



City and County of Denver Phase I Stakeholder Meetings

COMBINED

Commercial Meeting: October 2nd 9 AM - NOON at the City of Denver Offices, 201 W Colfax Ave

Attendees:

Keith Fox, City and County of Denver
Joe Havey, E Cube, Inc.
Bill Holicky, Coburn Partners
Sara Sullivan, 186 Lighting Design Group
Jenny Willford, Sierra Club
Cheryl Hoffman, Hensel Phelps
Tony Thornton, Stantec
Maria Stamas, NRDC
Stephen Kane, Namaste Solar
Chuck Kutscher, NREL
Celeste, Cizik, Group 14 Engineering
Jenn Jaffke, DDPHE
Jeff Hall, Gensler
Scott Prisco, City and County of Denver
Elizabeth Gillmore, Energetics
Aaron Esselink, Xcel Energy
Don Larsen, McWhinney
Christine Brinker, SWEEP
Tom Hootman, Integral Group
Amber Wood, DDPHE
Christy Collins, DDPHE
Katrina Managan, DDPHE
Jonny Rogers, DDPHE
Keith Emerson, ASHRAE
Julie Edwards, Oz Architecture
Lilly Jance, Community Development
Jim Neenan, Prime West
Talia, RMH
Jeff, RMH
Rick Osbaugh
Jeff Baylor, ASPE
Christina Schlachter, DDPHE
Sarah Parsons, McKinstry



Agenda

9:00 – 9:20 AM

Welcome

Introductions, Purpose and Process of Stakeholder Meetings

9:20 – 9:30 AM

Background: State of New Construction and National Perspective

- *Big Picture: Denver's Current State of New Construction*
- *Setting National Perspective*
 - *Commercial code = low, mid and high rise multifamily*

9:30 – 10:00 AM

Denver Case Studies of Net Zero Energy Implementation & Words from the Mayor

- ***Bill Holicky, Senior Architect, Coburn Group – Boulder Commons***

Key Messages:

- *Net Zero has to be cost competitive in spec and multi tenant*
- *Sustainability and net zero – one size does not fit all – formula does not equal quick repeat. In this case:*
 - *Oriented N/S – technically wrong orientation for NZ*
 - *Vertical solar – technically challenging and costly – 1500 solar panels BUT roof solar = \$80/foot and metal siding = \$40/foot. So it was \$50/foot extra for solar as siding.*
 - *Vertical solar performing better than roof*
 - *Conference rooms on the inside – offices on the outside to drive down lighting + areas that help drive the light all the way through the 70 foot wide space*
- *Rules: control renewables, then control the use (ex. Stairs vs. elevators)*
- *Penalize those that overuse plug loads (like Bullitt)*
- ***How can we improve to get to NZ by 2035? Windows are the weak link – window R9 and weaker walls for cheaper.***
- ***Bill has open source plans for all to use***



- **Mayor Michael B. Hancock:**
 - *Former VP Joe Biden Speech – first meeting with military leaders – Pres asking leaders what the greatest threat to US – expected to hear N Korea, etc. – they said CLIMATE CHANGE!*
 - *Climate change is like riding a roller coaster – it’s coming...*
 - *Be smart about how we build our buildings*
 - *Existing more efficient – energize Denver*
 - *New Construction – net zero as the only option*
 - *We need to ask the Industries (arch, eng, etc.) to have the need to think differently about how we can attain a net zero future*
 - *This is a need (requirement) and not just a suggestion*

- **Tony Thornton, Senior Associate, Stantec – Denver Net Zero Water Project**

Key Messages:

 - *Net Zero HAS to be Collaborative process – COLLABORATION OR BUST!*
 - *Denver water moving into building in October 2019 - Full campus project – 11 buildings – Admin building the largest piece*
 - *190,000 SF – 6 stories*
 - *Building to last 50-70 years +*
 - *Mind set change is key – how do we push this past the government institutions to the development community*
 - *Shoot for the moon to start – right away started costing a mechanical, structural and electrical design team*
 - ***Start EARLY – went into interview even with the aggressive goals and treating this building differently***
 - *Challenging the design – lighting and user needs*
 - *Innovated all the way through – iterative process*
 - ***Project doesn’t achieve and stay net zero unless the owner is deeply involved throughout the life of the building – staff specifically organized to achieve the target goals***

- **Chuck Kutscher, Fellow and Senior Research Associate, NREL – NREL RSF II Building (did not speak today)**



10:00 – 10:15 AM

Denver's Definitions and Metrics (Denver)

Denver will need:

