



Underground Climate Change; updates to CityBES, and more

14 conferences and other events for your diary

from IBPSA affiliates in Australia, the Danube and Nordic countries, & the USA

The newsletter of the International Building Performance Simulation Association

**GLOBAL COMMUNITY NEWS** 

CALENDAR OF EVENTS

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specifically designed for reading on-screen ever since volume 10 in 1999, and all the items in contents lists, and web and email addresses, are active links? Try it on your tablet! - Editor

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The International Building Performance Simulation Association exists to advance and promote the science of building performance simulation in order to improve the design, construction, operation and maintenance of new and existing buildings worldwide.

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## President's message

Dear IBPSA Colleagues and Friends

I start this message by saying on behalf of the Board that our thoughts are with you all in these strange and constantly evolving times. Like you, we all take the COVID-19/ Coronavirus crisis very seriously, and we are actively monitoring events while following guidance from CDC, the World Health Organization, our local and national health experts.

There is no easy way out - we cannot outrun this virus by trying to escape or hide out of reach - so we all need to take responsibility in our personal and professional lives in order to safeguard the health, safety and welfare of each other, our colleagues and of course our loved ones. Crises such as these remind us what is truly most important in our lives: family, friends, and community. There are difficult times ahead and as we negotiate our way through these, we must follow the best advice to keep ourselves and those closest to us safe in order to ensure that we get through this together safely.

What a difference a few months makes. In the last newsletter I wrote about all of the activities that would be happening regionally in 2020, describing this year as our 'non-conference year'. Little did I realise just how true those words were.

The situation is changing daily, with conferences and other events being cancelled, postponed and re-scheduled daily. Things may change and who knows, we may end up using one of the intended events as an opportunity to test 'virtual conferencing' as suggested by some of our IBPSA Student Members at the meeting in Rome, but the following is intended to provide you with the latest information we have:

eSim - Vancouver - postponed to September BSO - Loughborough - September - online, date to be announced International HVAC+R Symposium - Istanbul - Postponed to 1-3 June....

SimBuild - Chicago - still listed as August - but monitoring the situation.
BauSIM - Graz - still listed as September - but monitoring the situation
BuildSim-Nordic - Oslo - October as planned
uSIM - Edinburgh - November as planned
ASim - Osaka - December as planned.

The present health crisis is a reminder of how fragile our eco-systems and urban ecology and infrastructure are. IBPSA is a unique community with shared goals and ideas embedded in improving lives through better buildings and places and we were already observing a clear shift emerging - from individual buildings to community

### President's message



and urban modelling. Recent events demonstrate the positive impact of better places on people's physical and mental well-being – and the potentially negative impact of the direction the world was travelling in. In hindsight, should we have been able to predict this? Perhaps. But whatever the answer to that question, the world has an opportunity to pause and take a step back to review and, we would hope, move forward on a different path. As a virtual community of 4000 plus members with some of the best minds in the field amongst us, we can reach out to colleagues all over the world to explore and research how to make our cities and buildings more resilient and to engender a drive forward in the right direction.

People keep saying that we are all in this together - in IBPSA we really are a wellplaced community to work together for the greater good.

On a day to day, business as usual front, there is no better time to focus on inclusivity and bringing new people into the field, equality issues, mentoring, and expanding international collaboration. Work on virtual educational activities from the IBPSA webinar series to an IBPSA academy are developing as well as a local/ national IBPSA Summer School Programme for the sharing of new ideas. So please watch this space if you would like to get involved or contribute in other ways.

Finally - COVID-19 is affecting all of our lives, some of us directly, so please keep everyone in your thoughts and keep in touch with friends at home and abroad.

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# Best of 'Ask a Modeler': Career change and co-simulation

'Ask a Modeler' is an advice column for the building simulation community. Each month, committee chair Nathaniel Jones and members of the Emerging Simulation Technology subcommittee pose a question submitted by an IBPSA member to recognized experts to get their unique perspectives. Through this column, we hope to expand communication and create a sense of community among practitioners, researchers, and academics at all points in their building simulation careers. Below, we are reprinting some expert advice from the past few months. We hope that sharing these questions and insights will bring value to your work and possibly make you think about building performance modeling from a new point of view.

### I really care about the impact of buildings on the environment, but I don't see myself as an HVAC modeler. What are some alternative careers that use building energy modeling skills? — Sustainably Minded

Dear Sustainably Minded,

Speaking as a former building energy modeler myself, I've come to learn that one of the (many) great things about energy modeling is that the core skill set is highly transferable! I tend to find that rock star modelers are

- Inquisitive
- Precise
- Determined
- Resourceful
- Patient

Energy modelers have experience breaking down a complex problem into manageable chunks. They can communicate results in a clear and concise way. They have the ability to learn and adapt to new technologies quickly.



Now, what kind of careers use these skill sets? Think about some of our planet's biggest challenges. These are big and unwieldy problems that need creative solutions and buy in from a lot of diverse stakeholders. Sound familiar?

I know many former energy modelers who have found new career paths in software development, lighting design, data science, project management, computational design, corporate sustainability, event coordination, and content development, just to name a few. Some are still within the AEC industry, and some have left completely, but the skills they developed as an energy modeler still guide their new paths and successes.

And don't let lack of domain expertise stop you! The traits that make you a great modeler are much harder to learn than a new field. Open courseware and other low cost resources are available for all kinds of fields to help you dive in. There are currently 669 courses on Computer Science on edX.org. There are 0 on patience. In my experience, if there's a space you're interested in and a problem you want to help solve, the experts in that field are more than happy to bring you up to speed. They're actually thrilled to have someone else lending a hand to help shed new light on a problem.

Ultimately I think energy modelers are great problem solvers. And let's be honest, there are definitely some problems out there that could use some more people power. So whether you are concerned about the impact buildings have on the environment, or the impact climate change will have on bird migration patterns, use your skills you've sharpened as a modeler and start tackling them!

Stephanie Egger, LEED AP BD+C Product Manager, AMS

## I've heard repeatedly about Spawn of EnergyPlus and seen this project in the U.S. Department of Energy roadmap. What is the future of energy modelling going to look like for the industry? Can you provide a "Co-simulation 101" please?

- Curious about Co-Simulation

### Dear Curious,

The future of energy modeling will be similar to the present of energy modeling — EnergyPlus is not going away. What is hopefully going to change and what Spawn is about is the relationship of energy modeling to control design and implementation, and to model use during operation.

Controls are an increasingly important part of building energy efficiency. HVAC systems increasingly rely on advanced control strategies to achieve efficiency. Controls are key to leveraging "fifth-generation" district heating and cooling systems that distribute water at near ambient temperature to buildings, thereby increasing the efficiency of heat pumps, allowing buildings to share waste heat and cold, and facilitate the integration of renewables. And controls are obviously necessary to allow buildings to provide grid services and help integrate renewable resources.

Unfortunately, there is currently a disconnect between BEM and control workflows. Modern BEM engines like EnergyPlus use load calculations to deduce HVAC operation from high-level descriptions. In each time step, they first calculate the internal and weather-driven thermal loads on the zone, then they calculate the heating or cooling the HVAC system can provide, and finally use the difference between these to calculate updated zone conditions. Physical control sequences are not defined in terms of loads, they are defined in terms of temperature readings and valve and damper positions. The control strategies modeled by EnergyPlus and other BEM engines cannot be directly extracted and executed on control hardware. They must be manually interpreted and re-written. Often, rather than interpreting a modeled control strategy, a controls engineer may simply fall back to a known and trusted control sequence.



Spawn is designed to bridge this gap. Spawn couples EnergyPlus' simulation of the building envelope to HVAC simulation that can directly interpret control sequences as they are implemented in the real world. This HVAC simulation uses models implemented in the open-standard modeling language Modelica. Traditional, imperative HVAC and control models can only be simulated. Modelica models are declarative. They can be used for simulation, but they can also be translated for execution on commercial control product lines. OpenBuildingControl is a companion project to Spawn that is developing libraries of high-performance control sequences and translators for implementation of these sequences on actual product lines.

Spawn also builds on the Functional Mockup Interface (FMI) co-simulation standard. EnergyPlus has supported co-simulation for some time via a feature called External Interface. More recently, it added support for co-simulation using the FMI standard. Spawn uses FMI internally to co-simulate between its own modules, e.g., between the EnergyPlus envelope module and the various Modelica HVAC and control modules. This internal use of standard co-simulation protocols creates a modular architecture that allows Spawn to integrate externally developed component and system models, including data-driven machine learning models, and to export models for integration with other simulation tools or for use-cases such as hardware in the loop testing. One example of Spawn co-simulation is URBANopt, which couples multiple Spawn models with Modelica models of advanced district heating and cooling systems.

Michael Wetter, PhD Staff Scientist, Lawrence Berkeley National Laboratory

We want to hear your interesting, entertaining, or just plain odd questions about life and building performance simulation. Submit your questions at www.ibpsa.us/ask-modeler to be answered by prominent building performance simulation experts. Note that questions requiring an immediate response should be submitted to the community of experts at unmethours.com. Read our other past columns at www.ibpsa.us/ask-modeler-column-archive. If you are interested in replying to a question as a featured expert or have any other feedback about Ask a Modeler, please email askamodeler@ibpsa.us.

## **Interview with Jan Hensen**

Christina Hopfe has been talking to Jan Hensen (JLMH), the recipient of the IBPSA Distinguished Achievement Award in 2019, about his professional life and career in building performance simulation. This is her introduction:

It is challenging to write an introduction of someone who is as well-known as Jan but also who means a great deal personally to me. The list of Jan's accomplishments is long (some of them are listed at the end of this introduction.) At the most recent Building Simulation conference, in Rome, in September 2019, Jan was awarded IBPSA's Distinguished Achievement Award. This award is from my point of view the highest award that the organisation has to offer as IBPSA recognizes an individual "who has a distinguished record of contributions to the field of building performance simulation, over a long period." It is awarded only biennially.



Success is evidenced in the awards one receives or in one's achievements, but although harder to measure (and beyond a person's trophy cabinet), the highest forms of success might be better reflected by the way in which a person has positively influenced the life of others.

Jan displays many attributes which in combination few humans embrace. He has a sharp and brilliant mind, is considerate and fair, humble, kind, and last but not least has a great sense of humour. I have known Jan since 2005 when he offered me a PhD position in his unit. The four years that followed were amongst the best years in my academic life as he managed to create a working environment in which many of us could thrive.

To honour not only his achievements but also his unique personal qualities, I have invited others to share snippets of their experience of working and collaborating with Jan which are summarized in the following:

**Daniel Costola** (Strathclyde University, UK): "Jan constantly challenged his students and colleagues to find the underlying principles behind the topic we were investigating. He led by example, was always kind and able to put things under a positive light."

**Atze Boerstra** (bba Netherlands, vice-president REHVA): "One thing that I have always admired in Jan is that he has a keen eye for group chemistry. By organizing excursions (e.g. to München, with the man himself as dedicated driver), moderating presentations in a positive and often humorous way, initiating social activities etc. he was to a large extent responsible for the good atmosphere at BPS. Thanks for that!"

**Lori McElroy** (IBPSA President, BRE Scotland): "Jan is someone who has always been generous with his time in mentoring others - no more so than the support and kindness he gave to the current President - when I joined the Board as part of the 2009 organising committee." **Roberto Lamberts** (Federal University of Santa Catarina, Brazil): "Jan came to Brazil in 2006 as a visiting professor for a stay of 3 months. The initial idea was to write a joint journal paper but during his stay he became very worried with the lack of teaching books in Building Simulation. He then decided we should edit Building Performance Simulation for Design and Operation with the help of the IBPSA community that got involved in the chapters. In 2011 the first edition was launched and in 2019 the second and extended edition became reality. This was a great idea and is being used worldwide for teaching. Jan is a fantastic example of a researcher/ lecturer fully dedicated to Building Simulation; I am always learning from him."

