

**Climate
Change
& the
Built
Environment**

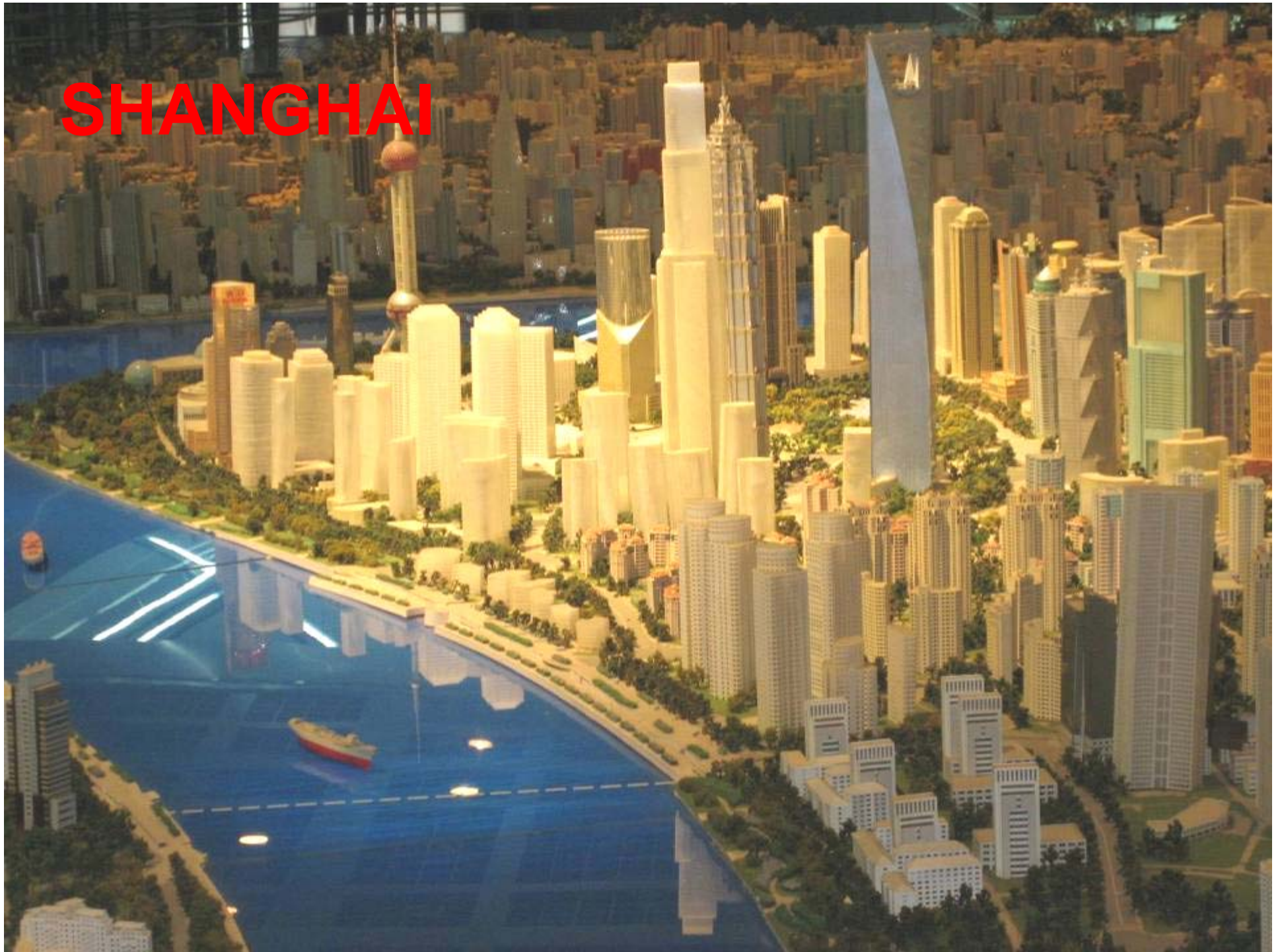


Marc Porat

DALLAS



SHANGHAI



GUJARAT



DUBAI



**72
billion
people**

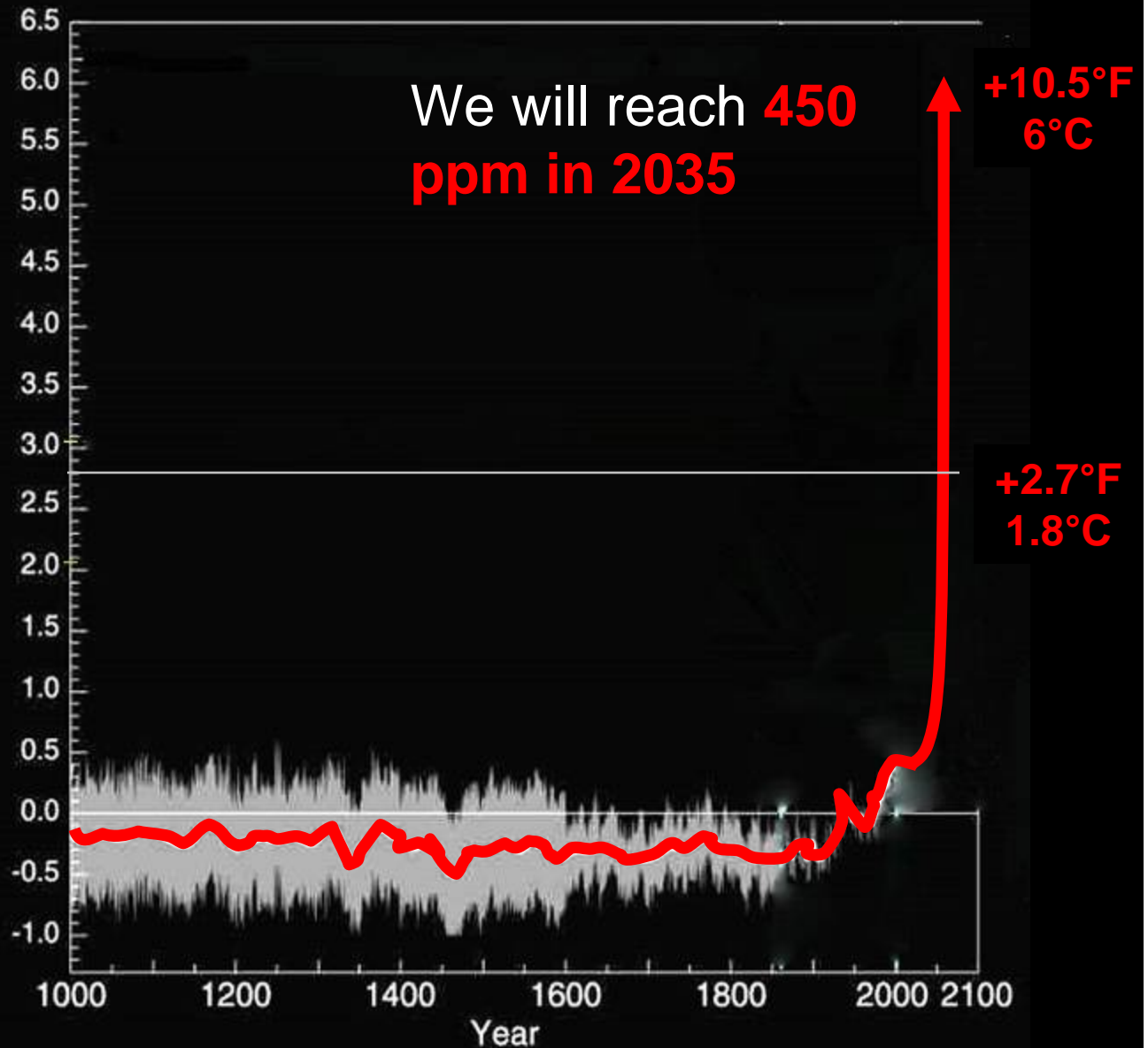


Earth's Surface Temperature

We are at **385 ppm**

Increasing at
+2.5 ppm
annually

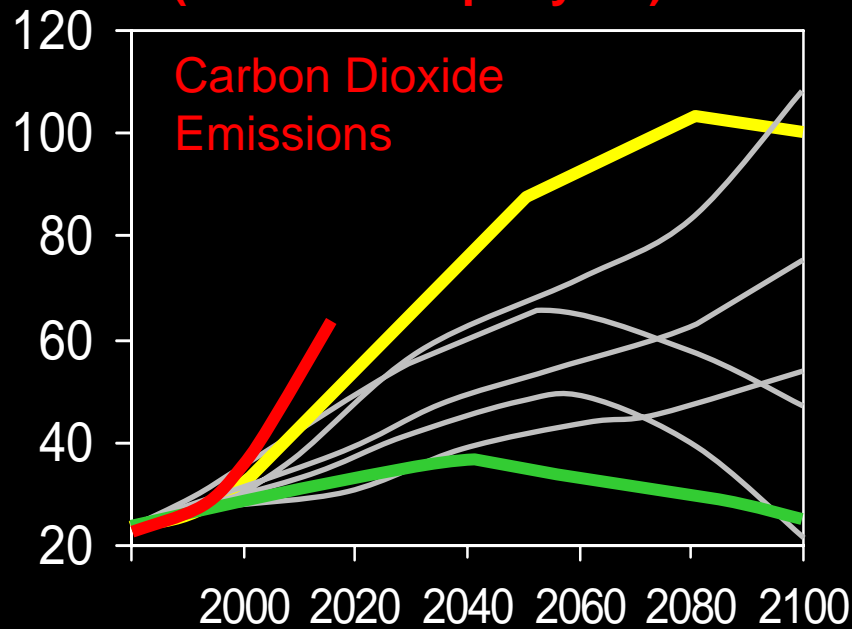
At **450 ppm** CO₂
“we will trigger
potentially
irreversible glacial
melt & sea level rise
out of humanity's
control”



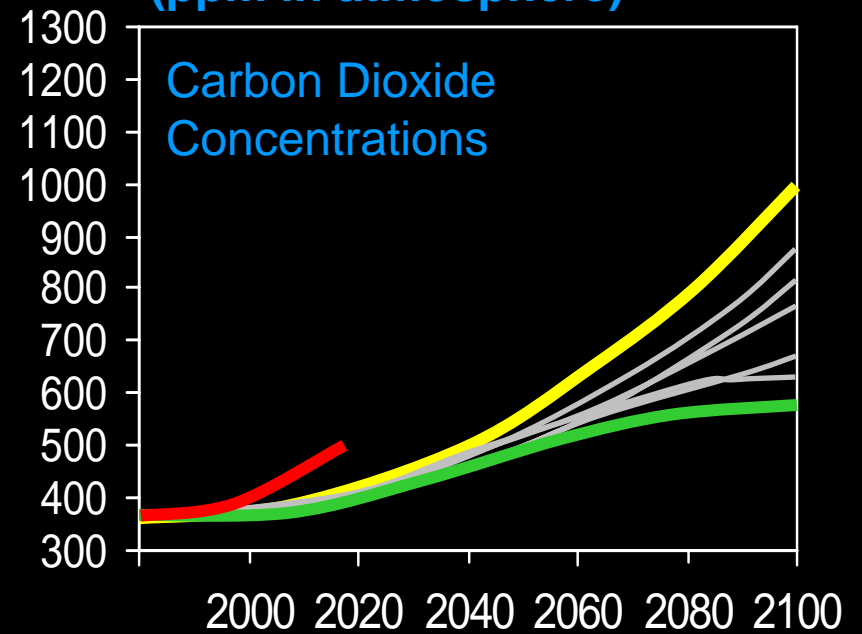
Source: UN Intergovernmental Panel on Climate Change (IPCC)

As CO2 increases...

**CO2 Emissions
(Billion tons per year)**



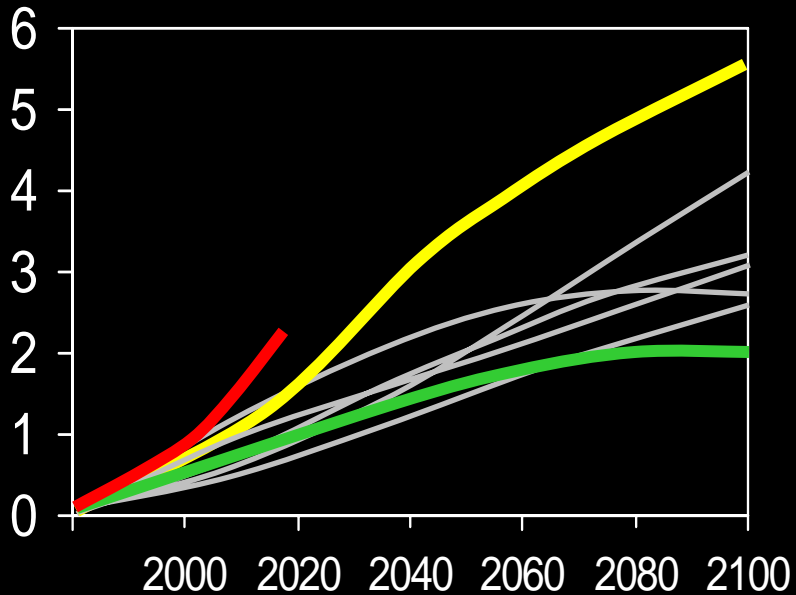
**CO2 Concentration
(ppm in atmosphere)**



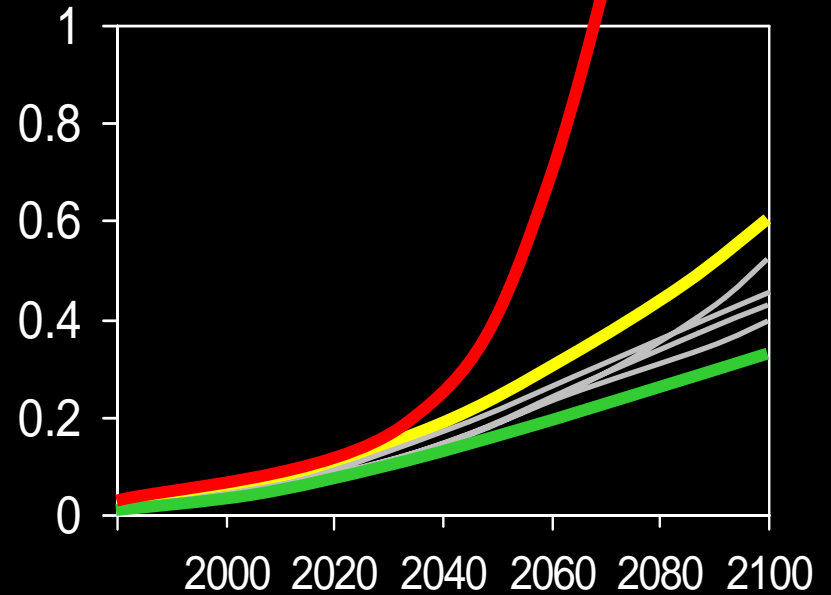
Temperature & sea-level rise...

