Sustainability Themes

Now and Next

July 29th, 2020
Speakers

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Sustainability Drivers

Preface of sustainability imperatives
(Paris agreement, California commitments, other overarching sustainability drivers)

Paris Climate Accord

What role does the built environment play?

Image Source: Arup C40 Deadline 2020, Arup ZNE+C 5 Minute Guide
Sustainability Drivers

Key California Policies

Carbon
- Executive Order B-55-18
  Carbon neutrality by 2045

Energy
- Senate Bill 100
  100% zero carbon electricity by 2045

Water
- CALGreen
  California green building code raises building water (and energy) efficiency standards with each amendment

Example Sector Specific Policies

Education
- BOG of California Community Colleges
- UC Sustainable Practices Policy

Aviation
- LAWA Sustainability Action Plan 2019
- CARB Zero-Emission Airport Shuttle (Approved 2020) and Ground Support Equipment (Proposed)

Highways
- Caltrans Sustainability Roadmap 2018-19
Now

Sustainability Themes
High Performance Building Design

Energy Conservation Measures

Baseline
Load Reduction
Passive Strategies
Active Strategies
Energy Recovery
Renewables
Offsets

Image Source: Morphosis
Demand Management

Higher renewables penetration leading to:
- Load profile mismatch
- Ramping and base loads

Cost ineffective for the grid; translated to pricier peak rates

**Summer Months**

**Winter Months**

Image Source: Fuergy
Demand Management

Load shifting through storage example

SBCCD | Crafton Hills College
Now to Next
Next

Sustainability Themes
Rating Systems

LEED
Leadership in Energy and Environmental Design

Image Source: USGBC, ILFI, ENVISION, EcoDistricts
Net Zero Energy (ZNE)
Net Energy Consumption = Renewable Energy Generation – Energy Consumption = 0

Net Zero Carbon (ZNC)
Net Carbon Emissions = Carbon Sources – Carbon Sinks = 0


Image Source: Arup ZNE+C 5 Minute Guide
Buy Clean California Act

Mandates that certain materials used in the construction of public works projects contracted under State agencies, the UC and UC State system do not exceed global warming potential (GWP) limits set by the Department of General Services (DGS).
Net Zero | Embodied Carbon

Life Cycle Analysis (LCA)

Consider low-carbon and local materials in construction

Consider reused materials or structures in construction

Consider repurposing or recycling materials at end of life

Raw materials sourcing
Manufacturing

Transport

Demolition
Operations

Installation & Construction

Image Source: SKANSKA, CNN, Scientific American, Bandera County Counter, Dezeen, NY Engineers
Utilize Principles of a Circular Economy

Buildings designed to be disassembled

Leasing lighting as a service

Image Source: US Chamber Foundation
Net Zero | Healthy Materials

Hazard Screening

Low-Emitting Materials

Biophilic

Resilient Systems

**Sustainability**
- Efficiency
- Performance
- Reduced Impact
  *Ability to meet today’s needs without compromise of future*

**Resilience**
- Redundant energy and water sources
- Disaster fortitude
  *Mitigation Preparation & Response Recovery*
- Energy Independence
- Water Independence
- Resource Storage
  *Capacity to adapt to change*

Ability to meet today’s needs without compromise of future
## Resilient Systems

<table>
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<tr>
<th>Earthquakes</th>
<th>Warming Weather</th>
<th>Drought</th>
<th>Fires / mudslides</th>
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<tr>
<td>• Failed distribution infrastructure</td>
<td>• More A/C and so more energy</td>
<td>• Excessive energy usage / strained infrastructure</td>
<td>• Failed distribution infrastructure</td>
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<td>• Damage to power generation facilities</td>
<td>• Wind storms</td>
<td>• Moving water / additional water use = more energy</td>
<td>• More frequent preemptive grid shutdowns</td>
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Future Proofing | Climate Adaptation

How can we prepare for a changing climate if we’re using old data?
Future Proofing | Climate Adaptation

SFO Airport - Civil 3D Storm & Sanitary Hydraulic Model

Baseline 5-yr Design Storm

95th Percentile High Climate Change Scenario
Future Proofing | Climate Adaptation

Potential for future extreme heat days:
- Consider impact on walkability
- Consider impact on infrastructure and building heating/cooling demands

Rise in daily temperatures

Shift to higher peaks
What would you do with your parking lots or garages if you had 75% fewer cars parking?
Future Proofing | Space Flexibility

- **Population**
  - As time increases, population increases.

- **Mode Share**
  - As time increases, mode share increases.

- **Vehicle Autonomy**
  - As time increases, vehicle autonomy increases.

**Diagram:**

- **Temporary**: Surface or Deconstructable Structures
  - Repurposable Structures or Podiums
  - Permanent: Onsite or at mobility hub

- **Time Axis**
  - Property Development
  - Repurpose / Deconstruct Parking

- **Peak Parking**
  - Future Demand
Decarbonization of Supply | Electrification

**Electrification**

“Electrification means fully or partially switching from technologies that directly use fossil fuel to those that use electricity.”  - ACEEE

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**Electrification of End Uses**

- **Buildings**
  - Space Heating
  - Water Heating
  - Cooking
  - Clothes Drying

- **Transport**
  - Light Duty
  - Heavy Duty

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**Policy Push for Electrification | Electric Reach Codes**

- 50+ cities across the US; 26 are in California
- Varying degrees of electrification and compliance pathways

- **Ban Natural Gas**
- **Limit Natural Gas**
- **Encourage Electrification**

  - Limit by building-type or end-use
  - Efficiency requirements for mixed-fuel & electric-ready requirements
Considerations:

- Higher electrical consumption and higher demand peaks especially in Winter
  - Consider implications on grid infrastructure and site in
- Impacts on equipment selection
- Cost savings or cost premiums depending on climate, building type and other factors
- Risk of user unfamiliarity and lack of acceptance
- Regulatory barriers for code compliance for some electric building systems
Decarbonization of Supply | Hydrogen

Hydrogen Creation
- Electrolysis
- Methane Reformation + CCS

Hydrogen Usage
- Transport
- Industry
- Buildings

Establishing a Hydrogen Economy

Hy4Heat

demonstrating hydrogen for heat

BEIS (Department for Business, Energy & Industrial Strategy) is looking at ways of decarbonising heat

METHANE GAS
Decarbonization of Supply | Hydrogen

Advantages:
- Avoids stranded network assets that would translate to higher rates for remaining customers
- Decarbonized gas energy depending on production; low emissions at point of use
- Safety considerations similar to NG or petroleum
- Strengths as a storage medium can complement intermittent renewables

Challenges:
- Immature infrastructure and policy development
- Public perception of safety
- Cost of fuel cells and other hydrogen equipment
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What sustainability related topic would you like to hear from us next?

Contact Us

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