

**MINUTES (DRAFT)**

**Refrigeration Committee Technology Committee**

**for**

**Comfort, Process, and Cold-Chain**

**(REF-CPCC)**

**2022 Spring Meeting**

**Monday Apr. 11th, 2022**

**Web Meeting**

**11 am to 12:30 pm ET**

## These minutes have not been approved and are not the official, approved record until approved by this committee.

|  |  |  |
| --- | --- | --- |
| **VOTING MEMBERS PRESENT:**  Dustin Lilya, *Chair*  Steve Kujak – *Vice Chair*  Roberto Aguilo  Ayman Eltalouny  Charles Hon  Carlos Alberto Mitroga  Kashif Nawaz  Alaa Olama  Harshal Arvind Surange  **VOTING MEMBERS NOT PRESENT:**  Nicole Dunbar  Didier Coulomb  Martin Dieryckx  Wade Conlon, BOD Ex-O  Tim McGinn, Coord. Officer  **ASHRAE STAFF:**  Mike Vaughn, MORTS | **GUESTS PRESENT: NONE**  **ASHRAE LEADERSHIP PRESENT**: **NONE** | |
|  | |  | |
|  | |  | |

**RECOMMENDATIONS FOR TECH COUNCIL APPROVAL: NONE**

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**MOTIONS**

|  |  |  |
| --- | --- | --- |
| No. | **Motion** | Page |
| 1 | 2022 REF-CPCC Committee minutes from the 2022 Winter meeting be approved. Motion Passed 9-0-0-3 (12) CNV CH/SK | 1 |
| 2 | Meeting Agenda approved with no proposed changes or additions. Motion Passed 9-0-0-3 CNV (12) SK/CH |  |
| 3 | Motion to adjourn meeting - Motion Passed 11-0-0-0 (11) CV DL/ – Meeting adjourned on April 11th at noon. | 6 |

**NEW ACTION ITEMS – 2022 Winter – Meeting**

|  |  |  |  |
| --- | --- | --- | --- |
| No. | **Responsibility** | **Action Item** | Status/  Page |
| 1 | Staff | Add Wade’s BOD ExO presentation to REF-CPCC Basecamp  And Martin’s Presentation on Bi-Annual Refrigeration Technology Report Subc. work to Basecamp. | Complete |
| 2 | Chair & Members | Recommend to Chair & Staff new potential voting members be added to the REF-CPCC committee roster for SY 2022-2023 so that staff can pass this information on to Chair & BOD ExO as soon as possible. | Complete |
| 3 | Staff | Refresh all the REF-CPCC Subc. Rosters before June Meeting. Look for additional folks to staff REF-CPCC Subcs. | On-going |
| 4 | Dieryckx | Propose alternate text or edits to IIR - IIF concerning the Five Fundamental Cooling & Refrigeration terms to address Heat Pump issue. | On-going |
| 5 | (All Sub. Chairs and Staff) | Work with staff to poll for a subcommittee meeting in early spring 2022 so that all subcommittees meet before Annual meeting of REF-CPPC in June. | New |
|  |  |  |  |
| 6 | Chair & Members | Decarbonization Task force not on REF-CPCC Agenda -Suggest retiring cold-chain Subc. and instead form Decarbonization Subcommittee | New |
| 7 | Chair & Members | Suggest working with R in ASHRAE Subc. to incorporate Cold Chain Subc. | New |
| 8 | Staff | Do we have liaisons to all 12 current MTGs, Particularly MTG.CEA (Controlled Environment Agriculture)? Carlos is the MTG.RAC (Refrigeration and Air Conditioning) Liaison & MTG LowGWP Liaison is Steve Kujak. | New |
| 9 | All | Look at revised position document Refrigerants and their Responsible Use to make sure heat pumps reflected properly in document – HVAC&R replaces Refrigeration & Air Conditioning | On-going |
| 10 | Staff | Recast Ammonia position document as a White Paper – MBO #2 – Translate to other languages such as Hindi besides English. Very important in developing countries. Incoming member Harshal Surange volunteered to help with translation and overall effort. | On-going /6 |
| 10 | Staff | Try to refresh all the Subc. rosters before June Meeting | On-going |
| 11 | Staff | Add Martin’s presentation to REF\_CPCC Basecamp | On-going |
| 12 | Staff | Information on Kigali Agreement is not included in the ASHRAE HDBK | On-going |
| 13 |  |  |  |