Greenland 5m

**Temperature
Change C°**



**Sea Level Rise
meters (m)**



Source: UN Intergovernmental Panel on Climate Change (IPCC)



~~750,000 Toyota Prius
drivers save 2.35M MT of
CO₂ per year~~

1 CFPP in 1 year



Sources: U.S. EPA, Toyota, CalStar analysis



Wal-Mart investing \$500M in
7 years to reduce energy &
CO₂ by 20%

1 CFPP in 1 month

Source: Architecture 2030





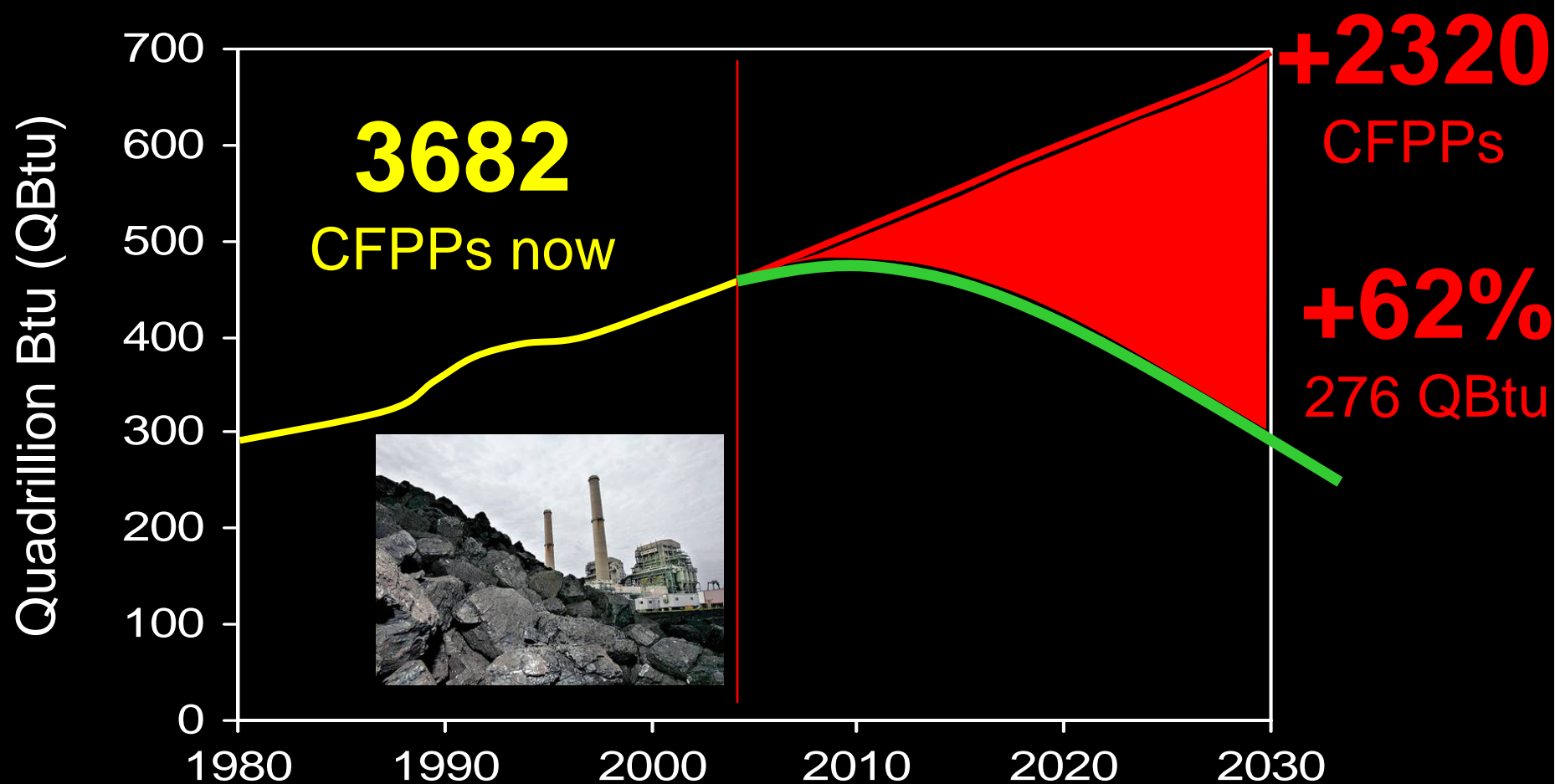
Home Depot planting
300,000 trees to absorb
CO₂...

1 CFPP in 10 days

Source: Architecture 2030



Worldwide Energy Demand & Coal



Sources: Architecture 2030, U.S. Energy Information Agency & CalStar analysis



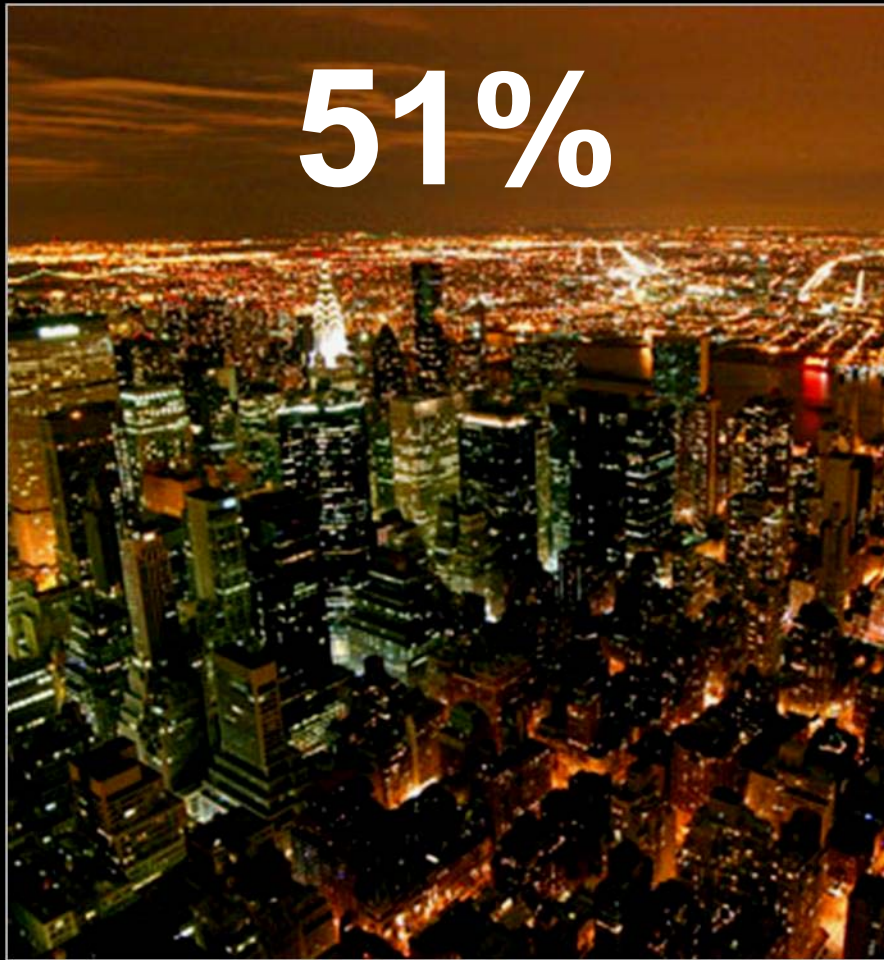
USA Built Environment

An aerial night photograph of a city skyline, likely New York City, showing numerous illuminated skyscrapers and a dense urban landscape. The lights from the buildings and streets create a vibrant orange and yellow glow against the dark sky. In the foreground, a body of water reflects the city lights, with a prominent red structure visible on the right side.

