FINAL REPORT: INDEPENDENT STUDY

ENG-573

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Contents

INTRODUCTION AND BACKGROUND

Illinois Climate Action Plan (iCAP)

The University of Illinois at Urbana-Champaign (UIUC), in 2008, signed the American College and University Presidents' Climate Commitment (ACUPCC) – later to be renamed as the Second Nature Carbon Commitment for its emphasis on emissions. This agreement meant that the campus is committed to become carbon neutral as soon as possible, and no later than 2050. The Illinois Climate Action Plan (iCAP) describes a path toward the fulfillment of this commitment. Since UIUC is considered Illinois' flagship university, it is the campus' responsibility to lead as an example, and to meet challenging targets (iSEE website). According to the iCAP Portal, "The first iCAP was developed in 2010 as a comprehensive roadmap towards a sustainable campus environment. The present 2015 iCAP was developed using the Procedure for Formulating and Evaluating Campus Sustainability Policies & Initiatives, with many 2010 iCAP targets restated or revised and new targets added. Additionally, an updated nomenclature is used in order to provide consistency throughout the document" (2015 iCAP).

The Institute for Sustainability, Energy, and Environment (iSEE) developed a three-tiered system, which was approved by the Chancellor in 2014. This would help the university to accomplish its goals to become a prototype of sustainable campus for the community and the whole world to emulate. The three-tiered system consisted of the "Procedure for Formulating and Evaluating Campus Sustainability Policies & Initiatives" or the "Campus Sustainability Procedures". The Campus Sustainability Procedures explained the roles of these three systems, the Sustainability Council, the iCAP Working Group (IWG), and the six Sustainability Working Advisory Teams (SWATeams) (iSEE website).

Illinois Climate Action Plan (iCAP) Portal

According to the Sustainability iCAP Portal, "iCAP Portal is a repository for summary information about each iCAP project, both to share the information publicly and to assist in collecting information for reporting purposes. Each project page includes a project description, contact names, funding details, location map(s), metrics and targets to measure success, current status of the project, and regular updates as projects are discussed, approved, and implemented." The projects on the iCAP Portal are organized into ten themes: Education, Energy, Funding, Land & Space, Outreach, Procurement & Waste, Reporting Progress, Research, Transportation, and Water. Each project page under these themes provide a detailed description and background about that project (2015 iCAP).

LED Campus Project

In October 2012, to honor Professor Nick Holonyak Jr., the inventor of LED, the University of Illinois at Urbana-Champaign made a commitment to replace all the interior and exterior wayfinding fixtures by 2025, and majority of all lights on campus to LED by 2050. The campus has been making progress to fulfill this vision over the past few years.

There are four parts to the commitment (LED Campus):

1. Demonstrated preference for LED lighting: At Illinois, the facility standards will clearly state that LED lighting is preferred for all appropriate applications.
2. Commitment to implement LED lighting throughout campus: Illinois will replace all exterior fixtures and interior wayfinding fixtures by 2025. By 2050 the majority of all campus lighting will be LED.
3. LED commitments will be reflected in the Illinois Climate Action Plan (iCAP): Illinois's commitment to LEDs will be included in the current iCAP update, with clear direction for implementation.
4. LED technology expansion and adaption using campus facilities: Illinois will encourage research and development to expand the application of LED technology through clinical trials using the campus facilities as a living learning laboratory.

The University believes following the above initiatives will continue its leadership in becoming an LED Campus. The full Chancellor's announcement of LED Campus Commitment is available online.

PROJECT OBJECTIVES AND SCOPE

There were two separate ongoing projects that I covered during this independent study.

Project 1 – A web-based portal for climate action: Illinois Climate Action Plan (iCAP) Portal

In the first project, the final objective was to develop an iCAP Portal User Guide for Advanced Users. The scope for the first project included,

Objective 1: Review, revise, and improve the user experience with the current portal.

Objective 2: Match objectives defined in the 2015 iCAP with the projects on the iCAP Portal.

Objective 3: Edit the projects to show the most current status.

Objective 4: Edit the projects to reflect the 2015 iCAP objectives.

Objective 5: Add the funding details, money details, and other metrics, as appropriate.

Objective 6: Create an advanced user manual.

