Towards Net Zero Energy Public Communities

Proposal for New IEA ECB Annex

First Preparatory meeting
September 12, 2016
Washington, DC

Discussion Outline

- Background
- Scope
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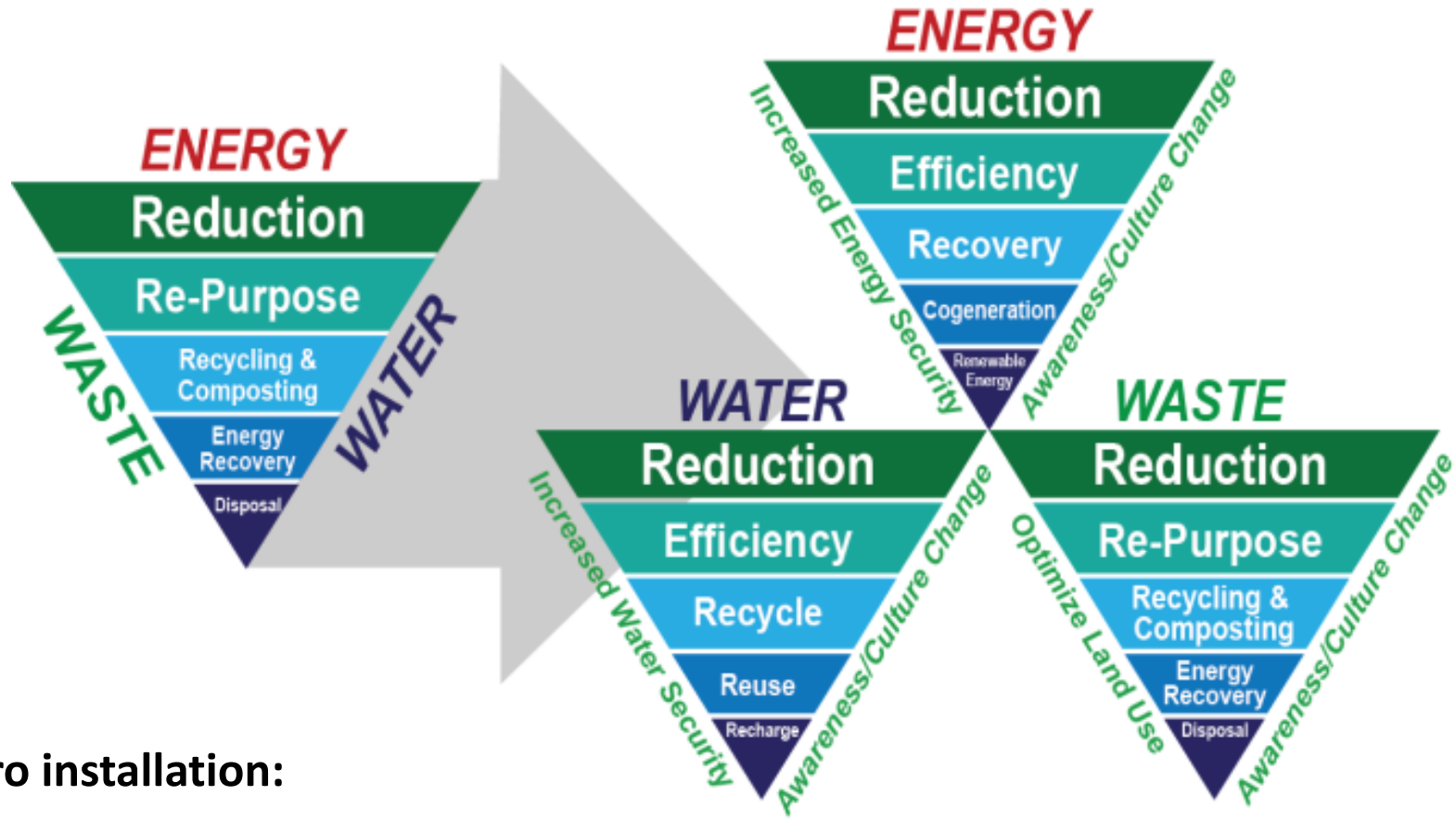
- Receptors
- Brief description of Subtasks
- Alignment with EBC strategy plan
- Benefit to participants of international participation
- Duration of Annex
- Discussion
  - Operating Agent and Subtask Leaders
  - Participants
  - Task Shared /Joint Fund
  - Technology Readiness Assessment

U.S. Army Net Zero Hierarchy



A Net Zero installation:

Applies an integrated approach to management of energy, water, and waste to capture and commercialize the resource value and/or enhance the ecological productivity of land, water, and air.

Background

- Until recently, most planners of public communities (military garrisons, universities, etc.) addressed energy systems for new facilities on an individual facility basis without consideration of energy sources, renewables, storage, or future energy generation needs
- Building retrofits of public buildings typically do not address energy needs beyond the minimum code requirements. Energy demand reduction using energy performance contracting models typically address mechanical and lighting systems and their controls; and electrical energy savings from these projects range between 20% and 40% from the pre-renovation baseline
- Significant additional energy savings and increased energy security can be realized by considering holistic solutions for the heating and cooling needs of the buildings
- The status quo in planning and execution of energy related projects will not support attainment of current energy goals (EPBD in Europe and 10CFR-433 in the U.S.) and minimizing costs for providing energy security
- Armed Forces in North America and Europe are major real estate owners in their respective countries and can demonstrate by example how to meet energy goals in the public sector

Background (Cont)

- Experience gained from Annex 51 and various demonstration projects using the Net Zero Planner (NZP™) tool developed by the US Army's Engineering Research and Development Center showed that additional work needs to be done with respect to
  - Definition and valuation of energy goals
  - Adding new military specific building types, thus improving benchmarks and the data base of energy efficiency building models complying with the current EPBD requirements
  - Adding advanced energy supply, distribution, and storage systems for district heating and cooling for the standalone campus or as an integrated part of a nearby city.
  - Incorporation of thermal distribution modelling tools into various planning tools such as the NZP™ to make them applicable to a broader spectrum of users.

Background (cont)

- The project concept has been discussed during the NATO Net Zero Energy Water and Waste Advanced Training Course in Wiesbaden (April 2016) and during the European Defence Agency Consultation Forum in Dublin (June 2016)
- The European Defence Agency has reviewed pre-proposal and expressed their support to this project
- US Army ERDC (USA) in collaboration with Office of Assistant Secretary of the Army (USA) and KEA (Germany) have prepared the project proposal, which has been presented at the IEA EBC Executive meeting in Oslo (June 2016) and approved for the preparation phase
- This project is intended as a collaborative effort by European countries, the United States, Canada, Israel and Australia, to be executed under the umbrella of the International Energy Agency (IEA) Energy in Buildings and Communities (EBC) program.

Scope

- The Scope of the Annex is the decision-making process and a computer based modeling tools for achieving net zero energy, water and waste at public owned communities (military garrisons, universities, etc.)

Objectives

- Assess existing case studies and develop representative buildings energy benchmarks
- Develop a database of energy /water utilization indexes (EUI) of Public, Academic, and Armed Forces building types
- Develop Energy/Water Targets: definitions, matrix, monetary values
- Summarize, develop and catalog representative building models by building use type, including mixed-use buildings, applicable to national public communities/military garrisons building stocks
- Develop Guidance for Net Zero Energy /Water Master Planning
- Develop functional description of the role of modeling tools in the Net Zero Energy /Water Master Planning Process
- Collect and describe business and financial aspects and legal requirements and constraints for NZEW master planning for public communities in participating countries
- Provide dissemination and training in participating countries

Receptors

- Decision makers, planners, building owners, architects, engineers and energy managers of public-owned and operated communities e.g:
  - National Armed Forces through their Infrastructure Components, military garrisons,
  - University and high school campuses,
  - Hospitals and housing which are responsible for all costs related to new construction, renovation and O&M.
- Industry, energy service companies, architects, engineers and financiers supporting public communies

Subtasks

A. Assessment of existing case studies and development of representative buildings energy benchmarks
B. Energy/Water Targets: definitions, matrix, monetary values.
C. Develop, catalog, database of representative building models by building use type, including mixed-use buildings, applicable to national public communities/military garrisons building stocks.
D. Develop architecture and models of modern central energy systems (power and thermal)
E. Develop Guidance for Net Zero Energy /Water Master Planning
F. Develop functional description of the role of modeling tools in the Net Zero Energy /Water Master Planning Process
G. Business, legal and financial aspects of Net Zero Energy /Water Master Planning
H. Dissemination and training.

