

POSITION PAPER

Recommending an Integrative Design Process (IDP) to create
a Flexible Carbon Pricing Mechanism (F-CPM) to augment
the Singapore Carbon Tax to benefit the future economy of Singapore.

8 June 2017

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Executive Summary

To meet its international pledge to reduce climate change, the Singapore Government has announced the introduction of a carbon tax targeting the national power sector and the Emissions Intensive Trade Exposed (EITE) sectors¹. Though a carbon tax will provide incentives to reduce the emissions of CO₂ and other greenhouse gasses, it may have negative impacts on the finances of the companies affected. Hence, it makes sense to explore additional complementary approaches that are likely to reduce any possible negative effects, while simultaneously providing a positive spin-off for the Singapore economy.

One option is to develop a Flexible Carbon Pricing Mechanism (F-CPM) that would operate in parallel with the proposed carbon tax. Such an F-CPM can be built on and benefit from the experiences of all kinds of carbon emission trading systems (ETS) elsewhere in the world. It is important to note that the creation of such an FCPM and linked to ETSS would create a significant number of jobs in both the private and public sectors. This has been demonstrated in other similar regions in Europe, like Sweden where 50,000 jobs were created. In addition, such a mechanism must be demand-driven.

The efficiency of emission trading systems depends on the number of emitters included. Although that number is relatively low in Singapore, it still is considered feasible to develop an F-CPM for Singapore. Subsequently, it would be advisable to explore in parallel possible expansion to or linking with similar systems in other regions or countries.

This paper recommends that the Singapore Government explores and develops an F-CPM through an Integrated Development Process (IDP), a well-structured brainstorming approach that involves all key stakeholders. These would include the industries concerned, the Singapore Government, and international experts on carbon markets and climate policies.

The intended outcome of the IDP is a proposal for the best system to augment the Singapore carbon tax. The goal of the F-CPM is to reduce greenhouse gasses at the lowest cost while simultaneously enhancing Singapore's social and economic position now, and in the future, through new growth opportunities.

Preparations for the IDP include collecting important basic information – together with their pros and cons – and presenting it to the IDP participants. Examples include:
Conventional and non-conventional Cap and Trade Schemes (based on absolute or relative emission reductions)
Cap and Trade + offsets through International or only Domestic Project Credits
Relationship and interaction between any Cap and Trade Scheme and the Singapore carbon tax

Among other things, the recommended IDP process should provide crucial information on:

- Which greenhouse gases (GHGs) and sectors are included
- Definition and size of any cap (whether relative or not) and how to allocate any emission allowances
- Eligibility criteria for entities to participate in the scheme
- Effective incentives that – in concert with the carbon tax – encourage voluntary participation in the F-CPM
- Eligibility criteria and limits for the inclusion of project-based credits
- Elements of a compliance framework that avoids double counting and includes an effective monitoring, verification and reporting protocol

¹ EITE covers refineries and industries which produce petrochemicals, specialty chemicals, other electronic components, semiconductors and data storage components, all of them facing competition at ASEAN or global scale.

- Suitable carbon market architecture (registries, trading platform, market participants, types of eligible contracts, etc.)
- Potential for international linkages
- Regulatory oversight and enforcement

If this proposed process can begin in Q3 2017, results should be available within 10 months, enabling it to be tabled for debate and approval by Parliament together with the carbon tax decisions in Q2 2018.

Introduction & Overview

1. This position paper is a follow up to meeting between Chamber members and the National Climate Change Secretariat on April 20, 2017. This paper has been written by Singapore member companies of the Chamber which have been active in the carbon markets since 2000.
2. The position paper proposes an inclusive, multi-lateral and interdisciplinary process that will create a “**Flexible Carbon Pricing Mechanism (F-CPM)**” to complement Singapore’s carbon tax. The proposed F-CPM will create an interconnected carbon market that supports Singapore’s Climate Action Plan and global efforts to mitigate climate change. The proposed F-CPM will also deepen these endeavours by offering the possibility of linking with future emissions trading schemes and creating options to integrate with like-minded countries that wish to cooperate with Singapore.
3. To achieve these goals, SICC proposes that a collaborative Integrative Design Process (IDP) be used. This is an optimal, inclusive approach that actively engages all stakeholders and multi-disciplinary experts in the creation of the solution. It results in a strong commitment to ambitious outcomes by all parties. In this case, stakeholders should include the existing large emitters, including power generators, **Emissions Intensive Trade Exposed (EITE)** companies and retailers that will be subject to the carbon tax. IDP will allow and facilitate a study of these large emitters, and discussions about ways in which they can utilize a flexible mechanism to adapt to the changing price of fossil fuels carbon tax while remaining competitive and sustainable for their future growth.
4. Currently, Emissions Trading Schemes (ETS) operate across four continents in 35 countries plus 13 states or provinces, and seven cities, covering 40 percent of global GDP. Some of these are trading schemes that operate with a carbon tax in place. Additional systems are under development, including the Chinese national carbon market which is expected to become operational in the Q3 or Q4 2017 and is also expected to be a key driver of China’s transition to a low-carbon economy.
5. This paper, therefore, recommends integrating additional elements and the benefits of a flexible mechanism into Singapore’s carbon pricing approach. This will deepen climate change awareness and foster a robust approach for companies to mitigate and adapt to catastrophic climate change as part of a global community. Including a flexible mechanism coupled with the carbon tax in Singapore’s carbon pricing strategy will create a more inclusive system that allows participants to improve their socio-economic development by choice rather than by enforcement.
6. Singapore has a significant opportunity to create and implement a carbon pricing program that will enhance the future economy. One that will create jobs, encourage entrepreneurship, foster energy efficiency measures, clean technology developments and stewardship in growing new industries together with the requisite R&D.

