Energy Efficient Buildings: Sustainable Technologies for Avant-garde Housing Systems

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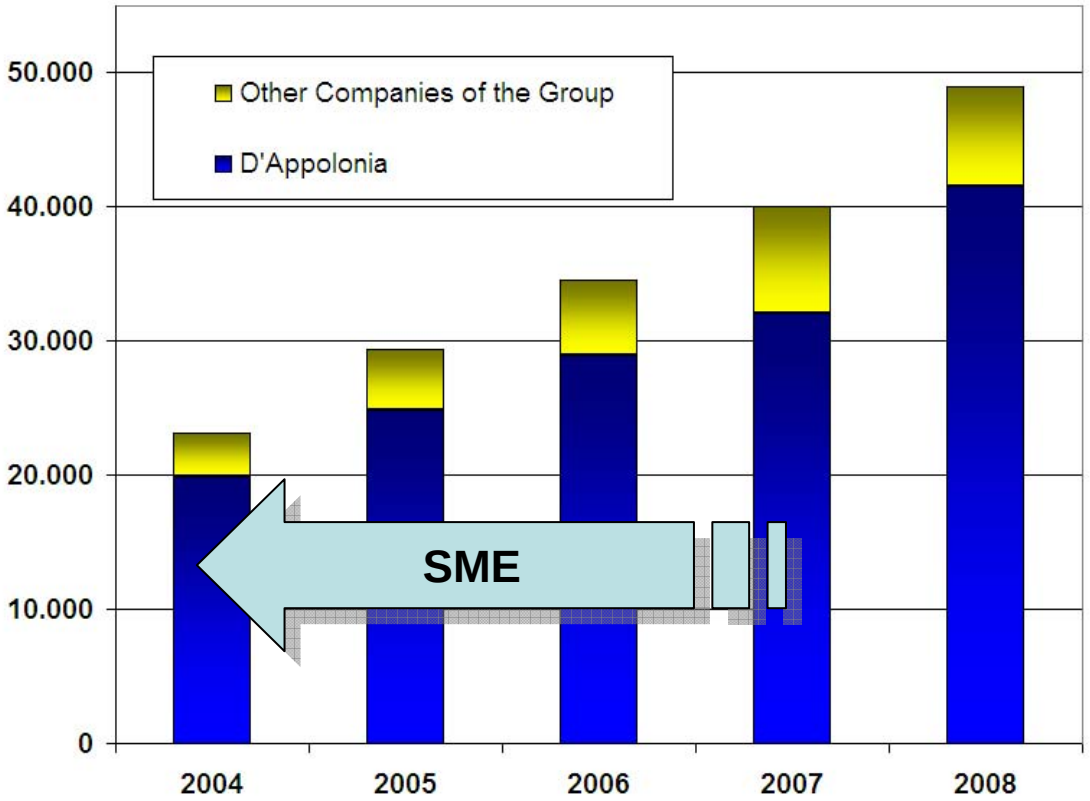
EIT SEMINAR
Shaping the Knowledge and Innovation Communities (KICs) - SUSTAINABLE ENERGY
Wien, 16th February 2009

THE COMPANY AT A GLANCE

D'Appolonia is an **engineering and innovation consulting company** which provides high added value services to government and industry, covering the whole project life cycle from research and feasibility studies to project management, commissioning and maintenance.



Production:

- D'Appolonia S.p.A.: 41.5 M€ (estimate for 2008)
- D'Appolonia Group : 49 M€ (estimate for 2008)

Staff D'Appolonia Group:

- about 450 people

Staff D'Appolonia S.p.A.:

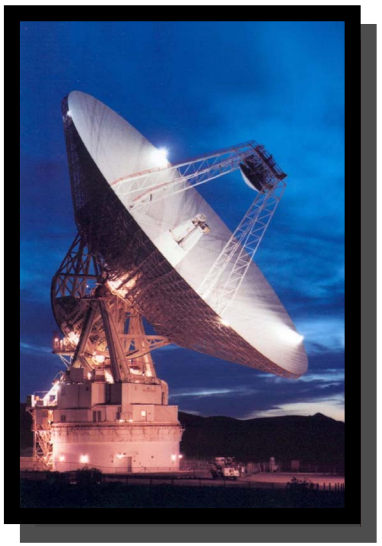
- 290 people, 85% with a scientific degree
- 25% of engineering personnel also granted a MSc or PhD

COMPANY ACTIVITIES

Oil & Gas

Transportation

Construction



Space & Security

1956

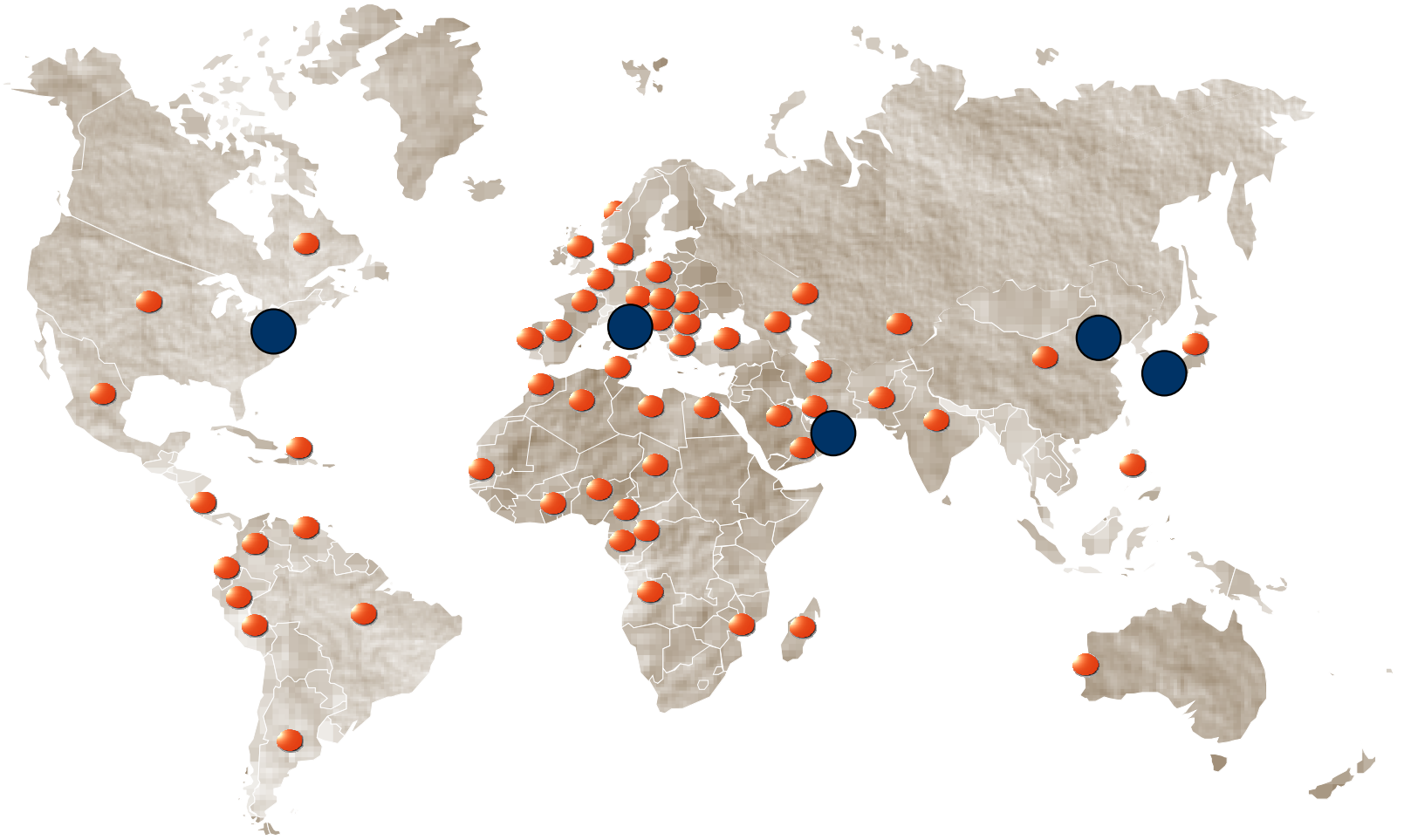
Specialistic Engineering
Nuclear Power Plants

