

New Jersey Institute of Technology
Center for Building Knowledge

GPIC R&D Scan Summary Report

(Subtask 4.4.2)

10 February 2012

Project Summary

The New Jersey Institute of Technology's Center for Building Knowledge ("NJIT CBK") has developed a web-accessible database documenting research and development (R&D) activities throughout North America focused on improving the energy performance of existing buildings in support of Greater Philadelphia Innovation Cluster (GPIC) efforts. The database serves to identify and organize the breadth of research activities with applicability to GPIC initiatives from three broad categories: academia; government; and private industry. The database provides GPIC members, partners, and the public-at-large with access to relevant, current research projects (typically within the last five years).

Bibliographic citations for a sample of several hundred research efforts were developed detailing technologies and systems relevant to retrofit existing commercial or multi-family residential buildings under 100,000 square feet. Each of these have been organized in a fashion so as to facilitate a quick review of relevant research efforts pertaining to the vast number of components incorporated in our building stock. That said it is but the start of what could be the basis of an ongoing effort which would allow researchers to communicate their efforts, facilitate collaboration, and advance knowledge about the built environment. As such, the database could be a useful tool to help guide the R&D undertaken by the GPIC HUB, ensuring that this R&D complements and extends existing research and development activities. It is anticipated that, the site will ultimately be hosted on GPIC HUB server space (<http://gpichub.org/>) and be integral to the allied efforts of the Knowledge Platform. The Knowledge Platform (AKA The Repository) being the name given to the efforts of the University of Pennsylvania's Institute of Urban Studies, which is intended to focus on policy research, and as such shall serve to complement CBK's scan of technology research.

The project has created an easily-administered website that addresses a variety of GPIC's audiences using varying degrees of privileges in order to allow for the ongoing maintenance and growth of the database content with minimal administration. GPIC Members will be permitted to edit and add citations; GPIC Partners will be permitted to add citations; and the public will be permitted to search and view citations. Non-technical staff will be able to easily update and maintain the features and content delivered by the site. Another key site feature is an advanced search function that allows users to select search criteria from menus of multiple areas including research category, type, source, availability and keywords. Similar to a retail website, this search method allows users to narrow or expand their search results as desired. The search feature relies largely on a taxonomy and list of keywords developed by CBK to classify data and ensure its integrity as multiple users enter citations.

CBK has captured hundreds of resources in the database that represent a vast cross section of current R&D activities. Additional opportunities to expand the database include developing a survey instrument to interview thought leaders identified amongst universities, national labs, and industry; developing an editorial summary of each category to identify current and emerging trends and leaders; and integrating the database citations with a web-interface case study of Building 661. Additionally, the website was designed so as to readily allow the following functions to be introduced at a future date: social networking, video posting, streaming, podcasting, comments & ranking, tagging & bookmarking, and blogs. The site can be accessed at the following url:

<http://www.episolve.com/clients/gpic/>

The following pages provide a quick overview of the key features of the database and site.

1. Levels of Access

The Home Page of the development website, located at <http://www.episolve.com/clients/gpic-dev/>, will welcome visitors and invite both Members and Partners to register so as to add and/or edit the site. Dependent upon their status, the visitor will be directed to a unique website that will follow separate navigational paths in which administration rights are granted accordingly:

- GPIC Members will be permitted to add new citations as well as search, view, and edit existing ones;
- GPIC Partners will be permitted to search, view and add citations, and finally
- the public will be able to search and view existing citations.




Welcome to the GPIC Hub Research and Development Database, a searchable collection of nationwide research and development activities that are focused on improving the energy performance of existing buildings. The database provides access to both current work (typically within the last five years) and that which is "on the horizon." Links to hundreds of bibliographic annotations were chosen and documented based on their focus on the development of technologies and systems to retrofit existing commercial or multi-family residential buildings under 100,000 square feet. A sampling of reports and resources from universities, national laboratories and the building industry are represented.

You may navigate through the resources by browsing them in list form or using the advanced search feature to find citations in your personal areas of interest. Select search criteria from multiple menus including research category, type, source, availability and keywords to narrow or expand your search results as necessary.

[Click here to visit site...](#)

GPIC Partners



We welcome you, as a GPIC Partner, to contribute resources you believe would be of interest to this community. We ask that you respectively not use the site as a promotional opportunity but rather a shared educational resource. All contributions will be subject to modification by both members and the administrator.

