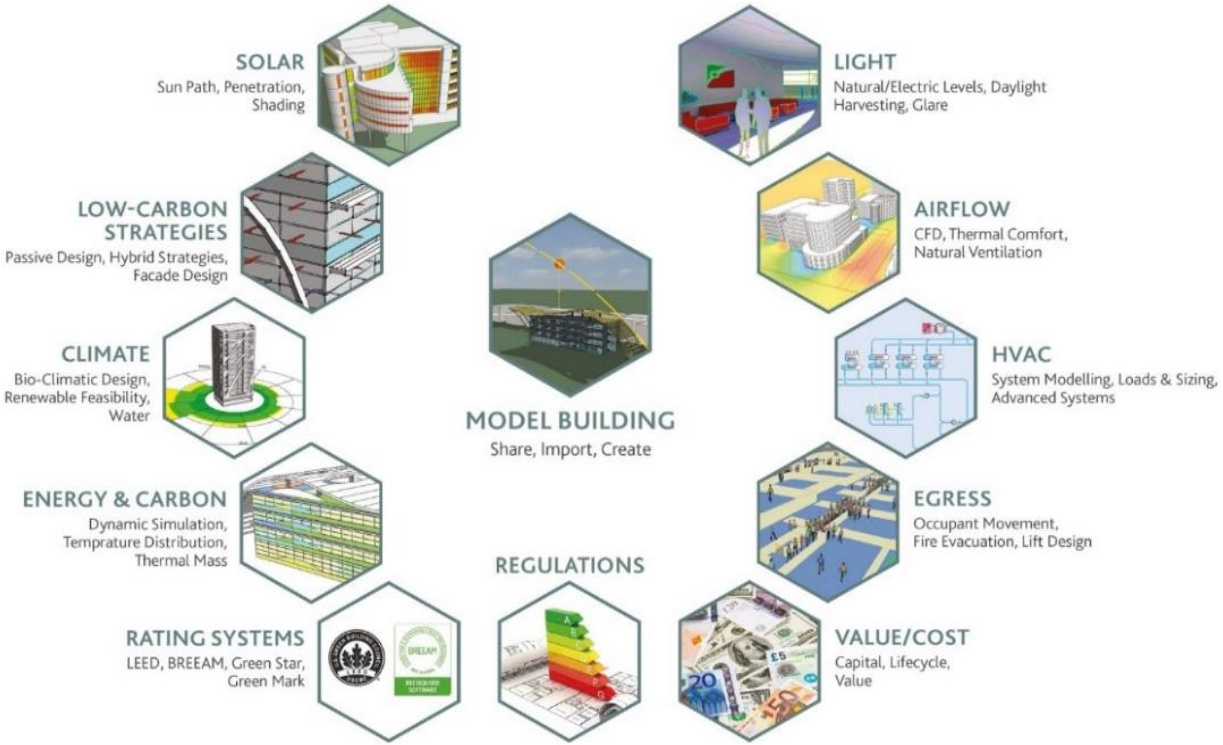
Technology to Deliver Low Carbon Districts (Modelling & Simulation)

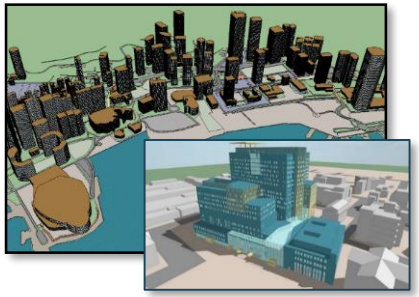
Rohan Rawte
Director
IESVE Singapore Pte Ltd

IES Corporate Information

- IES Founded June 1994
- Head Office in Glasgow, Scotland
  - Offices: Dublin (Ireland), Atlanta (USA), Pune (India), Melbourne (Australia), Singapore, Dubai (UAE)
  - Business Development Managers: San Francisco, Minneapolis, Mumbai, Johannesburg, Hong Kong, London, Vancouver, Moscow and Paris
- Technology development, technology deployment and knowledge sharing
- World leaders in building performance analysis technologies with a focus on sustainability
- Arguably the largest dedicated team under a single company for this niche sector in the world
- Over 30% of revenue spent on R&D
- Move towards Intelligent Community Lifecycle (ICL) suite of solutions

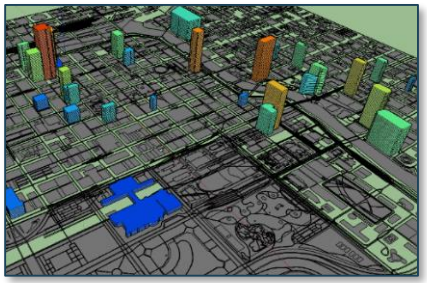


ICL: Intelligent Community Lifecycle

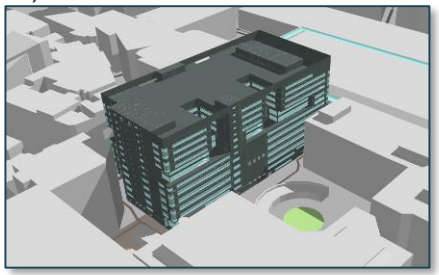


Communities
(Cities, Neighbourhoods, Districts, Campuses, Utilities)

From Single Building Performance Analysis – to: Community / Portfolio-Level Sustainability

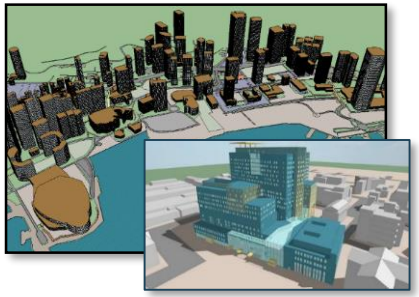


Building Portfolios
(Local, National, Global Portfolios)