Subtask A. Assessment of existing case studies and development of representative buildings energy benchmarks

1. Collect case studies and analyze completed Net-Zero or Near-Zero buildings and communities in the military sector, commercial campuses and academic campuses. Evaluate technical measures and their bundles implemented in these case studies with regard to the building usage types, climate zones, specific investment costs, impact on carbon footprint; develop energy consumption and cost benchmarks for certain technologies and technology bundles;

2. Develop a database of energy /water utilization indexes (EUI) of Public, Academic, Private Industry and Armed Forces building types: EUIs are a necessary requirement for efficient energy management and for establishing energy targets. The EUIs will be collected from available metering data for buildings, from existing Commercial Buildings Energy Consumption Surveys and from existing standards (ASHRAE Std 100, German VDI 3807, Switzerland SIA 380.1 etc.).

Example of National Energy Benchmarks and Targets

TABLE J-3 CBE CS/RECS Total Site-Based Energy-Use Intensities[1]

Building Category	Commercial Building Type	EUIs by Building Type by Climate Zone (kBtu/sf-yr)																
		ASHRAE Climate Zone																
		1A	2A	2B	3A	3B-Coast	3B-Other	3C	4A	4B	4C	5A	5B	5C[2]	6A	6B	7	8
Education	College/university	88	88	86	89	64	83	72	103	86	92	112	93	93	129	111	142	210
Education	Elementary/middle school	54	53	51	53	43	50	46	58	51	52	60	53	50	66	58	70	103
Education	High school	64	64	63	65	47	61	53	75	63	67	81	68	68	94	81	103	153
Education	Other classroom education	36	36	35	36	26	34	29	42	35	38	46	38	38	53	45	58	86
Education	Preschool/daycare	70	68	66	69	56	64	59	75	66	66	78	68	65	85	75	90	133
Enclosed mall	Enclosed mall	80	80	78	84	62	77	69	97	84	86	111	95	97	128	114	144	206
Food Sales	Convenience store	192	208	193	217	181	198	202	237	214	224	255	231	239	276	256	298	376
Food Sales	Convenience store with gas	155	168	156	175	146	160	163	191	172	181	205	186	192	223	206	240	303
Food Sales	Grocery/food market	160	174	161	181	151	165	168	197	178	187	212	192	199	230	213	248	313
Food Sales	Other food sales	48	53	49	55	46	50	51	60	54	57	64	58	60	70	64	75	95
Food Service	Fast food	374	383	375	396	339	379	361	436	400	405	474	430	422	519	476	561	710
Food Service	Other food service	110	113	110	117	98	111	107	129	118	122	140	127	129	153	141	166	209
Food Service	Restaurant/cafeteria	202	208	201	215	180	204	196	237	216	222	256	232	237	279	258	304	383
Inpatient Health Care	Hospital/inpatient health	202	204	200	201	191	197	186	205	184	193	198	180	192	203	186	205	237
Laboratory	Laboratory	255	252	244	250	210	236	227	277	247	255	299	267	258	331	302	356	473
Lodging	Dormitory/fraternity/sorority	57	61	60	68	45	62	57	83	69	77	94	79	74	107	95	122	170
Lodging	Hotel	71	72	69	74	67	70	69	78	74	75	82	78	75	87	84	92	107
Lodging	Motel or inn	79	75	75	73	68	72	66	74	71	68	75	72	70	80	75	82	98
Lodging	Other lodging	76	72	71	70	65	69	63	70	68	65	72	69	67	76	71	78	94
Nursing	Nursing home/assisted living	120	119	115	118	99	111	107	130	117	120	141	126	122	156	142	168	223
Office	Admin/professional office	56	57	56	59	47	55	48	65	56	58	69	60	56	77	67	83	116
Office	Bank/other financial	79	81	80	84	66	79	68	92	80	82	98	85	80	109	96	117	164
Office	Government office	69	72	70	74	58	69	59	81	70	72	86	74	70	95	84	103	144
Office	Medical office (non-diagnostic)	47	49	48	51	40	47	41	55	48	49	59	51	48	65	57	70	99
Office	Mixed-use office	64	66	65	69	54	64	55	75	65	67	80	69	65	88	78	96	134
Office	Other office	54	55	54	57	45	53	46	63	55	56	66	58	54	74	65	80	112
Outpatient Health Care	Clinic/other outpatient health	72	69	70	69	64	69	57	68	65	60	65	64	60	67	65	66	75
Outpatient Health Care	Medical office (diagnostic)	48	46	46	46	43	46	38	45	43	40	43	42	40	44	43	44	50
Public Assembly	Entertainment/culture	33	33	32	33	27	31	30	36	32	33	39	35	34	43	39	46	62
Public Assembly	Library	88	87	84	86	72	81	78	95	85	88	103	92	89	114	104	122	163
Public Assembly	Other public assembly	40	40	39	40	33	37	36	44	39	40	47	42	41	52	48	56	75
Public Assembly	Recreation	38	37	36	37	31	35	34	41	37	38	44	40	38	49	45	53	70
Public Assembly	Social/meeting	39	39	38	39	32	36	35	43	38	39	46	41	40	51	47	55	73
Public Order & Safety	Fire/police station	94	93	90	92	77	87	84	102	91	94	110	98	95	122	111	131	174
Public Order & Safety	Other public order and safety	85	84	82	84	70	79	76	93	83	86	100	90	87	111	101	119	159
Religious Worship	Religious worship	33	33	32	33	28	31	30	36	33	34	39	35	34	44	40	47	62
Retail (except malls)	Other retail	70	71	70	75	53	68	60	85	74	74	96	83	82	111	98	123	177
Retail (except malls)	Retail store	40	41	40	43	31	39	35	49	42	42	55	48	47	64	56	71	102
Retail (except malls)	Vehicle dealership/showroom	70	72	70	75	54	68	60	85	74	74	97	83	82	111	99	124	178
Service	Other service	86	85	82	85	71	80	77	94	84	86	101	90	87	112	102	120	160
Service	Post office/postal center	61	60	58	60	50	56	54	66	59	61	71	64	62	79	72	85	113

TABLE 7-2 Building Activity Energy Targets (EUI_{t1}) (SI Units)[1]