51%
total
energy

55%
total
CO₂

USA Energy Demand



51%

Built Environment



27%

Transport



22%

Industry

USA Energy



Built Environment 51%

**Residential
22%**



**Commercial
17%**



Operations 39%

**Buildings
9%**

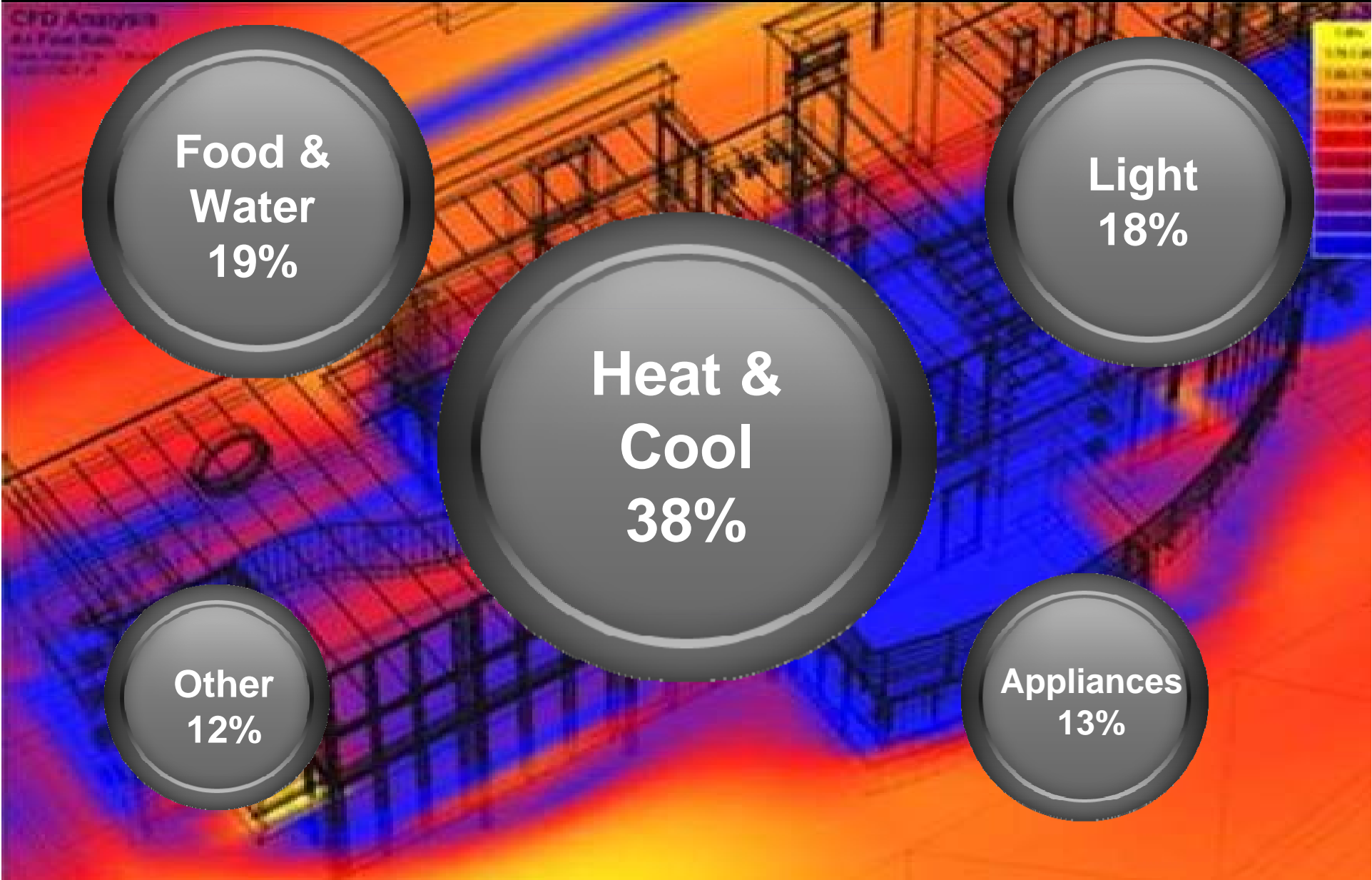


**Infra
3%**



Materials 12%

The Problem



Half of USA Electricity from Coal

Building Operations
76% of USA electricity



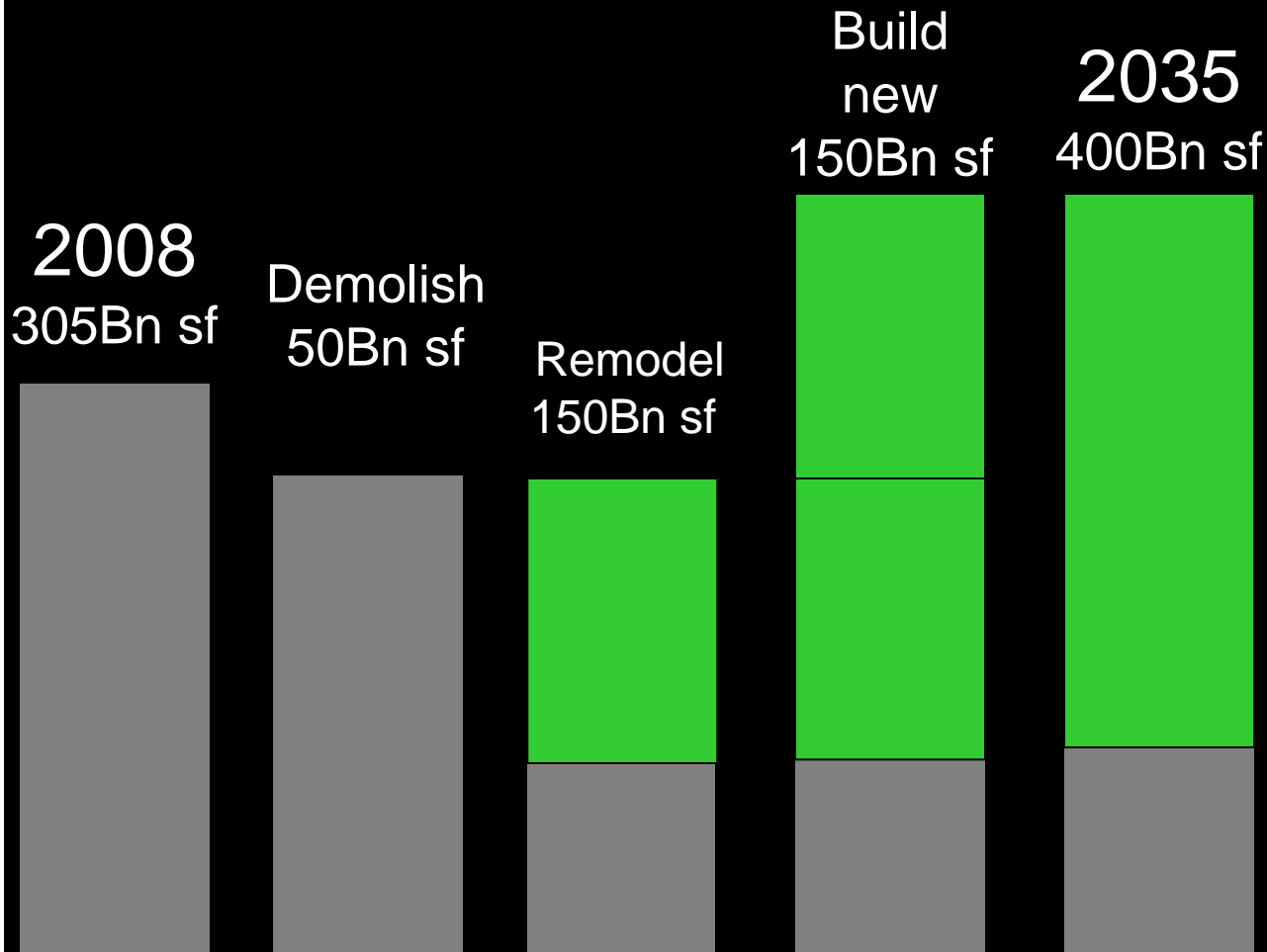
Industrial
23%



Transportation 1%



USA Construction Cash Flood: 2035



75% touched

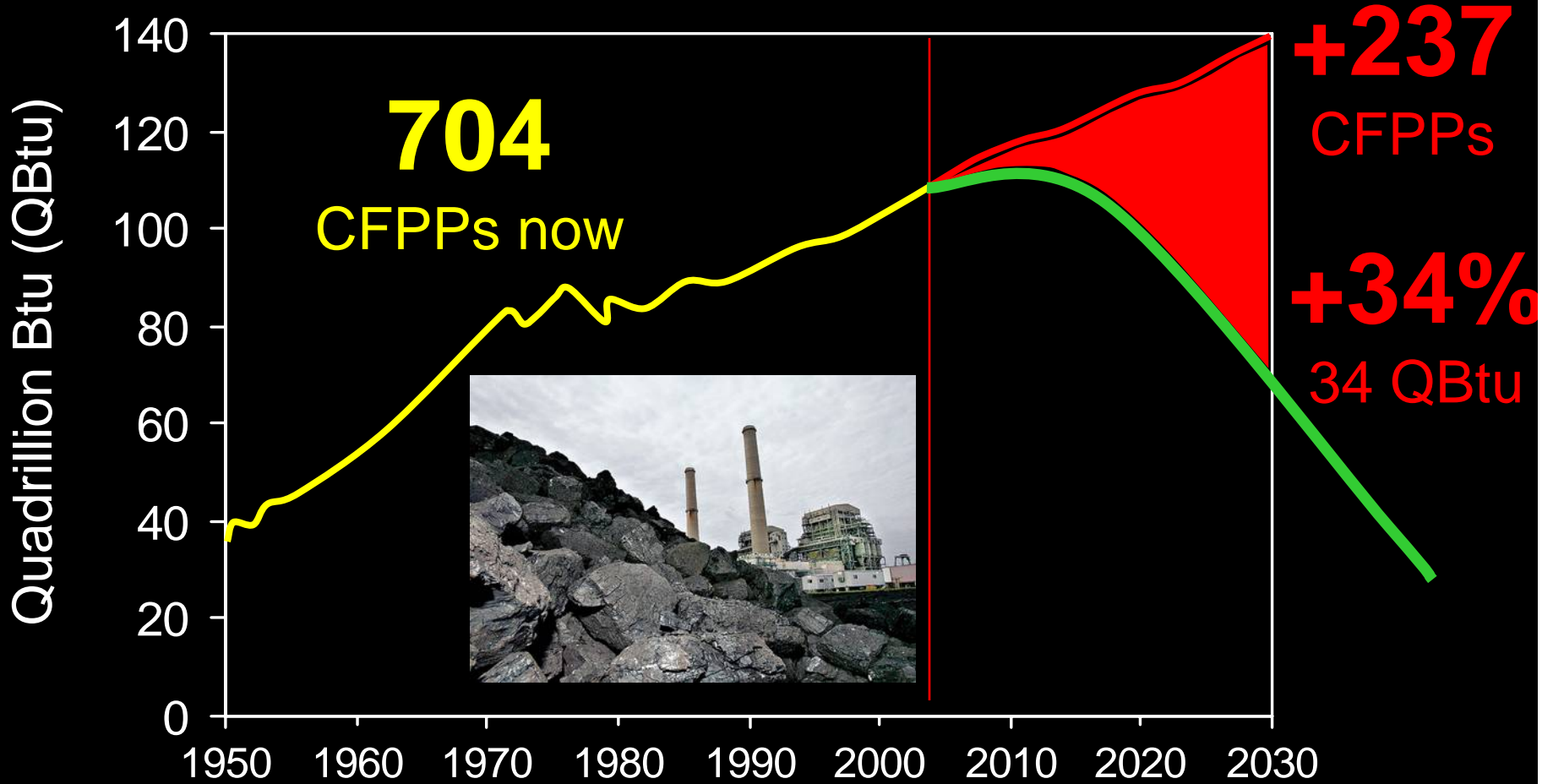
\$30T new construction

+

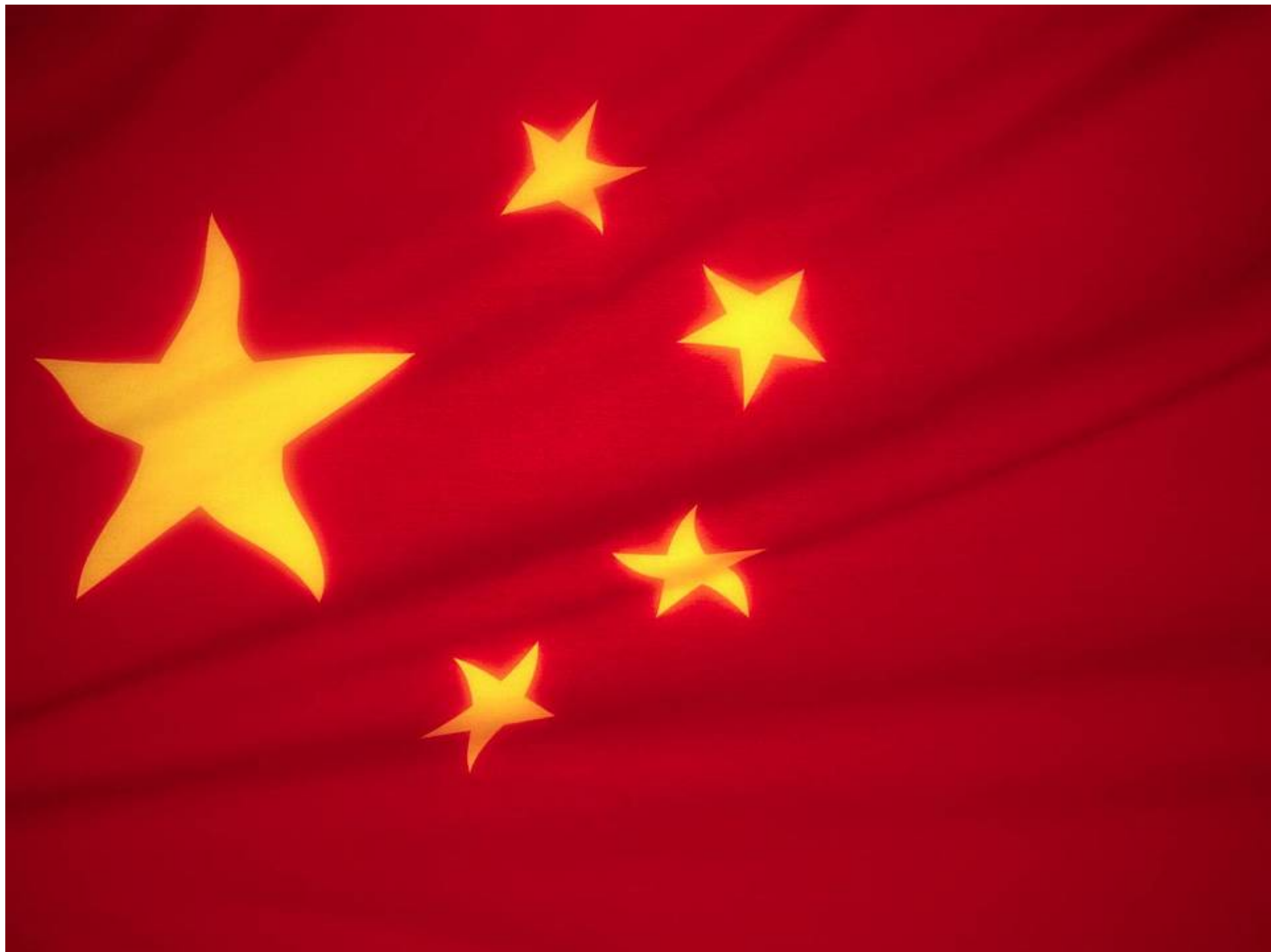
\$10T renovate

U.S. Building Inventory