Today

Innovation

Energy and Climate Change

OFFICES & PROJECT LOCATIONS



Main operating offices

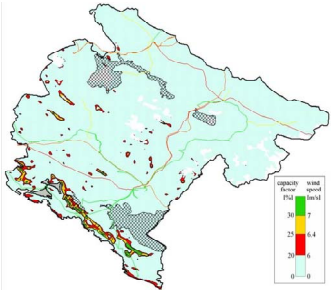
Project and representative offices

THE RATIONALE FOR US TO DEAL WITH E2Bs

WIND POWER INSTALLATION
VITERBO (Italy)

SMALL HYDRO POWER PLANTS
Southern Serbia and Montenegro

LANDFILL GAS RECOVERY AND REUSE - YINCHUAN, HANDAN, HAIKOU, ANYANG SITES (PRC)



MAPPING AND ASSESSMENT OF THE RENEWABLE ENERGY
Montenegro

Common theme across our different business divisions:

- Several industrial contracts on Sustainability and Climate Change, Energy Efficiency and the Built Environment
- Currently active in main international collaborative research projects in E2Bs and related enabling technologies

NEW RAILWAY STATION COMPLEX
BOLOGNA (Italy)

ROYAL PALACE RESTORATION
TURIN (Italy)

ENERGY DIAGNOSIS
BRITISH EMBASSY
ROME (Italy)

DEVELOPING THE E.NERGY EFFICIENCY POTENTIAL IN THE EIB'S FINANCING

E2BS: CHALLENGES AND SYNERGIES WITH CLIMATE CHANGE

QUESTIONS:

What will be the temperature on Earth for my grand-children ?

When shall we reach a "no-return" level of CO_2 ?

Will Greenland ice melt faster and faster ?

Is peak-oil behind us ?

Will our economic system survive ?

What is at stake is the stability
we have always taken for granted

E2BS: CHALLENGES AND SYNERGIES WITH CLIMATE CHANGE

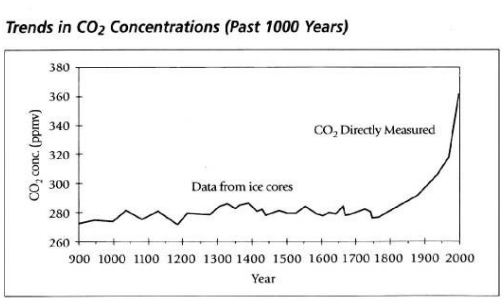
FACTS:

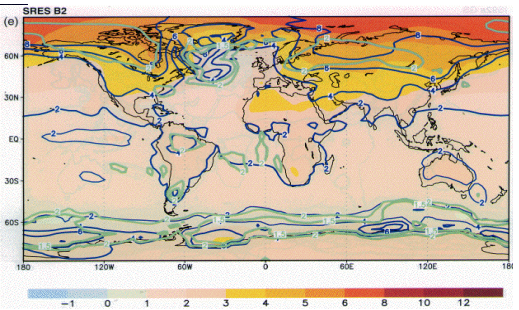
<u>The scientific community agrees on one point</u>:

All countries must drastically and rapidly reduce their CO_2 emissions

Doing so, we may reach 2020 and 2050 goals

and we shall increase our energy independence





E2BS: CHALLENGES AND SYNERGIES WITH CLIMATE CHANGE

OUR RESPONSIBILITY:

- Buildings use **40 %** of total EU energy consumption
- The built environment generates **1/3 of GHG in Europe**
- Replacement rate remains very small (1 to 2 % per year)
- New buildings are still far from being really energy efficient
- We should provide now solutions at a large scale

Business as usual is not an option

E2Bs AND NEW DESIGNS ARE APPEARING

Acciona Solar, 0 emission building

Green Office (Bouygues Immobilier)

INNOVATION AS DRIVER FOR E2Bs

Innovation is needed as state of the art solutions only partially address the challenges, knowledge creation and integration (**multidisciplinarity** and **cross-sectoriality**) are required, **new business models** and **value propositions** are necessary.

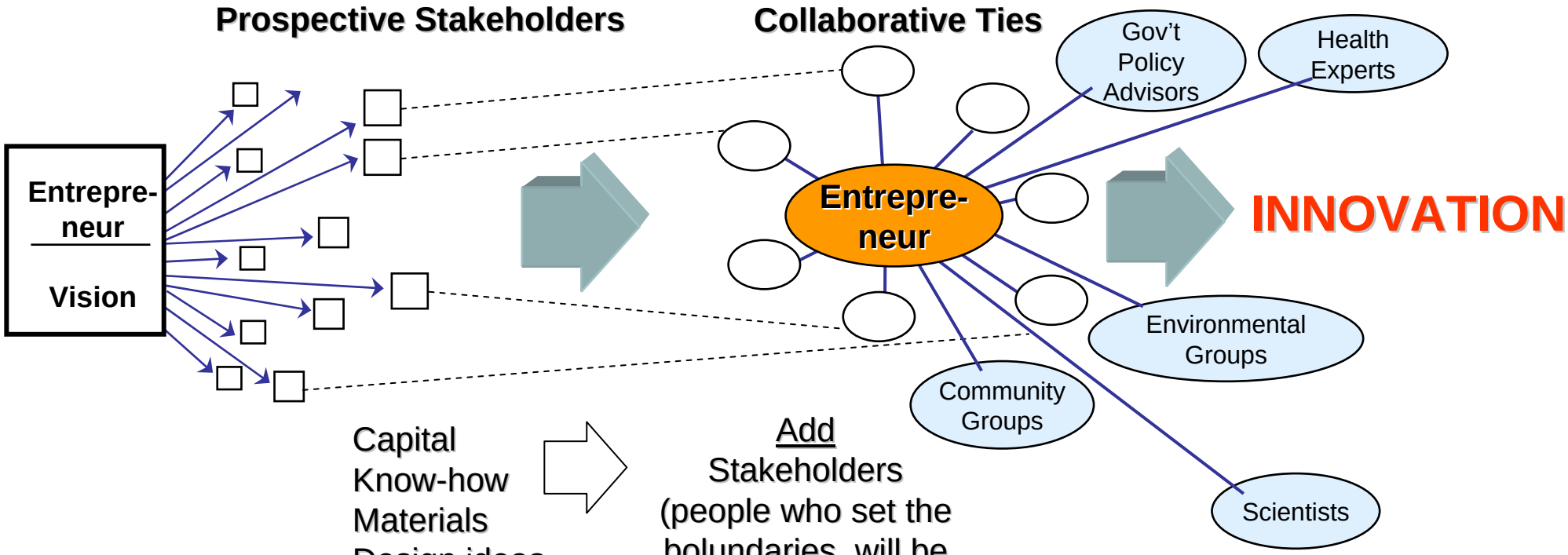
These are the drivers for D'Appolonia being deeply involved as founding member with 8 leading European Players in the **European Association for Energy Efficicency in Buildings (E2B)** which fosters the creation of a PPP to boost research in this interdisciplinary domain and to ensure a large impact at EU level.