No.	Commercial Building Type	EUIs by Building Type by Climate Zone (MJ/m²·yr)																
		ASHRAE Climate Zone																
		1A	2A	2B	3A	3B Coast	3B Other	3C	4A	4B	4C	5A	5B	5C[2]	6A	6B	7	8
1	Admin/professional office	443	456	446	472	372	440	379	518	449	458	547	475	446	608	536	657	921
2	Bank/other financial	628	648	633	670	528	625	537	735	637	651	777	673	633	864	761	932	1307
3	Government office	553	570	556	589	464	550	473	646	560	572	683	592	556	759	669	820	1149
4	Medical office (nondiagnostic)	377	389	380	402	317	375	322	441	382	390	466	404	380	518	457	559	784
5	Mixed-use office	512	528	516	546	430	509	438	599	519	530	633	549	516	704	620	760	1065
6	Other office	428	441	431	456	359	425	366	500	433	443	529	458	431	588	518	634	889
7	Laboratory	2025	2001	1939	1988	1668	1873	1806	2199	1968	2029	2374	2125	2055	2633	2399	2830	3759
8	Distribution/shipping center	140	178	187	227	121	202	163	306	256	248	403	340	271	558	458	682	1280
9	Nonrefrigerated warehouse	68	86	90	110	59	98	79	148	124	120	195	164	131	270	221	330	619
10	Convenience store	1528	1657	1538	1727	1442	1577	1606	1882	1700	1783	2027	1837	1898	2198	2032	2368	2987
11	Convenience store with gas	1231	1335	1239	1391	1161	1270	1294	1516	1370	1436	1633	1480	1529	1770	1637	1907	2407
12	Grocery/food market	1273	1381	1282	1439	1201	1314	1339	1568	1417	1486	1689	1531	1582	1831	1693	1973	2489
13	Other food sales	386	418	388	436	364	398	405	475	429	450	511	463	479	554	513	597	754
14	Fire/police station	746	737	714	732	614	690	665	810	725	747	874	782	757	970	883	1042	1384
15	Other public order and safety	679	672	651	667	560	629	606	738	660	681	797	713	690	884	805	950	1262
16	Medical office (diagnostic)	380	366	369	364	341	365	304	360	346	320	346	337	319	353	342	348	397
17	Clinic/other outpatient health	570	549	554	546	512	548	456	540	519	480	518	506	478	530	514	522	595
18	Refrigerated warehouse	784	775	751	770	646	726	700	852	762	786	920	823	796	1020	929	1096	1456
19	Religious worship	266	263	255	261	219	246	237	289	259	267	312	279	270	346	315	372	494
20	Entertainment/culture	264	261	253	259	217	244	235	286	256	264	309	277	268	343	312	369	490
21	Library	696	688	667	684	574	644	621	756	677	698	816	731	707	905	825	973	1293
22	Recreation	300	297	287	295	247	278	268	326	292	301	352	315	305	390	356	420	557
23	Social/meeting	313	309	300	307	258	290	279	340	304	314	367	329	318	407	371	438	581
24	Other public assembly	321	317	307	315	264	297	286	348	312	321	376	337	326	417	380	448	595
25	College/university	701	697	683	709	509	661	573	817	682	734	888	740	739	1028	882	1125	1668
26	Elementary/middle school	429	422	408	424	345	395	363	463	406	410	479	418	401	525	465	556	818
27	High school	512	508	499	518	372	482	418	596	498	536	648	540	539	750	644	821	1217

Example of National Military Energy Targets

Table 2 Presidio Energy Use Indexes (EUIs) in MMBtu/KSF

Building Type	Existing[3]		New Construction		Major Renovation*	
	Site Usage	Source Usage	Site Target	Source Target	Site Target	Source Target
Training Classroom	50	109	15	33	15	33
Barracks	85	129	27	32	27	35
Small Office	59	144	16	30	23	33
Mixed Office	52	120	16	30	25	33
Large Office**	118	318	16	30	25	33
Warehouse	37	70	5	6	5	8
Public Assembly	31	48	18	27	20	30
Recreation	73	117	19	31	20	32
Medical Clinic	85	206	32	37	32	50
Religious Worship	66	83	14	18	15	19
Shopping Mall	84	198	23	54	39	75
Library	50	108	16	35	20	37
Daycare	51	117	22	35	26	45
Convenience/Gas	94	309	65	220	65	220
COF	90	171	11	13	13	20
BGD/BN HQ	48	122	15	32	15	30
Cafeteria	521	808	170	115	194	275
Strip Mall	58	155	23	44	41	110
Reserve Center	---	---	12	19	14	22

* Major Renovation is classified as building work exceeding 25% of the facility replacement cost

** Buildings with high internal loads such as the DMDC shall have optimize building type EUI separately

Subtask B. Energy/Water Targets: definitions, matrix, monetary values

- Energy and water targets list, e.g.,
  - Site or end energy
  - Source or primary energy
  - Energy Efficiency
  - Energy Security
  - Energy Independence
  - Energy Resilience
  - Reliability of Energy Systems
- Definitions
- Matrix
- Monetary value
- Evaluate alternate units of measurement (per sq ft, per person, per hour of occupancy,...)

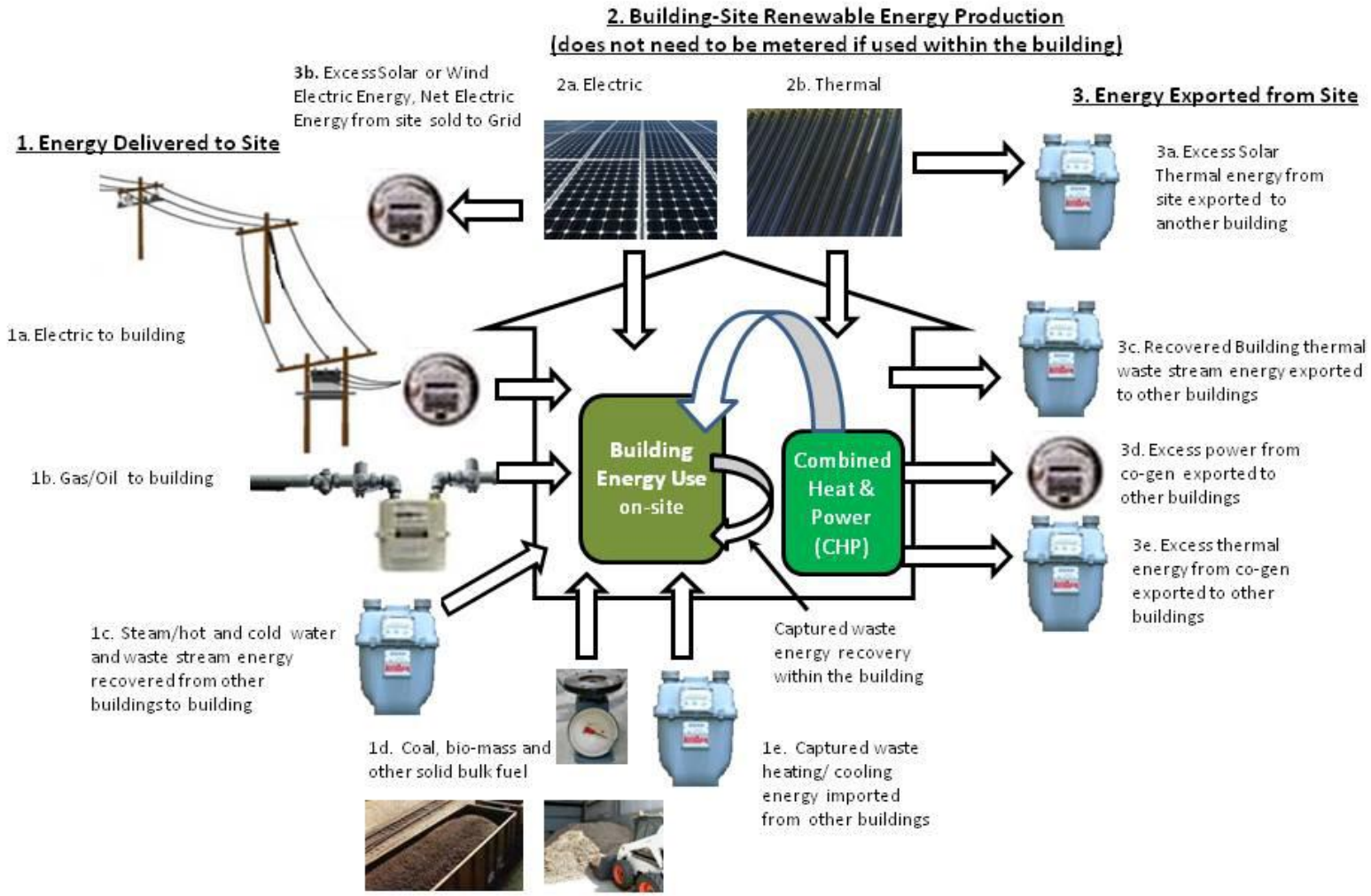
Site and Source Energy

- **Site energy:** The kWh or Btu net value of energy use at the point it enters the end user at the meter (building, building cluster, military installation, city or other community) sometimes is referred to as “delivered” energy. The site value of energy is used for all fuels, including electricity;

- **Primary or “source” energy** is an energy form found in nature that has not been subjected to any conversion or transformation process. It is energy contained in raw fuels, and other forms of energy received as input to a system. Primary energy can be non renewable or renewable. be non-renewable or renewable.

