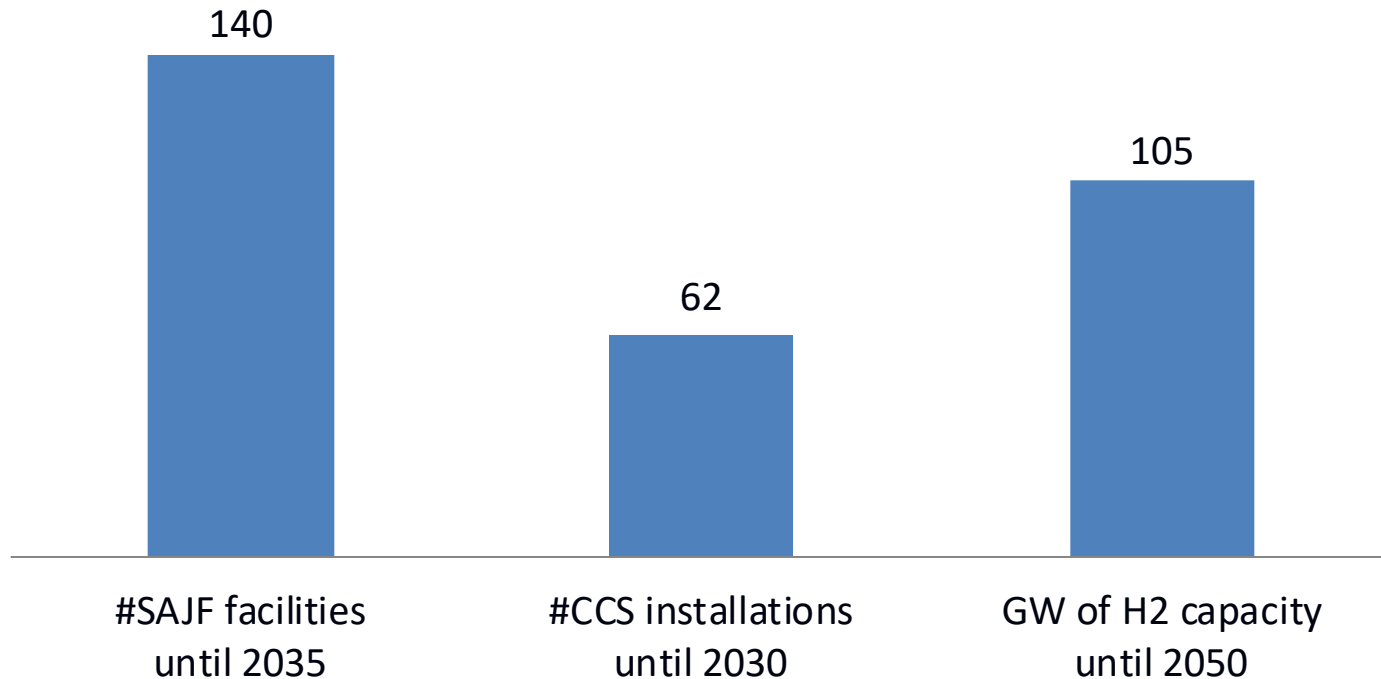
## “Efficiency First” implementation order



