Methane Moment:
High Level Cost Overview

What This Decks Contains

- This is the fourth of seven high level overviews of the proposals:
  - Chemistry, Toxicology, Environmental Effects and Dispersal
  - Governance
  - Operational Data and Security
  - Costs Overview
  - Methane Moment & Politics
  - Program/Project Plan
  - Background Story

- This one contains:
  - High-level overview of cost implications from the proposed programs

Methane Moment Pitch Package

This deck is part of a Methane Moment package:

- Website
- Methane Moment Pitch deck
- **High Level Summary Decks:**
  - Chemistry, Toxicology, Environmental Effects & Dispersal
  - Governance
  - Operational Data & Security
  - Cost Overview
  - Methane Moment & Politics
  - Program/Project Plan
  - Background Story
- Reference Document
- Methane Moment Cost Estimates

Methane Moment Cost Spreadsheet

- This deck refers to this spreadsheet **Methane Moment Cost Estimates**
- Within the spreadsheet it contains worksheets for:
  - MEWRS
  - HMLP
  - AICS
  - MGCS
  - HACIP

Deployment & Costs

- Methane bursts and melting ice are occurring more frequently across the Arctic
- The use of TOA-EDARA, TOA and crushed white marble, begs this question - **“What are the cost implications for deployment across the vast arctic?”**
- To answer this, we created within a spreadsheet, a worksheet each for MEWRS, HMLP, AICS and MGCS
- We wanted analysts to be able to vary conditions to understand the cost implications

MEWRS Deployment & Costs

- Within the MEWRS worksheet we created costing for three bursts
- This resulted in us quickly understanding large possible costs - why?
- A burst could go on for days, weeks, months or longer
- Depending on the burst intensity, the amount of methane release could be small or large

MEWRS Deployment & Costs

- Next, we realized the distance from base to the methane burst site would also affect costs and on-site time to reduce methane
- Add to this the carrying capacity of the dispersal delivery vehicle/mechanism, which in turn affects time on site
- Then add in costs for fuel, pilots, etc.
- Finally we began to consider capital costs of the dispersal delivery vehicle/mechanism and depreciation
- **The result?**

Costs Skyrocket Requiring Innovation

- For a long burst duration, costs could approach half a billion dollars
- Thus, we knew it required innovative thinking to create a suite of cost-effective dispersal delivery vehicles/mechanisms
- We can see how a sophisticated AI model would bring the most-cost effective dispersal deliveries to bear
- It might start off with jets, then move to localized drones flying off of containers with which they can refuel and restock, ships with drones, airships, etc.
- **Bottom line - Innovation must deliver low-cost methane burst reduction dispersal delivery vehicles/mechanisms**

Halving Methane Costs

- We created a worksheet for halving methane levels around the planet using three scenarios:
  - Jets
  - Ships
  - Land based dispersal
- Our idea is to leverage tax credit/subsidies to create thousands of dispersal delivery mechanisms, able to operate most days of the year
- When one factors in capital costs of the delivery mechanisms, then costs again soar to hundreds of millions to billions of dollars
- **Yet, it's more complicated than this - why?**

