

In LCA LCM '07 Conference

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# Life Cycle Assessments of Three Houses

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CTLGroup

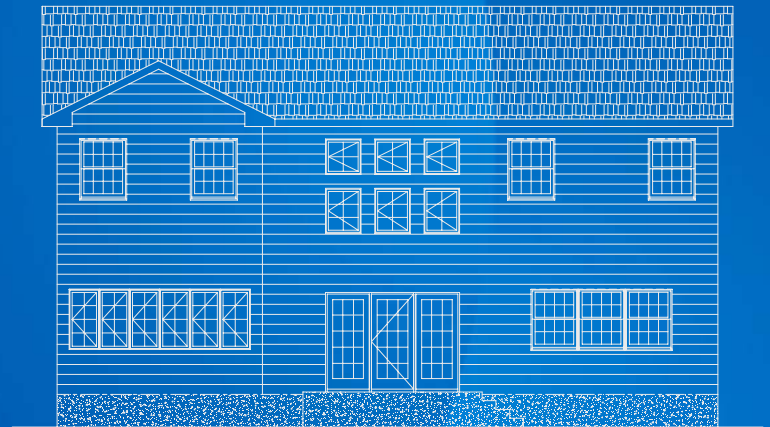
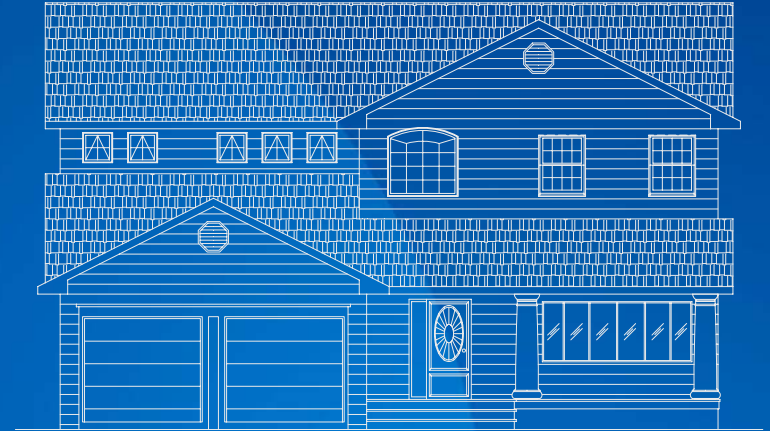


# Life Cycle Assessment - LCA

- ↪ Study of the environmental impacts throughout a product's life
  1. Life Cycle Inventory
  2. Impact Assessment
  3. Interpretation

# House LCA

- ↪ Typical, 2-story
- ↪ 2,450 sq ft
- ↪ Wood vs. masonry and ICF
- ↪ Meets IECC (energy code)