# Implied pace of build-out for new technology – estimates

## Build-out pace

Average annual new-build

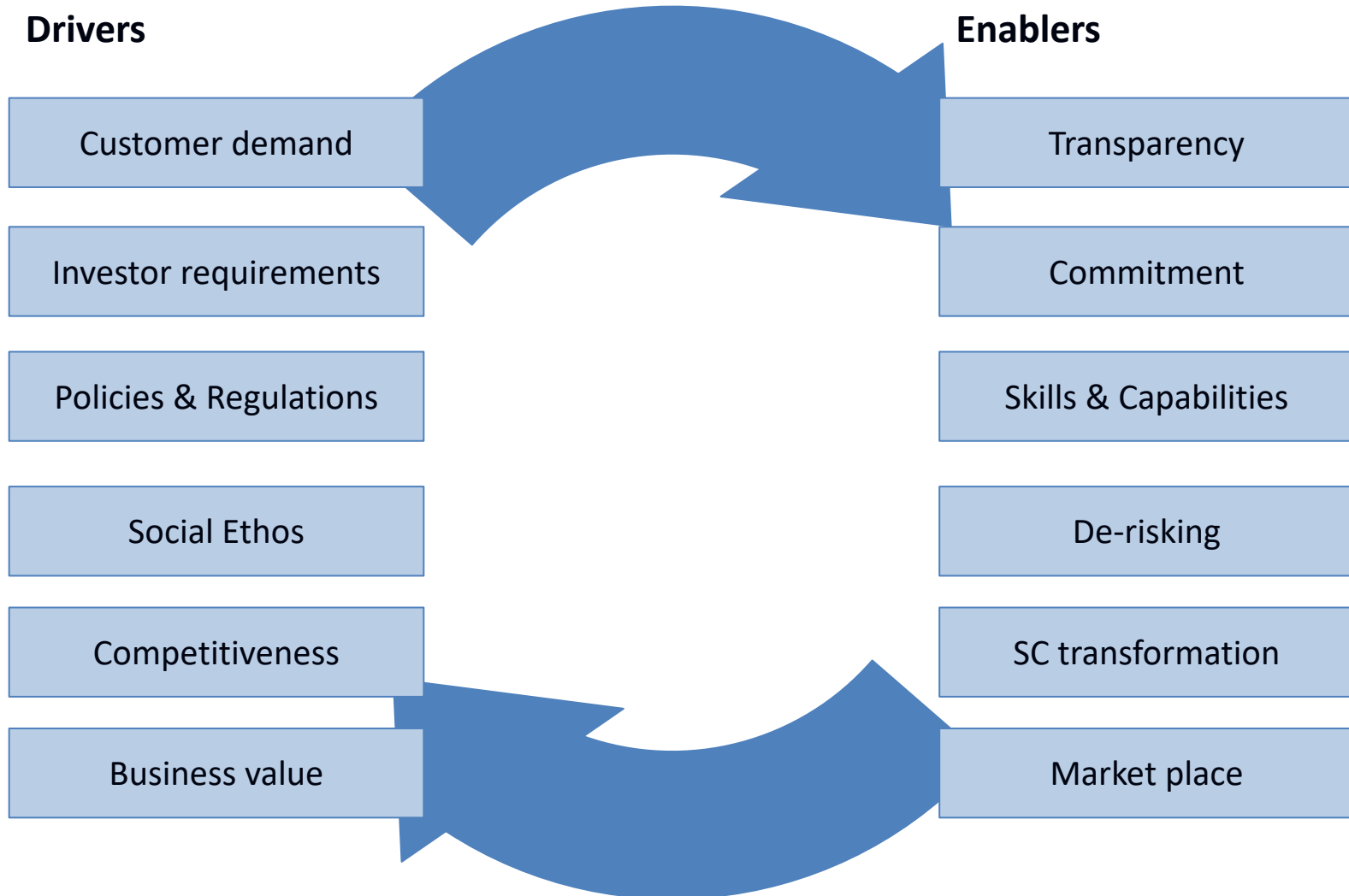


*“We are a nonprofit, focusing on profit.”*

- Sir Richard Branson



# Change at scale requires a unique combination of levers for each opportunity



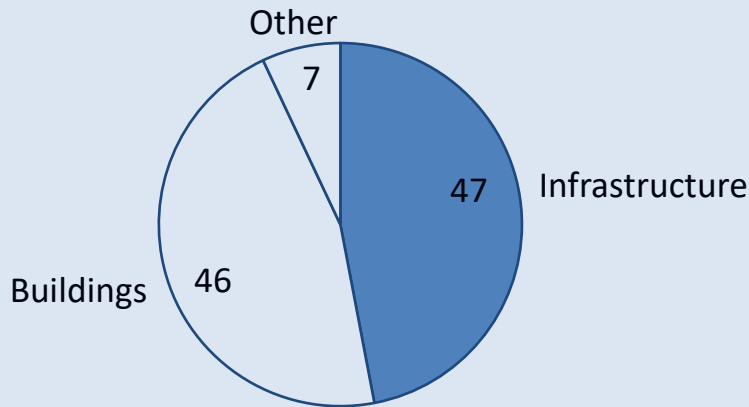


# Important insights – Industry decarbonization

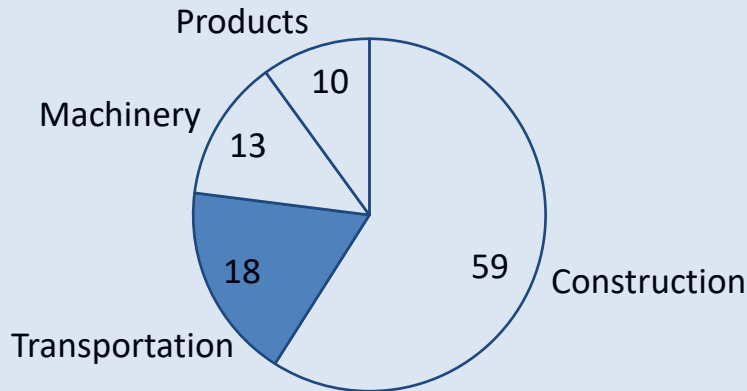
- 1 Significant scope to reduce industry emissions outside of “industry” scope
- 2 Efficient solutions do not always require “sexy” technology
