The Midwestern United States, equally devout in its worship of God as in its worship of gas-guzzling four-wheel-drive vehicles, is about to be asked to choose between the two.

“What Would Jesus Drive?” is the slogan dominating a television advertising campaign about to blanket cities in Iowa, Indiana and Missouri, along with the southern state of North Carolina.
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October 2003
2006 - 50%
2010 - 60%
2015 - 70%
2020 - 80%
2025 - 90%
2030 - carbon neutral
Roadmap 2050
Total Building Sector CO₂ Emissions Targets 2015 - 2050

Organization of Economic Cooperation and Development (OECD CCXG), Paris
UN Framework Convention on Climate Change (UNFCCC), Bonn
The International Union of Architects (UIA), representing over 1.3 million architects in 124 countries, announced that it had unanimously adopted the 2050 Imperative, a declaration that supports phasing out all CO₂ emissions by the middle of the century.
52 International and Chinese Firms Sign Historic Accord to Tackle Climate Change

Firms pledge to design cities, towns, urban developments, new buildings, and major renovations in China to low carbon/carbon neutral standards
If we are to avoid catastrophic climate change and enjoy an equitable and prosperous future, the built environment must decarbonise by 2050. But how? Where will we find the inspiration, programs, tools, partners, and funding?

Join us at the "Zero Emissions by 2050" Symposium on December 9 to meet the individuals and organizations leading the international movement to decarbonise the built environment.
LONG TERM GOAL:
To keep global average temperature increase “well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C.”

December 12, 2015
Pathways for Fossil Fuel Carbon Emissions to 2100

Source: IPCC 2013, Representative Concentration Pathways (RCP); Stockholm Environment Institute (SEI), 2013; Climate Analytics and ECOFYS, 2014.

Note: Emissions peak and cumulative carbon budgets are for fossil fuel CO2–only emissions.
Global Temperature Projections for various RCP Scenarios

- **RCP2.6**
  - 0.53 trillion tons carbon
  - zero CO₂ emissions ~2050

- **RCP4.5**
  - emissions peak 2040-50
  - 1.3 trillion tons carbon

- **RCP6.0**
  - emissions peak 2080
  - 1.6 trillion tons carbon

- **RCP8.5**
  - Business-as-usual
  - 2.2 trillion tons carbon

Source: Architecture 2030; Adapted from IPCC Fifth Assessment Report, 2013

Representative Concentration Pathways (RCP), temperature projections for SRES scenarios and the RCPs.
By 2030, world population is expected to be 8.3 billion, an increase of 1.1 billion people.
By 2030, world urban population is expected to increase by 1.1 billion, absorbing the entire population growth estimate.
Cities are responsible for approximately 75% of all human-produced global greenhouse gas emissions.
The percent of greenhouse gas emissions in cities attributed to Buildings:

<table>
<thead>
<tr>
<th>CITY</th>
<th>% emissions buildings</th>
</tr>
</thead>
<tbody>
<tr>
<td>New York City</td>
<td>71%</td>
</tr>
<tr>
<td>Seoul</td>
<td>63%</td>
</tr>
<tr>
<td>Atlanta</td>
<td>66%</td>
</tr>
<tr>
<td>London</td>
<td>79%</td>
</tr>
<tr>
<td>Washington DC</td>
<td>76%</td>
</tr>
<tr>
<td>Sydney</td>
<td>84%</td>
</tr>
<tr>
<td>Vancouver</td>
<td>56%</td>
</tr>
<tr>
<td>Copenhagen</td>
<td>66%</td>
</tr>
<tr>
<td>Boston</td>
<td>73%</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>54%</td>
</tr>
</tbody>
</table>
ZNC
Zero Net Carbon

A highly energy efficient building that produces on-site, and/or procures, enough carbon-free renewable energy to meet all building energy consumption annually.
high-performance
new building design

deep efficiency renovations
+

t renewable energy
IECC 2009
IECC 2012
IECC 2015
T-24 2016 (residential)
2016 Palo Alto Reach Code (PV)
2016 Palo Alto Reach Code

TYPICAL MODERN BUILDING (IECC 2006)
VOLUNTARY STRETCH CODES

- Fast track permitting
- Density bonus
- Tax credits / deductions
- Rebates / reduced fees
- PACE financing
- On-bill repayment
- Zoning upgrade

TYPICAL MODERN BUILDING
(CBECS 2003, IECC 2006)

ZERO Tool
(residential / commercial)

Code
IECC 2015/ ASHRAE 90.1-2013
+ 20% voluntary stretch codes
Code
20% Better
+ 40% voluntary stretch codes
Code
40% Better
+ ZNC voluntary stretch code

ZNC CODE
Building Energy CODES
+ stretch codes, certifications

Building Construction INTERVENTION POINTS
• New Buildings
• Major Renovations
• Zoning or Use Change
• Building Purchases

RENEWABLE ENERGY
• Regulation / Incentives
• Demand
• Market
• Finance
New York City’s Greenhouse Gas Emissions Drivers of Change, 2005-2013

- External effects: +1.91 tCO₂e
- Changes in use & efficiency, above impacts of growth & weather: -3.44 tCO₂e
- Changes in utility operations: -9.56 tCO₂e

Source: New York City Mayor’s Office of Long-Term Planning and Sustainability
NEW YORK CITY

ACHIEVING ZERO

2050

Building Energy Code: ZNE Code

City-owned buildings = 0.28 Bsf
NYC Housing Authority = 0.11 Bsf

TOTAL BUILDING STOCK

7.80 Billion sf

EXISTING

3% (0.24 Bsf)

RENOVATED

20% (1.55 Bsf)

NEW

18% (1.44 Bsf)

SALES/PROGRAMS (RENOVATED/RE)

59% (4.56 Bsf)

GHG EMISSIONS

33.9 MtCO₂e

3.1
This Plan will create approximately $5.8 billion dollars in construction each year, and create 82,780 new jobs annually.
This Plan will create about $500 million in City tax revenue annually.

- renovate public housing
- fund training programs
- incentives for stretch codes
• reduce Building Sector GHG emissions by 30.8 MtCO$_2$e, or 91% by 2050.
Los Angeles County Electricity Consumption (Buildings)

Source: California Energy Commission
Los Angeles County Gas Consumption (Buildings)

Source: California Energy Commission
SANTA BARBARA COUNTY ELECTRICITY CONSUMPTION (Buildings)

Source: California Energy Commission
SANTA BARBARA COUNTY GAS CONSUMPTION (Buildings)

Source: California Energy Commission