7. Based on these objectives, we are pleased to present this position paper for an inclusive process to determine a suitable, holistic and flexible carbon pricing mechanism for Singapore.
8. The global shift toward densely populated cities makes Singapore an ideal test-lab for implementing an urban planning tool that will apply the latest technologies in Energy Information and Communication Technology (ICT), from smart metering to big data analytics and predictive algorithms. The deployment of accurate and properly calibrated tools would represent a leading example for a city and a landmark achievement globally. The roles of technology in the development of the F-CPM can generally be the following:
 - **Education**
 - Digital Learning Management System (DLMS) Driven Knowledge Base for the F-CPM
 - Community Sharing and Learning to enable a social-networked platform
 - **Collaborative Platforms**
 - Digital Innovation Lab (e.g. Product Design, Project Design, etc.)
 - Within Market Collaboration Marketplace – A carbon-specific extension to the existing GeBiz platform
 - Extra-Market Collaboration Marketplace - Marketplace for International agencies to collaborate with local companies for • R&D • Innovation • Implementation
 - Avenues for International Companies and Government to access Singapore driven Innovations such as Data Management • Collation • Data-Driven-Decision-Making-Frameworks (D3MF) • Analytics Platform • Others
 - Artificial Intelligence and Automation Labs
 - CRX CarbonBank Trading (Platform for trading of Carbon Credits, managing offsets and Integration with global trading platforms)
 - API Creation for 3rd Party System builders to integrate with Collaboration Platform, Education Platform and Data Management
9. For example, the solution might involve the use of international carbon credits for a considered tax rebate while implementing measures that reduce emissions. The process could create options that enable participants who are subject to a carbon tax to avoid passing the price increase downstream. Instead, it would provide incentives to downstream participants such as Reward and Redemption (R&R) schemes.
10. We expect that by its completion, the IDP approach would have given the Government sufficient confidence to state that Singapore is studying the use of a flexible carbon pricing mechanism such as a carbon trading scheme to reduce the impact of a carbon tax on Singapore in the medium to long term.

Recommendations

11. A proper F-CPM will ensure resilience for Singapore in the short to long term, and in the long term, will allow for collaborative works with other countries and/or territories.
12. We strongly recommend that a collaborative team from various organizations, including international ones, such as the United Nations Framework Convention on Climate Change (UNFCCC), be part of the effort to create this F-CPM from the outset. Their combination of broad-based expertise and applied experience in the interdependencies of sustainability, resilience and self-reliance, will be of significant value.

13. To address this need for international collaboration in our region to develop an optimal F-CPM, we recommend establishing a working committee that includes EITE companies.
14. With a short to long term goal of connecting to other trading schemes and member countries or economies, we may consider substantial technical support for this effort from the UNFCCC and the World Bank.
15. To direct the efforts of this working group, the Chamber proposes that its qualified members facilitate an inclusive, inter-disciplinary IDP to derive the best methods to set up the proposed F-CPM. An inclusive, holistic Integrative Design Process that accounts for all possibilities, and includes all those affected by the said carbon pricing, is the most effective way to organize and manage such a collaborative effort.
16. Design and implementation of the proposed F-CPM needs to be professionally advised by a collaborative and non-hierarchical team structure such as the one proposed in Figure 2.
17. The threshold (% of emissions) for each sector must be defined during the IDP as part of the design of the F-CPM.
18. The Chamber's qualified members' involvement could include creating the overall concept, organizing and facilitating the IDP process, and deploying their domain knowledge experts and IT Team.
19. Outcomes will depend on the design of the F-CPM, its agreed scope for Singapore and how this can be flexible and scalable across borders over time. This consideration will also include expertise, hardware and software requirements and the approach from concept to implementation.

Key Deliverables from the Integrative Design Process

20. The Key Deliverable of engaging in the IDP to develop an F-CPM to augment and complement the carbon tax, is a comprehensive mid-to-long term roadmap for implementing an F-CPM to achieve the following objectives:
 - a. **Define** a comprehensive list of international carbon credits that can be used to offset emissions in Singapore with a pre-defined cap/limit of importing such credits.
 - b. **Recommend** Energy Efficiency measures that can be deployed at every possible opportunity in all the EITE sectors that will reduce their tax liabilities whilst promoting market dynamics and flexibility. This must include all types of business and households, outside of those that that will be directly affected by the carbon tax through energy consumption and lower their exposure to the carbon tax when the carbon tax flows downstream.
 - c. **Recommend** Renewable energy opportunities that can be deployed more effectively in Singapore, such as opportunities in biogas and biomass power generation and improved methodologies for the more efficient deployment of Solar PV projects.
 - d. **Define** how the F-CPM can generate new socio-economic opportunities for the low-carbon, future economy of Singapore, including opportunities in R&D, FINTECH, big data analytics, predictive algorithms and the creation of green-collar jobs, to name a few.
 - e. **Create** opportunities to link with like-minded countries and territories to extend the F-CPM into multiple ETS's or emission reduction opportunities such as technology transfer, carbon finance and project implementation, with an aim to building Singapore

into a carbon trading hub and a Centre of Excellence for Climate Change Cooperation Initiatives (CCOIs)

The IDP for Optimal Mechanism Design

21. IDP is a powerful proven tool for quickly reaching consensus on a host of innovative ideas, deciding on specific courses of action, assigning responsibilities, and facilitating change. (Please refer to Appendix 2 for a detailed description of IDP.)
22. IDP actively engages experts and stakeholders with decision-making authority at the outset of a project in a series of intensive, participatory, multi-stakeholder solution-generating roundtable working events, called “**Charrettes**”. These use a whole-systems approach and result in a strong commitment to ambitious deliverables by all key stakeholders. IDP is effective in dealing with both technical and political issues. Using IDP, the NCCS, together with other ministries and agencies, can make the best, and best informed, decisions to address the issues of creating an Emissions Trading System (ETS).
23. A collaborative, highly-motivated, and energetic IDP is the fastest, most effective, and transparent means for Singapore to create such a system and convince other like-minded countries to join in Singapore’s success, whilst respecting their cultures and systems. An example of how it applies to policy making is in the development of the US National Energy Policy in 2001 and more recently for the California Emissions Trading Scheme.
24. Working collaboratively with NCCS, qualified Chamber members could jointly select and convene a group of participants for the IDP that will include an International Expert Group (IEG) along with local participants from industry, NGOs, government agencies, etc. Stakeholders should include existing large emitters, including power generators and retailers, who will be subject to the carbon tax.
25. Expert participants may include existing UNFCCC personnel plus distinguished former UNFCCC personnel, as discussed further in the “Proposed Team Structure” section of this paper.
26. Participants will use a phased IDP approach outlined in Appendices 1 and 2 and facilitated by qualified Chamber members to develop recommendations in collaboration with the Singapore Government.
27. IDP discussions need to start with clear technical descriptions of each option including a summary of the pros and cons of each option. These descriptions need to be prepared by one or more deep domain expert consultants before any IDP Charrette starts and made available to all participants in the Charrette Briefing Pack that is usually issued 3-4 weeks before the Charrette.
28. Phase 1 of the IDP approach (Collaborative-Design Phase), will examine various options and approaches to designing an ETS that is suitable for the widest voluntary participation by countries (or territories) including and not restricted to the following:
 - a. Conventional Cap and Trade Scheme (i.e. based on absolute emission reductions)
 - b. Non-Conventional Cap and Trade Schemes (e.g. based on relative emission reductions, such as emissions per unit of GDP, or emissions measured against business-as-usual projections)
 - c. Cap and Trade + Domestic Project Credits (as in China ETS)
 - d. Cap and Trade + International Project Credits (lessons learnt from the EU ETS)
 - e. Cap and Trade with both Domestic and International Credits

