	Carbon Reduction Strategies	Policy (PO) Design (DE) Operations (OP)	Existing Buildings (EB) Renovations (RO) New Construction (NC)	Cost Scale Estimate	Approximate Energy Savings	Approx Carbon Savings	Policy Compatibility	Possible Use As Incentive	References
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	Carbon Savings Scale: Research In Progress								
1	**Immediate Carbon Reduction Strategies** The approaches listed below are achievable virtually without cost. Start with these strategies first								
1.01	**Turn Off Lights When They Are Not Required** a. Turning off everything that can be turned off without compromising quality of life b. Educate and motivate employees to turn off lights at the end of the day. c. Switch lights off when you leave home d. Use local switching for office occupants to illuminate only where required	**OP, DE**	**ALL**	**VNC**	Every 1,000 kilowatt-hours (kWh) saved equals $100 on your utility bill, assuming 10 cents per kWh.	**TBD**	**-**	**-**	http://www.focusonenergy.com
1.02	**Program Computers and Office Equipment to "Sleep Mode"** a. Activate individual desk computer's low-power "Sleep Mode" after a period (30 mins) of inactivity	**OP**	**EB**	**VNC**	Save $30 per year in energy cost / monitor in Sleep Mode on every weekend	**TBD**	**Yes**	**-**	www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=CO
1.03	**Reduce Overuse of Space Heaters** a. Plug heaters into power strips controlled by occupancy sensors (other loads such as task lights and monitors can also be plugged into the same power strips). b. Use of individual space heaters often signals poor HVAC system control. Schedule time for a technician out to check the system	**OP**	**EB**	**VNC**	Up to 1 Kw per hour dependant on unit	**TBD**	**-**	**-**	http://www.focusonenergy.com
1.04	**Setback HVAC Temperature Setbacks** a. During "off" hours or time away from home or work, turn furnace temperature settings down in warming seasons and up in cooling seasons. b. Install programmable thermostats (see short term strategy 2.02 for more information).	**OP, DE, PO**	**ALL**	**VNC**	**TBD**	**TBD**	**-**	**-**	www.energystar.gov
1.05	**Adjust Common Area Lighting** a. Consider dimming hallway lighting by 30 percent during daytime hours to reduce demand charges and energy consumption.	**OP, DE**	**ALL**	**$$**	**TBD**	**TBD**	**-**	**Yes**	
1.06	**Check the Economizer Cycle** a. Economizer draws in cool outside air directly into the interior conditioned space without heating or cooling b. During the shoulder seasons of spring and fall use the dampered vent system or economizer cycle to reduce cooling costs c. For best results, have a licensed technician check and/or repair your system yearly	**OP**	**EB**	**VNC**	An improperly serviced economizer cycle can add as much as 50 percent to a building's annual energy bill	**TBD**	**-**	**-**	www.eren.doe.gov/buildings
1.07	**Regulate Air-Conditioning Temperatures** a. Check air temperatures returning to air conditioner and coming out of the register. If the temperature difference is less than 14° Fahrenheit (F) or more than 22°F, have a licensed technician inspect your air-conditioning unit.	**OP**	**EB**	**$**	**TBD**	**TBD**	**-**	**-**	
1.08	**Change the Furnace Filters** a. Filters should be changed on a monthly basis b. Prior to occupancy or moving in, change all filters c. Change filters more often if you are located next to a highway, construction site, or other place where the air is dirtier than usual.	**OP**	**EB, RO, NC**	**$**	**TBD**	**TBD**	**-**	**-**	http://www.energystar.gov/index.cfm?c=sb_join.sb_resources

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1.09	**Secure all the Cabinet Panels** a. Confirm mechanical systems cabinet panels are fully attached each quarter b. Make sure all screws in place and all gaskets intact so that no air leaks out of the cabinet and energy is lost	**OP**	**EB**	**VNC**	Chilled air leaking out can cost $100 per rooftop unit per year in wasted energy	**TBD**	**-**	**-**	http://www.energystar.gov/index.cfm?c=small_business.sb_renters
1.10	**Clean Air Condenser Coils** a. Check the condenser coils quarterly for either man-made or natural debris and remove with vacuum cleaner or soft brush b. At the beginning and end of the cooling season, thoroughly wash the coils	**OP**	**EB**	**VNC**	**TBD**	**TBD**	**-**	**-**	
1.11	**Check the Registers Airflow** a. Ensure there is adequate airflow out of registers by hold your hand up against the grille. b. If flow is light or the register is full of dirt and dust, have a technician inspect your unit c. Clean ductwork to insure a properly flowing system	**OP**	**EB**	**VNC**	**TBD**	**TBD**	**-**	**-**	http://www.energystar.gov/ia/products/heat_cool/GUIDE_2COLOR.pdf
2	**Short-Term Carbon Reduction Strategies** The approaches listed below are achievable with low first costs and require little or no design integration. They can be implemented today or incrementally over short period of time.								