# LIST OF ACRONYMS

|  |  |  |  |
| --- | --- | --- | --- |
| AI | Action Item | MORTS | Manager of Research & Technical Services |
| ASHRAE | American Society of Heating, Refrigerating and Air-conditioning Engineers | MOU | Memorandum of Understanding |
| BOD | Board of Directors | MTG | Multidisciplinary Task Group |
| CNV | Chair Not Voting | OPS | TechC Operations Subcommittee |
| CTTC | Chapter Technology Transfer Committee | PAOE | Presidential Award of Excellence |
| DRSC | TechC Document Review Subcommittee | PD | Position Document |
| Ex-O | Ex-Officio | RatRU | Refrigerants and their Responsible Use |
| GCCA | Global Cold Chain Alliance | REF-CPCC | Refrigeration Technology Committee for Comfort, Process, and Cold-Chain |
| IIR | International Institute of Refrigeration | SY | Society Year |
| IoR | Institute of Refrigeration | TAC | Technical Activities Committee |
| MBO | Management by Objectives | TC | Technical Committee |
| MOP | Manual of Procedures | UNEP | United Nations Environment Programme |

**ATTACHMENT A**

**Refrigeration Technology Committee for Comfort, Process, and Cold-Chain**

**(REF-CPCC)**

|  |  |  |  |
| --- | --- | --- | --- |
| **REF-CPCC Awards Subcommittee** | | | |
| **Scope:** | REF-CPCC **Awards Subcommittee** will develop award recipient recommendations each year for the Briley and Garland awards and possibly develop new refrigeration related awards. | | |
| **Chair:** | **Ayman Eltalouny –** [ayman.eltalouny@unep.org](mailto:ayman.eltalouny@unep.org) **– Ph. 0097317825110** | | |
| **SY 19-20 Objectives:** | | | |
| **Objective #1** | **Ensure wider engagement of Ref. Committee members in the process of judging the Briley and Garland Awards** | | |
| **Objective #2** | **Map existing ASHRAE awards and recommend other award categories in relation to the scope of the Refrigeration Committee** | | |
|  | | | |
| **Subc. Members:** |  | | |
| **Name** | **Email** | **Phone Number** | **Affiliation** |
| **Ayman Eltalouny, Chair** | [ayman.eltalouny@unep.org](mailto:ayman.eltalouny@unep.org) | 0097317825110 | UNEP |
| Martin Dieryckx | [dieryckx.m@daikineurope.com](mailto:dieryckx.m@daikineurope.com) | 477663625 | Daikin |
| Charles Hon | [chon@truemfg.com](mailto:chon@truemfg.com) | (636) 240-2400x1383 | True Mfg. |
| Carlos Mitroga | [cmitroga@danfoss.com](mailto:cmitroga@danfoss.com) | 56228978811 | Danfoss |
|  |  |  |  |

**AWARDS Subcommittee Meeting Start Time Options based upon home base locations of members:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Ayman** | **Martin** | **Charlie** | **Carlos** | TBD | TBD | TBD |
| 4pm | 3pm | 8am | 10am |  |  |  |
| 5pm | 4pm | 9am | 11am |  |  |  |
| 6pm | 5pm | 10am | 12pm |  |  |  |
| 7pm | 6pm | 11am | 1pm |  |  |  |