29. In addition, the IDP needs to decide on a full range of ETS design and linkage issues, such as:
- a. Relationship between ETS and the Singapore carbon tax
 - b. Greenhouse gases (GHGs) to be included in the scheme
 - c. Sectors to be covered under the Scheme
 - d. Definition and size of the cap (whether relative or not)
 - e. Eligibility criteria for entities to participate in the scheme
 - f. Effective incentives that encourage voluntary participation in the ETS
 - g. Methods for allocating the emission allowances
 - h. Eligibility criteria for the inclusion of project-based credits
 - i. Limits on the utilization of project-based credits
 - j. Elements of a compliance framework
 - k. Suitable carbon market architecture (registries, trading platform, market participants, types of eligible contracts, etc.)
 - l. Carbon accounting using a suitable monitoring, verification and reporting protocol
 - m. International linkages, and whether export restrictions apply, and if so which ones
 - n. Regulatory oversight and enforcement
30. A key focus of the IDP should be methodologies for the prevention of double counting. Double counting of emission reductions must be avoided and prevented at all costs to avoid system failure and to ensure absolute, real, long-term and measurable climate change mitigation and adaptation efforts at all levels. Considerations include but are not restricted to the following:
- a. Ensure robust governance structure
 - b. Deliver real, measurable, verifiable and additional emission reductions
 - c. Secure net atmospheric benefits
 - d. Uphold human rights
 - e. Deliver sustainable development benefits
 - f. Do not undermine the goals of other international environmental treaties

Proposed Team Structure

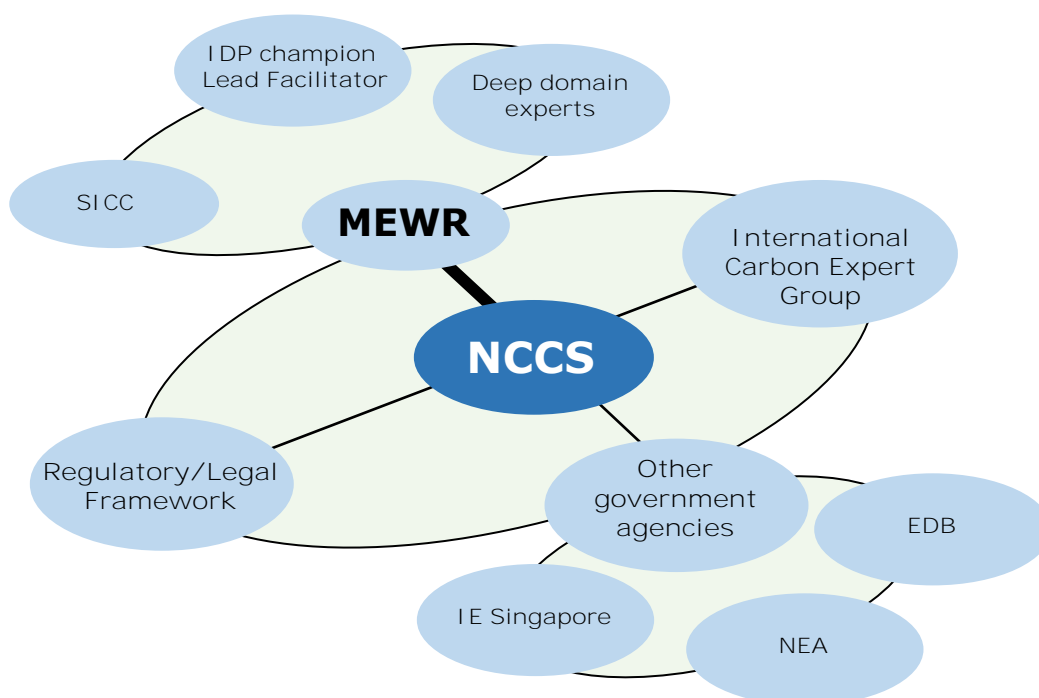


Figure 2: Proposed Development Team Structure

31. Figure 2 illustrates our proposed structure of the core team to ignite the process. More layers will likely be added as the initiative moves along.
32. The Chamber proposes that the UNFCCC International Carbon Expert Group (IEG) consist of leading experts who have extensive experience in the development of the original carbon markets beginning with the inception of the UNFCCC in 1992, and the adoption of the Kyoto Protocol in 1997. Two different types of experts are expected to be involved:
 - a. “Deep domain experts” who will individually and on an ad-hoc basis prepare and present detailed technical and/or organizational proposals on all elements of the F-CPM, which will be used as input for the IDP.
 - b. “Climate change policy domain experts” who have been involved with carbon market related developments and climate change policy developments for many years and who are able to (critically) assess these proposals and provide feedback and guidance during the charrettes.
33. If UNFCCC agrees to be a part of this process, it will be involved **from a technical perspective**. The relevant points for UNFCCC’s involvement in this effort are as follows:
 - a. It is the recognized international entity that has been key in moving the carbon markets forward since 1997.
 - b. It provides the opportunity for neutral brokering in any joint and international mechanism.
34. Examples of “Climate change policy domain experts” are Mr. Lex de Jonge, formerly of Ministry of Environment and Spatial Planning (VROM) in The Netherlands and subsequently the Chairman of the Clean Development Mechanism (CDM) Executive

Board of UNFCCC. Mr. Frank Joshua who has been with the United Nations from the early 1980s and has been specifically involved with UNFCCC since 1990. Both have agreed to work with Chamber qualified members us on this project. We expect that several other like-minded and experienced individuals will be added to the committee as mutually agreed between NCCS and qualified Chamber members.

