



# Evolution of Singapore's Research, Innovation and Enterprise (RIE) Strategy

MR LIM CHUAN POH  
CHAIRMAN, SINGAPORE FOOD AGENCY  
3 DECEMBER 2019

# Evolution of Singapore's RIE Strategy

- Singapore's RIE Strategies: early 90s to the present
- Outcomes: A\*Star's Achievements in RIE2015
- Looking Ahead

# Science for our Survival



*“I believe our future depends upon our ability to mobilise the qualities in our population to maximum advantage. It is the one thing we have which makes up for our lack of size and numbers, and **it is of the utmost importance that, in the field of science and technology, we should lead the field in this part of the world.**”*

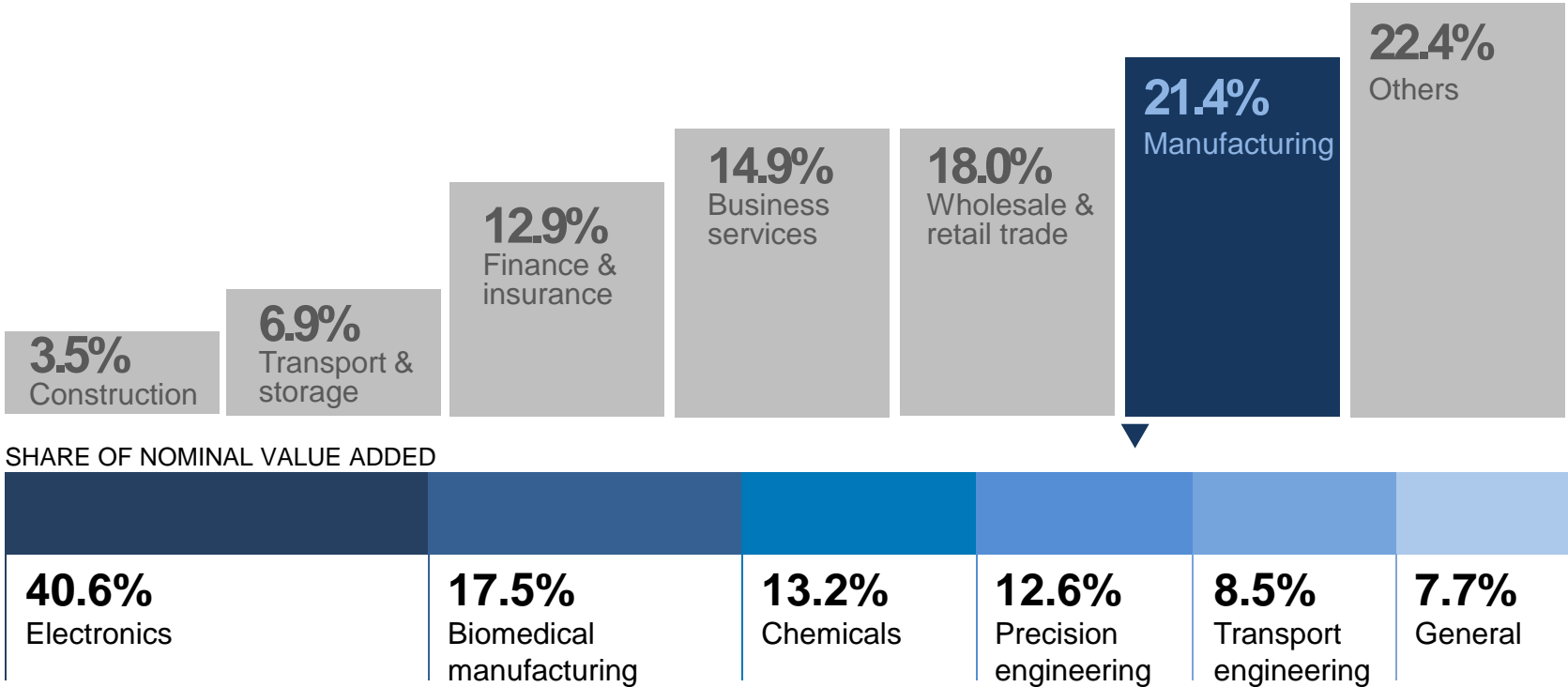
**- THEN PRIME MINISTER LEE KUAN YEOW, at the opening of the Science Tower in the University of Singapore, 1966**

