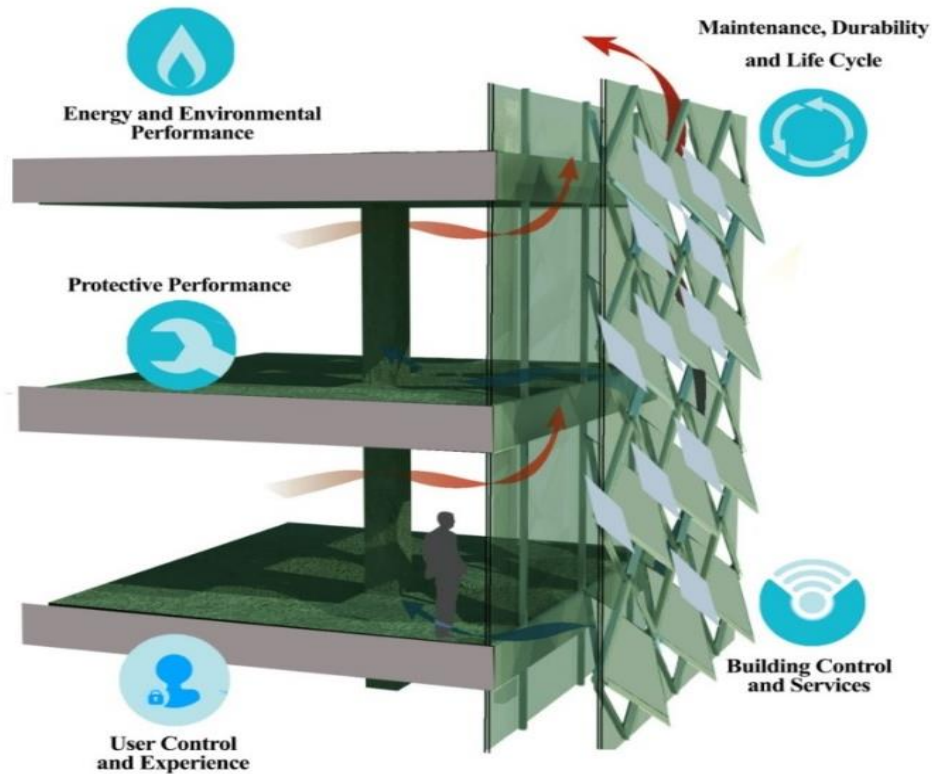


Smart Adaptive Facades

Market State of Play



Adaptive Façades Families



Dynamic Shading
Façades



Chromogenic
Façades





Solar Active
Façades



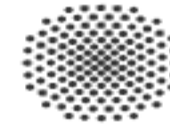
Active Ventilative
Façades

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Acknowledgment



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CRC 1244 Conference on Adaptivity I 11 October 2022



CA TU14030



ISO/AWI 52016-3

ISO/TC 163/SC2/WG 15



Architectural
Facades and
Products research
group



IEA Annex 80



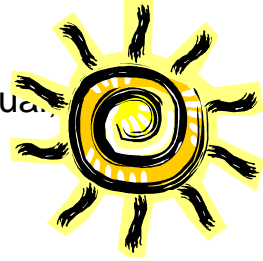
Resilient Cooling (2019-2023) Advanced Solar Control



Building Envelopes

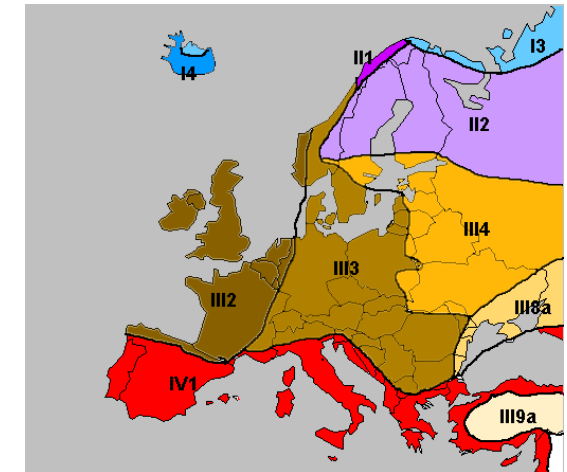
Varying boundary conditions

(hourly, diurnal, seasonal, annual, regional, ...)