Net Site Energy Use Concept

Per American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Standard 100-2015, Net site energy use = (1a+1b+1c+1d+1e) – (3a+3b+3c+3d+3e)



Site Vs Source Energy User Reduction

- There is often confusion between **site** and **source** energy in the definition of energy goals and net-zero energy community, and this difference defines technical approaches used to achieve these goals.
- **Community site energy reduction** - the emphasis is on energy efficiency of systems located inside community boundaries, thermal or electrical energy supplied to the community are treated equally (no consideration of inefficiency of electricity generation or distribution losses in thermal and power networks. May result in preferences to electrical heating, electrical cooling or ground-coupled heat pumps. Such approach will result in an **increase in fossil fuel usage and GHG emission**.
- **Source energy or fossil fuel based energy is a minimization parameter**: energy efficiency of the community systems may become of lesser importance. Communities connected to hydro power stations or to nuclear reactors will become fossil fuel neutral without any effort given to improvement of community energy systems. When electricity provided to the community is primarily based on fossil fuel, net-zero fossil fuel goal is becoming a challenge and requires improvement of community energy system efficiency along with reduced energy waste with power generation and distribution systems.

Energy Security

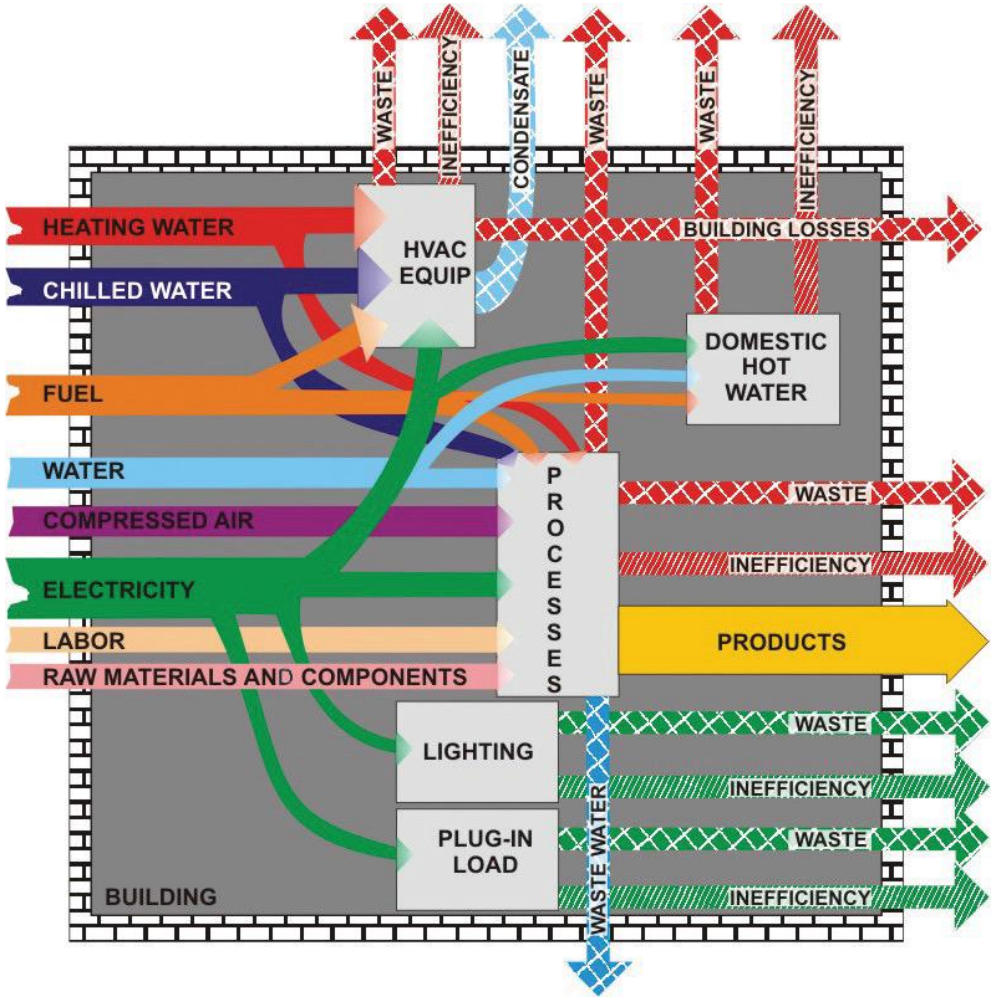
- **Surety** – Preventing loss of access to power & fuel sources
- **Sufficiency** – Providing adequate power for critical missions
- **Survivability** – Ensuring resilience in energy systems

Which means the following requirements for on-site generation and distribution systems:

- Uninterruptable
  - power to mission critical facilities,
  - heat to prevent freezing the buildings (leaving quarters),
  - steam to provide sterilization and operation needs for critical processes, and
  - cooling energy supply to food storage, data centers and other mission critical facilities
- Smart power and thermal grids + micro-grids

Energy Efficiency

Energy efficiency - percentage of total energy input to a process that is consumed in useful work and not wasted as useless heat. Analysis of energy flows and balances is a useful tool to identify energy waste and inefficiencies, which are potential areas of energy conservation. (Annex 46).



Energy Independence

Energy Independence relates to the goal of reducing imports of oil, natural gas, and other foreign sources of energy. Proposed matrix to be used: % of net energy imports against the total nationwide fossil-fuel-based energy consumption.

