Performance Standards

Key Learnings and Policy Considerations

Performance Standards are applied to building/thermal energy envelopes. This includes the energy/building code but is not limited to the energy/building code and can include REMP.

I. Intent

The BOCC has established a goal of Net Zero by 2030 for all new residential development, as measured by an ERI of 0. Net Zero, as defined by the International Code Council, is "an energy-efficient building where, on a source energy basis, the actual annual delivered energy is less than or equal to the on-site renewable exported energy." Zero-energy buildings typically combine energy efficiency and renewable energy in a building to result in net zero energy consumption over the course of a year.

II. Background

In 2020, the Board of County Commissioners adopted the Energy Code, which included the implementation of the Home Energy Rating System (HERS). HERS is the industry standard by which a home's energy efficiency is measured. It's also the nationally recognized system for inspecting and calculating a home's energy performance.

The Home Energy Rating System uses the Energy Rating Index - ERI. This is a scale from 100 to 0 to measure the energy efficiency of a home. The lower the score on the scale the more energy efficient the home is. The ERI compares the energy performance of a home to a baseline model ('reference home') rather than the energy use of a home (this is typically thought of as a home energy audit). The ERI requires the design to be a specified percentage better than the baseline. An ERI Score of 100 is approximately equivalent to a home built under the 2006 IECC and serves as the baseline for the Index. Each 1-point change in an ERI score is equivalent to a 1% change in energy use.

The 2020 Energy Code requires homes reach a score of 30 (70% more efficient than a standard 'reference home'), with the ultimate goal of reaching an ERI of 0 or Net Zero by 2030. This means all new homes built or remodeled must ultimately have an ERI of 30 for an approved building permit (as of 2023).

As part of the 2020 Energy Code adoption, the Renewable Energy Mitigation Program (REMP) fee structure was also updated. The program requires that homes with exterior energy usage either mitigate their consumption by installing on-site renewable energy systems or pay a REMP fee.

III. Lessons Learned and Looking to 2030

The Pitkin County Building Department is looking at future amendments to the energy code to meet the BOCC's goal of Net Zero by 2030. When the HERS rating system was implemented, it was based on model homes and it didn't account for internal amenity loads or external energy use. Both of these items will need to be accounted for in the HERS rating (ERI score) to meet the 2030 goal. In other words, an ERI of 0 is not the same as Net Zero as currently implemented and needs to account for internal amenity loads and external energy use.

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Baseline Performance Standards: Getting to ERI of 0 by 2030.

1. Reduce initial HERS ERI to 50 before renewables
2. Require continuous insulation
3. Limit glazing & lower window U value
4. Implement additional design and building performance standards such as electric-ready and EV-ready homes, water-efficient fixtures, and roof-ready systems

Baseline Performance Standards – Accounting for Amenity Loads: Getting to **Net Zero** by 2030

The current HERS' rating system model homes does not account for the amenity loads that we are seeing more and more common in Pitkin County. Amenity Loads are any load that utilizes energy and are not captured in a Home Energy Rating Index, examples include: snowmelt, pools, spas, heat tape, fire pits, heated garages, dehumidification systems, oxygen concentrator systems, oversized exhaust hoods, home theaters, outdoor kitchens, outdoor fountains, elevators, building automation systems, additional heating systems, backup generators, etc. Currently, the County has a cap on snowmelt of 6,000 square feet. There are no caps for any other amenity loads. To get to Net Zero, external and internal amenity loads/energy use needs to be addressed, in addition to the building's ERI.

Table 1: Actual Internal and External Amenity Load Examples of Two Existing Pitkin County Homes

	Home A: 5,750 Sq Ft	**Home B: 12,250 Sq Ft**
Electrical Service (before external use)	600 amps	1000 amps
Yearly BTUs (exterior)	14,086,710 Yearly BTUs *This home would easily meet the 200 million BTU cap adopted by COA*	477,309,301 Yearly BTUs *This home is more than twice the 200 million BTU cap that COA adopted this year*
If external use is converted to electricity	125 btu (snowmelt) X 170 sf = 6.2kW electrical demand **26 Amps added to electrical service**	125 btu (snowmelt) x 1,332 sf = 48.80 kW electrical demand 500 btu (pool) * 1,010 sf = 148 kW of electrical demand 1000 btu (spa) * 75 sf = 22kW of electrical demand **912 Amps added to electrical service**
Internal Amenity Loads	Washer (1) Dryer (1) Refrigerator (1) Range (1) Disposal (1) Microwave (1) AC Condenser (3) Fan Coils (3) Humidifiers (3)	Washer (2) Dryer (2) Refrigerator (3) Range (2) Disposal (3) Microwave (3) AC Condenser (6) Fan Coils (12) Humidifiers (12) Steam Showers (2) Home Theater System (1) Electrical Infrared Heaters (4)
Scenario: Home must meet ERI of 0 and off-set 100% of exterior energy with onsite renewables	- Max PV potential = 50 kW - ERI of 0 requires 23 kW - Surplus of 27 kW to mitigate exterior energy use - Max of 1500 sf snowmelt (230 amps)	- Max PV potential = 42kW - ERI of 0 = 36.5 kW - Surplus of 5.5 kW to mitigate exterior energy use - Max of 300 sf snowmelt (46 amps)