# Singapore's Economy Today

2018 GDP  
**S\$487.1B**

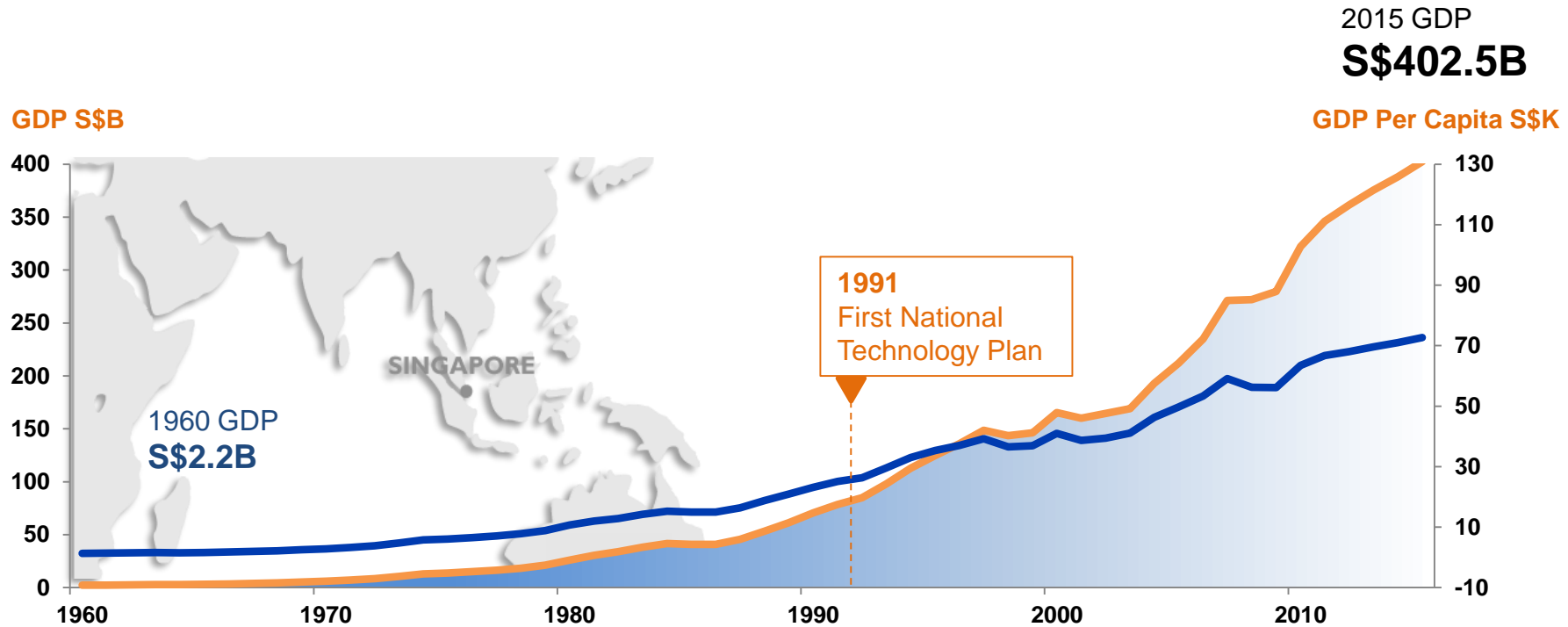
2018 GDP GROWTH  
**3.2%**

2019 FORECAST GDP GROWTH  
**0.0% - 1.0%**



Source: MTI Economy Survey of Singapore 2018, Press Release 13 Aug 2019

# RIE Integral to Singapore's Economic Strategy



## 1960s

Labour intensive  
Low-end commerce with only handful of industries catering to domestic consumption

## 1970s

Skill intensive  
MNC-led industrial development surging.  
Manufacturing evolving with greater sophistication

## 1980s

Capital intensive  
Move to capital intensive & high technology industries, as local wages swelled

## 1990s

Technology intensive  
Global offshoring directed heavy emphasis on technology

## 2000s

Knowledge & innovation based economy  
RIE became the cornerstone of economic development

# 1991: Launch of National Science and Technology Board (NSTB) to upgrade the economy

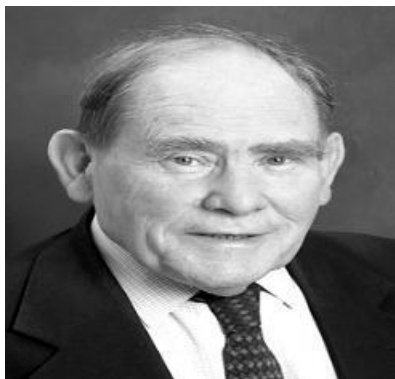
*1986 Economic Review Committee recommended Singapore to evolve from product assembly to high technology.*

*“...We need to master technology not for the sake of abstract knowledge of nature, but to apply what we know to become more competitive internationally. Hence, **NSTB’s emphasis is on promoting R&D in the private sector.** This is the best assurance that the R&D undertaken will contribute to our economy...”*

**DPM BG Lee Hsien Loong at Launch of NSTB, 1991**



Five-year R&D blueprint aims to propel republic into the big league  
**BG Lee unveils \$2 billion plan for S’pore**



*“I remember very clearly Minister Mentor said ‘We are a nation of technicians’ because he thought it was too early. **I replied that if you do not take up this path, you will remain a nation of technicians forever.**”*

**Nobel Laureate Dr Sydney Brenner, 1984**

# 2001: Launch of S&T Plan 2005 and Formation of Agency for Science Technology and Research (A\*STAR)

## NSTB

- Provided funding but RIs operated in silos as each RI had its own governing board.
- No structure to orchestrate holistic efforts.



## A\*STAR

- Re-organised into two Councils under one roof, to better coordinate public sector R&D – SERC and BMRC
- Addition of A\*STAR Graduate Academy and ETPL
- One single A\*STAR board

## Launch of Biomedical Sciences initiative

*“Our hope is to build Life Sciences into the fourth pillar of our manufacturing sector... We must encourage private sector R&D to be done here especially by world-class Life-Science companies. We need a critical mass of such activities here for the industry to take off.”*

BG George Yeo, then Minister for Trade & Industry, 2000 Life Sciences Exec Committee



Biomedical research hub launched

biomedical research help from Nobel laureates

INTERNATIONAL

**Herald Tribune**

City-state laying groundwork for Asian hub : Singapore's biotech bid

## \$1b push for life sciences

**Aim is to attract top-notch R&D projects to S'pore; also in the works is new \$60-m genomics programme**

**SARMA KRAHAI**

THAT'S the aim. The billion-dollar push ahead here is to provide Singapore to the life sciences at landmark speed.

But before Singapore can even the foundation, it will have to spend some serious

advice and the scientific community. EDB chairman Philip Yeo chaired its first meeting yesterday.

An international advisory council, which is expected to be constituted with top names, will set a global perspective. Its members are being recruited now, and are to meet for the first time in Singapore.

The first two names should already make the global community sit up and take note. Its chairman is Richard Sykes, chairman of

the world's biggest pharmaceutical company, GlaxoSmithKline plc.

A founding father of modern biology, Dr Victor Ambrose, director of the Molecular Research Institute here in the U.S., will assist him.

The research was initiated in setting up the Institute of Molecular and Cell Biology in Singapore, and will be a member of the Scientific Advisory Board, which he chaired from 1997 to 2007.

Trade and Industry Minister George Yeo said when he announced the news yesterday. "We need a lot of assistance and advice from those who are experts in the field."

The announcement comes practically on the eve of the launch of the "yearling" development of the five-year strategy, including the \$60-million Genomics Programme, whose aim is to map the building blocks of life.

Said Brigadier-General (NS) Yeo: "We are entering exciting times. The EDB certainly will see changes that will transform the world. In the life sciences, rapid advances are opening up a whole new frontiers and creating new industries."

The \$1 billion will get EDB collaborate with world-class life-science companies interested in carrying out research in Singapore, and good infrastructure, and government support. It will also show the EDB to encourage more private investment in the life sciences.

