



REVIEW AND NOTES ON
TAIWAN 2050 NET-ZERO PATHWAY

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INTRODUCTION

- THIS PRESENTATION PROVIDES INFORMATION ABOUT THE MOST RECENT DEVELOPMENT OF [TAIWAN'S NET-ZERO POLICY FORMULATION](#), AS WELL AS THE MOST UP-TO-DATE AND COMPREHENSIVE ANALYSIS ON [TAIWAN'S 2050 POTENTIAL NET-ZERO PATHWAYS](#).
- THE RESEARCH TEAM LED BY [PROFESSOR DAI-GEE SHAW OF THE ACADEMIA SINICA, TAIWAN](#) IS ONE OF THE MAJOR RESEARCH GROUPS FOCUSING ON MODELING AND POLICY ANALYSIS OF 3E ISSUES IN TAIWAN.
- TWO RECENTLY COMPLETED REPORTS : 1) TAIWAN 2050 NET-ZERO PATHWAY; AND 2) THE IMPACTS OF EU AND US CBAM ON TAIWAN'S ECONOMY AND ENVIRONMENT.

SUMMARY OF THE PRESENTATION BY PROFESSOR SHAW ⁽¹⁾

- NET ZERO ECONOMY WILL NOT BE SUFFICIENT TO PREVENT FURTHER WARMING AFTER 2050, MOVING ON TO **NET NEGATIVE ECONOMY** IS REQUIRED.
- NEGATIVE EMISSION RELIES ON CARBON REMOVAL, AND THE THREE **CARBON REMOVAL METHODS** ARE : 1) INCREASED BIOLOGICAL UPTAKE; 2) NATURAL INORGANIC REACTIONS; AND 3) ENGINEERED REMOVAL.
- IN TAIWAN, PRESIDENT ING-WEN TSAI ANNOUNCED THAT “THE **2050 NET-ZERO TRANSFORMATION** IS THE GOAL OF THE WHOLE WORLD, AND IT IS ALSO THE GOAL OF TAIWAN!”
- EXECUTIVE YUAN ORGANIZES THE **NET-ZERO PATHWAY TASK FORCE** IN 2020, AND IS EXPECTED TO FINALIZE THE NET ZERO PATHWAY BY **NOVEMBER 2021**.

SUMMARY OF THE PRESENTATION BY PROFESSOR SHAW (2)

- IN AUGUST, PRIME MINISTER SU ASKED TO AMEND **THE GREENHOUSE GAS REDUCTION AND MANAGEMENT ACT** :
 - THE TARGET OF **2050 NET-ZERO** SHOULD BE SPECIFIED IN THE ACT
 - **CARBON PRICING POLICY** TO BE ADOPTED IN THE ACT
- POLICY CHOICES FOR NET-ZERO PATHWAYS
 - TAKING INTO ACCOUNT TWO MAJOR APPROACHES TO MITIGATING THE CLIMATE CRISIS :
 - **EMISSION REDUCTION**
 - **GHG REMOVAL (GGR)** - USING **NEGATIVE EMISSIONS TECHNOLOGIES** (NETS)

SUMMARY OF THE PRESENTATION BY PROFESSOR SHAW (3)

- AVAILABLE **STRATEGIES AND POLICIES**
 - PROACTIVE GHG REDUCTION AND REMOVAL POLICIES
 - R&D OF LOW-CARBON AND GGR TECHNOLOGIES
 - TRANSFORMING TO BECOME A **NET-NEGATIVE ECONOMY** AND SOCIETY
- **ECONOMIC STRATEGIES AND POLICIES**
 - CARBON PRICING AND TAX-FUND SYSTEM (**GGR FUND**)
 - USING THE **INTERESTS OF THE GGR FUND** TO PAY THE CARBON REMOVAL PRICE (AN IDEA PROPOSED BY **BEDNAR ET AL., 2021**)
 - OTHERS...

SUMMARY OF THE PRESENTATION BY PROFESSOR SHAW (4)

- METHODOLOGY USED FOR ANALYZING TAIWAN'S 2050 NET-ZERO PATHWAY
 - **E3ME** MODEL (CAMBRIDGE ECONOMETRICS)
 - INTEGRATED TREATMENT OF THE WORLD'S ECONOMIES, ENERGY SYSTEMS, EMISSIONS AND MATERIAL DEMANDS, WHICH CAN CAPTURE **TWO-WAY LINKAGES AND FEEDBACKS** BETWEEN THESE COMPONENTS
- SCENARIOS :
 - BASELINE
 - **DIFFERENT COMBINATIONS** OF 1) **CARBON TAX**; 2) RENEWABLE TARGETS; 3) REGULATION ON FOSSIL FUELS; 4) EV MARKET SHARE; 5) TRANSFORMATION OF ENERGY INTENSIVE INDUSTRIES; 6) PAYMENT FOR NETS (NET EMISSION TECHNOLOGIES)
 - **CARBON TAX REVENUE RECYCLING** IS CONSIDERED FOR SOME SCENARIOS

MAJOR FINDINGS

- CARBON TAX WITH LUMP-SUM REVENUE RECYCLING WILL INCREASE CONSUMPTION AND INVESTMENT, AND HAVE **POSITIVE EFFECTS ON GDP**
- CARBON REMOVAL PRICE PAID BY CARBON TAX REVENUE (AS COMPARED TO PAID BY GOVERNMENT BUDGET) IS BETTER FOR GDP
- OVERALL, BY ADOPTING ALL POSSIBLE AND ECONOMICALLY CORRECT POLICIES AND STRATEGIES, TAIWAN CAN MEET THE TARGET OF 2050 NET-ZERO, AND RESULT IN A **WIN-WIN SOLUTION IN TERMS OF NET-ZERO EMISSIONS, ECONOMIC GROWTH, AND SOCIAL EQUITY**