2.01	**Replace and/or Relamp Light Bulbs or Lamps with Most Efficient Available Products** a. Use Compact fluorescents light bulbs (Phase out high-wattage, short-life incandescents until they are more efficient) b. Use HIR Halogen Bulbs/Lamps c. Relamp T12 fluorescent lamps with T8 or T5 lamps d. In High bay (typically industrial) facility use metal halide lamps or high-output fluorescent lamps e. Utilize task lighting for office uses f. Upgrade to LED or Induction lighting for traffic signals and street lighting	**OP, DE, PO**	**ALL**	**$**	Compact Fluorescents save up to 65% energy use above incandescent	**TBD**	**Yes - Phase out Incandescent**	**Yes**	www.globalwarmingsolutions.org/documents/CFL_factsheet.pdf www.mwalliance.org/resources_page.php?page=Illinois www.illinoiscleanenergy.org/lighting_body.asp#LED
2.02	**Install Programmable Thermostat** a. Regulate heating and cooling systems to match occupancy patterns b. Reduce energy and conditioning loads on mechanical systems c. In Commercial and Residential Cooling, offsets energy use to non-peak evening time to save money	**OP, DE, PO**	**ALL**	**$**	Save up to 33% of heating and cooling costs per year	**TBD**	**Yes**	**Yes**	www.energystar.gov www6.homedepot.com/ecooptions/index.html
2.03	**Add Insulation to Plumbing Supply Piping** a. Reduce heat loss between water heater and source of use b. Acts as a pre-heater before boiler c. Reduce condensation on piping	**OP, DE, PO**	**ALL**	**$**	**TBD**	**TBD**	**Yes**	**-**	
2.04	**Lobby Local and National Legislatures for Green Tax Incentives** a. Extend Energy Policy Act with higher tax credits b. Reduce or remove cap on residential solar tax credit c. Create tax free purchases on energy saving upgrades d. Every $1 invested in energy efficiency has been shown to return $3 in direct economic benefit which typically stay in the region they are given	**PO**	**ALL**	**N/A**	**TBD**	**TBD**	**Yes**	**Yes**	www.aceee.org/pubs/e066.htm www.mwalliance.org/news_article.php?article=84

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2.05	**Include Ceiling Fan/Light Combination Fixtures** a. Increase circulation effectiveness and micro-adjust comfort levels in summer and winter b. Dual purpose fixture for reduced installation costs	OP, DE	ALL	$	TBD	TBD	-	-	
2.06	**Purchase EPA EnergyStar Rated Appliances & Products** a. Government Rated for High Efficiency b. Typically are most Energy Efficient on market c. Also rates building materials for efficiency and longevity	OP, DE, PO	ALL	$	TBD	TBD	Yes	-	www.energystar.gov
2.07	**Include Bicycle Parking in all Private and Public Buildings Community Infrastructure** a. Convert unused closet space or loading dock for indoor parking b. Similar to conversion of unused Boulevard right of way to bike lane	OP, DE, PO	ALL	N/A	N/A	TBD	Chicago Zoning Code	Yes	http://www.bike2015plan.org/chapter3/chap3.html
2.08	**Include Dimming and Photocell Controls on Light Fixtures** a. Use dimming control systems especially when combined with daylighting to adjust light level automatically b. Use photocell control to turn on exterior lights at night only c. Add occupancy sensors or timers to illuminate room only when used, especially in commercial buildings d. Use dimming control systems to extend the life of lamps or bulbs	OP, DE. PO	ALL	$$	TBD	TBD	Yes - Exterior Photocells	-	