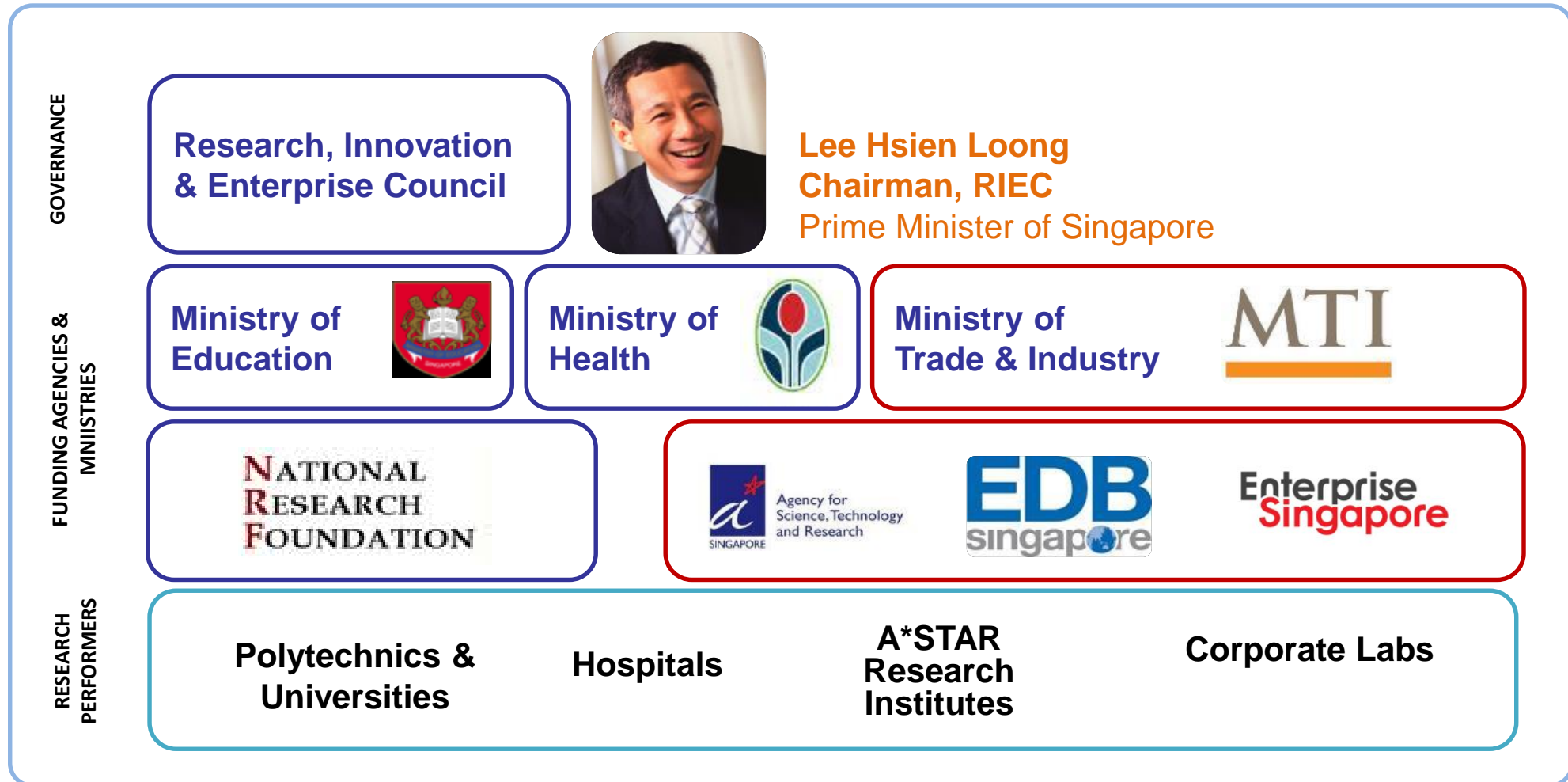
(See also Page B8 and B9)

# Science & Technology 2010 Plan

- **Research Innovation and Enterprise Council (RIEC)** set up to provide strategic direction for national R&D
- Formation of **National Research Foundation (NRF)** in 2006 under the Prime Minister's Office to support the RIEC through policy formulation and implementation
- Addition of two new growth sectors: Environmental and Water Technologies, Interactive and Digital Media
- BMS focused on adding translational and clinical research capabilities while strengthening upstream biomedical science capabilities
- Beginning of **research-intensive Autonomous University** journey - significant increase in public funding for academic research, setting up of Academic Research Council, and establishment of the Research Centres of Excellence (RCEs)



# Singapore's Research, Innovation & Enterprise (RIE) System



# Research, Innovation and Enterprise 2015 (RIE2015) Plan – Consolidating innovation

*“Singapore’s long-term aim is to be **one of the most research-intensive, innovative and entrepreneurial economies in the world** in order to create high-value jobs and prosperity for Singaporeans. Research and innovation underpin the competitiveness of our industries, catalyse new growth areas, and transform our economy.”*

**PM Lee Hsien Loong, at 2010 Announcement of RIE2015**



5-year S&T Plans

National  
Technology  
Plan  
(1991-1995)  
S\$2 billion

National  
Science &  
Technology Plan  
(1996-2000)  
S\$4 billion

Science &  
Technology  
Plan 2005  
(2001-2005)  
S\$6 billion

Science &  
Technology  
Plan 2010  
(2006-2010)  
S\$13.9 billion

**Research, Innovation  
& Enterprise Plan  
2015  
(2011-2015)  
S\$16.1 billion**



Invest in  
basic science for  
future innovation



Attract and  
develop  
scientific talent



Emphasis on  
competitive funding



Foster  
synergies  
in public-private  
partnership



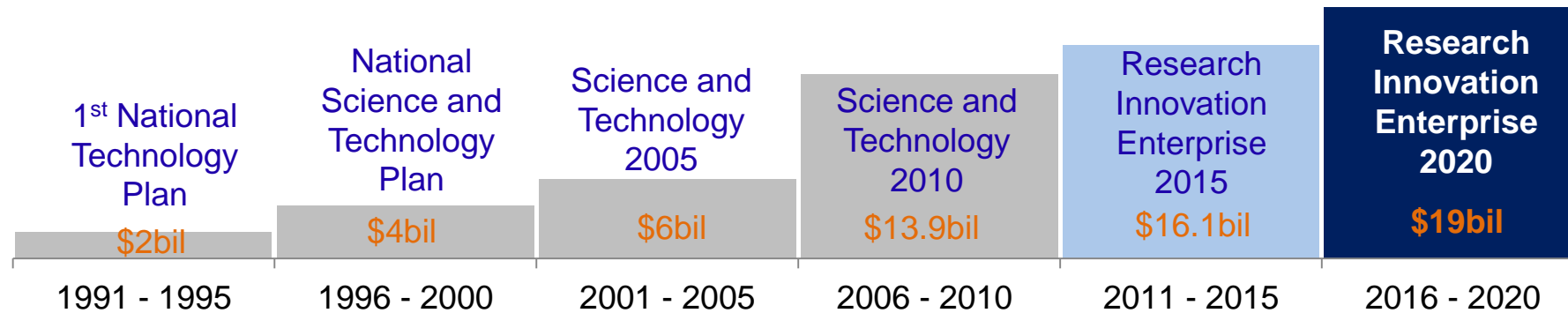
Focus on  
research with  
economic outcome



