



Aerial view
by Fan Wei.

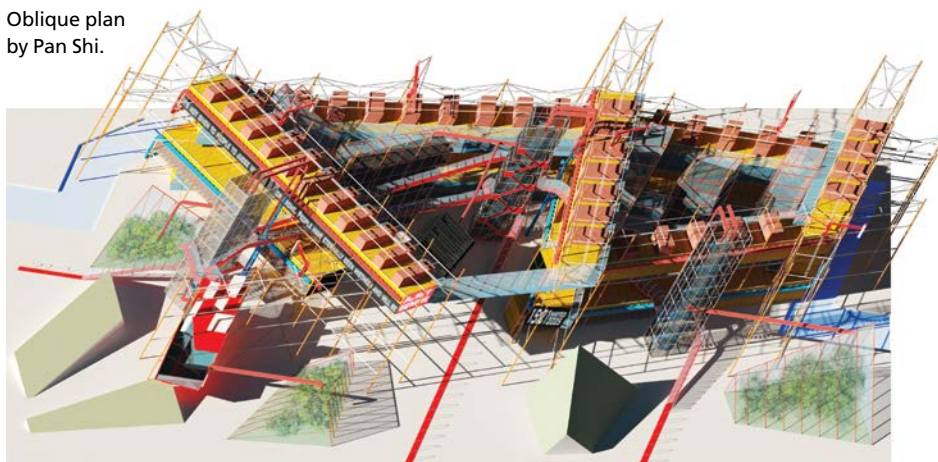
Union specific

The i-Hub Integrated Design Studio for data centre design seeks to provide a better marriage between the disciplines of engineering and architecture. The aim is to provide improved technical performance while maximising building amenity and community engagement.

In recognition of the rapid and continuing growth of data centres and the significant energy involved in their operations, AIRAH and the University of Melbourne have made the design of data centres the subject of further study.

The project is one of a series of Integrated Design Studios (IDSs) to be carried out under the Innovation Hub for Affordable Heating and Cooling (i-Hub), with funding provided by ARENA.

Oblique plan
by Pan Shi.



i-Hub is an umbrella program of HVAC industry-led research initiated by AIRAH in response to the Paris Agreement. The IDSs form part of the program, and set out to study how architects and engineers work together in design environments.

The IDS is hosted by the Melbourne School of Design at the University of Melbourne, and provides an environment where integrated design

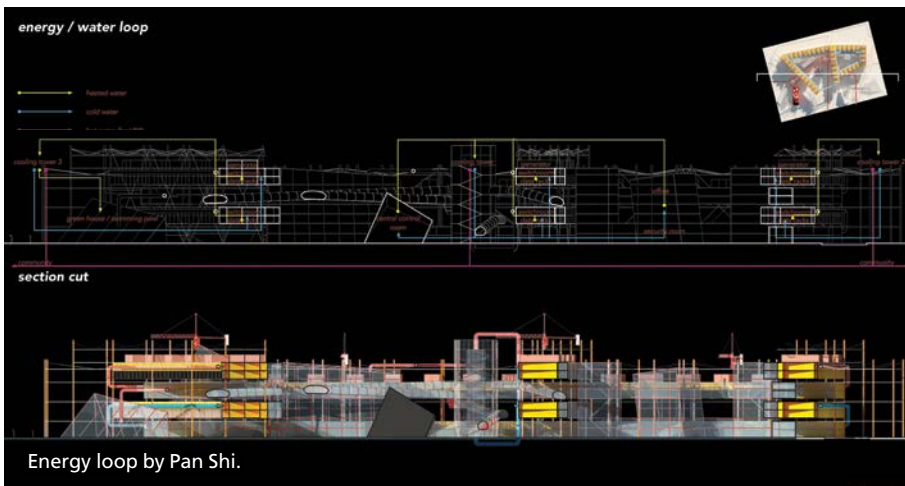
processes can be tested and refined on data centres' building typology.

A BETTER UNION

According to Brendon Niven, Enterprise Professor at the University's Melbourne School of Design, the goal is a better union between the disciplines, providing improved technical performance (energy) while maximising other aspects of design such as building amenity and community engagement.