- 3 Energy efficiency is not only about the equipment you install – but how you use it
- 4 Load flexibility can massively reduce the cost of supplying power
- 5 Industrial systems are more flexible than generally perceived

# 1 Critical levers are outside of industry scope

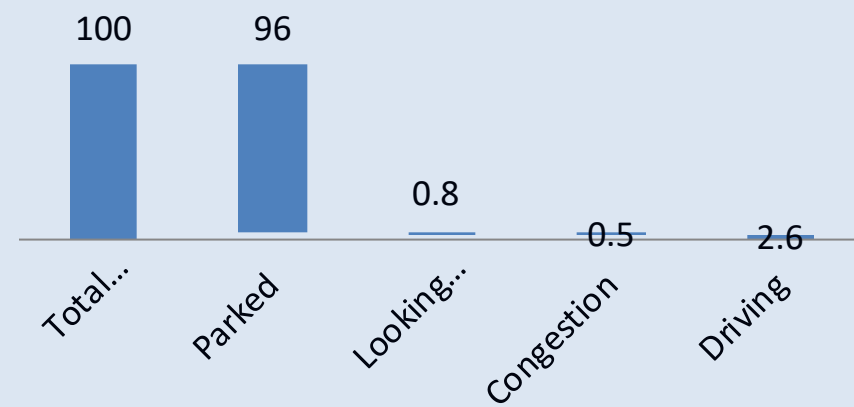
**Cement End Use**  
Percent



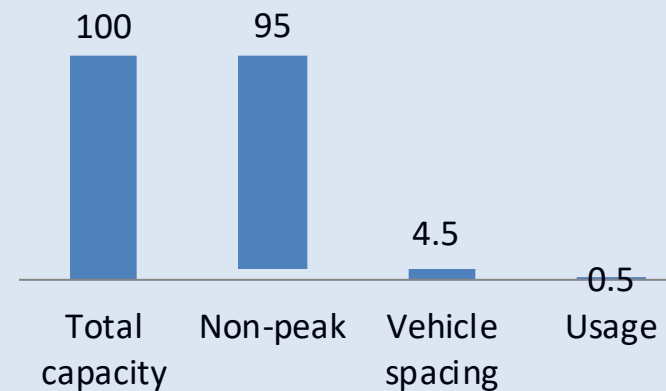
**Steel End Use**  
Percent



**Vehicle utilization**  
Percent



**Road utilization**  
Percent



## 2 Efficient solutions do not always require “sexy” technology

From thin, long, crooked...