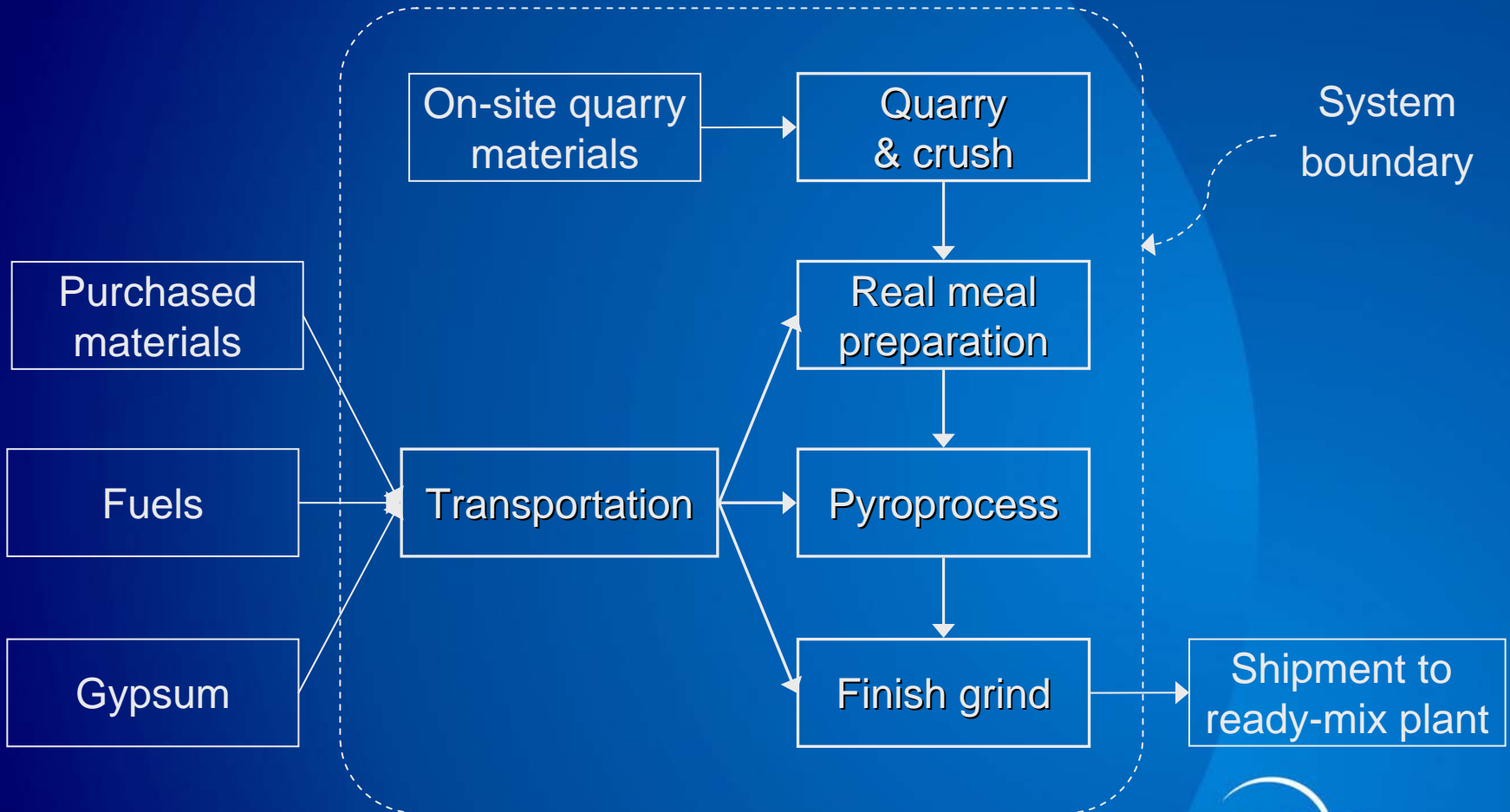


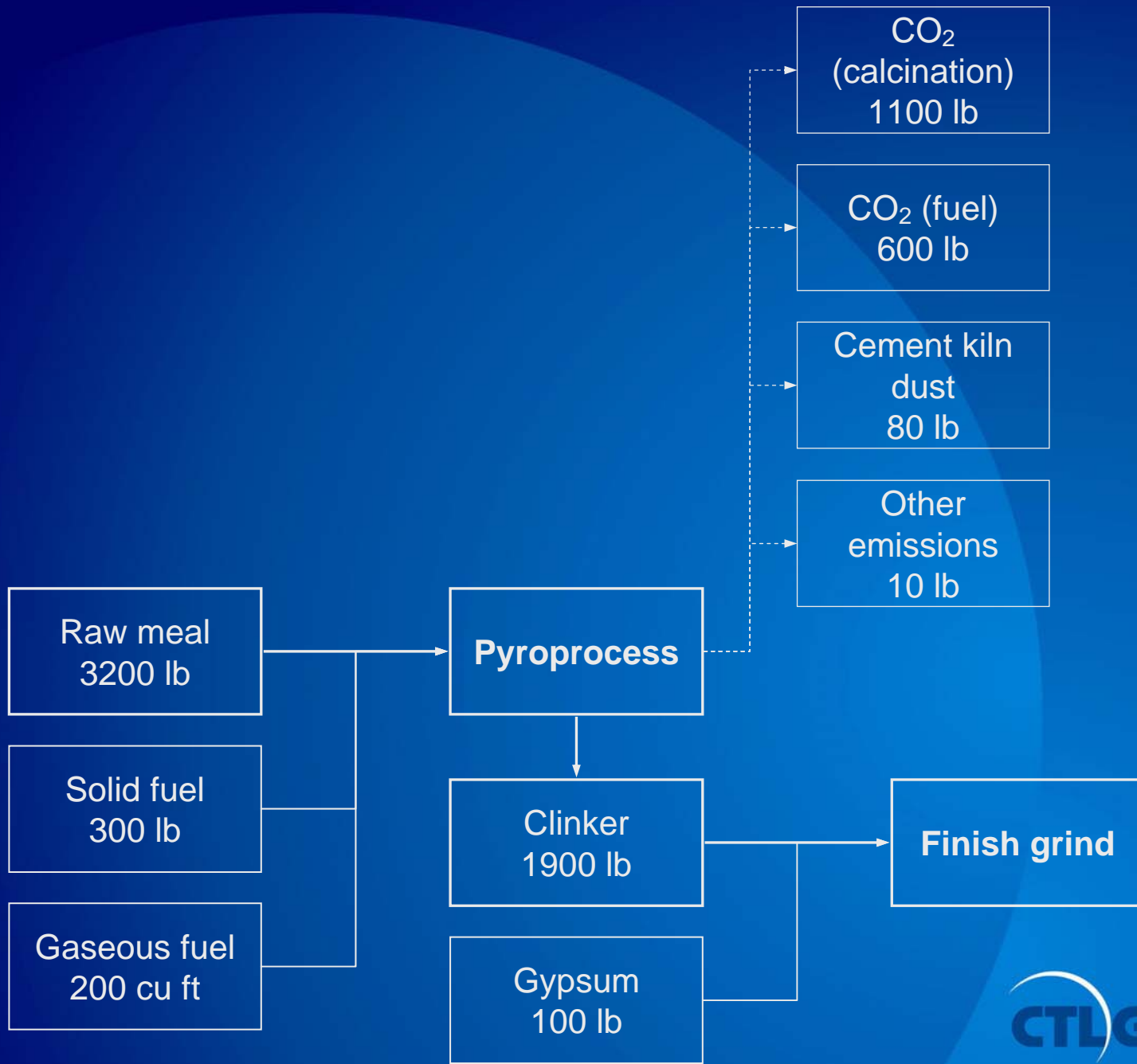
# Life Cycle Inventory - LCI

- Measures environmental flows associated with a product or process
  - Materials
  - Energy
  - Emissions
- Well-defined rules
  - ISO 14040 series