Single Building
(IES VE for Design & Retrofit)

ICL: Intelligent Community Lifecycle



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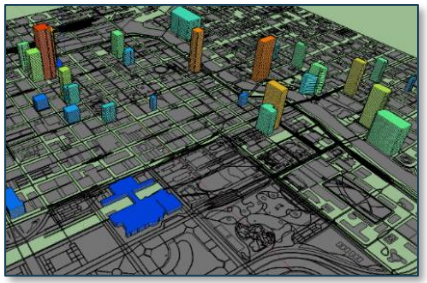


Building Portfolios
(Local, National, Global Portfolios)

Technology to help **create**, **plan** and **manage** communities that are resource efficient, resilient, low carbon and sustainable

Challenges/Opportunities for technology development to model and simulate LCDs: Three Aspects – Design, Operation & Lifecycle

Challenges or Opportunities?

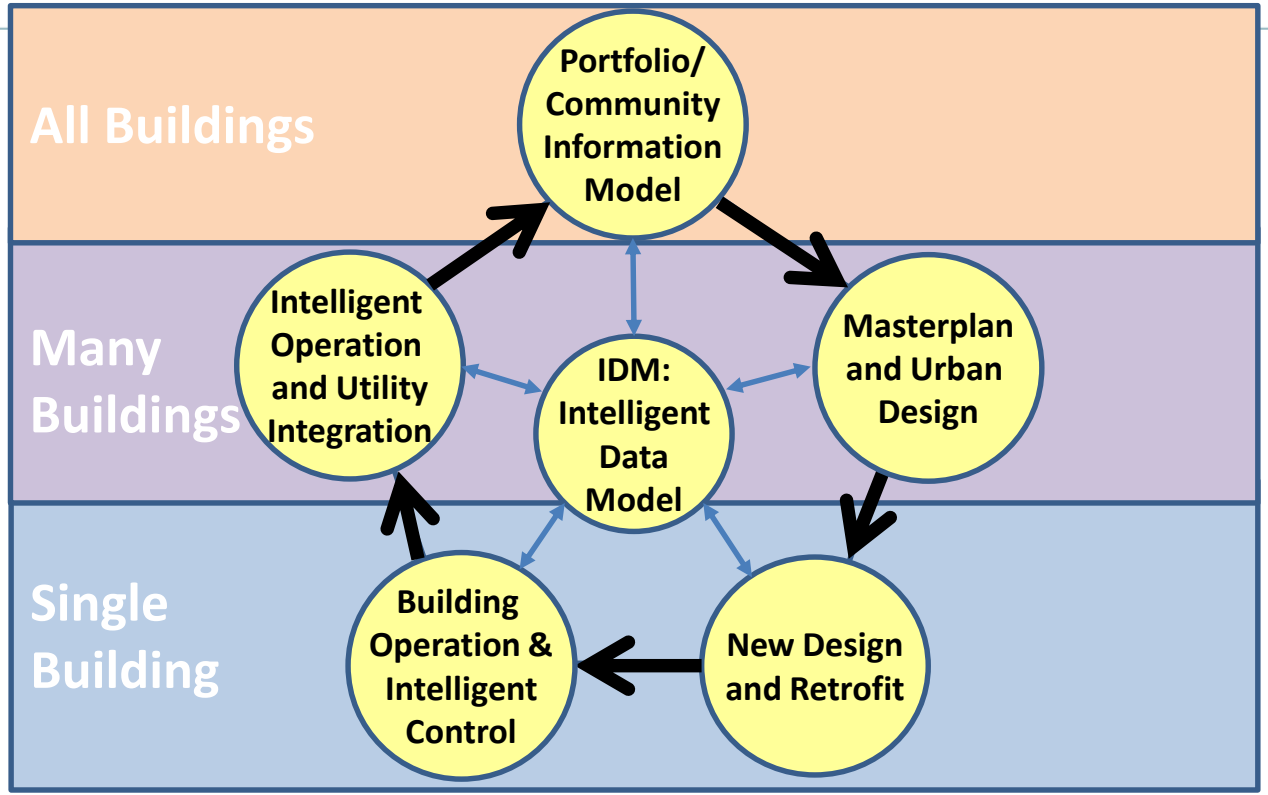
- What data do we need? Answer: Under research
  - Design
  - Operation
  - Lifecycle
- What data do we have? How can we use that data effectively? Answer: Under research
  - Templates/standards/indexes
  - Historic data
  - Live data, continuous monitoring
- What metrics/KPIs give highest impact to the LCD? Answer: Under research
  - Energy performance
  - Renewables
  - Comfort/User experience
- Level of detail? Answer: Under research
  - Too less = low value/accuracy
  - Too much = high cost

Challenges or Opportunities?

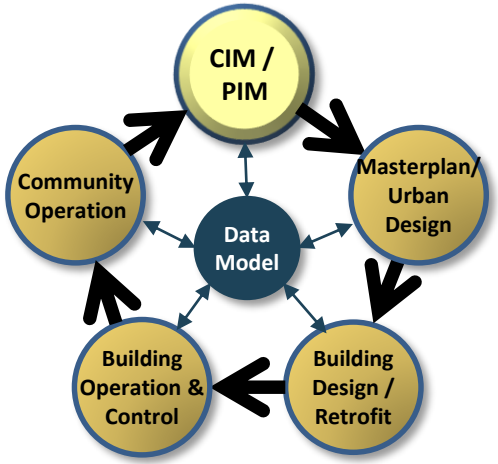
- Interlinking of physics/domains? Answer: Under research
  - Energy
  - Water
  - Waste
- Interlinking of allied technologies? Answer: Under research
  - BIM
  - GIS
  - IOT
  - Machine learning/AI
- Scalable? Answer: Under research
  - Offline or online?
  - Data security
  - API link