Support for  
technology  
commercialisation

- **Industry Alignment Fund** set up to foster public-private partnerships, industry relevance and impact

# RIE2020: Strategic Thrusts



Ensure **excellent science** and invest strategically in curiosity driven and mission oriented research



**Greater national coordination** of multi-stakeholder and multi-disciplinary collaboration



**Sustain a robust and diverse** research base and innovation **workforce**



**Strengthen** flow through from research to economic and societal **impact**



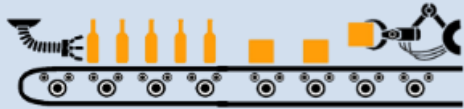
**Emphasis on competitive funding**



**Ensure responsiveness** to pursue new opportunities and technology developments

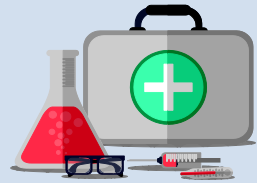
# Research, Innovation and Enterprise 2020 (RIE2020) Plan: Domain-based Governance Framework

*Prioritization of RIE agenda into four technology domains aligned to areas of competitive advantage and/or national needs*



## Advanced Manufacturing and Engineering (AME)

*Support growth & competitiveness of manufacturing & engineering sectors*



## Health and Biomedical Sciences (HBMS)

*Advance human health & wellness, and create economic value for Singapore & Singaporeans*



## Services and Digital Economy (SDE)

*Leverage digital innovation to create economic opportunities and meet national priorities*



## Urban Solutions and Sustainability (USS)

*Develop a sustainable & livable city through integrated solutions for Singapore and the world*

**CROSS-CUTTING  
PROGRAMMES  
(HORIZONTALS)**



## Academic Research

*Build up a significant base of capabilities and a pipeline of ideas that can drive the next phase of growth*



## Manpower

*Build a strong research and innovation community*



## Innovation & Enterprise

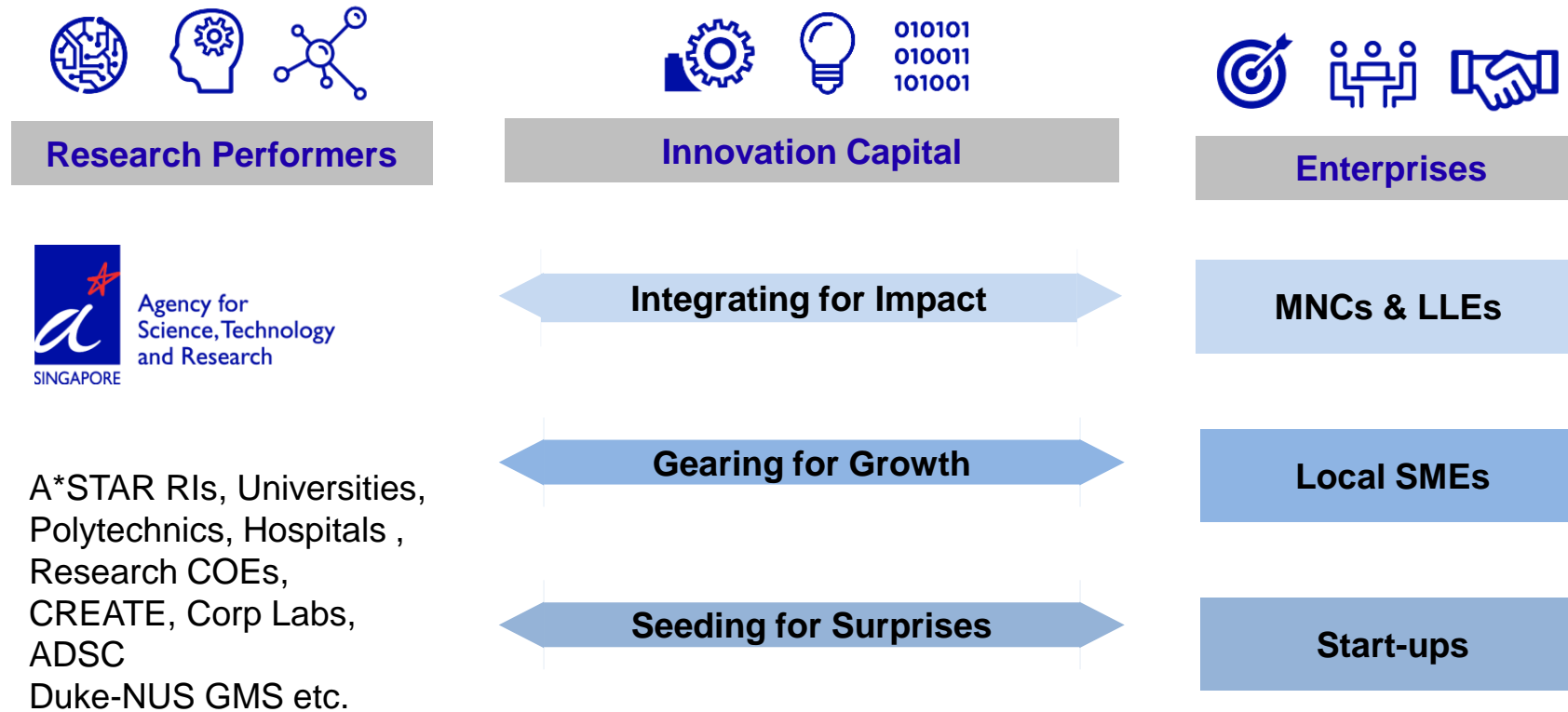
*Build a strong core of innovative enterprises that drive value creation and economic competitiveness*