35. The Chamber proposes that services required for the legal and regulatory framework be performed by a locally-based law firm, appointed by the Singapore Government.
36. A comprehensive list of roles and responsibilities needs to be defined in Phase 1 for the following phases, and prior to the proposed IDP Charrette.

Projected Timeline

37. The projected timeline to complete Phases 1-3 will be within 10 months. These 3 phases will be critical in developing an adaptive and complimentary mechanism that can be dovetailed with the carbon tax of 2019. The 10-month time-period will allow the flexible mechanism to be tabled together with the carbon tax in parliament in the second quarter of 2018. Should this IDP approach be approved, dates for workshops can be mutually agreed on.

Activity / Months	1-3	4-6	7-8	9-10
Phase 1				
Phase 2				
Phase 3				

Table 2: Approximated Project Timeline for design, development of an F-CPM

Estimated Budget

38. A rough estimate of the cost to proceed with this integrated inter-disciplinary approach will be approximately **S\$1,500,000/-** (Singapore Dollars One Million Five Hundred Thousand) and this budget will depend on a finalized scope of works through agreement.
39. Accurate costing depends on agreement about the participants in the process and the extent of their involvement; these include relevant deep domain-knowledge experts, the UN experts, other relevant stakeholders, the core team of the NCCS and the Chamber's qualified members.
40. The IDP Charrettes will be held in Singapore. Stakeholders would be able to visit and view good examples of building automation systems that monitor and report critical resource management from relevant sectors such as energy, water, petrochemicals, marine, buildings, data centers, waste-to- energy (WTE), and so on, apart from that of the Emissions Intensive Trade Exposed (EITE) sectors.

Note

This position paper, including its appendices, is solely for the information of the Singapore Government and its agencies. It may not be used, published or redistributed via any medium to any other party without the prior written approval of the Singapore International Chamber of Commerce.

About SICC

This position paper was prepared by the Singapore International Chamber of Commerce (SICC). SICC is a wholly independent, non-for-profit business association founded in Singapore in 1837.

SICC's members include global corporations, large local companies as well as SMEs from more than 20 industries. Its mission is to stand up for Singapore as a business hub and for its members' business interests. It achieves its mission by understanding its members' business concerns and advocating them to the government with the aim of achieving greater mutual understanding and practical solutions. This win-win approach benefits policymakers and the businesses that help sustain Singapore's economy. The Chamber also works to facilitate international trade via its Certification Services.

Appendix 1: Phased IDP Approach to the Proposed F-CPM

PROPOSED PHASES

Phase 1 – The Collaborative-Discovery Phase

Phase 2 – The Charrette: *Creating a Revolutionary Roadmap for low-carbon, future economy, leading to socio-economic growth*

Phase 3 – Finalization of a comprehensive roadmap and Delivery of a Plan-Of-Action Report

Phase 4* – Facilitate Implementation of SG's Roadmap to the F-CPM (To be determined)

Completion of Phases 1 through to 3 is essential to ensure the production of the Key Deliverables, as clearly outlined in Paragraph 33.

Phase 1 – The Collaborative-Discovery Phase

In this initial discovery phase, the lead facilitator (a qualified Chamber member) proposes to hold exploratory discussions with NCCS to refine program objectives, outputs, work plan, budgeting, etc. As part of developing these mechanisms for producing the roadmap, we will set up material emission source performance benchmarks, and develop strategies along the SG socio-economic value chain.

The discovery process will allow participants at the Charrette, in collaboration with NCCS, to factor and develop selection criteria and define the possibilities for developing the future low carbon economy of Singapore, whilst creating new growth opportunities for Singapore in a resilient manner. This will effectively determine the most relevant aspects to be considered in the next phase.

The discovery phase for this assignment will include the following:

Principles & Key Drivers to be considered from Phase 1 onwards

- Reducing emissions of Singapore based on Singapore's INDC where SG wishes to reduce its carbon intensity based on GDP by 36% by 2030 based on 2005 levels through energy efficiency and renewable energy means.
- Advancing Singapore's socio-economic growth based on a low-carbon, future-economy approach, that retains existing foreign direct investments whilst growing local brands and businesses.
- Define and develop goals to ensure the advancement of Singapore into a regional/international hub for carbon trading, for the next 50 years.

Planning

- Introduce NCCS and other relevant participants to the fundamentals of IDP and whole-systems, holistic thinking
- Elicit NCCS's deeper intentions in growing the Singapore economy through a low-carbon approach whilst ensuring that EITE sector industries are retained in Singapore and provide new opportunities for Singapore in the long run, such as those mentioned in the "Overview" section of this paper
- Work closely with other SG government agencies directly responsible for ensuring short to long term's economic growth.
- Identify and secure funding for the IDP.
- Develop an initial list of relevant and critical charrette topics
- Identify and prioritize key stakeholders to be involved in the charrette and through to implementation.

Preparations the development of an IDP Roadmap Charrette

- Develop initial function programmatic requirements
- Secure participation of all stakeholders identified above
- Organize all charrette logistics.
- Prepare stakeholders engagement and communication, including a detailed charrette briefing pack

Duration: Approximately 1.5 Months

Phase 2 – The Charrette: *Creating a Revolutionary Roadmap for low-carbon, future economy leading to socio-economic growth*

Based on the data and information gathered in Phase 1, the lead facilitator will organize (in collaboration with NCCS and other relevant SG agencies along with feedback from EITE sectors and others) and facilitate a charrette with all agreed stakeholders to use the IDP whole-systems thinking tool to achieve the objectives listed below, including discussing and developing realistic and unique mechanisms in Singapore, and ensuring that these mechanisms are scalable and replicable.

Based on the initial findings of Phase 1 the lead facilitator will lead a team effort by all Charrette participants to review internal policies and practices, and formulate strategies to mitigate or enhance the identified material emission sources, risks, and opportunities. The lead facilitator will also lead the team in a process of establishing Key Performance Indicators (KPIs) in a performance measurement system that will allow NCCS to benchmark performance against stated strategies, and effectively facilitate comparison over time.

