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## Assess Global Gas R&D Outlook with Patent Analytics

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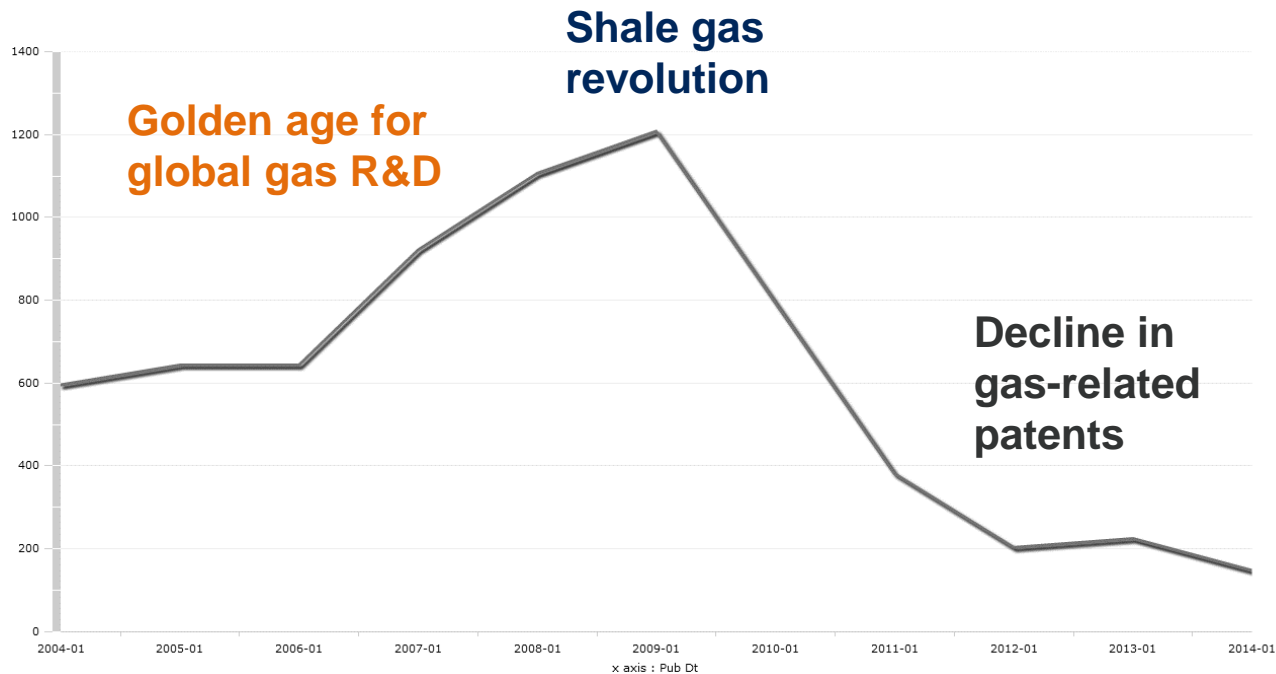
Intellectual Property Academy of Singapore





# Background.

## Number of Gas-related Patents Published by the Major Five IP Offices from 2004 to 2014



# Aim.

## Comprehensive Quantitative Assessment

- Comprehensive quantitative assessment of the global gas R&D landscape in the past decade (2004-2014) using patent analytics.



## Characterize Stages of Development

- Characterize the stages of development of the key technologies along the entire gas chain – exploration and production, storage, transmission, distribution, utilization – so as to access the R&D potential of each segment in the near future.