**Refrigeration Technology Committee for Comfort, Process, and Cold-Chain**

**(REF-CPCC)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Cold Chain Subcommittee** | | | |
| **Draft Scope:** | REF-CPCC **Cold Chain Subcommittee** will research and study current topics related to temperature-controlled supply chain and disseminate this new information to a broader audience through collaboration with the Program, Research subcommittees or through other organizations. | | |
| **Chair:** | **Dustin Lilya -** [dlilya@dcengineering.net](mailto:dlilya@dcengineering.net) **– Ph. (208) 288-2181** | | |
| **SY 19-20 Objectives:** | | | |
| **Objective #1** | **Recruit and form the Subcommittee membership and define roles responsibilities for the committee members.** | | |
| **Objective #2** | **Reach out to cold chain community and collect information on relevant current topics of interest Food Safety and Food Security. Communicate the relevant topics to the other stakeholders (Research and Program Committees)** | | |
|  | | | |
| **Subc. Members:** |  | | |
| **Name** | **Email** | **Phone Number** | **Affiliation** |
| **Dustin Lilya, Chair** | [dlilya@dcengineering.net](mailto:dlilya@dcengineering.net) | (208) 288-2181 | DC Engineering |
| Adnan Ayub | [adnan@iso-therm.com](mailto:adnan@iso-therm.com) | (817) 472-9922 | Isotherm Inc. |
| Charles Hon | [chon@truemfg.com](mailto:chon@truemfg.com) | (636) 240-2400x1383 | True Mfg. |
| Doug Scott | [dscott@vacomtech.com](mailto:dscott@vacomtech.com) | (909) 374-1113 | VaCom Technologies |
| Alaa Olama | [alaaolama@gmail.com](mailto:alaaolama@gmail.com) | +201006099950 | Montreal Protocol |
| Michael Saunders | [Mike.saunders@emerson.com](mailto:Mike.saunders@emerson.com) | 937-726-4928 | Emerson |
| John Gallaher | [John.gallaher2@gmail.com](mailto:John.gallaher2@gmail.com) | (828) 577-1122 | ASHRAE Member |
| Harshal Surange | [harshalsurange@gmail.com](mailto:harshalsurange@gmail.com) | 937-706-48458 | ACR Project Consultants |
| Ayman Eltalouny | [ayman.eltalouny@unep.org](mailto:ayman.eltalouny@unep.org) | 0097317825110 | UNEP |

**COLD CHAIN Subcommittee Meeting Start Time Options based upon home base locations of members:**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Doug** | **Dustin** | **Adnan** | **Charlie** | **MikeS.** | **JohnG.** | **Alaa** | **Ayman** | **Harshal** |
| 7am | 8am | 9am | 9am | 10am | 10am | 4pm | 4pm | 7:30pm |
| 8am | 9am | 10am | 10am | 11am | 11am | 5pm | 6pm | 8:30pm |
| 9am | 10am | 11am | 11am | 12pm | 12pm | 6pm | 7pm | 9:30pm |
| 10am | 11am | 12pm | 12pm | 1pm | 1pm | 7pm | 8pm | 10:30pm |

**Refrigeration Technology Committee for Comfort, Process, and Cold-Chain**

**(REF-CPCC)**

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| --- | --- | --- | --- |
| **HVAC Subcommittee** | | | |
| **Scope:** | REF-CPCC **Comfort Cooling and Heating Subcommittee** will research and study current topics related to comfort cooling in the refrigeration spectrum and disseminate this information to a broader audience through collaboration with the Program, Research subcommittees or through other organizations. | | |
| **Chair:** | **New Chair needed now that Walid has rolled off REF-CPCC** | | |
| **SY 19-20 Objectives:** | | | |
| **Objective #1** | **Identify councils, committees, subcommittees and other entities within ASHRAE that may help meeting the scope of the HVAC subcommittee** | | |
| **Objective #2** | **Work with ASHRAE CEC and other organizations to document and disseminate HVAC workshops, seminars and conferences related to comfort cooling.** | | |
|  |  | | |
| **Subc. Members:** |  | | |
| **Name** | **Email** | **Phone Number** | **Affiliation** |
| **Steve Kujak, Chair** | skujak@tranetechnologies.com | (608) 787-3766 | Trane |
| Glenn Hourahan | [ghoura@comcast.net](mailto:ghoura@comcast.net) | (703) 625-2522 | Hourahan Consulting, LLC |
| Omar Abdelaziz | [omar.abdel.aziz@gmail.com](mailto:omar.abdel.aziz@gmail.com) | (865)387-0725 | Oak Ridge National Lab |
|  |  |  |  |
|  |  |  |  |