[Please register or sign in to continue.](#)

GPIC Members



We welcome you, as a GPIC Member, to contribute citations you believe would be of interest to this community. We ask that you respectively not use the site as a promotional opportunity but rather a shared educational resource. Members may also edit existing citations if incomplete, inaccurate, or if you deem the entry to be solely self-promotional without substantive objective benefit to this community. You may change the title, URL, description, classification, availability, and date, as well as change or select additional category assignments, sources, authors, and keywords. You may also change or add an image to the entry.

[Please register or sign in to continue.](#)

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2. Searching the Database (for Members, Partners and the public)

The project developed an organizational taxonomy for the information in the database beginning with the following 7 broad groupings:

- Building Envelope
- Lighting
- HVAC
- Plumbing
- Electrical
- Furniture, Fixtures and Equipment (FF&E)
- Transportation Systems

These groupings were then broken down into more discrete categories and paired with other attributes to create a database that is sufficiently granular to allow targeted searches while also being straightforward and easy to navigate.

Category	Classification	Availability	Source
Cooling Daylight Integration Demand Management Elevators/Escalators Energy Management Equipment Exterior Lighting Fire Protection Fixtures Foundations Furniture General Heating Interior Lighting Power Generation Renewable Technologies Roofs Sewage & Stormwater Systems Ventilation Walls Water Supply & Distribution Windows & Doors	Product Literature Research Report Text Web Resource	Commercially Available Technology Emerging Technology	(Sources are too numerous to list here, comprised of all academic institutions, national labs and industry sources surveyed.)

Finally, a list of keywords was developed to facilitate even more granular searches.

Keyword		
Absorption	Evacuated Glazing	Plug Loads
Absorptive Refrigeration	Evaporative Cooling	Policy Change Material (PCM)
Accent Lighting	Façade	Policy
Accreditation	Facility Managers	Radiant Heating
Affordability	Fan	Rainscreen
Air Barrier	Fault Detection	Rainwater Harvesting
Air Handler	Finishes	Rapidly Renewable Materials
Air-Cooled Heat Exchanger	Fluorescent	Reflectivity
Air-Flow Windows	Gas Fill	Remediation
Appliances	Geothermal	Research Review
Assessment	Glare Control	Roof Top Unit (RTU)
Automation	Glazing	Sensors
Ballast	Green Roof	Shading
Behavior	Greenhouse Gas (GHG)	Sick Building Syndrome (SBS)
Benchmarking	Ground Source Heat Pump	Simulation
Biowall	Heat Pump	Smart Grid
Budget	Heat Recovery	Smart Meters
Building Energy Maintenance Management System (BEMS); Energy Information Systems (EIS)	High Albedo	Solar
Building Information Modeling (BIM)	High-Intensity Discharge (HID)	Solar Gain
Building Operators	Hot Water	Solid State Lighting (SSL)
Building Paper	Humidity Control	Sound Absorption
Chiller	Hygrothermal	Switchable Glazing
Cladding	Ice Storage	Tankless Water Heater
CO2 Emissions	Incandescent	Thermal Energy
Codes and Standards	Incentive	Thermal Resistance (R-Value)
Combined Heat and Power (CHP)	Indoor Air Quality (IAQ)	Thermal Transmittance (U-Value)
Commissioning	Infiltration	Thermochromic
Component Technology	Infrared-Reflecting (IR) Coating	Thermoelectric
Constant Volume	Insulation	Thermostats
Control Systems	Life Cycle	Transparent Conducting Oxide (TCO) Films
Cool Roof	Light-Emitting Diode (LED)	Triple-Glazed
Cooling Panels	Load Shedding	Troubleshooting
Crawlspace	Low Emissivity	Vacuum Glazing
Curtain Wall	Market-Based	Vapor Permeability
Design Guide	Metal Halide	Variable Air Volume (VAV)
Details	Metering	Volatile Organic Compound (VOC)
Diagnostics	Microgrid	Window Coating
Drainage System	Microturbine	Window Frame
Dual-Glazed	Moisture	Wireless
Ducts	Moisture Barrier	Zero Energy
Dynamic Glazing	Monitoring	
Education/Training	Motor	
Electrochromic	Natural Gas	
Embodied Energy	Night Flushing	
Energy Auditing	Occupants	
Energy Forecasting	Off Peak	
Energy Recovery	Operations and Maintenance (O&M)	
Energy Storage	Organic Light-Emitting Diode (OLED)	
	Passive System	
	Phase Photovoltaics (PV)	

A conventional search box can be found site-wide in which users can enter a keyword which the search engine will look for within the description of each citation. A thorough and easy-to-use advanced search feature allows users to select from a series of drop down menus with the options noted below. Users can highlight multiple choices from each category by holding down CTRL as they click. Users can select as few or as many choices as they like, thus narrowing or broadening their search results Search results will update automatically with each selection.