Project 2 – LED Campus: Fulfilling the promise for a sustainable campus

The second project was to work on the LED Campus project. The university had made a commitment, in 2012, to replace all the interior and exterior wayfinding fixtures by LED lights by 2025, and to replace majority of all lightings on campus by LED by 2050. The university has been working to fulfill its commitment, however, the whole project is not very well documented, and all concerned parties were not aware of this commitment. My role during this independent study was to organize the information for the LED Campus project and create an awareness about it. The scope of this project included,

Objective 1: Develop an outline for the process, and then implement it in the context of LED lighting commitments by the campus.

Objective 2: Review the commitments made by the campus in reference to the installation of LED lights on campus.

Objective 3: Identify which buildings have interior LED wayfinding signs. (These lights are mainly the Exit signs within each building).

Objective 4: The second part of the project will identify the exterior lights to be replaced. Exterior lights are the street lights, parking lot lights, and walkway lights, on campus property.

Objective 5: Meet with the university staff and the representatives of cities of CU to inform and discuss the plan for installing LED lights in the University District streets**.**

Objective 6: Estimate anticipated costs and savings for LED campus projects.

Objective 7: Write a detailed report on the process you developed, and its specific implementation.

METHODOLOGY

Project 1 – A web-based portal for climate action: Illinois Climate Action Plan (iCAP) Portal

Objective 1: Review, revise, and improve the user experience with the current portal.

The iCAP Portal is managed by the Mathematics, Science, and Technology Education (MSTE) in the College of Education. MSTE has been collaborating with iSEE since the portal was envisioned and created in 2012. Morgan Johnston (Associate Director of Facilities & Services, Director of Sustainability, University of Illinois Urbana-Champaign) and I meet the MSTE representatives Michael McKelvey and Andrew Stengele, every other Thursday, for one hour, to suggest any improvements in the iCAP Portal and discuss the changes they made, based on our requests, since the last meeting.

There have been several improvements made through these meetings and discussions. The following is a list of iCAP Portal user experience improvements completed from August to Dec 2016:

- Revised project order for solar-related projects
- Removed ability to change the user name field on Project Updates
- Revised the iCAP Portal layout for mobile users
- Project statuses on the Project Hierarchy page
- Removed the "tracking" data points from "Add new metric" and "Edit Metric" page.
- Discussed the possibility of adding the graph for the specific metric to the metric screen – for example, metric "Energy Use Intensity"
- Discussed the layout for what the funding page should look like – including total approved, total relinquished, and total spent in respective order
- Removed the amount of funding requested and allotted from the funding page – Morgan and I think that they should be addressed as project updates
- Removed the iCAP Moderator's and iCAP Advocate's access to add a new funding source and featured project
- Removed the options to access "Projects with no Project Status specified", "Projects WITH a Project Status specified", "Administer Projects Menu", "Administer Project Collections", "Administer Themes", "Administer Users", "Map of Project Locations", and "old Map of Project Locations" from the iCAP Moderator and iCAP Advocate accounts
- Renamed "All Metrics" to "View all metrics" in the Administration options
- Discussed the error on metrics page when we added a metric and linked it with two different projects
- Changed the center column order of the project pages to show Description, Background, Conclusions, Website URLs, Videos, Metrics, and Related Files – in that order
- Revised the list of funding sources and types of funding sources
- Added the "Add Project Update" button to the bottom of the screen

- Revised the layout of Adding/Editing a Project page – revised the layout for “other themes” from one long column to stacked view
- Revised the position of Maps on the theme page
- Organized the “Themes” on the home screen and revised some of their logos
- Finalized the option to select the project statuses – removed “Ongoing”, “In Planning”, and “Pending”
- Renamed “Suggest a Project” to “Suggestions”

Objective 2: Match objectives defined in the 2015 iCAP with the projects on the iCAP Portal.

The 2015 iCAP has a total of 47 objectives over 11 chapters (from chapter 2 to chapter 12). There is only one objective per project, and one key project for each objective. To identify the projects to match all the objectives in the 2015 iCAP, I divided the work in two parts. The first part consisted of going through the iCAP objectives from the chapters 2 to chapter 7, which correlate with the SWATeams. The objectives from chapter 8 to chapter 12 are the other part. I went through all the projects listed in the iCAP Portal to find the best match for the objectives. Once identified, I sent the list to Morgan for approval. If she approved, then I edit the projects to reflect the iCAP objective. Otherwise, she suggested a more appropriate project for the objective. In some cases, there were no projects directly related with an objective. For those objectives, she asked me to add a new project.

Objective 3: Edit the projects to show the most current status.