During the Charrette, each participant will work to agree on the recommended approach for evaluating improvements. In our experience, having the right specialists in the room during the Charrette is critical to idea generation, and increases the number of improvements that can be accepted without further evaluation.

Tasks & Activities

- Align team members with the integrative design process and consider operational factors around the goals
- Review the Impact of the carbon tax on Emissions-Intensive-Trade-Exposed (EITE) sectors and the further impact when the carbon tax flows downstream.
- Review internal policies and practices, and recommend improvements
- Create and agree on the vision and key objectives that will result in reducing Singapore's emissions profile whilst creating new opportunities and socio-economic growth.
- Solidify and align the Charrette team around that vision, and ensure all disciplines are integrated
- Develop and agree the key performance targets and outcomes required from the F-CPM
- Identify and agree on appropriate strategies to attain those goals; ensure all operational components are considered
- Brainstorm innovative ideas to develop a consolidated list of measures and procedures to be undertaken
- Evaluate and agree on which ideas are practical to implement and can be accepted; and those which require further evaluation
- Agree and assign responsibilities for further evaluation of the identified improvements to ensure augmentation of flexible measures to compliment the carbon tax of 2019.

Duration: Approximately 4 months

Phase 3 – Roadmap and Plan-Of-Action Report

Following the Charrette, the lead facilitator will prepare a summary of recommendations agreed on at the Charrette to create a framework to move forward. Documentation will include a Priority Rated Integrated Solutions Matrix (PRISM) to be used by all stakeholders to track progress, including achievement of performance targets, in the implementation of the roadmap. Judicious use of the information in this document also highlights potential conflicts and opportunities, mitigates risks, and encourages innovation.

Tasks and Activities

- Decide report layout, design and format for readability and utility
- Develop draft for both primary and secondary components and compile it into a single report
- Present draft report to NCCS, discuss, and modify as required
- Present final report to NCCS and discuss

NCCS can expect 1 draft report for review, and 2-3 desktop reviews during the production of the report.

Duration: Approximately 4.5 Months

Phase 4 – Facilitate Implementation of the Low-carbon, Future Economy Roadmap

“Implementing a Living Plan” – This scope of work will be defined by phases 1-3, cost not included in this proposal.

Duration: To be determined if NCCS so requires.

Appendix 2: The Integrative Design Process (IDP)

Approach

The lead facilitator (a qualified Chamber member) will use the Integrative Design Process (IDP) to assist its clients to create a collaborative, multi-disciplinary environment in which they can address the issues of resource-efficiency creatively and effectively, and make the best decisions. IDP uses holistic and whole-systems thinking that integrates the key pillars of resilience and self-reliance to generate results that are real, long-term, and measurable. It has been successfully applied to a variety of project types around the world, and has a long and well-defined track record as an effective alternative to business-as-usual approaches.

IDP encourages all stakeholders to provide input into solutions that help achieve the project goals. The lead facilitator has extensive experience facilitating the IDP and championing the resource efficient ideas developed during the process. Our extensive network of experts ensures deep domain knowledge, and we have achieved substantial results in various arenas.

Integrative Design Process (IDP)

The Integrative Design Process (IDP) is an alternative approach to problem solving that can be applied to any type of project. It is a means to explore and implement sustainable design principles effectively on a project while staying within schedule, budget, and program constraints. It relies upon the early engagement of a multi-disciplinary and collaborative team whose members make decisions together based on a shared vision and holistic understanding of the project. It focuses on identifying areas to improve efficiencies of performance through the entire project life; such as in energy, water, and waste.

IDP delivers substantial benefits compared to the conventional approach to design and construction. The following chart compares the two and lists the differences that produce these results:

Integrative Design Process	VS	Conventional Design Process
Inclusive from the outset		Involves team members intermittently
Time and energy invested early		Less time, energy and collaboration early on
Decisions influenced by broad team		Few decision makers
Iterative Process		Linear Process
Whole-systems thinking		Systems often considered in isolation
Allows for full optimization		Limited to constrained optimization
Seeks synergies		Seeks compromise
Life-cycle costing		Emphasis on up-front costs
Process continues post-application		Ends when Project is complete

Figure 3: Differences between Conventional and Integrative Design Process

The graphic below demonstrates how IDP methods changes the use of specialists' time in a design and policy construction project:

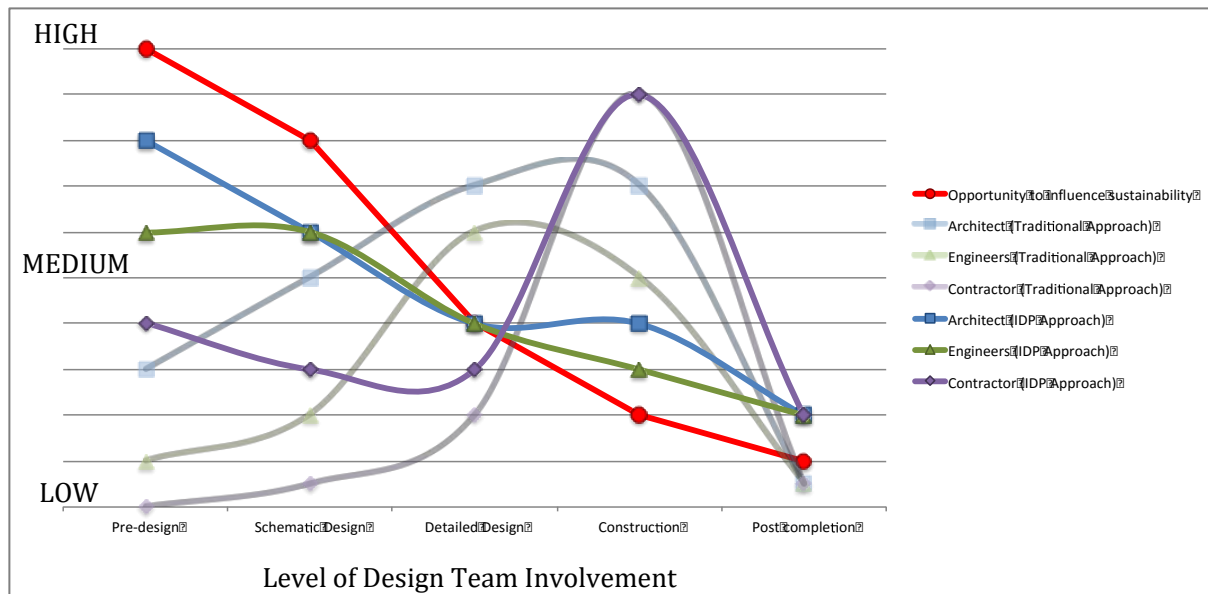


Figure 4: Streamlining of a Project through Integrative Design Process

Charrettes

Charrettes are the most powerful tool in the IDP for facilitating the changes that result in high-performance solutions. Considerable experience has proven that they are the most effective way to achieve ambitious performance goals, and are applicable in almost all problem-solving situations.