GPIC HUB

Home | About Us | HUBlog | Research & Development | Education & Workforce | Technology Transfer | For GPIC Members | Get Involved

Product Search

Category

- Building Envelope
- Cooling
- Daylight Integration
- Demand Management
- Electrical
- Elevators/ Escalators
- Energy Management
- Equipment

Source

- Acree Technologies Inc.
- Add-Vision Inc. (Scotts Valley, CA)
- Add-Vision, Inc.
- AlphaMicron, Inc.
- Arkema Inc.
- Arkema Inc. (King of Prussia, PA)
- Building Solutions, Inc
- Bureau of Planning & Sustainability . City of Portl

Availability

- Commercially Available Technology
- Emerging Technology

Classification

- Product Literature
- Research Report
- Text
- Web Resource

USER MENU

- My account
- Log out

QUICK LINKS

- View All Content
- Add New Page
- Add New Category
- Add New Author
- Add New Availability
- Add New Classification
- Add New Type
- Add New Product

APPLY **RESET**

by testing

asdfasdfsdf

new test

EERE Completed OLED Projects

Multiple Projects - some overlap with above

EERE Completed LED Projects

Multiple Projects - some overlap with above

Existing Commercial Building Retrofit

Tenant Plug Loads

Tapping into Plug Load Savings

Office of the Future Phase II Report: The 25% Solution

3. Editing an Existing Citation (for Members and Partners)

Select the citation you would like to change and click the ‘Edit’ tab. A form will opened in which you can edit the name, URL, description, classification, availability, and date, as well as change or select additional category assignments, sources, authors, and keywords. You may also change or add an image to the entry.

The screenshot shows a 'Create Product' form with the following sections:

- Category:** A dropdown menu with '- Select a value -'.
- Sub Category:** A dropdown menu with '- None -'.
- Classification:** A dropdown menu with '- Select a value -'.
- Name:** A text input field.
- URL:** A text input field.
- Description (Edit summary):** A rich text editor with a toolbar containing various formatting options like bold, italic, underline, link, and image.
- Switch to plain text editor:** A link below the description editor.
- Text format:** A dropdown menu set to 'Full HTML'.
- Availability:** A dropdown menu with '- Select a value -'.
- Source:** A dropdown menu with options: '2020, Inc.', '3M', 'Acree Technologies Inc.', and 'Add-Vision Inc. (Scotts Valley, CA)'.
- DATE:** A date picker showing '2012' and 'E.g., 2012'.
- Author:** A dropdown menu with options: '- None -', 'Ali M. Halkawil', 'Jimrod Bae', and 'A.Nischou'.
- Project image:** A file upload section with a 'Choose File' button, 'No file chosen', and an 'Upload' button. It includes instructions: 'Files must be less than 60 MB' and 'Allowed file types: png gif jpg jpeg'.
- Keywords:** A dropdown menu with options: '- None -', 'Absorption', 'Absorptive Refrigeration', and 'Accent Lighting'.
- Menu settings:** A checkbox labeled 'Provides a menu link'.
- URL path settings:** A dropdown menu set to 'Automatic alias'.
- Revision information:** A dropdown menu set to 'No revision'.

4. Adding a New Citation (for Members Only)

To add a new citation, first ensure that it is not already in the database by clicking on “Find Content” then filter by type → Product. Alphabetize the list by clicking on “Title” and look for the reference in the list. If the resource is not there, members may add additional citations using the following procedure:

i. Add New Author(s)

Determine if the author of the citation you would like to add is already in the database by clicking on “Find Content” then filter by type → Author. Alphabetize the list by clicking on “Title” and look for the author’s name in the list. If the author is not there, click on “Add Content,” then “Author” and complete the fields in the form.

ii. Add New Source(s)

Determine if the source of the citation you would like to add is already in the database by clicking on “Find Content” then filter by type → Source. Alphabetize the list by clicking on “Title” and look for the source in the list. If the source is not there, click on “Add Content,” then “Source” and complete the fields in the form.

iii. Add New Citation

Click on “Add Content,” then “Product” and complete the fields in the form. You may select multiple items in the “Category,” “Source,” “Author,” and “Keyword” menus by holding CTRL as you click.

iv. Add New Keyword

Click on “Structure”, then “Taxonomy” and choose “add terms” under the “Project Keywords” option. Current keywords are chosen according to the frequency of reoccurrence of a term in the scanned literature. Other criteria can be applied for choosing the keywords.