ENTREPRENEURSHIP vs THE INNOVATION PROCESS

The **entrepreneur** plays a crucial role in the E2B innovation chain to identify the key leverage points in the building or in the processes where a coordinated suite of small changes will yield the greatest synergy generating buying drivers accepted by the market and the stakeholders.

When it comes to E2Bs and Sustainability, **INNOVATION** should be considered as an iterative process of interactions with prospective Stakeholders that results in a stakeholder network from which the new product/process/service emerges.

ENTREPRENEURSHIP vs THE INNOVATION PROCESS

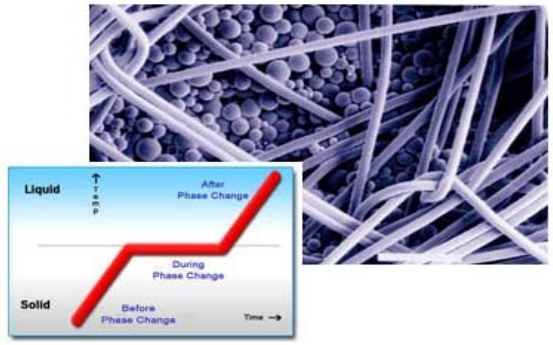


Courtesy Darden Un. Virginia

SOME TARGETS FOR INNOVATION IN E2Bs (1 OF 3)

A **more efficient envelope** :

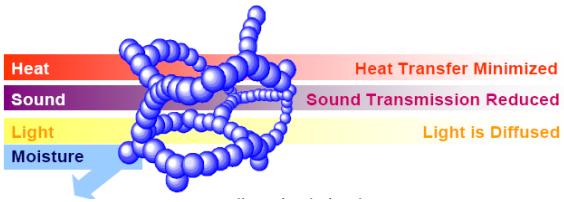
- Improved materials
- Bioclimatic architecture
- Improved design, new concepts



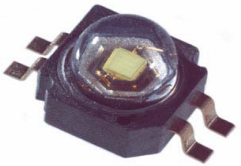
Phase Change Materials

Better equipment and systems :

- Efficient HVAC equipment
- Lightning and Electric appliances
- Energy Storage
- Improved monitoring
- Stronger systemic approach



Aero-nano gels



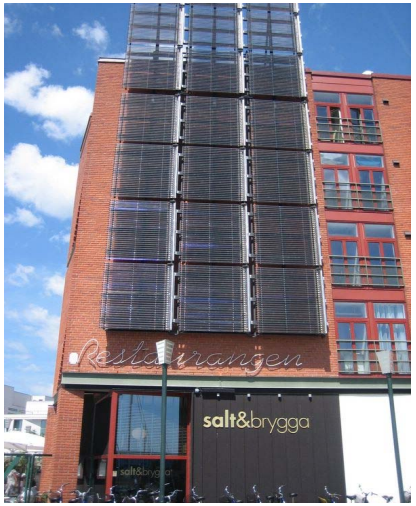
LED Lighting

SOME TARGETS FOR INNOVATION IN E2Bs (2 OF 3)

Stronger integration of renewable energies

- Solar PV *****
- Solar thermal *****
- Wind turbines
- Biomass
- Geothermal….

(***** No expected "peak sun" before 3 Billion years)



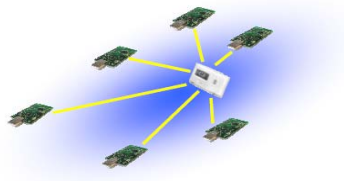
Change collective and individual behavior

- By harmonized EU regulations
- Standardisation
- Promotion of EE by public sector
- Disseminate global costing, think long-term
- Improve individual behavior

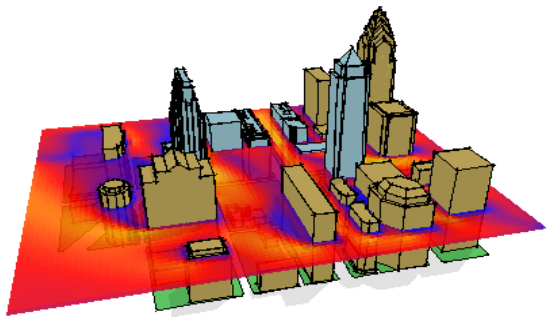
SOME TARGETS FOR INNOVATION IN E2Bs (3 OF 3)

ICTs for Energy Efficiency

- Tools for designing and measuring energy efficiency at building and district level
- Building Automation: New and improved control and management systems (BMS/EMS) based on smart appliances and communication networks
- Smart Metering: Meters that measure individual energy demand over time
- User Awareness Tools: Intuitive feedback to users on real time energy consumption in order to change behaviour on energy-intensive systems usage
- Interoperability / Standards: Development of standardisation for the interfaces and communication

