NET ZERO ENERGY DESIGN SERVICES

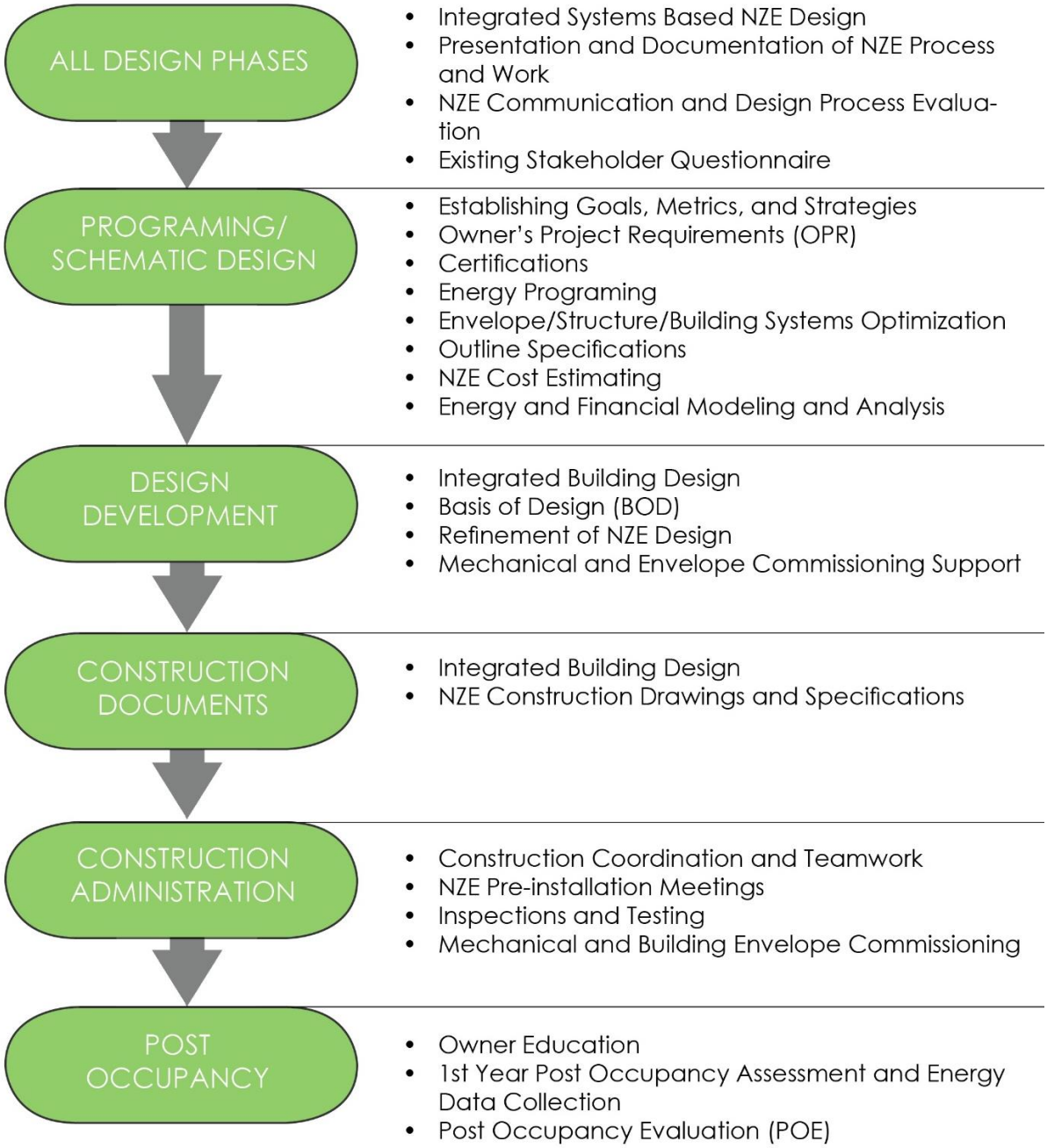
To successfully achieve low Energy Use Intensity, Net Zero Ready, Net Zero Energy, or Net Positive Energy building (NZE)[1] *performance, requires design services that are beyond standard architectural design services. Typically, healthy building, sustainable, ecological and/or biophilic design services and strategies based on building science are also used in conjunction with NZE strategies. The goal of these net zero and other environmental design services is to provide a healthy NZE building with reduced environmental impacts, enhanced environmental performance, and connection to nature in buildings that contribute positively toward the health of humans, living systems and the planet, while providing financial savings. Specifically, NZE buildings can save money through the reduction in energy costs as well as increasing the health, productivity, and satisfaction of building users. Because these strategies are a relatively new practice, additional care and measures are required to insure a positive outcome with minimized additional construction costs and less risk.*