Varying user requirements

activity, comfort, temperature, humidity, light, air quality, culture, occupancy



Currently building envelopes are «static»

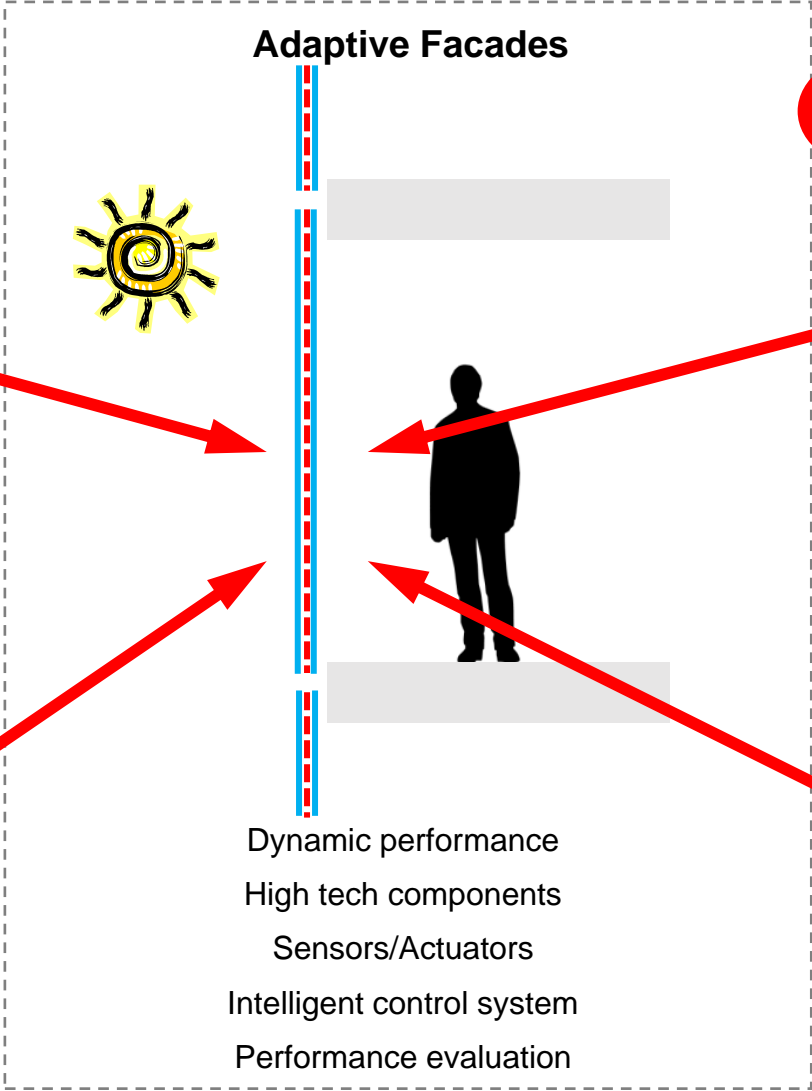
Complex & Interactive System

Environment

- Region
- Transient conditions
- Light
- Temperature
- ...

Owner/Investor

- Financial interests
- Maintenance
- Durability
- ...



1

Innovation

Building

- Energy concept
- Building technology
- HVAC System
- Solar power utilisation
- ...

Occupant/User

- Activity
- Requirements
- Wellbeing
- Perception
- ...