USA Energy Demand & Coal



Sources: Architecture 2030, U.S. Energy Information Agency & CalStar analysis





CHINA
2020

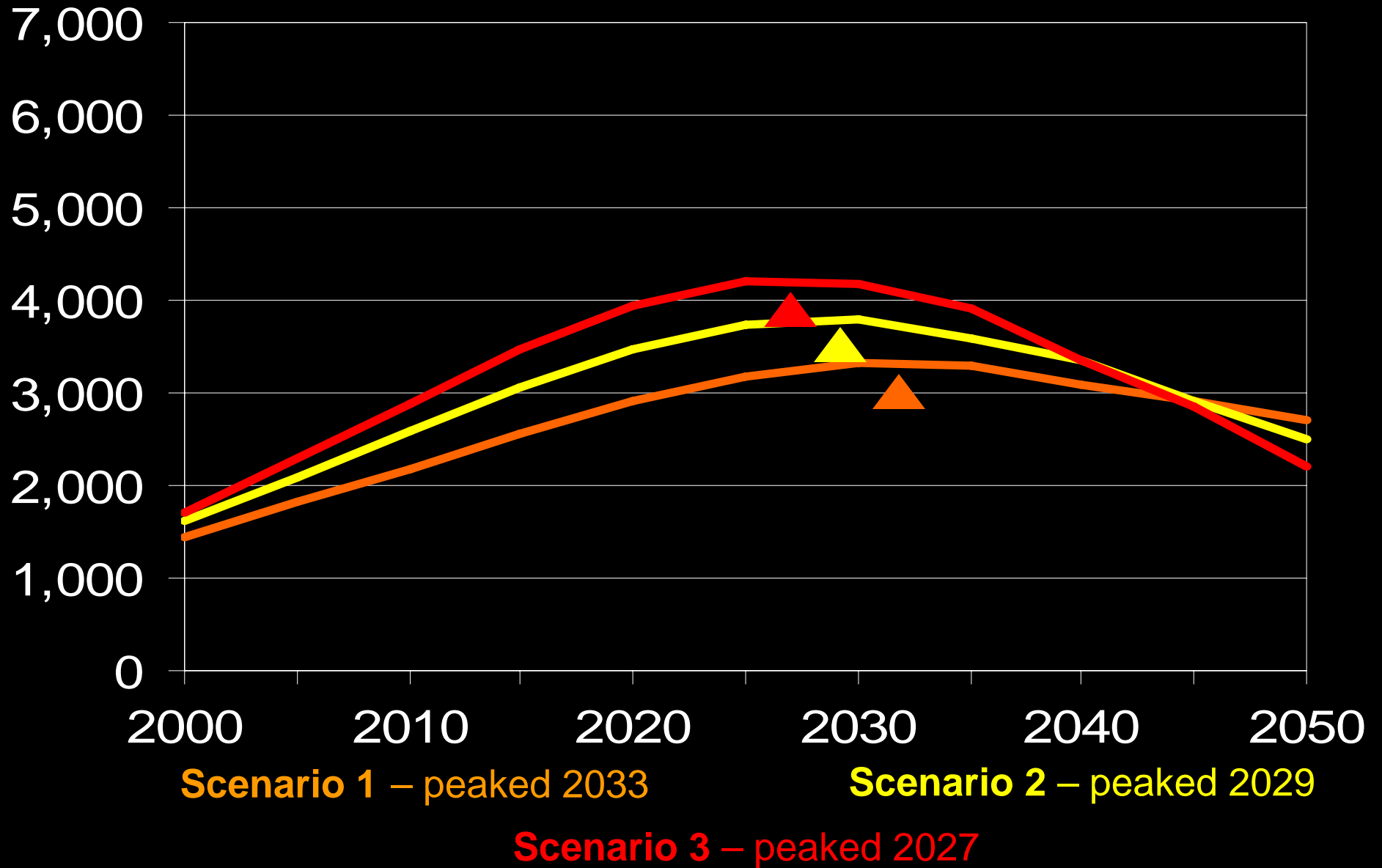
New Urban
350 million

+

New Rural
250 million

Million Metric Ton
Coal Equivalent

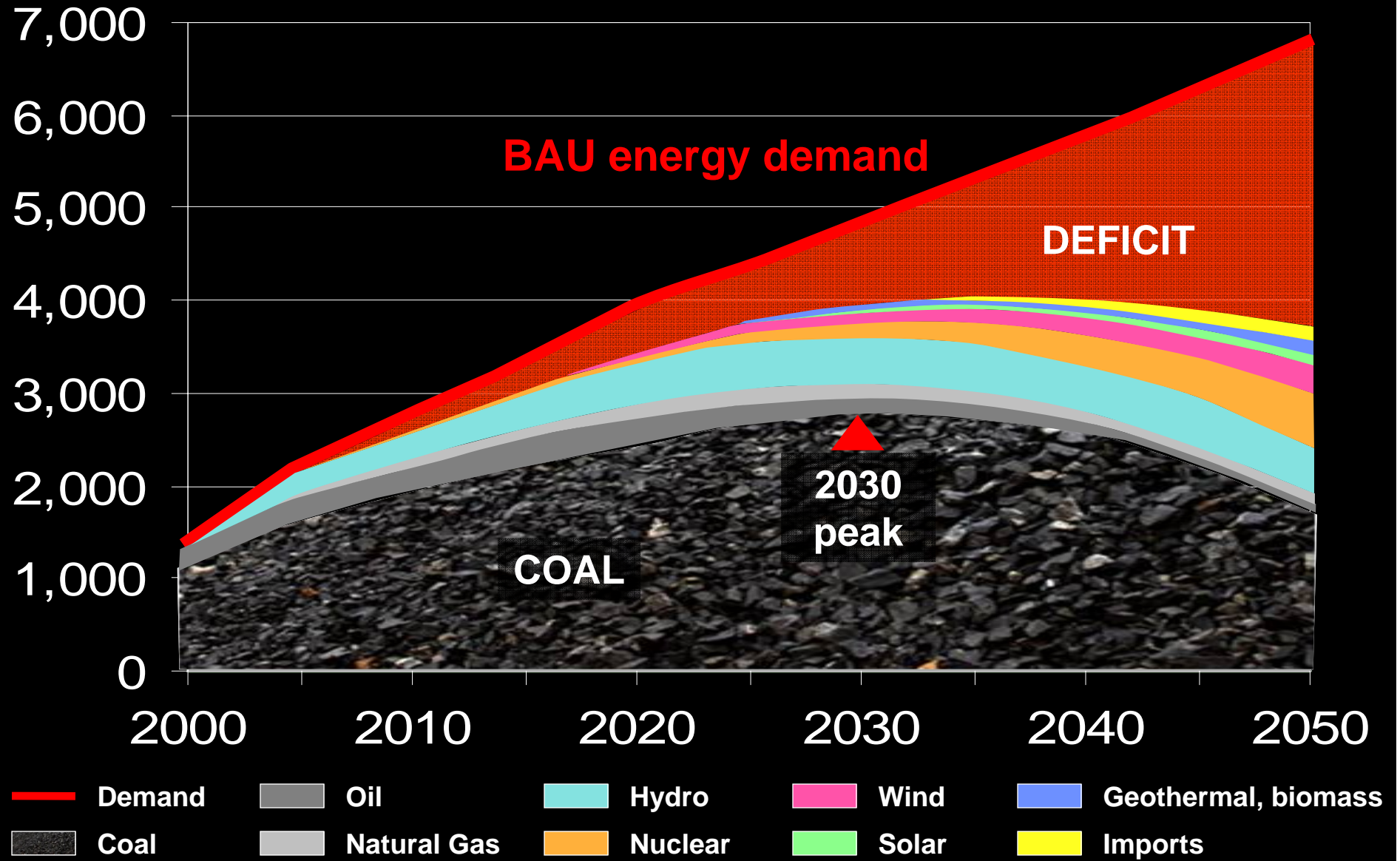
Peak Coal



Source: ???

Million Metric Ton
Coal Equivalent

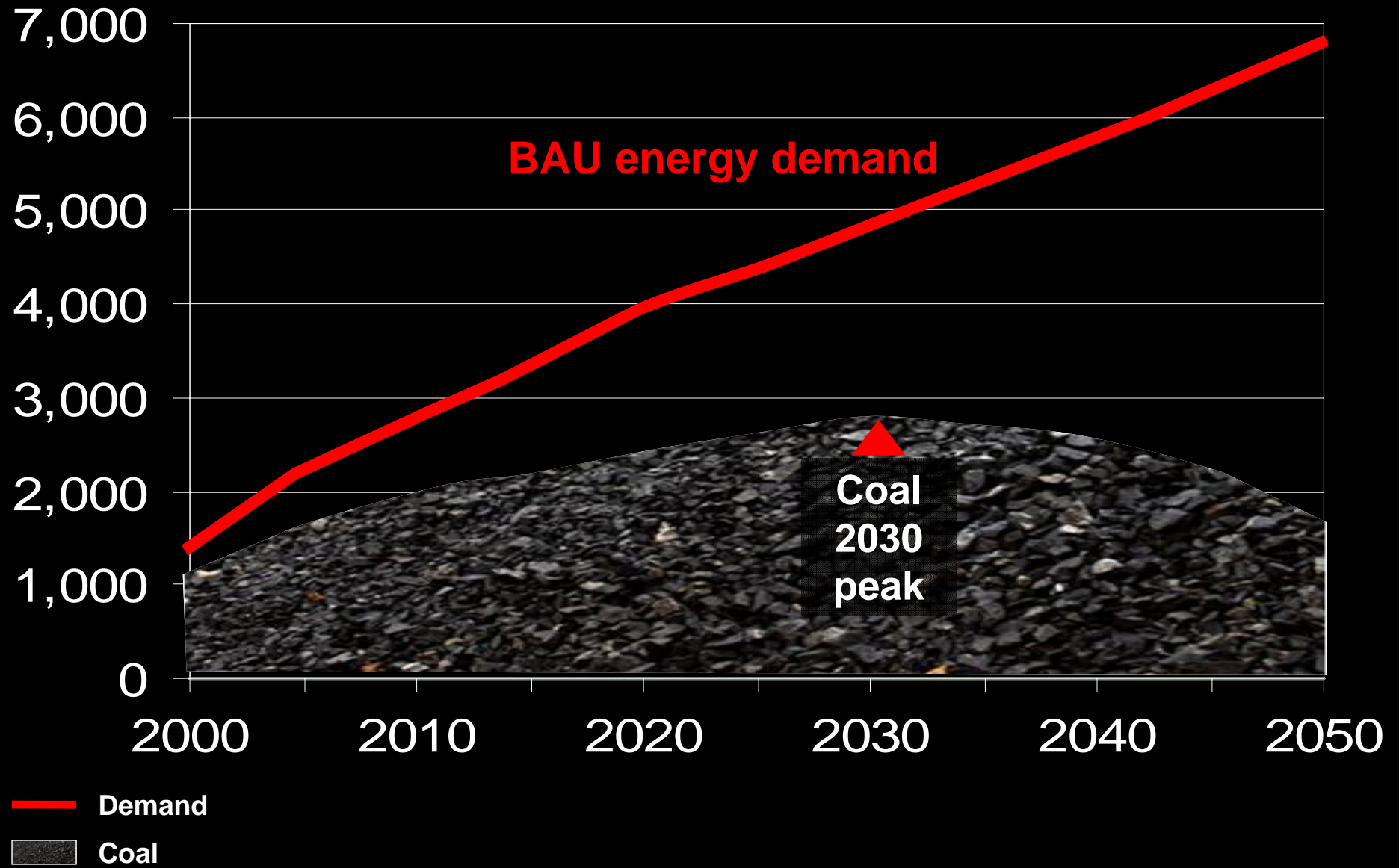
All Energy Sources



Source: Lawrence Berkeley National Lab, 2050 China Energy Study, preliminary estimates

Million Metric Ton
Coal Equivalent

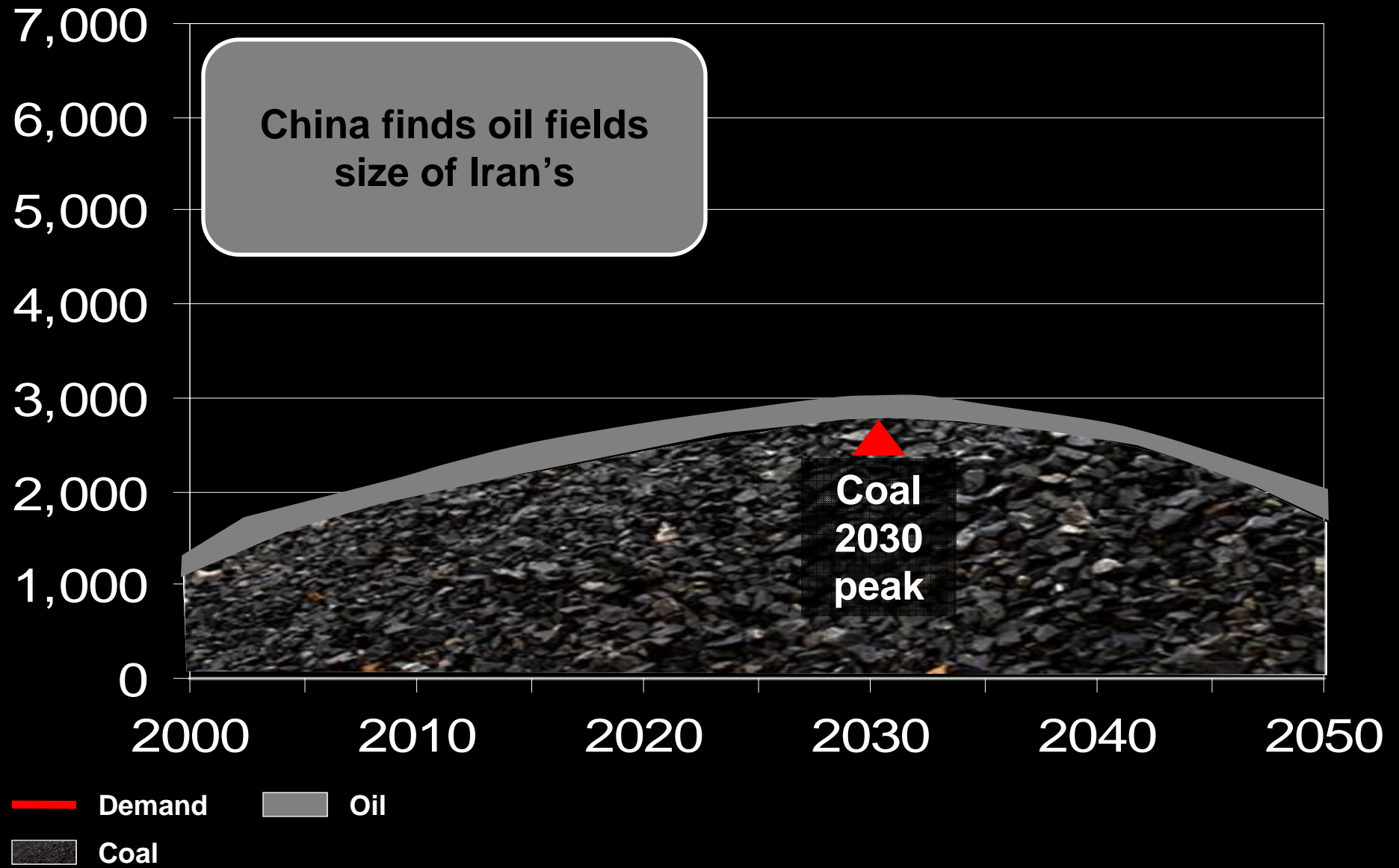
Hyper Optimism



Source: Lawrence Berkeley National Lab, 2050 China Energy Study, preliminary estimates