**HVAC Subcommittee Meeting Start Time Options based upon home base locations of members:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Steve** | **Glenn** | **Omar** | **TBD** | **TBD** |
| 7am | 8am | 2pm |  |  |
| 8am | 9am | 3pm |  |  |
| 9am | 10am | 4pm |  |  |
| 10am | 11am | 5pm |  |  |

**Refrigeration Technology Committee for Comfort, Process, and Cold-Chain**

**(REF-CPCC)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Program Subcommittee** | | | |
| **Scope:** | REF-CPPC **Program Subcommittee** will develop technical programs of various types (Technical Paper Sessions, Conference Paper Sessions, Seminars, Debates, Forums, Panels, and workshops) for the REF-HRAC committee that can be presented at Society meetings or at other organizations conferences. The subcommittee will also work with other Society committees and other organizations to co-sponsor programs that jointly benefit both committees or organizations. | | |
| **Chair:** | **Steven Gill -** ASHRAE@stephencgill.com **– PH: 1949850651** | | |
| **SY 19-20 Objectives:** | | | |
| **Objective #1** | **Develop Winter and Annual Programs** | | |
| **Objective #2** | **Reach-out to TC Program Subcommittees Chairs and work together to develop co-sponsored programs** | | |
|  | | | |
| **Subc. Members:** |  | | |
| **Name** | **Email** | **Phone Number** | **Affiliation** |
| **Steven Gill, Chair** | [ASHRAE@stephencgill.com](mailto:ASHRAE@stephencgill.com) | 1949850651 | Stephen Gill Associates |
| Didier Coulomb | [d.coulomb@iifiir.org](mailto:d.coulomb@iifiir.org) | 33142273235 | IIFIIR |
| Dr. Georgi Kazachki | [kazachki@comcast.net](mailto:kazachki@comcast.net) | (678)576-7135 | CRYOTHERM Consulting |
| Gurunarayana Ravi | [gurunarayana.ravi@lennoxind.com](mailto:gurunarayana.ravi@lennoxind.com) | (281)907-2901 | Lennox |
| Prof. Akio Miyara | [miyara@me.saga-u.ac.jp](mailto:miyara@me.saga-u.ac.jp) | 81952288623 |  |
| Prof. Yunho Hwang | [yhhwang@umd.edu](mailto:yhhwang@umd.edu) | (301) 405-5247 | U. Maryland |

**Program Subcommittee Meeting Start Time Options based upon home base locations of members:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Didier** | **Steven** | **Georgi** | **Yunho** | **Ravi** | **Akio** | TBD |
| 2pm | 1pm | 8am | 8am | 7am | 9pm |  |
| 3pm | 2pm | 9am | 9am | 8am | 10pm |  |
| 4pm | 3pm | 10am | 10am | 9am | 11pm |  |
| 5pm | 4pm | 11am | 11am | 10am | 12pm |  |

**Refrigeration Technology Committee for Comfort, Process, and Cold-Chain**

**(REF-CPCC)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Research Subcommittee** | | | |
| **Scope:** | REF-CPCC **Research Subcommittee** will develop research projects for bid that support and advance the scope of REF-HRAC (via RTARs, WS, TRPs, and RPs) The subcommittee will also work with other Society committees and outside organizations to co-sponsor research projects that jointly benefit both committees or organizations. | | |
| **Chair:** | **Kashif Nawaz –** [nawazk@ornl.gov](mailto:nawazk@ornl.gov) **– Ph. 865-574-9338** | | |
| **SY 19-20 Objectives:** | | | |
| **Objective #1** | **New! - Develop list of suggested refrigeration research topics for consideration by the new Research Advisory Panel (RAP) so that they can be included in new Research Strategic Plan for Society. Recruit Research Subcommittee members, brainstorm research topics, and develop RTARs** | | |
| **Objective #2** | **Reach-out to specific TC research subcommittee chairs and work towards developing cooperative research program.** | | |
| **Subc. Members:** |  | | |
| **Name** | **Email** | **Phone Number** | **Affiliation** |
| **Kashif Nawaz, Chair** | [nawazk@ornl.gov](mailto:nawazk@ornl.gov) | (865) 574-9338 | DOE- ORNL |
| Yunho Hwang | yhhwang@umd.edu | (301) 405-2025 | U. Maryland |
| Adnan Ayub | [adnan@iso-therm.com](mailto:adnan@iso-therm.com) | (817) 472-9922 | Isotherm Inc. |