2.09	**Seal Leaks in HVAC Ductwork** a. Use Low-VOC tapes, mastic, or sealants to reduce loss of conditioned air	OP, DE, PO	ALL	$	TBD	TBD	Yes - Green Homes for Chicago	-	www.energystar.gov http://www.hgtvpro.com/hpro/bp_mechanical/article/0,2617,HPRO_20151_4583390,00.html
2.10	**Install Most Efficient Light Fixtures Available** a. Projects in different locations fall within different illumination categories, design for the light category for your project b. Utilize the best efficacy of bulbs/ lamps available for the quality of lighting required c. Use rapid start electronic ballasts when instant "on" is not required. Rapid start ballasts increase the life of fluorescent lamps	OP, DE, PO	ALL	Varies	TBD	TBD	Yes - EnergyStar Required	-	
2.11	**Purchase Carbon Emission Offset Credits** a. A temporary means to reduce carbon footprint of buildings b. Not meant as substitute for energy reduction	OP	EB, RO	$	TBD	TBD	-	-	www.carbonfund.org
2.12	**Change Building and/or Zone Codes to Performance Based Model** a. Give advantage to holistic mechanical building design b. Reduce "rule-of-thumb" prescriptive based (one-size-fits all) approach to fit design to building	PO	RO, NC	N/A	TBD	TBD	Yes	-	www.ase.org/content/article/detail/2329

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2.13	**Utilize Building Commissioning** a. Commissioning is a process in which Engineers check and tune up building systems to ensure that they are operating appropriately and efficiently as designed. Savings typically come from adjusting existing controls to reduce HVAC waste while maintaining or even increasing comfort levels for building occupants b. Basic Commissioning in new systems and Retro Commissioning in existing systems are both beneficial c. Implement policy for all buildings to submit a commissioning report every (5 to 7 years) or required during Ownership change	**OP, DE, PO**	**ALL**	**$$-$$$ Building commissioning usually costs between 50 cents and $1 per square foot.**	**TBD**	**TBD**	**Yes**	**Yes**	www.wbdg.org/project/buildingcomm.php www.energydesignresources.com/resource/37/ www.eere.energy.gov/buildings/info/plan/commissioning.html
2.14	**Include Recycling and Composting Space** a. Create adequate spaces and facilities within buildings to allow multiple resource recycling b. Include adequate space and signage for sorting bins, rooms, and/or chutes c. Composting reduces yard and food waste up to 50% d. Reduced waste equates to reduced greenhouse gas off gassing of landfill waste AND reduced hauling rates	**OP, DE, PO**	**ALL**	**$**	**TBD**	**TBD**	**Yes**	**-**	www.chicagorecycling.org
2.15	**Utilize Car and Bicycle Sharing Programs** a. Use I-Go or other car sharing program which stocks low-emission, high efficiency and hybrid vehicles b. Eliminate Homeowner second/third car garages of under utilized vehicles c. Reduces retail parking area size in favor of smaller centralized shared car storage d. Policy implementation to require at least (1) car sharing vehicle for hotel guest local use	**OP, DE, PO**	**ALL**	**$**	**TBD**	**TBD**	**Market Driven**	**-**	http://www.igocars.org/