Our Approach: Integration

ICL: Intelligent Community Lifecycle



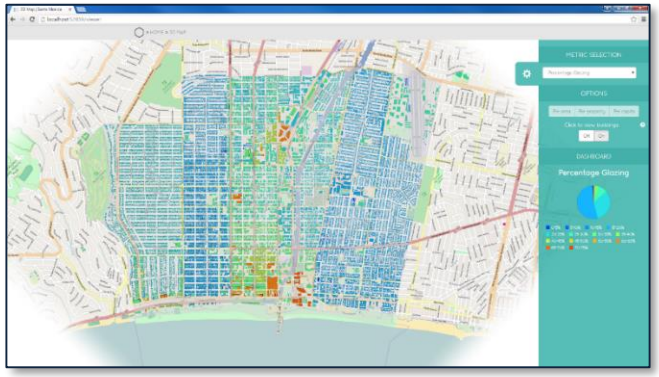
CIM: Community Information Model



A 3D interactive model of the community for visualisation and ongoing sustainability planning & strategy

CIM: Community Information Model

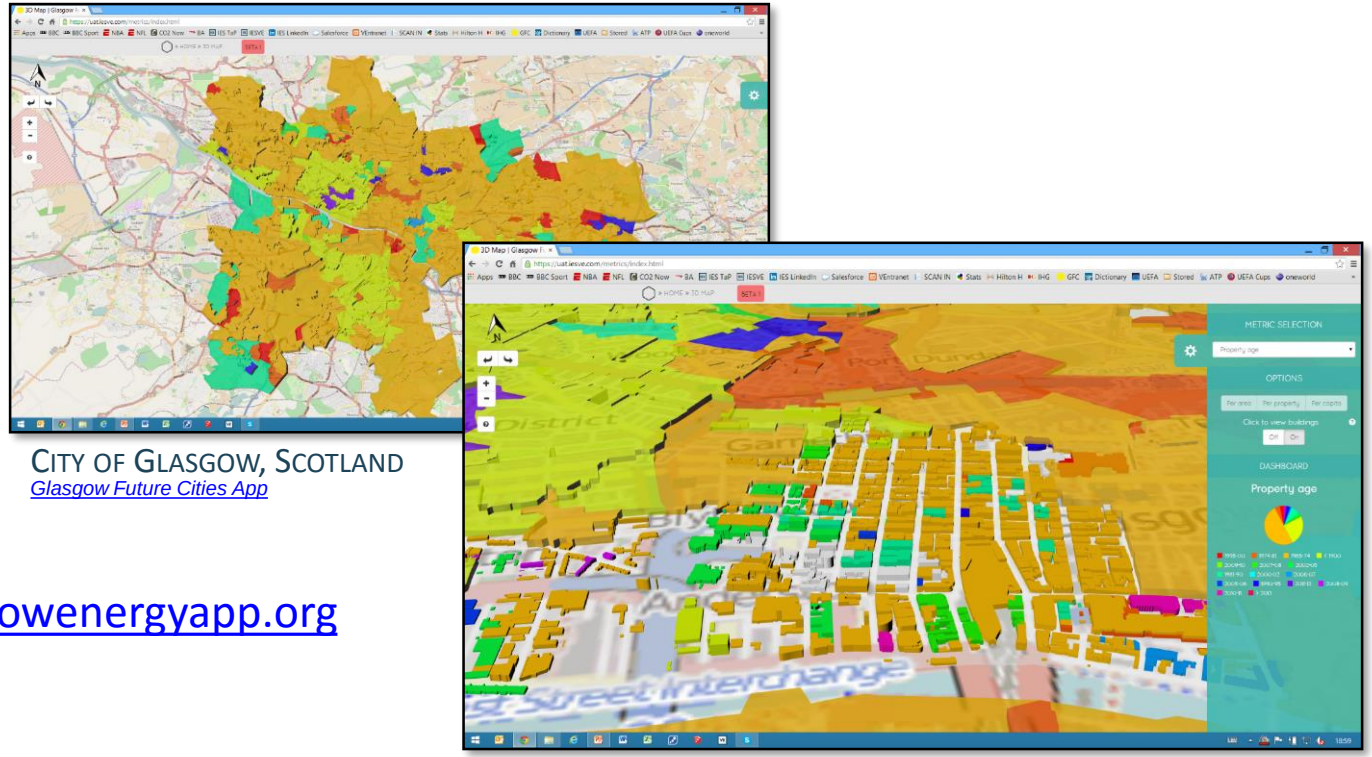
- A web-based portal to the **intelligent data model** of the community
- Tools to **filter** and **interrogate** volumes of data using any metric
- A means to **plan**, **track** and **share** project status, progress towards sustainability goals



SANTA MONICA, CA CITY VIEW

- A single, common data platform
- Data integrated from many sources:
  - GIS / climate / planners / BIM
  - Commissioning / BMS data
  - Building performance benchmarks
  - Lifecycle performance analytics
- Customisable with apps, dashboards