The key action in this objective was to initiate a process for updating the older iCAP Portal projects. Morgan asked me to work with the SWATeam clerks to instruct them on how to update a project and where to get the most recent information. In some cases, I edited a project directly, as requested by Morgan when an update occurred, such as:

- Updated the primary contact listed in the Bike Sharing project.
- Undid the “Sticky at top of lists” for all Project Updates.
- Added the meeting minutes from the meeting of Champaign County Pollinator Coalition, to the Sustainable Landscapes Plan and Contribute to a regional climate action plan projects.
- Added the Physical Plant Service Building (PPSB) as a location for Revolving Loan Fund project.
- Changed the “Uni high rooftop solar project” name to "Uni High Gym Rooftop Solar PVs" and change the other actual PV installation projects to say “PVs” at the end of their titles.
- Added the project update “An update from the South Arboretum Woods about the planting projects” for Native Plants at Arboretum, Prairie Restoration at Florida & Orchard, and Small Prairie at Natural Resources Building projects.
- Added a project for “Uni High Butterfly Garden” in the portal under “Support Pollinators” Added “Uni High” as the location, and the status as “In Progress”.
- Added project updates to the Uni High Butterfly Garden project.

- Added metrics to Energy Services Conservation Projects and 2015 Illinois Climate Action Plan (2015 iCAP).

There are six SWATeams, as mentioned earlier, and each team is responsible for projects in their expertise. The organization of chapters in the 2015 iCAP, is based on SWATeams and project themes. The chapters 2-7 of the 2015 iCAP are directly connected to the six SWATeams, the rest of the chapters do not have a SWATeam formed. Each SWATeam has a Clerk who directly reports to the chair of the SWATeam (typically a faculty member). These SWATeam Clerks are responsible for adding any updates to their projects.

I met with all of the six SWATeam Clerks in October 2016, to discuss the iCAP portal. In addition to instructing them on how to edit a project, add a project update, and a recap of iCAP Portal User Guide, I asked them to reach out to the project leaders and get an update on each project. I also asked them that once they had an update, they should update the status of the project in the iCAP portal. – The Clerks did not follow through with a lot of their to-do items. iSEE staff will be modifying the communication process with the Clerks in the spring, to address this issue.

For any other project – projects that are not monitored by the SWATeams, Morgan updated the status. Currently all the projects have their correct status listed.

Objective 4: Edit the projects to reflect the 2015 iCAP objectives.

This objective continues from objective 2 (above). Once the projects associated with the 2015 iCAP objectives were approved by Morgan, I edited the projects to reflect that connection.

For all the 47 2015 iCAP objectives, I have added the objectives in the description for the project. For example, the 2015 iCAP, chapter 2, objective 3 is "Strengthen centralized conservation efforts focusing on building systems to achieve a 30% reduction in total campus building energy use by FY20. This includes meeting LED Campus commitments." This objective is most appropriately related to the Energy Services Conservation Projects entry in the portal. Hence, I changed the project description as follows:

Previous description: “The Energy Services division at F&S is responsible for providing the Campus Utilities needs. The Retrocommissioning Teams are under this division, and energy consumption is tracked by this division. These staff are also the key people coordinating the energy efficiency grant applications for campus.”

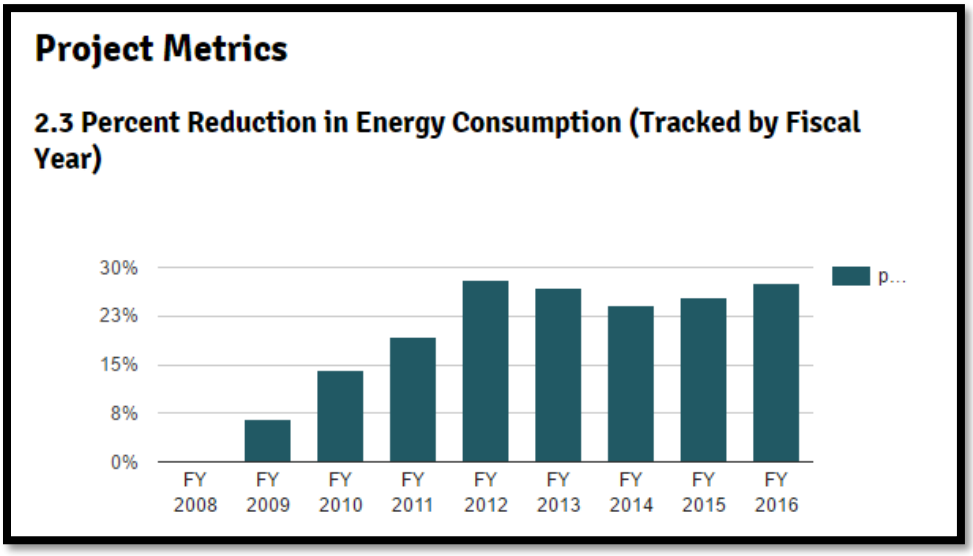
Updated description: “The 2015 iCAP, chapter 2, objective 3 is "Strengthen centralized conservation efforts focusing on building systems to achieve a 30% reduction in total campus building energy use by FY20. This includes meeting LED Campus commitments." The Utilities and Energy Services (UES) division at F&S is responsible for providing campus utilities. The Retrocommissioning Teams are under this division, and energy consumption is tracked by this division. These staff are also the key people coordinating the energy efficiency grant applications for campus.”