**Research Subcommittee Meeting Start Time Options based upon home base locations of members:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Yunho** | **Kashif** | **Adnan** | TBD | TBD | TBD |
| 8 am | 8 am | 7 am |  |  |  |
| 9 am | 9 am | 8 am |  |  |  |
| 10 am | 10 am | 9 am |  |  |  |

**Research Topic Ideas:**

1. Refrigerant Leakage Study:
   1. Evaluate the HVAC system performance degradation due to refrigerant leaks.
   2. A comprehensive study on the HVAC components that further contribute to leakages
   3. Determination and analysis specific improvements that can reduce specific leakages within the vapor-compression cycle.
2. Other Ideas
   1. Thermal performance prediction and analysis on the economized vapor injection air-source heat pump in hot climate region of Middle East
   2. Application characteristics of variable refrigerant flow heat pump system with vapor injection in severe hot region.
   3. Exergo-economic analysis and optimization of two-stage vapor injected system for cooling applications.
   4. Charge-sensitive modeling of vapor compression systems for off-design performance simulation
   5. Rooftop air-conditioning unit performance improvement using refrigerant circuitry optimization.
   6. Investigation of Nano-lubricants Applied to Residential Air-Conditioning System.

**Refrigeration Technology Committee for Comfort, Process, and Cold-Chain**

**(REF-CPCC)**

|  |  |  |  |
| --- | --- | --- | --- |
| **R in ASHRAE Subcommittee** | | | |
| **Scope:** | REF-CPCC **R in ASHRAE Subcommittee** will be responsible for maintaining the “R in ASHRAE” web page on the ASHRAE website and with developing new content for this webpage on a regular basis. | | |
| **Chair:** | **Didier Coulomb** – [d.coulomb@iifiir.org](mailto:d.coulomb@iifiir.org) **– Ph. 33142273235** | | |
| **SY 19-20 Objectives:** | | | |
| **Objective #1** | **Identifying ASHRAE technical committees involved in refrigeration issues and their activities** | | |
| **Objective #2** | **Identifying ASHRAE technical committees involved in refrigeration issues and their activities** | | |
|  | | | |
| **Subc. Members:** |  | | |
| **Name** | **Email** | **Phone Number** | **Affiliation** |
| **Didier Coulomb, Chair** | [d.coulomb@iifiir.org](mailto:d.coulomb@iifiir.org) | 33142273235 | Intl. Institute of Refrigeration |
| Rajan Rajendran | [Rajan.Rajendran@emerson.com](mailto:Rajan.Rajendran@emerson.com) | (937) 726-0620 | Emerson |
| Rachel Selbert | [rachel.selbert@icf.com](mailto:rachel.selbert@icf.com) | (202) 791-8879 | EPA/ENERGY STAR |
| Bill Walter | [Bill.Walter@carrier.com](mailto:Bill.Walter@carrier.com) | (315) 657-7407 | Carrier |
| Adnan Ayub | [adnan@iso-therm.com](mailto:adnan@iso-therm.com) | (817) 472-9922 | Isotherm Inc. |
|  |  |  |  |

**R in ASHRAE Subcommittee Meeting Start Time Options based upon home base locations of members:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Didier** | **Rachel** | **Bill** | **Rajan** | **Adnan** | TBD |
| 1pm | 7am | 7am | 7am | 6am |  |
| 2pm | 8am | 8am | 8am | 7am |  |
| 3pm | 9am | 9am | 9am | 8am |  |
| 4pm | 10am | 10am | 10am | 9am |  |