Charrettes are highly integrative design workshops with ambitious deliverables. They are intensive, participatory, multi-stakeholder, and trans-disciplinary. Participants must include project representatives with decision-making authority. These characteristics make them highly effective tools for quickly reaching consensus on general goals, establishing targets for performance, identifying courses of action, and assigning responsibilities. As such, the IDP/Charrette process needs to occur early in a project. Once you know where you want to go, it's much easier to create the roadmap to get you there – cost effectively.

An experienced facilitator guides the Charrettes to encourage innovation and challenge 'business-as-usual', establish the project goals, and ensure all stakeholders participate and are aligned with the goals.

Charrettes use "whole-system" thinking (see discussion below) and integrative design principles to look for solutions. This hands-on effort produces an economically attractive menu of options that the project team subsequently refine into thoroughly documented solutions. When well thought through, capital costs for these solutions can be lower than for conventional designs.

Through a series of Charrettes throughout the project, in which all stakeholders are invited to contribute, the focus shifts from 'compliance' to 'performance' – from reapplying business-as-usual solutions to envisioning and achieving a better future. These sessions provide a forum for discussion in which short feedback loops lead to fast solutions, discussions can be informed by real-time dynamic simulation modelling, and the team is made aware of the direct impacts of their decisions on other areas of the project. The process becomes streamlined, reducing consultant costs due to less abortive work. The result is fit-for-purpose and future-proof solutions, with appropriately sized systems that meet demand as efficiently as possible and have reduced operating costs.

The lead facilitator will coordinate preparations and logistics for the Charrette with the client.

Typical objectives of a Charrette are to:

- Align all stakeholders
- Set targets and resource performance goals
- Brainstorm an optimal list of performance improvement opportunities
- Evaluate these opportunities and agree on a list of recommended measures.

Charrettes typically include the following components:

- Welcome and introductions
- Project Presentation, focused on providing some context and highlighting the key objectives for the project.
- Educational Component
- Goal Setting: Discuss and agree on a framework of appropriate resource performance indicators and baselines.

The breakout groups further develop the performance indicators in their individual groups, and use them to evaluate suggested solutions. The charrette should conclude with a full set of thoroughly vetted performance metrics agreed upon and recommended by the charrette participants.

Opportunities and Strategies: The plenary group breaks into separate working groups to:

- Use “whole system” thinking to brainstorm a menu of possible opportunities in each topic area
- Identify design criteria, strategies, and performance targets for each opportunity identified
- Evaluate opportunities to determine which are appropriate for incorporation in the project
- Discuss next steps and implementation strategies, respecting project budget, schedule, design and performance implications
- Coordinate with other groups, and prioritize the design features in terms of relevance to overall resource efficiency goals
- Integration exercises: The entire group periodically reassembles to report on their discussions and elicit ideas from other groups, seeking and capitalizing on “whole system” interconnections. To further integrate the process, some individuals may float between groups to cross-pollinate ideas.
- Summing up: Team members present agreed recommendations and action plans discussed and agreed upon during the Charrette. The goal is for the plenary group to agree

How does a charrette work it's magic?

- Establish personal relationships (get acquainted)
- Prime the pump
 - presentations about the project by the project team
 - presentations about innovative solutions by experts
- Clarify the overall vision
- Set specific performance goals and targets
- Establish ground rules for charrette process
 - e.g. open minds, risk management, decision making, documentation, assigning responsibilities, synergies w/other groups
- An iterative process of breakout work groups followed by plenary discussions to integrate work of breakout groups
 - Repeat several times
- Document decisions in the consensus report, including D-PRISM
- *Following the charrette, the design team uses D-PRISM to manage the implementation of measures agreed at the charrette*

Essential ingredients for a successful charrette and Integrative Design Process

- Team values or “code of conduct,” such as respect, open-mindedness, and transparency
- Clear allocation of responsibilities
- Clear communication channels
- Risk tolerance and risk management strategies
- Defined decision making process
- Authority to confirm “unusual” technologies or systems
- Whole Systems Thinking

Figure 5: Essential Ingredients for a Successful

by the end of the Charrette on a list of measures to implement or to research further. This is critical to the charrette's success.

Charrette participants typically evaluate potential strategies against criteria such as:

- Sustainable benefit
- Initial cost implications
- Life cycle cost implications
- Is the recommendation applicable, realistic, and practical?
- Does the recommendation provide synergistic or multiple benefits?

Following the Charrette, the lead facilitator will prepare a report summarizing key recommendations developed at the Charrette for review by the client and other stakeholders. The report will include a Priority Rated Integrated Solutions Matrix (D-PRISM) to track the incorporation of strategies and to help the team achieve performance targets agreed upon at the Charrette.

If necessary, the lead facilitator may further analyze and assess the agreed recommendations prior to issuing the report, including investigating potential challenges and risks such as interdependencies and the impacts on timeline and space availability. The report may also provide additional documentation, calculations, sources of information, and include a comprehensive analysis (i.e. cost-benefit-analysis, lifecycle analysis, net present value, or sensitivity analysis) to evaluate and justify the final, recommended solutions.

Whole Systems Thinking

"Whole-systems" thinking is the process of understanding how things influence one another within a whole. In natural ecosystems, various elements must work together. In complex man-made systems, all the components that make up the system must work together.