While all of this may appear to require significant time and expense, the focus of this process is on assisting our clients in making prudent and informed choices that support the long-term financial sustainability of their projects. For additional information, please refer to our book: The New Net Zero.

[1] These buildings have subtle differences, but all work toward the ultimate goal of Net Positive Energy and will be referenced collectively as Net Zero Energy (NZE) buildings.

LOW EUI, NET ZERO READY, NET ZERO ENERGY (NZE) SCOPE OF DESIGN WORK

The following are NZE specific design services that shall be incorporated during design, construction, and occupancy. They are intended to support consistent success in achieving NZE projects' energy and associated environmental goals.



ALL DESIGN PHASES:

- Integrated Systems Based Net Zero Energy Design: The design of this project will incorporate net zero design strategies throughout all aspects of the design and construction process to support net zero goals. This includes building massing, daylighting, insulation, building science, healthy building design, air sealing, mechanical systems, passive solar, Photovoltaics, connection to nature, material selection, optimized indoor air quality, and other related strategies.
- Presentation and Documentation of Net Zero Process; Including Goals, Metrics, Modeling, Systems, Details, and Financial Analysis: Present and document the NZE work so that there is a clear record of decisions, as well as using the NZE design to build public and funding support for the net zero goals.
- Net Zero Energy Communication and Design Process Evaluation: Assess satisfaction with NZE work throughout the process. Use one-on-one and/or group conversations to confirm satisfaction and/or address concerns related to NZE design. Given the high environmental aspirations and goals of the project, this is particularly important throughout the process.
- Existing Stakeholder Questionnaire: Provide questionnaire to stakeholders regarding consumer comfort, health, and environmental satisfaction.

PROGRAMING/SCHEMATIC DESIGN:

- Establishing Goals, Metrics, and Strategies: Set NZE and environmental objectives that are drafted, reviewed, and revised for client approval. These criteria include insulation values, design strategies, technologies, energy consumption per square foot of building area, also referred to as Energy Use Intensity (EUI), and air infiltration requirements with blower door testing. The first energy modeling will occur by 50% completion of SD.
- Owner's Project Requirements (OPR): Beginning with goal setting, indicate owner's project requirements, such as, heating/cooling temperature, humidity, acoustic criteria, set points, etc. Include energy, daylighting, indoor air quality, occupant comfort, material selection, etc. so that the building design clearly incorporates owner specific needs and desires. The owner will review and approve this document as the basis for future work.
- Certifications: At the initial phases of design, review potential sustainable certifications such as LEED, Living Building Challenge full certification, Net Zero Energy Certification, Passive House, WELL, and others to see what certifications are the best fit.
- Energy Programing: The accurate calculation of energy loads is critical to designing a net zero building, as well as for optimizing long term energy costs. As a basis for energy modeling, include all equipment loads and occupancy for all spaces (including number of hours and occupants) that are proposed to accurately determine user loads. Summarize this on a spread sheet that is reviewed and approved by the owner.
- Envelope/Structure/Building Systems Optimization: For optimal building and financial performance, evaluate different structural, mechanical and envelope options to determine the best fit to meet project needs. This requires systems investigation and details to be developed much earlier than is typical in design. Provide system concepts/diagrams as well as envelope details so that pricing is accurate. This includes structural and MEP systems as well as building envelope options.