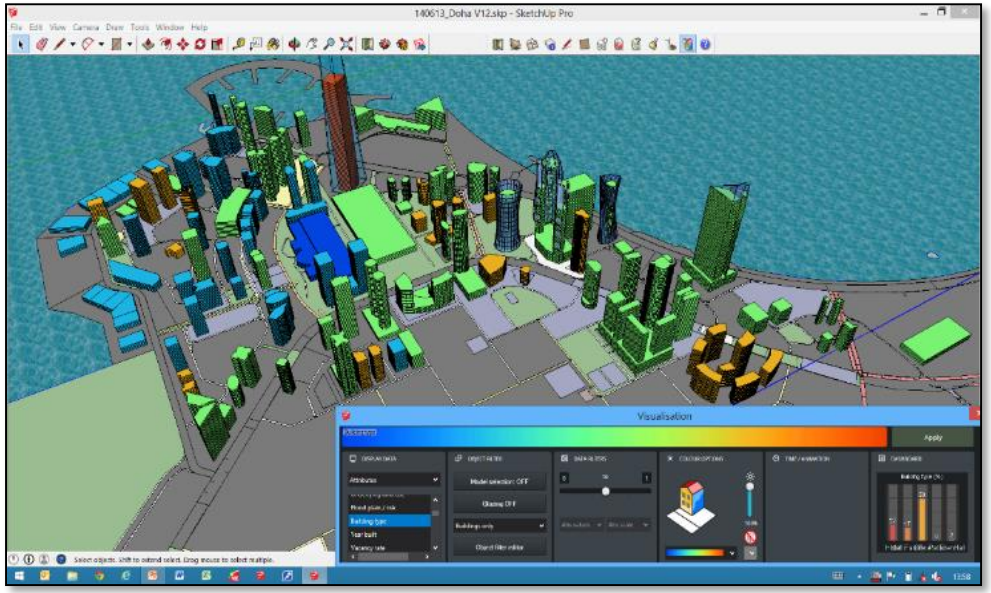
CIM: Web-based Glasgow CIM

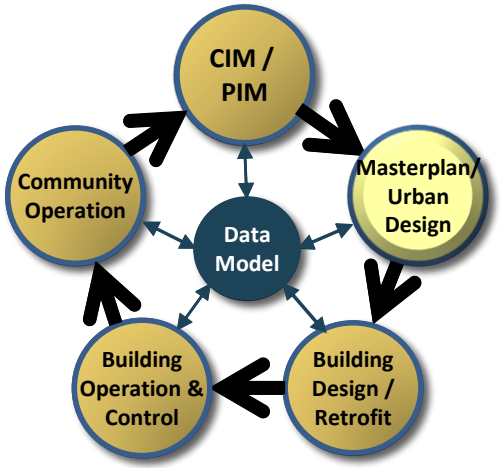


CITY OF GLASGOW, SCOTLAND
Glasgow Future Cities App

www.glasgowenergyapp.org

Masterplanning Tools



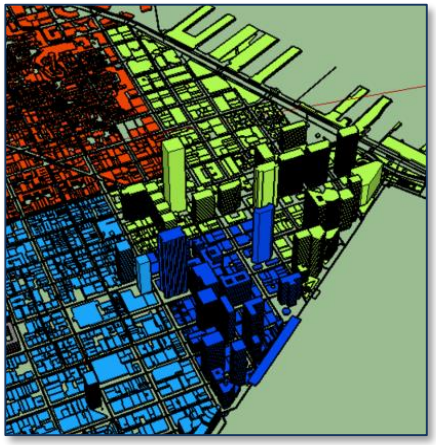


Sustainability, environmental & energy consumption analytics for a group of buildings in close proximity (e.g. campus, district)

Masterplanning Tools

Rapid, early stage energy/resources modelling:

- Quickly identify the poorest performing buildings
- Quantify & prioritise the highest impact sustainability improvements
- Calculate energy savings, cost savings & ROI
- Masterplan a more sustainable, energy efficient community



- **Quick, easy** 3D model creation & manipulation
- Example masterplanning analytics:
  - Energy & Carbon assessments
  - Resource (energy, water, etc.) usage
  - Renewables potential
  - Storm water collection
  - Heat island effect
  - Open space analysis
  - Urban form spatial analysis
  - Walkability / Accessibility
  - Several others