# **Outcomes**

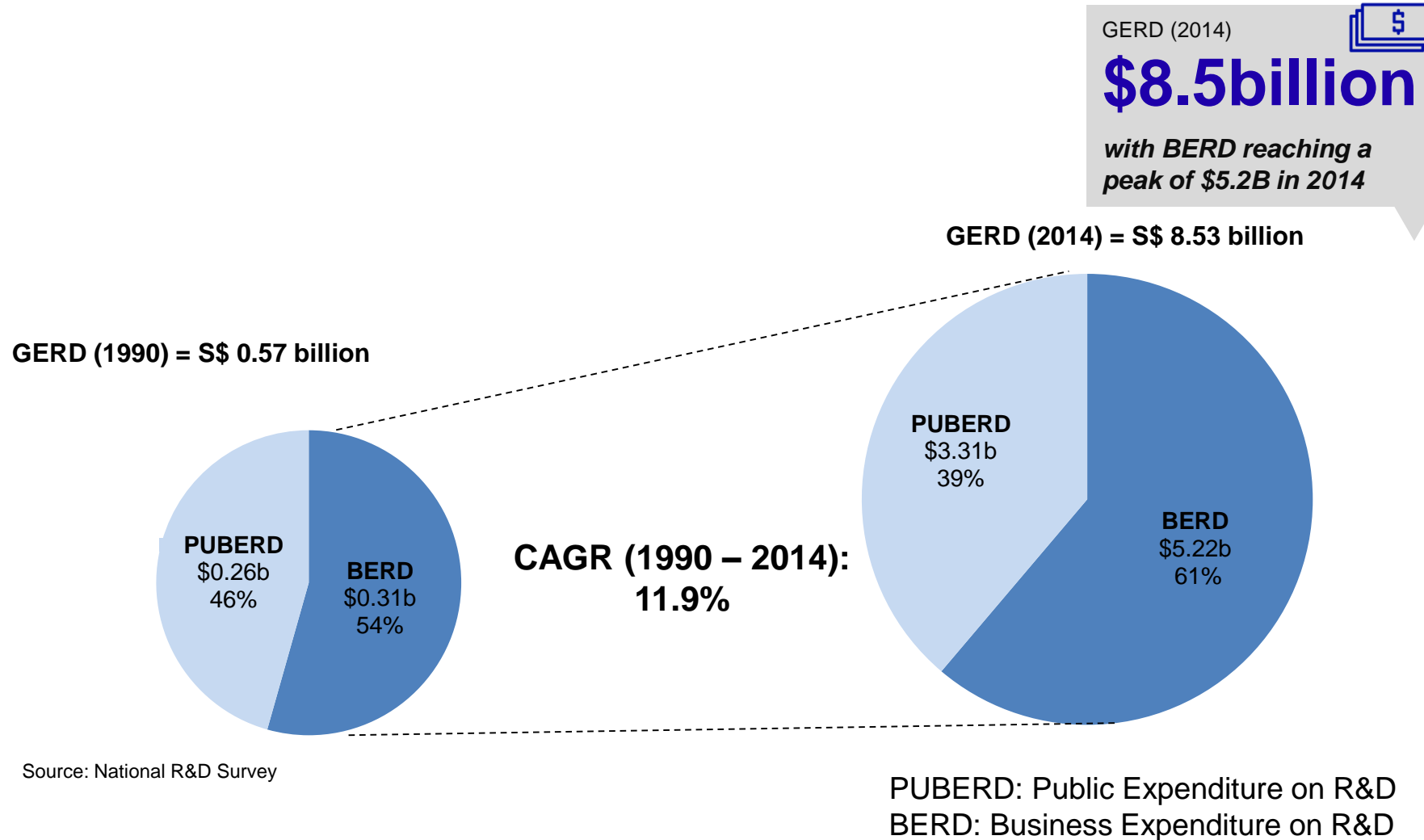
## **A\*Star's Achievements in RIE2015**

# Driving Asia's Innovation Capital

Following the Economic Strategies Committee Review done in 2010, A\*STAR adopted a differentiated innovation strategy in working with companies and creating economic impact



# Singapore has Built Up a Maturing RIE Ecosystem



# A\*STAR's Achievements in RIE2015

A\*STAR exceeded all KPIs (largely pertaining to work with industry) and has also attained international recognition

**3<sup>rd</sup>**

IEEE Patent Power 2015

**5<sup>th</sup>**

WIPO PCT 2015

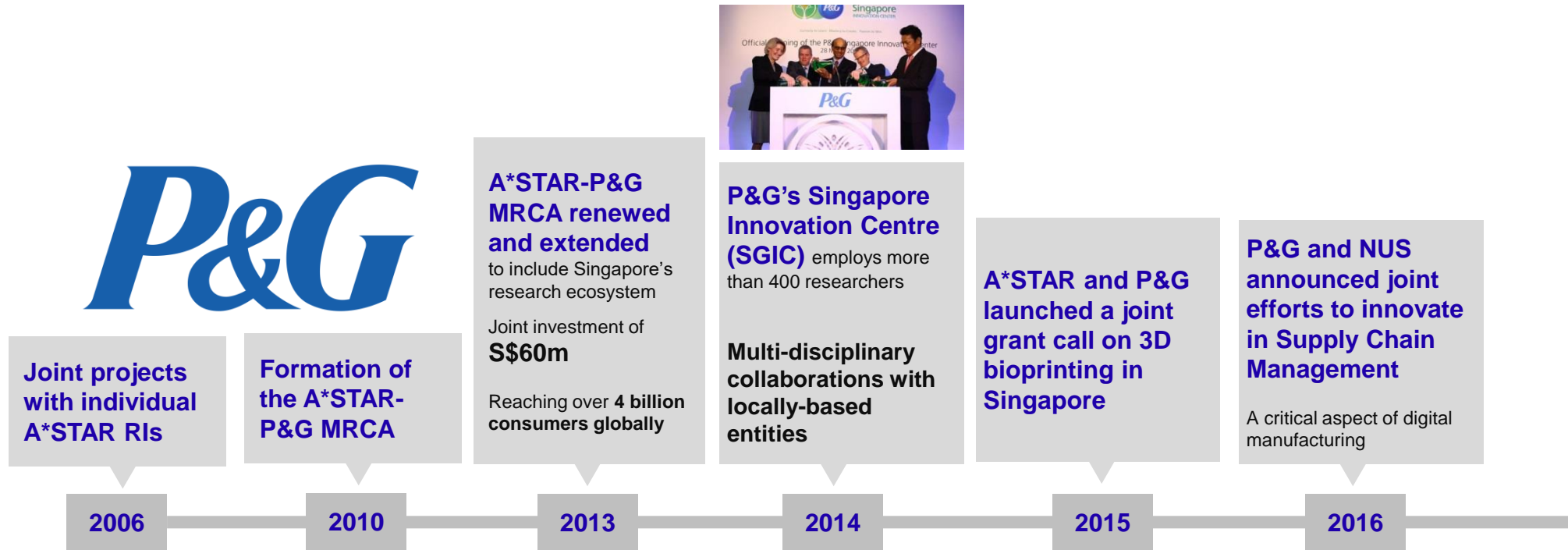
**9<sup>th</sup>**

Thomson Reuters Top Innovators Survey



# Integrating for Impact

**A\*STAR's role in strengthening P&G's R&D presence in Singapore and fostering partnerships within the ecosystem**



# Integrating for Impact

Providing solutions for rapidly evolving global electronics market

Working with Applied Materials to develop advanced semiconductor technologies



## Centre of Excellence in Advanced Packaging

Commitment of joint investment of **\$100 million**  
Employment of **100 researchers** and technical staff