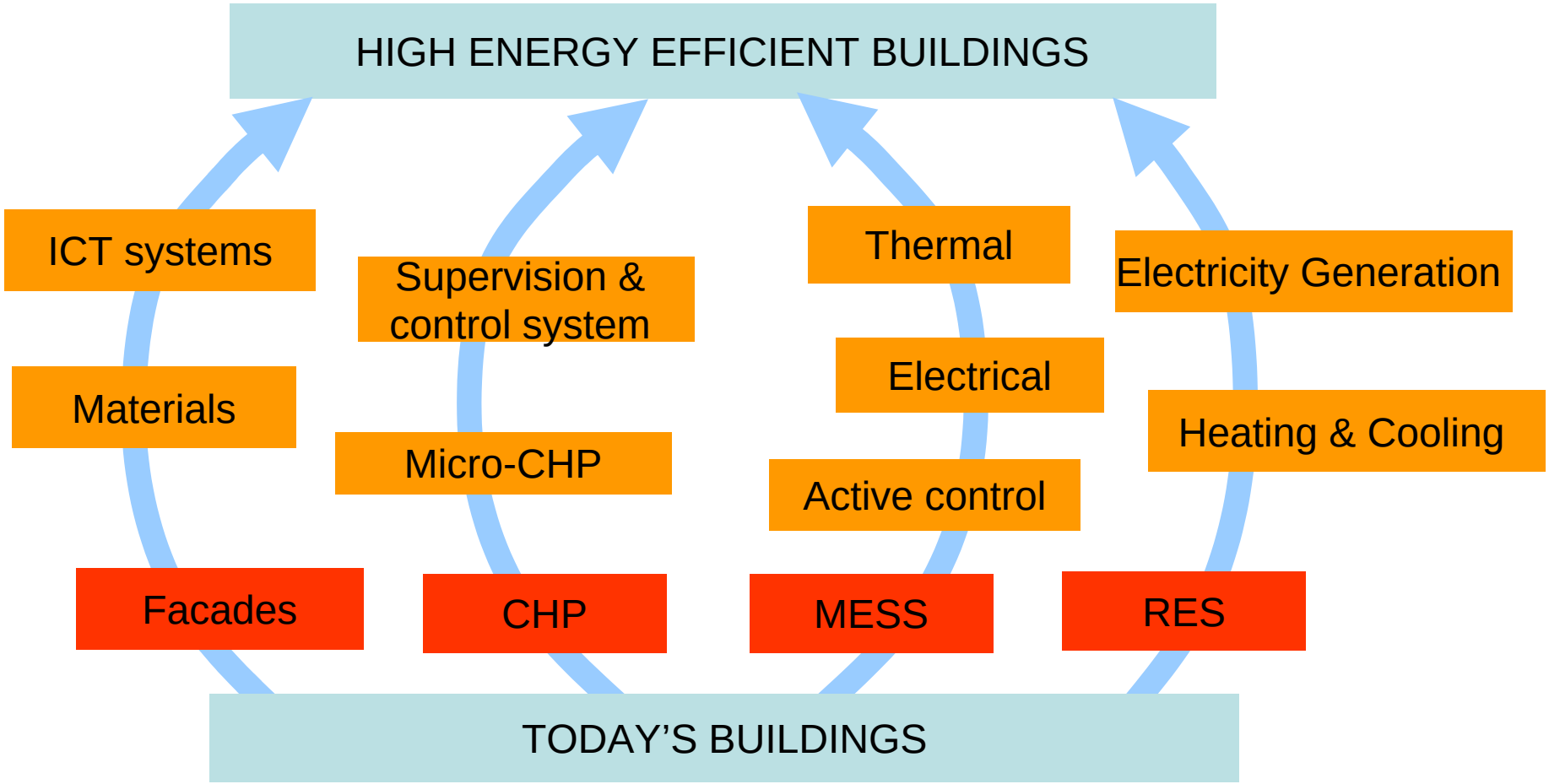


Wireless Sensors Networks



Design tools for Enegy Efficient districts

POSSIBLE EVOLUTION SCENARIOS



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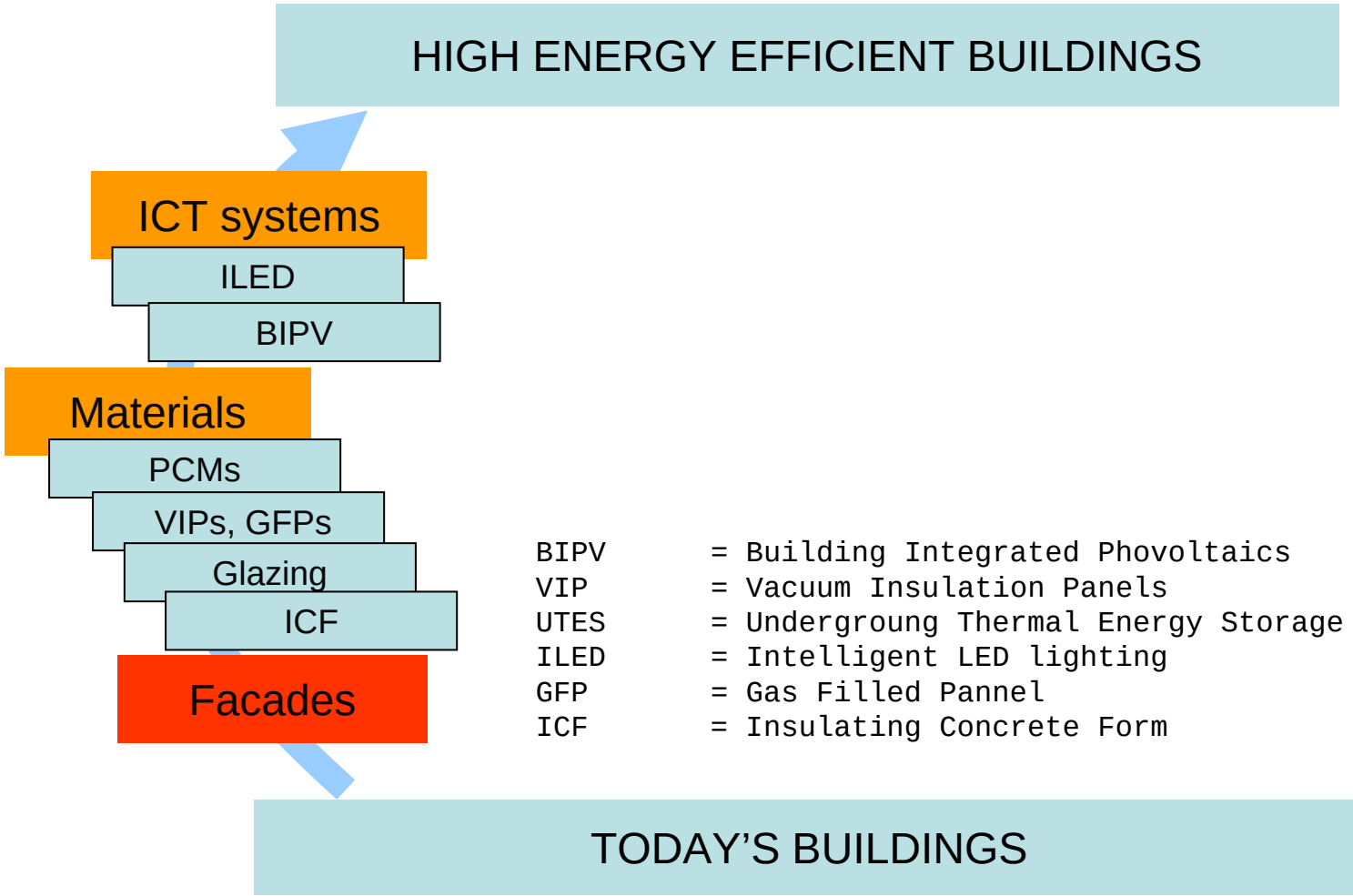
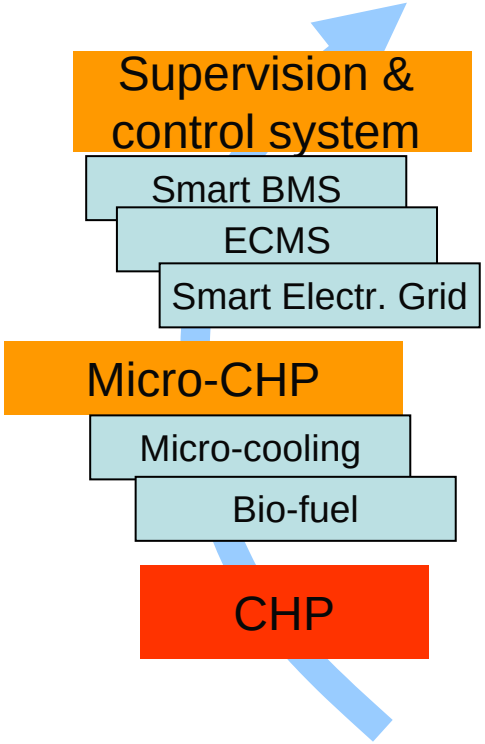