"The study has sought to develop innovative concepts for data centres that challenge their otherwise purely functional/cost-driven design, and explore options to minimise their carbon footprint via program and technology interventions," adds studio leader, Toby Reed.

The project has received the support of data centre operator NEXTDC acting in the role of client, with Aurecon in the role of consulting engineer and Greenbox engaged as architect.



PROJECT AT A GLANCE

The i-Hub Integrated Design Studios were supported by the following industry partners:

- ▲ Acting client: NEXTDC
- ▲ Architect: **Greenbox Architecture**
- ▲ Consulting engineer: **Aurecon**
- ▲ Integrated design studio: **Melbourne School of Design, University of Melbourne**
- ▲ Studio leader: **Nervegna Reed**

“Data centres are where the cloud meets the ground,” says Peter Greaves, Aurecon’s global electrical leader.

“With our increasing use of digital devices, from iPhones and laptops to autonomous vehicles and smart building technology, data centres are the beating heart that enables our interconnected, digital world to function. They are the new essential infrastructure for our interconnected world. As a society, we depend heavily on the reliability of our digital services. In fact, there is an expectation that they will always be available, no matter the circumstances.

“Therefore, it is vital that data centres can be developed at speed to meet market and consumer demand, and are also reliable and resilient.”

INTEGRATION IS KEY

The first studio was held in first semester this year. It consisted of 16 design students guided by university academics and assisted by the clients and consultants from industry, exploring the integrated design of data centres.

“As the name suggests, integration is key, with technical requirements being considered with equal priority alongside the requirements of the client, the staff using the building, and the wider community,” says McNiven.

Design solutions were developed that aimed to satisfy multiple ends for the various stakeholders at the same time. A hypothetical site was chosen in a sensitive residential neighbourhood on the fringes of the inner city, to examine the role of data centres in the community.

Solutions took into consideration the immediate urban fabric and its

inhabitants. They capitalised on the large amount of excess heat produced by the data centre to support the operation of potential community facilities such as swimming pools and public greenhouses.

Pitched as positive contributors to the physical urban realm (as well as the virtual/digital), the solutions incorporated recreational and educational uses, while still dealing with the essential security and safety aspects of a mixed-use program. Expandability and site-use-efficiency were other considerations, with one project using the language of modular “data units” in a framework of gantry crane-type structures. These allow the data centre to expand itself in the future and to self-update by replacing old units with new as technology develops.

ENERGY CONSUMERS

But as Greaves notes, the challenge that faces data centres is the large amount of energy they consume.

“Data centres contribute 3 per cent of carbon to our environments,” he says. “So, not only do data centres need to be available to meet our needs but they also need to be environmentally and socially sustainable.”

On the energy front, renewables including solar PVs and recycled waste-to-energy technologies were examined, along with the capture and reuse of waste heat from core operations.

The considerable energy involved in running data centres put the projected

renewables components considered into perspective, with power savings generated representing less than 1 per cent of total site energy usage for a large “mega” facility, or 2.5 per cent for typical facilities. The capture and reuse of waste energy from core operations meant, however, that valuable community assets considered (such as the swimming pools or greenhouses) could be run almost for nothing.

Lessons on the nature of integrated design were also learned. Key to the success of the dynamic and vibrant ideation that occurred in the studios was interaction between the industry partners and the student designers. The significant time invested from the partners was responded to by the students with increased commitment to design exploration.

“Preconceptions about what data centres currently are were left to one side,” says McNiven, “with the focus turned to imagining what they could be.”

To this end, the project studio considered data as an essential service to society held in almost the same esteem as water and power.

“Data centres are community assets and have the potential to be welcomed for the physical benefits they bring as well as the virtual,” the project has noted. “At a time where competition for potential sites is strong, this approach makes good commercial sense, offering operators a distinctive edge with councils and the greater public alike.” ■

Would you like to know more?

For more information go to www.ihub.org.au/ids-01-nextdc-data-centres-i/