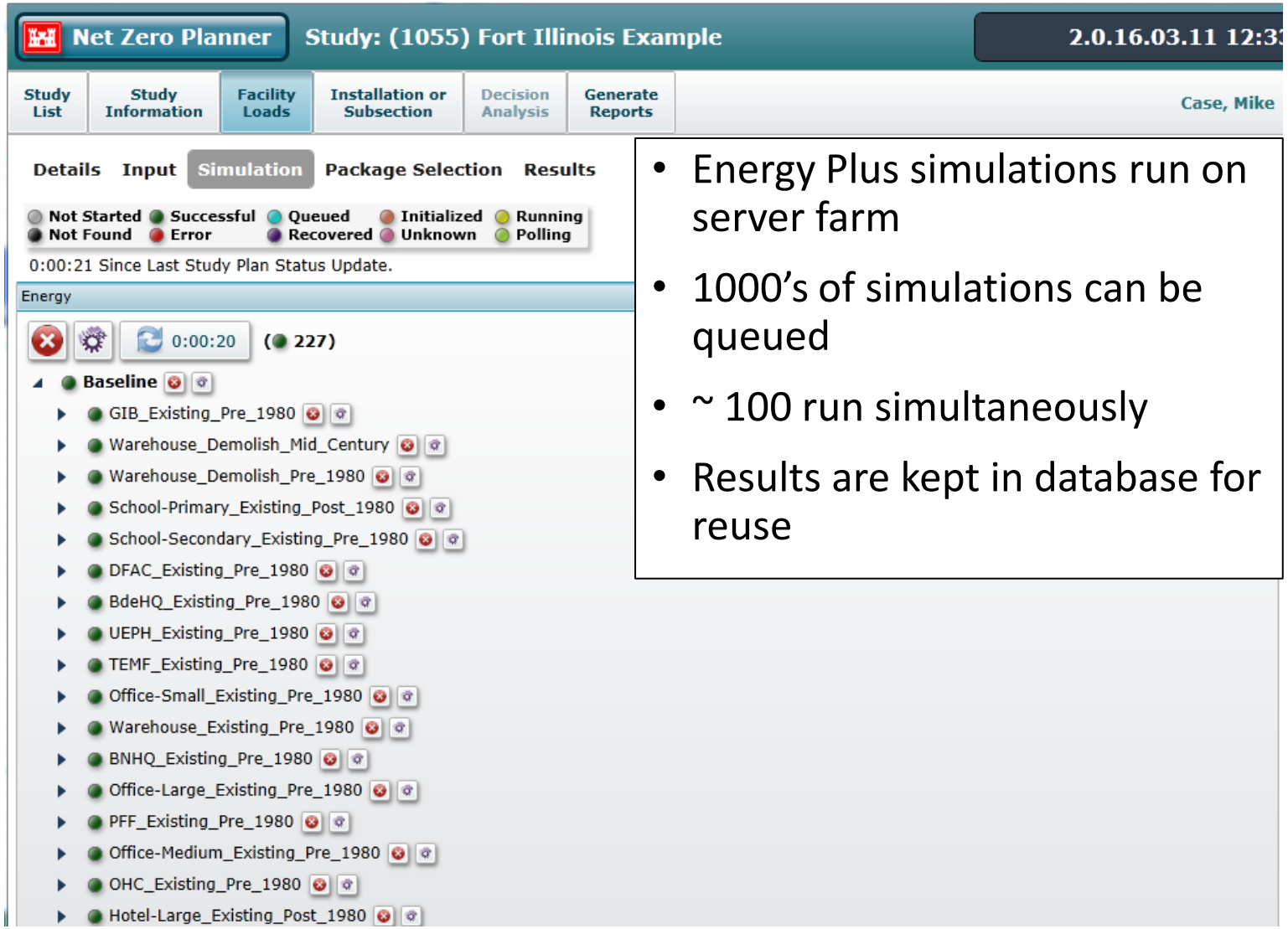
Resilience

- Resilience is the ability to provide and maintain an acceptable level of service in the face of various faults and challenges to normal operation (Wikipedia).
- Per Benjamin Sovacool (2011) resilience relates to “adaptive capacity” or the “ability for communities to respond to natural disasters” by maintaining:
  - Capacity margins
  - Reserve margins
  - Peak load to base load ratios
  - Generator profiles summer/winter
  - Emergency stockpiles for oil (days meet demand)
  - Emergency stockpiles for coal (days meet demand)
  - Emergency stockpiles for natural gas (days meet demand)
  - Availability of trained repair personnel
  - Availability of spare parts and supplies
  - Generation adequacy
  - System adequacy.

Subtask C. Develop, catalog, database of representative building models by building use type, including mixed-use buildings, applicable to national public communities/military garrisons building stocks.

- List MOD/University specific building architypes
- Collect existing representative computer models of buildings to be used for master planning. These models need to be generic, but adjustable to include major EEMs; applicable for multiple climate zones; cover past and current building typology and construction practices.
- Develop common approach to calibration of building models to existing energy use data available from metering and sub metering
- Modify these models to address different levels of energy efficiency (e.g., baseline, minimum current energy codes, near zero energy building, etc..) and store these options in the database.

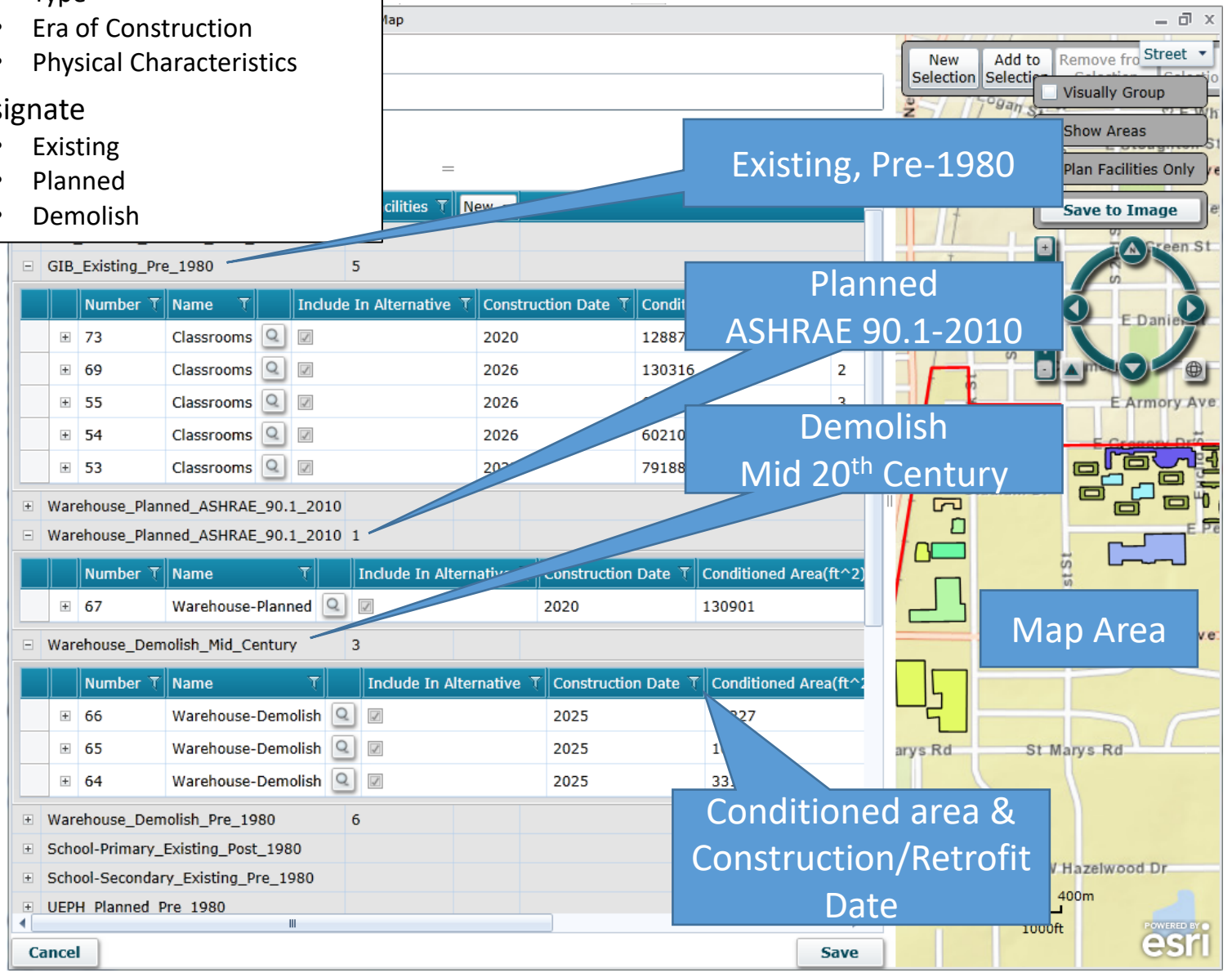
The Database Helps to Increase Facility Energy Use Calculation



- Energy Plus simulations run on server farm
- 1000's of simulations can be queued
- ~ 100 run simultaneously
- Results are kept in database for reuse

Example of Buildings Database (ERDC NZP)

- Group by:
  - Type
  - Era of Construction
  - Physical Characteristics
- Designate
  - Existing
  - Planned
  - Demolish



Subtask D. Develop architecture and models of modern central energy systems (power and thermal).

- Collect information on exiting and the state-of-the-art components and architecture of CEPs including those with co- and tri-generation, integrated RE sources and micro grids.
- Develop a database of important components (technical characteristics, useful life, first and operation costs) to be included into community-wide computer models.
- Correlate these systems with potable and non-potable water strategies
- Analyze existing models for generation and distribution systems and methods of their integration in the existing master planning tools

Selecting a Supply Architecture

The optimization process determines the best suite of equipment by ensuring that the demands for heat, cooling, electric, etc are fulfilled at each of the 8760 hours in the year, while satisfying the additional environmental and legislative requirements.