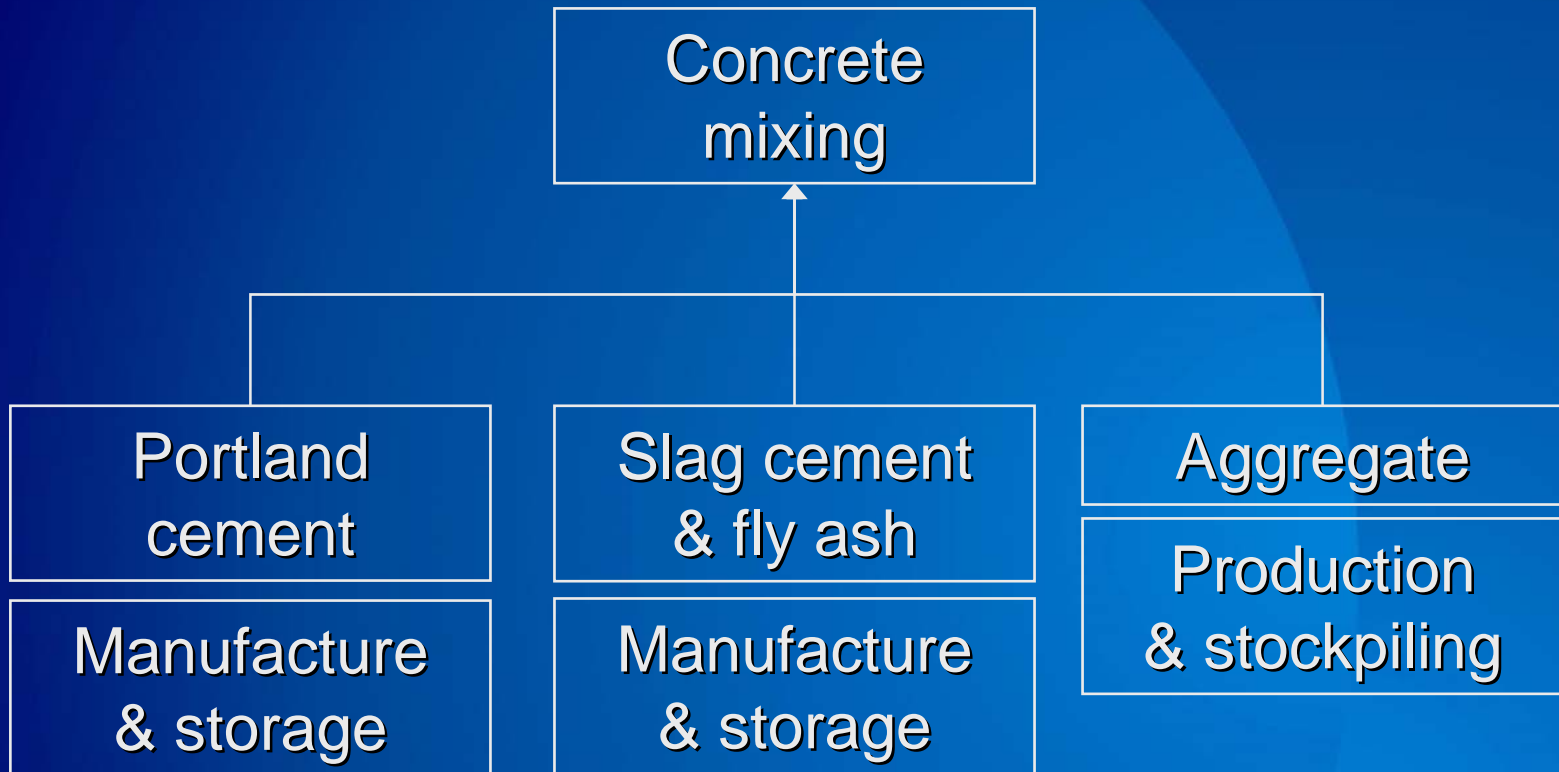


# Portland Cement LCI

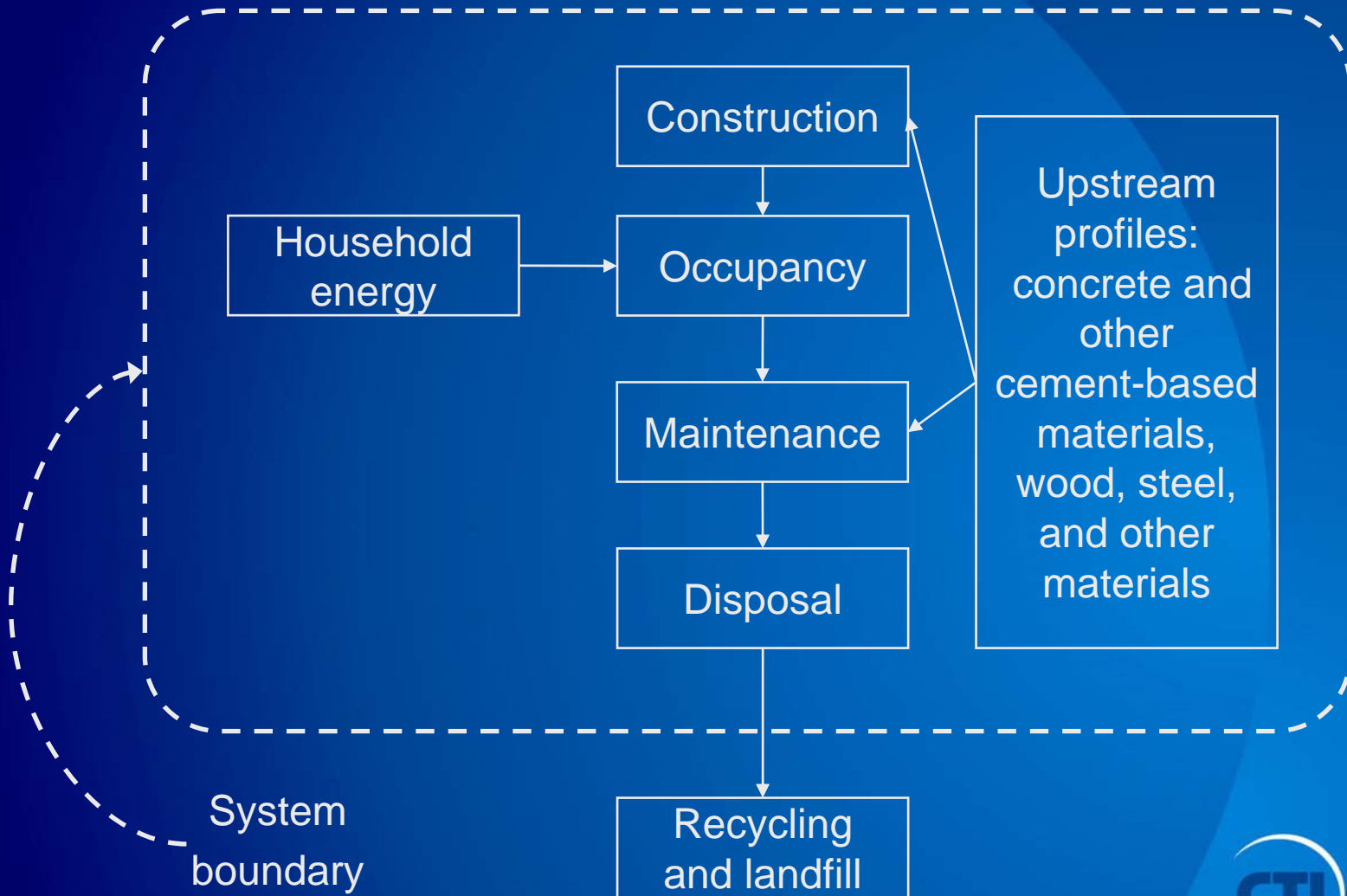




# Concrete LCI



# House LCI System Boundary



# Building Envelope and HVAC

- ↪ All components of the building envelope meet 2006 IECC requirements
- ↪ Within each climate, every house is identical except
  - exterior walls
  - HVAC size

# Impact Assessment

## ↪ Classification

- Group LCI data into similar categories

## ↪ Characterization

- Weight relative impact within categories
- Weight categories
- Normalize

# Impact Categories

- Ozone depletion
- Climate change
- Fossil fuel depletion
- Acidification
- Land use

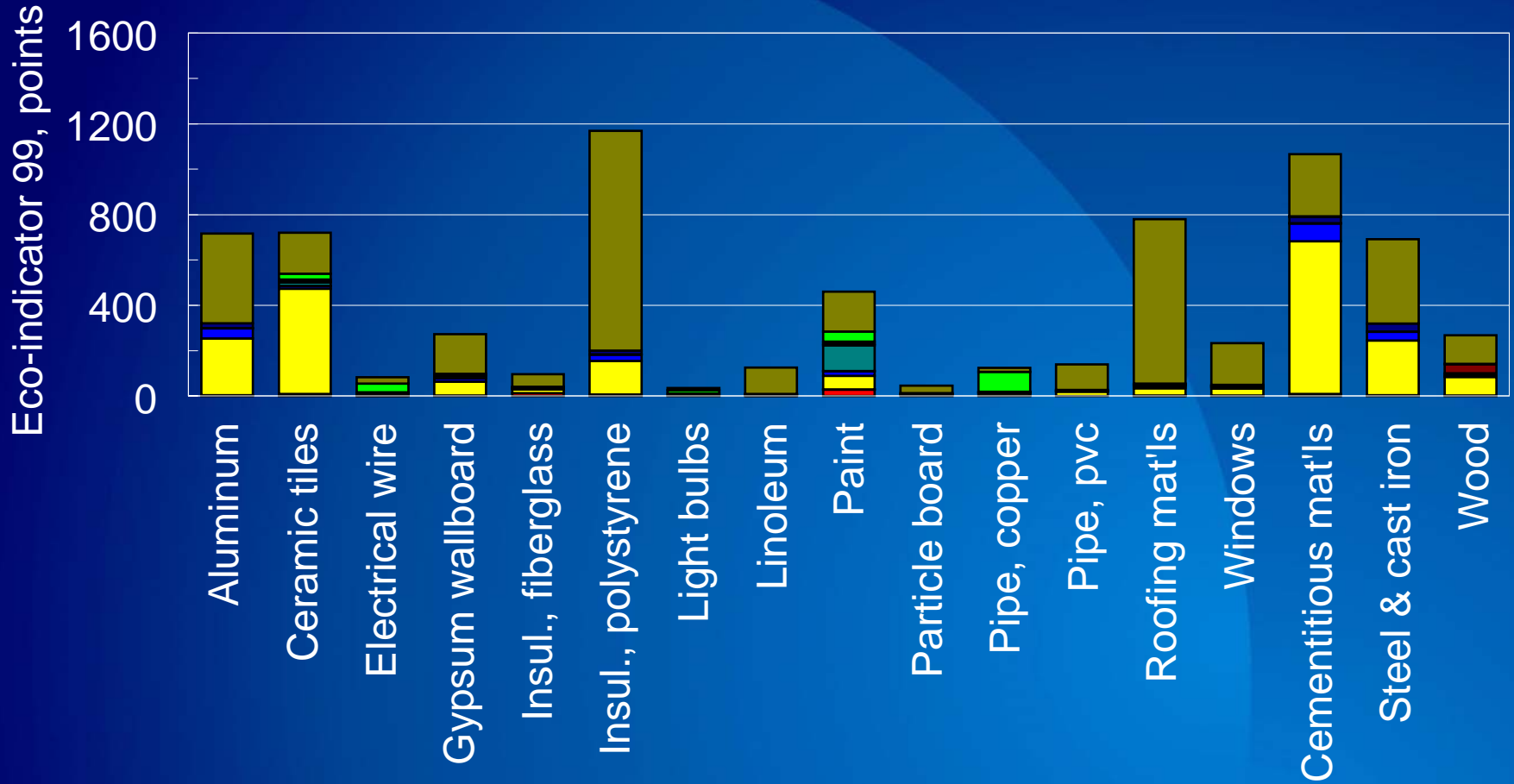


# Impact Categories (cont.)

- Carcinogens
- Respiratory organics
- Respiratory inorganics
- Mineral depletion
- Ecotoxicity
- Radiation