Million Metric Ton
Coal Equivalent

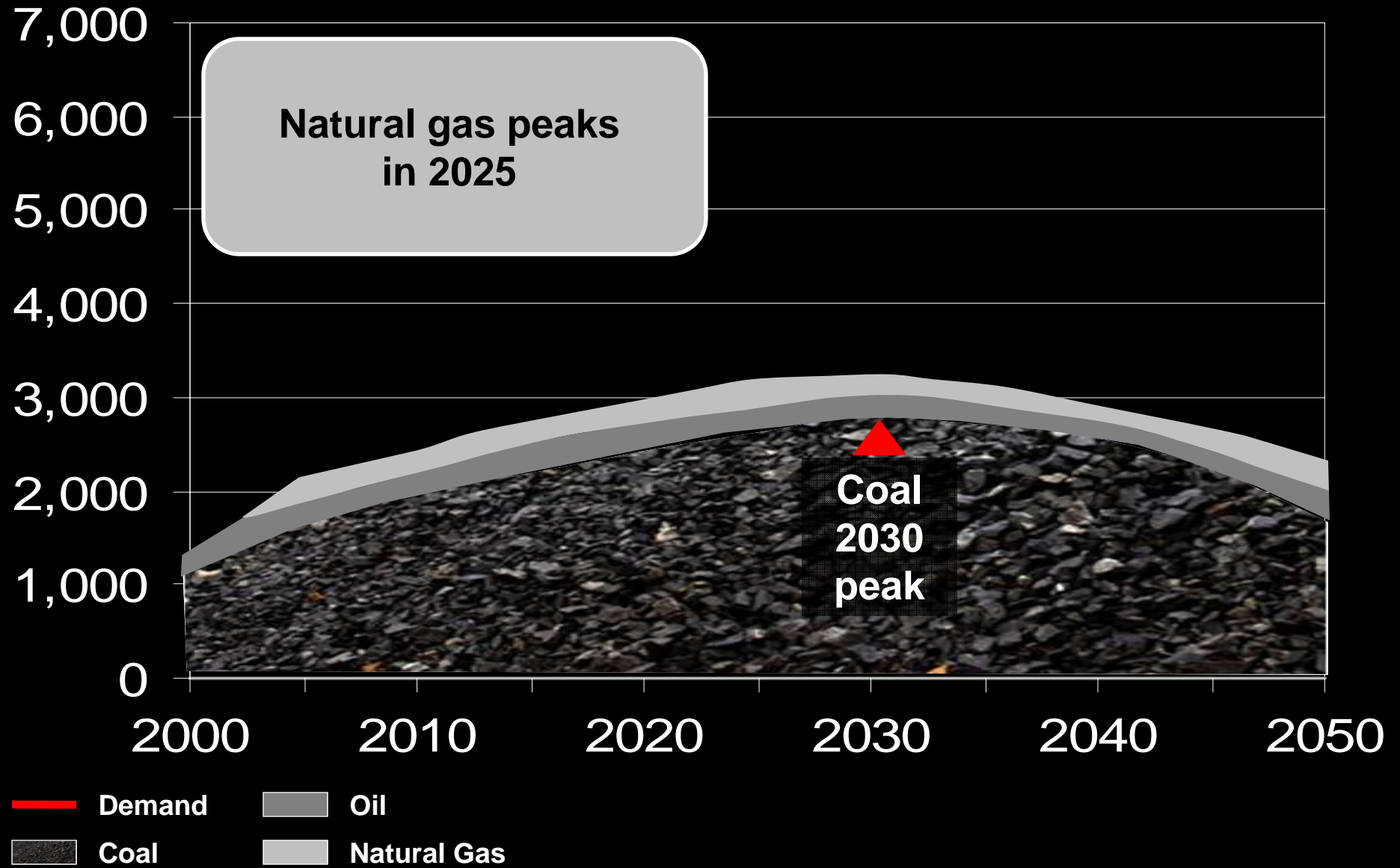
Hyper Optimism



Source: Lawrence Berkeley National Lab, 2050 China Energy Study, preliminary estimates

Million Metric Ton
Coal Equivalent

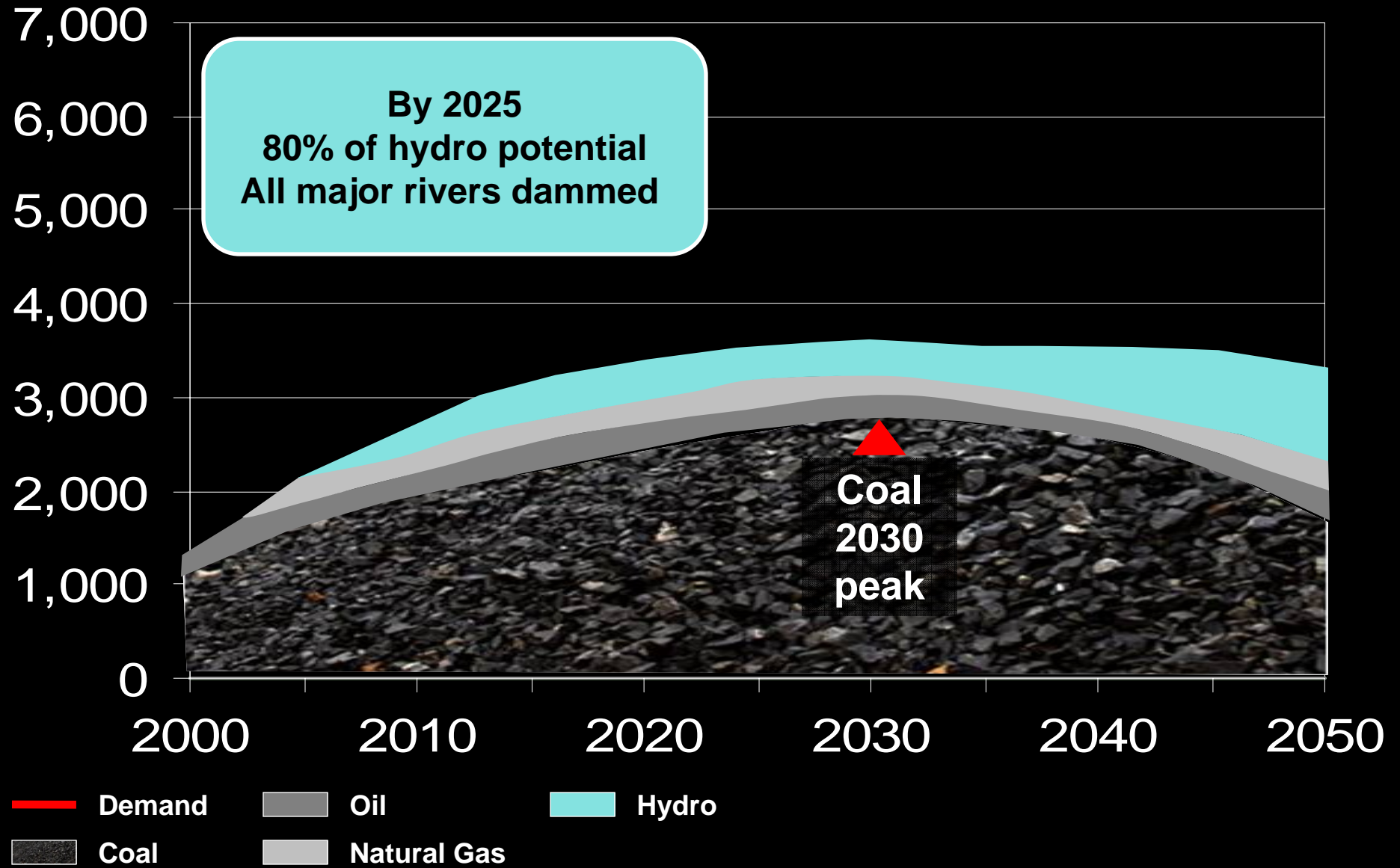
Natural Gas



Source: Lawrence Berkeley National Lab, 2050 China Energy Study, preliminary estimates

Million Metric Ton
Coal Equivalent

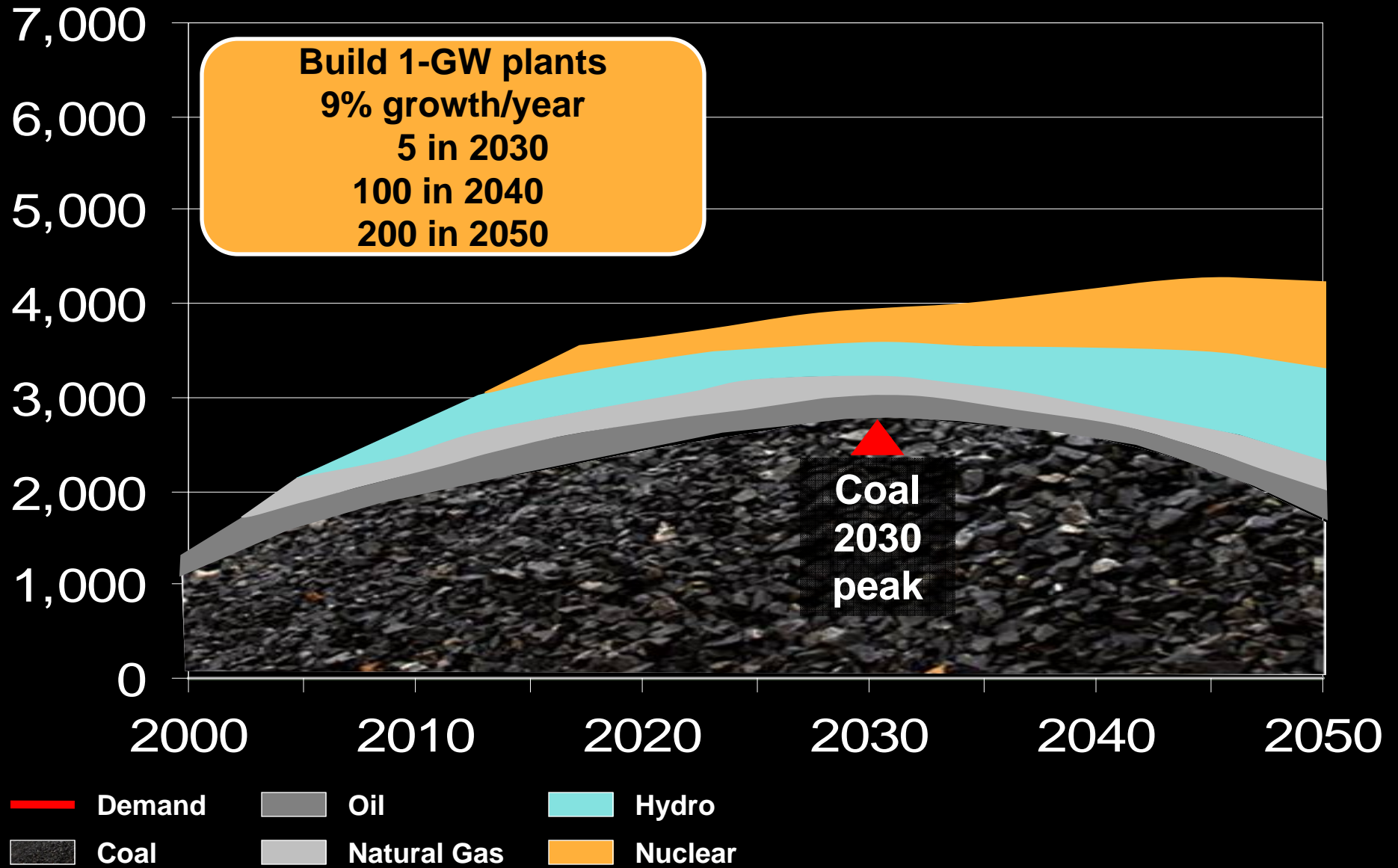
Hydro Optimism



Source: Lawrence Berkeley National Lab, 2050 China Energy Study, preliminary estimates