Electric Chiller

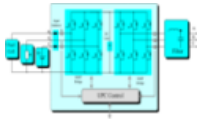
Photovoltaic

Absorption Chiller

Gas Boiler

Organic Rankine Cycle

Diesel Generator



AC Bus

Fuel Cell

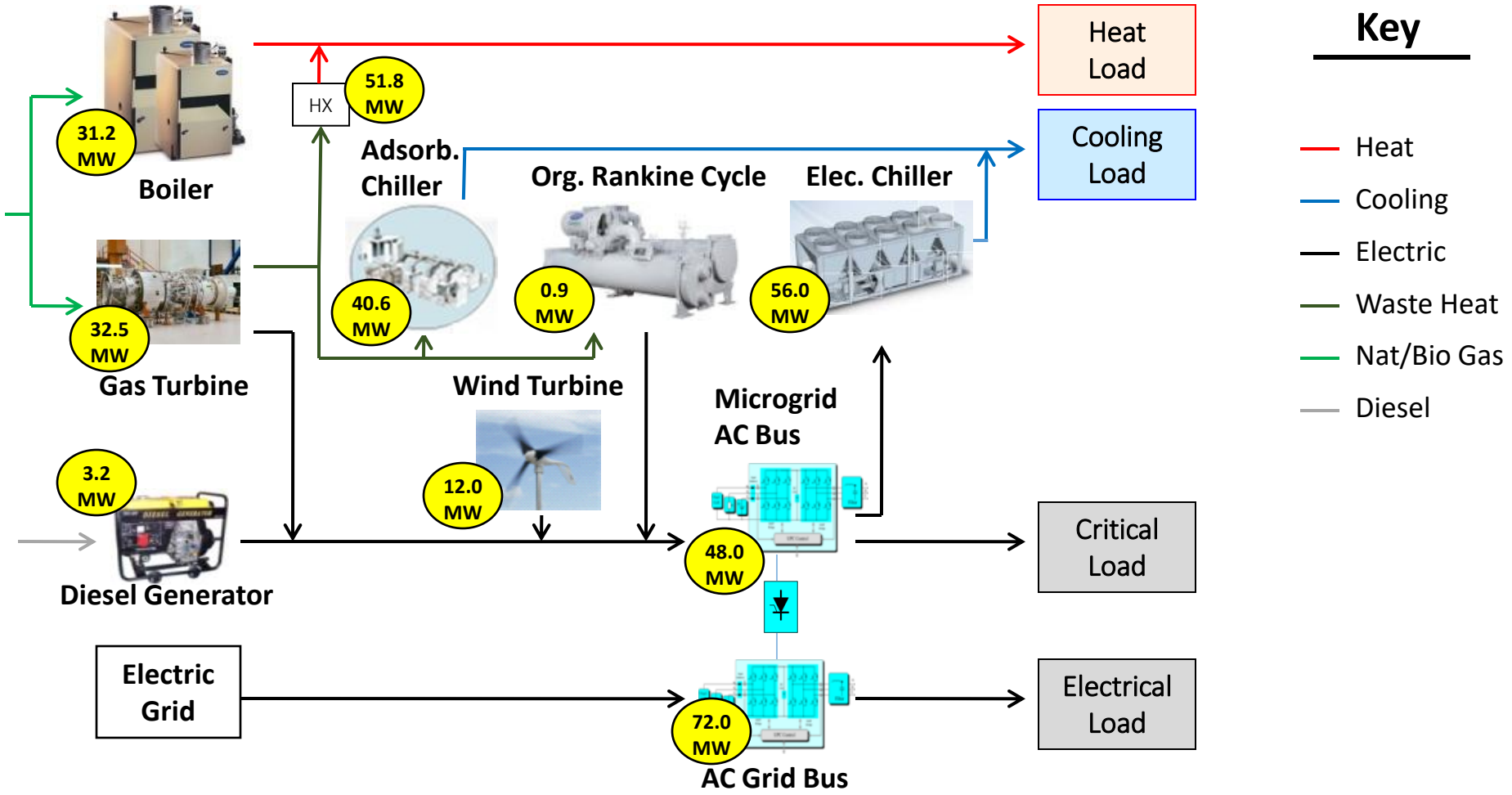
Wind Turbine

Gas Turbine

Electric Heater

Sizing the Supply Equipment

Specific equipment pieces are sized and their interactions with each other are tracked throughout the year. The result is a complete "supply" solution that provides the sizing, initial cost, and operating cost of every piece of equipment in the lowest cost solution.



Danish Concept of the District System of the Future

Subtask E. Develop Guidance for Net Zero Energy /Water Master Planning

- Develop a formalized E(W)MP process to include
  - Project team composition
  - List of required inputs
  - Establishing base line and base case.
  - Tradeoffs between energy/water efficiency cost, RE costs and energy conversion/distribution costs.
  - Methodology to selection of a limited number of scenarios to meet energy goals.
- Develop inputs into National/agency guidance on E(W)MP (e.g., UFC for U.S. DOD.)

Example of Requirement for National Implementation

ENERGY,
INSTALLATIONS
AND ENVIRONMENT

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
3400 DEFENSE PENTAGON
WASHINGTON, DC 20301-3400

MAR 3 1 2016

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (INSTALLATIONS, ENERGY AND ENVIRONMENT)
ASSISTANT SECRETARY OF THE NAVY (ENERGY, INSTALLATIONS AND ENVIRONMENT)
ASSISTANT SECRETARY OF THE AIR FORCE (INSTALLATIONS, ENVIRONMENT AND ENERGY)
DIRECTORS OF THE DEFENSE AGENCIES
DIRECTORS OF THE DOD FIELD ACTIVITIES

SUBJECT: Installation Energy Plans

The Department of Defense (DoD) continues to make progress toward reaching our energy goals with installation energy efficiency efforts contributing to DoD avoidance of approximately $1 billion in new operating costs since 2009. In today's resource constrained environment, the Department must continue to find creative ways to drive additional efficiencies in energy use and reduce costs. A larger coordinated effort is needed to gain synergy between current energy initiatives and future planned energy projects to maximize energy use and cost reductions. By leveraging improved access to meter and energy data, we can drive a more integrated and systematic approach to energy management through informed energy planning. Effective immediately, it is the Department's policy to require installation-level energy plans for all DoD Components to support this concept.