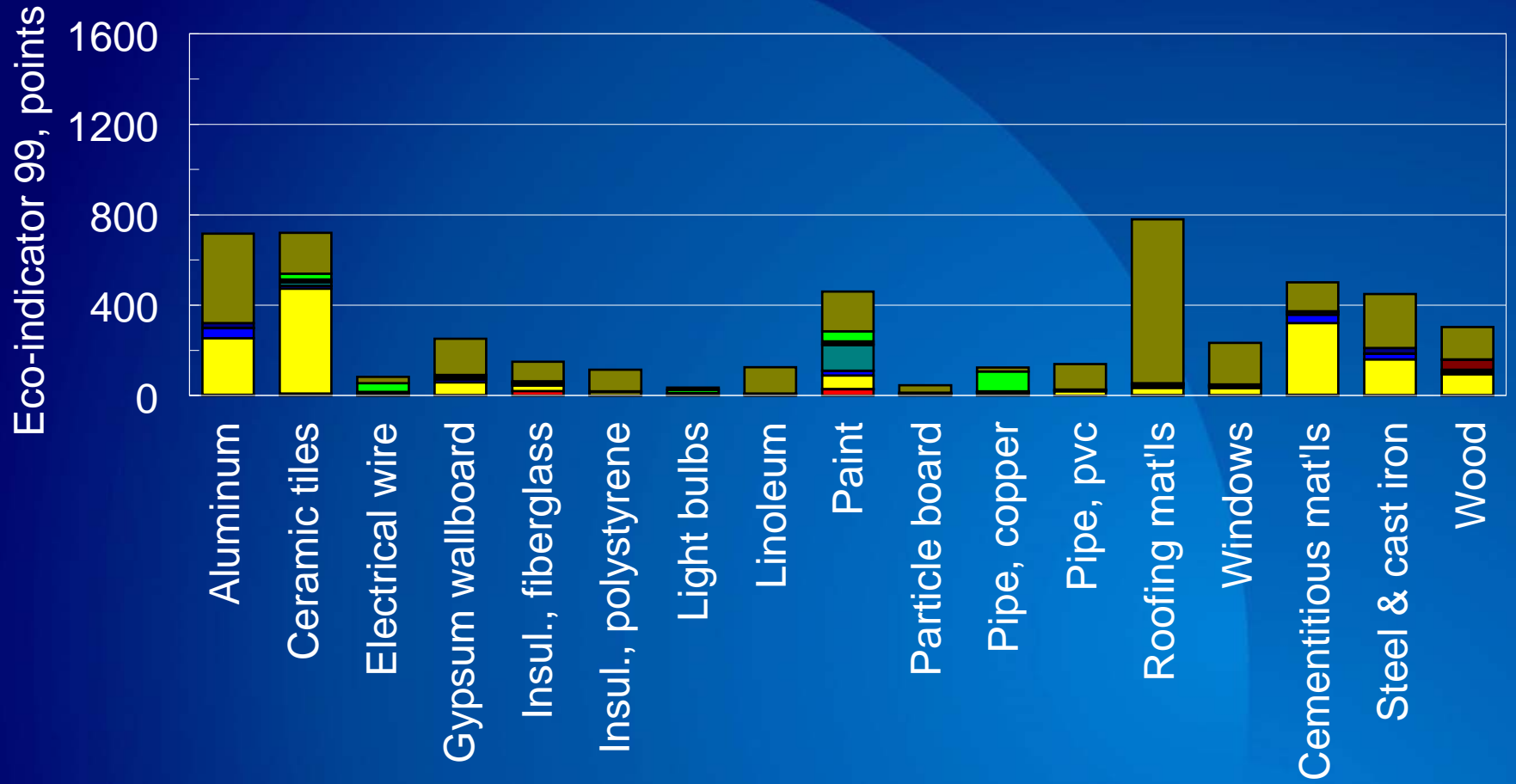


# Materials in ICF House Chicago



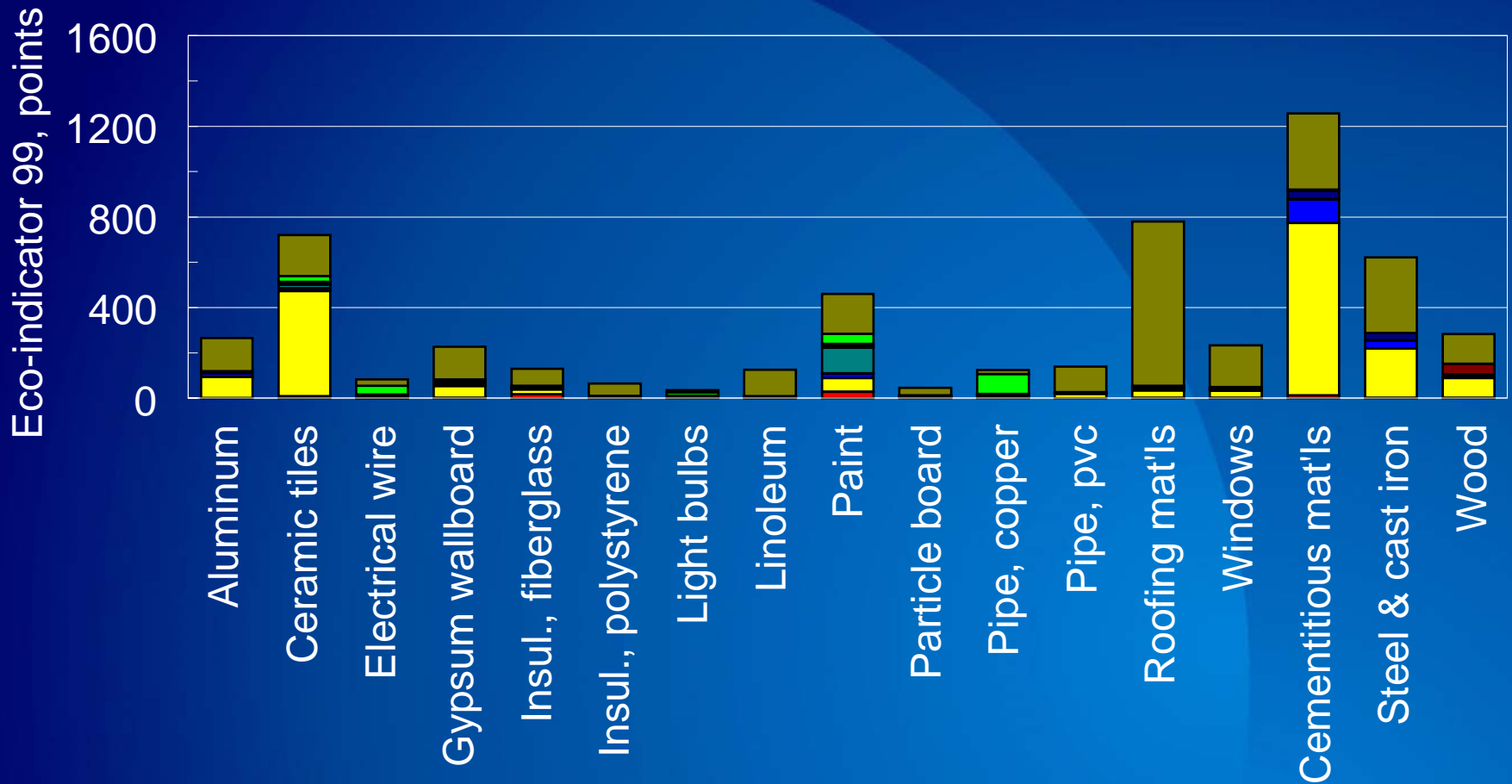
- Carcinogens
- Resp. organics
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- Ozone layer
- Ecotoxicity
- Acidification/ Eutrophication
- Land use
- Minerals
- Fossil fuels