Potential Future Developments

The project has the potential for future improvements that will introduce new data analysis tools and geographical mapping options.

i. **Data Analysis Tools**

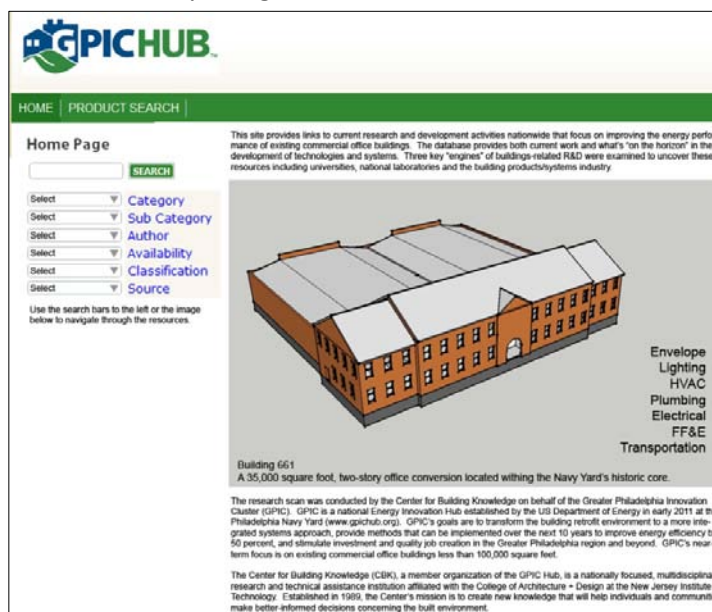
The project can function as a comprehensive source of data which allows users to build relations among categories, keywords, researchers, institutions and geographical locations of citations. In the future, new data analysis tools can be added to the engine, which will build reports about the frequency of occurrence of each keywords, relations between these occurrences and (sub)categories, relational patterns between the citations and geographical locations, change in research topics through time, etc. Introduction of these new data analysis tools might also require new protocols to standardize and validate the data, which will contribute to the utility and the effectiveness of the project.

ii. **Geographical Mapping Options**

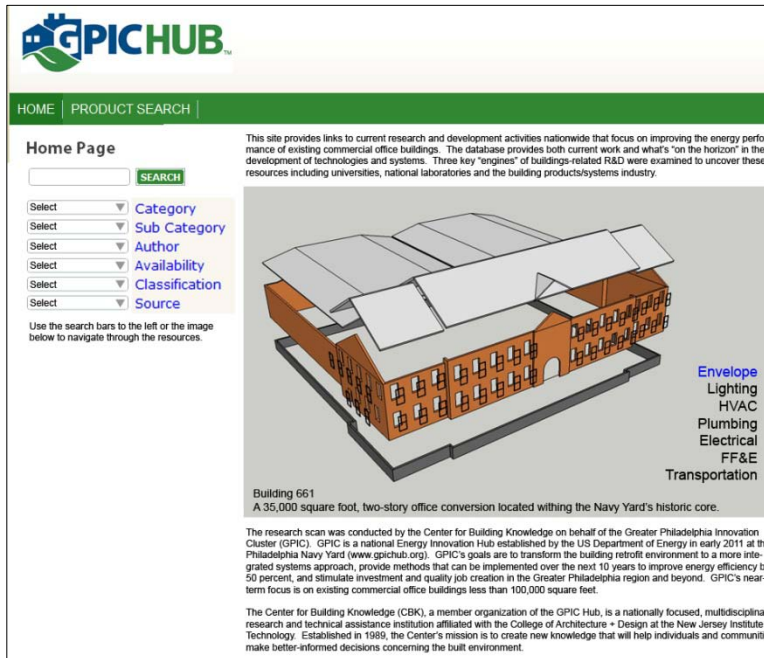
Once new data analysis tools are integrated and data have been standardized, Geographical Information System (GIS) tools can be added to the engine, enabling users to visualize these analyses through actual maps. For example GIS tools can help users see how research interests are distributed geographically, identify clusters of similar research interests in certain regions or see how R&D has evolved through time in particular regions. Visualizing R&D through maps can be useful at the decision making level by showing current trends and future possibilities for the allocation of resources.