BIPV = Building Integrated Phovoltaics
VIP = Vacuum Insulation Panels
UTES = Undergroung Thermal Energy Storage
ILED = Intelligent LED lighting
GFP = Gas Filled Pannel
ICF = Insulating Concrete Form

POSSIBLE EVOLUTION SCENARIOS

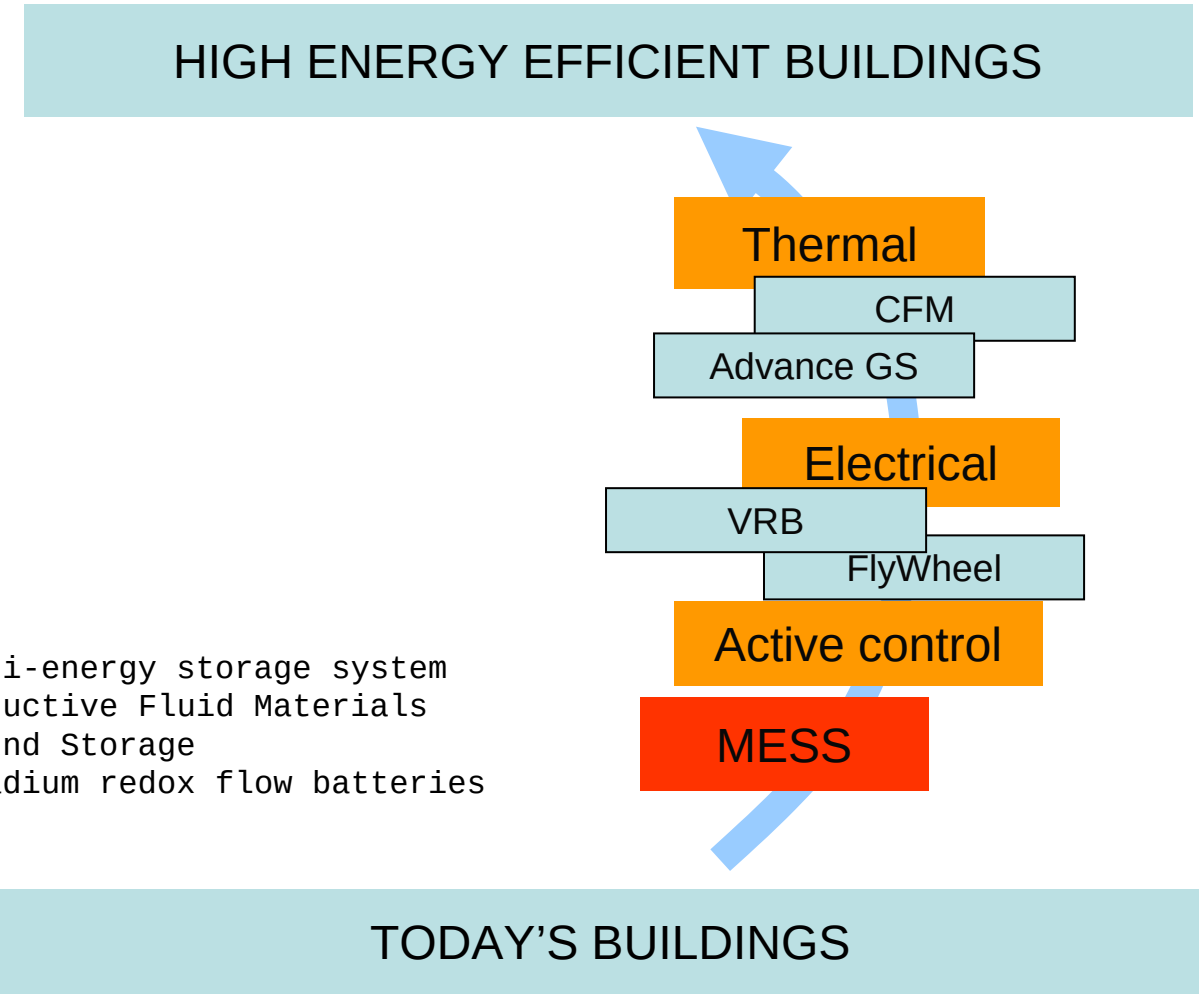
HIGH ENERGY EFFICIENT BUILDINGS



BMS = Building Management Systems
ECMS = Energy Control Manag. Systems
CHP = Combined Heat & Power

TODAY'S BUILDINGS

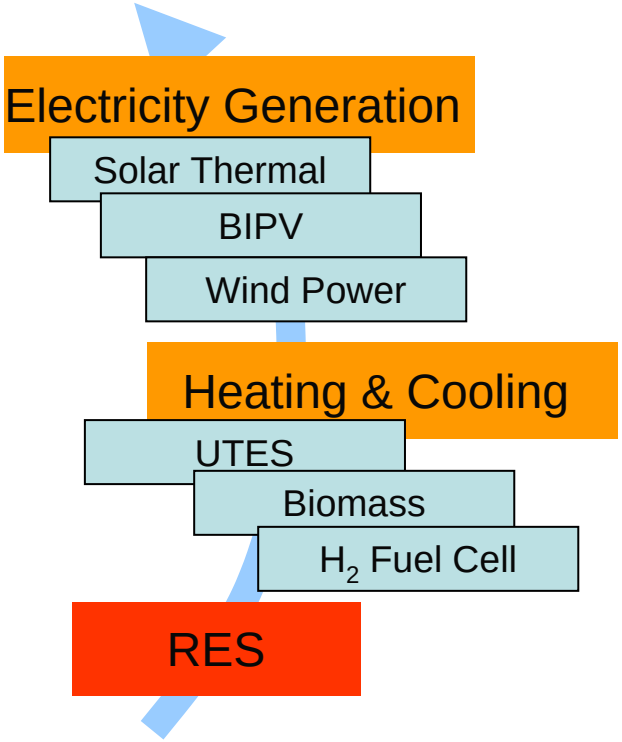
POSSIBLE EVOLUTION SCENARIOS



MESS = Multi-energy storage system
CFM = Conductive Fluid Materials
GS = Ground Storage
VRB = Vanadium redox flow batteries