# Materials in Wood House Chicago



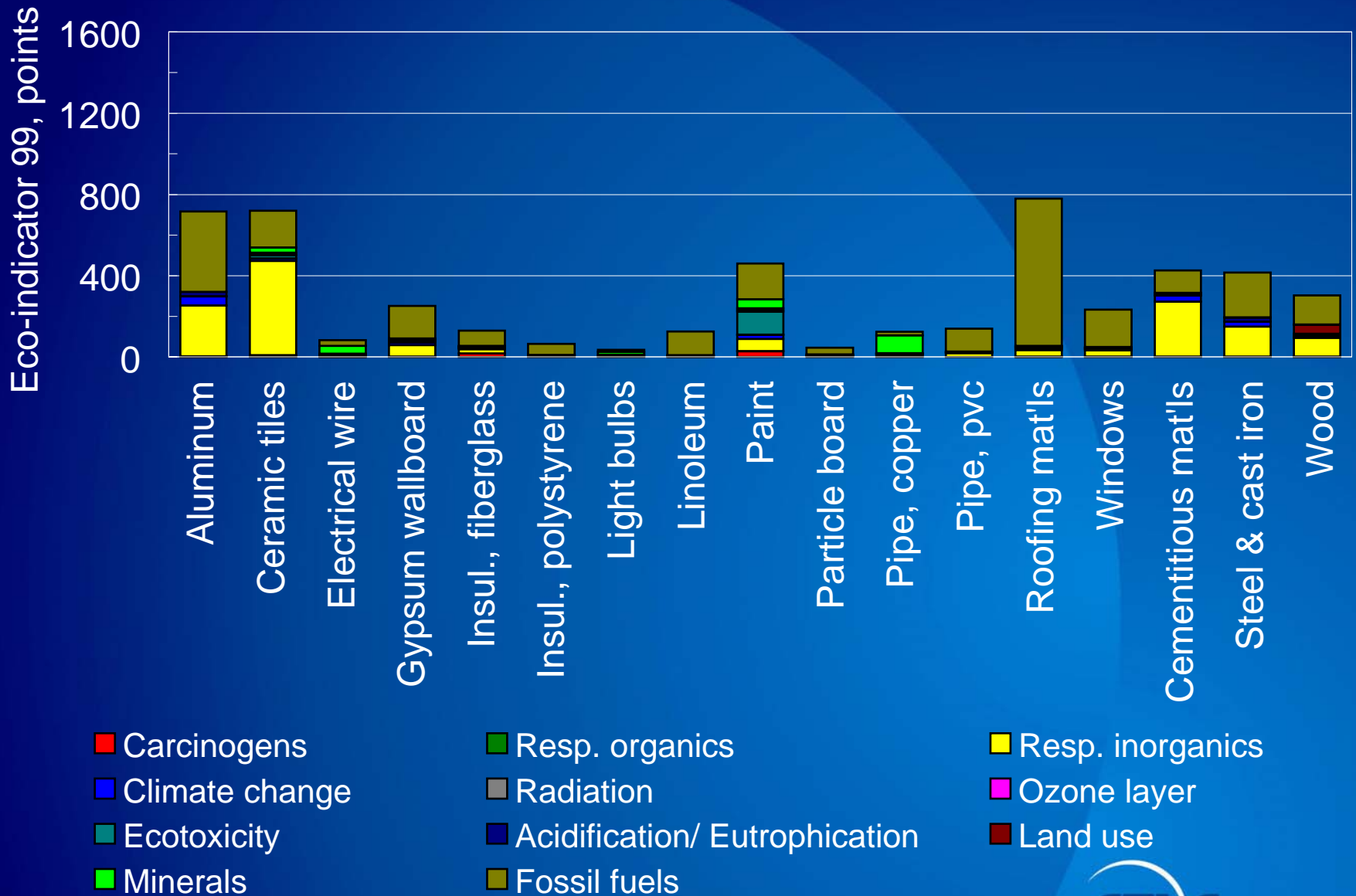
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# Materials in CMU House St. Louis

