CALIFORNIA STATE UNIVERSITY **LONG BEACH**

CLEAN ENERGY **MASTER PLAN**

CARBON NEUTRAL BY **2030**

IN 2018 WE WORKED WITH CALIFORNIA STATE UNIVERSITY LONG BEACH TO DEVELOP STRATEGIC ROAD MAP FOR BECOMING **A CARBON NEUTRAL CAMPUS BY 2030**.

KEY FINDINGS AT CSU LONG BEACH

SCENARIO ANALYSIS

Glumac developed and utilized a custom-built scenario analysis carbon planning tool during our assessment of various investment clean energy strategies on campus. This allowed for us and the campus to assess the multidimensional impacts (energy savings, GHG emissions, capital requirements, return on investment, etc.) and helped to develop a long-term energy strategy for CSULB. This analysis included the following three potential investment strategies, among others.

CAMPUS ENERGY USAGE INTENSITY (EUI)

1 BUSINESS AS USUAL

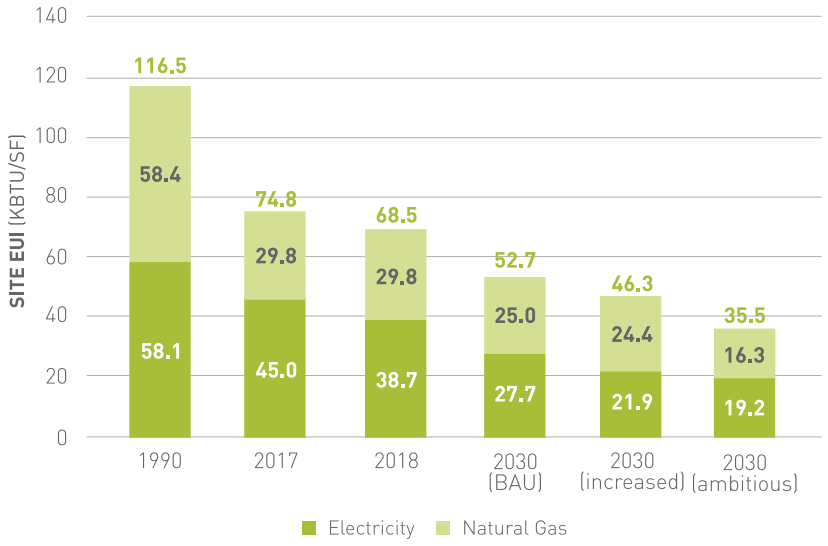
If the CSU Long Beach were to maintain its current rate of investment ~$1-1.5 million annually

2 INCREASED INVESTMENT

Should the institution increase average EE investment rate ~$2.8 million annually

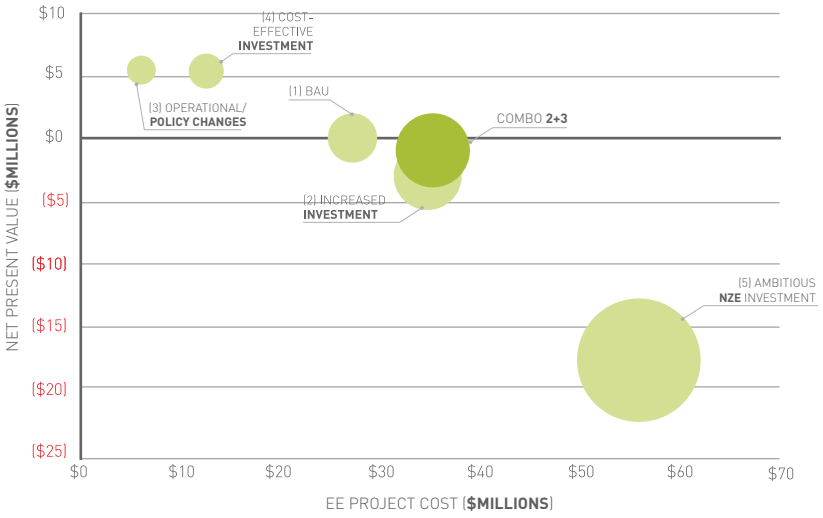
3 AMBITIOUS INVESTMENT

Reflecting an increase average EE investment rate ~$4.4 million annual (includes numerous electrification projects)



This chart shows the potential campus EUI of the campus in 2030 for these three scenarios. It was determined that CSULB **can realistically achieve an overall campus EUI as low as 35.5 kBtu/sf** through various energy-efficiency & renewable energy projects.