MP: Masterplanning Projects

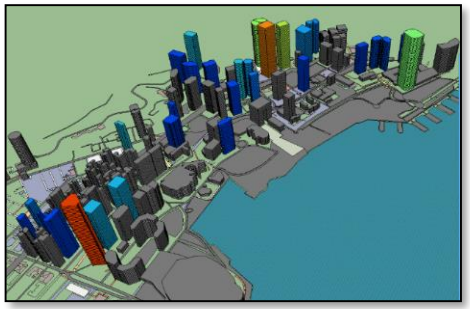
City-Level

View all Buildings

San Francisco
Rooftops >25k sqft

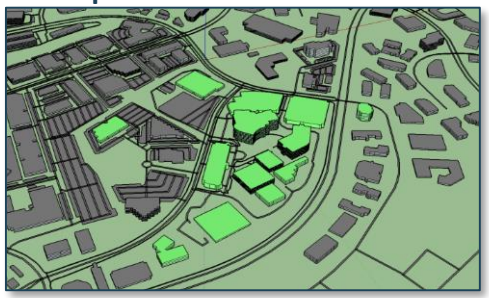
Washington DC: Urban Density Analysis

Portfolio-Level



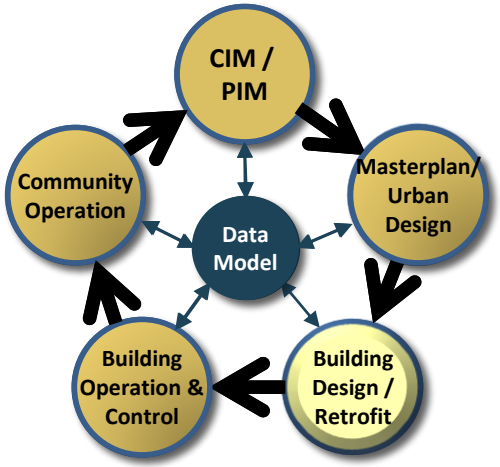
A Hong Kong Building Portfolio

Campus-Level



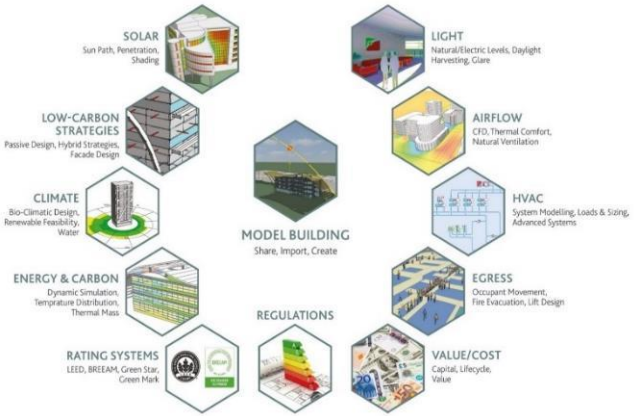
Qualcomm Campus

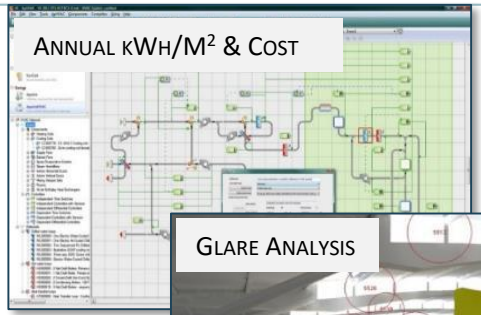
Building Design/Retrofit



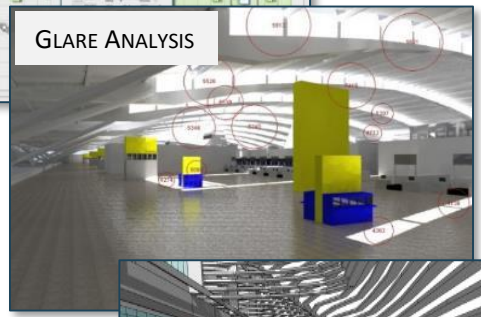
Building Performance analyses for any building design or retrofit