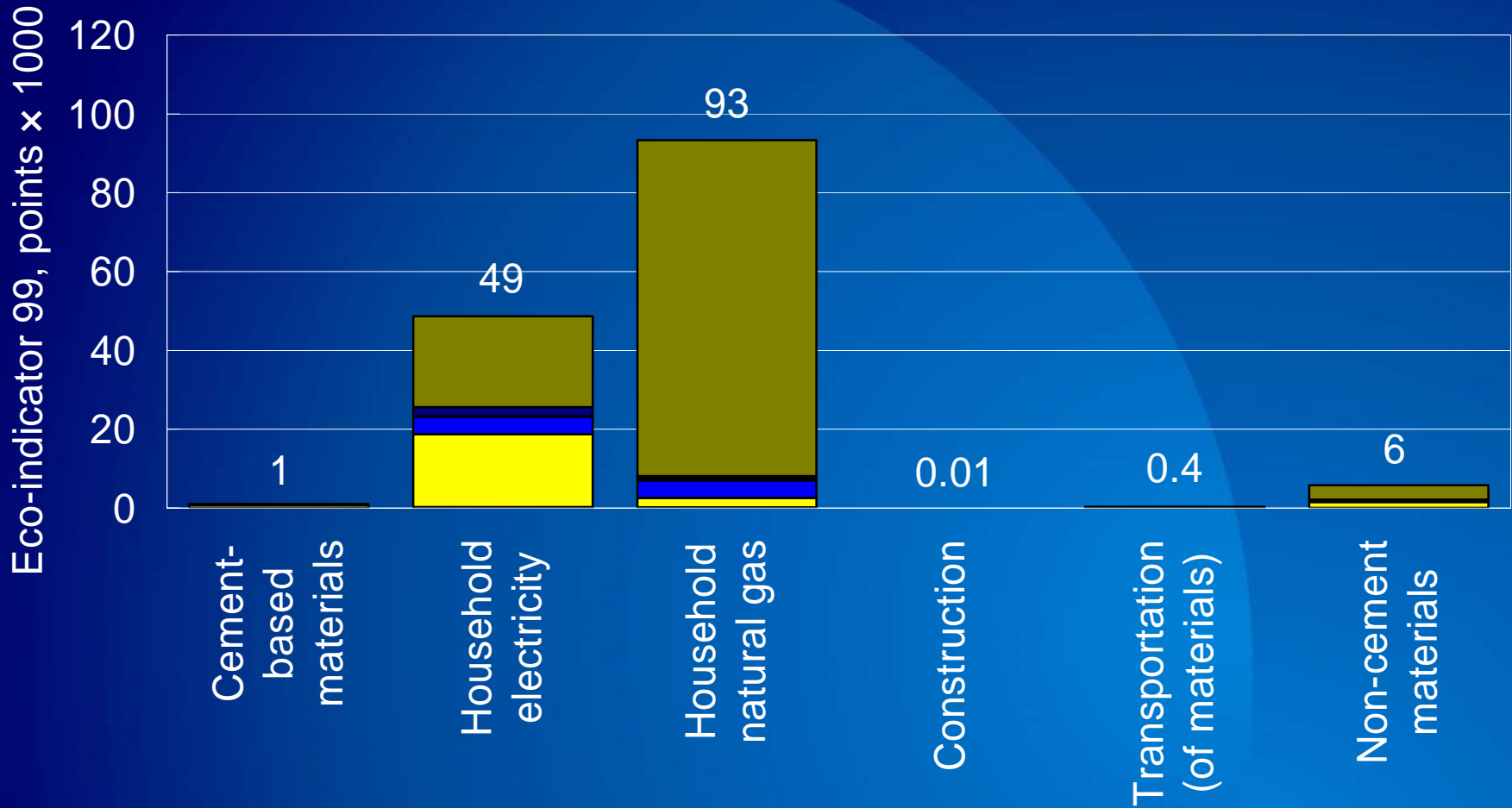


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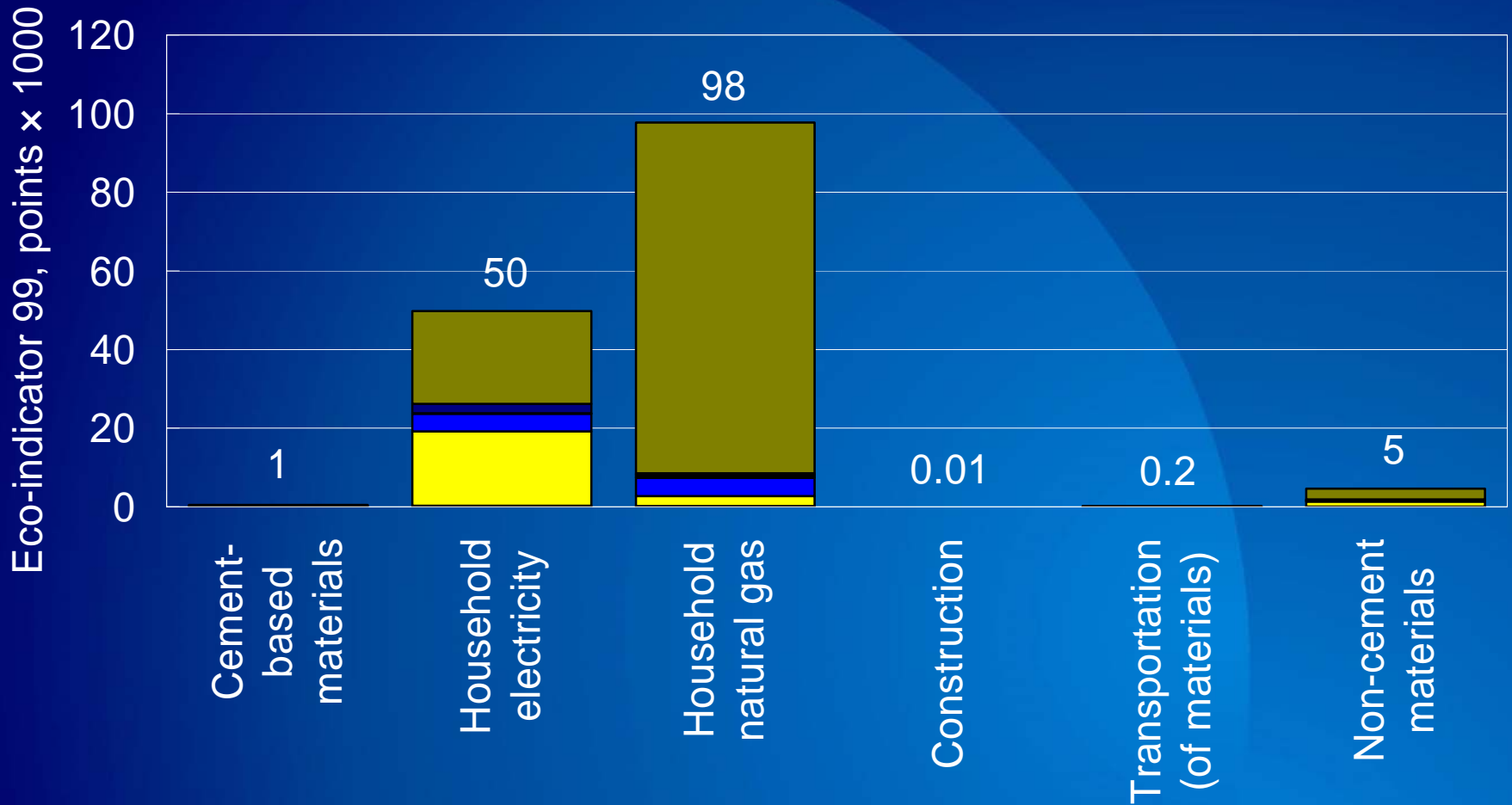