POSSIBLE EVOLUTION SCENARIOS

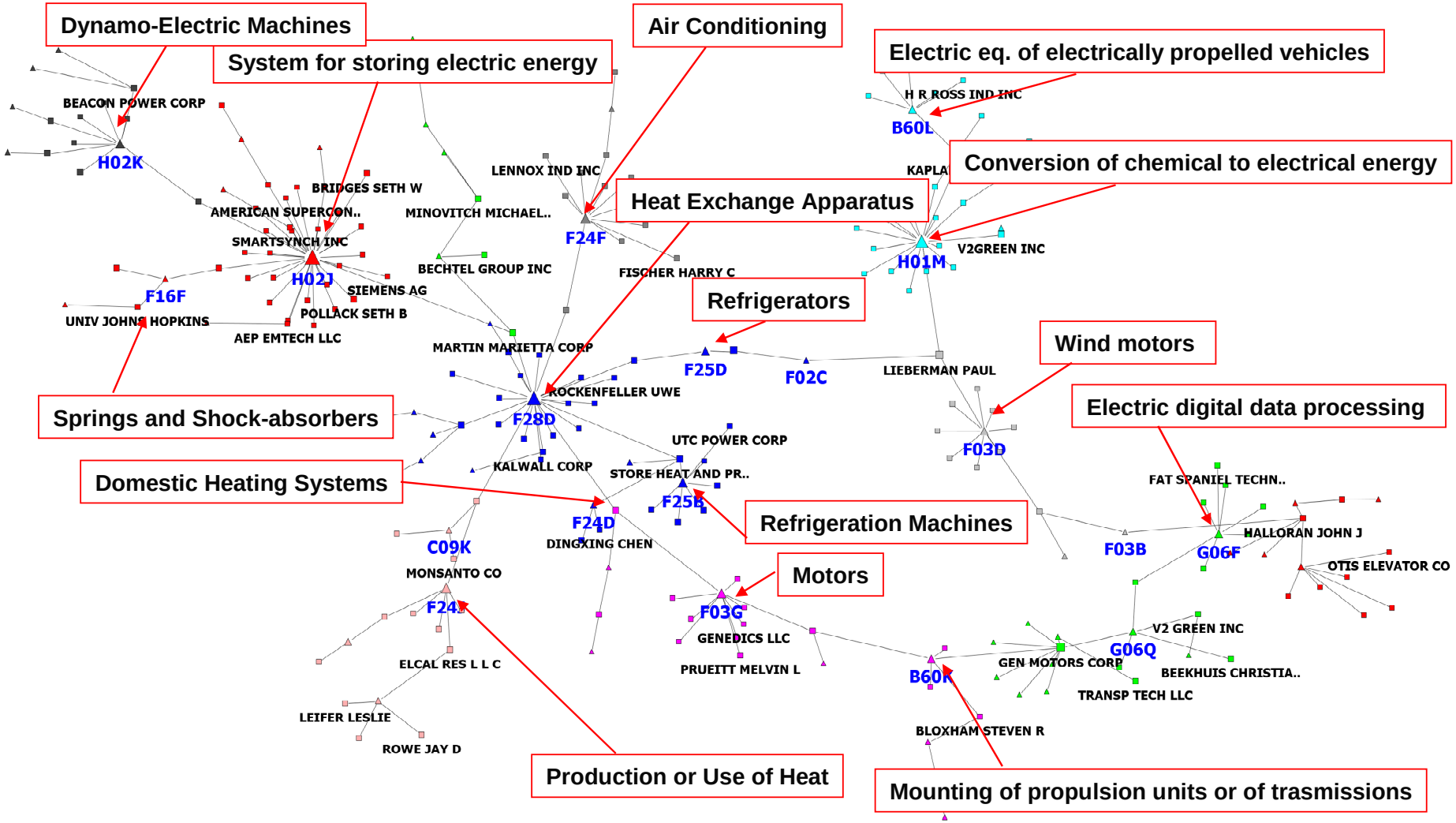
HIGH ENERGY EFFICIENT BUILDINGS



RES = Renewable Energy Sources
BIPV = Building Integrated Phovoltaics
UTES = Undergroung Thermal Energy Storage