**Refrigeration Technology Committee for Comfort, Process, and Cold-Chain**

**(REF-CPCC)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Refrigeration Technology Bi-Annual Report Subcommittee** | | | |
| **Scope:** | REF-CPCC **Bi-Annual Refrigeration Technology Report Subcommittee** will develop every other year the bi-annual Refrigeration Technology Report for publication and distribution. | | |
| **Chair:** | **Martin Dieryckx -** [Dieryckx.m@daikineurope.com](mailto:Dieryckx.m@daikineurope.com) – **Ph.** **0477663625** | | |
| **SY 19-20 Objectives:** | | | |
| **Objective #1** | **Define the scope and basic structure of the bi-annual report** | | |
| **Objective #2** | **Organize the required membership of the subcommittee in order to prepare the report in SY20-22** | | |
|  | | | |
| **Subc. Members:** |  | | |
| **Name** | **Email** | **Phone Number** | **Affiliation** |
| **Martin Dieryckx, Chair** | Dieryckx.m@daikineurope.com | 0477663625 | Daikin |
| Rajan Rajendran | [Rajan.Rajendran@emerson.com](mailto:Rajan.Rajendran@emerson.com) | (937) 726-0620 | Emerson |
| Tony Welter | [tony.welter@hendersonengineers.com](mailto:tony.welter@hendersonengineers.com) | (913) 742-5484 | Henderson Engineers |
| Georgi Kazachki | [kazachki@comcast.net](mailto:kazachki@comcast.net) | (678)576-7135 | CRYOTHERM Consulting |
| Shitong Zha | [shitongzha@gmail.com](mailto:shitongzha@gmail.com) | (470) 328-9018 |  |
| Adnan Ayub | [adnan@iso-therm.com](mailto:adnan@iso-therm.com) | (817) 472-9922 | Isotherm Inc. |
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|  |  |  |  |

**Refrigeration Technology Bi-Annual Report Subcommittee Meeting Start Time**

**Options based upon home base locations of members:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Martin** | **Rajan** | **Georgi** | **Shitong** | **Adnan** | **Tony** |
| 2pm | 8am | 8am | 8am | 7am | 7am |
| 3pm | 9am | 9am | 9am | 8am | 8am |
| 4pm | 10am | 10am | 10am | 9am | 9am |
| 5pm | 11am | 11am | 11am | 10am | 10am |

**Refrigeration Technology Committee for Comfort, Process, and Cold-Chain**

**(REF-CPCC)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Refrigeration Representatives to MTG.RAC** | | | |
| **Scope:** | The MTG will coordinate and oversee the creation of an ASHRAE/UNEP Guide for Refrigeration and Air-Conditioning (RAC) Plant Assessments. The Guide aims to be an international reference for the safe and sustainable operation and maintenance of air-conditioning and refrigeration plants, with special focus on developing markets. The Guide is to form the basis of tools that will verify compliance to recommended practices that can be verified through a point-based qualification or verification scheme. The work will be a cooperative effort with United Nations Environment due to the critical need for such guidance in the developing world with availability of UNEP funding to offset authoring expenses. | | |
| **REF-CPCC Voting Representative** | **Carlos Alberto Mitroga -** [cmitroga@danfoss.com](mailto:cmitroga@danfoss.com) **- 541147564100** | | |
| **SY 19-20 Objectives:** | | | |
| **Objective #1** | **Support the MTG.RAC in the development of Guide for Refrigeration and Air-Conditioning (RAC) Plant Assessments** | | |
| **Objective #2** | **Report back regularly to REF-CPCC on progress made on the guide and solicit assistance from REF-CPCC members as required to help complete the Guide in a timely fashion.** | | |
|  | | | |
| **Alternate Members** |  | | |
| **Name** | **Email** | **Phone Number** | **Affiliation** |
| Alt. #1 Tony Welter | [tony.welter@hei-eng.com](mailto:tony.welter@hei-eng.com) |  |  |
| Alt. #2 Dustin Lilya | dlilya@dcengineering.net | 208-288-2181 |  |
| Alt. #3 Stephen Gill | ASHRAE@stephencgill.com | 44 7970 786893 |  |
|  |  |  |  |

**MTG.RAC Voting Representative & Alternates Meeting Start Time Options based upon home base locations of members:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Carlos** | **Stephen** | **Tony** | **Dustin** |
| 9am | 2pm | 7am | 8am |
| 10am | 3pm | 8am | 9am |
| 11am | 4pm | 9am | 10am |
| 12pm | 5pm | 10am | 11am |