2.16	**Design Efficient Site and Amenity Lighting** a. Projects in different locations fall within different illumination categories, design for the light category than your project falls within. lighting levels for the ambient light category b. For landscape lighting consider low-wattage ceramic metal halide, fluorescent, or LED sources instead of halogen c. Highlight only what is necessary - take care to minimize spill light in into the atmosphere when floodlighting a building façade d. Street lighting level to adhere only to necessary light levels	**OP, DE, PO**	**ALL**	**$**	**TBD**	**TBD**	**Yes - Require Lighting Calculations**	**-**	
2.17	**Use Smart Lighting Design in Parking Lots** a. Design with maximum and average lighting recommendations in mind - do not provide more lighting than is required. b. For roadway/pathway lighting consider using low-wattage metal halide lamps which consume less energy per watt, instead of high-pressure sodium lamps c. Follow Dark Sky Initiative by directing all exterior fixtures downward - eliminate light emitted to the sky	**OP, DE. PO**	**ALL**	**$-$$**	**TBD**	**TBD**	**Yes**	**Yes**	www.darksky.org

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2.18	**Maintain Preventative Maintenance Programs** a. Update preventative maintenance programs to keep equipment running in optimal operating condition, thereby saving energy b. With the increase complexity of a system, the education for Building Engineers is a critical requirement. c. Maintain O&M Manuals and Record Keeping to gauge efficiency levels and assist troubleshooting d. The higher the energy efficiency is designed into the system, the more important to maintain records and stay educated	**OP**	**ALL**	**VNC**	**TBD**	**TBD**	**-**	**-**	http://www.focusonenergy.com
2.19	**Ramp up all Building and/or Energy Codes to Follow Best in Country or Region** a. Adopt Minimum Standards to follow current version of ASHRAE 90.1 without a date to allow code to change with all updates b. Investigate California "Title 24" Standards to work in your City c. Modify codes for specific requirements of region	**PO**	**ALL**	**N/A**	**TBD**	**TBD**	**Yes**	**-**	www.cee1.org/cee/mt-primer.php3
2.20	**Use Deconstruction / Material Salvage when Demolishing Buildings** a. Reuse building materials for other uses on site or save for use elsewhere b. Homeowners receive tax donations – large enough to pay for the costs of deconstruction.	**DE, PO**	**EB, RO**	**VNC**	up to 30% Savings over Demolition	**TBD**	**Yes**	**Yes**	www.smartgrowth.org/library/deconst_smart_demol.html www.TheReusePeople.org
2.21	**Give Incentives to Green Design during Building Code Review** a. Promote by faster review, local promotion, reduced reviewer fees b. Enhance with better FAR values or tax credits (see strategy 2.04)	**PO**	**ALL**	**N/A**	**TBD**	**TBD**	**Yes**	**Yes**	
2.22	**Advance Thermal Envelope Design (Exterior Wall)** a. Increase insulation thickness to reduce winter heat loss b. Include air sealing at exterior wall (envelope) to reduce conditioned air leaks and moisture infiltration c. Best if include prior to or simultaneous with mechanical systems upgrades	**DE**	**RO, NC**	**$**	**TBD**	**TBD**	**Yes**	**Yes Currently Available for Non Profits**	www.eeba.org

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3	**Mid-Term Carbon Reduction Strategies** The approaches listed below are achievable with moderate costs and most require modest design integration. These strategies can be incorporated as upgrades and/or during renovations.								