- Incentives to get to net zero NC
 - A whole community of low energy, efficient buildings to achieve in a way that may not touch every building on individual level. Building by building may not be necessary with renewables.
 - This will mean different things for different building types
 - Stakeholder input on how to achieve these metrics
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- *Building or Home that is highly energy efficient and full powered from onsite or offsite renewables*
 - Energy Efficiency = EUI = buildings performing as highly energy efficient
 - All electric because we will have 100% renewable electricity – there may stepping stone technologies along the way but will ultimately be all electric
 - Powered by renewable energy – buildings need to contribute to get to 100% renewable energy
 - Regulatory climate makes the renewables tricky
 - Better renewables: wind (contracts for KWH, subscription can be cancelled at any time, not new renewables), renewable connect (customer contains RECs), community solar gardens, net metering (customer contains RECs), solar rewards
 - Key to renewables is the best ability for new capacity and longevity for the customers

*Julie (Oz Arch): Will biogas be allowed? Customers asking for it

- Answer: Will write in creative alternatives like this into plan

- Grid Flexibility

- Not overstress the grid as we go renewable
- How we balance renewables with the grid

10:15 – 11:15 AM

Facilitated Discussion: Challenges, Opportunities and Solutions to Achieve Net Zero?

Highly energy efficient

Technology:

- Simple systems:
 - Buildings are built too complicated to operate - simpler high performance systems
 - Commissioning is key
- Increased Length of Design Period:
 - Design period may need to increase - Resetting the expectation that the design period will go longer than before
 - Ex. Need to run 40,000 energy model iterations on current building when typically its 8
 - Schedule constraints if additional testing and requirements
- Technologies and building design
 - Districts scale – not unusual for one heating and one cooling – ambient loops can share equipment
 - Modular factory construction – I-Unit – factory units tested at NREL that you can make super energy efficient
 - Warranty concerns and untested technologies
 - Air infiltration, thermal bridges and right sizing envelope and mechanical systems is key to success
- Technology Requirements
 - Infiltration issues – contractor can come back and say it's not their fault because details didn't specify those rates
 - Buildings that don't hit infiltration rates – how do we fix it? The building is buttoned up
 - More requirements for testing and mock up to mitigate issues
 - Design teams can only do as much as the owner or developer wants or requires
 - Regulatory: All new buildings need to have infiltration of x or better to drive the designers
 - We're writing these requirements for "bad" architects to hold them accountable to beyond BAU
 - **Solutions: aerobarrier doesn't require expertise – can take the human error**
 - Opportunities for performance requirements and the 5 facets that will ensure performance instead of just putting this into the design teams hands
- Building Modeling
 - Need to close the gap between models and outcomes
 - Worried about people gaming the system – design a building and model that shows some energy use – people could "fake it"
- Design templates – where does the information come from and who do we trust?
- Possible Solution:



- Establish set design target EUI numbers that new projects must achieve. Numbers will vary based on type of occupancy.
 - The established energy models must also use an acceptable modeling approach, and must use the same design values for internal loads.
 - Every proposed project must be submitted to the Denver Building Department during the Design Development phase, showing building siting with exterior renderings and the associated energy model.
 - Projects that do not meet the design EUI numbers will have a couple of options going forward – energy budget matching, Xcel monitors excess usage and billing.
 - The money collected by Xcel will be paid into the fund and be used to pay for energy saving projects, such as projects for low income homeowners to lower their energy usage.
 - The project owner could elect to buy Energy Conservation Measures (ECM's) that save annual energy equal to the modeled amount over the target EUI budget.

Cost

- Initial costs and technology costs are not really more - need to start vision of zero much sooner
- Need for template proforma
- Energy goals must be achievable at an acceptable cost and not seem punitive
- Fear of cost/Perceived cost:
 - Need examples of cost effective way to approach net zero and communicate this to developers, etc.
 - Increase in education level is needed for ALL to show them how to do this quickly and effectively so that it is cost effective
 - Biggest hurdle is perceived cost
- Denver to support a pilot project (apts, spec commercial) that achieved Net Zero and provide open source pro forma
 - Having those private examples are KEY to highlight the cost – showing a return to investors – show a project like this to show possible in city of Denver limits
- Quality Cost feedback necessary to optimize systems
- Costs are a perceived challenge – costs come in terms of time to evaluate all the options and new processes
- Some businesses that are considering relocating may use the higher construction cost as a reason for not relocating or building in Denver, or may ask for higher tax incentives. Some existing businesses may relocate out of Denver for the same reason.