...to fat, short, straight



- <1 yr payback
- Reduce 80-90% of friction / pressure head
- Savings potential corresponds to ~50% of global coal plants

### 3 Energy efficiency is not only about the equipment you use – but how you use it

#### Optimized technical setup...

Design energy and mass flow balance shows no heat integration opportunity

SOPs in place to adapt utility load to production level

Cooling circuit optimized to benchmark performance

Compressed air drills preferred to electric, due to higher productivity...

#### ... with significant operational losses

Plant operates at 65% load

Shift supervisor consistently underestimated stop duration by 4-12 hours

Cooling circuit of -14 °C used to cool down to +8 °C

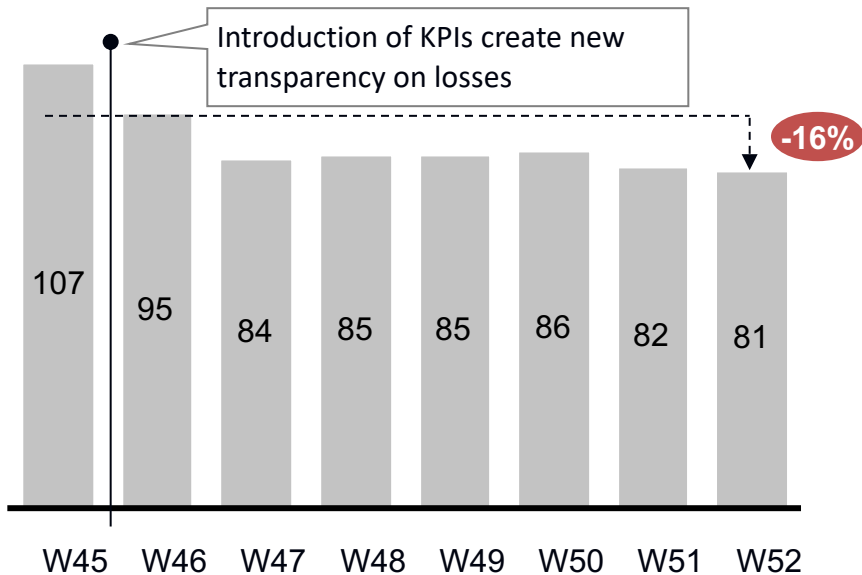
Air leakages lead to below-spec pressure and opposite performance