**Enabled the development of** high value precision engineering equipment

2012



## 4 Advanced Semiconductor Joint Labs Launched

**10 industry partners**

Provided integrated platform for complex microchip manufacturing R&D

2014



## New \$150m R&D joint lab

**First time AMAT conducted product development and commercialisation activities for sale to global customers**

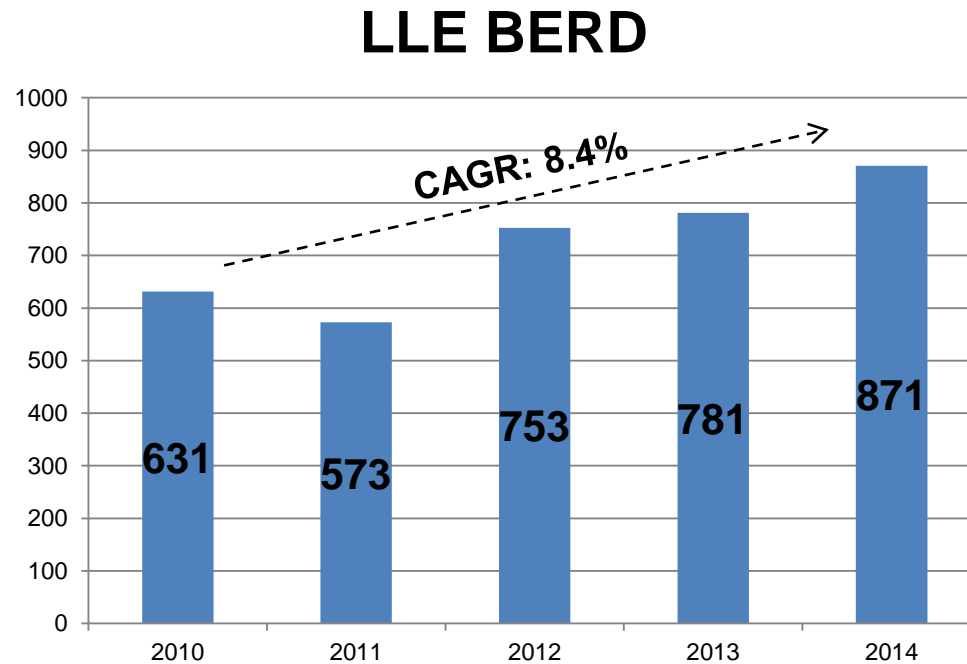
AMAT deepened their collaboration by working with multiple RIs (IME, IMRE, IHPC)

2015



# Expanding Innovative Capacity of Local Enterprises

## Increase in R&D expenditure by LLEs



Source: National R&D Survey



# Partnering LLEs For Success

Shaping the future of banking

Tapping on technology to better engage customers in real-time



**Joint lab in 2014**

I2R supports DBS in applied ICT R&D

**First-of-its-kind 3-year partnership**

To develop financial sector customer-centric solutions

**Developing talent**

To meet real banking challenges

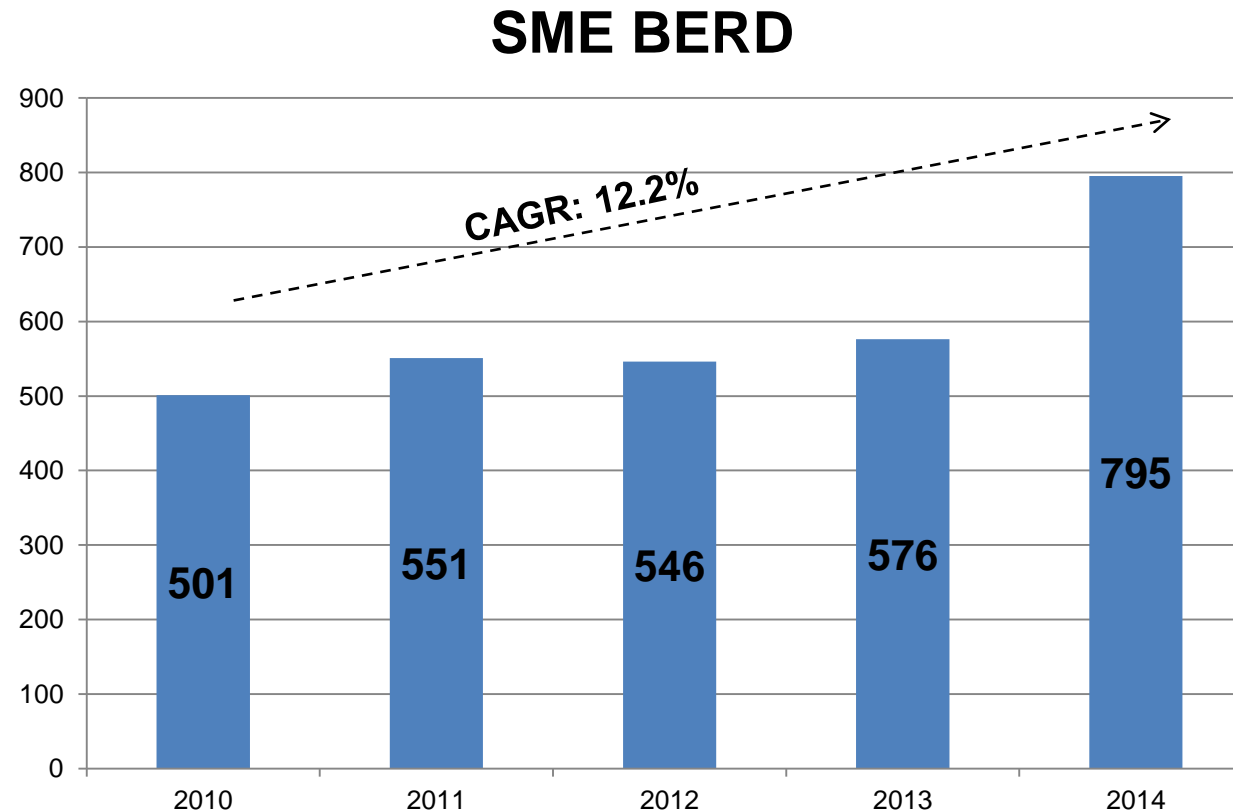
**Awarded**

**2015 IES Prestigious Engineering Award**



# Expanding Innovative Capacity of Local Enterprises

## Increase in R&D expenditure by SMEs



Source: National R&D Survey

# Gearing For Growth

Since 2013, A\*STAR has spearheaded Technology Adoption Programme (TAP)