"Whole-systems" thinking solves 'problems' by viewing them as parts of an overall system, rather than reacting to specific parts, outcomes or events. A piecemeal approach can create unintended consequences. Improvement in one area can adversely affect another, and small catalytic events can cause large changes in complex systems.

"Whole-systems" thinking focuses on cyclical rather than linear cause and effect.

Benefits

Lower operational costs that result from efficiency measures increase the project's net present value and return on investment, and thus its market value. Lower capital costs coupled with lower operating costs provide a higher return on capital employed. Measures that improve indoor environmental quality are thoroughly documented to enhance human health and comfort, and thus their productivity. These are highly marketable and sought-after benefits.

IDP typically pays for itself many times over through substantial reductions in project CAPEX and OPEX. Potential sources of cost savings include:

Quickly reaching consensus on a host of innovative ideas, deciding on specific courses of action, and assigning responsibilities

Producing a "big-picture" vision that goes beyond the original problem, permitting one solution to be leveraged to create many more — often at no additional cost

Developing better solutions that do more with fewer resources, are environmentally sustainable and socially responsible

Anticipating and avoiding technical difficulties that could add expense later in the process

Building support for sustainable strategies amongst the owner/developer, users, designers, contractors, regulators, and community

Based on the lead facilitator's experience, and if all Charrette participants embrace the spirit and process, we are confident that IDP will produce world-class results.

Participation

Success of a Charrette depends on broad participation by all the interests in the project, including project team members with decision-making authority. All participants need to be committed to the effort, fully engaged in the process, and as free as possible of distractions from the discussions.

Charrette organizers must carefully select participants who can provide experience and a "whole-systems" approach in each of the broad array of topic areas to be considered. These experts can be part of the project team, other appointed consultants or people with required expertise who are not directly related to the project. Selection of these participants requires careful consideration and 'thinking outside the box' to include topic area expertise that may not at first glance be considered relevant to the discussions. The lead facilitator will assist the client to identify experts that can be expected to contribute solutions.

Having the right specialists in the room during the Charrette is critical to idea generation, and increases the number of ideas and improvements that can be accepted. Including stakeholders across the lifecycle of the asset (including the operational phase, and even end-of-life) is critical to understanding and including all aspects of the proposed solution's performance and resource consumption.

Any existing appointed contractors and technical consultants should participate in the Charrettes to ensure collaboration and transparency in the exchange of ideas and recommendations. They have important information to contribute to the discussions. Moreover, without their involvement, a layer of misunderstanding can easily emerge wherever the conventional process would break the whole of the process into separate pieces. It is essential for all participants in creating and implementing the solutions to understand why systems have been designed the way they are to avoid making "business as usual" changes when implementing their separate components of the design.

To this end, the Charrette report needs to clearly document the integrative aspects of the design to ensure that tenderers for the work:

- Understand the integrative design process that was used to inform the design
- Understand the outcomes which are to be achieved/delivered
- Become fully engaged in the effort and desired results
- Can defend the design during implementation

Final Thoughts*

You know you are participating in an integrative design process when:

- You are asked for your input on a wide range of issues – including those outside of your immediate area of expertise
- Several project team members are pushed out of their comfort zone
- There is a shared understanding of project goals that results from collaborative working sessions
- The expectations of your work are clearly defined and sufficiently detailed – the results have targeted, quantified performance goals
- Other people's work depends on yours; tasks are interdependent – you can't just go off and hide in a corner, then push through your deliverables. Integrated systems result from an integrative process in which stakeholders co-solve problems
- You feel that group interactions inspire creativity – working sessions are more "fun"

- You feel more respected and valued than in a traditional project, and you feel obligated to respond in kind – you sense a higher level of morale and alignment with the core values expressed by the group, resulting in an expanded degree of pride in the outcome
- There is a focus and emphasis on process itself, including an early collaborative goal-setting session attended by all team members (no later than schematic design) to establish a shared understanding of project targets and priorities
- The process is mapped clearly – stakeholders spend time planning how problems will be solved together, with decisions made in a transparent way – this defined “map” is incorporated into the main project schedule
- Innovative solutions that challenge “rules-of-thumb” are encouraged (innovation doesn’t mean high-tech or risky strategies)
- Decision-makers (client) and an expanded array of stakeholders are involved in a significant and valuable way
- The project embraces issues not usually considered in the typical design process – such as the health of the watershed, the regional ecology, and the community – by engaging an ongoing process of discovery that identifies what contributes to the health of the project’s context or place
- You feel a greater sense of ownership in the project in its entirety (or whole), rather than in individual aspects or components
- There is dialogue and debate surrounding design decisions, leading to a higher level of “buy-in” and consensus among the team

** By Barbra Batshalom, quoted in The Integrative Design Guide to Green Building, by 7group and Bill Reed*

Sample Charrette Agenda

Refer to “General Notes” (below) for details on process, working groups, and discussion topics.

Day 1

- 08:30 - 09:00 Opening and Welcome; Rapid self-introductions by all participants
- 09:00 - 09:30 Briefing on the project, including discussion of vision, goals and objectives, issues, concepts and special factors relating to the project, by the project team
- 10:15 - 12:00 Focused presentations on principles and examples of innovative solutions.
- 12:00 - 12:45 *Buffet lunch provided on site; networking and informal conversations*
- 12:45 - 13:00 Organize Teams (See General Notes) and Charge to the Working Groups
- 13:00 - 15:00 Team Breakout N° 1 – See General Notes for list of discussion items.
- 15:15 - 17:30 Plenary report-out by teams, with group discussion of each. Each team will have approximately 10 minutes to present, followed by 10 minutes for questions and discussion. See General Notes for further information.
- 17:30 Adjourn for the day

Day 2

- 08:30 - 09:00 Plenary: “Shower Epiphanies”: quickly review and discuss reactions to previous day’s work.
- 09:00 - 12:00 Team Breakout N° 2 – See General Notes for list of discussion items
- 12:00 - 12:45 *Buffet lunch provided on site; networking and informal conversations or Teams may continue discussions if they so desire.*
- 12:45 - 14:40 Plenary report-out by teams: The goal is for the plenary group to agree by the end of this session on a list of measures to implement or to research further. See General Notes for further information.
- 15:00 - 17:00 Team Breakout N° 3 – See General Notes for list of discussion items.
- 17:00 Adjourn for the day