### 3 Improved energy management can deliver immediate impact

#### Weekly energy consumption

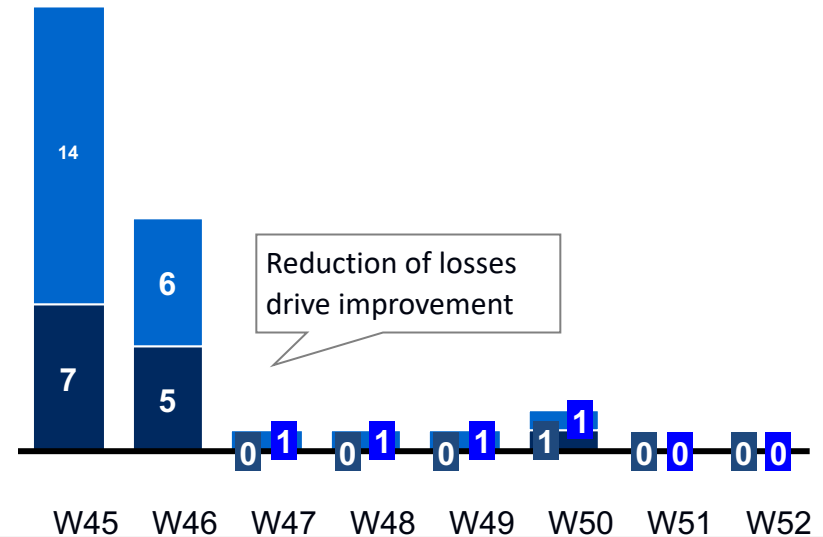
kWh/ton, 2011



#### Weekly energy losses

kWh/ton, 2011

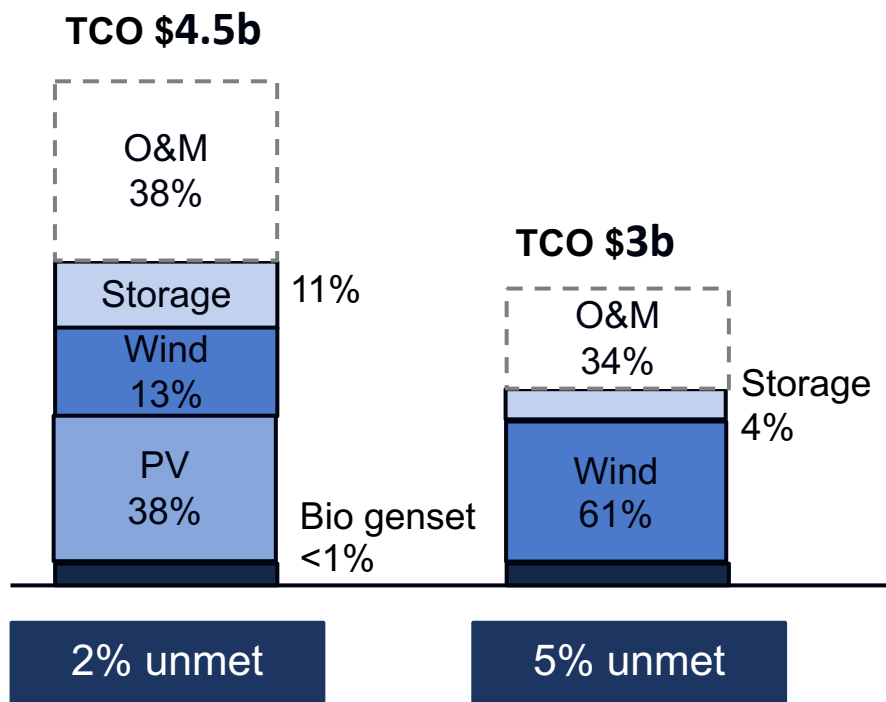
Load losses  
Operational losses



4

# Last 5% load requirement is disproportionately expensive to meet with renewable electricity supply

Total life cycle cost  
\$ billion

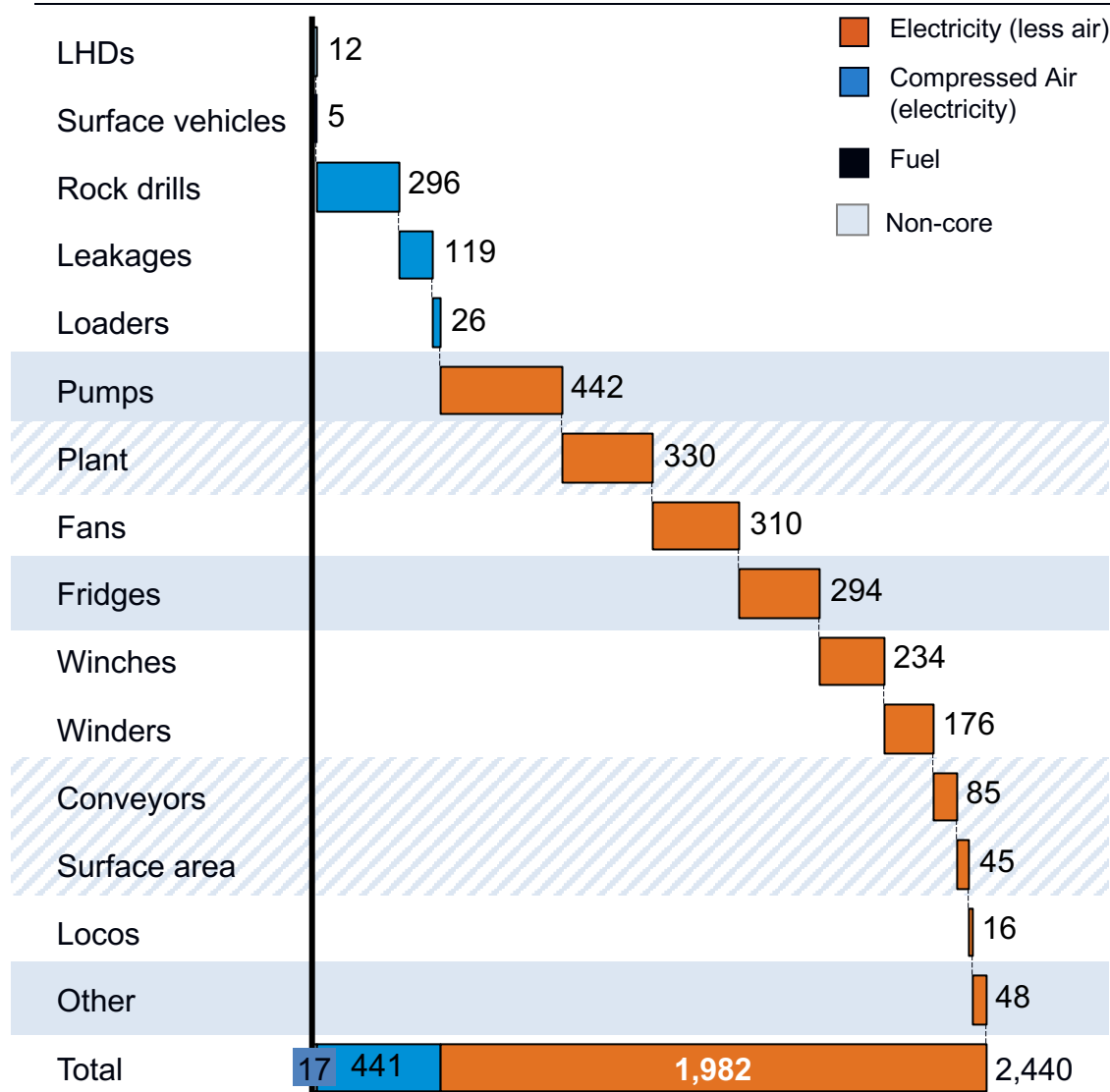


Solar PV only	
0.1% unmet	\$17b TCO
2.5% unmet	\$10b TCO
8% unmet	\$6b TCO

# 5 Up to 50% of energy in a mine is not critical for core process

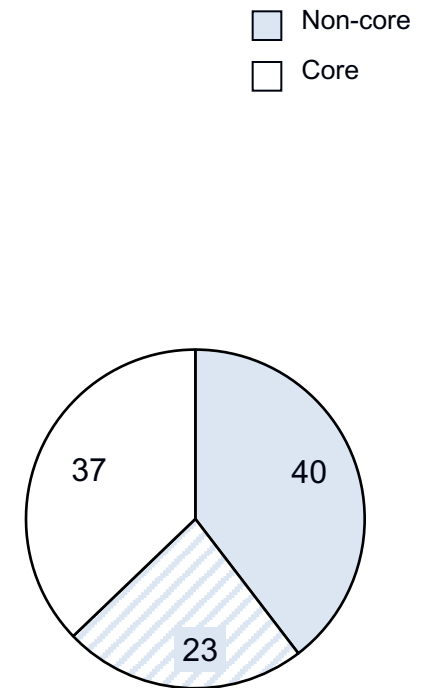
## Baseline breakdown for an underground mining operation

TJ p.a.



## Share of electricity use

Percent; 100% = 1,982 TJ p.a.



# RMI's emerging portfolio for industry abatement

## Opportunity / gap

## Initiatives

Slow adoption of new tech ("valley of death")

**Global Energy Solutions Lab**

**Hydrogen "sand-box"**

No incentives to provide low-carbon products

**De-commoditizing Commodities**

**America's Pledge, BRC & CRC**

**Energy Web Foundation**

Slow adoption of best-practice system design

**Energy Design MOOCs**

**Methane Leakage Reduction**

**Global Cooling Price**

Massive deployment of renewables needed

**Sunshine for Mines**

**Electricity Program**

Solutions needed for heavy transport sector

**Aviation and Shipping**

**Global Trucking and Freight**

Excessive material use

**Mobility transformation**

**Building design**