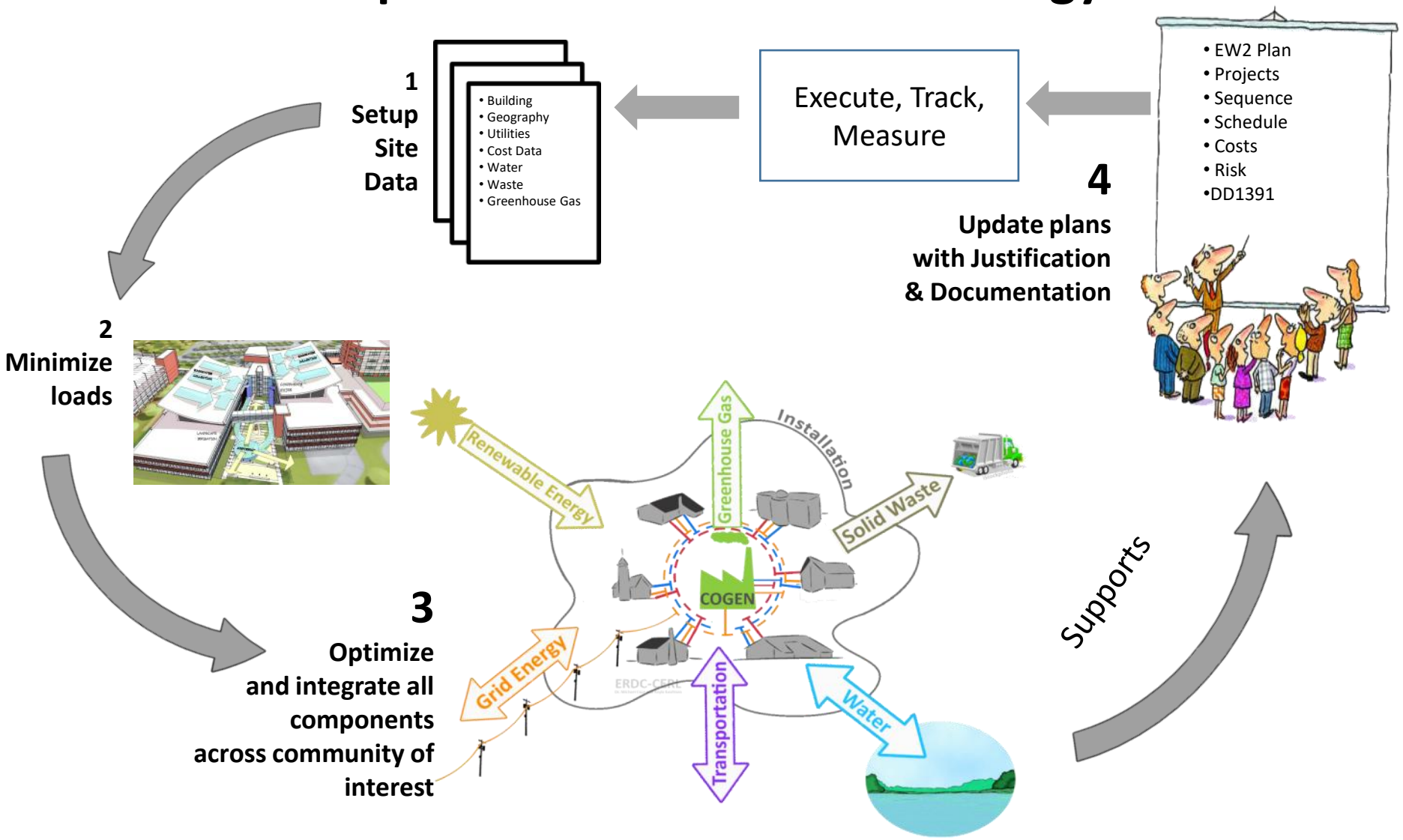
Currently, DoD Components are updating their installation master plans to meet the requirements of the Under Secretary of Defense (Acquisition, Technology and Logistics) memorandum, *Installation Master Planning*, of May 28, 2013, by October 1, 2018. The Installation Energy Plan (IEP) should be an integral part of this effort. Thus, within one year of the date of this memorandum, each DoD Component will brief my office on their prioritized plan for the implementation of this policy. Within three years of the date of this memorandum, energy plans, signed by the base commander, should be completed for installations that together compose 75 percent of each component's installation energy consumption. Attachments 1 and 2 provide a high-level overview of the suggested IEP development process and a general reference list of DoD energy management and master planning guidance documents.

Subtask F. Develop functional description of the role of modeling tools in the Net Zero Energy /Water Master Planning Process

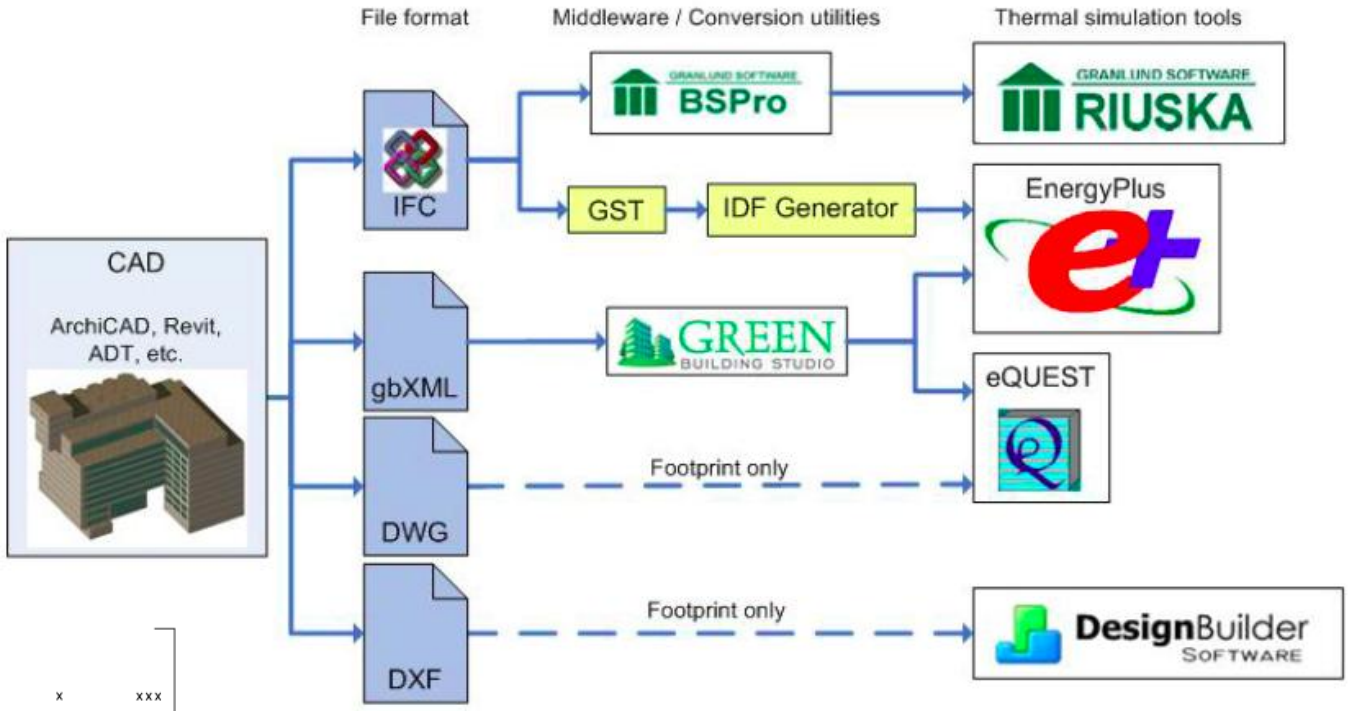
- For each major step of the process, describe the inputs, analysis steps, outputs, and level of details for each.
- Collect information on existing modeling tools appropriate for E(W)MP and identify where each meets the analysis requirements.
- Identify gaps and needed steps to enhance exiting master planning computer tools.

Integrated process for energy, water, waste, storm water

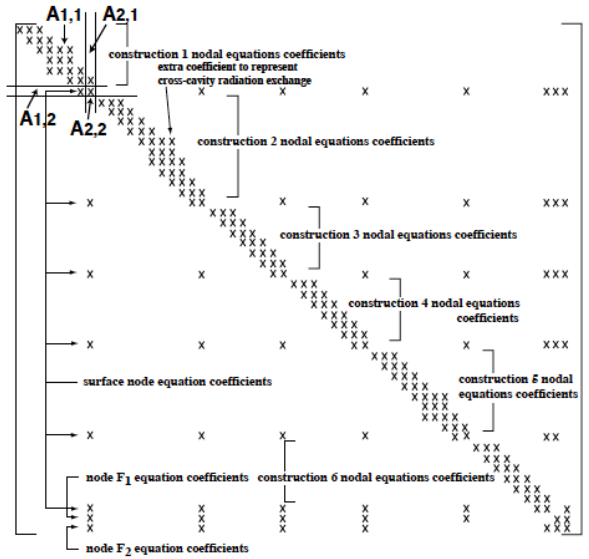
This presentation focuses on energy.