Incentives:

- Construction team and design team both had to hit targets to get monetary incentives - help make more collaborative
- Bigger bonuses for higher performance - outcome based performance
- Incentivize the contract structure
- Infiltration levels and testing as an incentive beyond what might be required in code
- Regulations, Enforcement and the City's role
 - Getting the political push to execute
 - What are the steps to include regulatory packages? (helps avoid gas giants coming after them)
 - Where can the city supplement to support the green building?
- City needs to put forth the effort to move permitting, approval, etc. process for Net Zero – incentive quickness to move forward
 - If you are exceeding code by x% - this is incredibly valuable to building owners. Has quantifiable implications.
- To incentivize the building outcome
 - Metrics around the big drivers - people need to report around what is in the building
 - Ex. lighting performing metrics → move the education in to the market, move the knowledge base and move the market overall because you are valuing the operations and the occupant behavior
- Drive a big enough incentives for performance that the workforce has to follow
- Incentivizing the right behavior up front
- Award bonuses from building owner for low performance goals (Denver water plug loads example)

Workforce

- Role of the city to educate:
 - Operators, designers and bring in expertise from other areas
 - City could host design charrettes that exchange this knowledge
 - Which groups do you prioritize the training for? Training and turnover rates - design teams can give the development team confidence which can trickle to the contractors
 - Training that contractors get is from manufacturers - this may not be the space for the City
 - Need to share technologies and training - knowledge sharing to ensure all contractors are able to do this work
 - From the consumer perspective – there is lack of info to be able to ask for Net zero
 - Training and certifications – subsidized or free

- Incentivize and pay for trainings
 - The program needs to be self-sustaining without a lot of bureaucracy and be easily monitored
- Certifications and Requirements
 - Require insulators and framers have specific trade certifications? May add cost and make contractors unhappy
- Owner Education/Lack of Understanding:
 - Saturated expertise market – but need owner direction and buy in to the process
 - There is a great lack of understanding from a developer – need to educate them that they are the forces driving this
 - There is a need for common knowledge and understanding of net zero implementation across the sectors
 - Developers are fear based so they need to be trained to react with net zero in mind
- Design Team Education and Delivery of Net Zero
 - Need for developer to ask for it but ALSO need to design team to take initiative
 - Contractors treated like a commodity and need to be treated like an equal partner – involved in integrated design process
 - Contractors are generally viewed as commodities so its low bid - how do you get contractors who market themselves as having the knowledge
 - The bar and qualifications for firms needs to be way higher
 - City and county create qualifications list or list of prequalified groups
 - Requirements and quals for ALL disciplines needs to improve
 - Major problem that 80% are performing at average
 - To solve: **need to raise the codes and showcase market demand**
- Need to share technologies and training - knowledge sharing to ensure all contractors are able to do this work
 - From the consumer perspective – there is lack of info to be able to ask for Net zero
 - Training and certifications – subsidized or free
 - Huge gap in understanding level
 - Education of design professionals, market, facility managers
 - How do we reach these groups?
 - Incentivize and pay for trainings
- Create local jobs instead of using expensive products built out of state or outside the country, such as the PV panels built in China that are currently commonly used. There should be workable program options in lieu of forcing expensive solutions that have long paybacks.

Equity

- Communicating benefits for the underserved areas
 - health, wellness, etc. electrification

OTHER TOPICS:

- Embodied Carbon:
 - Embodied carbon - between now and 2050 - 1/3 of emissions will be embodied. The technology is harder (taller wood frame buildings) -- write in some ideas and acknowledge the problem. Will have a goal to lower this. Boundary conditions.
- Consumers and the General Public:
 - Gas is so cheap – but gas company is not the issue – homeowners and decision making structure is the issue
 - Natural gas at home = carbon emissions BUT people don't perceive that this is necessary to remove even with climate awareness. There is not a direct tie in consumers minds to the natural gas and health issues
 - If the market asks for Net Zero it will happen – we need to get them to respond to push this
 - Market ambiguously wants this response to climate change but doesn't understand what that means for them. **Provide the options to them and the education to show them that tackling climate change is “easy” and starts “at home” . Give them the compliance pathways/the answer**
 - On the positive side, there may be civic minded companies who will decide to relocate to Denver because the city is taking bold steps to reduce carbon emissions in response to the climate crisis.
 - Using the term Zero Energy may create a lot of pushback. There are very few true onsite Zero Energy buildings that can be built in the Colorado climate other than large single- story building with low internal loads. Those types of buildings can offset their energy by using large scale PV on the roof. All other buildings can only strive to achieve net zero by being willing to spend a considerable amount of design effort and fees just to get under a 30 EUI.
 - A large percentage of the people in Denver may consider a program that will not really come to fruition until year 2035 to be too little too late.