**Bert Blocken** (TU Eindhoven, Netherlands and KU Leeuven, Belgium): *"Jan is a great mentor. I learned a lot from him, concerning science and engineering but also life in general. And I am proud to call him a friend".* 

**Rajesh Kotireddy** (TU Eindhoven, Netherlands): "Jan is a great supervisor. I feel privileged to have completed my PhD under his supervision. Under his supervision, we not only grow as a good professional researcher, but also a better human being"

Gülsu Ulukavak Harputlugil (Çankaya University, Turkey): "The first time I had contact with Jan was via email, in 2004, to get a comment on my doctoral topic and studies. Then, in 2005, I got a scholarship opportunity and Jan sent me a letter of acceptance without hesitation, allowing me to participate in his building simulation group at TU/e for 6 months. The building simulation group team had 7-8 researchers from many different countries and cultures. I have very fond memories of these six months; for example, fabulous friendships that I am still keeping in contact with; but also a great teaching and research experience. Jan not only opened up an extraordinary horizon for my research but also taught me how to become a better researcher. He helped me to understand the importance and pleasure of producing work in a team. When I finished my PhD in 2009, Jan came to Ankara-Turkey as one of my examiners. I have always been grateful to him for his trust and faith in me and my study. I must say that defending my thesis against a panel of examiners, including him, was a very important and proud stage of my academic life. I can definitely state that Jan is my academic idol. I learned from him what kind of perspective a researcher should have, and the pleasure of producing research collaboratively. Today, I am an associate professor; when working and training new researchers, Jan's vision and teaching philosophy have contributed greatly. This is a great opportunity for me to express my feelings and thoughts about Jan. I would like to convey my gratitude to him and wish him health and happiness for his entire life."

**Veronica Soebarto** (University of Adelaide, Australia): "The words 'humble', 'wise', 'mentor' come to my mind when I think of Jan Hensen. He is a well-known, well-respected expert in building performance, but he never brags about his expertise. Instead, he mentors others, and indeed he is behind a lot of 'experts' who are now leaders in their fields in their country as well as those who are now active and have become well-respected experts in building performance simulation. Jan is an initiator, but he does this rather quietly. He was actually the one who initiated a formal link between IBPSA and REHVA. With Ian Beausoleil-Morrison, he started the Journal of Building Performance Simulation, which within a relatively short time has increased its Impact Factor significantly. When I was planning to resign from my position as the Editor-in-Chief of IBPSA News back in 2011, he was the one who put me in touch with the person who he thought would do a good job on this. And he was right. That person is still the Editor-in-Chief of IBPSA News today. Jan is a great teacher, a mentor, a true leader who makes others become leaders too."

**Vojtech Zavrel** (Czech Technical University Prague, Czech Republic): "Jan is one of the most inspiring people that I have ever met. He always motivated me and encouraged me to think outside the box. I am thankful for having a chance to work with him."

**Roel Loonen** (TU Eindhoven, Netherlands): "Jan has been active in the IBPSA community for many decades, and he is always happy to share this wealth of knowledge with his students. I really appreciate Jan's ability to give others the chance to develop, while always noticing the important details in every project. Jan's optimistic attitude generates a lot of energy for the research group and the way in which he cares for the human behind the researcher is beyond compare."

**Bruno Lee** (Concordia University, Canada): "To me, Jan is an ideal supervisor offering the best research environment and atmosphere for whoever is entering the door, from exchange students to visiting scholars, and not the least, his own students."

**Isabella Gaetani** (Arup, London, UK): "The first glimpse I had of Jan was during one of the very first 'progress meetings' we had with MSc and PhD students at TU Eindhoven. I was impressed by how Jan had full understanding of the most diverse topics, and always found a challenging but constructive feedback for each student. Since then, the rest is history! Jan is the best 'boss' I have ever had. Through awkward silences and patient repetitions, he shows us the way. He never ceases to surprise and amaze us in every 'human' situation, where he simply does what needs to be done in the best way possible. He loves his students and treats them as family. Every June the BBQ in the Hensens' garden is an unmissable appointment to laugh together and exchange very 'nerdy' jokes. He has a wonderful family that supports him. He has been, is and will always be a great example and guidance for my (academic and non-academic!) life. Thank you, Jan!"

As most readers of *ibpsa*NEWS will know, Jan is Professor and Chair of Building Performance in the Department of the Built Environment, Eindhoven University of Technology (TU/e), and also a part-time Professor in Environmental Engineering in the Department of Mechanical Engineering, Czech Technical University in Prague. His research and teaching focusses on computational modeling and simulation for optimizing the design and operation of high-performance buildings in terms of energy use and indoor environmental quality.

Jan's contributions and outstanding accomplishments in the domain of BPS have been numerous. To highlight a few:

- Jan is the Past-President and Fellow of the International Building Performance Simulation Association (IBPSA), Fellow of the American Society of Heating, Refrigerating and Air-conditioning Engineers (ASHRAE), Fellow of the Federation of European Heating, Ventilation and Air-conditioning Associations (REHVA) and has received several other national and international scientific and practice awards.
- He has supervised and advised approximately 40 PhD students and about 95 final year MSc students in the field of Building Performance Simulation.
- He has authored and co-authored 10 books (including chapters in books) and over 70 scientific journal papers. Over his career he has made more than 250 academic conference contributions and authored 100 professional magazine articles. He is on the editorial boards of Building and Environment, Energy and Buildings and the International Journal of Low-Carbon Technologies. Jan is also the founding co-editor of the Journal of Building Performance Simulation. Last but not least, Jan is the co-editor of IBPSA's first book, *Building Performance Simulation for Design and Operation*. This 536-page book, now in its second edition, has contributions from 21 expert co-authors and is considered a keystone reference book in BPS, providing a unique and comprehensive overview of simulation.

And now Jan's story and thoughts in his own words, with a random selection of 'scenes from a life' alongside ...

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Christina Hopfe (CJH): First of all, many congratulations on receiving a well-deserved IBPSA Distinguished Achievement Award in 2019. Building performance simulation has had more and more impact over recent decades and is now widely established in academia and industry. Your list of accolades as a Professor of Building Performance Simulation is very long. What brought you personally to this field? Tell us a little about your career path.

Jan Hensen (JLMH): It was shortly after the 1973 oil crisis that I started my undergraduate studies in the Architectural Engineering department of Eindhoven University of Technology. Building physics attracted me the most, because of its integrated approach towards people's wellbeing and building energy efficiency. TU/e happened to be one of the places with early research on - and with - building energy simulation. I got really interested in it, and so it became the main theme of my graduation project that I completed in 1981.

I wanted to continue with doctoral studies, but in those days the available places were really scarce. It was only after almost six years - during which I worked for TNO - that a position in Eindhoven became available. By coincidence I came into contact with Prof Joe Clarke who then became my PhD co-advisor. Not long after completing my PhD in 1991, I moved to ESRU at the University of Strathclyde in Glasgow. In 2000 I relocated back to Eindhoven, where I became full professor in 2002. In the same year I also became full professor at CTU in Prague where I had been active since 1993.

Building performance simulation turned out to be a common thread throughout my career. However, due to various circumstances - such as societal/industrial interest and available funding at certain points in time - the specific focus areas changed over time. For example, my PhD research work was about dynamic thermal interactions of HVAC systems, building structure, and occupants' thermal comfort. Since then we have had hardly any projects in this area. It is only during the last couple of years that this topic has regained considerable interest because of energy flexibility in buildings.

### *CJH:* For the newer generation of building performance simulationists, what is your advice in terms of specialising in BPS?

JLMH: Actually I wouldn't advise specializing in building performance simulation. It is a very powerful technique, but at the same time we should not forget that it is just a means to an end. In the building performance context, we primarily use it to analyse building engineering problems (or challenges) and compare/ optimize potential solutions.

The world/society needs solutions. Clever and creative people can come up with these. These people should be well prepared and are expected to use the most appropriate tools available. Building simulation will often be one of those.

Modelling and simulation should be accompanied by experimental work both in laboratory settings (to check the model under assumed conditions; or is the model right) as well as in real world experiments (to check whether the assumptions represent the real world with sufficient accuracy; in other words: is it the right model).





Taking time out in the Blue Mountains of New South Wales after BS 2011 in Sydney. Jan is as comfortable talking about the natural habitat on a wild walk as he is the detail of dynamic thermal modelling! © Michael Wetter







One of many PhD presentations - and some celebrations afterwards

Before any simulation, the real world problem has to be translated into an appropriate simulation model. Afterwards, the simulation results have to be translated into information that can be used for decision making.

Thus in my view the first and foremost requirement for quality assurance is sufficient domain knowledge by the user. In addition, skills and knowledge relating to principles, assumptions and limitations of modelling and simulation need to be acquired. Only with this combined domain and simulation knowledge will it be possible to assure the quality and have confidence in the results and information generated from that.

My advice for students is to look around, and "follow your heart" rather than the prospect of a (financially) successful career. Hopefully you will find - like me - something that truly motivates and gives you energy. Then do your best and try to make the most of it.

No matter whether you intend to become a designer/consultant or rather plan a research career, it will be most important to first acquire domain knowledge. Modelling and simulation should be an integral part rather than the focus of your studies, professional or research work.

## *CJH*: You have done research in numerous fields of *BPS*, recently in robustness and occupancy for example. Being a Professor in Building Performance Simulation what interests you the most at the moment?

JLMH: As an engineer, researcher and teacher I like to contribute to solving "practical" current or future challenges such as decarbonization of the energy supply for residential and tertiary sectors. This implies the need to develop many innovative building solutions such as: building-integrated electricity production, energy storage systems, adaptive building skins, switchable glazing, super-insulation, demand response, grid independency, etc. Furthermore, these innovative solutions must be thoroughly tested to understand how they can be integrated into existing buildings or combined and optimized in new designs, and to determine how robust they may be to future scenarios.

For the optimization we have to consider the various stakeholders and their different (often competing) priorities (e.g. government mainly interested in CO2 emission reduction, versus building owners' interest in investment and operation costs). We also have to consider that many assumptions (future building use and weather in particular) are highly uncertain. This field of multi-stakeholder optimization under uncertainty I find really very interesting.

It is in this context that we have been (and still are) working on fit-for-purpose modelling of various aspects such as infiltration/ventilation, HVAC systems, (BI)PV systems, future weather and occupancy/occupant behaviour. Because of the innovative nature and inherent lack of models, very often experiments are needed as well.

In the past and for the immediate future much attention is rightfully devoted to energy efficiency of buildings and communities. However, it is vitally important to realize that the primary purpose of buildings is to protect against undesirable









Visits to Prague in 2005 and (last picture) 2006



IBPSA Board Dinner Meeting in Hyderabad, India during BS 2015

outside conditions, and in the case of commercial buildings and homes, to provide healthy, comfortable and also, in many cases, productive indoor environments. Awareness of the significant potential benefits of providing these features is rapidly increasing. As such, it can be expected that indoor environmental quality for health and well-being will arguably become more important than energy related performance in the not so distant future.

CJH: the journal of Building Performance Simulation (JBPS) is in its 13th year. Since its inauguration the impact factor has steadily risen and in 2018 it reached an Impact Factor of 3.110, which is comparable with well established and much broader journals such as Building and Environment and Energy and Buildings. This demonstrates the growing interest in this specialism but also the amount of research that is undertaken in the field. Do you foresee continuing upwards growth or do you anticipate this might begin tapering off?

JLMH: Since the launch of JBPS in 2008 there has indeed been a continuous increase in both the quantity and quality of paper submissions. This is critical for JBPS to achieve its objective of publishing only articles of the highest quality that are original, cutting edge, well researched and of significance to the international community.

There is clearly an increasing societal interest in global challenges such as decarbonisation of the built environment, scarcity of building materials and health promotion. It has been shown that building performance simulation can be very useful in addressing these challenges. Therefore it is to be expected that research in this area will keep on increasing for many years to come.

As mentioned before, I expect that in time the focus will shift from energy efficiency to other aspects. In addition we see already that building simulation research is shifting from a focus on modelling and software features towards aspects such as the effectiveness of building performance simulation in building life cycle processes, and the combination of building simulation with artificial intelligence and data science.

We want to ensure that JBPS will (continue to) be the premier outlet for high quality building performance simulation research results. We intend to do this by keeping a close watch on the aims and scope of JBPS, by support of the most knowledgeable reviewers available, by promoting special issues on emerging topics, and by publishing viewpoint articles.

CJH: You have been teaching courses in BPS, yet, I don't think that there is a pure Master's degree solely dedicated to building simulation. Also, as you mention in your previous response the focus of "energy efficiency" might shift to different aspects in the future. Apart from BPS as content for a Master's degree what other courses do you consider crucial in the future of higher educational degrees in this domain?