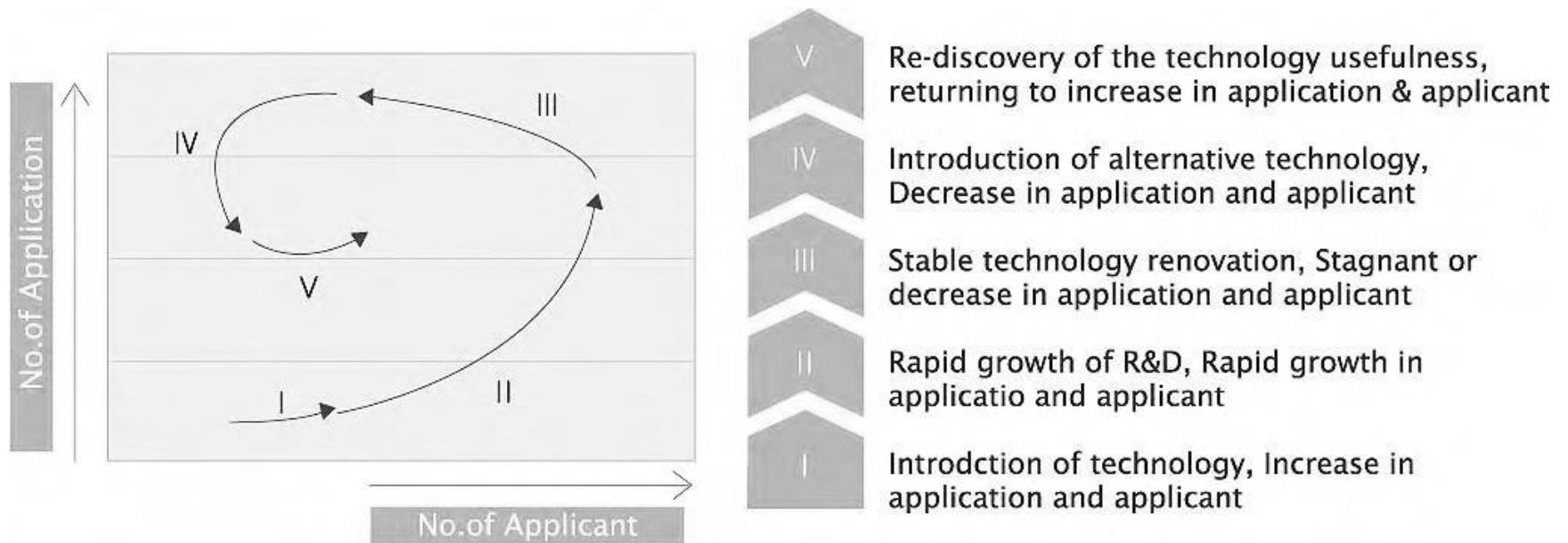


## Needs and Challenges of Global Gas R&D

- This potential is then compared against the current industry demands and expenditure in each segment, in order to unveil the needs and challenges of global gas R&D in the next decade.

# Methods.

## General Model for Patterns in Patenting Activity



# Data.

The data used in this study was extracted from the patent databases of the major five IP offices as well as that of the International Bureau of the World Intellectual Property Office (WIPO)

Database	Date of publication	Data coverage	No. of Gas-related Patents
European Patent Office (EPO)	01/09/2004 – 01/09/2004	Full text	517
International Bureau of the World Intellectual Property Office (WIPO)	01/09/2004 – 01/09/2004	Full text	1,559
United States Patent and Trademark Office (USPTO)	01/09/2004 – 01/09/2004	Full text	1,115
Japan Patent Office (JPO)	01/09/2004 – 01/09/2004	Abstract	443
Korean Intellectual Property Office (KIPO)	01/09/2004 – 01/09/2004	Abstract	594
State Intellectual Property Office of the People's Republic of China (SIPO)	01/09/2004 – 01/09/2004	Abstract	1,217

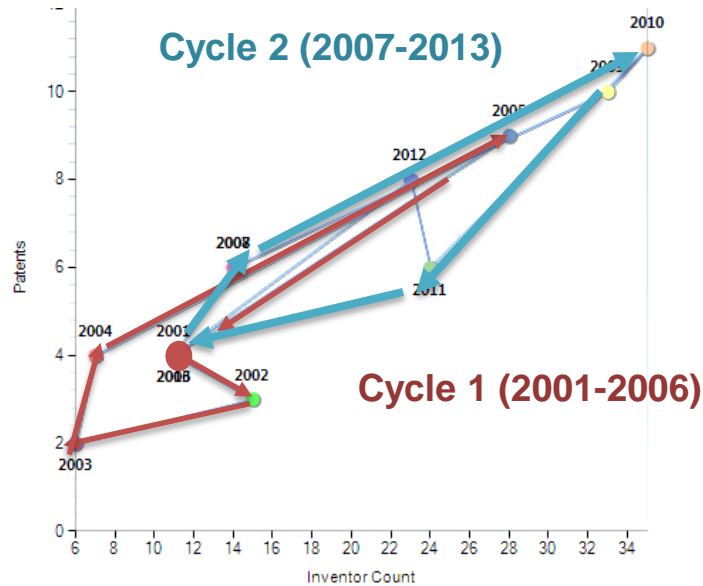
# Classification of Technologies.

For the purposes of this study, natural gas-related patents were classified according to their relevance to each segment of the gas chain. The list is non-exhaustive.