# ICF House LCA in Chicago



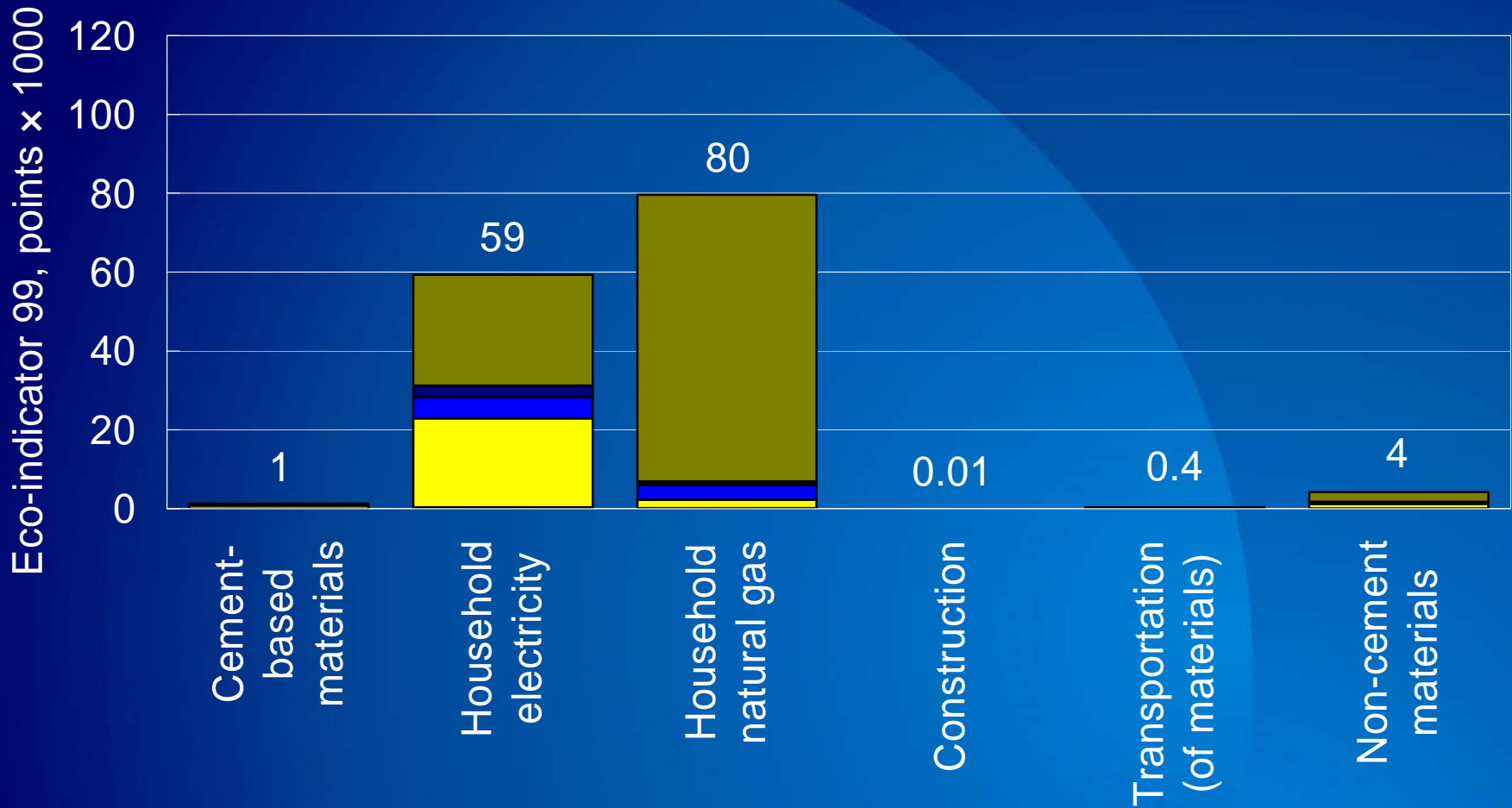
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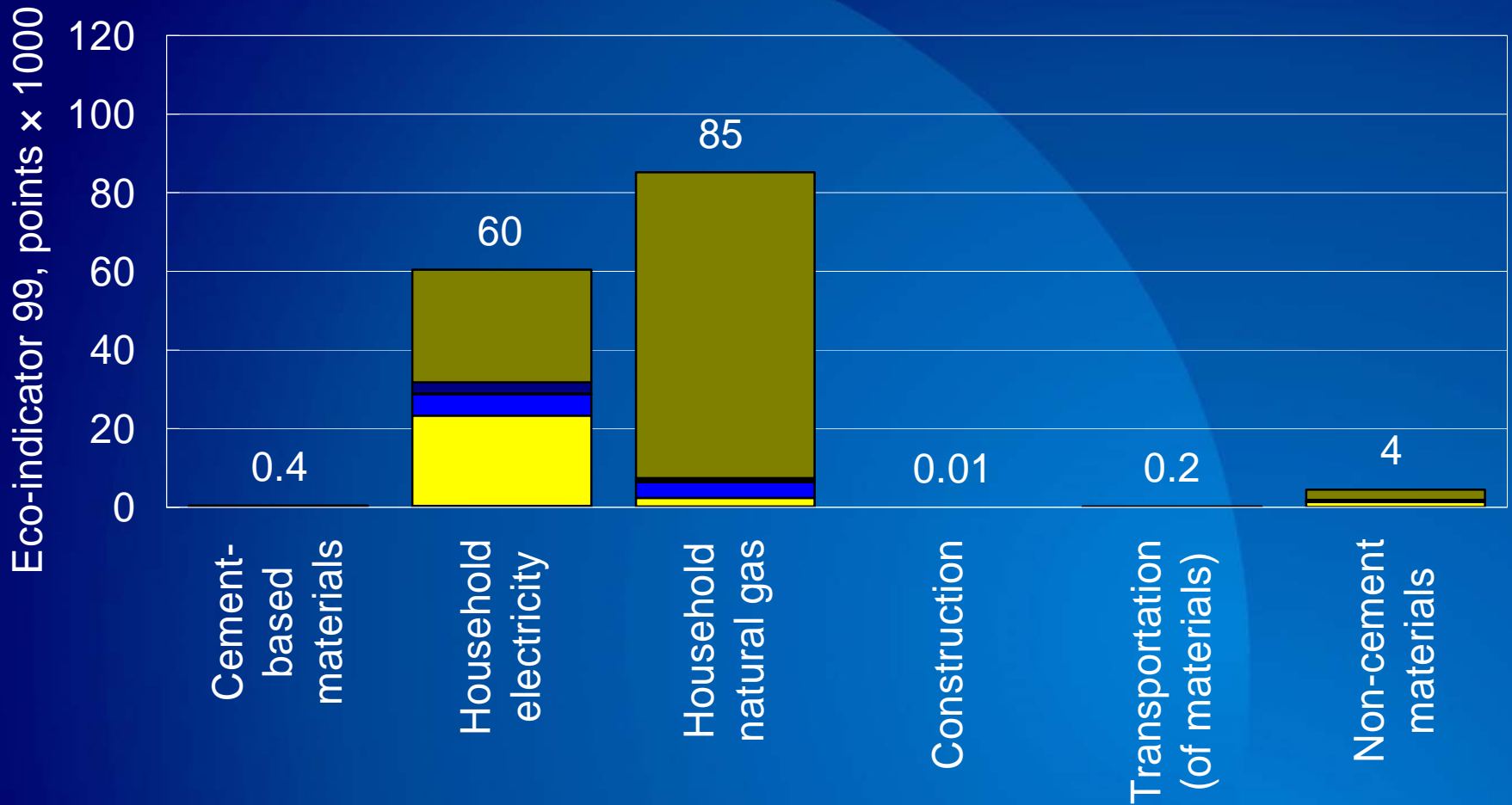
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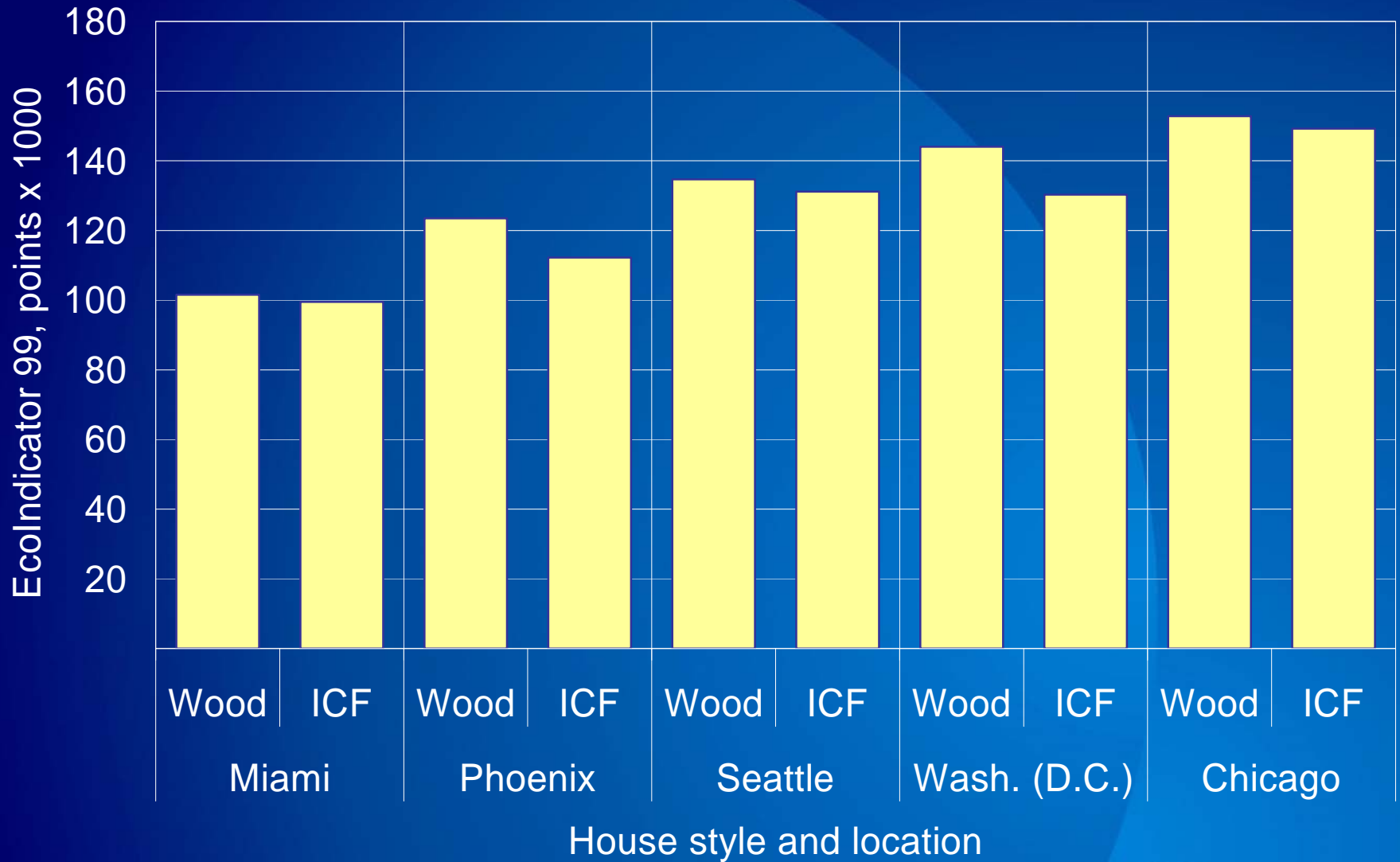
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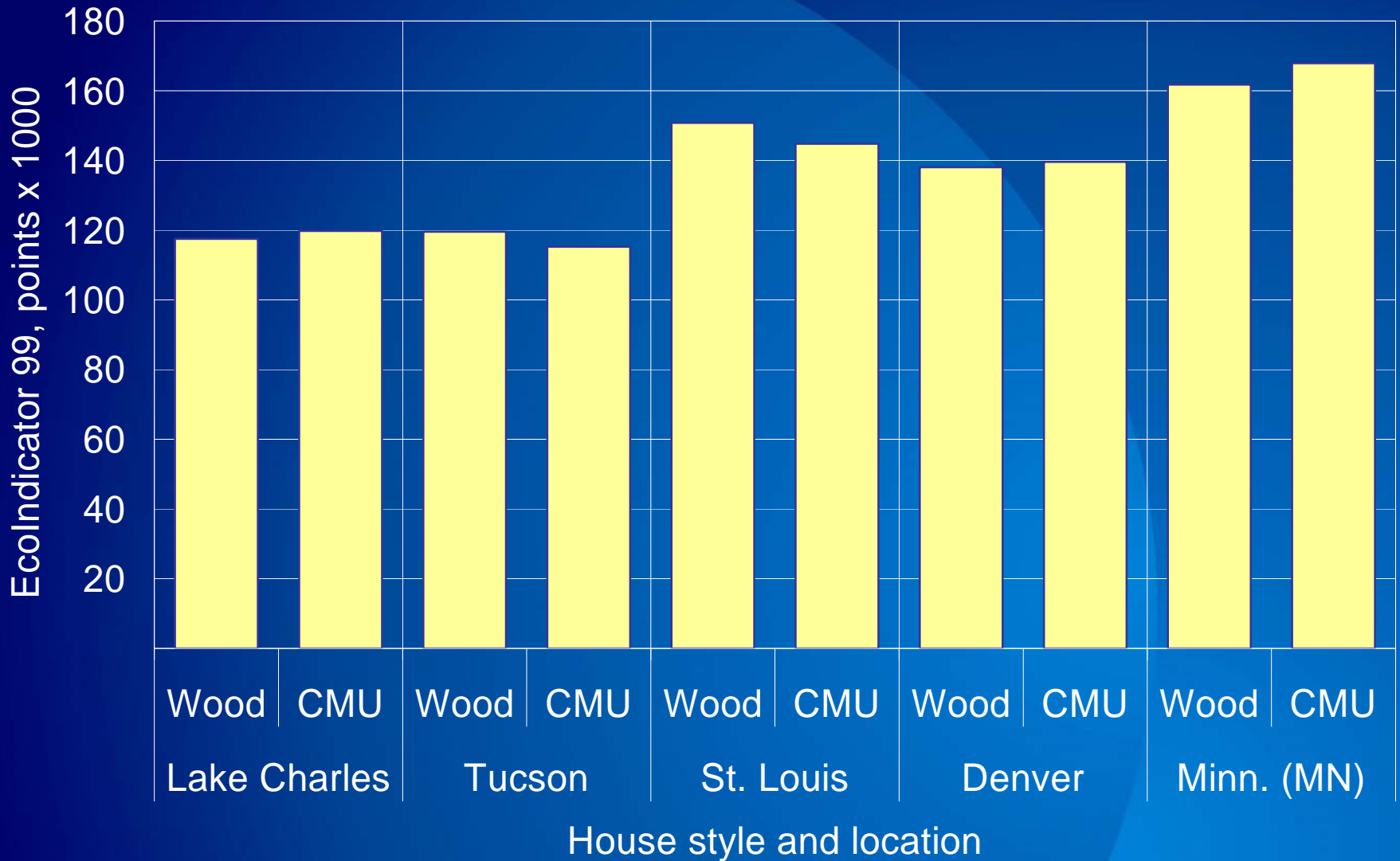
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# LCA Single-Score Results - ICF



■ Hierarchic

# LCA Single-Score Results - CMU



■ Hierarchic

# Conclusions

- ↪ Material with worst impacts depends on house
- ↪ Electricity and natural gas during life dominate impacts
- ↪ Lower energy consumption during life lowers impacts