Jan and Lori McElroy during BS2009 in Strathclyde, Scotland





PhD progress meetings



The annual PhD barbecue in 2006

JLMH: Most engineering studies already include generic computational modelling and simulation related courses or projects in the curriculum. The focus should primarily be on domain knowledge such as building physics, building services, energy systems, etc. Next to the basics, analytical and experimental methods, which are typically covered in the courses, can easily be complemented with knowledge and skills regarding the

various modelling and simulation approaches for that particular domain. In that way modelling and simulation becomes an integral part rather than the focus of study, professional or research work.

CJH: In one of the previous newsletters, Volume 19, number 2, Prof Veronica Soebarto held an interview with you. She referred to Joe Clarke's keynote speech at the BS2009 in Scotland, when he urged IBPSA to take a leading role as a main vehicle for integrated building simulation, linking both researchers/ academia and practitioners. You suggested at the time two main approaches, by either becoming a professional organization (with increased income, sponsorship, membership dues etc.) or by collaborating more closely with societies such as ASHRAE and REHVA. Is this still your personal vision of IBPSA? What are your thoughts about moving towards becoming a professional membership organisation such as CIBSE or, IMECHE for example?

JLMH: First of all I don't think that a "professional building performance simulationist" would be a good idea. Instead it seems to me more relevant/ feasible/ promising if practitioners would have the knowledge and ability to efficiently and effectively use building performance simulation when appropriate. This can be learned during initial studies but also as part of continuing education and knowledge transfer offered by the respective professional organizations.

This is actually already happening. Building performance simulation has developed into a mature technology and field of engineering research and application. Professional organizations (e.g. related to architecture, building services, building physics, lighting, acoustics, energy systems, fire safety, facility management, etc.) already offer modelling and simulation events, continuing professional development courses, and best practice guidance specifically for their own membership. These organizations have much better knowledge about what "their practitioners" need or could use for their professional activities/ responsibilities than we in IBPSA. They are also much better equipped (professionally organized and staffed) for dissemination activities than IBPSA.

Given the above, the most effective role of IBPSA could be to act as transdisciplinary thought leader (science pusher) and "incubator" for new tools, techniques and applications with strong communication links and relying on other organizations in relation to (practice/practical pull) demands from and dissemination to practice. Based on this, IBPSA could focus on novel research, innovative applications, and exchange of knowledge and experiences between different domains, while seeking cooperation with the above-mentioned professional organizations for feedback and dissemination purposes.

CJH: Last but not least, I noticed a recent announcement that the previous Dean of TU Eindhoven, Professor Elphi Nelissen will take over from you as the chair of Building Performance and that you became emeritus professor in 2019. Do you have new plans for your retirement or do you see yourself continuing to stay engaged with IBPSA in some form or another?

JLMH: Last year I reached the mandatory retirement age in The Netherlands, but I'm still part-time active at Eindhoven University of Technology and at the Czech Technical University in Prague. Professor Elphi Nelissen took over my administrative duties in Eindhoven and will focus on building sustainability.

Because I enjoy it so much, I'm still actively involved in several building performance simulation based research projects as well as in various related activities such as PhD advisor, MSc project supervisor, external PhD examiner, peer reviewer for several scientific journals and expert evaluator for various national and international research funding organizations, and of course I remain open to suggestions.

I've been active in IBPSA ever since 1993 and I hope to be able to make useful contributions for a long time to come.

CJH: Thank you, Jan!

## **Forthcoming events**

Date(s)	Event	Further information
2020		
17 April 2020	Architecture At Zero Competition registration deadline	info@architectureatzero.com
25-27 May 2020 ONLINE	SIMAUD online conference	www.simaud.org
26-27 May 2020 POSTPONED	Joint ASHRAE / IBPSA Research Symposium Galway, Ireland	magdalena.hajdukiewicz@nuigalway.ie
01-03 June 2020 NEW DATE	International HVAC+R Symposium Istanbul, Turkey	www.ttmd.org.tr/2020symposium
15-16 June 2020 POSTPONED to September - date tba	eSIM 2020 Vancouver, Canada	http://esim2020.sala.ubc.ca
12-14 August 2020	SimBuild (IBPSA USA and ASHRAE) Chicago, Illinois, USA	http://ashrae.org/BuildPerform2020
September 2020 ONLINE - date tba	Building Simulation & Optimization 2020 online conference	www.bso2020.org
23-25 September 2020	BauSIM 2020 Graz, Austria	www.bausim2020.tugraz.at
13-14 October 2020	Buildsim-Nordic 2020 Oslo, Norway	http://ibpsa-nordic.org
11-12 November 2020	<b>uSIM: Modelling, simulation and analysis of</b> <b>future urban energy systems</b> Edinburgh, Scotland, UK	www.usim20.hw.ac.uk
12-13 November 2020 NEW DATE	<b>IBPSA France 2020</b> Reims, France	www.ibpsa.fr http://conference2020.ibpsa.fr
07-09 December 2020	ASim: 5th Asia IBPSA conference Osaka, Japan	https://asim2020.org
2021		
23-27 January 2021	ASHRAE Winter conference Chicago, Illinois, USA	www.ashrae.org/conferences/2021-winter- conference-chicago
01-03 September 2021	BS2021 Bruges, Belgium	https://bs2021.org

Note that the dates in this calendar may, but do not necessarily, include pre and/or post-conference workshop days



### A COMPETITION FOR ZERO NET ENERGY ARCHITECTURE

The design challenge is to create a zero net energy library for the San Benito County Free Library in Hollister,

This competition, sponsored by Pacific Gas and Electric Company, serves to inform the public of the need for more energy efficient buildings and the value of design excellence in resolving the challenge.

### AWARDS

Up to \$25,000 in total prize money will be awarded to students and professionals.

### ELIGIBILITY

Architects, designers, urban planners, landscape architects, engineers and interns and students of these disciplines.

### **REGISTRATION DEADLINE**

April 17, 2020 6:00 pm PST

FEE Students (free) Professionals (\$275)

JURY **OUESTIONS?** Gregg D. Ander, FAIA info@architectureatzero.com Marsha Maytum, FAIA Cole Roberts PE, LEED AP Paul Torcellini, PhD Allison G. Williams, FAIA The Architecture at Zero competition challenge is to create a zero net energy (ZNE) library for San Benito County Free Library in Hollister, CA. The new building will replace the existing structure. First, entrants will create an overall site plan and are encouraged to highlight any energy efficiency strategies or systems shown. Second, entrants will design the building in detail, and should demonstrate how the design will achieve zero net energy (ZNE) performance. In order to support that the building design can meet the ZNE performance goal, entrants will provide required documentation and may also include supplementary documentation. The competition is open to students, architects, landscape architects, urban planners, engineers and designers anywhere in the world. Up to \$25,000 will be awarded to student and professional winners. For further information visit www.architectureatzero.com AIA Together, Building a Better California California



Copyright © 2019 Architecture at Zero, All rights reserved. Registered for 2017 competition

Our mailing address is: Architecture at Zero

870 Market Street Suite 1221 San Francisco, CA 94102 **ASHRA** 

**ASHRAF** 

### **ASHRAE Ireland Chapter**

### **IBPSA - Ireland**

American Society of Heating Refrigeration & Air-Conditioning Engineers International Building Performance Simulation Association

### Joint ASHRAE / IBPSA Research Symposium on Building Performance Analysis 2020 Alice Perry Engineering Building National University of Ireland Galway Tuesday, May 26th & Wednesday, May 27th, 2020

ASHRAE Ireland Chapter & IBPSA-Ireland are delighted to host a Research Symposium on Building Performance Analysis to be held at National University of Ireland, Galway.

### ASHRAE Ireland was founded to promote and disseminate all aspects of HVAC technologies to professionals and industries in Ireland.

IBPSA-Ireland was founded to advance and promote the science and sech ology of building performance simulation in Ireland.

### **Symposium Aim**

The overall aim of the symposium is to bring together graduate students and researchers from Irish third-level institutions who are engaged in research related to an available and simulation of the built environment. Given the diversity of ongoing research, the symposium will act as a unique forum to highlight both the breadth and depth of activity in the building simulation arena, as well as providing an opportunity for researchers to discuss and share their experiences.

### Presentation/Poster Suon ission

Researchers and graduate students are invited to give a short presentation or submit a poster to showcase their current research to the rest of Ireland' obvilding simulation community.

### Symposium Zi

To facilitate networking opportunities amongst participants a symposium dinner will be take place on the evening of Tuesday, yhav 26<sup>th</sup> at a central Galway city location.



### Registration

To register your interest please email magdalena.haidukiewicz@nuigalway.ie. If you would like to give a talk or present a poster at the symposium, please indicate your preference accordingly and forward a title, keywords and short abstract by email to the same address before March 31<sup>st,</sup> 2020. There is no registration fee to attend the symposium, but dinner will be at the expense of the individual participants. All building simulation stakeholders are invited to attend.

**Organising Committee:** Dr Marcus Keane, Dr Magdalena Hajdukiewicz, Dr Donal Finn and Dr James O'Donnell **Contact**: <u>magdalena hajdukiewicz@nuigalway ie</u> 01-03 June 2020 Istanbul, Turkey www.ttmd.org. tr/2020symposium



### 14th International HVAC&R Technology Symposium

The 14th International HVAC&R Symposium of the Turkish Society of HVAC and Sanitary Engineers (TTMD) will be held in Istanbul from 2-4 April 2020 with contributions from universities, industry, public agencies & institutions, and non-governmental organizations. The event combines an international conference on innovative technologies and practices in HVAC with an exhibition of related science and technology. The main theme will be **Resilient HVAC Solutions to achieve a more Sustainable Future**, and the symposium includes a session devoted to modeling tools and simulation organised in coordination with IBPSA-Turkey.

The deadline for submission of papers is **01 December 2019**.

For more information please visit www.ttmd.org.tr/2020symposium or email either symposium@ttmd.org.tr or ibpsa.tr@ttmd.org.tr. ■



BUILDING SIMULATION MEETS BUILDING DATA

15-16 June 2020 POSTPONED Vancouver, Canada http://esim2020.sala. ubc.ca

### eSIM 2020: IBPSA-Canada biennial conference

The coronavirus has forced us to postpone eSim 2020, which will now take place in September 2020 — exact dates will be announced shortly.

eSim is the conference of IBPSA-Canada, held biennially since 2001. IBPSA-Canada is one of the largest and most active of the 28 Regional Affiliates of the International Building Performance Simulation Association, with over 600 members. Though its reach for 2020 is global, eSIM will continue to represent the community of Canadian practioners and researchers pursuing advances in building performance simulation.

### **Background & themes**

This year's theme is *Building Simulation meets Building Data: exploring new synergies* between building simulation and data-driven methods of building analysis.

The building performance simulation domain is evolving. The increasing availability and affordability of collecting data from buildings is making it easier for simulation modelers to either calibrate physics-based models with data, or altogether replace some of these models with data. eSIM 2020 will explore synergies between simulation and data-driven methods of building analysis. An emphasis will be placed on new advances in machine learning and surrogate modelling techniques for building performance simulation; novel uses of operational building data and Internet of Things sensors; data-driven decision-making for building design and retrofits; and closing the performance gap. This broad theme will help

the conference to extend beyond the traditional building simulation audience to include energy auditors and energy service providers, software developers and policy-makers.

### **Topics**

- Building operations & controls
- Occupant behaviour, comfort and well-being
- Whole-building design
- Innovative HVAC systems and components
- Innovative building envelope systems
- Airflow / infiltration / natural ventilation
- Urban / district / community / stock modelling
- Renewable energy systems and components
- Impact of climate / future climate on building performance
- Simulation in practice
- The Internet-of-Things (IoT) and IoT-integration with building simulation
- Machine learning for building energy applications
- Surrogate-modeling / fitting models to synthetic data
- Optimisation / Design space exploration
- Parametric building design
- Data collection / sensors / smart meters / smart thermostats
- Model calibration to measured data
- Analysis of measured data / big data
- Code compliance / code development / incentive programs

We have received around 90 full papers and 15 practitioner papers, and will also host 5 workshops covering relevant topics.

The keynote speakers will be Dr Clayton Miller, Director of the Building and Urban Data Science (BUDS) Lab in Singapore, and Susan McDougall, founder of Focal Engineering in Victoria, BC and prolific contributor to the local energy modelling community.

We will also host a Power-Hour for Women in Energy Simulation and a candid panel discussion on the BC Energy Step Code.

eSim 2020 will be held at the University of British Columbia (UBC) in beautiful Vancouver, British Columbia, Canada. Ample discounted on-campus accommodation will be provided to conference participants. Further details are available from the conference website.