All Electric

Technology:

- Example about electrification: eliminated the gas hookup – saved 144\$ / year
 - Went to time of day pricing from Xcel – heat pump runs at night only
 - Broken even on electrification
 - More value on efficiency
- Phasing out gas:
 - Support electrification- BUT Natural gas in CO is really cheap – going to heat pumps you can end up with more cost
 - Also big industry push back from Natural gas



- Stranded assets – consider how do we incentivize heat pumps in the market?
- Gas as 5 to 6 times more expensive in LA, and 2 to 3 times in Denver. - Converting to gas TODAY because gas prices TODAY are low – expense delta is high between electric and gas
- Gas taps on commercial projects are way more expensive
- Cost to run gas to 50 units is VERY high. *Up front cost is cheaper for no gas.* Operating though will be higher (at today's prices)

Cost

- Driving down operating cost of electric

Incentives

- Faster hook ups from Xcel

Workforce

- See above in energy efficiency

Equity

- See above in energy efficiency

Powered by Renewables

Technology:

- Battery backups to peak shave to remove peak pricing – helps get closer to gas price
- Show the demand for electricity and the way to balance need and efficiency
- Need more access to community solar
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Cost

- Faster hook ups from Xcel
- Using PV to offset EUI to get to net Zero Energy may not be a rational or cost-effective approach to reduce carbon. To save design costs associated with an ultra-low energy project with an EUI lower than 30, a developer or building owner may simply elect to participate in a large-scale PV project. Xcel could possibly take credit for the green



energy produced as part of the program and use it toward their commitment to 100% green energy in the future.

Incentives

- Existing buildings vs new construction and the electric pricing structure - work with Xcel to push forward a better rate structure
- Reduced price for sell back of renewables – don't want to be selling too much back to the grid
- Time it will take to get permits from utilities

Workforce

- See above in energy efficiency

Equity

- Using valuable city property for large PV arrays does not make sense as compared with using those dollars in other areas such as reducing energy in existing buildings and/or low-income residential properties.

Grid Interactive

Needed more discussion on the grid interactive portion.

Technology:

- Demand Flexibility:
 - Demand flexibility and demand response - technology is there but little experience to execute this
 - Bring in teams around the country to focus on demand flexibility
 - Demand response – if going to 100% renewables grid has a variable supply – demand control and transactional controls to minimize cost at demand time. Precool buildings, PV, scheduling requirements
- Demand Response
 - Need to focus on demand response because renewables are variable

Cost

Incentives

Workforce

- Bring in teams around the country to focus on demand flexibility
- Owners understand the complexity so they can staff the building appropriately. Want to avoid shutting off systems and truly fix and operate them

Equity

OTHER TOPICS:

- Codes and Regulations
 - Calibrate for the next 10 years but slowly in a step by step process – essential things first
 - Evaluate each facet independently and process overall
 - Need to move to outcome based
 - **How to decide on stepped requirements:**
 - Create a venn Diagram of what is impactful for sustainability and the stuff that is inexpensive – the stuff in the middle goes in the “require” iteration of codes or regulations – like lighting.
 - Bucket “needs, wants and would likes” like the NREL building
- Embodied Carbon/Energy:
 - Embodied carbon - between now and 2050 - 1/3 of emissions will be embodied. The technology is harder (taller wood frame buildings) -- write in some ideas and acknowledge the problem. Will have a goal to lower this. Boundary conditions.
 - Embodied energy during construction – get utility their sooner to less temp measures impact environment
- Consumers and the General Public:
 - Natural gas at home = carbon emissions BUT people don’t perceive that this is necessary to remove even with climate awareness. There is not a direct tie in consumers minds to the natural gas and health issues
 - Education to the market to value this – this will drive codes and the industry to push the bar higher
 - If the market asks for Net Zero it will happen – we need to get them to respond to push this
 - More Denver pilots needed to point to feasibility: Need more private projects for real examples for developers – needs to pencil it out
 - Market ambiguously wants this response to climate change but doesn’t understand what that means for them. Provide the options to them and the education to show them that tackling climate change is “easy” and starts “at home”. Give them the compliance pathways/the answer
 - Need to celebrate that the buildings are BUILT not designed! Recognition program...
 - Political pushback by conservatives, developers, building owners and tenants who will face higher costs will be an expected negative consequence of the program.



ACTION ITEMS:

- Send slides (minus Denver Water)
- Send notes
- Sub working groups in email
 - Workforce
 - Affordability
 - Technical Specs
 - Regulatory needs
 - Incentives