German Building Community Simulation Model

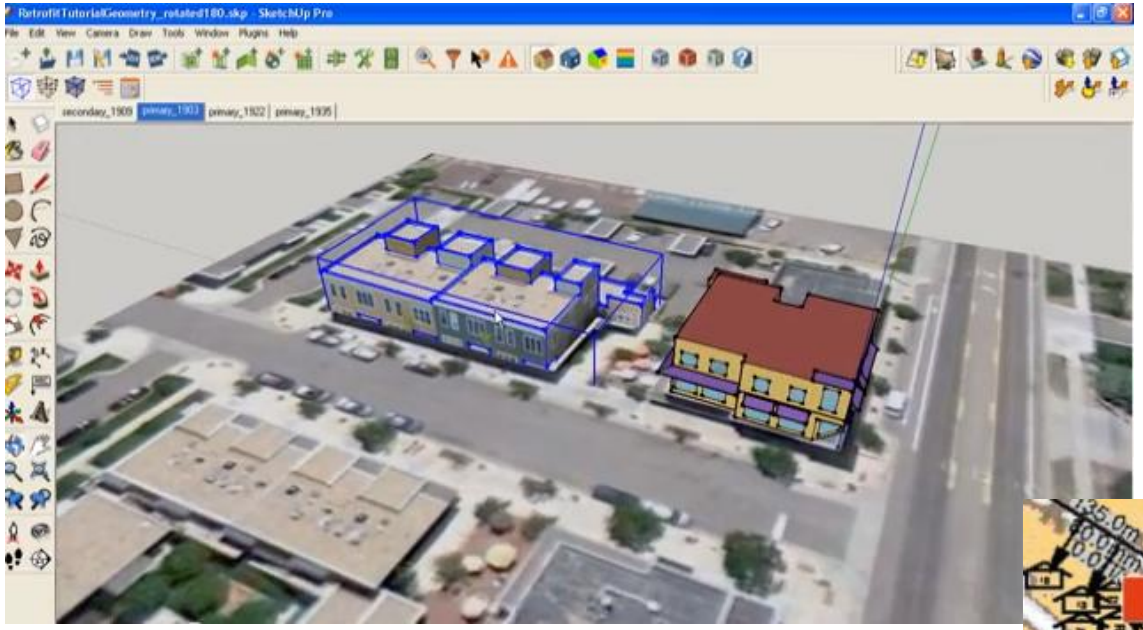


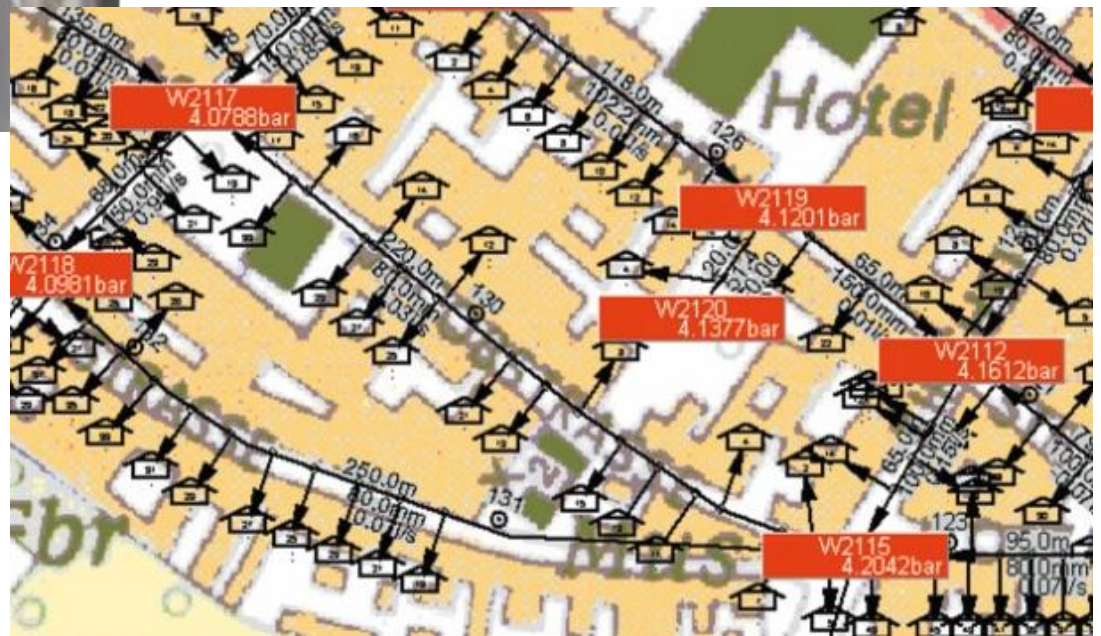
Maile, Fischer, Bazjanak, Stanford University 2007



Joe Clark, Strathclyde University

The Model Includes Urban context for shading, IR exchange, microclimate, network design





STANET program package for static and dynamic calculation of utility networks.

Subtask G. Business, legal and financial aspects of Net Zero Energy /Water Master Planning.

- Collect and describe:
  - Legal requirements and constraints for NZEW master planning in the participating countries;
  - Funding sources, their availability and limitations.
- Based on collected information and its analysis, develop recommendations for policy making and the project facilitation levels.
- The study will focus on single ownership communities (MoD, Federal estates, universities) and the typical funding sources used in participating countries, e.g., public, public- private and private funding sources; bank loans, or more specific approaches such as PACE, utility bill payments)

Subtask H. Dissemination and training

- On national levels the project will integrate participants from end users, academia and industry. That will allow for a solid data input into project tasks and dissemination of results as well as better communication between all parties involved in the project.
- Following previous experiences, the project progress will be presented at the major national and international forums, (e.g., ASHRAE and REHVA conferences) and published as a set of technical papers.
- Special training courses will be developed and taught to different industry segments (decision makers, master planners, ESPCs, designers and architects).
- Annex team will host its website describing the project and its progress.

Expertise or skills the project will require from participating counties

- Each National team will include experts representing end users from **military or other public sector, R&D experts, engineers and architects and industry partners, which will result in solid research based practical deliverables.**
- Energy Planners from MODs and Universities
- Community systems modellers and model integrators
- Cost estimators for advanced energy systems and their components
- System integrators for advanced energy systems
- Property value estimators
- O&M experts (to contribute to systems' life and O&M costs)
- Community real estate developers and owners
- Experts in Energy Performance Contracting

Initial estimate for how long the project will take to complete

- For the preparation phase - one year starting July 2016
- For the working phase - 3.5 years
- For the reporting phase – 1.0 year

Suggested Deliverables

- A “Guide for NZE planning in public and military building communities,”
- Enhanced NZP Tool
- A book of Case Studies (Examples of Energy Master Plans, Results of several realized or partially realized projects)

Preparation Phase Time Schedule

- First preparation meeting – Washington, DC – September 12, 2016
- Second preparation meeting – Frankfurt, DE – October 10-11, 2016
- Draft proposal – October 2016
- Draft proposal will be presented at the IEA EBC Executive Committee meeting in Sydney – November 17, 2016
- Second draft proposal – January 2017.
- Third preparation experts meeting location and time TBD (not later, than April 2017)
- Proposal presentation at the IEA EBC Executive Committee meeting – June 2017
- The proposal package will include
  - Text of the proposal
  - List of participating countries supported by National letters of participation (providing assurance that national representatives will have funded project at a level at least 6 person-months a year)
  - National organizations and individuals participating in the project by Subtasks, Subtask Leaders, Subtask working plans
  - National teams with network having a relevant technical, industry, financial, and business expertise representation

Countries, which expressed interest in the Annex

- USA
- Germany (DE)
- UK
- Italy (IT)
- Latvia (LT)
- Sweden (SE)
- Denmark (DK)
- Austria (AT)?
- Poland (PL)
- Estonia (ET)
- Norway (N0)?
- Australia (AU)?
- Spain (SP)?
- Israel (IS)?
- Canada (CA)?

Subtask	Participation	Co-lead
A. Assessment of existing case studies and development of representative buildings energy benchmarks		
B. Energy/Water Targets: definitions, matrix, monetary values		
C. Develop, catalog, database of representative building models by building use type, including mixed-use buildings, applicable to national public communities/military garrisons building stocks		
D. Develop architecture and models of modern central energy systems (power and thermal)		
E. Develop Guidance for Net Zero Energy /Water Master Planning		
F. Develop functional description of the role of modeling tools in the Net Zero Energy /Water Master Planning Process		
G. Business, legal and financial aspects of Net Zero Energy /Water Master Planning		
H. Dissemination and training.		