### **Further information**

Further information about the conference and submission arrangements can be found at http://esim2020.sala.ubc.ca.

12-14 August 2020 Chicago, IL, USA http://ashrae. org/BuildPerform2020

JOINTLY HOSTED BY ASHRAE AND IBPSA-USA

### 2020 SIMBUILD BUILDING PERFORMANCE ANALYSIS CONFERENCE

Westin River North, August 12–14, 2020 in Chicago, IL

Get updates from top experts in the energy simulation industry

### **Highlights:**

- Focus on practical applications using existing tools
- IBPSA-USA Project Stasio Competiion
- ASHRAE LowDown Showdown modeling challenge
- PDHs, AIA LUs and LEED AP credits available
- Virtual conference
- Vendor demonstrations
- Pre-conference courses on the 10th and 11th

www.ashrae.org/BuildPerform2020 Submit abstracts here: https://www.conftool.org/bpacs2020/ Scan this code to visit the conference website

23-25 September 2020 Graz, Austria www.bausim2020. tugraz.at

### **BauSIM 2020**

Preparations are under way for the BauSIM 2020 conference at Graz University of Technology from 23-25 September 2020. Despite the challenging situation caused by the Coronavirus, the conference is set to take place as planned. More than 130 abstracts were submitted covering the entire spectrum of conference topics. The extended full paper deadline is 5 April 2020. The BauSIM 2020 team would like to thank all authors for their contributions and is looking forward to welcoming you in Graz.

For more details, read the flyer on the next page and visit www.bausim2020.tugraz.at.



#### 23 - 25 September BauSIM 2020

#### Invitation

We are pleased to invite you to attend the 8th BauSIM Conference at Graz University of Technology. The BauSIM Conference has been organized under the auspices of IBPSA Germany and Austria since 2006 and takes place every second year. Building and district simulations and associated methodologies are at the focus of the conference. Emphasis is also placed on complementary topics such as building information modelling (BIM), component-level simulations or monitoring and operation of buildings and urban systems. The conference addresses stakeholders from science and education, the construction industry (design, planning, construction and operation), software development and public administration. It provides a forum for presenting research results and for multidisciplinary discussions of the latest trends in the field of simulation-based design of sustainable buildings and districts.

Linking and integration of data are increasingly shaping developments in both, building simulation and BIM. Based on the contents of the previous conferences, BauSIM 2020 will thus put a special focus on topics related to this most relevant field of research, including the development of digital twins, the use of IoT technologies for energy optimization of buildings and districts as well as the use of machine learning in the context of building operation and user behaviour.

We are looking forward to your participation and to an interesting and inspiring conference

Michael Monsberger | Markus Krüger | Alexander Passer

### 23-25 September 2020 Graz, Austria www.bausim2020.tugraz.at

#### **Topics BauSIM 2020**

- BIM-based planning tools and integration approaches
- District building system human
- Lifecycle-oriented modelling and simulation of buildings and urban systems
- Modelling of building physics on construction component level
- Numerical procedures, optimising and implementation
- Product data and databases
- Validation scenarios and quality management
- Monitoring and optimising operation of buildings
- and urban systems Teaching, training and further education in the field of simulation
- Knowledge transfer into simulation practice and case studies

For more details about the conference topics, visit the BauSIM 2020 website.

#### **Important Dates**

- Deadline for abstracts: 31 October 2019
- Deadline for full papers: 15 March 2020
- Early bird registration until: 30 June 2020

The main conference language at BauSIM 2020 will be German, but sub-missions in English are also accepted. Depending on the number of English submissions, entire sessions will be held in English.

#### Chairs

Michael Monsberger

Graz University of Technology Institute of Construction Management and Economics | Building Services Work Group

#### Markus Krüger

Graz University of Technology Institute of Technology and Testing of Construction Materials

Alexander Passer Graz University of Technology Institute of Technology and Testing of Construction Materials | Working Group Sustainable Construction

#### **Conference Secretariat**

### Marta Mierzeiek

Graz University of Technology Institute of Construction Management and Economics

- a bausim2020@tugraz.at Lessingstraße 25/III 8010 Graz
- Austria

### In cooperation with:



### 8th Conference of IBPSA *ibpsa* Germany and Austria

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### BauSIM2020

23 - 25 September 2020 Graz University of Technology

#### **City of Graz**

Graz, the capital of Styria, is the second largest city in Austria with about 293,000 inhabitants. It is an attractive and cosmopolitan city, where people from 160 different nations live. The city of Graz hosts four universities and two universities of applied sciences with over 50,000 students. Graz is located in the foothills of the Alps at the river Mur and impresses you with its southern flair and the nearby vinevards of the famous southern Styrian wine region. The historic city centre, which is placed around the Schlossberg with the well-known clock tower 'Uhrturm', and the castle Schloss Eggenberg have been declared UNESCO World Heritage Site. Graz was European Capital of Culture in 2003 and has become a UNESCO City of . Design in 2011.

#### **Graz University of Technology**

Science - Passion - Technology: Established in 1811. Graz University of Technology is located in the centre of Graz. It currently has over 13,000 students in the fields of natural sciences and engineering. The graduates from Graz University of Technology, around 1,000 per year, are in high demand on the employment market. The unique and strong networking with regional and international business partners is a crucial factor of success for the university in its five Fields of Expertise. The mission of Graz University of Technology is driven by strong passion for a responsible and sustainable development of our society, economy and environment.







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13-14 October 2020 Oslo, Norway https:// buildsimnordic2020. ibpsa-nordic.org

### **BuildSim-Nordic 2020**

Organized in cooperation between IBPSA-Nordic, OsloMet University in Oslo and the Norwegian Society of HVAC Engineers (Nemitek), this conference is open to members and non-members of IBPSA-Nordic. Any research related to building simulation, including system design, HVAC, energy production/use, indoor climate and environmental issues, is eligible to be presented at the event.

We have already received more than 80 abstracts! All authors of accepted abstracts will be invited to submit a full paper and to give an oral or poster presentation at the event. The papers accepted for oral presentation will be published in the conference proceedings published by SINTEF Academic Press. A selection of the best papers will be put forward for inclusion in a special edition of the International Journal of Building Performance Simulation published by Taylor & Francis.





### Preliminary programme





### Welcome to ASim2020

*The 5<sup>th</sup> Asia Conference of International Building Performance Simulation Association* 

### 7-9 December 2020, Osaka, Japan

Welcome!! We sincerely invite you to attend the 5<sup>th</sup> Asia Conference of International Building Performance Simulation Association – Asim2020, held on 7 -9 December, 2020 in Osaka, Japan. This biennial conference will provide a platform for academics, professionals, consultants, designers, engineers and research students exchange ideas, knowledge and information about building performance simulation. ASim2020 program will include keynote speeches, technical sessions, workshop session and poster presentations discussing all aspects of building performance simulation. We are looking forward to seeing you in Osaka!

### Call for abstract

Participants interested in making an oral or poster presentation on the topics listed below are invited to submit abstracts up to 300 words.

### Topics

- 1. Building physics
- 2. Simulation and real performance
- 3. Simulation in design practice
- 4. Simulation for regulation/code compliance and certification
- 5. Software/Interface development, test and validation
- 6. Simulation to support commissioning, controls and monitoring
- 7. Case studies of building simulation application
- $8. \ Community/Urban\ scale\ modelling\ and\ simulation$
- 9. Occupant behavior in buildings
- 10. Indoor environment: comfort, air quality, lighting and acoustic
- 11. Optimization of control and design
- 12. BIM and BEM
- 13. Uncertainty and sensitivity analysis
- 14. AI, machine learning and data-driven model

#### **Important Dates**

- Abstract submission deadline Abstract acceptance notification Draft paper submission deadline Paper acceptance notification Early registration deadline Online registration deadline Onsite registration and technical tour
- : May 10, 2020
- : June 5, 2020
- : August 5, 2020
- : September 7, 2020
- : October 23, 2020
- : November 31, 2020
- Onsite registration and technical tour: December 7, 2020Conference main program: December 8 and 9, 2020



https://asim2020.org/

### Organized by

International Building Performance Simulation

Association Japan.



#### Conference chairs

SHIMODA Yoshiyuki (Osaka University) YAMAGUCHI Yohei (Osaka University)

#### Venue

Osaka International Convention center (5-3-51, Nakanoshima Kita-ku, Osaka, JAPAN)





01-03 September 2021 Bruges, Belgium https://bs2021.org

## **BS 2021** 17th IBPSA International Conference & Exhibition

Following the successful BS 2019 in Rome, Bruges — 'the Venice of the North' — is hosting our next world building simulation conference. BS 2021 is scheduled for 1-3 September 2021, so save the date in your calendars now.

Bruges, a UNESCO world heritage city in Belgium, has flourished since the middle ages, and has kept its original and charming atmosphere ever since. A network of canals connects the numerous historical buildings in the center. The Belfry halls, located at the central market place, will be the heart of our conference. Bruges is a short 20 km distance from the coastline, and only 60 minutes by train from Brussels and two and a half hours from London, Paris and Amsterdam.

BS 2021 is being organized by a team of very enthusiastic people drawn from two universities (Leuven and Ghent) and two companies (Boydens Engineering and Daidalos-Peutz), assisted by the regional affiliate IBPSA-NVL.

As ever, the key to a great conference will be a good mix of academics, R&D people, practitioners and policy makers, and the conference is being planned to appeal to them all from day 1.



The social side of conferences is important, too. Amongst other events, BS 2021 will include a competition to compose a BS 2021 Bruges belfry theme. Musician members of our community are invited to write an original and exiting polyphonic song for the 47 bells of the impressive carillon in the Bruges Belfry, which will wake up the city every day, while we make our way to the conference sessions beneath the tower. If the challenge of composing the belfry theme appeals to you please email music@bs2021.org for more information.

Practical organisation of BS 2021 is in the hands of the KU Leuven Conference Office, who will help you wherever they can; please send any questions to info@bs2021. org.

We will keep you informed about progress in organising the conference through our website https://bs2021.org.



## Software news



### **BESOS: A Building and Energy Simulation, Optimization and Surrogatemodelling platform for the 21st century**

Ralph Evins, Theo Christiaanse &Gaëlle Faure, Energy in Cities group, University of Victoria, Canada

Imagine you woke up this morning with an urgent need to test the impact of different window-to-wall ratios on the energy demand of a particular building design. You have several choices. You can manually edit your model and run it for a series of options, then collate the results in Excel. Maybe your simulation program has some features to help you with this. You could maybe achieve something with the Parametric object in EnergyPlus.



Grasshopper could handle the geometric aspects, and might even play nicely with the simulation engine. But what if you want to vary many parameters at once? What if you want to make an interactive tool to rapidly interpolate between these many options? And then you want to apply all this again on your next project? At some point, existing workflows break down.

The Building and Energy Simulation, Optimization and Surrogate modelling platform (BESOS, http://besos.uvic.ca) may be able to help. Currently aimed at academics (we're working on a version for industry!), the platform provides a cloud-based Jupyter Notebook interface to run our Python library for surrogate-modelling of parametric building energy simulations. Let's quickly explain each of those terms. Cloud-based means it runs in your web browser from anywhere, using a supercomputer to do all the heavy lifting. Jupyter Notebooks (https://jupyter.org) interweave explanatory text, links and graphics with chunks of executable code, with the results (tables, graphics etc.) shown inline. Our Python-based BESOS library<sup>1</sup> (https://gitlab.com/energyincities/besos) provides lots of wrappers that hide complex code, so what you see in the notebook looks quite simple. Surrogate modelling (https://doi.org/10.1016/j.enbuild.2019.05.057) fits a machine-learning model (we don't like calling it AI, this isn't SkyNet) over a set of samples from a simulation program, providing a fast 'surrogate' for the underlying detailed model - more on this later.

<sup>&</sup>lt;sup>1</sup> We build on lots of other Python libraries, like EPPy for model editing, seaborn for plotting etc. Python itself is rapidly becoming the obvious choice for most programming tasks, from quick scripts to huge codebases.