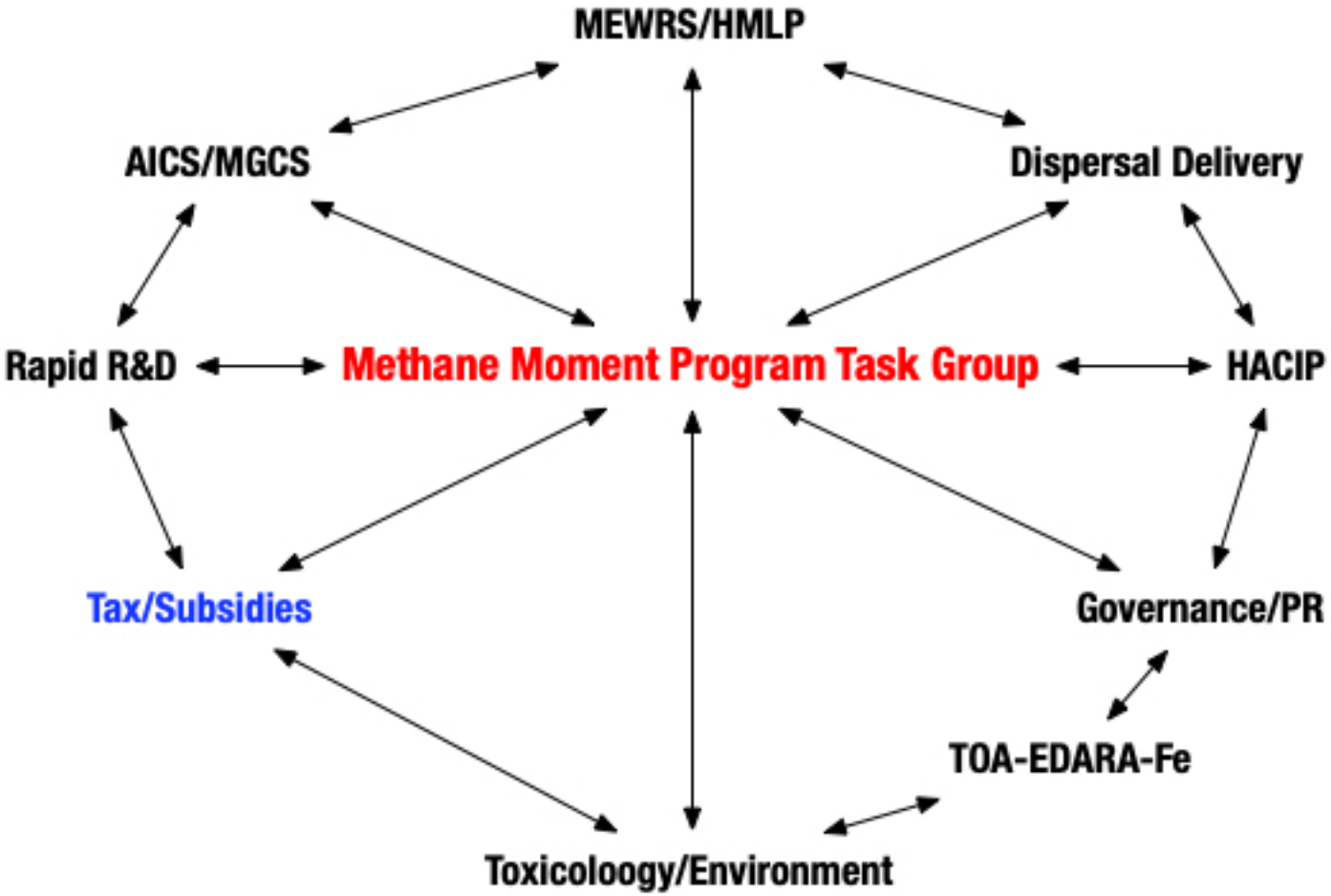
Where and When Does Methane Reduction Occur?

- The worksheet calls out for thousands of dispersal delivery vehicles/mechanisms
- We can easily see operators of these devices dispersing TOA-EDARA at the same place as others, collecting tax credits/subsidies from governments
- Yet, these won't be very successful because the amount of methane present will be low because of other dispersal vehicles operating in the same area
- **So, governments will be spending taxpayer dollars for little gain**

Which Led Us to Two Realizations…

- **The tax credit teams the proposal calls out for MUST be fully integrated with the MEWRS/HMLP project as well as the prototype dispersal delivery project**
  - **They need to understand how to lower capital costs for methane reduction delivery vehicles/mechanisms**
- **The tax credit team also must be tightly tied into the satellite methane detection systems development**
  - **This hypothetically might be able to track dispersal delivery in real time affirming amount of methane reduced by a dispersal delivery service for which is being paid tax credits**
- Which is why, in the following diagram from the **High Level Program/Project Plan deck** we show tight integration of the tax credit/subsidies team with the other teams…

Tax/Subsidies Integrated With Project Teams



The Actual Dispersal Mechanism Costs Are Too High…

- We created a cost model for land, jet and ship based dispersal systems mechanisms contained within the dispersal delivery vehicles/mechanisms (which are also used in AICS/MGCS)
- The initial cost is approximately $120,000
- We realized this cost MUST be driven down to thousands of dollars
- If so, it allows for relatively low cost retrofitting to existing jets, drones, ships, land based structures, etc.
- **Bottom line - It's in governments' fiscal interests to rapidly fund innovation re dispersal delivery mechanisms i.e. lower costs and increase uptake of tax credit based methane reduction**