TODAY'S BUILDINGS

SAMPLE ANALYSIS OF NETWORKS – ENERGY STORAGE SYSTEMS IN BUILDINGS



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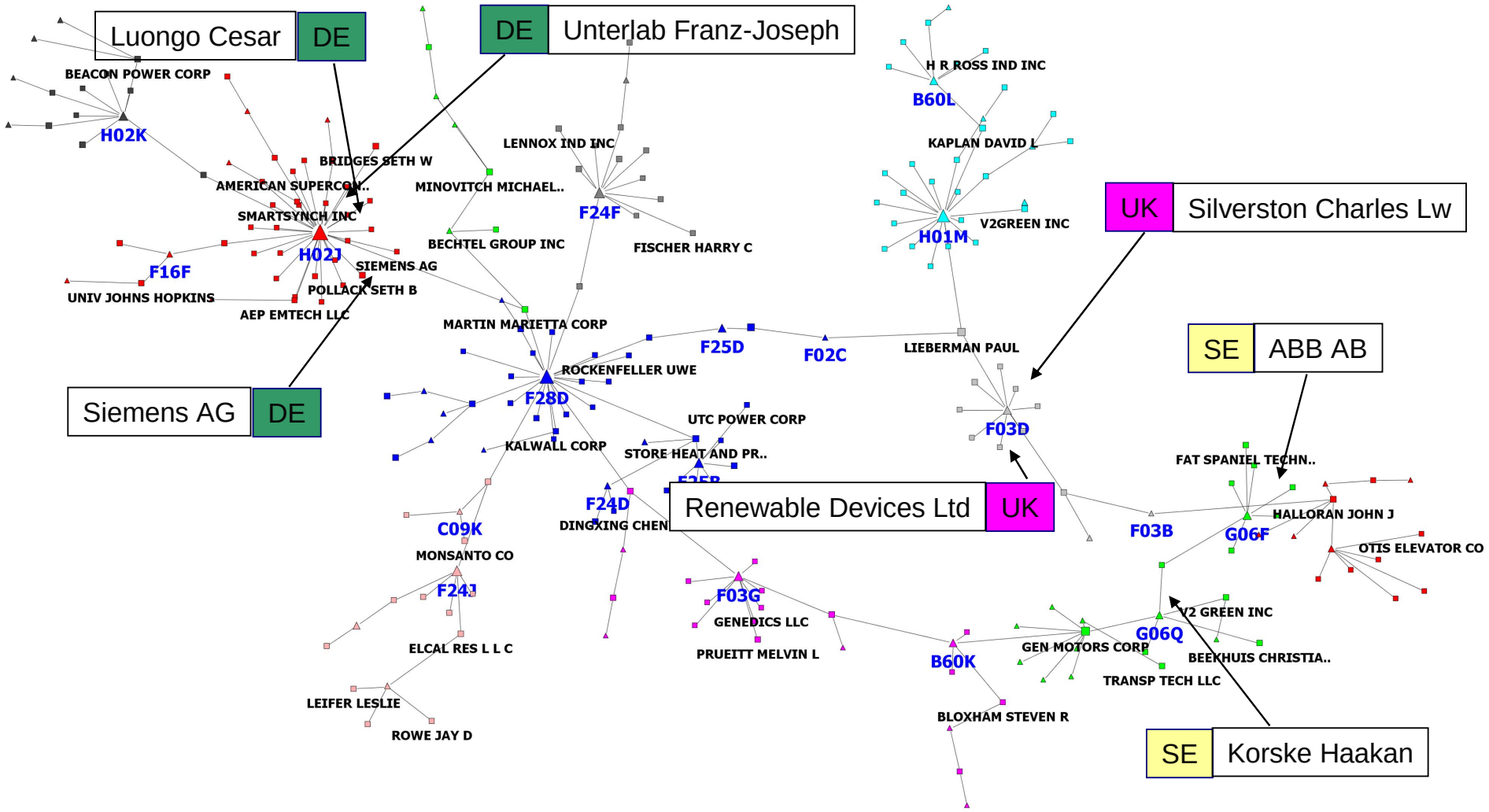
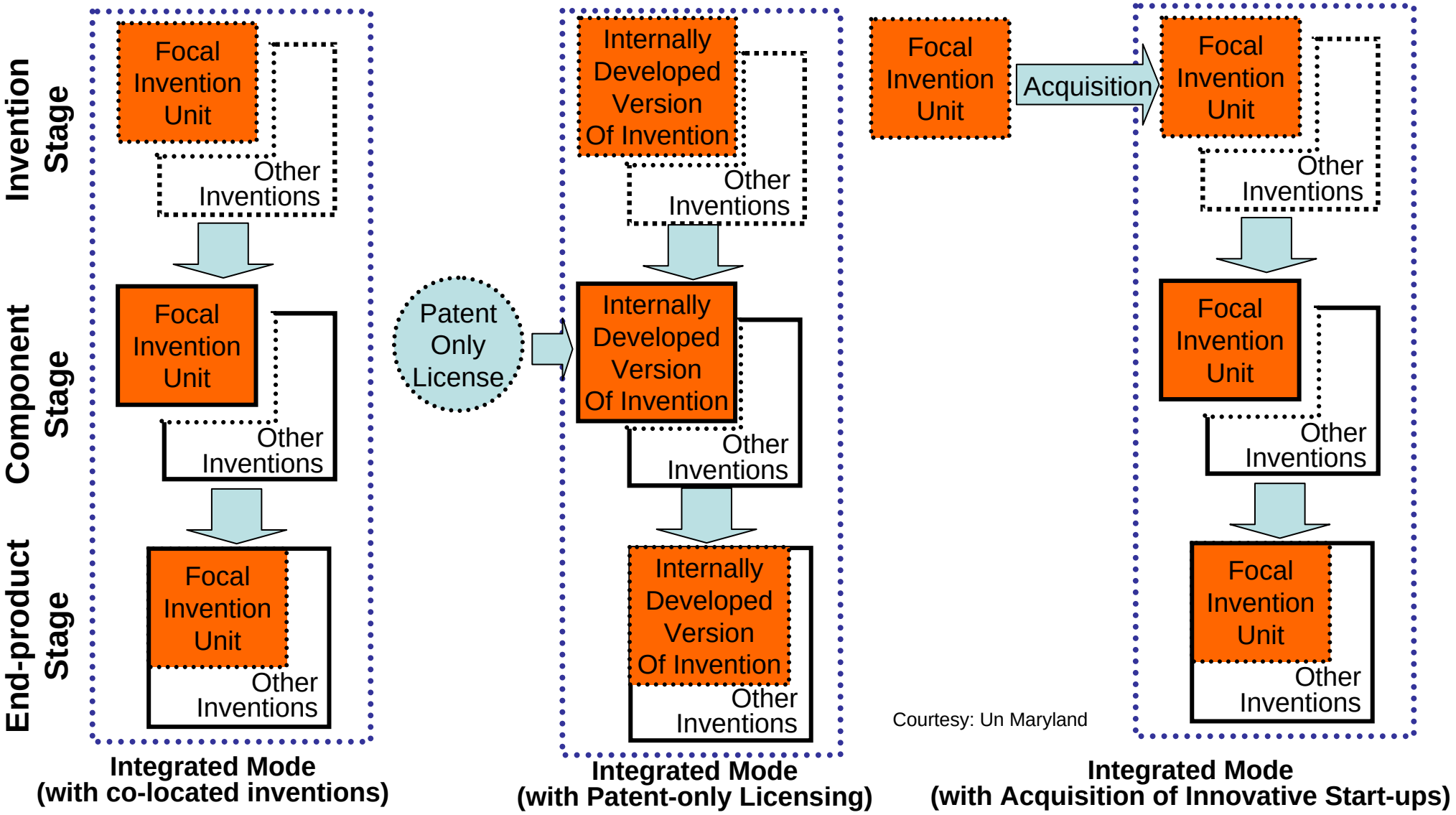


CHALLENGES FOR IPR AND TECH TRANSFER IN MULTI-INVENTION CONTEXTS

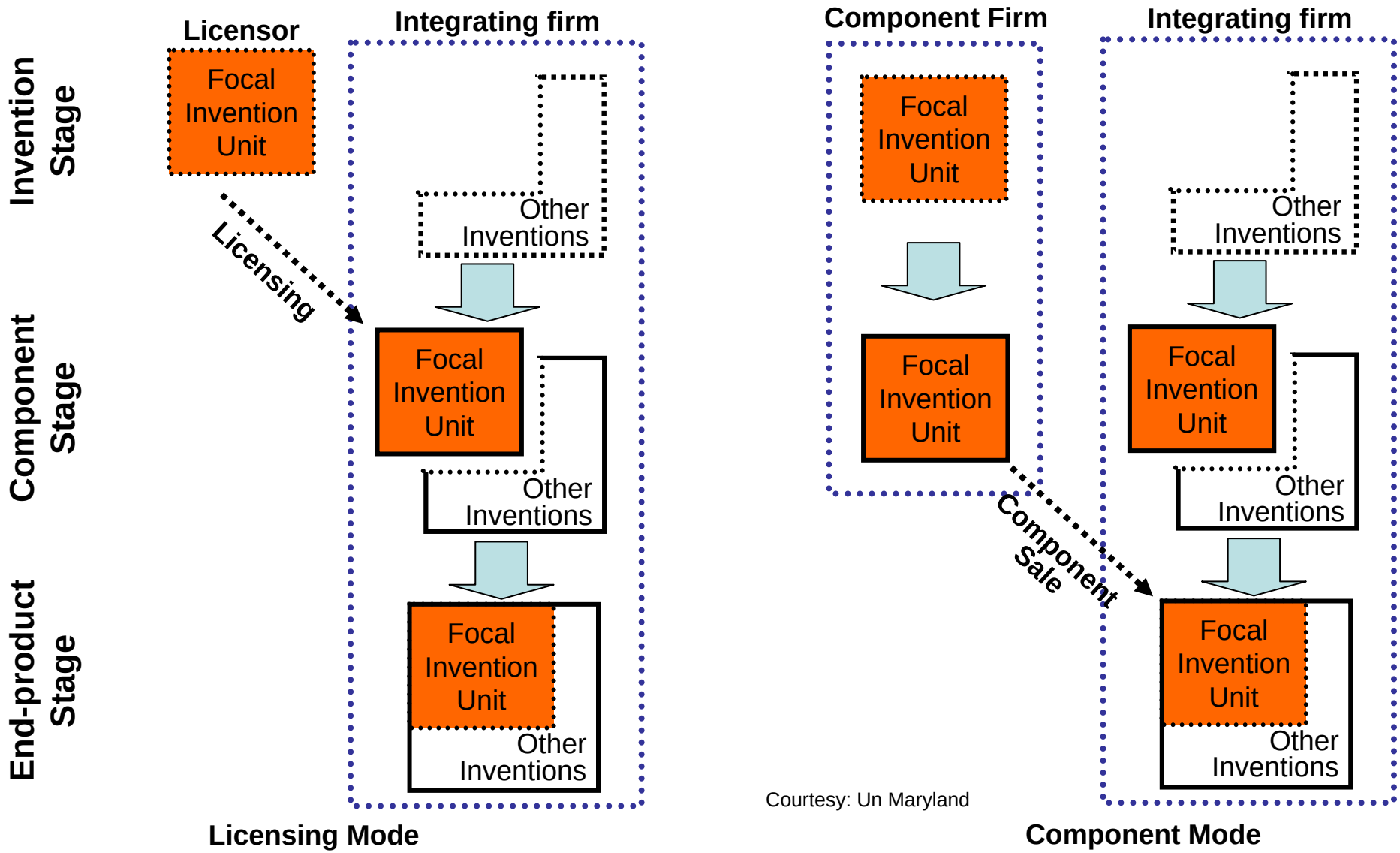
What if RES would produce Hydrogen within districts of buildings for trigeneration and/or car refuelling with no CO2 emissions??