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CIVE453	8 months ago			
CIVE580	3 months ago	This markdown cell gives a description of the code cell below.		
Examples	8 months ago	The sublation of the sublation (the basis of the sublation and )		
modelica	3 months ago	param = Parameter(FieldSelector('Lights', '*', 'Watts per Zone Floor Area'),		
MyExamples	8 months ago	value_descriptor=RangeParameter(8, 12)) # specify a parameter with a range		
testeplus	8 months ago	problem = EPProblem(param, objective) # link the parameter and objective into a problem		
🗅 Zcase12 CT0 bc grid fa	6 months ago	evaluator = EvaluatorEP(problem, building) # Link the problem and building into an evaluator		
CANARIEDemo.ipynb	8 months ago	<pre>inputs = sampling.dist_sampler(sampling.ins, problem, 5) # generate 5 sample evaluations samples = evaluator.df_apply(inputs) # run them</pre>		
C clf.pickle	5 months ago	<pre>samples.plot(style='x') # plot the results</pre>		
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The screenshot above shows the BESOS Jupyter Lab interface, with the file system and plugins on the left and a short example notebook on the right. The grey code cell shows how in 8 lines we can complete a simple parametric analysis, here varying lighting power density and reporting electricity use. The parameter and objective fields match the object names in the EnergyPlus model; these are combined into a problem object, which could be easily applied to different IDF files to make different evaluator objects. The last 3 lines generate 5 random samples, execute EnergyPlus for each, with the resulting plot shown in the final cell. This mix of descriptive comments, executable code and the resulting tables or plots leads to a very exploratory way of writing code, analogous to a laboratory notebook.



Surrogate modelling provides a way to generate approximate solutions which are easily accurate enough for early-stage design, and incredibly fast to evaluate, without requiring a vast number of samples or a lot of time to fit the model. As an example of this, the figure above gives details of a substantial surrogate model, which has 32 parameters spanning geometry, materials, set points, ventilation and building systems. The plot on the right compares the actual EnergyPlus results (x-axis) with the surrogate model result (y-axis), and gives some summary statistics like the R2 score of 0.996 and the mean absolute percentage error (MAPE) of 3.65%. The model was fitted on 8,000 EnergyPlus samples (total run time ~ 24 hours on a 16 core machine). The surrogate model returns a result in 32 microseconds, meaning we can generate a million samples in 32 seconds. Our BESOS library is organised to make it easy to integrate the machine learning methods needed to build surrogate models with the parametric building energy models needed to generate the underlying samples.



Put all this together and we have a powerful but easy-to-use tool for conducting a parametric analysis over an EnergyPlus model and fitting a surrogate model to the resulting samples. The surrogate model can then be connected to an interactive visualization as shown in the image above, allowing the end-user to explore the design space in an intuitive manner. This simple example shows the output of a surrogate model built on the parameters of solar heat gain coefficient (SHGC) and lighting power density (LPD). The surrogate has been used to densely sample the space, to provide the coloured plot, and is also directly connected to the sliders, which move the marker and report the model result as text. We are exploring much more advanced ways to provide interactive visual tools linked to surrogate models as an aid to design space exploration.

One of the driving aims of BESOS is to dramatically lower the barrier to entry to these types of analysis, so it takes new users hours rather than weeks to get going. This is achieved by keeping the core code behind the scenes in the repositories (though these are open-source and easily editable by advanced users), while the notebooks provide for easy, flexible configuration of a novel problem using only relatively simple code. This will allow building simulation users who are new to parametric modelling, Python or surrogate modelling to easily explore these new topics. It will also allow relatively advanced simulation tasks to be undertaken by users from other domains, for example simulating building demands to link with an electricity grid model, facilitating interdisciplinary research.

BESOS provides many example notebooks (currently around 40), which act as tutorials for different parts of the platform, and can be easily edited to suit your particular purpose. These include:

- different ways of setting up parameters to edit aspects of a model, including more complex parameters, pre-defined parameter sets, custom parameter functions and error handing;
- different surrogate modelling approaches, including the standard scikit learn library and Google's TensorFlow library for developing advanced neural network models;
- different interactive 'apps' linked to surrogate models.

BESOS also includes other aspects of energy modelling, as shown in the opening image. The Energy Hub library can be used for solving energy system load balancing and sizing problems using mixed-integer linear programming, though this library is less polished at the moment. Optimization algorithms can be linked to any of the evaluators above (EnergyPlus, surrogate models, energy hub models). We are continuing to develop more machine learning examples for analysing measured building data. All of the domains of BESOS can be easily linked into hybrid analyses, for example linking energy demands from a building simulation with an energy system optimization using the energy hub library.

The hosted Jupyter Notebook environment fits well with this flexible approach targeting many different user groups. Novice users can make small edits to example notebooks, while expert users can build on the underlying repositories. Notebooks themselves can be parametric components of a bigger workflow using papermill, and large jobs be executed on high-performance computing clusters<sup>2</sup>. It's easy to export your work from the platform (as a Notebook, pure Python file or PDF report) if you want to shift to a different environment. It's also easy to collaborate via the platform by requesting a folder that is shared with only your project partners. We're working on ways to make it easy to publish a notebook for others to interact with, to be used as 'apps' to disseminate your results or as an 'executable paper' to accompany a publication.

We hope this article will whet your appetite to try using the BESOS platform for surrogate modelling and other types of analysis. It's available free for non-commercial use - sign up at besos.uvic.ca! If you're interested in using BESOS for commercial projects, please fill in this form to let us know. If you have questions, comments or suggestions, please let us know at besos@uvic.ca. Happy (surrogate) modelling everyone!



The BESOS Platform was developed with support from the CANARIE Research Software Program. For more information visit https://besos.uvic.ca and https://gitlab.com/energyincities or email besos@uvic.ca.

<sup>&</sup>lt;sup>2</sup> We provide a reasonable amount of cloud computing resources on a fair-use basis for academic use, and instructions on how to run models on your own HPC resources.



### IBPSA Project 1: Update on city quarter and building information modeling

Avichal Malhotra, Eric Fichter, Gerald Schweiger, Jérôme Frisch, Christoph van Treeck

### **Project overview**

IBPSA Project 1 (https://ibpsa.github.io/project1) aims to create open-source software that can form the basis of next generation computing tools for the design and operation of building and district energy and control systems. It extends work conducted under the IEA EBC Annex 60 (www.iea-annex60.org). All work is open-source and built on three standards:

- Industry Foundation Classes (IFC) for data modeling at the building scale,
- City Geography Markup Language (CityGML) for data modeling at the district scale, and
- Modelica for modeling the performance of building and district energy systems.

The project runs from summer 2017 to summer 2022. It coordinates and further develops the work of its more than 30 participating organizations. The project is structured in three parts:

- Task 1 is developing a Modelica library for energy modeling, a Building Optimization Performance Test framework and a Modelica library for Model Predictive Control (MPC);
- Task 2 is to develop a GIS/BIM data model to Modelica translators for individual building and community energy systems
- Task 3 is developing a District Energy System Validation Suite and coordinating case studies.

This article describes the ongoing work and recent developments within Task 2 on City Quarter Information Modeling (WP 2.1) and Building Information Modeling (WP 2.2). This task addresses the transformation process from digital district and building information models into different energy simulation environments for energy performance analysis.

### WP2.1 City quarter information modeling

This work package addresses city and district level energy performance simulations for residential and non-residential buildings. A key goal is to develop and compare different workflows using data models such as CityGML, an open XML based format, and its Energy Application Domain Extension (EnergyADE) for energy related computations. This work package also deals with developments and comparisons relating to energy simulation results using environments such as Modelica, EnergyPlus, etc. Using different modeling approaches, statistical and manual enrichment techniques, a range of toolchains and workflows for multiple geographical contexts and application use cases are demonstrated. In the past, many constructive discussions between educational and industrial experts have led to extensions in the functionalities of pre-developed toolchains and the development of some new ones. Highlighting data exchange and usability requirements along with country-specific data mapping approaches, the team started with archetypal definitions of buildings with respect to the generalization of country-specific age-bands, geometrical forms and building functions. In developments, a review of country specific data availability and acquisition techniques for city quarter energy analysis was conducted. To bridge the gap between acquisition and processing of diverse datasets for energy performance modelling and simulations at city quarter level, an open-source Universal Data Categorization Template (UDCT) has been developed.

### Universal Data Categorization Template (UDCT)

The UDCT will provide a platform for contributing and disseminating information that could be used by the community for geographical, cadastral and energy related applications. In order to design this template, a study was carried out that introduces several universal data categories to facilitate and harmonize data collection. Firstly, this study defines the different datatypes (shown in Table 1) that are used for district level simulations:

Datatype	Description
Primary	Information that can be directly used for simulations. (e.g. building height)
Secondary	Mainly used to classify the characteristics of a building. (e.g. building usage)
Tertiary	Statistical information used with secondary datatypes to provide primary inputs for simulations. (e.g. building typology)

### Table 1: Datatypes and descriptions for UDCT

Although data used for city level energy simulations vary in resolution, usage, management and most importantly definition, the concept of data categorization is refined by taking previously implemented approaches and researches where the creation of building energy data models for districts is subdivided into different segments. Categories from building types to occupant compositions are identified with their datatypes (as defined in Table 1) respectively. Furthermore, as well as categorizing fundamental information, existing data models (such as CityGML, IFC) are also defined.

In addition to datatype identification, data categorization and data models definition, a detailed investigation of availability and acquisition techniques for essential simulation related data has been carried out. This analysis gave an insight into data availability types, such as open or commercial, and data holders, such as governmental or private organizations. As a first step, this investigation was carried out for Austria, Germany and Switzerland; the team expects to add data for other countries.

The UDCT will allow prospective scientific and non-scientific contributors to extend the template with much more information in an open way and will be available as a web-based template where participants can obtain information from past studies as well as contributing their own data.

### WP2.2 Building Information Modeling

Following the concept of Open BIM, building models should be exchanged between all planners using non-proprietary file formats. One of those file formats is Industry Foundation Classes (IFC), standardized in ISO 16739 and developed by the organization buildingSMART. Among others, IFC files can be used to transfer building data for the purpose of building energy simulations. Some challenges that occur using IFC are the determination of the accuracy and completeness of the transferred data. Hence, work package 2.2 aims to demonstrate a workflow connecting building models in the data format IFC 4 with building energy simulation programs such as EnergyPlus. The focus lies on the verification of relevant simulation parameters using model checks and on the generation, transfer and use of thermal space boundaries.

Model View Definitions (MVD) are subsets of the overall IFC schema to describe a data exchange for a specific use or workflow. An MVD can be defined as a machine-readable file as MVDXML to verify and filter IFC files according to predefined rules. In the Annex 60 project, an MVDXML for building energy simulation was defined. Because of the limited support by CAD software, the MVDXML could not be applied to IFC files. In WP 2.2 an MVD Checker was developed and made accessible in the KIT FZK Viewer 5.5<sup>1</sup>. The checker allows analysis of a building model on a semantic level of the IFC schema. Among other things, the following criteria are checked: names, description and geo reference of IfcProducts, availability and space boundaries of IfcSpaces and properties of IfcMaterials.



Figure 1: After defining the exchange requirements of the simulation (left), a model view definition can be set up as a subset of the overall IFC model (right)<sup>2</sup>

In WP 2.2, an IFC parser based on the library IfcOpenShell is in development. The aim is to collect all relevant simulation parameters, for example material properties (density, thickness), U-values, thermal zones and electric equipment. This information can be collected and populated into a python class structure. The data can then be exported into an IDF (Intermediate Data Format) file, which forms the basis of the building energy performance simulation in EnergyPlus.

WP 2.2 aims to develop geometric algorithms to generate missing space boundaries in the IFC file, that can later be imported by the parser. First, the geometry is generated as BREP (boundary representation) using the library OpenCascade. Currently, the

<sup>1</sup> URL: www.iai.kit.edu/1302.php

<sup>2</sup> Book: Building Information Modeling: Technology Foundations and Industry Practice (2018), Springer

focus lies on planar faces, that are maintained in their highest polygonal order. Curved faces have to be triangulated. A geometry checker analyzes the shapes for topological and geometrical correctness. For example, correct face orientations are necessary for the algorithms. An octree implementation is capable of detecting spaces and their surrounding building elements based on the building's geometry. This is the current state of the work package. The algorithm to be developed in the near future heals gaps in this geometrical selection and extracts second level space boundaries by Boolean and topological operations. Initial tests have already been conducted.