Dynamic Envelopes



Promising Technologies

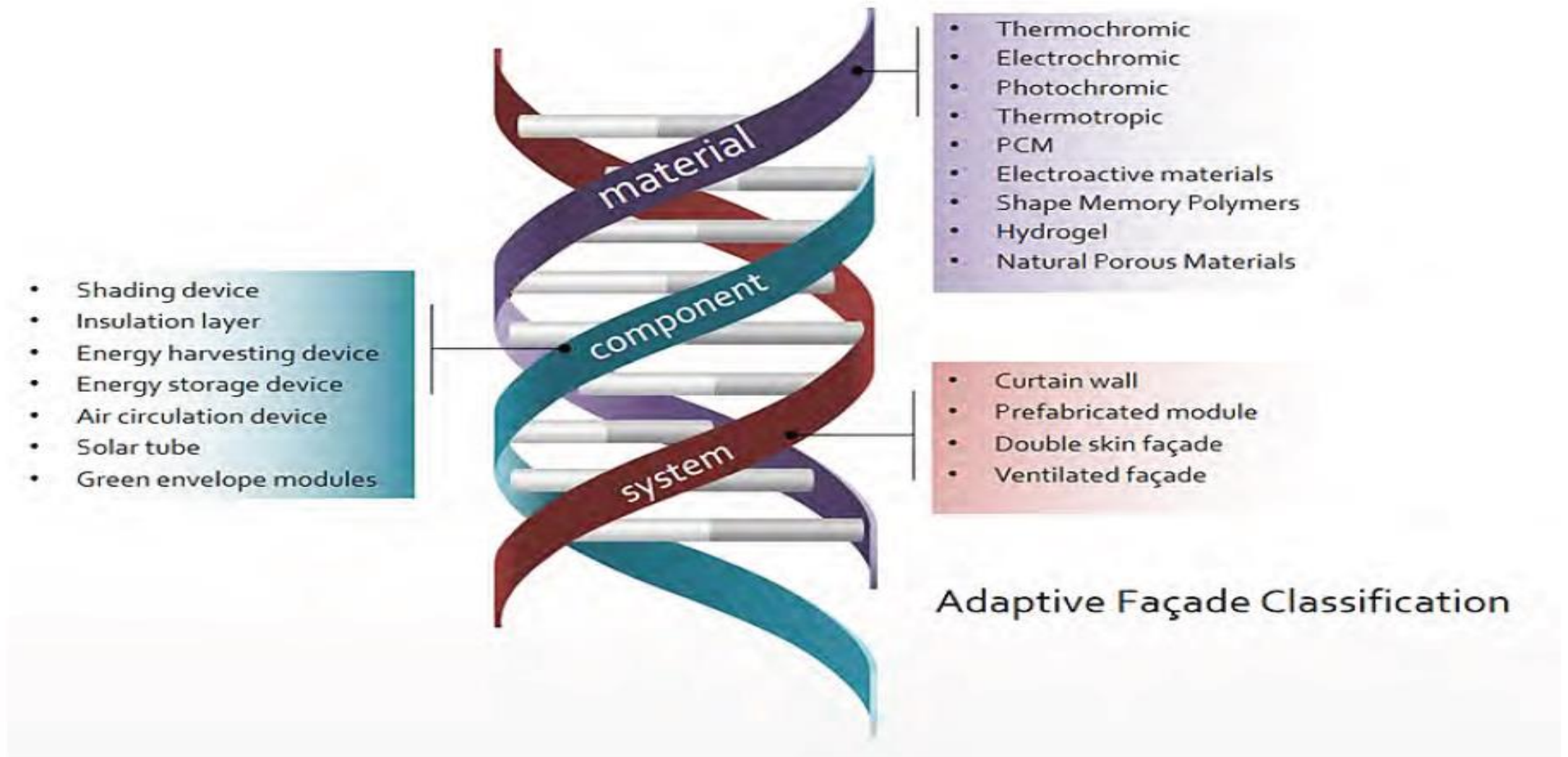
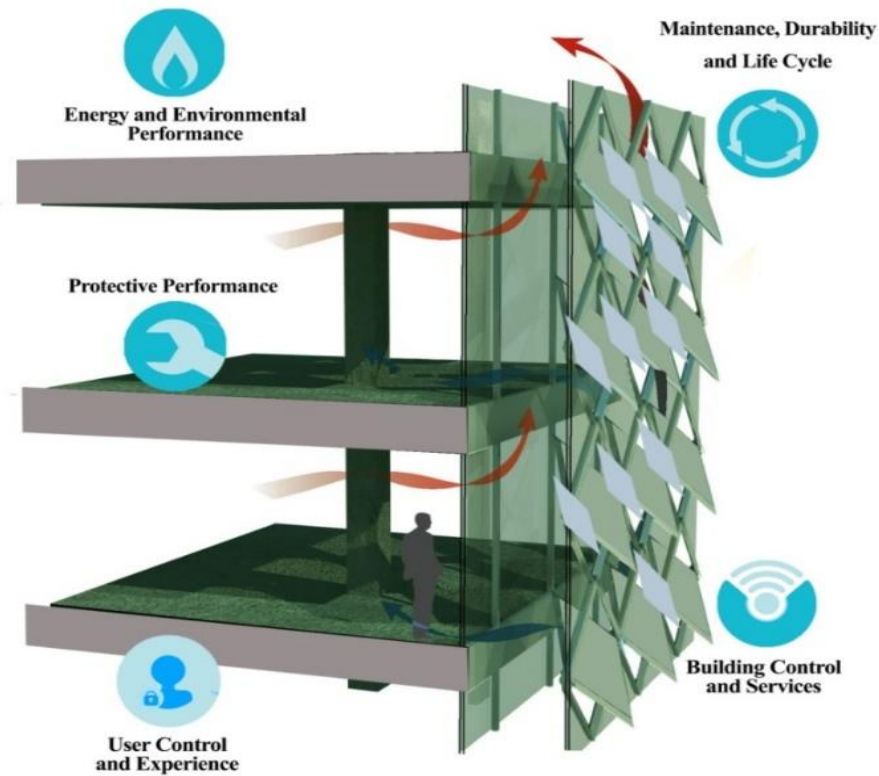