ENERGY EFFICIENCY FINANCIAL RESULTS



This figure displays financial return for **five of the energy efficiency project portfolios assessed**. Each scenario is represented as a bubble, with total investment on the x-axis, Net Present Value along the y-axis (better economics to the top), and total GHG reductions represented by the width of the bubble. Based on the findings of this analysis, Glumac recommend that CSULB combine the low/no-cost campus policies scenario **(3)** with an increased EE investment strategy **(2)** to achieve a cost neutral overall investment strategy. This is estimated to reduce campus Scope 1 & 2 emission by over 30% over the next 12 years.

GHG EMISSIONS MITIGATION STRATEGIES

SOLAR
PHOTOVOLTAICS

The CSULB campus can support up to **~10 MW of on-site solar photovoltaics**. Shifting utility rate structures across CA will adjust the economics of solar, but PV can still be a cost-effective investment.

CAMPUS
ELECTRIFICATION

Campus electrification is recommended to be a fundamental part of CSULB's long term carbon neutrality plans. **CA Senate Bill 100** will provide carbon free electricity by 2045.

LED
LIGHTING

LED lighting retrofit projects should be prioritized in the near term. They are cost effective projects and minimally impactful to campus operations - but **the energy impacts can be immediate** and powerful.

HVAC
RETROFITS

HVAC retrofit investments should be made over the next 12 years leading up to 2030. Glumac identified HVAC retrofit opportunities were identified across the entire campus.

ZERO EMISSION
VEHICLES

Electric vehicles should be prioritized for future purchases. **Diesel grounds equipment is most difficult to mitigate** – electric grounds equipment pilot program recommended.

FUNDING &
FINANCING

There are numerous funding/financing sources are available for CSULB. Establishing a long term funding plan will **improve capital outlay for energy efficiency investments** across the campus.

GLUMAC'S STRATEGIC RECOMMENDATIONS

BUILDING ENERGY EFFICIENCY

1. Implement all EE projects with a reasonable payback periods (Increased Investment Scenario) prior to 2030 – increase average annual EE investment rate to at least $2.8 million
2. Prioritize projects with lower paybacks up front and couple with external financing
3. Combine capital intensive retrofit projects with larger building renewal projects to reduce net project cost for EE project and limit impact to campus operations
4. Establish a campus wide retro-commissioning/ control optimization initiative
5. Review building hours of operations and reduce the HVAC hours of operation when buildings are always unoccupied or underutilized
6. Establish a quarterly classroom & EMS schedule review process to optimize building utilization. This should include: Summer Building Shutdown, Friday/Saturday Shutdown, Schedule & Space Optimization, etc.
7. Maintain ZNE and low-EUI standards for new construction and major renovation projects