All the iCAP objectives are now in the portal, and can be seen in the collection page called “2015 iCAP Objectives”.

Objective 5: Add the funding details, money details, and other metrics, as appropriate.

This portion of the project was started in November, and we found that there were structural improvements needed before data could be entered. Morgan asked me to focus on modifications needed to the metric and funding structures, so here is what I did for that….

Metrics – small edits to layouts – entered two metrics 2.3 Percent Reduction in Energy Consumption and Energy Use Intensity.



Funding – several discussions about the layout design and guidelines about funding source types and decisions were made about who can enter which level of detail.

Objective 6: Create an advanced user manual.

The advanced user manual is under review by Morgan Johnston. The advanced user guide will help the authorized users on how to edit project updates, how to use the Administration options, and how to add metrics, tasks, and money details.

The iCAP Portal Advanced User Guide has the Administration Options – how to add videos, place, and project updates to a project, and finding content, all metrics, and pending tasks. It helps the authorized users to understand how to edit a “Project Update”, adding “Metrics”, “Money” and “Funding Information” for a project.

Project 2 – LED Campus: Fulfilling the promise for a sustainable campus

Objective 1: Develop an outline for the process, and then implement it in the context of LED lighting commitments by the campus.

I met with Morgan Johnston during the start of the semester to discuss the LED Campus project. She introduced me to the project and explained the commitment made by the Chancellor in 2012. I read the commitment and the updates of the project which gave me an idea about the project. I created a list of all the buildings on campus and marked the ones where the project was initialized or completed. This list then went to the F&S and other university officials.

We received a detailed map of the campus district with labels denoting the street and parking lights that are owned by the university, or the cities of Champaign and Urbana, or others. This map helped me with understanding the boundary of the University of Illinois. Additionally, this helped me with my recommendation for the first phase of exterior light replacements by 2025.

Objective 2: Review the commitments made by the campus in reference to the installation of LED lights on campus.

This objective included reviewing the statements previously published regarding our LED Campus Commitment, and clarifying the specific to do items for the first deadline.