Day 3

- 08:30 - 10:15 Plenary report-out by teams, with group discussion of each. Each team will have approximately 10 minutes to present, followed by 10 minutes for questions and discussion. The session will be conducted by the Lead Facilitator.
- 10:30 - 12:00 Team Breakout N°4 – See General Notes for list of discussion items
- 12:00 - 13:00 *Buffet lunch provided on site; networking and informal conversations or Teams may continue discussions if they so desire.*
- 13:00 - 16:30 Final Plenary: presentations of conclusions, recommendations, action steps, strategies and comments by the teams, with plenary discussion of each. This list will be recommended for inclusion in the project. The final report will be developed from these presentations and notes taken by each group’s recorder on the ensuing discussions.
- 16:30 - 17:00 *Conclusions and wrap-up comments; adjourn*

General Notes to Charrette Agenda

Breakout group organization: Charrettes are very fluid processes. The lead facilitator and the client/project team will prepare a proposed list of breakout groups that is subject to modification; it will be reviewed early in the charrette and discussed by all participants prior to the beginning of the breakout group discussions, and can be modified to fit a better understanding of the program requirements as developed by the Charrette participants.

Participants are free to join the group that most closely suits their interests, although the facilitators may ask people to switch groups if necessary (or combine groups) to ensure sufficient participants in each group for a productive discussion. During the Charrette, facilitators and participants will continuously assess the organization of working teams and breakout groups, and may vary the groups sizes, topics, and members dependent on the evolving understanding of requirements and desired outcomes.

Once participants join a group they are encouraged to stay with that group in the interest of continuity; however, participants are free to move between groups if they believe they can make a more important contribution elsewhere. Certain participants with wide ranging expertise may be encouraged to move between groups to cross-pollinate. Also, groups may combine forces temporarily to work on matters that relate to multiple groups.

Typically, there is substantial overlap between the topics for each group; this is expected and is addressed in the plenary sessions and through informal discussions between members of the various teams. In addition, there will be universal considerations that each group should address in their discussions based on the goals defined in this paper.

Recorders: Persons with good note-taking skills will be designated in each breakout group to capture the various discussions leading up to the selection of each recommended measure, and prepare documentation for the plenary presentations. In general, this should be the same person throughout the Charrette to help ensure consistency and responsibility for completeness, and a contact point for follow up while preparing the report based on this recorder's notes; however, if necessary the recorder may be varied for different sessions.

Methodology: During the breakout sessions, all participants will work together to review recommended improvements, solicit additional ideas for improvements, coordinate recommendations with those of the other disciplines, and agree on the approach for evaluating them.

Plenary Reporting: The purpose of these sessions is to share information between the various Teams' areas of interest, seek synergies, and integrate solutions.

Just prior to each plenary integration session, each team needs to determine who will present, and what ideas your team needs or wants to communicate to and/or coordinate with the other Teams within the narrow time constraints. Typically, the presenter at plenary sessions is the leader of each team (facilitator or chair), but the group may decide to have its designated recorder or a particularly strong team member report instead. The selected presenter may change per session.

Justify and document: As part of their analysis of recommended measures during their breakout sessions, each team needs to provide documentation that may include calculations, sources of information, and "back-of-the-envelope" conceptual analyses (such as cost-benefit-analysis, lifecycle analysis, net present value, sensitivity analysis, etc.) to justify the recommended improvements. Throughout the charrette, and especially prior to the final presentations, team recorders are responsible to collect notes and record material for use in the final charrette report.

Final Presentations: A template is provided below to indicate types of information to be included, and format for presentation and written report. Presentations may include graphics, narratives, and any other material the group chooses to include.

TEAM BREAKOUT N° 1

Organize the team: Internal briefing and discussion, organization, agreement on topics and goals for the workgroup. Refine definition of team's specific areas of interest.

Brainstorm: Introduce, discuss, and document creative ideas for solutions, in addition to the ideas presented by the Lead Facilitator team in the morning session.

Identify necessary technical improvements: Discuss and agree on a range of practical resource efficiency strategies, technical opportunities, and improvements for each major resource-intensive system or process to attain key performance goals; consider all operational components.

Synergies: Seek synergies and integrated solutions. Identify, assess, and optimize synergies between systems and processes within each facility, and between the two facilities.

Metrics: Review fundamental performance metrics of recommended strategies. Use this information to optimize system performance and achieve significant construction and operating cost savings.

Determine economic impacts of recommended strategies, respecting the project's overall technical and economic requirements. Optimize integrated performance and economics of related improvements. Include rough estimates of net cost and return on investment (ROI).

TEAM BREAKOUT N° 2

Objective: Integrate ideas from reports and discussion in the preceding plenary session, continue discussions from previous session as necessary, and use agreed performance indicators and criteria to assess recommended resource efficiency measures.

Integration: Integrate ideas from reports and discussion in the preceding plenary session.

Identify constraints on the ability of recommended strategies or measures to achieve the target performance.

Challenges and risks: Identify and address potential challenges and risks – including such things as impact on timeline, space availability, inter-dependence on process units – of incorporating recommended strategies in the detailed design and actual construction.

Select and prioritize: Agree on recommended resource efficiency performance enhancement measures, and prioritize them. Each team should filter down to a maximum of 6 major recommended strategies, with related recommendations clustered under these major headings, to recommend at the full stakeholder charrette, and prioritize them.

Develop designs: To the extent possible within the time constraints of the charrette, flesh out details about agreed measures, and develop action plans and specific recommendations.

Finalize recommendations, measures or indicators of value, and action plans.

TEAM BREAKOUT N° 3

Objective: Integrate ideas from reports and discussion in the preceding plenary session, continue discussions from previous session as necessary, and use agreed performance indicators and criteria to further refine recommended measures.

TEAM BREAKOUT N° 4

Objective: Develop presentations in defense of measures to recommend at the full stakeholder charrette. Address any final comments from the earlier plenary session, and finalize the resource efficiencies listing.

Develop final summary slides: Each team should prepare up to three power point slides for each of their recommendations resource efficiency performance enhancements that have been accepted by the Plenary group either for inclusion in the project, or for further research and evaluation. These slides will be aggregated into one file and presented briefly in the closing plenary session.