NIA
Nanotechnology
Industries Association

INDUSTRIAL DRIVERS FOR NANOMATERIALS PILOT PLANT SCALE UP

Dr Claire Skentelbery
NIA Director General

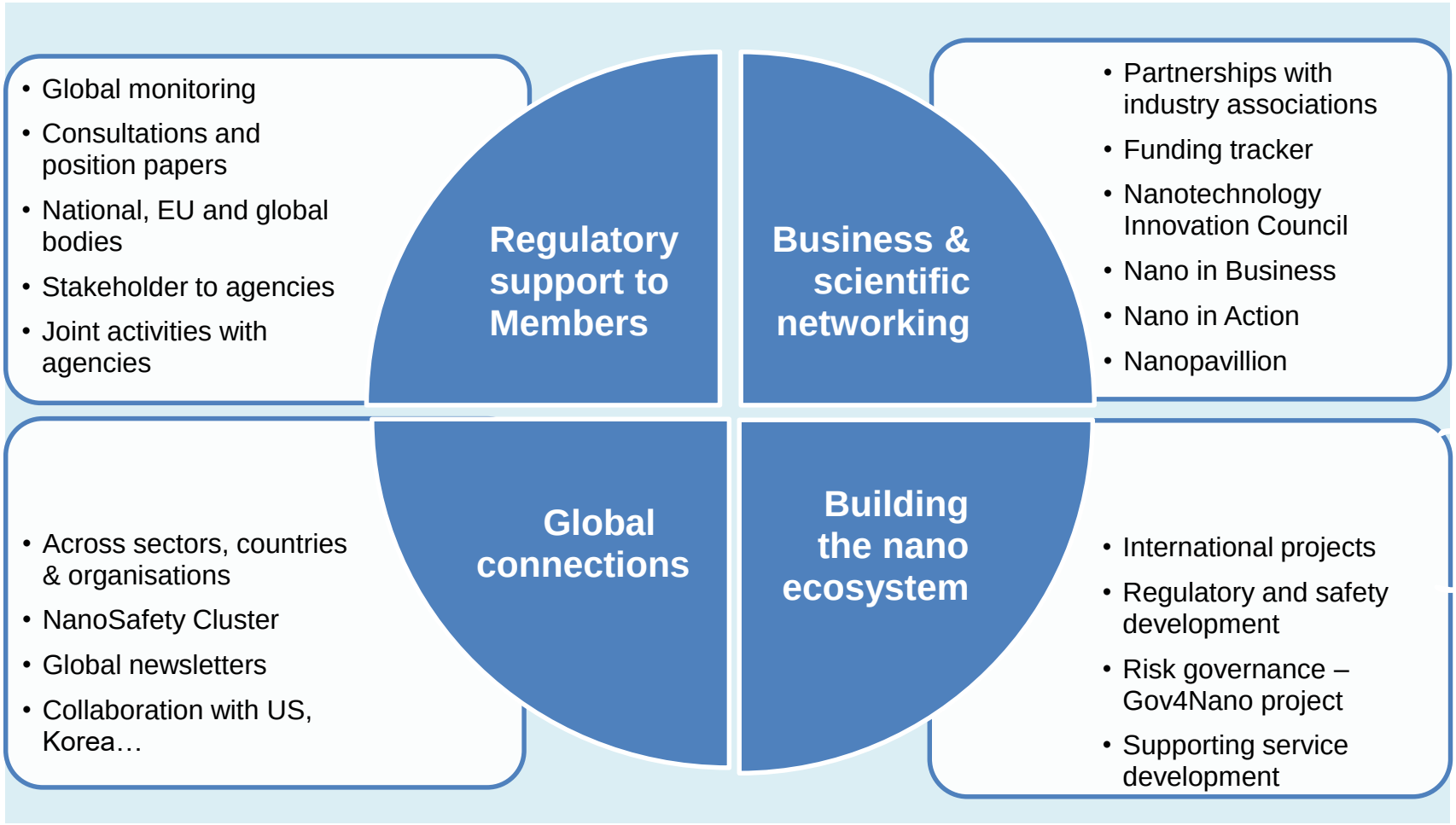
NIA
Nanotechnology
Industries Association

Today's presentation

- Introduction to NIA
- Focus on development of nanomaterials to market and key scale up decisions
- INSPIRED project 
- Functionalised inks for printed electronics
- Look at business decisions for scale up – influence early stage planning