- Outline Specifications: Provide comprehensive outline specifications that include specifications that are needed to achieve NZE performance such as envelope details, assembly R-values, mechanical systems, etc.
- NZE Cost Estimating: Work with the project cost estimator to incorporate design, systems, and details into cost estimates so that the budget accurately reflects costs for code compliant, NZR, and NZE options.
- Energy and Financial Modeling and Analysis: The goal is to determine what level of energy consumption meets owner's goals with computer modeling early in design. This work shall be based on iterative computer modeling that begins at 50% and 100% of schematic design as well as updating in DD and CD design phases. Include financial assessment of code compliant and NZE with the option for an intermediary energy level using the following methodology.
    - Provide the following for each building option (at a minimum, code and net zero ready, with the possibility for an intermediary energy level or NZE) of varying envelope and systems design:
        - Estimates of annual energy consumption
        - Unit cost construction estimates
        - Capital and operating costs and annual cash flow projections based on financing rates, fuel escalation and other assumptions agreed upon with owner.

DESIGN DEVELOPMENT:

- Integrated Building Design: Include building science, healthy building, environmental impact assistance, and indoor air quality assistance recommendations in all aspects of work.
- Basis of Design: At the beginning of Design Development include the OPR design requirements in a Basis of Design (BOD) document indicating how project requirements are being specifically addressed in the design. This process is critical to client satisfaction as different clients have different expectations, values, needs, desires, and standards. Also, every building project includes differing standards and desires by multiple stakeholders, as well as budget, schedule, and quality issues. Thus, recording those decisions in a BOD document allows modification for approval, and evaluation after project completion. This is critical in determining project success and stakeholder satisfaction.
- Refinement of NZE Design: Refine document and estimate costs of NZE design. Specifically refine systems and envelope design drawings and specifications to update construction costs.
- Mechanical and Envelope Commissioning Support: Assist in the selection of mechanical and envelope commissioning agents to begin review of projects in Design Development.

CONSTRUCTION DOCUMENTS:

- Integrated Building Design: Include building science, healthy building, environmental impact assistance, and indoor air quality assistance recommendations in all aspects of work.
- NZE Construction Drawings and Specifications: Construction Documents shall include detailed work beyond typical architectural design services such as in-depth net zero

construction details and specifications to document all net zero design strategies, technologies, and methods. Provide details and procedures for air barrier installation, including testing. While it is possible to design a net zero building without this additional documentation, with less drawings and specifications it is likely that construction cost will be larger, risk of not achieving net zero goals will increase, and the likelihood of expensive change orders will be greater. Construction documents for NZE aspects of the project shall clearly specify and indicate NZE project requirements.

CONSTRUCTION ADMINISTRATION:

- Construction Coordination and Teamwork: Net zero construction requires more time for the design team because it involves construction practices and technologies that are often new to the construction team owner, particularly if this is a publicly bid project. It is anticipated that this NZE project will require a higher level of care and communication with the contractor, owner, subcontractor, and design team. In order to cover additional questions, concerns, and occasional confusion encountered when taking on new technologies and design include time to address this.
- NZE Pre-installation Meetings: Documents and procedures shall include pre-installation meetings to go over NZE requirements so that the builder meets all NZE requirements with the least effort. Specifically, include an air barrier pre-installation meeting which explains and reviews all air barrier design, specifications, testing requirements, and schedule.
- Inspections and Testing: Construction documents and construction practices shall clearly indicate NZE related inspections and testing to support the builder and create success.
- Mechanical and Building Envelope Commissioning: Mechanical and building envelope commissioning are critical to the success of net zero projects and shall be included in architectural design services unless indicated otherwise by the owner. Include the preparation, coordination, and support of commissioning in net zero scope of work.

POST OCCUPANCY:

- Owner Education: Include services so that the building users understand the building, its operation, and how user behavior impacts operational and financial results. This education enables building operators and users to understand how to optimize performance, comfort and satisfaction.
- 1st Year Post Occupancy Assessment and Energy Data Collection: While basic architectural design services include support during a 1-year warrantee period, specifically include support for issues that arise around the net zero components as well as energy monitoring so that the NZE and environmental performance of the building is consistent with the owner's needs, design intent and computer modeling. If operational deficiencies or owner operation issues are discovered, then assist in addressing.
- Post Occupancy Evaluation (POE): At the end of the first year send out a post occupancy evaluation to building users and tabulate results related to the environmental, as well as the programmatic goals of the project. Review this evaluation and work with the client to address concerns and evaluate performance of this project. Speak with building managers and staff to make sure there is a smooth transition. Assess productivity and financial benefits of NZE, healthy building design, and environmental design components of building design.