Figure 2 - Conceptual diagram of the case study classification

Future Trends and Main concepts

Regulation Landscape, State of Technology Advancement, Future Market Technology



adaptive façades families



Dynamic Shading Facades



Chromogenic Facades

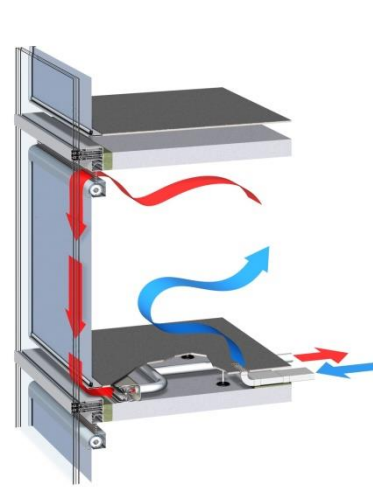
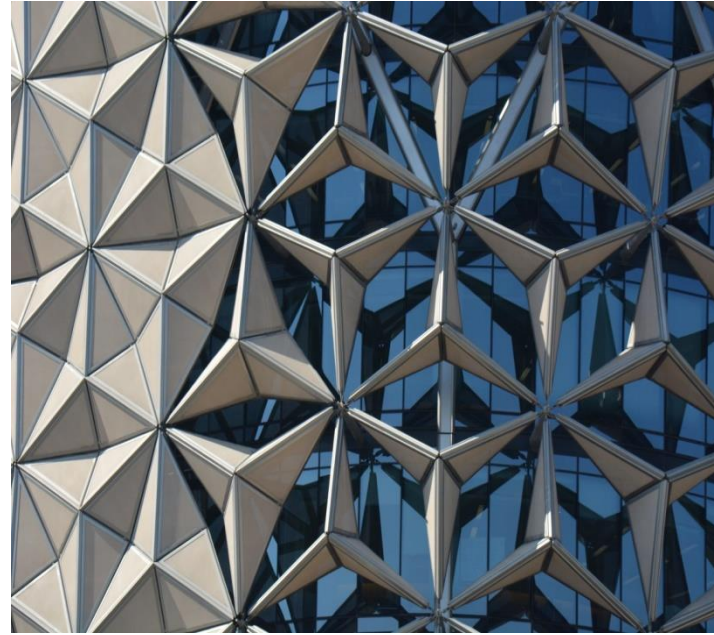


Solar Active Facades



Active Ventilative Facades

Promising Technologies



1. AlBahr Towers, Aedas, Abdulmajid Karanouh
2. Swiss International Scientific School, UA
3. Solar Leaf, Arup
4. Automation center - Esslingen, Architekturbüro Jaschek Stuttgart