NIA
Nanotechnology
Industries Association

About NIA



NIA
Nanotechnology
Industries Association

Meet a few of our Members…

Large companies

3M
BASF
SOLVAY
CABOT

Small/mid-size companies

ENERGENICS Europe Limited
INNOVNANO
cerion
CelluForce
NANOCO GROUP PLC
endomag
hiq-nano THE ART OF PRODUCING NANOPARTICLES
senolytx

Research

INL INTERNATIONAL IBERIAN NANOTECHNOLOGY LABORATORY
UNIVERSITY OF BIRMINGHAM
vito vision on technology
imec

Specialist service providers

GAB
everest advocaten . avocats . attorneys
yordas Group formerly THE REACH CENTRE
BC BERGESON & CAMPBELL PC

Associations & other

Canada
SWED NANO TECH
Czech is nano
BIO NANONET

NIA
Nanotechnology
Industries Association

The INSPIRED project

- Pilot line project: Functionalised inks for printed electronics produced to market demands
- Advanced formulations of copper, silver and graphene platelets
- Tested in touch screens, LCD signage and solar cells
- Consortium of industrial producers and expert research partners
- Industry partner producers and users of nanomaterials
- Project focus science, safety and economics

midsummer

TouchNetix

Thomas Swan
Chemical manufacturing since 1926

NANOGAP
SUBnmPARTICLES

M-SOLV Limited

EuroLCDs

intrinsiq materials

Financial drivers behind scale up

- Innovation and early commercial development focussed on material function and safety
- Successful ~~€€€€€€~~ reliant on ability to sell
- Quantity, reliability, consistency, cost, safety
- Scale up = specialist research and investment = cost
- Cost/unit
- Market potential
- Ability to supply
- Product consistency and reliability

Staying competitive

Staying alive

Experimental design for scale up

- Functionalised inks excellent example
  - Use in printed electronics
  - Conduct or resist electricity very important
  - Optimisation of material, formulation and print process
- Design Of Experiments (DOE)
  - *Materials:* Optimise yield, material purity, degree of functionalisation, changes to the surface chemistry, crystallinity and morphology and for controlling the degree of agglomeration
  - *Formulation*: multiple constituents that need to mix, interact and work in conjunction to perform a desired function – in process characterisation ideal
  - *Print:* Uniform deposition, adherence, gaps in NM deposition

Quality and consistency

- Consistency between batches or through continuous process
- Nanomaterials – new kid on the block
- Strengths behind nano create challenge for uniformity

Thomas Swan
Chemical manufacturing since 1926

Graphene nanoplatelets: Challenges to understand customer needs, plus agglomeration, dispersion problems

Production success: multiple ways tested to produce consistent larger volumes

Meeting customer needs

- € is king - balance between function/quality and cost
- Need to create long term clients
- Select scale up optimisation – can ‘over-optimise’
- Volume - Need to meet demand
  - International companies – evidence of production volume
  - Reduced cost/volume opens newer markets
- Standards – part of customer trusted relationship

NANOGAP
SUBnmPARTICLES

Scale up allowed € ↓ more competitive
while still offering tailored product

Safety aspects of scale up

- Industry carries responsibility for product
- Seen and communicated to be safe for employees, consumers and environment – critical for commercial success

NANOGAP SUBnmPARTICLES

Already minimal exposure – liquid handling
Reduced waste – advance for costs and exposure

Thomas Swan
Chemical manufacturing since 1926

SbD principles applied in absence of nano-specific methods
Risk minimisation used at each stage of process design
Innovated a closed system

NIA
Nanotechnology
Industries Association

Summary – it's the money, stupid

- Significant activities to reach market for novel nanomaterials
- In early stages of material design, need to consider:
  - Potential end uses – what will people pay?
  - Potential complex product – How do you create the final product?
  - Optimum functionality –What is min performance and max reliability?
- Know your market, know your client
- Use expert scale up partners
- Invest to stay competitive

It's not a product until somebody buys it….

NIA
Nanotechnology
Industries Association

Thank you

Claire Skentelbery
Director General
Nanotechnology Industries Association

Nanotechia.org: Newsletter, register for webinars
LinkedIn: Latest news and offers

Claire.skentelbery@nanotechia.org