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IV. Current Performance Standard Updates/Revisions

Following adoption of the updated energy code in 2020, staff has been working on the following energy code updates/revision recommendations to reach the 2030 NetZero code.

Update/Revision Recommendation #1: Limit exterior energy use (i.e., snowmelt, spas, pools, outdoor heating, etc.) and implement an exterior BTU cap.

- **Key Considerations:**
  - Applying an ERI to the thermal envelope helps to minimize the impact of external energy loads, reducing the total energy use for external amenities can help transition to electrification.
  - External energy use can be 2-3 times a building's total energy use (as demonstrated in the examples above), yet is a fraction of the building's square footage. While buildings continue to get more and more efficient, we also see a trend of external energy use continuing to increase the total energy load of a site.

Update/Revision Recommendation #2: Limit internal amenity loads.

- **Key Consideration:**
  - Large internal amenity loads contribute to a building's operational energy use that are not captured in the building permit process.
  - Moving towards an electrification policy needs to ensure the electrical grid is right sized for general use. Large internal amenity loads can lead to oversized energy use on individual properties beyond what is originally approved.
  - Account for internal amenity loads that are emerging trends seen in luxury homes and not part of the typical "reference home" used in the HERS rating.

Update/Revision Recommendation #3: Develop guidelines for on-site and community-based renewable energy sources.

- **Key Considerations:**
  - Not every site will be suitable for on-site renewable energy.
  - There are also community benefits to a community-based renewable energy source.
    - Given these two factors, identify a balance/ratio of how much must/should be required to be on-site renewables, and what, if any threshold, warrants a parth to community-based renewable energy to both support individual net zero goals and a community transition to a clean and resilient electric grid.
  - There must be a ratio or percentage of renewable energy produced on-site before entering into the community energy source and additional requirements once you do, such as additional battery storage to store the energy.

Staff believes the actions above are prerequisites for meeting the BOCC's goal of Net Zero by 2030. Additional policy considerations by the Committee can help further advance the goals and values of the BOCC and set Pitkin County as a leader in decarbonizing its built environment.

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V. Additional Policy Considerations:

Pitkin County is committed to working with Holy Cross Energy to supply 100% renewable energy, optimize energy efficiency in the built environment through energy codes and performance standards, and promote locally scaled renewable energy generation to serve the entire community.

Additional performance standards could be applied to limit and/or mitigate adverse impacts on the community. For example:

- Building above a certain sq ft requires more strict/advanced standards, such as accounting for embodied carbon. Sliding standards could increase as home size increases.
- Performance standards could be applied to redevelopment of a house that is less than a certain number of years old or recently remodeled.
- Incentives for Net Zero retrofits to existing homes - this could be a revision to REMP..
- Incentives for higher performing homes.
- Homes under a certain sq ft may have incentivized review/fee structures.

Another important consideration is whether there should be additional strategies beyond Net Zero 2030 to help reach longer-term goals, such as a 90% reduction of GHGs by 2050. For example:

- Net Zero applies to redevelopment by 2050.
- Beyond Net Zero: New homes must address embodied carbon impacts, not just operational energy use.
- Development of an Energy Master Plan to identify long-term strategy.
- Identify a target date for full electrification of all new development and/or redevelopment.

Readiness for Electrification – What is the path to electrification?

- Given Holy Cross's 100x30, if the energy source for homes will be clean electricity, what are the other energy use impacts on community values?
- Would an energy consumption policy for internal and external energy use help to reflect other goals and values (e.g., commercial-scale loads in residential structures)?
- What amount of clean energy generation needs to be mitigated on-site vs. what level of mitigation pools into community funds/development to achieve broader resiliency/equity goals?
- Future efforts should identify where the community would support clean energy generation (e.g., Energy Master Plan).
- If we go to full electrification to pursue climate goals, what other policy/infrastructure tools and decisions are needed to influence the community's desired quality of life outcomes.