3.01	**Integrated Architectural and Building Engineering Services Design Process** a. Implement "whole building" design process to engages all disciplines (Arch / MEP / Civil) early in design process. Can be through a charrette or workshop format b. Design with optimal site orientation and massing strategies for passive solar, heating, and cooling c. Integration reduces building energy consumption and reduces mechanical systems sizing, which saves first or initial costs and monthly energy expenses	DE, PO	RO, NC	$	TBD	TBD	Yes	Yes	
3.02	**Install Radiant Heating & Cooling Systems** a. Typically delivered through under floor piping b. Cooling runs system in reverse with piping absorbing heat and removing it from conditioned space c. Very efficient system approach d. Promotes good indoor air quality	DE	ALL	$$ Retro $ New	TBD	TBD			
3.03	**Upgrade Roof Insulation to R-49** a. Reduces heating and cooling loads for higher building efficiency b. Higher insulating value required for cold climates c. Insulated better than minimum required in Building Codes	DE, PO	ALL	N/A	TBD	TBD	Yes - Bldg Code		http://www.southface.org/web/resources&services/publications/factsheets/sf_factsheet-menu.htm
3.04	**Give Tax Incentives for Smaller, More Proportionately Sized Homes** a. Size rooms according to use and utilize multipurpose spaces to reduce number of spaces b. Target design of single family homes and new condo construction at 500sqft per person	DE, PO	RO, NC	N/A	TBD	TBD	Taxes	Yes	
3.05	**Utilize Heat Recovery Ventilation in HVAC Systems** a. Capture heat from bathroom vent stack b. Reuse low grade heat from Server Rooms as pre-heat	DE	RO, NC	$$	TBD	TBD			
3.06	**Update Exit Signage with Energy-Efficient LED bulbs/fixtures** a. Reduces energy costs, and extends your bulb life b. Tax breaks and incentives are currently available from Feds c. Policy to require LED fixtures in new buildings / renovations d. Similar technology to stop lights	OP, DE, PO	EB	$$	LEDs save 90% over Incandescent or $67 per exit sign per year. Savings of 80% over Compact Fluorescents	TBD	Bldg Code	Current	http://www.focusonenergy.com/page.jsp?pageId=1193
3.07	**Design with Daylighting or Daylight Harvesting** a. Install light shelves on exterior and/or interior of window b. Indirectly illuminates room from ceiling and/or prevent glare at window c. Design ceiling with slope to enhance room illumination	DE	RO, NC	$$	TBD	TBD		Yes	

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3.08	**Include Demand-Controlled Ventilation (DCV) or CO2 Monitoring in HVAC Systems** a. System monitors level of carbon dioxide in the return air stream, uses it as an indicator of occupancy and decreases/increases fresh air as required b. DCV systems are particularly applicable to variable-occupancy spaces like indoor parking garages, auditoriums, meeting rooms, and cafeterias	**DE**	**RO, NC**	**$$**	**TBD**	**TBD**			
3.09	**Install Evaporator Fan Controllers and Modulating Ventilators in Commercial Kitchens** a. Reduces energy consumption for these constantly operating fans b ased on motor power and duty cycle	**OP, DE, PO**	**ALL**	**$$**	Potential to save hundreds of dollars per piece of equipment	**TBD**	**Yes - Currently given in CA by PG&E**	**Yes**	www.fishnick.com/ www.energystar.gov/index.cfm?c=commer_refrig.pr_commercial_refrigerators
3.10	**Install Point of Use Water Heaters** a. Instant hot equipment reduce heating cost by removing required piping and length of time heated water takes to reaches user b. Reuse heated water in radiant floor for extra savings - see 3.02	**OP, DE**	**ALL**	**$$**	**TBD**	**TBD**			
3.11	**Install Geothermal Heat Wells / HVAC Systems** a. Use Earth's constant temperature as air conditioner in summer b. In winter as means to pre-condition supply air for building distribution c. Adapt configuration to space requirements of site, can be deployed either vertical, horizontal, or at pond bottom	**DE**	**RO, NC**	**$$$**	**TBD**	**TBD**		**Yes**	
3.12	**Sequester Carbon on Site** a. Absorb CO2 on site by vegetations natural processes b. Utilize landscape as means of natural carbon sequestration. Simultaneously reduces storm sewer crises b. Increase amount of plantings in building to absorb human CO2 output and promote good indoor air quality	**OP, DE**	**ALL**	**$**	**TBD**	**TBD**	**Yes**		
3.13	**Replace Windows with Triple Glazed Units (up to R-10)** a. Double insulating value while reduce energy loss and maintaining views / ventilation b. Newer product on the market and can sometimes be expensive	**OP, DE**	**ALL**	**$$$**	Reduce household energy bill by up to 15% using double pane, lowE, argon filled windows	**TBD**		**Yes**	http://www.efficientwindows.org/
3.14	**Tie Property Taxes to Benchmarked CO2 for Building Types** a. Reduce tax for low Carbon Bldgs - Similar to Vehicle tax b. Or create carbon tax for vehicles, buildings, or processes which produce large amounts of carbon and use proceeds to support energy conservation and renewable energy grants	**PO**	**EB**	**$**	**TBD**	**TBD**	**Yes**	**Yes**	
3.15	**Install Low Flow (minimum 1.3 gpm) or Dual Flush Toilets** a. Dramatic reduction in water use and sewage costs b. Maintain same quality with minimal water consumption b. When utilized in multi-story building, reduces pumping requirements	**OP, DE, PO**	**ALL**	**$**	Low Flow Fixture saves 20% water usage over typical fixture and over 60% water savings over pre-1994 fixtures (residential)	**TBD**	**Yes - Bldg Code**		www.energystar.gov http://www6.homedepot.com/ecooptions/index.html?