Figure 2: Parsed space boundaries from the IFC file (KIT Institute). Left: colorization according to surface type (wall, roof, window). Right: different thermal zones



Figure 3: Octree of an IFC building model (FZK-Haus). Red areas on the right show identified open spaces

### Outlook

The next steps of WP 2.1 are firstly focused on making the UDCT openly available to the community over the web. The team will continue investigating data availability in multiple countries on the basis of the categorization. Developing new workflows along with examining and enhancing the existing energy simulation related toolchains will also be done in parallel.

A future goal of work package 2.2 is the further development of the tools and codes. The space boundary generation needs to be faster and more robust. Also, the space boundary information needs to be written into the IFC file, that can be checked and parsed again. Regarding the process IFC to IDF, more information has to be transferred. Currently only selected data is converted automatically.

### **Further information**

For further information about IBPSA Project 1 and how to join this joint collaboration, please visit https://ibpsa.github.io/project1.



## Updated simulation climate data for entire world available from Climate.OneBuilding.Org

Climate.OneBuilding.org has completely updated the TMYx data since the October 2019 *ibpsa*NEWS! Our TMYx weather data set for building simulation now uses source data through 2018. More than 13,500 locations are available worldwide. For locations in the USA, Canada, Mexico, Central and much of South America, solar data from NSRDB PSM V3 (https://nsrdb.nrel.gov) are included.

TMYx are derived from the ISD (US NOAA's Integrated Surface Database) with hourly data using the TMY2/ISO 15927-4:2005 methodologies. These TMYx include access to more data within the source ISD, improving their consistency and quality. More details on the numbers of locations by WMO region are shown below. There may be two TMYxs for a location, e.g., Washington Dulles Intl AP, VA, USA: USA\_VA\_Dulles-Washington. Dulles.Intl.AP.724030\_TMYx and USA\_VA\_Dulles-Washington.Dulles.Intl.AP.724030\_TMYx and USA\_VA\_Dulles-Washington.Dulles.Intl.AP.724030\_TMYx.2004-2018. In these cases, there's a TMY for the entire period of record and a second TMY for the most recent 15 years (2004-2018). Not all locations have recent data.

Climate.OneBuilding.org now provides worldwide climate TMYx data for building simulation at no cost for more than 13,500 locations and another 3,200 from other data sources worldwide. All data have been through extensive quality checking to identify and correct data errors and out of normal range values where appropriate.

Each climate location .zip on Climate.OneBuilding.org contains: EPW (EnergyPlus weather format), CLM (ESP-r weather format), and WEA (Daysim weather format) along with DDY (ASHRAE design conditions in EnergyPlus format), RAIN (hourly precipitation in mm, where available), and STAT (expanded EnergyPlus weather statistics).

For more information or to download any of the weather data (no cost), go to http:// climate.onebuilding.org.

TMYx climate files in this update -- locations/recent (2004-2018):

- WMO Region 1 (Africa) 896 locations, 707 recent.
- WMO Region 2 (Asia) 2208 locations, 1664 recent.
- WMO Region 2 (Asia) / Region 6 (Europe) Russia 1399 locations, 834 recent.
- WMO Region 3 (South America) 708 locations, 511 recent.
- WMO Region 4 (North and Central America, Caribbean except USA and Canada) 332 locations, 268 recent.
- WMO Region 4 (USA) 2585 locations, 2396 recent.
- WMO Region 4 (Canada) 839 locations, 795 recent.
- WMO Region 5 (Southwest Pacific) 1083 locations, 928 recent.
- WMO Region 6 (Europe) 3454 locations, 2545 recent.
- WMO Region 7 (Antarctica) 49 locations, 39 recent.

Overall, a few more locations than in the previous update, with 13,553 locations and 10,687 recent TMYx.





### CityLearn - An Open AI Gym Environment for multi-agent reinforcement learning for demand response

Jose Vazquez-Canteli & Zoltan Nagy, University of Texas at Austin

Buildings are responsible for more than 40% of global energy use and about 30% of greenhouse gas emissions, and in countries like the United States, they represent about 70% of the total demand for electricity. Reducing the amount of energy consumed is as important as deciding when to consume it. Periods of high demand for electricity raise electricity prices and the overall cost of the power distribution networks. Therefore, flattening, smoothing, and reducing the overall curve of electrical demand helps reduce operational and capital costs of electricity generation, transmission, and distribution networks. Demand response (Figure 1) is the coordination of electricity consuming agents (i.e. buildings) in order to reshape the overall curve of electrical demand [1]. The heterogeneous nature of the building stock makes modeling of building energy demand with their associated energy systems and control strategies prohibitively challenging. Artificial intelligence algorithms are expected to support the development of such control strategies by providing data-driven solutions.



In recent years, reinforcement learning (RL), the third type of artificial intelligence algorithms besides supervised and unsupervised learning, has gained popularity in the research community as a model-free and adaptive controller for the built-environment. RL has the potential to become a computationally inexpensive plug-and-play controller that can be easily implemented in any building regardless of its model, unlike model predictive controllers (MPC), and coordinate multiple buildings for demand response and load shaping. Despite this potential, there are still open questions regarding its plug-and-play capabilities, performance, safety of operation, and learning speed. Yet a lack of standardization on previous research has made it difficult to compare different RL algorithms with each other, as researchers solve different problems with different frameworks.

In an attempt to tackle these problems, and to advance the research, we have created CityLearn, an OpenAI Gym Environment for the implementation of single-agent (centralized) and multi-agent (decentralized) RL controllers for demand response in urban settings. [2]

CityLearn is written in Python and allows for easy implementation of reinforcement learning agents in a multi-agent setting to reshape their aggregated curve of electrical demand. CityLearn agents control the storage of domestic hot water (DHW), and chilled water (for sensible cooling and dehumidification) (see Figure 2). CityLearn also includes models of air-to-water heat pumps, electric heaters, solar photovoltaic arrays, and the pre-computed energy loads of the buildings, which include space cooling, dehumidification, appliances, DHW, and solar generation. Its modularity also allows researchers to modify it at their will and add their own energy systems easily (in Python), which they can later share with the community for reproducibility purposes. This allows other researchers to use their own RL agents to solve the same problem and compare the results with each other.

To facilitate community building around RL for intelligent energy management at a city scale, we have released the code, including some examples to get started, on our github repository [3]. In addition, supported by IBPSA and in collaboration with Dr Henze's group at the University of Colorado Boulder, on www.citylearn.net we have called for a coding challenge to develop novel RL algorithms for load shaping and shifting, and are currently in the process of organizing a special issue of the Journal of Building Performance Simulation.

In conclusion, CityLearn effectively provides an interface between the building energy modeling and the computer science



**Figure 2:** CityLearn allows design of Reinforcement Learning algorithms for controlling heating and cooling of buildings

community to develop RL based energy control algorithms and will use the power of artificial intelligence to address climate change.

For more information visit http://nagy.caee.utexas.edu or email nagy@utexas.edu.

### References

[1] J. R. Vázquez-Canteli, Z. Nagy, Reinforcement learning for demand response: A review of algorithms and modeling techniques. Applied Energy. 235 (2019), pp. 1072-1089. DOI: https://dx.doi.org/10.1016/j.apenergy.2018.11.002

[2] J. R. Vázquez-Canteli, J. Kämpf, G. Henze, Z. Nagy, in BuildSys 2019 - Proceedings of the 6th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation (Association for Computing Machinery, Inc, 2019), pp. 356-357. DOI: https://doi.org/10.1145/3360322.3360998

[3] https://github.com/intelligent-environments-lab/CityLearn





### **Underground Climate Change**

The Universities of Cambridge and California, Berkeley have linked up with the British Geological Survey and the Alan Turing Institute in a joint project on Modelling and Monitoring of Urban Underground Climate Change launched on 25 February at the Alan Turing Institute, London.

The objective of this NSF(US)-EPSRC(UK) funded research is to better understand impacts of urban underground infrastructure, such as basements and tunnels, on shallow subsurface temperature increase at city-scale.



Recently emerging data indicate a significant impact of underground infrastructure on subsurface temperatures. This project will develop a framework for monitoring and predicting temperature and groundwater distributions at high resolutions in the presence of heat sources and sinks from built environments. This will be achieved via novel combinations of numerical modelling, continuous temperature and groundwater monitoring, and statistical analyses. The ultimate goal is for every city to generate reliable maps of underground climate, with the ability to understand the influence of future urbanization scenarios. Visit www-smartinfrastructure.eng.cam.ac.uk/whatwedo/projects/modelling-underground-climate-change for more information.



## CityBES update: new features to simulate and evaluate district energy systems and to visualize urban microclimate

*Tianzhen Hong, Building Technology and Urban Systems Division, Lawrence Berkeley National Laboratory* 

CityBES is an open data and computing web platform for modeling, analysis, and visualization of city buildings, energy, and sustainability. Two new features have recently been developed. The first new feature is district heating and cooling (DHC) systems. CityBES can simulate and evaluate four types of DHC systems using EnergyPlus as the modeling engine: water-cooled chillers and hot-water boilers; water-cooled chillers with ice-storage and hot-water boilers; heat-recovery chillers and heat pumps; and geothermal heat pumps. A load profile, containing 8760 hours of cooling loads, heating loads, and their corresponding electricity and fuel use, can be imported to or generated within CityBES for a group of buildings through EnergyPlus simulation. The load profile is visualized (Figure 1) to show the hourly cooling loads, heating loads, as well as statistics of the loads (e.g., peak load, duration curve). Users can enter the efficiency of the cooling and heating plant as

well as heat loss of the distribution network. Other inputs include utility rates and incremental costs of the DHC systems. Simulation results (Figure 2) are summarized in tables and figures for performance comparison.







**Figure 2:** District system simulation results (top-left: simulated electricity load duration curve comparison among different system types; bottom-left: annual electricity, natural gas, and utility cost comparison among different system types; right: detailed metrics table)

The second new feature is the urban microclimate visualization. CityBES visualizes (static image and animation) the spatial variation and temporal trends of urban microclimate in San Francisco (Figure 3) and Sydney (Figure 4). Key variables to display include outdoor air temperature, relative humidity, solar radiation, wind speed, heat index, HDD (Heating Degree Days), CDD (Cooling Degree Days)), and UHII (Urban Heat Island Index). Data of more cities (e.g., New York City and City of Los Angeles) are being added.



**Figure 3:** San Francisco Microclimate variation on the heatwave day of September 1, 2017, showing a 20° temperature difference between the downtown and the coastal areas





More information of these new features and other updates are available at https://CityBES.lbl.gov.

### Survey on the use of optimization in the AEC community

Thomas Wortmann (Xi'an Jiaotong-Liverpool University), Christoph Waibel (ETH Zurich) and Judyta Cichocka (Massachusetts Institute of Technology) are conducting a survey on the use of optimization in the architecture, engineering and construction community, building on previous similar, smaller studies. The survey is available online at https://forms.gle/q9V57wi5YGYvj2mK6 until 30 April 2020. Results will be shared with survey participants and submitted for publication in a scientific journal. For more information, please contact Thomas.Wortmann@xjtlu.edu.cn.

## **Calls for Nominations**

### **IBPSA Board of Directors**

As specified by the IBPSA by-laws, an election is held each year for half of the Board of Directors membership. The Board consists of 10 At-Large Directors plus one Affiliate Director from each region.

Any member can nominate a candidate for an At-Large seat. Five At-Large Directors will be elected during balloting in June and July. The official call for nominations will be circulated in early May.

If you have questions about nominating or being a candidate, you are encouraged to contact Christina Hopfe (c.j.hopfe@tugraz.at) or Lori McElroy (lori.mcelroy@bre.co.uk).

The new board will be seated at the Annual General Meeting - date TBC (usually in September - but date may be affected by COVID-19 travel restrictions).

### **IBPSA** Awards

The Board of Directors of IBPSA is seeking nominations for Awards to be presented at Building Simulation 2021, in Bruges, Belgium (1-3 September 2021). IBPSA makes three awards for outstanding work in the building performance simulation field. These awards are made on a biennial basis at each Building Simulation Conference, providing there is a qualified candidate. The three categories awarded are:

- 1 IBPSA Distinguished Achievement Award. This award, formerly named the IBPSA Award for Distinguished Service to Building Simulation, recognizes an individual who has a distinguished record of contributions to the field of building performance simulation, over a long period.
- **2** IBPSA Outstanding Young Contributor Award. This award recognizes an individual at the beginning of their career who has demonstrated potential for significant contributions to the field of building performance simulation.
- **3** IBPSA Innovative Application Award. This award, formerly named the IBPSA Award for Distinguished Practice, recognizes an individual, group or firm, who has made a significant contribution to the effective application and/or advancement of building performance simulation in practice. The award may be given for a unique or noteworthy use of simulation in practice; development of simulation software or supporting software that has had a significant impact on industry practice; or other contribution that has advanced building performance simulation in practice.