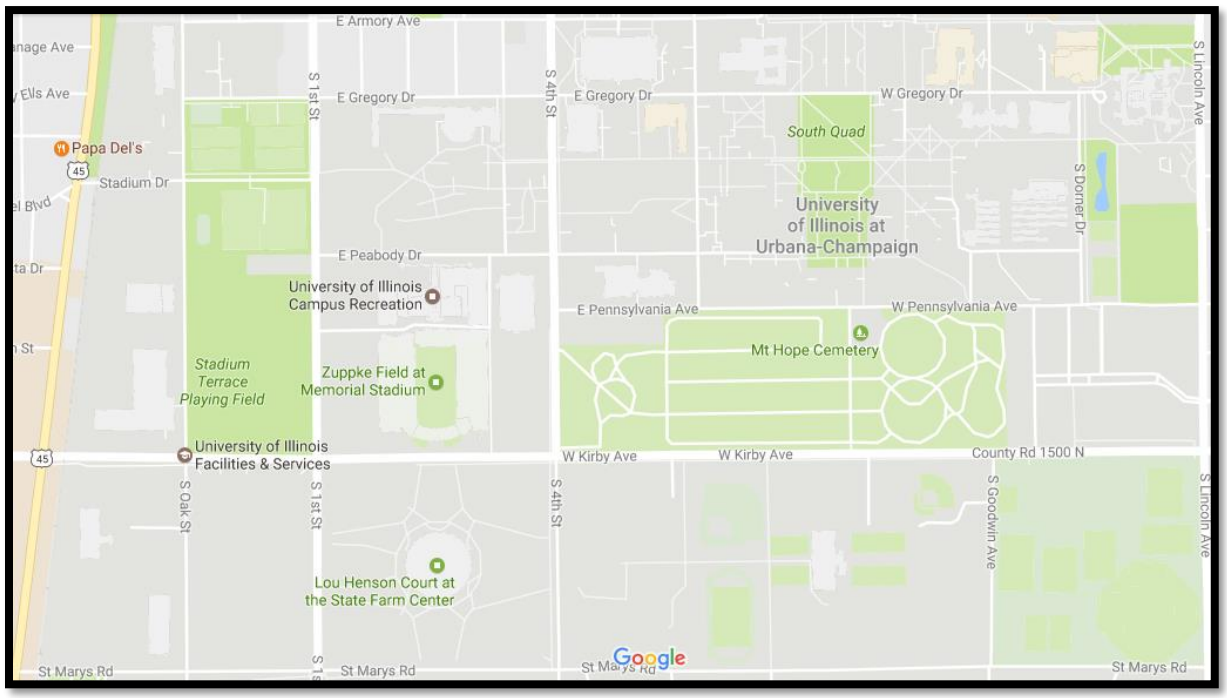
As discussed previously, the Chancellor made a commitment, to honor Professor Nick Holonyak, to replace all the exterior lights and interior wayfinding lights by 2025, and majority of all lights on campus by 2050. It was essential to define the meaning of interior and exterior lights, as well as the term 'on-campus' because the boundary of the University of Illinois at Urbana-Champaign has several definitions (leased or owned, on-campus or not, contiguous or separated, master planning boundary or university district boundary). Therefore, the first task was to define these terms and select the boundary of the campus for this particular commitment.

I defined the "exterior lights" as all the other exterior lights, including street and parking lot lights, wall packs, boulder lights, traffic lights, side-walk lights, etc. However, Morgan was wondering, if we could only use street and parking lot lights for the purpose of the LED Campus Project. We discussed this issue with the F&S and university officials in our meeting on November 2, 2016. They unanimously agreed that "exterior lights" mean all the other lights and not just street and parking lights.

Following that, I wrote a recommendation on what part of the campus should be prioritize for this project. In my recommendation, I argued that the cities of Urbana-Champaign have already started the process of replacement of street lights on the central campus roads with LEDs. However, the university can only authorize the replacement of lights that are university-owned. The university can propose and try to convince the cities to fulfil the commitment, but they cannot force it on the cities. Therefore, I recommended that the first phase of the exterior light replacement should be to have the university-owned exterior lights (especially street lights and

parking lot lights) South of Armory Ave. and North of St Marys Rd, replaced with LEDs before 2025.

I also reviewed the commitment about interior wayfinding signs, and I recommended continuing with the existing definition that this means all Emergency Exit Signs will be converted to LED by 2025.



Objective 3: Identify which buildings have interior LED wayfinding signs. (These lights are mainly the Exit signs within each building).

Morgan Johnston provided me with a list of the buildings that were considered for solar rooftop installation projects as well as the list of buildings that have been identified, started, or finished the replacement of the Exit signs with LED lights. This list was provided by Ken Buenting – Facilities and Services, Superintendent of Maintenance department, with the building details per fiscal year (FY). That list also contained the amount of money spent on the replacement project and how many lights were replaced and/or new LEDs were added.

However, the original list that I used for the list of all buildings on campus was not complete – since it only included the list of buildings that could potentially be used for the solar rooftop installation. Therefore, Ken Buenting provided Morgan and me with the complete list of all the buildings in Urbana and Champaign. Finally, I made changes to the original list that I made, to show all the buildings on campus with the LED Exit Sign project status.

That list has been forwarded to Morgan and further to all involved Facilities & Services and university officials. This list will be updated regularly so that it can be used as a reference to understand the progress of the project.