Moving local enterprises up value chain by adopting READY-TO-GO technologies

TAP has supported

**>1800**

**Tech Adoptions**

---

## Koh Brothers Building & Civil Engineering Contractor

SIMTech developed RFID-enabled structural steel tracking inventory management system



Annual savings  
**S\$58,700**



Reduced inventory tracking time by  
**98%** (54.25 hours to 1.1 hours per month)

## FOSTA

I2R developed IoT-based noise monitoring system



Manpower savings of nearly  
**90%**



Reduced processing time by  
**50%**

# Gearing for Growth

**GET-Up: A\*STAR's Growing Enterprises with Technology Upgrade programme**

**Upgrade SMEs through the secondment of our researchers, provision of technical advisory services and technology roadmapping**

**RIE 2015**

**377**

**projects with  
SMEs**

**Benefitted**

**202**

**companies**

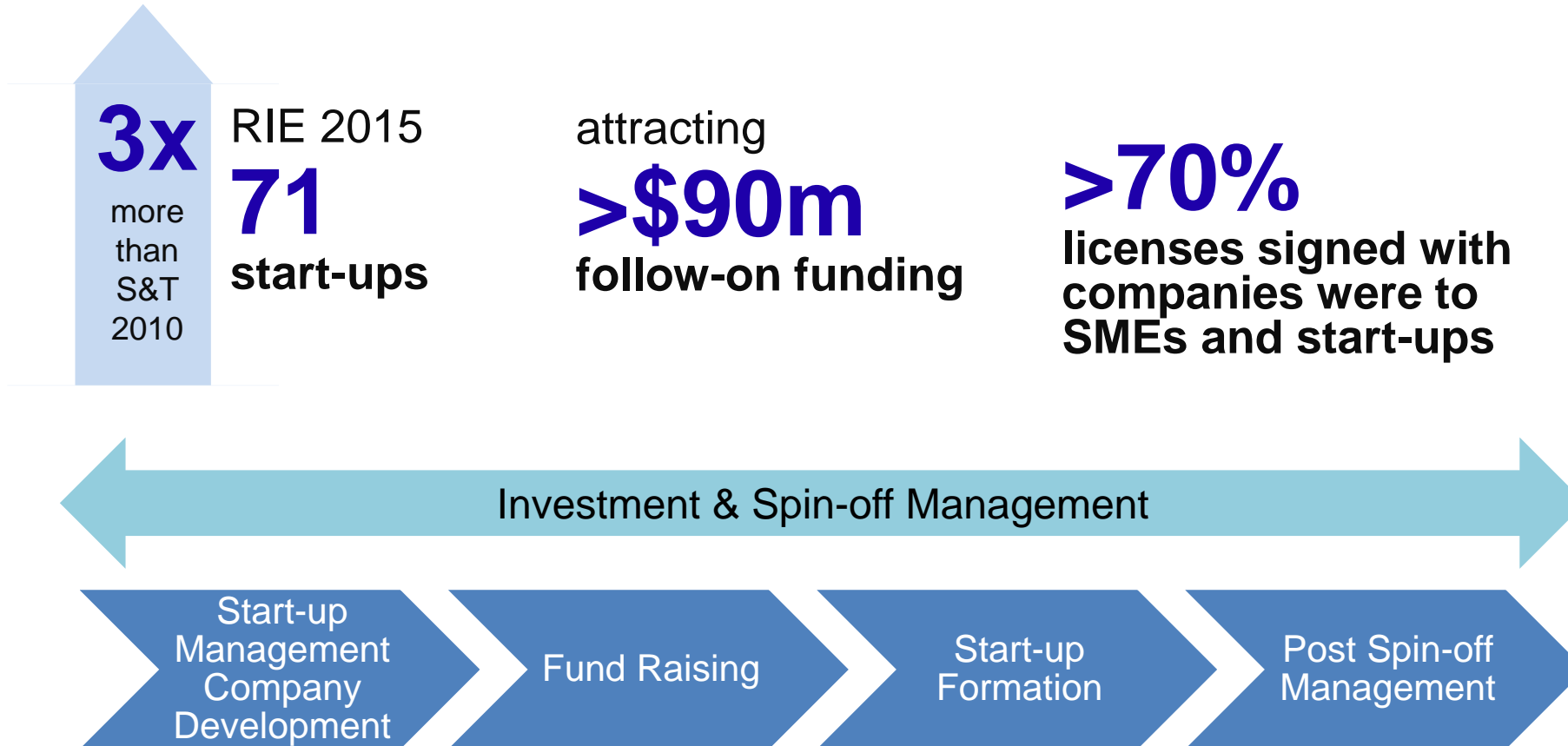
**RSEs seconded:**

**339**

**to 164 companies**

# Developing Singapore's Innovation Ecosystem

A\*STAR plays a key role in developing Singapore's entrepreneurial ecosystem





# Making a Difference to Singapore

## Making a difference to healthcare outcomes

- ATTRaCT, national level research programme involving local and international partners to study heart failure
- GUSTO, understanding the effects of diet and lifestyle during pregnancy on babies' growth after birth



## Making a difference to our living environment

- SAVI, developing driverless vehicles and automated road systems to fulfill vision of Car-lite Singapore to optimise resources
- Urban heat mapping, through microclimatic modelling tool designed to help city developers draw up urban heat island (UHI) countermeasures



# Making a Difference to Singapore

## ETC-159

- First publicly-funded drug candidate to enter first-in-man clinical trials
- Collaboration between A\*STAR and Duke-NUS
- Targets cancers including colorectal, ovarian and pancreatic cancers



Source: ST file

# Making a Difference to Singapore

## Advent Access Pte Ltd

- Local MedTech spin-off founded by Peh Ruey Feng
- AV-Guardian: Device to improve hemodialysis treatment
- First-in-man trials ongoing
- In market by 1Q2017
- First class 3 medical device from A\*STAR to progress in first-in-man clinical study