Building Design/Retrofit

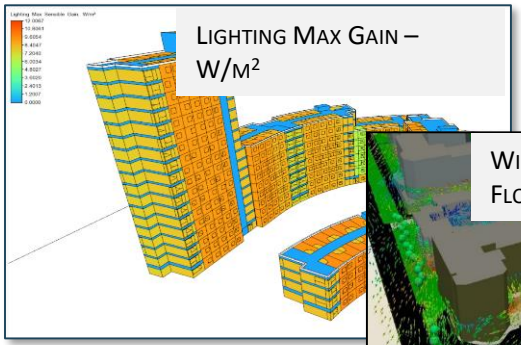




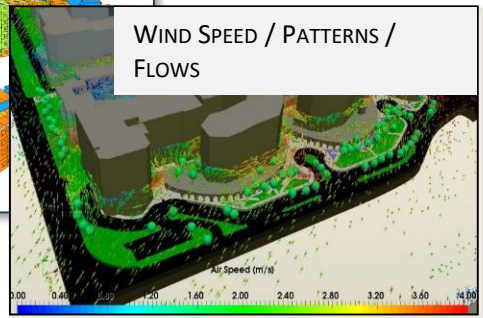
ANNUAL KWH/M^2 & COST



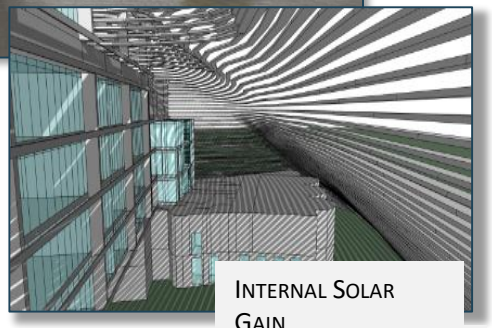
GLARE ANALYSIS



LIGHTING MAX GAIN – W/M^2



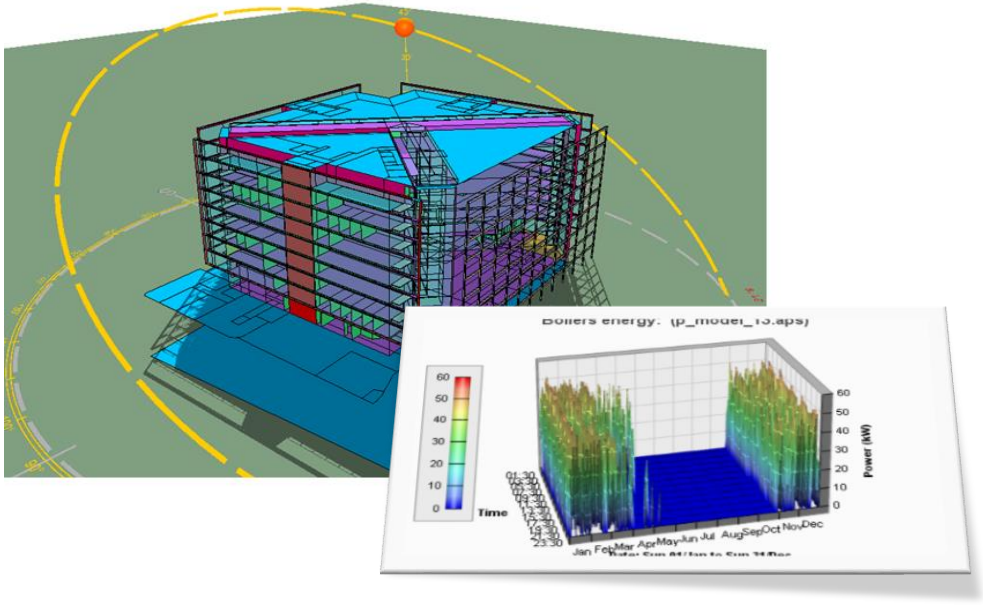
WIND SPEED / PATTERNS / FLOWS

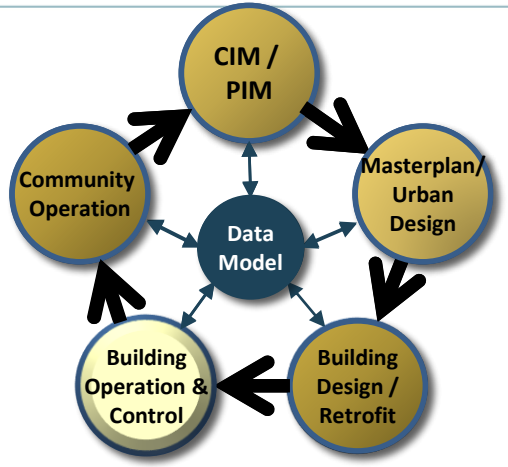


INTERNAL SOLAR GAIN

Case Studies

Building Operation



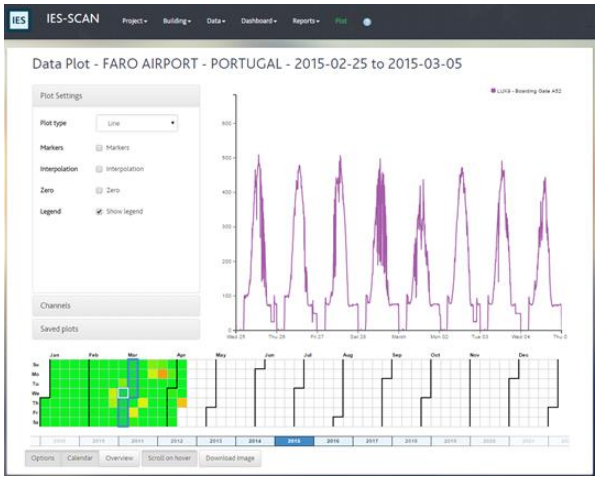


State of the art tools for more sustainable & energy efficient buildings

BOC: Building Operation & Control

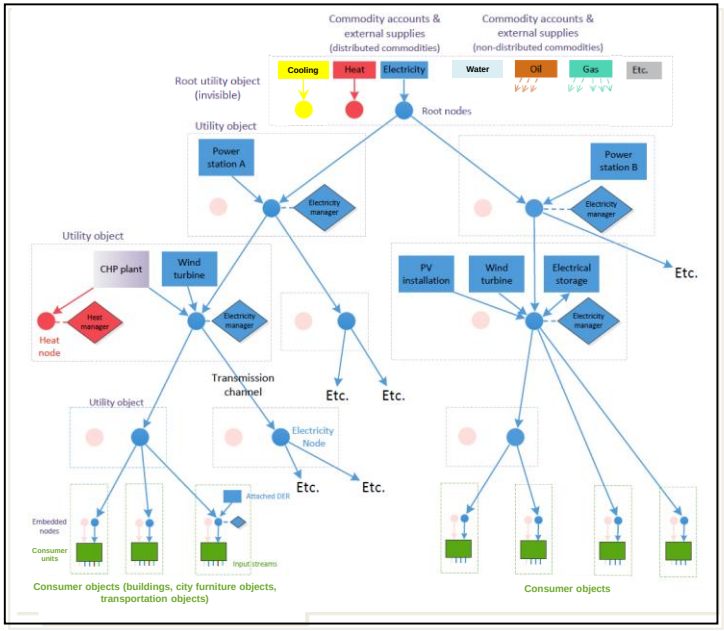
Web-based data analysis platform:

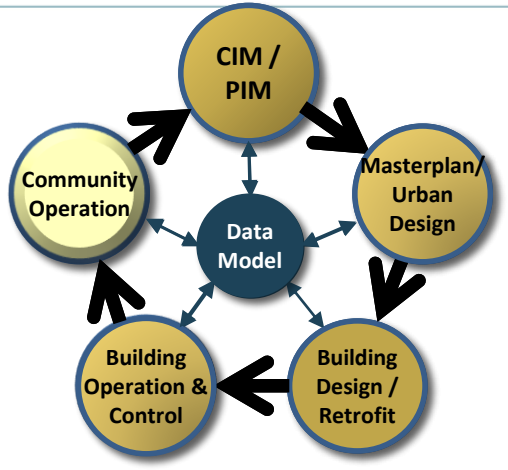
- Assess building performance
- Analyse & find hidden inefficiencies, other performance issues
- Identify cost-effective solutions to improve energy efficiency
- Predict performance and adjust building controls for ongoing efficient operation - based on real-time data



- **Ci²™ Process:**
  - **C**ollect actual building performance
  - **I**nvestigate issues, inefficiencies
  - **C**ompare to plan or benchmark data
  - **i**nvest in efficiency improvements

Community Operation



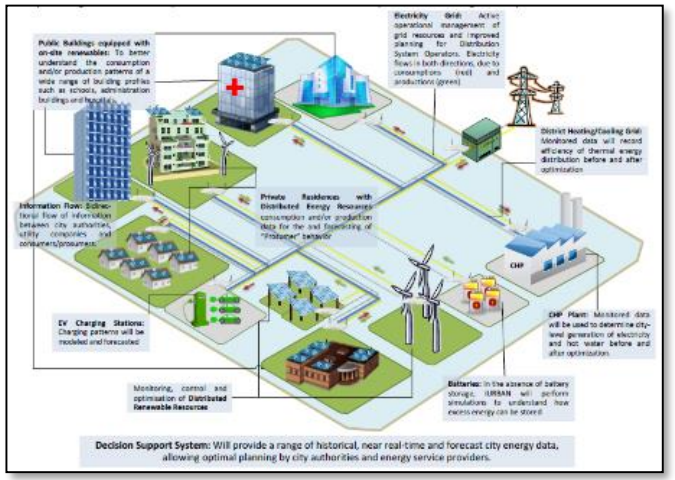


Integrated resource (energy, gas, water, waste) planning & management at the community, campus or district level