It would be a multi-invention framework.
This would generate challenges for IPR and Tech Transfer within a **COMMUNITY** driven by **OPEN INNOVATION**.

CHALLENGES AND POSSIBLE SCENARIOS FOR IPR AND TECH TRANSFER IN MULTI-INVENTION CONTEXTS

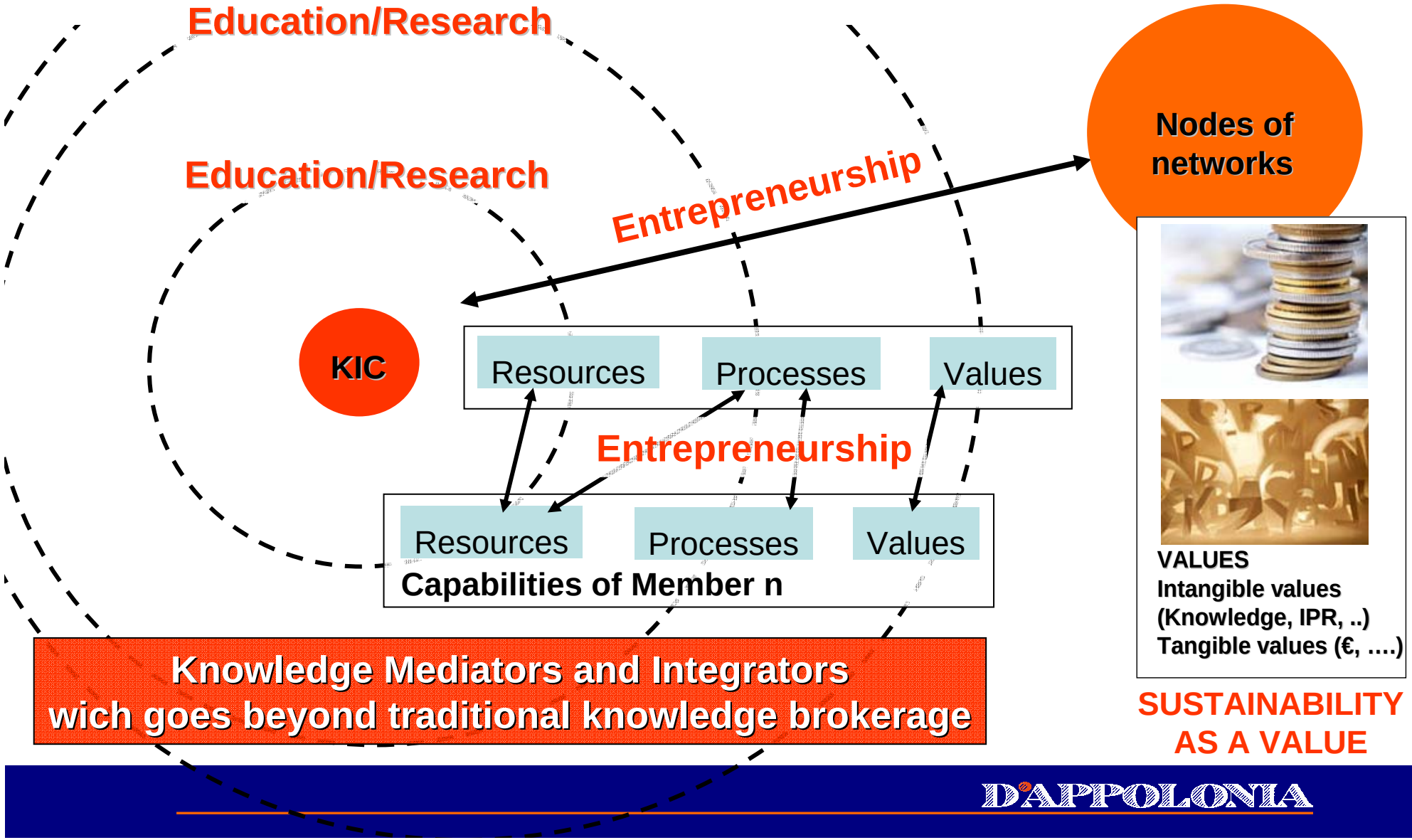


CHALLENGES AND POSSIBLE SCENARIOS FOR IPR AND TECH TRANSFER IN MULTI-INVENTION CONTEXTS



Courtesy: Un Maryland

SOME THOUGHTS FOR COOPERATION WITHIN A KIC ON SUSTAINABLE ENERGY (&/or CLIMATE CHANGE)



SOME THOUGHTS FOR COOPERATION WITHIN A KIC ON SUSTAINABLE ENERGY (&/or CLIMATE CHANGE)

Education/Research

Education/Research

Entrepreneurship

KICs
(i.e. ICT for E.E. or Dynamic Collaboration Networks

KIC

Resources | Processes | Values

Entrepreneurship

Resources | Processes | Values

Capabilities of Member n

VALUES
Intangible values (Knowledge, IPR, ..)
Tangible values (€, ….)

SUSTAINABILITY AS A VALUE

Knowledge Mediators and Integrators wich goes beyond traditional knowledge brokerage

THANK YOU FOR YOUR ATTENTION!!!

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PS: D'Appolonia, double P, one L ;-)