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3.16	**Utilize Natural Ventilation and "Stack Effect"** **a**. Utilizes natural flow of air to cool and heat, assist by ceiling fans b. Highly effective at dramatically swinging temperature of space c. Maintain "economizer" cycle on mechanical equipment to run in fan only method (mechanically assisted natural ventilation) - see strategy 1.06 d. The stack effect is a natural process which uses open stairways, shafts, or atriums to draw hot air up and out of building e. Utilize night-time cooling by replacing all interior air with cool night time air	**DE**	**RO, NC**	**$$**	**TBD**	**TBD**			
3.17	**Mandate Use of Energy Modeling to Design Building Systems** a. Facilitates integration of systems and building design for higher efficiencies b. Eases multi-option approach during design phase c. Reduces coordination obstacles during construction phase	**PO, DE**	**RO, NC**	**$**	**TBD**	**TBD**	**Yes**	**Yes**	
3.18	**Utilize EPA EnergyStar White or "Cool" Colored Roof** a. Light colored roof reduces heat absorption by reflectivity and emissivity b. Without absorbing heat, the lifetime of the roof is extended c. Reduces "heat island effect" of heat build up in urban areas	**OP, DE, PO**	**RO, NC**	**N/A**	10-15% Reduction in peak cooling demand	**TBD**	**Yes**	**Yes**	www.energystar.gov
3.19	**Use Off-Peak Cooling for Larger Commercial or Industrial Buildings** a. Produce ice or chiller water at night during offset energy periods b. Reduces cooling costs & energy loads	**OP, DE**	**RO, NC**	**$**	**TBD**	**TBD**		**Yes**	
3.20	**Install Brise Soleil or Sunshades on Building Exterior** a. Shading of building exterior reduces cooling load requirements and protects interior from harsh light b. Design shades to allow winter sun to reach fully into building when it's needed most c. For 1-3 story sloped roof buildings, include minimum 2ft overhangs of roof	**OP, DE**	**RO, NC**	**$$$**	**TBD**	**TBD**		**Yes**	

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4	**Long-Term Carbon Reduction Strategies** The approaches listed below are achievable for projects for moderate costs and do require higher design integration. These approaches are most applicable for New Construction and are readily available today.								