Then We Moved On to AICS…

- As in MEWRS, we created the ability for an analyst to specify the area requiring cooling
- We created the ability to specify if the dispersal would occur via dispersal delivery vehicles or, via land dispersal stations
- Next we decided to model Greenland to see what kind of guesstimate costs might be involved
- Finally, we decided to take a wild guesstimate at cooling the whole arctic (excluding Russia)
- **Here's what we learnt…**

Costs Widely Vary

- It comes down to weather, wind conditions, size of area and distance from base if air type dispersal delivery is selected
- Costs can easily range in hundreds of millions to billions of dollars annually
- **Further, our model is VERY CRUDE**
- Localized weather is very complicated which will directly affect costs of dispersal of TOA or crushed white marble as the ice whitener

Then When We Modeled MGCS…

- It became obvious that while the total surface area isn't anywhere near as large as the Arctic, localized weather condition might not make TOA cost effective
- If a glacier typically has high wind conditions, unless TOA is continually applied, it doesn't make cost-effective sense
- Thus, it might require ice whitener (crushed white marble) accompanied by TOA for days during the spring-summer-fall where the clouds stay around the glaciers
- **Add all the above up and it…**

Requires Innovation and AI Based Models…

- As with MEWRS/HMLP, it requires innovation to create a suite of low cost dispersal delivery vehicles/mechanisms
- Which must be accompanied by sophisticated AI based models requiring:
  - Localized weather data
  - Ability to calculate amounts of dispersant required
  - Ability to then recommend which dispersal delivery vehicles/mechanisms will be required
- **All in the most cost-effective manner**

Then There's HACIP…

- It's an innovate program designed to create new industry and jobs for arctic citizens built around climate management services
- It also seeks to pilot innovative energy creation using molten salt reactors and indoor growing allowing arctic people to support themselves rather then importing in food
- **ALL OF WHICH POTENTIALLY COMES WITH LARGE COSTS**

Which Requires LOTS of Cost Controls

- **So, in these programs, which we've listed as TBD (to be decided) in the worksheet, prudence must be used**
  - **Human Arctic Climate Industry Program Group HACIPG**
    - Initial management costs
  - **Arctic Energy Food Production Group (AEFG)**
    - Initial management costs
  - **Arctic Traditional Life Program Group (ATLPG)**
    - Initial management costs
  - **Arctic Climate Industry Group (ACIG)**
    - Initial management costs