Million Metric Ton
Coal Equivalent

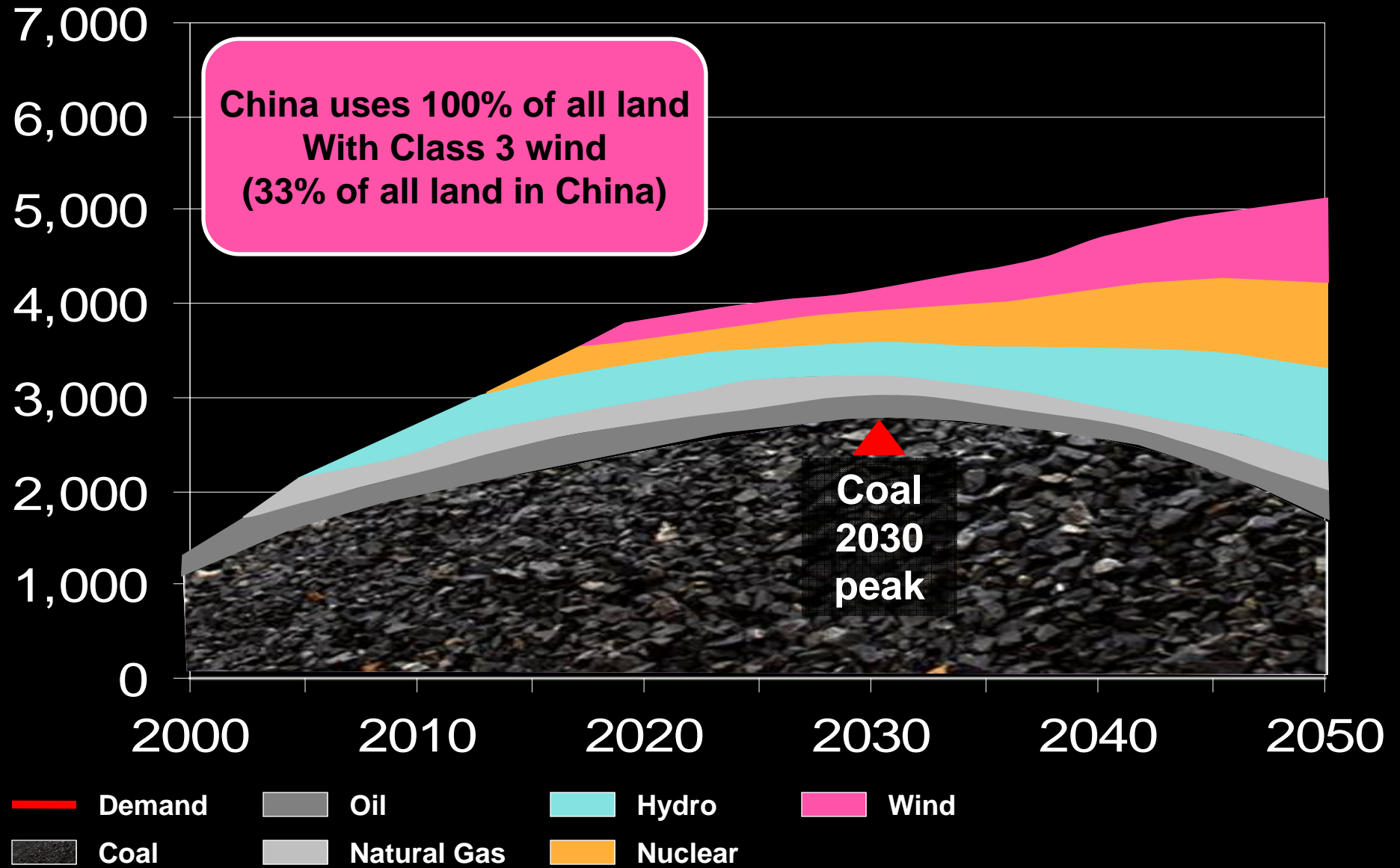
Nuclear Optimism



Source: Lawrence Berkeley National Lab, 2050 China Energy Study, preliminary estimates

Million Metric Ton
Coal Equivalent

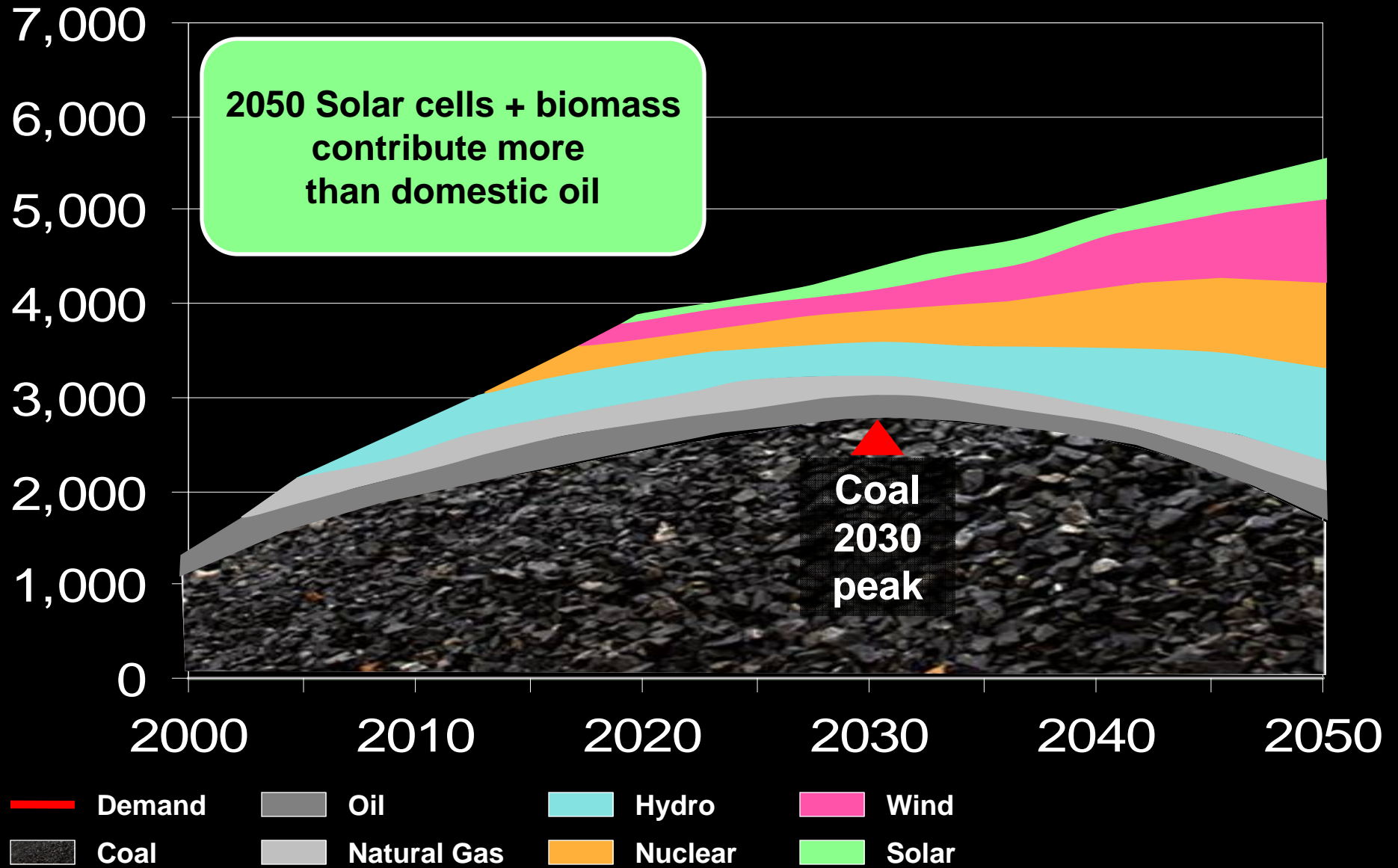
Wind Optimism



Source: Lawrence Berkeley National Lab, 2050 China Energy Study, preliminary estimates

Solar Optimism

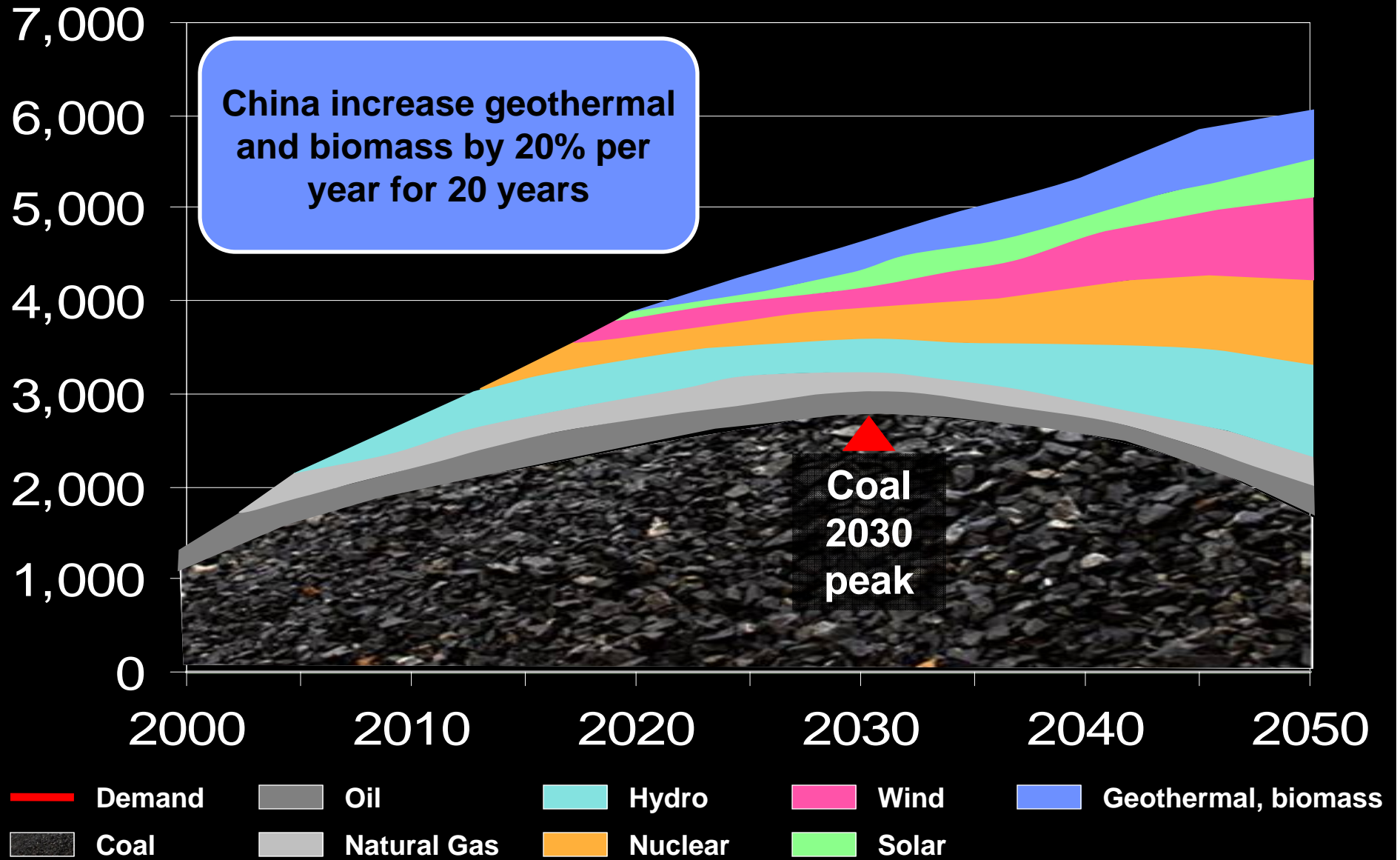
Million Metric Ton
Coal Equivalent



Source: Lawrence Berkeley National Lab, 2050 China Energy Study, preliminary estimates

Million Metric Ton
Coal Equivalent

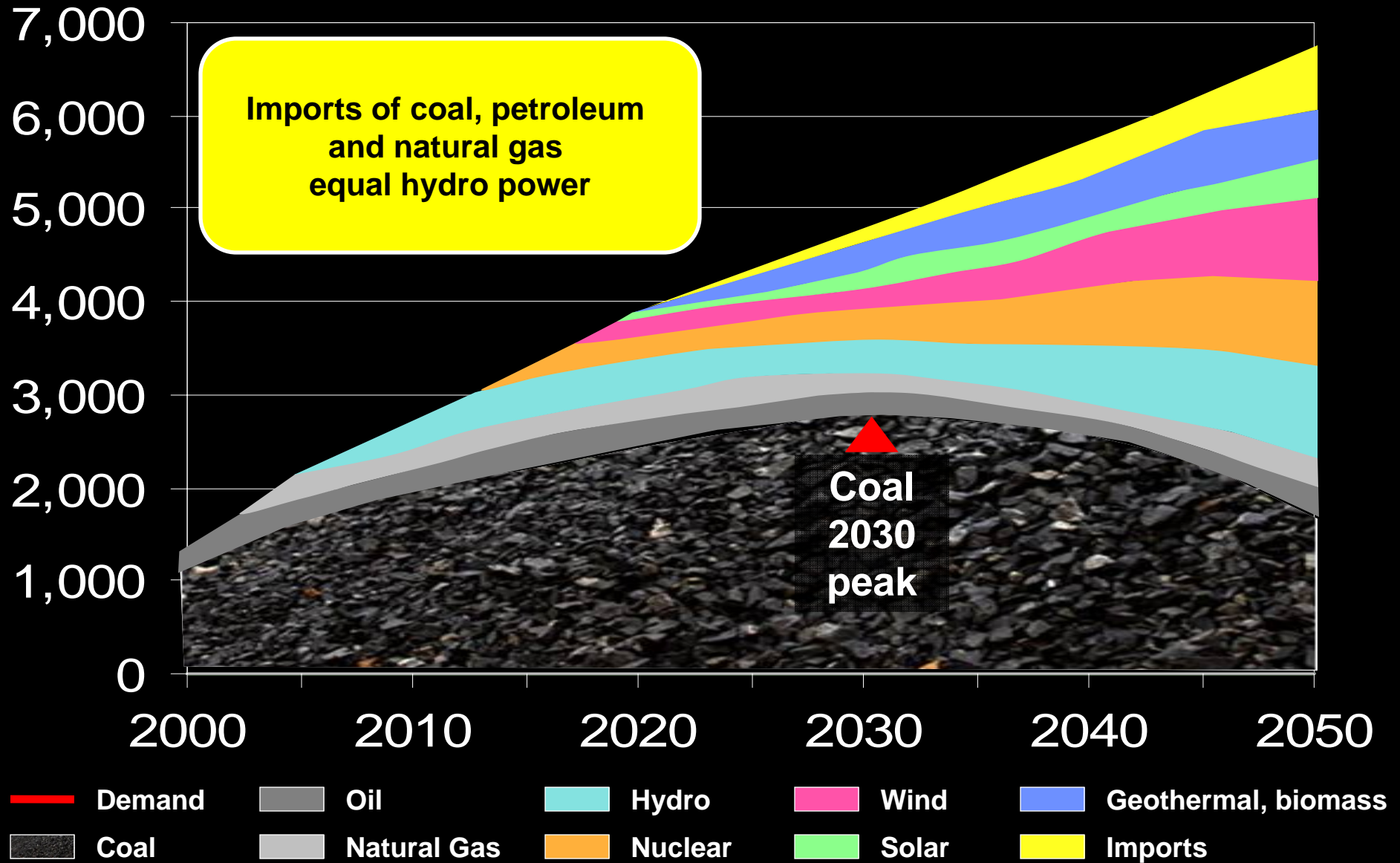
Geothermal & Biomass Optimism



Source: Lawrence Berkeley National Lab, 2050 China Energy Study, preliminary estimates