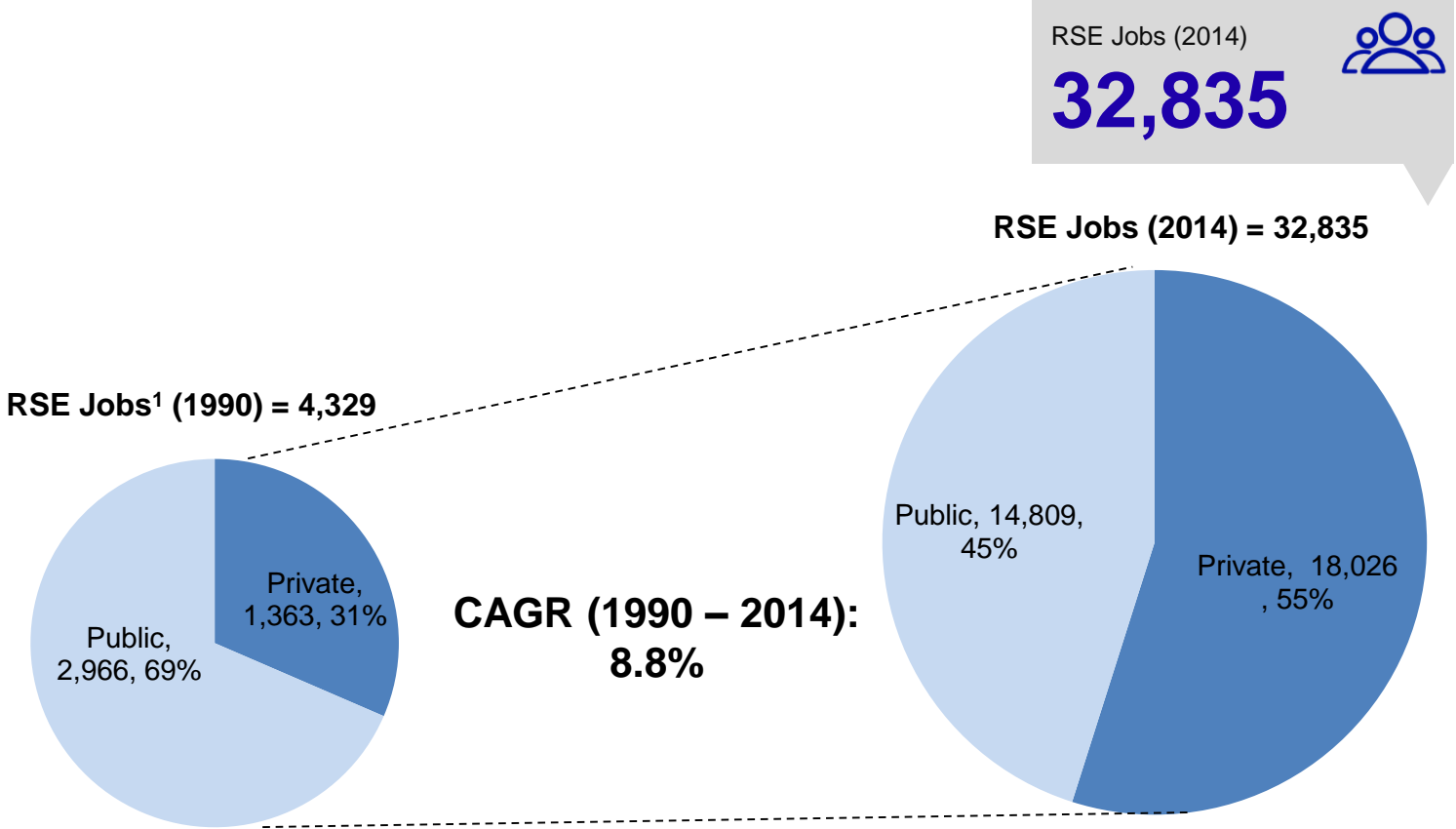


New product  
& start-up



*Advent Access's av-Guardian is an access device that preserves the lifespan of an arteriovenous (AV) fistula, and reduce preventable complications. av-Guardian reduces the need for cannulation skills and minimizes needling pain, thereby improving comfort and empowering more patients the option of home/frequent hemodialysis*

# Growing Pool of Scientific Talent



Source: National R&D Survey

70% of RSEs are locals

# Looking Ahead

# RIE2020: National Imperatives for Singapore

“RIE will continue to be important to secure our future. It contributes significantly to the economy and creates opportunities and jobs. It supports national initiatives like **Smart Nation, Skills Future... under the Committee of Future Economy.**”



*Mr Lee Hsien Loong, Prime Minister of Singapore  
Announcement of RIE2020 plan, 8 Jan 2016*

## Economic



Higher innovation, skills and productivity



Create more good jobs and pathways towards the future of jobs



Help enterprises, especially SMEs to adapt to a lean workforce and build links with the rest of the world

## Infrastructure



Continue to develop an urban landscape that is green, sustainable and livable



Help elderly age comfortably and more independently



Address mobility issues in light of land scarcity and rising population density;



Maintain cyber-security in parallel with increase in demand for data sharing.

*Adapted from: Speech by PM Lee at Cabinet swearing-in; PM Lee's articulation of Smart Nation Priorities*

# RIE2020: Preparing Singapore for Future Economy

## *Driving Economic Transformation*

“We must come together ... to transform our economy through enterprise and deeper innovation ... **Innovation is the engine of value creation and growth. We must make innovation pervasive in our society.**”



*Mr Heng Swee Keat,  
Minister for Finance and Chairman of Committee on the Future Economy,  
Budget Speech 2016*

### **Economic Review Committee (2003)**

- Restructuring towards a diversified economy powered by manufacturing and services
- Lowering costs to stay competitive

***Against the backdrop of US tech bubble burst and rising competition from other Asian economies***

### **Economic Strategies Committee (2010)**

- Productivity driven growth
- Transforming SG into a Global-Asia hub
- Creating a diverse mix of companies
- More Innovation
- Smart-energy economy
- Better use of land

***Amid recession in the aftermath of the 2007-2008 global financial crisis***

### **Committee of Future Economy (2015)**

- 1) Future Corporate Capabilities & Innovation
- 2) Future Growth Industries and Markets
- 3) Future of Connectivity
- 4) Future City
- 5) Future Jobs and Skills

***In the face of a weaker & uncertain global economy, against increasing domestic challenges***

***Innovation a strong and critical element to initiate value creation***

*“Heng Swee Keat to lead ‘The Future Economy’ committee: Other similar efforts in the past”, Straits Times (Oct 2015)*



**Thank You**