### **Nominations**

Nominations for awards must be made by an independent third party and submitted by November 30, 2020. We would like as many nominations as possible, so please contact the Chair of the Awards and Fellows Committee, Michaël Kummert, to discuss a possible nomination if required (michael.kummert@polymtl.ca). A list of recent past recipients of these awards can be found on the IBPSA website: www.ibpsa.org/?page\_ id=62. Detailed instructions to submit nominations will be posted there in due time.

### **Fellows of IBPSA**

The Board of Directors of IBPSA is seeking nominations for the 2021 class of Fellows. The IBPSA membership grade of Fellow recognizes individuals who are:

"A member who has attained distinction in the field of building performance simulation, or in the allied arts or sciences, or in teaching of major courses in said arts and sciences, or who by way of research, simulation code development, original work, or application of building simulation on projects of a significant scope, has made substantial contribution to said arts and sciences, and has been active in the field for at least ten (10) years".

The IBPSA Board of Directors elects new Fellows on a two-year cycle, culminating with recognition at the biennial Building Simulation conferences.

### **Nominations**

Nominations may be made by IBPSA members other than the nominee. The deadline for nominations is October 31, 2020. We would like as many nominations as possible, so please contact the Chair of the Awards and Fellows Committee, Michaël Kummert, to discuss a possible nomination if required (michael.kummert@polymtl.ca).

Nominations should include details of the nominee's accomplishments in one or more of the following categories: industrial leadership, research, simulation code development, application of building simulation on projects of significant scope, educational leadership, and significant technical contributions to the allied arts and sciences. A list of IBPSA fellows can be found on the IPBSA website: www.ibpsa.org/?page\_id=310. Detailed instructions to submit nominations will be posted there in due time.

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### Student Travel Awards - supporting students to attend BS2021

Travel to IBPSA Conferences can be an expensive business - especially for students. In order to assist as many students as possible to participate in Building Simulation 2021 in Bruges, Belgium, IBPSA will grant a number of travel awards of up to \$1,000 (US) to students presenting peer-reviewed papers. Student travel awards are limited to a maximum of 5 grants per biennial conference and are therefore highly competitive.

The selection committee bases its decisions upon the following selection criteria:

- need for financial assistance, evidenced in a letter of recommendation from the student's supervisor/ advisor of studies (must be on university letterhead);
- overall quality of the peer-reviewed paper;
- relevance of contribution to the field of and/or furthering the effective application of building simulation.

To be eligible, the student must be:

- enrolled in a graduate program related to building simulation at the time of the conference; and
- the thesis project must be directly related to building simulation.

### **Applications**

The deadline for applications will be aligned with the deadline to submit full papers at the conference, and is expected to be in early 2021.

Details on applications will be published on the IPBSA website in due time: www.ibpsa.org/?page\_id=62.

## **IBPSA-Announce** mailing list

In order to contact its members IBPSA uses a number of channels. At present, the primary way of reaching the membership is the 'IBPSA-Announce' mailing list. This mailing list is intended to send out brief messages about events organised by IBPSA, the association itself, and other matters of interest related to building simulation. IBPSA also posts messages to other lists and platforms, such as the 'bldg-sim' mailing list and LinkedIn groups, and contacts members via the regional affiliates in order to ensure a maximum reach of members.

The 'IBPSA-Announce' mailing list is moderated, which prevents spam from being distributed via the list. Members can subscribe (and, if desired, unsubscribe) via a web interface which is available at: http://lists.strath.ac.uk/mailman/listinfo/ibpsa-announce. This also provides members-only access to the archives of previous posts to 'IBPSA-Announce'.

## **BS 2021: Save the Date!**



See page 26 or visit **www.bs2021.org** for further information.



### Journal of Building Performance Analysis Two Special Issues — Call for Papers

## Theme 1: Simulating durability and resiliency of building materials in the face of uncertainties, natural hazards, and climate change

Growing interest towards the possibility of modelling and simulating both the durability and the resiliency of both traditional and innovative materials is evident. Meanwhile, the community of building simulations is increasingly aware of the importance of taking into account during simulations both natural hazards and climate change implications.



The main aim of this Special Issue is to investigate insights of recent studies on modelling and simulating the durability of building materials and resiliency in the face of uncertainties, natural hazards, and climate change.

It will address the followingtopics:

- Probabilistic approaches in simulating building material durability;
- Modelling approaches for material weathering and aging;
- Multi-criteria analysis and modelling for assessing building envelopes;
- Uncertainties in modelling natural hazards and climate change for building simulations.

### **Submission guidelines**

Detailed guidelines for authors are available in the *Guide for Authors* published on the JBPS website https://mc.manuscriptcentral.com/tbps. A key requirement is that only original manuscripts can be submitted.

To submit a proposal, follow the Submit your Paper link on the main page of the Journal website.

Please mention the name of the Special Issue in your cover letter. All manuscripts will be peer-reviewed in accordance with the established policies and procedures of the journal. The final papers will be selected for publication depending on the results of the peer review process and the reviews of the Guest Editors.

### **Guest editors**

Dr. Umberto Berardi, Ryerson University, Toronto, ON, Canada (uberardi@ryerson.ca) Dr. Sumin Kim, Yonsei University, Seoul, South Korea

### Key dates

Full papers due: Completion of the first-round review: Revised papers due: Final notification: Issue published: 31 August 2020
31 October 2020
30 November 2020
31 December 2020
31 January 2021

## Theme 2: Data-driven approaches to building simulation for enhanced building operation and grid interaction

The rapid emergence of big data availability, advanced modelling techniques and artificial intelligence has opened numerous opportunities for improving the performance of buildings, in terms of new approaches to design, operation, integration of distributed renewable energy sources, resilience and energy flexibility in the interaction with smart energy networks. In the world of building simulation, ever-increasing measured data from diverse sources will help to improve simulation models and expand their range of applications.

One page abstracts (250 words) of proposed papers are solicited in the following areas:

- Data-driven simulation models of appropriate resolution for optimizing building operation
- Enhanced calibration methodologies of building performance simulation models
- Identification of parameters of reduced order models for control applications
- **Rapid** generation and calibration of models from statistical inference
- Data cleaning and pre-treatment of data, including automatic labelling of variables
- Development of occupant-behaviour models for enhanced and optimized building operation
- Modeling and prediction of building-grid interaction and energy flexibility
- Uncertainty assessment for prediction of building response and grid interaction
- Application to urban districts for optimizing their operation and grid interaction
- Model predictive control methodologies and applications
- Novel application case studies, with generalization of results

### Scope

The novelty of the contribution with respect to the state-of-the-art will be an important criterion. The incorporation of measured data and case studies is an important consideration. As usual in the JBPS, there are rigorous expectations regarding the soundness of the scientific methodology and their potential as seminal works for future research and long-term impact.

### **Guest editors**

Andreas Athienitis, FCAE, FIBPSA, FASHRAE, NSERC/Hydro Quebec Industrial Chair & Concordia Research Chair, Director, Concordia Centre for Zero Energy Building Studies & Professor, Dept. of Building, Civil and Environmental Engineering, Concordia University

José A. Candanedo, Subtask Leader of EBC Annex 81 (Data-Driven Smart Buildings), Research scientist, Energy Technology Sector, Natural Resources Canada & Affiliate Professor Professor, Dept. of Building, Civil and Environmental Engineering, Concordia University

### Key dates

Abstract due date:14 April 2020Notification of selection for submission of full paper:30 April 2020Full paper due:30 October 2020



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Edited by **Jan L.M. Hensen**, Technical University of Eindhoven, the Netherlands and **Roberto Lamberts**, Federal University of Santa Catarina, Brazil

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*ibpsa*NEWS

## Building **Performance Analysis**

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Pieter de Wilde

Improved building performance is a key goal for all building owners, be it energy efficiency, indoor air quality, productivity or user comfort. In the context of increasingly scarce resources, these aims place significant demands on the design, construction and operation of new and existing buildings. With the emergence of big data and corresponding analysis techniques, building owners and operators will have access to huge amounts of information, yet the performance gap between predictions (by simulation and extrapolation of data) and measurements remains significant.

The purpose of Building Performance Analysis is to explore and bring together the existent body of knowledge on building performance analysis. In doing so, it provides a working definition of building performance, and an in-depth discussion of the role building performance plays throughout the building life cycle. It explores the perspectives of various stakeholders, the functions of buildings, performance requirements, performance quantification (both predicted and measured), criteria for success, and performance analysis. Driving this discussion are the following questions:

- What is building performance?
- · How can building performance be measured and analyzed?
- How does the analysis of building performance guide the improvement of buildings?
- What can the building domain learn from the way performance is handled in other disciplines?

In answering these questions the book makes a major contribution to the application of building performance concepts in the operation and management of high performance buildings.



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ISBN: 9781119341925 To be published in April 2018

Building

Analysis

Performance

Explores and brings together the existent body of knowledge on building performance analysis

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## **Building Performance Analysis:** book promotion contest 2020

Building Performance Analysis by Pieter de Wilde is the second book to be endorsed by IBPSA.

After running a successful book promotion contest last year, a new contest has been launched for 2020. This year the contest is all about novel building performance quantification / measurement methods. Please visit the website of the author at **www.bldg-perf.org** and navigate to the current contest. Note that the 2019 edition is also still there but archived, so don't compete in the wrong version!



For this year, the challenge is to review the various quantification/measurement methods listed, and to identify a new method that is not yet included in the overview. The winner will get a free copy of the book, posted to wherever he/she is based. The book promotion contest runs until 24 April 2020, noon (GMT). Terms and conditions of the contest are posted on the website.

## **News from IBPSA affiliates**

IBPSA affiliates are asked to submit a report to the IBPSA Board each year to keep Board members informed about their activities and membership. These are too detailed to include in ibpsaNEWS, so affiliates have been asked to make their latest annual report available through their web sites, and this section includes only selected, recent news. Other news from affiliates may be available from their websites; the URLs for these are available on the IBPSA Central web site at www.ibpsa.org/?page\_id=29.

### **IBPSA-Australasia**

A new building simulation group has been formed in Adelaide, initiated by Veronica Soebarto (University of Adelaide) with Paul Davy and Ken Long (dsquared Consulting). More than 40 people including engineers, architects, environmental consultants, educators, researchers as well as architecture and engineering students have expressed enthusiasm for being involved in this group. The group has met every two months since June 2019. Four meetings were held last year, including the initial meeting. Topics covered in the other three meetings were:

- simulations using Grasshopper/Honeybee/Ladybug, by Lewis Hewton from Cundall;
- design projects using parametric modelling coupled with simulation, by Juliana Croffi;
- and passive house / passivhaus, by Tony Pissanelli of Passive House Adelaide.



A presentation by Lewis Hewton from Cundall on 5 August 2019 introducing the use of Rhino/ Grasshopper with Ladybug and Honeybee

At the time this item was submitted, the next meeting was planned for February, with a presentation on simulation of nano-thermochromic glazing and its visual implications.

### **IBPSA-Danube**



### IBPSA at the 50th HVAC&R Congress and Exhibition in Belgrade, 4-6 December 2019

Half a century ago, the Serbian HVAC&R Society organized the first International HVAC&R Congress and Exhibition in Belgrade. Fifty years later, the 2019 Congress addressed all aspects of energy utilization relevant to the healthy indoor and outdoor environment. It is unique in Europe in gathering all professions in the field of energy itself, energy sustainability, energy demand, renewable energy sources, CO2 emissions and

### News from IBPSA Affiliates

climate change, all aspects of the relationship between indoor environmental quality, occupant behavior and health, buildings dynamics simulation and performance prediction (including buildings integrated HVAC&R equipment/systems and all other technical systems). The congress has become a gathering of the world HVAC&R elite and is endorsed by ASHRAE, REHVA, and IIR.

130 companies presented their advances and innovations at the 50th Exhibition. Every year since 2009, the section of the exhibition dedicated to green programs and networks has included software and information technologies, topics which arouse great interest in visitors now that they have become vital in the design, operation and maintenance of HVAC&R. Several of the ICT companies that shared this space in previous years have expanded their participation this year and exhibited in their own separate venues, joining companies that have done this in the past, and other posters and presentations by IBPSA-Danube and VEA-INVI Belgrade. The green section of the exhibition also included a gallery of posters from its nine-year archive.