NOTES ON METHODOLOGY

- THE CURRENT MODEL CAN SOLVE UP TO 2050, HOWEVER FOR **MODELING NET NEGATIVE ECONOMY BEYOND 2050**, AN EXTENDED-PERIOD MODEL IS REQUIRED.
- MORE POSSIBLE TECHNOLOGIES (FOR EXAMPLE, TRANSPORTATION TECHNOLOGIES) SHOULD BE ADDED TO THE **FTT MODULE** OF THE E3ME MODEL.
- THREE MAJOR MODELING APPROACHES ARE CURRENTLY USED IN TAIWAN TO EVALUATE THE NET-ZERO PATHWAY : 1) **E3ME** GLOBAL MACRO-ECONOMETRIC MODEL; 2) SINGLE-COUNTRY **CGE** MODEL; AND 3) ENERGY SYSTEM MODEL (**TIMES** MODEL) + ECONOMIC MODEL. COMMUNICATION AND COLLABORATION AMONG THE MODELING GROUPS ARE CALLED FOR TO MORE CORRECTLY AND EFFICIENTLY PROVIDE EFFECTIVE POLICY SUGGESTIONS TOWARD NET-ZERO PATHWAY.

NOTES ON SCENARIOS

FUTURE SCENARIOS CAN TAKE THE FOLLOWING INTO ACCOUNT :

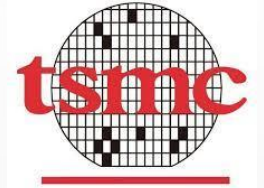
- THE DEVELOPMENT AND WORKING OF **RENEWABLE POWER STORAGE**
- UNCERTAINTY ABOUT RENEWABLES DEPLOYMENT
 - FOR EXAMPLE, THE GOVERNMENT'S PLANS FOR **OFFSHORE WIND FARMS** TO HAVE **2.6GW** OF POWER TO JOIN THE GRID BY THE END OF THIS YEAR ARE FACING **NUMEROUS DELAYS**. THE COVID-19 OUTBREAK HAS CAUSED MAJOR DISRUPTION FOR THE WIND FARM PROJECTS.
- UNCERTAINTY ABOUT THE POLICY PROCESSES

NOTES ON PRIVATE SECTOR INVOLVEMENT

- IN SEPTEMBER, **27** COMPANIES ESTABLISHED THE [NET ZERO ACTION ALLIANCE](#), COMMITTING TO BRINGING TAIWAN'S CARBON EMISSIONS DOWN TO ZERO BY 2050. THE ALLIANCE INCLUDES COMPANIES IN [FINANCE, MANUFACTURING, AND THE SERVICE SECTOR](#).
- THESE 27 COMPANIES ACCOUNT FOR AROUND **40% OF TAIWAN'S GDP** AND **20% OF ITS CARBON EMISSIONS**. THEREFORE, THE SUCCESS OF THE 2050 ZERO CARBON TARGET WILL DEPEND IN A LARGE PROPORTION ON THE PERFORMANCE OF THESE COMPANIES.
- THE ALLIANCE'S GREENHOUSE GAS PLAN INVOLVES **TWO PHASES**. THE FIRST WILL SEE **BUSINESS OFFICES STOP ALL CARBON EMISSIONS BY 2030**, AND THE SECOND WILL SEE **MANUFACTURING BASES MEET THE SAME GOAL BY 2050**.



NOTES ON PRIVATE SECTOR INVOLVEMENT



- AMONG THE 27 COMPANIES, TSMC'S ZERO-CARBON STRATEGY CONSISTS OF TWO MAIN ELEMENTS: USING RENEWABLE ENERGY FOR A QUARTER OF THE ELECTRICITY CONSUMED BY ITS WORLDWIDE MANUFACTURING FACILITIES BY 2030 AND PARTNERING WITH MULTINATIONAL CORPORATIONS ON RESEARCH INTO CARBON CAPTURE AND STORAGE TECHNOLOGIES.
- IN JULY 2020, TSMC ALSO SIGNED A 20-YEAR CORPORATE POWER PURCHASE AGREEMENT WITH ORSTED (沃旭能源) TO BUY POWER FROM THE OFFSHORE WIND FARM PROJECT THE DANISH COMPANY IS DEVELOPING OFF THE COAST OF CHANGHUA COUNTY.



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- **ITRI** (INDUSTRIAL TECHNOLOGY RESEARCH INSTITUTE) LAUNCHED A NET ZERO AND SUSTAINABILITY STRATEGY OFFICE IN MARCH AND ANNOUNCED THAT IT WOULD ACHIEVE NET-ZERO EMISSIONS BY 2050. THE OFFICE WILL HELP PROMOTE AND INTEGRATE TECHNOLOGY R&D ACROSS INDUSTRIES AND WILL ASSIST TAIWAN IN DRAWING ITS STRATEGIC BLUEPRINT TO MEET THE 2050 NET-ZERO TARGET.
- IN JULY 2021, THE **EPA** ANNOUNCED THE OFFICE OF RECYCLING AND THE OFFICE OF CLIMATE CHANGE, THROUGH WHICH THE EPA WILL THOROUGHLY REVIEW POLICIES AND REGULATIONS, INTEGRATE ADMINISTRATIVE RESOURCES, AND EFFECTIVELY PROMOTE RECYCLING AND CARBON REDUCTION MEASURES.

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