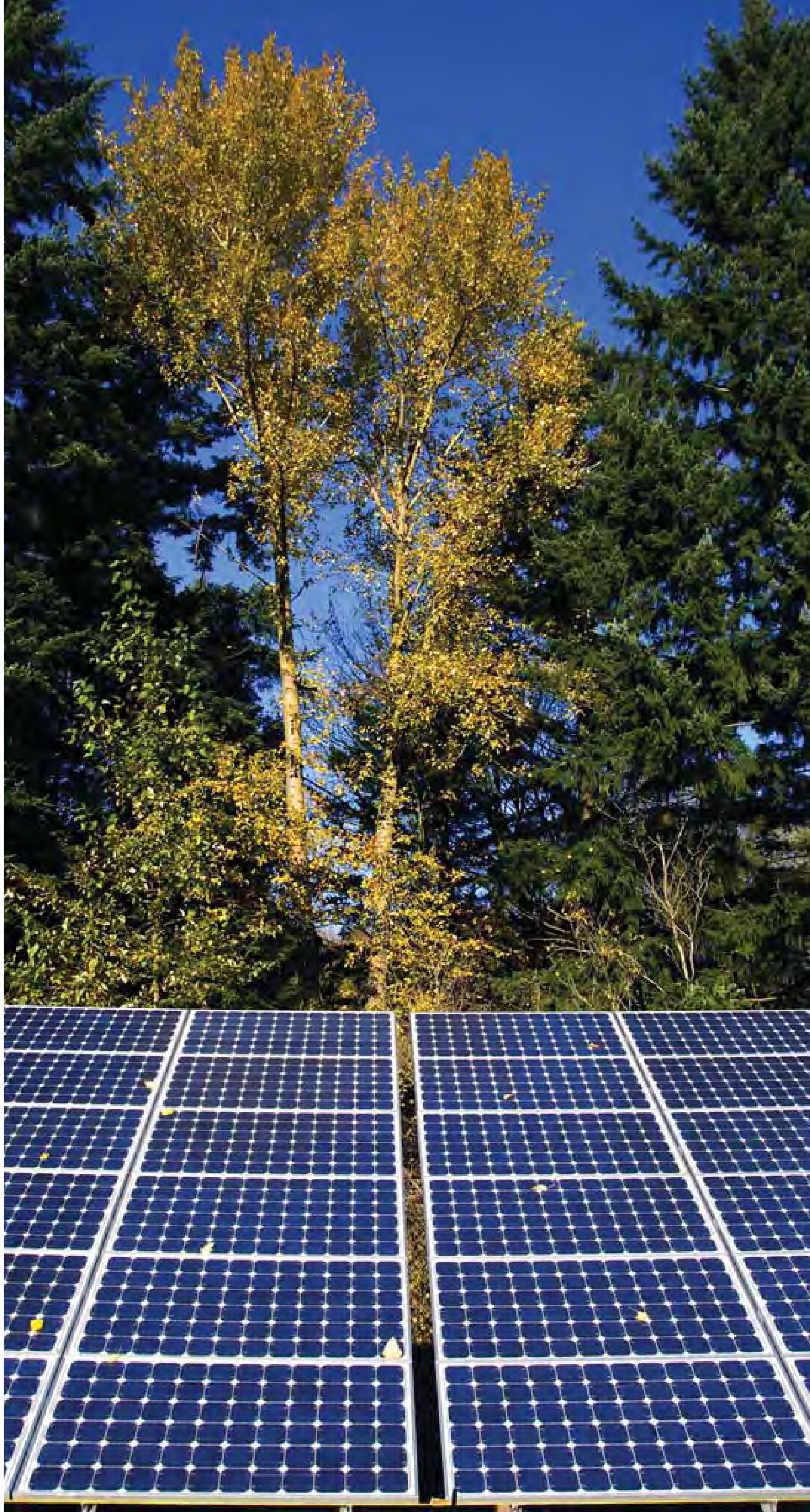
Energy Conservation

2.2



2.2 ENERGY CONSERVATION

Opportunities to conserve energy exist in all aspects of campus development, including energy sources, building systems and materials, landscape design and transportation.

2.2.1 Goals

- ***Maximize the use of renewable energy sources across the campus.***
- ***Design all new buildings to be as energy efficient as possible.***
- ***Minimize the embodied energy in all building products.***
- ***Develop landscape plans that minimize the demand for irrigation and potable water, reduce heat island effects and respond to seasonal temperatures.***
- ***Provide convenient and cost-effective transportation alternatives.***

2.2.2 Energy Sources

- *Evaluate the project site for on-site renewable energy opportunities, including solar photovoltaic, solar heating, wind generated electricity and geothermal.*
- *Provide 35% electrical power usage over at least a 2 year period from grid source renewable energy technology (purchase renewable energy certificates), or provide 10% electrical power usage on an ongoing basis through TVA's Green Power Switch program.*

2.2.3 Buildings

- Achieve LEED Silver Certification or higher for all new construction.
- *Select the building orientation (north, south, east, west) that best suits the site's solar attributes (solar energy, heat gain and daylighting) and topography.*
- Canopies, recessed windows and other shading devices are encouraged to create visual interest and scale and to respond to solar heat gain and daylight harvesting.
- Façade treatment should reflect solar orientation. To reduce solar heat gain and glare, designers are encouraged to utilize vegetation, screens, louvers, roof overhangs, recessed windows, light shelves and/or high efficiency glazing.
- *Buildings should utilize sustainable materials that are locally produced, indigenous to the region and high in recycled content.*
- *Where practical, all natural materials used in buildings should be of rapidly renewable origins.*
- *For wood building products, utilize Forest Stewardship Council (FSC) certified wood for a minimum of 50% of wood.*
- *Where practical, utilize salvaged or recycled materials in design and construction of new facilities.*

- Through life cycle cost analysis, evaluate the embodied energy of building systems and materials, accounting for how products are harvested, manufactured, and transported through the life of the product's use as well the disposal of products.