Million Metric Ton
Coal Equivalent

Import Optimism



Source: Lawrence Berkeley National Lab, 2050 China Energy Study, preliminary estimates

Harmonious Society

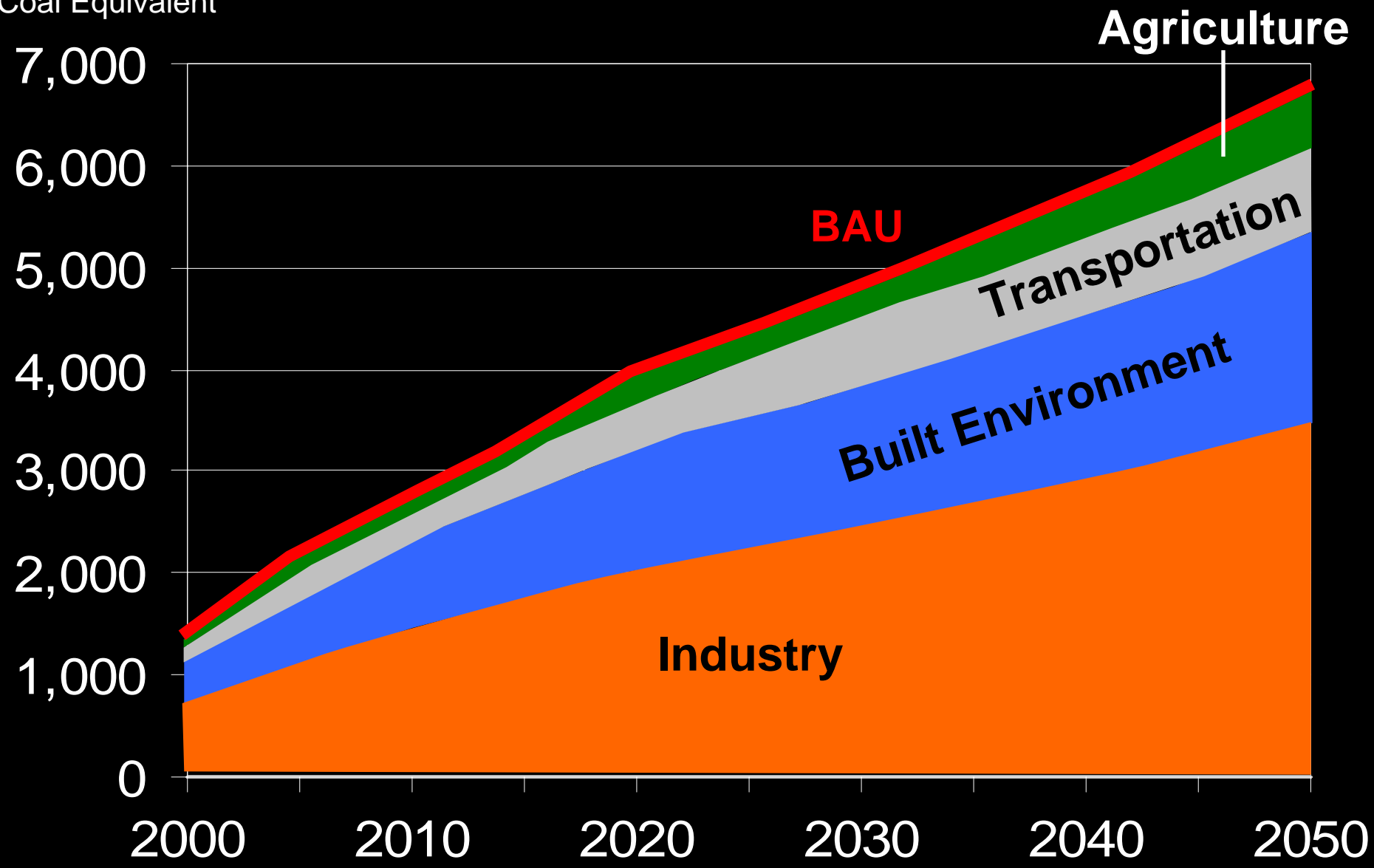
**Danger
path**



**Green
path**

Million Metric Ton
Coal Equivalent

Four Sectors Need to Conserve



Source: ???

CHINA Built Environment

A nighttime photograph of a cityscape, likely Shanghai, featuring the Oriental Pearl Tower and traditional Chinese architecture illuminated against a dark sky.

37%
total
energy

52%
total
CO₂

China Energy Demand



37%

Built Environment



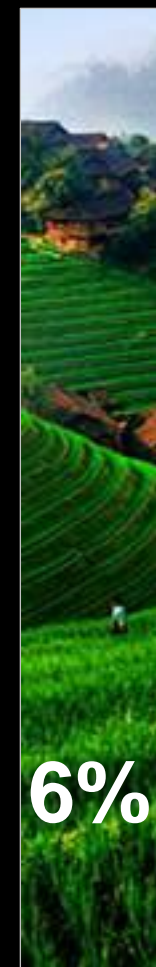
50%

Industry



9%

Transport



6%

Agr

Source: LBNL

China Energy & Built Environment



Built Environment 37%



**Residential
14%**



**Commercial
9%**

Operations 23%



**Buildings
11%**



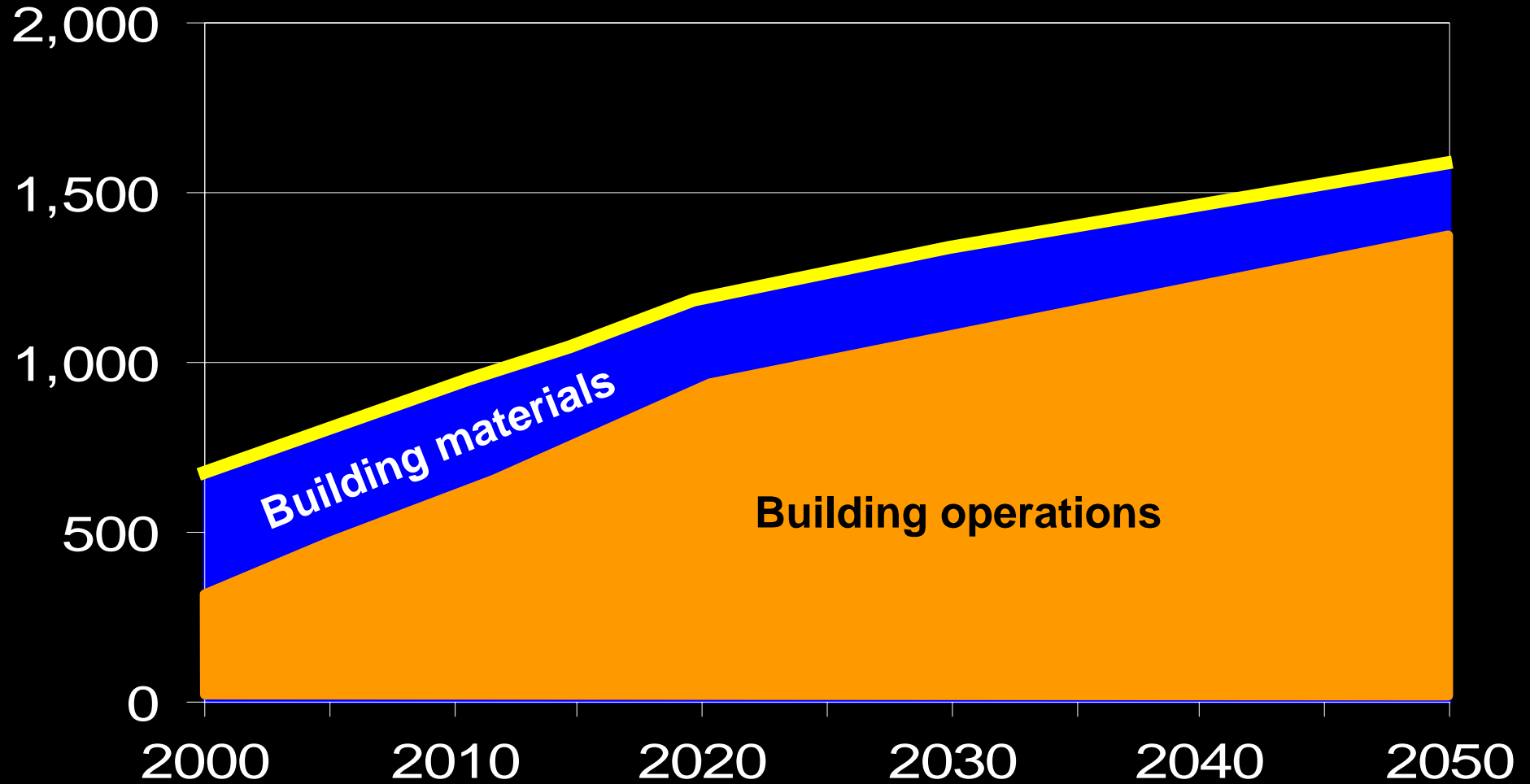
**Infra
3%**

Materials 14%

Million Metric Ton
Coal Equivalent

China Built Environment

Business As Usual (BAU)



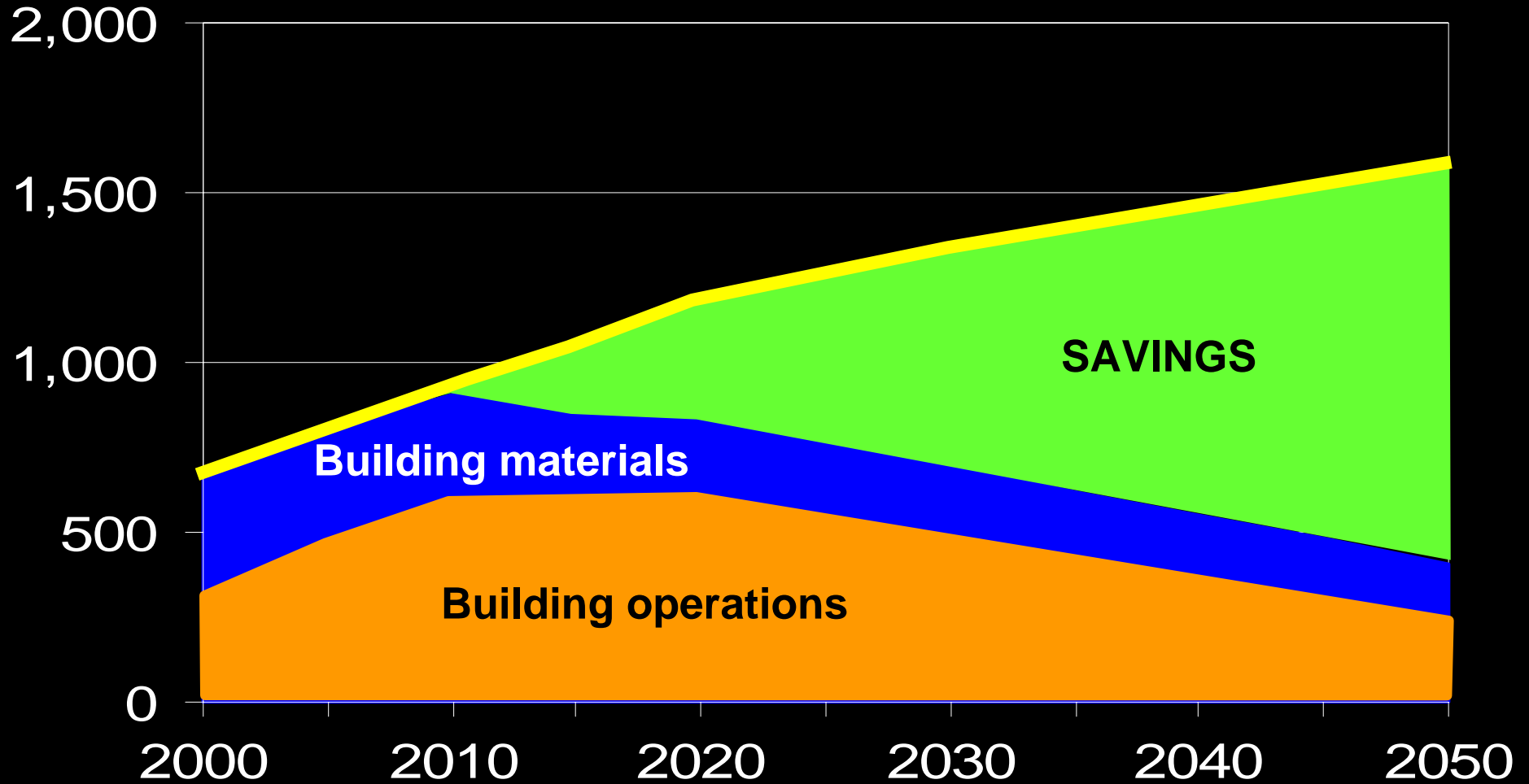
Materials: cement, steel, glass, bricks, wood