Building	Building Number	Exit Signs	Project from FY	total LED exit lights	# OF EXIT LIGHTS REPLACED W LED KIT	# OF BATTERY BACK-UP EXIT LIGHTS	# OF AC ONLY EXIT LIGHTS	added Exit Lights	DATE BLD WAS COMPLETED	Exit sign retrofit cost = $198 / LED
Parking Lots	0									
Davenport Hall	1	In Progress	Oct 14 needs expanded list							
Art-East Annex, Studio 2	2									
McKinley Helath Center	3									
Harding Band Building	4	Completed	Jun 08 Project							
Armory	6	Completed	Jun 08 Project							
Foellinger Auditorium	7	Completed	Oct 14 needs expanded list							
Ag Engineering Sciences Building	8									
Chem Annex	10	In Progress	Oct 14 needs expanded list							
Ceramics Kiln House	11	In Progress	Oct 14 needs expanded list							
Noyes Laboratory	12	Completed	Jun 07 Project							
Talbot Lab	13	In Progress	Oct 14 needs expanded list							
Ice Arena	14									
Engineering Hall	15	In Progress	Oct 14 needs expanded list							
Advanced Computation Building	17	Completed	FY 15 needs	22	12	0	10	0	13-May-15	
Art-East Annex, Studio 1	18	In Progress	Oct 14 needs expanded list							
Physiology Research Laboratory	20									
Kenney Gymnasium	21	In Progress	Oct 14 needs expanded list							
Illini Union	23	In Progress	Oct 14 needs expanded list							
Newmark Civil Engineering	24	In Progress	Oct 14 needs expanded list							
Harker Hall	25									
Altgeld Hall	26	Completed	Jun 07 Project							
Lincoln Hall	27									
Aeronautical Laboratory A	28	In Progress	Oct 14 needs expanded list							
Mechanical Engineering Laboratory	29	Completed	FY 15 needs	38	0	0	38	0	22-Jun-15	
Natural History Building	32	In Progress	Oct 14 needs expanded list							

Objective 4: The second part of the project will identify the exterior lights to be replaced. Exterior lights are the street lights, parking lot lights, and walkway lights, on campus property.

We received the detailed map with street and parking lights from Chad Kupferschmid – Facilities Information Management Coordinator, Facilities Information Resources at Physical Plant Service Building, on October 28. I wrote my recommendation for replacing exterior lights with LED lights after that. Morgan and I had a meeting with Lily Wilcock, Visiting Active Transportation Coordinator at F&S, other F&S officials, and lighting technicians on November 21, 2016, to discuss the current status of this project. They reported that a small number of exterior lights are already LEDs, and they said that all new street lights being installed are LEDs. However, they were not aware of the commitment made by the university regarding the LEDs. So, we briefed them about the commitment and we identified the regions where the street and parking lights are now LED lights. We also discussed the possible future sites for this project.

To clarify, exterior lights include street lights, parking lights, boulder lights, traffic lights, side-walk lights, wall packs, etc. The map that we received only had information about the street and parking lights, and therefore, I assumed all other exterior lights are not yet LED.

We received a list of subtypes collected for exterior lighting from Chad Kupferschmid: (i) Streetlight (ii) Parking lot, (iii) Recreation, (iv) Landscape, (v) Walkway, (vi) Yard.

Objective 5: Meet with the university staff and the representatives of cities of CU to inform and discuss the plan for installing LED lights in the University District streets.

Over the course of this semester, I had three meetings with the university officials, F&S officials, and LED store representatives. The first and second meetings were held specifically for LED Exit signs, and the third meeting was to discuss the progress of the replacement of exterior lights.

The first meeting was held on September 21, 2016, with the university Facilities and Services officials and staff from two LED stores. The main focus of the meeting was Exit signs in the buildings. Meeting was hosted by Morgan Johnston, and attended by Ken Buenting (F&S), Brian Finet (F&S), Steven Bainbridge (F&S), and Patty Douglas (LED). They had been forwarded the list of buildings and their statuses before the meeting, so we discussed the progress of the LED Campus projects, especially the Exit signs in the buildings. The panel suggested some changes in the list, for example, the inclusion of details about the LEDs installed in the buildings in the FY14 and FY15. Those were updated within the week and an updated list was forwarded to the concerned authority personnel.

The second meeting was also held by Morgan Johnston on November 2, 2016, and the main focus of this meeting was on the recommendation and the proposal for funding for the FY17 and FY18. Ken Buenting said that his team had surveyed various new buildings, and will have a list of 21 buildings as the next batch for the LED Exit Signs project. He said that there were about 411 wayfinding fixtures in the 21 selected buildings, and estimated replacement cost of $200 per LED, which would cost $83,000. Hence, they agreed that the proposal should request $100,000 over two years (FY17 and FY18), so that the excess amount by the end of FY18, could be relinquished.