RENEWABLE ENERGY

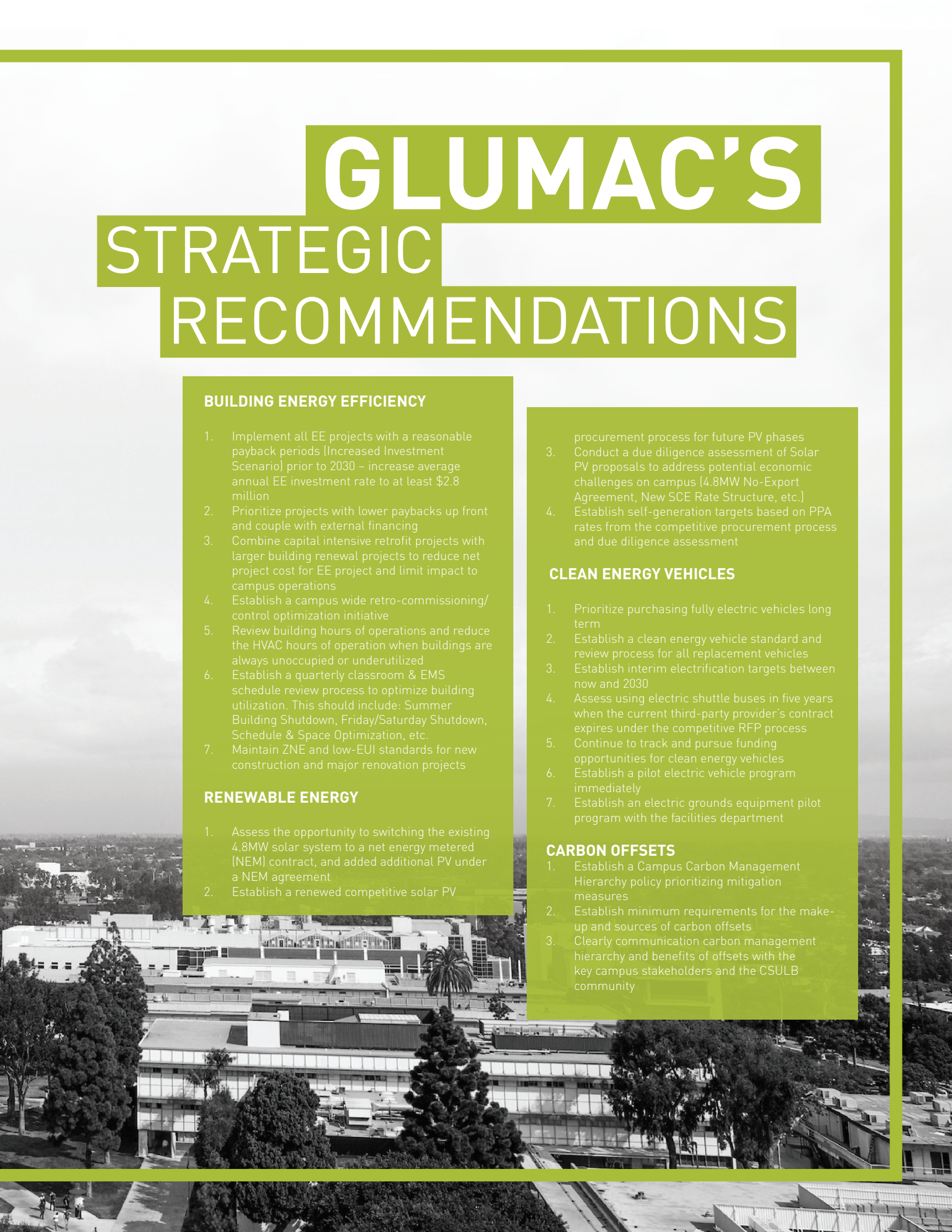
1. Assess the opportunity to switching the existing 4.8MW solar system to a net energy metered (NEM) contract, and added additional PV under a NEM agreement
2. Establish a renewed competitive solar PV procurement process for future PV phases
3. Conduct a due diligence assessment of Solar PV proposals to address potential economic challenges on campus (4.8MW No-Export Agreement, New SCE Rate Structure, etc.)
4. Establish self-generation targets based on PPA rates from the competitive procurement process and due diligence assessment

CLEAN ENERGY VEHICLES

1. Prioritize purchasing fully electric vehicles long term
2. Establish a clean energy vehicle standard and review process for all replacement vehicles
3. Establish interim electrification targets between now and 2030
4. Assess using electric shuttle buses in five years when the current third-party provider's contract expires under the competitive RFP process
5. Continue to track and pursue funding opportunities for clean energy vehicles
6. Establish a pilot electric vehicle program immediately
7. Establish an electric grounds equipment pilot program with the facilities department

CARBON OFFSETS

1. Establish a Campus Carbon Management Hierarchy policy prioritizing mitigation measures
2. Establish minimum requirements for the make-up and sources of carbon offsets
3. Clearly communication carbon management hierarchy and benefits of offsets with the key campus stakeholders and the CSULB community



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