4.01	**Increase Building Energy Independence** a. Upgrade building's energy source to on-site renewable energy sources to satisfy up to 50% of building's average energy consumption, 100% of emergency energy consumption b. Include BIPV in design (building-integrated photovoltaic) at roof and south facing facade c. Utilize BIWP in building design (building integrated wind power) d. Energy systems can be either entirely off-grid, maintain connection to power grid and sell excess energy, or both	**OP, DE**	**ALL**	**$$$**	**Possibility for energy producing buildings**	**Target: carbon neutral (free) buildings**	**Yes**	**Yes**	www.illinoissolar.org/ www1.eere.energy.gov/solar/
4.02	**Create Neighborhood Based / Sized Infrastructure** a. Utilize cogeneration or shared infrastructure for energy production b. Reuse waste from one user for raw material of another c. Trade energy peak use between different building types (light industrial, commercial, residential) and at different times of the day	**OP, DE, PO**	**ALL**	**$$$**	**Energy producing buildings likely**	**Lasting cost reduction impact**	**Yes**	**Yes**	www.ea2020.org/drupal/node/54
4.03	**Integrate Building's Energy Production Systems** a. Move beyond single use energy infrastructure to those which share wastes, footprints, and/or have alternating peak use and production periods b. Geothermal wells for heating and cooling - see strategy 3.11 c. Utilize photovoltaic shading as a daytime fresh air pre-heat d. Integrated solar electric with solar water heating systems e. Install direct-vent combination heater that includes a water heater and furnace	**OP, DE, PO**	**NC**	**$$$**	**Likelihood for energy producing buildings**	**Target: carbon neutral (free) buildings**	_	**Yes**	
4.04	**Move to Fully Automated Building Systems** a. Use systems capable immediately responded to changes in the external building environment or local microclimate fluctuations b. Moveable insulation, shades, and louvers c. Self-regulating MEP systems coupled with occupancy and activity sensors d. Design all MEP systems for highest efficiency possible (currently as high as 92% efficient) e. Require measuring and verification protocols, long-term building energy performance monitoring and data collection f. Require periodic building commissioning / re-commissioning	**OP, DE**	**NC**	**$$**	**TBD**	**TBD**	**-**	**-**	
4.05	**Incorporate "Intelligent Building Design" into All Disciplines Throughout Design and Construction** a. Shape the form / massing of the building with the focus on high performance and energy efficiency b. Develop building aesthetics in tandem with increased building energy performance c. Integrate Civil, Architectural, Structural, MEP and Landscaping design during design portion of process d. Develop integrated design, construction and operation delivery methods	**DE**	**NC**	**$$**	**TBD**	**Target: carbon neutral (free) buildings**	**-**	**-**	http://www.nrel.gov/buildings/whole_building_research.html

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	Cost Scale (Estimate): VNC = Virtually No Cost $ = $0 to $4,999 $$ = $5,000 to $49,999 $$$ = Over $50,000								
	Carbon Savings Scale: Research In Progress								
4.06	**Implement Smart Urban Design and Planning** a. Use zoning to direct growth toward areas with existing strong mass transit access to reduce dependence on personal vehicles b. Use zoning to increase density in urban area c. Increase mixed use developments to create neighborhood based services and jobs, further reducing need for commuting. d. Strategically target mass transit extensions to stimulate smart growth and urban development e. Promote urban infill over already utility and transportation infrastructure corridors (rail yards, rail lines and highways) with zoning f. Discourage use of personal vehicles in the city core by tax, regulation, or altering use days g. Mandating transit-oriented development with a transit portfolio that starts with walking h. Adopting urban growth boundaries in all controlled population areas to reverse sprawl	**DE, PO**	**NC**	**VNC**	**Potentially Enormous**	**Lasting cost reduction impact**	**Yes**	**Yes**	http://www.smartcommunities.ncat.org/articles/place3s.shtml
4.07	**Mandate Policy That Promotes Longer Lasting Buildings** a. Require deconstruction during "demolition" process which allows for direct material reuse and recycling instead of pure disposal -see strategy 2.20 b. Promote building reuse and historic preservation for building longevity (100+ years) and maintenance upkeep c. Include multi-purpose and adaptation of all spaces in original design for "functional sustainability" d. Use exclusively carbon neutral building materials - see strategy 2.06	**PO**	**RO, NC**	**$$**	**TBD**	**TBD**	**Yes**	**Yes**	

Note: Although this matrix of carbon reduction strategies provides general recommendations for energy and carbon reduction measures, it is not intended to substitute for professional design by a professional engineer or licensed architect and is not intended to conflict with specific code requirements. The recommendations are intended to alert the reader that many options are available and that due diligence of the user should occur. Understand that neither our guidance nor the opinions of energy analysts should ever be interpreted as a guarantee of future performance or rate of return.

References:

AIA Sustainability2030 Toolkit for Cities
http://www.aia.org/static/state_local_resources/adv_sustainability/
2030 Challenge for Carbon Reduction in Buildings
http://www.architecture2030.org/
AIA Nation 50to50 Reduction Strategies
http://www.aia.org/fiftytofifty
Pew Center on Global Climate
www.pewclimate.org