It was pointed out during the second meeting that there is nobody tracking when the project is completed. They said someone should come forward and report the progress of the project, including how many LEDs were replaced or added. They should also be responsible for keeping track of the warranty. The panel suggested having a building by building record keeping. The panel stressed that we should determine when the funding will be provided and for how long will it be provided. Say the funding is provided for one year, when will the funding period start and end? We also discussed the definition of ‘Interior Lights’ and ‘Exterior Lights’. This topic was not very clear, but our discussion helped me understand the term ‘Exterior Lights’ and the difference between ‘Interior Lights’ and ‘Interior Wayfinding Lights (Exit Signs)’.

The third meeting was held by Morgan Johnston on November 21, 2016, and the main focus of this meeting was street and parking lights on campus district. As mentioned earlier, we had received the map with detailed street and parking lights in the campus district and I tried to define the boundary of the campus. I also wrote a recommendation based on the project commitment and the boundary of the campus. The lighting technicians were not aware of the LED campus commitment and hence we gave them a brief description about that, at the start of our meeting. We identified the parts of the campus where the street and/or parking lights have been replaced by LED lights. We were told by the lighting technicians that the campus does not have any defined lighting standard. Also, they told us that there are no specific project and they change lights as the need arises.

Objective 6: Estimate anticipated costs and savings for LED campus projects.

For LED Exit Signs:

I received the list of all the buildings on-campus from Ken Buenting, which had the Gross Square Footage (GSF) data for each building on campus district. The original LED Exit Signs history file contained the information of buildings completed in FY14 and FY15. I got the average number of LED lights replaced in these buildings through this list.

I used these two files to get the average GSF for all buildings and average number of LEDs per GSF for the completed buildings. Ken told us that the average cost to replace a fixture with LED is $198, which I used to find the estimate cost for the extrapolated data – for all the buildings on-campus. However, some of the buildings have already been completed. We had received $200,000 earlier for FY14 and FY15 ($100,000 per year). Over the two-year period completed-

- 20 Buildings
- Replaced/added 1053 LED Exit sign
- Total cost for FY14 & FY15 = $207,942.22 average $197.50 per fixture labor and material.

The total estimated cost for the entire project would be nearly $1.5M.

For Exterior Lights:

Following table describe the total number of exterior lights within the campus by type of lights. Chad provided us this data. Morgan will ask Chad to show the LED status for exterior lights on our GIS system.

Type of Lights	All UI Owned lights within the University District Boundary	All lights within the University District Boundary	All lights currently in our GIS	All lights owned by UI currently in our GIS
Landscape	112	112	112	112
Parking Lot	816	832	838	822
Recreation	108	108	108	108
Street Light	714	1332	1341	719
Walkway	1410	1435	1513	1488
Yard	3	3	5	5
Total	**3163**	**3822**	**3917**	**3254**

Morgan spoke with the parking department on December 12, 2016 about the lots that have been changed to LED so far. Mike Wise, their facility guy, said that the only lots that have already been converted are E-14 and E-15. The State Farm Center lots are not managed by the Parking Department, so he didn't know about those. He also gave some information about the cost to replace existing parking with LEDs in a parking deck. He said they are planning to replace

470 existing fixtures in the North Campus Parking deck (B-4) with LEDs. The total project cost is expected to be about $475 per fixture. The payback in energy savings is expected to be 3-4 years.

Say, the cost for retrofitting Landscape and Yard fixture is $400 (approved by Morgan), then it would cost nearly $46,000 for this project.

Say, the cost for retrofitting Walkway fixture is $450 (approved by Morgan), it would cost nearly $634,500 for that project.

Say, the cost for retrofitting Streetlights, Parking lot, and Recreation fixture is $475 (approved by Morgan), it would cost nearly $778,050 for that project.

In total, it would cost $1.5M to retrofit All UI Owned lights within the University District Boundary with the LED lights.

Objective 7: Write a detailed report on the process you developed, and its specific implementation.

This document is the said detailed report.

DELIVERABLES

iCAP Portal Advanced User Guide

I have created the iCAP Portal Advanced User Guide. It is currently under review with Morgan Johnston, Michael McKelvey, Andrew Stengele, and Olivia Webb.

Please see the attached file: iCAP Portal Advanced User Guide.pdf

LED Exit Sign funding proposal template draft

I helped Morgan in drafting a funding proposal for the LED Exit Sign for the next two fiscal years. Morgan will provide comments on it.