Operations: cooling, heating, lighting, appliances

Source: Lawrence Berkeley National Lab, 2050 China Energy Study, preliminary estimates

Million Metric Ton
Coal Equivalent

Net Zero Energy (NZE)



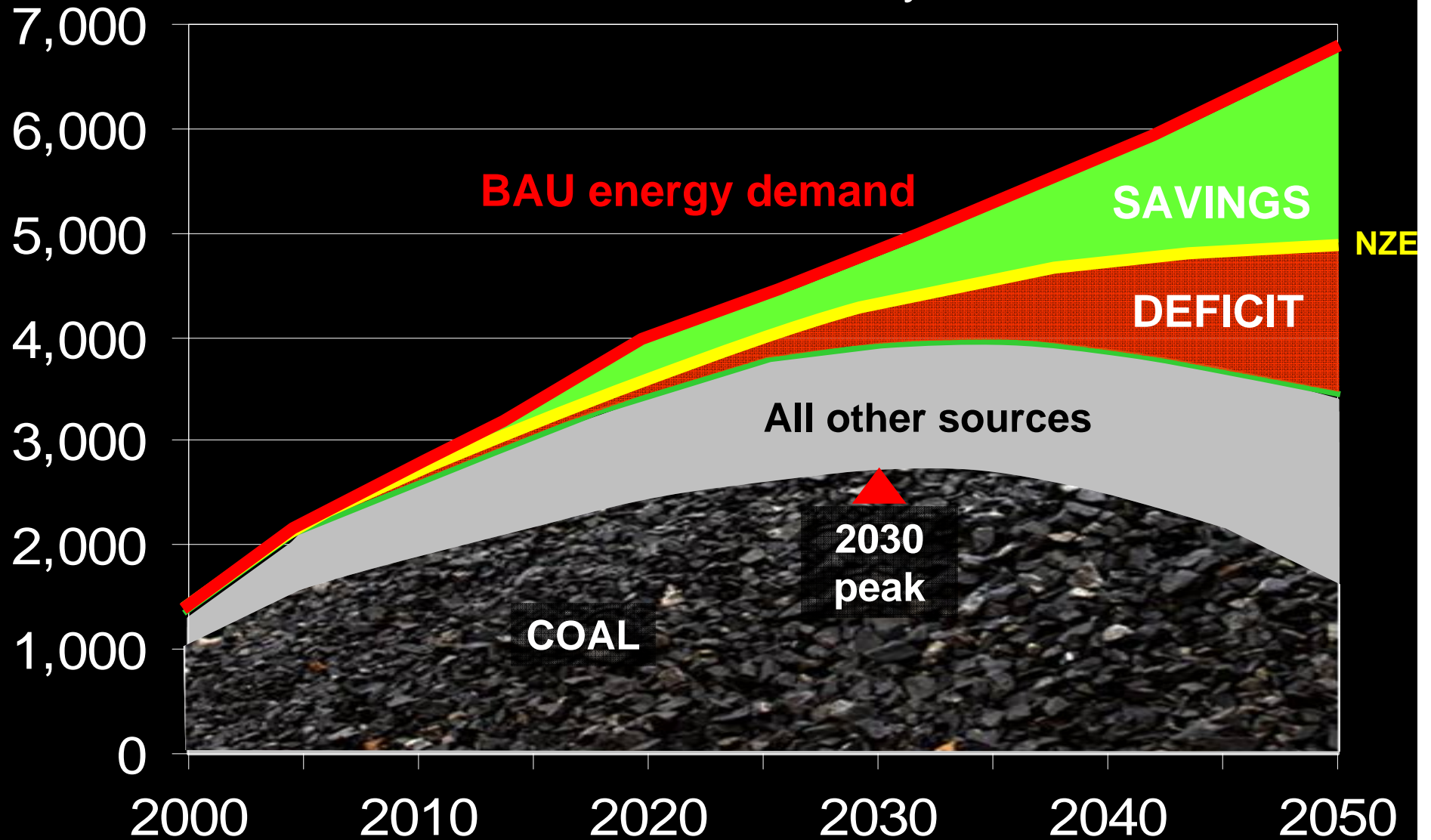
Materials: cement, steel, glass, bricks, wood
Operations: cooling, heating, lighting, appliances

Source: Lawrence Berkeley National Lab, 2050 China Energy Study, preliminary estimates

Million Metric Ton
Coal Equivalent

Net Zero Buildings

2030 deficit reduction by >33%



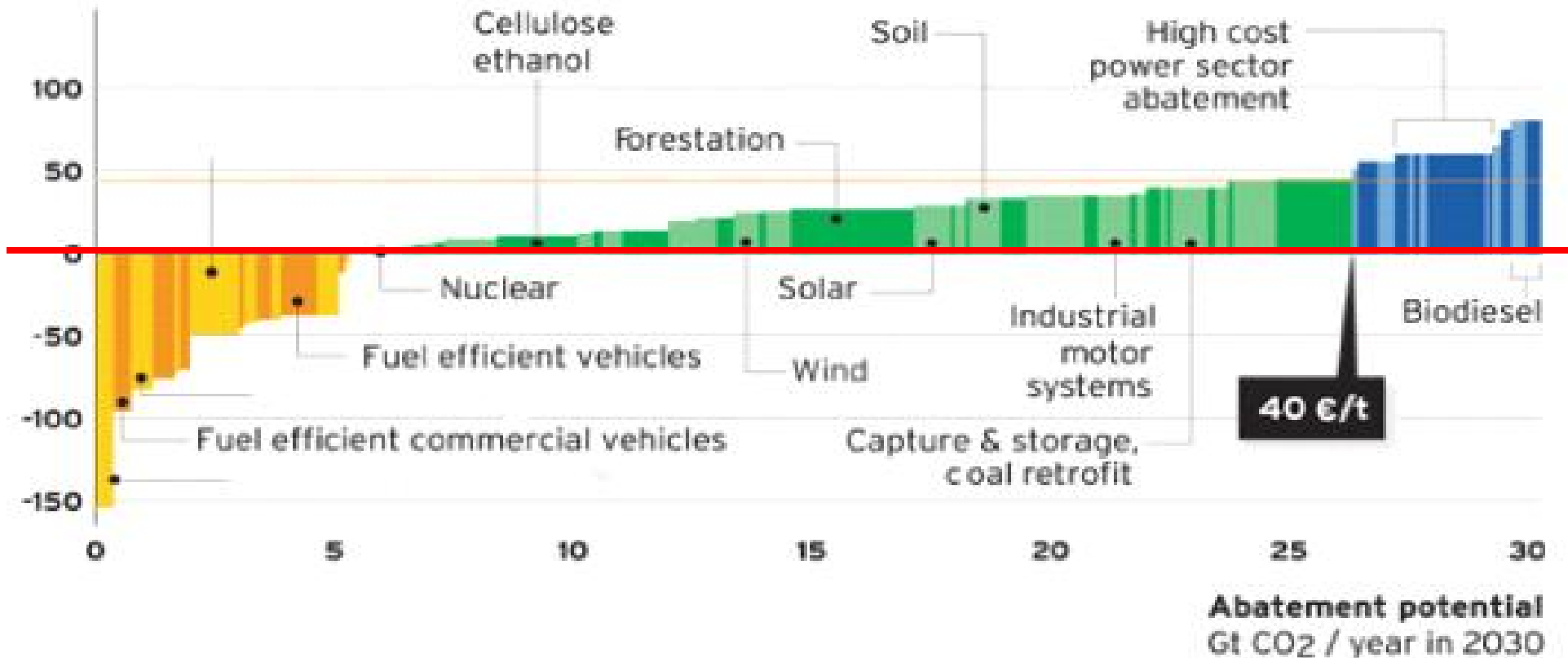
Source: Lawrence Berkeley National Lab, 2050 China Energy Study, preliminary estimates

Everything
in the built environment
can be reinvented



Eliminate 27B tons of CO₂

Marginal cost of abatement - examples
€/t CO₂



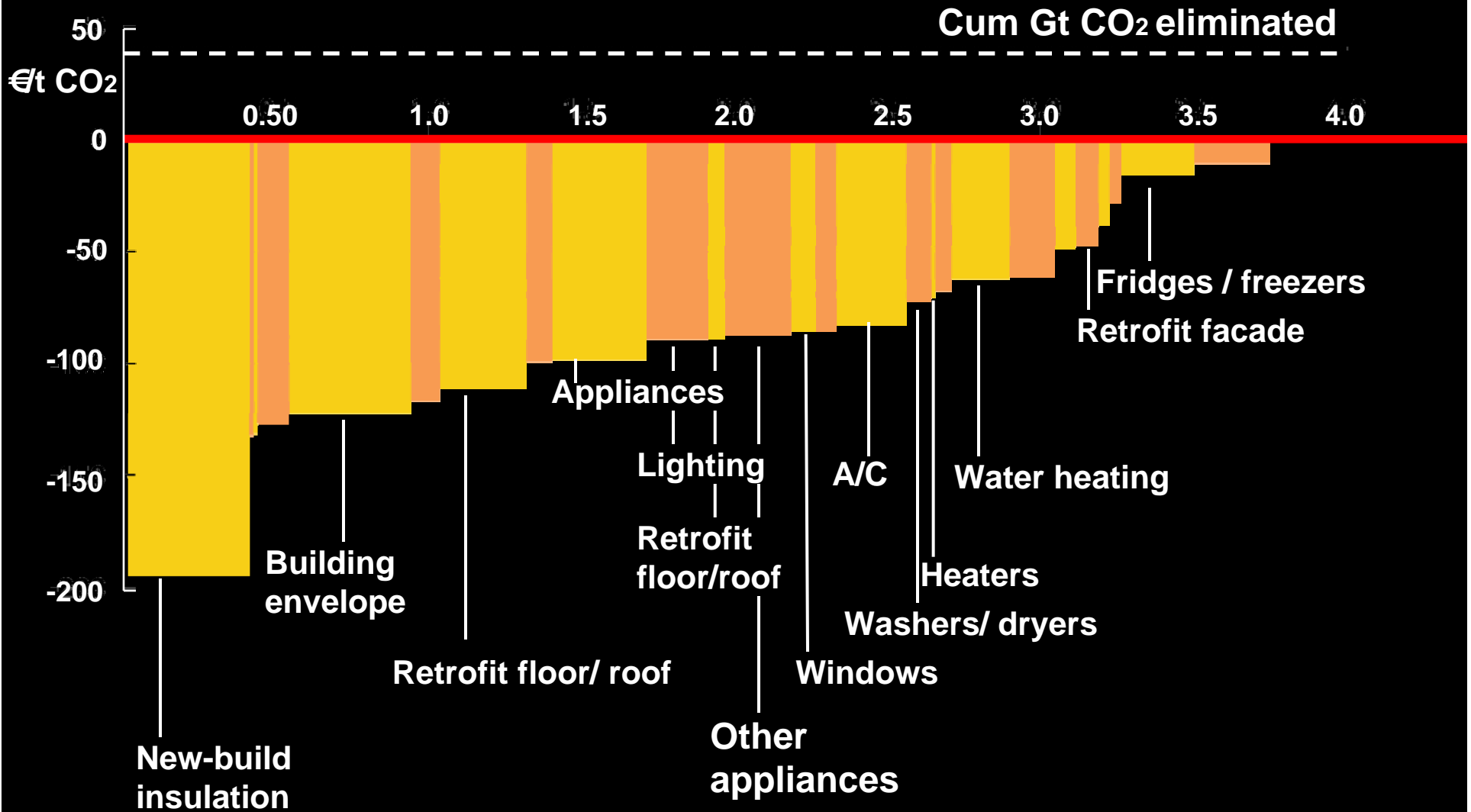
■ Negative abatement marginal cost

■ Abatement marginal cost below €40/t

■ Abatement marginal cost above €40/t

Sources: Vattenfall, McKinsey & Co.

4B tons of CO₂, **negative cost**



...all green building materials & technologies

Sources: Vattenfall, McKinsey & Co.

Serious Materials

Serious Snapshot

QuietRock®

Quiet enables urbanization and density

Quiet walls, floors, ceilings, windows, doors

EcoRock ®

Eco reduces CO2 and embodied energy

Drywall with 95% less CO2

ThermaProof ® Windows

Thermal envelope, R-15

Same rating as exterior wall

R-15 Windows

Save 38%
of building
energy bill





CALSTARTM
CEMENT

Cement

Portland cement, 8% of CO₂

2.5 billion tons/year

\$150B world market

Industry stuck

Same since 1824



Automobiles ~ Cement

Billion Tons CO₂

2.8 BT

700M autos x 4T



~

2.4 BT

2.6BT cement x 0.9





CHINA

49% of
world
Cement

1.2 billion
tonnes

CalStar Products



7/18/2008 CalStar Cement - Confidential - Do Not Distribute

HELIOTRICITY



Electric Buildings

100 watts
per m^2

North, South
East, West



ZETA Communities

Zero Energy Technology & Architecture

Zero Energy Technology & Architecture



	\$/sf	Utility bill/yr	Tons CO ₂ /yr
ZETA	\$150	\$0	0
Conventional	\$200	\$1,960	9

Make a Difference

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