CO: Community Operation & Utility Integration

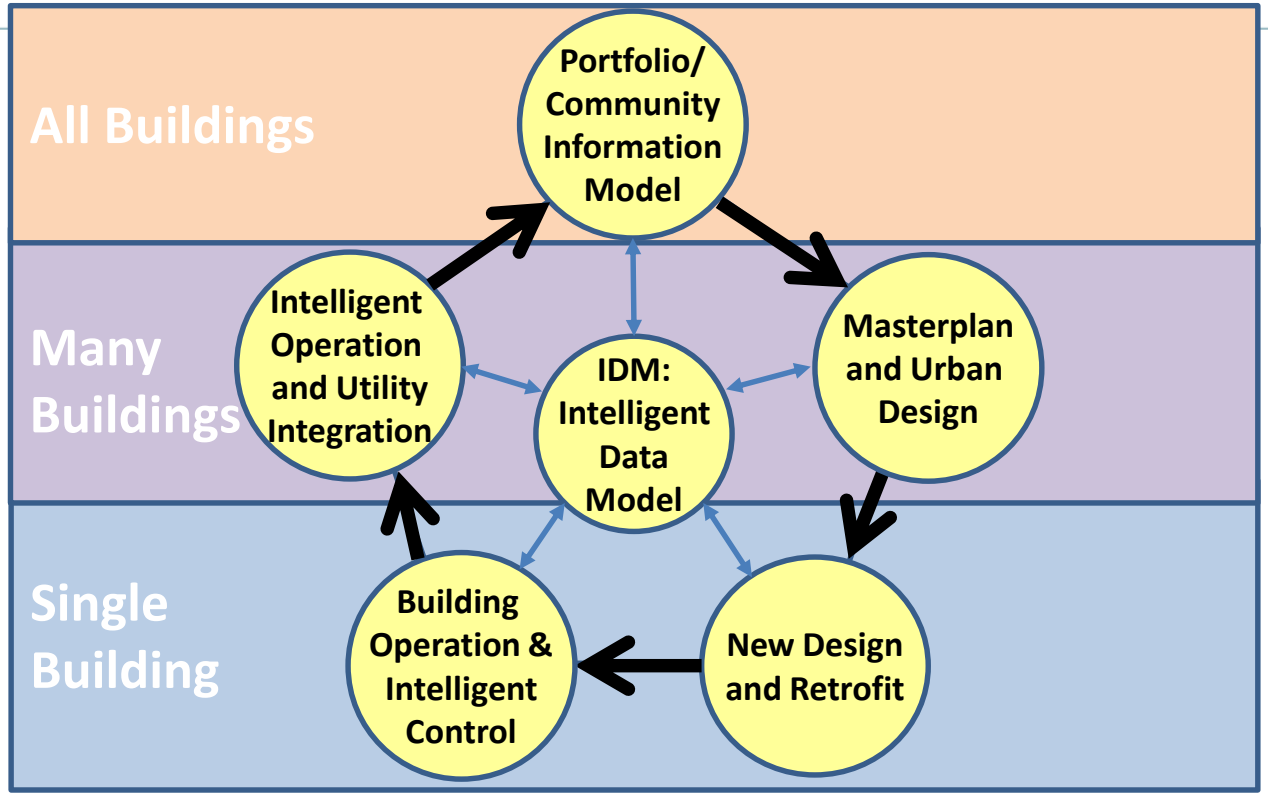
Community-level Energy Management:

- Understand current & future community energy needs
- Make informed decisions on energy conservation strategies and options
- Analyse the impact of new community growth on the energy network

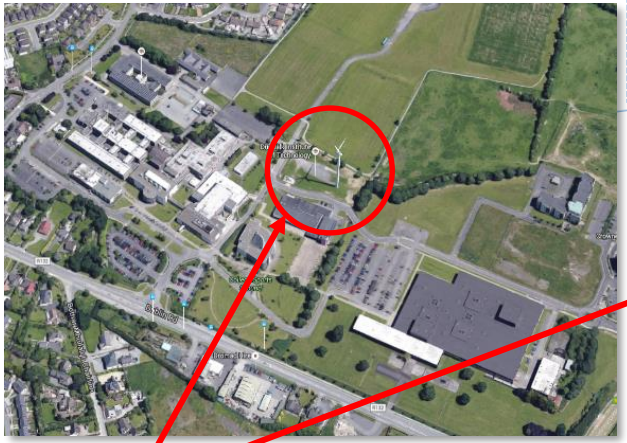


- Virtual Power Plant (VPP)
- Demand Response
- Community Microgrid
- District heating / cooling feasibility
- Analyse new renewable energy options