The 2019 Congress was organised in three main sessions:

### Modelling, Control & Validation

Chairpersons: Norbert Harmathy, Dru Crawley and Erik Pavlovic

- **Keynote lecture**: Going Digital modeling infrastructure resilience for sustainable urban development *Drury B. Crawley, Bentley Systems, Inc., Washington, D.C., USA*
- On the modelling of surgical operating theatres: four decades of CFD simulations *Essam Khalil, Cairo University, Cairo, Egypt*
- HVAC performance modeling in preliminary design phase for achieving green building certification Norbert Harmathy, Budapest University of Technology and Economics, Faculty of Architecture, Department of Building Energetics and Building Service Engineering, Budapest, Hungary
- Investigation of the effects of night cooling on building thermal performance with an hourly analysis program

*Ismail Celik & Murat Cakan, Faculty of Mechanical Engineering, Istanbul Technical University, Istanbul, Turkey* 

- Smoke management in sprinklers in a medium sized sprinklered car park Dalia E. Khalil & Essam E. Khalil, Cairo University, Cairo, Egypt
- Optimization of laminar airflow in laminar ceiling elements *Alen Orsulik, Erik Pavlovic, Lindab d.o.o., Godovic, Slovenia*
- Challenges in combining different methods and tools for improving performance monitoring in buildings Boris Sucic, Stane Merse & Marko Kovac (Jožef Stefan Institute - Energy Efficiency Centre, Ljubljana, Slovenia) and Željko Tomsic (Faculty of Electrical Engineering and Computing, University of Zagreb, Zagreb)
- Dynamic energy efficient heating systems Dejan Velicovic, Filip Zardan & Janko Krstic, Danfoss
- The influence of source temperature on electric floor heating panels Dragan Cvetovic, Aleksandar Nesovic, Jasmina Skerlic & Danijela Nikolic, Faculty of Engineering, University of Kragujevac, Kragujevac, Serbia
- A validated BMS system in pharmaceutical production *Andrej Škorc, Siemens Desigo CC, Sipatec Building, Beograd*
- CFD turbulence modeling in plate heat exchanger ducts Dragan Mandic, JKP Belgrade Powerolants, Beograd

### Environmental Quality - Modelling, Control, And Impact On Occupants Satisfaction

Chairpersons: Aleksandar Andjelkovic, Dušan Licina and Igor Mujan

- Introduction and welcome address Aleksandar Andelkovic
- Evaluation of the parameters of internal environment in buildings that have a "green" certificate Dušan Licina, École Polytechnique Fédérale de Lausanne (EPFL), Switzerland
- The effects of temperature and indoor environment quality on the quality of office and school work Pawel Wargocki, International Centre for Indoor Environment and Energy, Technical University of Denmark, Denmark
- The global WELL movement Veronica Foldvary Licina, Delos Living LLC, USA
- Development of an intelligent platform for indoor environmental quality the construction of a sensor node

Igor Mujan, Faculty of Technical Sciences in Novi Sad

- Using portable sensory devices for the estimation of metabolic rate *Tamara Bajc, Faculty of Mechanical Engineering, University of Belgrade*
- Evaluation of the change in thermal comfort during the warming-up phase of a passenger vehicle *Svetozar Grahovac, Mannheim, Germany*
- Advanced control logics for air terminals equipped with sensors using thermal dispersion *Sonny Vidovic, ET&B, USA*
- Humidity in the printing industry: environmental control for quality printing without stopping the machines

Massimiliano Maistro, Carel Industries, Italy

### Forum

In the final session, President of IBPSA-Italy Andrea Gasparella from the Free University of Bozen-Bolzano presented a paper *Via renewable energy sources and integrated refurbishment to zero CO2 emissions in large multipurpose buildings* (based on research carried out with Alessandro Prada and Francesca Cappelletti) which used a multi-objective approach to quantify and compare the economics of retrofitting on the scales of individual buildings and whole districts.

### First-ever Simulation Workshop in Hungary, late November 2019

Hungary's very first simulation workshop was held at the Budapest University of Technology and Economics during the local annual Building Service Engineers' Day event. Planned and organized by Zsófia Deme Bélafi, the workshop attracted an unexpectedly high number of participants — 50 — and was a great success.

The event opened with a presentation by István Kistelegdy, Helga Kovács, dr. Zsuzsa Szalay and Dóra Szagri on three interesting research projects conducted in Hungarian universities using simulations. Zsófia Deme Bélafi followed with a presentation on the current status of building energy modelling (BEM) education at the country's universities. Visiting colleagues from TU Wien (Ardeshir Mahdavi and Christiane



Berger) introduced their curriculum development project, a great example for Hungary to follow in introducing and improving BEM education. Finally, Zoltán Magyar presented this year's student simulation competitions which could be an excellent motivator for students here and throughout central Europe to learn and become involved in the international simulation community.

At the end of the event, participants agreed that it is time to build up a Hungarian BEM community, beginning by setting up a local mailing list to stay in contact. It was also proposed to organize similar workshops on a yearly basis. Hopefully, this workshop was the first milestone in a long, successful chapter of the history of the Hungarian BEM community within the IBPSA Danube Chapter.



### **IBPSA-Nordic**

The board of IBPSA-Nordic was elected in summer 2019 and met first on 19 September. The new president, vice-president, secretary and treasurer were elected for the period 2019 - 2021, and the board now comprises:

Board of IBPSA	A-Nordic 2019 - 2021		
COUNTRY	NAME	AFFILIATION	POSITION IN BOARD
FINLAND	Mika Vuolle	EQUA	Vice president
	Risto Kosonen	Aalto University	
	Santeri Siren	Rambøll	
DENMARK	Jørgen Erik Christensen	DTU	Treasurer
	Kim Bjarne Wittchen	Aalborg U, SBi	
	Mandana Sarey Khanie	DTU	
SWEDEN	Petter Wallentén	LTH	Secretary
	Patrik Rohdin	LIU	
	Max Tillberg	Bengt Dahlgren Göteborg AB	
NORWAY	Matthias Haase	SINTEF	President
	Laurent Georges	NTNU	
	Rasmus Hølmer-Hansen	Erichsen & Horgen	

One of the main foci of the new board will be the planning and organization of the BuildSim-Nordic conference in Oslo, 13th - 14th October 2020. This will be a cooperative effort by IBPSA-Nordic, OsloMet University in Oslo and the Norwegian Society of HVAC Engineers (NORVAC), and will be open for members and nonmembers of IBPSA-Nordic. The keynote speaker will be announced soon. It is still possible to submit proposals for workshops!





Some members of the organizing committee. Left to right: Peter Schild (OlsoMET), Laurent Georges (NTNU), Jørgen Christensen (DTU), Heidi Liavaag (OsloMET), Matthias Haase (SINTEF) (Voja Novakovic (NTNU), Petter Wallentén (LTH), Risto Kosenen (AltoU), Mandana Sarey Khanie (DTU), Rasmus Hølmer-Hansen (Erichsen&Horgen), Mika Vuolle (EQUA) not present)

Any research related to building simulation, including system design, HVAC, energy production/use, indoor climate and environmental issues, will be eligible to be presented at the event. All authors whose abstract is accepted will be invited to submit a full paper. All accepted papers will be invited to give an oral or poster presentation at the event. The papers accepted for oral presentation will be published in the conference proceedings published by SINTEF Academic Press, and a selection of best papers will be proposed for a Special edition in the International Journal of Building Performance Simulation, published by Taylor & Francis.

Stay tuned at https://buildsimnordic2020.ibpsa-nordic.org.

### **IBPSA-USA**

### Read All About It: SFBA Chapter January Event: Title 24 2019 and Beyond

The San Francisco Bay Area chapter of IBPSA-USA (IBPSA-USA-SFBA) recently held the latest instalment of their monthly conferences at Affiliated Engineers Inc. on January 22. The topic of this conference was *Title 24 2019 and beyond: What's new for non-residential buildings and how do we get to decarbonization and electrification of buildings?* 



At the conference, food and drinks were served while industry experts gave presentations on this month's topic. The first presenter was Rahul Athaly, program director at NORESCO, who discussed the changes in California's 2030 environmental goals and what these changes mean for the industry. Athalye also went into detail about new metrics being used by the California Energy Commission.

The second presenter was Stefan Gracik, performance engineer and partner at Alter Consulting Engineers. Gracik's presentation focused on the most recent updates on the Title 24, Part 6 energy codes that went into effect at the start of the year. He discussed how energy modeling played an integral role in the formation of the updates, and how others can get involved in upcoming codes and standards processes.

Bay Area engineers IES Vice President Liam Buckley and Arup senior engineer Panos Bakos are two of the seven volunteer board members responsible for the planning and coordination of the SFBA chapter monthly conferences. When asked about the turnout to their monthly meetings, Liam Buckley said "It depends on the topic, but 50 to 100 architecture and engineering firms have attended." "This is a very niche service we offer, but we are trying to grow as much as possible, to let other architects and engineers know the value we bring to the industry," added Panos Bakos.

While national and international conferences are held by IBPSA-USA and affiliated organizations, these local monthly meetings are an opportunity for industry professionals in the Bay Area to network, exchange ideas, and socialize while staying informed on recent trends and changes in the world of energy modeling and building performance simulation.

According to Bakos and Buckley, one of their goals is to grow as much as possible and spread awareness of IBPSA and the value of building simulation services. The SFBA chapter also partners with student chapters to share knowledge and to find new talent.

Join the IBPSA-San Francisco Bay Area LinkedIn Group (www.linkedin.com/groups/6962195) to get future updates about event announcements, job-postings and other building-simulation news.

### **Cuban Food Meets Building Performance in Orlando**

The IBPSA-USA Semiannual Winter meeting was a great success. Over 80 guests gathered in Orlando to eat Cuban food, socialize and get reconnected.

This year's event almost never happened. Prices for venues near the convention center in Orlando have been going up over the past couple of years, and the per-person charge for event centers and local restaurants able to host our event was averaging \$120 per head! Thanks to David Eldridge and IBPSA-USA staff, we were able to find an alternative solution that was affordable by being creative. The Unique Touch Events center — usually booked for small weddings and Quincineras — was a somewhat risky choice said Mike Wilson, IBPSA-USA Executive Director. "We were not certain that they



would be able to accommodate our needs, or that our members would feel comfortable in a space located in a strip mall, next to a nail salon, with an interior draped in white silk."





"This is the biggest Cuban sandwich I've ever seen!" - Dru Crawley, IBPSA-USA President

"We paired the highest-rated, most authentic Cuban food Truck in Orlando, with an open bar, to make up for the non-traditional venue and get creative with dinner." said David Eldridge. Attendees enjoyed local tastes with their friends and peers, including Garlic Fries Cubano, Cuban Sandwiches, Molos Shrimp Bowl, Empanadas (meat & cheese) and Caribbean Jerk Fish Filet, followed by local Key Lime Pie.

Attendees also enjoyed a short program with presentations from IES, EDSL-Tas, shout outs to TRANSYS, as well as organizational updates and a call for more committee participation from members.

Be on the look out for details about our Summer Meeting in Austin... we have heard rumblings about a great Texas BBQ place only locals know about that we may be able to secure.

## **IBPSA** affiliates

See the IBPSA Central web site at http://www.ibpsa.org/?page\_id=29 for details of affiliate websites and contacts. Affiliate representatives are voting members of the IBPSA Board except where marked \*.





- **IBPSA-Australasia** contact: Ouentin Jackson
- **IBPSA-Brazil** contact: Anderson Letti

**IBPSA-Argentina** 



**IBPSA-Chile** contact: Diego Ibarra













**IBPSA-Germany** contact: Christoph Nytsch-Geusen

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**Conference Committee** Paul Strachan

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For additional information about IBPSA, please visit the Association's web site at **www.ibpsa.org**. For information on joining, contact your nearest regional affiliate.

IBPSA's mailing list has been consolidated into another listserver known as BLDG-SIM, which is a mailing list for users of building energy simulation programs worldwide, including weather data and other software support resources. To **subscribe** to BLDG-SIM, to unsubscribe or to change your subscriber details, use the online forms at http://lists.onebuilding.org/listinfo.cgi/bldg-sim-onebuilding.org.

To post a message to all members, send email to **bldg-sim@lists.onebuilding.org**.

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