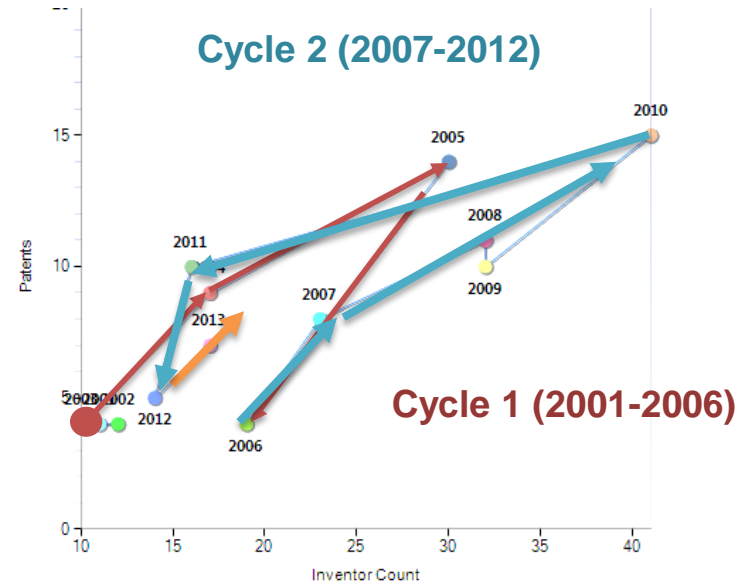
Segment	Examples of Technologies Included
Exploration	Seismic imaging, geological survey
Production	Drilling, hydraulic stimulation, well productivity, subsea systems
Storage	Underground gas storage
Transmission	Pipelines, networks, compression, turbo machineries, inspection, emission reduction
Distribution	Power to gas, gas chromatography, gas grids
Utilization	Cogeneration, carbon footprint, natural gas vehicles, compressed natural gas, biomethane

# Results (similarity across all the IP offices studied).

## Disruptive growth



Exploration (USPTO)

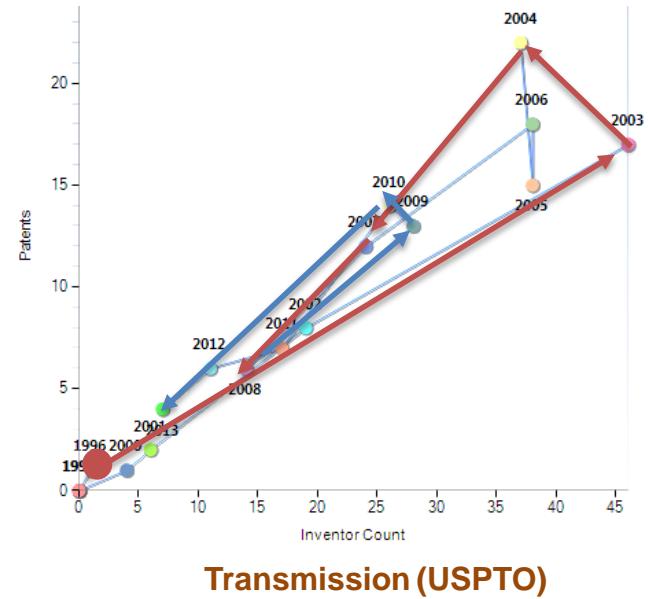
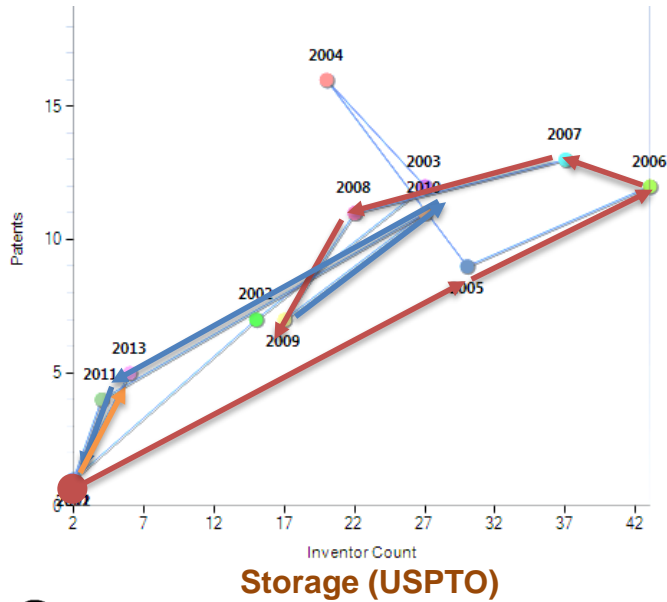


Production (USPTO)