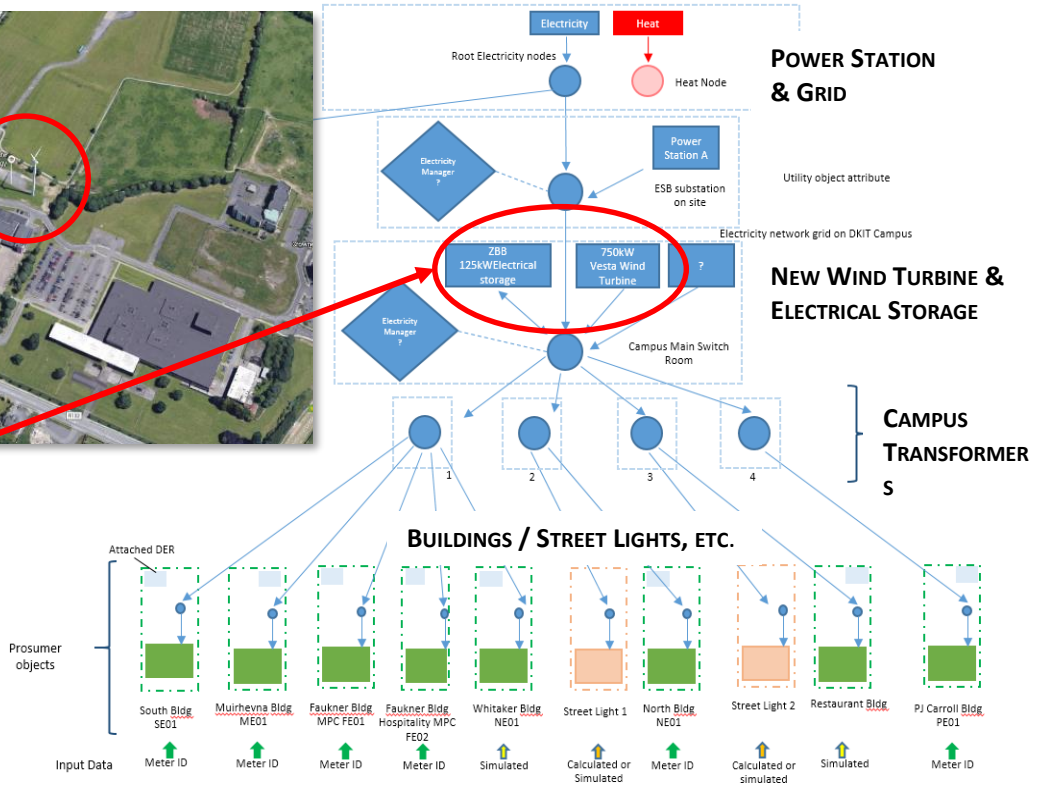
ICL: Intelligent Community Lifecycle



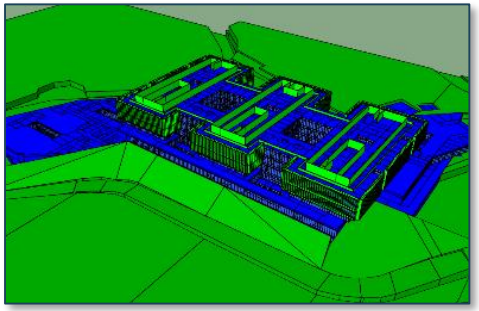
Dundalk Institute of Tech Campus, Ireland



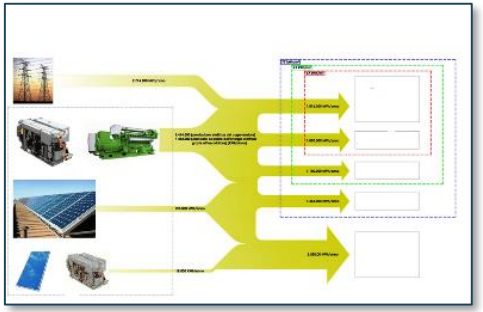
NEW WIND TURBINE & ELECTRICAL STORAGE



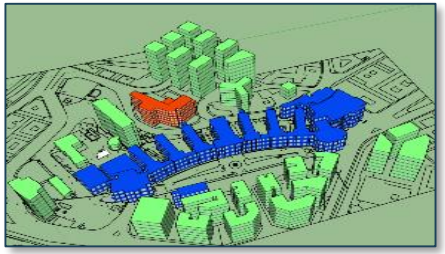
Galliera Hospital Campus, Italy



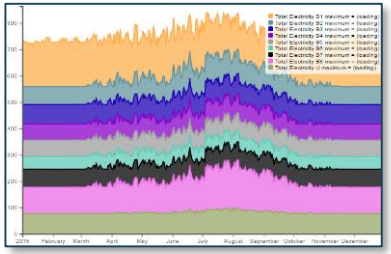
NEW HOSPITAL VE MODEL



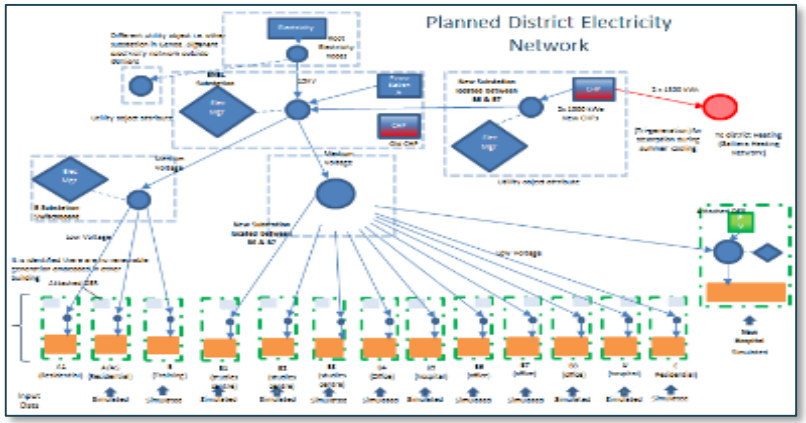
NEW HOSPITAL ELECTRICITY ENERGY FLOW



CAMPUS MASTERPLAN MODEL



SIMULATED BUILDINGS ELECTRICITY LOADS



PLANNED DISTRICT ELECTRICITY NETWORK

Thank You!

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Thank You