Please see the attached file: LED funding request.pdf

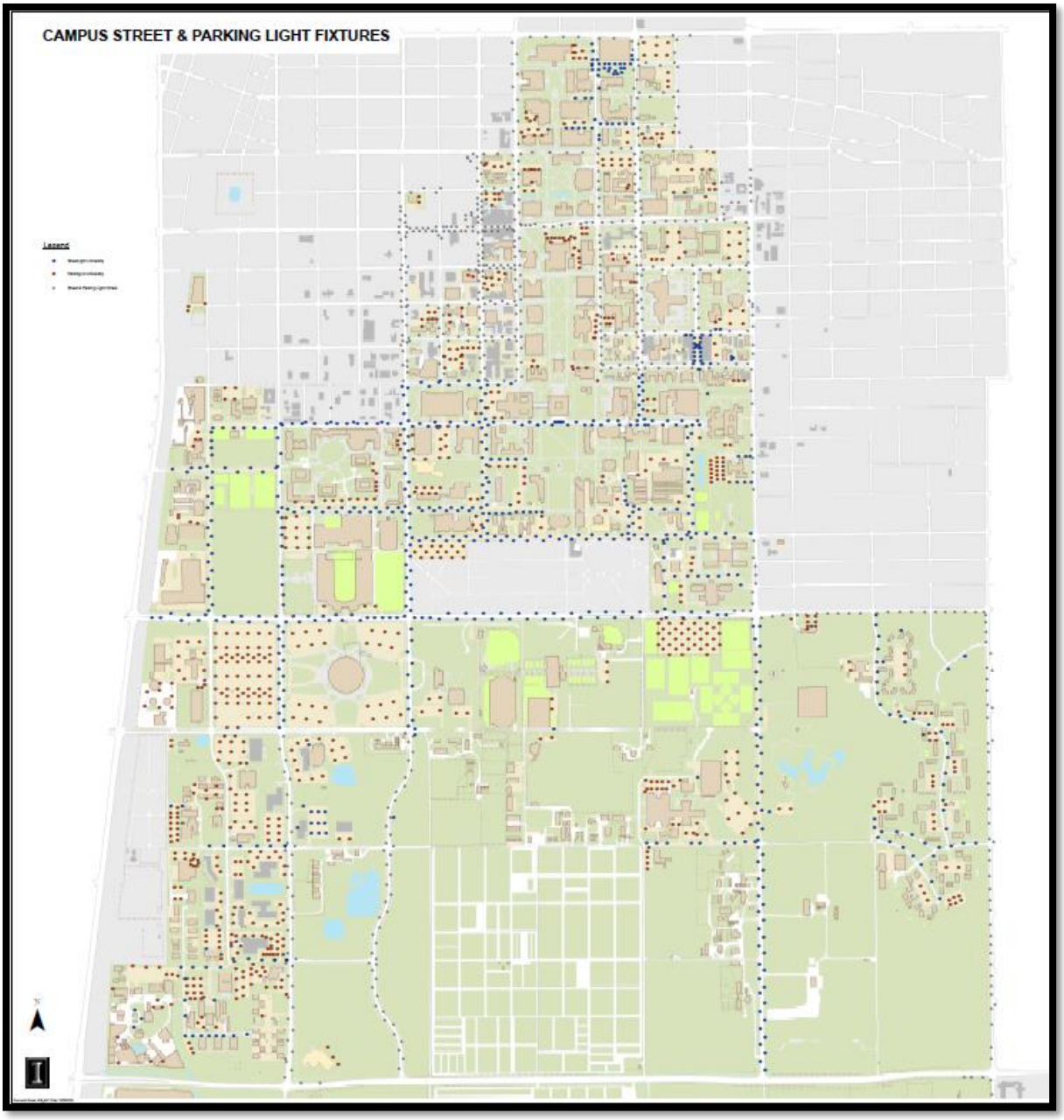
Complete List of LED Exit Sign buildings to do and status

This list will help in keeping track of all the buildings that have been done, how many fixtures were replaced or added, and also help the officials to determine the next batch of buildings for this project. This gave the F&S officials a way to track the progress of buildings that have been done, and a process for continued efforts.

Please see the attached file: LED campus exit signs Building data.xlsx

Map of exterior street and parking lot lights

Please see the attached file: GIS_847_UIStreetandParkingLights.pdf



Basic cost estimate for LED Campus Commitment

The estimate developed will help in the Funding Proposal for the LED Exit Sign project.

Please see the attached file: LED Exit Signs Extrapolation data.xlsx

2015 iCAP Objectives Collection

Please see the attached file: 2015 iCAP Objectives _ iCAP Portal.pdf

Final Detailed Report

Please see the attached file: PrasadSarthak_Final Report_ENG573.pdf