AF Technologies, Categories & Characteristics



3342

Energy, Science & Engineering
Open Access

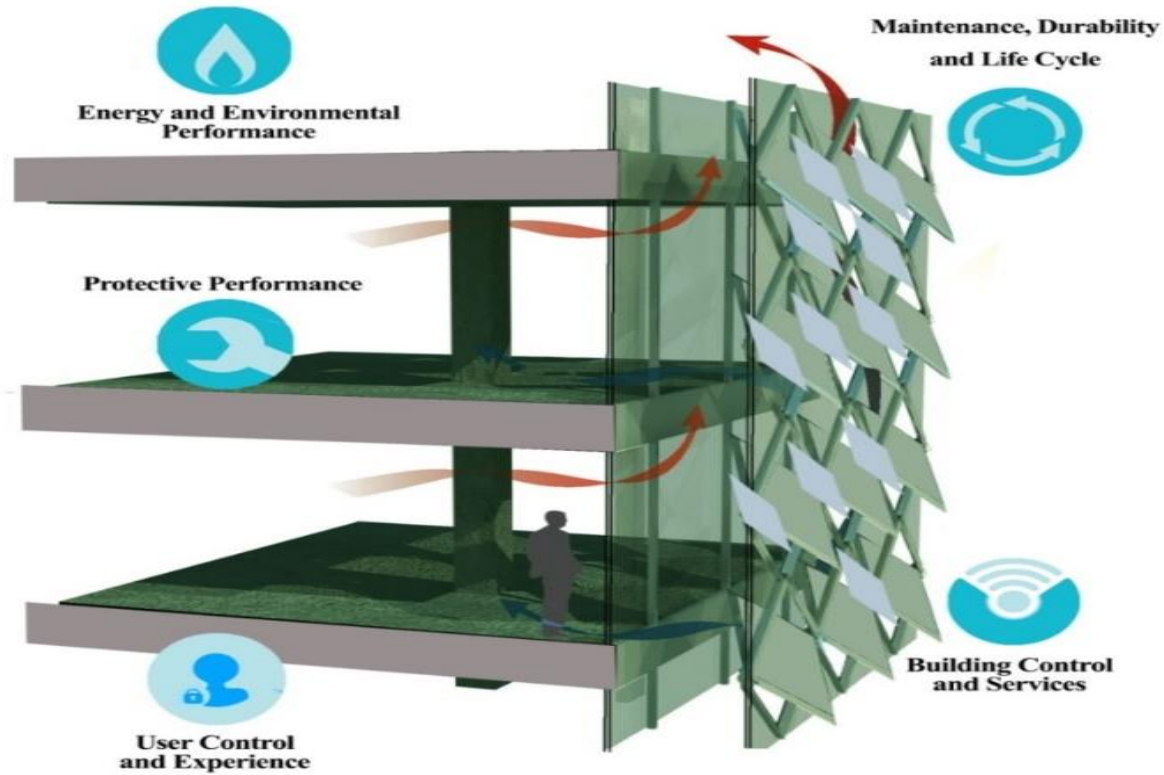
TABLE 1 Adaptive facade technologies, categories, and characteristics

Application/purpose	Control	Building type	Technology/materials
Dynamic shadings			
Shutter or equivalent	Obstruction of sunlight, thermal insulation, security, summer comfort, cooling savings, security, heat retention	Manual, motorized or automated (with different levels of automation)	Residential and nonresidential (schools, hospital, offices, public buildings)
Roller blinds or equivalent	Obstruction of sunlight, thermal insulation, summer comfort, privacy, glare protection, cooling savings		Often large wood or PVC, aluminum, integrated blinds in the ceiled glazing
Venetian blinds or equivalent	See above		Cellular shades and fabrics (different types and properties)
CCF: natural ventilated	Sunlight adjustment, daylight control, summer comfort, glare protection, privacy, cooling savings	Electric (motorized) or magnetic	Office buildings
			Tilting slats and glare control, aluminum and ceiled glazing
			Venetian blinds: aluminum
			Electrostatic: thin film
Chromogenic glazing			
Electrochromic glazing	Solar gain and daylight control, reduce cooling needs, summer comfort, glare reduction	On demand (active), automated (different levels of automation)	Residential and nonresidential (schools, hospital, offices, public buildings)
Liquid crystal glazing	Create privacy spaces, projection screen, and control (solar heat, visible light)		Suspended particles, organic and nonorganic coating, colloidal nanocrystal
Thermochromic glazing	Solar gain and daylight control, reduce cooling needs, summer comfort, glare reduction	Environmentally activated (passive)	Thin film or interlayer which changes its crystal structure
Solar active facades			
Double skin facade	Solar gain and daylight control, reduce cooling needs, summer and winter comfort, glare reduction	Active control, environmentally activated, automated	Residential and nonresidential buildings
Green facade and roof	See above	Environmentally activated (passive)	Two skins with a ventilated cavity (natural or mechanical)
Phase change materials	Solar gain control, reduce cooling needs, winter and summer comfort, heat and solar energy store	Environmentally activated (passive)	Different foliage layers and functional substrates for plant growing
			Salt or paraffin materials, micro or macro encapsulated into building components
AVF			
CCF: active ventilated	See above	On demand (active), automated (different levels of automation)	Office buildings

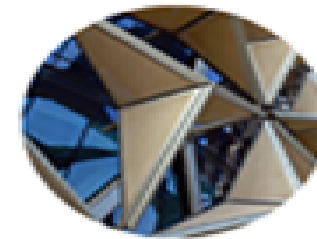
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Smart Adaptive Facades

Market State of Play



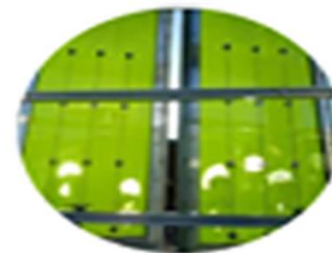
Adaptive Façades Families



Dynamic Shading Facades



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Active Ventilative Facades

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