iii. **Alternate Method of Navigation**

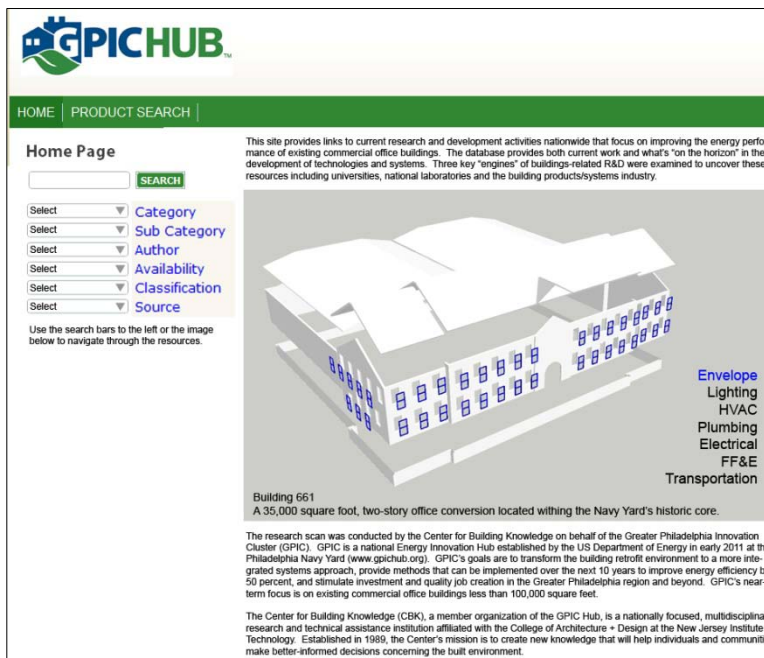
A potential way to enhance the site – and tie it more closely to the GPIC “brand” – might be to use an image of Building 661 for navigation/orientation. An example of this concept is outlined in the following images. It uses a roll-over function linked to the seven taxonomy categories for the database as the core navigational element.



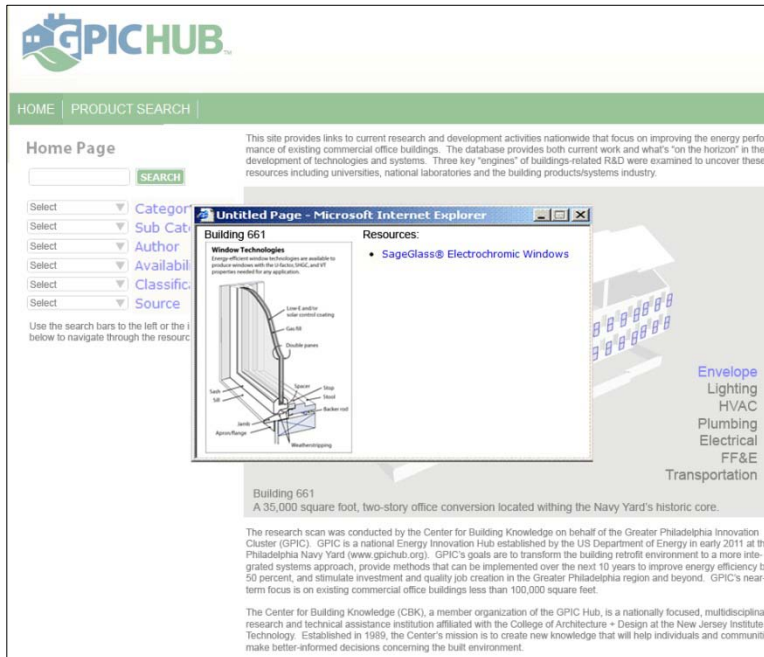
For example, rolling over the Envelope category reveals the core “envelope” components – foundation, walls and roof – in Building 661 and would provide a gross order link to R&D studies in the database that focus on envelope issues.



Delving deeper into Envelope would reveal additional subcategories, in this case Windows.



Further investigation would lead to specific subcategories of windows such as “glazing” and, in this case, “electrochromic glass.”



If this interface were eventually developed for the R&D database, it could also be for other GPIC resources – such as the overall GPIC data repository and/or a database of technologies used in Building 661 – as these resources come on line.