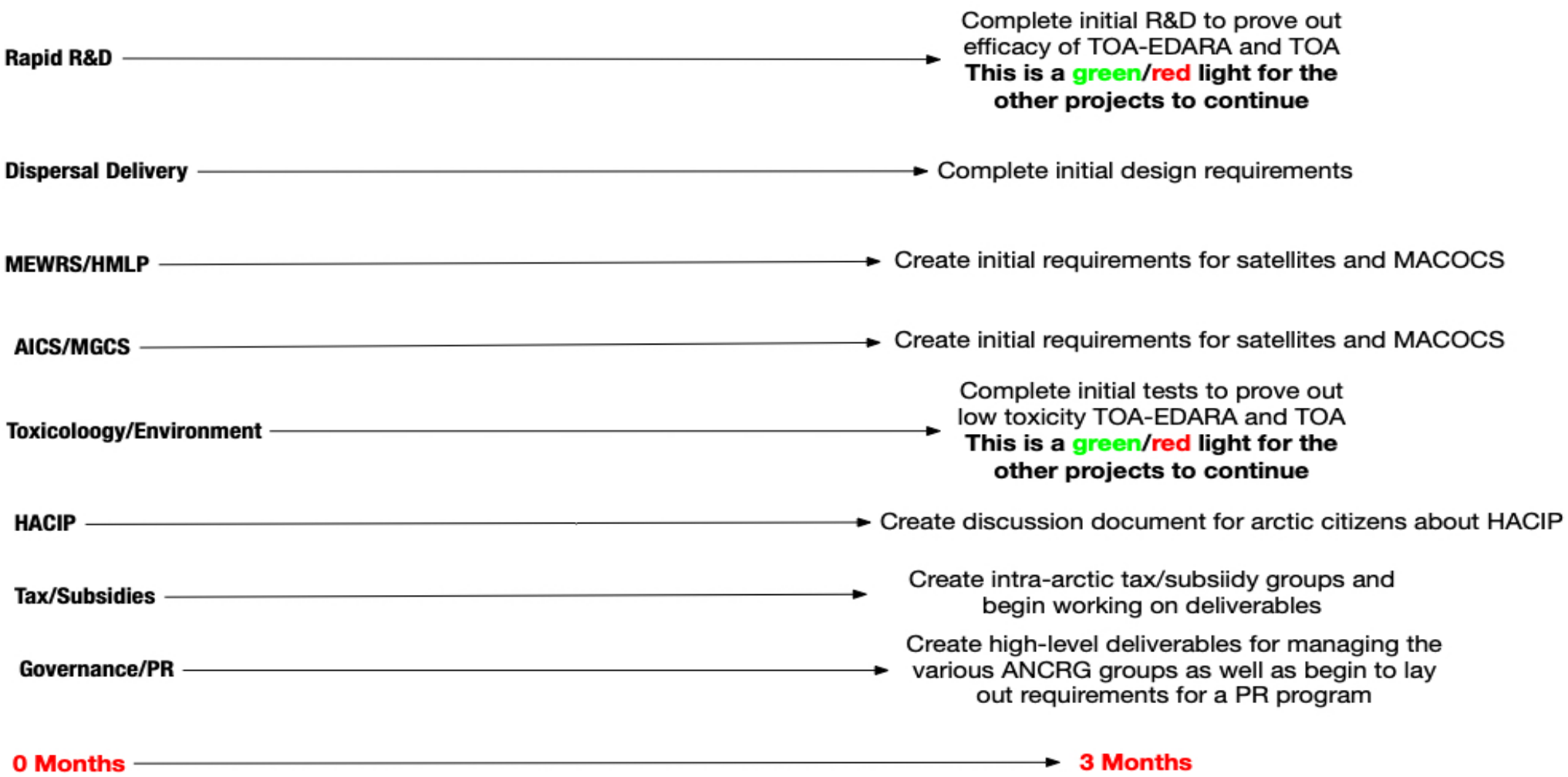
Then There's Initial Governance Costs…

- **Arctic Nations Climate Response Group (ANCRG)**
  - Group formation costs
  - Initial management costs
- **Methane Reduction Group (MRG)**
  - Initial management costs
- **Glacier Control Group (GCG)**
  - Initial management costs
- **Methane Reduction Tax Credit/Subsidies Group (MRTCSG)**
  - Initial management costs
- **Toxicology & Environmental Effects Group (TEEG)**
  - Initial management costs
- **Methane & Arctic Cooling Operational Centre (MACOC)**
  - Initial management costs

Out of the Gate Critical Costs…

- **TOA-EDARA**
  - Determine quick R&D and POC costs to prove out it's efficacy
  - Determine toxicology and environmental effects testing costs
- **TOA**
  - Determine quick R&D and POC costs to prove out it's efficacy
  - Determine toxicology and environmental effects testing costs
- **Ice Whitener (White Marble Dust)**
  - Determine quick R&D and POC costs to prove out it's efficacy
  - Determine toxicology and environmental effects testing costs

Which Are Shown As Project Gates In This Diagram



Bottom Costing/Funding Line…

- Rapid funding must occur to quickly see:
  - if the dispersants work as expected confirming low toxicity
  - Get initial design requirements done for innovative dispersal delivery vehicles and dispersant mechanism
- Then establish a program critical gate at 3 months to confirm the above
- **If it all works as expected, shift to warp funding gear allowing summer POC's (proof of concepts) and pilots to occur**

Summary

- As stated in the spreadsheet and reference doc, the spreadsheet is a good place to begin and a terrible place to end
- Very sophisticated cost models must be created leveraging innovative dispersal delivery systems
- From this accurate cost models can be created

Appendix - Contacts

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