- To the extent possible, vegetated roofs, using drought resistant plants, are a preferred option to mitigate heat absorption and stormwater runoff and reduce energy costs and roof replacement costs.

- *For low-sloped roofs (slope ≤ 2:12), finished roof surface should have an SRI of 78 or greater for a minimum of 75% of the roof surface.*

- *For steep-sloped roofs (slope ≥ 2:12), finished roof surface should have a minimum SRI of 29 or greater for a minimum of 75% of the roof surface.*

- *When utilizing vegetated roof surfaces, the vegetated space should cover at least 50% of the roof surface.*

- *When utilizing a combination of vegetated and high solar reflectance roof surfaces, install them such that the following equation is satisfied: (Area of SRI Roof / 0.75) + (Area of Vegetated Roof / 0.5) ≥ Total Roof Area.*

- *Design building façade and site lighting with lighting power densities that promote safety but minimize light pollution from the building site.*

- *Design exterior area lighting power densities to be 20% less than lighting power densities defined in ASHRAE 90.1-2007, Exterior Lighting Section.*

- *Design building façade lighting to be 50% less than the lighting power densities defined in ASHRAE 90.1-2007, Exterior Lighting Section.*

- *Design the placement and fixture styles of site lighting to minimize illumination above the horizontal plane and to minimize light trespass at the site boundary.*

- *Use fixture types designed as "cutoff" and "full-cutoff" styles to minimize fixture lumens emitted at 90 degrees or higher from straight down.*

- *Select exterior fixtures and locate them on the site to minimize light trespass at the site boundary. Document the foot-candle levels at the site boundary with a site illumination model.*

- *Provide a connection between indoor and the outdoor spaces through the introduction of daylight and views into regularly occupied areas of the building.*

- *Demonstrate that a minimum daylight illumination level of 25 footcandles has been achieved in at least 75% of the regularly occupied spaces.*

- *Design the building to maximize the interior daylighting by considering the use of floor plates with minimum widths, building orientation, increased building perimeter, exterior and interior shading devices, high performance glazing, and light shelves to project light deeper into the spaces.*

Reference: *State of Tennessee Sustainable Desian Guidelines.*

- *Daylighting strategies should address color schemes, integrated lighting systems and direct beam penetration into spaces.*

- *Raised flooring systems are encouraged. This system provides conditioned air at the level of the occupants while allowing flexibility in locations for outlets and vents.*

- *Specify high-efficiency fixtures and dry fixtures such as waterless urinals.*

- *Consider using rainwater or gray water systems for irrigation, flushing toilets and urinals and process water needs.*

- *Maintain consistent lighting levels through the use of photo-responsive controls.*

- *Appliances should be Energy Star rated.*

- *Verify that the buildings energy related systems are installed, calibrated and perform according to basis of design and construction documents through a commissioning process.*

- *At a minimum, the following systems and equipment should function per the design intent and be verified through a commissioning process: heating, ventilating, air conditioning, and refrigeration systems and equipment; lighting controls; domestic hot water.*

2.2.4 Landscape

- The campus plan and individual building site plans should utilize the plant palettes of both: Landscaping with Native Plants (East Tennessee), Tennessee Department of Environment and Conservation; Site Design Guidelines, University of Tennessee, Knoxville (July, 2008).

- Trees should be generally grouped to mimic naturally occurring forest type groups specific to soil, aspect, and water requirements, with a variety of types, sizes and species.

- Plantings should be supported, to the greatest extent possible, by detained or captured rainwater, and through drought resistant and native planting principles.

- *Plant tree types that will shade paved surfaces within 5 years to reduce urban heat islands.*

- *Use light colored paving surfaces with a Solar Reflectance Index greater than 29 to limit heat island effect.*

Reference: *State of Tennessee Sustainable Design Guidelines.*

2.2.5 Transportation

- Support transportation demand management (TDM) strategies, such as carpooling, park and ride lots, transit passes and bicycle and pedestrian facilities to minimize energy consumption associated with transportation.
- Promote pedestrian and bicycle safety within the campus, by limiting automobile traffic speed and designating bicycle lane networks throughout the campus.
- *Use light colored paving surfaces with a Solar Reflectance Index greater than 29 to limit heat island effect. For reference, typical new white concrete has an SRI of 86; typical new grey concrete has an SRI of 36; and typical new asphalt has an SRI of 0.*
- Lighting should be planned at the minimum level required for security of parking areas used only during peak hours (e.g., upper decks).
- Parking structures should be easily able to support electric plug-in vehicle receptacles and recharging services.
- The upper deck of parking structures should be planned for the installation of solar panels as a renewable energy source, following acceptable standards as they develop.
- *Provide parking decks to reduce the area of asphalt contributing to heat islands.*

Reference: *State of Tennessee Sustainable Desian Guidelines.*