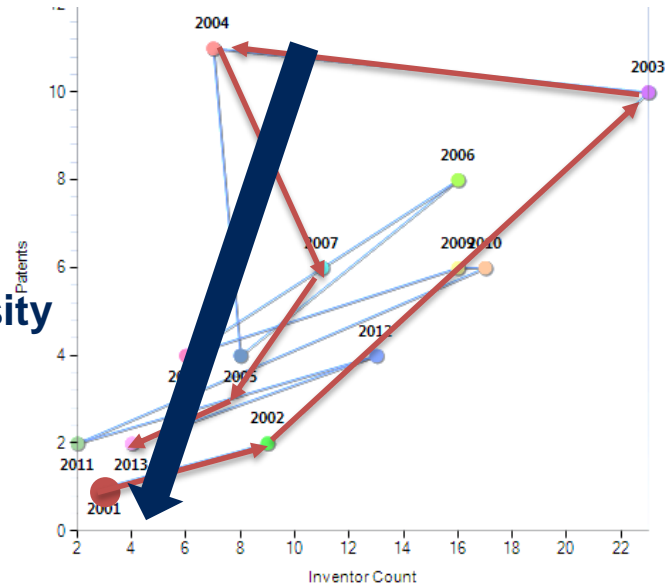
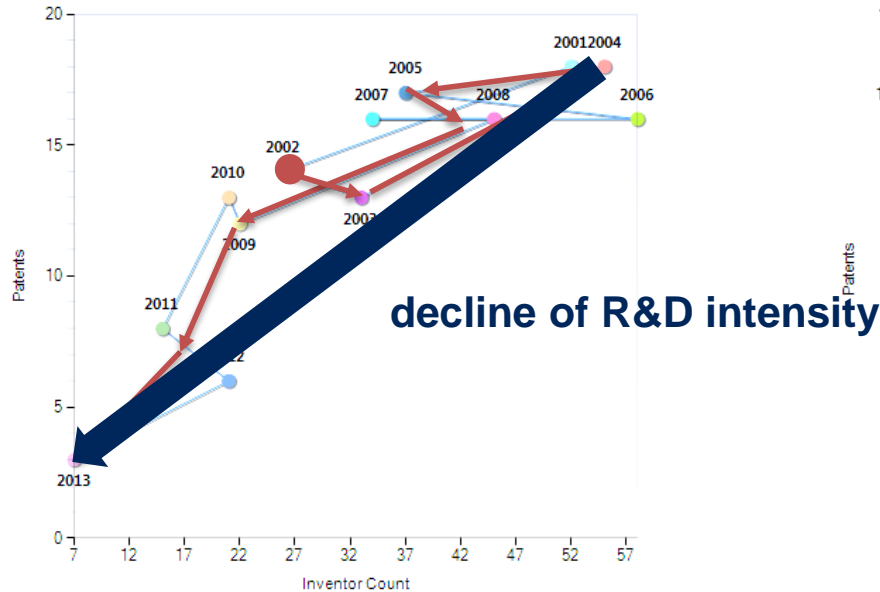
# Results (similarity across all the IP offices studied).

Stable phrase of technology renovation – ‘incremental advances’



# Results (similarity across all the IP offices studied).

## Introduction of alternative technology



Distribution (USPTO)

Utilization (USPTO)

# R&D Needs & Challenges.

## Disruptive growth

Segment	R&D Needs	R&D Challenges
Exploration	<ul style="list-style-type: none"><li>Idea-to-profit acceleration</li><li>Open innovation</li></ul>	<ul style="list-style-type: none"><li>Ongoing demands for new breakthroughs</li></ul>
Production	<ul style="list-style-type: none"><li>R&amp;D gaps in water technologies, fracturing media, geo-characterization, environmental assessment, and down-hole materials and sensors</li></ul>	<ul style="list-style-type: none"><li>High costs to fully commit to and complete ever larger R&amp;D projects</li></ul>

# R&D Needs & Challenges.

## Incremental advances

Segment	R&D Needs	R&D Challenges
Storage	<ul style="list-style-type: none"><li>• Move from 'incremental advances' to new innovative or game-changing technologies</li></ul>	<ul style="list-style-type: none"><li>• Lack of funding and priority</li></ul>
Transmission	<ul style="list-style-type: none"><li>• Joint innovation with closely related industries</li></ul>	<ul style="list-style-type: none"><li>• Convergence of value chains</li></ul>

# R&D Needs & Challenges.

## Declined interest

Segment	R&D Needs	R&D Challenges
<b>Distribution</b>	<ul style="list-style-type: none"><li>• Collaborative funding</li></ul>	<ul style="list-style-type: none"><li>• Imbalance in industry participation</li></ul>
<b>Utilization</b>	<ul style="list-style-type: none"><li>• Diversify the focus from ‘effective use’ to ‘innovative use’</li></ul>	<ul style="list-style-type: none"><li>• Competing R&amp;D interest in substituting industries</li></ul>

# Conclusions.

- **Polarizing R&D landscape** across the gas chain;
- **Short-term drivers** for R&D in gas exploration and production are ever present; **long-term drivers**, including the overall economic and social value of the industry, should also get the attention they deserve;
- R&D for gas exploration and production could easily **crowd out** the resources for other segments of the gas chain. R&D in other segments – especially in gas transmission, distribution and utilization – should therefore work even closer with associated industries in order to share resources, consolidate platforms, as well as to shorten their R&D lifecycles.

# THANK YOU.

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